Supplemental Information Related to Risk Assessment for the Off-Site Transportation of Low-Level Mixed Waste for the U.S. Department of Energy Waste Management Programmatic Environmental Impact Statement

by F.A. Monette, B.M. Biwer, D.J. LePoire, M.A. Lazaro, A.A. Antonopoulos, H.M. Hartmann,
A.J. Policastro, and S.Y. Chen

Environmental Assessment Division,
Argonne National Laboratory, 9700 South Cass Avenue, Argonne, Illinois 60439

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

December 1996

Work sponsored by United States Department of Energy,
Assistant Secretary for Environmental Management

MASTER

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED

DISCLAIMER

**Portions of this document may be illegible
electronic image products. Images are
produced from the best available original
document.**

CONTENTS

NOTATION	vii
ABSTRACT	1
1 INTRODUCTION	1
2 LOW-LEVEL MIXED WASTE CHARACTERISTICS, ALTERNATIVES, AND ASSESSMENT SCOPE	5
2.1 Definition of Low-Level Mixed Waste	5
2.2 Low-Level Mixed Waste Alternatives for the WM PEIS	5
2.3 Characteristics of Low-Level Mixed Waste	6
2.3.1 Physical Waste Forms	7
2.3.2 Radiological Profiles	8
2.3.3 Chemical Profiles	8
2.4 Quantities and Characteristics of Transported Low-Level Mixed Waste by Case	9
2.5 Scope of the Risk Assessment	10
2.5.1 Cargo-Related Impacts: Radiological	10
2.5.2 Cargo-Related Impacts: Hazardous	11
2.5.3 Vehicle-Related Impacts	13
2.5.4 Transportation Modes	13
2.5.5 Receptors	13
3 METHODS FOR CALCULATING TRANSPORTATION-RELATED RISKS	15
3.1 Overview of Risk Assessment Method	15
3.2 Routine Risk Assessment Method	18
3.2.1 Collective Population Risk	18
3.2.2 Maximally Exposed Individual Risk	20
3.2.3 Vehicle-Related Routine Risk	20
3.3 Accident Assessment Method	21
3.3.1 Accident Risk Assessment	21
3.3.2 Accident Consequence Assessment	23
3.3.2.1 Radiological Accident Consequence Assessment	23
3.3.2.2 Hazardous Accident Consequence Assessment	24
3.3.3 Maximally Exposed Individual Risk	26
3.3.3.1 Radiological Maximally Exposed Individual Risk	26
3.3.3.2 Hazardous Maximally Exposed Individual Risk	28
3.3.4 Vehicle-Related Accident Risk Assessment	29
3.4 Representative Route Determination Method	29
3.4.1 Truck Route Determination	30
3.4.2 Rail Route Determination	30

CONTENTS (Cont.)

4	RISK ASSESSMENT ASSUMPTIONS AND PARAMETERS	36
4.1	Shipping and Packaging Assumptions for Low-Level Mixed Waste	36
4.2	Accident Rates	37
4.3	Characteristics of Accident Releases	37
4.3.1	Accident Severity Categories	41
4.3.2	Package Release Fractions	44
4.4	Atmospheric Conditions during Accidents	45
4.5	External Dose Rates from Shipments	46
4.6	Radiological Maximally Exposed Individual Exposure Scenarios	47
4.7	General Radiological Assessment Input Parameters	48
5	RISK ASSESSMENT RESULTS	51
5.1	Radiological Assessment	51
5.1.1	Collective Population Radiological Risk Results	52
5.1.2	Maximally Exposed Individual Assessment: Routine Transport	53
5.1.3	Radiological Accident Consequence Assessment	55
5.2	Hazardous Assessment Results	61
6	REFERENCES	81
APPENDIX A: Transported Material Summary Files Generated by the WASTE_MGMT Model		A-1
APPENDIX B: Detailed Radiological Risk Assessment Results		B-1

TABLES

3.1	Container Breach Rates and Atmospheric Releases Derived from HMIRS Statistical Data for Truck and Railcar Accidents	25
3.2	Release Fractions for Eight Accident Severity Categories	26
3.3	Chemical-Specific Values of ICRC and PAEC for LLMW Carcinogenic and Any-Adverse-Effect Constituents	27
3.4	Truck Route Distances between Major DOE Sites	31
3.5	Rail Route Distances between Major DOE Sites	33
4.1	Highway Combination-Truck Accident, Fatality, and Injury Rates by Road Type Based on Reportable Interstate-Carrier Accidents, Reported Fatalities and Injuries, and Estimated Flows, 1986-1988	38

TABLES (Cont.)

4.2	Railroad-Freight-Car Accident Rates, by State, for 1986, 1987, 1988, and 1985-1988 Combined	40
4.3	Fractional Occurrences for Accidents by Severity Category and Population Density Zone	44
4.4	Estimated Release Fractions for LLMW Packages under Various Accident Severity Categories	45
4.5	Aerosolized and Respirable Material Release Fractions for LLMW	46
4.6	General RADTRAN Input Parameters for the LLMW Assessment	49
5.1	Total Number of Shipments and One-Way Shipping Distances for the WM LLMW Alternatives	54
5.2	Total Routine Dose for the WM LLMW Alternatives	54
5.3	Total Accident Dose Risk for the WM LLMW Alternatives	55
5.4	Total Estimated Fatalities for the WM LLMW Alternatives	56
5.5	Total Estimated Cancer Incidence for the WM LLMW Alternatives	58
5.6	Total Estimated Genetic Effects for the WM LLMW Alternatives	60
5.7	Estimated Routine Doses and Lifetime Risk of Fatal Cancer to MEIs from Shipments of WM LLMW	62
5.8	Cumulative Dose and Lifetime Risk to MEI Living along a Site Entrance Route for WM LLMW Shipments	63
5.9	Estimated Consequences for the Most Severe Accidents Involving Shipments of WM LLMW	68
5.10	Summary of Cargo-Related Population Risks for WM LLMW Shipments by Highway	69
5.11	Summary of Cargo-Related Population Risks for WM LLMW Shipments by Railway	70
5.12	Lifetime MEI PIC Risk for WM LLMW Transportation	72
5.13	MEI Hazard Quotients for PAE End Points for WM LLMW	73
5.14	Lifetime MEI PIC Risk by LLMW Alternative	74

TABLES (Cont.)

5.15	MEI Hazard Quotients for PAE Risk by LLMW Alternative	75
5.16	Estimated Chemical Exposure Consequences for the Most Severe Accident Involving the Hazardous Component of WM LLMW Shipments	77
5.17	Estimated Chemical Exposure Consequences Associated with the Most Severe Accident Involving the Radiological Component of WM LLMW Shipments	79

FIGURES

2.1	Conceptualization of Threshold Health Effects	12
3.1	Technical Approach for the Radiological Component of the LLMW Transportation Risk Assessment	16
3.2	Technical Approach for the Hazardous Component of the LLMW Transportation Risk Assessment	17
4.1	Scheme for NUREG-0170 Classification by Accident Severity Category for Truck Accidents	42
4.2	Scheme for NUREG-0170 Classification by Accident Severity Category for Rail Accidents	43

NOTATION

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

ACRONYMS, INITIALISMS, AND ABBREVIATIONS

ANL-E	Argonne National Laboratory-East
A-RAMS	ALOHA risk assessment modeling system
BNL	Brookhaven National Laboratory
CFR	<i>Code of Federal Regulations</i>
CH	contact-handled
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EPA	U.S. Environmental Protection Agency
Hanford	Hanford Site
HLW	high-level waste
HQ	hazard quotient
HW	hazardous waste
ICRC	increased carcinogenic risk concentration
ICRP	International Commission on Radiological Protection
IDB	Integrated Data Base
LLMW	low-level mixed waste
LLNL	Lawrence Livermore National Laboratory
LLW	low-level waste
MEI	maximally exposed individual
MWIR-2	<i>Mixed Waste Inventory Report</i>
NRC	U.S. Nuclear Regulatory Commission
NTS	Nevada Test Site
ORR	Oak Ridge Reservation
PAE	potential adverse effect
PAEC	potential adverse effect concentration
PCB	polychlorinated biphenyl
PGDP	Paducah Gaseous Diffusion Plant
PIC	potential-increased-cancer
PIH	poison inhalation hazard
PLC	potential life-threatening concentration
PORTS	Portsmouth Gaseous Diffusion Plant
RCRA	Resource Conservation and Recovery Act
RfD	reference dose
RH	remote-handled
SMAC	Shipment Mobility/Accountability Collection
SNL-NM	Sandia National Laboratories (New Mexico)
TRU	transuranic
TRUW	transuranic waste
TSD	treatment, storage, and disposal

UNITS OF MEASURE

cm	centimeter(s)
cm ²	square centimeter(s)
cm ³	cubic centimeter(s)
d	day(s)
ft	foot (feet)
g	gram(s)
gal	gallon(s)
h	hour(s)
K	(degree[s]) Kelvin
kg	kilogram(s)
km	kilometer(s)
km ²	square kilometer(s)
L	liter(s)
lb	pound(s)
m	meter(s)
m ³	cubic meter(s)
mg	milligram(s)
mi	mile(s)
mi ²	square mile(s)
min	minute(s)
mph	mile(s) per hour
mrem	millirem
N	newton(s)
nCi	nanocurie(s)
ppm	part(s) per million
rem	rem
s	second(s)
yd	yard(s)
yr	year(s)
µg	microgram(s)

**SUPPLEMENTAL INFORMATION RELATED TO RISK ASSESSMENT
FOR THE OFF-SITE TRANSPORTATION OF LOW-LEVEL MIXED
WASTE FOR THE U.S. DEPARTMENT OF ENERGY
WASTE MANAGEMENT PROGRAMMATIC
ENVIRONMENTAL IMPACT STATEMENT**

by

F.A. Monette, B.M. Biwer, D.J. LePoire, M.A. Lazaro, A.A. Antonopoulos,
H.M. Hartmann, A.J. Policastro, and S.Y. Chen

ABSTRACT

This report provides supplemental information to support the human health risk assessment conducted for the transportation of low-level mixed waste (LLMW) in support of the U.S. Department of Energy Waste Management Programmatic Environmental Impact Statement (WM PEIS). The assessment considers both the radioactive and chemical hazards associated with LLMW transportation. Detailed descriptions of the transportation health risk assessment methods and results of the assessment are presented in Appendix E of the WM PEIS. This report presents additional information that is not included in Appendix E but that was needed to conduct the transportation risk assessment for Waste Management (WM) LLMW. Included are definitions of the LLMW alternatives considered in the WM PEIS; data related to the inventory and to the physical, chemical, and radiological characteristics of WM LLMW; an overview of the risk assessment methods; and detailed results of the assessment for each WM LLMW case considered.

1 INTRODUCTION

This report presents supplemental information to support the human health risk assessment conducted for the transportation of low-level mixed waste (LLMW) for the U.S. Department of Energy (DOE) Waste Management Programmatic Environmental Impact Statement (WM PEIS) (DOE 1996). The assessment considers both the radioactive and chemical hazards associated with LLMW transportation. Detailed descriptions of the transportation health risk assessment methods, major assumptions, and packaging and routing determinations, as well as a summary of the results of the transportation assessment, are presented in Appendix E of the WM PEIS (DOE 1996). This report presents additional information that is not presented in Appendix E but that was needed to conduct the transportation risk assessment. This report should be read in conjunction with Appendix E to provide a complete description of the transportation risk assessment conducted for LLMW. Similar supporting reports have been prepared for the transportation assessments conducted

for the WM PEIS alternatives for high-level waste (HLW), low-level waste (LLW), transuranic waste (TRUW), and hazardous waste (HW) (Monette et al. 1996a,b,c; Lazaro et al. 1996).

The WM PEIS assessment of LLMW considers LLMW generated from Waste Management (WM) activities. Wilkins et al. (1996) present a description of the LLMW inventory, characteristics, and treatment options. This analysis does not include the updated LLMW volumes that are presented in Appendix I in the WM PEIS. This present report includes definitions of the LLMW alternatives considered in the WM PEIS and presents data related to the inventory and to the physical, chemical, and radiological characteristics of WM LLMW that are used in the transportation assessment (Section 2). An overview of the methods for risk assessment is provided in Section 3. In addition, supplemental assumptions and parameters for the risk assessment calculations are provided (Section 4); and detailed results of the assessment are presented for each WM LLMW alternative considered (Section 5).

The transportation of LLMW involves a risk to both crew members and members of the public. Part of this risk results from the nature of transportation itself, independent of the radioactive or hazardous characteristics of the cargo; for instance, increased levels of pollution from vehicular exhaust emissions may affect human health. Similarly, accidents during transportation may cause injuries and fatalities. These risks can be viewed as "vehicle-related" risks. On the other hand, the transportation of LLMW may pose an additional risk because of the characteristics and potential hazards of the material itself. These risks are considered to be "cargo-related" risks.

In this report, the risks to human health from both vehicle- and cargo-related causes are assessed for shipments of LLMW. Cargo-related risks from both the radiological and hazardous components of LLMW are assessed. Generally, the approaches are similar for the radioactive and hazardous risk assessment components, except that the physical mechanisms and measures for assessing the cargo-related effects on health are fundamentally different (see WM PEIS Appendix E) (DOE 1996). Differences exist in the assumptions and data used to develop the risk estimators for these two classes of contaminants.

For radioactive materials, the cargo-related impacts on human health during transportation are caused by exposure to ionizing radiation. Exposures to radiation occur during both routine (i.e., incident-free) transportation and during accidents. During routine operations, human exposures can be received from the low-level radiation field in the vicinity of a loaded shipment. The external radiation field must be below limits specified in federal regulations for all shipments of radioactive material. During transportation-related accidents, human exposures may occur following the release and dispersal of radioactive material into the environment via multiple environmental pathways, such as exposure to contaminated ground or air or the ingestion of contaminated food.

The potential exposures to the general population from transportation of radioactive materials, either from routine operations or from postulated accidents, are usually at a low dose, such that the primary adverse health effect is the potential induction of latent cancer (i.e., cancer that occurs after a latency period of several years from the time of exposure).

The types of cancers induced by radiation are similar to "naturally occurring" cancers and may be expressed at some point in the lifetimes of the exposed individuals. Transportation of radioactive waste is not expected to cause acute (short-term) radiation-induced fatalities or to produce immediately observable effects in exposed individuals.

The effects of low-level radiation are generally characterized by correlating the total human exposure to radiation (i.e., dose) to the number of cases of latent cancer. The correlation of radiation dose and human health effects for low doses has been traditionally based on what is termed the "linear/no-threshold hypothesis," which has been described by various international authorities on protection against radiation. This hypothesis implies, in part, that even small doses of radiation cause some risk of inducing cancer and that doubling the radiation dose would mean doubling the expected numbers of cancers. The data on the health risk from radiation have been derived primarily from human epidemiological studies of past exposures, such as Japanese survivors of the atomic bomb in World War II and persons exposed during medical applications.

In contrast to radioactive materials, hazardous chemicals do not pose cargo-related risks to humans during routine transportation-related operations. Waste transportation operations are generally well regulated with respect to packaging, such that small spills or seepages during routine transport are kept to a minimum and do not result in exposures; for example, containers of liquids are surrounded by absorbent overpacking. Potential cargo-related health risks to humans can occur only if the integrity of a container is compromised during an accident (i.e., a container is breached or spilled). Under such conditions, some toxic chemicals (such as chlorine gas) may cause an immediate health threat to exposed individuals.

For chemical exposures, the severity of the immediate health effects depends strongly on the toxicity and exposure concentration of the specific chemical(s) released. The severity of the immediate (i.e., acute) health effects can range from slight irritation to fatality for the exposed individuals. In this assessment, two end points for acute health effects are assessed: potential life-threatening and potential reversible or irreversible adverse health effects (from slight effects up to and including lethality). A nonlinear or threshold correlation is assumed between the exposure concentration and the toxicity for the evaluation of these acute effects; that is, some low level of exposure can be tolerated without affecting health. In many cases, data on human toxicity relating acute health effects to chemical exposures do not exist. When data on toxicity in humans are not available, chemical risk estimators are derived from levels that are toxic to laboratory animals. The use of animal data to predict toxic concentrations in humans adds uncertainty to the risk estimates.

In addition to acute health effects, the cargo-related risk of excess cases of latent cancer from accidental chemical exposures has been estimated in this report. Similar to the correlation for radionuclides, the correlation of chemical dose with the induction of human cancer has traditionally been based on the linear/no-threshold hypothesis. The treatment of the carcinogenic effects of exposures resulting from accidental chemical releases has added uncertainty because the carcinogenic risk is estimated for short-term (one-hour) exposures.

Lifetime risks less than 1×10^{-6} have been considered negligible and are not estimated. The number of individuals experiencing an increased risk of cancer of 1×10^{-6} or greater has been estimated, without attempting to estimate the precise risk for those in the category of greater than 1×10^{-6} .

For reasons stated previously, health impacts from the radioactive and hazardous components of LLMW are calculated and presented separately in this report. No attempt has been made to add or compare the estimated risks for the two classes of contaminants. To understand and interpret the estimated health impacts presented in this report, readers must keep in mind the fundamental differences between radioactive and chemical contaminants discussed previously.

2 LOW-LEVEL MIXED WASTE CHARACTERISTICS, ALTERNATIVES, AND ASSESSMENT SCOPE

The risks of transporting LLMW have been assessed for seven WM alternatives in the WM PEIS. The transportation risks for each case depend on the amount of waste transported, the physical form of the waste, the specific chemicals and chemical quantities in the waste, and the quantity of radioactivity (curies) in each shipment. This section of the report describes the alternatives considered for WM LLMW in the WM PEIS, presents important LLMW inventory and characterization data used in the transportation assessment, and defines the scope of the human health risk assessment.

2.1 DEFINITION OF LOW-LEVEL MIXED WASTE

Low-level mixed waste is material that is both hazardous under the Resource Conservation and Recovery Act (RCRA) and a low-level radioactive waste. Low-level mixed waste contains RCRA-regulated chemicals or special waste types in a form or concentration sufficient to render the waste hazardous under the guidelines of the *Code of Federal Regulations* (40 CFR Part 261). Although asbestos-contaminated wastes are not hazardous under federal RCRA rules, friable asbestos waste is considered a HW in several states. For the WM PEIS, low-level radioactive waste contaminated with asbestos is considered as LLMW. High-level waste, spent nuclear fuel, and TRUW that may be contaminated with RCRA HW are not LLMW.

Low-level mixed waste is either contact-handled (CH) waste (dose at waste surface <200 mrem/h) or remote-handled (RH) waste (dose at waste surface >200 mrem/h). The handling category determines the level of protective shielding required to safely store and process the material. Low-level mixed waste is also classified as either alpha LLMW (combined activity of transuranic [TRU] radionuclides with half-lives greater than 20 years is between 10 and 100 nCi/g) or nonalpha LLMW (TRU activity < 10 nCi/g). The alpha status of LLMW is important in determining the choice of waste treatment facilities because, in some states, facilities that process alpha-containing wastes cannot be used for wastes with minimal TRU activity. Mixed TRUW (TRU activity > 100 nCi/g) is not addressed in this report. Together, the four radioactivity classifications (CH nonalpha LLMW, CH alpha LLMW, RH nonalpha LLMW, and RH alpha LLMW) determine the handling and routing for treatment or disposal (or both) of all LLMW.

2.2 LOW-LEVEL MIXED WASTE ALTERNATIVES FOR THE WM PEIS

For the purposes of the WM PEIS, the DOE is considering a range of alternatives for the configuration of new or expanded WM facilities and the potential consolidation of existing facilities. In general, the WM PEIS alternatives reflect decentralized, regionalized, and centralized approaches. For each type of waste, several options, which are referred to as cases, have been defined for each broad alternative. The individual cases differ in the

number, location, and types of facilities for treatment, storage, and disposal (TSD) that are being considered. Definitions of WM cases are provided in the following paragraphs.

For LLMW, the alternatives are (1) No Action, (2) Decentralized, (3) Regionalized, and (4) Centralized. The major alternatives are subdivided into seven cases as follows: (1) No Action; (2) Decentralized Alternative (plus one special treatment exception) Case 2a (49 treatment and 16 disposal sites); (3) Regionalized Alternative, including Case 4 (11 treatment plus one special treatment site exception and 12 disposal sites), Case 7 (seven treatment and six disposal sites), Case 10a (seven treatment sites and one disposal site), and Case 15 (four treatment and six disposal sites); and (4) the Centralized Alternative Case 17 (one treatment and disposal site). Each of the alternatives also incorporates Case 26 involving shipment of RH LLMW at about 1 L/yr (0.26 gal/yr), which is negligible in terms of transportation risk.

Transportation risks have been calculated for seven WM LLMW alternatives. The number of disposal sites varies from 16 for decentralized disposal to one for centralized disposal. Options for treatment also vary from decentralized to centralized approaches. In general, sites not having the capability for treatment or disposal ship to the nearest site that has such capability. The alternatives are summarized as follows:

- *No Action (Case 1).* Treatment and indefinite storage of LLMW generated in the future. No transportation occurs.
- *Decentralized (Case 2a).* Thirty-seven sites treat LLMW to land disposal restriction (LDR) levels, and 16 sites dispose.
- *Regionalized 1 (Case 4).* Eleven sites treat LLMW, and 12 sites dispose.
- *Regionalized 2 (Case 7).* Seven sites treat LLMW, and six sites dispose.
- *Regionalized 3 (Case 10a).* Seven sites treat LLMW, and one site disposes (Nevada Test Site [NTS]).
- *Regionalized 4 (Case 15).* Four sites treat LLMW, and six sites dispose.
- *Centralized (Case 17).* One site treats LLMW (Hanford Site [Hanford]), and one site disposes (Hanford).

2.3 CHARACTERISTICS OF LOW-LEVEL MIXED WASTE

To support the WM PEIS analysis of LLMW alternatives, a report has been prepared describing the LLMW inventory and characteristics at each DOE site (Wilkins et al. 1996). In addition, Wilkins et al. (1996) describe the current LLMW TSD capabilities of the DOE complex and present the important assumptions associated with the analysis of LLMW alternatives. The information in the report by Wilkins et al. (1996) was used as the primary source of information for the transportation assessment.

The report by Wilkins et al. (1996) describes LLMW management alternatives for inventory and operations-generated waste (WM LLMW). The WM LLMW includes the LLMW inventory currently in storage and the LLMW projected to be generated through the year 2013 at 49 sites. For each site, information on the inventory is presented in terms of projected waste volumes and masses. In addition, the physical, chemical, and radiological characteristics of the waste at each site are presented. Information from Wilkins et al. (1996) that is important for the transportation assessment is summarized subsequently.

2.3.1 Physical Waste Forms

The LLMW at each site is characterized as a function of the potential options for treatment of the various waste forms in the report by Wilkins et al. (1996). Wilkins et al. (1996) define 32 separate treatment categories for WM LLMW on the basis of the physical characteristics of the waste; however, Wilkins et al. also show how the 32 categories can be compressed into the following eight categories for the purposes of WM PEIS assessment: (1) aqueous liquids, (2) organic liquids, (3) solid process residues, (4) soils, (5) debris, (6) laboratory packs, (7) inherently hazardous material, and (8) monolith waste. For the WM PEIS, all aqueous liquid LLMW is assumed to be treated at the site of generation before transportation. Residuals are then managed as solid LLMW.

For purposes of the transportation assessment, shipments of six different LLMW forms were considered on the basis of the treatability categories defined for LLMW. The following codes identify the LLMW treatability categories considered in the transportation assessment:

- O = CH organic liquids, nonalpha — untreated;
- OA = CH organic liquids, alpha — untreated;
- C = CH heterogeneous solids, nonalpha — untreated;
- CA = CH heterogeneous solids, alpha — untreated;
- CT = CH heterogeneous solids, nonalpha — treated; and
- T = CH heterogeneous solids, alpha — treated.

The previous material categories were considered separately because requirements for treatment differ among them, and different accident release characteristics were used in the transportation assessment (e.g., organic liquids were assumed to be totally aerosolized in severe accidents, versus only about 10% for heterogeneous solids). In addition, a distinction was drawn between untreated and treated materials because, once treated, all waste would be in a solid physical form. The heterogeneous solids include all treatability categories with the exception of Category 2. No transportation of RH waste occurs for the LLMW alternatives.

2.3.2 Radiological Profiles

Radiological characteristics of LLMW are described by Wilkins et al. (1996) and are summarized subsequently. For the WM PEIS, the assumption is that radiological profiles for LLMW are dependent on the site but independent of the waste stream. The LLMW radiological profiles developed in the WM PEIS are based on information about the specific mission and operational history that generated radionuclides at the various sites and on the LLW information in the 1991 Integrated Data Base (IDB) (Oak Ridge National Laboratory 1991).

For the WM PEIS, radiological profiles are grouped into five distinct source term categories: (1) fission products, (2) induced activity, (3) uranium or thorium or both (U/Th), (4) TRUW, and (5) tritium. The IDB data provide radiological profiles for the five different LLW source term categories close to the time of waste generation. The IDB data also provide the amount (volume and activity) of each of the five LLW source term categories accumulated at each of the major DOE sites. Because the data have been accumulated over a number of years, the data represent the cumulative result of the various DOE waste-generating activities over those years.

In estimating the radiological profiles for the LLMW in the WM PEIS, the assumption is that, at the time of waste generation, LLMW radiological profiles for each site are the same as those for LLW; however, radioactive decay since the time of generation has been considered for LLMW. Therefore, the radioactive profile of LLMW at the time of treatment will differ considerably from its profile at the time of generation. The appropriate waste ages, the activity percentages, and the source term radiological profiles are combined and used to generate site-dependent radiological profiles and activity concentrations for LLMW. The individual site radiological profiles are detailed in the report by Wilkins et al. (1996).

2.3.3 Chemical Profiles

Site-specific LLMW hazardous-chemical profiles are also provided by Wilkins et al. (1996). The majority of information on the hazardous-chemical composition in LLMW is derived from site-specific (process) operational knowledge.

For the WM PEIS, the chemical profiles (i.e., the composition and concentration of RCRA-hazardous chemical constituents) for CH nonalpha WM LLMW have been developed from (1) compilation of the chemical composition data presented in the *Mixed Waste Inventory Report* (MWIR-2) (DOE 1994) and (2) an engineering assessment of the industrial processes that generated the respective LLMW streams. Chemical profiles for alpha LLMW are not developed separately because of the relatively small volume (compared with nonalpha LLMW) of this waste. For the same reason, chemical profiles for RH LLMW also assume the composition developed for CH nonalpha LLMW. Polychlorinated biphenyl (PCB) wastes also assume the same generic waste-stream-dependent chemical profiles, with the additional assumption of PCB concentrations of 500 ppm for all PCB-contaminated LLMW.

Information about historical DOE site operations and industrial processes, as well as MWIR-2 information, suggests that waste streams of a given treatment category from different sites in the DOE complex are similar in chemical composition. Therefore, the chemical profiles for WM-derived LLMW are assumed to be independent of the site that generated the waste and to depend only on the waste-steam treatment category. The chemical profiles developed by Wilkins et al. (1996) focus on 16 distinct chemicals or grouped classes of chemicals that are common to most waste streams. These chemicals and classes include six toxic metals, three inorganic chemicals, and seven classes of organic chemicals that are grouped according to important treatment parameters such as density, solubility, volatility, and degree of chlorination.

2.4 QUANTITIES AND CHARACTERISTICS OF TRANSPORTED LOW-LEVEL MIXED WASTE BY CASE

The LLMW inventory and radiological and chemical characterization data described previously are used as the primary input to a computational model called WASTE_MGMT (Kotek et al. 1996). The WASTE_MGMT model has been developed at Argonne National Laboratory-East (ANL-E) to support analyses of risks and costs for all alternatives for each waste type considered in the WM PEIS (Kotek et al. 1996). Input to the model includes not only data on the waste inventory and characterization, but also data on operations for the TSD facilities used for the wastes, and the definitions of the various alternatives. Specific modeling parameters for the LLMW assessment are discussed by Wilkins et al. (1996).

One output of the WASTE_MGMT model consists of the annual quantity, physical form, and radiological characteristics of the waste shipped between sites for each case. The output of the model consists of a set of origin-and-destination pairs that represent shipping linkages among generator, treatment, and storage sites. For each origin-and-destination pair, the model computes the annual volume (cubic meters), weight (kilograms), and chemical and radioactive profiles of the LLMW transported. The effects of potential waste treatment, such as volume reduction or incineration, are considered in the model and are reflected in changes in waste density and activity concentrations. The WASTE_MGMT output files are used directly as input to the transportation risk assessment.

The WASTE_MGMT transportation summary files generated for the LLMW transportation assessment are presented in Appendix A of this report. For each of the WM cases, shipments are summarized separately for heterogeneous solids and for organic liquids. The total quantity of shipments for a case can be found by summing the quantities for these two categories.

Note that the WASTE_MGMT files report the quantity of waste shipped on an *annual* basis (cubic meters per year or kilograms per year). The WM PEIS considers a 20-year time frame for WM LLMW generation. For most of the WM alternatives considered in the WM PEIS, the assumption was that shipments would occur uniformly over a 10-year period, which would allow an initial 10-year period to build TSD facilities. Sites would essentially store their own waste for the first 10 years and ship all waste over the subsequent 10 years.

Because of the differences in the time frames noted previously and the uncertainties in the actual timing of future waste shipments, the impacts of transportation for the various cases are best compared by examining the total impacts of transporting a specific inventory of waste, independent of the annual shipping rates. The total amount of LLMW transported for each case can be calculated by multiplying the annual shipment quantities (reported in the WASTE_MGMT files in Appendix A of this report) by 10 years.

2.5 SCOPE OF THE RISK ASSESSMENT

The transportation risk assessment is limited to estimating the human health risks incurred during the actual transportation of LLMW by truck or rail. The risks to workers or to the public during the loading, unloading, and handling of waste before or after shipment are considered as part of the normal operations of the facility and are not included in the transportation assessment. Similarly, the transportation risk assessment does not address how increased transportation levels may possibly impact local traffic flow, noise levels, logistics, or infrastructure. The impacts that are addressed are discussed subsequently.

2.5.1 Cargo-Related Impacts: Radiological

For radioactive materials, the cargo-related impacts on human health during transportation are caused by exposure to ionizing radiation. For all cases, radiological risks (i.e., risks that result from the radioactive nature of the LLMW) are assessed both for routine (normal) transportation and for accidents. The radiological risk associated with routine transportation results from the potential exposure of people to low levels of external radiation in the vicinity of a loaded shipment. The radiological risk from transportation-related accidents lies in the potential release and dispersal of radioactive material into the environment during an accident and the subsequent exposure of people through multiple exposure pathways (i.e., exposure to contaminated ground or air or the ingestion of contaminated food).

All radiologically related impacts are calculated in terms of dose and associated health effects in the exposed populations. The dose of radiation calculated is the total effective dose equivalent as specified in 10 CFR Part 20, which is the sum of the effective dose equivalent from exposure to external radiation and the 50-year committed effective dose equivalent (International Commission on Radiological Protection [ICRP] 1977) from exposure to internal radiation. Doses of radiation are calculated in units of rem (roentgen-equivalent man) for individuals and in units of person-rem for collective populations.

The potential exposures to the general population from transportation of radioactive materials, whether during routine operations or from postulated accidents, are usually at a low dose, such that the primary adverse health effect is the potential induction of latent cancers (i.e., cancers that occur after a latency period of several years from the time of exposure). The correlation of radiation dose and human health effects for low doses has been traditionally based on what is termed the "linear/no-threshold hypothesis," which has been described by various international authorities on protection against radiation. This

hypothesis implies, in part, that even small doses of radiation cause some risk of inducing cancer and that doubling the radiation dose would mean doubling the expected numbers of cancers. The types of cancer induced by radiation are similar to "naturally occurring" cancers and can be expressed later in the lifetimes of the exposed individuals.

On the basis of the analyses conducted for this report, LLMW transportation-related operations are not expected to cause acute (short-term) radiation-induced fatalities or to produce immediately observable effects in exposed individuals. Acute radiation-induced fatalities occur at doses well in excess of 100 rem (ICRP 1991), which generally would not occur for a wide range of transportation activities, including routine operations and accidents.¹ For all severe accident scenarios analyzed, other short-term effects such as temporary sterility and changes in blood chemistry are not expected.

In this report, the radiological impacts are expressed as health risks in terms of the number of estimated latent-cancer fatalities, the incidence of cancer, and the genetic effects in exposed populations for each alternative. The health risk conversion factors (expected latent health effects per dose absorbed) were derived from ICRP publication 60 (ICRP 1991).

2.5.2 Cargo-Related Impacts: Hazardous

For hazardous materials, the cargo-related impacts to human health during transportation would be caused by exposure occurring as a result of container failure and chemical release during an accident (i.e., a collision with another vehicle or road obstacle). For all cases, chemical risks (i.e., risks that result from the toxicology of the chemical composition of the hazardous portion of LLMW) are assessed for cargo-related transportation accidents. The chemical risk from transportation-related accidents lies in the potential release, transport, and dispersion of hazardous chemicals into the environment during an accident and the subsequent exposure of people through primarily inhalation exposure. The risks from routine transportation operations, unlike the radiological risks, are due solely to vehicular exhaust emissions (i.e., vehicle-related impacts; see Section 2.5.3).

The risks from exposure to the hazardous component of LLMW during transportation-related accidents can be either acute (result in immediate injury or fatality) or latent (result in cancer that would present itself after a latency period of several years). Both population risks and risks to the maximally exposed individual (MEI) have been evaluated for transportation accidents. The acute health end points, potential life-threatening effects, and potential adverse effects (PAEs) have been evaluated for the assessment of cargo-related population impacts from transportation accidents. The identification of chemicals in the hazardous component of LLMW having potential life-threatening effects was based on gaseous and liquid substances designated "poison inhalation hazard" (PIH) chemicals by the U.S. Department of Transportation (DOT) (see Appendix E of the WM PEIS [DOE 1996]). Chemicals selected for the PAE analysis included PIHs and

¹ In general, individual acute whole-body doses in the range of 300-500 rem are expected to cause fatality in 50% of the exposed individuals within 30-60 days (ICRP 1991).

gaseous or liquid chemicals with inhalation toxicity values (reference concentrations) available from the U.S. Environmental Protection Agency (EPA 1993a,b).

The acute effects evaluated are assumed to exhibit a threshold nonlinear relationship with exposure; that is, some low level of exposure can be tolerated without inducing a health effect. In order to estimate risks, chemical-specific values for the potential life-threatening concentration (PLC) and potential adverse effect concentration (PAEC) were developed. All individuals exposed at these levels or higher following an accident are included in HW transportation risk estimates. Use of this type of population risk descriptor (i.e., estimate of the number of persons exposed above a specified benchmark level) is recommended under EPA guidance (EPA 1992). Figure 2.1 presents a conceptual diagram of how PLC and PAEC values were derived. Additionally, to address MEIs, the locations of maximum HW concentration were identified for shipments with the largest potential releases of individual HW components.

A latent health end point, the increased risk of cancer, has also been used to assess the cargo-related population impacts from accidents involving carcinogen releases. Traditionally, risk assessment for chemical carcinogens characterizes risk to the MEI (EPA 1989). The MEI is included in the assessment of the hazardous component of risk from LLMW shipments (see Section 3.3.3). Additionally, for assessing risk to the general population, increased carcinogenic risk has been expressed as the number of individuals in the general population with an increased lifetime cancer risk of 1×10^{-6} greater, as recommended under EPA guidance for characterization of population risks (EPA 1992). Cancer risks greater than 1×10^{-6} have been designated as *increased cancer risk concern levels*. Overall population risk (in terms of the number of excess cancers expected in the population) has not been calculated for the hazardous component of LLMW as it was for the

FIGURE 2.1 Conceptualization of Threshold Health Effects (LC_{50} = concentration that is lethal to 50% of the population; and LC_{Lo} = lowest reported lethal concentration). Values for PAEC are derived by using TC_{50} levels (toxic to 50% of population) or TC_{Lo} levels (lowest toxic levels), instead of LC_{50} and LC_{Lo} .

radiological component of the same waste because this calculation would require estimation of average exposure levels in the population, while standardized cancer risk assessment methods address only MEIs. Therefore, characterizing population cancer risks associated with the hazardous component of LLMW as the number of individuals experiencing an increased risk of 1×10^{-6} was deemed preferable. Note that the cargo-related population cancer risks presented in this assessment cannot be directly compared with cancer risks for individuals. Instead, population risk has been assessed to account for potentially impacted individuals collectively.

2.5.3 Vehicle-Related Impacts

In addition to the cargo-related hazardous and radiological risks posed by transportation-related activities, risks are also assessed for vehicle-related causes for the same routes. These risks are independent of the radioactive nature of the cargo and would be incurred for similar shipments of any commodity. The vehicle-related risks are assessed for both routine conditions and accidents. Vehicle-related risks during routine transportation are caused by potential exposure to increased vehicular exhaust emissions. The routine risks are primarily associated with travel in urban environments. The vehicle-related accident risk refers to the potential for transportation-related accidents that result in fatalities due to physical trauma that are not related to the cargo in the shipment. State-specific rates for transportation-related fatalities are used in the assessment. Vehicle-related risks are presented in terms of estimated fatalities for each alternative.

2.5.4 Transportation Modes

Although LLMW could be transported by a variety of modes, all shipments have been assumed to take place by either truck or rail. For each case, risks have been calculated separately for all-truck and all-rail options, although the actual shipping campaigns for a selected alternative may involve a combination of the two modes. Rail shipments are assumed to take place by regular freight-train service; the use of special or dedicated rail service was not considered. Shipments by barge, although feasible for some sites, have not been explicitly considered because this mode of transportation is somewhat limited and has not been established as a major programmatic option for the WM PEIS assessment. Similarly, shipments by aircraft and other modes are not considered.

2.5.5 Receptors

In this report, transportation-related risks are calculated and presented separately for workers and for members of the general public. The workers considered are truck and rail crew members involved in transporting LLMW. The general public includes all persons who could be exposed to a shipment while it is moving or stopped en route. Potential risks are estimated for the collective populations of exposed people, as well as for MEIs. The collective population risk is a measure of the radiological and chemical risk posed to society

as a whole by the alternative being considered. As such, the collective population risk is used as the primary means of comparing various alternatives.

3 METHODS FOR CALCULATING TRANSPORTATION-RELATED RISKS

3.1 OVERVIEW OF RISK ASSESSMENT METHOD

The technical approach for conducting the radiological transportation risk assessment was developed following a thorough and critical review of the literature and existing National Environmental Policy Act documentation for federal actions involving transportation of radioactive materials. Consideration was also given to recent DOE commitments arising from both litigation and public awareness. The approach selected uses several computer models and databases to determine the risks for each case.

The approach for the radiological component of the transportation risk assessment is summarized in Figure 3.1. For each case, radiological risks are assessed for both routine transportation and accidents. For the *routine assessment*, risks are calculated for the collective populations of potentially exposed individuals, as well as for the MEIs. The accident assessment consists of two components: (1) an *accident risk assessment*, which considers the probabilities and consequences of a range of possible transportation-related accidents, including low-probability accidents that have high consequences, and high-probability accidents that have low consequences; and (2) an *accident consequence assessment*, which considers only the radiological consequences of the severe transportation-related accidents that are postulated to result in the largest releases of radioactive material.

The approach for the hazardous component of the transportation risk assessment is summarized in Figure 3.2. The approach is similar to the radiological approach; however, no cargo-related impacts are assessed under routine conditions.

The RADTRAN 4 computer code (Neuhauser and Kanipe 1993) is used for the routine and accident risk assessments to estimate the radiological impacts to collective populations. RADTRAN 4 was developed by Sandia National Laboratories (New Mexico) (SNL-NM) to calculate population risks associated with the transportation of radioactive materials by a variety of modes, including truck, rail, air, ship, and barge. The code has been extensively reviewed, updated, and used for transportation risk assessments since it was issued in the late 1970s.

The RADTRAN 4 calculations of population risk take into account both the consequences and the probabilities of potential exposures. The collective population risk is a measure of the total radiological risk posed to society as a whole by the alternative being considered. As such, the collective population risks are used as the primary means of comparing the various cases.

As a complement to the RADTRAN calculations, the RISKIND computer code (Yuan et al. 1993) is used to estimate scenario-specific radiological doses to MEIs for both routine operation and for accidents and to estimate population impacts for the accident consequence assessment. The RISKIND computer code was developed for the DOE Office of

Cargo-Related Risk

FIGURE 3.1 Technical Approach for the Radiological Component of the LLMW Transportation Risk Assessment

Waste-Related Risks

FIGURE 3.2 Technical Approach for the Hazardous Component of the LLMW Transportation Risk Assessment

Civilian Radioactive Waste Management specifically to analyze radiological consequences to individuals and population subgroups associated with the transportation of spent nuclear fuel. Minor modifications to the code were made for WM PEIS applications to accommodate shipments of all types of radioactive waste.

The RISKIND calculations are conducted for the WM PEIS to supplement the results for collective risk calculated with RADTRAN 4. Whereas the results for collective risk provide a measure of the overall risks of each case, the RISKIND calculations are meant to address areas of specific concern to individuals and subgroups of population. Essentially, the RISKIND analyses are meant to address "what if" questions, such as, "What if I live next to a site access road?" or "What if an accident happens near my town?"

The HW transportation accident consequence assessment relies on the ALOHA™ model (version 5.1; Reynolds 1992) for both the collective population and individuals. The model is a widely applied code often used by the EPA to assist emergency field personnel in implementing emergency response measures. The ALOHA™ model has a built-in source-term algorithm that is used to compute the rate, quantity, and type of atmospheric release of a hazardous air pollutant, including pool evaporation from a volatile organic liquid spill. The model is able to handle frequently encountered accidental releases from ruptured tanks, drums, and pipes. The model incorporates a chemical data library of physical and chemical properties (such as vapor pressure, boiling point, and molecular weight) for several hundred chemical compounds. These properties, along with container content input, such as the container geometry and rupture characteristics (e.g., hole size), are used by ALOHA™ to compute chemical release rate and duration. The LLMW consequence assessment for HW assumes organic liquid spills and particulate releases are instantaneous as liquid and solid (as respirable fraction) aerosols. The release fractions are estimated with the approach used for radionuclide releases (described in Section 4.3.2). One additional source term is estimated for contaminated solids (with volatile organic compounds) spilled on the ground. The emission rate of these compounds is estimated with an evaporative gaseous emissions approach described in Section 3.3.2.2. These emission rates are used in the ALOHA™ code to provide hazard zone exposure estimates.

The risks associated with the consequences estimated with the ALOHA™ code are computed separately with a risk quantification spreadsheet program. This program, along with the ALOHA model, will be referred to for convenience as the ALOHA risk assessment modeling system (A-RAMS).

3.2 ROUTINE (INCIDENT-FREE) RISK ASSESSMENT METHOD

3.2.1 Collective Population Risk

The radiological risk associated with routine transportation results from the potential exposure of people to low-level external radiation in the vicinity of loaded shipments. No similar cargo-related risks occur from the hazardous component of LLMW. Because the

radiological consequences (dose) occur as a direct result of normal operations, the probability of routine consequences is taken to be unity in the RADTRAN 4 code.

For routine transportation, the RADTRAN 4 computer code considers all major groups of potentially exposed persons. The RADTRAN 4 calculations of risk for routine highway and rail transportation include exposures of the following population groups:

1. *Persons along the Route (Off-Link Population).* Collective doses are calculated for all persons living or working within 0.8 km (0.5 mi) of each side of a transportation route. The total number of persons within the 1.6-km (1-mi) corridor is calculated separately for each route considered in the assessment.
2. *Persons Sharing the Route (On-Link Population).* Collective doses are calculated for persons in all vehicles sharing the transportation route. This group includes persons traveling in the same or opposite directions as the shipment, as well as persons in vehicles passing the shipment.
3. *Persons at Stops.* Collective doses are calculated for people who may be exposed while a shipment is stopped en route. For truck transportation, these stops include stops for refueling, food, and rest. For rail transportation, stops are assumed to occur for purposes of classification.
4. *Crew Members.* Collective doses are calculated for truck and rail transportation crew members involved in the actual shipment of waste. Workers involved in loading or unloading are not considered.

The doses calculated for the first three population groups are added together to yield the collective dose to the general public; the dose calculated for the fourth group represents the collective dose to workers. The RADTRAN 4 models for routine dose are not intended for estimating specific risks to individuals.

The RADTRAN 4 calculations for routine dose are based on generically expressing the dose rate as a function of distance from a point source (Neuhauser and Kanipe 1993). Associated with the calculation of routine doses for each exposed population group are parameters such as the radiation field strength, the source-receptor distance, the duration of exposure, vehicular speed, stopping time, traffic density, and route characteristics such as population density. The RADTRAN manual contains derivations of the equations and descriptions of these parameters (Neuhauser and Kanipe 1993). The values for many of the most important parameters are presented in Section 4.

The collective routine risks are calculated for each LLMW case as follows. Each case is first defined as a set of origin-destination pairs, as shown in the WASTE_MGMT output files in Appendix A of this report. Representative highway and rail routes are then determined for each unique pair. The number of shipments transported across each linkage is then calculated for both truck and rail modes by dividing the estimated site-specific LLMW

inventories by the assumed truck and rail shipment capacities. For shipments between each origin-destination pair, RADTRAN 4 is used to calculate the collective risks to workers and the public on the basis of representative radiological and physical properties of the LLMW. The collective risks are then summed over the set of origin-destination pairs to estimate the collective routine risks associated with that case.

3.2.2 Maximally Exposed Individual Risk

In addition to the assessment of the routine collective population risk, the risk to MEIs has been estimated for a number of hypothetical exposure scenarios by using RISKIND. The receptors include transportation crew members, departure inspectors, and members of the public exposed during traffic delays, while working at a service station, or while living near a DOE site.

The dose to each MEI considered is calculated with RISKIND for an exposure scenario defined by a given distance, duration, and frequency of exposure specific to that receptor. The distances and durations of exposure are similar to those given in previous transportation risk assessments (DOE 1987b, 1990a) and are presented in Section 4. The scenarios are not meant to be exhaustive but were selected to provide a range of potential exposure situations.

The RISKIND external dose model considers direct external exposure and exposure from radiation scattered from the ground and air. RISKIND is used to calculate the dose as a function of distance (millirem per hour for stationary exposures and millirem per event for moving shipments) from a shipment on the basis of the dimensions of the shipment. The code approximates the shipment as a cylindrical volume source; and the calculated dose includes contributions from secondary radiation scattering from buildup (scattering by waste contents), cloudshine (scattering by the air), and groundshine (scattering by the ground). The dose rates calculated by using RISKIND have been shown to be comparable with output from existing shielding codes for various waste configurations. As a conservative measure, credit for potential shielding between the cask and the receptor is not considered.

3.2.3 Vehicle-Related Routine Risk

Vehicle-related health risks resulting from routine transportation may be associated with the generation of air pollutants by transport vehicles during shipment and are independent of the radioactive nature of the shipment. The health end point assessed under routine transportation conditions is the excess latent mortality due to inhalation of vehicular exhaust emissions. Risk factors for pollutant inhalation in terms of latent mortality have been generated by Rao et al. (1982). These risk factors are 1×10^{-7} mortality/km (1.6×10^{-7} /mi) and 1.3×10^{-7} mortality/km (2.1×10^{-7} /mi) of truck and rail travel in urban areas, respectively. The risk factors are based on regression analyses of the effects of sulfur dioxide and particulate releases from diesel exhaust on mortality rates. Excess latent mortalities are assumed to be equivalent to latent-cancer fatalities. Vehicle-related risks

from routine transportation are calculated for each case by multiplying the total distance traveled in urban areas by the appropriate risk factor. Similar data are not available for rural and suburban areas.

Risks are summed over the entire route and over all shipments for each LLMW case. This method has been used in several reports to calculate risks from routine transportation of radioactive wastes (DOE 1986, 1987a, 1990a). Lack of information for rural and suburban areas is an obvious data gap, although the risk factors would presumably be lower because of lower total emissions from all sources and lower population densities in rural and suburban areas.

3.3 ACCIDENT ASSESSMENT METHOD

3.3.1 Accident Risk Assessment

The risk analysis for potential accidents differs fundamentally from the risk analysis for routine transportation because occurrences of accidents are statistical in nature. The accident risk assessment is treated probabilistically in RADTRAN 4 and in the A-RAMS approach used to estimate the hazardous component of risk. Accident risk is defined as the product of the accident consequence (dose or exposure) and the probability of the accident occurring. In this respect, RADTRAN 4 and the A-RAMS approach for the hazardous component estimate the collective accident risk to populations by considering a spectrum of transportation-related accidents. The spectrum of accidents is designed to encompass a range of possible accidents, including low-probability accidents that have high consequences, and high-probability accidents that have low consequences (such as "fender benders"). The results for collective accident risk can be directly compared with the results for routine collective risk because the former results incorporate the probabilities of accident occurrences.

The RADTRAN 4 calculation of collective accident risk employs models that quantify the range of potential accident severities and the responses of transported packages to accidents. The spectrum of accident severity is divided into a number of categories. Each category of severity is assigned a conditional probability of occurrence — that is, the probability that an accident will be of a particular severity if an accident occurs. The more severe the accident, the more remote the chance of such an accident. Release fractions, defined as the fraction of the material in a package that could be released in an accident, are assigned to each accident severity category on the basis of the physical and chemical form of the waste material. The models take into account the mode of transportation and the type of packaging being considered. The accident rates, the definition of accident severity categories, and the release fractions used in this analysis are discussed further in Section 4. The approach for the hazardous component of LLMW (A-RAMS) incorporates the same accident severity categories and release fractions used by RADTRAN 4.

For accidents involving the release of radioactive material, RADTRAN 4 assumes that the material is dispersed in the environment according to standard Gaussian diffusion

models. For the risk assessment, default data for atmospheric dispersion were used, representing an instantaneous ground-level release and a small-diameter source cloud (Neuhauser and Kanipe 1993). The calculation of the collective population dose following the release and dispersal of radioactive material includes the following exposure pathways:

- External exposure to the passing radioactive cloud,
- External exposure to contaminated ground,
- Internal exposure from inhalation of airborne contaminants, and
- Internal exposure from the ingestion of contaminated food.

For the pathway of ingestion, state-specific food transfer factors, which relate the amount of radioactive material ingested to the amount deposited on the ground, were calculated in accordance with the methods described by the U.S. Nuclear Regulatory Commission (NRC) regulatory guide 1.109 (NRC 1977b) and were used as input to the RADTRAN code. Doses of radiation from the ingestion or inhalation of radionuclides are calculated by using standard dose conversion factors (DOE 1988a,b).

The primary exposure route of concern with respect to accidental release of the hazardous component of LLMW is inhalation. Although direct exposure to hazardous materials via other pathways, such as ingestion or dermal absorption, is also possible, these routes are expected to result in much lower exposure than the inhalation pathway doses. The likelihood of acute effects, such as those evaluated by using PLC and PAEC values, is much less for the ingestion and dermal pathways than for inhalation. Similarly, this assessment addresses inhalation of vapors and gases only; the potential for exposure of the general public via inhalation of particulates is also considered to be much lower than that for inhalation of vapors or gases because the acute toxicity of inhaled particulates is low. Although some particulates are carcinogens (e.g., cadmium salts), low exposure dose and duration make risks low compared with risks from vapors and gases.

The collective accident risk for each case is determined in a manner similar to that described for routine collective risks. Accident risks are first calculated for each unique origin-destination pair and then are summed over all pairs to estimate the total risk for the case. The accident risk assessment uses site-specific and waste-type-specific radiological and physical waste characteristics, as shown in the WASTE_MGMT output files in Appendix A of this report. In addition, the assessment uses route-specific information on population density and accident rates derived for individual states.

3.3.2 Accident Consequence Assessment

3.3.2.1 Radiological Accident Consequence Assessment

The RISKIND code is used to provide a scenario-specific assessment of radiological consequences of severe transportation-related accidents. Whereas the RADTRAN 4 accident risk assessment considers the entire range of accident severities and their related probabilities, the RISKIND accident consequence assessment focuses on accidents that result in the largest release of radioactive material to the environment.

Accident consequences are presented for a shipment of waste that represents the highest potential radiological risk if an accident occurs. This "worst-case" waste is identified by screening the site-specific radiological waste characteristics (i.e., activity concentrations) developed for the WM PEIS, taking into account the physical forms of waste and the relative hazards of individual radionuclides. For the majority of waste shipments, the consequences of severe accidents would be less than those presented for the "worst-case" waste. The accident consequence assessment is intended to provide an estimate of the maximum potential impacts posed by a severe transportation-related accident.

The severe accidents considered in the consequence assessment are characterized by extreme mechanical and thermal forces. In all cases, these accidents result in a release of radioactive material to the environment. The accidents correspond to those within the highest accident severity category, as described previously. These accidents represent low-probability high-consequence events. The probability of accidents of this magnitude occurring for each case depends on the total shipping distance for the case; however, accidents of this severity are expected to be extremely rare in general.

RISKIND was used for the accident consequence assessment for two reasons. First, the code has the ability to model the complex atmospheric (or site-specific) dispersion present in severe accidents. The atmospheric dispersion is modeled as an instantaneous release by using standard Gaussian puff methods. In addition, because severe accidents routinely involve fires, modeling of the potential radiological consequences takes into account physical phenomena resulting from the fire, such as buoyant plume rise. Second, RISKIND can be used to estimate the dose to MEIs in the vicinity of an accident. The location of the MEI is determined by RISKIND on the basis of the atmospheric conditions assumed at the time of the accident and the thermal characteristics of the release.

The accident consequences are calculated for both local populations and MEIs. The population dose includes the population within 80 km (50 mi) of the site of the accident. The exposure pathways considered are similar to those discussed previously for the accident risk assessment. Although remedial activities after the accident (e.g., evacuation or ground cleanup) would reduce the consequences of an accident, these activities were not given credit in the consequence assessment.

3.3.2.2 Hazardous Accident Consequence Assessment

Container releases of hazardous chemicals in LLMW accidents can enter the atmosphere in one or a combination of three modes: (1) as a direct liquid aerosol (liquid spill; no pool); (2) as a volatile organic vapor from contaminated spoils pile (solid waste spill on ground); and (3) as a respirable aerosol fraction (solid spill; direct to atmosphere). The release rate is simulated by a different approach (described subsequently) specific to the physical characteristics of the mode of release.

Hazardous organic chemicals in WM liquid LLMW are assumed to be released directly into the atmosphere following a transportation accident. The release duration is assumed to be one hour. For organic liquid wastes, the amount of liquid spilled is based on statistical data regarding container breach rates and atmospheric release rates for truck and railcar accidents presented in Table 3.1 and is computed from known shipping quantities for each alternative route. The spilled liquids are assumed to form a vapor plume immediately and are modeled as an instantaneous atmospheric release of a liquid aerosol with ALOHA™.

Transportation accidents with solid wastes involve two release modes. The first mode, the evaporative gaseous emission approach, assumes that the entire cargo-load of the solid wastes would be dumped onto the ground to form a cone-shaped pile no greater than 1.2 m (4 ft) in height. On the basis of the average density of LLMW solid wastes of 1,250 kg/m³ and the known shipping quantity per truck or railcar, the following equation is used to estimate the rate of gaseous organic chemical emissions for each alternative route (EPA 1988):

$$E = D \times C_s \times A \times (P_t^{1.333333}) \times (M/d_{sc}) , \quad (3.1)$$

where

E = emission rate of a specific chemical compound (g/s),

D = chemical diffusivity (cm²/s),

C_s = saturation vapor concentration (g/cm³),

M = chemical fraction in the waste,

P_t = total soil porosity (use default = 0.35),

A = exposure area (cm²), and

d_{sc} = effective depth of solid LLMW pile (cm).

The second release mode for solid waste accidents involves the direct release of particulates to the atmosphere by using a respirable aerosols emission approach. Because of the size

TABLE 3.1 Container Breach Rates and Atmospheric Releases Derived from HMIRS Statistical Data for Truck and Railcar Accidents^a

Transportation Mode	Container Contents	Container Size	Breach Rate ^b (%)	Quantity Release (%)
Truck	Liquid/gas	Package freight containers		
		• 0-2 gal in capacity	43.80	65.30
		• 2-10 gal in capacity	45.10	36.80
		• 10-50 gal in capacity	40.70	27.10
		• >50-gal capacity	35.90 ^c	19.90 ^c
		Bulk containers ^d	100.00	116.20
Railcar	Solids	Package freight containers	30.60	23.50
		Bulk containers ^d	100.00	32.60
	Liquid/gas	Package freight containers	25.00 ^c	38.00 ^c
		Bulk containers ^d	100.00	6.60
		Package freight containers	40.90	44.15
		Bulk containers ^d	100.00	1.26

^a HMIRS = Hazardous Materials Information Reporting System.

^b Breach rate refers to the number of shipment containers (expressed as a percentage of the total number of containers shipped) that are ruptured in a transportation accident.

^c Statistical data used in hazardous component of LLMW transportation risk assessment.

^d Bulk shipments include only one container per shipment.

distribution of the released particles, this method uses the same mass, aerosol, and respirable release fractions in the eight accident severity categories (Table 3.2), consistent with those used for the radiological transportation risk assessment.

For example, if a truck load of WM LLMW solid wastes contains 1,000 kg (2,205 lb) of benzene, the respirable particulate release of benzene under severity Category III would be 0.5 kg (i.e., $1,000 \text{ kg} \times 0.1 \times 0.1 \times 0.05$). The mass, aerosol, and respirable release fractions are assumed to be zero in severity Category I, indicating no atmospheric HW releases for a minor transportation-related accident. Thus the population risks for severity Category I will always be zero.

In many of these shipping accidents, a number of chemicals are released to the environment. The issue here is how to account for the inhalation of multiple chemicals for an individual downwind of the release. This additivity of human health impacts is addressed separately for increased cancer risk and the any-adverse-effects end points.

ALOHATM was run first for each of the chemicals to determine its individual plume footprint at the specified value for the increased carcinogenic risk concentration (ICRC) or

TABLE 3.2 Release Fractions for Eight Accident Severity Categories

Severity Category	Release Fractions		
	Mass	Aerosol	Respirable
I	0.00	0.0	0.00
II	0.01	0.1	0.05
III	0.10	0.1	0.05
IV-VIII	1.00	0.1	0.05

for the PAEC (see Table 3.3). By using an iteration method, the "composite" plume footprint for all chemicals of concern is determined such that the following relationship can be reached:

$$\sum_{i=1}^n \frac{C_n}{T_n} = 1 \quad , \quad (3.2)$$

where

C_n = concentration at "composite" plume footprint for the n th chemical of concern, and

T_n = threshold limit value (level of concern) for n th chemical.

This method would yield a larger plume area of influence of the chemical mixture than any one of its components.

Because predicting the exact location of a severe transportation-related accident is impossible, separate accident consequences are calculated for accidents occurring in rural, suburban, and urban zones of population density. Moreover, to address the effects of the atmospheric conditions existing at the time of an accident, two different atmospheric conditions are considered. The first case assumes neutral atmospheric conditions, and the second assumes stable conditions. Atmospheric conditions are discussed further in Section 4.

3.3.3 Maximally Exposed Individual Risk

3.3.3.1 Radiological Maximally Exposed Individual Risk

RISKIND is used to estimate the radiological dose to MEIs in the vicinity of the most severe transportation accidents. The location of the MEI is determined by RISKIND

TABLE 3.3 Chemical-Specific Values of ICRC and PAEC for LLMW Carcinogenic and Any-Adverse-Effect Constituents

LLMW Codes	Substance	Health End Point Concentration (ppm)		
<i>Carcinogenic Chemical Substances</i>		<i>ICRC (ppm)</i>		
75-09-2	Dichloromethane (methylene chloride)	380.0		
Cl-2-x	Dichloroethane	5.8		
Cl-4-x	Tetrachloroethene	160.0		
HC-soluble ^a	Hydrocarbons: soluble (benzene, ^b xylene, toluene, etc.)	23.0		
As ^c	Arsenic	0.047		
Cd ^c	Cadmium	0.075		
Cr ^c	Chromium	0.024		
Pb ^d	Lead	d		
<i>Any-Adverse-Effect Chemical Substances</i>		<i>PAEC (ppm)</i>		
		<i>15 min</i>	<i>30 min</i>	<i>60 min</i>
75-09-2	Dichloromethane (methylene chloride)	147.0	73.0	37.0
Cl-3-x	1,1,1-Trichloroethane	31.0	16.0	7.8
Cl-F-x	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	670.0	330.0	170.0
HC-soluble	Hydrocarbons: soluble (benzene, xylene, toluene, ^e etc.)	18.0	9.0	4.5
HC-insoluble	Hydrocarbons: insoluble	d	d	d
57-12-5 ^d	Cyanide	d	d	d
Ag ^d	Silver	d	d	d
Ba ^c	Barium	0.15	0.076	0.038
Hg ^c	Mercury	0.0062	0.0031	0.0016
Pb ^d	Lead	d	d	d
Se ^d	Selenium	d	d	d

^a HC = hydrocarbon.

^b The carcinogenic potential of soluble hydrocarbons was calculated by using the ICRC value for benzene.

^c Although ICRC or PAEC values are available for the substances, volatilization potential is limited; and the values are therefore not included in risk calculations.

^d Inhalation toxicity values are not available for these substances.

^e The PAEC end point for soluble hydrocarbons was calculated by using the PAEC value for toluene.

on the basis of the atmospheric conditions assumed at the time of the accident and the thermal characteristics of the release. The MEI is assumed to be present during the entire passage of the radioactive plume. The dose calculation considers inhalation, cloudshine, and groundshine for a period of two hours following the accident. No ingestion dose is considered.

3.3.3.2 Hazardous Maximally Exposed Individual Risk

The MEI for the hazardous component of LLMW was considered to be located at the point of highest chemical concentration accessible to the general public. This location is assumed to be 30 m (100 ft) from the release point (the closest distance to a residence from the middle of the roadway). Only the shipment accident resulting in the highest chemical concentration is evaluated for the MEI. To evaluate the MEI for each health end point, the primary factors considered were a combination of chemical potency, quantity released, and vapor plume dispersion, as reflected by the chemical concentrations in air predicted by the ALOHA™ model.

The following formula is used to determine the lifetime MEI carcinogenic risk to adults over an exposure period of 70 years:

$$MEI \text{ carcinogenic risk} = (CA \times IR \times ET \times EF \times ED \times SF) / (BW \times AT) , \quad (3.3)$$

where

CA = chemical concentration in air (mg/m^3),

IR = inhalation rate for adult ($0.014 \text{ m}^3/\text{min}$),

ET = exposure time (min/d) (same as chemical release duration, which is assumed to be $60 \text{ min}/\text{d}$),

EF = exposure frequency ($1 \text{ d}/\text{yr}$),

ED = exposure duration (1 yr),

SF = inhalation slope factor ($\text{mg}/\text{kg}\cdot\text{d}$)⁻¹,

BW = average body weight for an adult (70 kg), and

AT = averaging time ($70 \text{ yr} \times 365 \text{ d}/\text{yr}$).

The following formula is used to evaluate the MEI hazard quotient (HQ) for noncarcinogenic substances, on the basis of an average exposure period of 14 days for a 6-year-old child:

$$HQ = [(CA \times IR \times ET \times EF \times ED) / (BW \times AT)] / RfD , \quad (3.4)$$

where

CA = chemical concentration in air (mg/m^3),

IR = inhalation rate for 6-year-old child, with moderate activity ($0.033 \text{ m}^3/\text{min}$),

ET = exposure time (min/d) (same as chemical release duration, which is assumed to be $60 \text{ min}/\text{d}$),

EF = exposure frequency ($1 \text{ d}/\text{yr}$),

ED = exposure duration (1 yr),

BW = average body weight for a 6-year-old child (21 kg),

AT = averaging time ($14 \text{ d}/\text{yr} \times 1 \text{ yr}$), and

RfD = reference dose ($\text{mg}/\text{kg}/\text{d}$).

A value for HQ greater than 1 indicates that an adverse effect for the MEI is likely. Note that the level of concern associated with exposure to these compounds does not increase linearly as HQ values exceed 1. In other words, HQ values do not represent a probability or a percentage. As the HQ value increases above 1, greater concern exists about potential adverse effects; however, assuming that an HQ value of 10 indicates that adverse health effects are 10 times more likely to occur than for an HQ value of 1 is incorrect. Due to uncertainties and conservatism associated with the use of EPA reference dose (RfD) values to evaluate single brief exposures, the assumption may be made that the risk of adverse effects is minimal for substances with HQ values between 1 and 10.

3.3.4 Vehicle-Related Accident Risk Assessment

The vehicle-related accident risk refers to the potential for transportation-related accidents that directly result in fatalities that are not related to the cargo in the shipment. This risk represents fatalities from mechanical causes. State-specific rates for transportation-related fatalities are used in the assessment and are discussed in Section 4. Vehicle-related accident risks are calculated for each case by multiplying the total distance traveled in each state by the appropriate state rate for transportation-related fatalities. In all cases, the vehicle-related accident risks are calculated by using distances for round-trip shipment.

3.4 REPRESENTATIVE ROUTE DETERMINATION METHOD

Representative truck and rail routes were determined for all of the pairs of origin and destination sites specified by the case definitions. The routes were selected to be consistent with current routing practices and all applicable routing regulations and

guidelines; however, because the routes were determined for the purposes of risk assessment, the routes do not necessarily represent the actual routes that would be used to transport LLMW in the future.

The representative truck and rail routes were determined by using the routing models HIGHWAY 3.1 (Johnson et al. 1993a) and INTERLINE 5.0 (Johnson et al. 1993b), respectively. For both truck and rail transportation, the route characteristics that are most important to the radiological risk assessment include the total shipping distance between each origin-destination pair and the fractions of travel in rural, suburban, and urban zones of population density. The route selected determines the total potentially exposed population along a route and the expected frequency of transportation-related accidents. The route distances between major DOE sites are summarized in Tables 3.4 and 3.5 for truck and rail transportation, respectively.

3.4.1 Truck Route Determination

The HIGHWAY 3.1 computer program is used for predicting highway routes for transporting radioactive materials within the United States by truck. The HIGHWAY database is a computerized road atlas that currently describes approximately 386,243 km (240,000 mi) of roads. A complete description of the interstate highway system and of all U.S. highways is included in the database. In addition, most of the principal state highways and a number of local and community highways are also identified. The code is updated periodically to reflect current road conditions and has been benchmarked against reported mileages and observations of commercial trucking firms.

Routes are calculated within the model by minimizing the total impedance between the origin and the destination. The impedance is basically defined as a function of distance and driving time along a particular segment of highway. One of the special features of the HIGHWAY 3.1 model is its ability to calculate routes that maximize the use of interstate highways. This feature allows the user to predict routes for shipment of radioactive materials that conform to the DOT transportation regulations, specifically docket HM-164. The population densities along a route are derived from 1990 data from the U.S. Bureau of the Census. Rural, suburban, and urban areas are characterized according to the following breakdown: rural population densities range from 0 to 54 persons per square kilometer ($0-139/\text{mi}^2$); the suburban range is $55-1,284/\text{km}^2$ ($140-3,326/\text{mi}^2$); and urban is taken to mean all population densities greater than $1,284/\text{km}^2$ ($3,326/\text{mi}^2$).

3.4.2 Rail Route Determination

The INTERLINE 5.0 computer program is designed to simulate routing of the U.S. rail system. The INTERLINE database consists of 94 separate subnetworks and

TABLE 3.4 Truck Route Distances (mi) between Major DOE Sites^a

	Ames	ANL-E	ANL-W	BCL	Bettis	BNL	Fermi	FEMP	Hanford	INEL	ITRI	KCP	KAPL	LBL	LLNL	LANL	Mound	NRF
Ames	0	351	1287	675	894	1206	341	611	1703	1287	1703	2291	599	1703	1998	1560	2291	599
ANL-E	351	0	1582	348	567	874	312	294	1842	1582	1906	520	831	2139	2148	1431	317	1875
ANL-W	1287	1582	0	1906	2125	2437	380	113	2322	2125	1463	1325	2393	2463	2472	1552	1875	599
BCL	675	348	1906	0	223	506	599	326	2258	2125	1682	650	543	2682	2691	1444	1875	599
Bettis	894	567	2125	223	0	906	906	0	1975	1572	1359	869	241	2994	3003	1144	1875	599
BNL	1206	874	2437	506	906	0	906	326	2258	1572	1359	869	241	2994	3003	1144	1875	599
Fermi	341	611	1703	599	906	906	0	0	1975	1572	1359	869	241	2994	3003	1144	1875	599
FEMP	611	294	1842	312	326	326	0	0	2258	1572	1359	869	241	2994	3003	1144	1875	599
Hanford	1703	1998	1560	2322	2258	1975	1975	0	2258	1572	1359	869	241	2994	3003	1144	1875	599
INEL	1287	1582	1572	2125	1572	1572	1572	0	2258	1572	1359	869	241	2994	3003	1144	1875	599
ITRI	1703	1998	1560	2322	2258	1975	1975	0	2258	1572	1359	869	241	2994	3003	1144	1875	599
KCP	2291	599	1325	650	869	869	869	869	869	869	869	869	869	869	869	869	869	869
KAPL	1163	831	2393	626	543	241	863	733	2809	2393	2085	1272	0	2950	2959	1233	1875	599
LBL	1844	2139	963	2463	2682	2994	2129	2399	875	963	1194	1881	2950	0	45	1274	2432	963
LLNL	1853	2148	972	2472	2691	3003	2138	2408	894	972	1154	1890	2959	45	0	1233	2441	972
LANL	1136	1431	1144	1552	1771	2201	1421	1488	1560	1144	111	984	2174	1274	1233	0	1521	1144
Mound	644	317	1875	72	291	721	349	49	2291	1875	1432	619	694	2432	2441	1521	0	1875
NRF	1287	1582	0	1906	2125	2437	380	113	2322	2125	1463	1325	2393	2463	2472	1552	1875	599
ORR	900	584	2048	412	563	821	616	312	2464	2048	1391	723	885	2563	2523	1480	348	2048
PPPL	1217	822	2448	546	398	189	854	635	2864	2448	2006	1192	291	3005	3014	2094	614	2448
RMI	751	419	1982	214	175	531	451	321	2398	1982	1673	860	416	2538	2547	1762	282	1982
RFFTS	722	1017	716	1283	1500	1870	1005	1217	1132	716	483	631	1827	1283	1292	452	1250	716
SNL-NM	1120	1324	1168	1454	1673	2103	1350	1390	1584	1168	9	886	2076	1185	1145	102	1423	1168
SNL-CA	1853	2148	972	2472	2691	3003	2138	2408	894	972	1154	1890	2959	45	0	1233	2441	972
SRS	1175	892	2311	720	656	897	924	620	2727	2311	1653	987	961	2791	2750	1742	656	2311
SLAC	1885	2180	1004	2524	2723	3035	2167	2440	916	1004	1198	1939	2979	47	64	1294	2473	1004
WVDP	909	577	2140	372	257	492	609	479	2556	2140	1832	1018	314	2697	2706	1921	440	2140
WIPP	1301	1505	1759	1625	1813	2192	1531	1526	2175	1759	614	1067	2256	1509	1468	693	1561	1759
YM	1554	1849	746	2112	2331	2704	1839	2048	1162	746	952	1462	2660	753	712	1031	2081	746

TABLE 3.4 (Cont.)

Ames	1520	887	900	629	834	1481	755	1217	751	722	1120	1853	1175	1885	909	1301	1554
ANL-E	1815	571	584	385	1038	1204	428	822	419	1017	1324	2148	892	2180	577	1505	1849
ANL-W	712	2077	2048	1766	1468	2617	1986	2448	1982	716	1168	972	2311	1004	2140	1759	746
Hanford	1128	2493	2464	2182	1884	3033	2402	2864	2398	1132	1584	894	2727	916	2556	2175	1162
FEMP	2014	299	312	409	1104	965	173	635	321	1217	1390	2408	620	2440	479	1526	2048
Fermi	1805	603	616	417	1064	1236	460	854	451	1005	1350	2138	924	2167	609	1531	1839
BNL	2670	808	821	1115	1817	1329	689	189	531	1870	2103	3003	897	3035	492	2192	2704
Bettis	2297	586	563	696	1387	1252	265	398	175	1500	1673	2691	656	2723	257	1813	2331
BCL	2078	399	412	477	1168	1065	84	546	214	1283	1454	2472	720	2524	372	1625	2112
BCL	2078	399	412	477	1168	1065	84	546	214	1283	1454	2472	720	2524	372	1625	2112
INEL	712	2077	2048	1766	1468	2617	1986	2448	1982	716	1168	972	2311	1004	2140	1759	746
ITRI	918	1420	1391	1230	313	1959	1543	2006	1673	483	9	1154	1653	1198	1832	614	952
KCP	1428	752	723	441	600	1293	730	1192	860	631	886	1890	987	1939	1018	1067	1462
KAPL	2626	872	885	1099	1790	1393	688	291	416	1827	2076	2959	961	2979	314	2256	2660
LBL	719	2592	2563	2322	1485	2945	2543	3005	2538	1283	1185	45	2791	47	2697	1509	753
LLNL	678	2551	2523	2327	1445	2904	2532	3014	2547	1292	1145	0	2750	64	2706	1468	712
LANL	997	1509	1480	1319	402	2048	1632	2094	1762	452	102	1233	1742	1294	1921	693	1031
Mound	2047	335	348	441	1137	1001	152	614	282	1250	1423	2441	656	2473	440	1561	2081
NRF	712	2077	2048	1766	1468	2617	1986	2448	1982	716	1168	972	2311	1004	2140	1759	746
NTS	0	2180	2151	1864	1209	2720	2158	2620	2214	836	909	678	2414	739	2373	1365	46
ORISE	2180	0	10	333	1125	692	358	702	595	1383	1411	2551	369	2584	753	1410	2214
ORR	2151	10	0	304	1096	685	371	715	608	1354	1382	2523	379	2584	766	1381	2185
PGDP	1864	333	304	0	940	874	0	1009	687	1072	1226	2327	568	2359	845	1258	1903
Panex	1209	1125	1096	940	0	1664	1248	1710	1378	774	304	1445	1358	1506	1537	308	1243
Pinebliss	2720	692	685	874	1664	0	1024	1152	1261	1924	1950	2904	620	2969	1419	1762	2754
PORTS	2158	358	371	0	1248	1024	0	588	276	1361	1534	2552	540	2584	434	1632	2192
PPPL	2620	702	715	1009	1710	1152	588	0	528	1823	1997	3014	767	3046	489	2086	2654
RMI	2214	595	608	687	1378	1261	276	528	0	1415	1664	2547	726	2579	162	1822	2248
RFFETS	836	1383	1354	1072	774	1924	1361	1823	1415	0	474	1292	1618	1324	1573	1067	868
SNL-NM	909	1411	1382	1226	304	1950	1534	1997	1664	474	0	1145	1644	1198	1823	605	943
SNL-CA	678	2551	2523	2327	1445	2904	2552	3014	2547	1292	1145	0	2750	64	2706	1468	712
SRS	2414	369	379	568	1358	620	540	767	726	1618	1644	2750	0	2820	1023	1524	2448
SLAC	739	2584	2584	2359	1506	2969	2584	3046	2579	1324	1198	64	2820	0	2738	1529	773
WVDP	2373	753	766	845	1537	1419	1632	1822	1067	1823	1573	2706	1023	2738	0	1980	2407
WIPP	1365	1410	1381	1258	308	1762	1632	2086	1822	1067	605	1468	1524	1529	1980	0	1399
YM	46	2214	2185	1903	1243	2754	2192	2654	2248	868	943	712	2448	773	2407	1399	0

^a Truck routes generated by using the HIGHWAY 3.1 routing model (Johnson et al. 1993a).

Note: Ames = Ames Laboratory; ANL-E = Argonne National Laboratory-East; ANL-W = Argonne National Laboratory-West; BCL = Battelle Columbus Laboratories; Bettis = Bettis Atomic Power Laboratory; BNL = Brookhaven National Laboratory; Fermi = Fermi National Accelerator Laboratory; FEMP = Fernald Environmental Management Project; Hanford = Hanford Site; INEL = Idaho National Engineering Laboratory; ITRI = Inhalation Toxicology Research Institute; KCP = Kansas City Plant; KAPL = Knolls Atomic Power Laboratory; LBL = Lawrence Berkeley National Laboratory; LLNL = Lawrence Livermore National Laboratory; LANL = Los Alamos National Laboratory; Mound = Mound Plant; NRF = Naval Reactor Facility; NTS = Nevada Test Site; ORISE = Oak Ridge Institute for Science and Education; ORR = Oak Ridge Reservation; PGDP = Paducah Gaseous Diffusion Plant; Panex = Panex Plant; Pinebliss = Pinebliss Plant; PORTS = Portsmouth Gaseous Diffusion Plant; PPPL = Princeton Plasma Physics Laboratory; RMI = Reactive Metals, Inc.; RFFETS = Rocky Flats Environmental Technology Site; SNL-NM = Sandia National Laboratories (New Mexico); SNL-CA = Sandia National Laboratories (California); SRS = Savannah River Site; SLAC = Stanford Linear Accelerator Center; WVDP = West Valley Demonstration Project; WIPP = Waste Isolation Pilot Plant; and YM = Yucca Mountain.

TABLE 3.5 Rail Route Distances (mi) between Major DOE Sites^a

	Ames	ANL-E	ANL-W	BCL	Bettis	BNL	Fermi	FEMP	Hanford	INEL	ITRI	KCP	KAPL	LBL	LLNL	LANL	Mound	NRF
Ames	0	329	1242	700	823	1365	291	717	1788	1242	1187	275	1126	1873	2018	1124	715	1242
ANL-E	329	0	1655	401	518	1066	49	412	2201	1655	1351	439	827	2549	2506	1288	416	1655
ANL-W	1242	1655	0	1942	2133	2607	1533	1907	658	0	1247	1238	2468	1102	1100	1179	1926	0
BCL	700	401	1942	0	280	855	427	135	2488	1942	1759	753	615	2573	2718	1696	65	1942
Bettis	823	518	2133	280	0	772	543	475	2611	2133	1857	943	533	2696	2840	1794	345	2133
BNL	1365	1066	2607	855	772	0	1088	984	3153	2607	2414	1518	239	3238	3383	2351	920	2607
Fermi	291	49	1533	427	543	1088	0	441	1971	1533	1356	453	853	2343	2341	1405	443	1533
FEMP	717	412	1907	135	475	984	441	0	2505	1907	1751	717	745	2590	2735	1688	69	1907
Hanford	1788	2201	658	2488	2611	3153	1971	2505	0	658	1793	1784	2914	986	973	1725	2472	658
INEL	1242	1655	0	1942	2133	2607	1533	1907	658	0	1247	1238	2468	1102	1100	1179	1926	0
ITRI	1187	1351	1247	1759	1857	2414	1356	1751	1793	1247	0	932	2177	1266	1222	104	1767	1247
KCP	275	439	1238	753	943	1518	453	717	1784	1238	932	0	1250	2016	2013	869	708	1238
KAPL	1126	827	2468	615	533	239	853	745	2914	2468	2177	1250	0	2999	3144	2122	680	2468
LBL	1873	2549	1102	2573	2696	3238	2343	2590	986	1102	1266	2016	2999	0	46	1354	2717	1102
LLNL	2018	2506	1100	2718	2840	3383	2341	2735	973	1100	1222	2013	3144	46	0	1326	2695	1100
LANL	1124	1288	1179	1696	1794	2351	1405	1688	1725	1179	104	869	2122	1354	1326	0	1704	1179
Mound	715	416	1926	65	345	920	443	69	2472	1926	1767	708	680	2717	2695	1704	0	1926
NRF	1242	1655	0	1942	2133	2607	1533	1907	658	0	1247	1238	2468	1102	1100	1179	1926	0
NTS	1674	2348	756	2374	2496	3039	1997	2391	1302	756	1065	1670	2800	860	1370	1169	2386	756
ORISE	956	651	2099	366	714	1221	679	331	2644	2099	1989	881	981	2890	2868	1926	301	2099
ORR	954	649	2055	393	903	1152	682	358	2601	2055	1749	838	957	2686	2831	1686	328	2055
PGDP	646	390	1699	581	816	1346	469	468	2245	1699	1539	482	1106	2490	2469	1476	564	1699
Pantex	809	972	1141	1381	1479	2035	977	1373	1686	1141	379	554	1807	1561	1534	483	1396	1141
Pinellas	1623	1319	2721	1151	1293	1585	1344	1116	3267	2721	2079	1503	1390	3278	3491	2183	1086	2721
PORTS	727	422	1975	91	429	921	451	207	2515	1975	1761	758	681	2767	2745	1698	156	1975
PPPL	1197	898	2507	655	400	410	924	938	2985	2507	2248	1289	214	3298	3276	2186	719	2507
RMI	717	418	2060	207	136	648	445	337	2505	2060	1769	842	408	2851	2829	1706	272	2060
RFETS	782	1194	738	1502	1692	2266	1016	1466	1284	738	572	778	2027	1320	1394	504	1485	738
SNL-NM	1187	1351	1247	1759	1857	2414	1356	1751	1793	1247	0	932	2177	1266	1222	104	1767	1247
SNL-CA	2018	2506	1100	2718	2840	3383	2341	2735	973	1100	1222	2013	3144	46	0	1326	2695	1100
SRS	1281	976	2407	740	947	1239	1001	774	2953	2407	2315	1161	1044	3192	3183	2252	744	2407
SLAC	1924	2536	1160	2947	2746	3289	2393	2641	1036	1160	1253	2073	3050	56	60	1357	2930	1160
WVDP	881	579	2123	370	244	549	603	631	2669	2123	1929	1033	309	2773	2898	1866	562	2123
WIPP	1115	1279	1447	1688	1785	2342	1284	1679	1993	1447	477	861	2114	1660	1633	581	1703	1447
YM	1674	2348	756	2374	2496	3039	1997	2391	1302	756	1065	1670	2800	860	1370	1169	2386	756

TABLE 3.5 (Cont.)

	NTS	ORISE	ORR	PGDP	Pantex	Pinellas	PORTS	PPPL	RMI	RFETS	SNL-NM	SNL-CA	SRS	SLAC	WVDP	WIPP	YM
Ames	1674	956	954	646	809	1623	727	1197	717	782	1187	2018	1281	1924	881	1115	1674
ANL-E	2348	651	649	390	972	1319	422	898	418	1194	1351	2506	976	2536	579	1279	2348
ANL-W	756	2099	2055	1699	1141	2721	1975	2507	2060	738	1247	1100	2407	1160	2123	1447	756
BCL	2374	366	393	581	1381	1151	91	655	207	1502	1759	2718	740	2947	370	1688	2374
Bettis	2496	714	903	816	1479	1293	429	400	136	1692	1857	2840	947	2746	244	1785	2496
BNL	3039	1221	1152	1346	2035	1585	921	410	648	2266	2414	3383	1239	3289	549	2342	3039
Fermi	1997	679	682	469	977	1344	451	924	445	1016	1356	2341	1001	2393	603	1284	1997
FEMP	2391	331	358	468	1373	1116	207	938	337	1466	1751	2735	774	2641	631	1679	2391
Hanford	1302	2644	2601	2245	1686	3267	2515	2985	2505	1284	1793	973	2953	1036	2669	1993	1302
INEL	756	2099	2055	1699	1141	2721	1975	2507	2060	738	1247	1100	2407	1160	2123	1447	756
ITRI	1065	1989	1749	1539	379	2079	1761	2248	1769	572	0	1222	2315	1253	1929	477	1065
KCP	1670	881	838	482	554	1503	758	1289	842	778	932	2013	1161	2073	1033	861	1670
KAPL	2800	981	957	1106	1807	1390	681	214	408	2027	2177	3144	1044	3050	309	2114	2800
LBL	860	2890	2686	2490	1561	3278	2767	3298	2851	1320	1266	46	3192	56	2773	1660	860
LLNL	1370	2868	2831	2469	1534	3491	2745	3276	2829	1394	1222	0	3183	60	2898	1633	1370
LANL	1169	1926	1686	1476	483	2183	1698	2186	1706	504	104	1326	2252	1357	1866	581	1169
Mound	2386	301	328	564	1396	1086	156	719	272	1485	1767	2695	744	2930	562	1703	2386
NRF	756	2099	2055	1699	1141	2721	1975	2507	2060	738	1247	1100	2407	1160	2123	1447	756
NTS	0	2530	2487	2131	1376	3153	2401	2871	2391	987	1065	1370	2839	862	2554	1475	0
ORISE	2530	0	40	632	1611	786	392	1176	575	1658	1989	2868	443	3103	889	1918	2530
ORR	2487	40	0	527	1371	797	442	760	600	1586	1749	2831	417	3031	889	1678	2487
PGDP	2131	632	527	0	1103	1056	495	1145	698	1220	1539	2469	714	2597	861	1410	2131
Pantex	1376	1611	1371	1103	0	1825	1382	1867	1387	465	379	1534	1937	1564	1551	307	1376
Pinellas	3153	786	797	1056	1825	0	1106	1207	1361	2280	2079	3491	485	3280	1568	2019	3153
PORTS	2401	392	442	495	1382	1106	0	838	279	1535	1761	2745	655	2651	585	1689	2401
PPPL	2871	1176	760	1145	1867	1207	838	0	511	2066	2248	3276	848	3121	426	2185	2871
RMI	2391	575	600	698	1387	1361	279	511	0	1619	1769	2829	920	2641	163	1705	2391
RFETS	987	1658	1586	1220	465	2280	1535	2066	1619	0	572	1394	1938	1377	1782	769	987
SNL-NM	1065	1989	1749	1539	379	2079	1761	2248	1769	572	0	1222	2315	1253	1929	477	1065
SNL-CA	1370	2868	2831	2469	1534	3491	2745	3276	2829	1394	1222	0	3183	60	2898	1633	1370
SRS	2839	443	417	714	1937	485	655	848	920	1938	2315	3183	0	3194	1223	2243	2839
SLAC	862	3103	3031	2597	1564	3280	2651	3121	2641	1377	1253	60	3194	0	2804	1662	862
WVDP	2554	889	889	861	1551	1568	585	426	163	1782	1929	2898	1223	2804	0	1858	2540
WIPP	1475	1918	1678	1410	307	2019	1689	2185	1705	769	477	1633	2243	1662	1858	0	1475
YM	0	2530	2487	2131	1376	3153	2401	2871	2391	987	1065	1370	2839	862	2540	1475	0

^a Rail routes generated by using the INTERLINE 5.0 routing model (Johnson et al. 1993b).

Note: Ames = Ames Laboratory; ANL-E = Argonne National Laboratory-East; ANL-W = Argonne National Laboratory-West; BCL = Battelle Columbus Laboratories; Bettis = Bettis Atomic Power Laboratory; BNL = Brookhaven National Laboratory; Fermi = Fermi National Accelerator Laboratory; FEMP = Fernald Environmental Management Project; Hanford = Hanford Site; INEL = Idaho National Engineering Laboratory; ITRI = Inhalation Toxicology Research Institute; KCP = Kansas City Plant; KAPL = Knolls Atomic Power Laboratory; LBL = Lawrence Berkeley National Laboratory; LLNL = Lawrence Livermore National Laboratory; LANL = Los Alamos National Laboratory; Mound = Mound Plant; NRF = Naval Reactor Facility; NTS = Nevada Test Site; ORISE = Oak Ridge Institute for Science and Education; ORR = Oak Ridge Reservation; PGDP = Paducah Gaseous Diffusion Plant; Pantex = Pantex Plant; Pinellas = Pinellas Plant; PORTS = Portsmouth Gaseous Diffusion Plant; PPPL = Princeton Plasma Physics Laboratory; RMI = Reactive Metals, Inc.; RFETS = Rocky Flats Environmental Technology Site; SNL-NM = Sandia National Laboratories (New Mexico); SNL-CA = Sandia National Laboratories (California); SRS = Savannah River Site; SLAC = Stanford Linear Accelerator Center; WVDP = West Valley Demonstration Project; WIPP = Waste Isolation Pilot Plant; and YM = Yucca Mountain.

represents various competing rail companies in the United States. The database used by INTERLINE was originally based on data from the Federal Railroad Administration and reflected the U.S. railroad system in 1974. The database has since been expanded and modified over the past two decades. The code is updated periodically to reflect current track conditions and has been benchmarked against reported mileages and observations of commercial rail firms.

The INTERLINE 5.0 model uses a shortest-route algorithm that finds the path of minimum impedance within an individual subnetwork. A separate routine is used to find paths along the subnetworks. The routes chosen for this study used the standard assumptions in the INTERLINE model that simulate the process of selection that railroads would use to direct shipments of radioactive waste. For sites that do not have direct rail access, the rail siding nearest the site was used for routing purposes. The population densities along a route are derived from 1990 census data. Rural, suburban, and urban areas are characterized according to the following breakdown: rural population densities range from 0 to 54 persons per square kilometer ($0-139/\text{mi}^2$), the suburban range for population density is $55-1,284/\text{km}^2$ ($140-3,326/\text{mi}^2$), and urban is taken to mean all population densities greater than $1,284/\text{km}^2$ ($3,326/\text{mi}^2$).

4 RISK ASSESSMENT ASSUMPTIONS AND PARAMETERS

The majority of parameters and assumptions necessary to conduct the LLMW transportation risk assessment are described in detail in Appendix E of the WM PEIS (DOE 1996). Supplemental information is provided subsequently for a number of the most important assessment parameters.

4.1 SHIPPING AND PACKAGING ASSUMPTIONS FOR LOW-LEVEL MIXED WASTE

The type of packaging used to transport radioactive waste is determined primarily by the radiological characteristics of the waste material. For purposes of risk assessment, representative packagings and shipment configurations have been determined for each type of radioactive waste on the basis of average waste characteristics and consistent with currently accepted practice. In practice, packagings are selected on a case-by-case basis and may differ from the representative types presented here.

For all types of waste, the assumptions are that the waste is transported in certified packagings and that exclusive-use vehicles would be used. Highway transportation is assumed to take place by legal-weight heavy-haul combination (tractor-trailer) trucks. Typically, Type A packages are transported on common flatbed or covered trailers; Type B packages are generally shipped on trailers designed specially for the packaging being used. For truck transportation, the maximum payload weight has been taken to be 19,958 kg (44,000 lb), on the basis of DOT highway weight limitations and an average tractor-trailer weight of 16,330 kg (36,000 lb).

Rail transportation is assumed to take place by regular freight train service. The use of special or dedicated train service was not considered in the analysis. For rail transportation, average payload weights for boxcars range from 45,360 to 68,040 kg (100,000 to 150,000 lb). A median payload weight of 54,431 kg (120,000 lb) has been assumed for purposes of assessment.

All LLMW is assumed to be transported in Type A or "strong and tight" packaging, such as 208-L (55-gal) drums or standard waste boxes. Suitable Type A or "strong and tight" packagings are readily available from commercial sources. The number of shipments from a given site is calculated on the basis of projected site-specific waste inventory (weight) information and shipment capacity limitations for each transportation mode. The effects of potential waste treatment, such as volume reduction or thermal treatment are reflected in changes in waste density for each case. All shipments are assumed to be at the maximum weight limits for truck and rail shipments. On the basis of typical LLMW densities, roughly eighty 208-L (55-gal) drums would be shipped per truck and 300 per railcar.

Shipments of LLMW would meet any additional characterization and labeling requirements associated with the HW component. In addition, shipments of liquid waste would meet regulatory requirements specified for liquids (i.e., packages would contain

adequate absorbent material to absorb twice the liquid volume, or a leak-tight overpack would be used [10 CFR Part 71]).

4.2 ACCIDENT RATES

For the calculation of accident risks, rates for vehicular accidents and for fatalities are taken from data provided by Saricks and Kvitek (1994). For each mode of transportation, accident rates are generically defined as the number of accident involvements (or fatalities) in a given year per unit of travel by that mode in that same year. Therefore, the rate is a fractional value, with accident-involvement count as the numerator of the fraction and vehicular activity (total traveled distance) as the denominator. Accident rates are generally determined for a multiyear period. For purposes of assessment, the total number of expected accidents or fatalities is calculated by multiplying the total shipping distance for a specific case by the appropriate accident or fatality rate.

For truck transportation, the rates presented in Saricks and Kvitek (1994) are specifically for heavy combination trucks involved in interstate commerce. Heavy combination trucks are rigs composed of a separable tractor unit containing the engine and one to three freight trailers connected to each other. Heavy combination trucks are typically used for shipments of radioactive waste. Saricks and Kvitek (1994) base their truck accident rates for each state on statistics compiled by the DOT Office of Motor Carriers for 1986 to 1988. Saricks and Kvitek (1994) present counts of accident involvements and of fatalities, estimated kilometers of travel by state, and the corresponding average accident involvement, fatality, and injury rates for the three years investigated. Fatalities are deaths (including crew members) that are attributable to the accident and that occurred at any time within 30 days thereafter. The truck accident rates are summarized in Table 4.1.

Rail accident rates are computed and presented similarly to truck accident rates in Saricks and Kvitek (1994); however, the unit of haulage is considered to be the railcar. Saricks and Kvitek (1994) base their state-specific rail accident involvement and fatality rates on statistics compiled by the Federal Railroad Administration for 1985 to 1988. Rail accident rates include both main-line accidents and those occurring in rail yards. The rail accident rates are summarized in Table 4.2.

4.3 CHARACTERISTICS OF ACCIDENT RELEASES

The transportation accident risk assessment depends on the fraction of material in a package that would be released or spilled to the environment during an accident, commonly referred to as the release fraction. The fraction of material released from a package is a function of the severity of the accident and the waste packaging; for instance, a low-impact accident, such as a "fender-bender," would not be expected to cause any release of material.

TABLE 4.1 Highway Combination-Truck Accident, Fatality, and Injury Rates by Road Type^a Based on Reportable Interstate-Carrier Accidents, Reported Fatalities and Injuries, and Estimated Flows, 1986-1988 (10⁻⁷ accidents and injuries per shipment-kilometer, 10⁻⁸ fatalities per shipment-kilometer)

State ^b	Accident-Involvement Rates					Accident-Fatality Rates					Accident-Injury Rates				
	FAI-U	FAI-R	FAI	FAP	FAS	FAI-U	FAI-R	FAI	FAP	FAS	FAI-U	FAI-R	FAI	FAP	FAS
AL	4.68	1.26	1.85	5.16	3.96	3.29	1.84	2.09	6.34	7.84	4.66	1.24	1.83	5.62	4.22
AZ	2.71	1.60	1.76	2.12	1.45	3.56	2.13	2.33	4.97	1.20	2.89	1.65	1.82	2.20	2.77
AR	4.82	1.73	2.09	4.69	6.84	6.61	2.28	2.78	8.88	7.10	4.09	1.95	2.20	4.38	5.94
CA	1.92	1.64	1.76	1.15	2.22	1.39	2.56	2.06	1.98	3.81	1.82	1.68	1.74	1.12	2.67
CO	6.28	2.76	3.60	4.11	4.42	3.38	2.45	2.67	6.58	5.83	5.47	2.82	3.45	3.95	3.67
CT	2.67	4.60 ^c	3.23	2.56	9.09	1.01	5.11 ^c	2.20	1.17	9.09	1.71	4.61 ^c	2.55	1.89	7.09
DE	2.56	--	2.56	7.35	4.81	1.66	--	1.66	13.50 ^c	7.69	3.46	--	3.46	7.18	3.08
FL	2.25	1.21	1.50	3.73	6.33	1.74	2.62	2.38	5.92	6.12	2.36	1.28	1.58	4.12	7.92
GA	4.87	1.65	2.28	6.15	4.04	2.37	1.86	1.96	8.30	6.74	4.37	1.75	2.26	6.43	3.71
ID	1.73	2.30	2.22	4.93	2.29	0	2.06	1.78	7.46	2.54	1.18	2.12	1.99	3.54	1.69
IL	8.75 ^c	1.76	3.53	6.40	1.78	5.33	1.39	2.38	7.84	2.30	8.23 ^c	1.49	3.20	6.12	1.55
IN	4.58	1.92	2.43	4.72	2.80	3.51	1.22	1.66	7.66	4.02	4.36	1.81	2.30	4.42	2.32
IA	3.54	1.78	2.02	4.03	1.24	2.68	1.05	1.26	6.14	0.73	3.78	1.46	1.76	3.48	0.88
KS	4.48	2.04	2.56	5.11	1.38	5.52	1.88	2.66	9.35	1.72	3.66	1.91	2.28	4.09	1.12
KY	5.13	1.46	1.99	5.74	8.80	3.22	1.50	1.75	6.60	6.25	5.52	1.33	1.94	5.28	8.12
LA	3.54	1.30	1.88	3.53	2.39	4.90	1.77	2.59	5.73	3.28	4.57	1.32	2.16	4.46	2.85
ME	9.03 ^c	2.44	2.93	5.44	2.28	0	2.34	2.16	6.58	2.17	4.52	1.53	1.75	5.00	1.63
MD	3.08	3.95	3.46	3.56	12.40	1.62	4.03	2.69	3.66	8.99	3.41	3.98	3.66 ^c	4.32	13.40
MA	1.42	6.47 ^c	2.68	3.43	46.10 ^c	1.30	6.23 ^c	2.53	3.93	52.20 ^c	1.13	4.99 ^c	2.09	3.02	43.90 ^c
MI	3.16	1.59	2.12	2.68	0.81	1.52	1.23	1.33	3.96	1.22	3.04	1.29	1.87	2.61	1.38
MN	2.66	2.06	2.29	4.19	2.16	2.02	1.72	1.83	7.69	7.84	2.08	1.46	1.69	3.28	1.86
MS	2.01	1.19	1.35	4.48	0.65	2.46	1.81	1.93	9.26	1.62	1.85	1.10	1.25	4.55	0.50
MO	5.18	1.78	2.61	5.36	2.49	4.30	1.23	1.99	9.68	3.25	5.53	1.63	2.59	5.06	2.23
MT	10.00 ^c	2.52	2.89	5.38	1.02	3.12	1.44	1.52	7.97	2.04	4.69	1.79	1.93	3.95	0.20
NE	6.97	1.77	2.09	3.62	0.99	6.58	1.10	1.43	5.75	0	6.58	1.17	1.50	3.54	0.54
NV	6.33	1.57	1.97	4.35	3.17	8.89 ^c	1.14	1.79	10.50	7.94	5.67	1.58	1.93	3.72	2.54
NH	0.22	1.39	1.18	4.36	3.33	0	1.49	1.22	5.77	5.56	0	1.14	0.94	4.17	2.22
NJ	2.77	7.65 ^c	4.24 ^c	6.80	9.69	1.56	6.56 ^c	3.06	4.57	11.50	2.69	8.00 ^c	4.28 ^c	6.86	11.30
NM	9.64 ^c	1.92	2.35	4.77	12.20	9.01 ^c	1.93	2.32	6.99	5.56	8.92 ^c	1.86	2.25	4.62	10.60
NY	5.69	2.93	3.98 ^c	3.16	9.48	2.04	1.38	1.63	4.61	10.30	4.49	2.56	3.28	2.71	10.00
NC	5.92	2.28	2.97	5.17	6.37	5.08	2.92	3.33 ^c	6.71	11.00	6.37	2.19	2.99	5.53	6.22
OH	3.16	2.27	2.52	4.42	11.00	1.41	1.32	1.35	6.07	9.88	2.85	2.02	2.25	4.40	1070
OK	3.76	1.47	1.91	3.61	1.73	2.70	2.06	2.18	4.88	0.71	3.34	1.36	1.74	3.05	1.59
OR	3.99	2.20	2.48	4.17	1.63	2.47	1.12	1.33	5.85	4.07	3.82	1.69	2.02	2.94	0.57
PA	3.02	3.60	3.48	7.21	7.92	2.12	2.97	2.79	10.20	9.29	2.68	3.28	3.15	7.28	6.42
RI	2.27	1.98	2.16	1.37	16.70	0.71	3.70	1.80	1.71	66.70 ^c	3.12	2.35	2.84	0.86	23.30 ^c
SC	3.13	1.83	1.99	6.27	2.27	2.88	2.57	2.61	8.61	3.95	2.65	2.20	2.26	6.96	2.27
SD	8.57 ^c	2.09	2.18	3.94	1.49	14.30 ^c	0.42	0.62	5.38	2.13	5.71	1.38	1.95	2.94	0
TN	7.97	1.48	2.48	5.56	6.26	5.59	1.63	2.24	6.97	12.10	7.70 ^c	1.44	2.41	5.85	4.67

TABLE 4.1 (Cont.)

State	Accident-Involvement Rates					Accident-Fatality Rates					Accident-Injury Rates				
	FAI-U	FAI-R	FAI	FAP	FAS	FAI-U	FAI-R	FAI	FAP	FAS	FAI-U	FAI-R	FAI	FAP	FAS
TX	2.74	1.56	2.00	2.78	1.09	1.93	1.97	1.95	4.77	1.84	2.53	1.42	1.83	2.53	0.92
VT	0	1.38	1.33	6.30	6.80	0	0.43	0.42	3.36	24.00	0	1.08	1.04	6.13	4.40
VA	2.63	2.54	2.56	4.67	5.03	1.91	1.76	1.80	7.28	7.73	2.49	2.46	2.47	5.39	4.81
WA	1.61	2.50	2.10	2.62	0.73	0.80	1.47	1.17	2.54	0	1.49	2.14	1.85	2.11	0.51
WV	2.95	3.10	3.07	11.70 ^c	7.87	1.28	1.67	1.60	17.80 ^c	1.70	2.78	2.80	2.79	9.91 ^c	7.13
WI	5.29	1.74	2.18	2.80	3.24	0.77	0.66	0.67	3.62	3.68	4.33	1.45	1.81	2.51	3.16
WY	2.98	3.42	3.40	3.41	3.70	0	2.08	2.01	6.22	3.70	0	2.84	2.74	1.86	2.35
USA	3.58	2.03	2.44	3.94	3.48	2.37	1.91	2.03	5.82	4.62	3.36	1.89	2.28	3.82	3.30
σ^d	2.36	1.25	0.69	1.77	6.98	2.70	1.27	0.63	3.01	11.74	1.99	1.22	0.69	1.79	7.10

^a FAI = Federally aided interstate

U = Urban

R = Rural

FAP = Federally aided primary

FAS = Federally aided secondary

^b Includes only the 48 contiguous states, plus the totals for the United States.

^c Rates are two or more standard deviations greater than the national average rate for that highway category.

^d σ = standard deviation.

Source: Saricks and Kvitek (1994).

TABLE 4.2 Railroad-Freight-Car Accident Rates, by State, for 1986, 1987, 1988, and 1985-1988 Combined (10^{-8} accidents per railcar-kilometer^a)

State ^b	1986		1987		1988		1985-88	
	Total	Main Only	Total	Main Only	Total	Main Only	Total	Main Only
AL	3.88	2.00	4.80	3.37	4.13	2.52	4.80	2.75
AZ	1.40	1.05	1.30	1.08	1.44	1.18	1.75	1.30
AR	5.05	2.59	4.27	2.32	8.34	3.94	6.78	3.54
CA	5.10	2.64	3.30	1.98	4.32	2.30	5.10	2.51
CO	1.44	1.01	0.86	0.40	2.55	1.51	1.73	1.02
CT	26.47	17.65	16.67	8.34	24.95	0	28.27 ^c	10.10
DE	27.44	9.15	25.23	16.82	18.04	18.04	17.71	11.07
DC	0	0	316	316	0	0	117.09 ^c	78.06 ^c
FL	2.86	2.12	3.90	1.90	4.16	2.38	4.02	2.21
GA	6.44	3.08	6.77	2.81	6.18	2.69	6.44	2.84
ID	5.90	5.25	6.74	4.10	9.03	3.99	7.01	4.14
IL	11.70	3.10	9.97	3.10	9.08	2.45	10.67	2.97
IN	4.18	1.85	3.71	1.48	3.80	1.44	4.64	1.93
IA	17.63	7.15	12.72	6.65	11.95	7.01	14.67	7.16
KS	3.01	1.62	2.97	1.55	4.09	1.98	3.61	1.75
KY	4.78	2.39	3.77	1.98	3.60	1.84	4.48	2.44
LA	12.67	5.98	7.07	2.02	11.94	3.92	12.37	4.28
ME	28.22	16.93	29.40	13.36	52.57	26.29	37.80 ^c	18.53 ^c
MD	6.07	3.54	5.55	2.44	4.55	1.24	5.62	2.58
MA	12.33	5.87	10.06	3.71	7.31	2.81	11.65	4.97
MI	18.34	8.18	15.10	4.42	15.52	7.45	16.47	7.19
MN	8.63	2.64	6.24	3.30	7.86	3.63	8.48	3.16
MS	15.16	11.20	12.93	9.84	8.47	7.14	11.52	8.51
MO	4.59	2.12	3.60	1.87	5.05	2.87	5.28	2.56
MT	1.35	1.01	1.24	0.81	2.11	1.17	1.73	1.10
NE	4.04	2.11	4.81	2.49	4.46	2.23	4.63	2.56
NV	3.27	1.87	1.29	0.86	3.97	2.65	3.23	2.19
NH	6.60	6.60	17.52	11.68	24.27	16.18	21.45	17.16 ^c
NJ	13.86	2.64	9.44	5.31	10.10	4.75	12.38	4.82
NM	0.90	0.52	0.93	0.75	0.86	0.65	0.94	0.66
NY	7.23	3.92	6.80	4.14	7.26	3.36	8.32	4.30
NC	5.40	2.70	5.48	1.62	6.29	2.95	5.70	2.27
ND	2.18	1.48	2.43	1.86	1.49	1.12	2.41	1.80
OH	5.35	2.50	3.55	1.58	4.04	1.92	4.73	2.12
OK	5.25	3.01	3.52	1.90	3.77	1.88	4.66	2.72
OR	11.74	4.96	12.23	6.12	13.64	6.04	12.48	5.77
PA	4.86	3.73	4.22	2.37	3.54	1.95	4.38	2.69
RI	0	0	0	0	0	0	105.33 ^c	0
SC	4.64	2.16	4.74	3.62	5.03	3.71	5.11	3.31
SD	8.16	6.27	14.98	14.49	7.27	6.36	10.19	9.09
TN	4.88	1.69	4.67	1.89	7.56	2.02	5.59	1.88
TX	7.03	3.36	5.29	2.50	5.92	2.45	7.12	3.16
UT	3.69	1.34	1.85	0.93	11.19	4.04	5.78	2.31
VT	5.98	2.99	7.86	5.24	24.32	18.24	15.22	11.59
VA	4.27	1.42	4.39	2.31	4.59	2.15	4.35	1.91

TABLE 4.2 (Cont.)

State ^b	1986		1987		1988		1985-88	
	Total	Main Only	Total	Main Only	Total	Main Only	Total	Main Only
WA	3.65	1.38	2.69	1.50	3.57	1.12	3.49	1.44
WV	11.49	9.23	9.97	7.73	6.08	4.67	9.61	7.42
WI	18.79	7.52	16.75	7.75	12.57	7.21	16.53	7.66
WY	2.55	1.37	2.61	1.47	2.88	1.40	3.10	1.97
USA	5.51	2.63	4.70	2.36	5.14	2.43	5.57	2.66
σ^d	-	-	-	-	-	-	21.48	11.12

^a Nationwide average fatality rate, using count of fatalities consistent with combination-truck fatality counts, is 6.50×10^{-10} fatalities per railcar-kilometer. Nationwide average injury rate, using count of injuries consistent with combination-truck injury counts, is 7.83×10^{-8} injuries per railcar-kilometer.

^b Includes the 48 contiguous states, the District of Columbia, and the totals for the United States.

^c Rates are one or more standard deviations greater than the national average rate for that category (i.e., all accidents on carrier-owned track or accidents on main lines only).

^d σ = standard deviation.

Source: Saricks and Kvitek (1994).

Conversely, a very severe accident would be expected to release nearly all of the material in a shipment into the environment. The method used to characterize accident severities and the corresponding release fractions are described subsequently.

4.3.1 Accident Severity Categories

A method to characterize the potential severity of transportation-related accidents is described in an NRC report commonly referred to as NUREG-0170 (NRC 1977a). The NRC method divides the spectrum of transportation accident severities into eight categories. Other studies have divided the same accident spectrum into six categories (Wilmot 1981) and into 20 categories (Fischer et al. 1987); however, these studies focused primarily on accidents involving shipments of spent nuclear fuel and thus are not directly applicable to this assessment.

The NUREG-0170 scheme for accident classification is shown in Figures 4.1 and 4.2 for truck and rail transportation, respectively. Severity is described as a function of the magnitudes of the mechanical forces (impact) and thermal forces (fire) to which a package may be subjected during an accident. Because all accidents can be described in these terms, severity is independent of the specific accident sequence. In other words, any sequence of

**FIGURE 4.1 Scheme for NUREG-0170
Classification by Accident Severity Category
for Truck Accidents (Source: NRC 1977a)**

events that results in an accident in which a package is subjected to forces within a certain range of values is assigned to the accident severity category associated with that range. The scheme for accident severity is designed to take into account all credible transportation-related accidents, including accidents with low probability but high consequences and those with high probability but low consequences.

Each severity category represents a set of accident scenarios defined by a combination of mechanical and thermal forces. A conditional probability of occurrence — that is, the probability that if an accident occurs, it is of a particular severity — is assigned to each category. The fractional occurrences for accidents by the accident severity category and the population density zone are shown in Table 4.3.

Category I accidents are the least severe but the most frequent, whereas Category VIII accidents are very severe but very infrequent. To determine the expected

**FIGURE 4.2 Scheme for NUREG-0170
Classification by Accident Severity Category
for Rail Accidents (Source: NRC 1977a)**

frequency of an accident of a given severity, the conditional probability in the category is multiplied by the baseline accident rate. Each population density zone has a distinct baseline accident rate and distribution of accident severities related to differences in average vehicular velocity, traffic density, and other factors, including location (rural, suburban, or urban).

For the accident consequence assessment, the doses were assessed for populations and individuals by assuming an accident of severity Category VIII. This accident severity category represents the most severe accident scenarios that can be postulated that would result in the largest release of radioactive material. Accidents of this severity are extremely rare, occurring approximately once in every 70,000 truck or 100,000 rail accidents involving a shipment of radioactive waste. On the basis of national accident statistics (Saricks and Kvitek 1994), for every 1.6 km (1 mi) of loaded shipment, the probability of an accident of this severity is 6×10^{-12} for shipment by truck and 1×10^{-12} for shipment by rail.

**TABLE 4.3 Fractional Occurrences for Accidents
by Severity Category and Population Density Zone**

Severity Category	Fractional Occurrence	Fractional Occurrence by Population Density Zone		
		Rural	Suburban	Urban
Truck				
I	5.5E-01	1E-01	1E-01	8E-01
II	3.6E-01	1E-01	1E-01	8E-01
III	7.0E-02	3E-01	4E-01	3E-01
IV	1.6E-02	3E-01	4E-01	3E-01
V	2.8E-03	5E-01	3E-01	2E-01
VI	1.1E-03	7E-01	2E-01	1E-01
VII	8.5E-05	8E-01	1E-01	1E-01
VIII	1.5E-05	9E-01	5E-02	5E-02
Rail				
I	5.0E-01	1E-01	1E-01	8E-01
II	3.0E-01	1E-01	1E-01	8E-01
III	1.8E-01	3E-01	4E-01	3E-01
IV	1.8E-02	3E-01	4E-01	3E-01
V	1.8E-03	5E-01	3E-01	2E-01
VI	1.3E-04	7E-01	2E-01	1E-01
VII	6.0E-05	8E-01	1E-01	1E-01
VIII	1.0E-05	9E-01	5E-02	5E-02

Source: NRC (1977a).

4.3.2 Package Release Fractions

Radiological consequences are calculated by assigning package release fractions to each accident severity category. The release fraction is defined as the fraction of the radioactive material in a package that could be released from the package as the result of an accident of a given severity. Release fractions take into account all mechanisms necessary to create release of radioactive material from a damaged package to the environment. Release fractions vary according to the type of package and the physical form of the waste.

Representative cask release fractions for accidents involving LLMW shipments were taken from NUREG-0170 (NRC 1977a). The recommendations in NUREG-0170 are based on best engineering judgments and have been shown to provide conservative estimates of radioactive material releases following accidents. The release fractions used are those reported in NUREG-0170 for NRC Type A packages. Release fractions for accidents of each severity category are given in Table 4.4. As shown in Table 4.4, the amount of material released from the packaging ranges from zero for minor accidents to 100% for the most severe accidents.

Also important for the purposes of risk assessment are the fraction of the released material that can be entrained in an aerosol (part of an airborne radioactive plume) and the fraction of the aerosolized material that is also respirable (of a size that can be inhaled into the lungs). These fractions depend on the physical form of the waste material. As stated previously, the LLMW assessment considered two physical waste forms: heterogeneous solids and organic liquids. The aerosolized and respirable fractions for these two forms are given in Table 4.5.

4.4 ATMOSPHERIC CONDITIONS DURING ACCIDENTS

Radioactive and hazardous material released to the atmosphere is transported by the wind. Dispersion or dilution of the radioactive material in the air depends on meteorologic conditions at the time of the accident. Because predicting the specific location of an off-site transportation-related accident is impossible, generic atmospheric conditions were selected for the accident risk and consequence assessments.

For the accident risk assessment, neutral weather conditions (represented by Pasquill stability Class D with a wind speed of 4 m/s [9 mph]) were assumed. Because neutral meteorologic conditions constitute the most frequently occurring atmospheric stability conditions in the United States, these conditions are most likely to be present in the event of an accident involving a LLMW shipment. On the basis of observations from National Weather Service surface meteorologic stations at over 300 locations in the United States, on an annual average, neutral conditions (represented by Pasquill Class C) occur about one-half of the time, while stable (Pasquill Classes E and F) and unstable (Pasquill Classes A through C) conditions occur about one-third and one-sixth of the time, respectively (Doty et al. 1976). The neutral category predominates in all seasons but most frequently in the winter (nearly 60% of the observations). For the accident consequence assessment, doses were assessed under both neutral and stable (Class D with a wind speed of 4 m/s [9 mph] and Class F with

TABLE 4.4 Estimated Release Fractions for LLMW Packages under Various Accident Severity Categories

Severity Category	Release Fraction ^a
Truck	
I	0E+00
II	1E-02
III	1E-01
IV	1.0E+00
V	1.0E+00
VI	1.0E+00
VII	1.0E+00
VIII	1.0E+00
Rail	
I	0E+00
II	1E-02
III	1E-01
IV	1.0E+00
V	1.0E+00
VI	1.0E+00
VII	1.0E+00
VIII	1.0E+00

^a Values are for total material release fraction (the fraction of material in a package released to the environment during an accident).

Source: NRC (1977a).

TABLE 4.5 Aerosolized and Respirable Material Release Fractions for LLMW^a

Physical Form of Waste	Aerosolized Fraction	Respirable Fraction
Organic liquids	1E+00	1E+00
Heterogeneous solids ^b	1E-01	5E-02

^a The aerosolized fraction is the fraction of the released material that is entrained as an aerosol during an accident. The respirable fraction is the fraction of the aerosolized release that is of a respirable size.

^b Considered to behave as a loose powder.

Source: Neuhauser and Kanipe (1993).

a wind speed of 1 m/s [2.2 mph]) atmospheric conditions. The results calculated for neutral conditions represent the most likely consequences, and the results for stable conditions represent a "worst-case" weather situation (i.e., conditions that result in the least amount of dilution and the highest air concentrations of radioactive material).

4.5 EXTERNAL DOSE RATES FROM SHIPMENTS

The dose (and, correspondingly, the risk) to populations during routine transportation is directly proportional to the assumed external dose rate from the shipment. The actual dose rate from the shipment is a complex function of the composition and configuration of shielding and containment materials used in the waste packaging, the geometry of the loaded shipment, and the characteristics of the waste material itself. Representative shipment dose rates have been developed and used in the WM PEIS LLMW transportation analysis. In practice, external dose rates will vary not only from site to site and from waste type to waste type, but also from shipment to shipment at a given site.

The external dose rate for shipments of LLMW was assumed to be the same as for the LLW analysis conducted for the WM PEIS. For WM LLW shipments, the external dose rates from historical waste shipments were investigated by using the Shipment Mobility/Accountability Collection (SMAC) system (R. Morris, 1993, Science Applications International Corp., personal communication to F.A. Monette, ANL-E, Argonne, Ill., Dec. 9). The SMAC database contains information on unclassified commercial freight shipments made by the DOE and its contractors. The information available in the SMAC database is collected from site shipping and receiving documents. Available information for shipments of radioactive materials includes the types of material shipped, the number of packages in each shipment, shipment weights, external dose rates, and package isotopic inventories. Approximately two-thirds of all DOE unclassified shipments are estimated to be reported to the SMAC system.

Shipment information from the SMAC database was examined for fiscal years 1983 to 1993 (R. Morris, 1993, Science Applications International Corp., personal communication to F.A. Monette, ANL-E, Argonne, Ill., Dec. 9). Information was provided for three general categories of radioactive material: irradiated fuel, "other" highway route controlled quantities, and LLW. (The material categories chosen were dictated by the format in which data are submitted and entered into the SMAC database and are not consistent with the definitions of waste types used in the WM PEIS.) Of the 15,000 LLW shipments recorded in the SMAC database, approximately 2,500 reported external dose rates. The average dose rate reported was approximately 1 mrem/h measured at 1 m (3.3 ft) from the surface of a shipment. This value was used for future WM LLMW shipments for the WM PEIS analysis.

4.6 RADIOLOGICAL MAXIMALLY EXPOSED INDIVIDUAL EXPOSURE SCENARIOS

The radiological risk to MEIs has been estimated for a number of hypothetical exposure scenarios for LLMW shipments. The receptors include crew members, departure inspectors, and members of the public exposed during traffic obstructions (traffic jam), while working at a service station, or by living near a treatment, storage, or disposal site. The dose and risk to MEIs were calculated for given distances and durations of exposure. The distances and durations of exposure for each receptor are similar to those given in previous transportation assessments (DOE 1987b, 1990a). The scenarios for exposure are not meant to be exhaustive but were selected to provide a range of potential situations for exposure. The assumptions for exposure scenarios are as follows:

- *Crew Members.* Truck and rail crew members are assumed to be occupational radiation workers and would be monitored by a dosimetry program. Therefore, the maximum allowable dose would be 5 rem/yr. As an administrative procedure, the DOE limits doses to DOE workers to 2 rem/yr (DOE 1992).
- *Inspectors (Truck and Rail).* Inspectors are assumed to be either federal or state vehicle inspectors. Inspectors are not assumed to be monitored by a dosimetry program. An average exposure distance of 3 m (10 ft) and an exposure duration of 30 minutes are assumed.
- *Rail-Yard Crew Member.* A rail-yard crew member is not assumed to be monitored by a dosimetry program. An average exposure distance of 10 m (33 ft) and an exposure duration of two hours are assumed.
- *Resident (Truck and Rail).* A resident is assumed to live 30 m (98 ft) from a site entrance route (truck or rail). Shipments pass at an average speed of 24 km/h (15 mph), and the resident is exposed unshielded. Cumulative doses are assessed for each site on the basis of the number of shipments entering or exiting the site, with the assumption that the resident is present for 100% of the shipments.

- *Person in Traffic Obstruction (Truck and Rail).* A person is assumed to be stopped next to a waste shipment (e.g., because of traffic slowdown). The person is assumed to be exposed unshielded at a distance of 1 m (3.3 ft) for a duration of 30 minutes.
- *Person at Truck Service Station.* A person is assumed to be exposed at an average distance of 20 m (66 ft) for a duration of two hours. This receptor could be a worker at a truck stop.
- *Resident near a Rail Stop.* A resident is assumed to live near a rail classification yard. The resident is assumed to be exposed unshielded at a distance of 200 m (656 ft) for a duration of 20 hours.

The largest uncertainty in predicting the dose to MEIs during transportation involves determining the frequency of occurrence of exposures. This difficulty results from the uncertainties in future shipment schedules and route selection and from the inherent uncertainty in predicting the frequency of random or chance events; for instance, that an individual may be stopped in traffic next to a shipment of radioactive waste is conceivable; however, predicting how often the same individual would experience this event is difficult. Therefore, for the majority of receptors considered, doses are assessed on a per-event basis. To account for possible multiple exposures, ranges of realistic total doses are discussed qualitatively. One exception is the calculation of the dose to a hypothetical resident living near an entrance route to a storage or disposal site. For these residents, total doses are calculated on the basis of the number of shipments entering or exiting each site for each case.

4.7 GENERAL RADIOLOGICAL ASSESSMENT INPUT PARAMETERS

In addition to the specific parameters discussed previously, values for a number of general parameters must be specified within the RADTRAN code to calculate radiological risks. These general parameters define basic characteristics of the shipment and traffic and are specific to the mode of transportation. The user's manual for the RADTRAN code (Neuhauser and Kanipe 1993) contains derivations and descriptions of these parameters. The general RADTRAN input parameters used in the radiological transportation risk assessment are summarized in Table 4.6.

**TABLE 4.6 General RADTRAN Input Parameters
for the LLMW Assessment**

Parameter	Truck	Rail
Package type	Type A	Type A
Shipment size (length) (m)	12	16
Shipment capacity (kg)	20,000	55,000
No. of crewmen	2	5
Distance from source to crew (m)	3	152
Average vehicle speed (km/h)		
Rural	88	64
Suburban	40	40
Urban	24	24
Stop time (h/km)	0.011	0.033
No. of people exposed while stopped	25	100
No. of people per vehicle sharing route	2	3
Population densities (persons/km ²)		
Rural	6	6
Suburban	719	719
Urban	3,861	3,861
One-way traffic count (vehicles/h)		
Rural	470	1
Suburban	780	5
Urban	2,800	5
Accident release fractions	a	a
Accident conditional probabilities	b	b

^a See Table 4.4.

^b See Table 4.3.

Source: Neuhauser and Kanipe (1993).

5 RISK ASSESSMENT RESULTS

5.1 RADIOLOGICAL ASSESSMENT

The results of the LLMW transportation radiological risk assessment are summarized in this section for the seven WM cases defined in Section 2.2. Although the method for risk assessment and the important assumptions used for the assessment have been presented in detail in previous sections of this report, a brief overview of the risk assessment process is provided subsequently to aid the reader in interpreting the results of risk assessment.

The impacts of transportation are calculated in three areas: (1) collective population risks during routine conditions and accidents for each case, (2) risks to MEIs during routine conditions for each case, and (3) consequences to individuals and populations after the most severe accidents involving a release of radioactive material. These three areas are detailed in the following paragraphs:

- *Collective Population Risk.* The collective population risk is a measure of the total risk posed to society as a whole by the case being considered. For the collective population risk assessment, the persons exposed are considered as a group, without specifying individual receptors. The collective population risk is used as the primary means to compare the various cases.

Collective population risks are calculated from both vehicle- and cargo-related causes for routine transportation and accidents. Vehicle-related risks are independent of the cargo in the shipment and include risks from vehicular exhaust emissions and traffic accidents (fatalities caused by physical trauma). Vehicle-related risks are presented in terms of estimated fatalities for each case.

For radioactive material, cargo-related risk refers to the risk posed by the radioactive nature of the material. The collective population risks are calculated for each case by using RADTRAN 4. The RADTRAN 4 calculations for population risk take into account both the consequences and the probabilities of potential exposure-causing events (such as accidents). The accident risk values are referred to as "dose risk" because they incorporate the probabilities of a spectrum of accidents. The collective population risks are presented in terms of the total dose (person-rem) to workers and to members of the public for each case. The collective population risks are also presented in terms of the estimated number of fatal latent-cancer cases, the number of latent-cancer cases (incidence), and the number of severe genetic effects by using the health risk conversion factors from ICRP publication 60 (ICRP 1991).

- *Maximally Exposed Individuals during Routine Conditions.* During the routine transportation of radioactive waste, specific individuals may be exposed to radiation in the vicinity of a shipment. The risk to these individuals has been estimated for a number of hypothetical exposure-causing events by using RISKIND. The receptors include transportation crew members, inspectors, and members of the public exposed during traffic delays, while working at a service station, or while living near a DOE site. The assumptions about exposure are given in Section 4.6. The scenarios for exposure are not meant to be exhaustive but were selected to provide a range of potential exposures.

For the majority of the individual receptors considered, doses are assessed and presented on a per-event basis — no attempt is made to estimate the frequency of exposure-causing events, although the range of possible exposures is qualitatively discussed; however, one exception is the calculation of the dose to a hypothetical resident living near the entrance route to a treatment, storage, or disposal site. For these residents, cumulative doses are calculated on the basis of the total number of shipments entering or exiting each site for each case.

- *Accident Consequence Assessment.* The RISKIND code is used to provide a detailed assessment of the consequences of the most severe transportation-related accidents involving LLMW shipments. Whereas the RADTRAN 4 collective accident risk assessment considers the entire range of accident severities and their related probabilities, the RISKIND accident consequence assessment assumes that an accident of the highest severity category (Category VIII) has occurred. The consequences, in terms of committed dose (rem) and latent-cancer fatalities, are calculated for both exposed populations and individuals in the vicinity of an accident.

5.1.1 Collective Population Radiological Risk Results

The results of the collective population risk assessment are summarized in this section. The summarized results present the total transportation impacts that would be incurred across the DOE complex for each case from all LLMW shipments associated with that case. The summarized results do not indicate the quantity of waste that would be shipped between specific sites for a given case; however, detailed results of assessment are presented in Appendix B of this report. The detailed results include route information, the estimated number of annual shipments, and "per-shipment" risk factors (an estimate of the risk for a single shipment between two specific sites) for shipments between all origin-destination pairs considered by each case.

The collective risk results for the seven WM LLMW cases are summarized in a series of tables. The collective risk results were calculated with the RADTRAN 4 computer code by

using the WASTE_MGMT files provided in Appendix A of this report as the primary input. The summarized results present the total radiological impacts from shipping current inventories plus 20 years of WM LLMW generation. As stated previously, the average annual risk (or number of shipments) can be estimated by dividing the summarized results by the duration of the shipping campaigns. Shipments would be distributed uniformly over a 10-year period, with the assumption of a 10-year period to build TSD facilities. Note that LLMW Cases 1 and 26 involve no off-site transportation of waste and have thus been omitted from the following tables.

The total number of shipments and shipment mileages are presented for each of the WM LLMW cases in Table 5.1. The numbers of shipments were calculated by using the inventory data presented in Appendix A of this report and the assumptions concerning representative shipment sizes presented in Section 4.1. The total incident-free (routine) dose for each case is presented in Table 5.2 in terms of person-rem. The routine doses are presented separately for crew members and for members of the public along the transportation routes; these doses result from exposures to external radiation in the vicinity of a shipment. The total accident dose risk for each case is presented in Table 5.3. The estimates of accident dose risk depend on the specific radionuclides present in each shipment and take into account the probability of accident occurrences and the distribution of accident severities. Finally, impacts are presented in terms of human health risks in Tables 5.4 through 5.6. The health risks are presented for cargo-related (radiological) and vehicle-related (nonradiological) causes. All impacts are presented in two columns, with the first column assuming all truck shipments and the second assuming all rail shipments.

5.1.2 Maximally Exposed Individual Assessment: Routine Transport

Doses to individuals during routine transportation have been estimated for each of the receptor scenarios described in Section 4.6 for WM LLMW shipments. The estimated doses to individuals exposed to WM LLMW shipments are presented in Table 5.7. The doses are calculated by assuming an external dose rate of 1 mrem/h at 1 m (3.3 ft) from a shipment and are reported on a per-event basis (rem per event). The total dose for repeated exposures can be estimated by multiplying the per-event dose by the number of exposures.

The potential exists for significant individual exposures if multiple exposure-causing events occur during WM LLMW shipments; for instance, the dose to a person stuck in traffic next to a shipment for 30 minutes is estimated to be 0.5 mrem. If the duration of exposure is longer, the dose would rise proportionally. That a person could receive a dose on the order of 2 to 10 mrem while stopped in traffic next to a shipment is conceivable. In addition, a person working at a truck service station could receive an increased dose if trucks use the same stops repeatedly. If a truck-stop worker is present for 100 shipment stops (at the distance and duration given previously), the estimated dose is on the order of 2 mrem. Administrative controls could be instituted to control the location and duration of truck stops if multiple exposures were to happen routinely. The probability of multiple exposures increases as the amount of waste transportation increases.

TABLE 5.1 Total Number of Shipments and One-Way Shipping Distances for the WM LLMW Alternatives^a

WM LLMW Alternative	No. of Shipments ^b		Total Mileage (mi)	
	Truck	Rail	Truck	Rail
Decentralized	480	350	2.46E+05	2.31E+05
Regionalized 1	1,810	1,030	5.94E+05	4.81E+05
Regionalized 2	5,560	2,490	2.57E+06	1.37E+06
Regionalized 3	10,990	4,540	1.49E+07	6.76E+06
Regionalized 4	4,250	2,050	2.89E+06	1.57E+06
Centralized	7,520	3,340	1.35E+07	6.46E+06

^a For each alternative, impacts are calculated and presented separately assuming exclusive truck or exclusive rail shipments. Therefore, the impacts for truck and rail modes should not be added together.

^b The number of shipments is calculated by assuming that truck and rail shipments consist of 19,958 kg (44,000 lb) and 54,431 kg (120,000 lb) of LLMW, respectively.

TABLE 5.2 Total Routine (Incident-Free) Dose for the WM LLMW Alternatives^a

WM LLMW Alternative	Dose (person-rem)			
	Truck		Rail	
	Crew ^b	Public ^c	Crew ^b	Public ^c
Decentralized	8.22E+00	9.72E+00	1.97E+00	5.75E+00
Regionalized 1	2.04E+01	2.31E+01	4.98E+00	1.37E+01
Regionalized 2	8.03E+01	9.26E+01	1.29E+01	2.91E+01
Regionalized 3	4.29E+02	5.13E+02	4.13E+01	7.58E+01
Regionalized 4	8.41E+01	9.86E+01	1.25E+01	2.82E+01
Centralized	3.74E+02	4.47E+02	3.66E+01	6.93E+01

^a Routine doses result from exposure to external radiation in the vicinity of a loaded shipment. The external dose rate is assumed to be 1 mrem/h at 1 m (3.3 ft) from a WM LLMW shipment. For each alternative, impacts are calculated and presented separately assuming exclusive truck or exclusive rail shipments. Therefore, the impacts for truck and rail modes should not be added together.

^b The crew includes truck drivers, rail crew members, and rail workers in marshaling or classification yards.

