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1995 Baseline Solid Waste Management System Description

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EXECUTIVE SUMMARY

This document, prepared by the Pacific Northwest Laboratory (PNL) under the direction of Westinghouse Hanford Company (WHC), provides a detailed solid waste system description that documents the treatment, storage, and disposal (TSD) strategy for managing Hanford's solid low-level waste (LLW), low-level mixed waste (LLMW), transuranic and transuranic mixed (TRU_TRUM) waste, and greater-than-Class III (GTCIII) waste. This system description is intended for use by managers of the solid waste program, facility and system planners, as well as system modelers. The system description identifies the TSD facilities that constitute the solid waste system and defines these facilities' interfaces, schedules, and capacities. In addition, this system description provides the strategy for treating each of the waste streams generated or received by the Hanford Site from generation or receipt through final destination. Assumptions related to these waste process flows are also documented.

Three storage facilities—two existing and one planned—will provide storage for Hanford's solid waste inventory and solid waste to be generated or shipped to the Hanford site. Storage will be required for batching waste into treatment facilities, for housing waste until treatment or disposal capacity is available, and for storing waste being transferred from one treatment facility to another. These facilities are: the (existing) Radioactive Mixed Waste Storage Facility, the (planned) Enhanced Radioactive Mixed Waste Storage Facility, and the (existing) Transuranic Storage and Assay Facility (TRUSAF).

Four treatment facilities have been identified for processing waste volumes to meet disposal requirements.

- Waste Receiving and Processing (WRAP) Module 1. The primary function of WRAP 1 will be to certify CH_TRU_TRUM waste in drums and standard waste boxes (SWBs) for shipment to the Waste Isolation Pilot Plant (WIPP). In addition, WRAP 1 will perform lot sampling on CH_LLW_I in drums prior to the lot's disposal in the LLW Burial Ground. This facility, which is currently under construction, is planned to begin processing CH_LLW_I in 1997 and CH_TRU_TRUM in 1998..

- The Commercial LLMW Stabilization Treatment Program (STP). The LLMW STP will process CH_LLMW in drums and boxes smaller than 6 ft x 8 ft x 12 ft, to meet Resource Conservation and Recovery Act (RCRA) requirements for disposal in the mixed waste disposal trenches. The facility is expected to begin operation in 1999.

- Thermal Treatment Facility (TTF). The TTF will treat CH_LLMW in drums that contain physical waste forms or hazardous constituents requiring thermal destruction, such as organics and polychlorobiphenyls (PCBs). The treated LLMW will be shipped to the mixed waste disposal trenches for disposal. The TTF is expected to begin operation in 1997.

- M33 Facility. A facility, to be determined by the DOE upon review of the Tri-Party Agreement (TPA) Milestone M-33-00, will process several difficult-to-treat waste streams for disposal. Primarily, this facility will process suspect TRU_TRUM streams, all RH waste streams, and waste streams rejected from WRAP 1, the STP, and the TTF because of container size or hazardous or physical characteristics. The LLMW will be disposed in the mixed waste disposal trenches, and TRU_TRUM waste will be shipped to WIPP.

Three disposal facilities are planned for all waste streams. The LLW Burial Ground will provide disposal for CH and RH LLW classes I and III; the mixed waste disposal trenches will provide RCRA-compliant disposal for CH_LLMW and RH_LLMW; and WIPP will serve as a geologic repository for certified transuranic wastes.

ACRONYMS

AMW	Alkalide Metal Waste
CH	Contact (Waste Streams)
CWC	Central Waste Complex
CY	calendar year
D&D	Decontamination & Decommissioning
DOE	U.S. Department of Energy
EBR-II	Experimental Breeder Reactor II
ER	Environmental Restoration
FDC	Functional Design Criteria
FFTF	Fast Flux Test Facility
FRP	fiberglass reinforced plywood
GTCIII	Greater-Than-Class III
GTCC	Greater-Than-Class-C (waste)
HCWC	Hanford Central Waste Complex
HDW-EIS	Hanford Defense High-Level, Transuranic, and Tank Wastes Environmental Impact Statement
HEPA	High-Efficiency Particulate Air
HIC	High Integrity Container
LEC	Long Equipment Container
LFMW	Low Flashpoint Mixed Waste
LLMW	Low-Level Mixed Waste
LLW	Low-Level Waste
LTS	Long-Term Storage
MW	Mixed Waste
NDA	Nondestructive Assay
NDE	Nondestructive Examination
PCB	Polychlorinated Biphenyl compounds (or polychlorobiphenyls)
PFP	Plutonium Finishing Plant
PNL	Pacific Northwest Laboratory
PUREX	Plutonium-Uranium Extraction
QA	Quality Assurance
RCRA	Resource Conservation and Recovery Act
RH	Remote Handled (Waste Streams)
RWM	Restricted Waste Management
SAMSM	South Alkalide Metal Storage Module
SDAR	Storage/Disposal Approval Record
STP	(LLMW) Stabilization Treatment Program
SWB	Standard Waste Box
SWOC	Solid Waste Operations Complex
SWPM	Solid Waste Projection Model
TPA	Tri-Party Agreement

TRU_TRUM	Transuranic and Transuranic Mixed Waste
TRUPACT	Transuranic Waste Container Certified for Acceptance at the WIPP
TRUSAF	Transuranic Storage and Assay Facility
TSD	Treatment, Storage, and Disposal
TTF	Thermal Treatment Facility
TWRS	Tank Waste Remediation System
WAC	Waste Acceptance Criteria
WHC	Westinghouse Hanford Company
WIPP	Waste Isolation Pilot Plant
WRAP	Waste Receiving and Processing (treatment facility)

WASTE CLASSIFICATION ACRONYMS

CH_LLW_I	Contact-handled low-level waste, Class I
CH_LLW_III	Contact-handled low-level waste, Class III
RH_LLW_I	Remote-handled low-level waste, Class I
RH_LLW_III	Remote-handled low-level waste, Class III
CH_LLMW_I	Contact-handled low-level mixed waste, Class I
CH_LLMW_III	Contact-handled low-level mixed waste, Class III
RH_LLMW_I	Remote-handled low-level mixed waste, Class I
RH_LLMW_III	Remote-handled low-level mixed waste, Class III
CH_TRU_TRUM	Contact-handled transuranic waste and contact-handled transuranic and transuranic mixed waste
RH_TRU_TRUM	Remote-handled transuranic waste and remote-handled transuranic and transuranic mixed waste
CH_TRU_SUSPECT	Contact-handled waste that has not been fully characterized and is suspected to have a transuranic component
RH_TRU_SUSPECT	Remote-handled waste that has not been fully characterized and is suspected to have a transuranic component
RH_GTCIII	Remote-handled waste, greater-than-Class III
CH_GTCIII	Contact-handled waste, greater-than-Class III

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FIGURES

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1.0 INTRODUCTION

The Hanford Site, a U.S. Department of Energy (DOE) installation located in south central Washington, was a major manufacturer of plutonium for the defense industry from the early 1940s through the 1960s. Volumes of waste were generated together with the production of plutonium, and Hanford's mission changed from defense to "environmental cleanup." As part of the new mission, the Westinghouse Hanford Company (WHC) solid waste program is responsible for safely remediating solid waste generated or received by the Hanford Site.

This document, prepared by Pacific Northwest Laboratory (PNL)[a] under the direction of WHC, provides a detailed solid waste system description that documents the treatment, storage, and disposal (TSD) strategy for managing Hanford's solid low-level waste (LLW), low-level mixed waste (LLMW), transuranic and transuranic mixed (TRU_TRUM) waste, and greater-than-Class III (GTCIII) waste. This system description is intended for use by managers of the solid waste program, facility and system planners, as well as system modelers. This system description identifies the TSD facilities that constitute the solid waste system and defines these facilities' interfaces, schedules, and capacities. In addition, this system description provides the strategy for treating each waste stream generated or received by the Hanford Site from its generation or receipt through final destination. Assumptions related to these waste process flows are also documented.

Versions of this document have been revised and published annually for several years. It is important for the reader to recognize that the system defined in this document is constantly evolving, as the solid waste program gains better understanding of waste streams to be managed, disposal requirements for these waste streams, and technologies available to treat these wastes to meet disposal requirements. This current system description should be viewed as a "snapshot" of the solid waste program strategy for managing solid waste; it should not be viewed as final. As in past system descriptions, the current system description was developed based on existing project documents, such as functional design criteria (FDC) reports, engineering studies, and other facility descriptions. Then in addition, meetings were held with managers and engineers responsible for planning the storage facilities, treatment facilities, and disposal sites. These meetings allowed the responsible parties to review and revise the system description, ensuring that it reflected the most current planning.

A primary use of this system description is to support the Solid Waste Projection Model (SWPM), a computer simulation model. The system defined in this document is represented by the SWPM, and waste stream inventory and forecast volumes are fed into the model to represent the "real life" system. By studying this system as a whole rather than as individual projects, key facility interactions and requirements may be identified and investigated, and a better understanding of the overall system gained. This system description does not report

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[a] PNL is operated for the U.S. Department of Energy by Battelle Memorial Institute.

waste volumes from the inventory or forecast data, or from the SWPM. Rather, this document is part of a family of documents that define Hanford's solid waste program in detail. These other documents provide waste volumes associated with retrieval, generation, storage, treatment, and disposal. This family of documents provides an initial basis from which long-term technological, programmatic, and funding needs can be defined and clearly documented prior to full-scale design. Specifically, this family of documents includes:

- 1995 Solid Waste 30-Year Volume Summary (Valero et al. 1995). This document, which is developed annually, describes and summarizes the volumes of waste that Hanford is expected to generate or receive over the next 30 years. These data summarize the volumes for which Hanford's solid waste program is responsible.

- Scenario X.X Results Report. This document, yet to be published this year, describes and summarizes the annual treatment, storage, and disposal volumes that result from operating the system, based on the SWPM. The results report that will be developed from this system description and the 1995 Solid Waste 30-Year Volume Summary will be termed "Scenario 8.0."

Because this document is intended to serve several audiences, it is organized in a "macro to micro" order. Chapter two provides a high-level overview of the system and each of its components: waste sources, treatment facilities, storage facilities, and disposal facilities. Chapters three through six then define each of these components in further detail.

- Chapter three defines the waste sources of newly generated and stored waste.

- Chapter four identifies and describes the storage facilities: Radioactive Mixed Waste Storage Facility, Enhanced Radioactive Mixed Waste Storage Facility, and the Transuranic Storage and Assay Facility (TRUSAF).

- Chapter five describes the treatment facilities: Waste Receiving and Processing (WRAP) Module 1, the commercial LLMW Stabilization Treatment Program (STP), the Thermal Treatment Facility (TTF), and a yet-to-be determined facility called the "M33 Facility."

- Chapter six then discusses the disposal sites: the low-level waste burial ground, the mixed waste disposal trenches, and the Waste Isolation Pilot Plant (WIPP).

Chapter seven integrates all information provided in the previous chapters, illustrating the waste stream treatment strategies for each waste stream to be managed by the solid waste program. Chapter seven provides flow diagrams and documents management assumptions for both contact- and remote-handled wastes that are low-level, transuranic, or mixed.

2.0 SYSTEM OVERVIEW

For any present or future environmental clean-up mission to succeed at Hanford, a system must exist that can receive solid wastes generated during ongoing operations, store these wastes until treatment capability is available, and treat the wastes for final disposal. This chapter provides an overview of the Hanford solid waste management system, depicted in Figure 2.1, which provides the necessary capabilities to receive, store, treat, and dispose of solid wastes. Sections in this chapter correspond to one of the four major functions shown in Figure 2.1: waste sources, storage facilities, treatment facilities, and disposal facilities. More detailed descriptions of each major function are provided in subsequent chapters.

