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PROJECTED TRANSURANIC WASTE LOADS REQUIRING TREATMENT, STORAGE, AND DISPOSAL*

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ABSTRACT

Argonne National Laboratory's WASTE_MGMT computational model was used to calculate the volume of transuranic (TRU) waste loads requiring treatment, storage, and disposal at facilities located at various U.S. Department of Energy (DOE) sites. Inventory and generation data were taken from DOE's *Waste Isolation Pilot Plant Transuranic Waste Baseline Inventory Report* published in February 1995. Results indicate that WIPP's design capacity is sufficient for disposal of the contact-handled (CH) TRU waste located throughout the DOE Complex. Argonne compared the newly estimated waste loads with estimates from a previous study that used inventory and generation data published in 1992 and 1993. The differences between the old and new estimates, expressed as a percentage of the newly estimated waste loads, range from a few percent to about 60% for treatment of CH TRU waste and from about 10% to 30% for its storage and disposal.

INTRODUCTION

Data on TRU waste loads are important input for validating existing capacities and determining the size and cost of new facilities for TRU waste treatment, storage, and disposal (TSD) for various siting configurations. Such data are used to assess transportation requirements and health risks to workers and the general public. Two of the key parameters for calculating TRU waste loads are the current inventory and estimated generation of TRU waste. A study by Hong et al. (Ref. 1) projects waste loads estimated on the basis of inventory and generation data published in 1992 and 1993. Recently, updated inventory and generation data have been made available (Refs. 2 and 3). This paper compares the waste load information calculated from the updated data with the information presented in the earlier study.

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Before TRU can be disposed of at WIPP, it needs to be packaged or treated to meet various requirements. This study considers three levels of TRU waste treatment. The minimum level simply processes and packages TRU waste; it fulfills current WIPP waste acceptance criteria (WAC) requirements. The intermediate level reduces the gas generation rate of TRU waste after it has been disposed of in WIPP; it fulfills the requirements of the performance assessment study in addition to those of WIPP WAC. The most extensive level of treatment further destroys or stabilizes all hazardous constituents in TRU waste; it meets land disposal restrictions (LDRs).

This study considers three siting configurations for TRU waste treatment. In the regional configuration, TRU waste from individual sites would be sent to regional centers for treatment; in the decentralized configuration, it would be treated on the site where it was generated; in the centralized configuration, it would be sent from each of the sites to a centralized center for treatment. All treated TRU waste is temporarily stored in an interim storage facility before being shipped to WIPP for disposal.

UPDATED INVENTORY AND GENERATION DATA

The updated inventory and generation data are from revision 1 of the *Waste Isolation Pilot Plant Transuranic Waste Baseline Inventory Report* (WIPP-BIR) published in 1995 (Ref. 2). These WIPP-BIR data are essentially the same as those provided in the Integrated Data Base (IDB) for 1994 (Ref. 3). In general, these newly published data are more complete, consistent, and accurate than the data found in a previous study, which used data from the IDB for 1992 and from the interim mixed-waste inventory report published in 1993. The updated data were recently collected directly from each TRU waste generation or storage site. The latest data on the inventory volume of contact-handled (CH) TRU waste found throughout the DOE Complex is 73,000 m^3; it was previously reported as 65,000 m^3. The latest generation volume is 51,000 m^3; the previously reported volume was 33,000 m^3. Prediction of TRU waste volumes varies at each individual site.

The WIPP-BIR also provides detailed information on the characteristics of the TRU waste in each waste stream. On the basis of this information, waste streams were grouped into categories to facilitate their efficient treatment. The categories are aqueous liquid (1000), organic liquids (2000), solid process residues (3000), soils (4000), debris (5000), special (6000), inherently hazardous (7000), and unknown (8000). The numbers in parentheses are abbreviated designations used in the accompanying tables and figure. TRU waste in each category would be treated in a specific treatment train that involves a series of treatment technologies including solidification, shredding, incineration, and packaging.