^c Members of the public include persons in vehicles sharing transportation routes, persons living along routes, and persons exposed at shipment stops.

**TABLE 5.3 Total Accident Dose Risk
for the WM LLMW Alternatives^{a,b}**

WM LLMW Alternative	Dose Risk (person-rem)	
	Truck	Rail
Decentralized	1.09E+00	3.11E-01
Regionalized 1	2.23E+00	5.96E-01
Regionalized 2	1.54E+01	2.18E+00
Regionalized 3	2.60E+01	4.61E+00
Regionalized 4	1.59E+01	2.60E+00
Centralized	1.48E+02	2.76E+01

^a The calculation of accident dose risk takes into account the dose to the public following accidents involving the release of radioactive material to the environment, the probability of accident occurrences, and the distribution of accident severities.

^b For each alternative, impacts are calculated and presented separately assuming exclusive truck or exclusive rail shipments. Therefore, the impacts for truck and rail modes should not be added together.

The potential cumulative dose to a resident living along a site entrance route has been estimated and is summarized in Table 5.8 for each WM LLMW case. The cumulative dose assumes that a resident is present for every shipment either entering or exiting a site and is unshielded at a distance of 30 m (98 ft) from the roadway. The assessment considers 20 years of shipments for WM LLMW. The lifetime risk of fatality due to cancer has been calculated by multiplying the doses by the ICRP health risk conversion factor of 5×10^{-4} fatal cancers per rem for members of the public. The estimated annual dose to a resident would be well below the annual limit of 100 mrem specified for members of the public (DOE 1990b).

5.1.3 Radiological Accident Consequence Assessment

The RISKIND (Yuan et al. 1993) code is used to provide a detailed assessment of the consequences of the most severe transportation-related accidents for the WM LLMW shipments. Whereas the RADTRAN 4 accident risk assessment considers the entire range of accident severities and their related probabilities, the RISKIND accident consequence assessment assumes that an accident of the highest credible severity has occurred.

Accident consequences are presented for a shipment of waste that represents the highest potential radiological risk if an accident occurs. This "worst-case" waste is identified by screening the site-specific radiological waste characteristics (i.e., activity concentrations) developed for the WM PEIS, taking into account physical waste forms and the relative

TABLE 5.4 Total Estimated Fatalities for the WM LLMW Alternatives^{a,b}

WM LLMW Alternative	Exposure Group	Fatalities	
		Truck	Rail
Decentralized	Cargo-related (radiological)		
	Normal crew	3.3E-03	8.1E-04
	Normal public	5.0E-03	2.9E-03
	Accident public	5.4E-04	1.6E-04
	Vehicle-related (nonradiological)		
	Emission	4.6E-03	5.7E-03
	Accident	1.8E-02	5.0E-04
Regionalized 1	Cargo-related (radiological)		
	Normal crew	8.3E-03	2.0E-03
	Normal public	1.2E-02	6.9E-03
	Accident public	1.1E-03	3.0E-04
	Vehicle-related (nonradiological)		
	Emission	8.5E-03	1.3E-02
	Accident	3.8E-02	1.0E-03
Regionalized 2	Cargo-related (radiological)		
	Normal crew	3.2E-02	5.2E-03
	Normal public	4.5E-02	1.4E-02
	Accident public	7.6E-03	1.1E-03
	Vehicle-related (nonradiological)		
	Emission	2.4E-02	2.3E-02
	Accident	1.9E-01	2.8E-03
Regionalized 3	Cargo-related (radiological)		
	Normal crew	1.7E-01	1.7E-02
	Normal public	2.6E-01	3.8E-02
	Accident public	1.3E-02	2.4E-03
	Vehicle-related (nonradiological)		
	Emission	1.0E-01	5.5E-02
	Accident	1.0E+00	1.4E-02

TABLE 5.4 (Cont.)

WM LLMW Alternative	Exposure Group	Fatalities	
		Truck	Rail
Regionalized 4	Cargo-related (radiological)		
	Normal crew	3.3E-02	5.0E-03
	Normal public	4.8E-02	1.4E-02
	Accident public	7.8E-03	1.3E-03
	Vehicle-related (nonradiological)		
	Emission	1.5E-02	2.4E-02
	Accident	1.9E-01	3.2E-03
Centralized	Cargo-related (radiological)		
	Normal crew	1.5E-01	1.5E-02
	Normal public	2.2E-01	3.5E-02
	Accident public	7.4E-02	1.4E-02
	Vehicle-related (nonradiological)		
	Emission	5.4E-02	5.3E-02
	Accident	8.3E-01	1.4E-02

^a Latent-cancer fatalities are calculated by multiplying dose by the ICRP publication 60 (ICRP 1991) health risk conversion factors of 4E-04 and 5E-04 fatal cancers per person-rem for workers and for the public, respectively.

^b For each alternative, impacts are calculated and presented separately assuming exclusive truck or exclusive rail shipments. Therefore, the impacts for truck and rail modes should not be added together.

hazards of individual radionuclides. For the majority of waste shipments, the consequences of severe accidents would be less than those presented for the "worst-case" waste. The accident consequence assessment is intended to provide an estimate of the maximum potential impacts posed by a severe transportation accident involving a given waste type. The assessment is not meant to be used as a basis for comparison among the different alternatives.

As stated previously, the accident consequences were calculated for transportation-related accidents that result in the maximum release of radioactive material (accident severity Category VIII). For these accidents, the assumptions were that all of the material in the shipment would be released from its packaging, that 10% would be entrained as an aerosol, and that 5% of the aerosol would be respirable.

**TABLE 5.5 Total Estimated Cancer Incidence
for the WM LLMW Alternatives^{a,b}**

WM LLMW Alternative	Exposure Group	Cancer Cases	
		Truck	Rail
Decentralized	Cargo-related (radiological)		
	Normal crew	1.2E-02	2.9E-03
	Normal public	1.7E-02	1.0E-02
	Accident public	1.8E-03	5.4E-04
	Vehicle-related (nonradiological)		
	Emission	4.6E-03	5.7E-03
	Accident	NA ^c	NA
Regionalized 1	Cargo-related (radiological)		
	Normal crew	2.8E-02	7.0E-03
	Normal public	3.9E-02	2.3E-02
	Accident public	3.8E-03	1.0E-03
	Vehicle-related (nonradiological)		
	Emission	8.5E-03	1.3E-02
	Accident	NA	NA
Regionalized 2	Cargo-related (radiological)		
	Normal crew	1.1E-01	1.8E-02
	Normal public	1.6E-01	4.9E-02
	Accident public	2.6E-02	3.8E-03
	Vehicle-related (nonradiological)		
	Emission	2.4E-02	2.3E-02
	Accident	NA	NA
Regionalized 3	Cargo-related (radiological)		
	Normal crew	6.1E-01	5.8E-02
	Normal public	8.7E-01	1.3E-01
	Accident public	4.4E-02	7.9E-03
	Vehicle-related (nonradiological)		
	Emission	1.0E-01	5.5E-02
	Accident	NA	NA

TABLE 5.5 (Cont.)

WM LLMW Alternative	Exposure Group	Cancer Cases	
		Truck	Rail
Regionalized 4	Cargo-related (radiological)		
	Normal crew	1.2E-01	1.7E-02
	Normal public	1.7E-01	4.8E-02
	Accident public	2.7E-02	4.3E-03
	Vehicle-related (nonradiological)		
	Emission	1.5E-02	2.4E-02
	Accident	NA	NA
Centralized	Cargo-related (radiological)		
	Normal crew	5.3E-01	5.2E-02
	Normal public	7.6E-01	1.2E-01
	Accident public	2.5E-01	4.7E-02
	Vehicle-related (nonradiological)		
	Emission	5.4E-02	5.3E-02
	Accident	NA	NA

^a Latent-cancer incidences are calculated by multiplying dose by the ICRP publication 60 (ICRP 1991) health risk conversion factors of 1.4E-03 and 1.7E-03 cancer cases per person-rem for workers and for the public, respectively.

^b For each alternative, impacts are calculated and presented separately assuming exclusive truck or exclusive rail shipments. Therefore, the impacts for truck and rail modes should not be added together.

^c NA = not applicable.

During screening, the heterogeneous solid WM LLMW from the Paducah Gaseous Diffusion Plant (PGDP) was found to result in the highest transportation accident doses. The accident consequence results from RISKIND for WM LLMW shipments are presented in Table 5.9. The population doses are for a uniform population density within an 80-km (50-mi) radius of accidents occurring in rural, suburban, and urban population density zones. The location of the MEI after an accident is determined on the basis of atmospheric conditions and the buoyant characteristics of the released plume. The locations of maximum exposure are approximately 160 m (525 ft) and 400 m (1,312 ft) from the accident site for neutral and stable weather conditions, respectively. The dose to the MEI is independent of the location of the accident. The maximum dose to an individual (approximately 5 rem for a rail accident under unfavorable weather conditions) has a potential lifetime fatal-cancer risk of 2×10^{-3} .

**TABLE 5.6 Total Estimated Genetic Effects
for the WM LLMW Alternatives^{a,b}**

WM LLMW Alternative	Exposure Group	Genetic Effects	
		Truck	Rail
Decentralized	Cargo-related (radiological)		
	Normal crew	5.0E-04	1.2E-04
	Normal public	1.0E-03	5.8E-04
	Accident public	7.5E-05	2.1E-05
	Vehicle-related (nonradiological)		
	Emission	NA ^c	NA
	Accident	NA	NA
Regionalized 1	Cargo-related (radiological)		
	Normal crew	1.2E-03	3.0E-04
	Normal public	2.3E-03	1.4E-03
	Accident public	1.6E-04	4.0E-05
	Vehicle-related (nonradiological)		
	Emission	NA	NA
	Accident	NA	NA
Regionalized 2	Cargo-related (radiological)		
	Normal crew	4.8E-03	7.7E-04
	Normal public	9.3E-03	2.9E-03
	Accident public	2.6E-04	6.1E-05
	Vehicle-related (nonradiological)		
	Emission	NA	NA
	Accident	NA	NA
Regionalized 3	Cargo-related (radiological)		
	Normal crew	2.6E-02	2.5E-03
	Normal public	5.1E-02	7.6E-03
	Accident public	1.1E-03	2.3E-04
	Vehicle-related (nonradiological)		
	Emission	NA	NA
	Accident	NA	NA

TABLE 5.6 (Cont.)

WM LLMW Alternative	Exposure Group	Genetic Effects	
		Truck	Rail
Regionalized 4	Cargo-related (radiological)		
	Normal crew	5.0E-03	7.4E-04
	Normal public	9.8E-03	2.9E-03
	Accident public	2.4E-04	8.7E-05
	Vehicle-related (nonradiological)		
	Emission	NA	NA
	Accident	NA	NA
Centralized	Cargo-related (radiological)		
	Normal crew	2.3E-02	2.2E-03
	Normal public	4.5E-02	6.9E-03
	Accident public	4.5E-03	9.0E-04
	Vehicle-related (nonradiological)		
	Emission	NA	NA
	Accident	NA	NA

^a Genetic effects are calculated by multiplying dose by the ICRP publication 60 (ICRP 1991) health risk conversion factors of 6E-05 and 1E-04 adverse genetic effects per person-rem for workers and for the public, respectively.

^b For each alternative, impacts are calculated and presented separately assuming exclusive truck or exclusive rail shipments. Therefore, the impacts for truck and rail modes should not be added together.

^c NA = not applicable.

5.2 HAZARDOUS ASSESSMENT RESULTS

The results of the transportation risk assessment for the hazardous portion of LLMW are summarized in this section for the seven WM cases defined in Section 2.2. No risks are computed for the WM no action alternative (Case 1) or WM Case 26 because the number of LLMW shipments is zero or too small to produce any significant transportation risk. Cargo-related risks from accident conditions are calculated for the collective population and for the MEI. Vehicle-related risks from routine operations are reported in Section 5.1.1. The method for risk assessment and the assumptions used for the assessment have been presented in detail in Section 3.3 of this report.

TABLE 5.7 Estimated Routine Doses and Lifetime Risk of Fatal Cancer to MEIs from Shipments of WM LLMW (per Exposure Event)^a

Receptor ^b	Dose (rem)		Lifetime Risk ^c	
	Truck	Rail	Truck	Rail
Workers				
Crew member	d	d	d	d
Inspector	1.5E-04	1.5E-04	6E-08	6E-08
Rail-yard crew member	NA ^e	7.9E-05	NA	3E-08
Public				
Resident	1.6E-08	1.6E-08	8E-12	8E-12
Person in traffic jam	5.0E-04	5.0E-04	3E-07	3E-07
Person at service station	2.1E-05	NA	1E-08	NA
Resident near rail stop	NA	1.1E-06	NA	6E-10

^a Dose rate is assumed to be 1 mrem/h at 1 m (3.3 ft) from a WM LLMW shipment.

^b Receptor assumptions are described in Section 4.6 of this report.

^c Lifetime risk of fatal cancer is based on ICRP publication 60 (ICRP 1991) health risk conversion factors of 4E-04 and 5E-04 fatal cancers per person-rem for workers and for members of the public, respectively.

^d The DOE administrative control level limits doses to DOE workers to 2 rem/yr. For a representative shipment of 1,609 km (1,000 mi) and an average speed of 80 km/h (50 mph), the dose to a driver would be approximately 40 mrem if the dose rate in the crew compartment were at the regulatory limit of 2 mrem/h. Dose rates are typically much less than 2 mrem/h in the crew compartment.

^e NA = not applicable.

The collective cargo-related population risks to the general public for 10 years of off-site WM LLMW transportation, associated with the most frequently occurring meteorologic conditions (i.e., neutral atmospheric stability with a wind speed of 4 m/s [9 mph]), are summarized in Table 5.10 for highway shipments and in Table 5.11 for railroad shipments. Transportation accidents involving liquid waste shipments yield much higher population risks than those involving solid waste shipments by at least 4 orders of magnitude under the same LLMW treatment option. Due to the higher payload capacity of a railcar compared with that of a truck, the population risks are generally higher for railway than for highway transportation.

The potential population risks involving liquid waste shipments by trucks and railcars are attributed to the direct release of aerosolized liquid droplets. Truck-accident potential-increased-cancer (PIC) and PAE risks from aerosolized liquid droplets are highest for highway shipments under the centralized alternative, severity Category IV.

TABLE 5.8 Cumulative Dose and Lifetime Risk to MEI Living Along a Site Entrance Route for WM LLMW Shipments (Current Inventories plus 20 Years of Generation)^a

WM Alternative and Site ^b	All Truck			All Rail		
	Total Shipments	Dose (rem)	Risk (Fatal Cancer) ^c	Total Shipments	Dose (rem)	Risk (Fatal Cancer) ^c
Decentralized						
LLNL	250	4.0E-06	2.0E-09	120	1.9E-06	9.7E-10
ETEC	110	1.8E-06	8.9E-10	40	6.4E-07	3.2E-10
NTS	100	1.6E-06	8.1E-10	40	6.4E-07	3.2E-10
SRS	90	1.4E-06	7.2E-10	90	1.4E-06	7.2E-10
PORTS	90	1.4E-06	7.2E-10	90	1.4E-06	7.2E-10
WVDP	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
Mound	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
Hanford	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
Bettis	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
UofMO	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
RFETS	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
RMI	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
Puget So	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
PPPL	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
Ports Nav	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
Pearl H	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
PGDP	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
Norfolk	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
Mare Is	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
LBL	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
LEHR	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
KAPL-N	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
KCP	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
KAPL-W	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
KAPL-K	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
GJPO	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
GA	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
Colonie	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
Charleston	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
BCL	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
ANL-E	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
Ames	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
Regionalized 1						
FEMP	1,060	1.7E-05	8.5E-09	410	6.6E-06	3.3E-09
PORTS	820	1.3E-05	6.6E-09	440	7.1E-06	3.5E-09
ANL-E	450	7.2E-06	3.6E-09	180	2.9E-06	1.4E-09
LLNL	310	5.0E-06	2.5E-09	180	2.9E-06	1.4E-09
NTS	120	1.9E-06	9.7E-10	60	9.7E-07	4.8E-10
SRS	110	1.8E-06	8.9E-10	110	1.8E-06	8.9E-10
ETEC	110	1.8E-06	8.9E-10	40	6.4E-07	3.2E-10
Hanford	40	6.4E-07	3.2E-10	40	6.4E-07	3.2E-10
WVDP	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
RFETS	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
RMI	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
LANL	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
LEHR	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
GJPO	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
GA	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
Colonie	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
Charleston	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
Bettis	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10

TABLE 5.8 (Cont.)

WM Alternative and Site ^b	All Truck			All Rail		
	Total Shipments	Dose (rem)	Risk (Fatal Cancer) ^c	Total Shipments	Dose (rem)	Risk (Fatal Cancer) ^c
Regionalized 1 (Cont.)						
SNL-NM	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
Puget So	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
Pearl H	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
Mound	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
LBL	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
KAPL-N	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
KAPL-W	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
KAPL-K	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
BNL	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
Ames	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
UofMO	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
PPPL	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
Ports Nav	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
PGDP	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
Norfolk	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
Mare Is	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
KCP	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
ITRI	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
INEL	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
BCL	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
Regionalized 2						
LANL	2,610	4.2E-05	2.1E-08	1,020	1.6E-05	8.2E-09
RFETS	2,560	4.1E-05	2.1E-08	980	1.6E-05	7.9E-09
PORTS	2,260	3.6E-05	1.8E-08	960	1.5E-05	7.7E-09
ORR	1,660	2.7E-05	1.3E-08	650	1.0E-05	5.2E-09
ANL-E	450	7.2E-06	3.6E-09	180	2.9E-06	1.4E-09
INEL	220	3.5E-06	1.8E-09	120	1.9E-06	9.7E-10
Hanford	200	3.2E-06	1.6E-09	150	2.4E-06	1.2E-09
LLNL	190	3.1E-06	1.5E-09	90	1.4E-06	7.2E-10
SRS	110	1.8E-06	8.9E-10	110	1.8E-06	8.9E-10
FEMP	110	1.8E-06	8.9E-10	50	8.1E-07	4.0E-10
ETEC	90	1.4E-06	7.2E-10	40	6.4E-07	3.2E-10
PGDP	50	8.1E-07	4.0E-10	30	4.8E-07	2.4E-10
Pantex	40	6.4E-07	3.2E-10	30	4.8E-07	2.4E-10
WVDP	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
RMI	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
NTS	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
LEHR	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
GJPO	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
GA	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
Colonie	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
Charleston	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
Bettis	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
SNL-CA	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
SNL-NM	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
Puget So	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
Pearl H	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
Mound	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
LBL	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
KAPL-N	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
KAPL-W	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
KAPL-K	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
BNL	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10

TABLE 5.8 (Cont.)

WM Alternative and Site ^b	All Truck			All Rail		
	Total Shipments	Dose (rem)	Risk (Fatal Cancer) ^c	Total Shipments	Dose (rem)	Risk (Fatal Cancer) ^c
Regionalized 2 (Cont.)						
Ames	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
UofMO	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
PPPL	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
Ports Nav	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
Norfolk	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
Mare Is	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
KCP	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
ITRI	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
BCL	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
Regionalized 3						
NTS	9,650	1.6E-04	7.8E-08	3,700	6.0E-05	3.0E-08
RFETS	2,560	4.1E-05	2.1E-08	980	1.6E-05	7.9E-09
PORTS	2,260	3.6E-05	1.8E-08	960	1.5E-05	7.7E-09
ORR	2,100	3.4E-05	1.7E-08	790	1.3E-05	6.4E-09
Hanford	1,690	2.7E-05	1.4E-08	710	1.1E-05	5.7E-09
INEL	1,360	2.2E-05	1.1E-08	550	8.9E-06	4.4E-09
SRS	710	1.1E-05	5.7E-09	330	5.3E-06	2.7E-09
ANL-E	450	7.2E-06	3.6E-09	180	2.9E-06	1.4E-09
LLNL	190	3.1E-06	1.5E-09	90	1.4E-06	7.2E-10
LANL	180	2.9E-06	1.4E-09	100	1.6E-06	8.1E-10
FEMP	110	1.8E-06	8.9E-10	50	8.1E-07	4.0E-10
ETEC	90	1.4E-06	7.2E-10	40	6.4E-07	3.2E-10
PGDP	50	8.1E-07	4.0E-10	30	4.8E-07	2.4E-10
Pantex	40	6.4E-07	3.2E-10	30	4.8E-07	2.4E-10
WVDP	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
RMI	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
LEHR	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
GJPO	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
GA	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
Colonie	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
Charleston	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
Bettis	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
SNL-CA	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
SNL-NM	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
Puget So	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
Pearl H	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
Mound	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
LBL	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
KAPL-N	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
KAPL-W	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
KAPL-K	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
BNL	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
Ames	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
UofMO	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
PPPL	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
Ports Nav	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
Norfolk	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
Mare Is	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
KCP	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
ITRI	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
BCL	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11

TABLE 5.8 (Cont.)

WM Alternative and Site ^b	All Truck			All Rail		
	Total Shipments	Dose (rem)	Risk (Fatal Cancer) ^c	Total Shipments	Dose (rem)	Risk (Fatal Cancer) ^c
Regionalized 4						
INEL	2,450	3.9E-05	2.0E-08	1,040	1.7E-05	8.5E-09
RFETS	1,990	3.2E-05	1.6E-08	740	1.2E-05	6.0E-09
ORR	1,480	2.4E-05	1.2E-08	740	1.2E-05	6.0E-09
PORTS	650	1.0E-05	5.2E-09	260	4.2E-06	2.1E-09
ANL-E	450	7.2E-06	3.6E-09	180	2.9E-06	1.4E-09
Hanford	210	3.4E-06	1.7E-09	160	2.6E-06	1.3E-09
LLNL	190	3.1E-06	1.5E-09	90	1.4E-06	7.2E-10
LANL	130	2.1E-06	1.1E-09	80	1.3E-06	6.5E-10
SRS	110	1.8E-06	8.9E-10	110	1.8E-06	8.9E-10
FEMP	110	1.8E-06	8.9E-10	50	8.1E-07	4.0E-10
ETEC	90	1.4E-06	7.2E-10	40	6.4E-07	3.2E-10
PGDP	50	8.1E-07	4.0E-10	30	4.8E-07	2.4E-10
Pantex	40	6.4E-07	3.2E-10	30	4.8E-07	2.4E-10
WVDP	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
RMI	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
LEHR	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
GJPO	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
GA	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
Colonie	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
Charleston	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
Bettis	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
SNL-CA	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
SNL-NM	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
Puget So	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
Pearl H	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
Mound	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
LBL	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
KAPL-N	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
KAPL-W	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
KAPL-K	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
BNL	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
Ames	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
NTS	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
UofMO	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
PPPL	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
Ports Nav	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
Norfolk	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
Mare Is	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
KCP	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
ITRI	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
BCL	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
Centralized						
Hanford	7,520	1.2E-04	6.1E-08	3,340	5.4E-05	2.7E-08
RFETS	1,990	3.2E-05	1.6E-08	740	1.2E-05	6.0E-09
ORR	1,970	3.2E-05	1.6E-08	740	1.2E-05	6.0E-09
INEL	700	1.1E-05	5.6E-09	290	4.7E-06	2.3E-09
PORTS	650	1.0E-05	5.2E-09	260	4.2E-06	2.1E-09
SRS	580	9.3E-06	4.7E-09	240	3.9E-06	1.9E-09
ANL-E	450	7.2E-06	3.6E-09	180	2.9E-06	1.4E-09
LLNL	190	3.1E-06	1.5E-09	90	1.4E-06	7.2E-10
LANL	130	2.1E-06	1.0E-09	80	1.3E-06	6.4E-10
FEMP	110	1.8E-06	8.9E-10	50	8.1E-07	4.0E-10
ETEC	90	1.4E-06	7.2E-10	40	6.4E-07	3.2E-10

TABLE 5.8 (Cont.)

WM Alternative and Site ^b	All Truck			All Rail		
	Total Shipments	Dose (rem)	Risk (Fatal Cancer) ^c	Total Shipments	Dose (rem)	Risk (Fatal Cancer) ^c
Centralized (Cont.)						
PGDP	50	8.1E-07	4.0E-10	30	4.8E-07	2.4E-10
Pantex	40	6.4E-07	3.2E-10	30	4.8E-07	2.4E-10
WVDP	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
RMI	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
LEHR	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
GJPO	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
GA	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
Colonie	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
Charleston	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
Bettis	30	4.8E-07	2.4E-10	30	4.8E-07	2.4E-10
SNL-CA	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
SNL-NM	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
Puget So	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
Pearl H	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
Mound	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
LBL	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
KAPL-N	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
KAPL-W	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
KAPL-K	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
BNL	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
ANL-W	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
Ames	20	3.2E-07	1.6E-10	20	3.2E-07	1.6E-10
UofMO	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
PPPL	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
Ports Nav	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
Norfolk	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
NTS	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
Mare Is	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
KCP	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
ITRI	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11
BCL	10	1.6E-07	8.1E-11	10	1.6E-07	8.1E-11

^a The external dose rate is assumed to be 1 mrem/h at 1 m (3.3 ft) for all shipments. The resident is assumed to be present for all shipments that enter or exit the site. Shipments are assumed to pass at a distance of 30 m (98 ft) and an average speed of 24 km/h (15 mph).

^b Ames = Ames Laboratory; ANL-W = Argonne National Laboratory-West; BCL = Battelle Columbus Laboratories; Bettis = Bettis Atomic Power Laboratory; Charleston = Charleston Naval Shipyard; Colonie = Colonie; ETEC = Energy Technology Engineering Center; FEMP = Fernald Environmental Management Project; GA = General Atomics; GJPO = Grand Junction Projects Office; ITRI = Inhalation Toxicology Research Institute; KAPL-K = Knolls Atomic Power Laboratory (Kesselring); KAPL-N = Knolls Atomic Power Laboratory (Niskayuna); KAPL-W = Knolls Atomic Power Laboratory (Windsor); KCP = Kansas City Plant; LANL = Los Alamos National Laboratory; LBL = Lawrence Berkeley National Laboratory; LEHR = Laboratory for Energy-Related Health Research; Mare Is = Mare Island Naval Shipyard; Mound = Mound Plant; Norfolk = Norfolk Naval Shipyard; ORR = Oak Ridge Reservation; Pearl H = Pearl Harbor Naval Shipyard; PORTS = Portsmouth Gaseous Diffusion Plant; Ports Nav = Portsmouth Naval Shipyard; PPPL = Princeton Plasma Physics Laboratory; Puget So = Puget Sound Naval Shipyard; RFETS = Rocky Flats Environmental Technology Site; RMI = Reactive Metals, Inc.; SNL-CA = Sandia National Laboratories (California); SRS = Savannah River Site; UofMO = University of Missouri; and WVDP = West Valley Demonstration Project.

^c The risk of fatal cancer is calculated by using the ICRP publication 60 (ICRP 1991) health risk conversion factor of 5E-04 fatal cancers per person-rem for members of the public.

TABLE 5.9 Estimated Consequences for the Most Severe Accidents Involving Shipments of WM LLMW^{a,b}

Mode and Accident Location	Neutral Conditions ^d				Stable Conditions ^f			
	Population ^c		MEI ^e		Population ^c		MEI ^e	
	Dose (person-rem)	Risk (Cancer Fatalities)	Dose (rem)	Risk (Cancer Fatality)	Dose (person-rem)	Risk (Cancer Fatalities)	Dose (rem)	Risk (Cancer Fatality)
Truck								
Urban	6E+02	3E-01	5.3E-01	2.7E-04	4.75E+03	2E+00	1.8E+00	9.0E-04
Suburban	1.1E+02	6E-02	5.3E-01	2.7E-04	8.85E+02	4E-01	1.8E+00	9.0E-04
Rural	1.0E+00	5E-04	5.3E-01	2.7E-04	7.5E+00	4E-03	1.8E+00	9.0E-04
Rail								
Urban	1.62E+03	8E-01	1.4E+00	7.0E-04	1.283E+04	6E+00	4.8E+00	2.4E-03
Suburban	3.0E+02	2E-01	1.4E+00	7.0E-04	2.4E+03	1E+00	4.8E+00	2.4E-03
Rural	2.7E+00	1E-03	1.4E+00	7.0E-04	2.0E+01	1E-02	4.8E+00	2.4E-03

^a The most severe accidents correspond to the highest NUREG-0170 accident severity category (Category VIII) (NRC 1977a). Results are reported for WM LLMW from PGDP, which was found to result in the highest potential accident doses. The assumptions were that 100% of the radioactive material would be released from its packaging in an accident, that 10% of the release would be entrained in an aerosol, and that 5% of the aerosolized release would be respirable.

^b Buoyant plume rise resulting from fire for a severe accident was included in the exposure model.

^c Populations extend at a uniform population density to a radius of 80 km (50 mi) from the accident site. Population exposure pathways include acute inhalation; acute cloudshine; groundshine; resuspended inhalation; resuspended cloudshine; and ingestion of food, including initially contaminated food (rural only). No decontamination or mitigative actions are taken.

^d Neutral weather conditions result in moderate dispersion and dilution of the released plume. Neutral conditions were taken to be Pasquill stability Class D with a wind speed of 4 m/s (9 mph). Neutral conditions occur approximately 50% of the time in the United States.

^e The MEI is assumed to be at the location of maximum exposure. The locations of maximum exposure would be 160 m (525 ft) and 400 m (1,312 ft) from the accident site under neutral and stable atmospheric conditions, respectively. Individual exposure pathways include acute inhalation, acute cloudshine, and groundshine during passage of the plume. No ingested dose is considered.

^f Stable weather conditions result in minimal dispersion and dilution of the released plume and are thus unfavorable. Stable conditions were taken to be Pasquill stability Class F with a wind speed of 1 m/s (2.2 mph). Stable conditions occur approximately one-third of the time in the United States.

TABLE 5.10 Summary of Cargo-Related Population Risks^a for WM (10-Year Period)^b LLMW Shipments by Highway

Population Risks	LLMW Alternative					
	Decentralized	Regionalized 1	Regionalized 2	Regionalized 3	Regionalized 4	Centralized
Shipment summary						
Number of WM shipments	4.90E+02	1.81E+03	5.56E+03	1.09E+04	4.25E+03	7.52E+03
WM distance (km) ^c	3.75E+05	9.56E+05	4.14E+06	2.40E+07	4.34E+06	2.17E+07
Liquid wastes						
Potential for increased cancer incidence						
Severity Categories I-III	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Severity Category IV ^d	1.68E-07	3.51E-07	0.68E-05	0.68E-05	1.08E-05	1.95E-04
Severity Category V	1.29E-08	2.61E-08	4.96E-07	4.96E-07	0.80E-06	1.88E-05
Severity Category VI	0.65E-09	1.23E-09	2.28E-08	2.28E-08	3.72E-08	0.67E-06
Severity Category VII	2.03E-10	4.06E-10	0.73E-08	0.73E-08	1.14E-08	2.05E-07
Severity Category VIII	2.31E-11	4.27E-11	0.72E-09	0.72E-09	1.13E-09	2.01E-08
Potential adverse health effects						
Severity Categories I-III	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Severity Category IV ^d	1.04E-06	2.82E-06	2.84E-05	2.84E-05	4.36E-05	0.90E-03
Severity Category V	0.80E-07	2.04E-07	2.08E-06	2.08E-06	3.23E-06	0.67E-04
Severity Category VI	2.02E-09	0.99E-08	0.96E-07	0.96E-07	1.51E-07	3.13E-06
Severity Category VII	1.21E-09	3.11E-09	3.09E-08	3.09E-08	4.66E-08	0.95E-06
Severity Category VIII	1.33E-10	3.26E-10	3.05E-09	3.05E-09	4.62E-09	0.93E-07
Solid wastes						
(volatile-organic-contaminated soil/debris evaporative releases)						
Potential for increased cancer incidence	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential adverse health effects	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Solid wastes						
(respirable contaminated aerosol releases)						
Potential for increased cancer incidence	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential adverse health effects	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

^a Cargo-related risks refer to the number of people affected and were computed from the product of the probability of accidental release times the number of people exposed to the health criteria concentration.

^b Risks and travel distances are for the total shipping duration (10 years for WM LLMW). To obtain the annual values, the risks and distances must be divided by 10 for the WM cases.

^c Vehicle-related distances are the highway distances multiplied by 2 to account for the return of empty trucks with no cargo. As a result, distances may be overestimated.

^d Riskiest severity categories.

TABLE 5.11 Summary of Cargo-Related Population Risks^a for WM (10-Year Period)^b LLMW Shipments by Railway

Population Risks	LLMW Alternative					
	Decentralized	Regionalized 1	Regionalized 2	Regionalized 3	Regionalized 4	Centralized
Shipment summary						
Number of WM shipments	3.60E+02	1.03E+03	2.49E+03	4.54E+03	2.05E+03	3.34E+03
WM distance (km) ^c	3.44E+05	7.74E+05	2.20E+06	1.09E+06	2.45E+06	1.04E+06
Liquid wastes						
Potential for increased cancer incidence						
Severity Categories I-III	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Severity Category IV ^d	4.88E-08	1.16E-07	2.12E-06	2.12E-06	2.44E-06	2.82E-05
Severity Category V	3.60E-09	0.86E-08	1.51E-07	1.51E-07	1.77E-07	2.10E-06
Severity Category VI	1.68E-10	3.84E-10	0.66E-08	0.66E-08	0.79E-08	0.99E-07
Severity Category VII	0.58E-10	1.34E-10	2.46E-09	2.46E-09	2.96E-09	3.58E-08
Severity Category VIII	0.62E-11	1.32E-11	2.44E-10	2.44E-10	3.07E-10	3.88E-09
Potential adverse health effects						
Severity Categories I-III	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Severity Category IV ^d	2.70E-07	0.84E-06	0.87E-05	0.87E-05	1.01E-05	1.10E-04
Severity Category V	2.00E-08	0.61E-07	0.67E-06	0.67E-06	0.73E-06	0.82E-05
Severity Category VI	0.93E-09	2.77E-09	2.79E-08	2.99E-08	3.31E-08	3.89E-07
Severity Category VII	3.22E-10	0.99E-09	1.01E-08	1.01E-08	1.22E-08	1.39E-07
Severity Category VIII	3.42E-11	0.97E-10	1.01E-09	1.01E-09	1.37E-09	1.54E-08
Solid wastes						
(volatile-organic-contaminated soil/debris evaporative releases)						
Potential for increased cancer incidence	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential adverse health effects	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Solid wastes						
(respirable contaminated aerosol releases)						
Potential for increased cancer incidence ^d	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Potential adverse health effects						
Severity Categories I-III	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Severity Category IV ^d	0.00E+00	0.00E+00	4.21E-11	4.21E-11	0.52E-10	0.54E-09
Severity Category V	0.00E+00	0.00E+00	3.12E-12	3.12E-12	4.08E-12	3.98E-11
Severity Category VI	0.00E+00	0.00E+00	1.47E-13	1.47E-13	2.08E-13	1.73E-12
Severity Category VII	0.00E+00	0.00E+00	4.90E-14	4.90E-13	0.70E-13	0.65E-12
Severity Category VIII	0.00E+00	0.00E+00	0.55E-14	0.55E-14	0.85E-14	0.66E-13

^a Cargo-related risks refer to the number of people affected and were computed from the product of the probability of accidental release times the number of people exposed to the health criteria concentration.

^b Risks and travel distances are for the total shipping duration (10 years for WM LLMW). To obtain the annual values, the risks and distances must be divided by 10 for the WM cases.

^c Vehicle-related distances are the railway distances multiplied by 2 to account for the return of empty railcars with no cargo. As a result, distances may be overestimated.

^d Riskiest severity categories.

Railcar-accident PIC and PAE risks from aerosolized liquid droplets are also highest for rail shipments under the centralized alternative for the same severity category.

The potential population risks involving solid waste shipments by trucks and railcars are attributed to evaporative organic vapor emissions from a waste spoils-pile ground spill and to the direct release of respirable particulates from an overturned vehicle or a ruptured container (or both). Truck accident risks from evaporative and from respirable particulate releases are found to be zero for all of the WM cases. As for railway shipments, zero population risks are found under all WM cases for evaporative emissions and under the decentralized and regionalized 1 alternatives for respirable particulates. Severity Category V appears to yield slightly higher health-related risk than other severity categories, while zero population risks are found for severity Categories I through III for all LLMW treatment options. Note that the HW component risk of the LLMW shipments is much lower than the transportation risk of the purely HW shipments (i.e., those with no radiological component).

With regard to MEI risk evaluation, the lifetime increased PIC risk and the PAE HQ are summarized in Tables 5.12 and 5.13. The MEI risks are given for both liquid and solid LLMW transportation accidents by trucks and railcars by using the approach described in Section 3.3.3.2. The risk calculations are based on the maximum ambient concentrations at 30.5 m (100 ft) from the release point for all shipments for a single truck or railcar accident predicted by the ALOHATM model on a chemical-specific basis. As indicated in Table 5.12, the carcinogenic risks (incidence of increased cancers of one in a million or greater) for all chemicals are between 1×10^{-9} and 1×10^{-13} . The HQs, which are shown in Table 5.13, are greater than 1 for all liquid WM LLMW shipments and for solid-waste truck and rail shipments of toluene under accident severity Categories IV through VIII. Thus, accidental release involving any of these shipments would have a potential to result in adverse effects for receptors at the MEI location. Tables 5.14 and 5.15 identify the alternatives producing the largest lifetime increased PIC risks and the PAE HQs to the MEI.

Note that the comparison of the cargo-related population risks among the six LLMW treatment options presented previously is based on the most frequently occurring meteorologic conditions (i.e., neutral atmospheric stability with a wind speed of 4 m/s [9 mph]). In general, the severity of a transportation accident is determined by four important factors: prevailing meteorologic conditions, population distribution, chemical content of the container, and atmospheric release rate of the hazardous materials.

The "worst-case" meteorologic conditions associated with a release of hazardous materials into the atmosphere at ground level are light winds in a stable atmosphere (i.e., Pasquill stability Class F with a wind speed of 1 m/s [2.2 mph]). These nighttime meteorologic conditions are frequently associated with clear sky and temperature inversion. Population risks would be higher in urban areas than in rural areas due to denser population distributions. The population consequences are also compared for both neutral and stable atmospheric conditions under the most severe hazardous-chemical and radiological accidents.

TABLE 5.12 Lifetime MEI PIC Risk for WM LLMW Transportation

Transportation Mode	Release Mode	Chemical Code	Chemical Name	ALOHA Concentration (ppm)	Molecular Weight	ALOHA Concentration (mg/m ³)	Exposure Time (min/d)	Inhalation Air Intake (mg/kg/d)	Inhalation Unit Risk (μg/m ³) ⁻¹	Slope Factor (mg/kg/d) ⁻¹	Carcinogenic MEI Risk
Highway	Liquid aerosol (direct)	75-09-2	Dichloromethane	6.17E+01	85	2.14E+02	60	1.01E-04	4.70E-06	1.65E-02	1.7E-07
		Cl-2-x	Dichloroethane	2.72E+01	99	1.10E+02	60	5.16E-05	2.60E-04	9.10E-01	4.7E-06
		Cl-4-x	Tetrachloroethene	1.91E+02	186	1.29E+03	60	6.08E-04	1.70E-05	5.95E-02	3.6E-06
		HC-soluble ^a	Benzene	1.09E+04	78.1	3.47E+04	60	1.63E-02	8.30E-05	2.91E-01	4.7E-04
	Vapor spoils pile (Superfund)	75-09-2	Dichloromethane	1.18E-02	85	4.09E-02	60	1.92E-08	4.70E-06	1.65E-02	3.2E-11
		Cl-2-x	Dichloroethane	9.41E-02	99	3.80E-01	60	1.79E-07	2.60E-04	9.10E-01	1.6E-08
		Cl-4-x	Tetrachloroethene	1.26E-03	186	8.54E-03	60	4.01E-09	1.70E-05	5.95E-02	2.4E-11
		HC-soluble	Benzene	1.80E-02	78.1	5.74E-02	60	2.69E-08	8.30E-05	2.91E-01	7.8E-10
	Particulate (severity Category II)	75-09-2	Dichloromethane	1.20E-02	85	4.16E-02	60	1.96E-08	4.70E-06	1.65E-02	3.2E-11
		Cl-2-x	Dichloroethane	6.97E-03	99	2.82E-02	60	1.32E-08	2.60E-04	9.10E-01	1.2E-09
		Cl-4-x	Tetrachloroethene	2.28E-02	186	1.54E-01	60	7.26E-08	1.70E-05	5.95E-02	4.3E-10
		HC-soluble	Benzene	1.05E+01	78.1	3.35E-01	60	1.57E-07	8.30E-05	2.91E-01	4.6E-09
	Particulate (severity Category III)	75-09-2	Dichloromethane	1.20E-01	85	4.16E-01	60	1.96E-07	4.70E-06	1.65E-02	3.2E-10
		Cl-2-x	Dichloroethane	6.97E-02	99	2.82E-01	60	1.32E-07	2.60E-04	9.10E-01	1.2E-08
		Cl-4-x	Tetrachloroethene	2.28E-01	186	1.54E+00	60	7.26E-07	1.70E-05	5.95E-02	4.3E-09
		HC-soluble	Benzene	1.05E+00	78.1	3.35E+00	60	1.57E-06	8.30E-05	2.91E-01	4.6E-08
	Particulate (severity Categories IV-VIII)	75-09-2	Dichloromethane	1.20E+00	85	4.16E+00	60	1.96E-06	4.70E-06	1.65E-02	3.2E-09
		Cl-2-x	Dichloroethane	6.97E-01	99	2.82E+00	60	1.32E-06	2.60E-04	9.10E-01	1.2E-07
		Cl-4-x	Tetrachloroethene	2.28E+00	186	1.54E+01	60	7.26E-06	1.70E-05	5.95E-02	4.3E-08
		HC-soluble	Benzene	1.05E+01	78.1	3.35E+01	60	1.57E-05	8.30E-05	2.91E-01	4.6E-07
Railroad	Liquid aerosol (direct)	75-09-2	Dichloromethane	1.65E+02	85	5.72E+02	60	2.69E-04	4.70E-06	1.65E-02	4.4E-07
		Cl-2-x	Dichloroethane	5.85E+01	99	2.36E+02	60	1.11E-04	2.60E-04	9.10E-01	1.0E-05
		Cl-4-x	Tetrachloroethene	9.24E+02	186	6.26E+03	60	2.94E-03	1.70E-05	5.95E-02	1.7E-05
		HC-soluble	Benzene	1.46E+04	78.1	4.65E+04	60	2.19E-02	8.30E-05	2.91E-01	6.4E-04
	Vapor spoils pile (Superfund)	75-09-2	Dichloromethane	1.96E-02	85	6.80E-02	60	3.19E-08	4.70E-06	1.65E-02	5.3E-11
		Cl-2-x	Dichloroethane	1.57E-02	99	6.34E-02	60	2.98E-08	2.60E-04	9.10E-01	2.7E-09
		Cl-4-x	Tetrachloroethene	2.53E-03	186	1.71E-02	60	8.05E-09	1.70E-05	5.95E-02	4.8E-11
		HC-soluble	Benzene	3.31E-02	78.1	1.06E-01	60	4.96E-08	8.30E-05	2.91E-01	1.4E-09
	Particulate (severity Category II)	75-09-2	Dichloromethane	3.41E-02	85	1.18E-01	60	5.56E-08	4.70E-06	1.65E-02	9.1E-11
		Cl-2-x	Dichloroethane	1.98E-02	99	8.00E-02	60	3.76E-08	2.60E-04	9.10E-01	3.4E-09
		Cl-4-x	Tetrachloroethene	4.50E-02	186	3.05E+01	60	1.43E-07	1.70E-05	5.95E-02	8.5E-10
		HC-soluble	Benzene	5.25E-01	78.1	1.67E+00	60	7.86E-07	8.30E-05	2.91E-01	2.3E-08
	Particulate (severity Category III)	75-09-2	Dichloromethane	3.41E-01	85	1.18E+00	60	5.56E-07	4.70E-06	1.65E-02	9.1E-10
		Cl-2-x	Dichloroethane	1.98E-01	99	8.00E-01	60	3.76E-07	2.60E-04	9.10E-01	3.4E-08
		Cl-4-x	Tetrachloroethene	4.50E-01	186	3.05E+00	60	1.43E-06	1.70E-05	5.95E-02	8.5E-09
		HC-soluble	Benzene	5.25E+00	78.1	1.67E+01	60	7.86E-06	8.30E-05	2.91E-01	2.3E-07
	Particulate (severity Categories IV-VIII)	75-09-2	Dichloromethane	3.41E+00	85	1.18E+01	60	5.56E-06	4.70E-06	1.65E-02	9.1E-09
		Cl-2-x	Dichloroethane	1.98E+00	99	8.00E+00	60	3.76E-06	2.60E-04	9.10E-01	3.4E-07
		Cl-4-x	Tetrachloroethene	4.50E+00	186	3.05E+01	60	1.43E-05	1.70E-05	5.95E-02	8.5E-08
		HC-soluble	Benzene	5.25E+01	78.1	1.67E+02	60	7.86E-05	8.30E-05	2.91E-01	2.3E-06

^a HC = hydrocarbon.

TABLE 5.13 MEI Hazard Quotients for PAE End Points for WM LLMW

Transportation Mode	Release Mode	Chemical Code	Chemical Name	ALOHA Concentration (ppm)	Molecular Weight	ALOHA Concentration (mg/m ³)	Exposure Time (min/d)	Inhalation Air Intake (mg/kg/d)	RfC ^a (mg/m ³)	RfD ^b (mg/kg/d)	HQ
Highway	Liquid spill	75-09-2	Dichloromethane	6.17E+01	85	2.14E+02	60	1.4E+00	3E+00	8.6E+00	1.68E+00
		Cl-3-x	1,1,1-Trichloroethane	2.72E+01	133.4	1.48E+02	60	10.0E-01	1.00E+01	2.9E+00	3.49E+00
		Cl-F-x	Freon 113	1.91E+02	187	1.46E+03	60	9.8E+00	3.0E+01	8.6E+01	1.15E+00
		HC-soluble ^c	Toluene	1.09E+04	92.14	4.10E+04	60	2.8E+02	4E-01	1.1E+00	2.42E+03
	Spoils pile vapor (Superfund)	75-09-2	Dichloromethane	1.18E-02	85	4.09E-02	60	2.8E-04	3E+00	8.6E+00	3.22E-04
		Cl-3-x	1,1,1-Trichloroethane	9.41E-02	133.4	5.12E-01	60	3.5E-03	1.00E+01	2.9E+00	1.21E-02
		Cl-F-x	Freon 113	1.26E-03	187	9.62E-03	60	6.5E-05	3.0E+01	8.6E+01	7.56E-06
		HC-soluble	Toluene	1.80E-02	92.14	6.77E-02	60	4.6E-04	4E-01	1.1E+00	3.99E-03
	Particulate (severity Category II)	75-09-2	Dichloromethane	1.20E-02	85	4.16E-02	60	2.8E-04	3E+00	8.6E+00	3.27E-04
		Cl-3-x	1,1,1-Trichloroethane	6.97E-03	133.4	3.80E-02	60	2.6E-04	1.00E+01	2.9E+00	8.95E-04
		Cl-F-x	Freon 113	2.28E-02	187	1.74E-01	60	1.2E-03	3.0E+01	8.6E+01	1.37E-04
		HC-soluble	Toluene	1.05E-01	92.14	3.95E-01	60	2.7E-03	4E-01	1.1E+00	2.33E-02
	Particulate (severity Category III)	75-09-2	Dichloromethane	1.20E-01	85	4.16E-01	60	2.8E-03	3E+00	8.6E+00	3.27E-03
		Cl-3-x	1,1,1-Trichloroethane	6.97E-02	133.4	3.80E-01	60	2.6E-03	1.00E+01	2.9E+00	8.95E-03
		Cl-F-x	Freon 113	2.28E-01	187	1.74E+00	60	1.2E-02	3.0E+01	8.6E+01	1.37E-03
		HC-soluble	Toluene	1.05E+00	92.14	3.95E+00	60	2.7E-02	4E-01	1.1E+00	2.33E-01
	Particulate (severity Categories IV-VIII)	75-09-2	Dichloromethane	1.20E+00	85	4.16E+00	60	2.8E-02	3E+00	8.6E+00	3.27E-02
		Cl-3-x	1,1,1-Trichloroethane	6.97E-01	133.4	3.80E+00	60	2.6E-02	1.00E+01	2.9E+00	8.95E-02
		Cl-F-x	Freon 113	2.28E+00	187	1.74E+01	60	1.2E-01	3.0E+01	8.6E+01	1.37E-02
		HC-soluble	Toluene	1.05E+01	92.14	3.95E+01	60	2.7E-01	4E-01	1.1E+00	2.33E+00
Railroad	Liquid spill	75-09-2	Dichloromethane	1.65E+02	85	5.72E+02	60	3.9E+00	3E+00	8.6E+00	4.50E+00
		Cl-3-x	1,1,1-Trichloroethane	4.46E+03	133.4	2.43E+04	60	1.6E+02	1.00E+01	2.9E+00	5.72E+02
		Cl-F-x	Freon 113	4.94E+00	187	3.77E+01	60	2.5E-01	3.0E+01	8.6E+01	2.96E-02
		HC-soluble	Toluene	1.21E+04	92.14	4.55E+04	60	3.1E+02	4E-01	1.1E+00	2.68E+03
	Spoils pile vapor (Superfund)	75-09-2	Dichloromethane	1.96E-02	85	6.80E-02	60	4.6E-04	3E+00	8.6E+00	5.34E-04
		Cl-3-x	1,1,1-Trichloroethane	1.78E-02	133.4	9.69E-02	60	6.5E-04	1.00E+01	2.9E+00	2.28E-03
		Cl-F-x	Freon 113	1.87E-04	187	1.43E-03	60	9.6E-06	3.0E+01	8.6E+01	1.12E-06
		HC-soluble	Toluene	1.18E-02	92.14	4.44E-02	60	3.0E-04	4E-01	1.1E+00	2.62E-03
	Particulate (severity Category II)	75-09-2	Dichloromethane	3.41E-02	85	1.18E-01	60	8.0E-04	3E+00	8.6E+00	9.30E-04
		Cl-3-x	1,1,1-Trichloroethane	7.54E-02	133.4	4.11E-01	60	2.8E-03	1.00E+01	2.9E+00	9.68E-03
		Cl-F-x	Freon 113	5.07E-03	187	3.87E-02	60	2.6E-04	3.0E+01	8.6E+01	3.04E-05
		HC-soluble	Toluene	2.76E-01	92.14	1.04E+00	60	7.0E-03	4E-01	1.1E+00	6.12E-02
	Particulate (severity Category III)	75-09-2	Dichloromethane	3.41E-01	85	1.18E+00	60	8.0E-03	3E+00	8.6E+00	9.30E-03
		Cl-3-x	1,1,1-Trichloroethane	7.54E-01	133.4	4.11E+00	60	2.8E-02	1.00E+01	2.9E+00	9.68E-02
		Cl-F-x	Freon 113	5.07E-02	187	3.87E-01	60	2.6E-03	3.0E+01	8.6E+01	3.04E-04
		HC-soluble	Toluene	2.76E+00	92.14	1.04E+01	60	7.0E-02	4E-01	1.1E+00	6.12E-01
	Particulate (severity Categories IV-VIII)	75-09-2	Dichloromethane	3.41E+00	85	1.18E+01	60	8.0E-02	3E+00	8.6E+00	9.30E-02
		Cl-3-x	1,1,1-Trichloroethane	7.54E+00	133.4	4.11E+01	60	2.8E-01	1.00E+01	2.9E+00	9.68E-01
		Cl-F-x	Freon 113	5.07E-01	187	3.87E+00	60	2.6E-02	3.0E+01	8.6E+01	3.04E-03
		HC-soluble	Toluene	2.76E+01	92.14	1.04E+02	60	7.0E-01	4E-01	1.1E+00	6.12E+00

^a RfC = reference concentration.^b RfD = reference dose.^c HC = hydrocarbon.

TABLE 5.14 Lifetime MEI PIC Risk by LLMW Alternative

Transportation Mode	Release Mode	Chemical Name	Alternative	Origin Site ^a	Treatment Site ^a	Annual No. of Shipments	Total Mass per Shipment (kg)	Chemical Mass per Shipment (kg)	Carcinogen MEI Risk
Highway	Liquid aerosol (direct)	Dichloromethane	Centralized	SRS	Hanford	33	17,620	24	1.65E-08
		Dichloroethane	Centralized	SRS	Hanford	33	17,620	13	4.70E-07
		Tetrachloroethene	Centralized	SRS	Hanford	33	17,620	308	3.62E-07
		Benzene	Regionalized 4	PORTS	ORR	3	15,929	4,803	4.74E-05
	Spoils pile vapor (Superfund)	Dichloromethane	Regionalized 4	LANL	INEL	4	16,992	18	3.16E-12
		Dichloroethane	Regionalized 4	Pantex	INEL	2	12,559	11	1.63E-09
		Tetrachloroethene	Regionalized 4	Pantex	INEL	2	12,559	55	2.39E-12
		Benzene	Centralized	INEL	Hanford	4	15,240	137	7.83E-11
	Particulate (severity Category II)	Dichloromethane	Regionalized 4	LANL	INEL	4	16,992	18	3.22E-12
		Dichloroethane	Regionalized 4	Pantex	INEL	2	12,559	11	1.20E-10
		Tetrachloroethene	Regionalized 4	Pantex	INEL	2	12,559	55	4.32E-11
		Benzene	Centralized	INEL	Hanford	4	15,240	137	4.57E-10
	Particulate (severity Category III)	Dichloromethane	Regionalized 4	LANL	INEL	4	16,992	18	3.22E-11
		Dichloroethane	Regionalized 4	Pantex	INEL	2	12,559	11	1.20E-09
		Tetrachloroethene	Regionalized 4	Pantex	INEL	2	12,559	55	4.32E-10
		Benzene	Centralized	INEL	Hanford	4	15,240	137	4.57E-09
	Particulate (severity Categories IV-VIII)	Dichloromethane	Regionalized 4	LANL	INEL	4	16,992	18	3.22E-10
		Dichloroethane	Regionalized 4	Pantex	INEL	2	12,559	11	1.20E-08
		Tetrachloroethene	Regionalized 4	Pantex	INEL	2	12,559	55	4.32E-09
		Benzene	Centralized	INEL	Hanford	4	15,240	137	4.57E-08
Railroad	Liquid aerosol (direct)	Dichloromethane	Centralized	SRS	Hanford	13	44,727	61	4.42E-08
		Dichloroethane	Centralized	SRS	Hanford	13	44,727	32	1.01E-06
		Tetrachloroethene	Centralized	SRS	Hanford	13	44,727	782	1.75E-06
		Benzene	Regionalized 4	PORTS	ORR	2	23,894	7,204	6.35E-05
	Spoils pile vapor (Superfund)	Dichloromethane	Regionalized 4	LANL	INEL	2	33,983	37	5.25E-12
		Dichloroethane	Centralized	Pantex	Hanford	1	25,119	22	2.71E-10
		Tetrachloroethene	Centralized	FEMP	Hanford	3	39,356	123	4.79E-12
		Benzene	Centralized	FEMP	Hanford	3	39,356	313	1.44E-10
	Particulate (severity Category II)	Dichloromethane	Regionalized 4	LANL	INEL	2	33,983	37	9.14E-12
		Dichloroethane	Centralized	Pantex	Hanford	1	25,119	22	3.42E-10
		Tetrachloroethene	Centralized	FEMP	Hanford	3	39,356	123	8.52E-11
		Benzene	Centralized	FEMP	Hanford	3	39,356	313	2.28E-09
	Particulate (severity Category III)	Dichloromethane	Regionalized 4	LANL	INEL	2	33,983	37	9.14E-11
		Dichloroethane	Centralized	Pantex	Hanford	1	25,119	22	3.42E-09
		Tetrachloroethene	Centralized	FEMP	Hanford	3	39,356	123	8.52E-10
		Benzene	Centralized	FEMP	Hanford	3	39,356	313	2.28E-08
	Particulate (severity Categories IV-VIII)	Dichloromethane	Regionalized 4	LANL	INEL	2	33,983	37	9.14E-10
		Dichloroethane	Centralized	Pantex	Hanford	1	25,119	22	3.42E-08
		Tetrachloroethene	Centralized	FEMP	Hanford	3	39,356	123	8.52E-09
		Benzene	Centralized	FEMP	Hanford	3	39,356	313	2.28E-07

^a FEMP = Fernald Environmental Management Project; INEL = Idaho National Engineering Laboratory; LANL = Los Alamos National Laboratory; ORR = Oak Ridge Reservation; Pantex = Pantex Plant; PORTS = Portsmouth Gaseous Diffusion Plant; and SRS = Savannah River Site.

TABLE 5.15 MEI Hazard Quotients for PAE Risk by LLMW Alternative

Transportation Mode	Release Mode	Chemical Name	Alternative	Origin Site ^a	Treatment Site ^a	Annual No. of Shipments	Total Mass per Shipment (kg)	Chemical Mass per Shipment (kg)	Carcinogen MEI Risk
Highway	Liquid aerosol (direct)	Dichloromethane	Centralized	SRS	Hanford	33	17,620	24	1.68E-01
		1,1,1-Trichloroethane	Centralized	SRS	Hanford	33	17,620	1,384	3.49E-01
		Freon 113	Centralized	LANL	Hanford	4	16,496	3	1.15E-01
		Toluene	Regionalized 4	PORTS	ORR	3	15,929	4,803	2.42E+02
	Spoils pile vapor (Superfund)	Dichloromethane	Regionalized 4	LANL	INEL	4	16,992	18	3.22E-05
		1,1,1-Trichloroethane	Centralized	INEL	Hanford	4	15,240	87	1.21E-03
		Freon 113	Centralized	Pantex	Hanford	2	12,559	8	7.56E-07
		Toluene	Centralized	INEL	Hanford	4	15,240	137	3.99E-04
	Particulate (severity Category II)	Dichloromethane	Regionalized 4	LANL	INEL	4	16,992	18	3.27E-05
		1,1,1-Trichloroethane	Centralized	INEL	Hanford	4	15,240	87	8.95E-05
		Freon 113	Centralized	Pantex	Hanford	2	12,559	8	1.37E-05
		Toluene	Centralized	INEL	Hanford	4	15,240	137	2.33E-03
	Particulate (severity Category III)	Dichloromethane	Regionalized 4	LANL	INEL	4	16,992	18	3.27E-04
		1,1,1-Trichloroethane	Centralized	INEL	Hanford	4	15,240	87	8.95E-04
		Freon 113	Centralized	Pantex	Hanford	2	12,559	8	1.37E-04
		Toluene	Centralized	INEL	Hanford	4	15,240	137	2.33E-02
	Particulate (severity Categories IV-VIII)	Dichloromethane	Regionalized 4	LANL	INEL	4	16,992	18	3.27E-03
		1,1,1-Trichloroethane	Centralized	INEL	Hanford	4	15,240	87	8.95E-03
		Freon 113	Centralized	Pantex	Hanford	2	12,559	8	1.37E-03
		Toluene	Centralized	INEL	Hanford	4	15,240	137	2.33E-01
Railroad	Liquid aerosol (direct)	Dichloromethane	Regionalized 4	SRS	Hanford	13	44,727	61	4.50E-01
		1,1,1-Trichloroethane	Centralized	SRS	Hanford	13	44,727	3,512	5.72E+01
		Freon 113	Centralized	LLNL	Hanford	2	40,799	6	2.96E-03
		Toluene	Centralized	PORTS	ORR	2	23,894	7,204	2.68E+02
	Spoils pile vapor (Superfund)	Dichloromethane	Regionalized 4	LANL	INEL	2	33,983	37	5.34E-05
		1,1,1-Trichloroethane	Centralized	Pantex	Hanford	3	39,356	176	2.28E-04
		Freon 113	Centralized	FEMP	Hanford	1	25,119	16	1.12E-07
		Toluene	Centralized	FEMP	Hanford	3	39,356	313	2.62E-04
	Particulate (severity Category II)	Dichloromethane	Regionalized 4	LANL	INEL	2	33,983	37	9.30E-05
		1,1,1-Trichloroethane	Centralized	Pantex	Hanford	3	39,356	176	9.68E-04
		Freon 113	Centralized	FEMP	Hanford	1	25,119	16	3.04E-06
		Toluene	Centralized	FEMP	Hanford	3	39,356	313	6.12E-03
	Particulate (severity Category III)	Dichloromethane	Regionalized 4	LANL	INEL	2	33,983	37	9.30E-04
		1,1,1-Trichloroethane	Centralized	Pantex	Hanford	3	39,356	176	9.68E-03
		Freon 113	Centralized	FEMP	Hanford	1	25,119	16	3.04E-05
		Toluene	Centralized	FEMP	Hanford	3	39,356	313	6.12E-02
	Particulate (severity Categories IV-VIII)	Dichloromethane	Regionalized 4	LANL	INEL	2	33,983	37	9.30E-03
		1,1,1-Trichloroethane	Centralized	Pantex	Hanford	3	39,356	176	9.68E-02
		Freon 113	Centralized	FEMP	Hanford	1	25,119	16	3.04E-04
		Toluene	Centralized	FEMP	Hanford	3	39,356	313	6.12E-01

^a FEMP = Fernald Environmental Management Project; INEL = Idaho National Engineering Laboratory; LANL = Los Alamos National Laboratory; LLNL = Lawrence Livermore National Laboratory; ORR = Oak Ridge Reservation; Pantex = Pantex Plant; PORTS = Portsmouth Gaseous Diffusion Plant; and SRS = Savannah River Site.

The most severe conditions are "worst-case" meteorologic conditions, along with chemical release quantities leading to the largest exposed population area. The degree of consequence imposed by the release quantities would depend on the chemical's inhalation toxicity and the release form (i.e., liquid aerosol, organic vapor, or respirable particle). The consequences from the most severe accidents associated with the shipment of LLMW are discussed subsequently. Note that the reported consequences are not based on the probability of an accident, but the assumption should be that the most severe accident has occurred. The numbers should therefore not be interpreted as risks but as the consequences (i.e., potential increased PIC or PAE incidence) of a "worst-case" release. These estimates should only be used to compare the consequences of a severe release under different meteorologic conditions.

The most severe highway chemical-release accidents are caused by shipments of liquid WM LLMW from the Portsmouth Gaseous Diffusion Plant (PORTS). The most severe railway chemical-release accidents are caused by shipments of liquid WM LLMW from PORTS and from Lawrence Livermore National Laboratory (LLNL). The most severe hazardous-chemical-release accidents are determined from the largest computed exposure areas of all WM shipments under neutral stability conditions. The estimated consequences for the most severe hazardous-chemical release from an accident involving LLMW shipments under both neutral and stable atmospheric conditions are presented in Table 5.16 for the WM alternatives. The largest plume exposure areas to population are less than 0.025 km^2 (0.01 mi^2). Note that the national averaged population distribution statistics for urban, suburban, and rural zones are used for highway and railroad transportation routes. The population risks for urban zones are about 7 times greater than those for suburban zones and are about 200 times greater than those for rural zones. The population risks are generally 3 to 4 times greater for stable conditions than for neutral conditions. The highest hazardous-chemical concentrations at the location of maximum exposure (30.5 m [100 ft] downwind from the accident site) are $8.33\text{E}+03 \text{ mg/m}^3$ or less. The MEI consequences under stable conditions are about 2 to 10 times greater than those under neutral conditions. Detailed chemical-specific MEI calculations are presented in Appendix B of this report (Table B.1 for PIC risk from chemical substances and Table B.2 for PAE risk from chemical substances).

The most severe radiological release accidents are caused by shipments of solid WM LLMW from PGDP (see discussion in Section 5.1.3). Respirable particulate emissions under severity Categories IV through VIII are likely to produce the greatest amount of hazardous-chemical releases into the atmosphere. The most severe hazardous-chemical-release accidents are determined from the largest computed exposure areas of all WM shipments under neutral stability conditions. Specifically, these accidents are found to result from shipments of liquid WM LLMW from PORTS. Among the three different atmospheric release modes investigated, the greatest amounts of hazardous-chemical releases into the atmosphere are caused by liquid aerosol releases involving liquid WM LLMW.

TABLE 5.16 Estimated Chemical Exposure Consequences for the Most Severe Accident Involving the Hazardous Component of WM LLMW Shipments^a

Transportation Mode and Population Density Zone	Neutral Conditions ^c				Stable Conditions ^e			
	Collective Population ^b		MEI ^d		Collective Population ^b		MEI ^d	
	Maximum Exposure Area (km ²)	Consequence	Maximum Concentration (mg/m ³)	Consequence	Maximum Exposure Area (km ²)	Consequence	Maximum Concentration (mg/m ³)	Consequence
<i>Potential for Increased Cancer Incidence of >1E-06</i>								
Truck								
Urban	7.75E-03	8.40E-02	3.48E+03	4.74E-05	2.39E-02	2.60E-01	8.21E+03	1.12E-04
Suburban	7.75E-03	1.30E-02	3.48E+03	4.74E-05	2.39E-02	4.10E-02	8.21E+03	1.12E-04
Rural	7.75E-03	4.40E-04	3.48E+03	4.74E-05	2.39E-02	1.40E-03	8.21E+03	1.12E-04
Rail								
Urban	1.12E-02	1.20E-01	4.66E+03	6.35E-05	3.38E-02	3.70E-01	1.28E+04	1.74E-04
Suburban	1.12E-02	1.90E-02	4.66E+03	6.35E-05	3.38E-02	5.80E-02	1.28E+04	1.74E-04
Rural	1.12E-02	6.40E-04	4.66E+03	6.35E-05	3.38E-02	1.90E-03	1.28E+04	1.74E-04
<i>Hazard Quotients for Potential Adverse Health Effects</i>								
Truck								
Urban	3.07E-02	3.30E-01	3.48E+03	2.04E+02	1.39E-01	1.50E+00	8.33E+03	4.86E+02
Suburban	3.07E-02	5.30E-02	3.48E+03	2.04E+02	1.39E-01	2.40E-01	8.33E+03	4.86E+02
Rural	3.07E-02	1.70E-03	3.48E+03	2.04E+02	1.39E-01	7.90E-03	8.33E+03	4.86E+02
Rail								
Urban	4.50E-02	4.90E-01	4.79E+03	2.72E+02	2.03E-01	2.20E+00	1.34E+04	7.67E+02
Suburban	4.50E-02	7.70E-02	4.79E+03	2.72E+02	2.03E-01	3.50E-01	1.34E+04	7.67E+02
Rural	4.50E-02	2.60E-03	4.79E+03	2.72E+02	2.03E-01	1.20E-02	1.34E+04	7.67E+02

^a The most severe hazardous-chemical release accidents are caused by shipments of liquid WM LLMW originating from PORTS. Results are reported for the largest releases of liquid aerosols directly into the atmosphere following a transportation accident.

^b Populations extend at a uniform population density to a radius of 80 km (50 mi) from the accident site.

^c Neutral atmospheric conditions were based on Pasquill stability Class D with a wind speed of 4 m/s (9 mph).

^d The MEI is determined at the location of maximum exposure, which is assumed to be 30.5 m (100 ft) from the accident under both neutral and stable atmospheric conditions.

^e Stable atmospheric conditions were based on Pasquill stability Class F with a wind speed of 1 m/s (2.2 mph).

The estimated consequences for the most severe radiological release accidents under both neutral and stable atmospheric conditions are presented in Table 5.17. The population consequences are found to be zero for all cases under both neutral and stable atmospheric conditions due to small plume footprints less than 30.5 m (100 ft) from the accident site. Because MEI consequences are determined at the location of maximum exposure (30.5 m [100 ft] from the accident site), independent of population distributions, the estimated risks are the same for urban, suburban, and rural population zones. In general, the MEI consequences under stable conditions are about 3 to 10 times greater than those under neutral conditions. Detailed chemical-specific MEI calculations are presented in Appendix B of this report (Table B.3 for PIC risk from chemical substances and Table B.4 for any PAE risk from chemical substances).

TABLE 5.17 Estimated Chemical Exposure Consequences Associated with the Most Severe Accident Involving the Radiological Component of WM LLMW Shipments^a

Transportation Mode and Population Density Zone	Neutral Conditions ^c				Stable Conditions ^e			
	Collective Population ^b		MEI ^d		Collective Population ^b		MEI ^d	
	Maximum Exposure Area (km ²)	Consequence	Maximum Concentration (mg/m ³)	Consequence	Maximum Exposure Area (km ²)	Consequence	Maximum Concentration (mg/m ³)	Consequence
<i>Potential for Increased Cancer Incidence of >1E-06</i>								
Truck								
Urban	0.00E+00	0.00E+00	1.43E+00	1.78E-08	0.00E+00	0.00E+00	4.54E+00	5.58E-08
Suburban	0.00E+00	0.00E+00	1.43E+00	1.78E-08	0.00E+00	0.00E+00	4.54E+00	5.58E-08
Rural	0.00E+00	0.00E+00	1.43E+00	1.78E-08	0.00E+00	0.00E+00	4.54E+00	5.58E-08
Rail								
Urban	0.00E+00	0.00E+00	1.43E+00	1.78E-08	0.00E+00	0.00E+00	4.54E+00	5.58E-08
Suburban	0.00E+00	0.00E+00	1.43E+00	1.78E-08	0.00E+00	0.00E+00	4.54E+00	5.58E-08
Rural	0.00E+00	0.00E+00	1.43E+00	1.78E-08	0.00E+00	0.00E+00	4.54E+00	5.58E-08
<i>Hazard Quotients for Potential Adverse Health Effects</i>								
Truck								
Urban	0.00E+00	0.00E+00	2.03E+00	8.18E-02	0.00E+00	0.00E+00	5.46E+00	2.26E-01
Suburban	0.00E+00	0.00E+00	2.03E+00	8.18E-02	0.00E+00	0.00E+00	5.46E+00	2.26E-01
Rural	0.00E+00	0.00E+00	2.03E+00	8.18E-02	0.00E+00	0.00E+00	5.46E+00	2.26E-01
Rail								
Urban	0.00E+00	0.00E+00	2.03E+00	8.18E-02	0.00E+00	0.00E+00	5.46E+00	2.26E-01
Suburban	0.00E+00	0.00E+00	2.03E+00	8.18E-02	0.00E+00	0.00E+00	5.46E+00	2.26E-01
Rural	0.00E+00	0.00E+00	2.03E+00	8.18E-02	0.00E+00	0.00E+00	5.46E+00	2.26E-01

^a The most severe hazardous-chemical release accidents are caused by shipments of solid WM LLMW originating from PGDP (see Table 5.9). Results are reported for atmospheric releases of respirable particulate emissions under severity Categories IV through VIII.

^b Populations extend at a uniform population density to a radius of 80 km (50 mi) from the accident site.

^c Neutral atmospheric conditions were based on Pasquill stability Class D with a wind speed of 4 m/s (9 mph).

^d The MEI is determined at the location of maximum exposure, which is assumed to be 30.5 m (100 ft) from the accident under both neutral and stable atmospheric conditions.

^e Stable atmospheric conditions were based on Pasquill stability Class F with a wind speed of 1 m/s (2.2 mph).

6 REFERENCES

DOE: See U.S. Department of Energy.

Doty, S.R., et al., 1976, *A Climatological Analysis of Pasquill Stability Categories Based on "STAR" Summaries*, National Oceanic and Atmospheric Administration, National Climatic Center, Asheville, N.C., April.

EPA: See U.S. Environmental Protection Agency.

Fischer, L.E., et al., 1987, *Shipping Container Response to Severe Highway and Railway Accident Conditions*, NUREG/CR-4829, UCID-20733, prepared by Lawrence Livermore National Laboratory, Livermore, Calif., for U.S. Nuclear Regulatory Commission, Washington, D.C.

ICRP: See International Commission on Radiological Protection.

International Commission on Radiological Protection, 1977, "Recommendations of the International Commission on Radiological Protection," ICRP publication 26, *Annals of the ICRP* 1(3), Pergamon Press, New York, N.Y.

International Commission on Radiological Protection, 1991, "1990 Recommendations of the International Commission on Radiological Protection," ICRP publication 60, *Annals of the ICRP* 21(1-3), Pergamon Press, New York, N.Y.

Johnson, P.E., et al., 1993a, *HIGHWAY 3.1, An Enhanced Transportation Routing Model: Program Description, Methodology, and Revised User's Manual*, ORNL/TM-12124, Oak Ridge National Laboratory, Oak Ridge, Tenn., March.

Johnson, P.E., et al., 1993b, *INTERLINE 5.0, An Expanded Railroad Routing Model: Program Description, Methodology, and Revised User's Manual*, ORNL/TM-12090, Oak Ridge National Laboratory, Oak Ridge, Tenn., March.

Kotek, T.J., et al., 1996, *WASTE_MGMT: A Computer Model for Calculation of Waste Loads, Profiles, and Emissions*, ANL/EAD/TM-30, Argonne National Laboratory, Argonne, Ill., Dec.

Lazaro, M.A., et al., 1996, *Hazardous Waste Inventory, Characteristics, Generation, and Facility Assessment for Treatment, Storage, and Disposal Alternatives Considered in the U.S. Department of Energy Waste Management Programmatic Environmental Impact Statement*, ANL/EAD/TM-25, Argonne National Laboratory, Argonne, Ill., Dec.

Monette, F.A., et al., 1996a, *Supplemental Information Related to Risk Assessment for the Off-Site Transportation of Transuranic Waste for the U.S. Department of Energy Waste Management Programmatic Environmental Impact Statement*, ANL/EAD/TM-27, Argonne National Laboratory, Argonne, Ill., Dec.

Monette, F.A., et al., 1996b, *Risk Assessment for the Off-Site Transportation of High-Level Waste for the U.S. Department of Energy Waste Management Programmatic Environmental Impact Statement*, ANL/EAD/TM-21, Argonne National Laboratory, Argonne, Ill., Dec.

Monette, F.A., et al., 1996c, *Supplemental Information Related to Risk Assessment for the Off-Site Transportation of Low-Level Waste for the U.S. Department of Energy Waste Management Programmatic Environmental Impact Statement*, ANL/EAD/TM-23, Argonne National Laboratory, Argonne, Ill., Dec.

Neuhauser, K.S., and F.L. Kanipe, 1993, *RADTRAN 4: Volume II. Technical Manual*, SAND89-2370, Sandia National Laboratories, Albuquerque, N.M., Aug.

NRC: See U.S. Nuclear Regulatory Commission.

Oak Ridge National Laboratory, 1991, *Integrated Data Base for 1991: U.S. Spent Fuel and Radioactive Waste Inventories, Projections, and Characteristics*, DOE/RW-0006-Rev. 7, Oak Ridge, Tenn.

Rao, R.K., et al., 1982, *Non-Radiological Impacts of Transporting Radioactive Material*, SAND81-1703, TTC-0236, Sandia National Laboratories, Albuquerque, N.M.

Reynolds, R.M., 1992, *ALOHATM (Areal Locations of Hazardous Atmospheres) 5.0: Theoretical Description*, NOAA-TM NOS ORCA-65, National Oceanic and Atmospheric Administration, Seattle, Wash., Aug.

Saricks, C., and T. Kvitek, 1994, *Longitudinal Review of State-Level Accident Statistics for Carriers of Interstate Freight*, ANL/ESD/TM-68, Argonne National Laboratory, Argonne, Ill., Mar.

U.S. Department of Energy, 1986, *Environmental Assessment: Yucca Mountain Site, Nevada Research and Development Area, Nevada*, DOE/RW-0073, Office of Civilian Radioactive Waste Management, Washington, D.C., May.

U.S. Department of Energy, 1987a, *Final Environmental Impact Statement: Disposal of Hanford Defense High-Level, Transuranic and Tank Wastes*, DOE/EIS-0113, Washington, D.C., Dec.

U.S. Department of Energy, 1987b, *Analysis of Radiation Doses from Operation of Postulated Commercial Spent Fuel Transportation Systems*, DOE-CH/TPO-001, Pacific Northwest Laboratory, Richland, Wash., Nov.

U.S. Department of Energy, 1988a, *External Dose Rate Conversion Factors for Calculation of Dose to the Public*, DOE/EH-0070, Office of Environment, Safety, and Health, Washington, D.C.

U.S. Department of Energy, 1988b, *Internal Dose Conversion Factors for Calculation of Dose to the Public*, DOE/EH-0071, Office of Environment, Safety, and Health, Washington, D.C.

U.S. Department of Energy, 1990a, *Supplemental Environmental Impact Statement: Waste Isolation Pilot Plant*, DOE/EIS-0026-FS, Washington, D.C., Jan.

U.S. Department of Energy, 1990b, "Radiation Protection of the Public and the Environment," DOE Order 5400.5.

U.S. Department of Energy, 1992, "Public Affairs Policy and Planning Requirements for Emergencies," DOE Order 5500.4A.

U. S. Department of Energy, 1994, *Mixed Waste Inventory Report: Final Phase II Mixed Inventory Report Data*, EM-352, Washington, D.C., May.

U.S. Department of Energy, 1996, *Office of Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste*, DOE/EIS-0200-F, Office of Waste Management, Washington, D.C.

U.S. Environmental Protection Agency, 1988, *Superfund Exposure Assessment Manual*, EPA/540/1-68/001, Office of Emergency and Remedial Response, Washington, D.C., April.

U.S. Environmental Protection Agency, 1989, *Exposure Factor Handbook*, EPA/600/8-89/043, Office of Health and Environmental Assessment, Washington, D.C., July.

U.S. Environmental Protection Agency, 1992, "Guidance of Risk Characterization for Risk Managers and Risk Assessors," memorandum from F. Henry Habicht II, Deputy Administrator to Assistant and Regional Administrators, Feb. 26.

U.S. Environmental Protection Agency, 1993a, *Health Effects Assessment Summary Tables (HEAST), Annual FY 1993*, OERR 9200.6-303 (92-1), Office of Emergency and Remedial Response, Washington, D.C., March.

U.S. Environmental Protection Agency, 1993b, *Integrated Risk Information System (IRIS)*, database, Office of Emergency and Remedial Response, Washington, D.C. (accessed Oct. 1993).

U.S. Nuclear Regulatory Commission, 1977a, *Final Environmental Statement on the Transportation of Radioactive Material by Air and Other Modes*, NUREG-0170, Washington, D.C.

U.S. Nuclear Regulatory Commission, 1977b, *Calculation of Annual Dose to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I, Rev. 1*, Regulatory Guide 1.109, Washington, D.C.

Wilkins, B.D., et al., 1996, *Low-Level Mixed Waste Inventory, Characteristics, Generation, and Facility Assessment for Treatment, Storage, and Disposal Alternatives Considered in the U.S. Department of Energy Waste Management Programmatic Environmental Impact Statement*, ANL/EAD/TM-32, Argonne National Laboratory, Argonne, Ill., Dec.

Wilmot, E.L., 1981, *Transportation Accident Scenarios for Commercial Spent Fuel*, SAND80-2124, Sandia National Laboratories, Albuquerque, N.M.

Yuan, Y.C., et al., 1993, *RISKIND: A Computer Program for Calculating Radiological Consequences and Health Risks from Transportation of Spent Nuclear Fuel*, ANL/EAIS-6-Rev. 0, Argonne National Laboratory, Argonne, Ill., Feb.

APPENDIX A:

**TRANSPORTED MATERIAL SUMMARY FILES GENERATED
BY THE WASTE_MGMT MODEL**

APPENDIX A:**TRANSPORTED MATERIAL SUMMARY FILES GENERATED
BY THE WASTE_MGMT MODEL**

The WASTE_MGMT model has been developed at Argonne National Laboratory to support analyses of risks and costs for all alternatives for each waste type considered in the Waste Management Programmatic Environmental Impact Statement (WM PEIS) (Kotek et al. 1996). One output of the WASTE_MGMT model consists of the annual quantity, physical form, and radiological and chemical characteristics of the waste shipped between sites for each case. The WASTE_MGMT output files are used directly as input to the transportation risk assessment.

The WASTE_MGMT transportation summary files generated for the low-level mixed waste (LLMW) transportation assessment are presented in this appendix. For each of the seven WM alternatives, shipment summaries are presented separately for heterogeneous solids and organic liquids. The total quantity of shipments for a case can be found by summing the quantities for heterogeneous solids and organic liquids.

The WASTE_MGMT files report the quantity of waste shipped on an *annual* basis (cubic meters per year or kilograms per year). As stated previously, the WM PEIS considers a 20-year time frame for WM LLMW. For the Waste Management (WM) alternatives considered in the WM PEIS, the assumption was that shipments would occur uniformly over a 10-year period, which would allow an initial 10-year period to build treatment, storage, and disposal facilities. Sites would essentially store their own waste for the first 10 years and ship all waste over the subsequent 10 years.

Because of the differences in the time frames noted and the uncertainties in the actual timing of future waste shipments, the transportation impacts for the various cases are best compared by examining the total impacts of transporting a specific inventory of waste, independent of the annual shipping rates. The total amount of LLMW transported for each case can be calculated by multiplying the annual shipment quantities (reported in the WASTE_MGMT output files in this Appendix A) by 10 years for the WM alternatives.

A.1 WM LLMW DECENTRALIZED ALTERNATIVE (CASE 2a)

Transported Material with Radionuclide and Chemical Profiles

Waste Stream: MLLW

Alternative: 2 Decentralized Treat--16 Disposal Sites

Destination Site: LLNL

Shipping Site: SNLL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 7.662E+00

Total Mass (kg/yr): 7.356E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.013E-01	75-09-2	7.061E+00
Cs-137	1.062E-01	As	5.664E-02
H-3	4.822E+02	Ba	2.427E-01
Pa-234m	2.462E-02	Cd	8.091E+00
Pu-241	2.413E-02	Cl-2-x	3.678E+00
Sr-90	1.013E-01	Cl-3-x	5.517E+01
Th-234	2.462E-02	Cl-4-x	1.176E+01
U-238	2.462E-02	Cr	6.767E+00
Y-90	1.013E-01	HC-insol	3.236E+03
		HC-solub	1.029E+03
		Hg	4.413E-02
		Pb	1.544E+00

Shipping Site: SNLL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 7.770E-01

Total Mass (kg/yr): 1.193E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.027E-02	57-12-5	6.924E-03
Cs-137	1.076E-02	75-09-2	7.497E+00
H-3	4.890E+01	Ag	1.014E-02
Pa-234m	2.496E-03	As	6.737E-03
Pu-241	2.447E-03	Ba	3.347E-01
Sr-90	1.027E-02	Cd	8.243E-02
Th-234	2.496E-03	Cl-2-x	3.816E+00
U-238	2.496E-03	Cl-3-x	4.480E+01
Y-90	1.027E-02	Cl-4-x	3.090E+01
		Cl-F-x	6.827E-02
		Cr	6.765E-01
		HC-insol	1.187E+02
		HC-solub	5.754E+01
		Hg	1.257E-01
		Pb	2.595E-01
		Se	3.934E-02

Destination Site: SRS

Shipping Site: BAPL

Waste Type: Solids (CH-Alpha)

Total Volume (m3/yr): 8.357E-01

Total Mass (kg/yr): 3.493E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	6.984E-04	75-09-2	2.095E-01
Ba-137m	7.629E-01	Ag	3.493E-03
Co-60	1.021E-03	Ba	1.397E-01
Cs-137	8.160E-01	Cd	6.986E-04
Eu-154	1.217E-03	Cl-2-x	2.445E-01
H-3	6.053E-02	Cl-3-x	8.733E-01
Nb-94	6.984E-05	Cl-4-x	4.191E-01
Ni-59	1.563E-03	Cl-F-x	3.493E-01
Ni-63	1.606E-01	Cr	5.239E-03
Pa-234m	4.490E-04	HC-insol	3.493E+00
Pu-238	3.791E-02	HC-solub	1.746E-03
Pu-239	6.286E-04	Hg	6.986E-04
Pu-240	2.793E-04	Pb	3.493E-02
Pu-241	1.633E-02	Se	1.047E-03
Sm-151	1.167E-02		
Sr-90	7.264E-01		
Tc-99	3.625E-04		
Th-234	4.490E-04		
U-238	4.490E-04		
Y-90	7.264E-01		

Shipping Site: MOUND

Waste Type: Organic Liquids (CH-Alpha)

Total Volume (m3/yr): 1.768E+00

Total Mass (kg/yr): 2.190E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.339E-02	75-09-2	2.978E+00
Cs-137	2.450E-02	As	6.322E-03
H-3	1.111E+02	Ba	2.709E-02
Pa-234m	5.680E-03	Cd	2.409E+00
Pu-238	5.569E-03	Cl-2-x	1.574E+00
Pu-241	1.113E-01	Cl-3-x	1.718E+02
Sr-90	2.339E-02	Cl-4-x	3.827E+01
Th-234	5.680E-03	Cl-F-x	6.845E-02
U-238	5.680E-03	Cr	2.069E+00
Y-90	2.339E-02	HC-insol	3.617E+02
		HC-solub	1.237E+02
		Hg	1.355E-02
		Pb	4.599E-01

Shipping Site: MOUND

Waste Type: Solids (CH-Alpha)

Total Volume (m3/yr): 5.712E-03

Total Mass (kg/yr): 6.176E+00

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	7.557E-05	75-09-2	1.926E-02
Cs-137	7.917E-05	Ag	1.191E-04
H-3	3.591E-01	Ba	2.561E-04
Pa-234m	1.835E-05	Cd	2.102E-05
Pu-238	1.799E-05	Cl-2-x	9.886E-03
Pu-241	3.598E-04	Cl-3-x	9.601E-02
Sr-90	7.557E-05	Cl-4-x	7.627E-02
Th-234	1.835E-05	Cl-F-x	6.403E-04
U-238	1.835E-05	Cr	4.674E-05
Y-90	7.557E-05	HC-insol	2.423E-01
		HC-solub	1.132E-01
		Hg	1.951E-05
		Pb	9.361E-05
		Se	1.921E-06

Shipping Site: UMC

Waste Type: Solids (CH-Alpha)

Total Volume (m3/yr): 3.944E-02

Total Mass (kg/yr): 5.809E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	1.743E-07	57-12-5	9.876E-03
Cm-244	2.358E-07	75-09-2	1.161E-02
Pa-234m	8.511E-07	Ag	1.742E-03
Pu-238	9.108E-05	As	5.809E-04
Pu-239	9.331E-06	Ba	1.161E-01
Pu-240	3.260E-05	Cd	2.904E-04
Pu-241	8.894E-04	Cl-2-x	1.161E-02
Th-234	8.511E-07	Cl-3-x	3.253E-02
U-238	8.511E-07	Cl-4-x	2.033E-02
		Cl-F-x	5.809E-03
		Cr	1.161E-01
		HC-insol	5.809E-02
		HC-solub	2.904E-03
		Hg	5.809E-03
		Pb	2.904E-01
		Se	1.742E-03

Shipping Site: WVDP

Waste Type: Organic Liquids (CH-Alpha)

Total Volume (m3/yr): 1.773E+00

Total Mass (kg/yr): 1.897E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	1.482E-03	57-12-5	1.600E-01
Ba-137m	1.619E+00	75-09-2	2.840E-01
Co-60	2.167E-03	Ag	7.866E-02
Cs-137	1.731E+00	As	9.986E-03
Eu-154	2.583E-03	Ba	6.783E-02
H-3	1.284E-01	Cd	1.250E-01
Nb-94	1.482E-04	Cl-2-x	4.212E-01
Ni-59	3.317E-03	Cl-3-x	2.491E+01
Ni-63	3.409E-01	Cl-4-x	3.373E+00
Pa-234m	9.529E-04	Cl-F-x	2.744E-01
Pu-238	8.047E-02	Cr	2.914E-01
Pu-239	1.334E-03	HC-insol	1.686E+01
Pu-240	5.929E-04	HC-solub	3.228E+02
Pu-241	3.465E-02	Hg	4.473E-01
Sm-151	2.477E-02	Pb	9.175E-02
Sr-90	1.541E+00	Se	6.881E-02
Tc-99	7.694E-04		
Th-234	9.529E-04		
U-238	9.529E-04		
Y-90	1.541E+00		

Shipping Site: WVDP

Waste Type: Solids (CH-Alpha)

Total Volume (m3/yr): 8.473E-01

Total Mass (kg/yr): 1.355E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	7.096E-04	57-12-5	1.069E-03
Ba-137m	7.751E-01	75-09-2	2.958E-01
Co-60	1.037E-03	Ag	1.709E-02
Cs-137	8.243E-01	As	1.081E-02
Eu-154	1.236E-03	Ba	3.475E-01
H-3	6.150E-02	Cd	1.558E-01
Nb-94	7.096E-05	Cl-2-x	2.803E-01
Ni-59	1.588E-03	Cl-3-x	1.573E+01
Ni-63	1.632E-01	Cl-4-x	2.998E+00
Pa-234m	4.561E-04	Cl-F-x	1.176E-01
Pu-238	3.852E-02	Cr	5.922E-01
Pu-239	6.386E-04	HC-insol	5.230E+01
Pu-240	2.838E-04	HC-solub	2.619E+01
Pu-241	1.659E-02	Hg	1.760E-01
Sm-151	1.186E-02	Pb	2.784E-01
Sr-90	7.339E-01	Se	4.680E-02
Tc-99	3.662E-04		
Th-234	4.561E-04		
U-238	4.561E-04		
Y-90	7.339E-01		

A.2 WM LLMW REGIONALIZED 1 ALTERNATIVE (CASE 4)

Waste Stream: MLLW
12 Disposal Sites

Alternative: 4 Regional 11 Treatment Sites -

Destination Site: FEMP

Shipping Site: AMES

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 1.008E-01 Total Mass (kg/yr): 1.367E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	2.165E-07	57-12-5	7.878E-05
Bi-212	3.642E-08	75-09-2	6.039E-04
Pa-234	2.752E-08	Ag	6.841E-04
Pa-234m	2.673E-04	As	3.071E-06
Pb-212	3.642E-08	Ba	1.626E-04
Po-212	2.347E-08	Cd	6.901E-04
Po-216	3.642E-08	Cl-2-x	8.012E-04
Ra-224	3.614E-08	Cl-3-x	2.826E-03
Ra-228	2.148E-07	Cl-4-x	3.618E-03
Tc-99	3.995E-06	Cl-F-x	3.019E-04
Th-228	3.642E-08	Cr	9.937E-04
Th-231	2.088E-07	HC-insol	8.754E-05
Th-232	2.198E-06	HC-solub	4.115E-02
Th-234	2.673E-04	Hg	6.756E-04
Tl-208	1.376E-08	Pb	8.168E-04
U-235	2.080E-07	Se	4.877E-06
U-238	2.673E-04		

Shipping Site: ANL-E

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 4.838E+02 Total Mass (kg/yr): 8.170E+05

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	2.380E-02	57-12-5	2.002E+01
Ba-137m	3.504E+01	75-09-2	2.778E+01
Co-60	1.304E+01	Ag	1.623E+01
Cs-137	3.747E+01	As	6.714E+00
Eu-154	1.388E-01	Ba	2.781E+02
Eu-155	4.761E-02	Cd	9.989E+00
H-3	2.699E+00	Cl-2-x	1.822E+01
Nb-94	9.919E-02	Cl-3-x	3.658E+02
Ni-59	2.104E+00	Cl-4-x	4.608E+01
Ni-63	2.214E+02	Cl-F-x	1.759E+01
Pa-234m	4.796E+00	Cr	3.334E+02
Pu-238	1.474E+00	HC-insol	1.482E+03
Pu-239	2.380E-02	HC-solub	7.360E+02
Pu-240	3.571E-02	Hg	1.110E+02
Pu-241	1.561E+00	Pb	4.704E+02
Sm-151	4.519E-01	Se	4.660E+01
Sr-90	3.313E+01		
Tc-99	3.963E-01		
Th-232	3.967E-02		
Th-234	4.796E+00		
U-238	4.796E+00		
Y-90	3.313E+01		

Destination Site: HANF

Shipping Site: PHNS

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 1.736E-03 Total Mass (kg/yr): 1.979E+00

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.162E-03	75-09-2	2.572E-04
Co-60	1.877E-02	Ag	8.707E-05
Cs-134	1.103E-05	As	2.176E-05
Cs-137	1.227E-03	Ba	1.484E-04
Eu-154	1.493E-05	Cl-2-x	7.322E-04
Eu-155	7.141E-06	Cl-3-x	2.731E-02
Fe-55	2.454E-03	Cl-4-x	1.543E-03
H-3	5.346E-03	Cl-F-x	5.937E-04
Mn-54	7.791E-06	HC-insol	2.968E-03
Nb-94	1.168E-05	HC-solub	7.718E-04
Ni-59	2.454E-04	Hg	4.353E-04
Ni-63	3.299E-02	Pb	5.343E-05
Pa-234m	4.609E-05	Se	7.322E-05
Pm-147	1.337E-04		
Pu-238	3.830E-05		
Pu-241	3.116E-05		
Sb-125	5.194E-06		
Sm-151	1.038E-05		
Sr-90	1.155E-03		
Te-125m	1.298E-06		
Th-234	4.609E-05		
U-238	4.609E-05		
Y-90	1.155E-03		

Shipping Site: PHNS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 2.962E-01 Total Mass (kg/yr): 4.406E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.983E-01	57-12-5	4.073E-03
Co-60	3.204E+00	75-09-2	5.831E-02
Cs-134	1.883E-03	Ag	2.691E-03
Cs-137	2.094E-01	As	1.603E-03
Eu-154	2.548E-03	Ba	1.038E-01
Eu-155	1.218E-03	Cd	2.472E-02
Fe-55	4.188E-01	Cl-2-x	6.160E-02
H-3	9.124E-01	Cl-3-x	2.088E+00
Mn-54	1.329E-03	Cl-4-x	4.422E-01
Nb-94	1.994E-03	Cl-F-x	6.398E-02
Ni-59	4.188E-02	Cr	7.805E-01
Ni-63	5.631E+00	HC-insol	6.908E+00
Pa-234m	7.867E-03	HC-solub	3.289E+00
Pm-147	2.282E-02	Hg	2.617E-02
Pu-238	6.538E-03	Pb	1.563E-01
Pu-241	5.319E-03	Se	6.731E-03
Sb-125	8.865E-04		
Sm-151	1.773E-03		
Sr-90	1.972E-01		
Te-125m	2.216E-04		
Th-234	7.867E-03		
U-238	7.867E-03		
Y-90	1.972E-01		

Shipping Site: PSNS

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 3.990E-02

Total Mass (kg/yr): 5.986E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.671E-02	75-09-2	9.577E-02
Co-60	4.315E-01	Cd	6.584E-02
Cs-134	2.537E-04	Cl-2-x	5.088E-02
Cs-137	2.820E-02	Cl-3-x	7.243E+00
Eu-154	3.432E-04	Cl-4-x	1.616E+00
Eu-155	1.641E-04	Cl-F-x	2.993E-03
Fe-55	5.641E-02	Cr	5.746E-02
H-3	1.228E-01	HC-insol	1.975E-02
Mn-54	1.791E-04	HC-solub	3.831E-01
Nb-94	2.686E-04	Hg	3.771E-04
Ni-59	5.641E-03	Pb	1.257E-02
Ni-63	7.585E-01		
Pa-234m	1.059E-03		
Pm-147	3.074E-03		
Pu-238	8.806E-04		
Pu-241	7.164E-04		
Sb-125	1.194E-04		
Sm-151	2.388E-04		
Sr-90	2.656E-02		
Te-125m	2.985E-05		
Th-234	1.059E-03		
U-238	1.059E-03		
Y-90	2.656E-02		

Shipping Site: PSNS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 6.586E+00

Total Mass (kg/yr): 9.518E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	4.409E+00	57-12-5	7.312E-01
Co-60	7.122E+01	75-09-2	1.279E+00
Cs-134	4.187E-02	Ag	1.357E-01
Cs-137	4.655E+00	As	4.301E-02
Eu-154	5.665E-02	Ba	8.869E+00
Eu-155	2.709E-02	Cd	1.229E-01
Fe-55	9.311E+00	Cl-2-x	1.346E+00
H-3	2.028E+01	Cl-3-x	4.520E+00
Mn-54	2.956E-02	Cl-4-x	2.989E+00
Nb-94	4.434E-02	Cl-F-x	1.385E+00
Ni-59	9.311E-01	Cr	2.225E+01
Ni-63	1.251E+02	HC-insol	6.852E+00
Pa-234m	1.749E-01	HC-solub	2.684E-01
Pm-147	5.074E-01	Hg	4.633E-01
Pu-238	1.453E-01	Pb	2.158E+01
Pu-241	1.182E-01	Se	1.310E-01
Sb-125	1.970E-02		
Sm-151	3.941E-02		
Sr-90	4.384E+00		
Te-125m	4.926E-03		
Th-234	1.749E-01		
U-238	1.749E-01		
Y-90	4.384E+00		

Destination Site: INEL

Shipping Site: NTS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 6.621E-03

Total Mass (kg/yr): 8.886E+00

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	8.760E-05	75-09-2	5.331E-03
Cs-137	9.177E-05	Ag	9.774E-05
H-3	4.167E-01	Cd	5.331E-04
Pa-234m	2.127E-05	Cl-2-x	5.331E-03
Pu-241	2.085E-05	Cl-3-x	2.221E-02
Sr-90	8.760E-05	Cl-4-x	1.688E-01
Th-234	2.127E-05	Cl-F-x	2.665E-03
U-238	2.127E-05	Cr	1.777E-04
Y-90	8.760E-05	HC-insol	4.443E-02
		HC-solub	2.221E-02
		Hg	3.465E-04
		Pb	3.199E-04
		Se	8.886E-06

Destination Site: LANL

Shipping Site: ITRI

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 1.028E-01

Total Mass (kg/yr): 1.007E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.367E-03	57-12-5	1.813E-02
Co-60	1.879E-03	Ag	4.433E-03
Cs-137	1.424E-03	Cd	4.937E-04
Eu-154	1.566E-05	Cl-3-x	8.061E-02
Fe-55	2.364E-04	Cl-4-x	4.534E-03
H-3	2.725E-01	Cr	2.116E-02
Ni-59	3.133E-05	HC-insol	1.108E+00
Ni-63	4.158E-03	HC-solub	3.627E+01
Pm-147	1.310E-04	Hg	2.821E-02
Pu-238	5.411E-05	Pb	5.038E-03
Pu-241	2.734E-04	Se	4.030E-03
Sm-151	1.253E-05		
Sr-90	1.338E-03		
Y-90	1.338E-03		

Shipping Site: SNLA

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 5.487E-04

Total Mass (kg/yr): 5.793E-01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	6.627E-05	57-12-5	5.085E-05
Co-60	9.630E-05	75-09-2	3.859E-05
Cs-137	7.006E-05	Ag	2.549E-05
Eu-154	3.516E-07	As	3.265E-06
Eu-155	8.115E-08	Ba	2.226E-05
Fe-55	1.920E-06	Cd	1.384E-06
H-3	1.223E-03	Cl-2-x	1.098E-04
Nb-94	4.598E-07	Cl-3-x	4.322E-03
Ni-59	9.089E-06	Cl-4-x	2.442E-04
Ni-63	1.099E-03	Cl-F-x	8.905E-05
Pa-234m	3.246E-07	Cr	5.933E-05
Pu-238	2.380E-06	HC-insol	3.553E-03
Pu-240	1.893E-06	HC-solub	1.018E-01
Pu-241	1.893E-06	Hg	1.444E-04
Sm-151	7.574E-07	Pb	2.214E-05
Sr-90	6.519E-05	Se	2.228E-05
Tc-99	2.705E-08		
Th-234	3.246E-07		
U-238	3.246E-07		
Y-90	6.519E-05		

Shipping Site: SNLA

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 2.849E+00

Total Mass (kg/yr): 2.300E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	3.441E-01	57-12-5	2.628E-01
Co-60	5.000E-01	75-09-2	7.747E-01
Cs-137	3.637E-01	Ag	5.397E-02
Eu-154	1.825E-03	As	1.546E-02
Eu-155	4.213E-04	Ba	3.392E+00
Fe-55	9.972E-03	Cd	9.542E-03
H-3	6.351E+00	Cl-2-x	8.422E-01
Nb-94	2.387E-03	Cl-3-x	2.813E+00
Ni-59	4.719E-02	Cl-4-x	1.497E+00
Ni-63	5.706E+00	Cl-F-x	9.064E-01
Pa-234m	1.685E-03	Cr	3.104E+00
Pu-238	1.236E-02	HC-insol	7.682E+00
Pu-240	9.832E-03	HC-solub	1.619E-01
Pu-241	9.832E-03	Hg	1.563E-01
Sm-151	3.932E-03	Pb	7.814E+00
Sr-90	3.385E-01	Se	4.865E-02
Tc-99	1.404E-04		
Th-234	1.685E-03		
U-238	1.685E-03		
Y-90	3.385E-01		

Destination Site: LLNL

Shipping Site: GATOMIC

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 7.077E-02

Total Mass (kg/yr): 7.476E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	1.514E-07	57-12-5	6.543E-03
Bi-212	2.547E-08	75-09-2	5.261E-03
Pa-234	1.925E-08	Ag	3.280E-03
Pa-234m	1.870E-04	As	4.207E-04
Pb-212	2.547E-08	Ba	2.867E-03
Po-212	1.642E-08	Cd	4.175E-04
Po-216	2.547E-08	Cl-2-x	1.428E-02
Ra-224	2.547E-08	Cl-3-x	5.732E-01
Ra-228	1.514E-07	Cl-4-x	3.523E-02
Tc-99	2.816E-06	Cl-F-x	1.146E-02
Th-228	2.547E-08	Cr	7.839E-03
Th-231	1.460E-07	HC-insol	4.931E-01
Th-232	1.537E-06	HC-solub	1.311E+01
Th-234	1.870E-04	Hg	1.858E-02
Tl-208	9.625E-09	Pb	2.894E-03
U-235	1.455E-07	Se	2.867E-03
U-238	1.870E-04		

Shipping Site: GATOMIC

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 5.632E-01

Total Mass (kg/yr): 8.419E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	1.218E-06	57-12-5	9.298E-02
Bi-212	2.049E-07	75-09-2	1.998E-01
Pa-234	1.548E-07	Ag	2.502E-02
Pa-234m	1.504E-03	As	9.721E-03
Pb-212	2.049E-07	Ba	1.175E+00
Po-212	1.320E-07	Cd	4.463E-02
Po-216	2.049E-07	Cl-2-x	1.741E-01
Ra-224	1.996E-07	Cl-3-x	3.347E+00
Ra-228	1.186E-06	Cl-4-x	8.150E-01
Tc-99	2.207E-05	Cl-F-x	1.017E-01
Th-228	2.049E-07	Cr	1.315E+00
Th-231	1.175E-06	HC-insol	1.041E+01
Th-232	1.237E-05	HC-solub	6.899E+00
Th-234	1.504E-03	Hg	1.942E-01
Tl-208	7.742E-08	Pb	2.810E+00
U-235	1.170E-06	Se	7.067E-02
U-238	1.504E-03		

Shipping Site: LBL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 3.230E-01

Total Mass (kg/yr): 3.100E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	4.273E-03	75-09-2	2.976E-01
Cs-137	4.476E-03	As	2.387E-03
H-3	2.032E+01	Ba	1.023E-02
Pa-234m	1.037E-03	Cd	3.410E-01
Pu-241	1.017E-03	Cl-2-x	1.550E-01
Sr-90	4.273E-03	Cl-3-x	2.325E+00
Th-234	1.037E-03	Cl-4-x	4.961E-01
U-238	1.037E-03	Cr	2.852E-01
Y-90	4.273E-03	HC-insol	1.364E+02
		HC-solub	4.341E+01
		Hg	1.860E-03
		Pb	6.511E-02

Shipping Site: LBL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.112E+00

Total Mass (kg/yr): 4.402E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	4.117E-02	57-12-5	5.503E-01
Cs-137	4.314E-02	75-09-2	1.116E+01
H-3	1.958E+02	Ag	1.516E-01
Pa-234m	1.000E-02	As	3.237E-02
Pu-241	9.804E-03	Ba	6.474E+00
Sr-90	4.117E-02	Cd	1.754E-02
Th-234	1.000E-02	Cl-2-x	5.905E+00
U-238	1.000E-02	Cl-3-x	5.439E+01
Y-90	4.117E-02	Cl-4-x	4.320E+01
		Cl-F-x	3.237E-01
		Cr	6.485E+00
		HC-insol	1.314E+02
		HC-solub	6.326E+01
		Hg	3.242E-01
		Pb	1.619E+01
		Se	9.711E-02

Shipping Site: LERHR

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 5.020E-03

Total Mass (kg/yr): 5.750E+00

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	2.470E-07	57-12-5	2.373E-04
Ba-137m	3.636E-04	75-09-2	4.324E-03
Co-60	1.353E-04	Ag	1.189E-04
Cs-137	3.888E-04	As	2.403E-05
Eu-154	1.440E-06	Ba	1.415E-04
Eu-155	4.940E-07	Cd	3.358E-03
H-3	2.801E-05	Cl-2-x	2.702E-03
Nb-94	1.029E-06	Cl-3-x	2.592E-01
Ni-59	2.183E-05	Cl-4-x	5.439E-02
Ni-63	2.297E-03	Cl-F-x	5.108E-04
Pa-234m	4.976E-05	Cr	3.156E-03
Pu-238	1.529E-05	HC-insol	5.198E-01
Pu-239	2.470E-07	HC-solub	6.473E-01
Pu-240	3.705E-07	Hg	6.928E-04
Pu-241	1.620E-05	Pb	7.432E-04
Sm-151	4.688E-06	Se	1.039E-04
Sr-90	3.438E-04		
Tc-99	4.112E-06		
Th-232	4.116E-07		
Th-234	4.976E-05		
U-238	4.976E-05		
Y-90	3.438E-04		

Shipping Site: LERHR

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.442E-01

Total Mass (kg/yr): 2.492E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	1.701E-05	57-12-5	4.707E-04
Ba-137m	2.505E-02	75-09-2	1.438E-01
Co-60	9.323E-03	Ag	2.547E-03
Cs-137	2.641E-02	As	1.464E-05
Eu-154	9.928E-05	Ba	3.843E-02
Eu-155	3.403E-05	Cd	8.851E-03
H-3	1.930E-03	Cl-2-x	1.556E-01
Nb-94	7.091E-05	Cl-3-x	6.005E-01
Ni-59	1.504E-03	Cl-4-x	2.831E+00
Ni-63	1.583E-01	Cl-F-x	1.391E-01
Pa-234m	3.428E-03	Cr	4.652E-03
Pu-238	1.054E-03	HC-insol	1.675E+00
Pu-239	1.701E-05	HC-solub	3.579E-01
Pu-240	2.552E-05	Hg	5.762E-03
Pu-241	1.116E-03	Pb	1.542E-02
Sm-151	3.230E-04	Se	4.361E-04
Sr-90	2.335E-02		
Tc-99	2.793E-04		
Th-232	2.836E-05		
Th-234	3.428E-03		
U-238	3.428E-03		
Y-90	2.335E-02		

Shipping Site: MINS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.647E+00

Total Mass (kg/yr): 3.545E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.441E+00	75-09-2	5.544E-01
Co-60	3.943E+01	Ag	1.457E-02
Cs-134	2.318E-02	As	7.197E-03
Cs-137	2.578E+00	Ba	2.427E+00
Eu-154	3.137E-02	Cd	1.150E-01
Eu-155	1.500E-02	Cl-2-x	5.975E-01
Fe-55	5.156E+00	Cl-3-x	1.190E+01
H-3	1.123E+01	Cl-4-x	2.652E+00
Mn-54	1.636E-02	Cl-F-x	6.891E-01
Nb-94	2.455E-02	Cr	7.414E-01
Ni-59	5.156E-01	HC-insol	4.047E+01
Ni-63	6.932E+01	HC-solub	1.726E+01
Pa-234m	9.684E-02	Hg	5.165E-01
Pm-147	2.809E-01	Pb	4.557E-01
Pu-238	8.047E-02	Se	3.325E-02
Pu-241	6.547E-02		
Sb-125	1.091E-02		
Sm-151	2.182E-02		
Sr-90	2.427E+00		
Te-125m	2.728E-03		
Th-234	9.684E-02		
U-238	9.684E-02		
Y-90	2.427E+00		

Shipping Site: SNLL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 7.662E+00

Total Mass (kg/yr): 7.356E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.013E-01	75-09-2	7.061E+00
Cs-137	1.062E-01	As	5.664E-02
H-3	4.822E+02	Ba	2.427E-01
Pa-234m	2.462E-02	Cd	8.091E+00
Pu-241	2.413E-02	Cl-2-x	3.678E+00
Sr-90	1.013E-01	Cl-3-x	5.517E+01
Th-234	2.462E-02	Cl-4-x	1.176E+01
U-238	2.462E-02	Cr	6.767E+00
Y-90	1.013E-01	HC-insol	3.236E+03
		HC-solub	1.029E+03
		Hg	4.413E-02
		Pb	1.544E+00

Shipping Site: SNLL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 7.770E-01

Total Mass (kg/yr): 1.193E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.027E-02	57-12-5	6.924E-03
Cs-137	1.076E-02	75-09-2	7.497E+00
H-3	4.890E+01	Ag	1.014E-02
Pa-234m	2.496E-03	As	6.737E-03
Pu-241	2.447E-03	Ba	3.347E-01
Sr-90	1.027E-02	Cd	8.243E-02
Th-234	2.496E-03	Cl-2-x	3.816E+00
U-238	2.496E-03	Cl-3-x	4.480E+01
Y-90	1.027E-02	Cl-4-x	3.090E+01
		Cl-F-x	6.827E-02
		Cr	6.765E-01
		HC-insol	1.187E+02
		HC-solub	5.754E+01
		Hg	1.257E-01
		Pb	2.595E-01
		Se	3.934E-02

Destination Site: NTS

Shipping Site: LLNL

Waste Type: Organic Liquids (CH-Alpha)

Total Volume (m3/yr): 1.852E+00

Total Mass (kg/yr): 1.852E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.681E-06	57-12-5	2.012E-09
Cs-137	6.052E-05	75-09-2	6.870E-10
H-3	6.065E-01	Ag	9.364E-06
Pa-234m	6.512E-07	As	1.110E-06
Pu-238	6.384E-07	Ba	7.574E-06
Pu-241	1.276E-05	Cd	5.479E-07
Sr-90	5.777E-05	Cl-2-x	1.954E-09
Th-234	6.512E-07	Cl-3-x	7.751E-08
U-238	6.512E-07	Cl-4-x	4.380E-09
Y-90	5.777E-05	Cl-F-x	1.584E-09
		Cr	2.348E-05
		HC-insol	7.182E-08
		HC-solub	4.020E-01
		Hg	5.352E-05
		Pb	8.317E-06
		Se	8.209E-06

Destination Site: PADUCAH

Shipping Site: KCP

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 4.219E-02

Total Mass (kg/yr): 3.237E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.824E-02	75-09-2	2.982E-02
Co-60	4.562E-01	Ag	1.504E-04
Cs-134	2.682E-04	As	2.945E-05
Cs-137	2.982E-02	Ba	6.019E-03
Eu-154	3.629E-04	Cd	5.228E-03
Eu-155	1.735E-04	Cl-2-x	1.746E-02
Fe-55	5.964E-02	Cl-3-x	7.227E-02
H-3	1.299E-01	Cl-4-x	3.884E-02
Mn-54	1.893E-04	Cl-F-x	2.371E-02
Nb-94	2.840E-04	Cr	2.621E-02
Ni-59	5.964E-03	HC-insol	1.522E-01
Ni-63	8.019E-01	HC-solub	1.618E-04
Pa-234m	1.120E-03	Hg	4.361E-03
Pm-147	3.250E-03	Pb	1.747E-01
Pu-238	9.309E-04	Se	3.916E-04
Pu-241	7.573E-04		
Sb-125	1.262E-04		
Sm-151	2.524E-04		
Sr-90	2.808E-02		
Te-125m	3.155E-05		
Th-234	1.120E-03		
U-238	1.120E-03		
Y-90	2.808E-02		

Destination Site: PORTS

Shipping Site: BAPL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 6.410E-02 Total Mass (kg/yr): 6.163E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	5.332E-05	75-09-2	5.934E-02
Ba-137m	5.866E-02	As	4.724E-04
Co-60	7.908E-05	Ba	2.024E-03
Cs-137	6.272E-02	Cd	6.779E-02
Eu-154	9.439E-05	Cl-2-x	3.091E-02
H-3	4.694E-03	Cl-3-x	4.931E-01
Nb-94	5.357E-06	Cl-4-x	1.055E-01
Ni-59	1.209E-04	Cl-F-x	1.360E-05
Ni-63	1.242E-02	Cr	5.671E-02
Pa-234m	3.469E-05	HC-insol	2.699E+01
Pu-238	2.806E-03	HC-solub	8.592E+00
Pu-239	3.801E-05	Hg	3.698E-04
Pu-240	2.168E-05	Pb	1.294E-02
Pu-241	6.225E-04		
Sm-151	9.031E-04		
Sr-90	5.586E-02		
Tc-99	2.806E-05		
Th-234	3.469E-05		
U-238	3.469E-05		
Y-90	5.586E-02		

Shipping Site: BAPL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 6.105E-01 Total Mass (kg/yr): 6.010E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	5.078E-04	57-12-5	1.703E-03
Ba-137m	5.587E-01	75-09-2	6.266E-02
Co-60	7.532E-04	Ag	6.515E-03
Cs-137	5.974E-01	As	1.598E-03
Eu-154	8.990E-04	Ba	6.259E-02
H-3	4.471E-02	Cd	1.698E-02
Nb-94	5.102E-05	Cl-2-x	7.067E-02
Ni-59	1.151E-03	Cl-3-x	4.679E-01
Ni-63	1.183E-01	Cl-4-x	4.156E-01
Pa-234m	3.304E-04	Cl-F-x	8.727E-02
Pu-238	2.672E-02	Cr	4.102E-02
Pu-239	3.620E-04	HC-insol	2.697E+00
Pu-240	2.065E-04	HC-solub	2.666E+00
Pu-241	5.929E-03	Hg	1.514E-02
Sm-151	8.601E-03	Pb	7.746E-02
Sr-90	5.321E-01	Se	2.393E-03
Tc-99	2.672E-04		
Th-234	3.304E-04		
U-238	3.304E-04		
Y-90	5.321E-01		

Shipping Site: BATELLE

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 1.500E-03 Total Mass (kg/yr): 1.977E+00

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	3.211E-09	75-09-2	3.955E-02
Bi-212	5.400E-10	Cl-2-x	1.977E-02
Pa-234	4.080E-10	Cl-3-x	1.977E-01
Pa-234m	3.964E-06	Cl-4-x	1.582E-01
Pb-212	5.400E-10	HC-insol	4.943E-01
Po-212	3.480E-10	HC-solub	2.373E-01
Po-216	5.400E-10		
Ra-224	5.400E-10		
Ra-228	3.211E-09		
Tc-99	5.971E-08		
Th-228	5.400E-10		
Th-231	3.097E-09		
Th-232	3.260E-08		
Th-234	3.964E-06		
Tl-208	2.040E-10		
U-235	3.085E-09		
U-238	3.964E-06		

Shipping Site: BNL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 1.544E+00

Total Mass (kg/yr): 1.749E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	7.598E-05	57-12-5	8.298E-02
Ba-137m	1.118E-01	75-09-2	1.156E+00
Co-60	4.162E-02	Ag	4.159E-02
Cs-137	1.196E-01	As	7.649E-03
Eu-154	4.432E-04	Ba	4.627E-02
Eu-155	1.519E-04	Cd	8.868E-01
H-3	8.617E-03	Cl-2-x	7.572E-01
Nb-94	3.166E-04	Cl-3-x	7.014E+01
Ni-59	6.718E-03	Cl-4-x	1.445E+01
Ni-63	7.068E-01	Cl-F-x	1.704E-01
Pa-234m	1.530E-02	Cr	8.567E-01
Pu-238	4.706E-03	HC-insol	1.386E+02
Pu-239	7.598E-05	HC-solub	2.115E+02
Pu-240	1.139E-04	Hg	2.406E-01
Pu-241	4.984E-03	Pb	2.050E-01
Sm-151	1.442E-03	Se	3.636E-02
Sr-90	1.057E-01		
Tc-99	1.265E-03		
Th-232	1.266E-04		
Th-234	1.530E-02		
U-238	1.530E-02		
Y-90	1.057E-01		

Shipping Site: BNL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 8.915E+00

Total Mass (kg/yr): 1.190E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	4.386E-04	57-12-5	1.617E+00
Ba-137m	6.457E-01	75-09-2	8.722E-01
Co-60	2.402E-01	Ag	7.571E-01
Cs-137	6.904E-01	As	2.698E-01
Eu-154	2.558E-03	Ba	2.157E+01
Eu-155	8.772E-04	Cd	4.530E-01
H-3	4.974E-02	Cl-2-x	8.722E-01
Nb-94	1.827E-03	Cl-3-x	2.419E+01
Ni-59	3.878E-02	Cl-4-x	3.963E-01
Ni-63	4.080E+00	Cl-F-x	1.019E+00
Pa-234m	8.837E-02	Cr	2.698E+01
Pu-238	2.716E-02	HC-insol	1.091E+02
Pu-239	4.386E-04	HC-solub	5.459E+01
Pu-240	6.579E-04	Hg	8.531E+00
Pu-241	2.877E-02	Pb	2.912E+01
Sm-151	8.327E-03	Se	3.668E+00
Sr-90	6.105E-01		
Tc-99	7.303E-03		
Th-232	7.310E-04		
Th-234	8.837E-02		
U-238	8.837E-02		
Y-90	6.105E-01		

Shipping Site: COLONIE

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 9.054E-01

Total Mass (kg/yr): 1.026E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	1.937E-06	57-12-5	5.151E-02
Bi-212	3.259E-07	75-09-2	7.241E-01
Pa-234	2.462E-07	Ag	2.274E-02
Pa-234m	2.392E-03	As	3.999E-03
Pb-212	3.259E-07	Ba	2.356E-02
Po-212	2.100E-07	Cd	5.620E-01
Po-216	3.259E-07	Cl-2-x	4.522E-01
Ra-224	3.259E-07	Cl-3-x	4.355E+01
Ra-228	1.937E-06	Cl-4-x	9.136E+00
Tc-99	3.603E-05	Cl-F-x	8.522E-02
Th-228	3.259E-07	Cr	5.418E-01
Th-231	1.868E-06	HC-insol	8.707E+01
Th-232	1.967E-05	HC-solub	1.317E+02
Th-234	2.392E-03	Hg	1.340E-01
Tl-208	1.231E-07	Pb	1.275E-01
U-235	1.861E-06	Se	1.998E-02
U-238	2.392E-03		

Shipping Site: COLONIE

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 1.235E-02

Total Mass (kg/yr): 1.606E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	3.198E-08	57-12-5	7.229E-04
Bi-212	5.380E-09	75-09-2	8.484E-04
Pa-234	4.065E-09	Ag	2.570E-05
Pa-234m	3.949E-05	As	2.249E-05
Pb-212	5.380E-09	Ba	1.606E-05
Po-212	3.467E-09	Cd	1.429E-04
Po-216	5.380E-09	Cl-2-x	4.242E-03
Ra-224	2.690E-09	Cl-3-x	5.345E-03
Ra-228	1.599E-08	Cl-4-x	5.006E-03
Tc-99	2.974E-07	Cl-F-x	4.242E-04
Th-228	5.380E-09	Cr	5.462E-04
Th-231	3.084E-08	HC-insol	9.333E-04
Th-232	3.247E-07	HC-solub	8.032E-04
Th-234	3.949E-05	Hg	3.695E-06
Tl-208	2.032E-09	Pb	1.044E-03
U-235	3.072E-08	Se	8.032E-06
U-238	3.949E-05		

Shipping Site: KAPL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 6.167E-01

Total Mass (kg/yr): 7.065E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	4.129E-01	57-12-5	2.915E-02
Co-60	6.669E+00	75-09-2	5.312E-01
Cs-134	3.921E-03	Ag	1.461E-02
Cs-137	4.359E-01	As	2.952E-03
Eu-154	5.305E-03	Ba	1.739E-02
Eu-155	2.537E-03	Cd	4.125E-01
Fe-55	8.719E-01	Cl-2-x	3.320E-01
H-3	1.899E+00	Cl-3-x	3.184E+01
Mn-54	2.768E-03	Cl-4-x	6.682E+00
Nb-94	4.152E-03	Cl-F-x	6.275E-02
Ni-59	8.719E-02	Cr	3.877E-01
Ni-63	1.172E+01	HC-insol	6.386E+01
Pa-234m	1.637E-02	HC-solub	7.952E+01
Pm-147	4.752E-02	Hg	8.511E-02
Pu-238	1.361E-02	Pb	9.130E-02
Pu-241	1.107E-02	Se	1.277E-02
Sb-125	1.845E-03		
Sm-151	3.690E-03		
Sr-90	4.106E-01		
Te-125m	4.613E-04		
Th-234	1.637E-02		
U-238	1.637E-02		
Y-90	4.106E-01		

Shipping Site: KAPL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.572E+00

Total Mass (kg/yr): 5.162E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.391E+00	57-12-5	1.840E-02
Co-60	3.862E+01	75-09-2	2.577E+00
Cs-134	2.271E-02	Ag	6.267E-02
Cs-137	2.525E+00	As	2.265E-02
Eu-154	3.072E-02	Ba	5.050E-01
Eu-155	1.469E-02	Cd	2.428E-02
Fe-55	5.050E+00	Cl-2-x	1.464E+00
H-3	1.100E+01	Cl-3-x	1.328E+01
Mn-54	1.603E-02	Cl-4-x	1.024E+01
Nb-94	2.404E-02	Cl-F-x	4.115E-01
Ni-59	5.050E-01	Cr	4.769E-01
Ni-63	6.790E+01	HC-insol	3.511E+01
Pa-234m	9.486E-02	HC-solub	1.516E+01
Pm-147	2.752E-01	Hg	6.065E-02
Pu-238	7.882E-02	Pb	7.229E-01
Pu-241	6.413E-02	Se	1.698E-02
Sb-125	1.068E-02		
Sm-151	2.137E-02		
Sr-90	2.378E+00		
Te-125m	2.672E-03		
Th-234	9.486E-02		
U-238	9.486E-02		
Y-90	2.378E+00		

Shipping Site: KKS

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 4.733E-01

Total Mass (kg/yr): 5.422E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	3.168E-01	57-12-5	2.237E-02
Co-60	5.118E+00	75-09-2	4.077E-01
Cs-134	3.009E-03	Ag	1.121E-02
Cs-137	3.345E-01	As	2.266E-03
Eu-154	4.071E-03	Ba	1.335E-02
Eu-155	1.947E-03	Cd	3.166E-01
Fe-55	6.691E-01	Cl-2-x	2.548E-01
H-3	1.457E+00	Cl-3-x	2.443E+01
Mn-54	2.124E-03	Cl-4-x	5.128E+00
Nb-94	3.186E-03	Cl-F-x	4.816E-02
Ni-59	6.691E-02	Cr	2.976E-01
Ni-63	8.997E+00	HC-insol	4.901E+01
Pa-234m	1.256E-02	HC-solub	6.103E+01
Pm-147	3.646E-02	Hg	6.532E-02
Pu-238	1.044E-02	Pb	7.007E-02
Pu-241	8.497E-03	Se	9.805E-03
Sb-125	1.416E-03		
Sm-151	2.832E-03		
Sr-90	3.151E-01		
Te-125m	3.540E-04		
Th-234	1.256E-02		
U-238	1.256E-02		
Y-90	3.151E-01		

Shipping Site: KKS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.928E+00

Total Mass (kg/yr): 6.620E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.630E+00	57-12-5	1.282E-01
Co-60	4.248E+01	75-09-2	2.231E+00
Cs-134	2.497E-02	Ag	8.783E-02
Cs-137	2.776E+00	As	3.299E-02
Eu-154	3.379E-02	Ba	1.662E+00
Eu-155	1.616E-02	Cd	5.269E-02
Fe-55	5.553E+00	Cl-2-x	1.281E+00
H-3	1.209E+01	Cl-3-x	1.108E+01
Mn-54	1.763E-02	Cl-4-x	1.215E+01
Nb-94	2.644E-02	Cl-F-x	2.090E-01
Ni-59	5.553E-01	Cr	1.846E+00
Ni-63	7.467E+01	HC-insol	2.753E+01
Pa-234m	1.043E-01	HC-solub	1.411E+01
Pm-147	3.026E-01	Hg	1.438E-01
Pu-238	8.668E-02	Pb	4.165E+00
Pu-241	7.052E-02	Se	3.790E-02
Sb-125	1.175E-02		
Sm-151	2.350E-02		
Sr-90	2.615E+00		
Te-125m	2.938E-03		
Th-234	1.043E-01		
U-238	1.043E-01		
Y-90	2.615E+00		

Shipping Site: KWS

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 6.454E-02

Total Mass (kg/yr): 7.394E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	4.321E-02	57-12-5	3.051E-03
Co-60	6.979E-01	75-09-2	5.559E-02
Cs-134	4.103E-04	Ag	1.529E-03
Cs-137	4.562E-02	As	3.090E-04
Eu-154	5.552E-04	Ba	1.820E-03
Eu-155	2.655E-04	Cd	4.317E-02
Fe-55	9.125E-02	Cl-2-x	3.474E-02
H-3	1.987E-01	Cl-3-x	3.332E+00
Mn-54	2.896E-04	Cl-4-x	6.993E-01
Nb-94	4.345E-04	Cl-F-x	6.567E-03
Ni-59	9.125E-03	Cr	4.058E-02
Ni-63	1.226E+00	HC-insol	6.683E+00
Pa-234m	1.714E-03	HC-solub	8.322E+00
Pm-147	4.973E-03	Hg	8.907E-03
Pu-238	1.424E-03	Pb	9.555E-03
Pu-241	1.158E-03	Se	1.337E-03
Sb-125	1.931E-04		
Sm-151	3.862E-04		
Sr-90	4.297E-02		
Te-125m	4.828E-05		
Th-234	1.714E-03		
U-238	1.714E-03		
Y-90	4.297E-02		

Shipping Site: KWS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 1.262E+00

Total Mass (kg/yr): 1.580E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	8.449E-01	57-12-5	8.005E-02
Co-60	1.364E+01	75-09-2	3.801E-01
Cs-134	8.024E-03	Ag	2.572E-02
Cs-137	8.921E-01	As	8.795E-03
Eu-154	1.085E-02	Ba	1.035E+00
Eu-155	5.192E-03	Cd	1.157E-02
Fe-55	1.784E+00	Cl-2-x	3.221E-01
H-3	3.886E+00	Cl-3-x	1.699E+00
Mn-54	5.664E-03	Cl-4-x	1.988E+00
Nb-94	8.496E-03	Cl-F-x	2.323E-01
Ni-59	1.784E-01	Cr	1.010E+00
Ni-63	2.399E+01	HC-insol	4.421E+00
Pa-234m	3.351E-02	HC-solub	1.600E+00
Pm-147	9.724E-02	Hg	6.065E-02
Pu-238	2.785E-02	Pb	2.396E+00
Pu-241	2.265E-02	Se	1.789E-02
Sb-125	3.776E-03		
Sm-151	7.552E-03		
Sr-90	8.402E-01		
Te-125m	9.440E-04		
Th-234	3.351E-02		
U-238	3.351E-02		
Y-90	8.402E-01		

Shipping Site: PNS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 5.200E-02

Total Mass (kg/yr): 9.088E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	3.481E-02	75-09-2	1.324E-02
Co-60	5.623E-01	Ag	6.570E-04
Cs-134	3.306E-04	As	5.453E-04
Cs-137	3.676E-02	Ba	1.708E-02
Eu-154	4.473E-04	Cd	8.438E-03
Eu-155	2.139E-04	Cl-2-x	1.324E-02
Fe-55	7.352E-02	Cl-3-x	7.909E-01
H-3	1.601E-01	Cl-4-x	1.483E-01
Mn-54	2.333E-04	Cl-F-x	7.499E-03
Nb-94	3.500E-04	Cr	1.051E-01
Ni-59	7.352E-03	HC-insol	2.629E+00
Ni-63	9.884E-01	HC-solub	1.314E+00
Pa-234m	1.380E-03	Hg	9.046E-03
Pm-147	4.006E-03	Pb	1.319E-02
Pu-238	1.147E-03	Se	2.365E-03
Pu-241	9.335E-04		
Sb-125	1.555E-04		
Sm-151	3.111E-04		
Sr-90	3.462E-02		
Te-125m	3.889E-05		
Th-234	1.380E-03		
U-238	1.380E-03		
Y-90	3.462E-02		

Shipping Site: PPPL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 5.456E-04

Total Mass (kg/yr): 7.191E-01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	7.218E-06	75-09-2	1.438E-02
Cs-137	7.562E-06	Cl-2-x	7.190E-03
H-3	3.433E-02	Cl-3-x	7.190E-02
Pa-234m	1.753E-06	Cl-4-x	5.752E-02
Pu-241	1.718E-06	HC-insol	1.797E-01
Sr-90	7.218E-06	HC-solub	8.629E-02
Th-234	1.753E-06		
U-238	1.753E-06		
Y-90	7.218E-06		

Shipping Site: RMI

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 6.677E-01

Total Mass (kg/yr): 9.741E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	1.429E-06	75-09-2	1.527E+00
Bi-212	2.403E-07	As	3.769E-04
Pa-234	1.816E-07	Ba	1.615E-03
Pa-234m	1.764E-03	Cd	1.071E+00
Pb-212	2.403E-07	Cl-2-x	8.108E-01
Po-212	1.549E-07	Cl-3-x	1.123E+02
Po-216	2.403E-07	Cl-4-x	2.505E+01
Ra-224	2.403E-07	Cl-F-x	4.625E-02
Ra-228	1.429E-06	Cr	9.331E-01
Tc-99	2.657E-05	HC-insol	2.184E+01
Th-228	2.403E-07	HC-solub	1.277E+01
Th-231	1.378E-06	Hg	6.122E-03
Th-232	1.450E-05	Pb	2.045E-01
Th-234	1.764E-03		
Tl-208	9.081E-08		
U-235	1.372E-06		
U-238	1.764E-03		