2.1 WASTE SOURCES

The incoming waste streams shown in Figure 2.1 are solid materials, containerized liquids, and semisolid materials generated in the course of DOE operations at the Hanford Site. In addition, approval has been granted for other sites within the DOE complex to ship their solid waste to Hanford (no commercial wastes have yet been approved for shipment to Hanford). Existing solid waste that will be managed by the system includes waste volumes that are retrievably stored in buildings, trenches, and caissons at Hanford. The system will also manage waste volumes that will be generated over the next 30 years by various on- and off-site programs. These programs are defined below and further defined in 1995 Solid Waste 30-Year Volume Summary (Valero et al. 1995):

- Tank Waste Remediation System (TWRS). Solid waste from this program will be generated by current tank farm operations, retrieval of existing tank farm long-length contaminated equipment, retrieval pumps, miscellaneous equipment that will be used for retrieval of tank waste, and future tank waste treatment projects.

- Environmental Restoration (ER). This program includes both the Decontamination & Decommissioning (D&D) of Hanford facilities and remediation of past practice sites. Also included in this category are the facilities currently listed on the surplus facilities list, as well as several facilities identified as potentially requiring D&D in the future. In addition, waste generated during environmental restoration (ER) activities, such as excavated soil, is included within this program description.

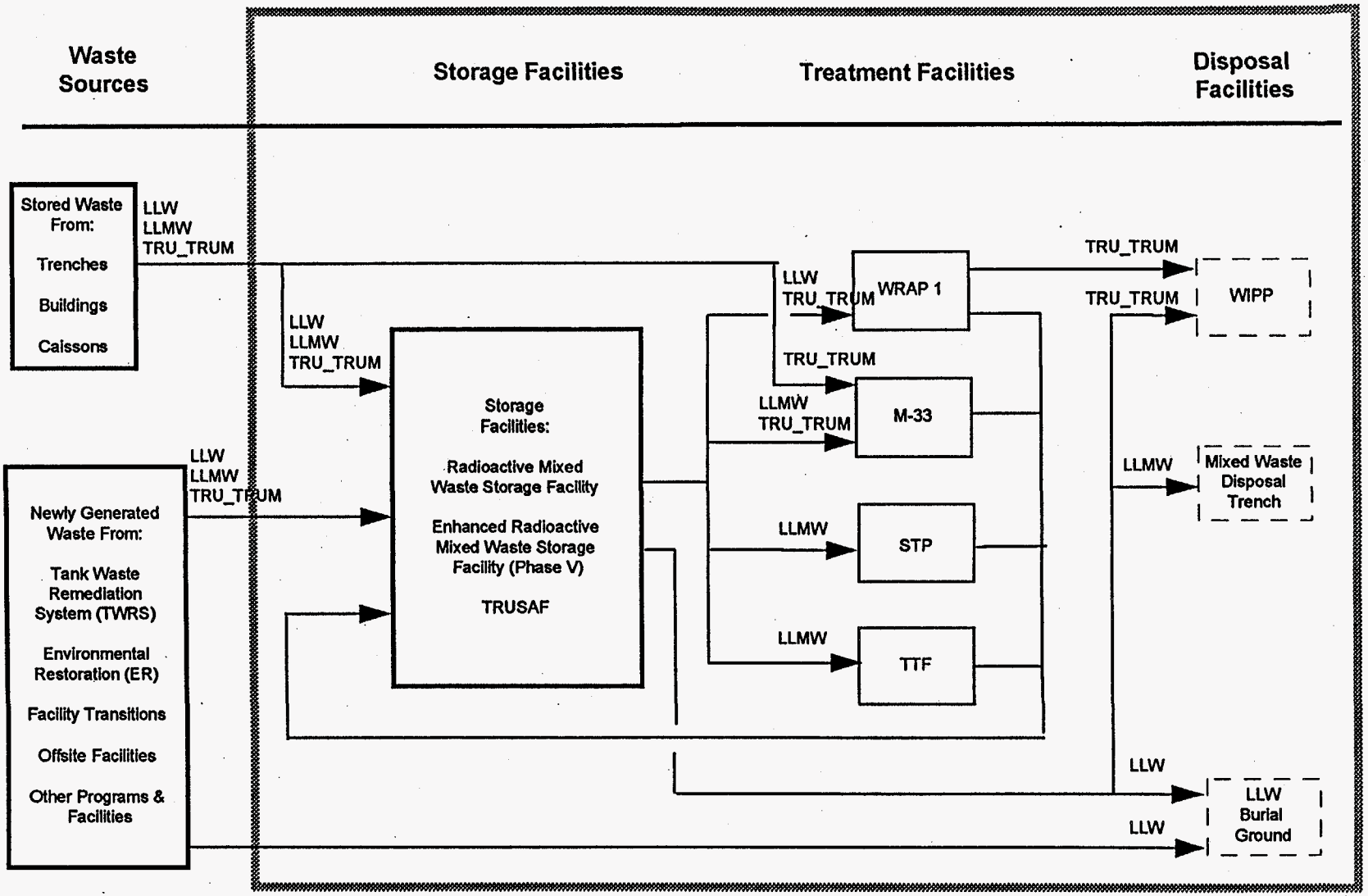

FIGURE 2.1 Hanford Solid Waste Management System Concept

- Facility Transitions. This waste results from terminal cleanout and stabilization activities (deactivation) that are occurring at four Hanford Site facilities: Plutonium-Uranium Extraction (PUREX), Plutonium Finishing Plant (PFP), 300 Area Fuel Supply, and B-Plant. In addition, it is assumed that waste from surveillance and maintenance operations are handled by this program.

- Other Programs. Several Hanford programs have forecast minimal solid waste volumes, and these programs have been grouped into Other Programs. Analytical Services, Liquid Effluent, Spent Nuclear Fuel (only that stored at K-Basins), PNL, and Solid Waste (secondary solid waste generated during operations of the TSD facilities) have been included in Other Programs.

- Non-Programmatic. Several waste generators that forecast future solid waste are not within a Hanford program (i.e., they are not discussed specifically within any of the Hanford Multi-Year Program Plans). These include facilities such as the Large Sodium Fire Facility, the Fuel Fabrication Building, and the Geotechnical Engineering Laboratory.

- Off-Site Facilities. Several off-site facilities have been certified to ship waste to the Hanford Site. Most off-site waste generators are national laboratories, universities, or gaseous diffusion plants conducting activities such as ER, D&D, and operations/maintenance.

The amount of future waste is estimated each year by the generators and varies over time. The waste generators categorize waste using Hanford's waste classification scheme, which is based on the radionuclide concentration and activity of the waste, as well as the dose rate at the surface of the waste container (DOE 1993).

Two additional labels are used in this baseline description to reflect waste characteristics that require special classification: CH_TRU_SUSPECT and RH_TRU_SUSPECT. These wastes are currently stored in trenches and buildings and are called suspect because not all waste characteristics are known. However, the historical data suggest that the waste could contain TRU_TRUM contaminants. Because regulations have changed since this material was placed in storage or because assay techniques have improved since that time, it is expected that only a portion of the waste originally identified as "suspect" TRU_TRUM will actually be TRU_TRUM. During treatment, such wastes will be subdivided into TRU_TRUM, LLMW, and LLW components. All waste stream labels are defined in the acronym list, and more information about forecast waste volumes is provided in the annual forecast documents, the latest being the 1995 Solid Waste 30-Year Volume Summary (Valero et al. 1995). That document addresses uncertainties associated with the data.

2.2 STORAGE FACILITIES

The Hanford storage facilities will receive waste and control inventories until a batch suitable for processing has accumulated, or until treatment or disposal capacity is available. Storage is also provided for wastes that have received some treatment and require further processing in another solid waste facility. Table 2.1 shows the primary storage facilities, years of activity, waste categories stored, and other information.

TABLE 2.1 Storage Facilities and Capabilities

Storage Facility	Years of Activity	Primary Waste Categories	Other Comments	References
TRUSAF	Storage began in 1985 and will be provided until all TRU_TRUM waste has been certified and sent to disposal.	TRU_TRUM	Examines and assays waste to establish whether it is TRU_TRUM and may be certified for shipment to WIPP.	Carlson et al. 1994
Radioactive Mixed Waste Storage Facility	Modules have begun storing waste at various times since 1986 and will be available during all operational years of the solid waste system.	LLMW LLW TRU_TRUM	Transfers waste to Phase V Storage prior to any form of treatment.	Bafus 1988
Enhanced Radioactive Mixed Waste Storage Facility, Phase V	Storage is expected to begin in 1999 and will be available during all operational years of the solid waste system.	LLW LLMW TRU_TRUM	• Transfers waste to and from treatment facilities. • Provides work-in-process storage for treatment facilities. • Performs head gas testing for WIPP certification. • Sends waste to burial.	Plowman 1991

The TRUSAF is currently receiving TRU_TRUM waste from generators. Waste received by the TRUSAF is examined and assayed to establish whether it is TRU_TRUM and may be certifiable for shipment to the WIPP. Certifiable TRU_TRUM waste is stored in TRUSAF until processing facilities (WRAP 1) open in 1998, at which time this waste will be sent directly to treatment for final packaging, certification, and shipment to the WIPP. TRUSAF will continue to provide storage during all years the solid waste system is operational.

Currently, an inventory of mixed waste is being stored at the Central Waste Complex (CWC) in the radioactive mixed waste storage facility. This facility includes several buildings that will provide storage for mixed waste until batching capability is available in the proposed Phase V building. The 2401 and 2402 buildings have accumulated LLMW since 1986, and storage will be provided during all operational years of the solid waste system. The 2403-W storage buildings (Phases I-IV) will store LLW and LLMW. Phase I came on-line in 1991, and, as predicted (Bafus 1988), Phases II-IV became operational in 1993.

A planned multipurpose storage facility, Phase V will serve as a batching and work-in-process storage facility supporting the treatment facilities. Phase V will interface with all functional components of the system. All waste stored in Phases I-IV, 2401, and 2402 will be transferred to Phase V (Project W-112) prior to any form of treatment. Phase V will also receive waste from retrieval operations and waste generators, and will provide work-in-process storage for waste transferring between treatment facilities. In addition to storing waste, Phase V will act as a shipment station, shipping waste to and from treatment facilities and sending waste to the burial grounds. Phase V will also perform head gas testing for certification of waste packages going to WIPP.

All storage facilities will receive and store waste in contact-handled containers only. Any remote-handled sources destined for storage will be shielded to a contact-handled level during retrieval activities or at the waste generating facility prior to shipment.

2.3 TREATMENT FACILITIES

Several treatment facilities are planned at Hanford to create waste forms suitable for final disposal. The major elements of the treatment functions shown in Figure 2.1 include a WRAP 1 facility, the commercial STP, the TTF, and the M33 facility. WRAP 1 is under construction, and the remaining facilities are still being designed.

Projected start dates and treatment capabilities of each facility are identified in Table 2.2.

TABLE 2.2 Treatment Facilities

Treatment Facility	Earliest Projected Start-up Dates	Primary Waste Streams
WRAP 1	1997 for LLW 1998 for TRU_TRUM	CH_LLW, CH_TRU_TRUM
STP	1999	CH_LLMW
TTF	1997	CH_LLMW
M33 facility	2006	CH_LLMW, CH_TRU_TRUM RH_LLMW, RH_TRU_TRUM

WRAP 1 will be the first operating treatment facility providing characterization and treatment for CH_LLW and CH_TRU_TRUM. WRAP 1 will receive CH_TRU_TRUM waste in drums and standard waste boxes (SWBs) from TRUSAF and the Phase V storage facility. The primary objective of WRAP 1 will be packaging and certification of CH_TRU_TRUM for shipment to the WIPP; however, it will also serve as a characterization and certification facility for CH_LLW (Hoover 1991).