Fig. 1 illustrates the treatment trains for five TRU waste stream categories being treated at a high level to meet LDRs. All treatment trains include a pretreatment step that segregates the waste into streams by separating liquids from solids or sorting out solids that have different physical properties. Currently, waste load calculations do not include three waste

stream categories (special, inherently hazardous, and unknown). These three constitute less than 10% of total TRU waste volume and are assumed to be set aside to await special processing. **Place Fig. 1 here.**

ESTIMATED WASTE LOADS

Argonne used the WASTE_MGMT computational model (Ref. 4) to calculate TRU waste loads. Input consisted of the updated data from WIPP-BIR for technologies at each treatment site and for each siting configuration. WASTE_MGMT accepts three types of data as input: (1) the volume, mass, and contaminant characteristics of the waste stream inventory, by generating site and waste stream category; (2) TSD unit operating parameters; and (3) site configurations for treatment. Some TSD processes generate secondary output streams that are also tracked through the treatment process. For example, the primary output stream of incineration is ash, but a secondary stream of high-chloride salt waste is generated in the off-gas treatment of combustion gases (Fig. 1).

Table I shows the annual CH TRU waste loads throughout the DOE Complex requiring representative treatment technologies for three siting configurations and three treatment levels: (1) decentralization of treatment to meet WIPP WAC requirements at each DOE site; (2) regionalization of treatment to reduce gas generation rates at five DOE sites; and (3) centralization of treatment to meet LDRs at one centralized DOE site. It also lists data on waste loads from the previous study for comparison. In general, the waste load for each technology under each siting configuration is higher when calculated with the updated data than when calculated with the previous data. The differences range from a few percent to about 60%. **Place Table I here.**

Table II shows the total CH TRU waste loads throughout the DOE Complex for storage and disposal. The highest calculated waste loads for the disposal facility at WIPP are as follows: (1) about 140,000 m^3 for the decentralization of treatment to meet WIPP WAC, (2) 93,000 m^3 for the regionalization of treatment to reduce gas generation, and (3) 63,000 m^3 for the centralization of treatment to meet LDRs. The differences between these data and the earlier study's data range from 10% to 30%. The estimated waste loads do not include waste volume that could result from environmental restoration activities. WIPP's design capacity for CH-TRU waste is 170,000 m^3. **Place Table II here.**

SUMMARY

This paper provides information on the volume of TRU waste loads requiring treatment, storage, and disposal at DOE facilities for three siting configurations. Input consisted of updated inventory and generation data from WIPP-BIR. Results indicate that WIPP's design capacity is sufficient for the CH TRU waste found throughout the DOE Complex.

In a comparison of waste loads estimated in this study with those estimated in a previous study, differences, expressed as a percentage of the newly estimated waste loads, ranged from a few percent to about 60% for treatment of CH TRUwaste and from about 10% to 30% for its storage and disposal.