Shipping Site: RMI

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 1.091E+00

Total Mass (kg/yr): 8.323E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	2.370E-06	57-12-5	4.647E-03
Bi-212	3.988E-07	75-09-2	2.315E-01
Pa-234	3.013E-07	Ag	6.651E-03
Pa-234m	2.927E-03	As	1.974E-03
Pb-212	3.988E-07	Ba	5.734E-01
Po-212	2.570E-07	Cd	1.836E-02
Po-216	3.988E-07	Cl-2-x	2.862E-01
Ra-224	3.815E-07	Cl-3-x	2.561E+00
Ra-228	2.267E-06	Cl-4-x	7.371E-01
Tc-99	4.218E-05	Cl-F-x	3.452E-01
Th-228	3.988E-07	Cr	2.638E-01
Th-231	2.286E-06	HC-insol	8.888E+00
Th-232	2.407E-05	HC-solub	2.825E+00
Th-234	2.927E-03	Hg	2.678E-02
Tl-208	1.506E-07	Pb	8.498E-02
U-235	2.277E-06	Se	6.070E-03
U-238	2.927E-03		

Destination Site: RFP

Shipping Site: GJCT

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 1.290E-02 Total Mass (kg/yr): 1.478E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	2.762E-08	57-12-5	6.102E-04
Bi-212	4.647E-09	75-09-2	1.111E-02
Pa-234	3.511E-09	Ag	3.059E-04
Pa-234m	3.411E-05	As	6.180E-05
Pb-212	4.647E-09	Ba	3.641E-04
Po-212	2.995E-09	Cd	8.635E-03
Po-216	4.647E-09	Cl-2-x	6.949E-03
Ra-224	4.647E-09	Cl-3-x	6.665E-01
Ra-228	2.762E-08	Cl-4-x	1.398E-01
Tc-99	5.138E-07	Cl-F-x	1.313E-03
Th-228	4.647E-09	Cr	8.116E-03
Th-231	2.664E-08	HC-insol	1.336E+00
Th-232	2.805E-07	HC-solub	1.664E+00
Th-234	3.411E-05	Hg	1.781E-03
Tl-208	1.756E-09	Pb	1.911E-03
U-235	2.654E-08	Se	2.674E-04
U-238	3.411E-05		

Shipping Site: GJCT

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 2.953E-02 Total Mass (kg/yr): 5.478E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	6.356E-08	57-12-5	1.997E-04
Bi-212	1.069E-08	75-09-2	1.051E-03
Pa-234	8.080E-09	Ag	6.108E-04
Pa-234m	7.849E-05	As	2.981E-04
Pb-212	1.069E-08	Ba	3.480E-03
Po-212	6.891E-09	Cd	4.003E-04
Po-216	1.069E-08	Cl-2-x	1.051E-03
Ra-224	1.054E-08	Cl-3-x	2.387E-02
Ra-228	6.268E-08	Cl-4-x	7.830E-03
Tc-99	1.165E-06	Cl-F-x	5.619E-04
Th-228	1.069E-08	Cr	4.507E-03
Th-231	6.131E-08	HC-insol	7.674E-02
Th-232	6.454E-07	HC-solub	8.522E-02
Th-234	7.849E-05	Hg	1.306E-03
Tl-208	4.040E-09	Pb	5.304E-03
U-235	6.107E-08	Se	4.666E-04
U-238	7.849E-05		

Destination Site: SRS

Shipping Site: BAPL

Waste Type: Solids (CH-Alpha)

Total Volume (m3/yr): 8.357E-01 Total Mass (kg/yr): 3.493E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	6.984E-04	75-09-2	2.095E-01
Ba-137m	7.629E-01	Ag	3.493E-03
Co-60	1.021E-03	Ba	1.397E-01
Cs-137	8.160E-01	Cd	6.986E-04
Eu-154	1.217E-03	Cl-2-x	2.445E-01
H-3	6.053E-02	Cl-3-x	8.733E-01
Nb-94	6.984E-05	Cl-4-x	4.191E-01
Ni-59	1.563E-03	Cl-F-x	3.493E-01
Ni-63	1.606E-01	Cr	5.239E-03
Pa-234m	4.490E-04	HC-insol	3.493E+00
Pu-238	3.791E-02	HC-solub	1.746E-03
Pu-239	6.286E-04	Hg	6.986E-04
Pu-240	2.793E-04	Pb	3.493E-02
Pu-241	1.633E-02	Se	1.047E-03
Sm-151	1.167E-02		
Sr-90	7.264E-01		
Tc-99	3.625E-04		
Th-234	4.490E-04		
U-238	4.490E-04		
Y-90	7.264E-01		

Shipping Site: CNS

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 9.054E-01 Total Mass (kg/yr): 1.026E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	6.061E-01	57-12-5	5.151E-02
Co-60	9.790E+00	75-09-2	7.241E-01
Cs-134	5.756E-03	Ag	2.274E-02
Cs-137	6.400E-01	As	3.999E-03
Eu-154	7.788E-03	Ba	2.356E-02
Eu-155	3.724E-03	Cd	5.620E-01
Fe-55	1.280E+00	Cl-2-x	4.522E-01
H-3	2.788E+00	Cl-3-x	4.355E+01
Mn-54	4.063E-03	Cl-4-x	9.136E+00
Nb-94	6.095E-03	Cl-F-x	8.522E-02
Ni-59	1.280E-01	Cr	5.418E-01
Ni-63	1.720E+01	HC-insol	8.707E+01
Pa-234m	2.404E-02	HC-solub	1.317E+02
Pm-147	6.975E-02	Hg	1.340E-01
Pu-238	1.997E-02	Pb	1.275E-01
Pu-241	1.625E-02	Se	1.998E-02
Sb-125	2.709E-03		
Sm-151	5.418E-03		
Sr-90	6.027E-01		
Te-125m	6.772E-04		
Th-234	2.404E-02		
U-238	2.404E-02		
Y-90	6.027E-01		

Shipping Site: CNS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 9.030E-02

Total Mass (kg/yr): 6.772E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	6.218E-02	57-12-5	2.357E-03
Co-60	1.004E+00	75-09-2	2.142E-02
Cs-134	5.431E-04	Ag	7.345E-04
Cs-137	6.038E-02	As	2.549E-04
Eu-154	7.990E-04	Ba	3.376E-02
Eu-155	3.821E-04	Cd	2.213E-03
Fe-55	1.313E-01	Cl-2-x	2.738E-02
H-3	2.860E-01	Cl-3-x	2.718E-01
Mn-54	4.169E-04	Cl-4-x	7.524E-02
Nb-94	6.253E-04	Cl-F-x	2.847E-02
Ni-59	1.313E-02	Cr	2.755E-02
Ni-63	1.765E+00	HC-insol	9.141E-01
Pa-234m	2.466E-03	HC-solub	3.299E-01
Pm-147	7.156E-03	Hg	3.234E-03
Pu-238	2.049E-03	Pb	5.496E-02
Pu-241	1.667E-03	Se	9.647E-04
Sb-125	2.779E-04		
Sm-151	5.558E-04		
Sr-90	5.686E-02		
Te-125m	6.948E-05		
Th-234	2.466E-03		
U-238	2.466E-03		
Y-90	5.686E-02		

Shipping Site: MOUND

Waste Type: Organic Liquids (CH-Alpha)

Total Volume (m3/yr): 1.768E+00

Total Mass (kg/yr): 2.190E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.339E-02	75-09-2	2.978E+00
Cs-137	2.450E-02	As	6.322E-03
H-3	1.111E+02	Ba	2.709E-02
Pa-234m	5.680E-03	Cd	2.409E+00
Pu-238	5.569E-03	Cl-2-x	1.574E+00
Pu-241	1.113E-01	Cl-3-x	1.718E+02
Sr-90	2.339E-02	Cl-4-x	3.827E+01
Th-234	5.680E-03	Cl-F-x	6.845E-02
U-238	5.680E-03	Cr	2.069E+00
Y-90	2.339E-02	HC-insol	3.617E+02
		HC-solub	1.237E+02
		Hg	1.355E-02
		Pb	4.599E-01

Shipping Site: MOUND

Waste Type: Solids (CH-Alpha)

Total Volume (m3/yr): 5.712E-03

Total Mass (kg/yr): 6.176E+00

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	7.557E-05	75-09-2	1.926E-02
Cs-137	7.917E-05	Ag	1.191E-04
H-3	3.591E-01	Ba	2.561E-04
Pa-234m	1.835E-05	Cd	2.102E-05
Pu-238	1.799E-05	Cl-2-x	9.886E-03
Pu-241	3.598E-04	Cl-3-x	9.601E-02
Sr-90	7.557E-05	Cl-4-x	7.627E-02
Th-234	1.835E-05	Cl-F-x	6.403E-04
U-238	1.835E-05	Cr	4.674E-05
Y-90	7.557E-05	HC-insol	2.423E-01
		HC-solub	1.132E-01
		Hg	1.951E-05
		Pb	9.361E-05
		Se	1.921E-06

Shipping Site: NNS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr):

3.560E-01

Total Mass (kg/yr):

3.925E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.383E-01	75-09-2	1.041E-01
Co-60	3.849E+00	Ag	3.925E-03
Cs-134	2.263E-03	As	2.726E-03
Cs-137	2.516E-01	Ba	1.110E-01
Eu-154	3.062E-03	Cd	3.955E-02
Eu-155	1.464E-03	Cl-2-x	1.105E-01
Fe-55	5.032E-01	Cl-3-x	4.102E+00
H-3	1.096E+00	Cl-4-x	7.996E-01
Mn-54	1.597E-03	Cl-F-x	9.360E-02
Nb-94	2.396E-03	Cr	1.488E-01
Ni-59	5.032E-02	HC-insol	1.378E+01
Ni-63	6.766E+00	HC-solub	6.570E+00
Pa-234m	9.453E-03	Hg	4.448E-02
Pm-147	2.742E-02	Pb	7.211E-02
Pu-238	7.855E-03	Se	1.201E-02
Pu-241	6.390E-03		
Sb-125	1.065E-03		
Sm-151	2.130E-03		
Sr-90	2.369E-01		
Te-125m	2.662E-04		
Th-234	9.453E-03		
U-238	9.453E-03		
Y-90	2.369E-01		

Shipping Site: UMC

Waste Type: Solids (CH-Alpha)

Total Volume (m3/yr):

3.944E-02

Total Mass (kg/yr):

5.809E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	1.743E-07	57-12-5	9.876E-03
Cm-244	2.358E-07	75-09-2	1.161E-02
Pa-234m	8.511E-07	Ag	1.742E-03
Pu-238	9.108E-05	As	5.809E-04
Pu-239	9.331E-06	Ba	1.161E-01
Pu-240	3.260E-05	Cd	2.904E-04
Pu-241	8.894E-04	Cl-2-x	1.161E-02
Th-234	8.511E-07	Cl-3-x	3.253E-02
U-238	8.511E-07	Cl-4-x	2.033E-02
		Cl-F-x	5.809E-03
		Cr	1.161E-01
		HC-insol	5.809E-02
		HC-solub	2.904E-03
		Hg	5.809E-03
		Pb	2.904E-01
		Se	1.742E-03

Shipping Site: WVDP

Waste Type: Organic Liquids (CH-Alpha)

Total Volume (m3/yr):

1.773E+00

Total Mass (kg/yr):

1.897E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	1.482E-03	57-12-5	1.600E-01
Ba-137m	1.619E+00	75-09-2	2.840E-01
Co-60	2.167E-03	Ag	7.866E-02
Cs-137	1.731E+00	As	9.986E-03
Eu-154	2.583E-03	Ba	6.783E-02
H-3	1.284E-01	Cd	1.250E-01
Nb-94	1.482E-04	Cl-2-x	4.212E-01
Ni-59	3.317E-03	Cl-3-x	2.491E+01
Ni-63	3.409E-01	Cl-4-x	3.373E+00
Pa-234m	9.529E-04	Cl-F-x	2.744E-01
Pu-238	8.047E-02	Cr	2.914E-01
Pu-239	1.334E-03	HC-insol	1.686E+01
Pu-240	5.929E-04	HC-solub	3.228E+02
Pu-241	3.465E-02	Hg	4.473E-01
Sm-151	2.477E-02	Pb	9.175E-02
Sr-90	1.541E+00	Se	6.881E-02
Tc-99	7.694E-04		
Th-234	9.529E-04		
U-238	9.529E-04		
Y-90	1.541E+00		

Shipping Site: WVDP

Waste Type: Solids (CH-Alpha)

Total Volume (m3/yr): 8.473E-01 Total Mass (kg/yr): 1.355E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	7.096E-04	57-12-5	1.069E-03
Ba-137m	7.751E-01	75-09-2	2.958E-01
Co-60	1.037E-03	Ag	1.709E-02
Cs-137	8.243E-01	As	1.081E-02
Eu-154	1.236E-03	Ba	3.475E-01
H-3	6.150E-02	Cd	1.558E-01
Nb-94	7.096E-05	Cl-2-x	2.803E-01
Ni-59	1.588E-03	Cl-3-x	1.573E+01
Ni-63	1.632E-01	Cl-4-x	2.998E+00
Pa-234m	4.561E-04	Cl-F-x	1.176E-01
Pu-238	3.852E-02	Cr	5.922E-01
Pu-239	6.386E-04	HC-insol	5.230E+01
Pu-240	2.838E-04	HC-solub	2.619E+01
Pu-241	1.659E-02	Hg	1.760E-01
Sm-151	1.186E-02	Pb	2.784E-01
Sr-90	7.339E-01	Se	4.680E-02
Tc-99	3.662E-04		
Th-234	4.561E-04		
U-238	4.561E-04		
Y-90	7.339E-01		

A.3 WM LLMW REGIONALIZED 2 ALTERNATIVE (CASE 7)

Waste Stream: MLLW
6 Disposal Sites

Alternative: 7 Regional 7 Treatment Sites -

Destination Site: HANF

Shipping Site: LBL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 3.230E-01 Total Mass (kg/yr): 3.100E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	4.273E-03	75-09-2	2.976E-01
Cs-137	4.476E-03	As	2.387E-03
H-3	2.032E+01	Ba	1.023E-02
Pa-234m	1.037E-03	Cd	3.410E-01
Pu-241	1.017E-03	Cl-2-x	1.550E-01
Sr-90	4.273E-03	Cl-3-x	2.325E+00
Th-234	1.037E-03	Cl-4-x	4.961E-01
U-238	1.037E-03	Cr	2.852E-01
Y-90	4.273E-03	HC-insol	1.364E+02
		HC-solub	4.341E+01
		Hg	1.860E-03
		Pb	6.511E-02

Shipping Site: LBL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.112E+00 Total Mass (kg/yr): 4.402E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	4.117E-02	57-12-5	5.503E-01
Cs-137	4.314E-02	75-09-2	1.116E+01
H-3	1.958E+02	Ag	1.516E-01
Pa-234m	1.000E-02	As	3.237E-02
Pu-241	9.804E-03	Ba	6.474E+00
Sr-90	4.117E-02	Cd	1.754E-02
Th-234	1.000E-02	Cl-2-x	5.905E+00
U-238	1.000E-02	Cl-3-x	5.439E+01
Y-90	4.117E-02	Cl-4-x	4.320E+01
		Cl-F-x	3.237E-01
		Cr	6.485E+00
		HC-insol	1.314E+02
		HC-solub	6.326E+01
		Hg	3.242E-01
		Pb	1.619E+01
		Se	9.711E-02

Shipping Site: LERHR

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 5.020E-03

Total Mass (kg/yr): 5.750E+00

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	2.470E-07	57-12-5	2.373E-04
Ba-137m	3.636E-04	75-09-2	4.324E-03
Co-60	1.353E-04	Ag	1.189E-04
Cs-137	3.888E-04	As	2.403E-05
Eu-154	1.440E-06	Ba	1.415E-04
Eu-155	4.940E-07	Cd	3.358E-03
H-3	2.801E-05	Cl-2-x	2.702E-03
Nb-94	1.029E-06	Cl-3-x	2.592E-01
Ni-59	2.183E-05	Cl-4-x	5.439E-02
Ni-63	2.297E-03	Cl-F-x	5.108E-04
Pa-234m	4.976E-05	Cr	3.156E-03
Pu-238	1.529E-05	HC-insol	5.198E-01
Pu-239	2.470E-07	HC-solub	6.473E-01
Pu-240	3.705E-07	Hg	6.928E-04
Pu-241	1.620E-05	Pb	7.432E-04
Sm-151	4.688E-06	Se	1.039E-04
Sr-90	3.438E-04		
Tc-99	4.112E-06		
Th-232	4.116E-07		
Th-234	4.976E-05		
U-238	4.976E-05		
Y-90	3.438E-04		

Shipping Site: LERHR

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.442E-01

Total Mass (kg/yr): 2.492E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	1.701E-05	57-12-5	4.707E-04
Ba-137m	2.505E-02	75-09-2	1.438E-01
Co-60	9.323E-03	Ag	2.547E-03
Cs-137	2.641E-02	As	1.464E-05
Eu-154	9.928E-05	Ba	3.843E-02
Eu-155	3.403E-05	Cd	8.851E-03
H-3	1.930E-03	Cl-2-x	1.556E-01
Nb-94	7.091E-05	Cl-3-x	6.005E-01
Ni-59	1.504E-03	Cl-4-x	2.831E+00
Ni-63	1.583E-01	Cl-F-x	1.391E-01
Pa-234m	3.428E-03	Cr	4.652E-03
Pu-238	1.054E-03	HC-insol	1.675E+00
Pu-239	1.701E-05	HC-solub	3.579E-01
Pu-240	2.552E-05	Hg	5.762E-03
Pu-241	1.116E-03	Pb	1.542E-02
Sm-151	3.230E-04	Se	4.361E-04
Sr-90	2.335E-02		
Tc-99	2.793E-04		
Th-232	2.836E-05		
Th-234	3.428E-03		
U-238	3.428E-03		
Y-90	2.335E-02		

Shipping Site: LLNL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 7.727E+01

Total Mass (kg/yr): 8.159E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.022E+00	57-12-5	7.162E+00
Cs-137	1.071E+00	75-09-2	5.434E+00
H-3	4.863E+03	Ag	3.590E+00
Pa-234m	2.482E-01	As	4.598E-01
Pu-241	2.434E-01	Ba	3.135E+00
Sr-90	1.022E+00	Cd	1.949E-01
Th-234	2.482E-01	Cl-2-x	1.546E+01
U-238	2.482E-01	Cl-3-x	6.087E+02
Y-90	1.022E+00	Cl-4-x	3.439E+01
		Cl-F-x	1.254E+01
		Cr	8.355E+00
		HC-insol	5.003E+02
		HC-solub	1.434E+04
		Hg	2.033E+01
		Pb	3.118E+00
		Se	3.138E+00

Shipping Site: LLNL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 4.978E+01

Total Mass (kg/yr): 6.833E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	6.586E-01	57-12-5	8.172E+00
Cs-137	6.899E-01	75-09-2	8.995E+00
H-3	3.132E+03	Ag	3.852E+00
Pa-234m	1.599E-01	As	1.401E+00
Pu-241	1.568E-01	Ba	1.097E+02
Sr-90	6.586E-01	Cd	2.705E+00
Th-234	1.599E-01	Cl-2-x	7.372E+00
U-238	1.599E-01	Cl-3-x	1.900E+02
Y-90	6.586E-01	Cl-4-x	3.100E+01
		Cl-F-x	5.418E+00
		Cr	1.262E+02
		HC-insol	7.525E+02
		HC-solub	3.756E+02
		Hg	4.188E+01
		Pb	1.529E+02
		Se	1.787E+01

Shipping Site: MINS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.647E+00

Total Mass (kg/yr): 3.545E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.441E+00	75-09-2	5.544E-01
Co-60	3.943E+01	Ag	1.457E-02
Cs-134	2.318E-02	As	7.197E-03
Cs-137	2.578E+00	Ba	2.427E+00
Eu-154	3.137E-02	Cd	1.150E-01
Eu-155	1.500E-02	Cl-2-x	5.975E-01
Fe-55	5.156E+00	Cl-3-x	1.190E+01
H-3	1.123E+01	Cl-4-x	2.652E+00
Mn-54	1.636E-02	Cl-F-x	6.891E-01
Nb-94	2.455E-02	Cr	7.414E-01
Ni-59	5.156E-01	HC-insol	4.047E+01
Ni-63	6.932E+01	HC-solub	1.726E+01
Pa-234m	9.684E-02	Hg	5.165E-01
Pm-147	2.809E-01	Pb	4.557E-01
Pu-238	8.047E-02	Se	3.325E-02
Pu-241	6.547E-02		
Sb-125	1.091E-02		
Sm-151	2.182E-02		
Sr-90	2.427E+00		
Te-125m	2.728E-03		
Th-234	9.684E-02		
U-238	9.684E-02		
Y-90	2.427E+00		

Shipping Site: PHNS

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr):

1.736E-03

Total Mass (kg/yr):

1.979E+00

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.162E-03	75-09-2	2.572E-04
Co-60	1.877E-02	Ag	8.707E-05
Cs-134	1.103E-05	As	2.176E-05
Cs-137	1.227E-03	Ba	1.484E-04
Eu-154	1.493E-05	Cl-2-x	7.322E-04
Eu-155	7.141E-06	Cl-3-x	2.731E-02
Fe-55	2.454E-03	Cl-4-x	1.543E-03
H-3	5.346E-03	Cl-F-x	5.937E-04
Mn-54	7.791E-06	HC-insol	2.968E-03
Nb-94	1.168E-05	HC-solub	7.718E-04
Ni-59	2.454E-04	Hg	4.353E-04
Ni-63	3.299E-02	Pb	5.343E-05
Pa-234m	4.609E-05	Se	7.322E-05
Pm-147	1.337E-04		
Pu-238	3.830E-05		
Pu-241	3.116E-05		
Sb-125	5.194E-06		
Sm-151	1.038E-05		
Sr-90	1.155E-03		
Te-125m	1.298E-06		
Th-234	4.609E-05		
U-238	4.609E-05		
Y-90	1.155E-03		

Shipping Site: PHNS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr):

2.962E-01

Total Mass (kg/yr):

4.406E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.983E-01	57-12-5	4.073E-03
Co-60	3.204E+00	75-09-2	5.831E-02
Cs-134	1.883E-03	Ag	2.691E-03
Cs-137	2.094E-01	As	1.603E-03
Eu-154	2.548E-03	Ba	1.038E-01
Eu-155	1.218E-03	Cd	2.472E-02
Fe-55	4.188E-01	Cl-2-x	6.160E-02
H-3	9.124E-01	Cl-3-x	2.088E+00
Mn-54	1.329E-03	Cl-4-x	4.422E-01
Nb-94	1.994E-03	Cl-F-x	6.398E-02
Ni-59	4.188E-02	Cr	7.805E-01
Ni-63	5.631E+00	HC-insol	6.908E+00
Pa-234m	7.867E-03	HC-solub	3.289E+00
Pm-147	2.282E-02	Hg	2.617E-02
Pu-238	6.538E-03	Pb	1.563E-01
Pu-241	5.319E-03	Se	6.731E-03
Sb-125	8.865E-04		
Sm-151	1.773E-03		
Sr-90	1.972E-01		
Te-125m	2.216E-04		
Th-234	7.867E-03		
U-238	7.867E-03		
Y-90	1.972E-01		

Shipping Site: PSNS

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 3.990E-02

Total Mass (kg/yr): 5.986E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.671E-02	75-09-2	9.577E-02
Co-60	4.315E-01	Cd	6.584E-02
Cs-134	2.537E-04	Cl-2-x	5.088E-02
Cs-137	2.820E-02	Cl-3-x	7.243E+00
Eu-154	3.432E-04	Cl-4-x	1.616E+00
Eu-155	1.641E-04	Cl-F-x	2.993E-03
Fe-55	5.641E-02	Cr	5.746E-02
H-3	1.228E-01	HC-insol	1.975E-02
Mn-54	1.791E-04	HC-solub	3.831E-01
Nb-94	2.686E-04	Hg	3.771E-04
Ni-59	5.641E-03	Pb	1.257E-02
Ni-63	7.585E-01		
Pa-234m	1.059E-03		
Pm-147	3.074E-03		
Pu-238	8.806E-04		
Pu-241	7.164E-04		
Sb-125	1.194E-04		
Sm-151	2.388E-04		
Sr-90	2.656E-02		
Te-125m	2.985E-05		
Th-234	1.059E-03		
U-238	1.059E-03		
Y-90	2.656E-02		

Shipping Site: PSNS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 6.586E+00

Total Mass (kg/yr): 9.518E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	4.409E+00	57-12-5	7.312E-01
Co-60	7.122E+01	75-09-2	1.279E+00
Cs-134	4.187E-02	Ag	1.357E-01
Cs-137	4.655E+00	As	4.301E-02
Eu-154	5.665E-02	Ba	8.869E+00
Eu-155	2.709E-02	Cd	1.229E-01
Fe-55	9.311E+00	Cl-2-x	1.346E+00
H-3	2.028E+01	Cl-3-x	4.520E+00
Mn-54	2.956E-02	Cl-4-x	2.989E+00
Nb-94	4.434E-02	Cl-F-x	1.385E+00
Ni-59	9.311E-01	Cr	2.225E+01
Ni-63	1.251E+02	HC-insol	6.852E+00
Pa-234m	1.749E-01	HC-solub	2.684E-01
Pm-147	5.074E-01	Hg	4.633E-01
Pu-238	1.453E-01	Pb	2.158E+01
Pu-241	1.182E-01	Se	1.310E-01
Sb-125	1.970E-02		
Sm-151	3.941E-02		
Sr-90	4.384E+00		
Te-125m	4.926E-03		
Th-234	1.749E-01		
U-238	1.749E-01		
Y-90	4.384E+00		

Shipping Site: SNLL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 7.662E+00

Total Mass (kg/yr): 7.356E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.013E-01	75-09-2	7.061E+00
Cs-137	1.062E-01	As	5.664E-02
H-3	4.822E+02	Ba	2.427E-01
Pa-234m	2.462E-02	Cd	8.091E+00
Pu-241	2.413E-02	Cl-2-x	3.678E+00
Sr-90	1.013E-01	Cl-3-x	5.517E+01
Th-234	2.462E-02	Cl-4-x	1.176E+01
U-238	2.462E-02	Cr	6.767E+00
Y-90	1.013E-01	HC-insol	3.236E+03
		HC-solub	1.029E+03
		Hg	4.413E-02
		Pb	1.544E+00

A-33

Shipping Site: SNLL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 7.770E-01

Total Mass (kg/yr): 1.193E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.027E-02	57-12-5	6.924E-03
Cs-137	1.076E-02	75-09-2	7.497E+00
H-3	4.890E+01	Ag	1.014E-02
Pa-234m	2.496E-03	As	6.737E-03
Pu-241	2.447E-03	Ba	3.347E-01
Sr-90	1.027E-02	Cd	8.243E-02
Th-234	2.496E-03	Cl-2-x	3.816E+00
U-238	2.496E-03	Cl-3-x	4.480E+01
Y-90	1.027E-02	Cl-4-x	3.090E+01
		Cl-F-x	6.827E-02
		Cr	6.765E-01
		HC-insol	1.187E+02
		HC-solub	5.754E+01
		Hg	1.257E-01
		Pb	2.595E-01
		Se	3.934E-02

Destination Site: INEL

Shipping Site: ETEC

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 6.767E-03

Total Mass (kg/yr): 7.145E+00

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	3.329E-07	57-12-5	6.272E-04
Ba-137m	4.901E-04	75-09-2	4.759E-04
Co-60	1.823E-04	Ag	3.144E-04
Cs-137	5.241E-04	As	4.027E-05
Eu-154	1.942E-06	Ba	2.745E-04
Eu-155	6.659E-07	Cd	1.707E-05
H-3	3.775E-05	Cl-2-x	1.354E-03
Nb-94	1.387E-06	Cl-3-x	5.331E-02
Ni-59	2.943E-05	Cl-4-x	3.012E-03
Ni-63	3.097E-03	Cl-F-x	1.098E-03
Pa-234m	6.707E-05	Cr	7.317E-04
Pu-238	2.062E-05	HC-insol	4.382E-02
Pu-239	3.329E-07	HC-solub	1.255E+00
Pu-240	4.994E-07	Hg	1.781E-03
Pu-241	2.184E-05	Pb	2.730E-04
Sm-151	6.320E-06	Se	2.748E-04
Sr-90	4.634E-04		
Tc-99	5.543E-06		
Th-232	5.549E-07		
Th-234	6.707E-05		
U-238	6.707E-05		
Y-90	4.634E-04		

Shipping Site: ETEC

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 7.380E+01

Total Mass (kg/yr): 1.326E+05

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	3.631E-03	57-12-5	4.222E-02
Ba-137m	5.346E+00	75-09-2	1.466E-01
Co-60	1.989E+00	Ag	1.331E+00
Cs-137	5.716E+00	As	6.654E-01
Eu-154	2.118E-02	Ba	2.587E+00
Eu-155	7.262E-03	Cd	4.415E-01
H-3	4.118E-01	Cl-2-x	1.504E-01
Nb-94	1.513E-02	Cl-3-x	5.990E+00
Ni-59	3.210E-01	Cl-4-x	1.869E+00
Ni-63	3.377E+01	Cl-F-x	9.652E-02
Pa-234m	7.316E-01	Cr	3.303E+00
Pu-238	2.249E-01	HC-insol	1.648E+01
Pu-239	3.631E-03	HC-solub	8.724E+00
Pu-240	5.447E-03	Hg	7.346E-01
Pu-241	2.382E-01	Pb	6.598E+00
Sm-151	6.893E-02	Se	2.188E-01
Sr-90	5.054E+00		
Tc-99	6.046E-02		
Th-232	6.052E-03		
Th-234	7.316E-01		
U-238	7.316E-01		
Y-90	5.054E+00		

Shipping Site: GATOMIC

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 7.077E-02

Total Mass (kg/yr): 7.476E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	1.514E-07	57-12-5	6.543E-03
Bi-212	2.547E-08	75-09-2	5.261E-03
Pa-234	1.925E-08	Ag	3.280E-03
Pa-234m	1.870E-04	As	4.207E-04
Pb-212	2.547E-08	Ba	2.867E-03
Po-212	1.642E-08	Cd	4.175E-04
Po-216	2.547E-08	Cl-2-x	1.428E-02
Ra-224	2.547E-08	Cl-3-x	5.732E-01
Ra-228	1.514E-07	Cl-4-x	3.523E-02
Tc-99	2.816E-06	Cl-F-x	1.146E-02
Th-228	2.547E-08	Cr	7.839E-03
Th-231	1.460E-07	HC-insol	4.931E-01
Th-232	1.537E-06	HC-solub	1.311E+01
Th-234	1.870E-04	Hg	1.858E-02
Tl-208	9.625E-09	Pb	2.894E-03
U-235	1.455E-07	Se	2.867E-03
U-238	1.870E-04		

Shipping Site: GATOMIC

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 5.632E-01

Total Mass (kg/yr): 8.419E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	1.218E-06	57-12-5	9.298E-02
Bi-212	2.049E-07	75-09-2	1.998E-01
Pa-234	1.548E-07	Ag	2.502E-02
Pa-234m	1.504E-03	As	9.721E-03
Pb-212	2.049E-07	Ba	1.175E+00
Po-212	1.320E-07	Cd	4.463E-02
Po-216	2.049E-07	Cl-2-x	1.741E-01
Ra-224	1.996E-07	Cl-3-x	3.347E+00
Ra-228	1.186E-06	Cl-4-x	8.150E-01
Tc-99	2.207E-05	Cl-F-x	1.017E-01
Th-228	2.049E-07	Cr	1.315E+00
Th-231	1.175E-06	HC-insol	1.041E+01
Th-232	1.237E-05	HC-solub	6.899E+00
Th-234	1.504E-03	Hg	1.942E-01
Tl-208	7.742E-08	Pb	2.810E+00
U-235	1.170E-06	Se	7.067E-02
U-238	1.504E-03		

Shipping Site: LLNL

Waste Type: Organic Liquids (CH-Alpha)

Total Volume (m3/yr): 5.737E+01

Total Mass (kg/yr): 6.269E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	7.591E-01	57-12-5	4.251E+00
Cs-137	7.952E-01	75-09-2	2.262E+01
H-3	3.607E+03	Ag	2.130E+00
Pa-234m	1.843E-01	As	3.141E-01
Pu-238	1.807E-01	Ba	2.037E+00
Pu-241	3.614E+00	Cd	1.580E+01
Sr-90	7.591E-01	Cl-2-x	1.943E+01
Th-234	1.843E-01	Cl-3-x	1.480E+03
U-238	1.843E-01	Cl-4-x	2.696E+02
Y-90	7.591E-01	Cl-F-x	7.889E+00
		Cr	1.843E+01
		HC-insol	2.652E+03
		HC-solub	9.317E+03
		Hg	1.216E+01
		Pb	4.845E+00
		Se	1.862E+00

Shipping Site: LLNL

Waste Type: Solids (CH-Alpha)

Total Volume (m3/yr):

5.230E+01

Total Mass (kg/yr):

1.017E+05

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	6.919E-01	57-12-5	4.138E+00
Cs-137	7.249E-01	75-09-2	1.192E+01
H-3	3.288E+03	Ag	9.746E-01
Pa-234m	1.680E-01	As	3.439E-01
Pu-238	1.647E-01	Ba	5.008E+01
Pu-241	3.295E+00	Cd	3.649E+00
Sr-90	6.919E-01	Cl-2-x	7.183E+00
Th-234	1.680E-01	Cl-3-x	4.229E+01
U-238	1.680E-01	Cl-4-x	2.492E+01
Y-90	6.919E-01	Cl-F-x	1.009E+01
		Cr	2.709E+02
		HC-insol	7.977E+01
		HC-solub	2.905E+01
		Hg	8.247E+00
		Pb	1.721E+02
		Se	2.561E+00

Shipping Site: NTS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr):

6.621E-03

Total Mass (kg/yr):

8.886E+00

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	8.760E-05	75-09-2	5.331E-03
Cs-137	9.177E-05	Ag	9.774E-05
H-3	4.167E-01	Cd	5.331E-04
Pa-234m	2.127E-05	Cl-2-x	5.331E-03
Pu-241	2.085E-05	Cl-3-x	2.221E-02
Sr-90	8.760E-05	Cl-4-x	1.688E-01
Th-234	2.127E-05	Cl-F-x	2.665E-03
U-238	2.127E-05	Cr	1.777E-04
Y-90	8.760E-05	HC-insol	4.443E-02
		HC-solub	2.221E-02
		Hg	3.465E-04
		Pb	3.199E-04
		Se	8.886E-06

Destination Site: LANL

Shipping Site: ITRI

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 1.028E-01

Total Mass (kg/yr): 1.007E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.367E-03	57-12-5	1.813E-02
Co-60	1.879E-03	Ag	4.433E-03
Cs-137	1.424E-03	Cd	4.937E-04
Eu-154	1.566E-05	Cl-3-x	8.061E-02
Fe-55	2.364E-04	Cl-4-x	4.534E-03
H-3	2.725E-01	Cr	2.116E-02
Ni-59	3.133E-05	HC-insol	1.108E+00
Ni-63	4.158E-03	HC-solub	3.627E+01
Pm-147	1.310E-04	Hg	2.821E-02
Pu-238	5.411E-05	Pb	5.038E-03
Pu-241	2.734E-04	Se	4.030E-03
Sm-151	1.253E-05		
Sr-90	1.338E-03		
Y-90	1.338E-03		

Shipping Site: PANT

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 1.461E+00

Total Mass (kg/yr): 2.110E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.942E-02	75-09-2	3.284E+00
Co-60	2.671E-02	As	1.112E-03
Cs-137	2.023E-02	Ba	4.766E-03
Eu-154	2.225E-04	Cd	2.321E+00
Fe-55	3.359E-03	Cl-2-x	1.743E+00
H-3	3.872E+00	Cl-3-x	2.389E+02
Ni-59	4.451E-04	Cl-4-x	5.331E+01
Ni-63	5.908E-02	Cl-F-x	9.829E-02
Pm-147	1.861E-03	Cr	2.020E+00
Pu-238	7.689E-04	HC-insol	6.419E+01
Pu-241	3.885E-03	HC-solub	3.280E+01
Sm-151	1.780E-04	Hg	1.325E-02
Sr-90	1.902E-02	Pb	4.431E-01
Y-90	1.902E-02		

Shipping Site: PANT

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.957E+01

Total Mass (kg/yr): 2.511E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	5.276E-01	57-12-5	2.480E-01
Co-60	7.254E-01	75-09-2	3.448E+01
Cs-137	5.454E-01	Ag	1.998E-01
Eu-154	6.045E-03	As	3.903E-02
Fe-55	9.123E-02	Ba	1.047E+01
H-3	1.051E+02	Cd	1.602E+00
Ni-59	1.209E-02	Cl-2-x	2.240E+01
Ni-63	1.604E+00	Cl-3-x	1.712E+02
Pm-147	5.056E-02	Cl-4-x	1.094E+02
Pu-238	2.088E-02	Cl-F-x	1.631E+01
Pu-241	1.055E-01	Cr	1.027E+01
Sm-151	4.836E-03	HC-insol	4.777E+02
Sr-90	5.126E-01	HC-solub	1.648E+02
Y-90	5.126E-01	Hg	1.896E+00
		Pb	5.162E+01
		Se	2.443E-01

Shipping Site: SNLA

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr):

5.487E-04

Total Mass (kg/yr):

5.793E-01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	6.627E-05	57-12-5	5.085E-05
Co-60	9.630E-05	75-09-2	3.859E-05
Cs-137	7.006E-05	Ag	2.549E-05
Eu-154	3.516E-07	As	3.265E-06
Eu-155	8.115E-08	Ba	2.226E-05
Fe-55	1.920E-06	Cd	1.384E-06
H-3	1.223E-03	Cl-2-x	1.098E-04
Nb-94	4.598E-07	Cl-3-x	4.322E-03
Ni-59	9.089E-06	Cl-4-x	2.442E-04
Ni-63	1.099E-03	Cl-F-x	8.905E-05
Pa-234m	3.246E-07	Cr	5.933E-05
Pu-238	2.380E-06	HC-insol	3.553E-03
Pu-240	1.893E-06	HC-solub	1.018E-01
Pu-241	1.893E-06	Hg	1.444E-04
Sm-151	7.574E-07	Pb	2.214E-05
Sr-90	6.519E-05	Se	2.228E-05
Tc-99	2.705E-08		
Th-234	3.246E-07		
U-238	3.246E-07		
Y-90	6.519E-05		

Shipping Site: SNLA

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr):

2.849E+00

Total Mass (kg/yr):

2.300E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	3.441E-01	57-12-5	2.628E-01
Co-60	5.000E-01	75-09-2	7.747E-01
Cs-137	3.637E-01	Ag	5.397E-02
Eu-154	1.825E-03	As	1.546E-02
Eu-155	4.213E-04	Ba	3.392E+00
Fe-55	9.972E-03	Cd	9.542E-03
H-3	6.351E+00	Cl-2-x	8.422E-01
Nb-94	2.387E-03	Cl-3-x	2.813E+00
Ni-59	4.719E-02	Cl-4-x	1.497E+00
Ni-63	5.706E+00	Cl-F-x	9.064E-01
Pa-234m	1.685E-03	Cr	3.104E+00
Pu-238	1.236E-02	HC-insol	7.682E+00
Pu-240	9.832E-03	HC-solub	1.619E-01
Pu-241	9.832E-03	Hg	1.563E-01
Sm-151	3.932E-03	Pb	7.814E+00
Sr-90	3.385E-01	Se	4.865E-02
Tc-99	1.404E-04		
Th-234	1.685E-03		
U-238	1.685E-03		
Y-90	3.385E-01		

Destination Site: ORNL

Shipping Site: PADUCAH

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 2.970E+01

Total Mass (kg/yr): 3.589E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	1.796E-02	57-12-5	4.590E-01
Bi-212	2.967E-03	75-09-2	4.205E+01
Pa-234	2.486E-03	Ag	2.300E-01
Pa-234m	2.420E+01	As	1.180E-01
Pb-212	2.967E-03	Ba	5.803E-01
Po-212	1.965E-03	Cd	3.374E+01
Po-216	2.967E-03	Cl-2-x	2.303E+01
Ra-224	2.967E-03	Cl-3-x	2.444E+03
Ra-228	1.796E-02	Cl-4-x	5.381E+02
Tc-99	7.291E+00	Cl-F-x	1.762E+00
Th-228	2.967E-03	Cr	2.951E+01
Th-231	1.892E-02	HC-insol	5.097E+03
Th-232	1.990E-01	HC-solub	2.651E+03
Th-234	2.420E+01	Hg	1.493E+00
Tl-208	1.163E-03	Pb	6.639E+00
U-235	1.876E-02	Se	2.011E-01
U-238	2.420E+01		

Shipping Site: PADUCAH

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 4.740E+00

Total Mass (kg/yr): 6.808E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	2.890E-03	57-12-5	1.016E+00
Bi-212	4.773E-04	75-09-2	1.710E+00
Pa-234	3.999E-04	Ag	2.502E-01
Pa-234m	3.894E+00	As	8.712E-02
Pb-212	4.773E-04	Ba	1.228E+01
Po-212	3.161E-04	Cd	1.504E-01
Po-216	4.773E-04	Cl-2-x	1.444E+00
Ra-224	4.664E-04	Cl-3-x	1.250E+01
Ra-228	2.824E-03	Cl-4-x	4.496E+00
Tc-99	1.146E+00	Cl-F-x	6.729E-01
Th-228	4.773E-04	Cr	1.293E+01
Th-231	3.044E-03	HC-insol	3.436E+01
Th-232	3.202E-02	HC-solub	1.740E+01
Th-234	3.894E+00	Hg	1.732E+00
Tl-208	1.870E-04	Pb	2.789E+01
U-235	3.019E-03	Se	6.716E-01
U-238	3.894E+00		

Destination Site: PORTS

Shipping Site: AMES

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 8.585E-03

Total Mass (kg/yr): 1.162E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	1.851E-08	57-12-5	1.759E-05
Bi-212	3.115E-09	75-09-2	1.485E-04
Pa-234	2.353E-09	Ag	5.841E-05
Pa-234m	2.286E-05	As	7.025E-07
Pb-212	3.115E-09	Ba	4.061E-05
Po-212	2.007E-09	Cd	5.957E-05
Po-216	3.115E-09	Cl-2-x	1.879E-04
Ra-224	3.051E-09	Cl-3-x	4.658E-04
Ra-228	1.813E-08	Cl-4-x	8.901E-04
Tc-99	3.373E-07	Cl-F-x	7.426E-05
Th-228	3.115E-09	Cr	1.342E-04
Th-231	1.785E-08	HC-insol	1.917E-05
Th-232	1.879E-07	HC-solub	1.017E-02
Th-234	2.286E-05	Hg	5.635E-05
Tl-208	1.177E-09	Pb	8.863E-05
U-235	1.778E-08	Se	1.196E-06
U-238	2.286E-05		

Shipping Site: ANL-E

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 4.838E+02

Total Mass (kg/yr): 8.170E+05

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	2.380E-02	57-12-5	2.002E+01
Ba-137m	3.504E+01	75-09-2	2.778E+01
Co-60	1.304E+01	Ag	1.623E+01
Cs-137	3.747E+01	As	6.714E+00
Eu-154	1.388E-01	Ba	2.781E+02
Eu-155	4.761E-02	Cd	9.989E+00
H-3	2.699E+00	Cl-2-x	1.822E+01
Nb-94	9.919E-02	Cl-3-x	3.658E+02
Ni-59	2.104E+00	Cl-4-x	4.608E+01
Ni-63	2.214E+02	Cl-F-x	1.759E+01
Pa-234m	4.796E+00	Cr	3.334E+02
Pu-238	1.474E+00	HC-insol	1.482E+03
Pu-239	2.380E-02	HC-solub	7.360E+02
Pu-240	3.571E-02	Hg	1.110E+02
Pu-241	1.561E+00	Pb	4.704E+02
Sm-151	4.519E-01	Se	4.660E+01
Sr-90	3.313E+01		
Tc-99	3.963E-01		
Th-232	3.967E-02		
Th-234	4.796E+00		
U-238	4.796E+00		
Y-90	3.313E+01		

Shipping Site: BAPL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 6.410E-02

Total Mass (kg/yr): 6.163E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	5.332E-05	75-09-2	5.934E-02
Ba-137m	5.866E-02	As	4.724E-04
Co-60	7.908E-05	Ba	2.024E-03
Cs-137	6.272E-02	Cd	6.779E-02
Eu-154	9.439E-05	Cl-2-x	3.091E-02
H-3	4.694E-03	Cl-3-x	4.931E-01
Nb-94	5.357E-06	Cl-4-x	1.055E-01
Ni-59	1.209E-04	Cl-F-x	1.360E-05
Ni-63	1.242E-02	Cr	5.671E-02
Pa-234m	3.469E-05	HC-insol	2.699E+01
Pu-238	2.806E-03	HC-solub	8.592E+00
Pu-239	3.801E-05	Hg	3.698E-04
Pu-240	2.168E-05	Pb	1.294E-02
Pu-241	6.225E-04		
Sm-151	9.031E-04		
Sr-90	5.586E-02		
Tc-99	2.806E-05		
Th-234	3.469E-05		
U-238	3.469E-05		
Y-90	5.586E-02		

Shipping Site: BAPL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 6.105E-01

Total Mass (kg/yr): 6.010E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	5.078E-04	57-12-5	1.703E-03
Ba-137m	5.587E-01	75-09-2	6.266E-02
Co-60	7.532E-04	Ag	6.515E-03
Cs-137	5.974E-01	As	1.598E-03
Eu-154	8.990E-04	Ba	6.259E-02
H-3	4.471E-02	Cd	1.698E-02
Nb-94	5.102E-05	Cl-2-x	7.067E-02
Ni-59	1.151E-03	Cl-3-x	4.679E-01
Ni-63	1.183E-01	Cl-4-x	4.156E-01
Pa-234m	3.304E-04	Cl-F-x	8.727E-02
Pu-238	2.672E-02	Cr	4.102E-02
Pu-239	3.620E-04	HC-insol	2.697E+00
Pu-240	2.065E-04	HC-solub	2.666E+00
Pu-241	5.929E-03	Hg	1.514E-02
Sm-151	8.601E-03	Pb	7.746E-02
Sr-90	5.321E-01	Se	2.393E-03
Tc-99	2.672E-04		
Th-234	3.304E-04		
U-238	3.304E-04		
Y-90	5.321E-01		

Shipping Site: BATELLE

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 1.500E-03

Total Mass (kg/yr): 1.977E+00

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	3.211E-09	75-09-2	3.955E-02
Bi-212	5.400E-10	Cl-2-x	1.977E-02
Pa-234	4.080E-10	Cl-3-x	1.977E-01
Pa-234m	3.964E-06	Cl-4-x	1.582E-01
Pb-212	5.400E-10	HC-insol	4.943E-01
Po-212	3.480E-10	HC-solub	2.373E-01
Po-216	5.400E-10		
Ra-224	5.400E-10		
Ra-228	3.211E-09		
Tc-99	5.971E-08		
Th-228	5.400E-10		
Th-231	3.097E-09		
Th-232	3.260E-08		
Th-234	3.964E-06		
Tl-208	2.040E-10		
U-235	3.085E-09		
U-238	3.964E-06		

Shipping Site: BNL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 1.544E+00

Total Mass (kg/yr): 1.749E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	7.598E-05	57-12-5	8.298E-02
Ba-137m	1.118E-01	75-09-2	1.156E+00
Co-60	4.162E-02	Ag	4.159E-02
Cs-137	1.196E-01	As	7.649E-03
Eu-154	4.432E-04	Ba	4.627E-02
Eu-155	1.519E-04	Cd	8.868E-01
H-3	8.617E-03	Cl-2-x	7.572E-01
Nb-94	3.166E-04	Cl-3-x	7.014E+01
Ni-59	6.718E-03	Cl-4-x	1.445E+01
Ni-63	7.068E-01	Cl-F-x	1.704E-01
Pa-234m	1.530E-02	Cr	8.567E-01
Pu-238	4.706E-03	HC-insol	1.386E+02
Pu-239	7.598E-05	HC-solub	2.115E+02
Pu-240	1.139E-04	Hg	2.406E-01
Pu-241	4.984E-03	Pb	2.050E-01
Sm-151	1.442E-03	Se	3.636E-02
Sr-90	1.057E-01		
Tc-99	1.265E-03		
Th-232	1.266E-04		
Th-234	1.530E-02		
U-238	1.530E-02		
Y-90	1.057E-01		

Shipping Site: BNL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 8.915E+00

Total Mass (kg/yr): 1.190E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	4.386E-04	57-12-5	1.617E+00
Ba-137m	6.457E-01	75-09-2	8.722E-01
Co-60	2.402E-01	Ag	7.571E-01
Cs-137	6.904E-01	As	2.698E-01
Eu-154	2.558E-03	Ba	2.157E+01
Eu-155	8.772E-04	Cd	4.530E-01
H-3	4.974E-02	Cl-2-x	8.722E-01
Nb-94	1.827E-03	Cl-3-x	2.419E+01
Ni-59	3.878E-02	Cl-4-x	3.963E-01
Ni-63	4.080E+00	Cl-F-x	1.019E+00
Pa-234m	8.837E-02	Cr	2.698E+01
Pu-238	2.716E-02	HC-insol	1.091E+02
Pu-239	4.386E-04	HC-solub	5.459E+01
Pu-240	6.579E-04	Hg	8.531E+00
Pu-241	2.877E-02	Pb	2.912E+01
Sm-151	8.327E-03	Se	3.668E+00
Sr-90	6.105E-01		
Tc-99	7.303E-03		
Th-232	7.310E-04		
Th-234	8.837E-02		
U-238	8.837E-02		
Y-90	6.105E-01		

Shipping Site: COLONIE

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 9.054E-01

Total Mass (kg/yr): 1.026E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	1.937E-06	57-12-5	5.151E-02
Bi-212	3.259E-07	75-09-2	7.241E-01
Pa-234	2.462E-07	Ag	2.274E-02
Pa-234m	2.392E-03	As	3.999E-03
Pb-212	3.259E-07	Ba	2.356E-02
Po-212	2.100E-07	Cd	5.620E-01
Po-216	3.259E-07	Cl-2-x	4.522E-01
Ra-224	3.259E-07	Cl-3-x	4.355E+01
Ra-228	1.937E-06	Cl-4-x	9.136E+00
Tc-99	3.603E-05	Cl-F-x	8.522E-02
Th-228	3.259E-07	Cr	5.418E-01
Th-231	1.868E-06	HC-insol	8.707E+01
Th-232	1.967E-05	HC-solub	1.317E+02
Th-234	2.392E-03	Hg	1.340E-01
Tl-208	1.231E-07	Pb	1.275E-01
U-235	1.861E-06	Se	1.998E-02
U-238	2.392E-03		

Shipping Site: COLONIE

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 1.235E-02

Total Mass (kg/yr): 1.606E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	3.198E-08	57-12-5	7.229E-04
Bi-212	5.380E-09	75-09-2	8.484E-04
Pa-234	4.065E-09	Ag	2.570E-05
Pa-234m	3.949E-05	As	2.249E-05
Pb-212	5.380E-09	Ba	1.606E-05
Po-212	3.467E-09	Cd	1.429E-04
Po-216	5.380E-09	Cl-2-x	4.242E-03
Ra-224	2.690E-09	Cl-3-x	5.345E-03
Ra-228	1.599E-08	Cl-4-x	5.006E-03
Tc-99	2.974E-07	Cl-F-x	4.242E-04
Th-228	5.380E-09	Cr	5.462E-04
Th-231	3.084E-08	HC-insol	9.333E-04
Th-232	3.247E-07	HC-solub	8.032E-04
Th-234	3.949E-05	Hg	3.695E-06
Tl-208	2.032E-09	Pb	1.044E-03
U-235	3.072E-08	Se	8.032E-06
U-238	3.949E-05		

Shipping Site: FEMP

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 2.034E+01

Total Mass (kg/yr): 2.423E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	4.353E-05	57-12-5	4.910E-01
Bi-212	7.324E-06	75-09-2	2.872E+01
Pa-234	5.533E-06	Ag	1.270E-01
Pa-234m	5.376E-02	As	6.728E-02
Pb-212	7.324E-06	Ba	2.928E-01
Po-212	4.720E-06	Cd	2.349E+01
Po-216	7.324E-06	Cl-2-x	1.522E+01
Ra-224	7.324E-06	Cl-3-x	1.621E+03
Ra-228	4.353E-05	Cl-4-x	3.603E+02
Tc-99	8.097E-04	Cl-F-x	6.895E-01
Th-228	7.324E-06	Cr	2.072E+01
Th-231	4.199E-05	HC-insol	3.779E+03
Th-232	4.420E-04	HC-solub	2.255E+03
Th-234	5.376E-02	Hg	9.307E-01
Tl-208	2.766E-06	Pb	4.623E+00
U-235	4.182E-05	Se	1.150E-01
U-238	5.376E-02		

Shipping Site: FEMP

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 7.909E+01

Total Mass (kg/yr): 1.180E+05

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	1.696E-04	57-12-5	5.948E+00
Bi-212	2.854E-05	75-09-2	2.117E+01
Pa-234	2.156E-05	Ag	3.226E+00
Pa-234m	2.095E-01	As	1.249E+00
Pb-212	2.854E-05	Ba	1.085E+02
Po-212	1.839E-05	Cd	6.815E+00
Po-216	2.854E-05	Cl-2-x	2.073E+01
Ra-224	2.837E-05	Cl-3-x	5.283E+02
Ra-228	1.686E-04	Cl-4-x	3.692E+02
Tc-99	3.136E-03	Cl-F-x	1.313E+01
Th-228	2.854E-05	Cr	1.531E+02
Th-231	1.636E-04	HC-insol	1.786E+03
Th-232	1.722E-03	HC-solub	9.390E+02
Th-234	2.095E-01	Hg	3.514E+01
Tl-208	1.078E-05	Pb	1.240E+02
U-235	1.630E-04	Se	1.366E+01
U-238	2.095E-01		

Shipping Site: KAPL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 6.167E-01

Total Mass (kg/yr): 7.065E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	4.129E-01	57-12-5	2.915E-02
Co-60	6.669E+00	75-09-2	5.312E-01
Cs-134	3.921E-03	Ag	1.461E-02
Cs-137	4.359E-01	As	2.952E-03
Eu-154	5.305E-03	Ba	1.739E-02
Eu-155	2.537E-03	Cd	4.125E-01
Fe-55	8.719E-01	Cl-2-x	3.320E-01
H-3	1.899E+00	Cl-3-x	3.184E+01
Mn-54	2.768E-03	Cl-4-x	6.682E+00
Nb-94	4.152E-03	Cl-F-x	6.275E-02
Ni-59	8.719E-02	Cr	3.877E-01
Ni-63	1.172E+01	HC-insol	6.386E+01
Pa-234m	1.637E-02	HC-solub	7.952E+01
Pm-147	4.752E-02	Hg	8.511E-02
Pu-238	1.361E-02	Pb	9.130E-02
Pu-241	1.107E-02	Se	1.277E-02
Sb-125	1.845E-03		
Sm-151	3.690E-03		
Sr-90	4.106E-01		
Te-125m	4.613E-04		
Th-234	1.637E-02		
U-238	1.637E-02		
Y-90	4.106E-01		

Shipping Site: KAPL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.572E+00

Total Mass (kg/yr): 5.162E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.391E+00	57-12-5	1.840E-02
Co-60	3.862E+01	75-09-2	2.577E+00
Cs-134	2.271E-02	Ag	6.267E-02
Cs-137	2.525E+00	As	2.265E-02
Eu-154	3.072E-02	Ba	5.050E-01
Eu-155	1.469E-02	Cd	2.428E-02
Fe-55	5.050E+00	Cl-2-x	1.464E+00
H-3	1.100E+01	Cl-3-x	1.328E+01
Mn-54	1.603E-02	Cl-4-x	1.024E+01
Nb-94	2.404E-02	Cl-F-x	4.115E-01
Ni-59	5.050E-01	Cr	4.769E-01
Ni-63	6.790E+01	HC-insol	3.511E+01
Pa-234m	9.486E-02	HC-solub	1.516E+01
Pm-147	2.752E-01	Hg	6.065E-02
Pu-238	7.882E-02	Pb	7.229E-01
Pu-241	6.413E-02	Se	1.698E-02
Sb-125	1.068E-02		
Sm-151	2.137E-02		
Sr-90	2.378E+00		
Te-125m	2.672E-03		
Th-234	9.486E-02		
U-238	9.486E-02		
Y-90	2.378E+00		

Shipping Site: KKS

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 4.733E-01

Total Mass (kg/yr): 5.422E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	3.168E-01	57-12-5	2.237E-02
Co-60	5.118E+00	75-09-2	4.077E-01
Cs-134	3.009E-03	Ag	1.121E-02
Cs-137	3.345E-01	As	2.266E-03
Eu-154	4.071E-03	Ba	1.335E-02
Eu-155	1.947E-03	Cd	3.166E-01
Fe-55	6.691E-01	Cl-2-x	2.548E-01
H-3	1.457E+00	Cl-3-x	2.443E+01
Mn-54	2.124E-03	Cl-4-x	5.128E+00
Nb-94	3.186E-03	Cl-F-x	4.816E-02
Ni-59	6.691E-02	Cr	2.976E-01
Ni-63	8.997E+00	HC-insol	4.901E+01
Pa-234m	1.256E-02	HC-solub	6.103E+01
Pm-147	3.646E-02	Hg	6.532E-02
Pu-238	1.044E-02	Pb	7.007E-02
Pu-241	8.497E-03	Se	9.805E-03
Sb-125	1.416E-03		
Sm-151	2.832E-03		
Sr-90	3.151E-01		
Te-125m	3.540E-04		
Th-234	1.256E-02		
U-238	1.256E-02		
Y-90	3.151E-01		

Shipping Site: KKS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.928E+00

Total Mass (kg/yr): 6.620E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.630E+00	57-12-5	1.282E-01
Co-60	4.248E+01	75-09-2	2.231E+00
Cs-134	2.497E-02	Ag	8.783E-02
Cs-137	2.776E+00	As	3.299E-02
Eu-154	3.379E-02	Ba	1.662E+00
Eu-155	1.616E-02	Cd	5.269E-02
Fe-55	5.553E+00	Cl-2-x	1.281E+00
H-3	1.209E+01	Cl-3-x	1.108E+01
Mn-54	1.763E-02	Cl-4-x	1.215E+01
Nb-94	2.644E-02	Cl-F-x	2.090E-01
Ni-59	5.553E-01	Cr	1.846E+00
Ni-63	7.467E+01	HC-insol	2.753E+01
Pa-234m	1.043E-01	HC-solub	1.411E+01
Pm-147	3.026E-01	Hg	1.438E-01
Pu-238	8.668E-02	Pb	4.165E+00
Pu-241	7.052E-02	Se	3.790E-02
Sb-125	1.175E-02		
Sm-151	2.350E-02		
Sr-90	2.615E+00		
Te-125m	2.938E-03		
Th-234	1.043E-01		
U-238	1.043E-01		
Y-90	2.615E+00		

Shipping Site: KWS

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 6.454E-02

Total Mass (kg/yr): 7.394E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	4.321E-02	57-12-5	3.051E-03
Co-60	6.979E-01	75-09-2	5.559E-02
Cs-134	4.103E-04	Ag	1.529E-03
Cs-137	4.562E-02	As	3.090E-04
Eu-154	5.552E-04	Ba	1.820E-03
Eu-155	2.655E-04	Cd	4.317E-02
Fe-55	9.125E-02	Cl-2-x	3.474E-02
H-3	1.987E-01	Cl-3-x	3.332E+00
Mn-54	2.896E-04	Cl-4-x	6.993E-01
Nb-94	4.345E-04	Cl-F-x	6.567E-03
Ni-59	9.125E-03	Cr	4.058E-02
Ni-63	1.226E+00	HC-insol	6.683E+00
Pa-234m	1.714E-03	HC-solub	8.322E+00
Pm-147	4.973E-03	Hg	8.907E-03
Pu-238	1.424E-03	Pb	9.555E-03
Pu-241	1.158E-03	Se	1.337E-03
Sb-125	1.931E-04		
Sm-151	3.862E-04		
Sr-90	4.297E-02		
Te-125m	4.828E-05		
Th-234	1.714E-03		
U-238	1.714E-03		
Y-90	4.297E-02		

Shipping Site: KWS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 1.262E+00

Total Mass (kg/yr): 1.580E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	8.449E-01	57-12-5	8.005E-02
Co-60	1.364E+01	75-09-2	3.801E-01
Cs-134	8.024E-03	Ag	2.572E-02
Cs-137	8.921E-01	As	8.795E-03
Eu-154	1.085E-02	Ba	1.035E+00
Eu-155	5.192E-03	Cd	1.157E-02
Fe-55	1.784E+00	Cl-2-x	3.221E-01
H-3	3.886E+00	Cl-3-x	1.699E+00
Mn-54	5.664E-03	Cl-4-x	1.988E+00
Nb-94	8.496E-03	Cl-F-x	2.323E-01
Ni-59	1.784E-01	Cr	1.010E+00
Ni-63	2.399E+01	HC-insol	4.421E+00
Pa-234m	3.351E-02	HC-solub	1.600E+00
Pm-147	9.724E-02	Hg	6.065E-02
Pu-238	2.785E-02	Pb	2.396E+00
Pu-241	2.265E-02	Se	1.789E-02
Sb-125	3.776E-03		
Sm-151	7.552E-03		
Sr-90	8.402E-01		
Te-125m	9.440E-04		
Th-234	3.351E-02		
U-238	3.351E-02		
Y-90	8.402E-01		

Shipping Site: PNS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr):

5.200E-02

Total Mass (kg/yr):

9.088E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	3.481E-02	75-09-2	1.324E-02
Co-60	5.623E-01	Ag	6.570E-04
Cs-134	3.306E-04	As	5.453E-04
Cs-137	3.676E-02	Ba	1.708E-02
Eu-154	4.473E-04	Cd	8.438E-03
Eu-155	2.139E-04	Cl-2-x	1.324E-02
Fe-55	7.352E-02	Cl-3-x	7.909E-01
H-3	1.601E-01	Cl-4-x	1.483E-01
Mn-54	2.333E-04	Cl-F-x	7.499E-03
Nb-94	3.500E-04	Cr	1.051E-01
Ni-59	7.352E-03	HC-insol	2.629E+00
Ni-63	9.884E-01	HC-solub	1.314E+00
Pa-234m	1.380E-03	Hg	9.046E-03
Pm-147	4.006E-03	Pb	1.319E-02
Pu-238	1.147E-03	Se	2.365E-03
Pu-241	9.335E-04		
Sb-125	1.555E-04		
Sm-151	3.111E-04		
Sr-90	3.462E-02		
Te-125m	3.889E-05		
Th-234	1.380E-03		
U-238	1.380E-03		
Y-90	3.462E-02		

Shipping Site: PPPL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr):

5.456E-04

Total Mass (kg/yr):

7.191E-01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	7.218E-06	75-09-2	1.438E-02
Cs-137	7.562E-06	Cl-2-x	7.190E-03
H-3	3.433E-02	Cl-3-x	7.190E-02
Pa-234m	1.753E-06	Cl-4-x	5.752E-02
Pu-241	1.718E-06	HC-insol	1.797E-01
Sr-90	7.218E-06	HC-solub	8.629E-02
Th-234	1.753E-06		
U-238	1.753E-06		
Y-90	7.218E-06		

Shipping Site: RMI

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr):

6.677E-01

Total Mass (kg/yr):

9.741E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	1.429E-06	75-09-2	1.527E+00
Bi-212	2.403E-07	As	3.769E-04
Pa-234	1.816E-07	Ba	1.615E-03
Pa-234m	1.764E-03	Cd	1.071E+00
Pb-212	2.403E-07	Cl-2-x	8.108E-01
Po-212	1.549E-07	Cl-3-x	1.123E+02
Po-216	2.403E-07	Cl-4-x	2.505E+01
Ra-224	2.403E-07	Cl-F-x	4.625E-02
Ra-228	1.429E-06	Cr	9.331E-01
Tc-99	2.657E-05	HC-insol	2.184E+01
Th-228	2.403E-07	HC-solub	1.277E+01
Th-231	1.378E-06	Hg	6.122E-03
Th-232	1.450E-05	Pb	2.045E-01
Th-234	1.764E-03		
Tl-208	9.081E-08		
U-235	1.372E-06		
U-238	1.764E-03		

Shipping Site: RMI

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 1.091E+00

Total Mass (kg/yr): 8.323E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	2.370E-06	57-12-5	4.647E-03
Bi-212	3.988E-07	75-09-2	2.315E-01
Pa-234	3.013E-07	Ag	6.651E-03
Pa-234m	2.927E-03	As	1.974E-03
Pb-212	3.988E-07	Ba	5.734E-01
Po-212	2.570E-07	Cd	1.836E-02
Po-216	3.988E-07	Cl-2-x	2.862E-01
Ra-224	3.815E-07	Cl-3-x	2.561E+00
Ra-228	2.267E-06	Cl-4-x	7.371E-01
Tc-99	4.218E-05	Cl-F-x	3.452E-01
Th-228	3.988E-07	Cr	2.638E-01
Th-231	2.286E-06	HC-insol	8.888E+00
Th-232	2.407E-05	HC-solub	2.825E+00
Th-234	2.927E-03	Hg	2.678E-02
Tl-208	1.506E-07	Pb	8.498E-02
U-235	2.277E-06	Se	6.070E-03
U-238	2.927E-03		

Destination Site: RFP

Shipping Site: GJCT

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 1.290E-02 Total Mass (kg/yr): 1.478E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	2.762E-08	57-12-5	6.102E-04
Bi-212	4.647E-09	75-09-2	1.111E-02
Pa-234	3.511E-09	Ag	3.059E-04
Pa-234m	3.411E-05	As	6.180E-05
Pb-212	4.647E-09	Ba	3.641E-04
Po-212	2.995E-09	Cd	8.635E-03
Po-216	4.647E-09	Cl-2-x	6.949E-03
Ra-224	4.647E-09	Cl-3-x	6.665E-01
Ra-228	2.762E-08	Cl-4-x	1.398E-01
Tc-99	5.138E-07	Cl-F-x	1.313E-03
Th-228	4.647E-09	Cr	8.116E-03
Th-231	2.664E-08	HC-insol	1.336E+00
Th-232	2.805E-07	HC-solub	1.664E+00
Th-234	3.411E-05	Hg	1.781E-03
Tl-208	1.756E-09	Pb	1.911E-03
U-235	2.654E-08	Se	2.674E-04
U-238	3.411E-05		

Shipping Site: GJCT

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 2.953E-02 Total Mass (kg/yr): 5.478E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	6.356E-08	57-12-5	1.997E-04
Bi-212	1.069E-08	75-09-2	1.051E-03
Pa-234	8.080E-09	Ag	6.108E-04
Pa-234m	7.849E-05	As	2.981E-04
Pb-212	1.069E-08	Ba	3.480E-03
Po-212	6.891E-09	Cd	4.003E-04
Po-216	1.069E-08	Cl-2-x	1.051E-03
Ra-224	1.054E-08	Cl-3-x	2.387E-02
Ra-228	6.268E-08	Cl-4-x	7.830E-03
Tc-99	1.165E-06	Cl-F-x	5.619E-04
Th-228	1.069E-08	Cr	4.507E-03
Th-231	6.131E-08	HC-insol	7.674E-02
Th-232	6.454E-07	HC-solub	8.522E-02
Th-234	7.849E-05	Hg	1.306E-03
Tl-208	4.040E-09	Pb	5.304E-03
U-235	6.107E-08	Se	4.666E-04
U-238	7.849E-05		

Shipping Site: KCP

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 4.219E-02 Total Mass (kg/yr): 3.237E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.824E-02	75-09-2	2.982E-02
Co-60	4.562E-01	Ag	1.504E-04
Cs-134	2.682E-04	As	2.945E-05
Cs-137	2.982E-02	Ba	6.019E-03
Eu-154	3.629E-04	Cd	5.228E-03
Eu-155	1.735E-04	Cl-2-x	1.746E-02
Fe-55	5.964E-02	Cl-3-x	7.227E-02
H-3	1.299E-01	Cl-4-x	3.884E-02
Mn-54	1.893E-04	Cl-F-x	2.371E-02
Nb-94	2.840E-04	Cr	2.621E-02
Ni-59	5.964E-03	HC-insol	1.522E-01
Ni-63	8.019E-01	HC-solub	1.618E-04
Pa-234m	1.120E-03	Hg	4.361E-03
Pm-147	3.250E-03	Pb	1.747E-01
Pu-238	9.309E-04	Se	3.916E-04
Pu-241	7.573E-04		
Sb-125	1.262E-04		
Sm-151	2.524E-04		
Sr-90	2.808E-02		
Te-125m	3.155E-05		
Th-234	1.120E-03		
U-238	1.120E-03		
Y-90	2.808E-02		

Destination Site: SRS

Shipping Site: BAPL

Waste Type: Solids (CH-Alpha)

Total Volume (m3/yr): 8.357E-01

Total Mass (kg/yr): 3.493E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	6.984E-04	75-09-2	2.095E-01
Ba-137m	7.629E-01	Ag	3.493E-03
Co-60	1.021E-03	Ba	1.397E-01
Cs-137	8.160E-01	Cd	6.986E-04
Eu-154	1.217E-03	Cl-2-x	2.445E-01
H-3	6.053E-02	Cl-3-x	8.733E-01
Nb-94	6.984E-05	Cl-4-x	4.191E-01
Ni-59	1.563E-03	Cl-F-x	3.493E-01
Ni-63	1.606E-01	Cr	5.239E-03
Pa-234m	4.490E-04	HC-insol	3.493E+00
Pu-238	3.791E-02	HC-solub	1.746E-03
Pu-239	6.286E-04	Hg	6.986E-04
Pu-240	2.793E-04	Pb	3.493E-02
Pu-241	1.633E-02	Se	1.047E-03
Sm-151	1.167E-02		
Sr-90	7.264E-01		
Tc-99	3.625E-04		
Th-234	4.490E-04		
U-238	4.490E-04		
Y-90	7.264E-01		

Shipping Site: CNS

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 9.054E-01

Total Mass (kg/yr): 1.026E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	6.061E-01	57-12-5	5.151E-02
Co-60	9.790E+00	75-09-2	7.241E-01
Cs-134	5.756E-03	Ag	2.274E-02
Cs-137	6.400E-01	As	3.999E-03
Eu-154	7.788E-03	Ba	2.356E-02
Eu-155	3.724E-03	Cd	5.620E-01
Fe-55	1.280E+00	Cl-2-x	4.522E-01
H-3	2.788E+00	Cl-3-x	4.355E+01
Mn-54	4.063E-03	Cl-4-x	9.136E+00
Nb-94	6.095E-03	Cl-F-x	8.522E-02
Ni-59	1.280E-01	Cr	5.418E-01
Ni-63	1.720E+01	HC-insol	8.707E+01
Pa-234m	2.404E-02	HC-solub	1.317E+02
Pm-147	6.975E-02	Hg	1.340E-01
Pu-238	1.997E-02	Pb	1.275E-01
Pu-241	1.625E-02	Se	1.998E-02
Sb-125	2.709E-03		
Sm-151	5.418E-03		
Sr-90	6.027E-01		
Te-125m	6.772E-04		
Th-234	2.404E-02		
U-238	2.404E-02		
Y-90	6.027E-01		

Shipping Site: CNS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 9.030E-02

Total Mass (kg/yr): 6.772E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	6.218E-02	57-12-5	2.357E-03
Co-60	1.004E+00	75-09-2	2.142E-02
Cs-134	5.431E-04	Ag	7.345E-04
Cs-137	6.038E-02	As	2.549E-04
Eu-154	7.990E-04	Ba	3.376E-02
Eu-155	3.821E-04	Cd	2.213E-03
Fe-55	1.313E-01	Cl-2-x	2.738E-02
H-3	2.860E-01	Cl-3-x	2.718E-01
Mn-54	4.169E-04	Cl-4-x	7.524E-02
Nb-94	6.253E-04	Cl-F-x	2.847E-02
Ni-59	1.313E-02	Cr	2.755E-02
Ni-63	1.765E+00	HC-insol	9.141E-01
Pa-234m	2.466E-03	HC-solub	3.299E-01
Pm-147	7.156E-03	Hg	3.234E-03
Pu-238	2.049E-03	Pb	5.496E-02
Pu-241	1.667E-03	Se	9.647E-04
Sb-125	2.779E-04		
Sm-151	5.558E-04		
Sr-90	5.686E-02		
Te-125m	6.948E-05		
Th-234	2.466E-03		
U-238	2.466E-03		
Y-90	5.686E-02		

Shipping Site: MOUND

Waste Type: Organic Liquids (CH-Alpha)

Total Volume (m3/yr): 1.768E+00

Total Mass (kg/yr): 2.190E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.339E-02	75-09-2	2.978E+00
Cs-137	2.450E-02	As	6.322E-03
H-3	1.111E+02	Ba	2.709E-02
Pa-234m	5.680E-03	Cd	2.409E+00
Pu-238	5.569E-03	Cl-2-x	1.574E+00
Pu-241	1.113E-01	Cl-3-x	1.718E+02
Sr-90	2.339E-02	Cl-4-x	3.827E+01
Th-234	5.680E-03	Cl-F-x	6.845E-02
U-238	5.680E-03	Cr	2.069E+00
Y-90	2.339E-02	HC-insol	3.617E+02
		HC-solub	1.237E+02
		Hg	1.355E-02
		Pb	4.599E-01

Shipping Site: MOUND

Waste Type: Solids (CH-Alpha)

Total Volume (m3/yr): 5.712E-03

Total Mass (kg/yr): 6.176E+00

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	7.557E-05	75-09-2	1.926E-02
Cs-137	7.917E-05	Ag	1.191E-04
H-3	3.591E-01	Ba	2.561E-04
Pa-234m	1.835E-05	Cd	2.102E-05
Pu-238	1.799E-05	Cl-2-x	9.886E-03
Pu-241	3.598E-04	Cl-3-x	9.601E-02
Sr-90	7.557E-05	Cl-4-x	7.627E-02
Th-234	1.835E-05	Cl-F-x	6.403E-04
U-238	1.835E-05	Cr	4.674E-05
Y-90	7.557E-05	HC-insol	2.423E-01
		HC-solub	1.132E-01
		Hg	1.951E-05
		Pb	9.361E-05
		Se	1.921E-06

Shipping Site: NNS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.560E-01

Total Mass (kg/yr): 3.925E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.383E-01	75-09-2	1.041E-01
Co-60	3.849E+00	Ag	3.925E-03
Cs-134	2.263E-03	As	2.726E-03
Cs-137	2.516E-01	Ba	1.110E-01
Eu-154	3.062E-03	Cd	3.955E-02
Eu-155	1.464E-03	Cl-2-x	1.105E-01
Fe-55	5.032E-01	Cl-3-x	4.102E+00
H-3	1.096E+00	Cl-4-x	7.996E-01
Mn-54	1.597E-03	Cl-F-x	9.360E-02
Nb-94	2.396E-03	Cr	1.488E-01
Ni-59	5.032E-02	HC-insol	1.378E+01
Ni-63	6.766E+00	HC-solub	6.570E+00
Pa-234m	9.453E-03	Hg	4.448E-02
Pm-147	2.742E-02	Pb	7.211E-02
Pu-238	7.855E-03	Se	1.201E-02
Pu-241	6.390E-03		
Sb-125	1.065E-03		
Sm-151	2.130E-03		
Sr-90	2.369E-01		
Te-125m	2.662E-04		
Th-234	9.453E-03		
U-238	9.453E-03		
Y-90	2.369E-01		

Shipping Site: UMC

Waste Type: Solids (CH-Alpha)

Total Volume (m3/yr): 3.944E-02

Total Mass (kg/yr): 5.809E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	1.743E-07	57-12-5	9.876E-03
Cm-244	2.358E-07	75-09-2	1.161E-02
Pa-234m	8.511E-07	Ag	1.742E-03
Pu-238	9.108E-05	As	5.809E-04
Pu-239	9.331E-06	Ba	1.161E-01
Pu-240	3.260E-05	Cd	2.904E-04
Pu-241	8.894E-04	Cl-2-x	1.161E-02
Th-234	8.511E-07	Cl-3-x	3.253E-02
U-238	8.511E-07	Cl-4-x	2.033E-02
		Cl-F-x	5.809E-03
		Cr	1.161E-01
		HC-insol	5.809E-02
		HC-solub	2.904E-03
		Hg	5.809E-03
		Pb	2.904E-01
		Se	1.742E-03

Shipping Site: WVDP

Waste Type: Organic Liquids (CH-Alpha)

Total Volume (m3/yr): 1.773E+00

Total Mass (kg/yr): 1.897E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	1.482E-03	57-12-5	1.600E-01
Ba-137m	1.619E+00	75-09-2	2.840E-01
Co-60	2.167E-03	Ag	7.866E-02
Cs-137	1.731E+00	As	9.986E-03
Eu-154	2.583E-03	Ba	6.783E-02
H-3	1.284E-01	Cd	1.250E-01
Nb-94	1.482E-04	Cl-2-x	4.212E-01
Ni-59	3.317E-03	Cl-3-x	2.491E+01
Ni-63	3.409E-01	Cl-4-x	3.373E+00
Pa-234m	9.529E-04	Cl-F-x	2.744E-01
Pu-238	8.047E-02	Cr	2.914E-01
Pu-239	1.334E-03	HC-insol	1.686E+01
Pu-240	5.929E-04	HC-solub	3.228E+02
Pu-241	3.465E-02	Hg	4.473E-01
Sm-151	2.477E-02	Pb	9.175E-02
Sr-90	1.541E+00	Se	6.881E-02
Tc-99	7.694E-04		
Th-234	9.529E-04		
U-238	9.529E-04		
Y-90	1.541E+00		

Shipping Site: WVDP

Waste Type: Solids (CH-Alpha)

Total Volume (m3/yr): 8.473E-01

Total Mass (kg/yr): 1.355E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	7.096E-04	57-12-5	1.069E-03
Ba-137m	7.751E-01	75-09-2	2.958E-01
Co-60	1.037E-03	Ag	1.709E-02
Cs-137	8.243E-01	As	1.081E-02
Eu-154	1.236E-03	Ba	3.475E-01
H-3	6.150E-02	Cd	1.558E-01
Nb-94	7.096E-05	Cl-2-x	2.803E-01
Ni-59	1.588E-03	Cl-3-x	1.573E+01
Ni-63	1.632E-01	Cl-4-x	2.998E+00
Pa-234m	4.561E-04	Cl-F-x	1.176E-01
Pu-238	3.852E-02	Cr	5.922E-01
Pu-239	6.386E-04	HC-insol	5.230E+01
Pu-240	2.838E-04	HC-solub	2.619E+01
Pu-241	1.659E-02	Hg	1.760E-01
Sm-151	1.186E-02	Pb	2.784E-01
Sr-90	7.339E-01	Se	4.680E-02
Tc-99	3.662E-04		
Th-234	4.561E-04		
U-238	4.561E-04		
Y-90	7.339E-01		

A.4 WM LLMW REGIONALIZED 3 ALTERNATIVE (CASE 10a)

Waste Stream: MLLW
1 Disposal Site

Alternative: 10 Regional 7 Treatment Sites -

Destination Site: HANF

Shipping Site: LBL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 3.230E-01 Total Mass (kg/yr): 3.100E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	4.273E-03	75-09-2	2.976E-01
Cs-137	4.476E-03	As	2.387E-03
H-3	2.032E+01	Ba	1.023E-02
Pa-234m	1.037E-03	Cd	3.410E-01
Pu-241	1.017E-03	Cl-2-x	1.550E-01
Sr-90	4.273E-03	Cl-3-x	2.325E+00
Th-234	1.037E-03	Cl-4-x	4.961E-01
U-238	1.037E-03	Cr	2.852E-01
Y-90	4.273E-03	HC-insol	1.364E+02
		HC-solub	4.341E+01
		Hg	1.860E-03
		Pb	6.511E-02

Shipping Site: LBL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.112E+00 Total Mass (kg/yr): 4.402E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	4.117E-02	57-12-5	5.503E-01
Cs-137	4.314E-02	75-09-2	1.116E+01
H-3	1.958E+02	Ag	1.516E-01
Pa-234m	1.000E-02	As	3.237E-02
Pu-241	9.804E-03	Ba	6.474E+00
Sr-90	4.117E-02	Cd	1.754E-02
Th-234	1.000E-02	Cl-2-x	5.905E+00
U-238	1.000E-02	Cl-3-x	5.439E+01
Y-90	4.117E-02	Cl-4-x	4.320E+01
		Cl-F-x	3.237E-01
		Cr	6.485E+00
		HC-insol	1.314E+02
		HC-solub	6.326E+01
		Hg	3.242E-01
		Pb	1.619E+01
		Se	9.711E-02

Shipping Site: LERHR

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 5.020E-03

Total Mass (kg/yr): 5.750E+00

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	2.470E-07	57-12-5	2.373E-04
Ba-137m	3.636E-04	75-09-2	4.324E-03
Co-60	1.353E-04	Ag	1.189E-04
Cs-137	3.888E-04	As	2.403E-05
Eu-154	1.440E-06	Ba	1.415E-04
Eu-155	4.940E-07	Cd	3.358E-03
H-3	2.801E-05	Cl-2-x	2.702E-03
Nb-94	1.029E-06	Cl-3-x	2.592E-01
Ni-59	2.183E-05	Cl-4-x	5.439E-02
Ni-63	2.297E-03	Cl-F-x	5.108E-04
Pa-234m	4.976E-05	Cr	3.156E-03
Pu-238	1.529E-05	HC-insol	5.198E-01
Pu-239	2.470E-07	HC-solub	6.473E-01
Pu-240	3.705E-07	Hg	6.928E-04
Pu-241	1.620E-05	Pb	7.432E-04
Sm-151	4.688E-06	Se	1.039E-04
Sr-90	3.438E-04		
Tc-99	4.112E-06		
Th-232	4.116E-07		
Th-234	4.976E-05		
U-238	4.976E-05		
Y-90	3.438E-04		

Shipping Site: LERHR

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.442E-01

Total Mass (kg/yr): 2.492E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	1.701E-05	57-12-5	4.707E-04
Ba-137m	2.505E-02	75-09-2	1.438E-01
Co-60	9.323E-03	Ag	2.547E-03
Cs-137	2.641E-02	As	1.464E-05
Eu-154	9.928E-05	Ba	3.843E-02
Eu-155	3.403E-05	Cd	8.851E-03
H-3	1.930E-03	Cl-2-x	1.556E-01
Nb-94	7.091E-05	Cl-3-x	6.005E-01
Ni-59	1.504E-03	Cl-4-x	2.831E+00
Ni-63	1.583E-01	Cl-F-x	1.391E-01
Pa-234m	3.428E-03	Cr	4.652E-03
Pu-238	1.054E-03	HC-insol	1.675E+00
Pu-239	1.701E-05	HC-solub	3.579E-01
Pu-240	2.552E-05	Hg	5.762E-03
Pu-241	1.116E-03	Pb	1.542E-02
Sm-151	3.230E-04	Se	4.361E-04
Sr-90	2.335E-02		
Tc-99	2.793E-04		
Th-232	2.836E-05		
Th-234	3.428E-03		
U-238	3.428E-03		
Y-90	2.335E-02		

Shipping Site: LLNL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 7.727E+01

Total Mass (kg/yr): 8.159E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.022E+00	57-12-5	7.162E+00
Cs-137	1.071E+00	75-09-2	5.434E+00
H-3	4.863E+03	Ag	3.590E+00
Pa-234m	2.482E-01	As	4.598E-01
Pu-241	2.434E-01	Ba	3.135E+00
Sr-90	1.022E+00	Cd	1.949E-01
Th-234	2.482E-01	Cl-2-x	1.546E+01
U-238	2.482E-01	Cl-3-x	6.087E+02
Y-90	1.022E+00	Cl-4-x	3.439E+01
		Cl-F-x	1.254E+01
		Cr	8.355E+00
		HC-insol	5.003E+02
		HC-solub	1.434E+04
		Hg	2.033E+01
		Pb	3.118E+00
		Se	3.138E+00

Shipping Site: LLNL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 4.978E+01

Total Mass (kg/yr): 6.833E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	6.586E-01	57-12-5	8.172E+00
Cs-137	6.899E-01	75-09-2	8.995E+00
H-3	3.132E+03	Ag	3.852E+00
Pa-234m	1.599E-01	As	1.401E+00
Pu-241	1.568E-01	Ba	1.097E+02
Sr-90	6.586E-01	Cd	2.705E+00
Th-234	1.599E-01	Cl-2-x	7.372E+00
U-238	1.599E-01	Cl-3-x	1.900E+02
Y-90	6.586E-01	Cl-4-x	3.100E+01
		Cl-F-x	5.418E+00
		Cr	1.262E+02
		HC-insol	7.525E+02
		HC-solub	3.756E+02
		Hg	4.188E+01
		Pb	1.529E+02
		Se	1.787E+01

Shipping Site: MINS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.647E+00

Total Mass (kg/yr): 3.545E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.441E+00	75-09-2	5.544E-01
Co-60	3.943E+01	Ag	1.457E-02
Cs-134	2.318E-02	As	7.197E-03
Cs-137	2.578E+00	Ba	2.427E+00
Eu-154	3.137E-02	Cd	1.150E-01
Eu-155	1.500E-02	Cl-2-x	5.975E-01
Fe-55	5.156E+00	Cl-3-x	1.190E+01
H-3	1.123E+01	Cl-4-x	2.652E+00
Mn-54	1.636E-02	Cl-F-x	6.891E-01
Nb-94	2.455E-02	Cr	7.414E-01
Ni-59	5.156E-01	HC-insol	4.047E+01
Ni-63	6.932E+01	HC-solub	1.726E+01
Pa-234m	9.684E-02	Hg	5.165E-01
Pm-147	2.809E-01	Pb	4.557E-01
Pu-238	8.047E-02	Se	3.325E-02
Pu-241	6.547E-02		
Sb-125	1.091E-02		
Sm-151	2.182E-02		
Sr-90	2.427E+00		
Te-125m	2.728E-03		
Th-234	9.684E-02		
U-238	9.684E-02		
Y-90	2.427E+00		

Shipping Site: PHNS

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 1.736E-03

Total Mass (kg/yr): 1.979E+00

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.162E-03	75-09-2	2.572E-04
Co-60	1.877E-02	Ag	8.707E-05
Cs-134	1.103E-05	As	2.176E-05
Cs-137	1.227E-03	Ba	1.484E-04
Eu-154	1.493E-05	Cl-2-x	7.322E-04
Eu-155	7.141E-06	Cl-3-x	2.731E-02
Fe-55	2.454E-03	Cl-4-x	1.543E-03
H-3	5.346E-03	Cl-F-x	5.937E-04
Mn-54	7.791E-06	HC-insol	2.968E-03
Nb-94	1.168E-05	HC-solub	7.718E-04
Ni-59	2.454E-04	Hg	4.353E-04
Ni-63	3.299E-02	Pb	5.343E-05
Pa-234m	4.609E-05	Se	7.322E-05
Pm-147	1.337E-04		
Pu-238	3.830E-05		
Pu-241	3.116E-05		
Sb-125	5.194E-06		
Sm-151	1.038E-05		
Sr-90	1.155E-03		
Te-125m	1.298E-06		
Th-234	4.609E-05		
U-238	4.609E-05		
Y-90	1.155E-03		

Shipping Site: PHNS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 2.962E-01

Total Mass (kg/yr): 4.406E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.983E-01	57-12-5	4.073E-03
Co-60	3.204E+00	75-09-2	5.831E-02
Cs-134	1.883E-03	Ag	2.691E-03
Cs-137	2.094E-01	As	1.603E-03
Eu-154	2.548E-03	Ba	1.038E-01
Eu-155	1.218E-03	Cd	2.472E-02
Fe-55	4.188E-01	Cl-2-x	6.160E-02
H-3	9.124E-01	Cl-3-x	2.088E+00
Mn-54	1.329E-03	Cl-4-x	4.422E-01
Nb-94	1.994E-03	Cl-F-x	6.398E-02
Ni-59	4.188E-02	Cr	7.805E-01
Ni-63	5.631E+00	HC-insol	6.908E+00
Pa-234m	7.867E-03	HC-solub	3.289E+00
Pm-147	2.282E-02	Hg	2.617E-02
Pu-238	6.538E-03	Pb	1.563E-01
Pu-241	5.319E-03	Se	6.731E-03
Sb-125	8.865E-04		
Sm-151	1.773E-03		
Sr-90	1.972E-01		
Te-125m	2.216E-04		
Th-234	7.867E-03		
U-238	7.867E-03		
Y-90	1.972E-01		

Shipping Site: PSNS

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 3.990E-02

Total Mass (kg/yr): 5.986E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.671E-02	75-09-2	9.577E-02
Co-60	4.315E-01	Cd	6.584E-02
Cs-134	2.537E-04	Cl-2-x	5.088E-02
Cs-137	2.820E-02	Cl-3-x	7.243E+00
Eu-154	3.432E-04	Cl-4-x	1.616E+00
Eu-155	1.641E-04	Cl-F-x	2.993E-03
Fe-55	5.641E-02	Cr	5.746E-02
H-3	1.228E-01	HC-insol	1.975E-02
Mn-54	1.791E-04	HC-solub	3.831E-01
Nb-94	2.686E-04	Hg	3.771E-04
Ni-59	5.641E-03	Pb	1.257E-02
Ni-63	7.585E-01		
Pa-234m	1.059E-03		
Pm-147	3.074E-03		
Pu-238	8.806E-04		
Pu-241	7.164E-04		
Sb-125	1.194E-04		
Sm-151	2.388E-04		
Sr-90	2.656E-02		
Te-125m	2.985E-05		
Th-234	1.059E-03		
U-238	1.059E-03		
Y-90	2.656E-02		

Shipping Site: PSNS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 6.586E+00

Total Mass (kg/yr): 9.518E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	4.409E+00	57-12-5	7.312E-01
Co-60	7.122E+01	75-09-2	1.279E+00
Cs-134	4.187E-02	Ag	1.357E-01
Cs-137	4.655E+00	As	4.301E-02
Eu-154	5.665E-02	Ba	8.869E+00
Eu-155	2.709E-02	Cd	1.229E-01
Fe-55	9.311E+00	Cl-2-x	1.346E+00
H-3	2.028E+01	Cl-3-x	4.520E+00
Mn-54	2.956E-02	Cl-4-x	2.989E+00
Nb-94	4.434E-02	Cl-F-x	1.385E+00
Ni-59	9.311E-01	Cr	2.225E+01
Ni-63	1.251E+02	HC-insol	6.852E+00
Pa-234m	1.749E-01	HC-solub	2.684E-01
Pm-147	5.074E-01	Hg	4.633E-01
Pu-238	1.453E-01	Pb	2.158E+01
Pu-241	1.182E-01	Se	1.310E-01
Sb-125	1.970E-02		
Sm-151	3.941E-02		
Sr-90	4.384E+00		
Te-125m	4.926E-03		
Th-234	1.749E-01		
U-238	1.749E-01		
Y-90	4.384E+00		

Shipping Site: SNLL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 7.662E+00

Total Mass (kg/yr): 7.356E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.013E-01	75-09-2	7.061E+00
Cs-137	1.062E-01	As	5.664E-02
H-3	4.822E+02	Ba	2.427E-01
Pa-234m	2.462E-02	Cd	8.091E+00
Pu-241	2.413E-02	Cl-2-x	3.678E+00
Sr-90	1.013E-01	Cl-3-x	5.517E+01
Th-234	2.462E-02	Cl-4-x	1.176E+01
U-238	2.462E-02	Cr	6.767E+00
Y-90	1.013E-01	HC-insol	3.236E+03
		HC-solub	1.029E+03
		Hg	4.413E-02
		Pb	1.544E+00

Shipping Site: SNLL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 7.770E-01

Total Mass (kg/yr): 1.193E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.027E-02	57-12-5	6.924E-03
Cs-137	1.076E-02	75-09-2	7.497E+00
H-3	4.890E+01	Ag	1.014E-02
Pa-234m	2.496E-03	As	6.737E-03
Pu-241	2.447E-03	Ba	3.347E-01
Sr-90	1.027E-02	Cd	8.243E-02
Th-234	2.496E-03	Cl-2-x	3.816E+00
U-238	2.496E-03	Cl-3-x	4.480E+01
Y-90	1.027E-02	Cl-4-x	3.090E+01
		Cl-F-x	6.827E-02
		Cr	6.765E-01
		HC-insol	1.187E+02
		HC-solub	5.754E+01
		Hg	1.257E-01
		Pb	2.595E-01
		Se	3.934E-02

Destination Site: INEL

Shipping Site: ETEC

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 6.767E-03 Total Mass (kg/yr): 7.145E+00

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	3.329E-07	57-12-5	6.272E-04
Ba-137m	4.901E-04	75-09-2	4.759E-04
Co-60	1.823E-04	Ag	3.144E-04
Cs-137	5.241E-04	As	4.027E-05
Eu-154	1.942E-06	Ba	2.745E-04
Eu-155	6.659E-07	Cd	1.707E-05
H-3	3.775E-05	Cl-2-x	1.354E-03
Nb-94	1.387E-06	Cl-3-x	5.331E-02
Ni-59	2.943E-05	Cl-4-x	3.012E-03
Ni-63	3.097E-03	Cl-F-x	1.098E-03
Pa-234m	6.707E-05	Cr	7.317E-04
Pu-238	2.062E-05	HC-insol	4.382E-02
Pu-239	3.329E-07	HC-solub	1.255E+00
Pu-240	4.994E-07	Hg	1.781E-03
Pu-241	2.184E-05	Pb	2.730E-04
Sm-151	6.320E-06	Se	2.748E-04
Sr-90	4.634E-04		
Tc-99	5.543E-06		
Th-232	5.549E-07		
Th-234	6.707E-05		
U-238	6.707E-05		
Y-90	4.634E-04		

Shipping Site: ETEC

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 7.380E+01 Total Mass (kg/yr): 1.326E+05

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	3.631E-03	57-12-5	4.222E-02
Ba-137m	5.346E+00	75-09-2	1.466E-01
Co-60	1.989E+00	Ag	1.331E+00
Cs-137	5.716E+00	As	6.654E-01
Eu-154	2.118E-02	Ba	2.587E+00
Eu-155	7.262E-03	Cd	4.415E-01
H-3	4.118E-01	Cl-2-x	1.504E-01
Nb-94	1.513E-02	Cl-3-x	5.990E+00
Ni-59	3.210E-01	Cl-4-x	1.869E+00
Ni-63	3.377E+01	Cl-F-x	9.652E-02
Pa-234m	7.316E-01	Cr	3.303E+00
Pu-238	2.249E-01	HC-insol	1.648E+01
Pu-239	3.631E-03	HC-solub	8.724E+00
Pu-240	5.447E-03	Hg	7.346E-01
Pu-241	2.382E-01	Pb	6.598E+00
Sm-151	6.893E-02	Se	2.188E-01
Sr-90	5.054E+00		
Tc-99	6.046E-02		
Th-232	6.052E-03		
Th-234	7.316E-01		
U-238	7.316E-01		
Y-90	5.054E+00		

Shipping Site: GATOMIC

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 7.077E-02

Total Mass (kg/yr): 7.476E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	1.514E-07	57-12-5	6.543E-03
Bi-212	2.547E-08	75-09-2	5.261E-03
Pa-234	1.925E-08	Ag	3.280E-03
Pa-234m	1.870E-04	As	4.207E-04
Pb-212	2.547E-08	Ba	2.867E-03
Po-212	1.642E-08	Cd	4.175E-04
Po-216	2.547E-08	Cl-2-x	1.428E-02
Ra-224	2.547E-08	Cl-3-x	5.732E-01
Ra-228	1.514E-07	Cl-4-x	3.523E-02
Tc-99	2.816E-06	Cl-F-x	1.146E-02
Th-228	2.547E-08	Cr	7.839E-03
Th-231	1.460E-07	HC-insol	4.931E-01
Th-232	1.537E-06	HC-solub	1.311E+01
Th-234	1.870E-04	Hg	1.858E-02
Tl-208	9.625E-09	Pb	2.894E-03
U-235	1.455E-07	Se	2.867E-03
U-238	1.870E-04		

Shipping Site: GATOMIC

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 5.632E-01

Total Mass (kg/yr): 8.419E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	1.218E-06	57-12-5	9.298E-02
Bi-212	2.049E-07	75-09-2	1.998E-01
Pa-234	1.548E-07	Ag	2.502E-02
Pa-234m	1.504E-03	As	9.721E-03
Pb-212	2.049E-07	Ba	1.175E+00
Po-212	1.320E-07	Cd	4.463E-02
Po-216	2.049E-07	Cl-2-x	1.741E-01
Ra-224	1.996E-07	Cl-3-x	3.347E+00
Ra-228	1.186E-06	Cl-4-x	8.150E-01
Tc-99	2.207E-05	Cl-F-x	1.017E-01
Th-228	2.049E-07	Cr	1.315E+00
Th-231	1.175E-06	HC-insol	1.041E+01
Th-232	1.237E-05	HC-solub	6.899E+00
Th-234	1.504E-03	Hg	1.942E-01
Tl-208	7.742E-08	Pb	2.810E+00
U-235	1.170E-06	Se	7.067E-02
U-238	1.504E-03		

Shipping Site: NTS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 6.621E-03

Total Mass (kg/yr): 8.886E+00

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	8.760E-05	75-09-2	5.331E-03
Cs-137	9.177E-05	Ag	9.774E-05
H-3	4.167E-01	Cd	5.331E-04
Pa-234m	2.127E-05	Cl-2-x	5.331E-03
Pu-241	2.085E-05	Cl-3-x	2.221E-02
Sr-90	8.760E-05	Cl-4-x	1.688E-01
Th-234	2.127E-05	Cl-F-x	2.665E-03
U-238	2.127E-05	Cr	1.777E-04
Y-90	8.760E-05	HC-insol	4.443E-02
		HC-solub	2.221E-02
		Hg	3.465E-04
		Pb	3.199E-04
		Se	8.886E-06

Destination Site: LANL

Shipping Site: ITRI

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 1.028E-01

Total Mass (kg/yr): 1.007E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.367E-03	57-12-5	1.813E-02
Co-60	1.879E-03	Ag	4.433E-03
Cs-137	1.424E-03	Cd	4.937E-04
Eu-154	1.566E-05	Cl-3-x	8.061E-02
Fe-55	2.364E-04	Cl-4-x	4.534E-03
H-3	2.725E-01	Cr	2.116E-02
Ni-59	3.133E-05	HC-insol	1.108E+00
Ni-63	4.158E-03	HC-solub	3.627E+01
Pm-147	1.310E-04	Hg	2.821E-02
Pu-238	5.411E-05	Pb	5.038E-03
Pu-241	2.734E-04	Se	4.030E-03
Sm-151	1.253E-05		
Sr-90	1.338E-03		
Y-90	1.338E-03		

Shipping Site: PANT

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 1.461E+00

Total Mass (kg/yr): 2.110E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.942E-02	75-09-2	3.284E+00
Co-60	2.671E-02	As	1.112E-03
Cs-137	2.023E-02	Ba	4.766E-03
Eu-154	2.225E-04	Cd	2.321E+00
Fe-55	3.359E-03	Cl-2-x	1.743E+00
H-3	3.872E+00	Cl-3-x	2.389E+02
Ni-59	4.451E-04	Cl-4-x	5.331E+01
Ni-63	5.908E-02	Cl-F-x	9.829E-02
Pm-147	1.861E-03	Cr	2.020E+00
Pu-238	7.689E-04	HC-insol	6.419E+01
Pu-241	3.885E-03	HC-solub	3.280E+01
Sm-151	1.780E-04	Hg	1.325E-02
Sr-90	1.902E-02	Pb	4.431E-01
Y-90	1.902E-02		

Shipping Site: PANT

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.957E+01

Total Mass (kg/yr): 2.511E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	5.276E-01	57-12-5	2.480E-01
Co-60	7.254E-01	75-09-2	3.448E+01
Cs-137	5.454E-01	Ag	1.998E-01
Eu-154	6.045E-03	As	3.903E-02
Fe-55	9.123E-02	Ba	1.047E+01
H-3	1.051E+02	Cd	1.602E+00
Ni-59	1.209E-02	Cl-2-x	2.240E+01
Ni-63	1.604E+00	Cl-3-x	1.712E+02
Pm-147	5.056E-02	Cl-4-x	1.094E+02
Pu-238	2.088E-02	Cl-F-x	1.631E+01
Pu-241	1.055E-01	Cr	1.027E+01
Sm-151	4.836E-03	HC-insol	4.777E+02
Sr-90	5.126E-01	HC-solub	1.648E+02
Y-90	5.126E-01	Hg	1.896E+00
		Pb	5.162E+01
		Se	2.443E-01

Shipping Site: SNLA

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 5.487E-04

Total Mass (kg/yr): 5.793E-01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	6.627E-05	57-12-5	5.085E-05
Co-60	9.630E-05	75-09-2	3.859E-05
Cs-137	7.006E-05	Ag	2.549E-05
Eu-154	3.516E-07	As	3.265E-06
Eu-155	8.115E-08	Ba	2.226E-05
Fe-55	1.920E-06	Cd	1.384E-06
H-3	1.223E-03	Cl-2-x	1.098E-04
Nb-94	4.598E-07	Cl-3-x	4.322E-03
Ni-59	9.089E-06	Cl-4-x	2.442E-04
Ni-63	1.099E-03	Cl-F-x	8.905E-05
Pa-234m	3.246E-07	Cr	5.933E-05
Pu-238	2.380E-06	HC-insol	3.553E-03
Pu-240	1.893E-06	HC-solub	1.018E-01
Pu-241	1.893E-06	Hg	1.444E-04
Sm-151	7.574E-07	Pb	2.214E-05
Sr-90	6.519E-05	Se	2.228E-05
Tc-99	2.705E-08		
Th-234	3.246E-07		
U-238	3.246E-07		
Y-90	6.519E-05		

Shipping Site: SNLA

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 2.849E+00

Total Mass (kg/yr): 2.300E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	3.441E-01	57-12-5	2.628E-01
Co-60	5.000E-01	75-09-2	7.747E-01
Cs-137	3.637E-01	Ag	5.397E-02
Eu-154	1.825E-03	As	1.546E-02
Eu-155	4.213E-04	Ba	3.392E+00
Fe-55	9.972E-03	Cd	9.542E-03
H-3	6.351E+00	Cl-2-x	8.422E-01
Nb-94	2.387E-03	Cl-3-x	2.813E+00
Ni-59	4.719E-02	Cl-4-x	1.497E+00
Ni-63	5.706E+00	Cl-F-x	9.064E-01
Pa-234m	1.685E-03	Cr	3.104E+00
Pu-238	1.236E-02	HC-insol	7.682E+00
Pu-240	9.832E-03	HC-solub	1.619E-01
Pu-241	9.832E-03	Hg	1.563E-01
Sm-151	3.932E-03	Pb	7.814E+00
Sr-90	3.385E-01	Se	4.865E-02
Tc-99	1.404E-04		
Th-234	1.685E-03		
U-238	1.685E-03		
Y-90	3.385E-01		

Destination Site: ORNL

Shipping Site: PADUCAH

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 2.970E+01

Total Mass (kg/yr): 3.589E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	1.796E-02	57-12-5	4.590E-01
Bi-212	2.967E-03	75-09-2	4.205E+01
Pa-234	2.486E-03	Ag	2.300E-01
Pa-234m	2.420E+01	As	1.180E-01
Pb-212	2.967E-03	Ba	5.803E-01
Po-212	1.965E-03	Cd	3.374E+01
Po-216	2.967E-03	Cl-2-x	2.303E+01
Ra-224	2.967E-03	Cl-3-x	2.444E+03
Ra-228	1.796E-02	Cl-4-x	5.381E+02
Tc-99	7.291E+00	Cl-F-x	1.762E+00
Th-228	2.967E-03	Cr	2.951E+01
Th-231	1.892E-02	HC-insol	5.097E+03
Th-232	1.990E-01	HC-solub	2.651E+03
Th-234	2.420E+01	Hg	1.493E+00
Tl-208	1.163E-03	Pb	6.639E+00
U-235	1.876E-02	Se	2.011E-01
U-238	2.420E+01		

Shipping Site: PADUCAH

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 4.740E+00

Total Mass (kg/yr): 6.808E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	2.890E-03	57-12-5	1.016E+00
Bi-212	4.773E-04	75-09-2	1.710E+00
Pa-234	3.999E-04	Ag	2.502E-01
Pa-234m	3.894E+00	As	8.712E-02
Pb-212	4.773E-04	Ba	1.228E+01
Po-212	3.161E-04	Cd	1.504E-01
Po-216	4.773E-04	Cl-2-x	1.444E+00
Ra-224	4.664E-04	Cl-3-x	1.250E+01
Ra-228	2.824E-03	Cl-4-x	4.496E+00
Tc-99	1.146E+00	Cl-F-x	6.729E-01
Th-228	4.773E-04	Cr	1.293E+01
Th-231	3.044E-03	HC-insol	3.436E+01
Th-232	3.202E-02	HC-solub	1.740E+01
Th-234	3.894E+00	Hg	1.732E+00
Tl-208	1.870E-04	Pb	2.789E+01
U-235	3.019E-03	Se	6.716E-01
U-238	3.894E+00		

Destination Site: PORTS

Shipping Site: AMES

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 8.585E-03

Total Mass (kg/yr): 1.162E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	1.851E-08	57-12-5	1.759E-05
Bi-212	3.115E-09	75-09-2	1.485E-04
Pa-234	2.353E-09	Ag	5.841E-05
Pa-234m	2.286E-05	As	7.025E-07
Pb-212	3.115E-09	Ba	4.061E-05
Po-212	2.007E-09	Cd	5.957E-05
Po-216	3.115E-09	Cl-2-x	1.879E-04
Ra-224	3.051E-09	Cl-3-x	4.658E-04
Ra-228	1.813E-08	Cl-4-x	8.901E-04
Tc-99	3.373E-07	Cl-F-x	7.426E-05
Th-228	3.115E-09	Cr	1.342E-04
Th-231	1.785E-08	HC-insol	1.917E-05
Th-232	1.879E-07	HC-solub	1.017E-02
Th-234	2.286E-05	Hg	5.635E-05
Tl-208	1.177E-09	Pb	8.863E-05
U-235	1.778E-08	Se	1.196E-06
U-238	2.286E-05		

Shipping Site: ANL-E

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 4.838E+02

Total Mass (kg/yr): 8.170E+05

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	2.380E-02	57-12-5	2.002E+01
Ba-137m	3.504E+01	75-09-2	2.778E+01
Co-60	1.304E+01	Ag	1.623E+01
Cs-137	3.747E+01	As	6.714E+00
Eu-154	1.388E-01	Ba	2.781E+02
Eu-155	4.761E-02	Cd	9.989E+00
H-3	2.699E+00	Cl-2-x	1.822E+01
Nb-94	9.919E-02	Cl-3-x	3.658E+02
Ni-59	2.104E+00	Cl-4-x	4.608E+01
Ni-63	2.214E+02	Cl-F-x	1.759E+01
Pa-234m	4.796E+00	Cr	3.334E+02
Pu-238	1.474E+00	HC-insol	1.482E+03
Pu-239	2.380E-02	HC-solub	7.360E+02
Pu-240	3.571E-02	Hg	1.110E+02
Pu-241	1.561E+00	Pb	4.704E+02
Sm-151	4.519E-01	Se	4.660E+01
Sr-90	3.313E+01		
Tc-99	3.963E-01		
Th-232	3.967E-02		
Th-234	4.796E+00		
U-238	4.796E+00		
Y-90	3.313E+01		

Shipping Site: BAPL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 6.410E-02

Total Mass (kg/yr): 6.163E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	5.332E-05	75-09-2	5.934E-02
Ba-137m	5.866E-02	As	4.724E-04
Co-60	7.908E-05	Ba	2.024E-03
Cs-137	6.272E-02	Cd	6.779E-02
Eu-154	9.439E-05	Cl-2-x	3.091E-02
H-3	4.694E-03	Cl-3-x	4.931E-01
Nb-94	5.357E-06	Cl-4-x	1.055E-01
Ni-59	1.209E-04	Cl-F-x	1.360E-05
Ni-63	1.242E-02	Cr	5.671E-02
Pa-234m	3.469E-05	HC-insol	2.699E+01
Pu-238	2.806E-03	HC-solub	8.592E+00
Pu-239	3.801E-05	Hg	3.698E-04
Pu-240	2.168E-05	Pb	1.294E-02
Pu-241	6.225E-04		
Sm-151	9.031E-04		
Sr-90	5.586E-02		
Tc-99	2.806E-05		
Th-234	3.469E-05		
U-238	3.469E-05		
Y-90	5.586E-02		

Shipping Site: BAPL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 6.105E-01

Total Mass (kg/yr): 6.010E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	5.078E-04	57-12-5	1.703E-03
Ba-137m	5.587E-01	75-09-2	6.266E-02
Co-60	7.532E-04	Ag	6.515E-03
Cs-137	5.974E-01	As	1.598E-03
Eu-154	8.990E-04	Ba	6.259E-02
H-3	4.471E-02	Cd	1.698E-02
Nb-94	5.102E-05	Cl-2-x	7.067E-02
Ni-59	1.151E-03	Cl-3-x	4.679E-01
Ni-63	1.183E-01	Cl-4-x	4.156E-01
Pa-234m	3.304E-04	Cl-F-x	8.727E-02
Pu-238	2.672E-02	Cr	4.102E-02
Pu-239	3.620E-04	HC-insol	2.697E+00
Pu-240	2.065E-04	HC-solub	2.666E+00
Pu-241	5.929E-03	Hg	1.514E-02
Sm-151	8.601E-03	Pb	7.746E-02
Sr-90	5.321E-01	Se	2.393E-03
Tc-99	2.672E-04		
Th-234	3.304E-04		
U-238	3.304E-04		
Y-90	5.321E-01		

Shipping Site: BATELLE

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 1.500E-03

Total Mass (kg/yr): 1.977E+00

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	3.211E-09	75-09-2	3.955E-02
Bi-212	5.400E-10	Cl-2-x	1.977E-02
Pa-234	4.080E-10	Cl-3-x	1.977E-01
Pa-234m	3.964E-06	Cl-4-x	1.582E-01
Pb-212	5.400E-10	HC-insol	4.943E-01
Po-212	3.480E-10	HC-solub	2.373E-01
Po-216	5.400E-10		
Ra-224	5.400E-10		
Ra-228	3.211E-09		
Tc-99	5.971E-08		
Th-228	5.400E-10		
Th-231	3.097E-09		
Th-232	3.260E-08		
Th-234	3.964E-06		
Tl-208	2.040E-10		
U-235	3.085E-09		
U-238	3.964E-06		

Shipping Site: BNL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 1.544E+00

Total Mass (kg/yr): 1.749E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	7.598E-05	57-12-5	8.298E-02
Ba-137m	1.118E-01	75-09-2	1.156E+00
Co-60	4.162E-02	Ag	4.159E-02
Cs-137	1.196E-01	As	7.649E-03
Eu-154	4.432E-04	Ba	4.627E-02
Eu-155	1.519E-04	Cd	8.868E-01
H-3	8.617E-03	Cl-2-x	7.572E-01
Nb-94	3.166E-04	Cl-3-x	7.014E+01
Ni-59	6.718E-03	Cl-4-x	1.445E+01
Ni-63	7.068E-01	Cl-F-x	1.704E-01
Pa-234m	1.530E-02	Cr	8.567E-01
Pu-238	4.706E-03	HC-insol	1.386E+02
Pu-239	7.598E-05	HC-solub	2.115E+02
Pu-240	1.139E-04	Hg	2.406E-01
Pu-241	4.984E-03	Pb	2.050E-01
Sm-151	1.442E-03	Se	3.636E-02
Sr-90	1.057E-01		
Tc-99	1.265E-03		
Th-232	1.266E-04		
Th-234	1.530E-02		
U-238	1.530E-02		
Y-90	1.057E-01		

Shipping Site: BNL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 8.915E+00

Total Mass (kg/yr): 1.190E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	4.386E-04	57-12-5	1.617E+00
Ba-137m	6.457E-01	75-09-2	8.722E-01
Co-60	2.402E-01	Ag	7.571E-01
Cs-137	6.904E-01	As	2.698E-01
Eu-154	2.558E-03	Ba	2.157E+01
Eu-155	8.772E-04	Cd	4.530E-01
H-3	4.974E-02	Cl-2-x	8.722E-01
Nb-94	1.827E-03	Cl-3-x	2.419E+01
Ni-59	3.878E-02	Cl-4-x	3.963E-01
Ni-63	4.080E+00	Cl-F-x	1.019E+00
Pa-234m	8.837E-02	Cr	2.698E+01
Pu-238	2.716E-02	HC-insol	1.091E+02
Pu-239	4.386E-04	HC-solub	5.459E+01
Pu-240	6.579E-04	Hg	8.531E+00
Pu-241	2.877E-02	Pb	2.912E+01
Sm-151	8.327E-03	Se	3.668E+00
Sr-90	6.105E-01		
Tc-99	7.303E-03		
Th-232	7.310E-04		
Th-234	8.837E-02		
U-238	8.837E-02		
Y-90	6.105E-01		

A-66

Shipping Site: COLONIE

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 9.054E-01

Total Mass (kg/yr): 1.026E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	1.937E-06	57-12-5	5.151E-02
Bi-212	3.259E-07	75-09-2	7.241E-01
Pa-234	2.462E-07	Ag	2.274E-02
Pa-234m	2.392E-03	As	3.999E-03
Pb-212	3.259E-07	Ba	2.356E-02
Po-212	2.100E-07	Cd	5.620E-01
Po-216	3.259E-07	Cl-2-x	4.522E-01
Ra-224	3.259E-07	Cl-3-x	4.355E+01
Ra-228	1.937E-06	Cl-4-x	9.136E+00
Tc-99	3.603E-05	Cl-F-x	8.522E-02
Th-228	3.259E-07	Cr	5.418E-01
Th-231	1.868E-06	HC-insol	8.707E+01
Th-232	1.967E-05	HC-solub	1.317E+02
Th-234	2.392E-03	Hg	1.340E-01
Tl-208	1.231E-07	Pb	1.275E-01
U-235	1.861E-06	Se	1.998E-02
U-238	2.392E-03		

Shipping Site: COLONIE

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 1.235E-02

Total Mass (kg/yr): 1.606E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	3.198E-08	57-12-5	7.229E-04
Bi-212	5.380E-09	75-09-2	8.484E-04
Pa-234	4.065E-09	Ag	2.570E-05
Pa-234m	3.949E-05	As	2.249E-05
Pb-212	5.380E-09	Ba	1.606E-05
Po-212	3.467E-09	Cd	1.429E-04
Po-216	5.380E-09	Cl-2-x	4.242E-03
Ra-224	2.690E-09	Cl-3-x	5.345E-03
Ra-228	1.599E-08	Cl-4-x	5.006E-03
Tc-99	2.974E-07	Cl-F-x	4.242E-04
Th-228	5.380E-09	Cr	5.462E-04
Th-231	3.084E-08	HC-insol	9.333E-04
Th-232	3.247E-07	HC-solub	8.032E-04
Th-234	3.949E-05	Hg	3.695E-06
Tl-208	2.032E-09	Pb	1.044E-03
U-235	3.072E-08	Se	8.032E-06
U-238	3.949E-05		

Shipping Site: FEMP

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 2.034E+01

Total Mass (kg/yr): 2.423E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	4.353E-05	57-12-5	4.910E-01
Bi-212	7.324E-06	75-09-2	2.872E+01
Pa-234	5.533E-06	Ag	1.270E-01
Pa-234m	5.376E-02	As	6.728E-02
Pb-212	7.324E-06	Ba	2.928E-01
Po-212	4.720E-06	Cd	2.349E+01
Po-216	7.324E-06	Cl-2-x	1.522E+01
Ra-224	7.324E-06	Cl-3-x	1.621E+03
Ra-228	4.353E-05	Cl-4-x	3.603E+02
Tc-99	8.097E-04	Cl-F-x	6.895E-01
Th-228	7.324E-06	Cr	2.072E+01
Th-231	4.199E-05	HC-insol	3.779E+03
Th-232	4.420E-04	HC-solub	2.255E+03
Th-234	5.376E-02	Hg	9.307E-01
Tl-208	2.766E-06	Pb	4.623E+00
U-235	4.182E-05	Se	1.150E-01
U-238	5.376E-02		

Shipping Site: FEMP

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 7.909E+01

Total Mass (kg/yr): 1.180E+05

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	1.696E-04	57-12-5	5.948E+00
Bi-212	2.854E-05	75-09-2	2.117E+01
Pa-234	2.156E-05	Ag	3.226E+00
Pa-234m	2.095E-01	As	1.249E+00
Pb-212	2.854E-05	Ba	1.085E+02
Po-212	1.839E-05	Cd	6.815E+00
Po-216	2.854E-05	Cl-2-x	2.073E+01
Ra-224	2.837E-05	Cl-3-x	5.283E+02
Ra-228	1.686E-04	Cl-4-x	3.692E+02
Tc-99	3.136E-03	Cl-F-x	1.313E+01
Th-228	2.854E-05	Cr	1.531E+02
Th-231	1.636E-04	HC-insol	1.786E+03
Th-232	1.722E-03	HC-solub	9.390E+02
Th-234	2.095E-01	Hg	3.514E+01
Tl-208	1.078E-05	Pb	1.240E+02
U-235	1.630E-04	Se	1.366E+01
U-238	2.095E-01		

Shipping Site: KAPL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 6.167E-01

Total Mass (kg/yr): 7.065E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	4.129E-01	57-12-5	2.915E-02
Co-60	6.669E+00	75-09-2	5.312E-01
Cs-134	3.921E-03	Ag	1.461E-02
Cs-137	4.359E-01	As	2.952E-03
Eu-154	5.305E-03	Ba	1.739E-02
Eu-155	2.537E-03	Cd	4.125E-01
Fe-55	8.719E-01	Cl-2-x	3.320E-01
H-3	1.899E+00	Cl-3-x	3.184E+01
Mn-54	2.768E-03	Cl-4-x	6.682E+00
Nb-94	4.152E-03	Cl-F-x	6.275E-02
Ni-59	8.719E-02	Cr	3.877E-01
Ni-63	1.172E+01	HC-insol	6.386E+01
Pa-234m	1.637E-02	HC-solub	7.952E+01
Pm-147	4.752E-02	Hg	8.511E-02
Pu-238	1.361E-02	Pb	9.130E-02
Pu-241	1.107E-02	Se	1.277E-02
Sb-125	1.845E-03		
Sm-151	3.690E-03		
Sr-90	4.106E-01		
Te-125m	4.613E-04		
Th-234	1.637E-02		
U-238	1.637E-02		
Y-90	4.106E-01		

Shipping Site: KAPL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.572E+00

Total Mass (kg/yr): 5.162E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.391E+00	57-12-5	1.840E-02
Co-60	3.862E+01	75-09-2	2.577E+00
Cs-134	2.271E-02	Ag	6.267E-02
Cs-137	2.525E+00	As	2.265E-02
Eu-154	3.072E-02	Ba	5.050E-01
Eu-155	1.469E-02	Cd	2.428E-02
Fe-55	5.050E+00	Cl-2-x	1.464E+00
H-3	1.100E+01	Cl-3-x	1.328E+01
Mn-54	1.603E-02	Cl-4-x	1.024E+01
Nb-94	2.404E-02	Cl-F-x	4.115E-01
Ni-59	5.050E-01	Cr	4.769E-01
Ni-63	6.790E+01	HC-insol	3.511E+01
Pa-234m	9.486E-02	HC-solub	1.516E+01
Pm-147	2.752E-01	Hg	6.065E-02
Pu-238	7.882E-02	Pb	7.229E-01
Pu-241	6.413E-02	Se	1.698E-02
Sb-125	1.068E-02		
Sm-151	2.137E-02		
Sr-90	2.378E+00		
Te-125m	2.672E-03		
Th-234	9.486E-02		
U-238	9.486E-02		
Y-90	2.378E+00		

Shipping Site: KKS

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 4.733E-01

Total Mass (kg/yr): 5.422E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	3.168E-01	57-12-5	2.237E-02
Co-60	5.118E+00	75-09-2	4.077E-01
Cs-134	3.009E-03	Ag	1.121E-02
Cs-137	3.345E-01	As	2.266E-03
Eu-154	4.071E-03	Ba	1.335E-02
Eu-155	1.947E-03	Cd	3.166E-01
Fe-55	6.691E-01	Cl-2-x	2.548E-01
H-3	1.457E+00	Cl-3-x	2.443E+01
Mn-54	2.124E-03	Cl-4-x	5.128E+00
Nb-94	3.186E-03	Cl-F-x	4.816E-02
Ni-59	6.691E-02	Cr	2.976E-01
Ni-63	8.997E+00	HC-insol	4.901E+01
Pa-234m	1.256E-02	HC-solub	6.103E+01
Pm-147	3.646E-02	Hg	6.532E-02
Pu-238	1.044E-02	Pb	7.007E-02
Pu-241	8.497E-03	Se	9.805E-03
Sb-125	1.416E-03		
Sm-151	2.832E-03		
Sr-90	3.151E-01		
Te-125m	3.540E-04		
Th-234	1.256E-02		
U-238	1.256E-02		
Y-90	3.151E-01		

Shipping Site: KKS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.928E+00

Total Mass (kg/yr): 6.620E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.630E+00	57-12-5	1.282E-01
Co-60	4.248E+01	75-09-2	2.231E+00
Cs-134	2.497E-02	Ag	8.783E-02
Cs-137	2.776E+00	As	3.299E-02
Eu-154	3.379E-02	Ba	1.662E+00
Eu-155	1.616E-02	Cd	5.269E-02
Fe-55	5.553E+00	Cl-2-x	1.281E+00
H-3	1.209E+01	Cl-3-x	1.108E+01
Mn-54	1.763E-02	Cl-4-x	1.215E+01
Nb-94	2.644E-02	Cl-F-x	2.090E-01
Ni-59	5.553E-01	Cr	1.846E+00
Ni-63	7.467E+01	HC-insol	2.753E+01
Pa-234m	1.043E-01	HC-solub	1.411E+01
Pm-147	3.026E-01	Hg	1.438E-01
Pu-238	8.668E-02	Pb	4.165E+00
Pu-241	7.052E-02	Se	3.790E-02
Sb-125	1.175E-02		
Sm-151	2.350E-02		
Sr-90	2.615E+00		
Te-125m	2.938E-03		
Th-234	1.043E-01		
U-238	1.043E-01		
Y-90	2.615E+00		

Shipping Site: KWS

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 6.454E-02

Total Mass (kg/yr): 7.394E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	4.321E-02	57-12-5	3.051E-03
Co-60	6.979E-01	75-09-2	5.559E-02
Cs-134	4.103E-04	Ag	1.529E-03
Cs-137	4.562E-02	As	3.090E-04
Eu-154	5.552E-04	Ba	1.820E-03
Eu-155	2.655E-04	Cd	4.317E-02
Fe-55	9.125E-02	Cl-2-x	3.474E-02
H-3	1.987E-01	Cl-3-x	3.332E+00
Mn-54	2.896E-04	Cl-4-x	6.993E-01
Nb-94	4.345E-04	Cl-F-x	6.567E-03
Ni-59	9.125E-03	Cr	4.058E-02
Ni-63	1.226E+00	HC-insol	6.683E+00
Pa-234m	1.714E-03	HC-solub	8.322E+00
Pm-147	4.973E-03	Hg	8.907E-03
Pu-238	1.424E-03	Pb	9.555E-03
Pu-241	1.158E-03	Se	1.337E-03
Sb-125	1.931E-04		
Sm-151	3.862E-04		
Sr-90	4.297E-02		
Te-125m	4.828E-05		
Th-234	1.714E-03		
U-238	1.714E-03		
Y-90	4.297E-02		

Shipping Site: KWS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 1.262E+00

Total Mass (kg/yr): 1.580E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	8.449E-01	57-12-5	8.005E-02
Co-60	1.364E+01	75-09-2	3.801E-01
Cs-134	8.024E-03	Ag	2.572E-02
Cs-137	8.921E-01	As	8.795E-03
Eu-154	1.085E-02	Ba	1.035E+00
Eu-155	5.192E-03	Cd	1.157E-02
Fe-55	1.784E+00	Cl-2-x	3.221E-01
H-3	3.886E+00	Cl-3-x	1.699E+00
Mn-54	5.664E-03	Cl-4-x	1.988E+00
Nb-94	8.496E-03	Cl-F-x	2.323E-01
Ni-59	1.784E-01	Cr	1.010E+00
Ni-63	2.399E+01	HC-insol	4.421E+00
Pa-234m	3.351E-02	HC-solub	1.600E+00
Pm-147	9.724E-02	Hg	6.065E-02
Pu-238	2.785E-02	Pb	2.396E+00
Pu-241	2.265E-02	Se	1.789E-02
Sb-125	3.776E-03		
Sm-151	7.552E-03		
Sr-90	8.402E-01		
Te-125m	9.440E-04		
Th-234	3.351E-02		
U-238	3.351E-02		
Y-90	8.402E-01		

Shipping Site: PNS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 5.200E-02

Total Mass (kg/yr): 9.088E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	3.481E-02	75-09-2	1.324E-02
Co-60	5.623E-01	Ag	6.570E-04
Cs-134	3.306E-04	As	5.453E-04
Cs-137	3.676E-02	Ba	1.708E-02
Eu-154	4.473E-04	Cd	8.438E-03
Eu-155	2.139E-04	Cl-2-x	1.324E-02
Fe-55	7.352E-02	Cl-3-x	7.909E-01
H-3	1.601E-01	Cl-4-x	1.483E-01
Mn-54	2.333E-04	Cl-F-x	7.499E-03
Nb-94	3.500E-04	Cr	1.051E-01
Ni-59	7.352E-03	HC-insol	2.629E+00
Ni-63	9.884E-01	HC-solub	1.314E+00
Pa-234m	1.380E-03	Hg	9.046E-03
Pm-147	4.006E-03	Pb	1.319E-02
Pu-238	1.147E-03	Se	2.365E-03
Pu-241	9.335E-04		
Sb-125	1.555E-04		
Sm-151	3.111E-04		
Sr-90	3.462E-02		
Te-125m	3.889E-05		
Th-234	1.380E-03		
U-238	1.380E-03		
Y-90	3.462E-02		

Shipping Site: PPPL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 5.456E-04

Total Mass (kg/yr): 7.191E-01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	7.218E-06	75-09-2	1.438E-02
Cs-137	7.562E-06	Cl-2-x	7.190E-03
H-3	3.433E-02	Cl-3-x	7.190E-02
Pa-234m	1.753E-06	Cl-4-x	5.752E-02
Pu-241	1.718E-06	HC-insol	1.797E-01
Sr-90	7.218E-06	HC-solub	8.629E-02
Th-234	1.753E-06		
U-238	1.753E-06		
Y-90	7.218E-06		

Shipping Site: RMI

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 6.677E-01

Total Mass (kg/yr): 9.741E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	1.429E-06	75-09-2	1.527E+00
Bi-212	2.403E-07	As	3.769E-04
Pa-234	1.816E-07	Ba	1.615E-03
Pa-234m	1.764E-03	Cd	1.071E+00
Pb-212	2.403E-07	Cl-2-x	8.108E-01
Po-212	1.549E-07	Cl-3-x	1.123E+02
Po-216	2.403E-07	Cl-4-x	2.505E+01
Ra-224	2.403E-07	Cl-F-x	4.625E-02
Ra-228	1.429E-06	Cr	9.331E-01
Tc-99	2.657E-05	HC-insol	2.184E+01
Th-228	2.403E-07	HC-solub	1.277E+01
Th-231	1.378E-06	Hg	6.122E-03
Th-232	1.450E-05	Pb	2.045E-01
Th-234	1.764E-03		
Tl-208	9.081E-08		
U-235	1.372E-06		
U-238	1.764E-03		

Shipping Site: RMI

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 1.091E+00

Total Mass (kg/yr): 8.323E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	2.370E-06	57-12-5	4.647E-03
Bi-212	3.988E-07	75-09-2	2.315E-01
Pa-234	3.013E-07	Ag	6.651E-03
Pa-234m	2.927E-03	As	1.974E-03
Pb-212	3.988E-07	Ba	5.734E-01
Po-212	2.570E-07	Cd	1.836E-02
Po-216	3.988E-07	Cl-2-x	2.862E-01
Ra-224	3.815E-07	Cl-3-x	2.561E+00
Ra-228	2.267E-06	Cl-4-x	7.371E-01
Tc-99	4.218E-05	Cl-F-x	3.452E-01
Th-228	3.988E-07	Cr	2.638E-01
Th-231	2.286E-06	HC-insol	8.888E+00
Th-232	2.407E-05	HC-solub	2.825E+00
Th-234	2.927E-03	Hg	2.678E-02
Tl-208	1.506E-07	Pb	8.498E-02
U-235	2.277E-06	Se	6.070E-03
U-238	2.927E-03		

Destination Site: RFP

Waste Type: Organic Liquids (CH-Non-alpha)

Shipping Site: GJCT

Total Volume (m3/yr): 1.290E-02 Total Mass (kg/yr): 1.478E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	2.762E-08	57-12-5	6.102E-04
Bi-212	4.647E-09	75-09-2	1.111E-02
Pa-234	3.511E-09	Ag	3.059E-04
Pa-234m	3.411E-05	As	6.180E-05
Pb-212	4.647E-09	Ba	3.641E-04
Po-212	2.995E-09	Cd	8.635E-03
Po-216	4.647E-09	Cl-2-x	6.949E-03
Ra-224	4.647E-09	Cl-3-x	6.665E-01
Ra-228	2.762E-08	Cl-4-x	1.398E-01
Tc-99	5.138E-07	Cl-F-x	1.313E-03
Th-228	4.647E-09	Cr	8.116E-03
Th-231	2.664E-08	HC-insol	1.336E+00
Th-232	2.805E-07	HC-solub	1.664E+00
Th-234	3.411E-05	Hg	1.781E-03
Tl-208	1.756E-09	Pb	1.911E-03
U-235	2.654E-08	Se	2.674E-04
U-238	3.411E-05		