A large portion of the waste received in WRAP 1 is expected to be retrieved waste for which the actual waste classification is unknown. This waste (labeled CH_TRU_SUSPECT) has been previously classified as TRU_TRUM, but it is expected to contain a substantial portion of material that will actually be classified as LLW or LLMW after the waste is characterized, sorted, and assayed within WRAP 1. All non-TRU_TRUM wastes requiring further treatment will be sent to the appropriate processing facilities, while certified TRU_TRUM wastes will be sent to Phase V to await head gas testing. After head gas testing, the TRU_TRUM drums and SWBs will return to WRAP 1 to be placed in TRUPACT-II containers for shipment to the WIPP.

In addition to newly generated and retrieved CH_TRU_TRUM, WRAP 1 will also provide sampling verification for approximately 5% of the total volume of newly generated CH_LLW_I (in drums). It is assumed that the remaining 95% of this waste stream will be shipped directly to on-site disposal.

The STP, expected to begin operation in 1999, will process CH_LLMW in preparation for on-site disposal (Nester 1994). The STP is planned to be a commercial facility whose contract has not yet been awarded. Assumptions concerning the STP are based on the most recent planning for the former WRAP 2A facility. The TTF, like the STP, is planned to be a commercialized facility. The TTF is expected to begin treating CH_LLMW in 1997.

This baseline assumes that a facility–or facilities–will be determined by DOE, upon review of the Tri-Party Agreement (TPA) M-33-00 Milestone to process several difficult-to-treat waste streams not accepted by other facilities in the system. For this baseline, the facility has been termed the M33 facility. The streams to be processed within the M33 facility include remote-handled waste, CH_LLMW in boxes larger than 6 ft x 8 ft x 12 ft, CH_TRU_SUSPECT waste in boxes, and newly generated CH_TRU_TRUM waste in boxes other than SWBs. The M33 facility is expected to begin accepting waste no earlier than 2006. Primary functions within the M33 facility include waste size reduction, processing, repackaging, final certification, and shipping.

2.4 DISPOSAL FACILITIES

Disposal is the final component of the system shown in Figure 2.1, and is the final destination for all waste streams. Table 2.3 lists the disposal facilities included in the Hanford solid waste system and their corresponding capacities. The LLW burial ground is currently accepting LLW from on- and off-site waste generators. Two trenches located at the Hanford site will provide disposal of LLMW. Both trenches are assumed to be available by 1999 (a date coinciding with the STP operations). WIPP will provide the final disposal for TRU_TRUM waste and is expected to begin accepting Hanford waste in 2002.

TABLE 2.3 Disposal Facilities and Capabilities

Disposal	Dates of Waste Acceptance	Waste Categories Accepted	Capacity	On-Site or Off-Site	References
LLW Burial Ground	Ongoing	LLW	Provided as needed	On-site	Carlson et al. 1994
Mixed Waste Disposal Trenches	Begins 1999	LLMW	7,600 m^3 each	On-site	Carlson et al. 1994
WIPP	2002-2020	TRU_TRUM	Provided as needed	Off-site	DOE 1989

2.5 ISSUES AND SPECIAL CASES

In the course of defining the baseline system and the various waste streams entering this system, several issues and special cases were identified. In most cases, these issues have not yet been addressed in the planning process; thus, the following assumptions were made about how they might be handled in the system.

- GTCIII waste. Requirements have not been defined for treating and disposing of LLW_GTCIII or LLMW_GTCIII wastes. It is assumed that the GTCIII wastes are stored in Phase V until treatment requirements are known and alternative solutions are assessed.

- long-length equipment. It is assumed that equipment recovered from the tank farms in the process of cleaning the single-shell and double-shell tanks will be processed by the M33 facility.

- waste with special physical characteristics. Several waste generators expect to send large pieces of equipment to the solid waste system, for example, the large, heavy, and highly contaminated equipment to be recovered from the PUREX tunnels. Similar waste would result from D&D activity within any canyon facility at Hanford. Because facilities currently planned for the Hanford solid waste system would not be able to receive, store, or treat this waste, this stream is not addressed in this system description.

- remote-handled waste. None of the storage facilities currently planned for the system have the capabilities required to receive, handle, and store waste containers that are remote-handled. All plans for the storage facilities assume that remote-handled sources will be placed in shielded containers at the generator or during the retrieval process.

- alpha caisson waste. This waste will be packaged into drums during retrieval, and any remote-handled drums will be shipped directly to the M33 facility in a shielded shipping cask.

- waste from unforecasted activities. Several Hanford activities are currently not providing forecast waste data. The solid waste from these activities is not addressed in this system description. The primary activities that do not forecast waste volumes, but that are expected to generate significant volumes of waste, include disposition of the K-Basin spent nuclear fuel, plutonium stabilization at the PFP, and the transition of B-Plant.

3.0 WASTE SOURCES

Waste volumes to be managed by the Hanford solid waste system originate from several waste sources. Hanford must manage newly generated waste volumes (i.e., those that will be generated by Hanford or other sites over the next 30 years), as well as waste volumes currently located in retrievable storage (i.e., buildings or trenches). Some of these wastes are held wastes, which means that they do not have a delivery schedule to the TSD system.

3.1 NEWLY GENERATED SOLID WASTE

Several solid waste generators within the DOE complex have been granted permission to ship solid waste to Hanford. Each year these generators, which are both on- and off-site, forecast the amount of waste they will be sending to Hanford over the next 30 years. The most recent compilation of these forecasts is the 1995 Solid Waste 30-Year Volume Summary (Valero et al. 1995). A brief summary of these waste programs is provided below, and is taken directly from that document.

- Tank Waste Remediation System (TWRS). Solid waste from this program is generated by current tank farm operations, retrieval of existing tank farm long-length contaminated equipment, retrieval pumps, miscellaneous equipment that will be used for retrieval of tank waste, and future tank waste treatment projects.

- Environmental Restoration (ER). This program includes both the D&D of Hanford facilities and remediation of past practice sites. Also included in this category are the facilities currently listed on the surplus facilities list, as well as several facilities identified as potentially requiring future D&D. In addition, waste generated during ER activities, such as excavated soil, is included within this program description.

- Facility Transitions. This waste results from terminal cleanout and stabilization activities (deactivation) that are occurring at four Hanford Site facilities: PUREX, PFP, 300 Area Fuel Supply, and B-Plant. In addition, it is assumed that surveillance and maintenance waste will be handled by this program.

- Other Programs. Several Hanford programs have forecast minimal solid waste volumes, and these programs have been grouped into Other Programs. Analytical Services, Liquid Effluent, Spent Nuclear Fuel (only that stored at K-Basins), Pacific Northwest Laboratory (PNL), and Solid Waste (secondary solid waste generated during operations of the TSD facilities) have been included in Other Programs.

- Non-Programmatic. Several waste generators that forecast future solid waste are not within a Hanford program (i.e., they are not discussed specifically within any of the Hanford Multi-Year Program Plans). These include facilities such as the Large Sodium Fire Facility, the Fuel Fabrication Building, and the Geotechnical Engineering Laboratory.

- Off-Site Facilities. Several off-site facilities have been certified to ship waste to the Hanford Site. Most off-site waste generators are national laboratories, universities, or gaseous diffusion plants conducting activities such as ER, D&D, and operations/maintenance.

3.2 RETRIEVED SOLID WASTE

The "Preferred Alternative" of disposing currently stored solid waste is discussed in the Disposal of Hanford Defense High-Level, Transuranic, and Tank Wastes Environmental Impact Statement (HDW-EIS). The preferred alternative calls for retrieving all suspect TRU_TRUM waste retrievably stored since 1970 and processing that waste together with newly generated TRU_TRUM waste at Hanford facilities. It is expected that not all retrieved waste will be classified as TRU_TRUM waste; LLMW and LLW are also expected. Once properly characterized, processed, and packaged, the TRU_TRUM waste will be shipped to the WIPP, LLMW to the mixed waste disposal trenches, and LLW to the LLW burial ground.

The retrieval function has been split into three activities for retrievably stored TRU_TRUM waste: (1) Phase 1 will be a full-scale retrieval project to address retrieving a portion of the waste expected to be intact, stored in a single burial ground trench, (2) Phase 2 retrieval will handle the remainder of retrievably stored waste in trenches, and (3) Alpha Caisson Retrieval will function in retrieving remote-handled waste from burial ground alpha caissons. The trench waste retrieval functions (Phase 1 and Phase 2) will primarily provide for retrieval of contact-handled suspect TRU_TRUM waste in 55-gallon drums. Some remote-handled waste will be encountered. The caisson waste retrieval function will provide for retrieving remote-handled TRU_TRUM waste stored in the dry waste alpha caissons. Remote-handled material, whether in caissons or trenches, will be retrieved only when treatment is directly available. No storage will be provided for remote-handled waste.

3.2.1 Solid Waste Retrieval, Phases 1 and 2

Prior to 1970, TRU_TRUM wastes were not segregated and were buried at Hanford commingled with LLW. Those TRU_TRUM wastes buried prior to 1970 are considered disposed and are not candidates for retrieval. Because technology existing in the 1970s could not determine the concentration of TRU_TRUM radionuclides at 10 or even 100 nCi/gram,

any solid waste that was suspected to be TRU_TRUM was placed in retrievable storage. As a result, it is anticipated that a large fraction of the post-1970 waste placed into storage at Hanford as "suspect TRU_TRUM" is actually LLW. It is also known that some of the waste stored as CH_TRU_SUSPECT has radioactive and hazardous mixed waste components in both the TRU_TRUM and LLW fractions. Historical data, as well as data obtained through nondestructive assay and examination tests during retrieval, will determine the basic splits between TRU_TRUM, LLW, and LLMW. Other waste types expected in the CH_TRU_SUSPECT waste include shielded remote-handled waste, commercially generated Greater-Than-Class-C (GTCC) LLW, classified DOE waste, and irradiated fuel and hardware from the Experimental Breeder Reactor II (EBR-II).

CH_TRU_SUSPECT and other waste types are stored in a variety of container types, including 55-gallon, 30-gallon, and 85-gallon steel drums; fiberboard boxes; steel boxes; plywood boxes; fiberglass reinforced plywood (FRP) boxes; concrete boxes; casks; and others. It was intended that most of the containers have a minimum expected life of 20 years, although little documentation exists concerning design life expectations for specific containers. The integrity of the containers that will be retrieved is expected to range from completely sound to totally degraded. Containers retrieved intact will be overpacked, whereas waste retrieved from breached containers will be repackaged. Waste that is repackaged will not be overpacked. The overpacks for drums are 83-gallon drums; for boxes, overpacks are larger metal boxes. Sizes and weights of these overpacks will need to comply with size and weight restrictions applicable to Phase V storage and other processing facilities.

The scope of Phase 1 retrieval is the entire inventory of retrievably stored TRU_TRUM waste in Trench 4 of the 218-W-4C burial ground, whereas the scope of Phase 2 retrieval is the entire inventory of retrievably stored TRU_TRUM waste minus the waste retrieved in Phase 1 (218-W-4C, Trench 4) and the Alpha Caisson Retrieval (218-W-4C Alpha Caissons). These retrieval activities are anticipated to begin when Phase V storage comes on-line in 1999. The retrieval operations must await the opening of Phase V because it will be the primary storage facility for retrieved waste.