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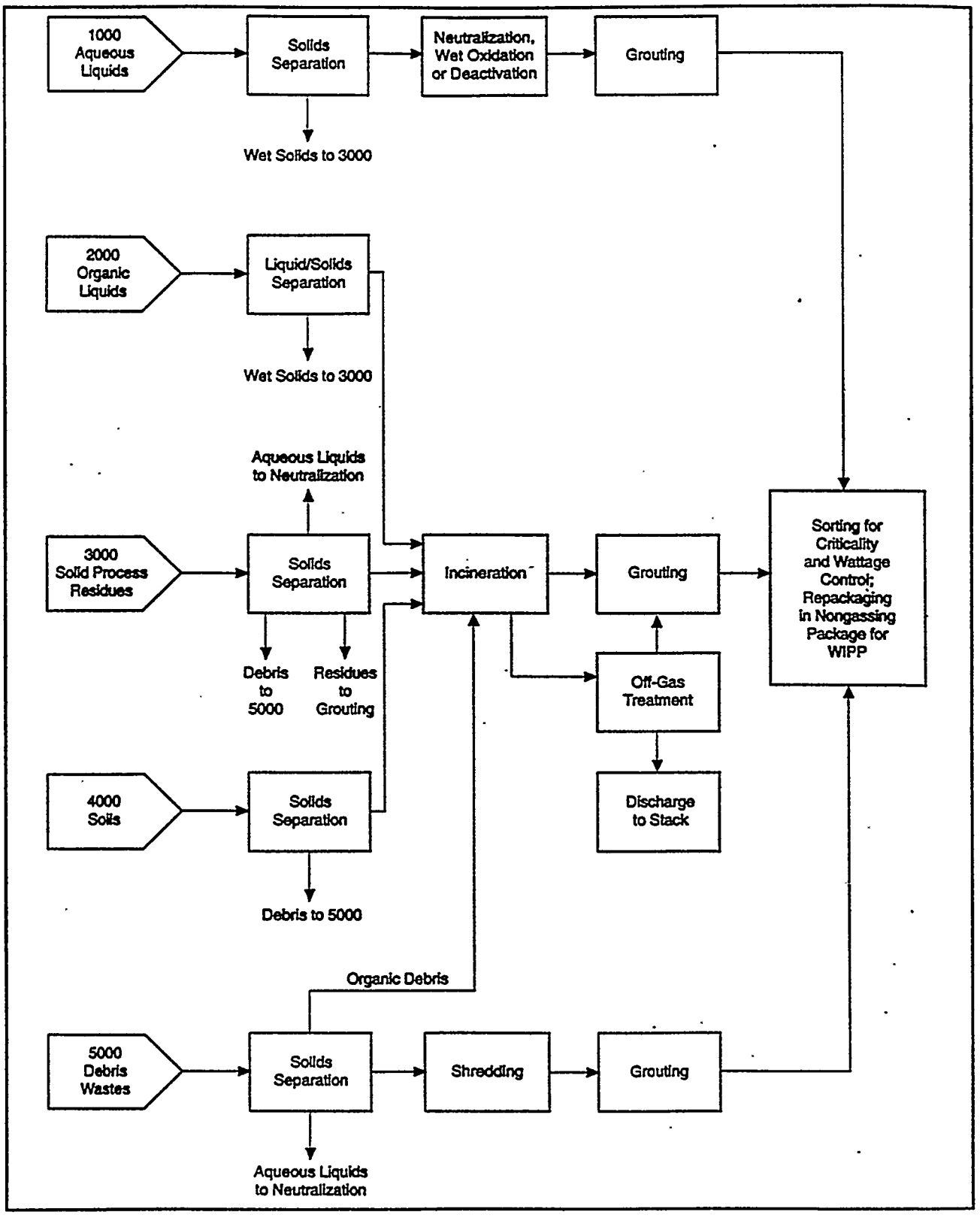

FIGURE 1 Treatment Trains for Meeting RCRA LDRs

Table I Comparison of Annual DOE-Complex-Wide CH TRU Waste Loads (m^3/yr) Requiring Treatment, Calculated on the Basis of Updated and Previous Inventory and Generation Data

Treatment Technology	Decentralization: Treat at Each Site to Meet WIPP WAC		Regionalization: Treat at Five Sites to Reduce Gas Generation		Centralization: Treat at One Site to Meet LDRs	
	This Study	Previous Study	This Study	Previous Study	This Study	Previous Study
Incineration	NA[a]	NA	NA	NA	6,100	2,600
Solidification	1,400	1,000	4,600	3,900	4,400	3,800
Shredding	NA	NA	8,500	6,300	5,000	4,900
Packaging	13,000	8,600	8,400	6,100	5,800	4,900

[a] NA= Not applicable.

Table II Comparison of DOE-Complex-Wide CH-TRU Waste Loads (m^3) Requiring Storage and Disposal, Calculated on the Basis of Updated and Previous Inventory and Generation Data

Decentralization: Treat at Each Site to Meet WIPP WAC		Regionalization: Treat at Five Sites to Reduce Gas Generation		Centralization: Treat at One Site to Meet LDRs	
This Study	Previous Study	This Study	Previous Study	This Study	Previous Study
140,000	95,000	93,000	67,000	63,000	54,000