Shipping Site: GJCT

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 2.953E-02 Total Mass (kg/yr): 5.478E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	6.356E-08	57-12-5	1.997E-04
Bi-212	1.069E-08	75-09-2	1.051E-03
Pa-234	8.080E-09	Ag	6.108E-04
Pa-234m	7.849E-05	As	2.981E-04
Pb-212	1.069E-08	Ba	3.480E-03
Po-212	6.891E-09	Cd	4.003E-04
Po-216	1.069E-08	Cl-2-x	1.051E-03
Ra-224	1.054E-08	Cl-3-x	2.387E-02
Ra-228	6.268E-08	Cl-4-x	7.830E-03
Tc-99	1.165E-06	Cl-F-x	5.619E-04
Th-228	1.069E-08	Cr	4.507E-03
Th-231	6.131E-08	HC-insol	7.674E-02
Th-232	6.454E-07	HC-solub	8.522E-02
Th-234	7.849E-05	Hg	1.306E-03
Tl-208	4.040E-09	Pb	5.304E-03
U-235	6.107E-08	Se	4.666E-04
U-238	7.849E-05		

Shipping Site: KCP

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 4.219E-02

Total Mass (kg/yr): 3.237E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.824E-02	75-09-2	2.982E-02
Co-60	4.562E-01	Ag	1.504E-04
Cs-134	2.682E-04	As	2.945E-05
Cs-137	2.982E-02	Ba	6.019E-03
Eu-154	3.629E-04	Cd	5.228E-03
Eu-155	1.735E-04	Cl-2-x	1.746E-02
Fe-55	5.964E-02	Cl-3-x	7.227E-02
H-3	1.299E-01	Cl-4-x	3.884E-02
Mn-54	1.893E-04	Cl-F-x	2.371E-02
Nb-94	2.840E-04	Cr	2.621E-02
Ni-59	5.964E-03	HC-insol	1.522E-01
Ni-63	8.019E-01	HC-solub	1.618E-04
Pa-234m	1.120E-03	Hg	4.361E-03
Pm-147	3.250E-03	Pb	1.747E-01
Pu-238	9.309E-04	Se	3.916E-04
Pu-241	7.573E-04		
Sb-125	1.262E-04		
Sm-151	2.524E-04		
Sr-90	2.808E-02		
Te-125m	3.155E-05		
Th-234	1.120E-03		
U-238	1.120E-03		
Y-90	2.808E-02		

Destination Site: SRS

Shipping Site: CNS

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 9.054E-01 Total Mass (kg/yr): 1.026E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	6.061E-01	57-12-5	5.151E-02
Co-60	9.790E+00	75-09-2	7.241E-01
Cs-134	5.756E-03	Ag	2.274E-02
Cs-137	6.400E-01	As	3.999E-03
Eu-154	7.788E-03	Ba	2.356E-02
Eu-155	3.724E-03	Cd	5.620E-01
Fe-55	1.280E+00	Cl-2-x	4.522E-01
H-3	2.788E+00	Cl-3-x	4.355E+01
Mn-54	4.063E-03	Cl-4-x	9.136E+00
Nb-94	6.095E-03	Cl-F-x	8.522E-02
Ni-59	1.280E-01	Cr	5.418E-01
Ni-63	1.720E+01	HC-insol	8.707E+01
Pa-234m	2.404E-02	HC-solub	1.317E+02
Pm-147	6.975E-02	Hg	1.340E-01
Pu-238	1.997E-02	Pb	1.275E-01
Pu-241	1.625E-02	Se	1.998E-02
Sb-125	2.709E-03		
Sm-151	5.418E-03		
Sr-90	6.027E-01		
Te-125m	6.772E-04		
Th-234	2.404E-02		
U-238	2.404E-02		
Y-90	6.027E-01		

Shipping Site: CNS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 9.030E-02 Total Mass (kg/yr): 6.772E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	6.218E-02	57-12-5	2.357E-03
Co-60	1.004E+00	75-09-2	2.142E-02
Cs-134	5.431E-04	Ag	7.345E-04
Cs-137	6.038E-02	As	2.549E-04
Eu-154	7.990E-04	Ba	3.376E-02
Eu-155	3.821E-04	Cd	2.213E-03
Fe-55	1.313E-01	Cl-2-x	2.738E-02
H-3	2.860E-01	Cl-3-x	2.718E-01
Mn-54	4.169E-04	Cl-4-x	7.524E-02
Nb-94	6.253E-04	Cl-F-x	2.847E-02
Ni-59	1.313E-02	Cr	2.755E-02
Ni-63	1.765E+00	HC-insol	9.141E-01
Pa-234m	2.466E-03	HC-solub	3.299E-01
Pm-147	7.156E-03	Hg	3.234E-03
Pu-238	2.049E-03	Pb	5.496E-02
Pu-241	1.667E-03	Se	9.647E-04
Sb-125	2.779E-04		
Sm-151	5.558E-04		
Sr-90	5.686E-02		
Te-125m	6.948E-05		
Th-234	2.466E-03		
U-238	2.466E-03		
Y-90	5.686E-02		

Shipping Site: NNS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.560E-01

Total Mass (kg/yr): 3.925E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.383E-01	75-09-2	1.041E-01
Co-60	3.849E+00	Ag	3.925E-03
Cs-134	2.263E-03	As	2.726E-03
Cs-137	2.516E-01	Ba	1.110E-01
Eu-154	3.062E-03	Cd	3.955E-02
Eu-155	1.464E-03	Cl-2-x	1.105E-01
Fe-55	5.032E-01	Cl-3-x	4.102E+00
H-3	1.096E+00	Cl-4-x	7.996E-01
Mn-54	1.597E-03	Cl-F-x	9.360E-02
Nb-94	2.396E-03	Cr	1.488E-01
Ni-59	5.032E-02	HC-insol	1.378E+01
Ni-63	6.766E+00	HC-solub	6.570E+00
Pa-234m	9.453E-03	Hg	4.448E-02
Pm-147	2.742E-02	Pb	7.211E-02
Pu-238	7.855E-03	Se	1.201E-02
Pu-241	6.390E-03		
Sb-125	1.065E-03		
Sm-151	2.130E-03		
Sr-90	2.369E-01		
Te-125m	2.662E-04		
Th-234	9.453E-03		
U-238	9.453E-03		
Y-90	2.369E-01		

A.5 WM LLMW REGIONALIZED 4 ALTERNATIVE (CASE 15)

Waste Stream: MLLW
6 Disposal Sites

Alternative: 15 Regional 4 Treatment Sites -

Destination Site: HANF

Shipping Site: LBL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 3.230E-01 Total Mass (kg/yr): 3.100E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	4.273E-03	75-09-2	2.976E-01
Cs-137	4.476E-03	As	2.387E-03
H-3	2.032E+01	Ba	1.023E-02
Pa-234m	1.037E-03	Cd	3.410E-01
Pu-241	1.017E-03	Cl-2-x	1.550E-01
Sr-90	4.273E-03	Cl-3-x	2.325E+00
Th-234	1.037E-03	Cl-4-x	4.961E-01
U-238	1.037E-03	Cr	2.852E-01
Y-90	4.273E-03	HC-insol	1.364E+02
		HC-solub	4.341E+01
		Hg	1.860E-03
		Pb	6.511E-02

Shipping Site: LBL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.112E+00 Total Mass (kg/yr): 4.402E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	4.117E-02	57-12-5	5.503E-01
Cs-137	4.314E-02	75-09-2	1.116E+01
H-3	1.958E+02	Ag	1.516E-01
Pa-234m	1.000E-02	As	3.237E-02
Pu-241	9.804E-03	Ba	6.474E+00
Sr-90	4.117E-02	Cd	1.754E-02
Th-234	1.000E-02	Cl-2-x	5.905E+00
U-238	1.000E-02	Cl-3-x	5.439E+01
Y-90	4.117E-02	Cl-4-x	4.320E+01
		Cl-F-x	3.237E-01
		Cr	6.485E+00
		HC-insol	1.314E+02
		HC-solub	6.326E+01
		Hg	3.242E-01
		Pb	1.619E+01
		Se	9.711E-02

Shipping Site: LERHR

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 5.020E-03

Total Mass (kg/yr): 5.750E+00

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	2.470E-07	57-12-5	2.373E-04
Ba-137m	3.636E-04	75-09-2	4.324E-03
Co-60	1.353E-04	Ag	1.189E-04
Cs-137	3.888E-04	As	2.403E-05
Eu-154	1.440E-06	Ba	1.415E-04
Eu-155	4.940E-07	Cd	3.358E-03
H-3	2.801E-05	Cl-2-x	2.702E-03
Nb-94	1.029E-06	Cl-3-x	2.592E-01
Ni-59	2.183E-05	Cl-4-x	5.439E-02
Ni-63	2.297E-03	Cl-F-x	5.108E-04
Pa-234m	4.976E-05	Cr	3.156E-03
Pu-238	1.529E-05	HC-insol	5.198E-01
Pu-239	2.470E-07	HC-solub	6.473E-01
Pu-240	3.705E-07	Hg	6.928E-04
Pu-241	1.620E-05	Pb	7.432E-04
Sm-151	4.688E-06	Se	1.039E-04
Sr-90	3.438E-04		
Tc-99	4.112E-06		
Th-232	4.116E-07		
Th-234	4.976E-05		
U-238	4.976E-05		
Y-90	3.438E-04		

Shipping Site: LERHR

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.442E-01

Total Mass (kg/yr): 2.492E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	1.701E-05	57-12-5	4.707E-04
Ba-137m	2.505E-02	75-09-2	1.438E-01
Co-60	9.323E-03	Ag	2.547E-03
Cs-137	2.641E-02	As	1.464E-05
Eu-154	9.928E-05	Ba	3.843E-02
Eu-155	3.403E-05	Cd	8.851E-03
H-3	1.930E-03	Cl-2-x	1.556E-01
Nb-94	7.091E-05	Cl-3-x	6.005E-01
Ni-59	1.504E-03	Cl-4-x	2.831E+00
Ni-63	1.583E-01	Cl-F-x	1.391E-01
Pa-234m	3.428E-03	Cr	4.652E-03
Pu-238	1.054E-03	HC-insol	1.675E+00
Pu-239	1.701E-05	HC-solub	3.579E-01
Pu-240	2.552E-05	Hg	5.762E-03
Pu-241	1.116E-03	Pb	1.542E-02
Sm-151	3.230E-04	Se	4.361E-04
Sr-90	2.335E-02		
Tc-99	2.793E-04		
Th-232	2.836E-05		
Th-234	3.428E-03		
U-238	3.428E-03		
Y-90	2.335E-02		

Shipping Site: LLNL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 7.727E+01

Total Mass (kg/yr): 8.159E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.022E+00	57-12-5	7.162E+00
Cs-137	1.071E+00	75-09-2	5.434E+00
H-3	4.863E+03	Ag	3.590E+00
Pa-234m	2.482E-01	As	4.598E-01
Pu-241	2.434E-01	Ba	3.135E+00
Sr-90	1.022E+00	Cd	1.949E-01
Th-234	2.482E-01	Cl-2-x	1.546E+01
U-238	2.482E-01	Cl-3-x	6.087E+02
Y-90	1.022E+00	Cl-4-x	3.439E+01
		Cl-F-x	1.254E+01
		Cr	8.355E+00
		HC-insol	5.003E+02
		HC-solub	1.434E+04
		Hg	2.033E+01
		Pb	3.118E+00
		Se	3.138E+00

Shipping Site: LLNL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 4.978E+01

Total Mass (kg/yr): 6.833E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	6.586E-01	57-12-5	8.172E+00
Cs-137	6.899E-01	75-09-2	8.995E+00
H-3	3.132E+03	Ag	3.852E+00
Pa-234m	1.599E-01	As	1.401E+00
Pu-241	1.568E-01	Ba	1.097E+02
Sr-90	6.586E-01	Cd	2.705E+00
Th-234	1.599E-01	Cl-2-x	7.372E+00
U-238	1.599E-01	Cl-3-x	1.900E+02
Y-90	6.586E-01	Cl-4-x	3.100E+01
		Cl-F-x	5.418E+00
		Cr	1.262E+02
		HC-insol	7.525E+02
		HC-solub	3.756E+02
		Hg	4.188E+01
		Pb	1.529E+02
		Se	1.787E+01

Shipping Site: MINS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.647E+00

Total Mass (kg/yr): 3.545E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.441E+00	75-09-2	5.544E-01
Co-60	3.943E+01	Ag	1.457E-02
Cs-134	2.318E-02	As	7.197E-03
Cs-137	2.578E+00	Ba	2.427E+00
Eu-154	3.137E-02	Cd	1.150E-01
Eu-155	1.500E-02	Cl-2-x	5.975E-01
Fe-55	5.156E+00	Cl-3-x	1.190E+01
H-3	1.123E+01	Cl-4-x	2.652E+00
Mn-54	1.636E-02	Cl-F-x	6.891E-01
Nb-94	2.455E-02	Cr	7.414E-01
Ni-59	5.156E-01	HC-insol	4.047E+01
Ni-63	6.932E+01	HC-solub	1.726E+01
Pa-234m	9.684E-02	Hg	5.165E-01
Pm-147	2.809E-01	Pb	4.557E-01
Pu-238	8.047E-02	Se	3.325E-02
Pu-241	6.547E-02		
Sb-125	1.091E-02		
Sm-151	2.182E-02		
Sr-90	2.427E+00		
Te-125m	2.728E-03		
Th-234	9.684E-02		
U-238	9.684E-02		
Y-90	2.427E+00		

Shipping Site: PHNS

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 1.736E-03

Total Mass (kg/yr): 1.979E+00

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.162E-03	75-09-2	2.572E-04
Co-60	1.877E-02	Ag	8.707E-05
Cs-134	1.103E-05	As	2.176E-05
Cs-137	1.227E-03	Ba	1.484E-04
Eu-154	1.493E-05	Cl-2-x	7.322E-04
Eu-155	7.141E-06	Cl-3-x	2.731E-02
Fe-55	2.454E-03	Cl-4-x	1.543E-03
H-3	5.346E-03	Cl-F-x	5.937E-04
Mn-54	7.791E-06	HC-insol	2.968E-03
Nb-94	1.168E-05	HC-solub	7.718E-04
Ni-59	2.454E-04	Hg	4.353E-04
Ni-63	3.299E-02	Pb	5.343E-05
Pa-234m	4.609E-05	Se	7.322E-05
Pm-147	1.337E-04		
Pu-238	3.830E-05		
Pu-241	3.116E-05		
Sb-125	5.194E-06		
Sm-151	1.038E-05		
Sr-90	1.155E-03		
Te-125m	1.298E-06		
Th-234	4.609E-05		
U-238	4.609E-05		
Y-90	1.155E-03		

Shipping Site: PHNS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 2.962E-01

Total Mass (kg/yr): 4.406E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.983E-01	57-12-5	4.073E-03
Co-60	3.204E+00	75-09-2	5.831E-02
Cs-134	1.883E-03	Ag	2.691E-03
Cs-137	2.094E-01	As	1.603E-03
Eu-154	2.548E-03	Ba	1.038E-01
Eu-155	1.218E-03	Cd	2.472E-02
Fe-55	4.188E-01	Cl-2-x	6.160E-02
H-3	9.124E-01	Cl-3-x	2.088E+00
Mn-54	1.329E-03	Cl-4-x	4.422E-01
Nb-94	1.994E-03	Cl-F-x	6.398E-02
Ni-59	4.188E-02	Cr	7.805E-01
Ni-63	5.631E+00	HC-insol	6.908E+00
Pa-234m	7.867E-03	HC-solub	3.289E+00
Pm-147	2.282E-02	Hg	2.617E-02
Pu-238	6.538E-03	Pb	1.563E-01
Pu-241	5.319E-03	Se	6.731E-03
Sb-125	8.865E-04		
Sm-151	1.773E-03		
Sr-90	1.972E-01		
Te-125m	2.216E-04		
Th-234	7.867E-03		
U-238	7.867E-03		
Y-90	1.972E-01		

Shipping Site: PSNS

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 3.990E-02

Total Mass (kg/yr): 5.986E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.671E-02	75-09-2	9.577E-02
Co-60	4.315E-01	Cd	6.584E-02
Cs-134	2.537E-04	Cl-2-x	5.088E-02
Cs-137	2.820E-02	Cl-3-x	7.243E+00
Eu-154	3.432E-04	Cl-4-x	1.616E+00
Eu-155	1.641E-04	Cl-F-x	2.993E-03
Fe-55	5.641E-02	Cr	5.746E-02
H-3	1.228E-01	HC-insol	1.975E-02
Mn-54	1.791E-04	HC-solub	3.831E-01
Nb-94	2.686E-04	Hg	3.771E-04
Ni-59	5.641E-03	Pb	1.257E-02
Ni-63	7.585E-01		
Pa-234m	1.059E-03		
Pm-147	3.074E-03		
Pu-238	8.806E-04		
Pu-241	7.164E-04		
Sb-125	1.194E-04		
Sm-151	2.388E-04		
Sr-90	2.656E-02		
Te-125m	2.985E-05		
Th-234	1.059E-03		
U-238	1.059E-03		
Y-90	2.656E-02		

Shipping Site: PSNS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr):

6.586E+00

Total Mass (kg/yr):

9.518E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	4.409E+00	57-12-5	7.312E-01
Co-60	7.122E+01	75-09-2	1.279E+00
Cs-134	4.187E-02	Ag	1.357E-01
Cs-137	4.655E+00	As	4.301E-02
Eu-154	5.665E-02	Ba	8.869E+00
Eu-155	2.709E-02	Cd	1.229E-01
Fe-55	9.311E+00	Cl-2-x	1.346E+00
H-3	2.028E+01	Cl-3-x	4.520E+00
Mn-54	2.956E-02	Cl-4-x	2.989E+00
Nb-94	4.434E-02	Cl-F-x	1.385E+00
Ni-59	9.311E-01	Cr	2.225E+01
Ni-63	1.251E+02	HC-insol	6.852E+00
Pa-234m	1.749E-01	HC-solub	2.684E-01
Pm-147	5.074E-01	Hg	4.633E-01
Pu-238	1.453E-01	Pb	2.158E+01
Pu-241	1.182E-01	Se	1.310E-01
Sb-125	1.970E-02		
Sm-151	3.941E-02		
Sr-90	4.384E+00		
Te-125m	4.926E-03		
Th-234	1.749E-01		
U-238	1.749E-01		
Y-90	4.384E+00		

Shipping Site: SNLL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr):

7.662E+00

Total Mass (kg/yr):

7.356E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.013E-01	75-09-2	7.061E+00
Cs-137	1.062E-01	As	5.664E-02
H-3	4.822E+02	Ba	2.427E-01
Pa-234m	2.462E-02	Cd	8.091E+00
Pu-241	2.413E-02	Cl-2-x	3.678E+00
Sr-90	1.013E-01	Cl-3-x	5.517E+01
Th-234	2.462E-02	Cl-4-x	1.176E+01
U-238	2.462E-02	Cr	6.767E+00
Y-90	1.013E-01	HC-insol	3.236E+03
		HC-solub	1.029E+03
		Hg	4.413E-02
		Pb	1.544E+00

Shipping Site: SNLL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr):

7.770E-01

Total Mass (kg/yr):

1.193E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.027E-02	57-12-5	6.924E-03
Cs-137	1.076E-02	75-09-2	7.497E+00
H-3	4.890E+01	Ag	1.014E-02
Pa-234m	2.496E-03	As	6.737E-03
Pu-241	2.447E-03	Ba	3.347E-01
Sr-90	1.027E-02	Cd	8.243E-02
Th-234	2.496E-03	Cl-2-x	3.816E+00
U-238	2.496E-03	Cl-3-x	4.480E+01
Y-90	1.027E-02	Cl-4-x	3.090E+01
		Cl-F-x	6.827E-02
		Cr	6.765E-01
		HC-insol	1.187E+02
		HC-solub	5.754E+01
		Hg	1.257E-01
		Pb	2.595E-01
		Se	3.934E-02

Destination Site: INEL

Shipping Site: ETEC

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 6.767E-03

Total Mass (kg/yr): 7.145E+00

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	3.329E-07	57-12-5	6.272E-04
Ba-137m	4.901E-04	75-09-2	4.759E-04
Co-60	1.823E-04	Ag	3.144E-04
Cs-137	5.241E-04	As	4.027E-05
Eu-154	1.942E-06	Ba	2.745E-04
Eu-155	6.659E-07	Cd	1.707E-05
H-3	3.775E-05	Cl-2-x	1.354E-03
Nb-94	1.387E-06	Cl-3-x	5.331E-02
Ni-59	2.943E-05	Cl-4-x	3.012E-03
Ni-63	3.097E-03	Cl-F-x	1.098E-03
Pa-234m	6.707E-05	Cr	7.317E-04
Pu-238	2.062E-05	HC-insol	4.382E-02
Pu-239	3.329E-07	HC-solub	1.255E+00
Pu-240	4.994E-07	Hg	1.781E-03
Pu-241	2.184E-05	Pb	2.730E-04
Sm-151	6.320E-06	Se	2.748E-04
Sr-90	4.634E-04		
Tc-99	5.543E-06		
Th-232	5.549E-07		
Th-234	6.707E-05		
U-238	6.707E-05		
Y-90	4.634E-04		

Shipping Site: ETEC

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 7.380E+01

Total Mass (kg/yr): 1.326E+05

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	3.631E-03	57-12-5	4.222E-02
Ba-137m	5.346E+00	75-09-2	1.466E-01
Co-60	1.989E+00	Ag	1.331E+00
Cs-137	5.716E+00	As	6.654E-01
Eu-154	2.118E-02	Ba	2.587E+00
Eu-155	7.262E-03	Cd	4.415E-01
H-3	4.118E-01	Cl-2-x	1.504E-01
Nb-94	1.513E-02	Cl-3-x	5.990E+00
Ni-59	3.210E-01	Cl-4-x	1.869E+00
Ni-63	3.377E+01	Cl-F-x	9.652E-02
Pa-234m	7.316E-01	Cr	3.303E+00
Pu-238	2.249E-01	HC-insol	1.648E+01
Pu-239	3.631E-03	HC-solub	8.724E+00
Pu-240	5.447E-03	Hg	7.346E-01
Pu-241	2.382E-01	Pb	6.598E+00
Sm-151	6.893E-02	Se	2.188E-01
Sr-90	5.054E+00		
Tc-99	6.046E-02		
Th-232	6.052E-03		
Th-234	7.316E-01		
U-238	7.316E-01		
Y-90	5.054E+00		

Shipping Site: GATOMIC

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 7.077E-02

Total Mass (kg/yr): 7.476E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	1.514E-07	57-12-5	6.543E-03
Bi-212	2.547E-08	75-09-2	5.261E-03
Pa-234	1.925E-08	Ag	3.280E-03
Pa-234m	1.870E-04	As	4.207E-04
Pb-212	2.547E-08	Ba	2.867E-03
Po-212	1.642E-08	Cd	4.175E-04
Po-216	2.547E-08	Cl-2-x	1.428E-02
Ra-224	2.547E-08	Cl-3-x	5.732E-01
Ra-228	1.514E-07	Cl-4-x	3.523E-02
Tc-99	2.816E-06	Cl-F-x	1.146E-02
Th-228	2.547E-08	Cr	7.839E-03
Th-231	1.460E-07	HC-insol	4.931E-01
Th-232	1.537E-06	HC-solub	1.311E+01
Th-234	1.870E-04	Hg	1.858E-02
Tl-208	9.625E-09	Pb	2.894E-03
U-235	1.455E-07	Se	2.867E-03
U-238	1.870E-04		

Shipping Site: GATOMIC

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 5.632E-01

Total Mass (kg/yr): 8.419E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	1.218E-06	57-12-5	9.298E-02
Bi-212	2.049E-07	75-09-2	1.998E-01
Pa-234	1.548E-07	Ag	2.502E-02
Pa-234m	1.504E-03	As	9.721E-03
Pb-212	2.049E-07	Ba	1.175E+00
Po-212	1.320E-07	Cd	4.463E-02
Po-216	2.049E-07	Cl-2-x	1.741E-01
Ra-224	1.996E-07	Cl-3-x	3.347E+00
Ra-228	1.186E-06	Cl-4-x	8.150E-01
Tc-99	2.207E-05	Cl-F-x	1.017E-01
Th-228	2.049E-07	Cr	1.315E+00
Th-231	1.175E-06	HC-insol	1.041E+01
Th-232	1.237E-05	HC-solub	6.899E+00
Th-234	1.504E-03	Hg	1.942E-01
Tl-208	7.742E-08	Pb	2.810E+00
U-235	1.170E-06	Se	7.067E-02
U-238	1.504E-03		

Shipping Site: GJCT

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 1.290E-02

Total Mass (kg/yr): 1.478E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	2.762E-08	57-12-5	6.102E-04
Bi-212	4.647E-09	75-09-2	1.111E-02
Pa-234	3.511E-09	Ag	3.059E-04
Pa-234m	3.411E-05	As	6.180E-05
Pb-212	4.647E-09	Ba	3.641E-04
Po-212	2.995E-09	Cd	8.635E-03
Po-216	4.647E-09	Cl-2-x	6.949E-03
Ra-224	4.647E-09	Cl-3-x	6.665E-01
Ra-228	2.762E-08	Cl-4-x	1.398E-01
Tc-99	5.138E-07	Cl-F-x	1.313E-03
Th-228	4.647E-09	Cr	8.116E-03
Th-231	2.664E-08	HC-insol	1.336E+00
Th-232	2.805E-07	HC-solub	1.664E+00
Th-234	3.411E-05	Hg	1.781E-03
Tl-208	1.756E-09	Pb	1.911E-03
U-235	2.654E-08	Se	2.674E-04
U-238	3.411E-05		

Shipping Site: GJCT

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 2.953E-02

Total Mass (kg/yr): 5.478E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	6.356E-08	57-12-5	1.997E-04
Bi-212	1.069E-08	75-09-2	1.051E-03
Pa-234	8.080E-09	Ag	6.108E-04
Pa-234m	7.849E-05	As	2.981E-04
Pb-212	1.069E-08	Ba	3.480E-03
Po-212	6.891E-09	Cd	4.003E-04
Po-216	1.069E-08	Cl-2-x	1.051E-03
Ra-224	1.054E-08	Cl-3-x	2.387E-02
Ra-228	6.268E-08	Cl-4-x	7.830E-03
Tc-99	1.165E-06	Cl-F-x	5.619E-04
Th-228	1.069E-08	Cr	4.507E-03
Th-231	6.131E-08	HC-insol	7.674E-02
Th-232	6.454E-07	HC-solub	8.522E-02
Th-234	7.849E-05	Hg	1.306E-03
Tl-208	4.040E-09	Pb	5.304E-03
U-235	6.107E-08	Se	4.666E-04
U-238	7.849E-05		

Shipping Site: ITRI

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 1.028E-01

Total Mass (kg/yr): 1.007E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.367E-03	57-12-5	1.813E-02
Co-60	1.879E-03	Ag	4.433E-03
Cs-137	1.424E-03	Cd	4.937E-04
Eu-154	1.566E-05	Cl-3-x	8.061E-02
Fe-55	2.364E-04	Cl-4-x	4.534E-03
H-3	2.725E-01	Cr	2.116E-02
Ni-59	3.133E-05	HC-insol	1.108E+00
Ni-63	4.158E-03	HC-solub	3.627E+01
Pm-147	1.310E-04	Hg	2.821E-02
Pu-238	5.411E-05	Pb	5.038E-03
Pu-241	2.734E-04	Se	4.030E-03
Sm-151	1.253E-05		
Sr-90	1.338E-03		
Y-90	1.338E-03		

Shipping Site: LANL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 7.053E+00

Total Mass (kg/yr): 6.912E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	9.378E-02	57-12-5	1.244E+00
Co-60	1.289E-01	Ag	3.041E-01
Cs-137	9.769E-02	Cd	3.387E-02
Eu-154	1.074E-03	Cl-3-x	5.530E+00
Fe-55	1.621E-02	Cl-4-x	3.110E-01
H-3	1.869E+01	Cr	1.451E+00
Ni-59	2.149E-03	HC-insol	7.603E+01
Ni-63	2.852E-01	HC-solub	2.488E+03
Pm-147	8.987E-03	Hg	1.935E+00
Pu-238	3.712E-03	Pb	3.456E-01
Pu-241	1.875E-02	Se	2.765E-01
Sm-151	8.597E-04		
Sr-90	9.183E-02		
Y-90	9.183E-02		

Shipping Site: LANL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 1.292E+01

Total Mass (kg/yr): 1.871E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.719E-01	57-12-5	1.814E-01
Co-60	2.364E-01	75-09-2	4.543E+00
Cs-137	1.787E-01	Ag	6.519E-02
Eu-154	1.970E-03	As	2.353E-02
Fe-55	2.973E-02	Ba	1.752E+01
H-3	3.428E+01	Cd	1.078E+00
Ni-59	3.940E-03	Cl-2-x	1.687E+00
Ni-63	5.230E-01	Cl-3-x	8.308E+00
Pm-147	1.647E-02	Cl-4-x	5.036E+00
Pu-238	6.806E-03	Cl-F-x	1.893E+00
Pu-241	3.439E-02	Cr	9.451E+00
Sm-151	1.576E-03	HC-insol	9.627E-01
Sr-90	1.680E-01	HC-solub	3.150E+00
Y-90	1.680E-01	Hg	3.315E+00
		Pb	4.093E+01
		Se	1.026E-01

Shipping Site: LANL

Waste Type: Organic Liquids (CH-Alpha)

Total Volume (m3/yr): 6.158E+01

Total Mass (kg/yr): 6.598E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	8.711E-01	57-12-5	4.658E+00
Co-60	1.197E+00	75-09-2	5.213E+00
Cs-137	9.073E-01	Ag	2.903E+00
Eu-154	9.977E-03	As	4.411E-01
Fe-55	1.505E-01	Ba	3.007E+00
H-3	1.736E+02	Cd	1.268E-01
Ni-59	1.995E-02	Cl-2-x	1.483E+01
Ni-63	2.649E+00	Cl-3-x	5.741E+02
Pm-147	8.351E-02	Cl-4-x	3.244E+01
Pu-238	1.814E-01	Cl-F-x	1.203E+01
Pu-239	1.459E-02	Cr	5.435E+00
Pu-240	4.896E-02	HC-insol	3.448E+02
Pu-241	3.230E+00	HC-solub	9.332E+03
Sm-151	7.944E-03	Hg	1.606E+01
Sr-90	8.530E-01	Pb	2.376E+00
Y-90	8.530E-01	Se	2.519E+00

Shipping Site: LANL

Waste Type: Solids (CH-Alpha)

Total Volume (m3/yr): 2.801E+01

Total Mass (kg/yr): 6.796E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	3.962E-01	57-12-5	9.199E-01
Co-60	5.448E-01	75-09-2	7.358E+01
Cs-137	4.126E-01	Ag	5.600E-01
Eu-154	4.538E-03	As	1.525E-01
Fe-55	6.850E-02	Ba	1.081E+01
H-3	7.900E+01	Cd	1.740E+01
Ni-59	9.077E-03	Cl-2-x	2.574E+01
Ni-63	1.205E+00	Cl-3-x	1.337E+02
Pm-147	3.799E-02	Cl-4-x	8.345E+01
Pu-238	8.253E-02	Cl-F-x	2.951E+01
Pu-239	6.639E-03	Cr	9.888E+01
Pu-240	2.227E-02	HC-insol	4.851E+01
Pu-241	1.469E+00	HC-solub	1.967E+01
Sm-151	3.614E-03	Hg	1.501E+01
Sr-90	3.879E-01	Pb	6.059E+02
Y-90	3.879E-01	Se	1.320E+00

Shipping Site: LLNL

Waste Type: Organic Liquids (CH-Alpha)

Total Volume (m3/yr): 5.737E+01

Total Mass (kg/yr): 6.269E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	7.591E-01	57-12-5	4.251E+00
Cs-137	7.952E-01	75-09-2	2.262E+01
H-3	3.607E+03	Ag	2.130E+00
Pa-234m	1.843E-01	As	3.141E-01
Pu-238	1.807E-01	Ba	2.037E+00
Pu-241	3.614E+00	Cd	1.580E+01
Sr-90	7.591E-01	Cl-2-x	1.943E+01
Th-234	1.843E-01	Cl-3-x	1.480E+03
U-238	1.843E-01	Cl-4-x	2.696E+02
Y-90	7.591E-01	Cl-F-x	7.889E+00
		Cr	1.843E+01
		HC-insol	2.652E+03
		HC-solub	9.317E+03
		Hg	1.216E+01
		Pb	4.845E+00
		Se	1.862E+00

Shipping Site: LLNL

Waste Type: Solids (CH-Alpha)

Total Volume (m3/yr): 5.230E+01

Total Mass (kg/yr): 1.017E+05

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	6.919E-01	57-12-5	4.138E+00
Cs-137	7.249E-01	75-09-2	1.192E+01
H-3	3.288E+03	Ag	9.746E-01
Pa-234m	1.680E-01	As	3.439E-01
Pu-238	1.647E-01	Ba	5.008E+01
Pu-241	3.295E+00	Cd	3.649E+00
Sr-90	6.919E-01	Cl-2-x	7.183E+00
Th-234	1.680E-01	Cl-3-x	4.229E+01
U-238	1.680E-01	Cl-4-x	2.492E+01
Y-90	6.919E-01	Cl-F-x	1.009E+01
		Cr	2.709E+02
		HC-insol	7.977E+01
		HC-solub	2.905E+01
		Hg	8.247E+00
		Pb	1.721E+02
		Se	2.561E+00

Shipping Site: NTS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 6.621E-03

Total Mass (kg/yr): 8.886E+00

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	8.760E-05	75-09-2	5.331E-03
Cs-137	9.177E-05	Ag	9.774E-05
H-3	4.167E-01	Cd	5.331E-04
Pa-234m	2.127E-05	Cl-2-x	5.331E-03
Pu-241	2.085E-05	Cl-3-x	2.221E-02
Sr-90	8.760E-05	Cl-4-x	1.688E-01
Th-234	2.127E-05	Cl-F-x	2.665E-03
U-238	2.127E-05	Cr	1.777E-04
Y-90	8.760E-05	HC-insol	4.443E-02
		HC-solub	2.221E-02
		Hg	3.465E-04
		Pb	3.199E-04
		Se	8.886E-06

Shipping Site: PANT

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 1.461E+00

Total Mass (kg/yr): 2.110E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.942E-02	75-09-2	3.284E+00
Co-60	2.671E-02	As	1.112E-03
Cs-137	2.023E-02	Ba	4.766E-03
Eu-154	2.225E-04	Cd	2.321E+00
Fe-55	3.359E-03	Cl-2-x	1.743E+00
H-3	3.872E+00	Cl-3-x	2.389E+02
Ni-59	4.451E-04	Cl-4-x	5.331E+01
Ni-63	5.908E-02	Cl-F-x	9.829E-02
Pm-147	1.861E-03	Cr	2.020E+00
Pu-238	7.689E-04	HC-insol	6.419E+01
Pu-241	3.885E-03	HC-solub	3.280E+01
Sm-151	1.780E-04	Hg	1.325E-02
Sr-90	1.902E-02	Pb	4.431E-01
Y-90	1.902E-02		

Shipping Site: PANT

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.957E+01

Total Mass (kg/yr): 2.511E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	5.276E-01	57-12-5	2.480E-01
Co-60	7.254E-01	75-09-2	3.448E+01
Cs-137	5.454E-01	Ag	1.998E-01
Eu-154	6.045E-03	As	3.903E-02
Fe-55	9.123E-02	Ba	1.047E+01
H-3	1.051E+02	Cd	1.602E+00
Ni-59	1.209E-02	Cl-2-x	2.240E+01
Ni-63	1.604E+00	Cl-3-x	1.712E+02
Pm-147	5.056E-02	Cl-4-x	1.094E+02
Pu-238	2.088E-02	Cl-F-x	1.631E+01
Pu-241	1.055E-01	Cr	1.027E+01
Sm-151	4.836E-03	HC-insol	4.777E+02
Sr-90	5.126E-01	HC-solub	1.648E+02
Y-90	5.126E-01	Hg	1.896E+00
		Pb	5.162E+01
		Se	2.443E-01

Shipping Site: RFP

Waste Type: Organic Liquids (CH-Alpha)

Total Volume (m3/yr): 1.037E+01

Total Mass (kg/yr): 1.212E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	4.584E-05	57-12-5	3.662E-01
Cm-244	6.202E-05	75-09-2	1.109E+01
Pa-234m	2.238E-04	Ag	1.835E-01
Pu-238	2.395E-02	As	4.647E-02
Pu-239	2.454E-03	Ba	2.587E-01
Pu-240	8.576E-03	Cd	8.759E+00
Pu-241	2.339E-01	Cl-2-x	6.508E+00
Th-234	2.238E-04	Cl-3-x	6.551E+02
U-238	2.238E-04	Cl-4-x	1.407E+02
		Cl-F-x	8.899E-01
		Cr	7.944E+00
		HC-insol	1.339E+03
		HC-solub	1.182E+03
		Hg	1.089E+00
		Pb	1.829E+00
		Se	1.604E-01

Shipping Site: RFP

Waste Type: Solids (CH-Alpha)

Total Volume (m3/yr): 1.143E+03

Total Mass (kg/yr): 2.424E+06

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	5.109E-03	57-12-5	1.417E+01
Cm-244	6.913E-03	75-09-2	1.164E+02
Pa-234m	2.494E-02	Ag	3.781E+00
Pu-238	2.669E+00	As	1.394E+00
Pu-239	2.735E-01	Ba	1.522E+02
Pu-240	9.558E-01	Cd	5.438E+01
Pu-241	2.607E+01	Cl-2-x	9.092E+01
Th-234	2.494E-02	Cl-3-x	7.111E+02
U-238	2.494E-02	Cl-4-x	7.915E+02
		Cl-F-x	1.730E+02
		Cr	6.697E+03
		HC-insol	1.167E+03
		HC-solub	3.682E+03
		Hg	2.810E+01
		Pb	4.658E+02
		Se	3.182E+00

Shipping Site: SNLA

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 5.487E-04

Total Mass (kg/yr): 5.793E-01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	6.627E-05	57-12-5	5.085E-05
Co-60	9.630E-05	75-09-2	3.859E-05
Cs-137	7.006E-05	Ag	2.549E-05
Eu-154	3.516E-07	As	3.265E-06
Eu-155	8.115E-08	Ba	2.226E-05
Fe-55	1.920E-06	Cd	1.384E-06
H-3	1.223E-03	Cl-2-x	1.098E-04
Nb-94	4.598E-07	Cl-3-x	4.322E-03
Ni-59	9.089E-06	Cl-4-x	2.442E-04
Ni-63	1.099E-03	Cl-F-x	8.905E-05
Pa-234m	3.246E-07	Cr	5.933E-05
Pu-238	2.380E-06	HC-insol	3.553E-03
Pu-240	1.893E-06	HC-solub	1.018E-01
Pu-241	1.893E-06	Hg	1.444E-04
Sm-151	7.574E-07	Pb	2.214E-05
Sr-90	6.519E-05	Se	2.228E-05
Tc-99	2.705E-08		
Th-234	3.246E-07		
U-238	3.246E-07		
Y-90	6.519E-05		

Shipping Site: SNLA

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 2.849E+00

Total Mass (kg/yr): 2.300E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	3.441E-01	57-12-5	2.628E-01
Co-60	5.000E-01	75-09-2	7.747E-01
Cs-137	3.637E-01	Ag	5.397E-02
Eu-154	1.825E-03	As	1.546E-02
Eu-155	4.213E-04	Ba	3.392E+00
Fe-55	9.972E-03	Cd	9.542E-03
H-3	6.351E+00	Cl-2-x	8.422E-01
Nb-94	2.387E-03	Cl-3-x	2.813E+00
Ni-59	4.719E-02	Cl-4-x	1.497E+00
Ni-63	5.706E+00	Cl-F-x	9.064E-01
Pa-234m	1.685E-03	Cr	3.104E+00
Pu-238	1.236E-02	HC-insol	7.682E+00
Pu-240	9.832E-03	HC-solub	1.619E-01
Pu-241	9.832E-03	Hg	1.563E-01
Sm-151	3.932E-03	Pb	7.814E+00
Sr-90	3.385E-01	Se	4.865E-02
Tc-99	1.404E-04		
Th-234	1.685E-03		
U-238	1.685E-03		
Y-90	3.385E-01		

Destination Site: ORNL

Shipping Site: AMES

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 8.585E-03

Total Mass (kg/yr): 1.162E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	1.851E-08	57-12-5	1.759E-05
Bi-212	3.115E-09	75-09-2	1.485E-04
Pa-234	2.353E-09	Ag	5.841E-05
Pa-234m	2.286E-05	As	7.025E-07
Pb-212	3.115E-09	Ba	4.061E-05
Po-212	2.007E-09	Cd	5.957E-05
Po-216	3.115E-09	Cl-2-x	1.879E-04
Ra-224	3.051E-09	Cl-3-x	4.658E-04
Ra-228	1.813E-08	Cl-4-x	8.901E-04
Tc-99	3.373E-07	Cl-F-x	7.426E-05
Th-228	3.115E-09	Cr	1.342E-04
Th-231	1.785E-08	HC-insol	1.917E-05
Th-232	1.879E-07	HC-solub	1.017E-02
Th-234	2.286E-05	Hg	5.635E-05
Tl-208	1.177E-09	Pb	8.863E-05
U-235	1.778E-08	Se	1.196E-06
U-238	2.286E-05		

Shipping Site: ANL-E

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 4.838E+02

Total Mass (kg/yr): 8.170E+05

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	2.380E-02	57-12-5	2.002E+01
Ba-137m	3.504E+01	75-09-2	2.778E+01
Co-60	1.304E+01	Ag	1.623E+01
Cs-137	3.747E+01	As	6.714E+00
Eu-154	1.388E-01	Ba	2.781E+02
Eu-155	4.761E-02	Cd	9.989E+00
H-3	2.699E+00	Cl-2-x	1.822E+01
Nb-94	9.919E-02	Cl-3-x	3.658E+02
Ni-59	2.104E+00	Cl-4-x	4.608E+01
Ni-63	2.214E+02	Cl-F-x	1.759E+01
Pa-234m	4.796E+00	Cr	3.334E+02
Pu-238	1.474E+00	HC-insol	1.482E+03
Pu-239	2.380E-02	HC-solub	7.360E+02
Pu-240	3.571E-02	Hg	1.110E+02
Pu-241	1.561E+00	Pb	4.704E+02
Sm-151	4.519E-01	Se	4.660E+01
Sr-90	3.313E+01		
Tc-99	3.963E-01		
Th-232	3.967E-02		
Th-234	4.796E+00		
U-238	4.796E+00		
Y-90	3.313E+01		

Shipping Site: BAPL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 6.410E-02

Total Mass (kg/yr): 6.163E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	5.332E-05	75-09-2	5.934E-02
Ba-137m	5.866E-02	As	4.724E-04
Co-60	7.908E-05	Ba	2.024E-03
Cs-137	6.272E-02	Cd	6.779E-02
Eu-154	9.439E-05	Cl-2-x	3.091E-02
H-3	4.694E-03	Cl-3-x	4.931E-01
Nb-94	5.357E-06	Cl-4-x	1.055E-01
Ni-59	1.209E-04	Cl-F-x	1.360E-05
Ni-63	1.242E-02	Cr	5.671E-02
Pa-234m	3.469E-05	HC-insol	2.699E+01
Pu-238	2.806E-03	HC-solub	8.592E+00
Pu-239	3.801E-05	Hg	3.698E-04
Pu-240	2.168E-05	Pb	1.294E-02
Pu-241	6.225E-04		
Sm-151	9.031E-04		
Sr-90	5.586E-02		
Tc-99	2.806E-05		
Th-234	3.469E-05		
U-238	3.469E-05		
Y-90	5.586E-02		

Shipping Site: BAPL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 6.105E-01

Total Mass (kg/yr): 6.010E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	5.078E-04	57-12-5	1.703E-03
Ba-137m	5.587E-01	75-09-2	6.266E-02
Co-60	7.532E-04	Ag	6.515E-03
Cs-137	5.974E-01	As	1.598E-03
Eu-154	8.990E-04	Ba	6.259E-02
H-3	4.471E-02	Cd	1.698E-02
Nb-94	5.102E-05	Cl-2-x	7.067E-02
Ni-59	1.151E-03	Cl-3-x	4.679E-01
Ni-63	1.183E-01	Cl-4-x	4.156E-01
Pa-234m	3.304E-04	Cl-F-x	8.727E-02
Pu-238	2.672E-02	Cr	4.102E-02
Pu-239	3.620E-04	HC-insol	2.697E+00
Pu-240	2.065E-04	HC-solub	2.666E+00
Pu-241	5.929E-03	Hg	1.514E-02
Sm-151	8.601E-03	Pb	7.746E-02
Sr-90	5.321E-01	Se	2.393E-03
Tc-99	2.672E-04		
Th-234	3.304E-04		
U-238	3.304E-04		
Y-90	5.321E-01		

Shipping Site: BATELLE

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 1.500E-03

Total Mass (kg/yr): 1.977E+00

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	3.211E-09	75-09-2	3.955E-02
Bi-212	5.400E-10	Cl-2-x	1.977E-02
Pa-234	4.080E-10	Cl-3-x	1.977E-01
Pa-234m	3.964E-06	Cl-4-x	1.582E-01
Pb-212	5.400E-10	HC-insol	4.943E-01
Po-212	3.480E-10	HC-solub	2.373E-01
Po-216	5.400E-10		
Ra-224	5.400E-10		
Ra-228	3.211E-09		
Tc-99	5.971E-08		
Th-228	5.400E-10		
Th-231	3.097E-09		
Th-232	3.260E-08		
Th-234	3.964E-06		
Tl-208	2.040E-10		
U-235	3.085E-09		
U-238	3.964E-06		

Shipping Site: BNL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 1.544E+00

Total Mass (kg/yr): 1.749E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	7.598E-05	57-12-5	8.298E-02
Ba-137m	1.118E-01	75-09-2	1.156E+00
Co-60	4.162E-02	Ag	4.159E-02
Cs-137	1.196E-01	As	7.649E-03
Eu-154	4.432E-04	Ba	4.627E-02
Eu-155	1.519E-04	Cd	8.868E-01
H-3	8.617E-03	Cl-2-x	7.572E-01
Nb-94	3.166E-04	Cl-3-x	7.014E+01
Ni-59	6.718E-03	Cl-4-x	1.445E+01
Ni-63	7.068E-01	Cl-F-x	1.704E-01
Pa-234m	1.530E-02	Cr	8.567E-01
Pu-238	4.706E-03	HC-insol	1.386E+02
Pu-239	7.598E-05	HC-solub	2.115E+02
Pu-240	1.139E-04	Hg	2.406E-01
Pu-241	4.984E-03	Pb	2.050E-01
Sm-151	1.442E-03	Se	3.636E-02
Sr-90	1.057E-01		
Tc-99	1.265E-03		
Th-232	1.266E-04		
Th-234	1.530E-02		
U-238	1.530E-02		
Y-90	1.057E-01		

Shipping Site: BNL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 8.915E+00

Total Mass (kg/yr): 1.190E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	4.386E-04	57-12-5	1.617E+00
Ba-137m	6.457E-01	75-09-2	8.722E-01
Co-60	2.402E-01	Ag	7.571E-01
Cs-137	6.904E-01	As	2.698E-01
Eu-154	2.558E-03	Ba	2.157E+01
Eu-155	8.772E-04	Cd	4.530E-01
H-3	4.974E-02	Cl-2-x	8.722E-01
Nb-94	1.827E-03	Cl-3-x	2.419E+01
Ni-59	3.878E-02	Cl-4-x	3.963E-01
Ni-63	4.080E+00	Cl-F-x	1.019E+00
Pa-234m	8.837E-02	Cr	2.698E+01
Pu-238	2.716E-02	HC-insol	1.091E+02
Pu-239	4.386E-04	HC-solub	5.459E+01
Pu-240	6.579E-04	Hg	8.531E+00
Pu-241	2.877E-02	Pb	2.912E+01
Sm-151	8.327E-03	Se	3.668E+00
Sr-90	6.105E-01		
Tc-99	7.303E-03		
Th-232	7.310E-04		
Th-234	8.837E-02		
U-238	8.837E-02		
Y-90	6.105E-01		

Shipping Site: COLONIE

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 9.054E-01

Total Mass (kg/yr): 1.026E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	1.937E-06	57-12-5	5.151E-02
Bi-212	3.259E-07	75-09-2	7.241E-01
Pa-234	2.462E-07	Ag	2.274E-02
Pa-234m	2.392E-03	As	3.999E-03
Pb-212	3.259E-07	Ba	2.356E-02
Po-212	2.100E-07	Cd	5.620E-01
Po-216	3.259E-07	Cl-2-x	4.522E-01
Ra-224	3.259E-07	Cl-3-x	4.355E+01
Ra-228	1.937E-06	Cl-4-x	9.136E+00
Tc-99	3.603E-05	Cl-F-x	8.522E-02
Th-228	3.259E-07	Cr	5.418E-01
Th-231	1.868E-06	HC-insol	8.707E+01
Th-232	1.967E-05	HC-solub	1.317E+02
Th-234	2.392E-03	Hg	1.340E-01
Tl-208	1.231E-07	Pb	1.275E-01
U-235	1.861E-06	Se	1.998E-02
U-238	2.392E-03		

Shipping Site: COLONIE

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 1.235E-02

Total Mass (kg/yr): 1.606E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	3.198E-08	57-12-5	7.229E-04
Bi-212	5.380E-09	75-09-2	8.484E-04
Pa-234	4.065E-09	Ag	2.570E-05
Pa-234m	3.949E-05	As	2.249E-05
Pb-212	5.380E-09	Ba	1.606E-05
Po-212	3.467E-09	Cd	1.429E-04
Po-216	5.380E-09	Cl-2-x	4.242E-03
Ra-224	2.690E-09	Cl-3-x	5.345E-03
Ra-228	1.599E-08	Cl-4-x	5.006E-03
Tc-99	2.974E-07	Cl-F-x	4.242E-04
Th-228	5.380E-09	Cr	5.462E-04
Th-231	3.084E-08	HC-insol	9.333E-04
Th-232	3.247E-07	HC-solub	8.032E-04
Th-234	3.949E-05	Hg	3.695E-06
Tl-208	2.032E-09	Pb	1.044E-03
U-235	3.072E-08	Se	8.032E-06
U-238	3.949E-05		

Shipping Site: FEMP

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 2.034E+01

Total Mass (kg/yr): 2.423E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	4.353E-05	57-12-5	4.910E-01
Bi-212	7.324E-06	75-09-2	2.872E+01
Pa-234	5.533E-06	Ag	1.270E-01
Pa-234m	5.376E-02	As	6.728E-02
Pb-212	7.324E-06	Ba	2.928E-01
Po-212	4.720E-06	Cd	2.349E+01
Po-216	7.324E-06	Cl-2-x	1.522E+01
Ra-224	7.324E-06	Cl-3-x	1.621E+03
Ra-228	4.353E-05	Cl-4-x	3.603E+02
Tc-99	8.097E-04	Cl-F-x	6.895E-01
Th-228	7.324E-06	Cr	2.072E+01
Th-231	4.199E-05	HC-insol	3.779E+03
Th-232	4.420E-04	HC-solub	2.255E+03
Th-234	5.376E-02	Hg	9.307E-01
Tl-208	2.766E-06	Pb	4.623E+00
U-235	4.182E-05	Se	1.150E-01
U-238	5.376E-02		

Shipping Site: FEMP

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 7.909E+01

Total Mass (kg/yr): 1.180E+05

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	1.696E-04	57-12-5	5.948E+00
Bi-212	2.854E-05	75-09-2	2.117E+01
Pa-234	2.156E-05	Ag	3.226E+00
Pa-234m	2.095E-01	As	1.249E+00
Pb-212	2.854E-05	Ba	1.085E+02
Po-212	1.839E-05	Cd	6.815E+00
Po-216	2.854E-05	Cl-2-x	2.073E+01
Ra-224	2.837E-05	Cl-3-x	5.283E+02
Ra-228	1.686E-04	Cl-4-x	3.692E+02
Tc-99	3.136E-03	Cl-F-x	1.313E+01
Th-228	2.854E-05	Cr	1.531E+02
Th-231	1.636E-04	HC-insol	1.786E+03
Th-232	1.722E-03	HC-solub	9.390E+02
Th-234	2.095E-01	Hg	3.514E+01
Tl-208	1.078E-05	Pb	1.240E+02
U-235	1.630E-04	Se	1.366E+01
U-238	2.095E-01		

Shipping Site: KAPL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 6.167E-01

Total Mass (kg/yr): 7.065E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	4.129E-01	57-12-5	2.915E-02
Co-60	6.669E+00	75-09-2	5.312E-01
Cs-134	3.921E-03	Ag	1.461E-02
Cs-137	4.359E-01	As	2.952E-03
Eu-154	5.305E-03	Ba	1.739E-02
Eu-155	2.537E-03	Cd	4.125E-01
Fe-55	8.719E-01	Cl-2-x	3.320E-01
H-3	1.899E+00	Cl-3-x	3.184E+01
Mn-54	2.768E-03	Cl-4-x	6.682E+00
Nb-94	4.152E-03	Cl-F-x	6.275E-02
Ni-59	8.719E-02	Cr	3.877E-01
Ni-63	1.172E+01	HC-insol	6.386E+01
Pa-234m	1.637E-02	HC-solub	7.952E+01
Pm-147	4.752E-02	Hg	8.511E-02
Pu-238	1.361E-02	Pb	9.130E-02
Pu-241	1.107E-02	Se	1.277E-02
Sb-125	1.845E-03		
Sm-151	3.690E-03		
Sr-90	4.106E-01		
Te-125m	4.613E-04		
Th-234	1.637E-02		
U-238	1.637E-02		
Y-90	4.106E-01		

Shipping Site: KAPL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.572E+00

Total Mass (kg/yr): 5.162E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.391E+00	57-12-5	1.840E-02
Co-60	3.862E+01	75-09-2	2.577E+00
Cs-134	2.271E-02	Ag	6.267E-02
Cs-137	2.525E+00	As	2.265E-02
Eu-154	3.072E-02	Ba	5.050E-01
Eu-155	1.469E-02	Cd	2.428E-02
Fe-55	5.050E+00	Cl-2-x	1.464E+00
H-3	1.100E+01	Cl-3-x	1.328E+01
Mn-54	1.603E-02	Cl-4-x	1.024E+01
Nb-94	2.404E-02	Cl-F-x	4.115E-01
Ni-59	5.050E-01	Cr	4.769E-01
Ni-63	6.790E+01	HC-insol	3.511E+01
Pa-234m	9.486E-02	HC-solub	1.516E+01
Pm-147	2.752E-01	Hg	6.065E-02
Pu-238	7.882E-02	Pb	7.229E-01
Pu-241	6.413E-02	Se	1.698E-02
Sb-125	1.068E-02		
Sm-151	2.137E-02		
Sr-90	2.378E+00		
Te-125m	2.672E-03		
Th-234	9.486E-02		
U-238	9.486E-02		
Y-90	2.378E+00		

Shipping Site: KCP

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 4.219E-02

Total Mass (kg/yr): 3.237E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.824E-02	75-09-2	2.982E-02
Co-60	4.562E-01	Ag	1.504E-04
Cs-134	2.682E-04	As	2.945E-05
Cs-137	2.982E-02	Ba	6.019E-03
Eu-154	3.629E-04	Cd	5.228E-03
Eu-155	1.735E-04	Cl-2-x	1.746E-02
Fe-55	5.964E-02	Cl-3-x	7.227E-02
H-3	1.299E-01	Cl-4-x	3.884E-02
Mn-54	1.893E-04	Cl-F-x	2.371E-02
Nb-94	2.840E-04	Cr	2.621E-02
Ni-59	5.964E-03	HC-insol	1.522E-01
Ni-63	8.019E-01	HC-solub	1.618E-04
Pa-234m	1.120E-03	Hg	4.361E-03
Pm-147	3.250E-03	Pb	1.747E-01
Pu-238	9.309E-04	Se	3.916E-04
Pu-241	7.573E-04		
Sb-125	1.262E-04		
Sm-151	2.524E-04		
Sr-90	2.808E-02		
Te-125m	3.155E-05		
Th-234	1.120E-03		
U-238	1.120E-03		
Y-90	2.808E-02		

Shipping Site: KKS

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 4.733E-01

Total Mass (kg/yr): 5.422E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	3.168E-01	57-12-5	2.237E-02
Co-60	5.118E+00	75-09-2	4.077E-01
Cs-134	3.009E-03	Ag	1.121E-02
Cs-137	3.345E-01	As	2.266E-03
Eu-154	4.071E-03	Ba	1.335E-02
Eu-155	1.947E-03	Cd	3.166E-01
Fe-55	6.691E-01	Cl-2-x	2.548E-01
H-3	1.457E+00	Cl-3-x	2.443E+01
Mn-54	2.124E-03	Cl-4-x	5.128E+00
Nb-94	3.186E-03	Cl-F-x	4.816E-02
Ni-59	6.691E-02	Cr	2.976E-01
Ni-63	8.997E+00	HC-insol	4.901E+01
Pa-234m	1.256E-02	HC-solub	6.103E+01
Pm-147	3.646E-02	Hg	6.532E-02
Pu-238	1.044E-02	Pb	7.007E-02
Pu-241	8.497E-03	Se	9.805E-03
Sb-125	1.416E-03		
Sm-151	2.832E-03		
Sr-90	3.151E-01		
Te-125m	3.540E-04		
Th-234	1.256E-02		
U-238	1.256E-02		
Y-90	3.151E-01		

Shipping Site: KKS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.928E+00

Total Mass (kg/yr): 6.620E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.630E+00	57-12-5	1.282E-01
Co-60	4.248E+01	75-09-2	2.231E+00
Cs-134	2.497E-02	Ag	8.783E-02
Cs-137	2.776E+00	As	3.299E-02
Eu-154	3.379E-02	Ba	1.662E+00
Eu-155	1.616E-02	Cd	5.269E-02
Fe-55	5.553E+00	Cl-2-x	1.281E+00
H-3	1.209E+01	Cl-3-x	1.108E+01
Mn-54	1.763E-02	Cl-4-x	1.215E+01
Nb-94	2.644E-02	Cl-F-x	2.090E-01
Ni-59	5.553E-01	Cr	1.846E+00
Ni-63	7.467E+01	HC-insol	2.753E+01
Pa-234m	1.043E-01	HC-solub	1.411E+01
Pm-147	3.026E-01	Hg	1.438E-01
Pu-238	8.668E-02	Pb	4.165E+00
Pu-241	7.052E-02	Se	3.790E-02
Sb-125	1.175E-02		
Sm-151	2.350E-02		
Sr-90	2.615E+00		
Te-125m	2.938E-03		
Th-234	1.043E-01		
U-238	1.043E-01		
Y-90	2.615E+00		

Shipping Site: KWS

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr):

6.454E-02

Total Mass (kg/yr):

7.394E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	4.321E-02	57-12-5	3.051E-03
Co-60	6.979E-01	75-09-2	5.559E-02
Cs-134	4.103E-04	Ag	1.529E-03
Cs-137	4.562E-02	As	3.090E-04
Eu-154	5.552E-04	Ba	1.820E-03
Eu-155	2.655E-04	Cd	4.317E-02
Fe-55	9.125E-02	Cl-2-x	3.474E-02
H-3	1.987E-01	Cl-3-x	3.332E+00
Mn-54	2.896E-04	Cl-4-x	6.993E-01
Nb-94	4.345E-04	Cl-F-x	6.567E-03
Ni-59	9.125E-03	Cr	4.058E-02
Ni-63	1.226E+00	HC-insol	6.683E+00
Pa-234m	1.714E-03	HC-solub	8.322E+00
Pm-147	4.973E-03	Hg	8.907E-03
Pu-238	1.424E-03	Pb	9.555E-03
Pu-241	1.158E-03	Se	1.337E-03
Sb-125	1.931E-04		
Sm-151	3.862E-04		
Sr-90	4.297E-02		
Te-125m	4.828E-05		
Th-234	1.714E-03		
U-238	1.714E-03		
Y-90	4.297E-02		

Shipping Site: KWS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr):

1.262E+00

Total Mass (kg/yr):

1.580E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	8.449E-01	57-12-5	8.005E-02
Co-60	1.364E+01	75-09-2	3.801E-01
Cs-134	8.024E-03	Ag	2.572E-02
Cs-137	8.921E-01	As	8.795E-03
Eu-154	1.085E-02	Ba	1.035E+00
Eu-155	5.192E-03	Cd	1.157E-02
Fe-55	1.784E+00	Cl-2-x	3.221E-01
H-3	3.886E+00	Cl-3-x	1.699E+00
Mn-54	5.664E-03	Cl-4-x	1.988E+00
Nb-94	8.496E-03	Cl-F-x	2.323E-01
Ni-59	1.784E-01	Cr	1.010E+00
Ni-63	2.399E+01	HC-insol	4.421E+00
Pa-234m	3.351E-02	HC-solub	1.600E+00
Pm-147	9.724E-02	Hg	6.065E-02
Pu-238	2.785E-02	Pb	2.396E+00
Pu-241	2.265E-02	Se	1.789E-02
Sb-125	3.776E-03		
Sm-151	7.552E-03		
Sr-90	8.402E-01		
Te-125m	9.440E-04		
Th-234	3.351E-02		
U-238	3.351E-02		
Y-90	8.402E-01		

Shipping Site: PADUCAH

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 2.970E+01

Total Mass (kg/yr): 3.589E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	1.796E-02	57-12-5	4.590E-01
Bi-212	2.967E-03	75-09-2	4.205E+01
Pa-234	2.486E-03	Ag	2.300E-01
Pa-234m	2.420E+01	As	1.180E-01
Pb-212	2.967E-03	Ba	5.803E-01
Po-212	1.965E-03	Cd	3.374E+01
Po-216	2.967E-03	Cl-2-x	2.303E+01
Ra-224	2.967E-03	Cl-3-x	2.444E+03
Ra-228	1.796E-02	Cl-4-x	5.381E+02
Tc-99	7.291E+00	Cl-F-x	1.762E+00
Th-228	2.967E-03	Cr	2.951E+01
Th-231	1.892E-02	HC-insol	5.097E+03
Th-232	1.990E-01	HC-solub	2.651E+03
Th-234	2.420E+01	Hg	1.493E+00
Tl-208	1.163E-03	Pb	6.639E+00
U-235	1.876E-02	Se	2.011E-01
U-238	2.420E+01		

Shipping Site: PADUCAH

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 4.740E+00

Total Mass (kg/yr): 6.808E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	2.890E-03	57-12-5	1.016E+00
Bi-212	4.773E-04	75-09-2	1.710E+00
Pa-234	3.999E-04	Ag	2.502E-01
Pa-234m	3.894E+00	As	8.712E-02
Pb-212	4.773E-04	Ba	1.228E+01
Po-212	3.161E-04	Cd	1.504E-01
Po-216	4.773E-04	Cl-2-x	1.444E+00
Ra-224	4.664E-04	Cl-3-x	1.250E+01
Ra-228	2.824E-03	Cl-4-x	4.496E+00
Tc-99	1.146E+00	Cl-F-x	6.729E-01
Th-228	4.773E-04	Cr	1.293E+01
Th-231	3.044E-03	HC-insol	3.436E+01
Th-232	3.202E-02	HC-solub	1.740E+01
Th-234	3.894E+00	Hg	1.732E+00
Tl-208	1.870E-04	Pb	2.789E+01
U-235	3.019E-03	Se	6.716E-01
U-238	3.894E+00		

Shipping Site: PNS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 5.200E-02

Total Mass (kg/yr): 9.088E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	3.481E-02	75-09-2	1.324E-02
Co-60	5.623E-01	Ag	6.570E-04
Cs-134	3.306E-04	As	5.453E-04
Cs-137	3.676E-02	Ba	1.708E-02
Eu-154	4.473E-04	Cd	8.438E-03
Eu-155	2.139E-04	Cl-2-x	1.324E-02
Fe-55	7.352E-02	Cl-3-x	7.909E-01
H-3	1.601E-01	Cl-4-x	1.483E-01
Mn-54	2.333E-04	Cl-F-x	7.499E-03
Nb-94	3.500E-04	Cr	1.051E-01
Ni-59	7.352E-03	HC-insol	2.629E+00
Ni-63	9.884E-01	HC-solub	1.314E+00
Pa-234m	1.380E-03	Hg	9.046E-03
Pm-147	4.006E-03	Pb	1.319E-02
Pu-238	1.147E-03	Se	2.365E-03
Pu-241	9.335E-04		
Sb-125	1.555E-04		
Sm-151	3.111E-04		
Sr-90	3.462E-02		
Te-125m	3.889E-05		
Th-234	1.380E-03		
U-238	1.380E-03		
Y-90	3.462E-02		

Shipping Site: PORTS

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 4.765E+01

Total Mass (kg/yr): 4.778E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	2.163E-05	57-12-5	7.201E+00
Bi-212	3.621E-06	75-09-2	1.017E+00
Pa-234	2.954E-06	Ag	2.102E+00
Pa-234m	2.876E-02	As	8.553E-02
Pb-212	3.621E-06	Ba	5.830E-01
Po-212	2.287E-06	Cd	2.050E-01
Po-216	3.621E-06	Cl-2-x	2.879E+00
Ra-224	3.621E-06	Cl-3-x	1.392E+02
Ra-228	2.163E-05	Cl-4-x	7.874E+00
Tc-99	8.664E-03	Cl-F-x	2.331E+00
Th-228	3.621E-06	Cr	8.409E+00
Th-231	2.249E-05	HC-insol	4.553E+02
Th-232	2.365E-04	HC-solub	1.440E+04
Th-234	2.876E-02	Hg	1.291E+01
Tl-208	1.334E-06	Pb	2.212E+00
U-235	2.230E-05	Se	1.887E+00
U-238	2.876E-02		

Shipping Site: PORTS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 7.763E+02

Total Mass (kg/yr): 1.096E+06

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	3.528E-04	57-12-5	1.691E+02
Bi-212	5.907E-05	75-09-2	2.135E+02
Pa-234	4.818E-05	Ag	3.471E+01
Pa-234m	4.691E-01	As	1.183E+01
Pb-212	5.907E-05	Ba	2.025E+03
Po-212	3.730E-05	Cd	1.587E+01
Po-216	5.907E-05	Cl-2-x	2.135E+02
Ra-224	5.888E-05	Cl-3-x	1.306E+03
Ra-228	3.517E-04	Cl-4-x	5.694E+02
Tc-99	1.408E-01	Cl-F-x	1.185E+02
Th-228	5.907E-05	Cr	2.062E+03
Th-231	3.668E-04	HC-insol	2.947E+03
Th-232	3.858E-03	HC-solub	1.642E+03
Th-234	4.691E-01	Hg	1.720E+02
Tl-208	2.176E-05	Pb	4.847E+03
U-235	3.637E-04	Se	6.061E+01
U-238	4.691E-01		

Shipping Site: PPPL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 5.456E-04

Total Mass (kg/yr): 7.191E-01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	7.218E-06	75-09-2	1.438E-02
Cs-137	7.562E-06	Cl-2-x	7.190E-03
H-3	3.433E-02	Cl-3-x	7.190E-02
Pa-234m	1.753E-06	Cl-4-x	5.752E-02
Pu-241	1.718E-06	HC-insol	1.797E-01
Sr-90	7.218E-06	HC-solub	8.629E-02
Th-234	1.753E-06		
U-238	1.753E-06		
Y-90	7.218E-06		

Shipping Site: RMI

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr):

6.677E-01

Total Mass (kg/yr):

9.741E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	1.429E-06	75-09-2	1.527E+00
Bi-212	2.403E-07	As	3.769E-04
Pa-234	1.816E-07	Ba	1.615E-03
Pa-234m	1.764E-03	Cd	1.071E+00
Pb-212	2.403E-07	Cl-2-x	8.108E-01
Po-212	1.549E-07	Cl-3-x	1.123E+02
Po-216	2.403E-07	Cl-4-x	2.505E+01
Ra-224	2.403E-07	Cl-F-x	4.625E-02
Ra-228	1.429E-06	Cr	9.331E-01
Tc-99	2.657E-05	HC-insol	2.184E+01
Th-228	2.403E-07	HC-solub	1.277E+01
Th-231	1.378E-06	Hg	6.122E-03
Th-232	1.450E-05	Pb	2.045E-01
Th-234	1.764E-03		
Tl-208	9.081E-08		
U-235	1.372E-06		
U-238	1.764E-03		

Shipping Site: RMI

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr):

1.091E+00

Total Mass (kg/yr):

8.323E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	2.370E-06	57-12-5	4.647E-03
Bi-212	3.988E-07	75-09-2	2.315E-01
Pa-234	3.013E-07	Ag	6.651E-03
Pa-234m	2.927E-03	As	1.974E-03
Pb-212	3.988E-07	Ba	5.734E-01
Po-212	2.570E-07	Cd	1.836E-02
Po-216	3.988E-07	Cl-2-x	2.862E-01
Ra-224	3.815E-07	Cl-3-x	2.561E+00
Ra-228	2.267E-06	Cl-4-x	7.371E-01
Tc-99	4.218E-05	Cl-F-x	3.452E-01
Th-228	3.988E-07	Cr	2.638E-01
Th-231	2.286E-06	HC-insol	8.888E+00
Th-232	2.407E-05	HC-solub	2.825E+00
Th-234	2.927E-03	Hg	2.678E-02
Tl-208	1.506E-07	Pb	8.498E-02
U-235	2.277E-06	Se	6.070E-03
U-238	2.927E-03		

Destination Site: SRS

Shipping Site: BAPL

Waste Type: Solids (CH-Alpha)

Total Volume (m3/yr): 8.357E-01 Total Mass (kg/yr): 3.493E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	6.984E-04	75-09-2	2.095E-01
Ba-137m	7.629E-01	Ag	3.493E-03
Co-60	1.021E-03	Ba	1.397E-01
Cs-137	8.160E-01	Cd	6.986E-04
Eu-154	1.217E-03	Cl-2-x	2.445E-01
H-3	6.053E-02	Cl-3-x	8.733E-01
Nb-94	6.984E-05	Cl-4-x	4.191E-01
Ni-59	1.563E-03	Cl-F-x	3.493E-01
Ni-63	1.606E-01	Cr	5.239E-03
Pa-234m	4.490E-04	HC-insol	3.493E+00
Pu-238	3.791E-02	HC-solub	1.746E-03
Pu-239	6.286E-04	Hg	6.986E-04
Pu-240	2.793E-04	Pb	3.493E-02
Pu-241	1.633E-02	Se	1.047E-03
Sm-151	1.167E-02		
Sr-90	7.264E-01		
Tc-99	3.625E-04		
Th-234	4.490E-04		
U-238	4.490E-04		
Y-90	7.264E-01		

Shipping Site: CNS

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 9.054E-01 Total Mass (kg/yr): 1.026E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	6.061E-01	57-12-5	5.151E-02
Co-60	9.790E+00	75-09-2	7.241E-01
Cs-134	5.756E-03	Ag	2.274E-02
Cs-137	6.400E-01	As	3.999E-03
Eu-154	7.788E-03	Ba	2.356E-02
Eu-155	3.724E-03	Cd	5.620E-01
Fe-55	1.280E+00	Cl-2-x	4.522E-01
H-3	2.788E+00	Cl-3-x	4.355E+01
Mn-54	4.063E-03	Cl-4-x	9.136E+00
Nb-94	6.095E-03	Cl-F-x	8.522E-02
Ni-59	1.280E-01	Cr	5.418E-01
Ni-63	1.720E+01	HC-insol	8.707E+01
Pa-234m	2.404E-02	HC-solub	1.317E+02
Pm-147	6.975E-02	Hg	1.340E-01
Pu-238	1.997E-02	Pb	1.275E-01
Pu-241	1.625E-02	Se	1.998E-02
Sb-125	2.709E-03		
Sm-151	5.418E-03		
Sr-90	6.027E-01		
Te-125m	6.772E-04		
Th-234	2.404E-02		
U-238	2.404E-02		
Y-90	6.027E-01		

Shipping Site: CNS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 9.030E-02

Total Mass (kg/yr): 6.772E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	6.218E-02	57-12-5	2.357E-03
Co-60	1.004E+00	75-09-2	2.142E-02
Cs-134	5.431E-04	Ag	7.345E-04
Cs-137	6.038E-02	As	2.549E-04
Eu-154	7.990E-04	Ba	3.376E-02
Eu-155	3.821E-04	Cd	2.213E-03
Fe-55	1.313E-01	Cl-2-x	2.738E-02
H-3	2.860E-01	Cl-3-x	2.718E-01
Mn-54	4.169E-04	Cl-4-x	7.524E-02
Nb-94	6.253E-04	Cl-F-x	2.847E-02
Ni-59	1.313E-02	Cr	2.755E-02
Ni-63	1.765E+00	HC-insol	9.141E-01
Pa-234m	2.466E-03	HC-solub	3.299E-01
Pm-147	7.156E-03	Hg	3.234E-03
Pu-238	2.049E-03	Pb	5.496E-02
Pu-241	1.667E-03	Se	9.647E-04
Sb-125	2.779E-04		
Sm-151	5.558E-04		
Sr-90	5.686E-02		
Te-125m	6.948E-05		
Th-234	2.466E-03		
U-238	2.466E-03		
Y-90	5.686E-02		

Shipping Site: MOUND

Waste Type: Organic Liquids (CH-Alpha)

Total Volume (m3/yr): 1.768E+00

Total Mass (kg/yr): 2.190E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.339E-02	75-09-2	2.978E+00
Cs-137	2.450E-02	As	6.322E-03
H-3	1.111E+02	Ba	2.709E-02
Pa-234m	5.680E-03	Cd	2.409E+00
Pu-238	5.569E-03	Cl-2-x	1.574E+00
Pu-241	1.113E-01	Cl-3-x	1.718E+02
Sr-90	2.339E-02	Cl-4-x	3.827E+01
Th-234	5.680E-03	Cl-F-x	6.845E-02
U-238	5.680E-03	Cr	2.069E+00
Y-90	2.339E-02	HC-insol	3.617E+02
		HC-solub	1.237E+02
		Hg	1.355E-02
		Pb	4.599E-01

Shipping Site: MOUND

Waste Type: Solids (CH-Alpha)

Total Volume (m3/yr): 5.712E-03

Total Mass (kg/yr): 6.176E+00

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	7.557E-05	75-09-2	1.926E-02
Cs-137	7.917E-05	Ag	1.191E-04
H-3	3.591E-01	Ba	2.561E-04
Pa-234m	1.835E-05	Cd	2.102E-05
Pu-238	1.799E-05	Cl-2-x	9.886E-03
Pu-241	3.598E-04	Cl-3-x	9.601E-02
Sr-90	7.557E-05	Cl-4-x	7.627E-02
Th-234	1.835E-05	Cl-F-x	6.403E-04
U-238	1.835E-05	Cr	4.674E-05
Y-90	7.557E-05	HC-insol	2.423E-01
		HC-solub	1.132E-01
		Hg	1.951E-05
		Pb	9.361E-05
		Se	1.921E-06

A-100

Shipping Site: NNS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.560E-01

Total Mass (kg/yr): 3.925E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.383E-01	75-09-2	1.041E-01
Co-60	3.849E+00	Ag	3.925E-03
Cs-134	2.263E-03	As	2.726E-03
Cs-137	2.516E-01	Ba	1.110E-01
Eu-154	3.062E-03	Cd	3.955E-02
Eu-155	1.464E-03	Cl-2-x	1.105E-01
Fe-55	5.032E-01	Cl-3-x	4.102E+00
H-3	1.096E+00	Cl-4-x	7.996E-01
Mn-54	1.597E-03	Cl-F-x	9.360E-02
Nb-94	2.396E-03	Cr	1.488E-01
Ni-59	5.032E-02	HC-insol	1.378E+01
Ni-63	6.766E+00	HC-solub	6.570E+00
Pa-234m	9.453E-03	Hg	4.448E-02
Pm-147	2.742E-02	Pb	7.211E-02
Pu-238	7.855E-03	Se	1.201E-02
Pu-241	6.390E-03		
Sb-125	1.065E-03		
Sm-151	2.130E-03		
Sr-90	2.369E-01		
Te-125m	2.662E-04		
Th-234	9.453E-03		
U-238	9.453E-03		
Y-90	2.369E-01		

Shipping Site: UMC

Waste Type: Solids (CH-Alpha)

Total Volume (m3/yr): 3.944E-02

Total Mass (kg/yr): 5.809E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	1.743E-07	57-12-5	9.876E-03
Cm-244	2.358E-07	75-09-2	1.161E-02
Pa-234m	8.511E-07	Ag	1.742E-03
Pu-238	9.108E-05	As	5.809E-04
Pu-239	9.331E-06	Ba	1.161E-01
Pu-240	3.260E-05	Cd	2.904E-04
Pu-241	8.894E-04	Cl-2-x	1.161E-02
Th-234	8.511E-07	Cl-3-x	3.253E-02
U-238	8.511E-07	Cl-4-x	2.033E-02
		Cl-F-x	5.809E-03
		Cr	1.161E-01
		HC-insol	5.809E-02
		HC-solub	2.904E-03
		Hg	5.809E-03
		Pb	2.904E-01
		Se	1.742E-03

Shipping Site: WVDP

Waste Type: Organic Liquids (CH-Alpha)

Total Volume (m3/yr): 1.773E+00

Total Mass (kg/yr): 1.897E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	1.482E-03	57-12-5	1.600E-01
Ba-137m	1.619E+00	75-09-2	2.840E-01
Co-60	2.167E-03	Ag	7.866E-02
Cs-137	1.731E+00	As	9.986E-03
Eu-154	2.583E-03	Ba	6.783E-02
H-3	1.284E-01	Cd	1.250E-01
Nb-94	1.482E-04	Cl-2-x	4.212E-01
Ni-59	3.317E-03	Cl-3-x	2.491E+01
Ni-63	3.409E-01	Cl-4-x	3.373E+00
Pa-234m	9.529E-04	Cl-F-x	2.744E-01
Pu-238	8.047E-02	Cr	2.914E-01
Pu-239	1.334E-03	HC-insol	1.686E+01
Pu-240	5.929E-04	HC-solub	3.228E+02
Pu-241	3.465E-02	Hg	4.473E-01
Sm-151	2.477E-02	Pb	9.175E-02
Sr-90	1.541E+00	Se	6.881E-02
Tc-99	7.694E-04		
Th-234	9.529E-04		
U-238	9.529E-04		
Y-90	1.541E+00		

Shipping Site: WVDP

Waste Type: Solids (CH-Alpha)

Total Volume (m3/yr): 8.473E-01

Total Mass (kg/yr): 1.355E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	7.096E-04	57-12-5	1.069E-03
Ba-137m	7.751E-01	75-09-2	2.958E-01
Co-60	1.037E-03	Ag	1.709E-02
Cs-137	8.243E-01	As	1.081E-02
Eu-154	1.236E-03	Ba	3.475E-01
H-3	6.150E-02	Cd	1.558E-01
Nb-94	7.096E-05	Cl-2-x	2.803E-01
Ni-59	1.588E-03	Cl-3-x	1.573E+01
Ni-63	1.632E-01	Cl-4-x	2.998E+00
Pa-234m	4.561E-04	Cl-F-x	1.176E-01
Pu-238	3.852E-02	Cr	5.922E-01
Pu-239	6.386E-04	HC-insol	5.230E+01
Pu-240	2.838E-04	HC-solub	2.619E+01
Pu-241	1.659E-02	Hg	1.760E-01
Sm-151	1.186E-02	Pb	2.784E-01
Sr-90	7.339E-01	Se	4.680E-02
Tc-99	3.662E-04		
Th-234	4.561E-04		
U-238	4.561E-04		
Y-90	7.339E-01		

A.6 WM LLMW CENTRALIZED ALTERNATIVE (CASE 17)

Waste Stream: MLLW
1 Disposal Site

Alternative: 17 Centralized 1 Treatment Site -

Destination Site: HANF

Shipping Site: AMES

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 8.585E-03 Total Mass (kg/yr): 1.162E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	1.851E-08	57-12-5	1.759E-05
Bi-212	3.115E-09	75-09-2	1.485E-04
Pa-234	2.353E-09	Ag	5.841E-05
Pa-234m	2.286E-05	As	7.025E-07
Pb-212	3.115E-09	Ba	4.061E-05
Po-212	2.007E-09	Cd	5.957E-05
Po-216	3.115E-09	Cl-2-x	1.879E-04
Ra-224	3.051E-09	Cl-3-x	4.658E-04
Ra-228	1.813E-08	Cl-4-x	8.901E-04
Tc-99	3.373E-07	Cl-F-x	7.426E-05
Th-228	3.115E-09	Cr	1.342E-04
Th-231	1.785E-08	HC-insol	1.917E-05
Th-232	1.879E-07	HC-solub	1.017E-02
Th-234	2.286E-05	Hg	5.635E-05
Tl-208	1.177E-09	Pb	8.863E-05
U-235	1.778E-08	Se	1.196E-06
U-238	2.286E-05		

Shipping Site: ANL-E

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 4.838E+02 Total Mass (kg/yr): 8.170E+05

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	2.380E-02	57-12-5	2.002E+01
Ba-137m	3.504E+01	75-09-2	2.778E+01
Co-60	1.304E+01	Ag	1.623E+01
Cs-137	3.747E+01	As	6.714E+00
Eu-154	1.388E-01	Ba	2.781E+02
Eu-155	4.761E-02	Cd	9.989E+00
H-3	2.699E+00	Cl-2-x	1.822E+01
Nb-94	9.919E-02	Cl-3-x	3.658E+02
Ni-59	2.104E+00	Cl-4-x	4.608E+01
Ni-63	2.214E+02	Cl-F-x	1.759E+01
Pa-234m	4.796E+00	Cr	3.334E+02
Pu-238	1.474E+00	HC-insol	1.482E+03
Pu-239	2.380E-02	HC-solub	7.360E+02
Pu-240	3.571E-02	Hg	1.110E+02
Pu-241	1.561E+00	Pb	4.704E+02
Sm-151	4.519E-01	Se	4.660E+01
Sr-90	3.313E+01		
Tc-99	3.963E-01		
Th-232	3.967E-02		
Th-234	4.796E+00		
U-238	4.796E+00		
Y-90	3.313E+01		

Shipping Site: ANL-W

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 1.434E-03

Total Mass (kg/yr): 1.643E+00

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	9.602E-04	57-12-5	6.780E-05
Co-60	1.551E-02	75-09-2	1.235E-03
Cs-134	9.119E-06	Ag	3.399E-05
Cs-137	1.013E-03	As	6.867E-06
Eu-154	1.233E-05	Ba	4.045E-05
Eu-155	5.901E-06	Cd	9.595E-04
Fe-55	2.027E-03	Cl-2-x	7.722E-04
H-3	4.417E-03	Cl-3-x	7.405E-02
Mn-54	6.437E-06	Cl-4-x	1.554E-02
Nb-94	9.656E-06	Cl-F-x	1.459E-04
Ni-59	2.027E-04	Cr	9.018E-04
Ni-63	2.726E-02	HC-insol	1.485E-01
Pa-234m	3.808E-05	HC-solub	1.849E-01
Pm-147	1.105E-04	Hg	1.979E-04
Pu-238	3.165E-05	Pb	2.123E-04
Pu-241	2.575E-05	Se	2.971E-05
Sb-125	4.291E-06		
Sm-151	8.583E-06		
Sr-90	9.549E-04		
Te-125m	1.072E-06		
Th-234	3.808E-05		
U-238	3.808E-05		
Y-90	9.549E-04		

Shipping Site: ANL-W

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 5.921E-01

Total Mass (kg/yr): 7.134E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	3.964E-01	57-12-5	5.489E-02
Co-60	6.403E+00	75-09-2	1.724E-01
Cs-134	3.765E-03	Ag	1.359E-02
Cs-137	4.185E-01	As	5.853E-03
Eu-154	5.094E-03	Ba	7.577E-01
Eu-155	2.436E-03	Cd	3.970E-02
Fe-55	8.371E-01	Cl-2-x	1.798E-01
H-3	1.823E+00	Cl-3-x	4.161E+00
Mn-54	2.657E-03	Cl-4-x	8.978E-01
Nb-94	3.986E-03	Cl-F-x	1.350E-01
Ni-59	8.371E-02	Cr	7.891E-01
Ni-63	1.125E+01	HC-insol	1.339E+01
Pa-234m	1.572E-02	HC-solub	6.340E+00
Pm-147	4.562E-02	Hg	7.512E-02
Pu-238	1.306E-02	Pb	1.685E+00
Pu-241	1.063E-02	Se	2.129E-02
Sb-125	1.771E-03		
Sm-151	3.543E-03		
Sr-90	3.942E-01		
Te-125m	4.429E-04		
Th-234	1.572E-02		
U-238	1.572E-02		
Y-90	3.942E-01		

Shipping Site: BAPL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 6.410E-02

Total Mass (kg/yr): 6.163E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	5.332E-05	75-09-2	5.934E-02
Ba-137m	5.866E-02	As	4.724E-04
Co-60	7.908E-05	Ba	2.024E-03
Cs-137	6.272E-02	Cd	6.779E-02
Eu-154	9.439E-05	Cl-2-x	3.091E-02
H-3	4.694E-03	Cl-3-x	4.931E-01
Nb-94	5.357E-06	Cl-4-x	1.055E-01
Ni-59	1.209E-04	Cl-F-x	1.360E-05
Ni-63	1.242E-02	Cr	5.671E-02
Pa-234m	3.469E-05	HC-insol	2.699E+01
Pu-238	2.806E-03	HC-solub	8.592E+00
Pu-239	3.801E-05	Hg	3.698E-04
Pu-240	2.168E-05	Pb	1.294E-02
Pu-241	6.225E-04		
Sm-151	9.031E-04		
Sr-90	5.586E-02		
Tc-99	2.806E-05		
Th-234	3.469E-05		
U-238	3.469E-05		
Y-90	5.586E-02		

Shipping Site: BAPL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 6.105E-01

Total Mass (kg/yr): 6.010E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	5.078E-04	57-12-5	1.703E-03
Ba-137m	5.587E-01	75-09-2	6.266E-02
Co-60	7.532E-04	Ag	6.515E-03
Cs-137	5.974E-01	As	1.598E-03
Eu-154	8.990E-04	Ba	6.259E-02
H-3	4.471E-02	Cd	1.698E-02
Nb-94	5.102E-05	Cl-2-x	7.067E-02
Ni-59	1.151E-03	Cl-3-x	4.679E-01
Ni-63	1.183E-01	Cl-4-x	4.156E-01
Pa-234m	3.304E-04	Cl-F-x	8.727E-02
Pu-238	2.672E-02	Cr	4.102E-02
Pu-239	3.620E-04	HC-insol	2.697E+00
Pu-240	2.065E-04	HC-solub	2.666E+00
Pu-241	5.929E-03	Hg	1.514E-02
Sm-151	8.601E-03	Pb	7.746E-02
Sr-90	5.321E-01	Se	2.393E-03
Tc-99	2.672E-04		
Th-234	3.304E-04		
U-238	3.304E-04		
Y-90	5.321E-01		

Shipping Site: BAPL

Waste Type: Solids (CH-Alpha)

Total Volume (m3/yr): 8.357E-01

Total Mass (kg/yr): 3.493E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	6.984E-04	75-09-2	2.095E-01
Ba-137m	7.629E-01	Ag	3.493E-03
Co-60	1.021E-03	Ba	1.397E-01
Cs-137	8.160E-01	Cd	6.986E-04
Eu-154	1.217E-03	Cl-2-x	2.445E-01
H-3	6.053E-02	Cl-3-x	8.733E-01
Nb-94	6.984E-05	Cl-4-x	4.191E-01
Ni-59	1.563E-03	Cl-F-x	3.493E-01
Ni-63	1.606E-01	Cr	5.239E-03
Pa-234m	4.490E-04	HC-insol	3.493E+00
Pu-238	3.791E-02	HC-solub	1.746E-03
Pu-239	6.286E-04	Hg	6.986E-04
Pu-240	2.793E-04	Pb	3.493E-02
Pu-241	1.633E-02	Se	1.047E-03
Sm-151	1.167E-02		
Sr-90	7.264E-01		
Tc-99	3.625E-04		
Th-234	4.490E-04		
U-238	4.490E-04		
Y-90	7.264E-01		

Shipping Site: BATELLE

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 1.500E-03

Total Mass (kg/yr): 1.977E+00

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	3.211E-09	75-09-2	3.955E-02
Bi-212	5.400E-10	Cl-2-x	1.977E-02
Pa-234	4.080E-10	Cl-3-x	1.977E-01
Pa-234m	3.964E-06	Cl-4-x	1.582E-01
Pb-212	5.400E-10	HC-insol	4.943E-01
Po-212	3.480E-10	HC-solub	2.373E-01
Po-216	5.400E-10		
Ra-224	5.400E-10		
Ra-228	3.211E-09		
Tc-99	5.971E-08		
Th-228	5.400E-10		
Th-231	3.097E-09		
Th-232	3.260E-08		
Th-234	3.964E-06		
Tl-208	2.040E-10		
U-235	3.085E-09		
U-238	3.964E-06		

Shipping Site: BNL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 1.544E+00

Total Mass (kg/yr): 1.749E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	7.598E-05	57-12-5	8.298E-02
Ba-137m	1.118E-01	75-09-2	1.156E+00
Co-60	4.162E-02	Ag	4.159E-02
Cs-137	1.196E-01	As	7.649E-03
Eu-154	4.432E-04	Ba	4.627E-02
Eu-155	1.519E-04	Cd	8.868E-01
H-3	8.617E-03	Cl-2-x	7.572E-01
Nb-94	3.166E-04	Cl-3-x	7.014E+01
Ni-59	6.718E-03	Cl-4-x	1.445E+01
Ni-63	7.068E-01	Cl-F-x	1.704E-01
Pa-234m	1.530E-02	Cr	8.567E-01
Pu-238	4.706E-03	HC-insol	1.386E+02
Pu-239	7.598E-05	HC-solub	2.115E+02
Pu-240	1.139E-04	Hg	2.406E-01
Pu-241	4.984E-03	Pb	2.050E-01
Sm-151	1.442E-03	Se	3.636E-02
Sr-90	1.057E-01		
Tc-99	1.265E-03		
Th-232	1.266E-04		
Th-234	1.530E-02		
U-238	1.530E-02		
Y-90	1.057E-01		

Shipping Site: BNL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 8.915E+00

Total Mass (kg/yr): 1.190E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	4.386E-04	57-12-5	1.617E+00
Ba-137m	6.457E-01	75-09-2	8.722E-01
Co-60	2.402E-01	Ag	7.571E-01
Cs-137	6.904E-01	As	2.698E-01
Eu-154	2.558E-03	Ba	2.157E+01
Eu-155	8.772E-04	Cd	4.530E-01
H-3	4.974E-02	Cl-2-x	8.722E-01
Nb-94	1.827E-03	Cl-3-x	2.419E+01
Ni-59	3.878E-02	Cl-4-x	3.963E-01
Ni-63	4.080E+00	Cl-F-x	1.019E+00
Pa-234m	8.837E-02	Cr	2.698E+01
Pu-238	2.716E-02	HC-insol	1.091E+02
Pu-239	4.386E-04	HC-solub	5.459E+01
Pu-240	6.579E-04	Hg	8.531E+00
Pu-241	2.877E-02	Pb	2.912E+01
Sm-151	8.327E-03	Se	3.668E+00
Sr-90	6.105E-01		
Tc-99	7.303E-03		
Th-232	7.310E-04		
Th-234	8.837E-02		
U-238	8.837E-02		
Y-90	6.105E-01		

Shipping Site: CNS

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 9.054E-01

Total Mass (kg/yr): 1.026E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	6.061E-01	57-12-5	5.151E-02
Co-60	9.790E+00	75-09-2	7.241E-01
Cs-134	5.756E-03	Ag	2.274E-02
Cs-137	6.400E-01	As	3.999E-03
Eu-154	7.788E-03	Ba	2.356E-02
Eu-155	3.724E-03	Cd	5.620E-01
Fe-55	1.280E+00	Cl-2-x	4.522E-01
H-3	2.788E+00	Cl-3-x	4.355E+01
Mn-54	4.063E-03	Cl-4-x	9.136E+00
Nb-94	6.095E-03	Cl-F-x	8.522E-02
Ni-59	1.280E-01	Cr	5.418E-01
Ni-63	1.720E+01	HC-insol	8.707E+01
Pa-234m	2.404E-02	HC-solub	1.317E+02
Pm-147	6.975E-02	Hg	1.340E-01
Pu-238	1.997E-02	Pb	1.275E-01
Pu-241	1.625E-02	Se	1.998E-02
Sb-125	2.709E-03		
Sm-151	5.418E-03		
Sr-90	6.027E-01		
Te-125m	6.772E-04		
Th-234	2.404E-02		
U-238	2.404E-02		
Y-90	6.027E-01		

Shipping Site: CNS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 9.030E-02

Total Mass (kg/yr): 6.772E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	6.218E-02	57-12-5	2.357E-03
Co-60	1.004E+00	75-09-2	2.142E-02
Cs-134	5.431E-04	Ag	7.345E-04
Cs-137	6.038E-02	As	2.549E-04
Eu-154	7.990E-04	Ba	3.376E-02
Eu-155	3.821E-04	Cd	2.213E-03
Fe-55	1.313E-01	Cl-2-x	2.738E-02
H-3	2.860E-01	Cl-3-x	2.718E-01
Mn-54	4.169E-04	Cl-4-x	7.524E-02
Nb-94	6.253E-04	Cl-F-x	2.847E-02
Ni-59	1.313E-02	Cr	2.755E-02
Ni-63	1.765E+00	HC-insol	9.141E-01
Pa-234m	2.466E-03	HC-solub	3.299E-01
Pm-147	7.156E-03	Hg	3.234E-03
Pu-238	2.049E-03	Pb	5.496E-02
Pu-241	1.667E-03	Se	9.647E-04
Sb-125	2.779E-04		
Sm-151	5.558E-04		
Sr-90	5.686E-02		
Te-125m	6.948E-05		
Th-234	2.466E-03		
U-238	2.466E-03		
Y-90	5.686E-02		

Shipping Site: COLONIE

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 9.054E-01

Total Mass (kg/yr): 1.026E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	1.937E-06	57-12-5	5.151E-02
Bi-212	3.259E-07	75-09-2	7.241E-01
Pa-234	2.462E-07	Ag	2.274E-02
Pa-234m	2.392E-03	As	3.999E-03
Pb-212	3.259E-07	Ba	2.356E-02
Po-212	2.100E-07	Cd	5.620E-01
Po-216	3.259E-07	Cl-2-x	4.522E-01
Ra-224	3.259E-07	Cl-3-x	4.355E+01
Ra-228	1.937E-06	Cl-4-x	9.136E+00
Tc-99	3.603E-05	Cl-F-x	8.522E-02
Th-228	3.259E-07	Cr	5.418E-01
Th-231	1.868E-06	HC-insol	8.707E+01
Th-232	1.967E-05	HC-solub	1.317E+02
Th-234	2.392E-03	Hg	1.340E-01
Tl-208	1.231E-07	Pb	1.275E-01
U-235	1.861E-06	Se	1.998E-02
U-238	2.392E-03		

Shipping Site: COLONIE

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 1.235E-02

Total Mass (kg/yr): 1.606E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	3.198E-08	57-12-5	7.229E-04
Bi-212	5.380E-09	75-09-2	8.484E-04
Pa-234	4.065E-09	Ag	2.570E-05
Pa-234m	3.949E-05	As	2.249E-05
Pb-212	5.380E-09	Ba	1.606E-05
Po-212	3.467E-09	Cd	1.429E-04
Po-216	5.380E-09	Cl-2-x	4.242E-03
Ra-224	2.690E-09	Cl-3-x	5.345E-03
Ra-228	1.599E-08	Cl-4-x	5.006E-03
Tc-99	2.974E-07	Cl-F-x	4.242E-04
Th-228	5.380E-09	Cr	5.462E-04
Th-231	3.084E-08	HC-insol	9.333E-04
Th-232	3.247E-07	HC-solub	8.032E-04
Th-234	3.949E-05	Hg	3.695E-06
Tl-208	2.032E-09	Pb	1.044E-03
U-235	3.072E-08	Se	8.032E-06
U-238	3.949E-05		

Shipping Site: ETEC

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 6.767E-03

Total Mass (kg/yr): 7.145E+00

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	3.329E-07	57-12-5	6.272E-04
Ba-137m	4.901E-04	75-09-2	4.759E-04
Co-60	1.823E-04	Ag	3.144E-04
Cs-137	5.241E-04	As	4.027E-05
Eu-154	1.942E-06	Ba	2.745E-04
Eu-155	6.659E-07	Cd	1.707E-05
H-3	3.775E-05	Cl-2-x	1.354E-03
Nb-94	1.387E-06	Cl-3-x	5.331E-02
Ni-59	2.943E-05	Cl-4-x	3.012E-03
Ni-63	3.097E-03	Cl-F-x	1.098E-03
Pa-234m	6.707E-05	Cr	7.317E-04
Pu-238	2.062E-05	HC-insol	4.382E-02
Pu-239	3.329E-07	HC-solub	1.255E+00
Pu-240	4.994E-07	Hg	1.781E-03
Pu-241	2.184E-05	Pb	2.730E-04
Sm-151	6.320E-06	Se	2.748E-04
Sr-90	4.634E-04		
Tc-99	5.543E-06		
Th-232	5.549E-07		
Th-234	6.707E-05		
U-238	6.707E-05		
Y-90	4.634E-04		

Shipping Site: ETEC

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 7.380E+01

Total Mass (kg/yr): 1.326E+05

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	3.631E-03	57-12-5	4.222E-02
Ba-137m	5.346E+00	75-09-2	1.466E-01
Co-60	1.989E+00	Ag	1.331E+00
Cs-137	5.716E+00	As	6.654E-01
Eu-154	2.118E-02	Ba	2.587E+00
Eu-155	7.262E-03	Cd	4.415E-01
H-3	4.118E-01	Cl-2-x	1.504E-01
Nb-94	1.513E-02	Cl-3-x	5.990E+00
Ni-59	3.210E-01	Cl-4-x	1.869E+00
Ni-63	3.377E-01	Cl-F-x	9.652E-02
Pa-234m	7.316E-01	Cr	3.303E+00
Pu-238	2.249E-01	HC-insol	1.648E+01
Pu-239	3.631E-03	HC-solub	8.724E+00
Pu-240	5.447E-03	Hg	7.346E-01
Pu-241	2.382E-01	Pb	6.598E+00
Sm-151	6.893E-02	Se	2.188E-01
Sr-90	5.054E+00		
Tc-99	6.046E-02		
Th-232	6.052E-03		
Th-234	7.316E-01		
U-238	7.316E-01		
Y-90	5.054E+00		

Shipping Site: FEMP

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 2.034E+01

Total Mass (kg/yr): 2.423E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	4.353E-05	57-12-5	4.910E-01
Bi-212	7.324E-06	75-09-2	2.872E+01
Pa-234	5.533E-06	Ag	1.270E-01
Pa-234m	5.376E-02	As	6.728E-02
Pb-212	7.324E-06	Ba	2.928E-01
Po-212	4.720E-06	Cd	2.349E+01
Po-216	7.324E-06	Cl-2-x	1.522E+01
Ra-224	7.324E-06	Cl-3-x	1.621E+03
Ra-228	4.353E-05	Cl-4-x	3.603E+02
Tc-99	8.097E-04	Cl-F-x	6.895E-01
Th-228	7.324E-06	Cr	2.072E+01
Th-231	4.199E-05	HC-insol	3.779E+03
Th-232	4.420E-04	HC-solub	2.255E+03
Th-234	5.376E-02	Hg	9.307E-01
Tl-208	2.766E-06	Pb	4.623E+00
U-235	4.182E-05	Se	1.150E-01
U-238	5.376E-02		

Shipping Site: FEMP

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 7.909E+01

Total Mass (kg/yr): 1.180E+05

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	1.696E-04	57-12-5	5.948E+00
Bi-212	2.854E-05	75-09-2	2.117E+01
Pa-234	2.156E-05	Ag	3.226E+00
Pa-234m	2.095E-01	As	1.249E+00
Pb-212	2.854E-05	Ba	1.085E+02
Po-212	1.839E-05	Cd	6.815E+00
Po-216	2.854E-05	Cl-2-x	2.073E+01
Ra-224	2.837E-05	Cl-3-x	5.283E+02
Ra-228	1.686E-04	Cl-4-x	3.692E+02
Tc-99	3.136E-03	Cl-F-x	1.313E+01
Th-228	2.854E-05	Cr	1.531E+02
Th-231	1.636E-04	HC-insol	1.786E+03
Th-232	1.722E-03	HC-solub	9.390E+02
Th-234	2.095E-01	Hg	3.514E+01
Tl-208	1.078E-05	Pb	1.240E+02
U-235	1.630E-04	Se	1.366E+01
U-238	2.095E-01		

Shipping Site: GATOMIC

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 7.077E-02

Total Mass (kg/yr): 7.476E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	1.514E-07	57-12-5	6.543E-03
Bi-212	2.547E-08	75-09-2	5.261E-03
Pa-234	1.925E-08	Ag	3.280E-03
Pa-234m	1.870E-04	As	4.207E-04
Pb-212	2.547E-08	Ba	2.867E-03
Po-212	1.642E-08	Cd	4.175E-04
Po-216	2.547E-08	Cl-2-x	1.428E-02
Ra-224	2.547E-08	Cl-3-x	5.732E-01
Ra-228	1.514E-07	Cl-4-x	3.523E-02
Tc-99	2.816E-06	Cl-F-x	1.146E-02
Th-228	2.547E-08	Cr	7.839E-03
Th-231	1.460E-07	HC-insol	4.931E-01
Th-232	1.537E-06	HC-solub	1.311E+01
Th-234	1.870E-04	Hg	1.858E-02
Tl-208	9.625E-09	Pb	2.894E-03
U-235	1.455E-07	Se	2.867E-03
U-238	1.870E-04		

Shipping Site: GATOMIC

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 5.632E-01

Total Mass (kg/yr): 8.419E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	1.218E-06	57-12-5	9.298E-02
Bi-212	2.049E-07	75-09-2	1.998E-01
Pa-234	1.548E-07	Ag	2.502E-02
Pa-234m	1.504E-03	As	9.721E-03
Pb-212	2.049E-07	Ba	1.175E+00
Po-212	1.320E-07	Cd	4.463E-02
Po-216	2.049E-07	Cl-2-x	1.741E-01
Ra-224	1.996E-07	Cl-3-x	3.347E+00
Ra-228	1.186E-06	Cl-4-x	8.150E-01
Tc-99	2.207E-05	Cl-F-x	1.017E-01
Th-228	2.049E-07	Cr	1.315E+00
Th-231	1.175E-06	HC-insol	1.041E+01
Th-232	1.237E-05	HC-solub	6.899E+00
Th-234	1.504E-03	Hg	1.942E-01
Tl-208	7.742E-08	Pb	2.810E+00
U-235	1.170E-06	Se	7.067E-02
U-238	1.504E-03		

Shipping Site: GJCT

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 1.290E-02

Total Mass (kg/yr): 1.478E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	2.762E-08	57-12-5	6.102E-04
Bi-212	4.647E-09	75-09-2	1.111E-02
Pa-234	3.511E-09	Ag	3.059E-04
Pa-234m	3.411E-05	As	6.180E-05
Pb-212	4.647E-09	Ba	3.641E-04
Po-212	2.995E-09	Cd	8.635E-03
Po-216	4.647E-09	Cl-2-x	6.949E-03
Ra-224	4.647E-09	Cl-3-x	6.665E-01
Ra-228	2.762E-08	Cl-4-x	1.398E-01
Tc-99	5.138E-07	Cl-F-x	1.313E-03
Th-228	4.647E-09	Cr	8.116E-03
Th-231	2.664E-08	HC-insol	1.336E+00
Th-232	2.805E-07	HC-solub	1.664E+00
Th-234	3.411E-05	Hg	1.781E-03
Tl-208	1.756E-09	Pb	1.911E-03
U-235	2.654E-08	Se	2.674E-04
U-238	3.411E-05		

A-110

Shipping Site: GJCT

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 2.953E-02

Total Mass (kg/yr): 5.478E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	6.356E-08	57-12-5	1.997E-04
Bi-212	1.069E-08	75-09-2	1.051E-03
Pa-234	8.080E-09	Ag	6.108E-04
Pa-234m	7.849E-05	As	2.981E-04
Pb-212	1.069E-08	Ba	3.480E-03
Po-212	6.891E-09	Cd	4.003E-04
Po-216	1.069E-08	Cl-2-x	1.051E-03
Ra-224	1.054E-08	Cl-3-x	2.387E-02
Ra-228	6.268E-08	Cl-4-x	7.830E-03
Tc-99	1.165E-06	Cl-F-x	5.619E-04
Th-228	1.069E-08	Cr	4.507E-03
Th-231	6.131E-08	HC-insol	7.674E-02
Th-232	6.454E-07	HC-solub	8.522E-02
Th-234	7.849E-05	Hg	1.306E-03
Tl-208	4.040E-09	Pb	5.304E-03
U-235	6.107E-08	Se	4.666E-04
U-238	7.849E-05		

Shipping Site: INEL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 3.228E+00

Total Mass (kg/yr): 3.542E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.161E+00	57-12-5	3.153E-02
Co-60	3.491E+01	75-09-2	3.795E+00
Cs-134	2.052E-02	Ag	1.639E-02
Cs-137	2.282E+00	As	1.784E-02
Eu-154	2.777E-02	Ba	8.196E-02
Eu-155	1.328E-02	Cd	3.488E+00
Fe-55	4.564E+00	Cl-2-x	2.055E+00
H-3	9.942E+00	Cl-3-x	1.554E+02
Mn-54	1.448E-02	Cl-4-x	3.406E+01
Nb-94	2.173E-02	Cl-F-x	1.159E-01
Ni-59	4.564E-01	Cr	2.998E+00
Ni-63	6.136E+01	HC-insol	8.980E+02
Pa-234m	8.573E-02	HC-solub	3.553E+02
Pm-147	2.487E-01	Hg	1.118E-01
Pu-238	7.124E-02	Pb	6.798E-01
Pu-241	5.795E-02	Se	1.431E-02
Sb-125	9.659E-03		
Sm-151	1.931E-02		
Sr-90	2.149E+00		
Te-125m	2.414E-03		
Th-234	8.573E-02		
U-238	8.573E-02		
Y-90	2.149E+00		

A-III

Shipping Site: INEL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.913E+01

Total Mass (kg/yr): 6.096E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.622E+01	57-12-5	3.846E+00
Co-60	4.236E+02	75-09-2	1.705E+01
Cs-134	2.484E-01	Ag	1.037E+00
Cs-137	2.761E+01	As	4.884E-01
Eu-154	3.370E-01	Ba	5.299E+01
Eu-155	1.611E-01	Cd	5.011E+00
Fe-55	5.538E+01	Cl-2-x	1.273E+01
H-3	1.206E+02	Cl-3-x	3.471E+02
Mn-54	1.758E-01	Cl-4-x	7.556E+01
Nb-94	2.637E-01	Cl-F-x	8.352E+00
Ni-59	5.538E+00	Cr	6.930E+01
Ni-63	7.447E+02	HC-insol	1.084E+03
Pa-234m	1.040E+00	HC-solub	5.495E+02
Pm-147	3.018E+00	Hg	8.011E+00
Pu-238	8.645E-01	Pb	1.706E+02
Pu-241	7.033E-01	Se	2.072E+00
Sb-125	1.172E-01		
Sm-151	2.344E-01		
Sr-90	2.601E+01		
Te-125m	2.930E-02		
Th-234	1.040E+00		
U-238	1.040E+00		
Y-90	2.601E+01		

Shipping Site: INEL

Waste Type: Solids (CH-Alpha)

Total Volume (m3/yr): 6.473E+02

Total Mass (kg/yr): 1.178E+06

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	2.175E-01	57-12-5	5.736E+01
Ba-137m	1.914E+02	75-09-2	6.107E+02
Co-60	6.829E+01	Ag	1.245E+01
Cs-137	2.022E+02	As	5.295E+00
Eu-154	3.262E-01	Ba	7.474E+02
H-3	2.751E+02	Cd	1.467E+02
Nb-94	4.567E+00	Cl-2-x	2.715E+02
Ni-59	1.044E+02	Cl-3-x	2.218E+03
Ni-63	9.589E+03	Cl-4-x	8.828E+02
Pa-234m	1.729E+01	Cl-F-x	2.953E+02
Pu-238	1.011E+01	Cr	2.118E+03
Pu-240	3.262E-01	HC-insol	4.349E+03
Pu-241	8.700E+00	HC-solub	1.889E+03
Sm-151	2.936E+00	Hg	1.775E+02
Sr-90	1.826E+02	Pb	5.937E+03
Th-234	1.729E+01	Se	2.939E+01
U-238	1.729E+01		
Y-90	1.826E+02		

Shipping Site: ITRI

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 1.028E-01

Total Mass (kg/yr): 1.007E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.367E-03	57-12-5	1.813E-02
Co-60	1.879E-03	Ag	4.433E-03
Cs-137	1.424E-03	Cd	4.937E-04
Eu-154	1.566E-05	Cl-3-x	8.061E-02
Fe-55	2.364E-04	Cl-4-x	4.534E-03
H-3	2.725E-01	Cr	2.116E-02
Ni-59	3.133E-05	HC-insol	1.108E+00
Ni-63	4.158E-03	HC-solub	3.627E+01
Pm-147	1.310E-04	Hg	2.821E-02
Pu-238	5.411E-05	Pb	5.038E-03
Pu-241	2.734E-04	Se	4.030E-03
Sm-151	1.253E-05		
Sr-90	1.338E-03		
Y-90	1.338E-03		

Shipping Site: KAPL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 6.167E-01

Total Mass (kg/yr): 7.065E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	4.129E-01	57-12-5	2.915E-02
Co-60	6.669E+00	75-09-2	5.312E-01
Cs-134	3.921E-03	Ag	1.461E-02
Cs-137	4.359E-01	As	2.952E-03
Eu-154	5.305E-03	Ba	1.739E-02
Eu-155	2.537E-03	Cd	4.125E-01
Fe-55	8.719E-01	Cl-2-x	3.320E-01
H-3	1.899E+00	Cl-3-x	3.184E+01
Mn-54	2.768E-03	Cl-4-x	6.682E+00
Nb-94	4.152E-03	Cl-F-x	6.275E-02
Ni-59	8.719E-02	Cr	3.877E-01
Ni-63	1.172E+01	HC-insol	6.386E+01
Pa-234m	1.637E-02	HC-solub	7.952E+01
Pm-147	4.752E-02	Hg	8.511E-02
Pu-238	1.361E-02	Pb	9.130E-02
Pu-241	1.107E-02	Se	1.277E-02
Sb-125	1.845E-03		
Sm-151	3.690E-03		
Sr-90	4.106E-01		
Te-125m	4.613E-04		
Th-234	1.637E-02		
U-238	1.637E-02		
Y-90	4.106E-01		

Shipping Site: KAPL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.572E+00

Total Mass (kg/yr): 5.162E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.391E+00	57-12-5	1.840E-02
Co-60	3.862E+01	75-09-2	2.577E+00
Cs-134	2.271E-02	Ag	6.267E-02
Cs-137	2.525E+00	As	2.265E-02
Eu-154	3.072E-02	Ba	5.050E-01
Eu-155	1.469E-02	Cd	2.428E-02
Fe-55	5.050E+00	Cl-2-x	1.464E+00
H-3	1.100E+01	Cl-3-x	1.328E+01
Mn-54	1.603E-02	Cl-4-x	1.024E+01
Nb-94	2.404E-02	Cl-F-x	4.115E-01
Ni-59	5.050E-01	Cr	4.769E-01
Ni-63	6.790E+01	HC-insol	3.511E+01
Pa-234m	9.486E-02	HC-solub	1.516E+01
Pm-147	2.752E-01	Hg	6.065E-02
Pu-238	7.882E-02	Pb	7.229E-01
Pu-241	6.413E-02	Se	1.698E-02
Sb-125	1.068E-02		
Sm-151	2.137E-02		
Sr-90	2.378E+00		
Te-125m	2.672E-03		
Th-234	9.486E-02		
U-238	9.486E-02		
Y-90	2.378E+00		

Shipping Site: KCP

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 4.219E-02

Total Mass (kg/yr): 3.237E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.824E-02	75-09-2	2.982E-02
Co-60	4.562E-01	Ag	1.504E-04
Cs-134	2.682E-04	As	2.945E-05
Cs-137	2.982E-02	Ba	6.019E-03
Eu-154	3.629E-04	Cd	5.228E-03
Eu-155	1.735E-04	Cl-2-x	1.746E-02
Fe-55	5.964E-02	Cl-3-x	7.227E-02
H-3	1.299E-01	Cl-4-x	3.884E-02
Mn-54	1.893E-04	Cl-F-x	2.371E-02
Nb-94	2.840E-04	Cr	2.621E-02
Ni-59	5.964E-03	HC-insol	1.522E-01
Ni-63	8.019E-01	HC-solub	1.618E-04
Pa-234m	1.120E-03	Hg	4.361E-03
Pm-147	3.250E-03	Pb	1.747E-01
Pu-238	9.309E-04	Se	3.916E-04
Pu-241	7.573E-04		
Sb-125	1.262E-04		
Sm-151	2.524E-04		
Sr-90	2.808E-02		
Te-125m	3.155E-05		
Th-234	1.120E-03		
U-238	1.120E-03		
Y-90	2.808E-02		

Shipping Site: KKS

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 4.733E-01

Total Mass (kg/yr): 5.422E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	3.168E-01	57-12-5	2.237E-02
Co-60	5.118E+00	75-09-2	4.077E-01
Cs-134	3.009E-03	Ag	1.121E-02
Cs-137	3.345E-01	As	2.266E-03
Eu-154	4.071E-03	Ba	1.335E-02
Eu-155	1.947E-03	Cd	3.166E-01
Fe-55	6.691E-01	Cl-2-x	2.548E-01
H-3	1.457E+00	Cl-3-x	2.443E+01
Mn-54	2.124E-03	Cl-4-x	5.128E+00
Nb-94	3.186E-03	Cl-F-x	4.816E-02
Ni-59	6.691E-02	Cr	2.976E-01
Ni-63	8.997E+00	HC-insol	4.901E+01
Pa-234m	1.256E-02	HC-solub	6.103E+01
Pm-147	3.646E-02	Hg	6.532E-02
Pu-238	1.044E-02	Pb	7.007E-02
Pu-241	8.497E-03	Se	9.805E-03
Sb-125	1.416E-03		
Sm-151	2.832E-03		
Sr-90	3.151E-01		
Te-125m	3.540E-04		
Th-234	1.256E-02		
U-238	1.256E-02		
Y-90	3.151E-01		

Shipping Site: KKS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.928E+00 Total Mass (kg/yr): 6.620E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.630E+00	57-12-5	1.282E-01
Co-60	4.248E+01	75-09-2	2.231E+00
Cs-134	2.497E-02	Ag	8.783E-02
Cs-137	2.776E+00	As	3.299E-02
Eu-154	3.379E-02	Ba	1.662E+00
Eu-155	1.616E-02	Cd	5.269E-02
Fe-55	5.553E+00	Cl-2-x	1.281E+00
H-3	1.209E+01	Cl-3-x	1.108E+01
Mn-54	1.763E-02	Cl-4-x	1.215E+01
Nb-94	2.644E-02	Cl-F-x	2.090E-01
Ni-59	5.553E-01	Cr	1.846E+00
Ni-63	7.467E+01	HC-insol	2.753E+01
Pa-234m	1.043E-01	HC-solub	1.411E+01
Pm-147	3.026E-01	Hg	1.438E-01
Pu-238	8.668E-02	Pb	4.165E+00
Pu-241	7.052E-02	Se	3.790E-02
Sb-125	1.175E-02		
Sm-151	2.350E-02		
Sr-90	2.615E+00		
Te-125m	2.938E-03		
Th-234	1.043E-01		
U-238	1.043E-01		
Y-90	2.615E+00		

Shipping Site: KWS

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 6.454E-02 Total Mass (kg/yr): 7.394E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	4.321E-02	57-12-5	3.051E-03
Co-60	6.979E-01	75-09-2	5.559E-02
Cs-134	4.103E-04	Ag	1.529E-03
Cs-137	4.562E-02	As	3.090E-04
Eu-154	5.552E-04	Ba	1.820E-03
Eu-155	2.655E-04	Cd	4.317E-02
Fe-55	9.125E-02	Cl-2-x	3.474E-02
H-3	1.987E-01	Cl-3-x	3.332E+00
Mn-54	2.896E-04	Cl-4-x	6.993E-01
Nb-94	4.345E-04	Cl-F-x	6.567E-03
Ni-59	9.125E-03	Cr	4.058E-02
Ni-63	1.226E+00	HC-insol	6.683E+00
Pa-234m	1.714E-03	HC-solub	8.322E+00
Pm-147	4.973E-03	Hg	8.907E-03
Pu-238	1.424E-03	Pb	9.555E-03
Pu-241	1.158E-03	Se	1.337E-03
Sb-125	1.931E-04		
Sm-151	3.862E-04		
Sr-90	4.297E-02		
Te-125m	4.828E-05		
Th-234	1.714E-03		
U-238	1.714E-03		
Y-90	4.297E-02		

Shipping Site: KWS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 1.262E+00

Total Mass (kg/yr): 1.580E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	8.449E-01	57-12-5	8.005E-02
Co-60	1.364E+01	75-09-2	3.801E-01
Cs-134	8.024E-03	Ag	2.572E-02
Cs-137	8.921E-01	As	8.795E-03
Eu-154	1.085E-02	Ba	1.035E+00
Eu-155	5.192E-03	Cd	1.157E-02
Fe-55	1.784E+00	Cl-2-x	3.221E-01
H-3	3.886E+00	Cl-3-x	1.699E+00
Mn-54	5.664E-03	Cl-4-x	1.988E+00
Nb-94	8.496E-03	Cl-F-x	2.323E-01
Ni-59	1.784E-01	Cr	1.010E+00
Ni-63	2.399E+01	HC-insol	4.421E+00
Pa-234m	3.351E-02	HC-solub	1.600E+00
Pm-147	9.724E-02	Hg	6.065E-02
Pu-238	2.785E-02	Pb	2.396E+00
Pu-241	2.265E-02	Se	1.789E-02
Sb-125	3.776E-03		
Sm-151	7.552E-03		
Sr-90	8.402E-01		
Te-125m	9.440E-04		
Th-234	3.351E-02		
U-238	3.351E-02		
Y-90	8.402E-01		

Shipping Site: LANL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 7.053E+00

Total Mass (kg/yr): 6.912E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	9.378E-02	57-12-5	1.244E+00
Co-60	1.289E-01	Ag	3.041E-01
Cs-137	9.769E-02	Cd	3.387E-02
Eu-154	1.074E-03	Cl-3-x	5.530E+00
Fe-55	1.621E-02	Cl-4-x	3.110E-01
H-3	1.869E+01	Cr	1.451E+00
Ni-59	2.149E-03	HC-insol	7.603E+01
Ni-63	2.852E-01	HC-solub	2.488E+03
Pm-147	8.987E-03	Hg	1.935E+00
Pu-238	3.712E-03	Pb	3.456E-01
Pu-241	1.875E-02	Se	2.765E-01
Sm-151	8.597E-04		
Sr-90	9.183E-02		
Y-90	9.183E-02		

Shipping Site: LANL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 1.292E+01

Total Mass (kg/yr): 1.871E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.719E-01	57-12-5	1.814E-01
Co-60	2.364E-01	75-09-2	4.543E+00
Cs-137	1.787E-01	Ag	6.519E-02
Eu-154	1.970E-03	As	2.353E-02
Fe-55	2.973E-02	Ba	1.752E+01
H-3	3.428E+01	Cd	1.078E+00
Ni-59	3.940E-03	Cl-2-x	1.687E+00
Ni-63	5.230E-01	Cl-3-x	8.308E+00
Pm-147	1.647E-02	Cl-4-x	5.036E+00
Pu-238	6.806E-03	Cl-F-x	1.893E+00
Pu-241	3.439E-02	Cr	9.451E+00
Sm-151	1.576E-03	HC-insol	9.627E-01
Sr-90	1.680E-01	HC-solub	3.150E+00
Y-90	1.680E-01	Hg	3.315E+00
		Pb	4.093E+01
		Se	1.026E-01

Shipping Site: LANL

Waste Type: Organic Liquids (CH-Alpha)

Total Volume (m3/yr): 6.158E+01

Total Mass (kg/yr): 6.598E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	8.711E-01	57-12-5	4.658E+00
Co-60	1.197E+00	75-09-2	5.213E+00
Cs-137	9.073E-01	Ag	2.903E+00
Eu-154	9.977E-03	As	4.411E-01
Fe-55	1.505E-01	Ba	3.007E+00
H-3	1.736E+02	Cd	1.268E-01
Ni-59	1.995E-02	Cl-2-x	1.483E+01
Ni-63	2.649E+00	Cl-3-x	5.741E+02
Pm-147	8.351E-02	Cl-4-x	3.244E+01
Pu-238	1.814E-01	Cl-F-x	1.203E+01
Pu-239	1.459E-02	Cr	5.435E+00
Pu-240	4.896E-02	HC-insol	3.448E+02
Pu-241	3.230E+00	HC-solub	9.332E+03
Sm-151	7.944E-03	Hg	1.606E+01
Sr-90	8.530E-01	Pb	2.376E+00
Y-90	8.530E-01	Se	2.519E+00

Shipping Site: LANL

Waste Type: Solids (CH-Alpha)

Total Volume (m3/yr): 2.801E+01

Total Mass (kg/yr): 6.796E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	3.962E-01	57-12-5	9.199E-01
Co-60	5.448E-01	75-09-2	7.358E+01
Cs-137	4.126E-01	Ag	5.600E-01
Eu-154	4.538E-03	As	1.525E-01
Fe-55	6.850E-02	Ba	1.081E+01
H-3	7.900E+01	Cd	1.740E+01
Ni-59	9.077E-03	Cl-2-x	2.574E+01
Ni-63	1.205E+00	Cl-3-x	1.337E+02
Pm-147	3.799E-02	Cl-4-x	8.345E+01
Pu-238	8.253E-02	Cl-F-x	2.951E+01
Pu-239	6.639E-03	Cr	9.888E+01
Pu-240	2.227E-02	HC-insol	4.851E+01
Pu-241	1.469E+00	HC-solub	1.967E+01
Sm-151	3.614E-03	Hg	1.501E+01
Sr-90	3.879E-01	Pb	6.059E+02
Y-90	3.879E-01	Se	1.320E+00

Shipping Site: LBL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 3.230E-01

Total Mass (kg/yr): 3.100E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	4.273E-03	75-09-2	2.976E-01
Cs-137	4.476E-03	As	2.387E-03
H-3	2.032E+01	Ba	1.023E-02
Pa-234m	1.037E-03	Cd	3.410E-01
Pu-241	1.017E-03	Cl-2-x	1.550E-01
Sr-90	4.273E-03	Cl-3-x	2.325E+00
Th-234	1.037E-03	Cl-4-x	4.961E-01
U-238	1.037E-03	Cr	2.852E-01
Y-90	4.273E-03	HC-insol	1.364E+02
		HC-solub	4.341E+01
		Hg	1.860E-03
		Pb	6.511E-02

Shipping Site: LBL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.112E+00

Total Mass (kg/yr): 4.402E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	4.117E-02	57-12-5	5.503E-01
Cs-137	4.314E-02	75-09-2	1.116E+01
H-3	1.958E+02	Ag	1.516E-01
Pa-234m	1.000E-02	As	3.237E-02
Pu-241	9.804E-03	Ba	6.474E+00
Sr-90	4.117E-02	Cd	1.754E-02
Th-234	1.000E-02	Cl-2-x	5.905E+00
U-238	1.000E-02	Cl-3-x	5.439E+01
Y-90	4.117E-02	Cl-4-x	4.320E+01
		Cl-F-x	3.237E-01
		Cr	6.485E+00
		HC-insol	1.314E+02
		HC-solub	6.326E+01
		Hg	3.242E-01
		Pb	1.619E+01
		Se	9.711E-02

Shipping Site: LERHR

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 5.020E-03

Total Mass (kg/yr): 5.750E+00

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	2.470E-07	57-12-5	2.373E-04
Ba-137m	3.636E-04	75-09-2	4.324E-03
Co-60	1.353E-04	Ag	1.189E-04
Cs-137	3.888E-04	As	2.403E-05
Eu-154	1.440E-06	Ba	1.415E-04
Eu-155	4.940E-07	Cd	3.358E-03
H-3	2.801E-05	Cl-2-x	2.702E-03
Nb-94	1.029E-06	Cl-3-x	2.592E-01
Ni-59	2.183E-05	Cl-4-x	5.439E-02
Ni-63	2.297E-03	Cl-F-x	5.108E-04
Pa-234m	4.976E-05	Cr	3.156E-03
Pu-238	1.529E-05	HC-insol	5.198E-01
Pu-239	2.470E-07	HC-solub	6.473E-01
Pu-240	3.705E-07	Hg	6.928E-04
Pu-241	1.620E-05	Pb	7.432E-04
Sm-151	4.688E-06	Se	1.039E-04
Sr-90	3.438E-04		
Tc-99	4.112E-06		
Th-232	4.116E-07		
Th-234	4.976E-05		
U-238	4.976E-05		
Y-90	3.438E-04		

Shipping Site: LERHR

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.442E-01

Total Mass (kg/yr): 2.492E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	1.701E-05	57-12-5	4.707E-04
Ba-137m	2.505E-02	75-09-2	1.438E-01
Co-60	9.323E-03	Ag	2.547E-03
Cs-137	2.641E-02	As	1.464E-05
Eu-154	9.928E-05	Ba	3.843E-02
Eu-155	3.403E-05	Cd	8.851E-03
H-3	1.930E-03	Cl-2-x	1.556E-01
Nb-94	7.091E-05	Cl-3-x	6.005E-01
Ni-59	1.504E-03	Cl-4-x	2.831E+00
Ni-63	1.583E-01	Cl-F-x	1.391E-01
Pa-234m	3.428E-03	Cr	4.652E-03
Pu-238	1.054E-03	HC-insol	1.675E+00
Pu-239	1.701E-05	HC-solub	3.579E-01
Pu-240	2.552E-05	Hg	5.762E-03
Pu-241	1.116E-03	Pb	1.542E-02
Sm-151	3.230E-04	Se	4.361E-04
Sr-90	2.335E-02		
Tc-99	2.793E-04		
Th-232	2.836E-05		
Th-234	3.428E-03		
U-238	3.428E-03		
Y-90	2.335E-02		

Shipping Site: LLNL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 7.727E+01

Total Mass (kg/yr): 8.159E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.022E+00	57-12-5	7.162E+00
Cs-137	1.071E+00	75-09-2	5.434E+00
H-3	4.863E+03	Ag	3.590E+00
Pa-234m	2.482E-01	As	4.598E-01
Pu-241	2.434E-01	Ba	3.135E+00
Sr-90	1.022E+00	Cd	1.949E-01
Th-234	2.482E-01	Cl-2-x	1.546E+01
U-238	2.482E-01	Cl-3-x	6.087E+02
Y-90	1.022E+00	Cl-4-x	3.439E+01
		Cl-F-x	1.254E+01
		Cr	8.355E+00
		HC-insol	5.003E+02
		HC-solub	1.434E+04
		Hg	2.033E+01
		Pb	3.118E+00
		Se	3.138E+00

Shipping Site: LLNL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 4.978E+01

Total Mass (kg/yr): 6.833E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	6.586E-01	57-12-5	8.172E+00
Cs-137	6.899E-01	75-09-2	8.995E+00
H-3	3.132E+03	Ag	3.852E+00
Pa-234m	1.599E-01	As	1.401E+00
Pu-241	1.568E-01	Ba	1.097E+02
Sr-90	6.586E-01	Cd	2.705E+00
Th-234	1.599E-01	Cl-2-x	7.372E+00
U-238	1.599E-01	Cl-3-x	1.900E+02
Y-90	6.586E-01	Cl-4-x	3.100E+01
		Cl-F-x	5.418E+00
		Cr	1.262E+02
		HC-insol	7.525E+02
		HC-solub	3.756E+02
		Hg	4.188E+01
		Pb	1.529E+02
		Se	1.787E+01

Shipping Site: LLNL

Waste Type: Organic Liquids (CH-Alpha)

Total Volume (m3/yr): 5.737E+01

Total Mass (kg/yr): 6.269E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	7.591E-01	57-12-5	4.251E+00
Cs-137	7.952E-01	75-09-2	2.262E+01
H-3	3.607E+03	Ag	2.130E+00
Pa-234m	1.843E-01	As	3.141E-01
Pu-238	1.807E-01	Ba	2.037E+00
Pu-241	3.614E+00	Cd	1.580E+01
Sr-90	7.591E-01	Cl-2-x	1.943E+01
Th-234	1.843E-01	Cl-3-x	1.480E+03
U-238	1.843E-01	Cl-4-x	2.696E+02
Y-90	7.591E-01	Cl-F-x	7.889E+00
		Cr	1.843E+01
		HC-insol	2.652E+03
		HC-solub	9.317E+03
		Hg	1.216E+01
		Pb	4.845E+00
		Se	1.862E+00

Shipping Site: LLNL

Waste Type: Solids (CH-Alpha)

Total Volume (m3/yr): 5.230E+01

Total Mass (kg/yr): 1.017E+05

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	6.919E-01	57-12-5	4.138E+00
Cs-137	7.249E-01	75-09-2	1.192E+01
H-3	3.288E+03	Ag	9.746E-01
Pa-234m	1.680E-01	As	3.439E-01
Pu-238	1.647E-01	Ba	5.008E+01
Pu-241	3.295E+00	Cd	3.649E+00
Sr-90	6.919E-01	Cl-2-x	7.183E+00
Th-234	1.680E-01	Cl-3-x	4.229E+01
U-238	1.680E-01	Cl-4-x	2.492E+01
Y-90	6.919E-01	Cl-F-x	1.009E+01
		Cr	2.709E+02
		HC-insol	7.977E+01
		HC-solub	2.905E+01
		Hg	8.247E+00
		Pb	1.721E+02
		Se	2.561E+00