Based on current documentation (Anderson 1991) for drums, the TRU_TRUM fraction of the retrieved waste is 50%, and the LLW fraction is 50%. The data also indicate that approximately 10% of the low-level waste contains mixed waste (MW) components. Retrieved waste is expected to be 50% CH_TRU_TRUM, 40% CH_LLW, and 10% CH_LLMW. Based on current data for boxes, the TRU_TRUM fraction is 84%, and the LLW fraction is 16%.

3.2.2 Solid Waste Retrieval from Alpha Caissons

Alpha caissons are underground, cylindrical vaults used to store dry, RH_TRU_TRUM waste. Five alpha caissons exist, all located in the 218-W-4B burial ground; but only four of the five caissons have been used. Access to a caisson is provided by a 3-ft diameter chute (fill chute) that follows an S-shaped path from the ground to the top of the caisson. The waste cans were deposited in the caisson by pulling a transfer cask allowing the cans to fall randomly into the fill chute and into the caisson. A quantity of plastic sheeting is used for contamination control during the transfer. This plastic is also dumped into the caisson.

The waste contained in the alpha caissons was generated in relatively small quantities in the 300 Area in "hot" cells, from inspection of irradiated and experimental fuels from the Fast Flux Test Facility (FFTF) and other sources. The generated waste was packaged into cans inside of the hot cells and sent to the alpha caissons for storage. This waste must be retrieved and properly processed and packaged for shipment to the WIPP.

The waste retrieved from the alpha caissons will be shipped directly to the M33 facility and will not be placed in storage because it is remote-handled. It is expected that the M33 facility will require that cask contents be free of surface contamination. The equipment or processes needed to meet this condition have not been completely identified.

4.0 STORAGE FACILITIES

The Hanford Solid Waste Operations Complex (SWOC) is an existing and planned series of facilities that will centralize the management of solid waste operations at a single location on the Hanford Site. The SWOC includes the Radioactive Mixed Waste Storage Facility, the Enhanced Radioactive Mixed Waste Storage Facility (Phase V Storage), TRUSAF, and planned treatment facilities. The storage facilities within the SWOC are referred to as the Hanford Central Waste Complex (CWC) and are addressed in this chapter. The treatment facilities are described in Chapter 5.0.

Before shipping waste to the CWC, waste generators must package the waste to meet the stipulations of the Hanford Site Solid Waste Acceptance Criteria (DOE 1993). This manual consolidates and implements federal and state regulations as well as Hanford Site requirements for storage and disposal of radioactive solid waste. Each waste generator is required to receive formal approval from the Solid Waste Engineering Manager or designee before shipping waste packages to the CWC. The approval process is detailed in the Hanford Site Solid Waste Acceptance Criteria, and each storage request is evaluated against those requirements. If the waste package is determined to conform to the applicable requirements, formal approval is documented by issuing a Waste Storage/Disposal Approval Record (SDAR). The waste packages may then be scheduled for shipment to the CWC.

Table 4.1 shows a summary of the Hanford storage facilities' schedules and capacities. The total storage capacity for all facilities combined is roughly 25,000 m^3, or 96,300 55-gallon drum equivalents. The storage facilities provide the necessary interface between many retrieval, treatment, and disposal operations. Hanford solid waste storage facilities will provide:

- Long-term storage for wastes that do not have treatment or disposal strategies. Waste, such as GTCIII waste volumes that do not have defined disposal requirements or TRU_TRUM waste volumes that do not have available thermal treatment capacity, will be sent to long-term storage. This waste will remain in long-term storage until treatment strategies are defined and appropriate treatment and disposal capacity is available.

- Storage for waste prior to processing activities. This form of storage provides inventory control until suitable batches for treatment have accumulated and treatment capability exists.

- Work-in-process storage for waste that is being transferred between treatment facilities. For example, CH_LLMW waste treated in the M33 facility that needs further treatment in the STP or the TTF will be sent to storage to await available treatment capacity.

- Storage for waste awaiting shipment to final disposal. This form of storage provides inventory control until suitable batches have accumulated for shipment to disposal sites and final certification and documentation has been completed.

TABLE 4.1 Summary of Storage Facilities' Schedules and Capacities

Storage Facility	Schedule	Estimated Capacity	
		Cubic Meters	Containers (55-gallon Drum Equivalents)
Radioactive Mixed Waste Storage Facility	Storing waste since 1986.	17,367	66,798
Enhanced Radioactive Mixed Waste Storage Facility (Phase V)	Will begin storing waste in 1999.	7,150	27,500
TRUSAF	Storing TRU_TRUM waste since 1985.	520	2,000

4.1 RADIOACTIVE MIXED WASTE STORAGE FACILITY

The Radioactive Mixed Waste Storage Facility consists of multiple structures that store radioactive and/or mixed waste before the waste has been processed or certified for final disposal. The facility will store both on-site and off-site waste, and currently consists of the following buildings:

- Plutonium/Polychlorinated Biphenyl Mixed Waste Storage Building
- Low-Flash-Point Mixed Waste Storage Modules
- Radioactive and/or Mixed Waste Storage Buildings
- Large Mixed-Waste Storage Facility, Phases I-IV
- Sodium Storage Modules
- Waste Receiving and Staging Area
- Mixed-Waste Storage Pad.

Each facility included in the Radioactive Mixed Waste Storage Facility at Hanford and its capacities is described in greater detail in the following paragraphs. The Radioactive Mixed Waste Storage Facility capacity is approximately 17,367 m^3. This capacity excludes the waste receiving and staging area, and the mixed waste storage pad.

Plutonium/Polychlorinated Biphenyl Mixed Waste Storage Building (2401-W)

The Plutonium/Polychlorinated Biphenyl Mixed Waste Storage Building, or the 2401-W Facility, is a preengineered steel structure 15-m wide x 24 m-long, with a clear span of near 14 m and an eave height of 6 m. The facility has 6.3-m-wide x 4.8-m-high roll-up truck doors and two personnel doors. The floor accommodates a 907 kg forklift and approximately 1,070 55-gal drum equivalents, or 278 m^3 of waste. The floor loading is limited to 450 lb/ft^2.

The storage facility was designed to meet all the requirements for polychlorobiphenyl (PCB), hazardous, radioactive, or mixed type wastes. The facility currently stores combustible PCB/radioactively contaminated wastes and other mixed combustible wastes; however, other compatible wastes may also be stored within the facility when segregated by one meter or more.

Low Flash-Point (Flammable) Mixed-Waste Storage Modules

The low flashpoint mixed waste (LFMW) storage modules 1 through 19 are small preengineered buildings. These modules have exterior dimensions ranging from 15 ft x 9 ft x 8 ft 7 in, to 33 ft x 10 ft x 9 ft. The modules have a floor space ranging from 12 m^2 to 27 m^2, and each module weighs approximately 9,072 kg. However, the size and weight vary between different manufacturers and, as a result, there is no "standard" module. The floor support systems are designed for loads up to 250 lb/ft^2, and each storage module can store approximately 20 55-gal drum equivalents. Total storage for all the modules is 380 55-gal drum equivalents or 99 m^3.

The storage modules are designed to meet storage requirements for hazardous and radioactive (except flammable TRU_TRUM) wastes. Most modules currently store low-level radioactively contaminated flammable waste. Compatible wastes normally will occupy any individual module at any one time. When incompatible wastes are to be stored in a single module, required segregation spacing will be provided between the incompatible waste containers. Two of the modules have been modified for TRU_TRUM flammable waste. The remaining modules and future modules could also be modified depending on programmatic scheduling needs.

Radioactive and/or Mixed Waste Storage Buildings

The Mixed Waste Storage Buildings consist of 12 identical storage buildings. These facilities are the 2402-W and 2402-WB through 2402-WL buildings. Adjacent to the buildings are two open air pads: an asphalt staging area and a concrete storage pad. The storage buildings are each 371 m^2 metal structures, approximately 15 m wide x 24 m long, with a minimum clear span of 12 m and an eave height of approximately 6 m. The allowable floor loading is 700 lb/ft^2 for building 2402-W and 2000 lb/ft^2 for 2402-WB through 2402-WL. Each building has a concrete floor and has ventilation, lighting, and a fire protection system. The maximum utilization of the storage buildings is 1,070 drums per building. Thus, all 12 buildings can store approximately 12,800 drums, or 3,328 m^3. Waste will be moved into the buildings from the Receiving and Staging Pad by forklift. Drums will be banded to pallets in groups of four and stacked up to three units high.

The buildings were designed to meet the requirements for hazardous, radioactive, and mixed wastes. According to the building loading schedules, the following wastes may be placed in these buildings: toxic, oxidizers, acid, caustic, combustible, PCB, LLW, TRU_TRUM, or any combination of compatible hazardous and radioactive wastes. Only compatible wastes will occupy a building at any time unless proper precautions are taken to isolate the incompatible packages.

Large Mixed Waste Storage Facility, Phases I-IV (2403-W Series)

The Large Mixed Waste Storage Facility consists of three identical buildings and one larger building. Buildings 2403-WA, 2403-WB, and 2403-WC are each 170 ft wide and 200 ft long; each will accommodate approximately 11,600 55-gal drums of waste. The 2403-WD facility is larger than the other three buildings with a width of 170 ft and length of 325 ft. This facility will accommodate approximately 17,500 55-gal drums of waste. The combined total available storage space of all 2403-W series facilities is 157,250 ft^2 (47,929.8 m^2), capable of storing approximately 52,300 55-gal drums or 13,598 m^3 of waste. Waste drums in the storage arrays will be banded and palletized. Pallets will be stacked three units high.

Each storage facility is planned and designed to contain four separate quadrants for managing various waste categories. Each facility was designed to meet all requirements for hazardous, mixed, and radioactive type wastes. Compatible wastes may be placed in any one containment zone according to the facility loading schedules. Compatible wastes include the following: toxic, oxidizers, acid, caustic, LLW, TRU_TRUM, or any combination of compatible hazardous and radioactive wastes. However, PCBs are not allowed because of limitations in the facility design. Only compatible wastes will occupy any one zone at any one time.

Sodium Storage Modules

The Alkalide Metal Waste (AMW) storage modules and South Alkalide Metal Storage Modules (SAMSMs) are similar in construction to the preengineered LFMW modules. Currently, eight SAMSMs and four AMW storage modules exist. The storage modules' exterior dimensions are 24 ft x 9 ft. Approximately 20 55-gal drums can be stored in each AMW module, and 21 55-gal drums can be stored in each SAMSM. The total storage is 80 55-gal drum equivalents, or 21 m^3 in the AMW storage modules and 168 55-gal drum equivalents, or 44 m^3 in the SAMSMs. The doors of the modules are sized to accommodate the irregular shaped inventory to be shipped from the 4843 Building. Modules are designed to prevent water intrusion due to the water reactive nature of sodium. The modules also possess catch sumps to provide spill containment.

The AMW Storage Modules were designed to meet the requirements for low-level radioactive alkali metal mixed waste storage. These requirements are outlined in the Central Waste Complex Interim Safety Basis (Cain 1995). AMW modules store only the low-level radioactive sodium metal transferred from the 400 Area 4843 Building. Low-level sodium mixed waste in the 4843 Building consists of 37 55-gal drums, three 30-gal drums, three 5-gal drums, one 3-ft x 9-ft steel box, one hot trap, one heat exchanger, and two tanks. The hot trap, heat exchanger, and tanks are components from the dismantled Fermi sodium cooled reactor. The SAMSMs store wastes with extremely low toxicity and radioactivity.