Shipping Site: MINS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.647E+00

Total Mass (kg/yr): 3.545E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.441E+00	75-09-2	5.544E-01
Co-60	3.943E+01	Ag	1.457E-02
Cs-134	2.318E-02	As	7.197E-03
Cs-137	2.578E+00	Ba	2.427E+00
Eu-154	3.137E-02	Cd	1.150E-01
Eu-155	1.500E-02	Cl-2-x	5.975E-01
Fe-55	5.156E+00	Cl-3-x	1.190E+01
H-3	1.123E+01	Cl-4-x	2.652E+00
Mn-54	1.636E-02	Cl-F-x	6.891E-01
Nb-94	2.455E-02	Cr	7.414E-01
Ni-59	5.156E-01	HC-insol	4.047E+01
Ni-63	6.932E+01	HC-solub	1.726E+01
Pa-234m	9.684E-02	Hg	5.165E-01
Pm-147	2.809E-01	Pb	4.557E-01
Pu-238	8.047E-02	Se	3.325E-02
Pu-241	6.547E-02		
Sb-125	1.091E-02		
Sm-151	2.182E-02		
Sr-90	2.427E+00		
Te-125m	2.728E-03		
Th-234	9.684E-02		
U-238	9.684E-02		
Y-90	2.427E+00		

Shipping Site: MOUND

Waste Type: Organic Liquids (CH-Alpha)

Total Volume (m3/yr): 1.768E+00

Total Mass (kg/yr): 2.190E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.339E-02	75-09-2	2.978E+00
Cs-137	2.450E-02	As	6.322E-03
H-3	1.111E+02	Ba	2.709E-02
Pa-234m	5.680E-03	Cd	2.409E+00
Pu-238	5.569E-03	Cl-2-x	1.574E+00
Pu-241	1.113E-01	Cl-3-x	1.718E+02
Sr-90	2.339E-02	Cl-4-x	3.827E+01
Th-234	5.680E-03	Cl-F-x	6.845E-02
U-238	5.680E-03	Cr	2.069E+00
Y-90	2.339E-02	HC-insol	3.617E+02
		HC-solub	1.237E+02
		Hg	1.355E-02
		Pb	4.599E-01

Shipping Site: MOUND

Waste Type: Solids (CH-Alpha)

Total Volume (m3/yr): 5.712E-03

Total Mass (kg/yr): 6.176E+00

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	7.557E-05	75-09-2	1.926E-02
Cs-137	7.917E-05	Ag	1.191E-04
H-3	3.591E-01	Ba	2.561E-04
Pa-234m	1.835E-05	Cd	2.102E-05
Pu-238	1.799E-05	Cl-2-x	9.886E-03
Pu-241	3.598E-04	Cl-3-x	9.601E-02
Sr-90	7.557E-05	Cl-4-x	7.627E-02
Th-234	1.835E-05	Cl-F-x	6.403E-04
U-238	1.835E-05	Cr	4.674E-05
Y-90	7.557E-05	HC-insol	2.423E-01
		HC-solub	1.132E-01
		Hg	1.951E-05
		Pb	9.361E-05
		Se	1.921E-06

Shipping Site: NNS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.560E-01

Total Mass (kg/yr): 3.925E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.383E-01	75-09-2	1.041E-01
Co-60	3.849E+00	Ag	3.925E-03
Cs-134	2.263E-03	As	2.726E-03
Cs-137	2.516E-01	Ba	1.110E-01
Eu-154	3.062E-03	Cd	3.955E-02
Eu-155	1.464E-03	Cl-2-x	1.105E-01
Fe-55	5.032E-01	Cl-3-x	4.102E+00
H-3	1.096E+00	Cl-4-x	7.996E-01
Mn-54	1.597E-03	Cl-F-x	9.360E-02
Nb-94	2.396E-03	Cr	1.488E-01
Ni-59	5.032E-02	HC-insol	1.378E+01
Ni-63	6.766E+00	HC-solub	6.570E+00
Pa-234m	9.453E-03	Hg	4.448E-02
Pm-147	2.742E-02	Pb	7.211E-02
Pu-238	7.855E-03	Se	1.201E-02
Pu-241	6.390E-03		
Sb-125	1.065E-03		
Sm-151	2.130E-03		
Sr-90	2.369E-01		
Te-125m	2.662E-04		
Th-234	9.453E-03		
U-238	9.453E-03		
Y-90	2.369E-01		

Shipping Site: NTS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr):

6.621E-03

Total Mass (kg/yr):

8.886E+00

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	8.760E-05	75-09-2	5.331E-03
Cs-137	9.177E-05	Ag	9.774E-05
H-3	4.167E-01	Cd	5.331E-04
Pa-234m	2.127E-05	Cl-2-x	5.331E-03
Pu-241	2.085E-05	Cl-3-x	2.221E-02
Sr-90	8.760E-05	Cl-4-x	1.688E-01
Th-234	2.127E-05	Cl-F-x	2.665E-03
U-238	2.127E-05	Cr	1.777E-04
Y-90	8.760E-05	HC-insol	4.443E-02
		HC-solub	2.221E-02
		Hg	3.465E-04
		Pb	3.199E-04
		Se	8.886E-06

Shipping Site: ORNL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr):

1.093E+03

Total Mass (kg/yr):

1.273E+06

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	5.381E-02	57-12-5	5.083E+01
Ba-137m	7.922E+01	75-09-2	1.025E+03
Co-60	2.947E+01	Ag	2.485E+01
Cs-137	8.470E+01	As	4.853E+00
Eu-154	3.138E-01	Ba	2.866E+01
Eu-155	1.076E-01	Cd	7.813E+02
H-3	6.102E+00	Cl-2-x	6.277E+02
Nb-94	2.242E-01	Cl-3-x	6.415E+04
Ni-59	4.757E+00	Cl-4-x	1.361E+04
Ni-63	5.005E+02	Cl-F-x	1.088E+02
Pa-234m	1.084E+01	Cr	7.309E+02
Pu-238	3.332E+00	HC-insol	1.035E+05
Pu-239	5.381E-02	HC-solub	1.366E+05
Pu-240	8.071E-02	Hg	1.456E+02
Pu-241	3.529E+00	Pb	1.706E+02
Sm-151	1.021E+00	Se	2.174E+01
Sr-90	7.490E+01		
Tc-99	8.959E-01		
Th-232	8.968E-02		
Th-234	1.084E+01		
U-238	1.084E+01		
Y-90	7.490E+01		

Shipping Site: ORNL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr):

1.685E+03

Total Mass (kg/yr):

2.230E+06

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	8.298E-02	57-12-5	2.297E+02
Ba-137m	1.221E+02	75-09-2	2.058E+02
Co-60	4.545E+01	Ag	1.090E+02
Cs-137	1.303E+02	As	3.946E+01
Eu-154	4.840E-01	Ba	3.128E+03
Eu-155	1.659E-01	Cd	6.604E+01
H-3	9.410E+00	Cl-2-x	2.067E+02
Nb-94	3.457E-01	Cl-3-x	3.997E+03
Ni-59	7.337E+00	Cl-4-x	4.388E+02
Ni-63	7.718E+02	Cl-F-x	2.170E+02
Pa-234m	1.671E+01	Cr	3.510E+03
Pu-238	5.139E+00	HC-insol	1.703E+04
Pu-239	8.298E-02	HC-solub	8.350E+03
Pu-240	1.244E-01	Hg	1.152E+03
Pu-241	5.443E+00	Pb	4.348E+03
Sm-151	1.575E+00	Se	4.888E+02
Sr-90	1.152E+02		
Tc-99	1.378E+00		
Th-232	1.383E-01		
Th-234	1.671E+01		
U-238	1.671E+01		
Y-90	1.152E+02		

Shipping Site: PADUCAH

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 2.970E+01

Total Mass (kg/yr): 3.589E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	1.796E-02	57-12-5	4.590E-01
Bi-212	2.967E-03	75-09-2	4.205E+01
Pa-234	2.486E-03	Ag	2.300E-01
Pa-234m	2.420E+01	As	1.180E-01
Pb-212	2.967E-03	Ba	5.803E-01
Po-212	1.965E-03	Cd	3.374E+01
Po-216	2.967E-03	Cl-2-x	2.303E+01
Ra-224	2.967E-03	Cl-3-x	2.444E+03
Ra-228	1.796E-02	Cl-4-x	5.381E+02
Tc-99	7.291E+00	Cl-F-x	1.762E+00
Th-228	2.967E-03	Cr	2.951E+01
Th-231	1.892E-02	HC-insol	5.097E+03
Th-232	1.990E-01	HC-solub	2.651E+03
Th-234	2.420E+01	Hg	1.493E+00
Tl-208	1.163E-03	Pb	6.639E+00
U-235	1.876E-02	Se	2.011E-01
U-238	2.420E+01		

Shipping Site: PADUCAH

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 4.740E+00

Total Mass (kg/yr): 6.808E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	2.890E-03	57-12-5	1.016E+00
Bi-212	4.773E-04	75-09-2	1.710E+00
Pa-234	3.999E-04	Ag	2.502E-01
Pa-234m	3.894E+00	As	8.712E-02
Pb-212	4.773E-04	Ba	1.228E+01
Po-212	3.161E-04	Cd	1.504E-01
Po-216	4.773E-04	Cl-2-x	1.444E+00
Ra-224	4.664E-04	Cl-3-x	1.250E+01
Ra-228	2.824E-03	Cl-4-x	4.496E+00
Tc-99	1.146E+00	Cl-F-x	6.729E-01
Th-228	4.773E-04	Cr	1.293E+01
Th-231	3.044E-03	HC-insol	3.436E+01
Th-232	3.202E-02	HC-solub	1.740E+01
Th-234	3.894E+00	Hg	1.732E+00
Tl-208	1.870E-04	Pb	2.789E+01
U-235	3.019E-03	Se	6.716E-01
U-238	3.894E+00		

Shipping Site: PANT

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 1.461E+00

Total Mass (kg/yr): 2.110E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.942E-02	75-09-2	3.284E+00
Co-60	2.671E-02	As	1.112E-03
Cs-137	2.023E-02	Ba	4.766E-03
Eu-154	2.225E-04	Cd	2.321E+00
Fe-55	3.359E-03	Cl-2-x	1.743E+00
H-3	3.872E+00	Cl-3-x	2.389E+02
Ni-59	4.451E-04	Cl-4-x	5.331E+01
Ni-63	5.908E-02	Cl-F-x	9.829E-02
Pm-147	1.861E-03	Cr	2.020E+00
Pu-238	7.689E-04	HC-insol	6.419E+01
Pu-241	3.885E-03	HC-solub	3.280E+01
Sm-151	1.780E-04	Hg	1.325E-02
Sr-90	1.902E-02	Pb	4.431E-01
Y-90	1.902E-02		

Shipping Site: PANT

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 3.957E+01

Total Mass (kg/yr): 2.511E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	5.276E-01	57-12-5	2.480E-01
Co-60	7.254E-01	75-09-2	3.448E+01
Cs-137	5.454E-01	Ag	1.998E-01
Eu-154	6.045E-03	As	3.903E-02
Fe-55	9.123E-02	Ba	1.047E+01
H-3	1.051E+02	Cd	1.602E+00
Ni-59	1.209E-02	Cl-2-x	2.240E+01
Ni-63	1.604E+00	Cl-3-x	1.712E+02
Pm-147	5.056E-02	Cl-4-x	1.094E+02
Pu-238	2.088E-02	Cl-F-x	1.631E+01
Pu-241	1.055E-01	Cr	1.027E+01
Sm-151	4.836E-03	HC-insol	4.777E+02
Sr-90	5.126E-01	HC-solub	1.648E+02
Y-90	5.126E-01	Hg	1.896E+00
		Pb	5.162E+01
		Se	2.443E-01

Shipping Site: PHNS

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 1.736E-03

Total Mass (kg/yr): 1.979E+00

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.162E-03	75-09-2	2.572E-04
Co-60	1.877E-02	Ag	8.707E-05
Cs-134	1.103E-05	As	2.176E-05
Cs-137	1.227E-03	Ba	1.484E-04
Eu-154	1.493E-05	Cl-2-x	7.322E-04
Eu-155	7.141E-06	Cl-3-x	2.731E-02
Fe-55	2.454E-03	Cl-4-x	1.543E-03
H-3	5.346E-03	Cl-F-x	5.937E-04
Mn-54	7.791E-06	HC-insol	2.968E-03
Nb-94	1.168E-05	HC-solub	7.718E-04
Ni-59	2.454E-04	Hg	4.353E-04
Ni-63	3.299E-02	Pb	5.343E-05
Pa-234m	4.609E-05	Se	7.322E-05
Pm-147	1.337E-04		
Pu-238	3.830E-05		
Pu-241	3.116E-05		
Sb-125	5.194E-06		
Sm-151	1.038E-05		
Sr-90	1.155E-03		
Te-125m	1.298E-06		
Th-234	4.609E-05		
U-238	4.609E-05		
Y-90	1.155E-03		

Shipping Site: PHNS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 2.962E-01

Total Mass (kg/yr): 4.406E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.983E-01	57-12-5	4.073E-03
Co-60	3.204E+00	75-09-2	5.831E-02
Cs-134	1.883E-03	Ag	2.691E-03
Cs-137	2.094E-01	As	1.603E-03
Eu-154	2.548E-03	Ba	1.038E-01
Eu-155	1.218E-03	Cd	2.472E-02
Fe-55	4.188E-01	Cl-2-x	6.160E-02
H-3	9.124E-01	Cl-3-x	2.088E+00
Mn-54	1.329E-03	Cl-4-x	4.422E-01
Nb-94	1.994E-03	Cl-F-x	6.398E-02
Ni-59	4.188E-02	Cr	7.805E-01
Ni-63	5.631E+00	HC-insol	6.908E+00
Pa-234m	7.867E-03	HC-solub	3.289E+00
Pm-147	2.282E-02	Hg	2.617E-02
Pu-238	6.538E-03	Pb	1.563E-01
Pu-241	5.319E-03	Se	6.731E-03
Sb-125	8.865E-04		
Sm-151	1.773E-03		
Sr-90	1.972E-01		
Te-125m	2.216E-04		
Th-234	7.867E-03		
U-238	7.867E-03		
Y-90	1.972E-01		

Shipping Site: PNS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 5.200E-02

Total Mass (kg/yr): 9.088E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	3.481E-02	75-09-2	1.324E-02
Co-60	5.623E-01	Ag	6.570E-04
Cs-134	3.306E-04	As	5.453E-04
Cs-137	3.676E-02	Ba	1.708E-02
Eu-154	4.473E-04	Cd	8.438E-03
Eu-155	2.139E-04	Cl-2-x	1.324E-02
Fe-55	7.352E-02	Cl-3-x	7.909E-01
H-3	1.601E-01	Cl-4-x	1.483E-01
Mn-54	2.333E-04	Cl-F-x	7.499E-03
Nb-94	3.500E-04	Cr	1.051E-01
Ni-59	7.352E-03	HC-insol	2.629E+00
Ni-63	9.884E-01	HC-solub	1.314E+00
Pa-234m	1.380E-03	Hg	9.046E-03
Pm-147	4.006E-03	Pb	1.319E-02
Pu-238	1.147E-03	Se	2.365E-03
Pu-241	9.335E-04		
Sb-125	1.555E-04		
Sm-151	3.111E-04		
Sr-90	3.462E-02		
Te-125m	3.889E-05		
Th-234	1.380E-03		
U-238	1.380E-03		
Y-90	3.462E-02		

Shipping Site: PORTS

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 4.765E+01

Total Mass (kg/yr): 4.778E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	2.163E-05	57-12-5	7.201E+00
Bi-212	3.621E-06	75-09-2	1.017E+00
Pa-234	2.954E-06	Ag	2.102E+00
Pa-234m	2.876E-02	As	8.553E-02
Pb-212	3.621E-06	Ba	5.830E-01
Po-212	2.287E-06	Cd	2.050E-01
Po-216	3.621E-06	Cl-2-x	2.879E+00
Ra-224	3.621E-06	Cl-3-x	1.392E+02
Ra-228	2.163E-05	Cl-4-x	7.874E+00
Tc-99	8.664E-03	Cl-F-x	2.331E+00
Th-228	3.621E-06	Cr	8.409E+00
Th-231	2.249E-05	HC-insol	4.553E+02
Th-232	2.365E-04	HC-solub	1.440E+04
Th-234	2.876E-02	Hg	1.291E+01
Tl-208	1.334E-06	Pb	2.212E+00
U-235	2.230E-05	Se	1.887E+00
U-238	2.876E-02		

Shipping Site: PORTS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 7.763E+02

Total Mass (kg/yr): 1.096E+06

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	3.528E-04	57-12-5	1.691E+02
Bi-212	5.907E-05	75-09-2	2.135E+02
Pa-234	4.818E-05	Ag	3.471E+01
Pa-234m	4.691E-01	As	1.183E+01
Pb-212	5.907E-05	Ba	2.025E+03
Po-212	3.730E-05	Cd	1.587E+01
Po-216	5.907E-05	Cl-2-x	2.135E+02
Ra-224	5.888E-05	Cl-3-x	1.306E+03
Ra-228	3.517E-04	Cl-4-x	5.694E+02
Tc-99	1.408E-01	Cl-F-x	1.185E+02
Th-228	5.907E-05	Cr	2.062E+03
Th-231	3.668E-04	HC-insol	2.947E+03
Th-232	3.858E-03	HC-solub	1.642E+03
Th-234	4.691E-01	Hg	1.720E+02
Tl-208	2.176E-05	Pb	4.847E+03
U-235	3.637E-04	Se	6.061E+01
U-238	4.691E-01		

Shipping Site: PPPL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 5.456E-04

Total Mass (kg/yr): 7.191E-01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	7.218E-06	75-09-2	1.438E-02
Cs-137	7.562E-06	Cl-2-x	7.190E-03
H-3	3.433E-02	Cl-3-x	7.190E-02
Pa-234m	1.753E-06	Cl-4-x	5.752E-02
Pu-241	1.718E-06	HC-insol	1.797E-01
Sr-90	7.218E-06	HC-solub	8.629E-02
Th-234	1.753E-06		
U-238	1.753E-06		
Y-90	7.218E-06		

Shipping Site: PSNS

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 3.990E-02

Total Mass (kg/yr): 5.986E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.671E-02	75-09-2	9.577E-02
Co-60	4.315E-01	Cd	6.584E-02
Cs-134	2.537E-04	Cl-2-x	5.088E-02
Cs-137	2.820E-02	Cl-3-x	7.243E+00
Eu-154	3.432E-04	Cl-4-x	1.616E+00
Eu-155	1.641E-04	Cl-F-x	2.993E-03
Fe-55	5.641E-02	Cr	5.746E-02
H-3	1.228E-01	HC-insol	1.975E-02
Mn-54	1.791E-04	HC-solub	3.831E-01
Nb-94	2.686E-04	Hg	3.771E-04
Ni-59	5.641E-03	Pb	1.257E-02
Ni-63	7.585E-01		
Pa-234m	1.059E-03		
Pm-147	3.074E-03		
Pu-238	8.806E-04		
Pu-241	7.164E-04		
Sb-125	1.194E-04		
Sm-151	2.388E-04		
Sr-90	2.656E-02		
Te-125m	2.985E-05		
Th-234	1.059E-03		
U-238	1.059E-03		
Y-90	2.656E-02		

Shipping Site: PSNS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 6.586E+00

Total Mass (kg/yr): 9.518E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	4.409E+00	57-12-5	7.312E-01
Co-60	7.122E+01	75-09-2	1.279E+00
Cs-134	4.187E-02	Ag	1.357E-01
Cs-137	4.655E+00	As	4.301E-02
Eu-154	5.665E-02	Ba	8.869E+00
Eu-155	2.709E-02	Cd	1.229E-01
Fe-55	9.311E+00	Cl-2-x	1.346E+00
H-3	2.028E+01	Cl-3-x	4.520E+00
Mn-54	2.956E-02	Cl-4-x	2.989E+00
Nb-94	4.434E-02	Cl-F-x	1.385E+00
Ni-59	9.311E-01	Cr	2.225E+01
Ni-63	1.251E+02	HC-insol	6.852E+00
Pa-234m	1.749E-01	HC-solub	2.684E-01
Pm-147	5.074E-01	Hg	4.633E-01
Pu-238	1.453E-01	Pb	2.158E+01
Pu-241	1.182E-01	Se	1.310E-01
Sb-125	1.970E-02		
Sm-151	3.941E-02		
Sr-90	4.384E+00		
Te-125m	4.926E-03		
Th-234	1.749E-01		
U-238	1.749E-01		
Y-90	4.384E+00		

Shipping Site: RFP

Waste Type: Organic Liquids (CH-Alpha)

Total Volume (m3/yr): 1.037E+01

Total Mass (kg/yr): 1.212E+04

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	4.584E-05	57-12-5	3.662E-01
Cm-244	6.202E-05	75-09-2	1.109E+01
Pa-234m	2.238E-04	Ag	1.835E-01
Pu-238	2.395E-02	As	4.647E-02
Pu-239	2.454E-03	Ba	2.587E-01
Pu-240	8.576E-03	Cd	8.759E+00
Pu-241	2.339E-01	Cl-2-x	6.508E+00
Th-234	2.238E-04	Cl-3-x	6.551E+02
U-238	2.238E-04	Cl-4-x	1.407E+02
		Cl-F-x	8.899E-01
		Cr	7.944E+00
		HC-insol	1.339E+03
		HC-solub	1.182E+03
		Hg	1.089E+00
		Pb	1.829E+00
		Se	1.604E-01

Shipping Site: RFP

Waste Type: Solids (CH-Alpha)

Total Volume (m3/yr): 1.143E+03

Total Mass (kg/yr): 2.424E+06

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	5.109E-03	57-12-5	1.417E+01
Cm-244	6.913E-03	75-09-2	1.164E+02
Pa-234m	2.494E-02	Ag	3.781E+00
Pu-238	2.669E+00	As	1.394E+00
Pu-239	2.735E-01	Ba	1.522E+02
Pu-240	9.558E-01	Cd	5.438E+01
Pu-241	2.607E+01	Cl-2-x	9.092E+01
Th-234	2.494E-02	Cl-3-x	7.111E+02
U-238	2.494E-02	Cl-4-x	7.915E+02
		Cl-F-x	1.730E+02
		Cr	6.697E+03
		HC-insol	1.167E+03
		HC-solub	3.682E+03
		Hg	2.810E+01
		Pb	4.658E+02
		Se	3.182E+00

Shipping Site: RMI

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 6.677E-01

Total Mass (kg/yr): 9.741E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	1.429E-06	75-09-2	1.527E+00
Bi-212	2.403E-07	As	3.769E-04
Pa-234	1.816E-07	Ba	1.615E-03
Pa-234m	1.764E-03	Cd	1.071E+00
Pb-212	2.403E-07	Cl-2-x	8.108E-01
Po-212	1.549E-07	Cl-3-x	1.123E+02
Po-216	2.403E-07	Cl-4-x	2.505E+01
Ra-224	2.403E-07	Cl-F-x	4.625E-02
Ra-228	1.429E-06	Cr	9.331E-01
Tc-99	2.657E-05	HC-insol	2.184E+01
Th-228	2.403E-07	HC-solub	1.277E+01
Th-231	1.378E-06	Hg	6.122E-03
Th-232	1.450E-05	Pb	2.045E-01
Th-234	1.764E-03		
Tl-208	9.081E-08		
U-235	1.372E-06		
U-238	1.764E-03		

Shipping Site: RMI

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 1.091E+00

Total Mass (kg/yr): 8.323E+02

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ac-228	2.370E-06	57-12-5	4.647E-03
Bi-212	3.988E-07	75-09-2	2.315E-01
Pa-234	3.013E-07	Ag	6.651E-03
Pa-234m	2.927E-03	As	1.974E-03
Pb-212	3.988E-07	Ba	5.734E-01
Po-212	2.570E-07	Cd	1.836E-02
Po-216	3.988E-07	Cl-2-x	2.862E-01
Ra-224	3.815E-07	Cl-3-x	2.561E+00
Ra-228	2.267E-06	Cl-4-x	7.371E-01
Tc-99	4.218E-05	Cl-F-x	3.452E-01
Th-228	3.988E-07	Cr	2.638E-01
Th-231	2.286E-06	HC-insol	8.888E+00
Th-232	2.407E-05	HC-solub	2.825E+00
Th-234	2.927E-03	Hg	2.678E-02
Tl-208	1.506E-07	Pb	8.498E-02
U-235	2.277E-06	Se	6.070E-03
U-238	2.927E-03		

Shipping Site: SNLA

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 5.487E-04

Total Mass (kg/yr): 5.793E-01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	6.627E-05	57-12-5	5.085E-05
Co-60	9.630E-05	75-09-2	3.859E-05
Cs-137	7.006E-05	Ag	2.549E-05
Eu-154	3.516E-07	As	3.265E-06
Eu-155	8.115E-08	Ba	2.226E-05
Fe-55	1.920E-06	Cd	1.384E-06
H-3	1.223E-03	Cl-2-x	1.098E-04
Nb-94	4.598E-07	Cl-3-x	4.322E-03
Ni-59	9.089E-06	Cl-4-x	2.442E-04
Ni-63	1.099E-03	Cl-F-x	8.905E-05
Pa-234m	3.246E-07	Cr	5.933E-05
Pu-238	2.380E-06	HC-insol	3.553E-03
Pu-240	1.893E-06	HC-solub	1.018E-01
Pu-241	1.893E-06	Hg	1.444E-04
Sm-151	7.574E-07	Pb	2.214E-05
Sr-90	6.519E-05	Se	2.228E-05
Tc-99	2.705E-08		
Th-234	3.246E-07		
U-238	3.246E-07		
Y-90	6.519E-05		

Shipping Site: SNLA

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 2.849E+00

Total Mass (kg/yr): 2.300E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	3.441E-01	57-12-5	2.628E-01
Co-60	5.000E-01	75-09-2	7.747E-01
Cs-137	3.637E-01	Ag	5.397E-02
Eu-154	1.825E-03	As	1.546E-02
Eu-155	4.213E-04	Ba	3.392E+00
Fe-55	9.972E-03	Cd	9.542E-03
H-3	6.351E+00	Cl-2-x	8.422E-01
Nb-94	2.387E-03	Cl-3-x	2.813E+00
Ni-59	4.719E-02	Cl-4-x	1.497E+00
Ni-63	5.706E+00	Cl-F-x	9.064E-01
Pa-234m	1.685E-03	Cr	3.104E+00
Pu-238	1.236E-02	HC-insol	7.682E+00
Pu-240	9.832E-03	HC-solub	1.619E-01
Pu-241	9.832E-03	Hg	1.563E-01
Sm-151	3.932E-03	Pb	7.814E+00
Sr-90	3.385E-01	Se	4.865E-02
Tc-99	1.404E-04		
Th-234	1.685E-03		
U-238	1.685E-03		
Y-90	3.385E-01		

Shipping Site: SNLL

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 7.662E+00

Total Mass (kg/yr): 7.356E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.013E-01	75-09-2	7.061E+00
Cs-137	1.062E-01	As	5.664E-02
H-3	4.822E+02	Ba	2.427E-01
Pa-234m	2.462E-02	Cd	8.091E+00
Pu-241	2.413E-02	Cl-2-x	3.678E+00
Sr-90	1.013E-01	Cl-3-x	5.517E+01
Th-234	2.462E-02	Cl-4-x	1.176E+01
U-238	2.462E-02	Cr	6.767E+00
Y-90	1.013E-01	HC-insol	3.236E+03
		HC-solub	1.029E+03
		Hg	4.413E-02
		Pb	1.544E+00

Shipping Site: SNLL

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 7.770E-01

Total Mass (kg/yr): 1.193E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.027E-02	57-12-5	6.924E-03
Cs-137	1.076E-02	75-09-2	7.497E+00
H-3	4.890E+01	Ag	1.014E-02
Pa-234m	2.496E-03	As	6.737E-03
Pu-241	2.447E-03	Ba	3.347E-01
Sr-90	1.027E-02	Cd	8.243E-02
Th-234	2.496E-03	Cl-2-x	3.816E+00
U-238	2.496E-03	Cl-3-x	4.480E+01
Y-90	1.027E-02	Cl-4-x	3.090E+01
		Cl-F-x	6.827E-02
		Cr	6.765E-01
		HC-insol	1.187E+02
		HC-solub	5.754E+01
		Hg	1.257E-01
		Pb	2.595E-01
		Se	3.934E-02

Shipping Site: SRS

Waste Type: Organic Liquids (CH-Non-alpha)

Total Volume (m3/yr): 4.691E+02

Total Mass (kg/yr): 5.814E+05

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	5.667E+01	57-12-5	3.366E-02
Co-60	8.234E+01	75-09-2	7.907E+02
Cs-137	5.990E+01	Ag	1.687E-02
Eu-154	3.007E-01	As	1.674E+00
Eu-155	6.939E-02	Ba	7.181E+00
Fe-55	1.642E+00	Cd	6.391E+02
H-3	1.045E+03	Cl-2-x	4.179E+02
Nb-94	3.932E-01	Cl-3-x	4.566E+04
Ni-59	7.771E+00	Cl-4-x	1.017E+04
Ni-63	9.397E+02	Cl-F-x	1.825E+01
Pa-234m	2.775E-01	Cr	5.491E+02
Pu-238	2.035E+00	HC-insol	9.568E+04
Pu-240	1.619E+00	HC-solub	3.280E+04
Pu-241	1.619E+00	Hg	3.691E+00
Sm-151	6.476E-01	Pb	1.220E+02
Sr-90	5.574E+01	Se	1.475E-02
Tc-99	2.313E-02		
Th-234	2.775E-01		
U-238	2.775E-01		
Y-90	5.574E+01		

Shipping Site: SRS

Waste Type: Solids (CH-Non-alpha)

Total Volume (m3/yr): 1.868E+02

Total Mass (kg/yr): 2.329E+05

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	2.257E+01	57-12-5	2.631E+01
Co-60	3.280E+01	75-09-2	4.659E+01
Cs-137	2.386E+01	Ag	1.180E+01
Eu-154	1.197E-01	As	4.217E+00
Eu-155	2.764E-02	Ba	3.783E+02
Fe-55	6.542E-01	Cd	1.304E+01
H-3	4.166E+02	Cl-2-x	3.100E+01
Nb-94	1.566E-01	Cl-3-x	4.540E+02
Ni-59	3.096E+00	Cl-4-x	4.891E+01
Ni-63	3.743E+02	Cl-F-x	3.618E+01
Pa-234m	1.105E-01	Cr	4.287E+02
Pu-238	8.109E-01	HC-insol	1.802E+03
Pu-240	6.450E-01	HC-solub	8.514E+02
Pu-241	6.450E-01	Hg	1.397E+02
Sm-151	2.580E-01	Pb	7.059E+02
Sr-90	2.220E+01	Se	5.588E+01
Tc-99	9.212E-03		
Th-234	1.105E-01		
U-238	1.105E-01		
Y-90	2.220E+01		

Shipping Site: SRS

Waste Type: Organic Liquids (CH-Alpha)

Total Volume (m3/yr): 6.450E+00

Total Mass (kg/yr): 6.811E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	6.249E-01	57-12-5	5.978E-01
Co-60	6.697E-01	75-09-2	4.536E-01
Cs-137	6.598E-01	Ag	2.996E-01
Eu-154	2.738E-03	As	3.838E-02
Eu-155	4.979E-04	Ba	2.617E-01
Fe-55	1.269E-02	Cd	1.627E-02
H-3	9.864E+00	Cl-2-x	1.291E+00
Nb-94	4.979E-03	Cl-3-x	5.081E+01
Ni-59	1.063E-01	Cl-4-x	2.871E+00
Ni-63	1.153E+01	Cl-F-x	1.046E+00
Pa-234m	3.485E-03	Cr	6.974E-01
Pu-238	3.510E-02	HC-insol	4.176E+01
Pu-239	9.959E-04	HC-solub	1.197E+03
Pu-240	3.734E-03	Hg	1.697E+00
Pu-241	1.429E-01	Pb	2.602E-01
Sm-151	7.718E-03	Se	2.619E-01
Sr-90	6.075E-01		
Th-234	3.485E-03		
U-238	3.485E-03		
Y-90	6.075E-01		

Shipping Site: SRS

Waste Type: Solids (CH-Alpha)

Total Volume (m3/yr): 1.209E+02

Total Mass (kg/yr): 1.823E+05

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Ba-137m	1.171E+01	57-12-5	2.345E+01
Co-60	1.255E+01	75-09-2	3.624E+01
Cs-137	1.237E+01	Ag	4.582E+00
Eu-154	5.135E-02	As	1.744E+00
Eu-155	9.338E-03	Ba	2.871E+02
Fe-55	2.381E-01	Cd	5.887E+00
H-3	1.849E+02	Cl-2-x	3.624E+01
Nb-94	9.338E-02	Cl-3-x	5.966E+02
Ni-59	1.993E+00	Cl-4-x	1.435E+02
Ni-63	2.163E+02	Cl-F-x	1.769E+01
Pa-234m	6.536E-02	Cr	2.954E+02
Pu-238	6.583E-01	HC-insol	1.869E+03
Pu-239	1.867E-02	HC-solub	8.725E+02
Pu-240	7.003E-02	Hg	1.964E+01
Pu-241	2.680E+00	Pb	6.984E+02
Sm-151	1.447E-01	Se	5.697E+00
Sr-90	1.139E+01		
Th-234	6.536E-02		
U-238	6.536E-02		
Y-90	1.139E+01		

Shipping Site: UMC

Waste Type: Solids (CH-Alpha)

Total Volume (m3/yr): 3.944E-02

Total Mass (kg/yr): 5.809E+01

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	1.743E-07	57-12-5	9.876E-03
Cm-244	2.358E-07	75-09-2	1.161E-02
Pa-234m	8.511E-07	Ag	1.742E-03
Pu-238	9.108E-05	As	5.809E-04
Pu-239	9.331E-06	Ba	1.161E-01
Pu-240	3.260E-05	Cd	2.904E-04
Pu-241	8.894E-04	Cl-2-x	1.161E-02
Th-234	8.511E-07	Cl-3-x	3.253E-02
U-238	8.511E-07	Cl-4-x	2.033E-02
		Cl-F-x	5.809E-03
		Cr	1.161E-01
		HC-insol	5.809E-02
		HC-solub	2.904E-03
		Hg	5.809E-03
		Pb	2.904E-01
		Se	1.742E-03

Shipping Site: WVDP

Waste Type: Organic Liquids (CH-Alpha)

Total Volume (m3/yr): 1.773E+00

Total Mass (kg/yr): 1.897E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	1.482E-03	57-12-5	1.600E-01
Ba-137m	1.619E+00	75-09-2	2.840E-01
Co-60	2.167E-03	Ag	7.866E-02
Cs-137	1.731E+00	As	9.986E-03
Eu-154	2.583E-03	Ba	6.783E-02
H-3	1.284E-01	Cd	1.250E-01
Nb-94	1.482E-04	Cl-2-x	4.212E-01
Ni-59	3.317E-03	Cl-3-x	2.491E+01
Ni-63	3.409E-01	Cl-4-x	3.373E+00
Pa-234m	9.529E-04	Cl-F-x	2.744E-01
Pu-238	8.047E-02	Cr	2.914E-01
Pu-239	1.334E-03	HC-insol	1.686E+01
Pu-240	5.929E-04	HC-solub	3.228E+02
Pu-241	3.465E-02	Hg	4.473E-01
Sm-151	2.477E-02	Pb	9.175E-02
Sr-90	1.541E+00	Se	6.881E-02
Tc-99	7.694E-04		
Th-234	9.529E-04		
U-238	9.529E-04		
Y-90	1.541E+00		

Shipping Site: WVDP

Waste Type: Solids (CH-Alpha)

Total Volume (m3/yr): 8.473E-01

Total Mass (kg/yr): 1.355E+03

Radionuclide	Activity (Ci/yr)	Chemical	Amount (kg/yr)
Am-241	7.096E-04	57-12-5	1.069E-03
Ba-137m	7.751E-01	75-09-2	2.958E-01
Co-60	1.037E-03	Ag	1.709E-02
Cs-137	8.243E-01	As	1.081E-02
Eu-154	1.236E-03	Ba	3.475E-01
H-3	6.150E-02	Cd	1.558E-01
Nb-94	7.096E-05	Cl-2-x	2.803E-01
Ni-59	1.588E-03	Cl-3-x	1.573E+01
Ni-63	1.632E-01	Cl-4-x	2.998E+00
Pa-234m	4.561E-04	Cl-F-x	1.176E-01
Pu-238	3.852E-02	Cr	5.922E-01
Pu-239	6.386E-04	HC-insol	5.230E+01
Pu-240	2.838E-04	HC-solub	2.619E+01
Pu-241	1.659E-02	Hg	1.760E-01
Sm-151	1.186E-02	Pb	2.784E-01
Sr-90	7.339E-01	Se	4.680E-02
Tc-99	3.662E-04		
Th-234	4.561E-04		
U-238	4.561E-04		
Y-90	7.339E-01		

APPENDIX B:
DETAILED RADIOLOGICAL RISK ASSESSMENT RESULTS

APPENDIX B:

DETAILED RADIOLOGICAL RISK ASSESSMENT RESULTS

Detailed results of the collective population radiological risk assessment for transportation of low-level mixed waste (LLMW) are presented in this appendix for the Waste Management (WM) LLMW alternatives. For each WM alternative, results are presented separately for the following categories of LLMW:

- Contact-handled (CH) organic liquids, nonalpha — untreated;
- CH organic liquids, alpha — untreated;
- CH heterogeneous solids, nonalpha — untreated;
- CH heterogeneous solids, alpha — untreated;
- CH heterogeneous solids, nonalpha — treated; and
- CH heterogeneous solids, alpha — treated.

Note that some cases do not involve the transportation of all six categories of LLMW listed previously. The total transportation impacts for an alternative can be found by summing the quantities for the six categories.

Similar to the WASTE_MGMT files presented in Appendix A of this report, the collective risk results are presented on an *annual* basis. As stated previously, the Waste Management Programmatic Environmental Impact Statement (WM PEIS) considers a 20-year time frame for WM LLMW. For the WM alternatives considered in the WM PEIS, the assumption was that shipments would occur uniformly over a 10-year period, which would allow an initial 10-year period to build treatment, storage, and disposal facilities. Sites would essentially store their own waste for the first 10 years and ship all waste over the subsequent 10 years.

Because of the differences in the time frames noted and the uncertainties in the actual timing of future waste shipments, the transportation impacts for the various cases are best compared by examining the total impacts of transporting a specific inventory of waste, independent of the annual shipping rates. The total impacts of LLMW transported for each alternative can be calculated by multiplying the annual shipment impacts by 10 years for the WM alternatives. The total impacts are provided in Section 5 of the main body of this report. Detailed chemical-specific calculations for the maximally exposed individual (MEI) are provided in Tables B.1 through B.5.

TABLE B.1 MEI Potential Increased Cancer Risk Associated with the Most Severe Chemical Accident^{a,b}

LLMW Type	Transportation Mode	Release Mode	Chemical Code	Chemical Name	ALOHA Concentration (ppm)	Molecular Weight	ALOHA Concentration (mg/m ³)	Exposure Time (min/d)	Inhalation Air Intake (mg/kg/d)	Inhalation Unit Risk (μg/m ³) ⁻¹	Slope Factor (mg/kg/d) ⁻¹	Carcinogenic MEI Risk
WM (neutral)	Highway	Liquid aerosol (direct)	75-09-2	Dichloromethane	3.73E-02	85	1.29E-01	60	6.08E-08	4.70E-07	1.65E-03	1.00E-10
			Cl-2-x	Dichloroethane	9.26E-02	99	3.74E-01	60	1.76E-07	2.60E-05	9.10E-02	1.60E-08
			Cl-4-x	Tetrachloroethene	1.48E-01	166	1.00E+00	60	4.71E-07	1.70E-06	5.95E-03	2.80E-09
			HC-soluble ^c	Benzene	1.09E+03	78.1	3.47E+03	60	1.63E-03	8.30E-06	2.91E-02	4.74E-05
				<u>Subtotal</u>	<u>1.09E+03</u>	^d	<u>3.48E+03</u>	-	-	-	-	<u>4.74E-05</u>
WM (stable)	Highway	Liquid aerosol (direct)	75-09-2	Dichloromethane	5.34E-01	85	1.85E+00	60	8.70E-07	4.70E-07	1.65E-03	1.43E-09
			Cl-2-x	Dichloroethane	2.02E+00	99	8.16E+00	60	3.83E-06	2.60E-05	9.10E-02	3.49E-07
			Cl-4-x	Tetrachloroethene	1.10E+00	166	7.45E+00	60	3.50E-06	1.70E-06	5.95E-03	2.08E-08
			HC-soluble	Benzene	2.57E+03	78.1	8.19E+03	60	3.85E-03	8.30E-06	2.91E-02	1.12E-04
				<u>Subtotal</u>	<u>2.57E+03</u>	-	<u>8.21E+03</u>	-	-	-	-	<u>1.12E-04</u>
WM (neutral)	Railroad	Liquid aerosol (direct)	75-09-2	Dichloromethane	2.99E-01	85	1.04E+00	60	4.87E-07	4.70E-07	1.65E-03	8.01E-10
			Cl-2-x	Dichloroethane	1.39E-01	99	5.62E-01	60	2.64E-07	2.60E-05	9.10E-02	2.40E-08
			Cl-4-x	Tetrachloroethene	2.22E-01	166	1.50E+00	60	7.06E-07	1.70E-06	5.95E-03	4.20E-09
			HC-soluble	Benzene	1.46E+03	78.1	4.65E+03	60	2.19E-03	8.30E-06	2.91E-02	6.35E-05
				<u>Subtotal</u>	<u>1.46E+03</u>	-	<u>4.66E+03</u>	-	-	-	-	<u>6.35E-05</u>
WM (stable)	Railroad	Liquid aerosol (direct)	75-09-2	Dichloromethane	4.88E+00	85	1.69E+01	60	7.95E-06	4.70E-07	1.65E-03	1.31E-08
			Cl-2-x	Dichloroethane	2.41E+00	99	9.74E+00	60	4.57E-06	2.60E-05	9.10E-02	4.16E-07
			Cl-4-x	Tetrachloroethene	1.53E+00	166	1.04E+01	60	4.87E-06	1.70E-06	5.95E-03	2.90E-08
			HC-soluble	Benzene	3.99E+03	78.1	1.27E+04	60	5.97E-03	8.30E-06	2.91E-02	1.74E-04
				<u>Subtotal</u>	<u>4.00E+03</u>	-	<u>1.28E+04</u>	-	-	-	-	<u>1.74E-04</u>

^a Neutral atmospheric conditions were based on Pasquill stability Class D with a wind speed of 4 m/s (9 mph).

^b Stable atmospheric conditions were based on Pasquill stability Class F with a wind speed of 1 m/s (2.2 mph).

^c HC = hydrocarbon.

^d Not applicable.

TABLE B.2 MEI Hazard Quotient for PAE Risk Associated with the Most Severe Chemical Accident^{a,b}

LLMW Type	Transportation Mode	Release Mode	Chemical Code	Chemical Name	ALOHA Concentration (ppm)	Molecular Weight	ALOHA Concentration (mg/m ³)	Exposure Time (min/d)	Inhalation Air Intake (mg/kg/d)	RfC ^c (mg/m ³)	RfD ^d (mg/kg/d)	Hazard Quotient
WM (neutral)	Highway	Liquid aerosol (direct)	75-09-2	Dichloromethane	3.73E-02	85	1.29E-01	60	8.72E-04	3	8.57E-01	1.02E-03
			Cl-3-x	1,1,1-Trichloroethane	7.69E+00	133.4	4.19E+01	60	2.82E-01	1	2.86E-01	9.87E-01
			Cl-F-x	Freon 113	3.88E-02	187	2.96E-01	60	1.99E-03	30	8.57E+00	2.33E-04
			HC-soluble ^e	Toluene	9.15E+02	92.14	3.44E+03	60	2.32E+01	0.4	1.14E-01	2.03E+02
				<u>Subtotal</u>	<u>9.23E+02</u>	^f	<u>3.48E+03</u>	-	-	-	-	<u>2.04E+02</u>
WM (stable)	Highway	Liquid aerosol (direct)	75-09-2	Dichloromethane	5.34E-01	85	1.85E+00	60	1.25E-02	3	8.57E-01	1.46E-02
			Cl-3-x	1,1,1-Trichloroethane	2.28E+01	133.4	1.24E+02	60	8.36E-01	1	2.86E-01	2.93E+00
			Cl-F-x	Freon 113	3.58E-01	187	2.73E+00	60	1.84E-02	30	8.57E+00	2.15E-03
			HC-soluble	Toluene	2.18E+03	92.14	8.20E+03	60	5.52E+01	0.4	1.14E-01	4.83E+02
				<u>Subtotal</u>	<u>2.20E+03</u>	-	<u>8.33E+03</u>	-	-	-	-	<u>4.86E+02</u>
WM (neutral)	Railroad	Liquid aerosol (direct)	75-09-2	Dichloromethane	2.99E-01	85	1.04E+00	60	6.99E-03	3	8.57E-01	8.15E-03
			Cl-3-x	1,1,1-Trichloroethane	4.98E+01	133.4	2.71E+02	60	1.83E+00	1	2.86E-01	6.39E+00
			Cl-F-x	Freon 113	7.46E-01	187	5.69E+00	60	3.83E-02	30	8.57E+00	4.47E-03
			HC-soluble	Toluene	1.20E+03	92.14	4.51E+03	60	3.04E+01	0.4	1.14E-01	2.66E+02
				<u>Subtotal</u>	<u>1.25E+03</u>	-	<u>4.79E+03</u>	-	-	-	-	<u>2.72E+02</u>
WM (stable)	Railroad	Liquid aerosol (direct)	75-09-2	Dichloromethane	4.88E+00	85	1.69E+01	60	1.14E-01	3	8.57E-01	1.33E-01
			Cl-3-x	1,1,1-Trichloroethane	1.07E+02	133.4	5.83E+02	60	3.92E+00	1	2.86E-01	1.37E+01
			Cl-F-x	Freon 113	5.14E+00	187	3.92E+01	60	2.64E-01	30	8.57E+00	3.08E-02
			HC-soluble	Toluene	3.40E+03	92.14	1.28E+04	60	8.61E+01	0.4	1.14E-01	7.54E+02
				<u>Subtotal</u>	<u>3.52E+03</u>	-	<u>1.34E+04</u>	-	-	-	-	<u>7.67E+02</u>

^a Neutral atmospheric conditions were based on Pasquill stability Class D with a wind speed of 4 m/s (9 mph). PAE = potential adverse effect.

^b Stable atmospheric conditions were based on Pasquill stability Class F with a wind speed of 1 m/s (2.2 mph).

^c RfC = reference concentration.

^d RfD = reference dose.

^e HC = hydrocarbon.

^f Not applicable.

TABLE B.3 MEI Potential Increased Cancer Risk Associated with the Most Severe Radiological Accident^{a,b}

LLMW Type	Transportation Mode	Modeling Approach	Chemical Code	Chemical Name	ALOHA Concentration (ppm)	Molecular Weight	ALOHA Concentration (mg/m ³)	Exposure Time (min/d)	Inhalation Air Intake (mg/kg/d)	Inhalation Unit Risk (μg/m ³) ⁻¹	Slope Factor (mg/kg/d) ⁻¹	Carcinogenic MEI Risk
WM (neutral)	Highway	Particulate (severity Categories IV-VIII)	75-09-2	Dichloromethane	3.22E-02	85	1.12E-01	60	5.25E-08	4.70E-07	1.65E-03	8.63E-11
			Cl-2-x	Dichloroethane	1.20E-02	99	4.85E-02	60	2.28E-08	2.60E-05	9.10E-02	2.07E-09
			Cl-4-x	Tetrachloroethene	2.21E-02	166	1.50E-01	60	7.03E-08	1.70E-06	5.95E-03	4.18E-10
			HC-soluble ^c	Benzene	3.51E-01	78.1	1.12E+00	60	5.26E-07	8.30E-06	2.91E-02	1.53E-08
				<u>Subtotal</u>	<u>4.17E-01</u>	^d	<u>1.43E+00</u>	-	-	-	-	<u>1.78E-08</u>
WM (stable)	Highway	Particulate (severity Categories IV-VIII)	75-09-2	Dichloromethane	8.66E-02	85	3.00E-01	60	1.41E-07	4.70E-07	1.65E-03	2.32E-10
			Cl-2-x	Dichloroethane	6.19E-02	99	2.50E-01	60	1.17E-07	2.60E-05	9.10E-02	1.07E-08
			Cl-4-x	Tetrachloroethene	1.29E-01	166	8.74E-01	60	4.11E-07	1.70E-06	5.95E-03	2.44E-09
			HC-soluble	Benzene	9.76E-01	78.1	3.11E+00	60	1.46E-06	8.30E-06	2.91E-02	4.24E-08
				<u>Subtotal</u>	<u>1.25E+00</u>	-	<u>4.54E+00</u>	-	-	-	-	<u>5.58E-08</u>
WM (neutral)	Railroad	Particulate (severity Categories IV-VIII)	75-09-2	Dichloromethane	3.22E-02	85	1.12E-01	60	5.25E-08	4.70E-07	1.65E-03	8.63E-11
			Cl-2-x	Dichloroethane	1.20E-02	99	4.85E-02	60	2.28E-08	2.60E-05	9.10E-02	2.07E-09
			Cl-4-x	Tetrachloroethene	2.21E-02	166	1.50E-01	60	7.03E-08	1.70E-06	5.95E-03	4.18E-10
			HC-soluble	Benzene	3.51E-01	78.1	1.12E+00	60	5.26E-07	8.30E-06	2.91E-02	1.53E-08
				<u>Subtotal</u>	<u>4.17E-01</u>	-	<u>1.43E+00</u>	-	-	-	-	<u>1.78E-08</u>
WM (stable)	Railroad	Particulate (severity Categories IV-VIII)	75-09-2	Dichloromethane	8.66E-02	85	3.00E-01	60	1.41E-07	4.70E-07	1.65E-03	2.32E-10
			Cl-2-x	Dichloroethane	6.19E-02	99	2.50E-01	60	1.17E-07	2.60E-05	9.10E-02	1.07E-08
			Cl-4-x	Tetrachloroethene	1.29E-01	166	8.74E-01	60	4.11E-07	1.70E-06	5.95E-03	2.44E-09
			HC-soluble	Benzene	9.76E-01	78.1	3.11E+00	60	1.46E-06	8.30E-06	2.91E-02	4.24E-08
				<u>Subtotal</u>	<u>1.25E+00</u>	-	<u>4.54E+00</u>	-	-	-	-	<u>5.58E-08</u>

^a Neutral atmospheric conditions were based on Pasquill stability Class D with a wind speed of 4 m/s (9 mph).

^b Stable atmospheric conditions were based on Pasquill stability Class F with a wind speed of 1 m/s (2.2 mph).

^c HC = hydrocarbon.

^d Not applicable.

TABLE B.4 MEI Hazard Quotient for PAE Risk Associated with the Most Severe Radiological Accident^{a,b}

LLMW Type	Transportation Mode	Modeling Approach	Chemical Code	Chemical Name	ALOHA Concentration (ppm)	Molecular Weight	ALOHA Concentration (mg/m ³)	Exposure Time (min/d)	Inhalation Air Intake (mg/kg/d)	RfC ^c (mg/m ³)	RfD ^d (mg/kg/d)	Hazard Quotient
WM (neutral)	Highway	Particulate (severity Categories IV-VIII)	75-09-2	Dichloromethane	3.22E-02	85	1.12E-01	60	7.52E-04	3	8.57E-01	8.78E-04
			Cl-3-x	1,1,1-Trichloroethane	1.54E-01	133.4	8.39E-01	60	5.65E-03	1	2.86E-01	1.98E-02
			Cl-F-x	Freon 113	5.82E-03	187	4.44E-02	60	2.99E-04	30	8.57E+00	3.49E-05
			HC-soluble*	Toluene	2.76E-01	92.14	1.04E+00	60	6.99E-03	0.4	1.14E-01	6.12E-02
				<u>Subtotal</u>	<u>4.68E-01</u>	-	<u>2.03E+00</u>	-	-	-	-	<u>8.18E-02</u>
WM (stable)	Highway	Particulate (severity Categories IV-VIII)	75-09-2	Dichloromethane	8.66E-02	85	3.00E-01	60	2.02E-03	3	8.57E-01	2.36E-03
			Cl-3-x	1,1,1-Trichloroethane	3.86E-01	133.4	2.10E+00	60	1.42E-02	1	2.86E-01	4.95E-02
			Cl-F-x	Freon 113	1.54E-02	187	1.18E-01	60	7.92E-04	30	8.57E+00	9.24E-05
			HC-soluble	Toluene	7.83E-01	92.14	2.94E+00	60	1.98E-02	0.4	1.14E-01	1.74E-01
				<u>Subtotal</u>	<u>1.27E+00</u>	-	<u>5.46E+00</u>	-	-	-	-	<u>2.26E-01</u>
WM (neutral)	Railroad	Particulate (severity Categories IV-VIII)	75-09-2	Dichloromethane	3.22E-02	85	1.12E-01	60	7.52E-04	3	8.57E-01	8.78E-04
			Cl-3-x	1,1,1-Trichloroethane	1.54E-01	133.4	8.39E-01	60	5.65E-03	1	2.86E-01	1.98E-02
			Cl-F-x	Freon 113	5.82E-03	187	4.44E-02	60	2.99E-04	30	8.57E+00	3.49E-05
			HC-soluble	Toluene	2.76E-01	92.14	1.04E+00	60	6.99E-03	0.4	1.14E-01	6.12E-02
				<u>Subtotal</u>	<u>4.68E-01</u>	-	<u>2.03E+00</u>	-	-	-	-	<u>8.18E-02</u>
WM (stable)	Railroad	Particulate (severity Categories IV-VIII)	75-09-2	Dichloromethane	8.66E-02	85	3.00E-01	60	2.02E-03	3	8.57E-01	2.36E-03
			Cl-3-x	1,1,1-Trichloroethane	3.86E-01	133.4	2.10E+00	60	1.42E-02	1	2.86E-01	4.95E-02
			Cl-F-x	Freon 113	1.54E-02	187	1.18E-01	60	7.92E-04	30	8.57E+00	9.24E-05
			HC-soluble	Toluene	7.83E-01	92.14	2.94E+00	60	1.98E-02	0.4	1.14E-01	1.74E-01
				<u>Subtotal</u>	<u>1.27E+00</u>	-	<u>5.46E+00</u>	-	-	-	-	<u>2.26E-01</u>

^a Neutral atmospheric conditions were based on Pasquill stability Class D with a wind speed of 4 m/s (9 mph). PAE = potential adverse effect.

^b Stable atmospheric conditions were based on Pasquill stability Class F with a wind speed of 1 m/s (2.2 mph).

^c RfC = reference concentration.

^d RfD = reference dose.

^e HC = hydrocarbon.

^f Not applicable.

TABLE B.5 Comparisons of Plume Footprint/Impact Areas between Worst Radiological and Worst Hazardous-Chemical Accident Scenarios

LLMW Type	Transportation Mode	Case	Origin Site	Treatment Site	State	Waste Quantity (kg/yr)	No. of Shipments	Total Mass per Shipment (kg)	Chemical Mass per Shipment (kg)				Plume Footprint Exposure Area				
													Neutral Conditions ^b		Stable Conditions ^b		
									75-09-2	Cl-2-x	Cl-4-x	HC-soluble ^a	Length (yd)	Area (ft ²)	Length (yd)	Area (ft ²)	
Transportation Routes for Estimating Potential Increased Cancer Risks to Population																	
Worst radiological accident consequences ^c																	
WM	Highway	7, 10, 15, 17	PGDP	ORR, Hanford	Solid	6,808	1	6,808	1.7E+00	1.3E+01	6.7E-01	1.7E+01	<33	0	<33	0	
WM	Railroad	7, 10, 15, 17	PGDP	ORR, Hanford	Solid	6,808	1	6,808	1.7E+00	1.3E+01	6.7E-01	1.7E+01	<33	0	<33	0	
Worst hazardous-chemical accident consequences ^d																	
WM	Highway	15, 17	PORTS	ORR, Hanford	Liquid	47,788	3	15,929	3.4E-01	9.6E-01	2.6E+00	4.8E+03	268	83,400	518	257,600	
WM	Railroad	15, 17	PORTS	ORR, Hanford	Liquid	47,788	2	23,894	5.1E-01	1.4E+00	3.9E+00	7.2E+03	333	120,190	630	364,100	
Transportation Routes for Estimating Potential Adverse Effects to Population																	
Worst radiological accident consequences ^c																	
WM	Highway	7, 10, 15, 17	PGDP	ORR, Hanford	Solid	6,808	1	6,808	1.7E+00	1.3E+01	6.7E-01	1.7E+01	<33	0	<33	0	
WM	Railroad	7, 10, 15, 17	PGDP	ORR, Hanford	Solid	6,808	1	6,808	1.7E+00	1.3E+01	6.7E-01	1.7E+01	<33	0	<33	0	
Worst hazardous-chemical accident consequences ^d																	
WM	Highway	15, 17	PORTS	ORR, Hanford	Liquid	47,788	3	15,929	3.4E-01	4.6E+01	7.8E-01	4.8E+03	596	329,960	1,366	1,494,100	
WM	Railroad	7, 10, 15, 17	LLNL	Hanford	Liquid	81,597	2	40,799	2.7E+00	3.0E+02	6.3E+00	7.2E+03	739	484,550	1,675	2,188,300	

^a HC = hydrocarbon.

^b Neutral conditions were based on Pasquill stability Class D with a wind speed of 4 m/s (9 mph), and stable conditions were based on Pasquill stability Class F with a wind speed of 1 m/s (2.2 mph).

^c Worst radiological accident consequences are caused by solid WM LLMW originating from PGDP.

^d Worst hazardous-chemical accident consequences are caused by liquid aerosol releases for WM cases.

B.1 WM LLMW DECENTRALIZED ALTERNATIVE (CASE 2): CONTACT-HANDLED ORGANIC LIQUIDS: ALPHA — UNTREATED

Table 1. Summary of Route Information

Route	Distance (miles)	Percentage in Zone		
		Rural	Suburban	Urban
Truck				
Mound Plant to Savannah River	656	66.5	32.7	0.8
West Valley DP to Savannah River	883	70.3	28.5	1.2
Rail				
Mound Plant to Savannah River	744	67.4	29.2	3.3
West Valley DP to Savannah River	1217	62.8	32.4	4.9

Table 2. Annual Number of Shipments and One-Way Shipment Distances

Route		# of Shipments		Total Mileage(mi)	
		Truck	Rail	Truck	Rail
Mound Plant to Savannah River		1	1	6.56E+02	7.44E+02
West Valley DP to Savannah River		1	1	8.83E+02	1.22E+03
Totals		2	2	1.54E+03	1.96E+03

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

Source/Route(s)	Crew	General Public			
		Off-Link	On-Link	Stops	Total
MLLW(OA) MP to SR Mound Plant to Savannah River					
Truck	2.21E-02	1.91E-03	2.83E-03	1.84E-02	2.31E-02
Rail	5.99E-03	9.25E-03	1.78E-04	5.77E-03	1.52E-02
MLLW(OA) WV to SR West Valley DP to Savannah River					
Truck	2.89E-02	2.45E-03	3.86E-03	2.47E-02	3.10E-02
Rail	7.96E-03	1.95E-02	3.38E-04	7.23E-03	2.70E-02

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route	Truck	Rail
MLLW(OA) MP to SR Mound Plant to Savannah River	4.15E-03	7.63E-04
MLLW(OA) WV to SR West Valley DP to Savannah River	4.27E-02	1.37E-02

Table 5. Nonradiological Risk Factors per Shipment (fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
Mound Plant to Savannah River		1.67E-06	5.26E-05
West Valley DP to Savannah River		3.28E-06	6.60E-05
Rail			
Mound Plant to Savannah River		1.03E-05	1.56E-06
West Valley DP to Savannah River		2.49E-05	2.55E-06

Table 6. Annual Incident-Free Dose for the Shipping Campaign
(person-rem/yr)

Route		Truck		Rail	
		Crew	Public	Crew	Public
Mound Plant	to Savannah River	2.21E-02	2.31E-02	5.99E-03	1.52E-02
West Valley DP	to Savannah River	2.89E-02	3.10E-02	7.96E-03	2.70E-02
Totals		5.09E-02	5.41E-02	1.39E-02	4.22E-02

Table 7. Annual Accident Dose Risk for the Shipping Campaign
(person-rem/yr)

Route		Truck	Rail
Mound Plant	to Savannah River	4.15E-03	7.63E-04
West Valley DP	to Savannah River	4.27E-02	1.37E-02
Totals		4.68E-02	1.45E-02

Table 8. Expected Annual Fatalities for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	2.0E-05	5.6E-06
Normal Public	2.7E-05	2.1E-05
Accident Public	2.3E-05	7.2E-06
Nonradiological		
Emission	5.0E-06	3.5E-05
Accident	1.2E-04	4.1E-06

Table 9. Expected Annual Cancer Incidence for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	7.1E-05	2.0E-05
Normal Public	9.2E-05	7.2E-05
Accident Public	8.0E-05	2.5E-05
Nonradiological		
Emission	5.0E-06	3.5E-05
Accident	NA	NA

Table 10. Expected Annual Genetic Effects for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	3.1E-06	8.4E-07
Normal Public	5.4E-06	4.2E-06
Accident Public	1.4E-06	4.4E-07
Nonradiological		
Emission	NA	NA
Accident	NA	NA

B.2 WMLLMW DECENTRALIZED ALTERNATIVE (CASE 2): CONTACT-HANDLED HETEROGENEOUS SOLIDS: ALPHA — UNTREATED

Table 1. Summary of Route Information

			Distance (miles)	Percentage in Zone		
				Rural	Suburban	Urban
Truck						
Bettis Atomic	to	Savannah River	656	71.7	26.4	1.9
Mound Plant	to	Savannah River	656	66.5	32.7	0.8
U of MO - Columbia	to	Savannah River	858	70.6	27.0	2.3
West Valley DP	to	Savannah River	883	70.3	28.5	1.2
Rail						
Bettis Atomic	to	Savannah River	947	68.5	27.1	4.4
Mound Plant	to	Savannah River	744	67.4	29.2	3.3
U of MO - Columbia	to	Savannah River	1011	66.6	29.5	4.0
West Valley DP	to	Savannah River	1217	62.8	32.4	4.9

Table 2. Annual Number of Shipments and One-Way Shipment Distances

Route	# of Shipments		Total Mileage(mi)	
	Truck	Rail	Truck	Rail
Bettis Atomic to Savannah River	1	1	6.56E+02	9.47E+02
Mound Plant to Savannah River	1	1	6.56E+02	7.44E+02
U of MO - Columbia to Savannah River	1	1	8.58E+02	1.01E+03
West Valley DP to Savannah River	1	1	8.83E+02	1.22E+03
Totals	4	4	3.05E+03	3.92E+03

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

Source/Route(s)		Crew	General Public			
			Off-Link	On-Link	Stops	Total
MLLW(CA) BA to SR						
Bettis Atomic	to Savannah River					
	Truck	2.14E-02	1.96E-03	3.14E-03	1.84E-02	2.35E-02
	Rail	6.83E-03	1.32E-02	2.31E-04	6.39E-03	1.99E-02
MLLW(CA) MP to SR						
Mound Plant	to Savannah River					
	Truck	2.21E-02	1.91E-03	2.83E-03	1.84E-02	2.31E-02
	Rail	5.99E-03	9.25E-03	1.78E-04	5.77E-03	1.52E-02
MLLW(CA) MC to SR						
U of MO - Columbia	to Savannah River					
	Truck	2.83E-02	2.79E-03	4.37E-03	2.40E-02	3.12E-02
	Rail	7.10E-03	1.39E-02	2.52E-04	6.59E-03	2.07E-02
MLLW(CA) WV to SR						
West Valley DP	to Savannah River					
	Truck	2.89E-02	2.45E-03	3.86E-03	2.47E-02	3.10E-02
	Rail	7.96E-03	1.95E-02	3.38E-04	7.23E-03	2.70E-02

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route	Truck	Rail
MLLW(CA) BA to SR		
Bettis Atomic to Savannah River	2.11E-04	7.45E-05
MLLW(CA) MP to SR		
Mound Plant to Savannah River	9.48E-08	1.85E-08
MLLW(CA) MC to SR		
U of MO - Columbia to Savannah River	6.78E-07	2.05E-07
MLLW(CA) WV to SR		
West Valley DP to Savannah River	3.36E-04	1.07E-04

Table 5. Nonradiological Risk Factors per Shipment
(fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
Bettis Atomic	to Savannah River	3.99E-06	4.90E-05
Mound Plant	to Savannah River	1.67E-06	5.26E-05
U of MO - Columbia	to Savannah River	6.41E-06	6.09E-05
West Valley DP	to Savannah River	3.28E-06	6.60E-05
Rail			
Bettis Atomic	to Savannah River	1.74E-05	1.98E-06
Mound Plant	to Savannah River	1.03E-05	1.56E-06
U of MO - Columbia	to Savannah River	1.69E-05	2.12E-06
West Valley DP	to Savannah River	2.49E-05	2.55E-06

Table 6. Annual Incident-Free Dose for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
		Crew	Public	Crew	Public
Bettis Atomic	to Savannah River	2.14E-02	2.35E-02	6.83E-03	1.99E-02
Mound Plant	to Savannah River	2.21E-02	2.31E-02	5.99E-03	1.52E-02
U of MO - Columbia	to Savannah River	2.83E-02	3.12E-02	7.10E-03	2.07E-02
West Valley DP	to Savannah River	2.89E-02	3.10E-02	7.96E-03	2.70E-02
Totals		1.01E-01	1.09E-01	2.79E-02	8.28E-02

Table 7. Annual Accident Dose Risk for the Shipping Campaign
(person-rem/yr)

Route		Truck	Rail
Bettis Atomic	to Savannah River	2.11E-04	7.45E-05
Mound Plant	to Savannah River	9.48E-08	1.85E-08
U of MO - Columbia	to Savannah River	6.78E-07	2.05E-07
West Valley DP	to Savannah River	3.36E-04	1.07E-04
Totals		5.47E-04	1.82E-04

Table 8. Expected Annual Fatalities for
the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	4.0E-05	1.1E-05
Normal Public	5.4E-05	4.1E-05
Accident Public	2.7E-07	9.1E-08
Nonradiological		
Emission	1.5E-05	6.9E-05
Accident	2.3E-04	8.2E-06

Table 9. Expected Annual Cancer Incidence
for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	1.4E-04	3.9E-05
Normal Public	1.8E-04	1.4E-04
Accident Public	9.3E-07	3.1E-07
Nonradiological		
Emission	1.5E-05	6.9E-05
Accident	NA	NA

Table 10. Expected Annual Genetic Effects
for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	6.0E-06	1.7E-06
Normal Public	1.1E-05	8.3E-06
Accident Public	4.1E-08	1.4E-08
Nonradiological		
Emission	NA	NA
Accident	NA	NA

B.3 WM LLMW DECENTRALIZED ALTERNATIVE (CASE 2): CONTACT-HANDLED HETEROGENEOUS SOLIDS: NONALPHA — TREATED

Table 1. Summary of Route Information

Route	Distance (miles)	Percentage in Zone			
		Rural	Suburban	Urban	
Truck					
Ames Laboratory to Argonne - East	351	85.3	14.4	0.3	
Bettis Atomic to Portsmouth GDP	265	58.8	37.4	3.8	
Battelle Columbus to Portsmouth GDP	84	68.4	28.3	3.3	
Charleston, SC to Savannah River	200	75.7	23.8	0.5	
Colonie to Portsmouth GDP	688	57.3	40.1	2.5	
ETEC to Lawrence Livermore	406	77.9	10.0	12.1	
General Atomic to Lawrence Livermore	500	69.2	15.1	15.6	
Grand Junction PO to Rocky Flats Plant	273	79.9	16.7	3.3	
Knolls Atomic to Portsmouth GDP	688	57.3	40.1	2.5	
Kansas City Plant to Paducah GDP	441	77.5	19.6	2.9	
KKS to Portsmouth GDP	688	57.3	40.1	2.5	
KWS to Portsmouth GDP	688	57.3	40.1	2.5	
Lawrence Berkeley to Lawrence Livermore	45	38.4	33.3	28.2	
LERHR to Lawrence Livermore	97	58.7	24.7	16.6	
Mare Island to Lawrence Livermore	45	38.4	33.3	28.2	
Norfolk Nav Shipyd to Savannah River	498	72.8	26.2	1.0	
Pearl Harbor NS to Hanford Site	226	76.8	20.9	2.3	
Portsmouth NS to Portsmouth GDP	959	46.4	45.3	8.2	
Princeton PPL to Portsmouth GDP	588	55.1	38.8	6.1	
Puget Sound NS to Hanford Site	226	76.8	20.9	2.3	
Reactive Metals to Portsmouth GDP	276	59.5	37.8	2.8	
Rail					
Ames Laboratory to Argonne - East	328	71.7	21.4	6.9	
Bettis Atomic to Portsmouth GDP	429	52.6	39.6	7.8	
Battelle Columbus to Portsmouth GDP	91	63.4	31.8	4.8	
Charleston, SC to Savannah River	140	83.9	13.6	2.5	
Colonie to Portsmouth GDP	681	52.1	40.3	7.5	
ETEC to Lawrence Livermore	474	60.0	24.8	15.2	
General Atomic to Lawrence Livermore	579	57.1	24.9	18.0	
Grand Junction PO to Rocky Flats Plant	239	95.5	4.3	0.3	
Knolls Atomic to Portsmouth GDP	681	52.1	40.3	7.5	
Kansas City Plant to Paducah GDP	482	75.0	20.3	4.8	
KKS to Portsmouth GDP	681	52.1	40.3	7.5	
KWS to Portsmouth GDP	681	52.1	40.3	7.5	
Lawrence Berkeley to Lawrence Livermore	46	39.0	34.5	26.5	
LERHR to Lawrence Livermore	93	45.5	31.3	23.2	
Mare Island to Lawrence Livermore	46	39.0	34.5	26.5	
Norfolk Nav Shipyd to Savannah River	529	74.3	24.1	1.6	
Pearl Harbor NS to Hanford Site	416	73.7	20.1	6.2	
Portsmouth NS to Portsmouth GDP	962	49.0	44.3	6.7	
Princeton PPL to Portsmouth GDP	838	58.3	32.6	9.1	
Puget Sound NS to Hanford Site	416	73.7	20.1	6.2	
Reactive Metals to Portsmouth GDP	279	48.4	41.8	9.8	

Table 2. Annual Number of Shipments and Total One-Way Shipment Distances

Route		# of Shipments		Total Mileage(mi)	
		Truck	Rail	Truck	Rail
Ames Laboratory to Argonne - East		1	1	3.51E+02	3.28E+02
Bettis Atomic to Portsmouth GDP		1	1	2.65E+02	4.29E+02
Battelle Columbus to Portsmouth GDP		1	1	8.41E+01	9.09E+01
Charleston, SC to Savannah River		1	1	2.00E+02	1.40E+02
Colonie to Portsmouth GDP		1	1	6.88E+02	6.81E+02
ETEC to Lawrence Livermore		11	4	4.46E+03	1.90E+03
General Atomic to Lawrence Livermore		1	1	5.00E+02	5.79E+02
Grand Junction PO to Rocky Flats Plant		1	1	2.73E+02	2.39E+02
Knolls Atomic to Portsmouth GDP		1	1	6.88E+02	6.81E+02
Kansas City Plant to Paducah GDP		1	1	4.41E+02	4.82E+02
KKS to Portsmouth GDP		1	1	6.88E+02	6.81E+02
KWS to Portsmouth GDP		1	1	6.88E+02	6.81E+02
Lawrence Berkeley to Lawrence Livermore		1	1	4.50E+01	4.61E+01
LERHR to Lawrence Livermore		1	1	9.72E+01	9.30E+01

Table 2. Annual Number of Shipments and Total One-Way Shipment Distances (Cont.)

Route	# of Shipments		Total Mileage(mi)	
	Truck	Rail	Truck	Rail
Mare Island to Lawrence Livermore	1	1	4.50E+01	4.61E+01
Norfolk Nav Shipyd to Savannah River	1	1	4.98E+02	5.29E+02
Pearl Harbor NS to Hanford Site	1	1	2.26E+02	4.16E+02
Portsmouth NS to Portsmouth GDP	1	1	9.59E+02	9.62E+02
Princeton PPL to Portsmouth GDP	1	1	5.88E+02	8.38E+02
Puget Sound NS to Hanford Site	1	1	2.26E+02	4.16E+02
Reactive Metals to Portsmouth GDP	1	1	2.76E+02	2.79E+02
Totals	31	24	1.23E+04	1.05E+04

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

Source/Route(s)	Crew	General Public			
		Off-Link	On-Link	Stops	Total
MLLW(CT) AL to AN Ames Laboratory					
to Argonne - East					
Truck	9.87E-03	4.50E-04	1.11E-03	9.83E-03	1.14E-02
Rail	4.25E-03	5.78E-03	8.30E-05	4.49E-03	1.04E-02
MLLW(CT) BA to WV Bettis Atomic					
to Portsmouth GDP					
Truck	9.78E-03	1.26E-03	1.73E-03	7.42E-03	1.04E-02
Rail	4.67E-03	9.85E-03	1.53E-04	4.80E-03	1.48E-02
MLLW(CT) BC to PO Battelle Columbus					
to Portsmouth GDP					
Truck	2.86E-03	3.24E-04	4.91E-04	2.35E-03	3.17E-03
Rail	3.26E-03	1.44E-03	2.49E-05	3.76E-03	5.22E-03
MLLW(CT) CH to SR Charleston, SC					
to Savannah River					
Truck	6.19E-03	4.20E-04	7.45E-04	5.60E-03	6.77E-03
Rail	3.47E-03	1.07E-03	2.07E-05	3.91E-03	5.00E-03
MLLW(CT) CL to WV Colonie					
to Portsmouth GDP					
Truck	2.54E-02	2.99E-03	4.01E-03	1.93E-02	2.63E-02
Rail	5.72E-03	1.54E-02	2.43E-04	5.58E-03	2.13E-02
MLLW(CT) LC to LL ETEC					
to Lawrence Livermore					
Truck	1.39E-02	2.80E-03	4.47E-03	1.14E-02	1.86E-02
Rail	4.86E-03	1.60E-02	1.86E-04	4.94E-03	2.11E-02
MLLW(CT) SO to LL General Atomic					
to Lawrence Livermore					
Truck	1.90E-02	4.51E-03	6.81E-03	1.40E-02	2.53E-02
Rail	5.30E-03	2.26E-02	2.50E-04	5.26E-03	2.81E-02
MLLW(CT) GJ to RF Grand Junction PO					
to Rocky Flats Plant					
Truck	8.39E-03	8.15E-04	1.46E-03	7.65E-03	9.92E-03
Rail	3.88E-03	3.51E-04	1.62E-05	4.21E-03	4.58E-03
MLLW(CT) KA to WV Knolls Atomic					
to Portsmouth GDP					
Truck	2.54E-02	2.99E-03	4.01E-03	1.93E-02	2.63E-02
Rail	5.72E-03	1.54E-02	2.43E-04	5.58E-03	2.13E-02
MLLW(CT) KC to PA Kansas City Plant					
to Paducah GDP					
Truck	1.38E-02	1.32E-03	2.28E-03	1.23E-02	1.59E-02
Rail	4.89E-03	6.38E-03	1.03E-04	4.96E-03	1.14E-02
MLLW(CT) KK to WV KKS					
to Portsmouth GDP					
Truck	2.54E-02	2.99E-03	4.01E-03	1.93E-02	2.63E-02
Rail	5.72E-03	1.54E-02	2.43E-04	5.58E-03	2.13E-02
MLLW(CT) KW to WV KWS					
to Portsmouth GDP					
Truck	2.54E-02	2.99E-03	4.01E-03	1.93E-02	2.63E-02
Rail	5.72E-03	1.54E-02	2.43E-04	5.58E-03	2.13E-02
MLLW(CT) LB to LL Lawrence Berkeley					
to Lawrence Livermore					
Truck	2.31E-03	7.51E-04	1.03E-03	1.26E-03	3.04E-03
Rail	3.07E-03	2.62E-03	2.79E-05	3.62E-03	6.27E-03

Table 3. Incident-Free Dose per Shipment (person-rem/shipment) (Cont.)

Source/Route(s)	Crew	General Public			
		Off-Link	On-Link	Stops	Total
MLLW(CT) SM to LL LERHR	to Lawrence Livermore				
	Truck	4.02E-03	9.92E-04	1.43E-03	2.72E-03
	Rail	3.27E-03	4.67E-03	5.04E-05	3.77E-03
MLLW(CT) MZ to LL Mare Island	to Lawrence Livermore				
	Truck	2.31E-03	7.51E-04	1.03E-03	1.26E-03
	Rail	3.07E-03	2.62E-03	2.79E-05	3.62E-03
MLLW(CT) US to SR Norfolk Nav Shipyd	to Savannah River				
	Truck	1.59E-02	1.26E-03	2.07E-03	1.39E-02
	Rail	5.09E-03	4.35E-03	9.95E-05	5.11E-03
MLLW(CT) SW to HS Pearl Harbor NS	to Hanford Site				
	Truck	7.06E-03	6.28E-04	1.09E-03	6.33E-03
	Rail	4.62E-03	6.63E-03	9.79E-05	4.76E-03
MLLW(CT) PT to WV Portsmouth NS	to Portsmouth GDP				
	Truck	4.03E-02	7.28E-03	9.52E-03	2.68E-02
	Rail	6.89E-03	2.10E-02	3.50E-04	6.44E-03
MLLW(CT) PR to WV Princeton PPL	to Portsmouth GDP				
	Truck	2.28E-02	3.55E-03	4.81E-03	1.65E-02
	Rail	6.38E-03	2.00E-02	2.85E-04	6.06E-03
MLLW(CT) PN to HS Puget Sound NS	to Hanford Site				
	Truck	7.06E-03	6.28E-04	1.09E-03	6.33E-03
	Rail	4.62E-03	6.63E-03	9.79E-05	4.76E-03
MLLW(CT) RM to PO Reactive Metals	to Portsmouth GDP				
	Truck	1.00E-02	1.18E-03	1.62E-03	7.73E-03
	Rail	4.05E-03	7.58E-03	1.11E-04	4.34E-03

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route	Truck	Rail
MLLW(CT) AL to AN Ames Laboratory	to Argonne - East	2.41E-08
MLLW(CT) BA to WV Bettis Atomic	to Portsmouth GDP	1.11E-04
MLLW(CT) BC to PO Battelle Columbus	to Portsmouth GDP	2.49E-10
MLLW(CT) CH to SR Charleston, SC	to Savannah River	6.91E-04
MLLW(CT) CL to WV Colonie	to Portsmouth GDP	2.17E-06
MLLW(CT) LC to LL ETEC	to Lawrence Livermore	5.06E-05
MLLW(CT) SO to LL General Atomic	to Lawrence Livermore	1.17E-06
MLLW(CT) GJ to RF Grand Junction PO	to Rocky Flats Plant	5.76E-08
MLLW(CT) KA to WV Knolls Atomic	to Portsmouth GDP	2.32E-02
MLLW(CT) KC to PA Kansas City Plant	to Paducah GDP	1.11E-04
MLLW(CT) KK to WV KKS	to Portsmouth GDP	2.44E-02
MLLW(CT) KW to WV KWS	to Portsmouth GDP	7.34E-03
MLLW(CT) LB to LL Lawrence Berkeley	to Lawrence Livermore	8.41E-07
MLLW(CT) SM to LL LERHR	to Lawrence Livermore	1.28E-06
MLLW(CT) MZ to LL Mare Island	to Lawrence Livermore	6.50E-04
MLLW(CT) US to SR Norfolk Nav Shipyd	to Savannah River	8.05E-04
MLLW(CT) SW to HS Pearl Harbor NS	to Hanford Site	1.12E-04

Table 4. Accident Dose Risk per Shipment (person-rem/shipment) (Cont.)

Source/Route			Truck	Rail
MLLW(CT) PT to WV				
Portsmouth NS	to Portsmouth GDP		3.37E-04	1.53E-04
MLLW(CT) PR to WV				
Princeton PPL	to Portsmouth GDP		2.71E-09	1.28E-09
MLLW(CT) PN to HS				
Puget Sound NS	to Hanford Site		2.49E-03	1.84E-03
MLLW(CT) RM to PO				
Reactive Metals	to Portsmouth GDP		1.47E-06	4.24E-07

Table 5. Nonradiological Risk Factors per Shipment (fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
Ames Laboratory	to Argonne - East	3.22E-07	1.87E-05
Bettis Atomic	to Portsmouth GDP	3.22E-06	1.33E-05
Battelle Columbus	to Portsmouth GDP	9.01E-07	3.65E-06
Charleston, SC	to Savannah River	3.22E-07	1.70E-05
Colonie	to Portsmouth GDP	5.63E-06	3.56E-05
ETEC	to Lawrence Livermore	1.59E-05	3.01E-05
General Atomic	to Lawrence Livermore	2.52E-05	3.54E-05
Grand Junction PO	to Rocky Flats Plant	2.93E-06	2.32E-05
Knolls Atomic	to Portsmouth GDP	5.63E-06	3.56E-05
Kansas City Plant	to Paducah GDP	4.12E-06	2.89E-05
KKS	to Portsmouth GDP	5.63E-06	3.56E-05
KWS	to Portsmouth GDP	5.63E-06	3.56E-05
Lawrence Berkeley	to Lawrence Livermore	4.09E-06	2.66E-06
LERHR	to Lawrence Livermore	5.18E-06	6.50E-06
Mare Island	to Lawrence Livermore	4.09E-06	2.66E-06
Norfolk Nav Shipyd	to Savannah River	1.58E-06	4.45E-05
Pearl Harbor NS	to Hanford Site	1.67E-06	9.56E-06
Portsmouth NS	to Portsmouth GDP	2.55E-05	6.65E-05
Princeton PPL	to Portsmouth GDP	1.16E-05	3.99E-05
Puget Sound NS	to Hanford Site	1.67E-06	9.56E-06
Reactive Metals	to Portsmouth GDP	2.45E-06	1.21E-05
Rail			
Ames Laboratory	to Argonne - East	9.54E-06	6.87E-07
Bettis Atomic	to Portsmouth GDP	1.40E-05	8.98E-07
Battelle Columbus	to Portsmouth GDP	1.84E-06	1.90E-07
Charleston, SC	to Savannah River	1.46E-06	2.93E-07
Colonie	to Portsmouth GDP	2.15E-05	1.43E-06
ETEC	to Lawrence Livermore	3.01E-05	9.92E-07
General Atomic	to Lawrence Livermore	4.35E-05	1.21E-06
Grand Junction PO	to Rocky Flats Plant	2.51E-07	4.99E-07
Knolls Atomic	to Portsmouth GDP	2.15E-05	1.43E-06
Kansas City Plant	to Paducah GDP	9.58E-06	1.01E-06
KKS	to Portsmouth GDP	2.15E-05	1.43E-06
KWS	to Portsmouth GDP	2.15E-05	1.43E-06
Lawrence Berkeley	to Lawrence Livermore	5.10E-06	9.64E-08
LERHR	to Lawrence Livermore	9.04E-06	1.95E-07
Mare Island	to Lawrence Livermore	5.10E-06	9.64E-08
Norfolk Nav Shipyd	to Savannah River	3.64E-06	1.11E-06
Pearl Harbor NS	to Hanford Site	1.08E-05	8.70E-07
Portsmouth NS	to Portsmouth GDP	2.69E-05	2.01E-06
Princeton PPL	to Portsmouth GDP	3.18E-05	1.75E-06
Puget Sound NS	to Hanford Site	1.08E-05	8.70E-07
Reactive Metals	to Portsmouth GDP	1.14E-05	5.84E-07

Table 6. Annual Incident-Free Dose for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
		Crew	Public	Crew	Public
Ames Laboratory	to Argonne - East	9.87E-03	1.14E-02	4.25E-03	1.04E-02
Bettis Atomic	to Portsmouth GDP	9.78E-03	1.04E-02	4.67E-03	1.48E-02
Battelle Columbus	to Portsmouth GDP	2.86E-03	3.17E-03	3.26E-03	5.22E-03
Charleston, SC	to Savannah River	6.19E-03	6.77E-03	3.47E-03	5.00E-03
Colonie	to Portsmouth GDP	2.54E-02	2.63E-02	5.72E-03	2.13E-02
ETEC	to Lawrence Livermore	1.53E-01	2.05E-01	1.94E-02	8.45E-02
General Atomic	to Lawrence Livermore	1.90E-02	2.53E-02	5.30E-03	2.81E-02
Grand Junction PO	to Rocky Flats Plant	8.39E-03	9.92E-03	3.88E-03	4.58E-03
Knolls Atomic	to Portsmouth GDP	2.54E-02	2.63E-02	5.72E-03	2.13E-02
Kansas City Plant	to Paducah GDP	1.38E-02	1.59E-02	4.89E-03	1.14E-02
KKS	to Portsmouth GDP	2.54E-02	2.63E-02	5.72E-03	2.13E-02
KWS	to Portsmouth GDP	2.54E-02	2.63E-02	5.72E-03	2.13E-02
Lawrence Berkeley	to Lawrence Livermore	2.31E-03	3.04E-03	3.07E-03	6.27E-03
LERHR	to Lawrence Livermore	4.02E-03	5.14E-03	3.27E-03	8.48E-03
Mare Island	to Lawrence Livermore	2.31E-03	3.04E-03	3.07E-03	6.27E-03
Norfolk Nav Shipyd	to Savannah River	1.59E-02	1.73E-02	5.09E-03	9.55E-03
Pearl Harbor NS	to Hanford Site	7.06E-03	8.04E-03	4.62E-03	1.15E-02
Portsmouth NS	to Portsmouth GDP	4.03E-02	4.36E-02	6.89E-03	2.78E-02
Princeton PPL	to Portsmouth GDP	2.28E-02	2.48E-02	6.38E-03	2.64E-02
Puget Sound NS	to Hanford Site	7.06E-03	8.04E-03	4.62E-03	1.15E-02
Reactive Metals	to Portsmouth GDP	1.00E-02	1.05E-02	4.05E-03	1.20E-02
Totals		4.37E-01	5.16E-01	1.13E-01	3.69E-01

Table 7. Annual Accident Dose Risk for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
Ames Laboratory	to Argonne - East	2.41E-08	1.38E-08		
Bettis Atomic	to Portsmouth GDP	1.11E-04	4.47E-05		
Battelle Columbus	to Portsmouth GDP	2.49E-10	6.63E-11		
Charleston, SC	to Savannah River	6.91E-04	8.02E-05		
Colonie	to Portsmouth GDP	2.17E-06	5.04E-07		
ETEC	to Lawrence Livermore	5.57E-04	7.12E-04		
General Atomic	to Lawrence Livermore	1.17E-06	1.28E-06		
Grand Junction PO	to Rocky Flats Plant	5.76E-08	6.35E-10		
Knolls Atomic	to Portsmouth GDP	2.32E-02	5.43E-03		
Kansas City Plant	to Paducah GDP	1.11E-04	2.52E-05		
KKS	to Portsmouth GDP	2.44E-02	5.72E-03		
KWS	to Portsmouth GDP	7.34E-03	1.72E-03		
Lawrence Berkeley	to Lawrence Livermore	8.41E-07	5.96E-07		
LERHR	to Lawrence Livermore	1.28E-06	1.05E-06		
Mare Island	to Lawrence Livermore	6.50E-04	4.68E-04		
Norfolk Nav Shipyd	to Savannah River	8.05E-04	1.41E-04		
Pearl Harbor NS	to Hanford Site	1.12E-04	8.26E-05		
Portsmouth NS	to Portsmouth GDP	3.37E-04	1.53E-04		
Princeton PPL	to Portsmouth GDP	2.71E-09	1.28E-09		
Puget Sound NS	to Hanford Site	2.49E-03	1.84E-03		
Reactive Metals	to Portsmouth GDP	1.47E-06	4.24E-07		
Totals		6.08E-02	1.64E-02		

Table 8. Expected Annual Fatalities for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	1.7E-04	4.5E-05
Normal Public	2.6E-04	1.8E-04
Accident Public	3.0E-05	8.2E-06
Nonradiological		
Emission	2.9E-04	4.0E-04
Accident	8.1E-04	2.2E-05

Table 9. Expected Annual Cancer Incidence
for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	6.1E-04	1.6E-04
Normal Public	8.8E-04	6.3E-04
Accident Public	1.0E-04	2.8E-05
Nonradiological		
Emission	2.9E-04	4.0E-04
Accident	NA	NA

Table 10. Expected Annual Genetic Effects
for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	2.6E-05	6.8E-06
Normal Public	5.2E-05	3.7E-05
Accident Public	6.0E-06	1.6E-06
Nonradiological		
Emission	NA	NA
Accident	NA	NA

B.4 WM LLMW DECENTRALIZED ALTERNATIVE (CASE 2): CONTACT-HANDLED HETEROGENEOUS SOLIDS: ALPHA — TREATED

Table 1. Summary of Route Information

Route		Distance (miles)	Percentage in Zone		
			Rural	Suburban	Urban
Truck					
Lawrence Livermore	to Nevada Test Site	678	84.7	9.2	6.1
West Valley DP	to Savannah River	883	70.3	28.5	1.2
Rail					
Lawrence Livermore	to Nevada Test Site	1370	94.5	3.8	1.8
West Valley DP	to Savannah River	1217	62.8	32.4	4.9

Table 2. Annual Number of Shipments and One-Way Shipment Distances

Route	# of Shipments		Total Mileage(mi)	
	Truck	Rail	Truck	Rail
Lawrence Livermore to Nevada Test Site	10	4	6.78E+03	5.48E+03
West Valley DP to Savannah River	1	1	8.83E+02	1.22E+03
Totals	11	5	7.66E+03	6.70E+03

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

		General Public			
Source/Route(s)	Crew	Off-Link	On-Link	Stops	Total
MLLW(T) LL to NT					
Lawrence Livermore	to Nevada Test Site				
	Truck	2.05E-02	2.57E-03	4.65E-03	1.90E-02
	Rail	8.60E-03	5.75E-03	1.20E-04	7.70E-03
MLLW(T) WV to SR					
West Valley DP	to Savannah River				
	Truck	2.89E-02	2.45E-03	3.86E-03	2.47E-02
	Rail	7.96E-03	1.95E-02	3.38E-04	7.23E-03

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route	Truck	Rail
MLLW(T) LL to NT		
Lawrence Livermore to Nevada Test Site	4.80E-05	3.53E-05
MLLW(T) WV to SR		
West Valley DP to Savannah River	4.43E-05	1.42E-05

Table 5. Nonradiological Risk Factors per Shipment
(fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
Lawrence Livermore to Nevada Test Site		1.32E-05	5.15E-05
West Valley DP to Savannah River		3.28E-06	6.60E-05
Rail			
Lawrence Livermore to Nevada Test Site		1.01E-05	2.87E-06
West Valley DP to Savannah River		2.49E-05	2.55E-06

Table 6. Annual Incident-Free Dose for the Shipping Campaign
(person-rem/yr)

Route	Truck		Rail	
	Crew	Public	Crew	Public
Lawrence Livermore to Nevada Test Site	2.05E-01	2.62E-01	3.44E-02	5.43E-02
West Valley DP to Savannah River	2.89E-02	3.10E-02	7.96E-03	2.70E-02
Totals	2.34E-01	2.93E-01	4.23E-02	8.13E-02

Table 7. Annual Accident Dose Risk for the Shipping Campaign
(person-rem/yr)

Route	Truck	Rail
Lawrence Livermore to Nevada Test Site	4.80E-04	1.41E-04
West Valley DP to Savannah River	4.43E-05	1.42E-05
Totals	5.25E-04	1.55E-04

Table 8. Expected Annual Fatalities for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	9.4E-05	1.7E-05
Normal Public	1.5E-04	4.1E-05
Accident Public	2.6E-07	7.8E-08
Nonradiological		
Emission	1.4E-04	6.5E-05
Accident	5.8E-04	1.4E-05

Table 9. Expected Annual Cancer Incidence for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	3.3E-04	5.9E-05
Normal Public	5.0E-04	1.4E-04
Accident Public	8.9E-07	2.6E-07
Nonradiological		
Emission	1.4E-04	6.5E-05
Accident	NA	NA

Table 10. Expected Annual Genetic Effects for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	1.4E-05	2.5E-06
Normal Public	2.9E-05	8.1E-06
Accident Public	2.0E-08	6.2E-09
Nonradiological		
Emission	NA	NA
Accident	NA	NA

B.5 WM LLMW REGIONALIZED 1 ALTERNATIVE (CASE 4): CONTACT-HANDLED ORGANIC LIQUIDS: NONALPHA — UNTREATED

Table 1. Summary of Route Information

		Distance (miles)	Percentage in Zone		
Route			Rural	Suburban	Urban
Truck					
Bettis Atomic	to Portsmouth GDP	265	58.8	37.4	3.8
Brookhaven NL	to Portsmouth GDP	689	53.5	39.4	7.0
Charleston, SC	to Savannah River	200	75.7	23.8	0.5
Colonie	to Portsmouth GDP	688	57.3	40.1	2.5
General Atomic	to Lawrence Livermore	500	69.2	15.1	15.6
Grand Junction PO	to Rocky Flats Plant	273	79.9	16.7	3.3
ITRI	to Los Alamos NL	111	76.8	18.9	4.2
Knolls Atomic	to Portsmouth GDP	688	57.3	40.1	2.5
KKS	to Portsmouth GDP	688	57.3	40.1	2.5
KWS	to Portsmouth GDP	688	57.3	40.1	2.5
Lawrence Berkeley	to Lawrence Livermore	45	38.4	33.3	28.2
LERHR	to Lawrence Livermore	97	58.7	24.7	16.6
Pearl Harbor NS	to Hanford Site	226	76.8	20.9	2.3
Puget Sound NS	to Hanford Site	226	76.8	20.9	2.3
Reactive Metals	to Portsmouth GDP	276	59.5	37.8	2.8
SNL - Albuquerque	to Los Alamos NL	102	75.8	20.1	4.1
Rail					
Bettis Atomic	to Portsmouth GDP	429	52.6	39.6	7.8
Brookhaven NL	to Portsmouth GDP	921	45.4	43.6	11.0
Charleston, SC	to Savannah River	140	83.9	13.6	2.5
Colonie	to Portsmouth GDP	681	52.1	40.3	7.5
General Atomic	to Lawrence Livermore	579	57.1	24.9	18.0
Grand Junction PO	to Rocky Flats Plant	239	95.5	4.3	0.3
ITRI	to Los Alamos NL	104	74.3	20.0	5.7
Knolls Atomic	to Portsmouth GDP	681	52.1	40.3	7.5
KKS	to Portsmouth GDP	681	52.1	40.3	7.5
KWS	to Portsmouth GDP	681	52.1	40.3	7.5
Lawrence Berkeley	to Lawrence Livermore	46	39.0	34.5	26.5
LERHR	to Lawrence Livermore	93	45.5	31.3	23.2
Pearl Harbor NS	to Hanford Site	416	73.7	20.1	6.2
Puget Sound NS	to Hanford Site	416	73.7	20.1	6.2
Reactive Metals	to Portsmouth GDP	279	48.4	41.8	9.8
SNL - Albuquerque	to Los Alamos NL	104	74.3	20.0	5.7

Table 2. Annual Number of Shipments and One-Way Shipment Distances

Route	# of Shipments		Total Mileage(mi)	
	Truck	Rail	Truck	Rail
Bettis Atomic to Portsmouth GDP	1	1	2.65E+02	4.29E+02
Brookhaven NL to Portsmouth GDP	1	1	6.89E+02	9.21E+02
Charleston, SC to Savannah River	1	1	2.00E+02	1.40E+02
Colonie to Portsmouth GDP	1	1	6.88E+02	6.81E+02
General Atomic to Lawrence Livermore	1	1	5.00E+02	5.79E+02
Grand Junction PO to Rocky Flats Plant	1	1	2.73E+02	2.39E+02
ITRI to Los Alamos NL	1	1	1.11E+02	1.04E+02
Knolls Atomic to Portsmouth GDP	1	1	6.88E+02	6.81E+02
KKS to Portsmouth GDP	1	1	6.88E+02	6.81E+02
KWS to Portsmouth GDP	1	1	6.88E+02	6.81E+02
Lawrence Berkeley to Lawrence Livermore	1	1	4.50E+01	4.61E+01
LERHR to Lawrence Livermore	1	1	9.72E+01	9.30E+01
Pearl Harbor NS to Hanford Site	1	1	2.26E+02	4.16E+02
Puget Sound NS to Hanford Site	1	1	2.26E+02	4.16E+02
Reactive Metals to Portsmouth GDP	1	1	2.76E+02	2.79E+02
SNL - Albuquerque to Los Alamos NL	1	1	1.02E+02	1.04E+02
Totals	16	16	5.76E+03	6.49E+03

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

Source/Route(s)		Crew	General Public			
			Off-Link	On-Link	Stops	Total
MLLW(O) BA to PO Bettis Atomic	to Portsmouth GDP					
	Truck	9.78E-03	1.26E-03	1.73E-03	7.42E-03	1.04E-02
	Rail	4.67E-03	9.85E-03	1.53E-04	4.80E-03	1.48E-02
MLLW(O) BN to PO Brookhaven NL	to Portsmouth GDP					
	Truck	2.73E-02	4.51E-03	6.10E-03	1.93E-02	2.99E-02
	Rail	6.72E-03	2.74E-02	3.90E-04	6.31E-03	3.41E-02
MLLW(O) CH to SR Charleston, SC	to Savannah River					
	Truck	6.19E-03	4.20E-04	7.45E-04	5.60E-03	6.77E-03
	Rail	3.47E-03	1.07E-03	2.07E-05	3.91E-03	5.00E-03
MLLW(O) CL to PO Colonie	to Portsmouth GDP					
	Truck	2.54E-02	2.99E-03	4.01E-03	1.93E-02	2.63E-02
	Rail	5.72E-03	1.54E-02	2.43E-04	5.58E-03	2.13E-02
MLLW(O) SO to LL General Atomic	to Lawrence Livermore					
	Truck	1.90E-02	4.51E-03	6.81E-03	1.40E-02	2.53E-02
	Rail	5.30E-03	2.26E-02	2.50E-04	5.26E-03	2.81E-02
MLLW(O) GJ to RF Grand Junction PO	to Rocky Flats Plant					
	Truck	8.39E-03	8.15E-04	1.46E-03	7.65E-03	9.92E-03
	Rail	3.88E-03	3.51E-04	1.62E-05	4.21E-03	4.58E-03
MLLW(O) IT to LA ITRI	to Los Alamos NL					
	Truck	3.54E-03	4.00E-04	6.71E-04	3.11E-03	4.18E-03
	Rail	3.31E-03	1.55E-03	2.36E-05	3.80E-03	5.37E-03
MLLW(O) KA to PO Knolls Atomic	to Portsmouth GDP					
	Truck	2.54E-02	2.99E-03	4.01E-03	1.93E-02	2.63E-02
	Rail	5.72E-03	1.54E-02	2.43E-04	5.58E-03	2.13E-02
MLLW(O) KK to PO KKS	to Portsmouth GDP					
	Truck	2.54E-02	2.99E-03	4.01E-03	1.93E-02	2.63E-02
	Rail	5.72E-03	1.54E-02	2.43E-04	5.58E-03	2.13E-02
MLLW(O) KW to PO KWS	to Portsmouth GDP					
	Truck	2.54E-02	2.99E-03	4.01E-03	1.93E-02	2.63E-02
	Rail	5.72E-03	1.54E-02	2.43E-04	5.58E-03	2.13E-02
MLLW(O) LB to LL Lawrence Berkeley	to Lawrence Livermore					
	Truck	2.31E-03	7.51E-04	1.03E-03	1.26E-03	3.04E-03
	Rail	3.07E-03	2.62E-03	2.79E-05	3.62E-03	6.27E-03
MLLW(O) SM to LL LERHR	to Lawrence Livermore					
	Truck	4.02E-03	9.92E-04	1.43E-03	2.72E-03	5.14E-03
	Rail	3.27E-03	4.67E-03	5.04E-05	3.77E-03	8.48E-03
MLLW(O) SW to HS Pearl Harbor NS	to Hanford Site					
	Truck	7.06E-03	6.28E-04	1.09E-03	6.33E-03	8.04E-03
	Rail	4.62E-03	6.63E-03	9.79E-05	4.76E-03	1.15E-02
MLLW(O) PN to HS Puget Sound NS	to Hanford Site					
	Truck	7.06E-03	6.28E-04	1.09E-03	6.33E-03	8.04E-03
	Rail	4.62E-03	6.63E-03	9.79E-05	4.76E-03	1.15E-02
MLLW(O) RM to PO Reactive Metals	to Portsmouth GDP					
	Truck	1.00E-02	1.18E-03	1.62E-03	7.73E-03	1.05E-02
	Rail	4.05E-03	7.58E-03	1.11E-04	4.34E-03	1.20E-02
MLLW(O) SA to LA SNL - Albuquerque	to Los Alamos NL					
	Truck	3.28E-03	3.70E-04	6.13E-04	2.86E-03	3.84E-03
	Rail	3.31E-03	1.55E-03	2.36E-05	3.80E-03	5.37E-03

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route			Truck	Rail
MLLW(O) BA to PO				
Bettis Atomic	to Portsmouth GDP		5.04E-04	2.16E-04
MLLW(O) BN to PO				
Brookhaven NL	to Portsmouth GDP		4.87E-03	2.63E-03
MLLW(O) CH to SR				
Charleston, SC	to Savannah River		7.75E-03	8.99E-04
MLLW(O) CL to PO				
Colonie	to Portsmouth GDP		3.74E-04	8.80E-05
MLLW(O) SO to LL				
General Atomic	to Lawrence Livermore		5.23E-06	6.00E-06
MLLW(O) GJ to RF				
Grand Junction PO	to Rocky Flats Plant		1.33E-06	1.13E-08
MLLW(O) IT to LA				
ITRI	to Los Alamos NL		8.49E-06	1.55E-07
MLLW(O) KA to PO				
Knolls Atomic	to Portsmouth GDP		4.50E-02	1.06E-02
MLLW(O) KK to PO				
KKS	to Portsmouth GDP		3.45E-02	8.09E-03
MLLW(O) KW to PO				
KWS	to Portsmouth GDP		4.71E-03	1.10E-03
MLLW(O) LB to LL				
Lawrence Berkeley	to Lawrence Livermore		5.87E-06	4.23E-06
MLLW(O) SM to LL				
LERHR	to Lawrence Livermore		9.63E-07	8.20E-07
MLLW(O) SW to HS				
Pearl Harbor NS	to Hanford Site		8.47E-06	6.32E-06
MLLW(O) PN to HS				
Puget Sound NS	to Hanford Site		1.95E-04	1.46E-04
MLLW(O) RM to PO				
Reactive Metals	to Portsmouth GDP		7.40E-05	2.29E-05
MLLW(O) SA to LA				
SNL - Albuquerque	to Los Alamos NL		5.82E-07	1.10E-08

Table 5. Nonradiological Risk Factors per Shipment (fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
Bettis Atomic	to Portsmouth GDP	3.22E-06	1.33E-05
Brookhaven NL	to Portsmouth GDP	1.56E-05	4.90E-05
Charleston, SC	to Savannah River	3.22E-07	1.70E-05
Colonie	to Portsmouth GDP	5.63E-06	3.56E-05
General Atomic	to Lawrence Livermore	2.52E-05	3.54E-05
Grand Junction PO	to Rocky Flats Plant	2.93E-06	2.32E-05
ITRI	to Los Alamos NL	1.51E-06	1.28E-05
Knolls Atomic	to Portsmouth GDP	5.63E-06	3.56E-05
KKS	to Portsmouth GDP	5.63E-06	3.56E-05
KWS	to Portsmouth GDP	5.63E-06	3.56E-05
Lawrence Berkeley	to Lawrence Livermore	4.09E-06	2.66E-06
LERHR	to Lawrence Livermore	5.18E-06	6.50E-06
Pearl Harbor NS	to Hanford Site	1.67E-06	9.56E-06
Puget Sound NS	to Hanford Site	1.67E-06	9.56E-06
Reactive Metals	to Portsmouth GDP	2.45E-06	1.21E-05
SNL - Albuquerque	to Los Alamos NL	1.35E-06	1.20E-05
Rail			
Bettis Atomic	to Portsmouth GDP	1.40E-05	8.98E-07
Brookhaven NL	to Portsmouth GDP	4.22E-05	1.93E-06
Charleston, SC	to Savannah River	1.46E-06	2.93E-07
Colonie	to Portsmouth GDP	2.15E-05	1.43E-06
General Atomic	to Lawrence Livermore	4.35E-05	1.21E-06
Grand Junction PO	to Rocky Flats Plant	2.51E-07	4.99E-07
ITRI	to Los Alamos NL	2.47E-06	2.18E-07
Knolls Atomic	to Portsmouth GDP	2.15E-05	1.43E-06
KKS	to Portsmouth GDP	2.15E-05	1.43E-06
KWS	to Portsmouth GDP	2.15E-05	1.43E-06
Lawrence Berkeley	to Lawrence Livermore	5.10E-06	9.64E-08
LERHR	to Lawrence Livermore	9.04E-06	1.95E-07
Pearl Harbor NS	to Hanford Site	1.08E-05	8.70E-07
Puget Sound NS	to Hanford Site	1.08E-05	8.70E-07
Reactive Metals	to Portsmouth GDP	1.14E-05	5.84E-07
SNL - Albuquerque	to Los Alamos NL	2.47E-06	2.18E-07

Table 6. Annual Incident-Free Dose for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
		Crew	Public	Crew	Public
Bettis Atomic	to Portsmouth GDP	9.78E-03	1.04E-02	4.67E-03	1.48E-02
Brookhaven NL	to Portsmouth GDP	2.73E-02	2.99E-02	6.72E-03	3.41E-02
Charleston, SC	to Savannah River	6.19E-03	6.77E-03	3.47E-03	5.00E-03
Colonie	to Portsmouth GDP	2.54E-02	2.63E-02	5.72E-03	2.13E-02
General Atomic	to Lawrence Livermore	1.90E-02	2.53E-02	5.30E-03	2.81E-02
Grand Junction PO	to Rocky Flats Plant	8.39E-03	9.92E-03	3.88E-03	4.58E-03
ITRI	to Los Alamos NL	3.54E-03	4.18E-03	3.31E-03	5.37E-03
Knolls Atomic	to Portsmouth GDP	2.54E-02	2.63E-02	5.72E-03	2.13E-02
KKS	to Portsmouth GDP	2.54E-02	2.63E-02	5.72E-03	2.13E-02
KWS	to Portsmouth GDP	2.54E-02	2.63E-02	5.72E-03	2.13E-02
Lawrence Berkeley	to Lawrence Livermore	2.31E-03	3.04E-03	3.07E-03	6.27E-03
LERHR	to Lawrence Livermore	4.02E-03	5.14E-03	3.27E-03	8.48E-03
Pearl Harbor NS	to Hanford Site	7.06E-03	8.04E-03	4.62E-03	1.15E-02
Puget Sound NS	to Hanford Site	7.06E-03	8.04E-03	4.62E-03	1.15E-02
Reactive Metals	to Portsmouth GDP	1.00E-02	1.05E-02	4.05E-03	1.20E-02
SNL - Albuquerque	to Los Alamos NL	3.28E-03	3.84E-03	3.31E-03	5.37E-03
Totals		2.09E-01	2.30E-01	7.32E-02	2.32E-01

Table 7. Annual Accident Dose Risk for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
Bettis Atomic	to Portsmouth GDP	5.04E-04	2.16E-04		
Brookhaven NL	to Portsmouth GDP	4.87E-03	2.63E-03		
Charleston, SC	to Savannah River	7.75E-03	8.99E-04		
Colonie	to Portsmouth GDP	3.74E-04	8.80E-05		
General Atomic	to Lawrence Livermore	5.23E-06	6.00E-06		
Grand Junction PO	to Rocky Flats Plant	1.33E-06	1.13E-08		
ITRI	to Los Alamos NL	8.49E-06	1.55E-07		
Knolls Atomic	to Portsmouth GDP	4.50E-02	1.06E-02		
KKS	to Portsmouth GDP	3.45E-02	8.09E-03		
KWS	to Portsmouth GDP	4.71E-03	1.10E-03		
Lawrence Berkeley	to Lawrence Livermore	5.87E-06	4.23E-06		
LERHR	to Lawrence Livermore	9.63E-07	8.20E-07		
Pearl Harbor NS	to Hanford Site	8.47E-06	6.32E-06		
Puget Sound NS	to Hanford Site	1.95E-04	1.46E-04		
Reactive Metals	to Portsmouth GDP	7.40E-05	2.29E-05		
SNL - Albuquerque	to Los Alamos NL	5.82E-07	1.10E-08		
Totals		9.80E-02	2.38E-02		

Table 8. Expected Annual Fatalities for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	8.4E-05	2.9E-05
Normal Public	1.2E-04	1.2E-04
Accident Public	4.9E-05	1.2E-05
Nonradiological		
Emission	8.8E-05	2.4E-04
Accident	3.5E-04	1.4E-05

Table 9. Expected Annual Cancer Incidence for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	2.9E-04	1.0E-04
Normal Public	3.9E-04	3.9E-04
Accident Public	1.7E-04	4.0E-05
Nonradiological		
Emission	8.8E-05	2.4E-04
Accident	NA	NA

Table 10. Expected Annual Genetic Effects
for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	1.3E-05	4.4E-06
Normal Public	2.3E-05	2.3E-05
Accident Public	7.5E-06	1.7E-06
Nonradiological		
Emission	NA	NA
Accident	NA	NA

B.6 WM LLMW REGIONALIZED 1 ALTERNATIVE (CASE 4): CONTACT-HANDLED ORGANIC LIQUIDS: ALPHA — UNTREATED

Table 1. Summary of Route Information

Route	Distance (miles)	Percentage in Zone			
		Rural	Suburban	Urban	
Truck					
Lawrence Livermore to Nevada Test Site	678	84.7	9.2	6.1	
Mound Plant to Savannah River	656	66.5	32.7	0.8	
West Valley DP to Savannah River	883	70.3	28.5	1.2	
Rail					
Lawrence Livermore to Nevada Test Site	1370	94.5	3.8	1.8	
Mound Plant to Savannah River	744	67.4	29.2	3.3	
West Valley DP to Savannah River	1217	62.8	32.4	4.9	

Table 2. Annual Number of Shipments and One-Way Shipment Distances

Route	# of Shipments		Total Mileage(mi)	
	Truck	Rail	Truck	Rail
Lawrence Livermore to Nevada Test Site	1	1	6.78E+02	1.37E+03
Mound Plant to Savannah River	1	1	6.56E+02	7.44E+02
West Valley DP to Savannah River	1	1	8.83E+02	1.22E+03
Totals	3	3	2.22E+03	3.33E+03

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

		General Public				
Source/Route(s)	Crew	Off-Link	On-Link	Stops	Total	
MLLW(OA) LL to NT						
Lawrence Livermore	to Nevada Test Site					
	Truck	2.05E-02	2.57E-03	4.65E-03	1.90E-02	
	Rail	8.60E-03	5.75E-03	1.20E-04	7.70E-03	
MLLW(OA) MP to SR						
Mound Plant	to Savannah River					
	Truck	2.21E-02	1.91E-03	2.83E-03	1.84E-02	
	Rail	5.99E-03	9.25E-03	1.78E-04	5.77E-03	
MLLW(OA) WV to SR						
West Valley DP	to Savannah River					
	Truck	2.89E-02	2.45E-03	3.86E-03	2.47E-02	
	Rail	7.96E-03	1.95E-02	3.38E-04	7.23E-03	

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route	Truck	Rail
MLLW(OA) LL to NT		
Lawrence Livermore to Nevada Test Site	1.72E-07	5.48E-08
MLLW(OA) MP to SR		
Mound Plant to Savannah River	4.15E-03	7.63E-04
MLLW(OA) WV to SR		
West Valley DP to Savannah River	4.27E-02	1.37E-02

Table 5. Nonradiological Risk Factors per Shipment (fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
Lawrence Livermore to Nevada Test Site		1.32E-05	5.15E-05
Mound Plant to Savannah River		1.67E-06	5.26E-05
West Valley DP to Savannah River		3.28E-06	6.60E-05
Rail			
Lawrence Livermore to Nevada Test Site		1.01E-05	2.87E-06
Mound Plant to Savannah River		1.03E-05	1.56E-06
West Valley DP to Savannah River		2.49E-05	2.55E-06

Table 6. Annual Incident-Free Dose for the Shipping Campaign (person-rem/yr)

Route	Truck		Rail	
	Crew	Public	Crew	Public
Lawrence Livermore to Nevada Test Site	2.05E-02	2.62E-02	8.60E-03	1.36E-02
Mound Plant to Savannah River	2.21E-02	2.31E-02	5.99E-03	1.52E-02
West Valley DP to Savannah River	2.89E-02	3.10E-02	7.96E-03	2.70E-02
Totals	7.15E-02	8.03E-02	2.25E-02	5.58E-02

Table 7. Annual Accident Dose Risk for the Shipping Campaign (person-rem/yr)

Route	Truck	Rail
Lawrence Livermore to Nevada Test Site	1.72E-07	5.48E-08
Mound Plant to Savannah River	4.15E-03	7.63E-04
West Valley DP to Savannah River	4.27E-02	1.37E-02
Totals	4.68E-02	1.45E-02

Table 8. Expected Annual Fatalities for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	2.9E-05	9.0E-06
Normal Public	4.0E-05	2.8E-05
Accident Public	2.3E-05	7.2E-06
Nonradiological		
Emission	1.8E-05	4.5E-05
Accident	1.7E-04	7.0E-06

Table 9. Expected Annual Cancer Incidence for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	1.0E-04	3.2E-05
Normal Public	1.4E-04	9.5E-05
Accident Public	8.0E-05	2.5E-05
Nonradiological		
Emission	1.8E-05	4.5E-05
Accident	NA	NA

Table 10. Expected Annual Genetic Effects for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	4.3E-06	1.4E-06
Normal Public	8.0E-06	5.6E-06
Accident Public	1.4E-06	4.4E-07
Nonradiological		
Emission	NA	NA
Accident	NA	NA

B.7 WM LLMW REGIONALIZED 1 ALTERNATIVE (CASE 4): CONTACT-HANDLED HETEROGENEOUS SOLIDS: NONALPHA — UNTREATED

Table 1. Summary of Route Information

		Distance (miles)	Percentage in Zone		
Route			Rural	Suburban	Urban
Truck					
Ames Laboratory	to Fernald (FEMP)	611	80.0	19.1	0.9
Argonne - East	to Fernald (FEMP)	294	62.0	32.9	5.1
Bettis Atomic	to Portsmouth GDP	265	58.8	37.4	3.8
Battelle Columbus	to Portsmouth GDP	84	68.4	28.3	3.3
Brookhaven NL	to Portsmouth GDP	689	53.5	39.4	7.0
Charleston, SC	to Savannah River	200	75.7	23.8	0.5
Colonie	to Portsmouth GDP	688	57.3	40.1	2.5
General Atomic	to Lawrence Livermore	500	69.2	15.1	15.6
Grand Junction PO	to Rocky Flats Plant	273	79.9	16.7	3.3
Knolls Atomic	to Portsmouth GDP	688	57.3	40.1	2.5
Kansas City Plant	to Paducah GDP	441	77.5	19.6	2.9
KKS	to Portsmouth GDP	688	57.3	40.1	2.5
KWS	to Portsmouth GDP	688	57.3	40.1	2.5
Lawrence Berkeley	to Lawrence Livermore	45	38.4	33.3	28.2
LERHR	to Lawrence Livermore	97	58.7	24.7	16.6
Mare Island	to Lawrence Livermore	45	38.4	33.3	28.2
Norfolk Nav Shipyd	to Savannah River	498	72.8	26.2	1.0
Nevada Test Site	to INEL	712	82.8	13.7	3.5
Pearl Harbor NS	to Hanford Site	226	76.8	20.9	2.3
Portsmouth NS	to Portsmouth GDP	959	46.4	45.3	8.2
Princeton PPL	to Portsmouth GDP	588	55.1	38.8	6.1
Puget Sound NS	to Hanford Site	226	76.8	20.9	2.3
Reactive Metals	to Portsmouth GDP	276	59.5	37.8	2.8
SNL - Albuquerque	to Los Alamos NL	102	75.8	20.1	4.1
Rail					
Ames Laboratory	to Fernald (FEMP)	717	65.3	26.3	8.4
Argonne - East	to Fernald (FEMP)	412	59.1	34.6	6.4
Bettis Atomic	to Portsmouth GDP	429	52.6	39.6	7.8
Battelle Columbus	to Portsmouth GDP	91	63.4	31.8	4.8
Brookhaven NL	to Portsmouth GDP	921	45.4	43.6	11.0
Charleston, SC	to Savannah River	140	83.9	13.6	2.5
Colonie	to Portsmouth GDP	681	52.1	40.3	7.5
General Atomic	to Lawrence Livermore	579	57.1	24.9	18.0
Grand Junction PO	to Rocky Flats Plant	239	95.5	4.3	0.3
Knolls Atomic	to Portsmouth GDP	681	52.1	40.3	7.5
Kansas City Plant	to Paducah GDP	482	75.0	20.3	4.8
KKS	to Portsmouth GDP	681	52.1	40.3	7.5
KWS	to Portsmouth GDP	681	52.1	40.3	7.5
Lawrence Berkeley	to Lawrence Livermore	46	39.0	34.5	26.5
LERHR	to Lawrence Livermore	93	45.5	31.3	23.2
Mare Island	to Lawrence Livermore	46	39.0	34.5	26.5
Norfolk Nav Shipyd	to Savannah River	529	74.3	24.1	1.6
Nevada Test Site	to INEL	756	92.8	5.9	1.3
Pearl Harbor NS	to Hanford Site	416	73.7	20.1	6.2
Portsmouth NS	to Portsmouth GDP	962	49.0	44.3	6.7
Princeton PPL	to Portsmouth GDP	838	58.3	32.6	9.1
Puget Sound NS	to Hanford Site	416	73.7	20.1	6.2
Reactive Metals	to Portsmouth GDP	279	48.4	41.8	9.8
SNL - Albuquerque	to Los Alamos NL	104	74.3	20.0	5.7

Table 2. Annual Number of Shipments and One-Way Shipment Distances

Route		# of Shipments		Total Mileage(mi)	
		Truck	Rail	Truck	Rail
Ames Laboratory	to Fernald (FEMP)	1	1	6.11E+02	7.17E+02
Argonne - East	to Fernald (FEMP)	44	17	1.29E+04	7.01E+03
Bettis Atomic	to Portsmouth GDP	1	1	2.65E+02	4.29E+02
Battelle Columbus	to Portsmouth GDP	1	1	8.41E+01	9.09E+01
Brookhaven NL	to Portsmouth GDP	1	1	6.89E+02	9.21E+02
Charleston, SC	to Savannah River	1	1	2.00E+02	1.40E+02
Colonie	to Portsmouth GDP	1	1	6.88E+02	6.81E+02
General Atomic	to Lawrence Livermore	1	1	5.00E+02	5.79E+02
Grand Junction PO	to Rocky Flats Plant	1	1	2.73E+02	2.39E+02
Knolls Atomic	to Portsmouth GDP	1	1	6.88E+02	6.81E+02
Kansas City Plant	to Paducah GDP	1	1	4.41E+02	4.82E+02
KKS	to Portsmouth GDP	1	1	6.88E+02	6.81E+02
KWS	to Portsmouth GDP	1	1	6.88E+02	6.81E+02
Lawrence Berkeley	to Lawrence Livermore	1	1	4.50E+01	4.61E+01
LERHR	to Lawrence Livermore	1	1	9.72E+01	9.30E+01
Mare Island	to Lawrence Livermore	1	1	4.50E+01	4.61E+01
Norfolk Nav Shipyd	to Savannah River	1	1	4.98E+02	5.29E+02
Nevada Test Site	to INEL	1	1	7.12E+02	7.56E+02
Pearl Harbor NS	to Hanford Site	1	1	2.26E+02	4.16E+02
Portsmouth NS	to Portsmouth GDP	1	1	9.59E+02	9.62E+02
Princeton PPL	to Portsmouth GDP	1	1	5.88E+02	8.38E+02
Puget Sound NS	to Hanford Site	1	1	2.26E+02	4.16E+02
Reactive Metals	to Portsmouth GDP	1	1	2.76E+02	2.79E+02
SNL - Albuquerque	to Los Alamos NL	1	1	1.02E+02	1.04E+02
Totals		67	40	2.25E+04	1.78E+04

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

Source/Route(s)	Crew	General Public			
		Off-Link	On-Link	Stops	Total
MLLW(C) AL to FE					
Ames Laboratory	to Fernald (FEMP)				
	Truck	1.82E-02	1.19E-03	2.31E-03	1.71E-02
	Rail	5.87E-03	1.53E-02	2.14E-04	5.69E-03
MLLW(C) AN to FE					
Argonne - East	to Fernald (FEMP)				
	Truck	1.07E-02	1.49E-03	2.12E-03	8.23E-03
	Rail	4.60E-03	7.93E-03	1.28E-04	4.75E-03
MLLW(C) BA to PO					
Bettis Atomic	to Portsmouth GDP				
	Truck	9.78E-03	1.26E-03	1.73E-03	7.42E-03
	Rail	4.67E-03	9.85E-03	1.53E-04	4.80E-03
MLLW(C) BC to PO					
Battelle Columbus	to Portsmouth GDP				
	Truck	2.86E-03	3.24E-04	4.91E-04	2.35E-03
	Rail	3.26E-03	1.44E-03	2.49E-05	3.76E-03
MLLW(C) BN to PO					
Brookhaven NL	to Portsmouth GDP				
	Truck	2.73E-02	4.51E-03	6.10E-03	1.93E-02
	Rail	6.72E-03	2.74E-02	3.90E-04	6.31E-03
MLLW(C) CH to SR					
Charleston, SC	to Savannah River				
	Truck	6.19E-03	4.20E-04	7.45E-04	5.60E-03
	Rail	3.47E-03	1.07E-03	2.07E-05	3.91E-03
MLLW(C) CL to PO					
Colonie	to Portsmouth GDP				
	Truck	2.54E-02	2.99E-03	4.01E-03	1.93E-02
	Rail	5.72E-03	1.54E-02	2.43E-04	5.58E-03
MLLW(C) SO to LL					
General Atomic	to Lawrence Livermore				
	Truck	1.90E-02	4.51E-03	6.81E-03	1.40E-02
	Rail	5.30E-03	2.26E-02	2.50E-04	5.26E-03
MLLW(C) GJ to RF					
Grand Junction PO	to Rocky Flats Plant				
	Truck	8.39E-03	8.15E-04	1.46E-03	7.65E-03
	Rail	3.88E-03	3.51E-04	1.62E-05	4.21E-03
MLLW(C) KA to PO					
Knolls Atomic	to Portsmouth GDP				
	Truck	2.54E-02	2.99E-03	4.01E-03	1.93E-02
	Rail	5.72E-03	1.54E-02	2.43E-04	5.58E-03

Table 3. Incident-Free Dose per Shipment (person-rem/shipment) (Cont.)