Waste Receiving and Staging Area and Mixed Waste Storage Pad

The Waste Receiving and Staging Area is an asphalt pad approximately 61 m long and 46 m wide. The allowable floor loading is 1,150 lb/ft^2. The pad is used for handling and staging containers of radioactively contaminated waste destined for the various facilities. Components of the pad include an access for loaded trucks and other vehicles. This area will be kept clear of inventory except when a truckload of containers arrives. Because waste is not stored in this area, the asphalt slab is fairly flat and allows excess rainwater to run off.

The MW storage pad is a 15-cm curbed, 836-m^2 concrete pad with an access ramp. The 18- to 20-cm-thick pad is designed to support loadings up to 1,150 lb/ft^2. Approximately 1,750 55-gal drums, or 455 m^3, can be stored on the storage pad; this storage is for temporary use only.

4.2 ENHANCED RADIOACTIVE MIXED WASTE STORAGE FACILITY, PHASE V

The Enhanced Radioactive and Mixed Waste Storage Building is planned to provide additional storage space to those facilities listed above while also performing the primary inventory control and waste batching for the Hanford solid waste management system. It is estimated that this facility will be available in 1999. Phase V is planned to provide storage space for approximately 27,500 55-gal drums, or 7,150 m^3 of waste. The facility will receive all classes of waste, hold this material prior to treatment, provide a shipping function between treatment facilities, and store treated waste awaiting disposal. Primary operations and segments of Phase V are as follows:

- drum storage module — This module will provide incoming, lag, outgoing, and long-term storage for all waste received in 55-gallon drums and 85-gallon drum overpacks, with the exception of ignitable and potentially ignitable drums, which will be sent to a separate ignitable storage area. The drum storage module will be sized for approximately 21,300 drum equivalents, based on an estimated maximum incoming storage requirement from a 1-year shutdown of WRAP 1 while the STP continues processing.

- ignitable drum storage module — This module will provide storage for ignitable and potentially ignitable mixed waste (waste containing combustible, flammable, or oxidizing constituents) in two segregated areas.

- box storage module — This module is designed to provide storage for SWBs and waste packages that are not manageable in the drum modules. The module is sized to contain approximately 1,482 m^3 (5,700 drum equivalents) of boxed waste.

- shipping and receiving modules — Three separate shipping and receiving modules will be used to handle the various waste types and container sizes. The Phase V storage facility will have one general shipping and receiving area for all waste containers entering Phase V. A second shipping and receiving module will transfer all boxes to and from the box storage module. The third shipping and receiving module will transfer ignitable and potentially ignitable waste packages to and from the ignitable waste storage module.

- head gas testing area — The facility will also perform head gas testing, which must be performed on CH_TRU_TRUM in drums and boxes prior to shipment to WIPP.

It is important to note that any remote-handled waste requiring storage in Phase V must be shielded to 200 mrem/hr or less prior to entering the facility. This shielded waste will be held in storage until appropriate treatment facilities become available. In addition, no storage facility has currently been designated to store the single-shell and double-shell tank long equipment prior to treatment in T-Plant and/or WRAP 2B. It is assumed that storage area for this long equipment is available as needed.

4.3 TRANSURANIC STORAGE AND ASSAY FACILITY (TRUSAF)

The TRUSAF currently stores TRU_TRUM waste and is assumed to have a capacity of 2000 55-gal drums, or 520 m^3. The TRUSAF has been available and is assumed to remain available throughout SWOC operations.

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5.0 TREATMENT FACILITIES

The 1993 Baseline Solid Waste Management System Description (Armacost et al. 1994) identified five planned and existing processing facilities for managing Hanford solid waste. In 1995, the number of planned and existing facilities has been reduced to four. Table 5.1 shows the comparison of the 1993 baseline treatment facilities with the 1995 baseline. The 1995 baseline is similar to the 1993 baseline in that they both include WRAP Module 1. However, the 1995 baseline includes the former WRAP 2A and TTF as privatized facilities. These facilities still exist in the solid waste system but will be operated by private contractors. The 1993 baseline plan to have WRAP 2B and T-Plant as processing facilities has been replaced in the 1995 baseline by a facility termed the "M33 facility," yet to be determined by the DOE.

Table 5.2 shows start dates, waste streams to be treated, and capacities of the 1995 baseline treatment facilities. Waste Receiving and Processing (WRAP) Module 1 will process CH_TRU_TRUM, CH_LLW_I, and CH_TRU_SUSPECT, which has been reclassified as CH_LLW_III or CH_LLMW. The STP, a commercial facility, will be the primary facility for treating CH_LLMW, whereas a TTF will treat the CH_LLMW that requires thermal destruction. Several difficult-to-treat waste streams, including remote-handled wastes, wastes in oversized containers, and long-length equipment retrieved from the tank farms, will be treated by the yet-to-be-decided facility, labeled as the M33 facility in this baseline description. The DOE will determine this facility after evaluating alternative treatment strategies presented under TPA Milestone M-33-00.

5.1 WRAP 1 FACILITY DESCRIPTION

The WRAP 1 facility will accept contact-handled low-level (CH_LLW) and transuranic (CH_TRU_TRUM) waste for inspection, certification, and preparation for final disposal. The facility is expected to begin processing CH_LLW in March of 1997 and CH_TRU_TRUM waste in 1998. WRAP 1 will be operational 175 days per year, which is 70% of the total days available in a given year. The facility will operate on one 8-hour shift per day, 5 days per week; however, an additional shift may be added for a time not to exceed 3 months in any year to meet TRU_TRUM throughput requirements. WRAP 1 is designed to process annually: 6,825 drums (4,200 drums newly generated waste and 2,625 drums retrieved waste) and 70 standard waste boxes (Weidert et al. 1993). The facility is expected to operate at one-third its design capacity in the first year of operation in 1997, increase to two-thirds capacity in 1998, and be at 100% capacity its third year of operation. The 3-year ramp-up represents improvements in facility operations.

TABLE 5.1 Comparing Treatment Facilities of Former Baseline With Current 1995 Baseline

Waste Streams	1993 Baseline Treatment Facilities	1995 Baseline Treatment Facilities
CH_TRU_TRUM, CH_LLW_I, CH_LLW_III, and limited amounts of CH_LLMW	Waste Receiving and Processing Module 1 (WRAP 1)	WRAP 1
CH_LLMW	The STP	A Commercial STP
CH_LLMW requiring thermal treatment	TTF	A TTF
Waste rejected from WRAP 1, the STP, or the TTF as well as difficult-to-treat waste streams including remote-handled (RH) waste, long length equipment from the tank farms, and waste in oversized containers.	WRAP 2B and/or T-Plant	The facility or facilities to treat these wastes have yet to be determined. Alternative treatment facilities are being reviewed by the Department of Energy (DOE) under Tri-Party Agreement Milestone M-33-00 for managing these wastes.

TABLE 5.2 Start Dates, Waste Streams, and Capacities of Treatment Facilities

Treatment Facility	Start Date = Calendar Year (CY)	Waste Streams	Annual Capacity	
			Containers	Cubic Meters
Waste Receiving and Processing (WRAP) Module 1	1997 for LLW, 1998 for TRU_TRUM	CH_TRU_TRUM in Standard Waste Boxes (SWBs)	70 SWBs	119
		CH_TRU_TRUM in Drums	6825 Drums	319[a]
		CH_LLW_I in Drums		319[a]
		CH_LLW_III in Drums (reclassified CH_TRU_SUSPECT)		
		CH_LLMW in Drums (reclassified CH_TRU_SUSPECT)		
Commercial STP	1999	CH_LLMW in Drums	8823 Drums[b]	2294[b]
		CH_LLMW in Boxes	24[b] 6x8x12-ft Boxes	381[b]
Thermal Treatment Facility (TTF)	1997	CH_LLMW in Drums	TBD[c]	TBD[c]
		CH_LLMW in Boxes	TBD[c]	TBD[c]
Facility Determined by Tri-Party Agreement (TPA) Milestone M-33-00. Referred to as M33 Facility.	2006	CH_TRU_SUSPECT in Boxes	TBD[c]	TBD[c]
		CH_TRU_TRUM in Boxes Other Than SWBs	TBD[c]	TBD[c]
		CH_TRU_TRUM in Drums Rejected by WRAP 1	TBD[c]	TBD[c]
		CH_LLMW in Long Equipment Containers (LECs)	TBD[c]	TBD[c]
		CH_LLMW in Boxes Larger Than 6 ft x 8 ft x 12 ft	TBD[c]	TBD[c]
		CH_LLMW in Drums not accepted by TTF or STP	TBD[c]	TBD[c]
		RH_LLMW in Boxes	TBD[c]	TBD[c]
		RH_LLMW in Drums	TBD[c]	TBD[c]
		RH_TRU_SUSPECT in Boxes	TBD[c]	TBD[c]
		RH_TRU_SUSPECT in Drums	TBD[c]	TBD[c]

[a] Cubic meter capacities reflect capacities at the WRAP 1 open-sort stations. The container capacity reflects capacity at the WRAP 1 drum receipt station.

[b] Capacity is based on the STP operating at three shifts per day.

[c] Capacity will be calculated to process all waste volumes received by this facility by the end of the 30-year clean-up schedule.

Figure 5.1 shows the overall flow of waste through the WRAP 1 facility functions from waste sources to disposal. WRAP 1 will receive waste from on-site retrieval operations and various waste generators via the CWC. Once the waste has been certified within WRAP 1, CH_LLW will be routed to the LLW burial ground and CH_TRU_TRUM waste to the WIPP.

The WRAP 1 facility will accept 55-gallon drums, overpacked drums, and standard waste boxes (SWBs). All boxed TRU_TRUM waste not in SWBs must be sent to the M33 facility to be repackaged, because the WIPP will not accept any other box type, and boxes will not be opened in WRAP 1. The facility will verify surface contamination and contaminant levels of the waste, and weigh all drums and boxes prior to treatment. WRAP 1 will accept drums up to 1,000 lb and boxes up to 7,000 lb; drums and boxes exceeding these criteria are returned to storage to await treatment in the M33 facility. The WRAP 1 facility will perform several basic functions needed to effectively prepare CH_LLW and CH_TRU_TRUM waste for disposal. These functions include the following:

- Nondestructive Examination (NDE)/Nondestructive Assay (NDA). The NDE station will use penetrating radiation to identify items that do not comply with LLW certification standards or WIPP waste acceptance criteria (WAC). Noncompliant items include aerosol cans, alkali or reactive metals, chelating compounds, chemically incompatible materials, corrosive materials, explosives and pyrophorics, gas cylinders without permanent vents, high-efficiency particulate air (HEPA) filters, lead, liquids, mercury, powder, ashes, and particulate materials. Information provided by the NDE will be used to determine the appropriate method of processing or repackaging the noncompliant items. The NDA function will determine the radioactive material content of incoming waste. Transuranic, fissile, and beta-gamma emitting fission and activation products will all be accounted for by the assay. The assay will provide the necessary information for certifying the waste as either CH_TRU_TRUM or CH_LLW.

- Sorting. WRAP 1 will contain an open-sort station for removing noncompliant items identified by the NDE. The open-sort station will accept only 55-gallon drums and overpacked drums; boxes will not be opened in WRAP 1. Boxes containing noncompliant items and drums containing compressed gas cylinders, plutonium loadings above acceptable limits, classified waste, internally shielded contents, or drums that are overweight will be sent to storage to await further processing in the M33 facility.

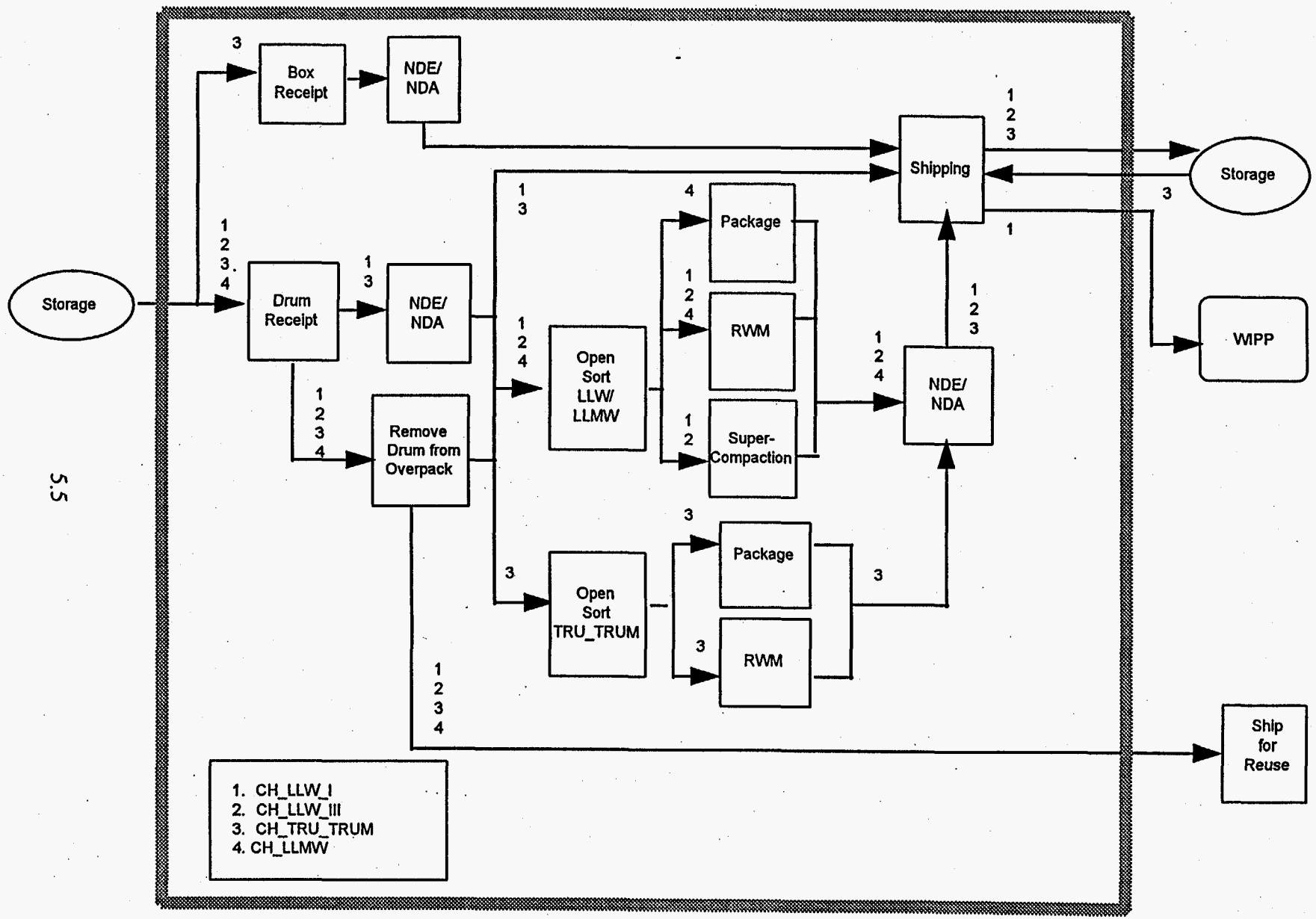

FIGURE 5.1 WRAP 1 Facility Flow Diagram

Drums accepted by the open-sort station will be opened, sorted (removing noncompliant items), and the compliant waste and emptied 55-gallon drums will be transferred to a compaction station. The drums will be compacted and repackaged together with the compliant waste in clean 55-gallon drums. Overpacks may be decontaminated and reused. Noncompliant items will be routed to a restricted waste management station where the items will undergo the proper treatment and/or repackaging.

- Treatment. WRAP 1 treatment may include the following: LLW compaction, sampling suspect mixed waste, depressurizing and draining aerosol cans, neutralizing corrosive materials, liquid absorption/solidification, particulate immobilization, sample management, liquid and solid waste collection, and decontamination.

- Packaging. All waste exiting WRAP 1 must pass through packaging, labeling, and shipping. All TRU_TRUM containers will be placed in TRUPACT II containers and loaded onto trucks, trailers, and vans that will haul the containers to WIPP. Two SWBs can fit in one TRUPACT II container. Drums containing TRU_TRUM waste will first be placed in SWBs before packaging in TRUPACT II containers. Seven 55-gallon drums fit in each SWB; therefore, 14 55-gallon drums fit within each TRUPACT II container.

  All sorted LLW and LLMW will be packaged in 55-gallon drums. The LLW drums will then be placed in 85-gallon overpacks and loaded onto trucks for transportation to storage. Drums containing LLMW will be sent to storage to await further treatment.

- Certification. WRAP 1 will perform final NDE/NDA, certification, and sampling of waste volumes to ensure that TRU_TRUM waste meets the WIPP WAC and that the LLW meets the Hanford WAC.

- Storage. The storage function will be provided for containers entering and exiting WRAP 1. The storage capacity will be 213 drums and 14 boxes. This capacity is based on providing storage for 100 incoming drums (enough for approximately 2.5 days of operation), 4 incoming boxes, 63 outgoing TRU_TRUM drums (may be a maximum of nine seven-packs), 50 outgoing LLW drums, 8 outgoing TRU_TRUM standard waste boxes, and 2 outgoing LLW SWBs.

WRAP 1 will process certifiable CH_LLW, certifiable CH_TRU_TRUM waste, and retrieved CH_TRU_SUSPECT waste. Of the anticipated 6,825 drums received annually by WRAP 1, it is expected that 2,100 will be certifiable CH_TRU_TRUM waste; 2,100 will be certifiable CH_LLW; and 2,625 will be retrieved drums suspected of containing TRU_TRUM waste. All 70 boxes processed by WRAP 1 annually will be certifiable CH_TRU_TRUM waste. The following describe each waste type that will be processed in WRAP 1.

- Certifiable CH_LLW. WRAP 1 will provide sampling verification for quality assurance (QA) samples of newly generated CH_LLW_I. The samples will be 5% by volume of the newly generated waste shipments. Upon certification, the CH_LLW samples will be shipped to the LLW burial ground via storage. The main waste lots from which the samples were taken are assumed not to enter the treatment system and will go directly to the LLW burial ground after the samples have been certified.

- Certifiable CH_TRU_TRUM waste. Certifiable CH_TRU_TRUM waste will be received from storage buildings and undergo initial NDE/NDA to identify noncompliant items and provide information for head gas testing. Drums containing noncompliant items will be sent to the open-sort station where the items will be removed. Drums containing compressed gas cylinders, plutonium loadings above acceptable limits, classified waste, internally shielded contents, or drums that are overweight will be sent to storage to await treatment in the M33 facility. In addition, SWBs containing noncompliant items will be sent to storage to await processing by the M33 facility; boxes will not be opened in WRAP 1. All certified CH_TRU_TRUM waste will be placed in TRUPACT II containers and sent to the WIPP.

- Retrieved CH_TRU_SUSPECT waste. All retrieved drums will receive an initial assay at the trench before being transferred to storage. Those drums containing TRU_TRUM waste will be sent to WRAP 1, opened, sorted, certified, and repackaged. Noncompliant items will be removed and treated or repackaged as necessary. All certified TRU_TRUM waste will be sent to the WIPP facility in TRUPACT II containers for final disposal.

  Any retrieved drums identified as CH_LLW will be sent to WRAP 1, opened, sorted, compacted, repackaged, and sent to storage. The waste will then be sent to the LLW burial ground for final disposal. Any retrieved drums identified as CH_LLMW will be sent to WRAP 1, opened, sorted, repackaged, and sent to Phase V storage to await additional treatment in the STP. Any retrieved drums requiring restricted waste management (RWM) will not be sent for additional treatment in the STP, but rather will be shipped to the mixed waste disposal trenches via storage.

5.2 THE COMMERCIAL STP FACILITY DESCRIPTION

The commercial STP facility will provide non-thermal treatment for CH_LLMW (Category I and III only) in preparation of final disposal at the mixed waste disposal trenches. The facility is expected to become operational in September of 1999 (fiscal year 2000). The STP will process annually 2,294 m^3 of CH_LLMW packaged in drums and 381 m^3 of CH_LLMW contained in boxes as large as 6 ft x 8 ft x 12 ft. CH_LLMW contained in boxes larger than 6 ft x 8 ft x 12 ft will be treated in the M33 facility.

The CWC storage facilities will provide storage for waste to be treated by the STP. All waste exiting the STP will be routed directly to the mixed waste disposal trenches for final disposal. The process by which the waste is treated will be left to the discretion of the STP contractor as long as the facility is able to accept CH_LLMW in drums and boxes, and create an acceptable waste form that meets all applicable state and federal regulations for final disposal.

5.3 M33 FACILITY DESCRIPTION

This baseline assumes a facility, or facilities, will be determined by the DOE upon review of the TPA M-33-00 Milestone to process several difficult-to-treat waste streams not accepted by other facilities in the system. These streams include remote-handled waste, CH_LLMW in boxes larger than 6 ft x 8 ft x 12 ft, CH_TRU_SUSPECT waste in boxes, and newly generated CH_TRU_TRUM waste in boxes other than SWBs. The M33 facility is expected to begin accepting waste no earlier than 2006. The M33 facility does not have a defined capacity for the baseline. The only capacity requirement for the facility is that it processes all TRU_TRUM waste volumes prior to the WIPP closure in 2020.

Figure 5.2 shows waste flow through the M33 facility from waste sources to disposal. Primary functions within the M33 facility include waste size reduction, processing, repackaging, final certification, and shipping. More detailed descriptions of internal functions are not yet available because the facility is in the early stages of development.

The M33 facility will receive waste from on-site retrieval operations and a variety of waste generators both on- and off-site. The majority of the waste will be routed to the M33 facility through the CWC. Some remote-handled waste may be sent directly to the M33 facility. Treated CH_TRU_TRUM waste will be sent to the WIPP facility, CH_LLMW to the LLMW burial trenches, and CH_LLW to the LLW burial ground. The M33 facility will process the following waste:

- Retrieved CH_TRU_SUSPECT Waste. The M33 facility will process retrieved CH_TRU_TRUM waste in boxes and in drums weighing more than 1000 lbs. The M33 facility will also accept drums containing compressed gas cylinders, ^{238}Pu loadings that exceed limits of other facilities, classified waste, or internally shielded contents.

- Newly Generated RH_TRU_TRUM and RH_LLMW. The facility will accept newly generated, internally shielded, remote-handled (greater than 200 mrem at the container surface) TRU_TRUM and LLMW.