Source/Route(s)	Crew	General Public			
		Off-Link	On-Link	Stops	Total
MLLW(C) KC to PA Kansas City Plant	to Paducah GDP				
	Truck	1.38E-02	1.32E-03	2.28E-03	1.23E-02
	Rail	4.89E-03	6.38E-03	1.03E-04	4.96E-03
MLLW(C) KK to PO KKS	to Portsmouth GDP				
	Truck	2.54E-02	2.99E-03	4.01E-03	1.93E-02
	Rail	5.72E-03	1.54E-02	2.43E-04	5.58E-03
MLLW(C) KW to PO KWS	to Portsmouth GDP				
	Truck	2.54E-02	2.99E-03	4.01E-03	1.93E-02
	Rail	5.72E-03	1.54E-02	2.43E-04	5.58E-03
MLLW(C) LB to LL Lawrence Berkeley	to Lawrence Livermore				
	Truck	2.31E-03	7.51E-04	1.03E-03	1.26E-03
	Rail	3.07E-03	2.62E-03	2.79E-05	3.62E-03
MLLW(C) SM to LL LERHR	to Lawrence Livermore				
	Truck	4.02E-03	9.92E-04	1.43E-03	2.72E-03
	Rail	3.27E-03	4.67E-03	5.04E-05	3.77E-03
MLLW(C) MZ to LL Mare Island	to Lawrence Livermore				
	Truck	2.31E-03	7.51E-04	1.03E-03	1.26E-03
	Rail	3.07E-03	2.62E-03	2.79E-05	3.62E-03
MLLW(C) US to SR Norfolk Nav Shipyd	to Savannah River				
	Truck	1.59E-02	1.26E-03	2.07E-03	1.39E-02
	Rail	5.09E-03	4.35E-03	9.95E-05	5.11E-03
MLLW(C) NT to IN Nevada Test Site	to INEL				
	Truck	2.13E-02	2.03E-03	3.79E-03	1.99E-02
	Rail	6.04E-03	2.80E-03	6.88E-05	5.81E-03
MLLW(C) SW to HS Pearl Harbor NS	to Hanford Site				
	Truck	7.06E-03	6.28E-04	1.09E-03	6.33E-03
	Rail	4.62E-03	6.63E-03	9.79E-05	4.76E-03
MLLW(C) PT to PO Portsmouth NS	to Portsmouth GDP				
	Truck	4.03E-02	7.28E-03	9.52E-03	2.68E-02
	Rail	6.89E-03	2.10E-02	3.50E-04	6.44E-03
MLLW(C) PR to PO Princeton PPL	to Portsmouth GDP				
	Truck	2.28E-02	3.55E-03	4.81E-03	1.65E-02
	Rail	6.38E-03	2.00E-02	2.85E-04	6.06E-03
MLLW(C) PN to HS Puget Sound NS	to Hanford Site				
	Truck	7.06E-03	6.28E-04	1.09E-03	6.33E-03
	Rail	4.62E-03	6.63E-03	9.79E-05	4.76E-03
MLLW(C) RM to PO Reactive Metals	to Portsmouth GDP				
	Truck	1.00E-02	1.18E-03	1.62E-03	7.73E-03
	Rail	4.05E-03	7.58E-03	1.11E-04	4.34E-03
MLLW(C) SA to LA SNL - Albuquerque	to Los Alamos NL				
	Truck	3.28E-03	3.70E-04	6.13E-04	2.86E-03
	Rail	3.31E-03	1.55E-03	2.36E-05	3.80E-03

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route			Truck	Rail
MLLW(C) AL to FE				
Ames Laboratory	to Fernald (FEMP)		2.21E-06	1.07E-06
MLLW(C) AN to FE				
Argonne - East	to Fernald (FEMP)		3.87E-04	2.70E-04
MLLW(C) BA to PO				
Bettis Atomic	to Portsmouth GDP		1.00E-04	4.05E-05
MLLW(C) BC to PO				
Battelle Columbus	to Portsmouth GDP		2.49E-10	6.63E-11
MLLW(C) BN to PO				
Brookhaven NL	to Portsmouth GDP		4.93E-04	2.53E-04
MLLW(C) CH to SR				
Charleston, SC	to Savannah River		5.98E-05	6.95E-06
MLLW(C) CL to PO				
Colonie	to Portsmouth GDP		3.28E-08	7.61E-09
MLLW(C) SO to LL				
General Atomic	to Lawrence Livermore		2.24E-07	2.45E-07
MLLW(C) GJ to RF				
Grand Junction PO	to Rocky Flats Plant		1.60E-08	1.77E-10
MLLW(C) KA to PO				
Knolls Atomic	to Portsmouth GDP		1.98E-02	4.64E-03
MLLW(C) KC to PA				
Kansas City Plant	to Paducah GDP		1.11E-04	2.52E-05
MLLW(C) KK to PO				
KKS	to Portsmouth GDP		2.17E-02	5.10E-03
MLLW(C) KW to PO				
KWS	to Portsmouth GDP		6.98E-03	1.64E-03
MLLW(C) LB to LL				
Lawrence Berkeley	to Lawrence Livermore		7.64E-07	5.42E-07
MLLW(C) SM to LL				
LERHR	to Lawrence Livermore		1.12E-06	9.15E-07
MLLW(C) MZ to LL				
Mare Island	to Lawrence Livermore		6.50E-04	4.68E-04
MLLW(C) US to SR				
Norfolk Nav Shipyd	to Savannah River		8.05E-04	1.41E-04
MLLW(C) NT to IN				
Nevada Test Site	to INEL		1.30E-08	2.10E-09
MLLW(C) SW to HS				
Pearl Harbor NS	to Hanford Site		1.11E-04	8.21E-05
MLLW(C) PT to PO				
Portsmouth NS	to Portsmouth GDP		3.37E-04	1.53E-04
MLLW(C) PR to PO				
Princeton PPL	to Portsmouth GDP		2.72E-09	1.28E-09
MLLW(C) PN to HS				
Puget Sound NS	to Hanford Site		2.47E-03	1.83E-03
MLLW(C) RM to PO				
Reactive Metals	to Portsmouth GDP		7.25E-07	2.09E-07
MLLW(C) SA to LA				
SNL - Albuquerque	to Los Alamos NL		8.43E-05	1.60E-06

Table 5. Nonradiological Risk Factors per Shipment (fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
Ames Laboratory	to Fernald (FEMP)	1.77E-06	3.47E-05
Argonne - East	to Fernald (FEMP)	4.80E-06	2.06E-05
Bettis Atomic	to Portsmouth GDP	3.22E-06	1.33E-05
Battelle Columbus	to Portsmouth GDP	9.01E-07	3.65E-06
Brookhaven NL	to Portsmouth GDP	1.56E-05	4.90E-05
Charleston, SC	to Savannah River	3.22E-07	1.70E-05
Colonie	to Portsmouth GDP	5.63E-06	3.56E-05
General Atomic	to Lawrence Livermore	2.52E-05	3.54E-05
Grand Junction PO	to Rocky Flats Plant	2.93E-06	2.32E-05
Knolls Atomic	to Portsmouth GDP	5.63E-06	3.56E-05
Kansas City Plant	to Paducah GDP	4.12E-06	2.89E-05
KKS	to Portsmouth GDP	5.63E-06	3.56E-05
KWS	to Portsmouth GDP	5.63E-06	3.56E-05
Lawrence Berkeley	to Lawrence Livermore	4.09E-06	2.66E-06
LERHR	to Lawrence Livermore	5.18E-06	6.50E-06
Mare Island	to Lawrence Livermore	4.09E-06	2.66E-06
Norfolk Nav Shipyd	to Savannah River	1.58E-06	4.45E-05
Nevada Test Site	to INEL	8.08E-06	4.36E-05
Pearl Harbor NS	to Hanford Site	1.67E-06	9.56E-06
Portsmouth NS	to Portsmouth GDP	2.55E-05	6.65E-05
Princeton PPL	to Portsmouth GDP	1.16E-05	3.99E-05
Puget Sound NS	to Hanford Site	1.67E-06	9.56E-06
Reactive Metals	to Portsmouth GDP	2.45E-06	1.21E-05
SNL - Albuquerque	to Los Alamos NL	1.35E-06	1.20E-05
Rail			
Ames Laboratory	to Fernald (FEMP)	2.53E-05	1.50E-06
Argonne - East	to Fernald (FEMP)	1.10E-05	8.63E-07
Bettis Atomic	to Portsmouth GDP	1.40E-05	8.98E-07
Battelle Columbus	to Portsmouth GDP	1.84E-06	1.90E-07
Brookhaven NL	to Portsmouth GDP	4.22E-05	1.93E-06
Charleston, SC	to Savannah River	1.46E-06	2.93E-07
Colonie	to Portsmouth GDP	2.15E-05	1.43E-06
General Atomic	to Lawrence Livermore	4.35E-05	1.21E-06
Grand Junction PO	to Rocky Flats Plant	2.51E-07	4.99E-07
Knolls Atomic	to Portsmouth GDP	2.15E-05	1.43E-06
Kansas City Plant	to Paducah GDP	9.58E-06	1.01E-06
KKS	to Portsmouth GDP	2.15E-05	1.43E-06
KWS	to Portsmouth GDP	2.15E-05	1.43E-06
Lawrence Berkeley	to Lawrence Livermore	5.10E-06	9.64E-08
LERHR	to Lawrence Livermore	9.04E-06	1.95E-07
Mare Island	to Lawrence Livermore	5.10E-06	9.64E-08
Norfolk Nav Shipyd	to Savannah River	3.64E-06	1.11E-06
Nevada Test Site	to INEL	3.98E-06	1.58E-06
Pearl Harbor NS	to Hanford Site	1.08E-05	8.70E-07
Portsmouth NS	to Portsmouth GDP	2.69E-05	2.01E-06
Princeton PPL	to Portsmouth GDP	3.18E-05	1.75E-06
Puget Sound NS	to Hanford Site	1.08E-05	8.70E-07
Reactive Metals	to Portsmouth GDP	1.14E-05	5.84E-07
SNL - Albuquerque	to Los Alamos NL	2.47E-06	2.18E-07

Table 6. Annual Incident-Free Dose for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
		Crew	Public	Crew	Public
Ames Laboratory	to Fernald (FEMP)	1.82E-02	2.06E-02	5.87E-03	2.12E-02
Argonne - East	to Fernald (FEMP)	4.71E-01	5.21E-01	7.82E-02	2.18E-01
Bettis Atomic	to Portsmouth GDP	9.78E-03	1.04E-02	4.67E-03	1.48E-02
Battelle Columbus	to Portsmouth GDP	2.86E-03	3.17E-03	3.26E-03	5.22E-03
Brookhaven NL	to Portsmouth GDP	2.73E-02	2.99E-02	6.72E-03	3.41E-02
Charleston, SC	to Savannah River	6.19E-03	6.77E-03	3.47E-03	5.00E-03
Colonie	to Portsmouth GDP	2.54E-02	2.63E-02	5.72E-03	2.13E-02
General Atomic	to Lawrence Livermore	1.90E-02	2.53E-02	5.30E-03	2.81E-02
Grand Junction PO	to Rocky Flats Plant	8.39E-03	9.92E-03	3.88E-03	4.58E-03
Knolls Atomic	to Portsmouth GDP	2.54E-02	2.63E-02	5.72E-03	2.13E-02
Kansas City Plant	to Paducah GDP	1.38E-02	1.59E-02	4.89E-03	1.14E-02
KKS	to Portsmouth GDP	2.54E-02	2.63E-02	5.72E-03	2.13E-02
KWS	to Portsmouth GDP	2.54E-02	2.63E-02	5.72E-03	2.13E-02
Lawrence Berkeley	to Lawrence Livermore	2.31E-03	3.04E-03	3.07E-03	6.27E-03
LERHR	to Lawrence Livermore	4.02E-03	5.14E-03	3.27E-03	8.48E-03
Mare Island	to Lawrence Livermore	2.31E-03	3.04E-03	3.07E-03	6.27E-03
Norfolk Nav Shipyard	to Savannah River	1.59E-02	1.73E-02	5.09E-03	9.55E-03
Nevada Test Site	to INEL	2.13E-02	2.58E-02	6.04E-03	8.67E-03
Pearl Harbor NS	to Hanford Site	7.06E-03	8.04E-03	4.62E-03	1.15E-02
Portsmouth NS	to Portsmouth GDP	4.03E-02	4.36E-02	6.89E-03	2.78E-02
Princeton PPL	to Portsmouth GDP	2.28E-02	2.48E-02	6.38E-03	2.64E-02
Puget Sound NS	to Hanford Site	7.06E-03	8.04E-03	4.62E-03	1.15E-02
Reactive Metals	to Portsmouth GDP	1.00E-02	1.05E-02	4.05E-03	1.20E-02
SNL - Albuquerque	to Los Alamos NL	3.28E-03	3.84E-03	3.31E-03	5.37E-03
Totals		8.14E-01	9.01E-01	1.90E-01	5.61E-01

Table 7. Annual Accident Dose Risk for the Shipping Campaign (person-rem/yr)

Route		Truck	Rail
Ames Laboratory	to Fernald (FEMP)	2.21E-06	1.07E-06
Argonne - East	to Fernald (FEMP)	1.70E-02	4.59E-03
Bettis Atomic	to Portsmouth GDP	1.00E-04	4.05E-05
Battelle Columbus	to Portsmouth GDP	2.49E-10	6.63E-11
Brookhaven NL	to Portsmouth GDP	4.93E-04	2.53E-04
Charleston, SC	to Savannah River	5.98E-05	6.95E-06
Colonie	to Portsmouth GDP	3.28E-08	7.61E-09
General Atomic	to Lawrence Livermore	2.24E-07	2.45E-07
Grand Junction PO	to Rocky Flats Plant	1.60E-08	1.77E-10
Knolls Atomic	to Portsmouth GDP	1.98E-02	4.64E-03
Kansas City Plant	to Paducah GDP	1.11E-04	2.52E-05
KKS	to Portsmouth GDP	2.17E-02	5.10E-03
KWS	to Portsmouth GDP	6.98E-03	1.64E-03
Lawrence Berkeley	to Lawrence Livermore	7.64E-07	5.42E-07
LERHR	to Lawrence Livermore	1.12E-06	9.15E-07
Mare Island	to Lawrence Livermore	6.50E-04	4.68E-04
Norfolk Nav Shipyard	to Savannah River	8.05E-04	1.41E-04
Nevada Test Site	to INEL	1.30E-08	2.10E-09
Pearl Harbor NS	to Hanford Site	1.11E-04	8.21E-05
Portsmouth NS	to Portsmouth GDP	3.37E-04	1.53E-04
Princeton PPL	to Portsmouth GDP	2.72E-09	1.28E-09
Puget Sound NS	to Hanford Site	2.47E-03	1.83E-03
Reactive Metals	to Portsmouth GDP	7.25E-07	2.09E-07
SNL - Albuquerque	to Los Alamos NL	8.43E-05	1.60E-06
Totals		7.08E-02	1.90E-02

Table 8. Expected Annual Fatalities for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	3.3E-04	7.6E-05
Normal Public	4.5E-04	2.8E-04
Accident Public	3.5E-05	9.5E-06
Nonradiological		
Emission	3.5E-04	5.3E-04
Accident	1.5E-03	3.7E-05

Table 9. Expected Annual Cancer Incidence
for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	1.1E-03	2.7E-04
Normal Public	1.5E-03	9.5E-04
Accident Public	1.2E-04	3.2E-05
Nonradiological		
Emission	3.5E-04	5.3E-04
Accident	NA	NA

Table 10. Expected Annual Genetic Effects
for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	4.9E-05	1.1E-05
Normal Public	9.0E-05	5.6E-05
Accident Public	6.4E-06	1.7E-06
Nonradiological		
Emission	NA	NA
Accident	NA	NA

B.8 WMLLMW REGIONALIZED 1 ALTERNATIVE (CASE 4): CONTACT-HANDLED HETEROGENEOUS SOLIDS: ALPHA — UNTREATED

Table 1. Summary of Route Information

Route		Distance (miles)	Percentage in Zone		
			Rural	Suburban	Urban
Truck					
Bettis Atomic	to Savannah River	656	71.7	26.4	1.9
Mound Plant	to Savannah River	656	66.5	32.7	0.8
U of MO - Columbia	to Savannah River	858	70.6	27.0	2.3
West Valley DP	to Savannah River	883	70.3	28.5	1.2
Rail					
Bettis Atomic	to Savannah River	947	68.5	27.1	4.4
Mound Plant	to Savannah River	744	67.4	29.2	3.3
U of MO - Columbia	to Savannah River	1011	66.6	29.5	4.0
West Valley DP	to Savannah River	1217	62.8	32.4	4.9

Table 2. Annual Number of Shipments and One-Way Shipment Distances

Route	# of Shipments		Total Mileage(mi)	
	Truck	Rail	Truck	Rail
Bettis Atomic to Savannah River	1	1	6.56E+02	9.47E+02
Mound Plant to Savannah River	1	1	6.56E+02	7.44E+02
U of MO - Columbia to Savannah River	1	1	8.58E+02	1.01E+03
West Valley DP to Savannah River	1	1	8.83E+02	1.22E+03
Totals	4	4	3.05E+03	3.92E+03

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

Source/Route(s)		Crew	General Public			
			Off-Link	On-Link	Stops	Total
MLLW(CA) BA to SR Bettis Atomic		to Savannah River				
	Truck	2.14E-02	1.96E-03	3.14E-03	1.84E-02	2.35E-02
	Rail	6.83E-03	1.32E-02	2.31E-04	6.39E-03	1.99E-02
MLLW(CA) MP to SR Mound Plant		to Savannah River				
	Truck	2.21E-02	1.91E-03	2.83E-03	1.84E-02	2.31E-02
	Rail	5.99E-03	9.25E-03	1.78E-04	5.77E-03	1.52E-02
MLLW(CA) MC to SR U of MO - Columbia		to Savannah River				
	Truck	2.83E-02	2.79E-03	4.37E-03	2.40E-02	3.12E-02
	Rail	7.10E-03	1.39E-02	2.52E-04	6.59E-03	2.07E-02
MLLW(CA) WV to SR West Valley DP		to Savannah River				
	Truck	2.89E-02	2.45E-03	3.86E-03	2.47E-02	3.10E-02
	Rail	7.96E-03	1.95E-02	3.38E-04	7.23E-03	2.70E-02

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route	Truck	Rail
MLLW(CA) BA to SR		
Bettis Atomic to Savannah River	2.11E-04	7.45E-05
MLLW(CA) MP to SR		
Mound Plant to Savannah River	9.48E-08	1.85E-08
MLLW(CA) MC to SR		
U of MO - Columbia to Savannah River	6.78E-07	2.05E-07
MLLW(CA) WV to SR		
West Valley DP to Savannah River	3.36E-04	1.07E-04

Table 5. Nonradiological Risk Factors per Shipment (fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
Bettis Atomic	to Savannah River	3.99E-06	4.90E-05
Mound Plant	to Savannah River	1.67E-06	5.26E-05
U of MO - Columbia	to Savannah River	6.41E-06	6.09E-05
West Valley DP	to Savannah River	3.28E-06	6.60E-05
Rail			
Bettis Atomic	to Savannah River	1.74E-05	1.98E-06
Mound Plant	to Savannah River	1.03E-05	1.56E-06
U of MO - Columbia	to Savannah River	1.69E-05	2.12E-06
West Valley DP	to Savannah River	2.49E-05	2.55E-06

Table 6. Annual Incident-Free Dose for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
		Crew	Public	Crew	Public
Bettis Atomic	to Savannah River	2.14E-02	2.35E-02	6.83E-03	1.99E-02
Mound Plant	to Savannah River	2.21E-02	2.31E-02	5.99E-03	1.52E-02
U of MO - Columbia	to Savannah River	2.83E-02	3.12E-02	7.10E-03	2.07E-02
West Valley DP	to Savannah River	2.89E-02	3.10E-02	7.96E-03	2.70E-02
Totals		1.01E-01	1.09E-01	2.79E-02	8.28E-02

Table 7. Annual Accident Dose Risk for the Shipping Campaign (person-rem/yr)

Route		Truck	Rail
Bettis Atomic	to Savannah River	2.11E-04	7.45E-05
Mound Plant	to Savannah River	9.48E-08	1.85E-08
U of MO - Columbia	to Savannah River	6.78E-07	2.05E-07
West Valley DP	to Savannah River	3.36E-04	1.07E-04
Totals		5.47E-04	1.82E-04

Table 8. Expected Annual Fatalities for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	4.0E-05	1.1E-05
Normal Public	5.4E-05	4.1E-05
Accident Public	2.7E-07	9.1E-08
Nonradiological		
Emission	1.5E-05	6.9E-05
Accident	2.3E-04	8.2E-06

Table 9. Expected Annual Cancer Incidence for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	1.4E-04	3.9E-05
Normal Public	1.8E-04	1.4E-04
Accident Public	9.3E-07	3.1E-07
Nonradiological		
Emission	1.5E-05	6.9E-05
Accident	NA	NA

Table 10. Expected Annual Genetic Effects
for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	6.0E-06	1.7E-06
Normal Public	1.1E-05	8.3E-06
Accident Public	4.1E-08	1.4E-08
Nonradiological		
Emission	NA	NA
Accident	NA	NA

B.9 WMLLMW REGIONALIZED 1 ALTERNATIVE (CASE 4): CONTACT-HANDLED HETEROGENEOUS SOLIDS: NONALPHA — TREATED

Table 1. Summary of Route Information

			Distance (miles)	Percentage in Zone		
				Rural	Suburban	Urban
Truck						
Ames Laboratory	to Portsmouth GDP	755	77.4	21.0	1.7	
Argonne - East	to Portsmouth GDP	428	64.6	30.5	4.9	
Charleston, SC	to Savannah River	200	75.7	23.8	0.5	
Colonie	to Portsmouth GDP	688	57.3	40.1	2.5	
ETEC	to Lawrence Livermore	406	77.9	10.0	12.1	
Fernald (FEMP)	to Portsmouth GDP	173	68.0	31.6	0.3	
General Atomic	to Lawrence Livermore	500	69.2	15.1	15.6	
Grand Junction PO	to Rocky Flats Plant	273	79.9	16.7	3.3	
LERHR	to Lawrence Livermore	97	58.7	24.7	16.6	
Reactive Metals	to Portsmouth GDP	276	59.5	37.8	2.8	
Rail						
Ames Laboratory	to Portsmouth GDP	727	68.6	23.8	7.7	
Argonne - East	to Portsmouth GDP	422	64.8	30.0	5.1	
Charleston, SC	to Savannah River	140	83.9	13.6	2.5	
Colonie	to Portsmouth GDP	681	52.1	40.3	7.5	
ETEC	to Lawrence Livermore	474	60.0	24.8	15.2	
Fernald (FEMP)	to Portsmouth GDP	207	69.6	26.5	4.0	
General Atomic	to Lawrence Livermore	579	57.1	24.9	18.0	
Grand Junction PO	to Rocky Flats Plant	239	95.5	4.3	0.3	
LERHR	to Lawrence Livermore	93	45.5	31.3	23.2	
Reactive Metals	to Portsmouth GDP	279	48.4	41.8	9.8	

Table 2. Annual Number of Shipments and One-Way Shipment Distances

Route		# of Shipments		Total Mileage(mi)	
		Truck	Rail	Truck	Rail
Ames Laboratory	to Portsmouth GDP	1	1	7.55E+02	7.27E+02
Argonne - East	to Portsmouth GDP	1	1	4.28E+02	4.22E+02
Charleston, SC	to Savannah River	1	1	2.00E+02	1.40E+02
Colonie	to Portsmouth GDP	1	1	6.88E+02	6.81E+02
ETEC	to Lawrence Livermore	11	4	4.46E+03	1.90E+03
Fernald (FEMP)	to Portsmouth GDP	61	23	1.05E+04	4.77E+03
General Atomic	to Lawrence Livermore	1	1	5.00E+02	5.79E+02
Grand Junction PO	to Rocky Flats Plant	1	1	2.73E+02	2.39E+02
LERHR	to Lawrence Livermore	1	1	9.72E+01	9.30E+01
Reactive Metals	to Portsmouth GDP	1	1	2.76E+02	2.79E+02
Totals		80	35	1.82E+04	9.83E+03

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

Source/Route(s)	Crew	General Public			
		Off-Link	On-Link	Stops	Total
MLLW(CT) AL to PO Ames Laboratory	to Portsmouth GDP				
	Truck	2.33E-02	1.86E-03	3.31E-03	2.11E-02
	Rail	5.91E-03	1.42E-02	2.00E-04	5.72E-03
MLLW(CT) AN to PO Argonne - East	to Portsmouth GDP				
	Truck	1.53E-02	2.05E-03	2.99E-03	1.20E-02
	Rail	4.64E-03	6.76E-03	1.14E-04	4.78E-03
MLLW(CT) CH to SR Charleston, SC	to Savannah River				
	Truck	6.19E-03	4.20E-04	7.45E-04	5.60E-03
	Rail	3.47E-03	1.07E-03	2.07E-05	3.91E-03
MLLW(CT) CL to PO Colonie	to Portsmouth GDP				
	Truck	2.54E-02	2.99E-03	4.01E-03	1.93E-02
	Rail	5.72E-03	1.54E-02	2.43E-04	5.58E-03
MLLW(CT) LC to LL ETEC	to Lawrence Livermore				
	Truck	1.39E-02	2.80E-03	4.47E-03	1.14E-02
	Rail	4.86E-03	1.60E-02	1.86E-04	4.94E-03
MLLW(CT) FE to PO Fernald (FEMP)	to Portsmouth GDP				
	Truck	5.72E-03	4.51E-04	6.85E-04	4.84E-03
	Rail	3.75E-03	2.71E-03	4.86E-05	4.12E-03
MLLW(CT) SO to LL General Atomic	to Lawrence Livermore				
	Truck	1.90E-02	4.51E-03	6.81E-03	1.40E-02
	Rail	5.30E-03	2.26E-02	2.50E-04	5.26E-03
MLLW(CT) GJ to RF Grand Junction PO	to Rocky Flats Plant				
	Truck	8.39E-03	8.15E-04	1.46E-03	7.65E-03
	Rail	3.88E-03	3.51E-04	1.62E-05	4.21E-03
MLLW(CT) SM to LL LERHR	to Lawrence Livermore				
	Truck	4.02E-03	9.92E-04	1.43E-03	2.72E-03
	Rail	3.27E-03	4.67E-03	5.04E-05	3.77E-03
MLLW(CT) RM to PO Reactive Metals	to Portsmouth GDP				
	Truck	1.00E-02	1.18E-03	1.62E-03	7.73E-03
	Rail	4.05E-03	7.58E-03	1.11E-04	4.34E-03

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route	Truck	Rail
MLLW(CT) AL to PO Ames Laboratory	3.14E-08	1.28E-08
MLLW(CT) AN to PO Argonne - East	1.04E-05	2.13E-06
MLLW(CT) CH to SR Charleston, SC	4.40E-05	5.11E-06
MLLW(CT) CL to PO Colonie	1.48E-07	3.44E-08
MLLW(CT) LC to LL ETEC	5.06E-05	1.78E-04
MLLW(CT) FE to PO Fernald (FEMP)	9.35E-05	5.55E-05
MLLW(CT) SO to LL General Atomic	9.14E-07	9.99E-07
MLLW(CT) GJ to RF Grand Junction PO	3.47E-08	3.83E-10
MLLW(CT) SM to LL LERHR	1.50E-07	1.22E-07
MLLW(CT) RM to PO Reactive Metals	3.05E-07	8.81E-08

Table 5. Nonradiological Risk Factors per Shipment
(fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
Ames Laboratory	to Portsmouth GDP	4.02E-06	4.11E-05
Argonne - East	to Portsmouth GDP	6.73E-06	2.60E-05
Charleston, SC	to Savannah River	3.22E-07	1.70E-05
Colonie	to Portsmouth GDP	5.63E-06	3.56E-05
ETEC	to Lawrence Livermore	1.59E-05	3.01E-05
Fernald (FEMP)	to Portsmouth GDP	1.93E-07	7.51E-06
General Atomic	to Lawrence Livermore	2.52E-05	3.54E-05
Grand Junction PO	to Rocky Flats Plant	2.93E-06	2.32E-05
LERHR	to Lawrence Livermore	5.18E-06	6.50E-06
Reactive Metals	to Portsmouth GDP	2.45E-06	1.21E-05
Rail			
Ames Laboratory	to Portsmouth GDP	2.34E-05	1.52E-06
Argonne - East	to Portsmouth GDP	9.08E-06	8.84E-07
Charleston, SC	to Savannah River	1.46E-06	2.93E-07
Colonie	to Portsmouth GDP	2.15E-05	1.43E-06
ETEC	to Lawrence Livermore	3.01E-05	9.92E-07
Fernald (FEMP)	to Portsmouth GDP	3.43E-06	4.34E-07
General Atomic	to Lawrence Livermore	4.35E-05	1.21E-06
Grand Junction PO	to Rocky Flats Plant	2.51E-07	4.99E-07
LERHR	to Lawrence Livermore	9.04E-06	1.95E-07
Reactive Metals	to Portsmouth GDP	1.14E-05	5.84E-07

Table 6. Annual Incident-Free Dose for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
		Crew	Public	Crew	Public
Ames Laboratory	to Portsmouth GDP	2.33E-02	2.63E-02	5.91E-03	2.01E-02
Argonne - East	to Portsmouth GDP	1.53E-02	1.70E-02	4.64E-03	1.17E-02
Charleston, SC	to Savannah River	6.19E-03	6.77E-03	3.47E-03	5.00E-03
Colonie	to Portsmouth GDP	2.54E-02	2.63E-02	5.72E-03	2.13E-02
ETEC	to Lawrence Livermore	1.53E-01	2.05E-01	1.94E-02	8.45E-02
Fernald (FEMP)	to Portsmouth GDP	3.49E-01	3.65E-01	8.62E-02	1.58E-01
General Atomic	to Lawrence Livermore	1.90E-02	2.53E-02	5.30E-03	2.81E-02
Grand Junction PO	to Rocky Flats Plant	8.39E-03	9.92E-03	3.88E-03	4.58E-03
LERHR	to Lawrence Livermore	4.02E-03	5.14E-03	3.27E-03	8.48E-03
Reactive Metals	to Portsmouth GDP	1.00E-02	1.05E-02	4.05E-03	1.20E-02
Totals		6.14E-01	6.97E-01	1.42E-01	3.54E-01

Table 7. Annual Accident Dose Risk for the Shipping Campaign
(person-rem/yr)

Route		Truck	Rail
Ames Laboratory	to Portsmouth GDP	3.14E-08	1.28E-08
Argonne - East	to Portsmouth GDP	1.04E-05	2.13E-06
Charleston, SC	to Savannah River	4.40E-05	5.11E-06
Colonie	to Portsmouth GDP	1.48E-07	3.44E-08
ETEC	to Lawrence Livermore	5.57E-04	7.12E-04
Fernald (FEMP)	to Portsmouth GDP	5.70E-03	1.28E-03
General Atomic	to Lawrence Livermore	9.14E-07	9.99E-07
Grand Junction PO	to Rocky Flats Plant	3.47E-08	3.83E-10
LERHR	to Lawrence Livermore	1.50E-07	1.22E-07
Reactive Metals	to Portsmouth GDP	3.05E-07	8.81E-08
Totals		6.32E-03	2.00E-03

Table 8. Expected Annual Fatalities for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	2.5E-04	5.7E-05
Normal Public	3.5E-04	1.8E-04
Accident Public	3.2E-06	1.0E-06
Nonradiological		
Emission	2.4E-04	3.2E-04
Accident	9.9E-04	2.1E-05

Table 9. Expected Annual Cancer Incidence for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	8.6E-04	2.0E-04
Normal Public	1.2E-03	6.0E-04
Accident Public	1.1E-05	3.4E-06
Nonradiological		
Emission	2.4E-04	3.2E-04
Accident	NA	NA

Table 10. Expected Annual Genetic Effects for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	3.7E-05	8.5E-06
Normal Public	7.0E-05	3.5E-05
Accident Public	4.4E-07	1.5E-07
Nonradiological		
Emission	NA	NA
Accident	NA	NA

B.10 WMLLMW REGIONALIZED 1 ALTERNATIVE (CASE 4): CONTACT-HANDLED HETEROGENEOUS SOLIDS: ALPHA — TREATED

Table 1. Summary of Route Information

Route	Distance (miles)	Percentage in Zone		
		Rural	Suburban	Urban
Truck				
Lawrence Livermore to Nevada Test Site	678	84.7	9.2	6.1
West Valley DP to Savannah River	883	70.3	28.5	1.2
Rail				
Lawrence Livermore to Nevada Test Site	1370	94.5	3.8	1.8
West Valley DP to Savannah River	1217	62.8	32.4	4.9

Table 2. Annual Number of Shipments and One-Way Shipment Distances

Route	# of Shipments		Total Mileage(mi)	
	Truck	Rail	Truck	Rail
Lawrence Livermore to Nevada Test Site	10	4	6.78E+03	5.48E+03
West Valley DP to Savannah River	1	1	8.83E+02	1.22E+03
Totals	11	5	7.66E+03	6.70E+03

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

Source/Route(s)	Crew	General Public			
		Off-Link	On-Link	Stops	Total
MLLW(T) LL to NT					
Lawrence Livermore to Nevada Test Site					
Truck	2.05E-02	2.57E-03	4.65E-03	1.90E-02	2.62E-02
Rail	8.60E-03	5.75E-03	1.20E-04	7.70E-03	1.36E-02
MLLW(T) WV to SR					
West Valley DP to Savannah River					
Truck	2.89E-02	2.45E-03	3.86E-03	2.47E-02	3.10E-02
Rail	7.96E-03	1.95E-02	3.38E-04	7.23E-03	2.70E-02

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route	Truck	Rail
MLLW(T) LL to NT		
Lawrence Livermore to Nevada Test Site	4.80E-05	3.53E-05
MLLW(T) WV to SR		
West Valley DP to Savannah River	4.43E-05	1.42E-05

Table 5. Nonradiological Risk Factors per Shipment
(fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
Lawrence Livermore to Nevada Test Site		1.32E-05	5.15E-05
West Valley DP to Savannah River		3.28E-06	6.60E-05
Rail			
Lawrence Livermore to Nevada Test Site		1.01E-05	2.87E-06
West Valley DP to Savannah River		2.49E-05	2.55E-06

Table 6. Annual Incident-Free Dose for the Shipping Campaign (person-rem/yr)

Route	Truck		Rail	
	Crew	Public	Crew	Public
Lawrence Livermore to Nevada Test Site	2.05E-01	2.62E-01	3.44E-02	5.43E-02
West Valley DP to Savannah River	2.89E-02	3.10E-02	7.96E-03	2.70E-02
Totals	2.34E-01	2.93E-01	4.23E-02	8.13E-02

Table 7. Annual Accident Dose Risk for the Shipping Campaign (person-rem/yr)

Route	Truck	Rail
Lawrence Livermore to Nevada Test Site	4.80E-04	1.41E-04
West Valley DP to Savannah River	4.43E-05	1.42E-05
Totals	5.25E-04	1.55E-04

Table 8. Expected Annual Fatalities for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	9.4E-05	1.7E-05
Normal Public	1.5E-04	4.1E-05
Accident Public	2.6E-07	7.8E-08
Nonradiological		
Emission	1.4E-04	6.5E-05
Accident	5.8E-04	1.4E-05

Table 9. Expected Annual Cancer Incidence for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	3.3E-04	5.9E-05
Normal Public	5.0E-04	1.4E-04
Accident Public	8.9E-07	2.6E-07
Nonradiological		
Emission	1.4E-04	6.5E-05
Accident	NA	NA

Table 10. Expected Annual Genetic Effects for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	1.4E-05	2.5E-06
Normal Public	2.9E-05	8.1E-06
Accident Public	2.0E-08	6.2E-09
Nonradiological		
Emission	NA	NA
Accident	NA	NA

B.11 WM LLMW REGIONALIZED 2 ALTERNATIVE (CASE 7): CONTACT-HANDLED ORGANIC LIQUIDS: NONALPHA — UNTREATED

Table 1. Summary of Route Information

Route	Distance (miles)	Percentage in Zone			
		Rural	Suburban	Urban	
Truck					
Bettis Atomic to Portsmouth GDP	265	58.8	37.4	3.8	
Brookhaven NL to Portsmouth GDP	689	53.5	39.4	7.0	
Charleston, SC to Savannah River	200	75.7	23.8	0.5	
Colonie to Portsmouth GDP	688	57.3	40.1	2.5	
ETEC to INEL	979	77.7	14.2	8.1	
Fernald (FEMP) to Portsmouth GDP	173	68.0	31.6	0.3	
General Atomic to INEL	976	78.8	17.1	4.1	
Grand Junction PO to Rocky Flats Plant	273	79.9	16.7	3.3	
ITRI to Los Alamos NL	111	76.8	18.9	4.2	
Knolls Atomic to Portsmouth GDP	688	57.3	40.1	2.5	
KKS to Portsmouth GDP	688	57.3	40.1	2.5	
KWS to Portsmouth GDP	688	57.3	40.1	2.5	
Lawrence Berkeley to Hanford Site	875	78.1	17.8	4.1	
LERHR to Hanford Site	830	80.5	17.0	2.6	
Lawrence Livermore to Hanford Site	894	77.2	19.3	3.4	
Paducah GDP to Oak Ridge Reserv.	304	81.3	18.5	0.2	
Pantex Plant to Los Alamos NL	402	89.5	8.0	2.5	
Pearl Harbor NS to Hanford Site	226	76.8	20.9	2.3	
Puget Sound NS to Hanford Site	226	76.8	20.9	2.3	
Reactive Metals to Portsmouth GDP	276	59.5	37.8	2.8	
SNL - Albuquerque to Los Alamos NL	102	75.8	20.1	4.1	
SNL - Livermore to Hanford Site	894	77.2	19.3	3.4	
Rail					
Bettis Atomic to Portsmouth GDP	429	52.6	39.6	7.8	
Brookhaven NL to Portsmouth GDP	921	45.4	43.6	11.0	
Charleston, SC to Savannah River	140	83.9	13.6	2.5	
Colonie to Portsmouth GDP	681	52.1	40.3	7.5	
ETEC to INEL	1041	81.5	10.5	8.0	
Fernald (FEMP) to Portsmouth GDP	207	69.6	26.5	4.0	
General Atomic to INEL	1076	82.6	11.4	6.0	
Grand Junction PO to Rocky Flats Plant	239	95.5	4.3	0.3	
ITRI to Los Alamos NL	104	74.3	20.0	5.7	
Knolls Atomic to Portsmouth GDP	681	52.1	40.3	7.5	
KKS to Portsmouth GDP	681	52.1	40.3	7.5	
KWS to Portsmouth GDP	681	52.1	40.3	7.5	
Lawrence Berkeley to Hanford Site	986	78.5	15.8	5.7	
LERHR to Hanford Site	890	81.0	14.3	4.7	
Lawrence Livermore to Hanford Site	973	78.9	15.3	5.8	
Paducah GDP to Oak Ridge Reserv.	527	89.3	9.0	1.7	
Pantex Plant to Los Alamos NL	482	89.2	9.6	1.3	
Pearl Harbor NS to Hanford Site	416	73.7	20.1	6.2	
Puget Sound NS to Hanford Site	416	73.7	20.1	6.2	
Reactive Metals to Portsmouth GDP	279	48.4	41.8	9.8	
SNL - Albuquerque to Los Alamos NL	104	74.3	20.0	5.7	
SNL - Livermore to Hanford Site	973	78.9	15.3	5.8	

Table 2. Annual Number of Shipments and One-Way Shipment Distances

Route		# of Shipments		Total Mileage(mi)	
		Truck	Rail	Truck	Rail
Bettis Atomic	to Portsmouth GDP	1	1	2.65E+02	4.29E+02
Brookhaven NL	to Portsmouth GDP	1	1	6.89E+02	9.21E+02
Charleston, SC	to Savannah River	1	1	2.00E+02	1.40E+02
Colonie	to Portsmouth GDP	1	1	6.88E+02	6.81E+02
ETEC	to INEL	1	1	9.79E+02	1.04E+03
Fernald (FEMP)	to Portsmouth GDP	2	1	3.46E+02	2.07E+02
General Atomic	to INEL	1	1	9.76E+02	1.08E+03
Grand Junction PO	to Rocky Flats Plant	1	1	2.73E+02	2.39E+02
ITRI	to Los Alamos NL	1	1	1.11E+02	1.04E+02
Knolls Atomic	to Portsmouth GDP	1	1	6.88E+02	6.81E+02
KKS	to Portsmouth GDP	1	1	6.88E+02	6.81E+02
KWS	to Portsmouth GDP	1	1	6.88E+02	6.81E+02
Lawrence Berkeley	to Hanford Site	1	1	8.75E+02	9.86E+02
LERHR	to Hanford Site	1	1	8.30E+02	8.90E+02
Lawrence Livermore	to Hanford Site	5	2	4.47E+03	1.95E+03
Paducah GDP	to Oak Ridge Reserv.	3	1	9.12E+02	5.27E+02
Pantex Plant	to Los Alamos NL	1	1	4.02E+02	4.82E+02
Pearl Harbor NS	to Hanford Site	1	1	2.26E+02	4.16E+02
Puget Sound NS	to Hanford Site	1	1	2.26E+02	4.16E+02
Reactive Metals	to Portsmouth GDP	1	1	2.76E+02	2.79E+02
SNL - Albuquerque	to Los Alamos NL	1	1	1.02E+02	1.04E+02
SNL - Livermore	to Hanford Site	1	1	8.94E+02	9.73E+02
Totals		29	23	1.58E+04	1.39E+04

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

Source/Route(s)		General Public			
		Crew	Off-Link	On-Link	Stops Total
MLLW(O) BA to PO					
Bettis Atomic	to Portsmouth GDP				
	Truck	9.78E-03	1.26E-03	1.73E-03	7.42E-03 1.04E-02
	Rail	4.67E-03	9.85E-03	1.53E-04	4.80E-03 1.48E-02
MLLW(O) BN to PO					
Brookhaven NL	to Portsmouth GDP				
	Truck	2.73E-02	4.51E-03	6.10E-03	1.93E-02 2.99E-02
	Rail	6.72E-03	2.74E-02	3.90E-04	6.31E-03 3.41E-02
MLLW(O) CH to SR					
Charleston, SC	to Savannah River				
	Truck	6.19E-03	4.20E-04	7.45E-04	5.60E-03 6.77E-03
	Rail	3.47E-03	1.07E-03	2.07E-05	3.91E-03 5.00E-03
MLLW(O) CL to PO					
Colonie	to Portsmouth GDP				
	Truck	2.54E-02	2.99E-03	4.01E-03	1.93E-02 2.63E-02
	Rail	5.72E-03	1.54E-02	2.43E-04	5.58E-03 2.13E-02
MLLW(O) LC to IN					
ETEC	to INEL				
	Truck	3.23E-02	5.06E-03	8.27E-03	2.74E-02 4.07E-02
	Rail	7.22E-03	1.80E-02	2.22E-04	6.68E-03 2.49E-02
MLLW(O) FE to PO					
Fernald (FEMP)	to Portsmouth GDP				
	Truck	5.72E-03	4.51E-04	6.85E-04	4.84E-03 5.98E-03
	Rail	3.75E-03	2.71E-03	4.86E-05	4.12E-03 6.87E-03
MLLW(O) SO to IN					
General Atomic	to INEL				
	Truck	3.06E-02	3.33E-03	5.75E-03	2.73E-02 3.64E-02
	Rail	7.37E-03	1.48E-02	2.03E-04	6.79E-03 2.18E-02
MLLW(O) GJ to RF					
Grand Junction PO	to Rocky Flats Plant				
	Truck	8.39E-03	8.15E-04	1.46E-03	7.65E-03 9.92E-03
	Rail	3.88E-03	3.51E-04	1.62E-05	4.21E-03 4.58E-03
MLLW(O) IT to LA					
ITRI	to Los Alamos NL				
	Truck	3.54E-03	4.00E-04	6.71E-04	3.11E-03 4.18E-03
	Rail	3.31E-03	1.55E-03	2.36E-05	3.80E-03 5.37E-03
MLLW(O) KA to PO					
Knolls Atomic	to Portsmouth GDP				
	Truck	2.54E-02	2.99E-03	4.01E-03	1.93E-02 2.63E-02
	Rail	5.72E-03	1.54E-02	2.43E-04	5.58E-03 2.13E-02

Table 3. Incident-Free Dose per Shipment (person-rem/shipment) (Cont.)

Source/Route(s)	Crew	General Public			
		Off-Link	On-Link	Stops	Total
MLLW(O) KK to PO KKS	to Portsmouth GDP				
	Truck	2.54E-02	2.99E-03	4.01E-03	1.93E-02
	Rail	5.72E-03	1.54E-02	2.43E-04	5.58E-03
MLLW(O) KW to PO KWS	to Portsmouth GDP				
	Truck	2.54E-02	2.99E-03	4.01E-03	1.93E-02
	Rail	5.72E-03	1.54E-02	2.43E-04	5.58E-03
MLLW(O) LB to HS Lawrence Berkeley	to Hanford Site				
	Truck	2.76E-02	3.02E-03	5.17E-03	2.45E-02
	Rail	6.99E-03	1.38E-02	2.03E-04	6.51E-03
MLLW(O) SM to HS LERHR	to Hanford Site				
	Truck	2.51E-02	2.17E-03	4.00E-03	2.32E-02
	Rail	6.59E-03	1.07E-02	1.64E-04	6.22E-03
MLLW(O) LL to HS Lawrence Livermore	to Hanford Site				
	Truck	2.82E-02	2.88E-03	4.92E-03	2.50E-02
	Rail	6.94E-03	1.38E-02	2.00E-04	6.48E-03
MLLW(O) PA to OR Paducah GDP	to Oak Ridge Reserv.				
	Truck	8.88E-03	4.70E-04	9.98E-04	8.51E-03
	Rail	5.08E-03	2.75E-03	5.97E-05	5.10E-03
MLLW(O) PP to LA Pantex Plant	to Los Alamos NL				
	Truck	1.11E-02	7.76E-04	1.77E-03	1.13E-02
	Rail	4.89E-03	2.18E-03	5.29E-05	4.96E-03
MLLW(O) SW to HS Pearl Harbor NS	to Hanford Site				
	Truck	7.06E-03	6.28E-04	1.09E-03	6.33E-03
	Rail	4.62E-03	6.63E-03	9.79E-05	4.76E-03
MLLW(O) PN to HS Puget Sound NS	to Hanford Site				
	Truck	7.06E-03	6.28E-04	1.09E-03	6.33E-03
	Rail	4.62E-03	6.63E-03	9.79E-05	4.76E-03
MLLW(O) RM to PO Reactive Metals	to Portsmouth GDP				
	Truck	1.00E-02	1.18E-03	1.62E-03	7.73E-03
	Rail	4.05E-03	7.58E-03	1.11E-04	4.34E-03
MLLW(O) SA to LA SNL - Albuquerque	to Los Alamos NL				
	Truck	3.28E-03	3.70E-04	6.13E-04	2.86E-03
	Rail	3.31E-03	1.55E-03	2.36E-05	3.80E-03
MLLW(O) SL to HS SNL - Livermore	to Hanford Site				
	Truck	2.82E-02	2.88E-03	4.92E-03	2.50E-02
	Rail	6.94E-03	1.38E-02	2.00E-04	6.48E-03

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route		Truck	Rail
MLLW(O) BA to PO			
Bettis Atomic	to Portsmouth GDP	5.04E-04	2.16E-04
MLLW(O) BN to PO			
Brookhaven NL	to Portsmouth GDP	4.87E-03	2.63E-03
MLLW(O) CH to SR			
Charleston, SC	to Savannah River	7.75E-03	8.99E-04
MLLW(O) CL to PO			
Colonie	to Portsmouth GDP	3.74E-04	8.80E-05
MLLW(O) LC to IN			
ETEC	to INEL	9.54E-06	4.35E-06
MLLW(O) FE to PO			
Fernald (FEMP)	to Portsmouth GDP	5.76E-04	2.78E-04
MLLW(O) SO to IN			
General Atomic	to INEL	1.08E-05	4.28E-06
MLLW(O) GJ to RF			
Grand Junction PO	to Rocky Flats Plant	1.33E-06	1.13E-08
MLLW(O) IT to LA			
ITRI	to Los Alamos NL	8.49E-06	1.55E-07
MLLW(O) KA to PO			
Knolls Atomic	to Portsmouth GDP	4.50E-02	1.06E-02
MLLW(O) KK to PO			
KKS	to Portsmouth GDP	3.45E-02	8.09E-03
MLLW(O) KW to PO			
KWS	to Portsmouth GDP	4.71E-03	1.10E-03
MLLW(O) LB to HS			
Lawrence Berkeley	to Hanford Site	7.79E-05	4.38E-05
MLLW(O) SM to HS			
LERHR	to Hanford Site	7.78E-06	4.14E-06
MLLW(O) LL to HS			
Lawrence Livermore	to Hanford Site	3.93E-03	5.23E-03
MLLW(O) PA to OR			
Paducah GDP	to Oak Ridge Reserv.	3.89E-01	1.21E-01
MLLW(O) PP to LA			
Pantex Plant	to Los Alamos NL	1.60E-04	9.37E-06
MLLW(O) SW to HS			
Pearl Harbor NS	to Hanford Site	8.47E-06	6.32E-06
MLLW(O) PN to HS			
Puget Sound NS	to Hanford Site	1.95E-04	1.46E-04
MLLW(O) RM to PO			
Reactive Metals	to Portsmouth GDP	7.40E-05	2.29E-05
MLLW(O) SA to LA			
SNL - Albuquerque	to Los Alamos NL	5.82E-07	1.10E-08
MLLW(O) SL to HS			
SNL - Livermore	to Hanford Site	1.95E-03	1.04E-03

Table 5. Nonradiological Risk Factors per Shipment
(fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
Bettis Atomic	to Portsmouth GDP	3.22E-06	1.33E-05
Brookhaven NL	to Portsmouth GDP	1.56E-05	4.90E-05
Charleston, SC	to Savannah River	3.22E-07	1.70E-05
Colonie	to Portsmouth GDP	5.63E-06	3.56E-05
ETEC	to INEL	2.55E-05	6.21E-05
Fernald (FEMP)	to Portsmouth GDP	1.93E-07	7.51E-06
General Atomic	to INEL	1.30E-05	6.23E-05
Grand Junction PO	to Rocky Flats Plant	2.93E-06	2.32E-05
ITRI	to Los Alamos NL	1.51E-06	1.28E-05
Knolls Atomic	to Portsmouth GDP	5.63E-06	3.56E-05
KKS	to Portsmouth GDP	5.63E-06	3.56E-05
KWS	to Portsmouth GDP	5.63E-06	3.56E-05
Lawrence Berkeley	to Hanford Site	1.16E-05	4.91E-05
LERHR	to Hanford Site	6.82E-06	4.66E-05
Lawrence Livermore	to Hanford Site	9.85E-06	5.03E-05
Paducah GDP	to Oak Ridge Reserv.	1.93E-07	2.14E-05
Pantex Plant	to Los Alamos NL	3.28E-06	3.21E-05
Pearl Harbor NS	to Hanford Site	1.67E-06	9.56E-06
Puget Sound NS	to Hanford Site	1.67E-06	9.56E-06
Reactive Metals	to Portsmouth GDP	2.45E-06	1.21E-05
SNL - Albuquerque	to Los Alamos NL	1.35E-06	1.20E-05
SNL - Livermore	to Hanford Site	9.85E-06	5.03E-05
Rail			
Bettis Atomic	to Portsmouth GDP	1.40E-05	8.98E-07
Brookhaven NL	to Portsmouth GDP	4.22E-05	1.93E-06
Charleston, SC	to Savannah River	1.46E-06	2.93E-07
Colonie	to Portsmouth GDP	2.15E-05	1.43E-06
ETEC	to INEL	3.48E-05	2.18E-06
Fernald (FEMP)	to Portsmouth GDP	3.43E-06	4.34E-07
General Atomic	to INEL	2.72E-05	2.25E-06
Grand Junction PO	to Rocky Flats Plant	2.51E-07	4.99E-07
ITRI	to Los Alamos NL	2.47E-06	2.18E-07
Knolls Atomic	to Portsmouth GDP	2.15E-05	1.43E-06
KKS	to Portsmouth GDP	2.15E-05	1.43E-06
KWS	to Portsmouth GDP	2.15E-05	1.43E-06
Lawrence Berkeley	to Hanford Site	2.33E-05	2.06E-06
LERHR	to Hanford Site	1.77E-05	1.86E-06
Lawrence Livermore	to Hanford Site	2.36E-05	2.04E-06
Paducah GDP	to Oak Ridge Reserv.	3.81E-06	1.10E-06
Pantex Plant	to Los Alamos NL	2.59E-06	1.01E-06
Pearl Harbor NS	to Hanford Site	1.08E-05	8.70E-07
Puget Sound NS	to Hanford Site	1.08E-05	8.70E-07
Reactive Metals	to Portsmouth GDP	1.14E-05	5.84E-07
SNL - Albuquerque	to Los Alamos NL	2.47E-06	2.18E-07
SNL - Livermore	to Hanford Site	2.36E-05	2.04E-06

Table 6. Annual Incident-Free Dose for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
		Crew	Public	Crew	Public
Bettis Atomic	to Portsmouth GDP	9.78E-03	1.04E-02	4.67E-03	1.48E-02
Brookhaven NL	to Portsmouth GDP	2.73E-02	2.99E-02	6.72E-03	3.41E-02
Charleston, SC	to Savannah River	6.19E-03	6.77E-03	3.47E-03	5.00E-03
Colonie	to Portsmouth GDP	2.54E-02	2.63E-02	5.72E-03	2.13E-02
ETEC	to INEL	3.23E-02	4.07E-02	7.22E-03	2.49E-02
Fernald (FEMP)	to Portsmouth GDP	1.14E-02	1.20E-02	3.75E-03	6.87E-03
General Atomic	to INEL	3.06E-02	3.64E-02	7.37E-03	2.18E-02
Grand Junction PO	to Rocky Flats Plant	8.39E-03	9.92E-03	3.88E-03	4.58E-03
ITRI	to Los Alamos NL	3.54E-03	4.18E-03	3.31E-03	5.37E-03
Knolls Atomic	to Portsmouth GDP	2.54E-02	2.63E-02	5.72E-03	2.13E-02
KKS	to Portsmouth GDP	2.54E-02	2.63E-02	5.72E-03	2.13E-02
KWS	to Portsmouth GDP	2.54E-02	2.63E-02	5.72E-03	2.13E-02
Lawrence Berkeley	to Hanford Site	2.76E-02	3.27E-02	6.99E-03	2.05E-02
LERHR	to Hanford Site	2.51E-02	2.94E-02	6.59E-03	1.70E-02
Lawrence Livermore	to Hanford Site	1.41E-01	1.64E-01	1.39E-02	4.10E-02
Paducah GDP	to Oak Ridge Reserv.	2.67E-02	2.99E-02	5.08E-03	7.91E-03
Pantex Plant	to Los Alamos NL	1.11E-02	1.38E-02	4.89E-03	7.19E-03
Pearl Harbor NS	to Hanford Site	7.06E-03	8.04E-03	4.62E-03	1.15E-02
Puget Sound NS	to Hanford Site	7.06E-03	8.04E-03	4.62E-03	1.15E-02
Reactive Metals	to Portsmouth GDP	1.00E-02	1.05E-02	4.05E-03	1.20E-02
SNL - Albuquerque	to Los Alamos NL	3.28E-03	3.84E-03	3.31E-03	5.37E-03
SNL - Livermore	to Hanford Site	2.82E-02	3.28E-02	6.94E-03	2.05E-02
Totals		5.18E-01	5.89E-01	1.24E-01	3.57E-01

Table 7. Annual Accident Dose Risk for the Shipping Campaign
person-rem/yr)

Route		Truck	Rail
Bettis Atomic	to Portsmouth GDP	5.04E-04	2.16E-04
Brookhaven NL	to Portsmouth GDP	4.87E-03	2.63E-03
Charleston, SC	to Savannah River	7.75E-03	8.99E-04
Colonie	to Portsmouth GDP	3.74E-04	8.80E-05
ETEC	to INEL	9.54E-06	4.35E-06
Fernald (FEMP)	to Portsmouth GDP	1.15E-03	2.78E-04
General Atomic	to INEL	1.08E-05	4.28E-06
Grand Junction PO	to Rocky Flats Plant	1.33E-06	1.13E-08
ITRI	to Los Alamos NL	8.49E-06	1.55E-07
Knolls Atomic	to Portsmouth GDP	4.50E-02	1.06E-02
KKS	to Portsmouth GDP	3.45E-02	8.09E-03
KWS	to Portsmouth GDP	4.71E-03	1.10E-03
Lawrence Berkeley	to Hanford Site	7.79E-05	4.38E-05
LERHR	to Hanford Site	7.78E-06	4.14E-06
Lawrence Livermore	to Hanford Site	1.97E-02	1.05E-02
Paducah GDP	to Oak Ridge Reserv.	1.17E+00	1.21E-01
Pantex Plant	to Los Alamos NL	1.60E-04	9.37E-06
Pearl Harbor NS	to Hanford Site	8.47E-06	6.32E-06
Puget Sound NS	to Hanford Site	1.95E-04	1.46E-04
Reactive Metals	to Portsmouth GDP	7.40E-05	2.29E-05
SNL - Albuquerque	to Los Alamos NL	5.82E-07	1.10E-08
SNL - Livermore	to Hanford Site	1.95E-03	1.04E-03
Totals		1.29E+00	1.56E-01

Table 8. Expected Annual Fatalities for
the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	2.1E-04	5.0E-05
Normal Public	2.9E-04	1.8E-04
Accident Public	6.4E-04	7.8E-05
Nonradiological		
Emission	1.7E-04	3.7E-04
Accident	9.3E-04	2.9E-05

Table 9. Expected Annual Cancer Incidence
for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	7.2E-04	1.7E-04
Normal Public	1.0E-03	6.1E-04
Accident Public	2.2E-03	2.7E-04
Nonradiological		
Emission	1.7E-04	3.7E-04
Accident	NA	NA

Table 10. Expected Annual Genetic Effects
for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	3.1E-05	7.5E-06
Normal Public	5.9E-05	3.6E-05
Accident Public	1.2E-05	2.5E-06
Nonradiological		
Emission	NA	NA
Accident	NA	NA

B.12 WM LLMW REGIONALIZED 2 ALTERNATIVE (CASE 7): CONTACT-HANDLED ORGANIC LIQUIDS: ALPHA — UNTREATED

Table 1. Summary of Route Information

			Distance (miles)	Percentage in Zone		
				Rural	Suburban	Urban
Truck						
Lawrence Livermore	to INEL		972	85.7	10.4	4.0
Mound Plant	to Savannah River		656	66.5	32.7	0.8
West Valley DP	to Savannah River		883	70.3	28.5	1.2
Rail						
Lawrence Livermore	to INEL		1100	89.5	7.4	3.1
Mound Plant	to Savannah River		744	67.4	29.2	3.3
West Valley DP	to Savannah River		1217	62.8	32.4	4.9

Table 2. Annual Number of Shipments and One-Way Shipment Distances

Route	# of Shipments		Total Mileage(mi)	
	Truck	Rail	Truck	Rail
Lawrence Livermore to INEL	4	2	3.89E+03	2.20E+03
Mound Plant to Savannah River	1	1	6.56E+02	7.44E+02
West Valley DP to Savannah River	1	1	8.83E+02	1.22E+03
Totals	6	4	5.43E+03	4.16E+03

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

Source/Route(s)		Crew	General Public				
			Off-Link	On-Link	Stops	Total	
MLLW(OA) LL to IN							
Lawrence Livermore to INEL							
	Truck	2.85E-02	2.74E-03	5.33E-03	2.72E-02	3.53E-02	
	Rail	7.47E-03	8.12E-03	1.38E-04	6.87E-03	1.51E-02	
MLLW(OA) MP to SR							
Mound Plant							
	to Savannah River						
	Truck	2.21E-02	1.91E-03	2.83E-03	1.84E-02	2.31E-02	
	Rail	5.99E-03	9.25E-03	1.78E-04	5.77E-03	1.52E-02	
MLLW(OA) WV to SR							
West Valley DP							
	to Savannah River						
	Truck	2.89E-02	2.45E-03	3.86E-03	2.47E-02	3.10E-02	
	Rail	7.96E-03	1.95E-02	3.38E-04	7.23E-03	2.70E-02	

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route	Truck	Rail
MLLW(OA) LL to IN		
Lawrence Livermore to INEL	1.16E-02	7.55E-03
MLLW(OA) MP to SR		
Mound Plant to Savannah River	4.15E-03	7.63E-04
MLLW(OA) WV to SR		
West Valley DP to Savannah River	4.27E-02	1.37E-02

Table 5. Nonradiological Risk Factors per Shipment
(fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
Lawrence Livermore to INEL		1.24E-05	5.73E-05
Mound Plant to Savannah River		1.67E-06	5.26E-05
West Valley DP to Savannah River		3.28E-06	6.60E-05
Rail			
Lawrence Livermore to INEL		1.41E-05	2.30E-06
Mound Plant to Savannah River		1.03E-05	1.56E-06
West Valley DP to Savannah River		2.49E-05	2.55E-06

Table 6. Annual Incident-Free Dose for the Shipping Campaign (person-rem/yr)

Route	Truck		Rail	
	Crew	Public	Crew	Public
Lawrence Livermore to INEL	1.14E-01	1.41E-01	1.49E-02	3.03E-02
Mound Plant to Savannah River	2.21E-02	2.31E-02	5.99E-03	1.52E-02
West Valley DP to Savannah River	2.89E-02	3.10E-02	7.96E-03	2.70E-02
Totals	1.65E-01	1.95E-01	2.89E-02	7.25E-02

Table 7. Annual Accident Dose Risk for the Shipping Campaign (person-rem/yr)

Route	Truck	Rail
Lawrence Livermore to INEL	4.63E-02	1.51E-02
Mound Plant to Savannah River	4.15E-03	7.63E-04
West Valley DP to Savannah River	4.27E-02	1.37E-02
Totals	9.31E-02	2.96E-02

Table 8. Expected Annual Fatalities for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	6.6E-05	1.2E-05
Normal Public	9.8E-05	3.6E-05
Accident Public	4.7E-05	1.5E-05
Nonradiological		
Emission	5.5E-05	6.3E-05
Accident	3.5E-04	8.7E-06

Table 9. Expected Annual Cancer Incidence for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	2.3E-04	4.0E-05
Normal Public	3.3E-04	1.2E-04
Accident Public	1.6E-04	5.0E-05
Nonradiological		
Emission	5.5E-05	6.3E-05
Accident	NA	NA

Table 10. Expected Annual Genetic Effects for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	9.9E-06	1.7E-06
Normal Public	2.0E-05	7.2E-06
Accident Public	2.3E-06	7.3E-07
Nonradiological		
Emission	NA	NA
Accident	NA	NA

B.13 WM LLMW REGIONALIZED 2 ALTERNATIVE (CASE 7): CONTACT-HANDLED HETEROGENEOUS SOLIDS: NONALPHA — UNTREATED

Table 1. Summary of Route Information

		Distance (miles)	Percentage in Zone		
Route			Rural	Suburban	Urban
Truck					
Ames Laboratory	to Portsmouth GDP	755	77.4	21.0	1.7
Argonne - East	to Portsmouth GDP	428	64.6	30.5	4.9
Bettis Atomic	to Portsmouth GDP	265	58.8	37.4	3.8
Battelle Columbus	to Portsmouth GDP	84	68.4	28.3	3.3
Brookhaven NL	to Portsmouth GDP	689	53.5	39.4	7.0
Charleston, SC	to Savannah River	200	75.7	23.8	0.5
Colonie	to Portsmouth GDP	688	57.3	40.1	2.5
ETEC	to INEL	979	77.7	14.2	8.1
Fernald (FEMP)	to Portsmouth GDP	173	68.0	31.6	0.3
General Atomic	to INEL	976	78.8	17.1	4.1
Grand Junction PO	to Rocky Flats Plant	273	79.9	16.7	3.3
Knolls Atomic	to Portsmouth GDP	688	57.3	40.1	2.5
Kansas City Plant	to Rocky Flats Plant	631	89.0	9.4	1.6
KKS	to Portsmouth GDP	688	57.3	40.1	2.5
KWS	to Portsmouth GDP	688	57.3	40.1	2.5
Lawrence Berkeley	to Hanford Site	875	78.1	17.8	4.1
LERHR	to Hanford Site	830	80.5	17.0	2.6
Lawrence Livermore	to Hanford Site	894	77.2	19.3	3.4
Mare Island	to Hanford Site	875	78.1	17.8	4.1
Norfolk Nav Shipyd	to Savannah River	498	72.8	26.2	1.0
Nevada Test Site	to INEL	712	82.8	13.7	3.5
Paducah GDP	to Oak Ridge Reserv.	304	81.3	18.5	0.2
Pantex Plant	to Los Alamos NL	402	89.5	8.0	2.5
Pearl Harbor NS	to Hanford Site	226	76.8	20.9	2.3
Portsmouth NS	to Portsmouth GDP	959	46.4	45.3	8.2
Princeton PPL	to Portsmouth GDP	588	55.1	38.8	6.1
Puget Sound NS	to Hanford Site	226	76.8	20.9	2.3
Reactive Metals	to Portsmouth GDP	276	59.5	37.8	2.8
SNL - Albuquerque	to Los Alamos NL	102	75.8	20.1	4.1
SNL - Livermore	to Hanford Site	894	77.2	19.3	3.4
Rail					
Ames Laboratory	to Portsmouth GDP	727	68.6	23.8	7.7
Argonne - East	to Portsmouth GDP	422	64.8	30.0	5.1
Bettis Atomic	to Portsmouth GDP	429	52.6	39.6	7.8
Battelle Columbus	to Portsmouth GDP	91	63.4	31.8	4.8
Brookhaven NL	to Portsmouth GDP	921	45.4	43.6	11.0
Charleston, SC	to Savannah River	140	83.9	13.6	2.5
Colonie	to Portsmouth GDP	681	52.1	40.3	7.5
ETEC	to INEL	1041	81.5	10.5	8.0
Fernald (FEMP)	to Portsmouth GDP	207	69.6	26.5	4.0
General Atomic	to INEL	1076	82.6	11.4	6.0
Grand Junction PO	to Rocky Flats Plant	239	95.5	4.3	0.3
Knolls Atomic	to Portsmouth GDP	681	52.1	40.3	7.5
Kansas City Plant	to Rocky Flats Plant	778	89.8	7.8	2.3
KKS	to Portsmouth GDP	681	52.1	40.3	7.5
KWS	to Portsmouth GDP	681	52.1	40.3	7.5
Lawrence Berkeley	to Hanford Site	986	78.5	15.8	5.7
LERHR	to Hanford Site	890	81.0	14.3	4.7
Lawrence Livermore	to Hanford Site	973	78.9	15.3	5.8
Mare Island	to Hanford Site	986	78.5	15.8	5.7
Norfolk Nav Shipyd	to Savannah River	529	74.3	24.1	1.6
Nevada Test Site	to INEL	756	92.8	5.9	1.3
Paducah GDP	to Oak Ridge Reserv.	527	89.3	9.0	1.7
Pantex Plant	to Los Alamos NL	482	89.2	9.6	1.3
Pearl Harbor NS	to Hanford Site	416	73.7	20.1	6.2
Portsmouth NS	to Portsmouth GDP	962	49.0	44.3	6.7
Princeton PPL	to Portsmouth GDP	838	58.3	32.6	9.1
Puget Sound NS	to Hanford Site	416	73.7	20.1	6.2
Reactive Metals	to Portsmouth GDP	279	48.4	41.8	9.8
SNL - Albuquerque	to Los Alamos NL	104	74.3	20.0	5.7
SNL - Livermore	to Hanford Site	973	78.9	15.3	5.8

Table 2. Annual Number of Shipments and One-Way Shipment Distances

Route		# of Shipments		Total Mileage(mi)	
		Truck	Rail	Truck	Rail
Ames Laboratory	to Portsmouth GDP	1	1	7.55E+02	7.27E+02
Argonne - East	to Portsmouth GDP	44	17	1.88E+04	7.18E+03
Bettis Atomic	to Portsmouth GDP	1	1	2.65E+02	4.29E+02
Battelle Columbus	to Portsmouth GDP	1	1	8.41E+01	9.09E+01
Brookhaven NL	to Portsmouth GDP	1	1	6.89E+02	9.21E+02
Charleston, SC	to Savannah River	1	1	2.00E+02	1.40E+02
Colonie	to Portsmouth GDP	1	1	6.88E+02	6.81E+02
ETEC	to INEL	8	3	7.83E+03	3.12E+03
Fernald (FEMP)	to Portsmouth GDP	7	3	1.21E+03	6.22E+02
General Atomic	to INEL	1	1	9.76E+02	1.08E+03
Grand Junction PO	to Rocky Flats Plant	1	1	2.73E+02	2.39E+02
Knolls Atomic	to Portsmouth GDP	1	1	6.88E+02	6.81E+02
Kansas City Plant	to Rocky Flats Plant	1	1	6.31E+02	7.78E+02
KKS	to Portsmouth GDP	1	1	6.88E+02	6.81E+02
KWS	to Portsmouth GDP	1	1	6.88E+02	6.81E+02
Lawrence Berkeley	to Hanford Site	1	1	8.75E+02	9.86E+02
LERHR	to Hanford Site	1	1	8.30E+02	8.90E+02
Lawrence Livermore	to Hanford Site	4	2	3.58E+03	1.95E+03
Mare Island	to Hanford Site	1	1	8.75E+02	9.86E+02
Norfolk Nav Shipyd	to Savannah River	1	1	4.98E+02	5.29E+02
Nevada Test Site	to INEL	1	1	7.12E+02	7.56E+02
Paducah GDP	to Oak Ridge Reserv.	1	1	3.04E+02	5.27E+02
Pantex Plant	to Los Alamos NL	2	1	8.04E+02	4.82E+02
Pearl Harbor NS	to Hanford Site	1	1	2.26E+02	4.16E+02
Portsmouth NS	to Portsmouth GDP	1	1	9.59E+02	9.62E+02
Princeton PPL	to Portsmouth GDP	1	1	5.88E+02	8.38E+02
Puget Sound NS	to Hanford Site	1	1	2.26E+02	4.16E+02
Reactive Metals	to Portsmouth GDP	1	1	2.76E+02	2.79E+02
SNL - Albuquerque	to Los Alamos NL	1	1	1.02E+02	1.04E+02
SNL - Livermore	to Hanford Site	1	1	8.94E+02	9.73E+02
Totals		90	51	4.62E+04	2.91E+04

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

Source/Route(s)	Crew	General Public			
		Off-Link	On-Link	Stops	Total
MLLW(C) AL to PO Ames Laboratory	to Portsmouth GDP				
	Truck	2.33E-02	1.86E-03	3.31E-03	2.11E-02
	Rail	5.91E-03	1.42E-02	2.00E-04	5.72E-03
MLLW(C) AN to PO Argonne - East	to Portsmouth GDP				
	Truck	1.53E-02	2.05E-03	2.99E-03	1.20E-02
	Rail	4.64E-03	6.76E-03	1.14E-04	4.78E-03
MLLW(C) BA to PO Bettis Atomic	to Portsmouth GDP				
	Truck	9.78E-03	1.26E-03	1.73E-03	7.42E-03
	Rail	4.67E-03	9.85E-03	1.53E-04	4.80E-03
MLLW(C) BC to PO Battelle Columbus	to Portsmouth GDP				
	Truck	2.86E-03	3.24E-04	4.91E-04	2.35E-03
	Rail	3.26E-03	1.44E-03	2.49E-05	3.76E-03
MLLW(C) BN to PO Brookhaven NL	to Portsmouth GDP				
	Truck	2.73E-02	4.51E-03	6.10E-03	1.93E-02
	Rail	6.72E-03	2.74E-02	3.90E-04	6.31E-03
MLLW(C) CH to SR Charleston, SC	to Savannah River				
	Truck	6.19E-03	4.20E-04	7.45E-04	5.60E-03
	Rail	3.47E-03	1.07E-03	2.07E-05	3.91E-03
MLLW(C) CL to PO Colonie	to Portsmouth GDP				
	Truck	2.54E-02	2.99E-03	4.01E-03	1.93E-02
	Rail	5.72E-03	1.54E-02	2.43E-04	5.58E-03
MLLW(C) LC to IN ETEC	to INEL				
	Truck	3.23E-02	5.06E-03	8.27E-03	2.74E-02
	Rail	7.22E-03	1.80E-02	2.22E-04	6.68E-03
MLLW(C) FE to PO Fernald (FEMP)	to Portsmouth GDP				
	Truck	5.72E-03	4.51E-04	6.85E-04	4.84E-03
	Rail	3.75E-03	2.71E-03	4.86E-05	4.12E-03
MLLW(C) SO to IN General Atomic	to INEL				
	Truck	3.06E-02	3.33E-03	5.75E-03	2.73E-02
	Rail	7.37E-03	1.48E-02	2.03E-04	6.79E-03
MLLW(C) GJ to RF Grand Junction PO	to Rocky Flats Plant				
	Truck	8.39E-03	8.15E-04	1.46E-03	7.65E-03
	Rail	3.88E-03	3.51E-04	1.62E-05	4.21E-03
MLLW(C) KA to PO Knolls Atomic	to Portsmouth GDP				
	Truck	2.54E-02	2.99E-03	4.01E-03	1.93E-02
	Rail	5.72E-03	1.54E-02	2.43E-04	5.58E-03
MLLW(C) KC to RF Kansas City Plant	to Rocky Flats Plant				
	Truck	1.74E-02	9.83E-04	2.41E-03	1.77E-02
	Rail	6.13E-03	4.77E-03	9.07E-05	5.87E-03
MLLW(C) KK to PO KKS	to Portsmouth GDP				
	Truck	2.54E-02	2.99E-03	4.01E-03	1.93E-02
	Rail	5.72E-03	1.54E-02	2.43E-04	5.58E-03
MLLW(C) KW to PO KWS	to Portsmouth GDP				
	Truck	2.54E-02	2.99E-03	4.01E-03	1.93E-02
	Rail	5.72E-03	1.54E-02	2.43E-04	5.58E-03
MLLW(C) LB to HS Lawrence Berkeley	to Hanford Site				
	Truck	2.76E-02	3.02E-03	5.17E-03	2.45E-02
	Rail	6.99E-03	1.38E-02	2.03E-04	6.51E-03
MLLW(C) SM to HS LERHR	to Hanford Site				
	Truck	2.51E-02	2.17E-03	4.00E-03	2.32E-02
	Rail	6.59E-03	1.07E-02	1.64E-04	6.22E-03
MLLW(C) LL to HS Lawrence Livermore	to Hanford Site				
	Truck	2.82E-02	2.88E-03	4.92E-03	2.50E-02
	Rail	6.94E-03	1.38E-02	2.00E-04	6.48E-03
MLLW(C) MZ to HS Mare Island	to Hanford Site				
	Truck	2.76E-02	3.02E-03	5.17E-03	2.45E-02
	Rail	6.99E-03	1.38E-02	2.03E-04	6.51E-03

Table 3. Incident-Free Dose per Shipment (person-rem/shipment) (Cont.)

Source/Route(s)	Crew	General Public			
		Off-Link	On-Link	Stops	Total
MLLW(C) US to SR Norfolk Nav Shipyard to Savannah River					
Truck	1.59E-02	1.26E-03	2.07E-03	1.39E-02	1.73E-02
Rail	5.09E-03	4.35E-03	9.95E-05	5.11E-03	9.55E-03
MLLW(C) NT to IN Nevada Test Site to INEL					
Truck	2.13E-02	2.03E-03	3.79E-03	1.99E-02	2.58E-02
Rail	6.04E-03	2.80E-03	6.88E-05	5.81E-03	8.67E-03
MLLW(C) PA to OR Paducah GDP to Oak Ridge Reserv.					
Truck	8.88E-03	4.70E-04	9.98E-04	8.51E-03	9.98E-03
Rail	5.08E-03	2.75E-03	5.97E-05	5.10E-03	7.91E-03
MLLW(C) PP to LA Pantex Plant to Los Alamos NL					
Truck	1.11E-02	7.76E-04	1.77E-03	1.13E-02	1.38E-02
Rail	4.89E-03	2.18E-03	5.29E-05	4.96E-03	7.19E-03
MLLW(C) SW to HS Pearl Harbor NS to Hanford Site					
Truck	7.06E-03	6.28E-04	1.09E-03	6.33E-03	8.04E-03
Rail	4.62E-03	6.63E-03	9.79E-05	4.76E-03	1.15E-02
MLLW(C) PT to PO Portsmouth NS to Portsmouth GDP					
Truck	4.03E-02	7.28E-03	9.52E-03	2.68E-02	4.36E-02
Rail	6.89E-03	2.10E-02	3.50E-04	6.44E-03	2.78E-02
MLLW(C) PR to PO Princeton PPL to Portsmouth GDP					
Truck	2.28E-02	3.55E-03	4.81E-03	1.65E-02	2.48E-02
Rail	6.38E-03	2.00E-02	2.85E-04	6.06E-03	2.64E-02
MLLW(C) PN to HS Puget Sound NS to Hanford Site					
Truck	7.06E-03	6.28E-04	1.09E-03	6.33E-03	8.04E-03
Rail	4.62E-03	6.63E-03	9.79E-05	4.76E-03	1.15E-02
MLLW(C) RM to PO Reactive Metals to Portsmouth GDP					
Truck	1.00E-02	1.18E-03	1.62E-03	7.73E-03	1.05E-02
Rail	4.05E-03	7.58E-03	1.11E-04	4.34E-03	1.20E-02
MLLW(C) SA to LA SNL - Albuquerque to Los Alamos NL					
Truck	3.28E-03	3.70E-04	6.13E-04	2.86E-03	3.84E-03
Rail	3.31E-03	1.55E-03	2.36E-05	3.80E-03	5.37E-03
MLLW(C) SL to HS SNL - Livermore to Hanford Site					
Truck	2.82E-02	2.88E-03	4.92E-03	2.50E-02	3.28E-02
Rail	6.94E-03	1.38E-02	2.00E-04	6.48E-03	2.05E-02

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route			Truck	Rail
MLLW(C) AL to PO				
Ames Laboratory	to Portsmouth GDP		1.84E-08	7.49E-09
MLLW(C) AN to PO				
Argonne - East	to Portsmouth GDP		4.72E-04	2.52E-04
MLLW(C) BA to PO				
Bettis Atomic	to Portsmouth GDP		1.00E-04	4.05E-05
MLLW(C) BC to PO				
Battelle Columbus	to Portsmouth GDP		2.49E-10	6.63E-11
MLLW(C) BN to PO				
Brookhaven NL	to Portsmouth GDP		4.93E-04	2.53E-04
MLLW(C) CH to SR				
Charleston, SC	to Savannah River		5.98E-05	6.95E-06
MLLW(C) CL to PO				
Colonie	to Portsmouth GDP		3.28E-08	7.61E-09
MLLW(C) LC to IN				
ETEC	to INEL		2.18E-04	2.61E-04
MLLW(C) FE to PO				
Fernald (FEMP)	to Portsmouth GDP		4.03E-06	2.15E-06
MLLW(C) SO to IN				
General Atomic	to INEL		4.51E-07	1.77E-07
MLLW(C) GJ to RF				
Grand Junction PO	to Rocky Flats Plant		1.60E-08	1.77E-10
MLLW(C) KA to PO				
Knolls Atomic	to Portsmouth GDP		1.98E-02	4.64E-03
MLLW(C) KC to RF				
Kansas City Plant	to Rocky Flats Plant		6.95E-05	1.08E-05
MLLW(C) KK to PO				
KKS	to Portsmouth GDP		2.17E-02	5.10E-03
MLLW(C) KW to PO				
KWS	to Portsmouth GDP		6.98E-03	1.64E-03
MLLW(C) LB to HS				
Lawrence Berkeley	to Hanford Site		1.05E-05	5.80E-06
MLLW(C) SM to HS				
LERHR	to Hanford Site		9.03E-06	4.74E-06
MLLW(C) LL to HS				
Lawrence Livermore	to Hanford Site		4.37E-05	4.58E-05
MLLW(C) MZ to HS				
Mare Island	to Hanford Site		8.65E-03	4.86E-03
MLLW(C) US to SR				
Norfolk Nav Shipyd	to Savannah River		8.05E-04	1.41E-04
MLLW(C) NT to IN				
Nevada Test Site	to INEL		1.30E-08	2.10E-09
MLLW(C) PA to OR				
Paducah GDP	to Oak Ridge Reserv.		9.75E-04	1.25E-04
MLLW(C) PP to LA				
Pantex Plant	to Los Alamos NL		7.12E-05	8.96E-06
MLLW(C) SW to HS				
Pearl Harbor NS	to Hanford Site		1.11E-04	8.21E-05
MLLW(C) PT to PO				
Portsmouth NS	to Portsmouth GDP		3.37E-04	1.53E-04
MLLW(C) PR to PO				
Princeton PPL	to Portsmouth GDP		2.72E-09	1.28E-09
MLLW(C) PN to HS				
Puget Sound NS	to Hanford Site		2.47E-03	1.83E-03
MLLW(C) RM to PO				
Reactive Metals	to Portsmouth GDP		7.25E-07	2.09E-07
MLLW(C) SA to LA				
SNL - Albuquerque	to Los Alamos NL		8.43E-05	1.60E-06
MLLW(C) SL to HS				
SNL - Livermore	to Hanford Site		2.72E-06	1.43E-06

Table 5. Nonradiological Risk Factors per Shipment (fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
Ames Laboratory	to Portsmouth GDP	4.02E-06	4.11E-05
Argonne - East	to Portsmouth GDP	6.73E-06	2.60E-05
Bettis Atomic	to Portsmouth GDP	3.22E-06	1.33E-05
Battelle Columbus	to Portsmouth GDP	9.01E-07	3.65E-06
Brookhaven NL	to Portsmouth GDP	1.56E-05	4.90E-05
Charleston, SC	to Savannah River	3.22E-07	1.70E-05
Colonie	to Portsmouth GDP	5.63E-06	3.56E-05
ETEC	to INEL	2.55E-05	6.21E-05
Fernald (FEMP)	to Portsmouth GDP	1.93E-07	7.51E-06
General Atomic	to INEL	1.30E-05	6.23E-05
Grand Junction PO	to Rocky Flats Plant	2.93E-06	2.32E-05
Knolls Atomic	to Portsmouth GDP	5.63E-06	3.56E-05
Kansas City Plant	to Rocky Flats Plant	3.22E-06	4.74E-05
KKS	to Portsmouth GDP	5.63E-06	3.56E-05
KWS	to Portsmouth GDP	5.63E-06	3.56E-05
Lawrence Berkeley	to Hanford Site	1.16E-05	4.91E-05
LERHR	to Hanford Site	6.82E-06	4.66E-05
Lawrence Livermore	to Hanford Site	9.85E-06	5.03E-05
Mare Island	to Hanford Site	1.16E-05	4.91E-05
Norfolk Nav Shipyd	to Savannah River	1.58E-06	4.45E-05
Nevada Test Site	to INEL	8.08E-06	4.36E-05
Paducah GDP	to Oak Ridge Reserv.	1.93E-07	2.14E-05
Pantex Plant	to Los Alamos NL	3.28E-06	3.21E-05
Pearl Harbor NS	to Hanford Site	1.67E-06	9.56E-06
Portsmouth NS	to Portsmouth GDP	2.55E-05	6.65E-05
Princeton PPL	to Portsmouth GDP	1.16E-05	3.99E-05
Puget Sound NS	to Hanford Site	1.67E-06	9.56E-06
Reactive Metals	to Portsmouth GDP	2.45E-06	1.21E-05
SNL - Albuquerque	to Los Alamos NL	1.35E-06	1.20E-05
SNL - Livermore	to Hanford Site	9.85E-06	5.03E-05
Rail			
Ames Laboratory	to Portsmouth GDP	2.34E-05	1.52E-06
Argonne - East	to Portsmouth GDP	9.08E-06	8.84E-07
Bettis Atomic	to Portsmouth GDP	1.40E-05	8.98E-07
Battelle Columbus	to Portsmouth GDP	1.84E-06	1.90E-07
Brookhaven NL	to Portsmouth GDP	4.22E-05	1.93E-06
Charleston, SC	to Savannah River	1.46E-06	2.93E-07
Colonie	to Portsmouth GDP	2.15E-05	1.43E-06
ETEC	to INEL	3.48E-05	2.18E-06
Fernald (FEMP)	to Portsmouth GDP	3.43E-06	4.34E-07
General Atomic	to INEL	2.72E-05	2.25E-06
Grand Junction PO	to Rocky Flats Plant	2.51E-07	4.99E-07
Knolls Atomic	to Portsmouth GDP	2.15E-05	1.43E-06
Kansas City Plant	to Rocky Flats Plant	7.62E-06	1.63E-06
KKS	to Portsmouth GDP	2.15E-05	1.43E-06
KWS	to Portsmouth GDP	2.15E-05	1.43E-06
Lawrence Berkeley	to Hanford Site	2.33E-05	2.06E-06
LERHR	to Hanford Site	1.77E-05	1.86E-06
Lawrence Livermore	to Hanford Site	2.36E-05	2.04E-06
Mare Island	to Hanford Site	2.33E-05	2.06E-06
Norfolk Nav Shipyd	to Savannah River	3.64E-06	1.11E-06
Nevada Test Site	to INEL	3.98E-06	1.58E-06
Paducah GDP	to Oak Ridge Reserv.	3.81E-06	1.10E-06
Pantex Plant	to Los Alamos NL	2.59E-06	1.01E-06
Pearl Harbor NS	to Hanford Site	1.08E-05	8.70E-07
Portsmouth NS	to Portsmouth GDP	2.69E-05	2.01E-06
Princeton PPL	to Portsmouth GDP	3.18E-05	1.75E-06
Puget Sound NS	to Hanford Site	1.08E-05	8.70E-07
Reactive Metals	to Portsmouth GDP	1.14E-05	5.84E-07
SNL - Albuquerque	to Los Alamos NL	2.47E-06	2.18E-07
SNL - Livermore	to Hanford Site	2.36E-05	2.04E-06

Table 6. Annual Incident-Free Dose for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
		Crew	Public	Crew	Public
Ames Laboratory	to Portsmouth GDP	2.33E-02	2.63E-02	5.91E-03	2.01E-02
Argonne - East	to Portsmouth GDP	6.71E-01	7.49E-01	7.89E-02	1.98E-01
Bettis Atomic	to Portsmouth GDP	9.78E-03	1.04E-02	4.67E-03	1.48E-02
Battelle Columbus	to Portsmouth GDP	2.86E-03	3.17E-03	3.26E-03	5.22E-03
Brookhaven NL	to Portsmouth GDP	2.73E-02	2.99E-02	6.72E-03	3.41E-02
Charleston, SC	to Savannah River	6.19E-03	6.77E-03	3.47E-03	5.00E-03
Colonie	to Portsmouth GDP	2.54E-02	2.63E-02	5.72E-03	2.13E-02
ETEC	to INEL	2.58E-01	3.26E-01	2.17E-02	7.47E-02
Fernald (FEMP)	to Portsmouth GDP	4.00E-02	4.18E-02	1.12E-02	2.06E-02
General Atomic	to INEL	3.06E-02	3.64E-02	7.37E-03	2.18E-02
Grand Junction PO	to Rocky Flats Plant	8.39E-03	9.92E-03	3.88E-03	4.58E-03
Knolls Atomic	to Portsmouth GDP	2.54E-02	2.63E-02	5.72E-03	2.13E-02
Kansas City Plant	to Rocky Flats Plant	1.74E-02	2.11E-02	6.13E-03	1.07E-02
KKS	to Portsmouth GDP	2.54E-02	2.63E-02	5.72E-03	2.13E-02
KWS	to Portsmouth GDP	2.54E-02	2.63E-02	5.72E-03	2.13E-02
Lawrence Berkeley	to Hanford Site	2.76E-02	3.27E-02	6.99E-03	2.05E-02
LERHR	to Hanford Site	2.51E-02	2.94E-02	6.59E-03	1.70E-02
Lawrence Livermore	to Hanford Site	1.13E-01	1.31E-01	1.39E-02	4.10E-02
Mare Island	to Hanford Site	2.76E-02	3.27E-02	6.99E-03	2.05E-02
Norfolk Nav Shipyd	to Savannah River	1.59E-02	1.73E-02	5.09E-03	9.55E-03
Nevada Test Site	to INEL	2.13E-02	2.58E-02	6.04E-03	8.67E-03
Paducah GDP	to Oak Ridge Reserv.	8.88E-03	9.98E-03	5.08E-03	7.91E-03
Pantex Plant	to Los Alamos NL	2.23E-02	2.76E-02	4.89E-03	7.19E-03
Pearl Harbor NS	to Hanford Site	7.06E-03	8.04E-03	4.62E-03	1.15E-02
Portsmouth NS	to Portsmouth GDP	4.03E-02	4.36E-02	6.89E-03	2.78E-02
Princeton PPL	to Portsmouth GDP	2.28E-02	2.48E-02	6.38E-03	2.64E-02
Puget Sound NS	to Hanford Site	7.06E-03	8.04E-03	4.62E-03	1.15E-02
Reactive Metals	to Portsmouth GDP	1.00E-02	1.05E-02	4.05E-03	1.20E-02
SNL - Albuquerque	to Los Alamos NL	3.28E-03	3.84E-03	3.31E-03	5.37E-03
SNL - Livermore	to Hanford Site	2.82E-02	3.28E-02	6.94E-03	2.05E-02
Totals		1.58E+00	1.80E+00	2.69E-01	7.42E-01

Table 7. Annual Accident Dose Risk for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
Ames Laboratory	to Portsmouth GDP	1.84E-08	7.49E-09		
Argonne - East	to Portsmouth GDP	2.08E-02	4.28E-03		
Bettis Atomic	to Portsmouth GDP	1.00E-04	4.05E-05		
Battelle Columbus	to Portsmouth GDP	2.49E-10	6.63E-11		
Brookhaven NL	to Portsmouth GDP	4.93E-04	2.53E-04		
Charleston, SC	to Savannah River	5.98E-05	6.95E-06		
Colonie	to Portsmouth GDP	3.28E-08	7.61E-09		
ETEC	to INEL	1.75E-03	7.83E-04		
Fernald (FEMP)	to Portsmouth GDP	2.82E-05	6.44E-06		
General Atomic	to INEL	4.51E-07	1.77E-07		
Grand Junction PO	to Rocky Flats Plant	1.60E-08	1.77E-10		
Knolls Atomic	to Portsmouth GDP	1.98E-02	4.64E-03		
Kansas City Plant	to Rocky Flats Plant	6.95E-05	1.08E-05		
KKS	to Portsmouth GDP	2.17E-02	5.10E-03		
KWS	to Portsmouth GDP	6.98E-03	1.64E-03		
Lawrence Berkeley	to Hanford Site	1.05E-05	5.80E-06		
LERHR	to Hanford Site	9.03E-06	4.74E-06		
Lawrence Livermore	to Hanford Site	1.75E-04	9.17E-05		
Mare Island	to Hanford Site	8.65E-03	4.86E-03		
Norfolk Nav Shipyd	to Savannah River	8.05E-04	1.41E-04		
Nevada Test Site	to INEL	1.30E-08	2.10E-09		
Paducah GDP	to Oak Ridge Reserv.	9.75E-04	1.25E-04		
Pantex Plant	to Los Alamos NL	1.42E-04	8.96E-06		
Pearl Harbor NS	to Hanford Site	1.11E-04	8.21E-05		
Portsmouth NS	to Portsmouth GDP	3.37E-04	1.53E-04		
Princeton PPL	to Portsmouth GDP	2.72E-09	1.28E-09		
Puget Sound NS	to Hanford Site	2.47E-03	1.83E-03		
Reactive Metals	to Portsmouth GDP	7.25E-07	2.09E-07		
SNL - Albuquerque	to Los Alamos NL	8.43E-05	1.60E-06		
SNL - Livermore	to Hanford Site	2.72E-06	1.43E-06		
Totals		8.56E-02	2.40E-02		

Table 8. Expected Annual Fatalities for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	6.3E-04	1.1E-04
Normal Public	9.0E-04	3.7E-04
Accident Public	4.3E-05	1.2E-05
Nonradiological		
Emission	7.1E-04	7.2E-04
Accident	2.8E-03	6.1E-05

Table 9. Expected Annual Cancer Incidence for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	2.2E-03	3.8E-04
Normal Public	3.1E-03	1.3E-03
Accident Public	1.5E-04	4.1E-05
Nonradiological		
Emission	7.1E-04	7.2E-04
Accident	NA	NA

Table 10. Expected Annual Genetic Effects for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	9.5E-05	1.6E-05
Normal Public	1.8E-04	7.4E-05
Accident Public	7.6E-06	2.2E-06
Nonradiological		
Emission	NA	NA
Accident	NA	NA

B.14 WMLLMW REGIONALIZED 2 ALTERNATIVE (CASE 7): CONTACT-HANDLED HETEROGENEOUS SOLIDS: ALPHA — UNTREATED

Table 1. Summary of Route Information

Route		Distance (miles)	Percentage in Zone		
			Rural	Suburban	Urban
Truck					
Bettis Atomic	to Savannah River	656	71.7	26.4	1.9
Lawrence Livermore	to INEL	972	85.7	10.4	4.0
Mound Plant	to Savannah River	656	66.5	32.7	0.8
U of MO - Columbia	to Savannah River	858	70.6	27.0	2.3
West Valley DP	to Savannah River	883	70.3	28.5	1.2
Rail					
Bettis Atomic	to Savannah River	947	68.5	27.1	4.4
Lawrence Livermore	to INEL	1100	89.5	7.4	3.1
Mound Plant	to Savannah River	744	67.4	29.2	3.3
U of MO - Columbia	to Savannah River	1011	66.6	29.5	4.0
West Valley DP	to Savannah River	1217	62.8	32.4	4.9

Table 2. Annual Number of Shipments and One-Way Shipment Distances

Route	# of Shipments		Total Mileage(mi)	
	Truck	Rail	Truck	Rail
Bettis Atomic to Savannah River	1	1	6.56E+02	9.47E+02
Lawrence Livermore to INEL	6	3	5.83E+03	3.30E+03
Mound Plant to Savannah River	1	1	6.56E+02	7.44E+02
U of MO - Columbia to Savannah River	1	1	8.58E+02	1.01E+03
West Valley DP to Savannah River	1	1	8.83E+02	1.22E+03
Totals	10	7	8.88E+03	7.22E+03

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

Source/Route(s)		Crew	General Public			
			Off-Link	On-Link	Stops	Total
MLLW(CA) BA to SR						
Bettis Atomic						
	to Savannah River					
	Truck	2.14E-02	1.96E-03	3.14E-03	1.84E-02	2.35E-02
	Rail	6.83E-03	1.32E-02	2.31E-04	6.39E-03	1.99E-02
MLLW(CA) LL to IN						
Lawrence Livermore						
	to INEL					
	Truck	2.85E-02	2.74E-03	5.33E-03	2.72E-02	3.53E-02
	Rail	7.47E-03	8.12E-03	1.38E-04	6.87E-03	1.51E-02
MLLW(CA) MP to SR						
Mound Plant						
	to Savannah River					
	Truck	2.21E-02	1.91E-03	2.83E-03	1.84E-02	2.31E-02
	Rail	5.99E-03	9.25E-03	1.78E-04	5.77E-03	1.52E-02
MLLW(CA) MC to SR						
U of MO - Columbia						
	to Savannah River					
	Truck	2.83E-02	2.79E-03	4.37E-03	2.40E-02	3.12E-02
	Rail	7.10E-03	1.39E-02	2.52E-04	6.59E-03	2.07E-02
MLLW(CA) WV to SR						
West Valley DP						
	to Savannah River					
	Truck	2.89E-02	2.45E-03	3.86E-03	2.47E-02	3.10E-02
	Rail	7.96E-03	1.95E-02	3.38E-04	7.23E-03	2.70E-02

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route		Truck	Rail
MLLW(CA) BA to SR			
Bettis Atomic	to Savannah River	2.11E-04	7.45E-05
MLLW(CA) LL to IN			
Lawrence Livermore	to INEL	5.14E-05	3.46E-05
MLLW(CA) MP to SR			
Mound Plant	to Savannah River	9.48E-08	1.85E-08
MLLW(CA) MC to SR			
U of MO - Columbia	to Savannah River	6.78E-07	2.05E-07
MLLW(CA) WV to SR			
West Valley DP	to Savannah River	3.36E-04	1.07E-04

Table 5. Nonradiological Risk Factors per Shipment (fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
Bettis Atomic	to Savannah River	3.99E-06	4.90E-05
Lawrence Livermore	to INEL	1.24E-05	5.73E-05
Mound Plant	to Savannah River	1.67E-06	5.26E-05
U of MO - Columbia	to Savannah River	6.41E-06	6.09E-05
West Valley DP	to Savannah River	3.28E-06	6.60E-05
Rail			
Bettis Atomic	to Savannah River	1.74E-05	1.98E-06
Lawrence Livermore	to INEL	1.41E-05	2.30E-06
Mound Plant	to Savannah River	1.03E-05	1.56E-06
U of MO - Columbia	to Savannah River	1.69E-05	2.12E-06
West Valley DP	to Savannah River	2.49E-05	2.55E-06

Table 6. Annual Incident-Free Dose for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
		Crew	Public	Crew	Public
Bettis Atomic	to Savannah River	2.14E-02	2.35E-02	6.83E-03	1.99E-02
Lawrence Livermore	to INEL	1.71E-01	2.12E-01	2.24E-02	4.54E-02
Mound Plant	to Savannah River	2.21E-02	2.31E-02	5.99E-03	1.52E-02
U of MO - Columbia	to Savannah River	2.83E-02	3.12E-02	7.10E-03	2.07E-02
West Valley DP	to Savannah River	2.89E-02	3.10E-02	7.96E-03	2.70E-02
Totals		2.71E-01	3.20E-01	5.03E-02	1.28E-01

Table 7. Annual Accident Dose Risk for the Shipping Campaign (person-rem/yr)

Route		Truck	Rail
Bettis Atomic	to Savannah River	2.11E-04	7.45E-05
Lawrence Livermore	to INEL	3.09E-04	1.04E-04
Mound Plant	to Savannah River	9.48E-08	1.85E-08
U of MO - Columbia	to Savannah River	6.78E-07	2.05E-07
West Valley DP	to Savannah River	3.36E-04	1.07E-04
Totals		8.56E-04	2.86E-04

Table 8. Expected Annual Fatalities for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	1.1E-04	2.0E-05
Normal Public	1.6E-04	6.4E-05
Accident Public	4.3E-07	1.4E-07
Nonradiological		
Emission	9.0E-05	1.1E-04
Accident	5.7E-04	1.5E-05

Table 9. Expected Annual Cancer Incidence
for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	3.8E-04	7.0E-05
Normal Public	5.4E-04	2.2E-04
Accident Public	1.5E-06	4.9E-07
Nonradiological		
Emission	9.0E-05	1.1E-04
Accident	NA	NA

Table 10. Expected Annual Genetic Effects
for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	1.6E-05	3.0E-06
Normal Public	3.2E-05	1.3E-05
Accident Public	5.2E-08	1.7E-08
Nonradiological		
Emission	NA	NA
Accident	NA	NA

B.15 WMLLMW REGIONALIZED 2 ALTERNATIVE (CASE 7): CONTACT-HANDLED HETEROGENEOUS SOLIDS: NONALPHA — TREATED

Table 1. Summary of Route Information

		Distance (miles)	Percentage in Zone		
Route			Rural	Suburban	Urban
Truck					
Ames Laboratory	to Oak Ridge Reserv.	900	75.2	23.4	1.5
Argonne - East	to Oak Ridge Reserv.	584	67.0	30.1	2.9
Charleston, SC	to Savannah River	200	75.7	23.8	0.5
Colonie	to Oak Ridge Reserv.	2193	84.1	13.8	2.1
Fernald (FEMP)	to Oak Ridge Reserv.	312	69.9	29.5	0.6
General Atomic	to Nevada Test Site	398	73.9	19.8	6.3
Grand Junction PO	to Los Alamos NL	685	84.2	13.7	2.2
LERHR	to Nevada Test Site	735	81.1	11.2	7.6
Paducah GDP	to Oak Ridge Reserv.	304	81.3	18.5	0.2
Pantex Plant	to Los Alamos NL	402	89.5	8.0	2.5
Portsmouth GDP	to Oak Ridge Reserv.	371	74.5	24.6	0.9
Rocky Flats Plant	to Los Alamos NL	452	82.2	14.9	2.9
Reactive Metals	to Oak Ridge Reserv.	608	64.1	34.1	1.8
Rail					
Ames Laboratory	to Oak Ridge Reserv.	954	71.7	22.0	6.3
Argonne - East	to Oak Ridge Reserv.	648	70.7	25.3	4.0
Charleston, SC	to Savannah River	140	83.9	13.6	2.5
Colonie	to Oak Ridge Reserv.	2709	86.8	10.0	3.1
Fernald (FEMP)	to Oak Ridge Reserv.	358	75.7	21.8	2.5
General Atomic	to Nevada Test Site	518	73.4	15.9	10.7
Grand Junction PO	to Los Alamos NL	682	95.6	4.1	0.2
LERHR	to Nevada Test Site	827	75.4	17.7	6.9
Paducah GDP	to Oak Ridge Reserv.	527	89.3	9.0	1.7
Pantex Plant	to Los Alamos NL	482	89.2	9.6	1.3
Portsmouth GDP	to Oak Ridge Reserv.	442	66.8	31.5	1.7
Rocky Flats Plant	to Los Alamos NL	504	85.7	11.1	3.2
Reactive Metals	to Oak Ridge Reserv.	600	59.4	33.2	7.4

Table 2. Annual Number of Shipments and One-Way Shipment Distances

Route		# of Shipments		Total Mileage(mi)	
		Truck	Rail	Truck	Rail
Ames Laboratory	to Oak Ridge Reserv.	1	1	9.00E+02	9.54E+02
Argonne - East	to Oak Ridge Reserv.	1	1	5.84E+02	6.48E+02
Charleston, SC	to Savannah River	1	1	2.00E+02	1.40E+02
Colonie	to Oak Ridge Reserv.	1	1	2.19E+03	2.71E+03
Fernald (FEMP)	to Oak Ridge Reserv.	2	1	6.24E+02	3.58E+02
General Atomic	to Nevada Test Site	1	1	3.98E+02	5.18E+02
Grand Junction PO	to Los Alamos NL	1	1	6.85E+02	6.82E+02
LERHR	to Nevada Test Site	1	1	7.35E+02	8.27E+02
Paducah GDP	to Oak Ridge Reserv.	1	1	3.04E+02	5.27E+02
Pantex Plant	to Los Alamos NL	1	1	4.02E+02	4.82E+02
Portsmouth GDP	to Oak Ridge Reserv.	155	57	5.75E+04	2.52E+04
Rocky Flats Plant	to Los Alamos NL	1	1	4.52E+02	5.04E+02
Reactive Metals	to Oak Ridge Reserv.	1	1	6.08E+02	6.00E+02
Totals		168	69	6.55E+04	3.41E+04

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

Source/Route(s)	Crew	General Public			
		Off-Link	On-Link	Stops	Total
MLLW(CT) AL to OR Ames Laboratory	to Oak Ridge Reserv.				
	Truck	2.83E-02	2.29E-03	3.92E-03	2.52E-02
	Rail	6.86E-03	1.58E-02	2.35E-04	6.42E-03
MLLW(CT) AN to OR Argonne - East	to Oak Ridge Reserv.				
	Truck	2.00E-02	2.19E-03	3.27E-03	1.63E-02
	Rail	5.59E-03	8.34E-03	1.48E-04	5.48E-03
MLLW(CT) CH to SR Charleston, SC	to Savannah River				
	Truck	6.19E-03	4.20E-04	7.45E-04	5.60E-03
	Rail	3.47E-03	1.07E-03	2.07E-05	3.91E-03
MLLW(CT) CL to OR Colonie	to Oak Ridge Reserv.				
	Truck	6.37E-02	4.68E-03	9.54E-03	6.14E-02
	Rail	1.42E-02	2.19E-02	3.78E-04	1.18E-02
MLLW(CT) FE to OR Fernald (FEMP)	to Oak Ridge Reserv.				
	Truck	1.02E-02	8.00E-04	1.26E-03	8.73E-03
	Rail	4.37E-03	3.32E-03	6.75E-05	4.58E-03
MLLW(CT) SO to NT General Atomic	to Nevada Test Site				
	Truck	1.33E-02	1.88E-03	2.99E-03	1.11E-02
	Rail	5.04E-03	1.22E-02	1.45E-04	5.07E-03
MLLW(CT) GJ to LA Grand Junction PO	to Los Alamos NL				
	Truck	1.99E-02	1.48E-03	3.02E-03	1.92E-02
	Rail	5.73E-03	9.65E-04	4.57E-05	5.58E-03
MLLW(CT) SM to NT LERHR	to Nevada Test Site				
	Truck	2.34E-02	3.47E-03	5.89E-03	2.06E-02
	Rail	6.33E-03	1.38E-02	1.93E-04	6.02E-03
MLLW(CT) PA to OR Paducah GDP	to Oak Ridge Reserv.				
	Truck	8.88E-03	4.70E-04	9.98E-04	8.51E-03
	Rail	5.08E-03	2.75E-03	5.97E-05	5.10E-03
MLLW(CT) PP to LA Pantex Plant	to Los Alamos NL				
	Truck	1.11E-02	7.76E-04	1.77E-03	1.13E-02
	Rail	4.89E-03	2.18E-03	5.29E-05	4.96E-03
MLLW(CT) PO to OR Portsmouth GDP	to Oak Ridge Reserv.				
	Truck	1.16E-02	8.77E-04	1.50E-03	1.04E-02
	Rail	4.73E-03	4.37E-03	1.00E-04	4.84E-03
MLLW(CT) RF to LA Rocky Flats Plant	to Los Alamos NL				
	Truck	1.35E-02	1.19E-03	2.25E-03	1.27E-02
	Rail	4.98E-03	4.26E-03	7.35E-05	5.03E-03
MLLW(CT) RM to OR Reactive Metals	to Oak Ridge Reserv.				
	Truck	2.11E-02	2.15E-03	3.08E-03	1.70E-02
	Rail	5.38E-03	1.25E-02	1.91E-04	5.33E-03

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route			Truck	Rail
MLLW(CT) AL to OR	Ames Laboratory	to Oak Ridge Reserv.	4.17E-08	1.36E-08
MLLW(CT) AN to OR	Argonne - East	to Oak Ridge Reserv.	1.48E-05	2.57E-06
MLLW(CT) CH to SR	Charleston, SC	to Savannah River	4.40E-05	5.11E-06
MLLW(CT) CL to OR	Colonie	to Oak Ridge Reserv.	1.66E-07	4.81E-08
MLLW(CT) FE to OR	Fernald (FEMP)	to Oak Ridge Reserv.	3.14E-05	7.21E-06
MLLW(CT) SO to NT	General Atomic	to Nevada Test Site	9.22E-07	5.27E-07
MLLW(CT) GJ to LA	Grand Junction PO	to Los Alamos NL	7.50E-08	9.34E-10
MLLW(CT) SM to NT	LERHR	to Nevada Test Site	7.12E-07	4.22E-07
MLLW(CT) PA to OR	Paducah GDP	to Oak Ridge Reserv.	2.33E-04	2.98E-05
MLLW(CT) PP to LA	Pantex Plant	to Los Alamos NL	1.02E-05	6.41E-07
MLLW(CT) PO to OR	Portsmouth GDP	to Oak Ridge Reserv.	2.50E-04	1.29E-04
MLLW(CT) RF to LA	Rocky Flats Plant	to Los Alamos NL	9.40E-05	3.72E-06
MLLW(CT) RM to OR	Reactive Metals	to Oak Ridge Reserv.	7.69E-07	1.45E-07

Table 5. Nonradiological Risk Factors per Shipment (fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
Ames Laboratory	to Oak Ridge Reserv.	4.25E-06	5.79E-05
Argonne - East	to Oak Ridge Reserv.	5.38E-06	4.21E-05
Charleston, SC	to Savannah River	3.22E-07	1.70E-05
Colonie	to Oak Ridge Reserv.	1.46E-05	1.61E-04
Fernald (FEMP)	to Oak Ridge Reserv.	5.79E-07	2.25E-05
General Atomic	to Nevada Test Site	8.11E-06	2.85E-05
Grand Junction PO	to Los Alamos NL	4.76E-06	5.68E-05
LERHR	to Nevada Test Site	1.81E-05	5.49E-05
Paducah GDP	to Oak Ridge Reserv.	1.93E-07	2.14E-05
Pantex Plant	to Los Alamos NL	3.28E-06	3.21E-05
Portsmouth GDP	to Oak Ridge Reserv.	1.09E-06	2.56E-05
Rocky Flats Plant	to Los Alamos NL	4.25E-06	3.76E-05
Reactive Metals	to Oak Ridge Reserv.	3.57E-06	3.56E-05
Rail			
Ames Laboratory	to Oak Ridge Reserv.	2.52E-05	2.00E-06
Argonne - East	to Oak Ridge Reserv.	1.08E-05	1.36E-06
Charleston, SC	to Savannah River	1.46E-06	2.93E-07
Colonie	to Oak Ridge Reserv.	3.56E-05	5.67E-06
Fernald (FEMP)	to Oak Ridge Reserv.	3.68E-06	7.48E-07
General Atomic	to Nevada Test Site	2.32E-05	1.08E-06
Grand Junction PO	to Los Alamos NL	6.69E-07	1.43E-06
LERHR	to Nevada Test Site	2.38E-05	1.73E-06
Paducah GDP	to Oak Ridge Reserv.	3.81E-06	1.10E-06
Pantex Plant	to Los Alamos NL	2.59E-06	1.01E-06
Portsmouth GDP	to Oak Ridge Reserv.	3.18E-06	9.25E-07
Rocky Flats Plant	to Los Alamos NL	6.78E-06	1.05E-06
Reactive Metals	to Oak Ridge Reserv.	1.85E-05	1.25E-06

Table 6. Annual Incident-Free Dose for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
		Crew	Public	Crew	Public
Ames Laboratory	to Oak Ridge Reserv.	2.83E-02	3.14E-02	6.86E-03	2.24E-02
Argonne - East	to Oak Ridge Reserv.	2.00E-02	2.18E-02	5.59E-03	1.40E-02
Charleston, SC	to Savannah River	6.19E-03	6.77E-03	3.47E-03	5.00E-03
Colonie	to Oak Ridge Reserv.	6.37E-02	7.56E-02	1.42E-02	3.41E-02
Fernald (FEMP)	to Oak Ridge Reserv.	2.03E-02	2.16E-02	4.37E-03	7.96E-03
General Atomic	to Nevada Test Site	1.33E-02	1.60E-02	5.04E-03	1.74E-02
Grand Junction PO	to Los Alamos NL	1.99E-02	2.37E-02	5.73E-03	6.59E-03
LERHR	to Nevada Test Site	2.34E-02	2.99E-02	6.33E-03	2.00E-02
Paducah GDP	to Oak Ridge Reserv.	8.88E-03	9.98E-03	5.08E-03	7.91E-03
Pantex Plant	to Los Alamos NL	1.11E-02	1.38E-02	4.89E-03	7.19E-03
Portsmouth GDP	to Oak Ridge Reserv.	1.81E+00	1.98E+00	2.69E-01	5.31E-01
Rocky Flats Plant	to Los Alamos NL	1.35E-02	1.61E-02	4.98E-03	9.36E-03
Reactive Metals	to Oak Ridge Reserv.	2.11E-02	2.23E-02	5.38E-03	1.80E-02
Totals		2.06E+00	2.27E+00	3.41E-01	7.01E-01

Table 7. Annual Accident Dose Risk for the Shipping Campaign (person-rem/yr)

Route		Truck	Rail
Ames Laboratory	to Oak Ridge Reserv.	4.17E-08	1.36E-08
Argonne - East	to Oak Ridge Reserv.	1.48E-05	2.57E-06
Charleston, SC	to Savannah River	4.40E-05	5.11E-06
Colonie	to Oak Ridge Reserv.	1.66E-07	4.81E-08
Fernald (FEMP)	to Oak Ridge Reserv.	6.28E-05	7.21E-06
General Atomic	to Nevada Test Site	9.22E-07	5.27E-07
Grand Junction PO	to Los Alamos NL	7.50E-08	9.34E-10
LERHR	to Nevada Test Site	7.12E-07	4.22E-07
Paducah GDP	to Oak Ridge Reserv.	2.33E-04	2.98E-05
Pantex Plant	to Los Alamos NL	1.02E-05	6.41E-07
Portsmouth GDP	to Oak Ridge Reserv.	3.88E-02	7.34E-03
Rocky Flats Plant	to Los Alamos NL	9.40E-05	3.72E-06
Reactive Metals	to Oak Ridge Reserv.	7.69E-07	1.45E-07
Totals		3.92E-02	7.39E-03

Table 8. Expected Annual Fatalities for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	8.2E-04	1.4E-04
Normal Public	1.1E-03	3.5E-04
Accident Public	2.0E-05	3.7E-06
Nonradiological		
Emission	2.4E-04	3.4E-04
Accident	4.6E-03	7.1E-05

Table 9. Expected Annual Cancer Incidence for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	2.9E-03	4.8E-04
Normal Public	3.9E-03	1.2E-03
Accident Public	6.7E-05	1.3E-05
Nonradiological		
Emission	2.4E-04	3.4E-04
Accident	NA	NA

Table 10. Expected Annual Genetic Effects
for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	1.2E-04	2.0E-05
Normal Public	2.3E-04	7.0E-05
Accident Public	3.5E-06	6.6E-07
Nonradiological		
Emission	NA	NA
Accident	NA	NA

B.16 WMLLMW REGIONALIZED 2 ALTERNATIVE (CASE 7): CONTACT-HANDLED HETEROGENEOUS SOLIDS: ALPHA — TREATED

Table 1. Summary of Route Information

Route	Distance (miles)	Percentage in Zone		
		Rural	Suburban	Urban
Truck				
Rocky Flats Plant to Los Alamos NL	452	82.2	14.9	2.9
West Valley DP to Savannah River	883	70.3	28.5	1.2
Rail				
Rocky Flats Plant to Los Alamos NL	504	85.7	11.1	3.2
West Valley DP to Savannah River	1217	62.8	32.4	4.9

Table 2. Annual Number of Shipments and One-Way Shipment Distances

Route	# of Shipments		Total Mileage(mi)	
	Truck	Rail	Truck	Rail
Rocky Flats Plant to Los Alamos NL	252	94	1.14E+05	4.73E+04
West Valley DP to Savannah River	1	1	8.83E+02	1.22E+03
Totals	253	95	1.15E+05	4.86E+04

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

Source/Route(s)	Crew	General Public			
		Off-Link	On-Link	Stops	Total
MLLW(T) RF to LA					
Rocky Flats Plant to Los Alamos NL					
Truck	1.35E-02	1.19E-03	2.25E-03	1.27E-02	1.61E-02
Rail	4.98E-03	4.26E-03	7.35E-05	5.03E-03	9.36E-03
MLLW(T) WV to SR					
West Valley DP to Savannah River					
Truck	2.89E-02	2.45E-03	3.86E-03	2.47E-02	3.10E-02
Rail	7.96E-03	1.95E-02	3.38E-04	7.23E-03	2.70E-02

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route	Truck	Rail
MLLW(T) RF to LA		
Rocky Flats Plant to Los Alamos NL	1.04E-04	1.20E-05
MLLW(T) WV to SR		
West Valley DP to Savannah River	4.43E-05	1.42E-05

Table 5. Nonradiological Risk Factors per Shipment (fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
Rocky Flats Plant to Los Alamos NL		4.25E-06	3.76E-05
West Valley DP to Savannah River		3.28E-06	6.60E-05
Rail			
Rocky Flats Plant to Los Alamos NL		6.78E-06	1.05E-06
West Valley DP to Savannah River		2.49E-05	2.55E-06

Table 6. Annual Incident-Free Dose for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
		Crew	Public	Crew	Public
Rocky Flats Plant	to Los Alamos NL	3.41E+00	4.05E+00	4.68E-01	8.80E-01
West Valley DP	to Savannah River	2.89E-02	3.10E-02	7.96E-03	2.70E-02
Totals		3.44E+00	4.09E+00	4.76E-01	9.07E-01

Table 7. Annual Accident Dose Risk for the Shipping Campaign (person-rem/yr)

Route		Truck	Rail
Rocky Flats Plant	to Los Alamos NL	2.62E-02	1.13E-03
West Valley DP	to Savannah River	4.43E-05	1.42E-05
Totals		2.63E-02	1.15E-03

Table 8. Expected Annual Fatalities for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	1.4E-03	1.9E-04
Normal Public	2.0E-03	4.5E-04
Accident Public	1.3E-05	5.7E-07
Nonradiological		
Emission	1.1E-03	6.6E-04
Accident	9.6E-03	1.0E-04

Table 9. Expected Annual Cancer Incidence for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	4.8E-03	6.7E-04
Normal Public	6.9E-03	1.5E-03
Accident Public	4.5E-05	1.9E-06
Nonradiological		
Emission	1.1E-03	6.6E-04
Accident	NA	NA

Table 10. Expected Annual Genetic Effects for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	2.1E-04	2.9E-05
Normal Public	4.1E-04	9.1E-05
Accident Public	7.8E-07	3.7E-08
Nonradiological		
Emission	NA	NA
Accident	NA	NA

B.17 WM LLMW REGIONALIZED 3 ALTERNATIVE (CASE 10a): CONTACT-HANDLED ORGANIC LIQUIDS: NONALPHA — UNTREATED

Table 1. Summary of Route Information

		Distance (miles)	Percentage in Zone		
Route			Rural	Suburban	Urban
Truck					
Bettis Atomic	to Portsmouth GDP	265	58.8	37.4	3.8
Brookhaven NL	to Portsmouth GDP	689	53.5	39.4	7.0
Charleston, SC	to Savannah River	200	75.7	23.8	0.5
Colonie	to Portsmouth GDP	688	57.3	40.1	2.5
ETEC	to INEL	979	77.7	14.2	8.1
Fernald (FEMP)	to Portsmouth GDP	173	68.0	31.6	0.3
General Atomic	to INEL	976	78.8	17.1	4.1
Grand Junction PO	to Rocky Flats Plant	273	79.9	16.7	3.3
ITRI	to Los Alamos NL	111	76.8	18.9	4.2
Knolls Atomic	to Portsmouth GDP	688	57.3	40.1	2.5
KKS	to Portsmouth GDP	688	57.3	40.1	2.5
KWS	to Portsmouth GDP	688	57.3	40.1	2.5
Lawrence Berkeley	to Hanford Site	875	78.1	17.8	4.1
LERHR	to Hanford Site	830	80.5	17.0	2.6
Lawrence Livermore	to Hanford Site	894	77.2	19.3	3.4
Paducah GDP	to Oak Ridge Reserv.	304	81.3	18.5	0.2
Pantex Plant	to Los Alamos NL	402	89.5	8.0	2.5
Pearl Harbor NS	to Hanford Site	226	76.8	20.9	2.3
Puget Sound NS	to Hanford Site	226	76.8	20.9	2.3
Reactive Metals	to Portsmouth GDP	276	59.5	37.8	2.8
SNL - Albuquerque	to Los Alamos NL	102	75.8	20.1	4.1
SNL - Livermore	to Hanford Site	894	77.2	19.3	3.4
Rail					
Bettis Atomic	to Portsmouth GDP	429	52.6	39.6	7.8
Brookhaven NL	to Portsmouth GDP	921	45.4	43.6	11.0
Charleston, SC	to Savannah River	140	83.9	13.6	2.5
Colonie	to Portsmouth GDP	681	52.1	40.3	7.5
ETEC	to INEL	1041	81.5	10.5	8.0
Fernald (FEMP)	to Portsmouth GDP	207	69.6	26.5	4.0
General Atomic	to INEL	1076	82.6	11.4	6.0
Grand Junction PO	to Rocky Flats Plant	239	95.5	4.3	0.3
ITRI	to Los Alamos NL	104	74.3	20.0	5.7
Knolls Atomic	to Portsmouth GDP	681	52.1	40.3	7.5
KKS	to Portsmouth GDP	681	52.1	40.3	7.5
KWS	to Portsmouth GDP	681	52.1	40.3	7.5
Lawrence Berkeley	to Hanford Site	986	78.5	15.8	5.7
LERHR	to Hanford Site	890	81.0	14.3	4.7
Lawrence Livermore	to Hanford Site	973	78.9	15.3	5.8
Paducah GDP	to Oak Ridge Reserv.	527	89.3	9.0	1.7
Pantex Plant	to Los Alamos NL	482	89.2	9.6	1.3
Pearl Harbor NS	to Hanford Site	416	73.7	20.1	6.2
Puget Sound NS	to Hanford Site	416	73.7	20.1	6.2
Reactive Metals	to Portsmouth GDP	279	48.4	41.8	9.8
SNL - Albuquerque	to Los Alamos NL	104	74.3	20.0	5.7
SNL - Livermore	to Hanford Site	973	78.9	15.3	5.8

Table 2. Annual Number of Shipments and One-Way Shipment Distances

Route		# of Shipments		Total Mileage(mi)	
		Truck	Rail	Truck	Rail
Bettis Atomic	to Portsmouth GDP	1	1	2.65E+02	4.29E+02
Brookhaven NL	to Portsmouth GDP	1	1	6.89E+02	9.21E+02
Charleston, SC	to Savannah River	1	1	2.00E+02	1.40E+02
Colonie	to Portsmouth GDP	1	1	6.88E+02	6.81E+02
ETEC	to INEL	1	1	9.79E+02	1.04E+03
Fernald (FEMP)	to Portsmouth GDP	2	1	3.46E+02	2.07E+02
General Atomic	to INEL	1	1	9.76E+02	1.08E+03
Grand Junction PO	to Rocky Flats Plant	1	1	2.73E+02	2.39E+02
ITRI	to Los Alamos NL	1	1	1.11E+02	1.04E+02
Knolls Atomic	to Portsmouth GDP	1	1	6.88E+02	6.81E+02
KKS	to Portsmouth GDP	1	1	6.88E+02	6.81E+02
KWS	to Portsmouth GDP	1	1	6.88E+02	6.81E+02
Lawrence Berkeley	to Hanford Site	1	1	8.75E+02	9.86E+02
LERHR	to Hanford Site	1	1	8.30E+02	8.90E+02
Lawrence Livermore	to Hanford Site	5	2	4.47E+03	1.95E+03
Paducah GDP	to Oak Ridge Reserv.	3	1	9.12E+02	5.27E+02
Pantex Plant	to Los Alamos NL	1	1	4.02E+02	4.82E+02
Pearl Harbor NS	to Hanford Site	1	1	2.26E+02	4.16E+02
Puget Sound NS	to Hanford Site	1	1	2.26E+02	4.16E+02
Reactive Metals	to Portsmouth GDP	1	1	2.76E+02	2.79E+02
SNL - Albuquerque	to Los Alamos NL	1	1	1.02E+02	1.04E+02
SNL - Livermore	to Hanford Site	1	1	8.94E+02	9.73E+02
Totals		29	23	1.58E+04	1.39E+04

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

Source/Route(s)		General Public			
		Crew	Off-Link	On-Link	Stops Total
MLLW(O) BA to PO					
Bettis Atomic	to Portsmouth GDP				
	Truck	9.78E-03	1.26E-03	1.73E-03	7.42E-03 1.04E-02
	Rail	4.67E-03	9.85E-03	1.53E-04	4.80E-03 1.48E-02
MLLW(O) BN to PO					
Brookhaven NL	to Portsmouth GDP				
	Truck	2.73E-02	4.51E-03	6.10E-03	1.93E-02 2.99E-02
	Rail	6.72E-03	2.74E-02	3.90E-04	6.31E-03 3.41E-02
MLLW(O) CH to SR					
Charleston, SC	to Savannah River				
	Truck	6.19E-03	4.20E-04	7.45E-04	5.60E-03 6.77E-03
	Rail	3.47E-03	1.07E-03	2.07E-05	3.91E-03 5.00E-03
MLLW(O) CL to PO					
Colonie	to Portsmouth GDP				
	Truck	2.54E-02	2.99E-03	4.01E-03	1.93E-02 2.63E-02
	Rail	5.72E-03	1.54E-02	2.43E-04	5.58E-03 2.13E-02
MLLW(O) LC to IN					
ETEC	to INEL				
	Truck	3.23E-02	5.06E-03	8.27E-03	2.74E-02 4.07E-02
	Rail	7.22E-03	1.80E-02	2.22E-04	6.68E-03 2.49E-02
MLLW(O) FE to PO					
Fernald (FEMP)	to Portsmouth GDP				
	Truck	5.72E-03	4.51E-04	6.85E-04	4.84E-03 5.98E-03
	Rail	3.75E-03	2.71E-03	4.86E-05	4.12E-03 6.87E-03
MLLW(O) SO to IN					
General Atomic	to INEL				
	Truck	3.06E-02	3.33E-03	5.75E-03	2.73E-02 3.64E-02
	Rail	7.37E-03	1.48E-02	2.03E-04	6.79E-03 2.18E-02
MLLW(O) GJ to RF					
Grand Junction PO	to Rocky Flats Plant				
	Truck	8.39E-03	8.15E-04	1.46E-03	7.65E-03 9.92E-03
	Rail	3.88E-03	3.51E-04	1.62E-05	4.21E-03 4.58E-03
MLLW(O) IT to LA					
ITRI	to Los Alamos NL				
	Truck	3.54E-03	4.00E-04	6.71E-04	3.11E-03 4.18E-03
	Rail	3.31E-03	1.55E-03	2.36E-05	3.80E-03 5.37E-03
MLLW(O) KA to PO					
Knolls Atomic	to Portsmouth GDP				
	Truck	2.54E-02	2.99E-03	4.01E-03	1.93E-02 2.63E-02
	Rail	5.72E-03	1.54E-02	2.43E-04	5.58E-03 2.13E-02

Table 3. Incident-Free Dose per Shipment (person-rem/shipment) (Cont.)

Source/Route(s)	Crew	General Public				
		Off-Link	On-Link	Stops	Total	
MLLW(O) KK to PO KKS	to Portsmouth GDP					
	Truck	2.54E-02	2.99E-03	4.01E-03	1.93E-02	2.63E-02
	Rail	5.72E-03	1.54E-02	2.43E-04	5.58E-03	2.13E-02
MLLW(O) KW to PO KWS	to Portsmouth GDP					
	Truck	2.54E-02	2.99E-03	4.01E-03	1.93E-02	2.63E-02
	Rail	5.72E-03	1.54E-02	2.43E-04	5.58E-03	2.13E-02
MLLW(O) LB to HS Lawrence Berkeley	to Hanford Site					
	Truck	2.76E-02	3.02E-03	5.17E-03	2.45E-02	3.27E-02
	Rail	6.99E-03	1.38E-02	2.03E-04	6.51E-03	2.05E-02
MLLW(O) SM to HS LERHR	to Hanford Site					
	Truck	2.51E-02	2.17E-03	4.00E-03	2.32E-02	2.94E-02
	Rail	6.59E-03	1.07E-02	1.64E-04	6.22E-03	1.70E-02
MLLW(O) LL to HS Lawrence Livermore	to Hanford Site					
	Truck	2.82E-02	2.88E-03	4.92E-03	2.50E-02	3.28E-02
	Rail	6.94E-03	1.38E-02	2.00E-04	6.48E-03	2.05E-02
MLLW(O) PA to OR Paducah GDP	to Oak Ridge Reserv.					
	Truck	8.88E-03	4.70E-04	9.98E-04	8.51E-03	9.98E-03
	Rail	5.08E-03	2.75E-03	5.97E-05	5.10E-03	7.91E-03
MLLW(O) PP to LA Pantex Plant	to Los Alamos NL					
	Truck	1.11E-02	7.76E-04	1.77E-03	1.13E-02	1.38E-02
	Rail	4.89E-03	2.18E-03	5.29E-05	4.96E-03	7.19E-03
MLLW(O) SW to HS Pearl Harbor NS	to Hanford Site					
	Truck	7.06E-03	6.28E-04	1.09E-03	6.33E-03	8.04E-03
	Rail	4.62E-03	6.63E-03	9.79E-05	4.76E-03	1.15E-02
MLLW(O) PN to HS Puget Sound NS	to Hanford Site					
	Truck	7.06E-03	6.28E-04	1.09E-03	6.33E-03	8.04E-03
	Rail	4.62E-03	6.63E-03	9.79E-05	4.76E-03	1.15E-02
MLLW(O) RM to PO Reactive Metals	to Portsmouth GDP					
	Truck	1.00E-02	1.18E-03	1.62E-03	7.73E-03	1.05E-02
	Rail	4.05E-03	7.58E-03	1.11E-04	4.34E-03	1.20E-02
MLLW(O) SA to LA SNL - Albuquerque	to Los Alamos NL					
	Truck	3.28E-03	3.70E-04	6.13E-04	2.86E-03	3.84E-03
	Rail	3.31E-03	1.55E-03	2.36E-05	3.80E-03	5.37E-03
MLLW(O) SL to HS SNL - Livermore	to Hanford Site					
	Truck	2.82E-02	2.88E-03	4.92E-03	2.50E-02	3.28E-02
	Rail	6.94E-03	1.38E-02	2.00E-04	6.48E-03	2.05E-02

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route			Truck	Rail
MLLW(O) BA to PO				
Bettis Atomic	to Portsmouth GDP		5.04E-04	2.16E-04
MLLW(O) BN to PO				
Brookhaven NL	to Portsmouth GDP		4.87E-03	2.63E-03
MLLW(O) CH to SR				
Charleston, SC	to Savannah River		7.75E-03	8.99E-04
MLLW(O) CL to PO				
Colonie	to Portsmouth GDP		3.74E-04	8.80E-05
MLLW(O) LC to IN				
ETEC	to INEL		9.54E-06	4.35E-06
MLLW(O) FE to PO				
Fernald (FEMP)	to Portsmouth GDP		5.76E-04	2.78E-04
MLLW(O) SO to IN				
General Atomic	to INEL		1.08E-05	4.28E-06
MLLW(O) GJ to RF				
Grand Junction PO	to Rocky Flats Plant		1.33E-06	1.13E-08
MLLW(O) IT to LA				
ITRI	to Los Alamos NL		8.49E-06	1.55E-07
MLLW(O) KA to PO				
Knolls Atomic	to Portsmouth GDP		4.50E-02	1.06E-02
MLLW(O) KK to PO				
KKS	to Portsmouth GDP		3.45E-02	8.09E-03
MLLW(O) KW to PO				
KWS	to Portsmouth GDP		4.71E-03	1.10E-03
MLLW(O) LB to HS				
Lawrence Berkeley	to Hanford Site		7.79E-05	4.38E-05
MLLW(O) SM to HS				
LERHR	to Hanford Site		7.78E-06	4.14E-06
MLLW(O) LL to HS				
Lawrence Livermore	to Hanford Site		3.93E-03	5.23E-03
MLLW(O) PA to OR				
Paducah GDP	to Oak Ridge Reserv.		3.89E-01	1.21E-01
MLLW(O) PP to LA				
Pantex Plant	to Los Alamos NL		1.60E-04	9.37E-06
MLLW(O) SW to HS				
Pearl Harbor NS	to Hanford Site		8.47E-06	6.32E-06
MLLW(O) PN to HS				
Puget Sound NS	to Hanford Site		1.95E-04	1.46E-04
MLLW(O) RM to PO				
Reactive Metals	to Portsmouth GDP		7.40E-05	2.29E-05
MLLW(O) SA to LA				
SNL - Albuquerque	to Los Alamos NL		5.82E-07	1.10E-08
MLLW(O) SL to HS				
SNL - Livermore	to Hanford Site		1.95E-03	1.04E-03

Table 5. Nonradiological Risk Factors per Shipment (fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
Bettis Atomic	to Portsmouth GDP	3.22E-06	1.33E-05
Brookhaven NL	to Portsmouth GDP	1.56E-05	4.90E-05
Charleston, SC	to Savannah River	3.22E-07	1.70E-05
Colonie	to Portsmouth GDP	5.63E-06	3.56E-05
ETEC	to INEL	2.55E-05	6.21E-05
Fernald (FEMP)	to Portsmouth GDP	1.93E-07	7.51E-06
General Atomic	to INEL	1.30E-05	6.23E-05
Grand Junction PO	to Rocky Flats Plant	2.93E-06	2.32E-05
ITRI	to Los Alamos NL	1.51E-06	1.28E-05
Knolls Atomic	to Portsmouth GDP	5.63E-06	3.56E-05
KKS	to Portsmouth GDP	5.63E-06	3.56E-05
KWS	to Portsmouth GDP	5.63E-06	3.56E-05
Lawrence Berkeley	to Hanford Site	1.16E-05	4.91E-05
LERHR	to Hanford Site	6.82E-06	4.66E-05
Lawrence Livermore	to Hanford Site	9.85E-06	5.03E-05
Paducah GDP	to Oak Ridge Reserv.	1.93E-07	2.14E-05
Pantex Plant	to Los Alamos NL	3.28E-06	3.21E-05
Pearl Harbor NS	to Hanford Site	1.67E-06	9.56E-06
Puget Sound NS	to Hanford Site	1.67E-06	9.56E-06
Reactive Metals	to Portsmouth GDP	2.45E-06	1.21E-05
SNL - Albuquerque	to Los Alamos NL	1.35E-06	1.20E-05
SNL - Livermore	to Hanford Site	9.85E-06	5.03E-05
Rail			
Bettis Atomic	to Portsmouth GDP	1.40E-05	8.98E-07
Brookhaven NL	to Portsmouth GDP	4.22E-05	1.93E-06
Charleston, SC	to Savannah River	1.46E-06	2.93E-07
Colonie	to Portsmouth GDP	2.15E-05	1.43E-06
ETEC	to INEL	3.48E-05	2.18E-06
Fernald (FEMP)	to Portsmouth GDP	3.43E-06	4.34E-07
General Atomic	to INEL	2.72E-05	2.25E-06
Grand Junction PO	to Rocky Flats Plant	2.51E-07	4.99E-07
ITRI	to Los Alamos NL	2.47E-06	2.18E-07
Knolls Atomic	to Portsmouth GDP	2.15E-05	1.43E-06
KKS	to Portsmouth GDP	2.15E-05	1.43E-06
KWS	to Portsmouth GDP	2.15E-05	1.43E-06
Lawrence Berkeley	to Hanford Site	2.33E-05	2.06E-06
LERHR	to Hanford Site	1.77E-05	1.86E-06
Lawrence Livermore	to Hanford Site	2.36E-05	2.04E-06
Paducah GDP	to Oak Ridge Reserv.	3.81E-06	1.10E-06
Pantex Plant	to Los Alamos NL	2.59E-06	1.01E-06
Pearl Harbor NS	to Hanford Site	1.08E-05	8.70E-07
Puget Sound NS	to Hanford Site	1.08E-05	8.70E-07
Reactive Metals	to Portsmouth GDP	1.14E-05	5.84E-07
SNL - Albuquerque	to Los Alamos NL	2.47E-06	2.18E-07
SNL - Livermore	to Hanford Site	2.36E-05	2.04E-06

Table 6. Annual Incident-Free Dose for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
		Crew	Public	Crew	Public
Bettis Atomic	to Portsmouth GDP	9.78E-03	1.04E-02	4.67E-03	1.48E-02
Brookhaven NL	to Portsmouth GDP	2.73E-02	2.99E-02	6.72E-03	3.41E-02
Charleston, SC	to Savannah River	6.19E-03	6.77E-03	3.47E-03	5.00E-03
Colonie	to Portsmouth GDP	2.54E-02	2.63E-02	5.72E-03	2.13E-02
ETEC	to INEL	3.23E-02	4.07E-02	7.22E-03	2.49E-02
Fernald (FEMP)	to Portsmouth GDP	1.14E-02	1.20E-02	3.75E-03	6.87E-03
General Atomic	to INEL	3.06E-02	3.64E-02	7.37E-03	2.18E-02
Grand Junction PO	to Rocky Flats Plant	8.39E-03	9.92E-03	3.88E-03	4.58E-03
ITRI	to Los Alamos NL	3.54E-03	4.18E-03	3.31E-03	5.37E-03
Knolls Atomic	to Portsmouth GDP	2.54E-02	2.63E-02	5.72E-03	2.13E-02
KKS	to Portsmouth GDP	2.54E-02	2.63E-02	5.72E-03	2.13E-02
KWS	to Portsmouth GDP	2.54E-02	2.63E-02	5.72E-03	2.13E-02
Lawrence Berkeley	to Hanford Site	2.76E-02	3.27E-02	6.99E-03	2.05E-02
LERHR	to Hanford Site	2.51E-02	2.94E-02	6.59E-03	1.70E-02
Lawrence Livermore	to Hanford Site	1.41E-01	1.64E-01	1.39E-02	4.10E-02
Paducah GDP	to Oak Ridge Reserv.	2.67E-02	2.99E-02	5.08E-03	7.91E-03
Pantex Plant	to Los Alamos NL	1.11E-02	1.38E-02	4.89E-03	7.19E-03
Pearl Harbor NS	to Hanford Site	7.06E-03	8.04E-03	4.62E-03	1.15E-02
Puget Sound NS	to Hanford Site	7.06E-03	8.04E-03	4.62E-03	1.15E-02
Reactive Metals	to Portsmouth GDP	1.00E-02	1.05E-02	4.05E-03	1.20E-02
SNL - Albuquerque	to Los Alamos NL	3.28E-03	3.84E-03	3.31E-03	5.37E-03
SNL - Livermore	to Hanford Site	2.82E-02	3.28E-02	6.94E-03	2.05E-02
Totals		5.18E-01	5.89E-01	1.24E-01	3.57E-01

Table 7. Annual Accident Dose Risk for the Shipping Campaign (person-rem/yr)

Route		Truck	Rail
Bettis Atomic	to Portsmouth GDP	5.04E-04	2.16E-04
Brookhaven NL	to Portsmouth GDP	4.87E-03	2.63E-03
Charleston, SC	to Savannah River	7.75E-03	8.99E-04
Colonie	to Portsmouth GDP	3.74E-04	8.80E-05
ETEC	to INEL	9.54E-06	4.35E-06
Fernald (FEMP)	to Portsmouth GDP	1.15E-03	2.78E-04
General Atomic	to INEL	1.08E-05	4.28E-06
Grand Junction PO	to Rocky Flats Plant	1.33E-06	1.13E-08
ITRI	to Los Alamos NL	8.49E-06	1.55E-07
Knolls Atomic	to Portsmouth GDP	4.50E-02	1.06E-02
KKS	to Portsmouth GDP	3.45E-02	8.09E-03
KWS	to Portsmouth GDP	4.71E-03	1.10E-03
Lawrence Berkeley	to Hanford Site	7.79E-05	4.38E-05
LERHR	to Hanford Site	7.78E-06	4.14E-06
Lawrence Livermore	to Hanford Site	1.97E-02	1.05E-02
Paducah GDP	to Oak Ridge Reserv.	1.17E+00	1.21E-01
Pantex Plant	to Los Alamos NL	1.60E-04	9.37E-06
Pearl Harbor NS	to Hanford Site	8.47E-06	6.32E-06
Puget Sound NS	to Hanford Site	1.95E-04	1.46E-04
Reactive Metals	to Portsmouth GDP	7.40E-05	2.29E-05
SNL - Albuquerque	to Los Alamos NL	5.82E-07	1.10E-08
SNL - Livermore	to Hanford Site	1.95E-03	1.04E-03
Totals		1.29E+00	1.56E-01

Table 8. Expected Annual Fatalities for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	2.1E-04	5.0E-05
Normal Public	2.9E-04	1.8E-04
Accident Public	6.4E-04	7.8E-05
Nonradiological		
Emission	1.7E-04	3.7E-04
Accident	9.3E-04	2.9E-05

Table 9. Expected Annual Cancer Incidence
for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	7.2E-04	1.7E-04
Normal Public	1.0E-03	6.1E-04
Accident Public	2.2E-03	2.7E-04
Nonradiological		
Emission	1.7E-04	3.7E-04
Accident	NA	NA

Table 10. Expected Annual Genetic Effects
for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	3.1E-05	7.5E-06
Normal Public	5.9E-05	3.6E-05
Accident Public	1.2E-05	2.5E-06
Nonradiological		
Emission	NA	NA
Accident	NA	NA

B.18 WM LLMW REGIONALIZED 3 ALTERNATIVE (CASE 10a): CONTACT-HANDLED ORGANIC LIQUIDS: ALPHA — UNTREATED

Table 1. Summary of Route Information

Route		Distance (miles)	Percentage in Zone		
			Rural	Suburban	Urban
Truck					
Lawrence Livermore	to INEL	972	85.7	10.4	4.0
Mound Plant	to Savannah River	656	66.5	32.7	0.8
West Valley DP	to Savannah River	883	70.3	28.5	1.2
Rail					
Lawrence Livermore	to INEL	1100	89.5	7.4	3.1
Mound Plant	to Savannah River	744	67.4	29.2	3.3
West Valley DP	to Savannah River	1217	62.8	32.4	4.9

Table 2. Annual Number of Shipments and One-Way Shipment Distances

Route	# of Shipments		Total Mileage(mi)	
	Truck	Rail	Truck	Rail
Lawrence Livermore to INEL	4	2	3.89E+03	2.20E+03
Mound Plant to Savannah River	1	1	6.56E+02	7.44E+02
West Valley DP to Savannah River	1	1	8.83E+02	1.22E+03
Totals	6	4	5.43E+03	4.16E+03

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

Source/Route(s)		Crew	General Public				
			Off-Link	On-Link	Stops	Total	
MLLW(OA) LL to IN							
Lawrence Livermore to INEL							
	Truck	2.85E-02	2.74E-03	5.33E-03	2.72E-02	3.53E-02	
	Rail	7.47E-03	8.12E-03	1.38E-04	6.87E-03	1.51E-02	
MLLW(OA) MP to SR							
Mound Plant							
	to Savannah River						
	Truck	2.21E-02	1.91E-03	2.83E-03	1.84E-02	2.31E-02	
	Rail	5.99E-03	9.25E-03	1.78E-04	5.77E-03	1.52E-02	
MLLW(OA) WV to SR							
West Valley DP							
	to Savannah River						
	Truck	2.89E-02	2.45E-03	3.86E-03	2.47E-02	3.10E-02	
	Rail	7.96E-03	1.95E-02	3.38E-04	7.23E-03	2.70E-02	

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route	Truck	Rail
MLLW(OA) LL to IN		
Lawrence Livermore to INEL	1.16E-02	7.55E-03
MLLW(OA) MP to SR		
Mound Plant to Savannah River	4.15E-03	7.63E-04
MLLW(OA) WV to SR		
West Valley DP to Savannah River	4.27E-02	1.37E-02

Table 5. Nonradiological Risk Factors per Shipment (fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
Lawrence Livermore	to INEL	1.24E-05	5.73E-05
Mound Plant	to Savannah River	1.67E-06	5.26E-05
West Valley DP	to Savannah River	3.28E-06	6.60E-05
Rail			
Lawrence Livermore	to INEL	1.41E-05	2.30E-06
Mound Plant	to Savannah River	1.03E-05	1.56E-06
West Valley DP	to Savannah River	2.49E-05	2.55E-06

Table 6. Annual Incident-Free Dose for the Shipping Campaign (person-rem/yr)

Route	Truck		Rail	
	Crew	Public	Crew	Public
Lawrence Livermore to INEL	1.14E-01	1.41E-01	1.49E-02	3.03E-02
Mound Plant to Savannah River	2.21E-02	2.31E-02	5.99E-03	1.52E-02
West Valley DP to Savannah River	2.89E-02	3.10E-02	7.96E-03	2.70E-02
Totals	1.65E-01	1.95E-01	2.89E-02	7.25E-02

Table 7. Annual Accident Dose Risk for the Shipping Campaign (person-rem/yr)

Route	Truck	Rail
Lawrence Livermore to INEL	4.63E-02	1.51E-02
Mound Plant to Savannah River	4.15E-03	7.63E-04
West Valley DP to Savannah River	4.27E-02	1.37E-02
Totals	9.31E-02	2.96E-02

Table 8. Expected Annual Fatalities for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	6.6E-05	1.2E-05
Normal Public	9.8E-05	3.6E-05
Accident Public	4.7E-05	1.5E-05
Nonradiological		
Emission	5.5E-05	6.3E-05
Accident	3.5E-04	8.7E-06

Table 9. Expected Annual Cancer Incidence for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	2.3E-04	4.0E-05
Normal Public	3.3E-04	1.2E-04
Accident Public	1.6E-04	5.0E-05
Nonradiological		
Emission	5.5E-05	6.3E-05
Accident	NA	NA

Table 10. Expected Annual Genetic Effects
for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	9.9E-06	1.7E-06
Normal Public	2.0E-05	7.2E-06
Accident Public	2.3E-06	7.3E-07
Nonradiological		
Emission	NA	NA
Accident	NA	NA

**B.19 WM LLMW REGIONALIZED 3 ALTERNATIVE (CASE 10a):
CONTACT-HANDLED HETEROGENEOUS SOLIDS:
NONALPHA — UNTREATED**

Table 1. Summary of Route Information

		Distance (miles)	Percentage in Zone		
Route			Rural	Suburban	Urban
Truck					
Ames Laboratory	to Portsmouth GDP	755	77.4	21.0	1.7
Argonne - East	to Portsmouth GDP	428	64.6	30.5	4.9
Bettis Atomic	to Portsmouth GDP	265	58.8	37.4	3.8
Battelle Columbus	to Portsmouth GDP	84	68.4	28.3	3.3
Brookhaven NL	to Portsmouth GDP	689	53.5	39.4	7.0
Charleston, SC	to Savannah River	200	75.7	23.8	0.5
Colonie	to Portsmouth GDP	688	57.3	40.1	2.5
ETEC	to INEL	979	77.7	14.2	8.1
Fernald (FEMP)	to Portsmouth GDP	173	68.0	31.6	0.3
General Atomic	to INEL	976	78.8	17.1	4.1
Grand Junction PO	to Rocky Flats Plant	273	79.9	16.7	3.3
Knolls Atomic	to Portsmouth GDP	688	57.3	40.1	2.5
Kansas City Plant	to Rocky Flats Plant	631	89.0	9.4	1.6
KKS	to Portsmouth GDP	688	57.3	40.1	2.5
KWS	to Portsmouth GDP	688	57.3	40.1	2.5
Lawrence Berkeley	to Hanford Site	875	78.1	17.8	4.1
LERHR	to Hanford Site	830	80.5	17.0	2.6
Lawrence Livermore	to Hanford Site	894	77.2	19.3	3.4
Mare Island	to Hanford Site	875	78.1	17.8	4.1
Norfolk Nav Shipyd	to Savannah River	498	72.8	26.2	1.0
Nevada Test Site	to INEL	712	82.8	13.7	3.5
Paducah GDP	to Oak Ridge Reserv.	304	81.3	18.5	0.2
Pantex Plant	to Los Alamos NL	402	89.5	8.0	2.5
Pearl Harbor NS	to Hanford Site	226	76.8	20.9	2.3
Portsmouth NS	to Portsmouth GDP	959	46.4	45.3	8.2
Princeton PPL	to Portsmouth GDP	588	55.1	38.8	6.1
Puget Sound NS	to Hanford Site	226	76.8	20.9	2.3
Reactive Metals	to Portsmouth GDP	276	59.5	37.8	2.8
SNL - Albuquerque	to Los Alamos NL	102	75.8	20.1	4.1
SNL - Livermore	to Hanford Site	894	77.2	19.3	3.4
Rail					
Ames Laboratory	to Portsmouth GDP	727	68.6	23.8	7.7
Argonne - East	to Portsmouth GDP	422	64.8	30.0	5.1
Bettis Atomic	to Portsmouth GDP	429	52.6	39.6	7.8
Battelle Columbus	to Portsmouth GDP	91	63.4	31.8	4.8
Brookhaven NL	to Portsmouth GDP	921	45.4	43.6	11.0
Charleston, SC	to Savannah River	140	83.9	13.6	2.5
Colonie	to Portsmouth GDP	681	52.1	40.3	7.5
ETEC	to INEL	1041	81.5	10.5	8.0
Fernald (FEMP)	to Portsmouth GDP	207	69.6	26.5	4.0
General Atomic	to INEL	1076	82.6	11.4	6.0
Grand Junction PO	to Rocky Flats Plant	239	95.5	4.3	0.3
Knolls Atomic	to Portsmouth GDP	681	52.1	40.3	7.5
Kansas City Plant	to Rocky Flats Plant	778	89.8	7.8	2.3
KKS	to Portsmouth GDP	681	52.1	40.3	7.5
KWS	to Portsmouth GDP	681	52.1	40.3	7.5
Lawrence Berkeley	to Hanford Site	986	78.5	15.8	5.7
LERHR	to Hanford Site	890	81.0	14.3	4.7
Lawrence Livermore	to Hanford Site	973	78.9	15.3	5.8
Mare Island	to Hanford Site	986	78.5	15.8	5.7
Norfolk Nav Shipyd	to Savannah River	529	74.3	24.1	1.6
Nevada Test Site	to INEL	756	92.8	5.9	1.3
Paducah GDP	to Oak Ridge Reserv.	527	89.3	9.0	1.7
Pantex Plant	to Los Alamos NL	482	89.2	9.6	1.3
Pearl Harbor NS	to Hanford Site	416	73.7	20.1	6.2
Portsmouth NS	to Portsmouth GDP	962	49.0	44.3	6.7
Princeton PPL	to Portsmouth GDP	838	58.3	32.6	9.1
Puget Sound NS	to Hanford Site	416	73.7	20.1	6.2
Reactive Metals	to Portsmouth GDP	279	48.4	41.8	9.8
SNL - Albuquerque	to Los Alamos NL	104	74.3	20.0	5.7
SNL - Livermore	to Hanford Site	973	78.9	15.3	5.8

Table 2. Annual Number of Shipments and One-Way Shipment Distances

Route		# of Shipments		Total Mileage(mi)	
		Truck	Rail	Truck	Rail
Ames Laboratory	to Portsmouth GDP	1	1	7.55E+02	7.27E+02
Argonne - East	to Portsmouth GDP	44	17	1.88E+04	7.18E+03
Bettis Atomic	to Portsmouth GDP	1	1	2.65E+02	4.29E+02
Battelle Columbus	to Portsmouth GDP	1	1	8.41E+01	9.09E+01
Brookhaven NL	to Portsmouth GDP	1	1	6.89E+02	9.21E+02
Charleston, SC	to Savannah River	1	1	2.00E+02	1.40E+02
Colonie	to Portsmouth GDP	1	1	6.88E+02	6.81E+02
ETEC	to INEL	8	3	7.83E+03	3.12E+03
Fernald (FEMP)	to Portsmouth GDP	7	3	1.21E+03	6.22E+02
General Atomic	to INEL	1	1	9.76E+02	1.08E+03
Grand Junction PO	to Rocky Flats Plant	1	1	2.73E+02	2.39E+02
Knolls Atomic	to Portsmouth GDP	1	1	6.88E+02	6.81E+02
Kansas City Plant	to Rocky Flats Plant	1	1	6.31E+02	7.78E+02
KKS	to Portsmouth GDP	1	1	6.88E+02	6.81E+02
KWS	to Portsmouth GDP	1	1	6.88E+02	6.81E+02
Lawrence Berkeley	to Hanford Site	1	1	8.75E+02	9.86E+02
LERHR	to Hanford Site	1	1	8.30E+02	8.90E+02
Lawrence Livermore	to Hanford Site	4	2	3.58E+03	1.95E+03
Mare Island	to Hanford Site	1	1	8.75E+02	9.86E+02
Norfolk Nav Shipyd	to Savannah River	1	1	4.98E+02	5.29E+02
Nevada Test Site	to INEL	1	1	7.12E+02	7.56E+02
Paducah GDP	to Oak Ridge Reserv.	1	1	3.04E+02	5.27E+02
Pantex Plant	to Los Alamos NL	2	1	8.04E+02	4.82E+02
Pearl Harbor NS	to Hanford Site	1	1	2.26E+02	4.16E+02
Portsmouth NS	to Portsmouth GDP	1	1	9.59E+02	9.62E+02
Princeton PPL	to Portsmouth GDP	1	1	5.88E+02	8.38E+02
Puget Sound NS	to Hanford Site	1	1	2.26E+02	4.16E+02
Reactive Metals	to Portsmouth GDP	1	1	2.76E+02	2.79E+02
SNL - Albuquerque	to Los Alamos NL	1	1	1.02E+02	1.04E+02
SNL - Livermore	to Hanford Site	1	1	8.94E+02	9.73E+02
Totals		90	51	4.62E+04	2.91E+04

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

Source/Route(s)	Crew	General Public			
		Off-Link	On-Link	Stops	Total
MLLW(C) AL to PO Ames Laboratory	to Portsmouth GDP				
	Truck	2.33E-02	1.86E-03	3.31E-03	2.11E-02
	Rail	5.91E-03	1.42E-02	2.00E-04	5.72E-03
MLLW(C) AN to PO Argonne - East	to Portsmouth GDP				
	Truck	1.53E-02	2.05E-03	2.99E-03	1.20E-02
	Rail	4.64E-03	6.76E-03	1.14E-04	4.78E-03
MLLW(C) BA to PO Bettis Atomic	to Portsmouth GDP				
	Truck	9.78E-03	1.26E-03	1.73E-03	7.42E-03
	Rail	4.67E-03	9.85E-03	1.53E-04	4.80E-03
MLLW(C) BC to PO Battelle Columbus	to Portsmouth GDP				
	Truck	2.86E-03	3.24E-04	4.91E-04	2.35E-03
	Rail	3.26E-03	1.44E-03	2.49E-05	3.76E-03
MLLW(C) BN to PO Brookhaven NL	to Portsmouth GDP				
	Truck	2.73E-02	4.51E-03	6.10E-03	1.93E-02
	Rail	6.72E-03	2.74E-02	3.90E-04	6.31E-03
MLLW(C) CH to SR Charleston, SC	to Savannah River				
	Truck	6.19E-03	4.20E-04	7.45E-04	5.60E-03
	Rail	3.47E-03	1.07E-03	2.07E-05	3.91E-03
MLLW(C) CL to PO Colonie	to Portsmouth GDP				
	Truck	2.54E-02	2.99E-03	4.01E-03	1.93E-02
	Rail	5.72E-03	1.54E-02	2.43E-04	5.58E-03
MLLW(C) LC to IN ETEC	to INEL				
	Truck	3.23E-02	5.06E-03	8.27E-03	2.74E-02
	Rail	7.22E-03	1.80E-02	2.22E-04	6.68E-03
MLLW(C) FE to PO Fernald (FEMP)	to Portsmouth GDP				
	Truck	5.72E-03	4.51E-04	6.85E-04	4.84E-03
	Rail	3.75E-03	2.71E-03	4.86E-05	4.12E-03
MLLW(C) SO to IN General Atomic	to INEL				
	Truck	3.06E-02	3.33E-03	5.75E-03	2.73E-02
	Rail	7.37E-03	1.48E-02	2.03E-04	6.79E-03
MLLW(C) GJ to RF Grand Junction PO	to Rocky Flats Plant				
	Truck	8.39E-03	8.15E-04	1.46E-03	7.65E-03
	Rail	3.88E-03	3.51E-04	1.62E-05	4.21E-03
MLLW(C) KA to PO Knolls Atomic	to Portsmouth GDP				
	Truck	2.54E-02	2.99E-03	4.01E-03	1.93E-02
	Rail	5.72E-03	1.54E-02	2.43E-04	5.58E-03
MLLW(C) KC to RF Kansas City Plant	to Rocky Flats Plant				
	Truck	1.74E-02	9.83E-04	2.41E-03	1.77E-02
	Rail	6.13E-03	4.77E-03	9.07E-05	5.87E-03
MLLW(C) KK to PO KKS	to Portsmouth GDP				
	Truck	2.54E-02	2.99E-03	4.01E-03	1.93E-02
	Rail	5.72E-03	1.54E-02	2.43E-04	5.58E-03
MLLW(C) KW to PO KWS	to Portsmouth GDP				
	Truck	2.54E-02	2.99E-03	4.01E-03	1.93E-02
	Rail	5.72E-03	1.54E-02	2.43E-04	5.58E-03
MLLW(C) LB to HS Lawrence Berkeley	to Hanford Site				
	Truck	2.76E-02	3.02E-03	5.17E-03	2.45E-02
	Rail	6.99E-03	1.38E-02	2.03E-04	6.51E-03
MLLW(C) SM to HS LERHR	to Hanford Site				
	Truck	2.51E-02	2.17E-03	4.00E-03	2.32E-02
	Rail	6.59E-03	1.07E-02	1.64E-04	6.22E-03
MLLW(C) LL to HS Lawrence Livermore	to Hanford Site				
	Truck	2.82E-02	2.88E-03	4.92E-03	2.50E-02
	Rail	6.94E-03	1.38E-02	2.00E-04	6.48E-03

Table 3. Incident-Free Dose per Shipment (person-rem/shipment) (Cont.)

Source/Route(s)	Crew	General Public			
		Off-Link	On-Link	Stops	Total
MLLW(C) MZ to HS Mare Island	to Hanford Site				
	Truck	2.76E-02	3.02E-03	5.17E-03	2.45E-02
	Rail	6.99E-03	1.38E-02	2.03E-04	6.51E-03
MLLW(C) US to SR Norfolk Nav Shipyd	to Savannah River				
	Truck	1.59E-02	1.26E-03	2.07E-03	1.39E-02
	Rail	5.09E-03	4.35E-03	9.95E-05	5.11E-03
MLLW(C) NT to IN Nevada Test Site	to INEL				
	Truck	2.13E-02	2.03E-03	3.79E-03	1.99E-02
	Rail	6.04E-03	2.80E-03	6.88E-05	5.81E-03
MLLW(C) PA to OR Paducah GDP	to Oak Ridge Reserv.				
	Truck	8.88E-03	4.70E-04	9.98E-04	8.51E-03
	Rail	5.08E-03	2.75E-03	5.97E-05	5.10E-03
MLLW(C) PP to LA Pantex Plant	to Los Alamos NL				
	Truck	1.11E-02	7.76E-04	1.77E-03	1.13E-02
	Rail	4.89E-03	2.18E-03	5.29E-05	4.96E-03
MLLW(C) SW to HS Pearl Harbor NS	to Hanford Site				
	Truck	7.06E-03	6.28E-04	1.09E-03	6.33E-03
	Rail	4.62E-03	6.63E-03	9.79E-05	4.76E-03
MLLW(C) PT to PO Portsmouth NS	to Portsmouth GDP				
	Truck	4.03E-02	7.28E-03	9.52E-03	2.68E-02
	Rail	6.89E-03	2.10E-02	3.50E-04	6.44E-03
MLLW(C) PR to PO Princeton PPL	to Portsmouth GDP				
	Truck	2.28E-02	3.55E-03	4.81E-03	1.65E-02
	Rail	6.38E-03	2.00E-02	2.85E-04	6.06E-03
MLLW(C) PN to HS Puget Sound NS	to Hanford Site				
	Truck	7.06E-03	6.28E-04	1.09E-03	6.33E-03
	Rail	4.62E-03	6.63E-03	9.79E-05	4.76E-03
MLLW(C) RM to PO Reactive Metals	to Portsmouth GDP				
	Truck	1.00E-02	1.18E-03	1.62E-03	7.73E-03
	Rail	4.05E-03	7.58E-03	1.11E-04	4.34E-03
MLLW(C) SA to LA SNL - Albuquerque	to Los Alamos NL				
	Truck	3.28E-03	3.70E-04	6.13E-04	2.86E-03
	Rail	3.31E-03	1.55E-03	2.36E-05	3.80E-03
MLLW(C) SL to HS SNL - Livermore	to Hanford Site				
	Truck	2.82E-02	2.88E-03	4.92E-03	2.50E-02
	Rail	6.94E-03	1.38E-02	2.00E-04	6.48E-03

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route			Truck	Rail
MLLW(C) AL to PO				
Ames Laboratory	to Portsmouth GDP		1.84E-08	7.49E-09
MLLW(C) AN to PO				
Argonne - East	to Portsmouth GDP		4.72E-04	2.52E-04
MLLW(C) BA to PO				
Bettis Atomic	to Portsmouth GDP		1.00E-04	4.05E-05
MLLW(C) BC to PO				
Battelle Columbus	to Portsmouth GDP		2.49E-10	6.63E-11
MLLW(C) BN to PO				
Brookhaven NL	to Portsmouth GDP		4.93E-04	2.53E-04
MLLW(C) CH to SR				
Charleston, SC	to Savannah River		5.98E-05	6.95E-06
MLLW(C) CL to PO				
Colonie	to Portsmouth GDP		3.28E-08	7.61E-09
MLLW(C) LC to IN				
ETEC	to INEL		2.18E-04	2.61E-04
MLLW(C) FE to PO				
Fernald (FEMP)	to Portsmouth GDP		4.03E-06	2.15E-06
MLLW(C) SO to IN				
General Atomic	to INEL		4.51E-07	1.77E-07
MLLW(C) GJ to RF				
Grand Junction PO	to Rocky Flats Plant		1.60E-08	1.77E-10
MLLW(C) KA to PO				
Knolls Atomic	to Portsmouth GDP		1.98E-02	4.64E-03
MLLW(C) KC to RF				
Kansas City Plant	to Rocky Flats Plant		6.95E-05	1.08E-05
MLLW(C) KK to PO				
KKS	to Portsmouth GDP		2.17E-02	5.10E-03
MLLW(C) KW to PO				
KWS	to Portsmouth GDP		6.98E-03	1.64E-03
MLLW(C) LB to HS				
Lawrence Berkeley	to Hanford Site		1.05E-05	5.80E-06
MLLW(C) SM to HS				
LERHR	to Hanford Site		9.03E-06	4.74E-06
MLLW(C) LL to HS				
Lawrence Livermore	to Hanford Site		4.37E-05	4.58E-05
MLLW(C) MZ to HS				
Mare Island	to Hanford Site		8.65E-03	4.86E-03
MLLW(C) US to SR				
Norfolk Nav Shipyd	to Savannah River		8.05E-04	1.41E-04
MLLW(C) NT to IN				
Nevada Test Site	to INEL		1.30E-08	2.10E-09
MLLW(C) PA to OR				
Paducah GDP	to Oak Ridge Reserv.		9.75E-04	1.25E-04
MLLW(C) PP to LA				
Pantex Plant	to Los Alamos NL		7.12E-05	8.96E-06
MLLW(C) SW to HS				
Pearl Harbor NS	to Hanford Site		1.11E-04	8.21E-05
MLLW(C) PT to PO				
Portsmouth NS	to Portsmouth GDP		3.37E-04	1.53E-04
MLLW(C) PR to PO				
Princeton PPL	to Portsmouth GDP		2.72E-09	1.28E-09
MLLW(C) PN to HS				
Puget Sound NS	to Hanford Site		2.47E-03	1.83E-03
MLLW(C) RM to PO				
Reactive Metals	to Portsmouth GDP		7.25E-07	2.09E-07
MLLW(C) SA to LA				
SNL - Albuquerque	to Los Alamos NL		8.43E-05	1.60E-06
MLLW(C) SL to HS				
SNL - Livermore	to Hanford Site		2.72E-06	1.43E-06

Table 5. Nonradiological Risk Factors per Shipment (fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
Ames Laboratory	to Portsmouth GDP	4.02E-06	4.11E-05
Argonne - East	to Portsmouth GDP	6.73E-06	2.60E-05
Bettis Atomic	to Portsmouth GDP	3.22E-06	1.33E-05
Battelle Columbus	to Portsmouth GDP	9.01E-07	3.65E-06
Brookhaven NL	to Portsmouth GDP	1.56E-05	4.90E-05
Charleston, SC	to Savannah River	3.22E-07	1.70E-05
Colonie	to Portsmouth GDP	5.63E-06	3.56E-05
ETEC	to INEL	2.55E-05	6.21E-05
Fernald (FEMP)	to Portsmouth GDP	1.93E-07	7.51E-06
General Atomic	to INEL	1.30E-05	6.23E-05
Grand Junction PO	to Rocky Flats Plant	2.93E-06	2.32E-05
Knolls Atomic	to Portsmouth GDP	5.63E-06	3.56E-05
Kansas City Plant	to Rocky Flats Plant	3.22E-06	4.74E-05
KKS	to Portsmouth GDP	5.63E-06	3.56E-05
KWS	to Portsmouth GDP	5.63E-06	3.56E-05
Lawrence Berkeley	to Hanford Site	1.16E-05	4.91E-05
LERHR	to Hanford Site	6.82E-06	4.66E-05
Lawrence Livermore	to Hanford Site	9.85E-06	5.03E-05
Mare Island	to Hanford Site	1.16E-05	4.91E-05
Norfolk Nav Shipyd	to Savannah River	1.58E-06	4.45E-05
Nevada Test Site	to INEL	8.08E-06	4.36E-05
Paducah GDP	to Oak Ridge Reserv.	1.93E-07	2.14E-05
Pantex Plant	to Los Alamos NL	3.28E-06	3.21E-05
Pearl Harbor NS	to Hanford Site	1.67E-06	9.56E-06
Portsmouth NS	to Portsmouth GDP	2.55E-05	6.65E-05
Princeton PPL	to Portsmouth GDP	1.16E-05	3.99E-05
Puget Sound NS	to Hanford Site	1.67E-06	9.56E-06
Reactive Metals	to Portsmouth GDP	2.45E-06	1.21E-05
SNL - Albuquerque	to Los Alamos NL	1.35E-06	1.20E-05
SNL - Livermore	to Hanford Site	9.85E-06	5.03E-05
Rail			
Ames Laboratory	to Portsmouth GDP	2.34E-05	1.52E-06
Argonne - East	to Portsmouth GDP	9.08E-06	8.84E-07
Bettis Atomic	to Portsmouth GDP	1.40E-05	8.98E-07
Battelle Columbus	to Portsmouth GDP	1.84E-06	1.90E-07
Brookhaven NL	to Portsmouth GDP	4.22E-05	1.93E-06
Charleston, SC	to Savannah River	1.46E-06	2.93E-07
Colonie	to Portsmouth GDP	2.15E-05	1.43E-06
ETEC	to INEL	3.48E-05	2.18E-06
Fernald (FEMP)	to Portsmouth GDP	3.43E-06	4.34E-07
General Atomic	to INEL	2.72E-05	2.25E-06
Grand Junction PO	to Rocky Flats Plant	2.51E-07	4.99E-07
Knolls Atomic	to Portsmouth GDP	2.15E-05	1.43E-06
Kansas City Plant	to Rocky Flats Plant	7.62E-06	1.63E-06
KKS	to Portsmouth GDP	2.15E-05	1.43E-06
KWS	to Portsmouth GDP	2.15E-05	1.43E-06
Lawrence Berkeley	to Hanford Site	2.33E-05	2.06E-06
LERHR	to Hanford Site	1.77E-05	1.86E-06
Lawrence Livermore	to Hanford Site	2.36E-05	2.04E-06
Mare Island	to Hanford Site	2.33E-05	2.06E-06
Norfolk Nav Shipyd	to Savannah River	3.64E-06	1.11E-06
Nevada Test Site	to INEL	3.98E-06	1.58E-06
Paducah GDP	to Oak Ridge Reserv.	3.81E-06	1.10E-06
Pantex Plant	to Los Alamos NL	2.59E-06	1.01E-06
Pearl Harbor NS	to Hanford Site	1.08E-05	8.70E-07
Portsmouth NS	to Portsmouth GDP	2.69E-05	2.01E-06
Princeton PPL	to Portsmouth GDP	3.18E-05	1.75E-06
Puget Sound NS	to Hanford Site	1.08E-05	8.70E-07
Reactive Metals	to Portsmouth GDP	1.14E-05	5.84E-07
SNL - Albuquerque	to Los Alamos NL	2.47E-06	2.18E-07
SNL - Livermore	to Hanford Site	2.36E-05	2.04E-06

Table 6. Annual Incident-Free Dose for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
		Crew	Public	Crew	Public
Ames Laboratory	to Portsmouth GDP	2.33E-02	2.63E-02	5.91E-03	2.01E-02
Argonne - East	to Portsmouth GDP	6.71E-01	7.49E-01	7.89E-02	1.98E-01
Bettis Atomic	to Portsmouth GDP	9.78E-03	1.04E-02	4.67E-03	1.48E-02
Battelle Columbus	to Portsmouth GDP	2.86E-03	3.17E-03	3.26E-03	5.22E-03
Brookhaven NL	to Portsmouth GDP	2.73E-02	2.99E-02	6.72E-03	3.41E-02
Charleston, SC	to Savannah River	6.19E-03	6.77E-03	3.47E-03	5.00E-03
Colonie	to Portsmouth GDP	2.54E-02	2.63E-02	5.72E-03	2.13E-02
ETEC	to INEL	2.58E-01	3.26E-01	2.17E-02	7.47E-02
Fernald (FEMP)	to Portsmouth GDP	4.00E-02	4.18E-02	1.12E-02	2.06E-02
General Atomic	to INEL	3.06E-02	3.64E-02	7.37E-03	2.18E-02
Grand Junction PO	to Rocky Flats Plant	8.39E-03	9.92E-03	3.88E-03	4.58E-03
Knolls Atomic	to Portsmouth GDP	2.54E-02	2.63E-02	5.72E-03	2.13E-02
Kansas City Plant	to Rocky Flats Plant	1.74E-02	2.11E-02	6.13E-03	1.07E-02
KKS	to Portsmouth GDP	2.54E-02	2.63E-02	5.72E-03	2.13E-02
KWS	to Portsmouth GDP	2.54E-02	2.63E-02	5.72E-03	2.13E-02
Lawrence Berkeley	to Hanford Site	2.76E-02	3.27E-02	6.99E-03	2.05E-02
LERHR	to Hanford Site	2.51E-02	2.94E-02	6.59E-03	1.70E-02
Lawrence Livermore	to Hanford Site	1.13E-01	1.31E-01	1.39E-02	4.10E-02
Mare Island	to Hanford Site	2.76E-02	3.27E-02	6.99E-03	2.05E-02
Norfolk Nav Shipyd	to Savannah River	1.59E-02	1.73E-02	5.09E-03	9.55E-03
Nevada Test Site	to INEL	2.13E-02	2.58E-02	6.04E-03	8.67E-03
Paducah GDP	to Oak Ridge Reserv.	8.88E-03	9.98E-03	5.08E-03	7.91E-03
Pantex Plant	to Los Alamos NL	2.23E-02	2.76E-02	4.89E-03	7.19E-03
Pearl Harbor NS	to Hanford Site	7.06E-03	8.04E-03	4.62E-03	1.15E-02
Portsmouth NS	to Portsmouth GDP	4.03E-02	4.36E-02	6.89E-03	2.78E-02
Princeton PPL	to Portsmouth GDP	2.28E-02	2.48E-02	6.38E-03	2.64E-02
Puget Sound NS	to Hanford Site	7.06E-03	8.04E-03	4.62E-03	1.15E-02
Reactive Metals	to Portsmouth GDP	1.00E-02	1.05E-02	4.05E-03	1.20E-02
SNL - Albuquerque	to Los Alamos NL	3.28E-03	3.84E-03	3.31E-03	5.37E-03
SNL - Livermore	to Hanford Site	2.82E-02	3.28E-02	6.94E-03	2.05E-02
Totals		1.58E+00	1.80E+00	2.69E-01	7.42E-01

Table 7. Annual Accident Dose Risk for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
Ames Laboratory	to Portsmouth GDP	1.84E-08	7.49E-09		
Argonne - East	to Portsmouth GDP	2.08E-02	4.28E-03		
Bettis Atomic	to Portsmouth GDP	1.00E-04	4.05E-05		
Battelle Columbus	to Portsmouth GDP	2.49E-10	6.63E-11		
Brookhaven NL	to Portsmouth GDP	4.93E-04	2.53E-04		
Charleston, SC	to Savannah River	5.98E-05	6.95E-06		
Colonie	to Portsmouth GDP	3.28E-08	7.61E-09		
ETEC	to INEL	1.75E-03	7.83E-04		
Fernald (FEMP)	to Portsmouth GDP	2.82E-05	6.44E-06		
General Atomic	to INEL	4.51E-07	1.77E-07		
Grand Junction PO	to Rocky Flats Plant	1.60E-08	1.77E-10		
Knolls Atomic	to Portsmouth GDP	1.98E-02	4.64E-03		
Kansas City Plant	to Rocky Flats Plant	6.95E-05	1.08E-05		
KKS	to Portsmouth GDP	2.17E-02	5.10E-03		
KWS	to Portsmouth GDP	6.98E-03	1.64E-03		
Lawrence Berkeley	to Hanford Site	1.05E-05	5.80E-06		
LERHR	to Hanford Site	9.03E-06	4.74E-06		
Lawrence Livermore	to Hanford Site	1.75E-04	9.17E-05		
Mare Island	to Hanford Site	8.65E-03	4.86E-03		
Norfolk Nav Shipyd	to Savannah River	8.05E-04	1.41E-04		
Nevada Test Site	to INEL	1.30E-08	2.10E-09		
Paducah GDP	to Oak Ridge Reserv.	9.75E-04	1.25E-04		
Pantex Plant	to Los Alamos NL	1.42E-04	8.96E-06		
Pearl Harbor NS	to Hanford Site	1.11E-04	8.21E-05		
Portsmouth NS	to Portsmouth GDP	3.37E-04	1.53E-04		
Princeton PPL	to Portsmouth GDP	2.72E-09	1.28E-09		
Puget Sound NS	to Hanford Site	2.47E-03	1.83E-03		
Reactive Metals	to Portsmouth GDP	7.25E-07	2.09E-07		
SNL - Albuquerque	to Los Alamos NL	8.43E-05	1.60E-06		
SNL - Livermore	to Hanford Site	2.72E-06	1.43E-06		
Totals		8.56E-02	2.40E-02		

Table 8. Expected Annual Fatalities for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	6.3E-04	1.1E-04
Normal Public	9.0E-04	3.7E-04
Accident Public	4.3E-05	1.2E-05
Nonradiological		
Emission	7.1E-04	7.2E-04
Accident	2.8E-03	6.1E-05

Table 9. Expected Annual Cancer Incidence for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	2.2E-03	3.8E-04
Normal Public	3.1E-03	1.3E-03
Accident Public	1.5E-04	4.1E-05
Nonradiological		
Emission	7.1E-04	7.2E-04
Accident	NA	NA

Table 10. Expected Annual Genetic Effects for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	9.5E-05	1.6E-05
Normal Public	1.8E-04	7.4E-05
Accident Public	7.6E-06	2.2E-06
Nonradiological		
Emission	NA	NA
Accident	NA	NA

B.20 WM LLMW REGIONALIZED 3 ALTERNATIVE (CASE 10a): CONTACT-HANDLED HETEROGENEOUS SOLIDS: ALPHA — UNTREATED

Table 1. Summary of Route Information

			Distance (miles)	Percentage in Zone		
				Rural	Suburban	Urban
Truck						
Bettis Atomic	to	Savannah River	656	71.7	26.4	1.9
Lawrence Livermore	to	INEL	972	85.7	10.4	4.0
Mound Plant	to	Savannah River	656	66.5	32.7	0.8
U of MO - Columbia	to	Savannah River	858	70.6	27.0	2.3
West Valley DP	to	Savannah River	883	70.3	28.5	1.2
Rail						
Bettis Atomic	to	Savannah River	947	68.5	27.1	4.4
Lawrence Livermore	to	INEL	1100	89.5	7.4	3.1
Mound Plant	to	Savannah River	744	67.4	29.2	3.3
U of MO - Columbia	to	Savannah River	1011	66.6	29.5	4.0
West Valley DP	to	Savannah River	1217	62.8	32.4	4.9

Table 2. Annual Number of Shipments and One-Way Shipment Distances

Route	# of Shipments		Total Mileage(mi)	
	Truck	Rail	Truck	Rail
Bettis Atomic to Savannah River	1	1	6.56E+02	9.47E+02
Lawrence Livermore to INEL	6	3	5.83E+03	3.30E+03
Mound Plant to Savannah River	1	1	6.56E+02	7.44E+02
U of MO - Columbia to Savannah River	1	1	8.58E+02	1.01E+03
West Valley DP to Savannah River	1	1	8.83E+02	1.22E+03
Totals	10	7	8.88E+03	7.22E+03

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

Source/Route(s)		Crew	General Public			
			Off-Link	On-Link	Stops	Total
MLLW(CA) BA to SR Bettis Atomic		to Savannah River				
	Truck	2.14E-02	1.96E-03	3.14E-03	1.84E-02	2.35E-02
	Rail	6.83E-03	1.32E-02	2.31E-04	6.39E-03	1.99E-02
MLLW(CA) LL to IN Lawrence Livermore		to INEL				
	Truck	2.85E-02	2.74E-03	5.33E-03	2.72E-02	3.53E-02
	Rail	7.47E-03	8.12E-03	1.38E-04	6.87E-03	1.51E-02
MLLW(CA) MP to SR Mound Plant		to Savannah River				
	Truck	2.21E-02	1.91E-03	2.83E-03	1.84E-02	2.31E-02
	Rail	5.99E-03	9.25E-03	1.78E-04	5.77E-03	1.52E-02
MLLW(CA) MC to SR U of MO - Columbia		to Savannah River				
	Truck	2.83E-02	2.79E-03	4.37E-03	2.40E-02	3.12E-02
	Rail	7.10E-03	1.39E-02	2.52E-04	6.59E-03	2.07E-02
MLLW(CA) WV to SR West Valley DP		to Savannah River				
	Truck	2.89E-02	2.45E-03	3.86E-03	2.47E-02	3.10E-02
	Rail	7.96E-03	1.95E-02	3.38E-04	7.23E-03	2.70E-02

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route		Truck	Rail
MLLW(CA) BA to SR			
Bettis Atomic	to Savannah River	2.11E-04	7.45E-05
MLLW(CA) LL to IN			
Lawrence Livermore	to INEL	5.14E-05	3.46E-05
MLLW(CA) MP to SR			
Mound Plant	to Savannah River	9.48E-08	1.85E-08
MLLW(CA) MC to SR			
U of MO - Columbia	to Savannah River	6.78E-07	2.05E-07
MLLW(CA) WV to SR			
West Valley DP	to Savannah River	3.36E-04	1.07E-04

Table 5. Nonradiological Risk Factors per Shipment (fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
Bettis Atomic	to Savannah River	3.99E-06	4.90E-05
Lawrence Livermore	to INEL	1.24E-05	5.73E-05
Mound Plant	to Savannah River	1.67E-06	5.26E-05
U of MO - Columbia	to Savannah River	6.41E-06	6.09E-05
West Valley DP	to Savannah River	3.28E-06	6.60E-05
Rail			
Bettis Atomic	to Savannah River	1.74E-05	1.98E-06
Lawrence Livermore	to INEL	1.41E-05	2.30E-06
Mound Plant	to Savannah River	1.03E-05	1.56E-06
U of MO - Columbia	to Savannah River	1.69E-05	2.12E-06
West Valley DP	to Savannah River	2.49E-05	2.55E-06

Table 6. Annual Incident-Free Dose for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
		Crew	Public	Crew	Public
Bettis Atomic	to Savannah River	2.14E-02	2.35E-02	6.83E-03	1.99E-02
Lawrence Livermore	to INEL	1.71E-01	2.12E-01	2.24E-02	4.54E-02
Mound Plant	to Savannah River	2.21E-02	2.31E-02	5.99E-03	1.52E-02
U of MO - Columbia	to Savannah River	2.83E-02	3.12E-02	7.10E-03	2.07E-02
West Valley DP	to Savannah River	2.89E-02	3.10E-02	7.96E-03	2.70E-02
Totals		2.71E-01	3.20E-01	5.03E-02	1.28E-01

Table 7. Annual Accident Dose Risk for the Shipping Campaign (person-rem/yr)

Route		Truck	Rail
Bettis Atomic	to Savannah River	2.11E-04	7.45E-05
Lawrence Livermore	to INEL	3.09E-04	1.04E-04
Mound Plant	to Savannah River	9.48E-08	1.85E-08
U of MO - Columbia	to Savannah River	6.78E-07	2.05E-07
West Valley DP	to Savannah River	3.36E-04	1.07E-04
Totals		8.56E-04	2.86E-04

Table 8. Expected Annual Fatalities for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	1.1E-04	2.0E-05
Normal Public	1.6E-04	6.4E-05
Accident Public	4.3E-07	1.4E-07
Nonradiological		
Emission	9.0E-05	1.1E-04
Accident	5.7E-04	1.5E-05

Table 9. Expected Annual Cancer Incidence for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	3.8E-04	7.0E-05
Normal Public	5.4E-04	2.2E-04
Accident Public	1.5E-06	4.9E-07
Nonradiological		
Emission	9.0E-05	1.1E-04
Accident	NA	NA

Table 10. Expected Annual Genetic Effects for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	1.6E-05	3.0E-06
Normal Public	3.2E-05	1.3E-05
Accident Public	5.2E-08	1.7E-08
Nonradiological		
Emission	NA	NA
Accident	NA	NA

B.21 WM LLMW REGIONALIZED 3 ALTERNATIVE (CASE 10a): CONTACT-HANDLED HETEROGENEOUS SOLIDS: NONALPHA — TREATED

Table 1. Summary of Route Information

Route	Distance (miles)	Percentage in Zone		
		Rural	Suburban	Urban
Truck				
Ames Laboratory to Nevada Test Site	1520	92.0	6.8	1.2
Argonne - East to Nevada Test Site	1815	91.0	8.0	1.0
Charleston, SC to Nevada Test Site	2545	84.4	14.0	1.6
Colonie to Nevada Test Site	407	76.9	18.3	4.8
Fernald (FEMP) to Nevada Test Site	2014	86.9	11.5	1.6
General Atomic to Nevada Test Site	398	73.9	19.8	6.3
Grand Junction PO to Nevada Test Site	573	93.1	5.3	1.7
Hanford Site to Nevada Test Site	1128	86.5	10.9	2.6
INEL to Nevada Test Site	712	82.8	13.7	3.5
Los Alamos NL to Nevada Test Site	997	93.2	5.7	1.1
LERHR to Nevada Test Site	735	81.1	11.2	7.6
Oak Ridge Reserv. to Nevada Test Site	2151	86.9	11.5	1.6
Paducah GDP to Nevada Test Site	1864	87.6	10.7	1.8
Pantex Plant to Nevada Test Site	1209	93.9	4.6	1.6
Portsmouth GDP to Nevada Test Site	2158	85.5	12.6	1.9
Rocky Flats Plant to Nevada Test Site	836	89.5	8.5	2.0
Reactive Metals to Nevada Test Site	2214	85.8	12.2	2.0
Savannah River to Nevada Test Site	2414	83.1	15.1	1.8
Rail				
Ames Laboratory to Nevada Test Site	1674	94.0	5.1	0.9
Argonne - East to Nevada Test Site	2348	92.8	6.4	0.8
Charleston, SC to Nevada Test Site	2945	84.3	13.7	2.0
Colonie to Nevada Test Site	518	73.4	15.9	10.7
Fernald (FEMP) to Nevada Test Site	2391	85.4	11.4	3.1
General Atomic to Nevada Test Site	518	73.4	15.9	10.7
Grand Junction PO to Nevada Test Site	749	96.0	3.8	0.2
Hanford Site to Nevada Test Site	1302	93.0	5.9	1.1
INEL to Nevada Test Site	756	92.8	5.9	1.3
Los Alamos NL to Nevada Test Site	1169	92.8	5.9	1.3
LERHR to Nevada Test Site	827	75.4	17.7	6.9
Oak Ridge Reserv. to Nevada Test Site	2487	91.4	7.2	1.5
Paducah GDP to Nevada Test Site	2131	90.9	7.6	1.5
Pantex Plant to Nevada Test Site	1376	94.9	4.4	0.7
Portsmouth GDP to Nevada Test Site	2401	86.3	10.7	2.9
Rocky Flats Plant to Nevada Test Site	987	95.9	3.9	0.2
Reactive Metals to Nevada Test Site	2391	83.1	13.1	3.7
Savannah River to Nevada Test Site	2839	84.5	13.5	1.9

Table 2. Annual Number of Shipments and One-Way Shipment Distances

Route	# of Shipments		Total Mileage(mi)	
	Truck	Rail	Truck	Rail
Ames Laboratory to Nevada Test Site	1	1	1.52E+03	1.67E+03
Argonne - East to Nevada Test Site	1	1	1.81E+03	2.35E+03
Charleston, SC to Nevada Test Site	1	1	2.55E+03	2.94E+03
Colonie to Nevada Test Site	1	1	4.07E+02	5.18E+02
Fernald (FEMP) to Nevada Test Site	2	1	4.03E+03	2.39E+03
General Atomic to Nevada Test Site	1	1	3.98E+02	5.18E+02
Grand Junction PO to Nevada Test Site	1	1	5.73E+02	7.49E+02
Hanford Site to Nevada Test Site	149	56	1.68E+05	7.29E+04
INEL to Nevada Test Site	16	6	1.14E+04	4.54E+03
Los Alamos NL to Nevada Test Site	4	2	3.99E+03	2.34E+03
LERHR to Nevada Test Site	1	1	7.35E+02	8.27E+02
Oak Ridge Reserv. to Nevada Test Site	206	77	4.43E+05	1.91E+05
Paducah GDP to Nevada Test Site	1	1	1.86E+03	2.13E+03
Pantex Plant to Nevada Test Site	1	1	1.21E+03	1.38E+03
Portsmouth GDP to Nevada Test Site	155	57	3.34E+05	1.37E+05
Rocky Flats Plant to Nevada Test Site	1	1	8.36E+02	9.87E+02
Reactive Metals to Nevada Test Site	1	1	2.21E+03	2.39E+03
Savannah River to Nevada Test Site	47	18	1.13E+05	5.11E+04
Totals	590	228	1.09E+06	4.78E+05

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

Source/Route(s)		Crew	General Public			
			Off-Link	On-Link	Stops	Total
MLLW(CT) AL to NT Ames Laboratory	to Nevada Test Site					
	Truck	4.03E-02	1.78E-03	5.25E-03	4.25E-02	4.96E-02
	Rail	9.87E-03	4.68E-03	1.36E-04	8.63E-03	1.34E-02
MLLW(CT) AN to NT Argonne - East	to Nevada Test Site					
	Truck	4.86E-02	2.13E-03	6.15E-03	5.08E-02	5.91E-02
	Rail	1.27E-02	6.96E-03	2.04E-04	1.07E-02	1.79E-02
MLLW(CT) CH to NT Charleston, SC	to Nevada Test Site					
	Truck	7.34E-02	4.87E-03	1.03E-02	7.13E-02	8.64E-02
	Rail	1.52E-02	1.96E-02	4.14E-04	1.25E-02	3.25E-02
MLLW(CT) CL to NT Colonie	to Nevada Test Site					
	Truck	1.31E-02	1.56E-03	2.61E-03	1.14E-02	1.56E-02
	Rail	5.04E-03	1.22E-02	1.45E-04	5.07E-03	1.74E-02
MLLW(CT) FE to NT Fernald (FEMP)	to Nevada Test Site					
	Truck	5.67E-02	3.50E-03	7.96E-03	5.64E-02	6.78E-02
	Rail	1.29E-02	2.00E-02	3.50E-04	1.08E-02	3.12E-02
MLLW(CT) SO to NT General Atomic	to Nevada Test Site					
	Truck	1.33E-02	1.88E-03	2.99E-03	1.11E-02	1.60E-02
	Rail	5.04E-03	1.22E-02	1.45E-04	5.07E-03	1.74E-02
MLLW(CT) GJ to NT Grand Junction PO	to Nevada Test Site					
	Truck	1.51E-02	7.35E-04	2.12E-03	1.60E-02	1.89E-02
	Rail	6.01E-03	9.43E-04	4.85E-05	5.78E-03	6.78E-03
MLLW(CT) HS to NT Hanford Site	to Nevada Test Site					
	Truck	3.22E-02	2.46E-03	5.18E-03	3.16E-02	3.92E-02
	Rail	8.31E-03	4.39E-03	1.15E-04	7.49E-03	1.20E-02
MLLW(CT) IN to NT INEL	to Nevada Test Site					
	Truck	2.13E-02	2.03E-03	3.79E-03	1.99E-02	2.58E-02
	Rail	6.04E-03	2.80E-03	6.88E-05	5.81E-03	8.67E-03
MLLW(CT) LA to NT Los Alamos NL	to Nevada Test Site					
	Truck	2.61E-02	1.04E-03	3.33E-03	2.79E-02	3.23E-02
	Rail	7.76E-03	4.40E-03	1.07E-04	7.08E-03	1.16E-02
MLLW(CT) SM to NT LERHR	to Nevada Test Site					
	Truck	2.34E-02	3.47E-03	5.89E-03	2.06E-02	2.99E-02
	Rail	6.33E-03	1.38E-02	1.93E-04	6.02E-03	2.00E-02
MLLW(CT) OR to NT Oak Ridge Reserv.	to Nevada Test Site					
	Truck	6.04E-02	3.66E-03	8.38E-03	6.02E-02	7.22E-02
	Rail	1.33E-02	1.08E-02	2.50E-04	1.11E-02	2.22E-02
MLLW(CT) PA to NT Paducah GDP	to Nevada Test Site					
	Truck	5.22E-02	3.26E-03	7.47E-03	5.22E-02	6.29E-02
	Rail	1.18E-02	9.42E-03	2.18E-04	1.00E-02	1.97E-02
MLLW(CT) PP to NT Pantex Plant	to Nevada Test Site					
	Truck	3.16E-02	1.43E-03	4.34E-03	3.38E-02	3.96E-02
	Rail	8.62E-03	3.19E-03	1.03E-04	7.72E-03	1.10E-02
MLLW(CT) PO to NT Portsmouth GDP	to Nevada Test Site					
	Truck	6.17E-02	4.18E-03	8.96E-03	6.04E-02	7.36E-02
	Rail	1.29E-02	1.88E-02	3.36E-04	1.09E-02	3.01E-02
MLLW(CT) RF to NT Rocky Flats Plant	to Nevada Test Site					
	Truck	2.30E-02	1.44E-03	3.43E-03	2.34E-02	2.83E-02
	Rail	7.00E-03	1.29E-03	6.47E-05	6.52E-03	7.88E-03
MLLW(CT) RM to NT Reactive Metals	to Nevada Test Site					
	Truck	6.33E-02	4.39E-03	9.38E-03	6.20E-02	7.58E-02
	Rail	1.29E-02	2.35E-02	3.91E-04	1.08E-02	3.47E-02
MLLW(CT) SR to NT Savannah River	to Nevada Test Site					
	Truck	7.07E-02	5.10E-03	1.03E-02	6.76E-02	8.30E-02
	Rail	1.47E-02	1.85E-02	3.95E-04	1.22E-02	3.11E-02

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route			Truck	Rail
MLLW(CT) AL to NT				
Ames Laboratory	to Nevada Test Site		2.30E-08	6.01E-09
MLLW(CT) AN to NT				
Argonne - East	to Nevada Test Site		2.08E-05	3.99E-06
MLLW(CT) CH to NT				
Charleston, SC	to Nevada Test Site		6.63E-04	1.26E-04
MLLW(CT) CL to NT				
Colonie	to Nevada Test Site		2.54E-08	1.54E-08
MLLW(CT) FE to NT				
Fernald (FEMP)	to Nevada Test Site		9.55E-05	8.86E-05
MLLW(CT) SO to NT				
General Atomic	to Nevada Test Site		9.22E-07	5.27E-07
MLLW(CT) GJ to NT				
Grand Junction PO	to Nevada Test Site		1.84E-08	2.27E-09
MLLW(CT) HS to NT				
Hanford Site	to Nevada Test Site		1.56E-03	1.03E-03
MLLW(CT) IN to NT				
INEL	to Nevada Test Site		4.96E-03	2.08E-03
MLLW(CT) LA to NT				
Los Alamos NL	to Nevada Test Site		1.27E-04	1.86E-05
MLLW(CT) SM to NT				
LERHR	to Nevada Test Site		7.12E-07	4.22E-07
MLLW(CT) OR to NT				
Oak Ridge Reserv.	to Nevada Test Site		1.58E-03	8.35E-04
MLLW(CT) PA to NT				
Paducah GDP	to Nevada Test Site		8.93E-04	1.77E-04
MLLW(CT) PP to NT				
Pantex Plant	to Nevada Test Site		1.35E-05	1.40E-06
MLLW(CT) PO to NT				
Portsmouth GDP	to Nevada Test Site		7.76E-04	8.13E-04
MLLW(CT) RF to NT				
Rocky Flats Plant	to Nevada Test Site		8.31E-05	4.41E-06
MLLW(CT) RM to NT				
Reactive Metals	to Nevada Test Site		1.67E-06	6.28E-07
MLLW(CT) SR to NT				
Savannah River	to Nevada Test Site		5.10E-03	2.72E-03

Table 5. Nonradiological Risk Factors per Shipment
(fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
Ames Laboratory	to Nevada Test Site	5.92E-06	9.75E-05
Argonne - East	to Nevada Test Site	6.02E-06	1.14E-04
Charleston, SC	to Nevada Test Site	1.32E-05	1.92E-04
Colonie	to Nevada Test Site	6.31E-06	2.96E-05
Fernald (FEMP)	to Nevada Test Site	1.06E-05	1.41E-04
General Atomic	to Nevada Test Site	8.11E-06	2.85E-05
Grand Junction PO	to Nevada Test Site	3.06E-06	3.96E-05
Hanford Site	to Nevada Test Site	9.50E-06	6.38E-05
INEL	to Nevada Test Site	8.08E-06	4.36E-05
Los Alamos NL	to Nevada Test Site	3.54E-06	7.82E-05
LERHR	to Nevada Test Site	1.81E-05	5.49E-05
Oak Ridge Reserv.	to Nevada Test Site	1.08E-05	1.54E-04
Paducah GDP	to Nevada Test Site	1.07E-05	1.34E-04
Pantex Plant	to Nevada Test Site	6.05E-06	9.02E-05
Portsmouth GDP	to Nevada Test Site	1.29E-05	1.48E-04
Rocky Flats Plant	to Nevada Test Site	5.50E-06	6.18E-05
Reactive Metals	to Nevada Test Site	1.43E-05	1.36E-04
Savannah River	to Nevada Test Site	1.43E-05	1.74E-04
Rail			
Ames Laboratory	to Nevada Test Site	6.07E-06	3.50E-06
Argonne - East	to Nevada Test Site	7.99E-06	4.91E-06
Charleston, SC	to Nevada Test Site	2.42E-05	6.16E-06
Colonie	to Nevada Test Site	2.32E-05	1.08E-06
Fernald (FEMP)	to Nevada Test Site	3.13E-05	5.00E-06
General Atomic	to Nevada Test Site	2.32E-05	1.08E-06
Grand Junction PO	to Nevada Test Site	5.86E-07	1.57E-06
Hanford Site	to Nevada Test Site	5.90E-06	2.72E-06
INEL	to Nevada Test Site	3.98E-06	1.58E-06
Los Alamos NL	to Nevada Test Site	6.32E-06	2.45E-06
LERHR	to Nevada Test Site	2.38E-05	1.73E-06
Oak Ridge Reserv.	to Nevada Test Site	1.52E-05	5.20E-06
Paducah GDP	to Nevada Test Site	1.29E-05	4.46E-06
Pantex Plant	to Nevada Test Site	3.98E-06	2.88E-06
Portsmouth GDP	to Nevada Test Site	2.95E-05	5.02E-06
Rocky Flats Plant	to Nevada Test Site	8.37E-07	2.07E-06
Reactive Metals	to Nevada Test Site	3.72E-05	5.00E-06
Savannah River	to Nevada Test Site	2.27E-05	5.94E-06

Table 6. Annual Incident-Free Dose for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
		Crew	Public	Crew	Public
Ames Laboratory	to Nevada Test Site	4.03E-02	4.96E-02	9.87E-03	1.34E-02
Argonne - East	to Nevada Test Site	4.86E-02	5.91E-02	1.27E-02	1.79E-02
Charleston, SC	to Nevada Test Site	7.34E-02	8.64E-02	1.52E-02	3.25E-02
Colonie	to Nevada Test Site	1.31E-02	1.56E-02	5.04E-03	1.74E-02
Fernald (FEMP)	to Nevada Test Site	1.13E-01	1.36E-01	1.29E-02	3.12E-02
General Atomic	to Nevada Test Site	1.33E-02	1.60E-02	5.04E-03	1.74E-02
Grand Junction PO	to Nevada Test Site	1.51E-02	1.89E-02	6.01E-03	6.78E-03
Hanford Site	to Nevada Test Site	4.80E+00	5.84E+00	4.66E-01	6.72E-01
INEL	to Nevada Test Site	3.41E-01	4.12E-01	3.62E-02	5.20E-02
Los Alamos NL	to Nevada Test Site	1.04E-01	1.29E-01	1.55E-02	2.32E-02
LERHR	to Nevada Test Site	2.34E-02	2.99E-02	6.33E-03	2.00E-02
Oak Ridge Reserv.	to Nevada Test Site	1.24E+01	1.49E+01	1.02E+00	1.71E+00
Paducah GDP	to Nevada Test Site	5.22E-02	6.29E-02	1.18E-02	1.97E-02
Pantex Plant	to Nevada Test Site	3.16E-02	3.96E-02	8.62E-03	1.10E-02
Portsmouth GDP	to Nevada Test Site	9.57E+00	1.14E+01	7.35E-01	1.71E+00
Rocky Flats Plant	to Nevada Test Site	2.30E-02	2.83E-02	7.00E-03	7.88E-03
Reactive Metals	to Nevada Test Site	6.33E-02	7.58E-02	1.29E-02	3.47E-02
Savannah River	to Nevada Test Site	3.32E+00	3.90E+00	2.65E-01	5.60E-01
Totals		3.11E+01	3.72E+01	2.65E+00	4.96E+00

Table 7. Annual Accident Dose Risk for the Shipping Campaign
(person-rem/yr)

Route		Truck	Rail
Ames Laboratory	to Nevada Test Site	2.30E-08	6.01E-09
Argonne - East	to Nevada Test Site	2.08E-05	3.99E-06
Charleston, SC	to Nevada Test Site	6.63E-04	1.26E-04
Colonie	to Nevada Test Site	2.54E-08	1.54E-08
Fernald (FEMP)	to Nevada Test Site	1.91E-04	8.86E-05
General Atomic	to Nevada Test Site	9.22E-07	5.27E-07
Grand Junction PO	to Nevada Test Site	1.84E-08	2.27E-09
Hanford Site	to Nevada Test Site	2.33E-01	5.77E-02
INEL	to Nevada Test Site	7.93E-02	1.25E-02
Los Alamos NL	to Nevada Test Site	5.09E-04	3.72E-05
LERHR	to Nevada Test Site	7.12E-07	4.22E-07
Oak Ridge Reserv.	to Nevada Test Site	3.25E-01	6.43E-02
Paducah GDP	to Nevada Test Site	8.93E-04	1.77E-04
Pantex Plant	to Nevada Test Site	1.35E-05	1.40E-06
Portsmouth GDP	to Nevada Test Site	1.20E-01	4.63E-02
Rocky Flats Plant	to Nevada Test Site	8.31E-05	4.41E-06
Reactive Metals	to Nevada Test Site	1.67E-06	6.28E-07
Savannah River	to Nevada Test Site	2.40E-01	4.90E-02
Totals		9.99E-01	2.30E-01

Table 8. Expected Annual Fatalities for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	1.2E-02	1.1E-03
Normal Public	1.9E-02	2.5E-03
Accident Public	5.0E-04	1.2E-04
Nonradiological		
Emission	6.6E-03	3.8E-03
Accident	7.5E-02	1.0E-03

Table 9. Expected Annual Cancer Incidence for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	4.4E-02	3.7E-03
Normal Public	6.3E-02	8.4E-03
Accident Public	1.7E-03	3.9E-04
Nonradiological		
Emission	6.6E-03	3.8E-03
Accident	NA	NA

Table 10. Expected Annual Genetic Effects for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	1.9E-03	1.6E-04
Normal Public	3.7E-03	5.0E-04
Accident Public	7.7E-05	1.6E-05
Nonradiological		
Emission	NA	NA
Accident	NA	NA

B.22 WM LLMW REGIONALIZED 3 ALTERNATIVE (CASE 10a): CONTACT-HANDLED HETEROGENEOUS SOLIDS: ALPHA — TREATED

Table 1. Summary of Route Information

					Percentage in Zone			
					Distance (miles)	Rural	Suburban	Urban
Route								
Truck								
INEL	to Nevada	Test Site		712	82.8	13.7	3.5	
Los Alamos NL	to Nevada	Test Site		997	93.2	5.7	1.1	
Rocky Flats Plant	to Nevada	Test Site		836	89.5	8.5	2.0	
Savannah River	to Nevada	Test Site		2414	83.1	15.1	1.8	
West Valley DP	to Nevada	Test Site		2373	83.7	14.3	2.0	
Rail								
INEL	to Nevada	Test Site		756	92.8	5.9	1.3	
Los Alamos NL	to Nevada	Test Site		1169	92.8	5.9	1.3	
Rocky Flats Plant	to Nevada	Test Site		987	95.9	3.9	0.2	
Savannah River	to Nevada	Test Site		2839	84.5	13.5	1.9	
West Valley DP	to Nevada	Test Site		2554	80.8	15.1	4.0	

Table 2. Annual Number of Shipments and One-Way Shipment Distances

Route		# of Shipments		Total Mileage(mi)	
		Truck	Rail	Truck	Rail
INEL to Nevada Test Site		98	37	6.98E+04	2.80E+04
Los Alamos NL to Nevada Test Site		8	3	7.98E+03	3.51E+03
Rocky Flats Plant to Nevada Test Site		252	94	2.11E+05	9.28E+04
Savannah River to Nevada Test Site		15	6	3.62E+04	1.70E+04
West Valley DP to Nevada Test Site		1	1	2.37E+03	2.55E+03
Totals		374	141	3.27E+05	1.44E+05

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

Source/Route(s)		Crew	General Public				
			Off-Link	On-Link	Stops	Total	
MLLW(T) IN to NT							
INEL	to Nevada Test Site						
	Truck	2.13E-02	2.03E-03	3.79E-03	1.99E-02	2.58E-02	
	Rail	6.04E-03	2.80E-03	6.88E-05	5.81E-03	8.67E-03	
MLLW(T) LA to NT							
Los Alamos NL	to Nevada Test Site						
	Truck	2.61E-02	1.04E-03	3.33E-03	2.79E-02	3.23E-02	
	Rail	7.76E-03	4.40E-03	1.07E-04	7.08E-03	1.16E-02	
MLLW(T) RF to NT							
Rocky Flats Plant	to Nevada Test Site						
	Truck	2.30E-02	1.44E-03	3.43E-03	2.34E-02	2.83E-02	
	Rail	7.00E-03	1.29E-03	6.47E-05	6.52E-03	7.88E-03	
MLLW(T) SR to NT							
Savannah River	to Nevada Test Site						
	Truck	7.07E-02	5.10E-03	1.03E-02	6.76E-02	8.30E-02	
	Rail	1.47E-02	1.85E-02	3.95E-04	1.22E-02	3.11E-02	
MLLW(T) WV to NT							
West Valley DP	to Nevada Test Site						
	Truck	6.92E-02	5.06E-03	1.02E-02	6.64E-02	8.17E-02	
	Rail	1.35E-02	2.77E-02	4.56E-04	1.13E-02	3.95E-02	

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route			Truck	Rail
MLLW(T) IN to NT				
INEL	to Nevada Test Site		7.53E-04	3.19E-04
MLLW(T) LA to NT				
Los Alamos NL	to Nevada Test Site		1.16E-04	2.50E-05
MLLW(T) RF to NT				
Rocky Flats Plant	to Nevada Test Site		9.61E-05	1.45E-05
MLLW(T) SR to NT				
Savannah River	to Nevada Test Site		2.41E-03	1.27E-03
MLLW(T) WV to NT				
West Valley DP	to Nevada Test Site		1.42E-04	5.58E-05

Table 5. Nonradiological Risk Factors per Shipment (fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
INEL	to Nevada Test Site	8.08E-06	4.36E-05
Los Alamos NL	to Nevada Test Site	3.54E-06	7.82E-05
Rocky Flats Plant	to Nevada Test Site	5.50E-06	6.18E-05
Savannah River	to Nevada Test Site	1.43E-05	1.74E-04
West Valley DP	to Nevada Test Site	1.52E-05	1.46E-04
Rail			
INEL	to Nevada Test Site	3.98E-06	1.58E-06
Los Alamos NL	to Nevada Test Site	6.32E-06	2.45E-06
Rocky Flats Plant	to Nevada Test Site	8.37E-07	2.07E-06
Savannah River	to Nevada Test Site	2.27E-05	5.94E-06
West Valley DP	to Nevada Test Site	4.33E-05	5.34E-06

Table 6. Annual Incident-Free Dose for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
		Crew	Public	Crew	Public
INEL	to Nevada Test Site	2.09E+00	2.52E+00	2.23E-01	3.21E-01
Los Alamos NL	to Nevada Test Site	2.09E-01	2.58E-01	2.33E-02	3.48E-02
Rocky Flats Plant	to Nevada Test Site	5.80E+00	7.12E+00	6.58E-01	7.41E-01
Savannah River	to Nevada Test Site	1.06E+00	1.24E+00	8.84E-02	1.87E-01
West Valley DP	to Nevada Test Site	6.92E-02	8.17E-02	1.35E-02	3.95E-02
Totals		9.23E+00	1.12E+01	1.01E+00	1.32E+00

Table 7. Annual Accident Dose Risk for the Shipping Campaign (person-rem/yr)

Route		Truck	Rail
INEL	to Nevada Test Site	7.38E-02	1.18E-02
Los Alamos NL	to Nevada Test Site	9.27E-04	7.51E-05
Rocky Flats Plant	to Nevada Test Site	2.42E-02	1.36E-03
Savannah River	to Nevada Test Site	3.61E-02	7.62E-03
West Valley DP	to Nevada Test Site	1.42E-04	5.58E-05
Totals		1.35E-01	2.09E-02

Table 8. Expected Annual Fatalities for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	3.7E-03	4.0E-04
Normal Public	5.6E-03	6.6E-04
Accident Public	6.8E-05	1.0E-05
Nonradiological		
Emission	2.4E-03	4.2E-04
Accident	2.3E-02	3.0E-04

Table 9. Expected Annual Cancer Incidence
for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	1.3E-02	1.4E-03
Normal Public	1.9E-02	2.2E-03
Accident Public	2.3E-04	3.6E-05
Nonradiological		
Emission	2.4E-03	4.2E-04
Accident	NA	NA

Table 10. Expected Annual Genetic Effects
for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	5.5E-04	6.0E-05
Normal Public	1.1E-03	1.3E-04
Accident Public	1.0E-05	1.6E-06
Nonradiological		
Emission	NA	NA
Accident	NA	NA

B.23 WM LLMW REGIONALIZED 4 ALTERNATIVE (CASE 15): CONTACT-HANDLED ORGANIC LIQUIDS: NONALPHA — UNTREATED

Table 1. Summary of Route Information

Route	Distance (miles)	Percentage in Zone			
		Rural	Suburban	Urban	
Truck					
Bettis Atomic	to Oak Ridge Reserv.	562	70.7	27.4	1.9
Brookhaven NL	to Oak Ridge Reserv.	821	56.9	37.9	5.2
Charleston, SC	to Savannah River	200	75.7	23.8	0.5
Colonie	to Oak Ridge Reserv.	2193	84.1	13.8	2.1
ETEC	to INEL	979	77.7	14.2	8.1
Fernald (FEMP)	to Oak Ridge Reserv.	312	69.9	29.5	0.6
General Atomic	to INEL	976	78.8	17.1	4.1
Grand Junction PO	to INEL	670	85.1	12.0	2.8
ITRI	to INEL	1177	88.6	9.8	1.6
Knolls Atomic	to Oak Ridge Reserv.	885	66.6	32.6	0.8
KKS	to Oak Ridge Reserv.	885	66.6	32.6	0.8
KWS	to Oak Ridge Reserv.	885	66.6	32.6	0.8
Los Alamos NL	to INEL	1144	88.7	9.8	1.4
Lawrence Berkeley	to Hanford Site	875	78.1	17.8	4.1
LERHR	to Hanford Site	830	80.5	17.0	2.6
Lawrence Livermore	to Hanford Site	894	77.2	19.3	3.4
Paducah GDP	to Oak Ridge Reserv.	304	81.3	18.5	0.2
Pantex Plant	to INEL	1468	89.8	8.6	1.6
Pearl Harbor NS	to Hanford Site	226	76.8	20.9	2.3
Portsmouth GDP	to Oak Ridge Reserv.	371	74.5	24.6	0.9
Puget Sound NS	to Hanford Site	226	76.8	20.9	2.3
Reactive Metals	to Oak Ridge Reserv.	608	64.1	34.1	1.8
SNL - Albuquerque	to INEL	1168	88.6	9.8	1.6
SNL - Livermore	to Hanford Site	894	77.2	19.3	3.4
Rail					
Bettis Atomic	to Oak Ridge Reserv.	903	64.0	31.3	4.7
Brookhaven NL	to Oak Ridge Reserv.	1152	39.5	44.7	15.8
Charleston, SC	to Savannah River	140	83.9	13.6	2.5
Colonie	to Oak Ridge Reserv.	2709	86.8	10.0	3.1
ETEC	to INEL	1041	81.5	10.5	8.0
Fernald (FEMP)	to Oak Ridge Reserv.	358	75.7	21.8	2.5
General Atomic	to INEL	1076	82.6	11.4	6.0
Grand Junction PO	to INEL	517	83.7	13.9	2.4
ITRI	to INEL	1247	91.0	7.6	1.4
Knolls Atomic	to Oak Ridge Reserv.	957	42.1	43.9	14.0
KKS	to Oak Ridge Reserv.	957	42.1	43.9	14.0
KWS	to Oak Ridge Reserv.	957	42.1	43.9	14.0
Los Alamos NL	to INEL	1179	92.2	6.8	1.0
Lawrence Berkeley	to Hanford Site	986	78.5	15.8	5.7
LERHR	to Hanford Site	890	81.0	14.3	4.7
Lawrence Livermore	to Hanford Site	973	78.9	15.3	5.8
Paducah GDP	to Oak Ridge Reserv.	527	89.3	9.0	1.7
Pantex Plant	to INEL	1141	91.3	7.6	1.0
Pearl Harbor NS	to Hanford Site	416	73.7	20.1	6.2
Portsmouth GDP	to Oak Ridge Reserv.	442	66.8	31.5	1.7
Puget Sound NS	to Hanford Site	416	73.7	20.1	6.2
Reactive Metals	to Oak Ridge Reserv.	600	59.4	33.2	7.4
SNL - Albuquerque	to INEL	1247	91.0	7.6	1.4
SNL - Livermore	to Hanford Site	973	78.9	15.3	5.8

Table 2. Annual Number of Shipments and One-Way Shipment Distances

Route		# of Shipments		Total Mileage(mi)	
		Truck	Rail	Truck	Rail
Bettis Atomic	to Oak Ridge Reserv.	1	1	5.62E+02	9.03E+02
Brookhaven NL	to Oak Ridge Reserv.	1	1	8.21E+02	1.15E+03
Charleston, SC	to Savannah River	1	1	2.00E+02	1.40E+02
Colonie	to Oak Ridge Reserv.	1	1	2.19E+03	2.71E+03
ETEC	to INEL	1	1	9.79E+02	1.04E+03
Fernald (FEMP)	to Oak Ridge Reserv.	2	1	6.24E+02	3.58E+02
General Atomic	to INEL	1	1	9.76E+02	1.08E+03
Grand Junction PO	to INEL	1	1	6.70E+02	5.17E+02
ITRI	to INEL	1	1	1.18E+03	1.25E+03
Knolls Atomic	to Oak Ridge Reserv.	1	1	8.85E+02	9.57E+02
KKS	to Oak Ridge Reserv.	1	1	8.85E+02	9.57E+02
KWS	to Oak Ridge Reserv.	1	1	8.85E+02	9.57E+02
Los Alamos NL	to INEL	1	1	1.14E+03	1.18E+03
Lawrence Berkeley	to Hanford Site	1	1	8.75E+02	9.86E+02
LERHR	to Hanford Site	1	1	8.30E+02	8.90E+02
Lawrence Livermore	to Hanford Site	5	2	4.47E+03	1.95E+03
Paducah GDP	to Oak Ridge Reserv.	3	1	9.12E+02	5.27E+02
Pantex Plant	to INEL	1	1	1.47E+03	1.14E+03
Pearl Harbor NS	to Hanford Site	1	1	2.26E+02	4.16E+02
Portsmouth GDP	to Oak Ridge Reserv.	3	2	1.11E+03	8.84E+02
Puget Sound NS	to Hanford Site	1	1	2.26E+02	4.16E+02
Reactive Metals	to Oak Ridge Reserv.	1	1	6.08E+02	6.00E+02
SNL - Albuquerque	to INEL	1	1	1.17E+03	1.25E+03
SNL - Livermore	to Hanford Site	1	1	8.94E+02	9.73E+02
Totals		33	26	2.48E+04	2.32E+04

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

Source/Route(s)		Crew	General Public			
			Off-Link	On-Link	Stops	Total
MLLW(O) BA to OR Bettis Atomic	to Oak Ridge Reserv.					
	Truck	1.85E-02	1.72E-03	2.71E-03	1.57E-02	2.02E-02
	Rail	6.65E-03	1.40E-02	2.44E-04	6.26E-03	2.05E-02
MLLW(O) BN to OR Brookhaven NL	to Oak Ridge Reserv.					
	Truck	3.11E-02	4.51E-03	6.17E-03	2.30E-02	3.37E-02
	Rail	7.69E-03	4.49E-02	5.76E-04	7.03E-03	5.25E-02
MLLW(O) CH to SR Charleston, SC	to Savannah River					
	Truck	6.19E-03	4.20E-04	7.45E-04	5.60E-03	6.77E-03
	Rail	3.47E-03	1.07E-03	2.07E-05	3.91E-03	5.00E-03
MLLW(O) CL to OR Colonie	to Oak Ridge Reserv.					
	Truck	6.37E-02	4.68E-03	9.54E-03	6.14E-02	7.56E-02
	Rail	1.42E-02	2.19E-02	3.78E-04	1.18E-02	3.41E-02
MLLW(O) LC to IN ETEC	to INEL					
	Truck	3.23E-02	5.06E-03	8.27E-03	2.74E-02	4.07E-02
	Rail	7.22E-03	1.80E-02	2.22E-04	6.68E-03	2.49E-02
MLLW(O) FE to OR Fernald (FEMP)	to Oak Ridge Reserv.					
	Truck	1.02E-02	8.00E-04	1.26E-03	8.73E-03	1.08E-02
	Rail	4.37E-03	3.32E-03	6.75E-05	4.58E-03	7.96E-03
MLLW(O) SO to IN General Atomic	to INEL					
	Truck	3.06E-02	3.33E-03	5.75E-03	2.73E-02	3.64E-02
	Rail	7.37E-03	1.48E-02	2.03E-04	6.79E-03	2.18E-02
MLLW(O) GJ to IN Grand Junction PO	to INEL					
	Truck	1.95E-02	1.59E-03	3.20E-03	1.88E-02	2.35E-02
	Rail	5.04E-03	3.86E-03	7.64E-05	5.07E-03	9.01E-03
MLLW(O) IT to IN ITRI	to INEL					
	Truck	3.25E-02	1.87E-03	4.53E-03	3.29E-02	3.93E-02
	Rail	8.09E-03	5.30E-03	1.26E-04	7.32E-03	1.27E-02
MLLW(O) KA to OR Knolls Atomic	to Oak Ridge Reserv.					
	Truck	2.98E-02	2.55E-03	3.79E-03	2.48E-02	3.11E-02
	Rail	6.87E-03	3.39E-02	4.49E-04	6.42E-03	4.08E-02
MLLW(O) KK to OR KKS	to Oak Ridge Reserv.					
	Truck	2.98E-02	2.55E-03	3.79E-03	2.48E-02	3.11E-02
	Rail	6.87E-03	3.39E-02	4.49E-04	6.42E-03	4.08E-02
MLLW(O) KW to OR KWS	to Oak Ridge Reserv.					
	Truck	2.98E-02	2.55E-03	3.79E-03	2.48E-02	3.11E-02
	Rail	6.87E-03	3.39E-02	4.49E-04	6.42E-03	4.08E-02
MLLW(O) LA to IN Los Alamos NL	to INEL					
	Truck	3.15E-02	1.73E-03	4.27E-03	3.20E-02	3.80E-02
	Rail	7.80E-03	4.00E-03	1.08E-04	7.11E-03	1.12E-02
MLLW(O) LB to HS Lawrence Berkeley	to Hanford Site					
	Truck	2.76E-02	3.02E-03	5.17E-03	2.45E-02	3.27E-02
	Rail	6.99E-03	1.38E-02	2.03E-04	6.51E-03	2.05E-02
MLLW(O) SM to HS LERHR	to Hanford Site					
	Truck	2.51E-02	2.17E-03	4.00E-03	2.32E-02	2.94E-02
	Rail	6.59E-03	1.07E-02	1.64E-04	6.22E-03	1.70E-02
MLLW(O) LL to HS Lawrence Livermore	to Hanford Site					
	Truck	2.82E-02	2.88E-03	4.92E-03	2.50E-02	3.28E-02
	Rail	6.94E-03	1.38E-02	2.00E-04	6.48E-03	2.05E-02
MLLW(O) PA to OR Paducah GDP	to Oak Ridge Reserv.					
	Truck	8.88E-03	4.70E-04	9.98E-04	8.51E-03	9.98E-03
	Rail	5.08E-03	2.75E-03	5.97E-05	5.10E-03	7.91E-03
MLLW(O) PP to IN Pantex Plant	to INEL					
	Truck	4.01E-02	2.24E-03	5.63E-03	4.11E-02	4.90E-02
	Rail	7.64E-03	4.12E-03	1.10E-04	6.99E-03	1.12E-02
MLLW(O) SW to HS Pearl Harbor NS	to Hanford Site					
	Truck	7.06E-03	6.28E-04	1.09E-03	6.33E-03	8.04E-03
	Rail	4.62E-03	6.63E-03	9.79E-05	4.76E-03	1.15E-02

Table 3. Incident-Free Dose per Shipment (person-rem/shipment) (Cont.)

Source/Route(s)		Crew	General Public			
			Off-Link	On-Link	Stops	Total
MLLW(O) PO to OR						
Portsmouth GDP	to Oak Ridge Reserv.					
	Truck	1.16E-02	8.77E-04	1.50E-03	1.04E-02	1.28E-02
	Rail	4.73E-03	4.37E-03	1.00E-04	4.84E-03	9.32E-03
MLLW(O) PN to HS						
Puget Sound NS	to Hanford Site					
	Truck	7.06E-03	6.28E-04	1.09E-03	6.33E-03	8.04E-03
	Rail	4.62E-03	6.63E-03	9.79E-05	4.76E-03	1.15E-02
MLLW(O) RM to OR						
Reactive Metals	to Oak Ridge Reserv.					
	Truck	2.11E-02	2.15E-03	3.08E-03	1.70E-02	2.23E-02
	Rail	5.38E-03	1.25E-02	1.91E-04	5.33E-03	1.80E-02
MLLW(O) SA to IN						
SNL - Albuquerque	to INEL					
	Truck	3.22E-02	1.83E-03	4.46E-03	3.27E-02	3.90E-02
	Rail	8.09E-03	5.30E-03	1.26E-04	7.32E-03	1.27E-02
MLLW(O) SL to HS						
SNL - Livermore	to Hanford Site					
	Truck	2.82E-02	2.88E-03	4.92E-03	2.50E-02	3.28E-02
	Rail	6.94E-03	1.38E-02	2.00E-04	6.48E-03	2.05E-02

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route		Truck	Rail
MLLW(O) BA to OR Bettis Atomic	to Oak Ridge Reserv.	9.86E-04	3.35E-04
MLLW(O) BN to OR Brookhaven NL	to Oak Ridge Reserv.	6.04E-03	4.26E-03
MLLW(O) CH to SR Charleston, SC	to Savannah River	7.75E-03	8.99E-04
MLLW(O) CL to OR Colonie	to Oak Ridge Reserv.	4.25E-04	9.32E-05
MLLW(O) LC to IN ETEC	to INEL	9.54E-06	4.35E-06
MLLW(O) FE to OR Fernald (FEMP)	to Oak Ridge Reserv.	1.80E-03	3.68E-04
MLLW(O) SO to IN General Atomic	to INEL	1.08E-05	4.28E-06
MLLW(O) GJ to IN Grand Junction PO	to INEL	1.05E-06	3.06E-07
MLLW(O) IT to IN ITRI	to INEL	2.64E-05	1.59E-06
MLLW(O) KA to OR Knolls Atomic	to Oak Ridge Reserv.	4.06E-02	2.38E-02
MLLW(O) KK to OR KKS	to Oak Ridge Reserv.	3.11E-02	1.83E-02
MLLW(O) KW to OR KWS	to Oak Ridge Reserv.	4.24E-03	2.49E-03
MLLW(O) LA to IN Los Alamos NL	to INEL	1.71E-03	1.01E-04
MLLW(O) LB to HS Lawrence Berkeley	to Hanford Site	7.79E-05	4.38E-05
MLLW(O) SM to HS LERHR	to Hanford Site	7.78E-06	4.14E-06
MLLW(O) LL to HS Lawrence Livermore	to Hanford Site	3.93E-03	5.23E-03
MLLW(O) PA to OR Paducah GDP	to Oak Ridge Reserv.	3.89E-01	1.21E-01
MLLW(O) PP to IN Pantex Plant	to INEL	4.15E-04	2.58E-05
MLLW(O) SW to HS Pearl Harbor NS	to Hanford Site	8.47E-06	6.32E-06
MLLW(O) PO to OR Portsmouth GDP	to Oak Ridge Reserv.	6.55E-04	1.86E-04
MLLW(O) PN to HS Puget Sound NS	to Hanford Site	1.95E-04	1.46E-04
MLLW(O) RM to OR Reactive Metals	to Oak Ridge Reserv.	2.01E-04	3.81E-05
MLLW(O) SA to IN SNL - Albuquerque	to INEL	1.85E-06	1.12E-07
MLLW(O) SL to HS SNL - Livermore	to Hanford Site	1.95E-03	1.04E-03

Table 5. Nonradiological Risk Factors per Shipment (fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
Bettis Atomic	to Oak Ridge Reserv.	3.41E-06	3.71E-05
Brookhaven NL	to Oak Ridge Reserv.	1.37E-05	5.92E-05
Charleston, SC	to Savannah River	3.22E-07	1.70E-05
Colonie	to Oak Ridge Reserv.	1.46E-05	1.61E-04
ETEC	to INEL	2.55E-05	6.21E-05
Fernald (FEMP)	to Oak Ridge Reserv.	5.79E-07	2.25E-05
General Atomic	to INEL	1.30E-05	6.23E-05
Grand Junction PO	to INEL	6.08E-06	4.24E-05
ITRI	to INEL	6.02E-06	8.53E-05
Knolls Atomic	to Oak Ridge Reserv.	2.16E-06	6.08E-05
KKS	to Oak Ridge Reserv.	2.16E-06	6.08E-05
KWS	to Oak Ridge Reserv.	2.16E-06	6.08E-05
Los Alamos NL	to INEL	5.25E-06	8.21E-05
Lawrence Berkeley	to Hanford Site	1.16E-05	4.91E-05
LERHR	to Hanford Site	6.82E-06	4.66E-05
Lawrence Livermore	to Hanford Site	9.85E-06	5.03E-05
Paducah GDP	to Oak Ridge Reserv.	1.93E-07	2.14E-05
Pantex Plant	to INEL	7.79E-06	1.05E-04
Pearl Harbor NS	to Hanford Site	1.67E-06	9.56E-06
Portsmouth GDP	to Oak Ridge Reserv.	1.09E-06	2.56E-05
Puget Sound NS	to Hanford Site	1.67E-06	9.56E-06
Reactive Metals	to Oak Ridge Reserv.	3.57E-06	3.56E-05
SNL - Albuquerque	to INEL	5.83E-06	8.45E-05
SNL - Livermore	to Hanford Site	9.85E-06	5.03E-05
Rail			
Bettis Atomic	to Oak Ridge Reserv.	1.78E-05	1.89E-06
Brookhaven NL	to Oak Ridge Reserv.	7.59E-05	2.41E-06
Charleston, SC	to Savannah River	1.46E-06	2.93E-07
Colonie	to Oak Ridge Reserv.	3.56E-05	5.67E-06
ETEC	to INEL	3.48E-05	2.18E-06
Fernald (FEMP)	to Oak Ridge Reserv.	3.68E-06	7.48E-07
General Atomic	to INEL	2.72E-05	2.25E-06
Grand Junction PO	to INEL	5.15E-06	1.08E-06
ITRI	to INEL	7.11E-06	2.61E-06
Knolls Atomic	to Oak Ridge Reserv.	5.59E-05	2.00E-06
KKS	to Oak Ridge Reserv.	5.59E-05	2.00E-06
KWS	to Oak Ridge Reserv.	5.59E-05	2.00E-06
Los Alamos NL	to INEL	4.90E-06	2.47E-06
Lawrence Berkeley	to Hanford Site	2.33E-05	2.06E-06
LERHR	to Hanford Site	1.77E-05	1.86E-06
Lawrence Livermore	to Hanford Site	2.36E-05	2.04E-06
Paducah GDP	to Oak Ridge Reserv.	3.81E-06	1.10E-06
Pantex Plant	to INEL	4.85E-06	2.39E-06
Pearl Harbor NS	to Hanford Site	1.08E-05	8.70E-07
Portsmouth GDP	to Oak Ridge Reserv.	3.18E-06	9.25E-07
Puget Sound NS	to Hanford Site	1.08E-05	8.70E-07
Reactive Metals	to Oak Ridge Reserv.	1.85E-05	1.25E-06
SNL - Albuquerque	to INEL	7.11E-06	2.61E-06
SNL - Livermore	to Hanford Site	2.36E-05	2.04E-06

Table 6. Annual Incident-Free Dose for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
		Crew	Public	Crew	Public
Bettis Atomic	to Oak Ridge Reserv.	1.85E-02	2.02E-02	6.65E-03	2.05E-02
Brookhaven NL	to Oak Ridge Reserv.	3.11E-02	3.37E-02	7.69E-03	5.25E-02
Charleston, SC	to Savannah River	6.19E-03	6.77E-03	3.47E-03	5.00E-03
Colonie	to Oak Ridge Reserv.	6.37E-02	7.56E-02	1.42E-02	3.41E-02
ETEC	to INEL	3.23E-02	4.07E-02	7.22E-03	2.49E-02
Fernald (FEMP)	to Oak Ridge Reserv.	2.03E-02	2.16E-02	4.37E-03	7.96E-03
General Atomic	to INEL	3.06E-02	3.64E-02	7.37E-03	2.18E-02
Grand Junction PO	to INEL	1.95E-02	2.35E-02	5.04E-03	9.01E-03
ITRI	to INEL	3.25E-02	3.93E-02	8.09E-03	1.27E-02
Knolls Atomic	to Oak Ridge Reserv.	2.98E-02	3.11E-02	6.87E-03	4.08E-02
KKS	to Oak Ridge Reserv.	2.98E-02	3.11E-02	6.87E-03	4.08E-02
KWS	to Oak Ridge Reserv.	2.98E-02	3.11E-02	6.87E-03	4.08E-02
Los Alamos NL	to INEL	3.15E-02	3.80E-02	7.80E-03	1.12E-02
Lawrence Berkeley	to Hanford Site	2.76E-02	3.27E-02	6.99E-03	2.05E-02
LERHR	to Hanford Site	2.51E-02	2.94E-02	6.59E-03	1.70E-02
Lawrence Livermore	to Hanford Site	1.41E-01	1.64E-01	1.39E-02	4.10E-02
Paducah GDP	to Oak Ridge Reserv.	2.67E-02	2.99E-02	5.08E-03	7.91E-03
Pantex Plant	to INEL	4.01E-02	4.90E-02	7.64E-03	1.12E-02
Pearl Harbor NS	to Hanford Site	7.06E-03	8.04E-03	4.62E-03	1.15E-02
Portsmouth GDP	to Oak Ridge Reserv.	3.49E-02	3.83E-02	9.45E-03	1.86E-02
Puget Sound NS	to Hanford Site	7.06E-03	8.04E-03	4.62E-03	1.15E-02
Reactive Metals	to Oak Ridge Reserv.	2.11E-02	2.23E-02	5.38E-03	1.80E-02
SNL - Albuquerque	to INEL	3.22E-02	3.90E-02	8.09E-03	1.27E-02
SNL - Livermore	to Hanford Site	2.82E-02	3.28E-02	6.94E-03	2.05E-02
Totals		7.66E-01	8.83E-01	1.72E-01	5.13E-01

Table 7. Annual Accident Dose Risk for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
Bettis Atomic	to Oak Ridge Reserv.	9.86E-04	3.35E-04		
Brookhaven NL	to Oak Ridge Reserv.	6.04E-03	4.26E-03		
Charleston, SC	to Savannah River	7.75E-03	8.99E-04		
Colonie	to Oak Ridge Reserv.	4.25E-04	9.32E-05		
ETEC	to INEL	9.54E-06	4.35E-06		
Fernald (FEMP)	to Oak Ridge Reserv.	3.60E-03	3.68E-04		
General Atomic	to INEL	1.08E-05	4.28E-06		
Grand Junction PO	to INEL	1.05E-06	3.06E-07		
ITRI	to INEL	2.64E-05	1.59E-06		
Knolls Atomic	to Oak Ridge Reserv.	4.06E-02	2.38E-02		
KKS	to Oak Ridge Reserv.	3.11E-02	1.83E-02		
KWS	to Oak Ridge Reserv.	4.24E-03	2.49E-03		
Los Alamos NL	to INEL	1.71E-03	1.01E-04		
Lawrence Berkeley	to Hanford Site	7.79E-05	4.38E-05		
LERHR	to Hanford Site	7.78E-06	4.14E-06		
Lawrence Livermore	to Hanford Site	1.97E-02	1.05E-02		
Paducah GDP	to Oak Ridge Reserv.	1.17E+00	1.21E-01		
Pantex Plant	to INEL	4.15E-04	2.58E-05		
Pearl Harbor NS	to Hanford Site	8.47E-06	6.32E-06		
Portsmouth GDP	to Oak Ridge Reserv.	1.96E-03	3.72E-04		
Puget Sound NS	to Hanford Site	1.95E-04	1.46E-04		
Reactive Metals	to Oak Ridge Reserv.	2.01E-04	3.81E-05		
SNL - Albuquerque	to INEL	1.85E-06	1.12E-07		
SNL - Livermore	to Hanford Site	1.95E-03	1.04E-03		
Totals		1.29E+00	1.84E-01		

Table 8. Expected Annual Fatalities for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	3.1E-04	6.9E-05
Normal Public	4.4E-04	2.6E-04
Accident Public	6.4E-04	9.2E-05
Nonradiological		
Emission	2.0E-04	5.6E-04
Accident	1.6E-03	4.9E-05

Table 9. Expected Annual Cancer Incidence
for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	1.1E-03	2.4E-04
Normal Public	1.5E-03	8.7E-04
Accident Public	2.2E-03	3.1E-04
Nonradiological		
Emission	2.0E-04	5.6E-04
Accident	NA	NA

Table 10. Expected Annual Genetic Effects
for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	4.6E-05	1.0E-05
Normal Public	8.8E-05	5.1E-05
Accident Public	1.1E-05	4.5E-06
Nonradiological		
Emission	NA	NA
Accident	NA	NA

B.24 WM LLMW REGIONALIZED 4 ALTERNATIVE (CASE 15): CONTACT-HANDLED ORGANIC LIQUIDS: ALPHA — UNTREATED

Table 1. Summary of Route Information

Route		Distance (miles)	Percentage in Zone		
			Rural	Suburban	Urban
Truck					
Los Alamos NL	to INEL	1144	88.7	9.8	1.4
Lawrence Livermore	to INEL	972	85.7	10.4	4.0
Mound Plant	to Savannah River	656	66.5	32.7	0.8
Rocky Flats Plant	to INEL	716	91.3	8.1	0.6
West Valley DP	to Savannah River	883	70.3	28.5	1.2
Rail					
Los Alamos NL	to INEL	1179	92.2	6.8	1.0
Lawrence Livermore	to INEL	1100	89.5	7.4	3.1
Mound Plant	to Savannah River	744	67.4	29.2	3.3
Rocky Flats Plant	to INEL	738	93.0	5.2	1.8
West Valley DP	to Savannah River	1217	62.8	32.4	4.9

Table 2. Annual Number of Shipments and One-Way Shipment Distances

Route	# of Shipments		Total Mileage(mi)	
	Truck	Rail	Truck	Rail
Los Alamos NL to INEL	4	2	4.57E+03	2.36E+03
Lawrence Livermore to INEL	4	2	3.89E+03	2.20E+03
Mound Plant to Savannah River	1	1	6.56E+02	7.44E+02
Rocky Flats Plant to INEL	1	1	7.16E+02	7.38E+02
West Valley DP to Savannah River	1	1	8.83E+02	1.22E+03
Totals	11	7	1.07E+04	7.26E+03

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

Source/Route(s)		Crew	General Public				
			Off-Link	On-Link	Stops	Total	
MLLW(OA) LA to IN							
Los Alamos NL	to INEL						
	Truck	3.15E-02	1.73E-03	4.27E-03	3.20E-02	3.80E-02	
	Rail	7.80E-03	4.00E-03	1.08E-04	7.11E-03	1.12E-02	
MLLW(OA) LL to IN							
Lawrence Livermore	to INEL						
	Truck	2.85E-02	2.74E-03	5.33E-03	2.72E-02	3.53E-02	
	Rail	7.47E-03	8.12E-03	1.38E-04	6.87E-03	1.51E-02	
MLLW(OA) MP to SR							
Mound Plant	to Savannah River						
	Truck	2.21E-02	1.91E-03	2.83E-03	1.84E-02	2.31E-02	
	Rail	5.99E-03	9.25E-03	1.78E-04	5.77E-03	1.52E-02	
MLLW(OA) RF to IN							
Rocky Flats Plant	to INEL						
	Truck	1.90E-02	6.95E-04	2.22E-03	2.00E-02	2.30E-02	
	Rail	5.96E-03	3.32E-03	7.00E-05	5.75E-03	9.14E-03	
MLLW(OA) WV to SR							
West Valley DP	to Savannah River						
	Truck	2.89E-02	2.45E-03	3.86E-03	2.47E-02	3.10E-02	
	Rail	7.96E-03	1.95E-02	3.38E-04	7.23E-03	2.70E-02	

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route	Truck	Rail
MLLW(OA) LA to IN		
Los Alamos NL to INEL	2.33E-02	2.71E-03
MLLW(OA) LL to IN		
Lawrence Livermore to INEL	1.16E-02	7.55E-03
MLLW(OA) MP to SR		
Mound Plant to Savannah River	4.15E-03	7.63E-04
MLLW(OA) RF to IN		
Rocky Flats Plant to INEL	3.75E-03	5.26E-04
MLLW(OA) WV to SR		
West Valley DP to Savannah River	4.27E-02	1.37E-02

Table 5. Nonradiological Risk Factors per Shipment (fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
Los Alamos NL	to INEL	5.25E-06	8.21E-05
Lawrence Livermore	to INEL	1.24E-05	5.73E-05
Mound Plant	to Savannah River	1.67E-06	5.26E-05
Rocky Flats Plant	to INEL	1.42E-06	4.68E-05
West Valley DP	to Savannah River	3.28E-06	6.60E-05
Rail			
Los Alamos NL	to INEL	4.90E-06	2.47E-06
Lawrence Livermore	to INEL	1.41E-05	2.30E-06
Mound Plant	to Savannah River	1.03E-05	1.56E-06
Rocky Flats Plant	to INEL	5.44E-06	1.54E-06
West Valley DP	to Savannah River	2.49E-05	2.55E-06

Table 6. Annual Incident-Free Dose for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
		Crew	Public	Crew	Public
Los Alamos NL	to INEL	1.26E-01	1.52E-01	1.56E-02	2.24E-02
Lawrence Livermore	to INEL	1.14E-01	1.41E-01	1.49E-02	3.03E-02
Mound Plant	to Savannah River	2.21E-02	2.31E-02	5.99E-03	1.52E-02
Rocky Flats Plant	to INEL	1.90E-02	2.30E-02	5.96E-03	9.14E-03
West Valley DP	to Savannah River	2.89E-02	3.10E-02	7.96E-03	2.70E-02
Totals		3.10E-01	3.70E-01	5.05E-02	1.04E-01

Table 7. Annual Accident Dose Risk for the Shipping Campaign (person-rem/yr)

Route	Truck	Rail
Los Alamos NL to INEL	9.32E-02	5.42E-03
Lawrence Livermore to INEL	4.63E-02	1.51E-02
Mound Plant to Savannah River	4.15E-03	7.63E-04
Rocky Flats Plant to INEL	3.75E-03	5.26E-04
West Valley DP to Savannah River	4.27E-02	1.37E-02
Totals	1.90E-01	3.55E-02

Table 8. Expected Annual Fatalities for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	1.2E-04	2.0E-05
Normal Public	1.9E-04	5.2E-05
Accident Public	9.5E-05	1.8E-05
Nonradiological		
Emission	7.7E-05	7.9E-05
Accident	7.2E-04	1.5E-05

Table 9. Expected Annual Cancer Incidence
for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	4.3E-04	7.1E-05
Normal Public	6.3E-04	1.8E-04
Accident Public	3.2E-04	6.0E-05
Nonradiological		
Emission	7.7E-05	7.9E-05
Accident	NA	NA

Table 10. Expected Annual Genetic Effects
for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	1.9E-05	3.0E-06
Normal Public	3.7E-05	1.0E-05
Accident Public	4.9E-06	9.0E-07
Nonradiological		
Emission	NA	NA
Accident	NA	NA

**B.25 WM LLMW REGIONALIZED 4 ALTERNATIVE (CASE 15):
CONTACT-HANDLED HETEROGENEOUS SOLIDS:
NONALPHA — UNTREATED**

Table 1. Summary of Route Information

Route	Distance (miles)	Percentage in Zone			
		Rural	Suburban	Urban	
Truck					
Ames Laboratory	to Oak Ridge Reserv.	900	75.2	23.4	1.5
Argonne - East	to Oak Ridge Reserv.	584	67.0	30.1	2.9
Bettis Atomic	to Oak Ridge Reserv.	562	70.7	27.4	1.9
Battelle Columbus	to Oak Ridge Reserv.	412	59.1	38.9	2.1
Brookhaven NL	to Oak Ridge Reserv.	821	56.9	37.9	5.2
Charleston, SC	to Savannah River	200	75.7	23.8	0.5
Colonie	to Oak Ridge Reserv.	2193	84.1	13.8	2.1
ETEC	to INEL	979	77.7	14.2	8.1
Fernald (FEMP)	to Oak Ridge Reserv.	312	69.9	29.5	0.6
General Atomic	to INEL	976	78.8	17.1	4.1
Grand Junction PO	to INEL	670	85.1	12.0	2.8
Knolls Atomic	to Oak Ridge Reserv.	885	66.6	32.6	0.8
Kansas City Plant	to Oak Ridge Reserv.	723	79.0	19.2	1.9
KKS	to Oak Ridge Reserv.	885	66.6	32.6	0.8
KWS	to Oak Ridge Reserv.	885	66.6	32.6	0.8
Los Alamos NL	to INEL	1144	88.7	9.8	1.4
Lawrence Berkeley	to Hanford Site	875	78.1	17.8	4.1
LERHR	to Hanford Site	830	80.5	17.0	2.6
Lawrence Livermore	to Hanford Site	894	77.2	19.3	3.4
Mare Island	to Hanford Site	875	78.1	17.8	4.1
Norfolk Nav Shipyd	to Savannah River	498	72.8	26.2	1.0
Nevada Test Site	to INEL	712	82.8	13.7	3.5
Paducah GDP	to Oak Ridge Reserv.	304	81.3	18.5	0.2
Pantex Plant	to INEL	1468	89.8	8.6	1.6
Pearl Harbor NS	to Hanford Site	226	76.8	20.9	2.3
Portsmouth NS	to Oak Ridge Reserv.	1063	48.2	44.7	7.1
Portsmouth GDP	to Oak Ridge Reserv.	371	74.5	24.6	0.9
Princeton PPL	to Oak Ridge Reserv.	715	60.8	32.2	7.0
Puget Sound NS	to Hanford Site	226	76.8	20.9	2.3
Reactive Metals	to Oak Ridge Reserv.	608	64.1	34.1	1.8
SNL - Albuquerque	to INEL	1168	88.6	9.8	1.6
SNL - Livermore	to Hanford Site	894	77.2	19.3	3.4
Rail					
Ames Laboratory	to Oak Ridge Reserv.	954	71.7	22.0	6.3
Argonne - East	to Oak Ridge Reserv.	648	70.7	25.3	4.0
Bettis Atomic	to Oak Ridge Reserv.	903	64.0	31.3	4.7
Battelle Columbus	to Oak Ridge Reserv.	393	68.2	26.8	5.0
Brookhaven NL	to Oak Ridge Reserv.	1152	39.5	44.7	15.8
Charleston, SC	to Savannah River	140	83.9	13.6	2.5
Colonie	to Oak Ridge Reserv.	2709	86.8	10.0	3.1
ETEC	to INEL	1041	81.5	10.5	8.0
Fernald (FEMP)	to Oak Ridge Reserv.	358	75.7	21.8	2.5
General Atomic	to INEL	1076	82.6	11.4	6.0
Grand Junction PO	to INEL	517	83.7	13.9	2.4
Knolls Atomic	to Oak Ridge Reserv.	957	42.1	43.9	14.0
Kansas City Plant	to Oak Ridge Reserv.	838	83.0	13.6	3.4
KKS	to Oak Ridge Reserv.	957	42.1	43.9	14.0
KWS	to Oak Ridge Reserv.	957	42.1	43.9	14.0
Los Alamos NL	to INEL	1179	92.2	6.8	1.0
Lawrence Berkeley	to Hanford Site	986	78.5	15.8	5.7
LERHR	to Hanford Site	890	81.0	14.3	4.7
Lawrence Livermore	to Hanford Site	973	78.9	15.3	5.8
Mare Island	to Hanford Site	986	78.5	15.8	5.7
Norfolk Nav Shipyd	to Savannah River	529	74.3	24.1	1.6
Nevada Test Site	to INEL	756	92.8	5.9	1.3
Paducah GDP	to Oak Ridge Reserv.	527	89.3	9.0	1.7
Pantex Plant	to INEL	1141	91.3	7.6	1.0
Pearl Harbor NS	to Hanford Site	416	73.7	20.1	6.2
Portsmouth NS	to Oak Ridge Reserv.	1288	53.5	40.1	6.4
Portsmouth GDP	to Oak Ridge Reserv.	442	66.8	31.5	1.7
Princeton PPL	to Oak Ridge Reserv.	760	45.8	44.5	9.7
Puget Sound NS	to Hanford Site	416	73.7	20.1	6.2
Reactive Metals	to Oak Ridge Reserv.	600	59.4	33.2	7.4
SNL - Albuquerque	to INEL	1247	91.0	7.6	1.4
SNL - Livermore	to Hanford Site	973	78.9	15.3	5.8

Table 2. Annual Number of Shipments and One-Way Shipment Distances

Route		# of Shipments		Total Mileage(mi)	
		Truck	Rail	Truck	Rail
Ames Laboratory	to Oak Ridge Reserv.	1	1	9.00E+02	9.54E+02
Argonne - East	to Oak Ridge Reserv.	44	17	2.57E+04	1.10E+04
Bettis Atomic	to Oak Ridge Reserv.	1	1	5.62E+02	9.03E+02
Battelle Columbus	to Oak Ridge Reserv.	1	1	4.12E+02	3.93E+02
Brookhaven NL	to Oak Ridge Reserv.	1	1	8.21E+02	1.15E+03
Charleston, SC	to Savannah River	1	1	2.00E+02	1.40E+02
Colonie	to Oak Ridge Reserv.	1	1	2.19E+03	2.71E+03
ETEC	to INEL	8	3	7.83E+03	3.12E+03
Fernald (FEMP)	to Oak Ridge Reserv.	7	3	2.18E+03	1.07E+03
General Atomic	to INEL	1	1	9.76E+02	1.08E+03
Grand Junction PO	to INEL	1	1	6.70E+02	5.17E+02
Knolls Atomic	to Oak Ridge Reserv.	1	1	8.85E+02	9.57E+02
Kansas City Plant	to Oak Ridge Reserv.	1	1	7.23E+02	8.38E+02
KKS	to Oak Ridge Reserv.	1	1	8.85E+02	9.57E+02
KWS	to Oak Ridge Reserv.	1	1	8.85E+02	9.57E+02
Los Alamos NL	to INEL	2	1	2.29E+03	1.18E+03
Lawrence Berkeley	to Hanford Site	1	1	8.75E+02	9.86E+02
LERHR	to Hanford Site	1	1	8.30E+02	8.90E+02
Lawrence Livermore	to Hanford Site	4	2	3.58E+03	1.95E+03
Mare Island	to Hanford Site	1	1	8.75E+02	9.86E+02
Norfolk Nav Shipyd	to Savannah River	1	1	4.98E+02	5.29E+02
Nevada Test Site	to INEL	1	1	7.12E+02	7.56E+02
Paducah GDP	to Oak Ridge Reserv.	1	1	3.04E+02	5.27E+02
Pantex Plant	to INEL	2	1	2.94E+03	1.14E+03
Pearl Harbor NS	to Hanford Site	1	1	2.26E+02	4.16E+02
Portsmouth NS	to Oak Ridge Reserv.	1	1	1.06E+03	1.29E+03
Portsmouth GDP	to Oak Ridge Reserv.	60	23	2.22E+04	1.02E+04
Princeton PPL	to Oak Ridge Reserv.	1	1	7.15E+02	7.60E+02
Puget Sound NS	to Hanford Site	1	1	2.26E+02	4.16E+02
Reactive Metals	to Oak Ridge Reserv.	1	1	6.08E+02	6.00E+02
SNL - Albuquerque	to INEL	1	1	1.17E+03	1.25E+03
SNL - Livermore	to Hanford Site	1	1	8.94E+02	9.73E+02
Totals		152	75	8.59E+04	5.16E+04

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

Source/Route(s)	Crew	General Public			
		Off-Link	On-Link	Stops	Total
MLLW(C) AL to OR Ames Laboratory	to Oak Ridge Reserv.				
	Truck	2.83E-02	2.29E-03	3.92E-03	2.52E-02 3.14E-02
	Rail	6.86E-03	1.58E-02	2.35E-04	6.42E-03 2.24E-02
MLLW(C) AN to OR Argonne - East	to Oak Ridge Reserv.				
	Truck	2.00E-02	2.19E-03	3.27E-03	1.63E-02 2.18E-02
	Rail	5.59E-03	8.34E-03	1.48E-04	5.48E-03 1.40E-02
MLLW(C) BA to OR Bettis Atomic	to Oak Ridge Reserv.				
	Truck	1.85E-02	1.72E-03	2.71E-03	1.57E-02 2.02E-02
	Rail	6.65E-03	1.40E-02	2.44E-04	6.26E-03 2.05E-02
MLLW(C) BC to OR Battelle Columbus	to Oak Ridge Reserv.				
	Truck	1.49E-02	1.65E-03	2.24E-03	1.15E-02 1.54E-02
	Rail	4.52E-03	5.91E-03	9.86E-05	4.69E-03 1.07E-02
MLLW(C) BN to OR Brookhaven NL	to Oak Ridge Reserv.				
	Truck	3.11E-02	4.51E-03	6.17E-03	2.30E-02 3.37E-02
	Rail	7.69E-03	4.49E-02	5.76E-04	7.03E-03 5.25E-02
MLLW(C) CH to SR Charleston, SC	to Savannah River				
	Truck	6.19E-03	4.20E-04	7.45E-04	5.60E-03 6.77E-03
	Rail	3.47E-03	1.07E-03	2.07E-05	3.91E-03 5.00E-03
MLLW(C) CL to OR Colonie	to Oak Ridge Reserv.				
	Truck	6.37E-02	4.68E-03	9.54E-03	6.14E-02 7.56E-02
	Rail	1.42E-02	2.19E-02	3.78E-04	1.18E-02 3.41E-02
MLLW(C) LC to IN ETEC	to INEL				
	Truck	3.23E-02	5.06E-03	8.27E-03	2.74E-02 4.07E-02
	Rail	7.22E-03	1.80E-02	2.22E-04	6.68E-03 2.49E-02
MLLW(C) FE to OR Fernald (FEMP)	to Oak Ridge Reserv.				
	Truck	1.02E-02	8.00E-04	1.26E-03	8.73E-03 1.08E-02
	Rail	4.37E-03	3.32E-03	6.75E-05	4.58E-03 7.96E-03
MLLW(C) SO to IN General Atomic	to INEL				
	Truck	3.06E-02	3.33E-03	5.75E-03	2.73E-02 3.64E-02
	Rail	7.37E-03	1.48E-02	2.03E-04	6.79E-03 2.18E-02
MLLW(C) GJ to IN Grand Junction PO	to INEL				
	Truck	1.95E-02	1.59E-03	3.20E-03	1.88E-02 2.35E-02
	Rail	5.04E-03	3.86E-03	7.64E-05	5.07E-03 9.01E-03
MLLW(C) KA to OR Knolls Atomic	to Oak Ridge Reserv.				
	Truck	2.98E-02	2.55E-03	3.79E-03	2.48E-02 3.11E-02
	Rail	6.87E-03	3.39E-02	4.49E-04	6.42E-03 4.08E-02
MLLW(C) KC to OR Kansas City Plant	to Oak Ridge Reserv.				
	Truck	2.20E-02	1.75E-03	3.21E-03	2.02E-02 2.52E-02
	Rail	6.38E-03	7.77E-03	1.35E-04	6.06E-03 1.40E-02
MLLW(C) KK to OR KKS	to Oak Ridge Reserv.				
	Truck	2.98E-02	2.55E-03	3.79E-03	2.48E-02 3.11E-02
	Rail	6.87E-03	3.39E-02	4.49E-04	6.42E-03 4.08E-02
MLLW(C) KW to OR KWS	to Oak Ridge Reserv.				
	Truck	2.98E-02	2.55E-03	3.79E-03	2.48E-02 3.11E-02
	Rail	6.87E-03	3.39E-02	4.49E-04	6.42E-03 4.08E-02
MLLW(C) LA to IN Los Alamos NL	to INEL				
	Truck	3.15E-02	1.73E-03	4.27E-03	3.20E-02 3.80E-02
	Rail	7.80E-03	4.00E-03	1.08E-04	7.11E-03 1.12E-02
MLLW(C) LB to HS Lawrence Berkeley	to Hanford Site				
	Truck	2.76E-02	3.02E-03	5.17E-03	2.45E-02 3.27E-02
	Rail	6.99E-03	1.38E-02	2.03E-04	6.51E-03 2.05E-02
MLLW(C) SM to HS LERHR	to Hanford Site				
	Truck	2.51E-02	2.17E-03	4.00E-03	2.32E-02 2.94E-02
	Rail	6.59E-03	1.07E-02	1.64E-04	6.22E-03 1.70E-02

Table 3. Incident-Free Dose per Shipment (person-rem/shipment) (Cont.)