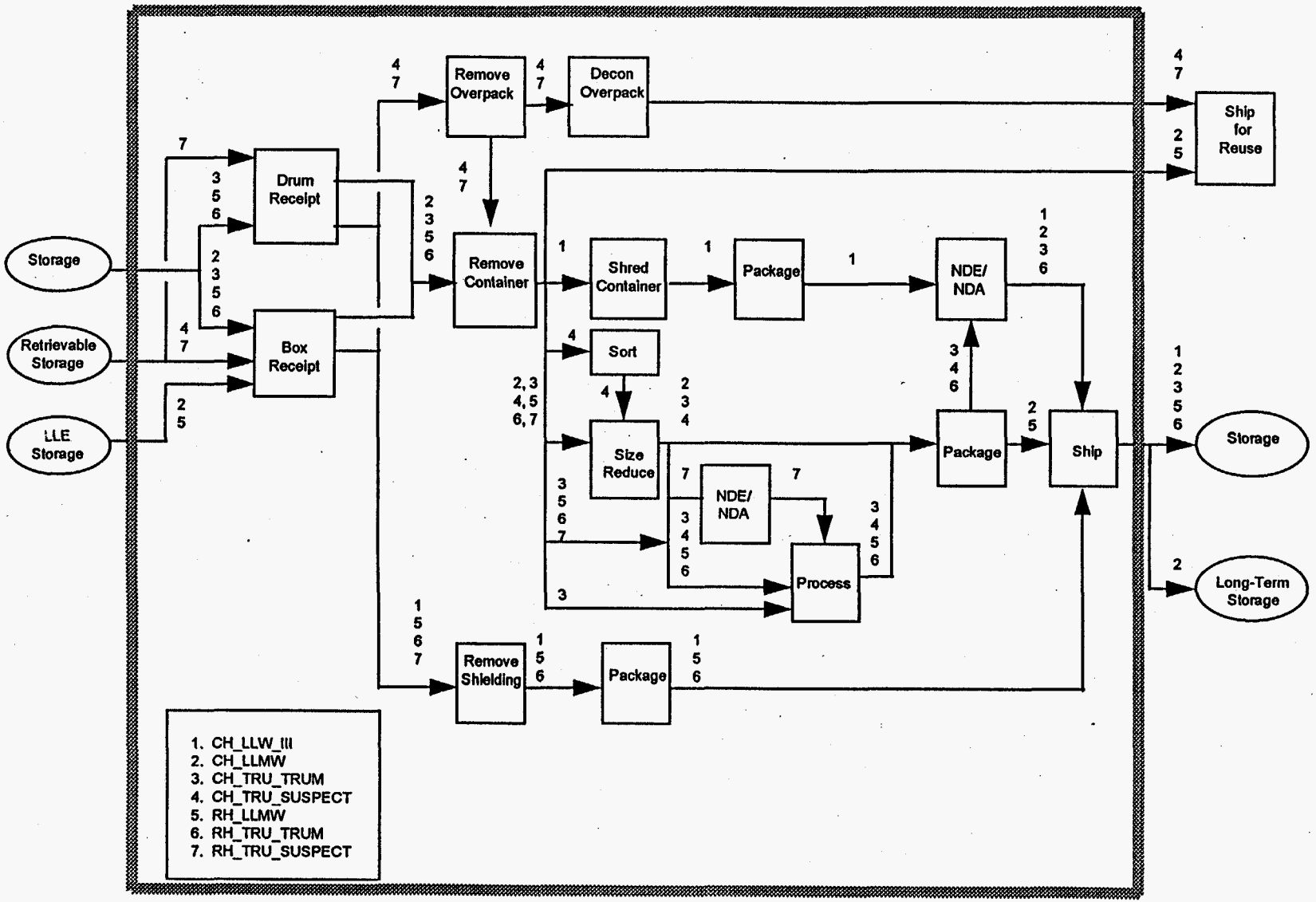

FIGURE 5.2 M33 Facility Flow Diagram

- Newly Generated CH_TRU_TRUM Waste. The M33 facility will provide processing capacity for newly generated CH_TRU_TRUM waste in boxes other than SWBs and drums weighing over 1000 lbs.

- Retrieved RH_TRU_SUSPECT. The facility will accept remote-handled waste retrieved from trenches and caissons.

- Newly Generated CH_LLMW. The M33 facility will process newly generated CH_LLMW containing explosives or propellants that will not be accepted by the STP or the TTF. The facility will also accept boxes larger than 6 ft x 8 ft x 12 ft containing CH_LLMW that will not be accepted by the STP.

- Retrieved Long-Length Equipment. The M33 facility will process long-length equipment retrieved from double- and single-shell tanks. Waste from the double- and single-shell tanks will be routed to the facility through the CWC and Phase V storage facilities.

5.4 THERMAL TREATMENT FACILITY DESCRIPTION

The TTF will accept CH_LLMW requiring thermal treatment. The TTF will provide thermal treatment and residue characterization for the waste volumes that have specific combinations of physical characteristics and hazardous constituents. Primarily, the TTF will treat all volumes of waste that contain PCBs, reactive metals, or organic materials (These attributes that dictate treatment of CH_LLMW are further described in Chapter 7 and shown in Figure 7.2.). It has not yet been established how many years the facility will operate, but it is expected to begin operations in 1997. Initially, the facility will be contracted to operate only through 2009. However, the contract is expected to be extended, if necessary, to finish processing all volumes of CH_LLMW requiring thermal treatment.

The TTF will receive waste from the CWC and off-site generators. Treated CH_LLMW will be transported directly to the mixed waste disposal trenches for final disposal. The process by which the waste is treated will be left to the discretion of the TTF contractor as long as the facility is able to accept CH_LLMW in drums and create an acceptable waste form that meets all applicable state and federal regulations for final disposal.

6.0 DISPOSAL FACILITIES

Three different facilities will provide disposal capacity for the Hanford Site. Currently, one burial ground provides permanent disposal for CH_LLW_I and CH_LLW_III, and two mixed waste disposal trenches are planned to provide disposal for CH_LLMW and RH_LLMW. All TRU_TRUM waste will be sent to the WIPP for final disposal. The destination of GTCIII wastes has not yet been determined. Table 6.1 shows the schedules and capacities of the disposal facilities.

TABLE 6.1 Schedules and Capacities of Disposal Facilities

Disposal Facility	Waste Streams	Anticipated Schedule	Capacity
Waste Isolation Pilot Plant (WIPP)	CH_TRU_TRUM RH_TRU_TRUM	2002-2020	As needed[a]
Mixed Waste Disposal Trenches	CH_LLMW RH_LLMW	Opens 1999	7,600 m^3 [b] (per trench)
Low-Level Waste Burial Ground	CH_LLW_I CH_LLW_III RH_LLW_I RH_LLW_III	Currently Receiving Waste	As needed[b]

[a] It is assumed that Hanford will ship all certified TRU_TRUM waste volumes to the WIPP.
[b] It is assumed that additional disposal capacity will be provided as it is needed.

6.1 WASTE ISOLATION PILOT PLANT (WIPP)

Based on the latest planning at WIPP (November 1993), the facility will accept waste for 20 years starting in 2000. With the emphasis on waste from the Rocky Flats Plant and the Idaho National Engineering Laboratory, it is assumed that the initial two years of WIPP operations will be devoted to addressing these wastes. Based on this information, this baseline assumes that Hanford waste will first be accepted by the WIPP in 2002.

The following wastes will be sent to the WIPP:

- CH_TRU_TRUM waste that has been certified in WRAP 1 or the M33 facility
- RH_TRU_TRUM waste that has been certified in the M33 facility.

TRUPACT-II containers will be used to ship CH_TRU_TRUM wastes to the WIPP, whereas special remote-handled casks will be used for RH_TRU_TRUM waste shipments. The current system assumes no transportation limits for waste shipments to the WIPP.

Although the Draft Supplement Environmental Impact Statement for the Waste Isolation Pilot Plant (DOE 1989) asserts that the final waste acceptance year is 2013, it is widely understood that the closure date for WIPP will be extended to 2020. It is assumed that all Hanford retrieval activities and treatment facilities will be geared to meet this 2020 closure date. It is further assumed that Hanford will not be limited in the amount of TRU_TRUM waste it will be allowed to send to the WIPP.

6.2 MIXED WASTE DISPOSAL TRENCHES

Two mixed waste disposal trenches will provide RCRA-compliant, permanent on-site disposal for existing and newly generated radioactive mixed waste. CH_LLMW treated in the STP, the M33 facility, or the TTF and RH_LLMW treated in the M33 facility will be shipped to the mixed waste disposal trenches. The current capacity of each of the mixed waste disposal trenches is 7,600 m^3.

The following assumptions have been made:

- This disposal site will be operational by 1999 (before the STP commences operation). Any waste volumes that arrive prior to 1999, such as waste from the TTF, will be placed in storage until the trenches are available.
- Hanford will not be limited in the amount of waste that can be shipped to the trenches; the necessity of additional trenches will be assessed throughout operations of the solid waste system.

6.3 EXISTING LOW-LEVEL WASTE BURIAL SITE

This disposal site is currently accepting CH_LLW_I and CH_LLW_III. CH_LLW_III is segregated from CH_LLW_I for protection and control in the unlined trench. This trench will also be accepting RH_LLW from waste generators. It is assumed that Hanford will not be limited in the amount of waste that can be shipped to the burial ground; the necessity for additional burial sites will be assessed throughout operations of the solid waste disposal system.

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7.0 WASTE STREAMS

Chapter 7 describes the routing of various waste streams through the Hanford TSD facilities. Figure 7.1 describes the symbols used on the waste stream diagrams. The routing of each waste stream is shown on a separate diagram followed by a brief description and list of assumptions.

All streams begin as either newly generated or retrieved waste and are eventually routed to one of the three disposal facilities. In many instances, streams must be reclassified because of treatment or more accurate characterization of the waste. When a stream is reclassified, it is sent to the corresponding diagram as indicated by the diagram name listed after the connecting letter of the stream.

Volume changes are indicated on the diagram as they occur within the treatment and disposal facilities. Explanation of these volume changes may be found in the list of assumptions for each diagram. Occasionally within the system, a stream will be repackaged in different containers. A change in container type is indicated by "Boxes" or "Drums" following the process in which the repackaging takes place.

Descriptions of stream splits are shown one of two ways on the diagrams:

- Deterministic percentages are listed on the streams that result from the split.
- A reference to a waste stream routing diagram is listed.

The supporting assumptions of the deterministic splits are given in the list of assumptions following the waste stream description. The waste stream routing diagrams are used to route the waste based on its hazardous constituents and physical waste forms. If a given volume of waste has more than one hazardous constituent/physical waste form combination and they do not indicate treatment in the same facility, the waste is routed based on a prioritization of the treatment facilities. For CH_LLMW (see Figure 7.2), if any combination indicates long-term storage (LTS), the waste must be sent there. If none of the hazardous constituent/ physical waste form combinations requires LTS, but at least one indicates treatment in the TTF, then the waste must be thermally treated. If treatment in the TTF is not indicated by the diagram, the waste is sent to the STP.