Source/Route(s)	Crew	General Public			
		Off-Link	On-Link	Stops	Total
MLLW(C) LL to HS Lawrence Livermore	to Hanford Site				
	Truck	2.82E-02	2.88E-03	4.92E-03	2.50E-02
	Rail	6.94E-03	1.38E-02	2.00E-04	6.48E-03
MLLW(C) MZ to HS Mare Island	to Hanford Site				
	Truck	2.76E-02	3.02E-03	5.17E-03	2.45E-02
	Rail	6.99E-03	1.38E-02	2.03E-04	6.51E-03
MLLW(C) US to SR Norfolk Nav Shipyd	to Savannah River				
	Truck	1.59E-02	1.26E-03	2.07E-03	1.39E-02
	Rail	5.09E-03	4.35E-03	9.95E-05	5.11E-03
MLLW(C) NT to IN Nevada Test Site	to INEL				
	Truck	2.13E-02	2.03E-03	3.79E-03	1.99E-02
	Rail	6.04E-03	2.80E-03	6.88E-05	5.81E-03
MLLW(C) PA to OR Paducah GDP	to Oak Ridge Reserv.				
	Truck	8.88E-03	4.70E-04	9.98E-04	8.51E-03
	Rail	5.08E-03	2.75E-03	5.97E-05	5.10E-03
MLLW(C) PP to IN Pantex Plant	to INEL				
	Truck	4.01E-02	2.24E-03	5.63E-03	4.11E-02
	Rail	7.64E-03	4.12E-03	1.10E-04	6.99E-03
MLLW(C) SW to HS Pearl Harbor NS	to Hanford Site				
	Truck	7.06E-03	6.28E-04	1.09E-03	6.33E-03
	Rail	4.62E-03	6.63E-03	9.79E-05	4.76E-03
MLLW(C) PT to OR Portsmouth NS	to Oak Ridge Reserv.				
	Truck	4.37E-02	7.41E-03	9.70E-03	2.98E-02
	Rail	8.26E-03	2.64E-02	4.36E-04	7.45E-03
MLLW(C) PO to OR Portsmouth GDP	to Oak Ridge Reserv.				
	Truck	1.16E-02	8.77E-04	1.50E-03	1.04E-02
	Rail	4.73E-03	4.37E-03	1.00E-04	4.84E-03
MLLW(C) PR to OR Princeton PPL	to Oak Ridge Reserv.				
	Truck	2.68E-02	4.27E-03	6.06E-03	2.00E-02
	Rail	6.05E-03	2.10E-02	3.11E-04	5.82E-03
MLLW(C) PN to HS Puget Sound NS	to Hanford Site				
	Truck	7.06E-03	6.28E-04	1.09E-03	6.33E-03
	Rail	4.62E-03	6.63E-03	9.79E-05	4.76E-03
MLLW(C) RM to OR Reactive Metals	to Oak Ridge Reserv.				
	Truck	2.11E-02	2.15E-03	3.08E-03	1.70E-02
	Rail	5.38E-03	1.25E-02	1.91E-04	5.33E-03
MLLW(C) SA to IN SNL - Albuquerque	to INEL				
	Truck	3.22E-02	1.83E-03	4.46E-03	3.27E-02
	Rail	8.09E-03	5.30E-03	1.26E-04	7.32E-03
MLLW(C) SL to HS SNL - Livermore	to Hanford Site				
	Truck	2.82E-02	2.88E-03	4.92E-03	2.50E-02
	Rail	6.94E-03	1.38E-02	2.00E-04	6.48E-03

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route		Truck	Rail
MLLW(C) AL to OR			
Ames Laboratory	to Oak Ridge Reserv.	2.44E-08	7.95E-09
MLLW(C) AN to OR			
Argonne - East	to Oak Ridge Reserv.	6.72E-04	3.03E-04
MLLW(C) BA to OR			
Bettis Atomic	to Oak Ridge Reserv.	1.56E-04	6.60E-05
MLLW(C) BC to OR			
Battelle Columbus	to Oak Ridge Reserv.	1.96E-09	2.32E-10
MLLW(C) BN to OR			
Brookhaven NL	to Oak Ridge Reserv.	5.76E-04	3.98E-04
MLLW(C) CH to SR			
Charleston, SC	to Savannah River	5.98E-05	6.95E-06
MLLW(C) CL to OR			
Colonie	to Oak Ridge Reserv.	3.67E-08	1.06E-08
MLLW(C) LC to IN			
ETEC	to INEL	2.18E-04	2.61E-04
MLLW(C) FE to OR			
Fernald (FEMP)	to Oak Ridge Reserv.	1.04E-05	2.79E-06
MLLW(C) SO to IN			
General Atomic	to INEL	4.51E-07	1.77E-07
MLLW(C) GJ to IN			
Grand Junction PO	to INEL	1.26E-08	3.64E-09
MLLW(C) KA to OR			
Knolls Atomic	to Oak Ridge Reserv.	1.78E-02	1.05E-02
MLLW(C) KC to OR			
Kansas City Plant	to Oak Ridge Reserv.	1.79E-04	3.07E-05
MLLW(C) KK to OR			
KKS	to Oak Ridge Reserv.	1.96E-02	1.15E-02
MLLW(C) KW to OR			
KWS	to Oak Ridge Reserv.	6.28E-03	3.68E-03
MLLW(C) LA to IN			
Los Alamos NL	to INEL	5.25E-05	6.56E-06
MLLW(C) LB to HS			
Lawrence Berkeley	to Hanford Site	1.05E-05	5.80E-06
MLLW(C) SM to HS			
LERHR	to Hanford Site	9.03E-06	4.74E-06
MLLW(C) LL to HS			
Lawrence Livermore	to Hanford Site	4.37E-05	4.58E-05
MLLW(C) MZ to HS			
Mare Island	to Hanford Site	8.65E-03	4.86E-03
MLLW(C) US to SR			
Norfolk Nav Shipyd	to Savannah River	8.05E-04	1.41E-04
MLLW(C) NT to IN			
Nevada Test Site	to INEL	1.30E-08	2.10E-09
MLLW(C) PA to OR			
Paducah GDP	to Oak Ridge Reserv.	9.75E-04	1.25E-04
MLLW(C) PP to IN			
Pantex Plant	to INEL	1.88E-04	2.55E-05
MLLW(C) SW to HS			
Pearl Harbor NS	to Hanford Site	1.11E-04	8.21E-05
MLLW(C) PT to OR			
Portsmouth NS	to Oak Ridge Reserv.	3.89E-04	1.70E-04
MLLW(C) PO to OR			
Portsmouth GDP	to Oak Ridge Reserv.	2.80E-06	1.38E-06
MLLW(C) PR to OR			
Princeton PPL	to Oak Ridge Reserv.	3.07E-09	1.20E-09
MLLW(C) PN to HS			
Puget Sound NS	to Hanford Site	2.47E-03	1.83E-03
MLLW(C) RM to OR			
Reactive Metals	to Oak Ridge Reserv.	1.83E-06	3.43E-07
MLLW(C) SA to IN			
SNL - Albuquerque	to INEL	2.77E-04	1.78E-05
MLLW(C) SL to HS			
SNL - Livermore	to Hanford Site	2.72E-06	1.43E-06

Table 5. Nonradiological Risk Factors per Shipment
(fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
Ames Laboratory	to Oak Ridge Reserv.	4.25E-06	5.79E-05
Argonne - East	to Oak Ridge Reserv.	5.38E-06	4.21E-05
Bettis Atomic	to Oak Ridge Reserv.	3.41E-06	3.71E-05
Battelle Columbus	to Oak Ridge Reserv.	2.74E-06	2.71E-05
Brookhaven NL	to Oak Ridge Reserv.	1.37E-05	5.92E-05
Charleston, SC	to Savannah River	3.22E-07	1.70E-05
Colonie	to Oak Ridge Reserv.	1.46E-05	1.61E-04
ETEC	to INEL	2.55E-05	6.21E-05
Fernald (FEMP)	to Oak Ridge Reserv.	5.79E-07	2.25E-05
General Atomic	to INEL	1.30E-05	6.23E-05
Grand Junction PO	to INEL	6.08E-06	4.24E-05
Knolls Atomic	to Oak Ridge Reserv.	2.16E-06	6.08E-05
Kansas City Plant	to Oak Ridge Reserv.	4.31E-06	4.90E-05
KKS	to Oak Ridge Reserv.	2.16E-06	6.08E-05
KWS	to Oak Ridge Reserv.	2.16E-06	6.08E-05
Los Alamos NL	to INEL	5.25E-06	8.21E-05
Lawrence Berkeley	to Hanford Site	1.16E-05	4.91E-05
LERHR	to Hanford Site	6.82E-06	4.66E-05
Lawrence Livermore	to Hanford Site	9.85E-06	5.03E-05
Mare Island	to Hanford Site	1.16E-05	4.91E-05
Norfolk Nav Shipyd	to Savannah River	1.58E-06	4.45E-05
Nevada Test Site	to INEL	8.08E-06	4.36E-05
Paducah GDP	to Oak Ridge Reserv.	1.93E-07	2.14E-05
Pantex Plant	to INEL	7.79E-06	1.05E-04
Pearl Harbor NS	to Hanford Site	1.67E-06	9.56E-06
Portsmouth NS	to Oak Ridge Reserv.	2.43E-05	7.12E-05
Portsmouth GDP	to Oak Ridge Reserv.	1.09E-06	2.56E-05
Princeton PPL	to Oak Ridge Reserv.	1.60E-05	4.89E-05
Puget Sound NS	to Hanford Site	1.67E-06	9.56E-06
Reactive Metals	to Oak Ridge Reserv.	3.57E-06	3.56E-05
SNL - Albuquerque	to INEL	5.83E-06	8.45E-05
SNL - Livermore	to Hanford Site	9.85E-06	5.03E-05
Rail			
Ames Laboratory	to Oak Ridge Reserv.	2.52E-05	2.00E-06
Argonne - East	to Oak Ridge Reserv.	1.08E-05	1.36E-06
Bettis Atomic	to Oak Ridge Reserv.	1.78E-05	1.89E-06
Battelle Columbus	to Oak Ridge Reserv.	8.20E-06	8.21E-07
Brookhaven NL	to Oak Ridge Reserv.	7.59E-05	2.41E-06
Charleston, SC	to Savannah River	1.46E-06	2.93E-07
Colonie	to Oak Ridge Reserv.	3.56E-05	5.67E-06
ETEC	to INEL	3.48E-05	2.18E-06
Fernald (FEMP)	to Oak Ridge Reserv.	3.68E-06	7.48E-07
General Atomic	to INEL	2.72E-05	2.25E-06
Grand Junction PO	to INEL	5.15E-06	1.08E-06
Knolls Atomic	to Oak Ridge Reserv.	5.59E-05	2.00E-06
Kansas City Plant	to Oak Ridge Reserv.	1.18E-05	1.75E-06
KKS	to Oak Ridge Reserv.	5.59E-05	2.00E-06
KWS	to Oak Ridge Reserv.	5.59E-05	2.00E-06
Los Alamos NL	to INEL	4.90E-06	2.47E-06
Lawrence Berkeley	to Hanford Site	2.33E-05	2.06E-06
LERHR	to Hanford Site	1.77E-05	1.86E-06
Lawrence Livermore	to Hanford Site	2.36E-05	2.04E-06
Mare Island	to Hanford Site	2.33E-05	2.06E-06
Norfolk Nav Shipyd	to Savannah River	3.64E-06	1.11E-06
Nevada Test Site	to INEL	3.98E-06	1.58E-06
Paducah GDP	to Oak Ridge Reserv.	3.81E-06	1.10E-06
Pantex Plant	to INEL	4.85E-06	2.39E-06
Pearl Harbor NS	to Hanford Site	1.08E-05	8.70E-07
Portsmouth NS	to Oak Ridge Reserv.	3.44E-05	2.69E-06
Portsmouth GDP	to Oak Ridge Reserv.	3.18E-06	9.25E-07
Princeton PPL	to Oak Ridge Reserv.	3.08E-05	1.59E-06
Puget Sound NS	to Hanford Site	1.08E-05	8.70E-07
Reactive Metals	to Oak Ridge Reserv.	1.85E-05	1.25E-06
SNL - Albuquerque	to INEL	7.11E-06	2.61E-06
SNL - Livermore	to Hanford Site	2.36E-05	2.04E-06

Table 6. Annual Incident-Free Dose for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
		Crew	Public	Crew	Public
Ames Laboratory	to Oak Ridge Reserv.	2.83E-02	3.14E-02	6.86E-03	2.24E-02
Argonne - East	to Oak Ridge Reserv.	8.79E-01	9.59E-01	9.50E-02	2.37E-01
Bettis Atomic	to Oak Ridge Reserv.	1.85E-02	2.02E-02	6.65E-03	2.05E-02
Battelle Columbus	to Oak Ridge Reserv.	1.49E-02	1.54E-02	4.52E-03	1.07E-02
Brookhaven NL	to Oak Ridge Reserv.	3.11E-02	3.37E-02	7.69E-03	5.25E-02
Charleston, SC	to Savannah River	6.19E-03	6.77E-03	3.47E-03	5.00E-03
Colonie	to Oak Ridge Reserv.	6.37E-02	7.56E-02	1.42E-02	3.41E-02
ETEC	to INEL	2.58E-01	3.26E-01	2.17E-02	7.47E-02
Fernald (FEMP)	to Oak Ridge Reserv.	7.12E-02	7.55E-02	1.31E-02	2.39E-02
General Atomic	to INEL	3.06E-02	3.64E-02	7.37E-03	2.18E-02
Grand Junction PO	to INEL	1.95E-02	2.35E-02	5.04E-03	9.01E-03
Knolls Atomic	to Oak Ridge Reserv.	2.98E-02	3.11E-02	6.87E-03	4.08E-02
Kansas City Plant	to Oak Ridge Reserv.	2.20E-02	2.52E-02	6.38E-03	1.40E-02
KKS	to Oak Ridge Reserv.	2.98E-02	3.11E-02	6.87E-03	4.08E-02
KWS	to Oak Ridge Reserv.	2.98E-02	3.11E-02	6.87E-03	4.08E-02
Los Alamos NL	to INEL	6.30E-02	7.60E-02	7.80E-03	1.12E-02
Lawrence Berkeley	to Hanford Site	2.76E-02	3.27E-02	6.99E-03	2.05E-02
LERHR	to Hanford Site	2.51E-02	2.94E-02	6.59E-03	1.70E-02
Lawrence Livermore	to Hanford Site	1.13E-01	1.31E-01	1.39E-02	4.10E-02
Mare Island	to Hanford Site	2.76E-02	3.27E-02	6.99E-03	2.05E-02
Norfolk Nav Shipyd	to Savannah River	1.59E-02	1.73E-02	5.09E-03	9.55E-03
Nevada Test Site	to INEL	2.13E-02	2.58E-02	6.04E-03	8.67E-03
Paducah GDP	to Oak Ridge Reserv.	8.88E-03	9.98E-03	5.08E-03	7.91E-03
Pantex Plant	to INEL	8.02E-02	9.79E-02	7.64E-03	1.12E-02
Pearl Harbor NS	to Hanford Site	7.06E-03	8.04E-03	4.62E-03	1.15E-02
Portsmouth NS	to Oak Ridge Reserv.	4.37E-02	4.69E-02	8.26E-03	3.42E-02
Portsmouth GDP	to Oak Ridge Reserv.	6.99E-01	7.65E-01	1.09E-01	2.14E-01
Princeton PPL	to Oak Ridge Reserv.	2.68E-02	3.04E-02	6.05E-03	2.71E-02
Puget Sound NS	to Hanford Site	7.06E-03	8.04E-03	4.62E-03	1.15E-02
Reactive Metals	to Oak Ridge Reserv.	2.11E-02	2.23E-02	5.38E-03	1.80E-02
SNL - Albuquerque	to INEL	3.22E-02	3.90E-02	8.09E-03	1.27E-02
SNL - Livermore	to Hanford Site	2.82E-02	3.28E-02	6.94E-03	2.05E-02
Totals		2.78E+00	3.13E+00	4.31E-01	1.15E+00

Table 7. Annual Accident Dose Risk for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
Ames Laboratory	to Oak Ridge Reserv.	2.44E-08	7.95E-09		
Argonne - East	to Oak Ridge Reserv.	2.96E-02	5.16E-03		
Bettis Atomic	to Oak Ridge Reserv.	1.56E-04	6.60E-05		
Battelle Columbus	to Oak Ridge Reserv.	1.96E-09	2.32E-10		
Brookhaven NL	to Oak Ridge Reserv.	5.76E-04	3.98E-04		
Charleston, SC	to Savannah River	5.98E-05	6.95E-06		
Colonie	to Oak Ridge Reserv.	3.67E-08	1.06E-08		
ETEC	to INEL	1.75E-03	7.83E-04		
Fernald (FEMP)	to Oak Ridge Reserv.	7.30E-05	8.37E-06		
General Atomic	to INEL	4.51E-07	1.77E-07		
Grand Junction PO	to INEL	1.26E-08	3.64E-09		
Knolls Atomic	to Oak Ridge Reserv.	1.78E-02	1.05E-02		
Kansas City Plant	to Oak Ridge Reserv.	1.79E-04	3.07E-05		
KKS	to Oak Ridge Reserv.	1.96E-02	1.15E-02		
KWS	to Oak Ridge Reserv.	6.28E-03	3.68E-03		
Los Alamos NL	to INEL	1.05E-04	6.56E-06		
Lawrence Berkeley	to Hanford Site	1.05E-05	5.80E-06		
LERHR	to Hanford Site	9.03E-06	4.74E-06		
Lawrence Livermore	to Hanford Site	1.75E-04	9.17E-05		
Mare Island	to Hanford Site	8.65E-03	4.86E-03		
Norfolk Nav Shipyd	to Savannah River	8.05E-04	1.41E-04		
Nevada Test Site	to INEL	1.30E-08	2.10E-09		
Paducah GDP	to Oak Ridge Reserv.	9.75E-04	1.25E-04		
Pantex Plant	to INEL	3.76E-04	2.55E-05		
Pearl Harbor NS	to Hanford Site	1.11E-04	8.21E-05		
Portsmouth NS	to Oak Ridge Reserv.	3.89E-04	1.70E-04		
Portsmouth GDP	to Oak Ridge Reserv.	1.68E-04	3.18E-05		
Princeton PPL	to Oak Ridge Reserv.	3.07E-09	1.20E-09		
Puget Sound NS	to Hanford Site	2.47E-03	1.83E-03		
Reactive Metals	to Oak Ridge Reserv.	1.83E-06	3.43E-07		
SNL - Albuquerque	to INEL	2.77E-04	1.78E-05		
SNL - Livermore	to Hanford Site	2.72E-06	1.43E-06		
Totals		9.06E-02	3.95E-02		

Table 8. Expected Annual Fatalities for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	1.1E-03	1.7E-04
Normal Public	1.6E-03	5.7E-04
Accident Public	4.5E-05	2.0E-05
Nonradiological		
Emission	7.5E-04	1.0E-03
Accident	5.9E-03	1.1E-04

Table 9. Expected Annual Cancer Incidence for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	3.9E-03	6.0E-04
Normal Public	5.3E-03	1.9E-03
Accident Public	1.5E-04	6.7E-05
Nonradiological		
Emission	7.5E-04	1.0E-03
Accident	NA	NA

Table 10. Expected Annual Genetic Effects for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	1.7E-04	2.6E-05
Normal Public	3.1E-04	1.1E-04
Accident Public	7.9E-06	3.7E-06
Nonradiological		
Emission	NA	NA
Accident	NA	NA

B.26 WM LLMW REGIONALIZED 4 ALTERNATIVE (CASE 15): CONTACT-HANDLED HETEROGENEOUS SOLIDS: ALPHA — UNTREATED

Table 1. Summary of Route Information

Route		Distance (miles)	Percentage in Zone		
			Rural	Suburban	Urban
Truck					
Bettis Atomic	to Savannah River	656	71.7	26.4	1.9
Los Alamos NL	to INEL	1144	88.7	9.8	1.4
Lawrence Livermore	to INEL	972	85.7	10.4	4.0
Mound Plant	to Savannah River	656	66.5	32.7	0.8
Rocky Flats Plant	to INEL	716	91.3	8.1	0.6
U of MO - Columbia	to Savannah River	858	70.6	27.0	2.3
West Valley DP	to Savannah River	883	70.3	28.5	1.2
Rail					
Bettis Atomic	to Savannah River	947	68.5	27.1	4.4
Los Alamos NL	to INEL	1179	92.2	6.8	1.0
Lawrence Livermore	to INEL	1100	89.5	7.4	3.1
Mound Plant	to Savannah River	744	67.4	29.2	3.3
Rocky Flats Plant	to INEL	738	93.0	5.2	1.8
U of MO - Columbia	to Savannah River	1011	66.6	29.5	4.0
West Valley DP	to Savannah River	1217	62.8	32.4	4.9

Table 2. Annual Number of Shipments and One-Way Shipment Distances

Route		# of Shipments		Total Mileage(mi)	
		Truck	Rail	Truck	Rail
Bettis Atomic to Savannah River		1	1	6.56E+02	9.47E+02
Los Alamos NL to INEL		4	2	4.57E+03	2.36E+03
Lawrence Livermore to INEL		6	3	5.83E+03	3.30E+03
Mound Plant to Savannah River		1	1	6.56E+02	7.44E+02
Rocky Flats Plant to INEL		130	48	9.30E+04	3.54E+04
U of MO - Columbia to Savannah River		1	1	8.58E+02	1.01E+03
West Valley DP to Savannah River		1	1	8.83E+02	1.22E+03
Totals		144	57	1.06E+05	4.50E+04

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

Source/Route(s)		Crew	General Public			
			Off-Link	On-Link	Stops	Total
MLLW(CA) BA to SR Bettis Atomic		to Savannah River				
	Truck	2.14E-02	1.96E-03	3.14E-03	1.84E-02	2.35E-02
	Rail	6.83E-03	1.32E-02	2.31E-04	6.39E-03	1.99E-02
MLLW(CA) LA to IN Los Alamos NL		to INEL				
	Truck	3.15E-02	1.73E-03	4.27E-03	3.20E-02	3.80E-02
	Rail	7.80E-03	4.00E-03	1.08E-04	7.11E-03	1.12E-02
MLLW(CA) LL to IN Lawrence Livermore		to INEL				
	Truck	2.85E-02	2.74E-03	5.33E-03	2.72E-02	3.53E-02
	Rail	7.47E-03	8.12E-03	1.38E-04	6.87E-03	1.51E-02
MLLW(CA) MP to SR Mound Plant		to Savannah River				
	Truck	2.21E-02	1.91E-03	2.83E-03	1.84E-02	2.31E-02
	Rail	5.99E-03	9.25E-03	1.78E-04	5.77E-03	1.52E-02
MLLW(CA) RF to IN Rocky Flats Plant		to INEL				
	Truck	1.90E-02	6.95E-04	2.22E-03	2.00E-02	2.30E-02
	Rail	5.96E-03	3.32E-03	7.00E-05	5.75E-03	9.14E-03
MLLW(CA) MC to SR U of MO - Columbia		to Savannah River				
	Truck	2.83E-02	2.79E-03	4.37E-03	2.40E-02	3.12E-02
	Rail	7.10E-03	1.39E-02	2.52E-04	6.59E-03	2.07E-02
MLLW(CA) WV to SR West Valley DP		to Savannah River				
	Truck	2.89E-02	2.45E-03	3.86E-03	2.47E-02	3.10E-02
	Rail	7.96E-03	1.95E-02	3.38E-04	7.23E-03	2.70E-02

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route			Truck	Rail
MLLW(CA) BA to SR	Bettis Atomic	to Savannah River	2.11E-04	7.45E-05
MLLW(CA) LA to IN	Los Alamos NL	to INEL	1.13E-04	1.54E-05
MLLW(CA) LL to IN	Lawrence Livermore	to INEL	5.14E-05	3.46E-05
MLLW(CA) MP to SR	Mound Plant	to Savannah River	9.48E-08	1.85E-08
MLLW(CA) RF to IN	Rocky Flats Plant	to INEL	2.17E-05	9.38E-06
MLLW(CA) MC to SR	U of MO - Columbia	to Savannah River	6.78E-07	2.05E-07
MLLW(CA) WV to SR	West Valley DP	to Savannah River	3.36E-04	1.07E-04

Table 5. Nonradiological Risk Factors per Shipment (fatalities/shipment)

Mode	Route		Emission	Accident
Truck				
	Bettis Atomic	to Savannah River	3.99E-06	4.90E-05
	Los Alamos NL	to INEL	5.25E-06	8.21E-05
	Lawrence Livermore	to INEL	1.24E-05	5.73E-05
	Mound Plant	to Savannah River	1.67E-06	5.26E-05
	Rocky Flats Plant	to INEL	1.42E-06	4.68E-05
	U of MO - Columbia	to Savannah River	6.41E-06	6.09E-05
	West Valley DP	to Savannah River	3.28E-06	6.60E-05
Rail				
	Bettis Atomic	to Savannah River	1.74E-05	1.98E-06
	Los Alamos NL	to INEL	4.90E-06	2.47E-06
	Lawrence Livermore	to INEL	1.41E-05	2.30E-06
	Mound Plant	to Savannah River	1.03E-05	1.56E-06
	Rocky Flats Plant	to INEL	5.44E-06	1.54E-06
	U of MO - Columbia	to Savannah River	1.69E-05	2.12E-06
	West Valley DP	to Savannah River	2.49E-05	2.55E-06

Table 6. Annual Incident-Free Dose for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
		Crew	Public	Crew	Public
Bettis Atomic	to Savannah River	2.14E-02	2.35E-02	6.83E-03	1.99E-02
Los Alamos NL	to INEL	1.26E-01	1.52E-01	1.56E-02	2.24E-02
Lawrence Livermore	to INEL	1.71E-01	2.12E-01	2.24E-02	4.54E-02
Mound Plant	to Savannah River	2.21E-02	2.31E-02	5.99E-03	1.52E-02
Rocky Flats Plant	to INEL	2.47E+00	2.98E+00	2.86E-01	4.39E-01
U of MO - Columbia	to Savannah River	2.83E-02	3.12E-02	7.10E-03	2.07E-02
West Valley DP	to Savannah River	2.89E-02	3.10E-02	7.96E-03	2.70E-02
Totals		2.86E+00	3.46E+00	3.52E-01	5.89E-01

Table 7. Annual Accident Dose Risk for the Shipping Campaign (person-rem/yr)

Route		Truck	Rail
Bettis Atomic	to Savannah River	2.11E-04	7.45E-05
Los Alamos NL	to INEL	4.51E-04	3.07E-05
Lawrence Livermore	to INEL	3.09E-04	1.04E-04
Mound Plant	to Savannah River	9.48E-08	1.85E-08
Rocky Flats Plant	to INEL	2.82E-03	4.50E-04
U of MO - Columbia	to Savannah River	6.78E-07	2.05E-07
West Valley DP	to Savannah River	3.36E-04	1.07E-04
Totals		4.12E-03	7.67E-04

Table 8. Expected Annual Fatalities for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	1.1E-03	1.4E-04
Normal Public	1.7E-03	2.9E-04
Accident Public	2.1E-06	3.8E-07
Nonradiological		
Emission	2.9E-04	3.8E-04
Accident	7.0E-03	9.4E-05

Table 9. Expected Annual Cancer Incidence for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	4.0E-03	4.9E-04
Normal Public	5.9E-03	1.0E-03
Accident Public	7.0E-06	1.3E-06
Nonradiological		
Emission	2.9E-04	3.8E-04
Accident	NA	NA

Table 10. Expected Annual Genetic Effects for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	1.7E-04	2.1E-05
Normal Public	3.5E-04	5.9E-05
Accident Public	1.7E-07	3.5E-08
Nonradiological		
Emission	NA	NA
Accident	NA	NA

B.27 WM LLMW REGIONALIZED 4 ALTERNATIVE (CASE 15): CONTACT-HANDLED HETEROGENEOUS SOLIDS: NONALPHA — TREATED

Table 1. Summary of Route Information

		Distance (miles)	Percentage in Zone		
Route			Rural	Suburban	Urban
Truck					
Ames Laboratory	to Oak Ridge Reserv.	900	75.2	23.4	1.5
Argonne - East	to Oak Ridge Reserv.	584	67.0	30.1	2.9
Charleston, SC	to Savannah River	200	75.7	23.8	0.5
Colonie	to Oak Ridge Reserv.	2193	84.1	13.8	2.1
Fernald (FEMP)	to Oak Ridge Reserv.	312	69.9	29.5	0.6
General Atomic	to INEL	976	78.8	17.1	4.1
Grand Junction PO	to INEL	670	85.1	12.0	2.8
Los Alamos NL	to INEL	1144	88.7	9.8	1.4
LERHR	to Hanford Site	830	80.5	17.0	2.6
Paducah GDP	to Oak Ridge Reserv.	304	81.3	18.5	0.2
Pantex Plant	to INEL	1468	89.8	8.6	1.6
Portsmouth GDP	to Oak Ridge Reserv.	371	74.5	24.6	0.9
Reactive Metals	to Oak Ridge Reserv.	608	64.1	34.1	1.8
Rail					
Ames Laboratory	to Oak Ridge Reserv.	954	71.7	22.0	6.3
Argonne - East	to Oak Ridge Reserv.	648	70.7	25.3	4.0
Charleston, SC	to Savannah River	140	83.9	13.6	2.5
Colonie	to Oak Ridge Reserv.	957	42.1	43.9	14.0
Fernald (FEMP)	to Oak Ridge Reserv.	358	75.7	21.8	2.5
General Atomic	to INEL	1076	82.6	11.4	6.0
Grand Junction PO	to INEL	517	83.7	13.9	2.4
Los Alamos NL	to INEL	1179	92.2	6.8	1.0
LERHR	to Hanford Site	890	81.0	14.3	4.7
Paducah GDP	to Oak Ridge Reserv.	527	89.3	9.0	1.7
Pantex Plant	to INEL	1141	91.3	7.6	1.0
Portsmouth GDP	to Oak Ridge Reserv.	442	66.8	31.5	1.7
Reactive Metals	to Oak Ridge Reserv.	600	59.4	33.2	7.4

Table 2. Annual Number of Shipments and Total One-Way Shipment Distances

Route	# of Shipments		Total Mileage(mi)	
	Truck	Rail	Truck	Rail
Ames Laboratory	1	1	9.00E+02	9.54E+02
Argonne - East	1	1	5.84E+02	6.48E+02
Charleston, SC	1	1	2.00E+02	1.40E+02
Colonie	1	1	2.19E+03	9.57E+02
Fernald (FEMP)	2	1	6.24E+02	3.58E+02
General Atomic	1	1	9.76E+02	1.08E+03
Grand Junction PO	1	1	6.70E+02	5.17E+02
Los Alamos NL	1	1	1.14E+03	1.18E+03
LERHR	1	1	8.30E+02	8.90E+02
Paducah GDP	1	1	3.04E+02	5.27E+02
Pantex Plant	1	1	1.47E+03	1.14E+03
Portsmouth GDP	2	1	7.41E+02	4.42E+02
Reactive Metals	1	1	6.08E+02	6.00E+02
Totals	15	13	1.12E+04	9.43E+03

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

Source/Route(s)	Crew	General Public			
		Off-Link	On-Link	Stops	Total
MLLW(CT) AL to OR Ames Laboratory	to Oak Ridge Reserv.				
	Truck	2.83E-02	2.29E-03	3.92E-03	2.52E-02
	Rail	6.86E-03	1.58E-02	2.35E-04	6.42E-03
MLLW(CT) AN to OR Argonne - East	to Oak Ridge Reserv.				
	Truck	2.00E-02	2.19E-03	3.27E-03	1.63E-02
	Rail	5.59E-03	8.34E-03	1.48E-04	5.48E-03
MLLW(CT) CH to SR Charleston, SC	to Savannah River				
	Truck	6.19E-03	4.20E-04	7.45E-04	5.60E-03
	Rail	3.47E-03	1.07E-03	2.07E-05	3.91E-03
MLLW(CT) KA to OR Colonie	to Oak Ridge Reserv.				
	Truck	6.37E-02	4.68E-03	9.54E-03	6.14E-02
	Rail	6.87E-03	3.39E-02	4.49E-04	6.42E-03
MLLW(CT) FE to OR Fernald (FEMP)	to Oak Ridge Reserv.				
	Truck	1.02E-02	8.00E-04	1.26E-03	8.73E-03
	Rail	4.37E-03	3.32E-03	6.75E-05	4.58E-03
MLLW(CT) SO to NT General Atomic	to INEL				
	Truck	3.06E-02	3.33E-03	5.75E-03	2.73E-02
	Rail	7.37E-03	1.48E-02	2.03E-04	6.79E-03
MLLW(CT) GJ to LA Grand Junction PO	to INEL				
	Truck	1.95E-02	1.59E-03	3.20E-03	1.88E-02
	Rail	5.04E-03	3.86E-03	7.64E-05	5.07E-03
MLLW(CT) LA to IN Los Alamos NL	to INEL				
	Truck	3.15E-02	1.73E-03	4.27E-03	3.20E-02
	Rail	7.80E-03	4.00E-03	1.08E-04	7.11E-03
MLLW(CT) SM to NT LERHR	to Hanford Site				
	Truck	2.51E-02	2.17E-03	4.00E-03	2.32E-02
	Rail	6.59E-03	1.07E-02	1.64E-04	6.22E-03
MLLW(CT) PA to OR Paducah GDP	to Oak Ridge Reserv.				
	Truck	8.88E-03	4.70E-04	9.98E-04	8.51E-03
	Rail	5.08E-03	2.75E-03	5.97E-05	5.10E-03
MLLW(CT) PP to LA Pantex Plant	to INEL				
	Truck	4.01E-02	2.24E-03	5.63E-03	4.11E-02
	Rail	7.64E-03	4.12E-03	1.10E-04	6.99E-03
MLLW(CT) PO to OR Portsmouth GDP	to Oak Ridge Reserv.				
	Truck	1.16E-02	8.77E-04	1.50E-03	1.04E-02
	Rail	4.73E-03	4.37E-03	1.00E-04	4.84E-03
MLLW(CT) RM to OR Reactive Metals	to Oak Ridge Reserv.				
	Truck	2.11E-02	2.15E-03	3.08E-03	1.70E-02
	Rail	5.38E-03	1.25E-02	1.91E-04	5.33E-03

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route		Truck	Rail
MLLW(CT) AL to OR			
Ames Laboratory	to Oak Ridge Reserv.	4.17E-08	1.36E-08
MLLW(CT) AN to OR			
Argonne - East	to Oak Ridge Reserv.	1.48E-05	2.57E-06
MLLW(CT) CH to SR			
Charleston, SC	to Savannah River	4.40E-05	5.11E-06
MLLW(CT) KA to OR			
Colonie	to Oak Ridge Reserv.	1.66E-07	7.54E-08
MLLW(CT) FE to OR			
Fernald (FEMP)	to Oak Ridge Reserv.	3.14E-05	7.21E-06
MLLW(CT) SO to NT			
General Atomic	to INEL	1.84E-06	7.22E-07
MLLW(CT) GJ to LA			
Grand Junction PO	to INEL	2.73E-08	7.88E-09
MLLW(CT) LA to IN			
Los Alamos NL	to INEL	3.14E-05	1.96E-06
MLLW(CT) SM to NT			
LERHR	to Hanford Site	1.21E-06	6.33E-07
MLLW(CT) PA to OR			
Paducah GDP	to Oak Ridge Reserv.	2.33E-04	2.98E-05
MLLW(CT) PP to LA			
Pantex Plant	to INEL	2.69E-05	1.83E-06
MLLW(CT) PO to OR			
Portsmouth GDP	to Oak Ridge Reserv.	9.59E-06	3.63E-06
MLLW(CT) RM to OR			
Reactive Metals	to Oak Ridge Reserv.	7.69E-07	1.45E-07

Table 5. Nonradiological Risk Factors per Shipment (fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
Ames Laboratory	to Oak Ridge Reserv.	4.25E-06	5.79E-05
Argonne - East	to Oak Ridge Reserv.	5.38E-06	4.21E-05
Charleston, SC	to Savannah River	3.22E-07	1.70E-05
Colonie	to Oak Ridge Reserv.	1.46E-05	1.61E-04
Fernald (FEMP)	to Oak Ridge Reserv.	5.79E-07	2.25E-05
General Atomic	to INEL	1.30E-05	6.23E-05
Grand Junction PO	to INEL	6.08E-06	4.24E-05
Los Alamos NL	to INEL	5.25E-06	8.21E-05
LERHR	to Hanford Site	6.82E-06	4.66E-05
Paducah GDP	to Oak Ridge Reserv.	1.93E-07	2.14E-05
Pantex Plant	to INEL	7.79E-06	1.05E-04
Portsmouth GDP	to Oak Ridge Reserv.	1.09E-06	2.56E-05
Reactive Metals	to Oak Ridge Reserv.	3.57E-06	3.56E-05
Rail			
Ames Laboratory	to Oak Ridge Reserv.	2.52E-05	2.00E-06
Argonne - East	to Oak Ridge Reserv.	1.08E-05	1.36E-06
Charleston, SC	to Savannah River	1.46E-06	2.93E-07
Colonie	to Oak Ridge Reserv.	5.59E-05	2.00E-06
Fernald (FEMP)	to Oak Ridge Reserv.	3.68E-06	7.48E-07
General Atomic	to INEL	2.72E-05	2.25E-06
Grand Junction PO	to INEL	5.15E-06	1.08E-06
Los Alamos NL	to INEL	4.90E-06	2.47E-06
LERHR	to Hanford Site	1.77E-05	1.86E-06
Paducah GDP	to Oak Ridge Reserv.	3.81E-06	1.10E-06
Pantex Plant	to INEL	4.85E-06	2.39E-06
Portsmouth GDP	to Oak Ridge Reserv.	3.18E-06	9.25E-07
Reactive Metals	to Oak Ridge Reserv.	1.85E-05	1.25E-06

Table 6. Annual Incident-Free Dose for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
		Crew	Public	Crew	Public
Ames Laboratory	to Oak Ridge Reserv.	2.83E-02	3.14E-02	6.86E-03	2.24E-02
Argonne - East	to Oak Ridge Reserv.	2.00E-02	2.18E-02	5.59E-03	1.40E-02
Charleston, SC	to Savannah River	6.19E-03	6.77E-03	3.47E-03	5.00E-03
Colonie	to Oak Ridge Reserv.	6.37E-02	7.56E-02	6.87E-03	4.08E-02
Fernald (FEMP)	to Oak Ridge Reserv.	2.03E-02	2.16E-02	4.37E-03	7.96E-03
General Atomic	to INEL	3.06E-02	3.64E-02	7.37E-03	2.18E-02
Grand Junction PO	to INEL	1.95E-02	2.35E-02	5.04E-03	9.01E-03
Los Alamos NL	to INEL	3.15E-02	3.80E-02	7.80E-03	1.12E-02
LERHR	to Hanford Site	2.51E-02	2.94E-02	6.59E-03	1.70E-02
Paducah GDP	to Oak Ridge Reserv.	8.88E-03	9.98E-03	5.08E-03	7.91E-03
Pantex Plant	to INEL	4.01E-02	4.90E-02	7.64E-03	1.12E-02
Portsmouth GDP	to Oak Ridge Reserv.	2.33E-02	2.55E-02	4.73E-03	9.32E-03
Reactive Metals	to Oak Ridge Reserv.	2.11E-02	2.23E-02	5.38E-03	1.80E-02
Totals		3.39E-01	3.91E-01	7.68E-02	1.96E-01

Table 7. Annual Accident Dose Risk for the Shipping Campaign (person-rem/yr)

Route		Truck	Rail
Ames Laboratory	to Oak Ridge Reserv.	4.17E-08	1.36E-08
Argonne - East	to Oak Ridge Reserv.	1.48E-05	2.57E-06
Charleston, SC	to Savannah River	4.40E-05	5.11E-06
Colonie	to Oak Ridge Reserv.	1.66E-07	7.54E-08
Fernald (FEMP)	to Oak Ridge Reserv.	6.28E-05	7.21E-06
General Atomic	to INEL	1.84E-06	7.22E-07
Grand Junction PO	to INEL	2.73E-08	7.88E-09
Los Alamos NL	to INEL	3.14E-05	1.96E-06
LERHR	to Hanford Site	1.21E-06	6.33E-07
Paducah GDP	to Oak Ridge Reserv.	2.33E-04	2.98E-05
Pantex Plant	to INEL	2.69E-05	1.83E-06
Portsmouth GDP	to Oak Ridge Reserv.	1.92E-05	3.63E-06
Reactive Metals	to Oak Ridge Reserv.	7.69E-07	1.45E-07
Totals		4.36E-04	5.37E-05

Table 8. Expected Annual Fatalities for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	1.4E-04	3.1E-05
Normal Public	2.0E-04	9.8E-05
Accident Public	2.2E-07	2.7E-08
Nonradiological		
Emission	7.1E-05	1.8E-04
Accident	7.7E-04	2.0E-05

Table 9. Expected Annual Cancer Incidence for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	4.7E-04	1.1E-04
Normal Public	6.7E-04	3.3E-04
Accident Public	7.4E-07	9.1E-08
Nonradiological		
Emission	7.1E-05	1.8E-04
Accident	NA	NA

Table 10. Expected Annual Genetic Effects
for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	2.0E-05	4.6E-06
Normal Public	3.9E-05	2.0E-05
Accident Public	1.2E-08	1.2E-09
Nonradiological		
Emission	NA	NA
Accident	NA	NA

B.28 WM LLMW REGIONALIZED 4 ALTERNATIVE (CASE 15): CONTACT-HANDLED HETEROGENEOUS SOLIDS: ALPHA — TREATED

Table 1. Summary of Route Information

			Distance (miles)	Percentage in Zone		
				Rural	Suburban	Urban
Route						
Truck						
Los Alamos NL	to	INEL	1144	88.7	9.8	1.4
Rocky Flats Plant	to	INEL	716	91.3	8.1	0.6
West Valley DP	to	Savannah River	883	70.3	28.5	1.2
Rail						
Los Alamos NL	to	INEL	1179	92.2	6.8	1.0
Rocky Flats Plant	to	INEL	738	93.0	5.2	1.8
West Valley DP	to	Savannah River	1217	62.8	32.4	4.9

Table 2. Annual Number of Shipments and Total One-Way Shipment Distances

Route		# of Shipments		Total Mileage(mi)	
		Truck	Rail	Truck	Rail
Los Alamos NL to INEL		1	1	1.14E+03	1.18E+03
Rocky Flats Plant to INEL		68	25	4.87E+04	1.85E+04
West Valley DP to Savannah River		1	1	8.83E+02	1.22E+03
Totals		70	27	5.07E+04	2.09E+04

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

Source/Route(s)		Crew	General Public			
			Off-Link	On-Link	Stops	Total
MLLW(T) LA to IN						
Los Alamos NL	to INEL					
	Truck	3.15E-02	1.73E-03	4.27E-03	3.20E-02	3.80E-02
	Rail	7.80E-03	4.00E-03	1.08E-04	7.11E-03	1.12E-02
MLLW(T) RF to LA						
Rocky Flats Plant	to INEL					
	Truck	1.90E-02	6.95E-04	2.22E-03	2.00E-02	2.30E-02
	Rail	5.96E-03	3.32E-03	7.00E-05	5.75E-03	9.14E-03
MLLW(T) WV to SR						
West Valley DP	to Savannah River					
	Truck	2.89E-02	2.45E-03	3.86E-03	2.47E-02	3.10E-02
	Rail	7.96E-03	1.95E-02	3.38E-04	7.23E-03	2.70E-02

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route	Truck	Rail
MLLW(T) LA to IN		
Los Alamos NL to INEL	2.67E-05	1.82E-06
MLLW(T) RF to LA		
Rocky Flats Plant to INEL	1.57E-04	6.82E-05
MLLW(T) WV to SR		
West Valley DP to Savannah River	4.43E-05	1.42E-05

Table 5. Nonradiological Risk Factors per Shipment (fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
	Los Alamos NL to INEL	5.25E-06	8.21E-05
	Rocky Flats Plant to INEL	1.42E-06	4.68E-05
	West Valley DP to Savannah River	3.28E-06	6.60E-05
Rail			
	Los Alamos NL to INEL	4.90E-06	2.47E-06
	Rocky Flats Plant to INEL	5.44E-06	1.54E-06
	West Valley DP to Savannah River	2.49E-05	2.55E-06

Table 6. Annual Incident-Free Dose for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
		Crew	Public	Crew	Public
Los Alamos NL	to INEL	3.15E-02	3.80E-02	7.80E-03	1.12E-02
Rocky Flats Plant	to INEL	1.29E+00	1.56E+00	1.49E-01	2.29E-01
West Valley DP	to Savannah River	2.89E-02	3.10E-02	7.96E-03	2.70E-02
Totals		1.35E+00	1.63E+00	1.65E-01	2.67E-01

Table 7. Annual Accident Dose Risk for the Shipping Campaign (person-rem/yr)

Route		Truck	Rail
Los Alamos NL	to INEL	2.67E-05	1.82E-06
Rocky Flats Plant	to INEL	1.07E-02	1.71E-03
West Valley DP	to Savannah River	4.43E-05	1.42E-05
Totals		1.07E-02	1.72E-03

Table 8. Expected Annual Fatalities for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	5.4E-04	6.6E-05
Normal Public	8.1E-04	1.3E-04
Accident Public	5.4E-06	8.6E-07
Nonradiological		
Emission	1.0E-04	1.7E-04
Accident	3.3E-03	4.4E-05

Table 9. Expected Annual Cancer Incidence for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	1.9E-03	2.3E-04
Normal Public	2.8E-03	4.5E-04
Accident Public	1.8E-05	2.9E-06
Nonradiological		
Emission	1.0E-04	1.7E-04
Accident	NA	NA

Table 10. Expected Annual Genetic Effects for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	8.1E-05	9.9E-06
Normal Public	1.6E-04	2.7E-05
Accident Public	3.6E-07	6.1E-08
Nonradiological		
Emission	NA	NA
Accident	NA	NA

B.29 WM LLMW CENTRALIZED ALTERNATIVE (CASE 17): CONTACT-HANDLED ORGANIC LIQUIDS: NONALPHA — UNTREATED

Table 1. Summary of Route Information

		Distance (miles)	Percentage in Zone		
Route			Rural	Suburban	Urban
Truck					
Argonne - West	to Hanford Site	599	91.3	7.6	1.1
Bettis Atomic	to Hanford Site	2541	85.8	12.8	1.4
Brookhaven NL	to Hanford Site	2853	83.3	14.5	2.3
Charleston, SC	to Hanford Site	2858	85.5	13.2	1.3
Colonie	to Hanford Site	1373	75.4	16.7	7.9
ETEC	to Hanford Site	1241	80.5	14.3	5.2
Fernald (FEMP)	to Hanford Site	2258	89.4	9.8	0.8
General Atomic	to Hanford Site	1352	76.3	16.0	7.7
Grand Junction PO	to Hanford Site	1086	88.1	9.8	2.1
INEL	to Hanford Site	599	91.3	7.6	1.1
ITRI	to Hanford Site	1593	89.7	8.8	1.5
Knolls Atomic	to Hanford Site	2809	82.1	16.1	1.8
KKS	to Hanford Site	2809	82.1	16.1	1.8
KWS	to Hanford Site	2809	82.1	16.1	1.8
Los Alamos NL	to Hanford Site	1560	89.8	8.8	1.3
Lawrence Berkeley	to Hanford Site	875	78.1	17.8	4.1
LERHR	to Hanford Site	830	80.5	17.0	2.6
Lawrence Livermore	to Hanford Site	894	77.2	19.3	3.4
Oak Ridge Reserv.	to Hanford Site	2464	87.8	11.0	1.2
Paducah GDP	to Hanford Site	2182	88.7	10.0	1.3
Pantex Plant	to Hanford Site	1884	90.4	8.0	1.5
Pearl Harbor NS	to Hanford Site	226	76.8	20.9	2.3
Portsmouth GDP	to Hanford Site	2402	88.0	11.0	1.0
Puget Sound NS	to Hanford Site	226	76.8	20.9	2.3
Reactive Metals	to Hanford Site	2398	86.6	11.7	1.6
SNL - Albuquerque	to Hanford Site	1584	89.7	8.8	1.4
SNL - Livermore	to Hanford Site	894	77.2	19.3	3.4
Savannah River	to Hanford Site	2727	84.3	14.2	1.5
Rail					
Argonne - West	to Hanford Site	658	91.4	7.1	1.4
Bettis Atomic	to Hanford Site	2611	81.2	15.1	3.7
Brookhaven NL	to Hanford Site	3153	75.1	19.7	5.2
Charleston, SC	to Hanford Site	3059	84.5	13.7	1.8
Colonie	to Hanford Site	1622	86.2	9.5	4.3
ETEC	to Hanford Site	1587	85.6	8.9	5.5
Fernald (FEMP)	to Hanford Site	2505	85.6	11.5	2.9
General Atomic	to Hanford Site	1622	86.2	9.5	4.3
Grand Junction PO	to Hanford Site	1063	88.6	9.8	1.6
INEL	to Hanford Site	658	91.4	7.1	1.4
ITRI	to Hanford Site	1793	91.7	7.1	1.2
Knolls Atomic	to Hanford Site	2914	79.1	17.0	3.9
KKS	to Hanford Site	2914	79.1	17.0	3.9
KWS	to Hanford Site	2914	79.1	17.0	3.9
Los Alamos NL	to Hanford Site	1725	92.5	6.5	0.9
Lawrence Berkeley	to Hanford Site	986	78.5	15.8	5.7
LERHR	to Hanford Site	890	81.0	14.3	4.7
Lawrence Livermore	to Hanford Site	973	78.9	15.3	5.8
Oak Ridge Reserv.	to Hanford Site	2601	91.2	7.4	1.3
Paducah GDP	to Hanford Site	2245	90.8	7.9	1.3
Pantex Plant	to Hanford Site	1686	92.0	7.1	1.0
Pearl Harbor NS	to Hanford Site	416	73.7	20.1	6.2
Portsmouth GDP	to Hanford Site	2515	86.4	10.8	2.7
Puget Sound NS	to Hanford Site	416	73.7	20.1	6.2
Reactive Metals	to Hanford Site	2505	83.4	13.1	3.5
SNL - Albuquerque	to Hanford Site	1793	91.7	7.1	1.2
SNL - Livermore	to Hanford Site	973	78.9	15.3	5.8
Savannah River	to Hanford Site	2953	84.7	13.5	1.8

Table 2. Annual Number of Shipments and One-Way Shipment Distances

Route		# of Shipments		Total Mileage(mi)	
		Truck	Rail	Truck	Rail
Argonne - West	to Hanford Site	1	1	5.99E+02	6.58E+02
Bettis Atomic	to Hanford Site	1	1	2.54E+03	2.61E+03
Brookhaven NL	to Hanford Site	1	1	2.85E+03	3.15E+03
Charleston, SC	to Hanford Site	1	1	2.86E+03	3.06E+03
Colonie	to Hanford Site	1	1	1.37E+03	1.62E+03
ETEC	to Hanford Site	1	1	1.24E+03	1.59E+03
Fernald (FEMP)	to Hanford Site	2	1	4.52E+03	2.51E+03
General Atomic	to Hanford Site	1	1	1.35E+03	1.62E+03
Grand Junction PO	to Hanford Site	1	1	1.09E+03	1.06E+03
INEL	to Hanford Site	1	1	5.99E+02	6.58E+02
ITRI	to Hanford Site	1	1	1.59E+03	1.79E+03
Knolls Atomic	to Hanford Site	1	1	2.81E+03	2.91E+03
KKS	to Hanford Site	1	1	2.81E+03	2.91E+03
KWS	to Hanford Site	1	1	2.81E+03	2.91E+03
Los Alamos NL	to Hanford Site	1	1	1.56E+03	1.72E+03
Lawrence Berkeley	to Hanford Site	1	1	8.75E+02	9.86E+02
LERHR	to Hanford Site	1	1	8.30E+02	8.90E+02
Lawrence Livermore	to Hanford Site	5	2	4.47E+03	1.95E+03
Oak Ridge Reserv.	to Hanford Site	71	27	1.75E+05	7.02E+04
Paducah GDP	to Hanford Site	3	1	6.54E+03	2.25E+03
Pantex Plant	to Hanford Site	1	1	1.88E+03	1.69E+03
Pearl Harbor NS	to Hanford Site	1	1	2.26E+02	4.16E+02
Portsmouth GDP	to Hanford Site	3	2	7.21E+03	5.03E+03
Puget Sound NS	to Hanford Site	1	1	2.26E+02	4.16E+02
Reactive Metals	to Hanford Site	1	1	2.40E+03	2.51E+03
SNL - Albuquerque	to Hanford Site	1	1	1.58E+03	1.79E+03
SNL - Livermore	to Hanford Site	1	1	8.94E+02	9.73E+02
Savannah River	to Hanford Site	33	13	9.00E+04	3.84E+04
Totals		139	68	3.23E+05	1.58E+05

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

Source/Route(s)		General Public				
		Crew	Off-Link	On-Link	Stops	Total
MLLW(O) AW to HS						
Argonne - West	to Hanford Site					
	Truck	1.60E-02	7.18E-04	2.06E-03	1.68E-02	1.95E-02
	Rail	5.63E-03	2.83E-03	6.58E-05	5.51E-03	8.40E-03
MLLW(O) BA to HS						
Bettis Atomic	to Hanford Site					
	Truck	7.21E-02	4.36E-03	9.77E-03	7.11E-02	8.53E-02
	Rail	1.38E-02	2.67E-02	4.53E-04	1.15E-02	3.87E-02
MLLW(O) BN to HS						
Brookhaven NL	to Hanford Site					
	Truck	8.38E-02	6.48E-03	1.28E-02	7.99E-02	9.92E-02
	Rail	1.60E-02	4.38E-02	6.87E-04	1.32E-02	5.76E-02
MLLW(O) CH to HS						
Charleston, SC	to Hanford Site					
	Truck	8.12E-02	4.87E-03	1.09E-02	8.00E-02	9.58E-02
	Rail	1.56E-02	1.96E-02	4.24E-04	1.29E-02	3.29E-02
MLLW(O) CL to HS						
Colonie	to Hanford Site					
	Truck	4.61E-02	7.22E-03	1.16E-02	3.84E-02	5.72E-02
	Rail	9.65E-03	1.64E-02	2.49E-04	8.47E-03	2.52E-02
MLLW(O) LC to HS						
ETEC	to Hanford Site					
	Truck	3.87E-02	4.63E-03	8.05E-03	3.47E-02	4.74E-02
	Rail	9.50E-03	1.96E-02	2.68E-04	8.37E-03	2.82E-02
MLLW(O) FE to HS						
Fernald (FEMP)	to Hanford Site					
	Truck	6.13E-02	2.71E-03	7.49E-03	6.32E-02	7.34E-02
	Rail	1.33E-02	2.00E-02	3.60E-04	1.12E-02	3.16E-02
MLLW(O) SO to HS						
General Atomic	to Hanford Site					
	Truck	4.49E-02	6.88E-03	1.11E-02	3.78E-02	5.58E-02
	Rail	9.65E-03	1.64E-02	2.49E-04	8.47E-03	2.52E-02
MLLW(O) GJ to HS						
Grand Junction PO	to Hanford Site					
	Truck	3.04E-02	2.03E-03	4.58E-03	3.04E-02	3.70E-02
	Rail	7.32E-03	5.46E-03	1.23E-04	6.75E-03	1.23E-02

Table 3. Incident-Free Dose per Shipment (person-rem/shipment) (Cont.)

Source/Route(s)	Crew	General Public			
		Off-Link	On-Link	Stops	Total
MLLW(O) IN to HS INEL	to Hanford Site				
	Truck	1.60E-02	7.18E-04	2.06E-03	1.68E-02
	Rail	5.63E-03	2.83E-03	6.58E-05	5.51E-03
MLLW(O) IT to HS ITRI	to Hanford Site				
	Truck	4.34E-02	2.30E-03	5.91E-03	4.46E-02
	Rail	1.04E-02	6.90E-03	1.72E-04	9.00E-03
MLLW(O) KA to HS Knolls Atomic	to Hanford Site				
	Truck	8.30E-02	6.03E-03	1.19E-02	7.87E-02
	Rail	1.50E-02	3.18E-02	5.40E-04	1.25E-02
MLLW(O) KK to HS KKS	to Hanford Site				
	Truck	8.30E-02	6.03E-03	1.19E-02	7.87E-02
	Rail	1.50E-02	3.18E-02	5.40E-04	1.25E-02
MLLW(O) KW to HS KWS	to Hanford Site				
	Truck	8.30E-02	6.03E-03	1.19E-02	7.87E-02
	Rail	1.50E-02	3.18E-02	5.40E-04	1.25E-02
MLLW(O) LA to HS Los Alamos NL	to Hanford Site				
	Truck	4.24E-02	2.16E-03	5.65E-03	4.37E-02
	Rail	1.01E-02	5.60E-03	1.54E-04	8.79E-03
MLLW(O) LB to HS Lawrence Berkeley	to Hanford Site				
	Truck	2.76E-02	3.02E-03	5.17E-03	2.45E-02
	Rail	6.99E-03	1.38E-02	2.03E-04	6.51E-03
MLLW(O) SM to HS LERHR	to Hanford Site				
	Truck	2.51E-02	2.17E-03	4.00E-03	2.32E-02
	Rail	6.59E-03	1.07E-02	1.64E-04	6.22E-03
MLLW(O) LL to HS Lawrence Livermore	to Hanford Site				
	Truck	2.82E-02	2.88E-03	4.92E-03	2.50E-02
	Rail	6.94E-03	1.38E-02	2.00E-04	6.48E-03
MLLW(O) OR to HS Oak Ridge Reserv.	to Hanford Site				
	Truck	6.83E-02	3.65E-03	8.95E-03	6.90E-02
	Rail	1.37E-02	1.08E-02	2.59E-04	1.15E-02
MLLW(O) PA to HS Paducah GDP	to Hanford Site				
	Truck	6.00E-02	3.22E-03	8.02E-03	6.11E-02
	Rail	1.22E-02	9.43E-03	2.28E-04	1.04E-02
MLLW(O) PP to HS Pantex Plant	to Hanford Site				
	Truck	5.10E-02	2.68E-03	7.01E-03	5.27E-02
	Rail	9.92E-03	5.71E-03	1.56E-04	8.67E-03
MLLW(O) SW to HS Pearl Harbor NS	to Hanford Site				
	Truck	7.06E-03	6.28E-04	1.09E-03	6.33E-03
	Rail	4.62E-03	6.63E-03	9.79E-05	4.76E-03
MLLW(O) PO to HS Portsmouth GDP	to Hanford Site				
	Truck	6.63E-02	3.38E-03	8.48E-03	6.72E-02
	Rail	1.34E-02	1.89E-02	3.46E-04	1.12E-02
MLLW(O) PN to HS Puget Sound NS	to Hanford Site				
	Truck	7.06E-03	6.28E-04	1.09E-03	6.33E-03
	Rail	4.62E-03	6.63E-03	9.79E-05	4.76E-03
MLLW(O) RM to HS Reactive Metals	to Hanford Site				
	Truck	6.76E-02	4.22E-03	9.51E-03	6.71E-02
	Rail	1.33E-02	2.35E-02	4.01E-04	1.12E-02
MLLW(O) SA to HS SNL - Albuquerque	to Hanford Site				
	Truck	4.31E-02	2.27E-03	5.84E-03	4.43E-02
	Rail	1.04E-02	6.90E-03	1.72E-04	9.00E-03
MLLW(O) SL to HS SNL - Livermore	to Hanford Site				
	Truck	2.82E-02	2.88E-03	4.92E-03	2.50E-02
	Rail	6.94E-03	1.38E-02	2.00E-04	6.48E-03
MLLW(O) SR to HS Savannah River	to Hanford Site				
	Truck	7.86E-02	5.10E-03	1.08E-02	7.64E-02
	Rail	1.52E-02	1.85E-02	4.05E-04	1.26E-02

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route		Truck	Rail
MLLW(O) AW to HS			
Argonne - West	to Hanford Site	1.00E-05	5.37E-06
MLLW(O) BA to HS			
Bettis Atomic	to Hanford Site	2.62E-03	9.99E-04
MLLW(O) BN to HS			
Brookhaven NL	to Hanford Site	9.79E-03	4.90E-03
MLLW(O) CH to HS			
Charleston, SC	to Hanford Site	1.12E-01	2.27E-02
MLLW(O) CL to HS			
Colonie	to Hanford Site	2.25E-04	6.67E-05
MLLW(O) LC to HS			
ETEC	to Hanford Site	1.30E-05	5.22E-06
MLLW(O) FE to HS			
Fernald (FEMP)	to Hanford Site	3.88E-03	3.18E-03
MLLW(O) SO to HS			
General Atomic	to Hanford Site	1.69E-05	5.22E-06
MLLW(O) GJ to HS			
Grand Junction PO	to Hanford Site	1.38E-06	4.77E-07
MLLW(O) IN to HS			
INEL	to Hanford Site	2.25E-02	1.21E-02
MLLW(O) IT to HS			
ITRI	to Hanford Site	2.96E-05	3.23E-06
MLLW(O) KA to HS			
Knolls Atomic	to Hanford Site	8.53E-02	2.73E-02
MLLW(O) KK to HS			
KKS	to Hanford Site	6.55E-02	2.10E-02
MLLW(O) KW to HS			
KWS	to Hanford Site	8.93E-03	2.86E-03
MLLW(O) LA to HS			
Los Alamos NL	to Hanford Site	1.93E-03	2.13E-04
MLLW(O) LB to HS			
Lawrence Berkeley	to Hanford Site	7.79E-05	4.38E-05
MLLW(O) SM to HS			
LERHR	to Hanford Site	7.78E-06	4.14E-06
MLLW(O) LL to HS			
Lawrence Livermore	to Hanford Site	3.93E-03	5.23E-03
MLLW(O) OR to HS			
Oak Ridge Reserv.	to Hanford Site	7.41E-02	3.07E-02
MLLW(O) PA to HS			
Paducah GDP	to Hanford Site	1.14E+00	5.74E-01
MLLW(O) PP to HS			
Pantex Plant	to Hanford Site	4.59E-04	4.90E-05
MLLW(O) SW to HS			
Pearl Harbor NS	to Hanford Site	8.47E-06	6.32E-06
MLLW(O) PO to HS			
Portsmouth GDP	to Hanford Site	1.56E-03	8.20E-04
MLLW(O) PN to HS			
Puget Sound NS	to Hanford Site	1.95E-04	1.46E-04
MLLW(O) RM to HS			
Reactive Metals	to Hanford Site	2.99E-04	1.12E-04
MLLW(O) SA to HS			
SNL - Albuquerque	to Hanford Site	2.07E-06	2.27E-07
MLLW(O) SL to HS			
SNL - Livermore	to Hanford Site	1.95E-03	1.04E-03
MLLW(O) SR to HS			
Savannah River	to Hanford Site	1.53E-01	7.69E-02

Table 5. Nonradiological Risk Factors per Shipment (fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
Argonne - West	to Hanford Site	2.19E-06	3.07E-05
Bettis Atomic	to Hanford Site	1.14E-05	1.36E-04
Brookhaven NL	to Hanford Site	2.07E-05	1.68E-04
Charleston, SC	to Hanford Site	1.20E-05	1.99E-04
Colonie	to Hanford Site	3.48E-05	8.47E-05
ETEC	to Hanford Site	2.08E-05	7.74E-05
Fernald (FEMP)	to Hanford Site	5.86E-06	1.22E-04
General Atomic	to Hanford Site	3.33E-05	8.36E-05
Grand Junction PO	to Hanford Site	7.50E-06	6.25E-05
INEL	to Hanford Site	2.19E-06	3.07E-05
ITRI	to Hanford Site	7.44E-06	1.05E-04
Knolls Atomic	to Hanford Site	1.59E-05	1.51E-04
KKS	to Hanford Site	1.59E-05	1.51E-04
KWS	to Hanford Site	1.59E-05	1.51E-04
Los Alamos NL	to Hanford Site	6.66E-06	1.02E-04
Lawrence Berkeley	to Hanford Site	1.16E-05	4.91E-05
LERHR	to Hanford Site	6.82E-06	4.66E-05
Lawrence Livermore	to Hanford Site	9.85E-06	5.03E-05
Oak Ridge Reserv.	to Hanford Site	9.50E-06	1.61E-04
Paducah GDP	to Hanford Site	9.30E-06	1.41E-04
Pantex Plant	to Hanford Site	9.21E-06	1.25E-04
Pearl Harbor NS	to Hanford Site	1.67E-06	9.56E-06
Portsmouth GDP	to Hanford Site	8.11E-06	1.28E-04
Puget Sound NS	to Hanford Site	1.67E-06	9.56E-06
Reactive Metals	to Hanford Site	1.27E-05	1.28E-04
SNL - Albuquerque	to Hanford Site	7.24E-06	1.05E-04
SNL - Livermore	to Hanford Site	9.85E-06	5.03E-05
Savannah River	to Hanford Site	1.31E-05	1.81E-04
Rail			
Argonne - West	to Hanford Site	3.98E-06	1.38E-06
Bettis Atomic	to Hanford Site	4.07E-05	5.46E-06
Brookhaven NL	to Hanford Site	6.80E-05	6.60E-06
Charleston, SC	to Hanford Site	2.35E-05	6.40E-06
Colonie	to Hanford Site	2.91E-05	3.39E-06
ETEC	to Hanford Site	3.67E-05	3.32E-06
Fernald (FEMP)	to Hanford Site	3.07E-05	5.24E-06
General Atomic	to Hanford Site	2.91E-05	3.39E-06
Grand Junction PO	to Hanford Site	7.07E-06	2.22E-06
INEL	to Hanford Site	3.98E-06	1.38E-06
ITRI	to Hanford Site	9.04E-06	3.75E-06
Knolls Atomic	to Hanford Site	4.72E-05	6.10E-06
KKS	to Hanford Site	4.72E-05	6.10E-06
KWS	to Hanford Site	4.72E-05	6.10E-06
Los Alamos NL	to Hanford Site	6.82E-06	3.61E-06
Lawrence Berkeley	to Hanford Site	2.33E-05	2.06E-06
LERHR	to Hanford Site	1.77E-05	1.86E-06
Lawrence Livermore	to Hanford Site	2.36E-05	2.04E-06
Oak Ridge Reserv.	to Hanford Site	1.45E-05	5.44E-06
Paducah GDP	to Hanford Site	1.23E-05	4.70E-06
Pantex Plant	to Hanford Site	6.78E-06	3.53E-06
Pearl Harbor NS	to Hanford Site	1.08E-05	8.70E-07
Portsmouth GDP	to Hanford Site	2.88E-05	5.26E-06
Puget Sound NS	to Hanford Site	1.08E-05	8.70E-07
Reactive Metals	to Hanford Site	3.65E-05	5.24E-06
SNL - Albuquerque	to Hanford Site	9.04E-06	3.75E-06
SNL - Livermore	to Hanford Site	2.36E-05	2.04E-06
Savannah River	to Hanford Site	2.21E-05	6.18E-06

Table 6. Annual Incident-Free Dose for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
		Crew	Public	Crew	Public
Argonne - West	to Hanford Site	1.60E-02	1.95E-02	5.63E-03	8.40E-03
Bettis Atomic	to Hanford Site	7.21E-02	8.53E-02	1.38E-02	3.87E-02
Brookhaven NL	to Hanford Site	8.38E-02	9.92E-02	1.60E-02	5.76E-02
Charleston, SC	to Hanford Site	8.12E-02	9.58E-02	1.56E-02	3.29E-02
Colonie	to Hanford Site	4.61E-02	5.72E-02	9.65E-03	2.52E-02
ETEC	to Hanford Site	3.87E-02	4.74E-02	9.50E-03	2.82E-02
Fernald (FEMP)	to Hanford Site	1.23E-01	1.47E-01	1.33E-02	3.16E-02
General Atomic	to Hanford Site	4.49E-02	5.58E-02	9.65E-03	2.52E-02
Grand Junction PO	to Hanford Site	3.04E-02	3.70E-02	7.32E-03	1.23E-02
INEL	to Hanford Site	1.60E-02	1.95E-02	5.63E-03	8.40E-03
ITRI	to Hanford Site	4.34E-02	5.28E-02	1.04E-02	1.61E-02
Knolls Atomic	to Hanford Site	8.30E-02	9.66E-02	1.50E-02	4.48E-02
KKS	to Hanford Site	8.30E-02	9.66E-02	1.50E-02	4.48E-02
KWS	to Hanford Site	8.30E-02	9.66E-02	1.50E-02	4.48E-02
Los Alamos NL	to Hanford Site	4.24E-02	5.15E-02	1.01E-02	1.45E-02
Lawrence Berkeley	to Hanford Site	2.76E-02	3.27E-02	6.99E-03	2.05E-02
LERHR	to Hanford Site	2.51E-02	2.94E-02	6.59E-03	1.70E-02
Lawrence Livermore	to Hanford Site	1.41E-01	1.64E-01	1.39E-02	4.10E-02
Oak Ridge Reserv.	to Hanford Site	4.85E+00	5.79E+00	3.71E-01	6.09E-01
Paducah GDP	to Hanford Site	1.80E-01	2.17E-01	1.22E-02	2.01E-02
Pantex Plant	to Hanford Site	5.10E-02	6.24E-02	9.92E-03	1.45E-02
Pearl Harbor NS	to Hanford Site	7.06E-03	8.04E-03	4.62E-03	1.15E-02
Portsmouth GDP	to Hanford Site	1.99E-01	2.37E-01	2.68E-02	6.09E-02
Puget Sound NS	to Hanford Site	7.06E-03	8.04E-03	4.62E-03	1.15E-02
Reactive Metals	to Hanford Site	6.76E-02	8.09E-02	1.33E-02	3.51E-02
SNL - Albuquerque	to Hanford Site	4.31E-02	5.24E-02	1.04E-02	1.61E-02
SNL - Livermore	to Hanford Site	2.82E-02	3.28E-02	6.94E-03	2.05E-02
Savannah River	to Hanford Site	2.59E+00	3.05E+00	1.98E-01	4.10E-01
Totals		9.10E+00	1.08E+01	8.56E-01	1.72E+00

Table 7. Annual Accident Dose Risk for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
Argonne - West	to Hanford Site	1.00E-05	5.37E-06		
Bettis Atomic	to Hanford Site	2.62E-03	9.99E-04		
Brookhaven NL	to Hanford Site	9.79E-03	4.90E-03		
Charleston, SC	to Hanford Site	1.12E-01	2.27E-02		
Colonie	to Hanford Site	2.25E-04	6.67E-05		
ETEC	to Hanford Site	1.30E-05	5.22E-06		
Fernald (FEMP)	to Hanford Site	7.77E-03	3.18E-03		
General Atomic	to Hanford Site	1.69E-05	5.22E-06		
Grand Junction PO	to Hanford Site	1.38E-06	4.77E-07		
INEL	to Hanford Site	2.25E-02	1.21E-02		
ITRI	to Hanford Site	2.96E-05	3.23E-06		
Knolls Atomic	to Hanford Site	8.53E-02	2.73E-02		
KKS	to Hanford Site	6.55E-02	2.10E-02		
KWS	to Hanford Site	8.93E-03	2.86E-03		
Los Alamos NL	to Hanford Site	1.93E-03	2.13E-04		
Lawrence Berkeley	to Hanford Site	7.79E-05	4.38E-05		
LERHR	to Hanford Site	7.78E-06	4.14E-06		
Lawrence Livermore	to Hanford Site	1.97E-02	1.05E-02		
Oak Ridge Reserv.	to Hanford Site	5.26E+00	8.29E-01		
Paducah GDP	to Hanford Site	3.41E+00	5.74E-01		
Pantex Plant	to Hanford Site	4.59E-04	4.90E-05		
Pearl Harbor NS	to Hanford Site	8.47E-06	6.32E-06		
Portsmouth GDP	to Hanford Site	4.68E-03	1.64E-03		
Puget Sound NS	to Hanford Site	1.95E-04	1.46E-04		
Reactive Metals	to Hanford Site	2.99E-04	1.12E-04		
SNL - Albuquerque	to Hanford Site	2.07E-06	2.27E-07		
SNL - Livermore	to Hanford Site	1.95E-03	1.04E-03		
Savannah River	to Hanford Site	5.04E+00	1.00E+00		
Totals		1.40E+01	2.51E+00		

Table 8. Expected Annual Fatalities for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	3.6E-03	3.4E-04
Normal Public	5.4E-03	8.6E-04
Accident Public	7.0E-03	1.3E-03
Nonradiological		
Emission	1.5E-03	1.4E-03
Accident	2.1E-02	3.3E-04

Table 9. Expected Annual Cancer Incidence for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	1.3E-02	1.2E-03
Normal Public	1.8E-02	2.9E-03
Accident Public	2.4E-02	4.3E-03
Nonradiological		
Emission	1.5E-03	1.4E-03
Accident	NA	NA

Table 10. Expected Annual Genetic Effects for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	5.5E-04	5.1E-05
Normal Public	1.1E-03	1.7E-04
Accident Public	4.0E-04	7.6E-05
Nonradiological		
Emission	NA	NA
Accident	NA	NA

B.30 WM LLMW CENTRALIZED ALTERNATIVE (CASE 17): CONTACT-HANDLED ORGANIC LIQUIDS: ALPHA — UNTREATED

Table 1. Summary of Route Information

Route		Distance (miles)	Percentage in Zone		
			Rural	Suburban	Urban
Truck					
Los Alamos NL	to Hanford Site	1560	89.8	8.8	1.3
Lawrence Livermore	to Hanford Site	894	77.2	19.3	3.4
Mound Plant	to Hanford Site	2291	88.6	10.3	1.1
Rocky Flats Plant	to Hanford Site	1132	91.9	7.3	0.8
Savannah River	to Hanford Site	2727	84.3	14.2	1.5
West Valley DP	to Hanford Site	2556	84.6	13.7	1.7
Rail					
Los Alamos NL	to Hanford Site	1725	92.5	6.5	0.9
Lawrence Livermore	to Hanford Site	973	78.9	15.3	5.8
Mound Plant	to Hanford Site	2472	87.0	11.2	1.9
Rocky Flats Plant	to Hanford Site	1284	93.1	5.5	1.4
Savannah River	to Hanford Site	2953	84.7	13.5	1.8
West Valley DP	to Hanford Site	2654	78.3	18.0	3.7

Table 2. Annual Number of Shipments and One-Way Shipment Distances

Route	# of Shipments		Total Mileage(mi)	
	Truck	Rail	Truck	Rail
Los Alamos NL to Hanford Site	4	2	6.24E+03	3.45E+03
Lawrence Livermore to Hanford Site	4	2	3.58E+03	1.95E+03
Mound Plant to Hanford Site	1	1	2.29E+03	2.47E+03
Rocky Flats Plant to Hanford Site	1	1	1.13E+03	1.28E+03
Savannah River to Hanford Site	1	1	2.73E+03	2.95E+03
West Valley DP to Hanford Site	1	1	2.56E+03	2.65E+03
Totals	12	8	1.85E+04	1.48E+04

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

Source/Route(s)		Crew	General Public				
			Off-Link	On-Link	Stops	Total	
MLLW(OA) LA to HS							
Los Alamos NL							
	to Hanford Site						
	Truck	4.24E-02	2.16E-03	5.65E-03	4.37E-02	5.15E-02	
	Rail	1.01E-02	5.60E-03	1.54E-04	8.79E-03	1.45E-02	
MLLW(OA) LL to HS							
Lawrence Livermore							
	to Hanford Site						
	Truck	2.82E-02	2.88E-03	4.92E-03	2.50E-02	3.28E-02	
	Rail	6.94E-03	1.38E-02	2.00E-04	6.48E-03	2.05E-02	
MLLW(OA) MP to HS							
Mound Plant							
	to Hanford Site						
	Truck	6.29E-02	3.13E-03	8.05E-03	6.41E-02	7.53E-02	
	Rail	1.32E-02	1.47E-02	3.13E-04	1.11E-02	2.61E-02	
MLLW(OA) RF to HS							
Rocky Flats Plant							
	to Hanford Site						
	Truck	2.99E-02	1.13E-03	3.61E-03	3.17E-02	3.64E-02	
	Rail	8.24E-03	4.91E-03	1.16E-04	7.43E-03	1.25E-02	
MLLW(OA) SR to HS							
Savannah River							
	to Hanford Site						
	Truck	7.86E-02	5.10E-03	1.08E-02	7.64E-02	9.23E-02	
	Rail	1.52E-02	1.85E-02	4.05E-04	1.26E-02	3.15E-02	
MLLW(OA) WV to HS							
West Valley DP							
	to Hanford Site						
	Truck	7.36E-02	4.90E-03	1.04E-02	7.16E-02	8.68E-02	
	Rail	1.40E-02	2.88E-02	5.00E-04	1.17E-02	4.09E-02	

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route		Truck	Rail
MLLW(OA) LA to HS			
Los Alamos NL	to Hanford Site	2.62E-02	5.71E-03
MLLW(OA) LL to HS			
Lawrence Livermore	to Hanford Site	1.89E-02	2.02E-02
MLLW(OA) MP to HS			
Mound Plant	to Hanford Site	5.43E-03	1.22E-03
MLLW(OA) RF to HS			
Rocky Flats Plant	to Hanford Site	5.14E-03	1.25E-03
MLLW(OA) SR to HS			
Savannah River	to Hanford Site	5.47E-02	1.09E-02
MLLW(OA) WV to HS			
West Valley DP	to Hanford Site	8.22E-02	3.21E-02

Table 5. Nonradiological Risk Factors per Shipment (fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
	Los Alamos NL to Hanford Site	6.66E-06	1.02E-04
	Lawrence Livermore to Hanford Site	9.85E-06	5.03E-05
	Mound Plant to Hanford Site	7.89E-06	1.23E-04
	Rocky Flats Plant to Hanford Site	2.83E-06	6.69E-05
	Savannah River to Hanford Site	1.31E-05	1.81E-04
	West Valley DP to Hanford Site	1.36E-05	1.38E-04
Rail			
	Los Alamos NL to Hanford Site	6.82E-06	3.61E-06
	Lawrence Livermore to Hanford Site	2.36E-05	2.04E-06
	Mound Plant to Hanford Site	1.94E-05	5.17E-06
	Rocky Flats Plant to Hanford Site	7.36E-06	2.69E-06
	Savannah River to Hanford Site	2.21E-05	6.18E-06
	West Valley DP to Hanford Site	4.14E-05	5.55E-06

Table 6. Annual Incident-Free Dose for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
		Crew	Public	Crew	Public
Los Alamos NL	to Hanford Site	1.70E-01	2.06E-01	2.02E-02	2.91E-02
Lawrence Livermore	to Hanford Site	1.13E-01	1.31E-01	1.39E-02	4.10E-02
Mound Plant	to Hanford Site	6.29E-02	7.53E-02	1.32E-02	2.61E-02
Rocky Flats Plant	to Hanford Site	2.99E-02	3.64E-02	8.24E-03	1.25E-02
Savannah River	to Hanford Site	7.86E-02	9.23E-02	1.52E-02	3.15E-02
West Valley DP	to Hanford Site	7.36E-02	8.68E-02	1.40E-02	4.09E-02
Totals		5.27E-01	6.28E-01	8.46E-02	1.81E-01

Table 7. Annual Accident Dose Risk for the Shipping Campaign (person-rem/yr)

Route		Truck	Rail
Los Alamos NL	to Hanford Site	1.05E-01	1.14E-02
Lawrence Livermore	to Hanford Site	7.58E-02	4.03E-02
Mound Plant	to Hanford Site	5.43E-03	1.22E-03
Rocky Flats Plant	to Hanford Site	5.14E-03	1.25E-03
Savannah River	to Hanford Site	5.47E-02	1.09E-02
West Valley DP	to Hanford Site	8.22E-02	3.21E-02
Totals		3.28E-01	9.72E-02

Table 8. Expected Annual Fatalities for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	2.1E-04	3.4E-05
Normal Public	3.1E-04	9.1E-05
Accident Public	1.6E-04	4.9E-05
Nonradiological		
Emission	1.0E-04	1.5E-04
Accident	1.1E-03	3.1E-05

Table 9. Expected Annual Cancer Incidence for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	7.4E-04	1.2E-04
Normal Public	1.1E-03	3.1E-04
Accident Public	5.6E-04	1.7E-04
Nonradiological		
Emission	1.0E-04	1.5E-04
Accident	NA	NA

Table 10. Expected Annual Genetic Effects for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	3.2E-05	5.1E-06
Normal Public	6.3E-05	1.8E-05
Accident Public	9.2E-06	2.6E-06
Nonradiological		
Emission	NA	NA
Accident	NA	NA

B.31 WM LLMW CENTRALIZED ALTERNATIVE (CASE 17): CONTACT-HANDLED HETEROGENEOUS SOLIDS: NONALPHA — UNTREATED

Table 1. Summary of Route Information

Route	Distance (miles)	Percentage in Zone			
		Rural	Suburban	Urban	
Truck					
Ames Laboratory	to Hanford Site	1703	92.6	6.6	0.8
Argonne - East	to Hanford Site	1998	91.5	7.8	0.7
Argonne - West	to Hanford Site	599	91.3	7.6	1.1
Bettis Atomic	to Hanford Site	2541	85.8	12.8	1.4
Battelle Columbus	to Hanford Site	2322	88.7	10.3	1.0
Brookhaven NL	to Hanford Site	2853	83.3	14.5	2.3
Charleston, SC	to Hanford Site	2858	85.5	13.2	1.3
Colonie	to Hanford Site	1373	75.4	16.7	7.9
ETEC	to Hanford Site	1241	80.5	14.3	5.2
Fernald (FEMP)	to Hanford Site	2258	89.4	9.8	0.8
General Atomic	to Hanford Site	1352	76.3	16.0	7.7
Grand Junction PO	to Hanford Site	1086	88.1	9.8	2.1
INEL	to Hanford Site	599	91.3	7.6	1.1
Knolls Atomic	to Hanford Site	2809	82.1	16.1	1.8
Kansas City Plant	to Hanford Site	1741	91.5	7.6	0.9
KKS	to Hanford Site	2809	82.1	16.1	1.8
KWS	to Hanford Site	2809	82.1	16.1	1.8
Los Alamos NL	to Hanford Site	1560	89.8	8.8	1.3
Lawrence Berkeley	to Hanford Site	875	78.1	17.8	4.1
LERHR	to Hanford Site	830	80.5	17.0	2.6
Lawrence Livermore	to Hanford Site	894	77.2	19.3	3.4
Mare Island	to Hanford Site	875	78.1	17.8	4.1
Norfolk Nav Shipyd	to Hanford Site	2949	84.4	13.8	1.7
Nevada Test Site	to Hanford Site	1128	86.5	10.9	2.6
Oak Ridge Reserv.	to Hanford Site	2464	87.8	11.0	1.2
Paducah GDP	to Hanford Site	2182	88.7	10.0	1.3
Pantex Plant	to Hanford Site	1884	90.4	8.0	1.5
Pearl Harbor NS	to Hanford Site	226	76.8	20.9	2.3
Portsmouth NS	to Hanford Site	3084	79.4	19.0	1.7
Portsmouth GDP	to Hanford Site	2402	88.0	11.0	1.0
Princeton PPL	to Hanford Site	2864	82.0	15.9	2.1
Puget Sound NS	to Hanford Site	226	76.8	20.9	2.3
Reactive Metals	to Hanford Site	2398	86.6	11.7	1.6
SNL - Albuquerque	to Hanford Site	1584	89.7	8.8	1.4
SNL - Livermore	to Hanford Site	894	77.2	19.3	3.4
Savannah River	to Hanford Site	2727	84.3	14.2	1.5
Rail					
Ames Laboratory	to Hanford Site	1788	93.7	5.6	0.7
Argonne - East	to Hanford Site	2200	93.3	6.0	0.7
Argonne - West	to Hanford Site	658	91.4	7.1	1.4
Bettis Atomic	to Hanford Site	2611	81.2	15.1	3.7
Battelle Columbus	to Hanford Site	2488	86.0	11.1	2.9
Brookhaven NL	to Hanford Site	3153	75.1	19.7	5.2
Charleston, SC	to Hanford Site	3059	84.5	13.7	1.8
Colonie	to Hanford Site	1622	86.2	9.5	4.3
ETEC	to Hanford Site	1587	85.6	8.9	5.5
Fernald (FEMP)	to Hanford Site	2505	85.6	11.5	2.9
General Atomic	to Hanford Site	1622	86.2	9.5	4.3
Grand Junction PO	to Hanford Site	1063	88.6	9.8	1.6
INEL	to Hanford Site	658	91.4	7.1	1.4
Knolls Atomic	to Hanford Site	2914	79.1	17.0	3.9
Kansas City Plant	to Hanford Site	1784	94.1	5.0	0.9
KKS	to Hanford Site	2914	79.1	17.0	3.9
KWS	to Hanford Site	2914	79.1	17.0	3.9
Los Alamos NL	to Hanford Site	1725	92.5	6.5	0.9
Lawrence Berkeley	to Hanford Site	986	78.5	15.8	5.7
LERHR	to Hanford Site	890	81.0	14.3	4.7
Lawrence Livermore	to Hanford Site	973	78.9	15.3	5.8
Mare Island	to Hanford Site	986	78.5	15.8	5.7
Norfolk Nav Shipyd	to Hanford Site	3187	83.8	13.6	2.7
Nevada Test Site	to Hanford Site	1302	93.0	5.9	1.1
Oak Ridge Reserv.	to Hanford Site	2601	91.2	7.4	1.3
Paducah GDP	to Hanford Site	2245	90.8	7.9	1.3
Pantex Plant	to Hanford Site	1686	92.0	7.1	1.0
Pearl Harbor NS	to Hanford Site	416	73.7	20.1	6.2
Portsmouth NS	to Hanford Site	3194	75.8	20.2	3.9
Portsmouth GDP	to Hanford Site	2515	86.4	10.8	2.7
Princeton PPL	to Hanford Site	2985	76.6	19.0	4.3
Puget Sound NS	to Hanford Site	416	73.7	20.1	6.2
Reactive Metals	to Hanford Site	2505	83.4	13.1	3.5
SNL - Albuquerque	to Hanford Site	1793	91.7	7.1	1.2
SNL - Livermore	to Hanford Site	973	78.9	15.3	5.8
Savannah River	to Hanford Site	2953	84.7	13.5	1.8

Table 2. Annual Number of Shipments and One-Way Shipment Distances

Route			# of Shipments		Total Mileage(mi)	
			Truck	Rail	Truck	Rail
Ames Laboratory	to Hanford Site		1	1	1.70E+03	1.79E+03
Argonne - East	to Hanford Site		44	17	8.79E+04	3.74E+04
Argonne - West	to Hanford Site		1	1	5.99E+02	6.58E+02
Bettis Atomic	to Hanford Site		1	1	2.54E+03	2.61E+03
Battelle Columbus	to Hanford Site		1	1	2.32E+03	2.49E+03
Brookhaven NL	to Hanford Site		1	1	2.85E+03	3.15E+03
Charleston, SC	to Hanford Site		1	1	2.86E+03	3.06E+03
Colonie	to Hanford Site		1	1	1.37E+03	1.62E+03
ETEC	to Hanford Site		8	3	9.93E+03	4.76E+03
Fernald (FEMP)	to Hanford Site		7	3	1.58E+04	7.52E+03
General Atomic	to Hanford Site		1	1	1.35E+03	1.62E+03
Grand Junction PO	to Hanford Site		1	1	1.09E+03	1.06E+03
INEL	to Hanford Site		4	2	2.40E+03	1.32E+03
Knolls Atomic	to Hanford Site		1	1	2.81E+03	2.91E+03
Kansas City Plant	to Hanford Site		1	1	1.74E+03	1.78E+03
KKS	to Hanford Site		1	1	2.81E+03	2.91E+03
KWS	to Hanford Site		1	1	2.81E+03	2.91E+03
Los Alamos NL	to Hanford Site		2	1	3.12E+03	1.72E+03
Lawrence Berkeley	to Hanford Site		1	1	8.75E+02	9.86E+02
LERHR	to Hanford Site		1	1	8.30E+02	8.90E+02
Lawrence Livermore	to Hanford Site		4	2	3.58E+03	1.95E+03
Mare Island	to Hanford Site		1	1	8.75E+02	9.86E+02
Norfolk Nav Shipyd	to Hanford Site		1	1	2.95E+03	3.19E+03
Nevada Test Site	to Hanford Site		1	1	1.13E+03	1.30E+03
Oak Ridge Reserv.	to Hanford Site		124	46	3.05E+05	1.20E+05
Paducah GDP	to Hanford Site		1	1	2.18E+03	2.25E+03
Pantex Plant	to Hanford Site		2	1	3.77E+03	1.69E+03
Pearl Harbor NS	to Hanford Site		1	1	2.26E+02	4.16E+02
Portsmouth NS	to Hanford Site		1	1	3.08E+03	3.19E+03
Portsmouth GDP	to Hanford Site		60	23	1.44E+05	5.78E+04
Princeton PPL	to Hanford Site		1	1	2.86E+03	2.98E+03
Puget Sound NS	to Hanford Site		1	1	2.26E+02	4.16E+02
Reactive Metals	to Hanford Site		1	1	2.40E+03	2.51E+03
SNL - Albuquerque	to Hanford Site		1	1	1.58E+03	1.79E+03
SNL - Livermore	to Hanford Site		1	1	8.94E+02	9.73E+02
Savannah River	to Hanford Site		13	5	3.55E+04	1.48E+04
Totals			294	129	6.58E+05	2.99E+05

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

Source/Route(s)	Crew	General Public			
		Off-Link	On-Link	Stops	Total
MLLW(C) AL to HS Ames Laboratory	to Hanford Site				
	Truck	4.46E-02	1.62E-03	5.39E-03	4.77E-02
	Rail	1.03E-02	4.69E-03	1.46E-04	8.98E-03
MLLW(C) AN to HS Argonne - East	to Hanford Site				
	Truck	5.29E-02	1.97E-03	6.28E-03	5.59E-02
	Rail	1.21E-02	5.75E-03	1.82E-04	1.03E-02
MLLW(C) AW to HS Argonne - West	to Hanford Site				
	Truck	1.60E-02	7.18E-04	2.06E-03	1.68E-02
	Rail	5.63E-03	2.83E-03	6.58E-05	5.51E-03
MLLW(C) BA to HS Bettis Atomic	to Hanford Site				
	Truck	7.21E-02	4.36E-03	9.77E-03	7.11E-02
	Rail	1.38E-02	2.67E-02	4.53E-04	1.15E-02
MLLW(C) BC to HS Battelle Columbus	to Hanford Site				
	Truck	6.36E-02	3.06E-03	8.01E-03	6.50E-02
	Rail	1.33E-02	1.95E-02	3.51E-04	1.11E-02
MLLW(C) BN to HS Brookhaven NL	to Hanford Site				
	Truck	8.38E-02	6.48E-03	1.28E-02	7.99E-02
	Rail	1.60E-02	4.38E-02	6.87E-04	1.32E-02
MLLW(C) CH to HS Charleston, SC	to Hanford Site				
	Truck	8.12E-02	4.87E-03	1.09E-02	8.00E-02
	Rail	1.56E-02	1.96E-02	4.24E-04	1.29E-02
MLLW(C) CL to HS Colonie	to Hanford Site				
	Truck	4.61E-02	7.22E-03	1.16E-02	3.84E-02
	Rail	9.65E-03	1.64E-02	2.49E-04	8.47E-03
MLLW(C) LC to HS ETEC	to Hanford Site				
	Truck	3.87E-02	4.63E-03	8.05E-03	3.47E-02
	Rail	9.50E-03	1.96E-02	2.68E-04	8.37E-03
MLLW(C) FE to HS Fernald (FEMP)	to Hanford Site				
	Truck	6.13E-02	2.71E-03	7.49E-03	6.32E-02
	Rail	1.33E-02	2.00E-02	3.60E-04	1.12E-02
MLLW(C) SO to HS General Atomic	to Hanford Site				
	Truck	4.49E-02	6.88E-03	1.11E-02	3.78E-02
	Rail	9.65E-03	1.64E-02	2.49E-04	8.47E-03
MLLW(C) GJ to HS Grand Junction PO	to Hanford Site				
	Truck	3.04E-02	2.03E-03	4.58E-03	3.04E-02
	Rail	7.32E-03	5.46E-03	1.23E-04	6.75E-03
MLLW(C) IN to HS INEL	to Hanford Site				
	Truck	1.60E-02	7.18E-04	2.06E-03	1.68E-02
	Rail	5.63E-03	2.83E-03	6.58E-05	5.51E-03
MLLW(C) KA to HS Knolls Atomic	to Hanford Site				
	Truck	8.30E-02	6.03E-03	1.19E-02	7.87E-02
	Rail	1.50E-02	3.18E-02	5.40E-04	1.25E-02
MLLW(C) KC to HS Kansas City Plant	to Hanford Site				
	Truck	4.62E-02	1.90E-03	5.74E-03	4.87E-02
	Rail	1.03E-02	5.00E-03	1.44E-04	8.97E-03
MLLW(C) KK to HS KKS	to Hanford Site				
	Truck	8.30E-02	6.03E-03	1.19E-02	7.87E-02
	Rail	1.50E-02	3.18E-02	5.40E-04	1.25E-02
MLLW(C) KW to HS KWS	to Hanford Site				
	Truck	8.30E-02	6.03E-03	1.19E-02	7.87E-02
	Rail	1.50E-02	3.18E-02	5.40E-04	1.25E-02
MLLW(C) LA to HS Los Alamos NL	to Hanford Site				
	Truck	4.24E-02	2.16E-03	5.65E-03	4.37E-02
	Rail	1.01E-02	5.60E-03	1.54E-04	8.79E-03

Table 3. Incident-Free Dose per Shipment (person-rem/shipment) (Cont.)

Source/Route(s)	Crew	General Public			
		Off-Link	On-Link	Stops	Total
MLLW(C) LB to HS Lawrence Berkeley	to Hanford Site				
	Truck	2.76E-02	3.02E-03	5.17E-03	2.45E-02
	Rail	6.99E-03	1.38E-02	2.03E-04	6.51E-03
MLLW(C) SM to HS LERHR	to Hanford Site				
	Truck	2.51E-02	2.17E-03	4.00E-03	2.32E-02
	Rail	6.59E-03	1.07E-02	1.64E-04	6.22E-03
MLLW(C) LL to HS Lawrence Livermore	to Hanford Site				
	Truck	2.82E-02	2.88E-03	4.92E-03	2.50E-02
	Rail	6.94E-03	1.38E-02	2.00E-04	6.48E-03
MLLW(C) MZ to HS Mare Island	to Hanford Site				
	Truck	2.76E-02	3.02E-03	5.17E-03	2.45E-02
	Rail	6.99E-03	1.38E-02	2.03E-04	6.51E-03
MLLW(C) US to HS Norfolk Nav Shipyd	to Hanford Site				
	Truck	8.51E-02	5.79E-03	1.21E-02	8.26E-02
	Rail	1.62E-02	2.53E-02	4.79E-04	1.33E-02
MLLW(C) NT to HS Nevada Test Site	to Hanford Site				
	Truck	3.22E-02	2.46E-03	5.18E-03	3.16E-02
	Rail	8.31E-03	4.39E-03	1.15E-04	7.49E-03
MLLW(C) OR to HS Oak Ridge Reserv.	to Hanford Site				
	Truck	6.83E-02	3.65E-03	8.95E-03	6.90E-02
	Rail	1.37E-02	1.08E-02	2.59E-04	1.15E-02
MLLW(C) PA to HS Paducah GDP	to Hanford Site				
	Truck	6.00E-02	3.22E-03	8.02E-03	6.11E-02
	Rail	1.22E-02	9.43E-03	2.28E-04	1.04E-02
MLLW(C) PP to HS Pantex Plant	to Hanford Site				
	Truck	5.10E-02	2.68E-03	7.01E-03	5.27E-02
	Rail	9.92E-03	5.71E-03	1.56E-04	8.67E-03
MLLW(C) SW to HS Pearl Harbor NS	to Hanford Site				
	Truck	7.06E-03	6.28E-04	1.09E-03	6.33E-03
	Rail	4.62E-03	6.63E-03	9.79E-05	4.76E-03
MLLW(C) PT to HS Portsmouth NS	to Hanford Site				
	Truck	9.34E-02	7.12E-03	1.32E-02	8.64E-02
	Rail	1.62E-02	3.74E-02	6.47E-04	1.33E-02
MLLW(C) PO to HS Portsmouth GDP	to Hanford Site				
	Truck	6.63E-02	3.38E-03	8.48E-03	6.72E-02
	Rail	1.34E-02	1.89E-02	3.46E-04	1.12E-02
MLLW(C) PR to HS Princeton PPL	to Hanford Site				
	Truck	8.51E-02	6.65E-03	1.28E-02	8.02E-02
	Rail	1.53E-02	3.63E-02	6.03E-04	1.27E-02
MLLW(C) PN to HS Puget Sound NS	to Hanford Site				
	Truck	7.06E-03	6.28E-04	1.09E-03	6.33E-03
	Rail	4.62E-03	6.63E-03	9.79E-05	4.76E-03
MLLW(C) RM to HS Reactive Metals	to Hanford Site				
	Truck	6.76E-02	4.22E-03	9.51E-03	6.71E-02
	Rail	1.33E-02	2.35E-02	4.01E-04	1.12E-02
MLLW(C) SA to HS SNL - Albuquerque	to Hanford Site				
	Truck	4.31E-02	2.27E-03	5.84E-03	4.43E-02
	Rail	1.04E-02	6.90E-03	1.72E-04	9.00E-03
MLLW(C) SL to HS SNL - Livermore	to Hanford Site				
	Truck	2.82E-02	2.88E-03	4.92E-03	2.50E-02
	Rail	6.94E-03	1.38E-02	2.00E-04	6.48E-03
MLLW(C) SR to HS Savannah River	to Hanford Site				
	Truck	7.86E-02	5.10E-03	1.08E-02	7.64E-02
	Rail	1.52E-02	1.85E-02	4.05E-04	1.26E-02

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route			Truck	Rail
MLLW(C) AL to HS				
Ames Laboratory	to Hanford Site		1.16E-08	3.94E-09
MLLW(C) AN to HS				
Argonne - East	to Hanford Site		8.84E-04	5.65E-04
MLLW(C) AW to HS				
Argonne - West	to Hanford Site		3.17E-04	1.69E-04
MLLW(C) BA to HS				
Bettis Atomic	to Hanford Site		7.32E-04	3.03E-04
MLLW(C) BC to HS				
Battelle Columbus	to Hanford Site		4.78E-09	1.98E-09
MLLW(C) BN to HS				
Brookhaven NL	to Hanford Site		1.31E-03	6.47E-04
MLLW(C) CH to HS				
Charleston, SC	to Hanford Site		8.69E-04	1.79E-04
MLLW(C) CL to HS				
Colonie	to Hanford Site		1.95E-08	5.82E-09
MLLW(C) LC to HS				
ETEC	to Hanford Site		3.06E-04	3.23E-04
MLLW(C) FE to HS				
Fernald (FEMP)	to Hanford Site		3.46E-05	3.56E-05
MLLW(C) SO to HS				
General Atomic	to Hanford Site		7.14E-07	2.22E-07
MLLW(C) GJ to HS				
Grand Junction PO	to Hanford Site		1.71E-08	5.97E-09
MLLW(C) IN to HS				
INEL	to Hanford Site		5.25E-03	5.61E-03
MLLW(C) KA to HS				
Knolls Atomic	to Hanford Site		3.82E-02	1.24E-02
MLLW(C) KC to HS				
Kansas City Plant	to Hanford Site		1.11E-04	2.02E-05
MLLW(C) KK to HS				
KKS	to Hanford Site		4.20E-02	1.36E-02
MLLW(C) KW to HS				
KWS	to Hanford Site		1.35E-02	4.37E-03
MLLW(C) LA to HS				
Los Alamos NL	to Hanford Site		5.97E-05	1.41E-05
MLLW(C) LB to HS				
Lawrence Berkeley	to Hanford Site		1.05E-05	5.80E-06
MLLW(C) SM to HS				
LERHR	to Hanford Site		9.03E-06	4.74E-06
MLLW(C) LL to HS				
Lawrence Livermore	to Hanford Site		4.37E-05	4.58E-05
MLLW(C) MZ to HS				
Mare Island	to Hanford Site		8.65E-03	4.86E-03
MLLW(C) US to HS				
Norfolk Nav Shipyard	to Hanford Site		2.86E-03	1.09E-03
MLLW(C) NT to HS				
Nevada Test Site	to Hanford Site		1.69E-08	4.11E-09
MLLW(C) OR to HS				
Oak Ridge Reserv.	to Hanford Site		1.34E-03	8.03E-04
MLLW(C) PA to HS				
Paducah GDP	to Hanford Site		3.55E-03	8.14E-04
MLLW(C) PP to HS				
Pantex Plant	to Hanford Site		2.10E-04	4.85E-05
MLLW(C) SW to HS				
Pearl Harbor NS	to Hanford Site		1.11E-04	8.21E-05
MLLW(C) PT to HS				
Portsmouth NS	to Hanford Site		5.84E-04	2.66E-04
MLLW(C) PO to HS				
Portsmouth GDP	to Hanford Site		1.00E-05	1.04E-05
MLLW(C) PR to HS				
Princeton PPL	to Hanford Site		9.99E-09	3.93E-09
MLLW(C) PN to HS				
Puget Sound NS	to Hanford Site		2.47E-03	1.83E-03
MLLW(C) RM to HS				
Reactive Metals	to Hanford Site		3.72E-06	1.55E-06
MLLW(C) SA to HS				
SNL - Albuquerque	to Hanford Site		3.14E-04	3.68E-05
MLLW(C) SL to HS				
SNL - Livermore	to Hanford Site		2.72E-06	1.43E-06
MLLW(C) SR to HS				
Savannah River	to Hanford Site		4.85E-03	2.82E-03

Table 5. Nonradiological Risk Factors per Shipment (fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
Ames Laboratory	to Hanford Site	4.31E-06	8.93E-05
Argonne - East	to Hanford Site	4.41E-06	1.06E-04
Argonne - West	to Hanford Site	2.19E-06	3.07E-05
Bettis Atomic	to Hanford Site	1.14E-05	1.36E-04
Battelle Columbus	to Hanford Site	7.24E-06	1.25E-04
Brookhaven NL	to Hanford Site	2.07E-05	1.68E-04
Charleston, SC	to Hanford Site	1.20E-05	1.99E-04
Colonie	to Hanford Site	3.48E-05	8.47E-05
ETEC	to Hanford Site	2.08E-05	7.74E-05
Fernald (FEMP)	to Hanford Site	5.86E-06	1.22E-04
General Atomic	to Hanford Site	3.33E-05	8.36E-05
Grand Junction PO	to Hanford Site	7.50E-06	6.25E-05
INEL	to Hanford Site	2.19E-06	3.07E-05
Knolls Atomic	to Hanford Site	1.59E-05	1.51E-04
Kansas City Plant	to Hanford Site	5.18E-06	1.12E-04
KKS	to Hanford Site	1.59E-05	1.51E-04
KWS	to Hanford Site	1.59E-05	1.51E-04
Los Alamos NL	to Hanford Site	6.66E-06	1.02E-04
Lawrence Berkeley	to Hanford Site	1.16E-05	4.91E-05
LERHR	to Hanford Site	6.82E-06	4.66E-05
Lawrence Livermore	to Hanford Site	9.85E-06	5.03E-05
Mare Island	to Hanford Site	1.16E-05	4.91E-05
Norfolk Nav Shipyd	to Hanford Site	1.64E-05	1.83E-04
Nevada Test Site	to Hanford Site	9.50E-06	6.38E-05
Oak Ridge Reserv.	to Hanford Site	9.50E-06	1.61E-04
Paducah GDP	to Hanford Site	9.30E-06	1.41E-04
Pantex Plant	to Hanford Site	9.21E-06	1.25E-04
Pearl Harbor NS	to Hanford Site	1.67E-06	9.56E-06
Portsmouth NS	to Hanford Site	1.64E-05	1.78E-04
Portsmouth GDP	to Hanford Site	8.11E-06	1.28E-04
Princeton PPL	to Hanford Site	1.97E-05	1.63E-04
Puget Sound NS	to Hanford Site	1.67E-06	9.56E-06
Reactive Metals	to Hanford Site	1.27E-05	1.28E-04
SNL - Albuquerque	to Hanford Site	7.24E-06	1.05E-04
SNL - Livermore	to Hanford Site	9.85E-06	5.03E-05
Savannah River	to Hanford Site	1.31E-05	1.81E-04
Rail			
Ames Laboratory	to Hanford Site	5.40E-06	3.74E-06
Argonne - East	to Hanford Site	6.15E-06	4.60E-06
Argonne - West	to Hanford Site	3.98E-06	1.38E-06
Bettis Atomic	to Hanford Site	4.07E-05	5.46E-06
Battelle Columbus	to Hanford Site	3.00E-05	5.21E-06
Brookhaven NL	to Hanford Site	6.80E-05	6.60E-06
Charleston, SC	to Hanford Site	2.35E-05	6.40E-06
Colonie	to Hanford Site	2.91E-05	3.39E-06
ETEC	to Hanford Site	3.67E-05	3.32E-06
Fernald (FEMP)	to Hanford Site	3.07E-05	5.24E-06
General Atomic	to Hanford Site	2.91E-05	3.39E-06
Grand Junction PO	to Hanford Site	7.07E-06	2.22E-06
INEL	to Hanford Site	3.98E-06	1.38E-06
Knolls Atomic	to Hanford Site	4.72E-05	6.10E-06
Kansas City Plant	to Hanford Site	6.57E-06	3.73E-06
KKS	to Hanford Site	4.72E-05	6.10E-06
KWS	to Hanford Site	4.72E-05	6.10E-06
Los Alamos NL	to Hanford Site	6.82E-06	3.61E-06
Lawrence Berkeley	to Hanford Site	2.33E-05	2.06E-06
LERHR	to Hanford Site	1.77E-05	1.86E-06
Lawrence Livermore	to Hanford Site	2.36E-05	2.04E-06
Mare Island	to Hanford Site	2.33E-05	2.06E-06
Norfolk Nav Shipyd	to Hanford Site	3.56E-05	6.67E-06
Nevada Test Site	to Hanford Site	5.90E-06	2.72E-06
Oak Ridge Reserv.	to Hanford Site	1.45E-05	5.44E-06
Paducah GDP	to Hanford Site	1.23E-05	4.70E-06
Pantex Plant	to Hanford Site	6.78E-06	3.53E-06
Pearl Harbor NS	to Hanford Site	1.08E-05	8.70E-07
Portsmouth NS	to Hanford Site	5.26E-05	6.68E-06
Portsmouth GDP	to Hanford Site	2.88E-05	5.26E-06
Princeton PPL	to Hanford Site	5.38E-05	6.24E-06
Puget Sound NS	to Hanford Site	1.08E-05	8.70E-07
Reactive Metals	to Hanford Site	3.65E-05	5.24E-06
SNL - Albuquerque	to Hanford Site	9.04E-06	3.75E-06
SNL - Livermore	to Hanford Site	2.36E-05	2.04E-06
Savannah River	to Hanford Site	2.21E-05	6.18E-06

Table 6. Annual Incident-Free Dose for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
		Crew	Public	Crew	Public
Ames Laboratory	to Hanford Site	4.46E-02	5.47E-02	1.03E-02	1.38E-02
Argonne - East	to Hanford Site	2.33E+00	2.82E+00	2.05E-01	2.75E-01
Argonne - West	to Hanford Site	1.60E-02	1.95E-02	5.63E-03	8.40E-03
Bettis Atomic	to Hanford Site	7.21E-02	8.53E-02	1.38E-02	3.87E-02
Battelle Columbus	to Hanford Site	6.36E-02	7.61E-02	1.33E-02	3.10E-02
Brookhaven NL	to Hanford Site	8.38E-02	9.92E-02	1.60E-02	5.76E-02
Charleston, SC	to Hanford Site	8.12E-02	9.58E-02	1.56E-02	3.29E-02
Colonie	to Hanford Site	4.61E-02	5.72E-02	9.65E-03	2.52E-02
ETEC	to Hanford Site	3.10E-01	3.79E-01	2.85E-02	8.47E-02
Fernald (FEMP)	to Hanford Site	4.29E-01	5.14E-01	4.00E-02	9.47E-02
General Atomic	to Hanford Site	4.49E-02	5.58E-02	9.65E-03	2.52E-02
Grand Junction PO	to Hanford Site	3.04E-02	3.70E-02	7.32E-03	1.23E-02
INEL	to Hanford Site	6.40E-02	7.82E-02	1.13E-02	1.68E-02
Knolls Atomic	to Hanford Site	8.30E-02	9.66E-02	1.50E-02	4.48E-02
Kansas City Plant	to Hanford Site	4.62E-02	5.64E-02	1.03E-02	1.41E-02
KKS	to Hanford Site	8.30E-02	9.66E-02	1.50E-02	4.48E-02
KWS	to Hanford Site	8.30E-02	9.66E-02	1.50E-02	4.48E-02
Los Alamos NL	to Hanford Site	8.48E-02	1.03E-01	1.01E-02	1.45E-02
Lawrence Berkeley	to Hanford Site	2.76E-02	3.27E-02	6.99E-03	2.05E-02
LERHR	to Hanford Site	2.51E-02	2.94E-02	6.59E-03	1.70E-02
Lawrence Livermore	to Hanford Site	1.13E-01	1.31E-01	1.39E-02	4.10E-02
Mare Island	to Hanford Site	2.76E-02	3.27E-02	6.99E-03	2.05E-02
Norfolk Nav Shipyd	to Hanford Site	8.51E-02	1.00E-01	1.62E-02	3.91E-02
Nevada Test Site	to Hanford Site	3.22E-02	3.92E-02	8.31E-03	1.20E-02
Oak Ridge Reserv.	to Hanford Site	8.47E+00	1.01E+01	6.32E-01	1.04E+00
Paducah GDP	to Hanford Site	6.00E-02	7.23E-02	1.22E-02	2.01E-02
Pantex Plant	to Hanford Site	1.02E-01	1.25E-01	9.92E-03	1.45E-02
Pearl Harbor NS	to Hanford Site	7.06E-03	8.04E-03	4.62E-03	1.15E-02
Portsmouth NS	to Hanford Site	9.34E-02	1.07E-01	1.62E-02	5.14E-02
Portsmouth GDP	to Hanford Site	3.98E+00	4.75E+00	3.08E-01	7.00E-01
Princeton PPL	to Hanford Site	8.51E-02	9.97E-02	1.53E-02	4.96E-02
Puget Sound NS	to Hanford Site	7.06E-03	8.04E-03	4.62E-03	1.15E-02
Reactive Metals	to Hanford Site	6.76E-02	8.09E-02	1.33E-02	3.51E-02
SNL - Albuquerque	to Hanford Site	4.31E-02	5.24E-02	1.04E-02	1.61E-02
SNL - Livermore	to Hanford Site	2.82E-02	3.28E-02	6.94E-03	2.05E-02
Savannah River	to Hanford Site	1.02E+00	1.20E+00	7.60E-02	1.58E-01
Totals		1.83E+01	2.18E+01	1.62E+00	3.16E+00

Table 7. Annual Accident Dose Risk for the Shipping Campaign
(person-rem/yr)

Route		Truck	Rail
Ames Laboratory	to Hanford Site	1.16E-08	3.94E-09
Argonne - East	to Hanford Site	3.89E-02	9.60E-03
Argonne - West	to Hanford Site	3.17E-04	1.69E-04
Bettis Atomic	to Hanford Site	7.32E-04	3.03E-04
Battelle Columbus	to Hanford Site	4.78E-09	1.98E-09
Brookhaven NL	to Hanford Site	1.31E-03	6.47E-04
Charleston, SC	to Hanford Site	8.69E-04	1.79E-04
Colonie	to Hanford Site	1.95E-08	5.82E-09
ETEC	to Hanford Site	2.45E-03	9.70E-04
Fernald (FEMP)	to Hanford Site	2.42E-04	1.07E-04
General Atomic	to Hanford Site	7.14E-07	2.22E-07
Grand Junction PO	to Hanford Site	1.71E-08	5.97E-09
INEL	to Hanford Site	2.10E-02	1.12E-02
Knolls Atomic	to Hanford Site	3.82E-02	1.24E-02
Kansas City Plant	to Hanford Site	1.11E-04	2.02E-05
KKS	to Hanford Site	4.20E-02	1.36E-02
KWS	to Hanford Site	1.35E-02	4.37E-03
Los Alamos NL	to Hanford Site	1.19E-04	1.41E-05
Lawrence Berkeley	to Hanford Site	1.05E-05	5.80E-06
LERHR	to Hanford Site	9.03E-06	4.74E-06
Lawrence Livermore	to Hanford Site	1.75E-04	9.17E-05
Mare Island	to Hanford Site	8.65E-03	4.86E-03
Norfolk Nav Shipyd	to Hanford Site	2.86E-03	1.09E-03
Nevada Test Site	to Hanford Site	1.69E-08	4.11E-09
Oak Ridge Reserv.	to Hanford Site	1.66E-01	3.69E-02
Paducah GDP	to Hanford Site	3.55E-03	8.14E-04
Pantex Plant	to Hanford Site	4.21E-04	4.85E-05
Pearl Harbor NS	to Hanford Site	1.11E-04	8.21E-05
Portsmouth NS	to Hanford Site	5.84E-04	2.66E-04
Portsmouth GDP	to Hanford Site	6.03E-04	2.39E-04
Princeton PPL	to Hanford Site	9.99E-09	3.93E-09
Puget Sound NS	to Hanford Site	2.47E-03	1.83E-03
Reactive Metals	to Hanford Site	3.72E-06	1.55E-06
SNL - Albuquerque	to Hanford Site	3.14E-04	3.68E-05
SNL - Livermore	to Hanford Site	2.72E-06	1.43E-06
Savannah River	to Hanford Site	6.31E-02	1.41E-02
Totals		4.08E-01	1.14E-01

Table 8. Expected Annual Fatalities for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	7.3E-03	6.5E-04
Normal Public	1.1E-02	1.6E-03
Accident Public	2.0E-04	5.7E-05
Nonradiological		
Emission	2.6E-03	2.5E-03
Accident	4.0E-02	6.3E-04

Table 9. Expected Annual Cancer Incidence for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	2.6E-02	2.3E-03
Normal Public	3.7E-02	5.4E-03
Accident Public	6.9E-04	1.9E-04
Nonradiological		
Emission	2.6E-03	2.5E-03
Accident	NA	NA

Table 10. Expected Annual Genetic Effects
for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	1.1E-03	9.7E-05
Normal Public	2.2E-03	3.2E-04
Accident Public	3.1E-05	8.4E-06
Nonradiological		
Emission	NA	NA
Accident	NA	NA

B.32 WM LLMW CENTRALIZED ALTERNATIVE (CASE 17): CONTACT-HANDLED HETEROGENEOUS SOLIDS: ALPHA — UNTREATED

Table 1. Summary of Route Information

Route		Distance (miles)	Percentage in Zone		
			Rural	Suburban	Urban
Truck					
Bettis Atomic	to Hanford Site	2541	85.8	12.8	1.4
INEL	to Hanford Site	599	91.3	7.6	1.1
Los Alamos NL	to Hanford Site	1560	89.8	8.8	1.3
Lawrence Livermore	to Hanford Site	894	77.2	19.3	3.4
Mound Plant	to Hanford Site	2291	88.6	10.3	1.1
Rocky Flats Plant	to Hanford Site	1132	91.9	7.3	0.8
Savannah River	to Hanford Site	2727	84.3	14.2	1.5
U of MO - Columbia	to Hanford Site	1870	90.6	8.3	1.1
West Valley DP	to Hanford Site	2556	84.6	13.7	1.7
Rail					
Bettis Atomic	to Hanford Site	2611	81.2	15.1	3.7
INEL	to Hanford Site	658	91.4	7.1	1.4
Los Alamos NL	to Hanford Site	1725	92.5	6.5	0.9
Lawrence Livermore	to Hanford Site	973	78.9	15.3	5.8
Mound Plant	to Hanford Site	2472	87.0	11.2	1.9
Rocky Flats Plant	to Hanford Site	1284	93.1	5.5	1.4
Savannah River	to Hanford Site	2953	84.7	13.5	1.8
U of MO - Columbia	to Hanford Site	1948	94.1	5.3	0.6
West Valley DP	to Hanford Site	2654	78.3	18.0	3.7

Table 2. Annual Number of Shipments and One-Way Shipment Distances

Route	# of Shipments		Total Mileage(mi)	
	Truck	Rail	Truck	Rail
Bettis Atomic to Hanford Site	1	1	2.54E+03	2.61E+03
INEL to Hanford Site	63	24	3.77E+04	1.58E+04
Los Alamos NL to Hanford Site	4	2	6.24E+03	3.45E+03
Lawrence Livermore to Hanford Site	6	3	5.36E+03	2.92E+03
Mound Plant to Hanford Site	1	1	2.29E+03	2.47E+03
Rocky Flats Plant to Hanford Site	130	48	1.47E+05	6.16E+04
Savannah River to Hanford Site	10	4	2.73E+04	1.18E+04
U of MO - Columbia to Hanford Site	1	1	1.87E+03	1.95E+03
West Valley DP to Hanford Site	1	1	2.56E+03	2.65E+03
Totals	217	85	2.33E+05	1.05E+05

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

Source/Route(s)	Crew	General Public			
		Off-Link	On-Link	Stops	Total
MLLW(CA) BA to HS Bettis Atomic	to Hanford Site				
	Truck	7.21E-02	4.36E-03	9.77E-03	7.11E-02
	Rail	1.38E-02	2.67E-02	4.53E-04	1.15E-02
MLLW(CA) IN to HS INEL	to Hanford Site				
	Truck	1.60E-02	7.18E-04	2.06E-03	1.68E-02
	Rail	5.63E-03	2.83E-03	6.58E-05	5.51E-03
MLLW(CA) LA to HS Los Alamos NL	to Hanford Site				
	Truck	4.24E-02	2.16E-03	5.65E-03	4.37E-02
	Rail	1.01E-02	5.60E-03	1.54E-04	8.79E-03
MLLW(CA) LL to HS Lawrence Livermore	to Hanford Site				
	Truck	2.82E-02	2.88E-03	4.92E-03	2.50E-02
	Rail	6.94E-03	1.38E-02	2.00E-04	6.48E-03
MLLW(CA) MP to HS Mound Plant	to Hanford Site				
	Truck	6.29E-02	3.13E-03	8.05E-03	6.41E-02
	Rail	1.32E-02	1.47E-02	3.13E-04	1.11E-02
MLLW(CA) RF to HS Rocky Flats Plant	to Hanford Site				
	Truck	2.99E-02	1.13E-03	3.61E-03	3.17E-02
	Rail	8.24E-03	4.91E-03	1.16E-04	7.43E-03
MLLW(CA) SR to HS Savannah River	to Hanford Site				
	Truck	7.86E-02	5.10E-03	1.08E-02	7.64E-02
	Rail	1.52E-02	1.85E-02	4.05E-04	1.26E-02
MLLW(CA) MC to HS U of MO - Columbia	to Hanford Site				
	Truck	5.03E-02	2.31E-03	6.45E-03	5.23E-02
	Rail	1.10E-02	4.60E-03	1.53E-04	9.48E-03
MLLW(CA) WV to HS West Valley DP	to Hanford Site				
	Truck	7.36E-02	4.90E-03	1.04E-02	7.16E-02
	Rail	1.40E-02	2.88E-02	5.00E-04	1.17E-02

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route	Truck	Rail
MLLW(CA) BA to HS Bettis Atomic	1.02E-03	4.22E-04
MLLW(CA) IN to HS INEL	4.98E-04	6.67E-04
MLLW(CA) LA to HS Los Alamos NL	1.30E-04	3.35E-05
MLLW(CA) LL to HS Lawrence Livermore	8.38E-05	8.72E-05
MLLW(CA) MP to HS Mound Plant	2.93E-07	6.53E-08
MLLW(CA) RF to HS Rocky Flats Plant	3.19E-05	2.35E-05
MLLW(CA) SR to HS Savannah River	2.98E-03	1.69E-03
MLLW(CA) MC to HS U of MO - Columbia	4.78E-07	1.23E-07
MLLW(CA) WV to HS West Valley DP	1.05E-03	4.44E-04

Table 5. Nonradiological Risk Factors per Shipment (fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
Bettis Atomic	to Hanford Site	1.14E-05	1.36E-04
INEL	to Hanford Site	2.19E-06	3.07E-05
Los Alamos NL	to Hanford Site	6.66E-06	1.02E-04
Lawrence Livermore	to Hanford Site	9.85E-06	5.03E-05
Mound Plant	to Hanford Site	7.89E-06	1.23E-04
Rocky Flats Plant	to Hanford Site	2.83E-06	6.69E-05
Savannah River	to Hanford Site	1.31E-05	1.81E-04
U of MO - Columbia	to Hanford Site	6.66E-06	1.20E-04
West Valley DP	to Hanford Site	1.36E-05	1.38E-04
Rail			
Bettis Atomic	to Hanford Site	4.07E-05	5.46E-06
INEL	to Hanford Site	3.98E-06	1.38E-06
Los Alamos NL	to Hanford Site	6.82E-06	3.61E-06
Lawrence Livermore	to Hanford Site	2.36E-05	2.04E-06
Mound Plant	to Hanford Site	1.94E-05	5.17E-06
Rocky Flats Plant	to Hanford Site	7.36E-06	2.69E-06
Savannah River	to Hanford Site	2.21E-05	6.18E-06
U of MO - Columbia	to Hanford Site	4.98E-06	4.08E-06
West Valley DP	to Hanford Site	4.14E-05	5.55E-06

Table 6. Annual Incident-Free Dose for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
		Crew	Public	Crew	Public
Bettis Atomic	to Hanford Site	7.21E-02	8.53E-02	1.38E-02	3.87E-02
INEL	to Hanford Site	1.01E+00	1.23E+00	1.35E-01	2.02E-01
Los Alamos NL	to Hanford Site	1.70E-01	2.06E-01	2.02E-02	2.91E-02
Lawrence Livermore	to Hanford Site	1.69E-01	1.97E-01	2.08E-02	6.15E-02
Mound Plant	to Hanford Site	6.29E-02	7.53E-02	1.32E-02	2.61E-02
Rocky Flats Plant	to Hanford Site	3.88E+00	4.73E+00	3.96E-01	5.98E-01
Savannah River	to Hanford Site	7.86E-01	9.23E-01	6.08E-02	1.26E-01
U of MO - Columbia	to Hanford Site	5.03E-02	6.11E-02	1.10E-02	1.42E-02
West Valley DP	to Hanford Site	7.36E-02	8.68E-02	1.40E-02	4.09E-02
Totals		6.28E+00	7.60E+00	6.84E-01	1.14E+00

Table 7. Annual Accident Dose Risk for the Shipping Campaign (person-rem/yr)

Route		Truck	Rail
Bettis Atomic	to Hanford Site	1.02E-03	4.22E-04
INEL	to Hanford Site	3.14E-02	1.60E-02
Los Alamos NL	to Hanford Site	5.21E-04	6.70E-05
Lawrence Livermore	to Hanford Site	5.03E-04	2.62E-04
Mound Plant	to Hanford Site	2.93E-07	6.53E-08
Rocky Flats Plant	to Hanford Site	4.15E-03	1.13E-03
Savannah River	to Hanford Site	2.98E-02	6.74E-03
U of MO - Columbia	to Hanford Site	4.78E-07	1.23E-07
West Valley DP	to Hanford Site	1.05E-03	4.44E-04
Totals		6.85E-02	2.51E-02

Table 8. Expected Annual Fatalities for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	2.5E-03	2.7E-04
Normal Public	3.8E-03	5.7E-04
Accident Public	3.4E-05	1.3E-05
Nonradiological		
Emission	7.6E-04	7.3E-04
Accident	1.4E-02	2.2E-04

Table 9. Expected Annual Cancer Incidence
for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	8.8E-03	9.6E-04
Normal Public	1.3E-02	1.9E-03
Accident Public	1.2E-04	4.3E-05
Nonradiological		
Emission	7.6E-04	7.3E-04
Accident	NA	NA

Table 10. Expected Annual Genetic Effects
for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	3.8E-04	4.1E-05
Normal Public	7.6E-04	1.1E-04
Accident Public	5.1E-06	1.9E-06
Nonradiological		
Emission	NA	NA
Accident	NA	NA

B.33 WM LLMW CENTRALIZED ALTERNATIVE (CASE 17): CONTACT-HANDLED HETEROGENEOUS SOLIDS: NONALPHA — TREATED

Table 1. Summary of Route Information

Route		Distance (miles)	Percentage in Zone		
			Rural	Suburban	Urban
Truck					
Ames Laboratory	to Hanford Site	1703	92.6	6.6	0.8
Argonne - East	to Hanford Site	1998	91.5	7.8	0.7
Charleston, SC	to Hanford Site	2858	85.5	13.2	1.3
Colonie	to Hanford Site	1373	75.4	16.7	7.9
Fernald (FEMP)	to Hanford Site	2258	89.4	9.8	0.8
General Atomic	to Hanford Site	1352	76.3	16.0	7.7
Grand Junction PO	to Hanford Site	1086	88.1	9.8	2.1
INEL	to Hanford Site	599	91.3	7.6	1.1
Los Alamos NL	to Hanford Site	1560	89.8	8.8	1.3
LERHR	to Hanford Site	830	80.5	17.0	2.6
Oak Ridge Reserv.	to Hanford Site	2464	87.8	11.0	1.2
Paducah GDP	to Hanford Site	2182	88.7	10.0	1.3
Pantex Plant	to Hanford Site	1884	90.4	8.0	1.5
Portsmouth GDP	to Hanford Site	2402	88.0	11.0	1.0
Reactive Metals	to Hanford Site	2398	86.6	11.7	1.6
Savannah River	to Hanford Site	2727	84.3	14.2	1.5
Rail					
Ames Laboratory	to Hanford Site	1788	93.7	5.6	0.7
Argonne - East	to Hanford Site	2200	93.3	6.0	0.7
Charleston, SC	to Hanford Site	3059	84.5	13.7	1.8
Colonie	to Hanford Site	1622	86.2	9.5	4.3
Fernald (FEMP)	to Hanford Site	2505	85.6	11.5	2.9
General Atomic	to Hanford Site	1622	86.2	9.5	4.3
Grand Junction PO	to Hanford Site	1063	88.6	9.8	1.6
INEL	to Hanford Site	658	91.4	7.1	1.4
Los Alamos NL	to Hanford Site	1725	92.5	6.5	0.9
LERHR	to Hanford Site	890	81.0	14.3	4.7
Oak Ridge Reserv.	to Hanford Site	2601	91.2	7.4	1.3
Paducah GDP	to Hanford Site	2245	90.8	7.9	1.3
Pantex Plant	to Hanford Site	1686	92.0	7.1	1.0
Portsmouth GDP	to Hanford Site	2515	86.4	10.8	2.7
Reactive Metals	to Hanford Site	2505	83.4	13.1	3.5
Savannah River	to Hanford Site	2953	84.7	13.5	1.8

Table 2. Annual Number of Shipments and One-Way Shipment Distances

Route	# of Shipments		Total Mileage(mi)	
	Truck	Rail	Truck	Rail
Ames Laboratory to Hanford Site	1	1	1.70E+03	1.79E+03
Argonne - East to Hanford Site	1	1	2.00E+03	2.20E+03
Charleston, SC to Hanford Site	1	1	2.86E+03	3.06E+03
Colonie to Hanford Site	1	1	1.37E+03	1.62E+03
Fernald (FEMP) to Hanford Site	2	1	4.52E+03	2.51E+03
General Atomic to Hanford Site	1	1	1.35E+03	1.62E+03
Grand Junction PO to Hanford Site	1	1	1.09E+03	1.06E+03
INEL to Hanford Site	1	1	5.99E+02	6.58E+02
Los Alamos NL to Hanford Site	1	1	1.56E+03	1.72E+03
LERHR to Hanford Site	1	1	8.30E+02	8.90E+02
Oak Ridge Reserv. to Hanford Site	2	1	4.93E+03	2.60E+03
Paducah GDP to Hanford Site	1	1	2.18E+03	2.25E+03
Pantex Plant to Hanford Site	1	1	1.88E+03	1.69E+03
Portsmouth GDP to Hanford Site	2	1	4.80E+03	2.52E+03
Reactive Metals to Hanford Site	1	1	2.40E+03	2.51E+03
Savannah River to Hanford Site	1	1	2.73E+03	2.95E+03
Totals	19	16	3.68E+04	3.16E+04

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

Source/Route(s)	Crew	General Public			
		Off-Link	On-Link	Stops	Total
MLLW(CT) AL to HS Ames Laboratory	to Hanford Site				
	Truck	4.46E-02	1.62E-03	5.39E-03	4.77E-02
	Rail	1.03E-02	4.69E-03	1.46E-04	8.98E-03
MLLW(CT) AN to HS Argonne - East	to Hanford Site				
	Truck	5.29E-02	1.97E-03	6.28E-03	5.59E-02
	Rail	1.21E-02	5.75E-03	1.82E-04	1.03E-02
MLLW(CT) CH to HS Charleston, SC	to Hanford Site				
	Truck	8.12E-02	4.87E-03	1.09E-02	8.00E-02
	Rail	1.56E-02	1.96E-02	4.24E-04	1.29E-02
MLLW(CT) CL to HS Colonie	to Hanford Site				
	Truck	4.61E-02	7.22E-03	1.16E-02	3.84E-02
	Rail	9.65E-03	1.64E-02	2.49E-04	8.47E-03
MLLW(CT) FE to HS Fernald (FEMP)	to Hanford Site				
	Truck	6.13E-02	2.71E-03	7.49E-03	6.32E-02
	Rail	1.33E-02	2.00E-02	3.60E-04	1.12E-02
MLLW(CT) SO to HS General Atomic	to Hanford Site				
	Truck	4.49E-02	6.88E-03	1.11E-02	3.78E-02
	Rail	9.65E-03	1.64E-02	2.49E-04	8.47E-03
MLLW(CT) GJ to HS Grand Junction PO	to Hanford Site				
	Truck	3.04E-02	2.03E-03	4.58E-03	3.04E-02
	Rail	7.32E-03	5.46E-03	1.23E-04	6.75E-03
MLLW(CT) IN to HS INEL	to Hanford Site				
	Truck	1.60E-02	7.18E-04	2.06E-03	1.68E-02
	Rail	5.63E-03	2.83E-03	6.58E-05	5.51E-03
MLLW(CT) LA to HS Los Alamos NL	to Hanford Site				
	Truck	4.24E-02	2.16E-03	5.65E-03	4.37E-02
	Rail	1.01E-02	5.60E-03	1.54E-04	8.79E-03
MLLW(CT) SM to HS LERHR	to Hanford Site				
	Truck	2.51E-02	2.17E-03	4.00E-03	2.32E-02
	Rail	6.59E-03	1.07E-02	1.64E-04	6.22E-03
MLLW(CT) OR to HS Oak Ridge Reserv.	to Hanford Site				
	Truck	6.83E-02	3.65E-03	8.95E-03	6.90E-02
	Rail	1.37E-02	1.08E-02	2.59E-04	1.15E-02
MLLW(CT) PA to HS Paducah GDP	to Hanford Site				
	Truck	6.00E-02	3.22E-03	8.02E-03	6.11E-02
	Rail	1.22E-02	9.43E-03	2.28E-04	1.04E-02
MLLW(CT) PP to HS Pantex Plant	to Hanford Site				
	Truck	5.10E-02	2.68E-03	7.01E-03	5.27E-02
	Rail	9.92E-03	5.71E-03	1.56E-04	8.67E-03
MLLW(CT) PO to HS Portsmouth GDP	to Hanford Site				
	Truck	6.63E-02	3.38E-03	8.48E-03	6.72E-02
	Rail	1.34E-02	1.89E-02	3.46E-04	1.12E-02
MLLW(CT) RM to HS Reactive Metals	to Hanford Site				
	Truck	6.76E-02	4.22E-03	9.51E-03	6.71E-02
	Rail	1.33E-02	2.35E-02	4.01E-04	1.12E-02
MLLW(CT) SR to HS Savannah River	to Hanford Site				
	Truck	7.86E-02	5.10E-03	1.08E-02	7.64E-02
	Rail	1.52E-02	1.85E-02	4.05E-04	1.26E-02

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route		Truck	Rail
MLLW(CT) AL to HS			
Ames Laboratory	to Hanford Site	1.98E-08	6.73E-09
MLLW(CT) AN to HS			
Argonne - East	to Hanford Site	1.94E-05	4.79E-06
MLLW(CT) CH to HS			
Charleston, SC	to Hanford Site	6.40E-04	1.32E-04
MLLW(CT) CL to HS			
Colonie	to Hanford Site	8.81E-08	2.63E-08
MLLW(CT) FE to HS			
Fernald (FEMP)	to Hanford Site	1.04E-04	9.19E-05
MLLW(CT) SO to HS			
General Atomic	to Hanford Site	2.91E-06	9.03E-07
MLLW(CT) GJ to HS			
Grand Junction PO	to Hanford Site	3.70E-08	1.29E-08
MLLW(CT) IN to HS			
INEL	to Hanford Site	6.55E-03	3.50E-03
MLLW(CT) LA to HS			
Los Alamos NL	to Hanford Site	3.57E-05	4.20E-06
MLLW(CT) SM to HS			
LERHR	to Hanford Site	1.21E-06	6.33E-07
MLLW(CT) OR to HS			
Oak Ridge Reserv.	to Hanford Site	5.39E-03	2.40E-03
MLLW(CT) PA to HS			
Paducah GDP	to Hanford Site	8.48E-04	1.95E-04
MLLW(CT) PP to HS			
Pantex Plant	to Hanford Site	3.00E-05	3.48E-06
MLLW(CT) PO to HS			
Portsmouth GDP	to Hanford Site	3.44E-05	2.74E-05
MLLW(CT) RM to HS			
Reactive Metals	to Hanford Site	1.57E-06	6.51E-07
MLLW(CT) SR to HS			
Savannah River	to Hanford Site	1.40E-04	3.13E-05

Table 5. Nonradiological Risk Factors per Shipment (fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
Ames Laboratory	to Hanford Site	4.31E-06	8.93E-05
Argonne - East	to Hanford Site	4.41E-06	1.06E-04
Charleston, SC	to Hanford Site	1.20E-05	1.99E-04
Colonie	to Hanford Site	3.48E-05	8.47E-05
Fernald (FEMP)	to Hanford Site	5.86E-06	1.22E-04
General Atomic	to Hanford Site	3.33E-05	8.36E-05
Grand Junction PO	to Hanford Site	7.50E-06	6.25E-05
INEL	to Hanford Site	2.19E-06	3.07E-05
Los Alamos NL	to Hanford Site	6.66E-06	1.02E-04
LERHR	to Hanford Site	6.82E-06	4.66E-05
Oak Ridge Reserv.	to Hanford Site	9.50E-06	1.61E-04
Paducah GDP	to Hanford Site	9.30E-06	1.41E-04
Pantex Plant	to Hanford Site	9.21E-06	1.25E-04
Portsmouth GDP	to Hanford Site	8.11E-06	1.28E-04
Reactive Metals	to Hanford Site	1.27E-05	1.28E-04
Savannah River	to Hanford Site	1.31E-05	1.81E-04
Rail			
Ames Laboratory	to Hanford Site	5.40E-06	3.74E-06
Argonne - East	to Hanford Site	6.15E-06	4.60E-06
Charleston, SC	to Hanford Site	2.35E-05	6.40E-06
Colonie	to Hanford Site	2.91E-05	3.39E-06
Fernald (FEMP)	to Hanford Site	3.07E-05	5.24E-06
General Atomic	to Hanford Site	2.91E-05	3.39E-06
Grand Junction PO	to Hanford Site	7.07E-06	2.22E-06
INEL	to Hanford Site	3.98E-06	1.38E-06
Los Alamos NL	to Hanford Site	6.82E-06	3.61E-06
LERHR	to Hanford Site	1.77E-05	1.86E-06
Oak Ridge Reserv.	to Hanford Site	1.45E-05	5.44E-06
Paducah GDP	to Hanford Site	1.23E-05	4.70E-06
Pantex Plant	to Hanford Site	6.78E-06	3.53E-06
Portsmouth GDP	to Hanford Site	2.88E-05	5.26E-06
Reactive Metals	to Hanford Site	3.65E-05	5.24E-06
Savannah River	to Hanford Site	2.21E-05	6.18E-06

Table 6. Annual Incident-Free Dose for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
		Crew	Public	Crew	Public
Ames Laboratory	to Hanford Site	4.46E-02	5.47E-02	1.03E-02	1.38E-02
Argonne - East	to Hanford Site	5.29E-02	6.42E-02	1.21E-02	1.62E-02
Charleston, SC	to Hanford Site	8.12E-02	9.58E-02	1.56E-02	3.29E-02
Colonie	to Hanford Site	4.61E-02	5.72E-02	9.65E-03	2.52E-02
Fernald (FEMP)	to Hanford Site	1.23E-01	1.47E-01	1.33E-02	3.16E-02
General Atomic	to Hanford Site	4.49E-02	5.58E-02	9.65E-03	2.52E-02
Grand Junction PO	to Hanford Site	3.04E-02	3.70E-02	7.32E-03	1.23E-02
INEL	to Hanford Site	1.60E-02	1.95E-02	5.63E-03	8.40E-03
Los Alamos NL	to Hanford Site	4.24E-02	5.15E-02	1.01E-02	1.45E-02
LERHR	to Hanford Site	2.51E-02	2.94E-02	6.59E-03	1.70E-02
Oak Ridge Reserv.	to Hanford Site	1.37E-01	1.63E-01	1.37E-02	2.26E-02
Paducah GDP	to Hanford Site	6.00E-02	7.23E-02	1.22E-02	2.01E-02
Pantex Plant	to Hanford Site	5.10E-02	6.24E-02	9.92E-03	1.45E-02
Portsmouth GDP	to Hanford Site	1.33E-01	1.58E-01	1.34E-02	3.04E-02
Reactive Metals	to Hanford Site	6.76E-02	8.09E-02	1.33E-02	3.51E-02
Savannah River	to Hanford Site	7.86E-02	9.23E-02	1.52E-02	3.15E-02
Totals		1.03E+00	1.24E+00	1.78E-01	3.51E-01

Table 7. Annual Accident Dose Risk for the Shipping Campaign (person-rem/yr)

Route		Truck	Rail
Ames Laboratory	to Hanford Site	1.98E-08	6.73E-09
Argonne - East	to Hanford Site	1.94E-05	4.79E-06
Charleston, SC	to Hanford Site	6.40E-04	1.32E-04
Colonie	to Hanford Site	8.81E-08	2.63E-08
Fernald (FEMP)	to Hanford Site	2.08E-04	9.19E-05
General Atomic	to Hanford Site	2.91E-06	9.03E-07
Grand Junction PO	to Hanford Site	3.70E-08	1.29E-08
INEL	to Hanford Site	6.55E-03	3.50E-03
Los Alamos NL	to Hanford Site	3.57E-05	4.20E-06
LERHR	to Hanford Site	1.21E-06	6.33E-07
Oak Ridge Reserv.	to Hanford Site	1.08E-02	2.40E-03
Paducah GDP	to Hanford Site	8.48E-04	1.95E-04
Pantex Plant	to Hanford Site	3.00E-05	3.48E-06
Portsmouth GDP	to Hanford Site	6.89E-05	2.74E-05
Reactive Metals	to Hanford Site	1.57E-06	6.51E-07
Savannah River	to Hanford Site	1.40E-04	3.13E-05
Totals		1.93E-02	6.39E-03

Table 8. Expected Annual Fatalities for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	4.1E-04	7.1E-05
Normal Public	6.2E-04	1.8E-04
Accident Public	9.7E-06	3.2E-06
Nonradiological		
Emission	2.0E-04	2.8E-04
Accident	2.2E-03	6.6E-05

Table 9. Expected Annual Cancer Incidence for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	1.4E-03	2.5E-04
Normal Public	2.1E-03	6.0E-04
Accident Public	3.3E-05	1.1E-05
Nonradiological		
Emission	2.0E-04	2.8E-04
Accident	NA	NA

Table 10. Expected Annual Genetic Effects
for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	6.2E-05	1.1E-05
Normal Public	1.2E-04	3.5E-05
Accident Public	1.4E-06	4.9E-07
Nonradiological		
Emission	NA	NA
Accident	NA	NA

B.34 WM LLMW CENTRALIZED ALTERNATIVE (CASE 17): CONTACT-HANDLED HETEROGENEOUS SOLIDS: ALPHA — TREATED

Table 1. Summary of Route Information

Route		Distance (miles)	Percentage in Zone		
			Rural	Suburban	Urban
Truck					
INEL	to Hanford Site	599	91.3	7.6	1.1
Los Alamos NL	to Hanford Site	1560	89.8	8.8	1.3
Rocky Flats Plant	to Hanford Site	1132	91.9	7.3	0.8
West Valley DP	to Hanford Site	2556	84.6	13.7	1.7
Rail					
INEL	to Hanford Site	658	91.4	7.1	1.4
Los Alamos NL	to Hanford Site	1725	92.5	6.5	0.9
Rocky Flats Plant	to Hanford Site	1284	93.1	5.5	1.4
West Valley DP	to Hanford Site	2654	78.3	18.0	3.7

Table 2. Annual Number of Shipments and One-Way Shipment Distances

Route		# of Shipments		Total Mileage(mi)	
		Truck	Rail	Truck	Rail
INEL to Hanford Site		1	1	5.99E+02	6.58E+02
Los Alamos NL to Hanford Site		1	1	1.56E+03	1.72E+03
Rocky Flats Plant to Hanford Site		68	25	7.69E+04	3.21E+04
West Valley DP to Hanford Site		1	1	2.56E+03	2.65E+03
Totals		71	28	8.17E+04	3.71E+04

Table 3. Incident-Free Dose per Shipment (person-rem/shipment)

Source/Route(s)		Crew	General Public			
			Off-Link	On-Link	Stops	Total
MLLW(T) IN to HS						
INEL						
	to Hanford Site					
	Truck	1.60E-02	7.18E-04	2.06E-03	1.68E-02	1.95E-02
	Rail	5.63E-03	2.83E-03	6.58E-05	5.51E-03	8.40E-03
MLLW(T) LA to HS						
Los Alamos NL						
	to Hanford Site					
	Truck	4.24E-02	2.16E-03	5.65E-03	4.37E-02	5.15E-02
	Rail	1.01E-02	5.60E-03	1.54E-04	8.79E-03	1.45E-02
MLLW(T) RF to HS						
Rocky Flats Plant						
	to Hanford Site					
	Truck	2.99E-02	1.13E-03	3.61E-03	3.17E-02	3.64E-02
	Rail	8.24E-03	4.91E-03	1.16E-04	7.43E-03	1.25E-02
MLLW(T) WV to HS						
West Valley DP						
	to Hanford Site					
	Truck	7.36E-02	4.90E-03	1.04E-02	7.16E-02	8.68E-02
	Rail	1.40E-02	2.88E-02	5.00E-04	1.17E-02	4.09E-02

Table 4. Accident Dose Risk per Shipment (person-rem/shipment)

Source/Route	Truck	Rail
MLLW(T) IN to HS		
INEL to Hanford Site	2.32E-05	1.18E-05
MLLW(T) LA to HS		
Los Alamos NL to Hanford Site	3.09E-05	3.97E-06
MLLW(T) RF to HS		
Rocky Flats Plant to Hanford Site	2.31E-04	1.71E-04
MLLW(T) WV to HS		
West Valley DP to Hanford Site	1.38E-04	5.85E-05

Table 5. Nonradiological Risk Factors per Shipment
(fatalities/shipment)

Mode	Route	Emission	Accident
Truck			
INEL	to Hanford Site	2.19E-06	3.07E-05
Los Alamos NL	to Hanford Site	6.66E-06	1.02E-04
Rocky Flats Plant	to Hanford Site	2.83E-06	6.69E-05
West Valley DP	to Hanford Site	1.36E-05	1.38E-04
Rail			
INEL	to Hanford Site	3.98E-06	1.38E-06
Los Alamos NL	to Hanford Site	6.82E-06	3.61E-06
Rocky Flats Plant	to Hanford Site	7.36E-06	2.69E-06
West Valley DP	to Hanford Site	4.14E-05	5.55E-06

Table 6. Annual Incident-Free Dose for the Shipping Campaign (person-rem/yr)

Route		Truck		Rail	
		Crew	Public	Crew	Public
INEL	to Hanford Site	1.60E-02	1.95E-02	5.63E-03	8.40E-03
Los Alamos NL	to Hanford Site	4.24E-02	5.15E-02	1.01E-02	1.45E-02
Rocky Flats Plant	to Hanford Site	2.03E+00	2.48E+00	2.06E-01	3.12E-01
West Valley DP	to Hanford Site	7.36E-02	8.68E-02	1.40E-02	4.09E-02
Totals		2.16E+00	2.63E+00	2.36E-01	3.75E-01

Table 7. Annual Accident Dose Risk for the Shipping Campaign
(person-rem/yr)

Route		Truck	Rail
INEL	to Hanford Site	2.32E-05	1.18E-05
Los Alamos NL	to Hanford Site	3.09E-05	3.97E-06
Rocky Flats Plant	to Hanford Site	1.57E-02	4.28E-03
West Valley DP	to Hanford Site	1.38E-04	5.85E-05
Totals		1.59E-02	4.35E-03

Table 8. Expected Annual Fatalities for
the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	8.7E-04	9.4E-05
Normal Public	1.3E-03	1.9E-04
Accident Public	8.0E-06	2.2E-06
Nonradiological		
Emission	2.2E-04	2.4E-04
Accident	4.8E-03	7.8E-05

Table 9. Expected Annual Cancer Incidence
for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	3.0E-03	3.3E-04
Normal Public	4.5E-03	6.4E-04
Accident Public	2.7E-05	7.4E-06
Nonradiological		
Emission	2.2E-04	2.4E-04
Accident	NA	NA

Table 10. Expected Annual Genetic Effects
for the Shipping Campaign

Exposure Group	Truck	Rail
Radiological		
Normal Crew	1.3E-04	1.4E-05
Normal Public	2.6E-04	3.8E-05
Accident Public	5.5E-07	1.6E-07
Nonradiological		
Emission	NA	NA
Accident	NA	NA