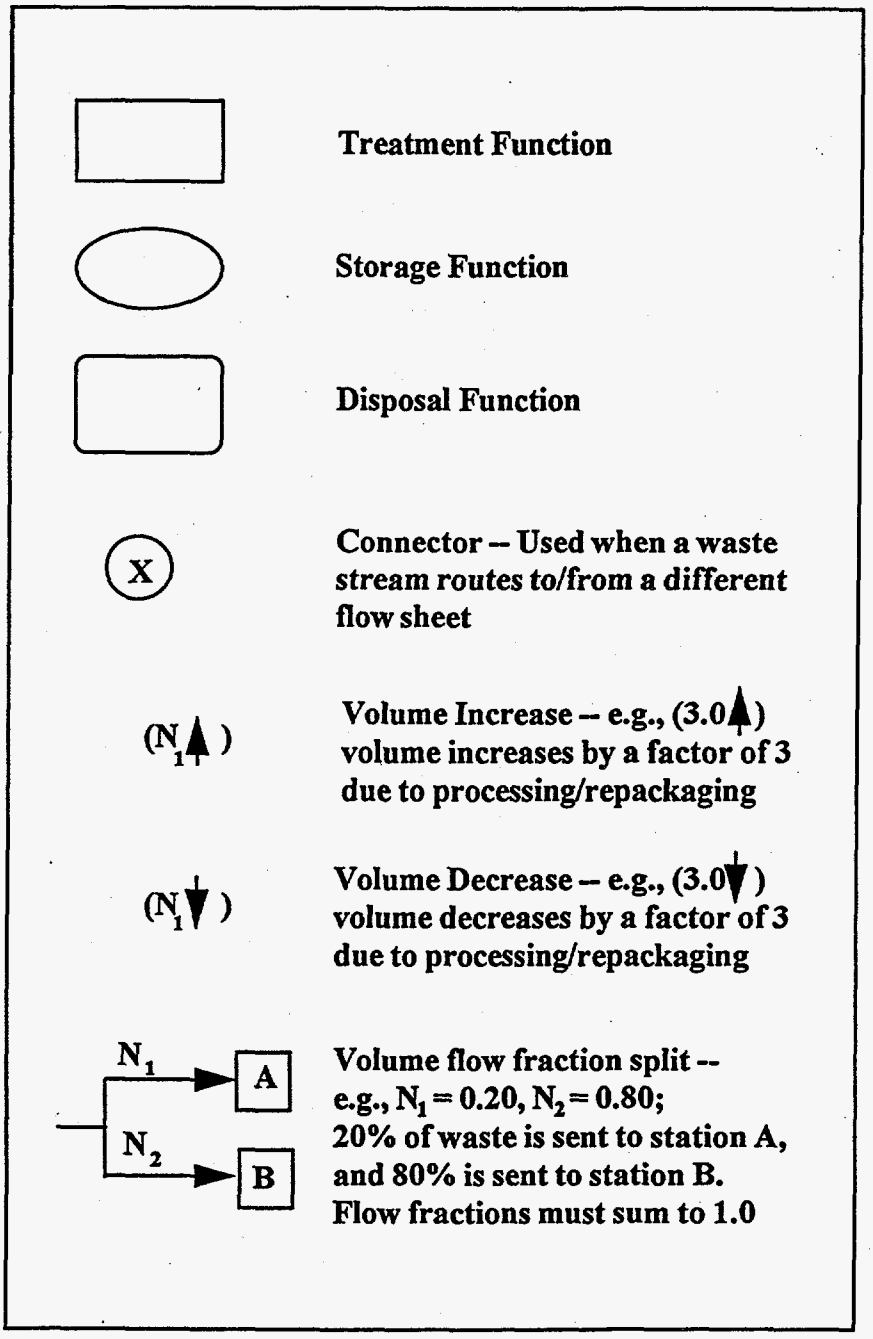

FIGURE 7.1 Legend for Waste Stream Flow Diagrams

PHYSICAL WASTE FORMS	HAZARDOUS CONSTITUENTS								
	Ignitables D001	Corrosives D002	Reactive D003	Metals	Mercury D009 P065 P092 U151	Organics	Washington Regulated Mats. WT WP WC	PCB W001 <50ppm	PCB W001 >50ppm
Shielding									
Steel	STP	STP	STP	STP	STP	STP	STP	STP	TTF
Lead	STP	STP	STP	STP	STP	STP	STP	STP	TTF
Concrete	STP	STP	STP	STP	STP	STP	STP	STP	TTF
Solid Process Residues									
Inorganic Particulate	STP	STP	STP	STP	STP	TTF	TTF	STP	TTF
Inorganic Absorbed Liquid/ Sludges	STP	STP	STP	STP	STP	TTF	TTF	STP	TTF
Salt Waste	STP	STP	STP	STP	STP	TTF	TTF	STP	TTF
Organic Particulates	TTF	TTF	TTF	TTF	TTF	TTF	TTF	TTF	TTF
Organic Absorbed Liquid/Sludges	TTF	TTF	TTF	TTF	TTF	TTF	TTF	TTF	TTF
Soils									
Contaminated Soils	STP	STP	STP	STP	STP	TTF	TTF	STP	TTF
Debris Contaminated Soils	STP	STP	STP	STP	STP	TTF	TTF	STP	TTF
Debris Waste									
Metal	STP	STP	STP	STP	STP	STP	STP	STP	TTF
Inorganic Non-Metal	STP	STP	STP	STP	STP	STP	STP	STP	TTF
Combustible	STP	STP	STP	STP	STP	STP	STP	STP	TTF
Heterogeneous	STP	STP	STP	STP	STP	STP	STP	STP	TTF
Special Wastes									
Labpacks/Containerized Liquids	TTF	STP	STP	STP	STP	TTF	TTF	STP	TTF
Reactive Metals	TTF	TTF	TTF	TTF	TTF	TTF	TTF	TTF	TTF
Explosives/Propellants	LTS	LTS	LTS	LTS	LTS	LTS	LTS	LTS	LTS
Inherently Hazardous Waste									
Elemental Mercury	STP	STP	STP	STP	STP	TTF	TTF	STP	TTF
Elemental Lead	STP	STP	STP	STP	TTF	TTF	TTF	STP	TTF
Beryllium Waste	STP	STP	STP	STP	STP	TTF	TTF	STP	TTF
Batteries	STP	STP	STP	STP	STP	TTF	TTF	STP	TTF
Unknown									
Other	STP	STP	STP	STP	STP	TTF	TTF	STP	TTF

FIGURE 7.2 Waste Routing Matrix for CH_LLMW

For CH_TRU_TRUM waste (see Figure 7.3), if a hazardous constituent/physical waste form combination indicates routing to LTS, the waste must be sent there. These streams require thermal treatment, but the currently planned TTF will not accept CH_TRU_TRUM streams. If any of the remaining waste has hazardous constituent/physical waste form combinations that require treatment in the M33 facility, the waste must be sent there. Theses wastes have characteristics that are unacceptable for WRAP 1. All remaining waste will be routed to WRAP 1.

A similar strategy was developed for RH_LLMW (see Figure 7.4). Waste not requiring thermal treatment is routed to the M33 facility.

PHYSICAL WASTE FORMS	HAZARDOUS CONSTITUENTS								
	Ignitables D001	Corrosives D002	Reactive D003	Metals	Mercury D009 P065 P092 U151	Organics	Washington Regulated Mats. WT WP WC	PCB W001 <50ppm	PCB W001 >50ppm
Shielding									
Steel	W1	W1	M33	W1	W1	W1	W1	W1	LTS
Lead	W1	W1	M33	W1	W1	W1	W1	W1	LTS
Concrete	W1	W1	M33	W1	W1	W1	W1	W1	LTS
Solid Process Residues									
Inorganic Particulates	M33	M33	M33	M33	M33	LTS	LTS	M33	LTS
Inorganic Absorbed Liquid/ Sludges	W1	W1	M33	W1	W1	LTS	LTS	W1	LTS
Salt Waste	W1	W1	M33	W1	W1	LTS	LTS	W1	LTS
Organic Particulates	LTS	M33	M33	M33	M33	M33	M33	M33	M33
Organic Absorbed Liquid/Sludges	LTS	LTS	LTS	LTS	LTS	LTS	LTS	LTS	LTS
Soils									
Contaminated Soils	W1	W1	M33	W1	W1	LTS	LTS	W1	LTS
Debris Contaminated Soils	W1	W1	M33	W1	W1	LTS	LTS	W1	LTS
Debris Waste									
Metal	W1	W1	M33	W1	W1	W1	W1	W1	LTS
Inorganic Non-Metal	W1	W1	M33	W1	W1	W1	W1	W1	LTS
Combustible	W1	W1	M33	W1	W1	W1	W1	W1	LTS
Heterogeneous	W1	W1	M33	W1	W1	W1	W1	W1	LTS
Special Wastes									
Labpacks/Containerized Liquids	LTS	W1	M33	W1	W1	LTS	LTS	W1	LTS
Reactive Metals	LTS	LTS	LTS	LTS	LTS	LTS	LTS	LTS	LTS
Explosives/Propellants	W1	W1	M33	W1	W1	W1	W1	W1	W1
Inherently Hazardous Waste									
Elemental Mercury	W1	W1	M33	W1	W1	LTS	LTS	W1	LTS
Elemental Lead	W1	W1	M33	W1	LTS	LTS	LTS	W1	LTS
Beryllium Waste	W1	W1	M33	W1	W1	LTS	LTS	W1	LTS
Batteries	W1	W1	M33	W1	W1	LTS	LTS	W1	LTS
Unknown									
Other	W1	W1	M33	W1	W1	LTS	LTS	W1	LTS

FIGURE 7.3 Waste Routing Matrix for CH_TRU_TRUM

PHYSICAL WASTE FORMS	HAZARDOUS CONSTITUENTS								
	Ignitables D001	Corrosives D002	Reactive D003	Metals	Mercury D009 P065 P092 U151	Organics	Washington Regulated Mats. WT WP WC	PCB W001 <50ppm	PCB W001 >50ppm
Shielding									
Steel	M33	M33	M33	M33	M33	M33	M33	M33	LTS
Lead	M33	M33	M33	M33	M33	M33	M33	M33	LTS
Concrete	M33	M33	M33	M33	M33	M33	M33	M33	LTS
Solid Process Residues									
Inorganic Particulates	M33	M33	M33	M33	M33	LTS	LTS	M33	LTS
Inorganic Absorbed Liquid/ Sludges	M33	M33	M33	M33	M33	LTS	LTS	M33	LTS
Salt Waste	M33	M33	M33	M33	M33	LTS	LTS	M33	LTS
Organic Particulates	LTS	M33	M33	M33	M33	M33	M33	M33	M33
Organic Absorbed Liquid/Sludges	LTS	LTS	LTS	LTS	LTS	LTS	LTS	LTS	LTS
Soils									
Contaminated Soils	M33	M33	M33	M33	M33	LTS	LTS	M33	LTS
Debris Contaminated Soils	M33	M33	M33	M33	M33	LTS	LTS	M33	LTS
Debris Waste									
Metal	M33	M33	M33	M33	M33	M33	M33	M33	LTS
Inorganic Non-Metal	M33	M33	M33	M33	M33	M33	M33	M33	LTS
Combustible	M33	M33	M33	M33	M33	M33	M33	M33	LTS
Heterogeneous	M33	M33	M33	M33	M33	M33	M33	M33	LTS
Special Wastes									
Labpacks/Containerized Liquids	LTS	M33	M33	M33	M33	LTS	LTS	M33	LTS
Reactive Metals	LTS	LTS	LTS	LTS	LTS	LTS	LTS	LTS	LTS
Explosives/Propellants	M33	M33	M33	M33	M33	M33	M33	M33	M33
Inherently Hazardous Waste									
Elemental Mercury	M33	M33	M33	M33	M33	LTS	LTS	M33	LTS
Elemental Lead	M33	M33	M33	M33	LTS	LTS	LTS	M33	LTS
Beryllium Waste	M33	M33	M33	M33	M33	LTS	LTS	M33	LTS
Batteries	M33	M33	M33	M33	M33	LTS	LTS	M33	LTS
Unknown									
Other	M33	M33	M33	M33	M33	LTS	LTS	M33	LTS

FIGURE 7.4 Waste Routing Matrix for RH_LLMW

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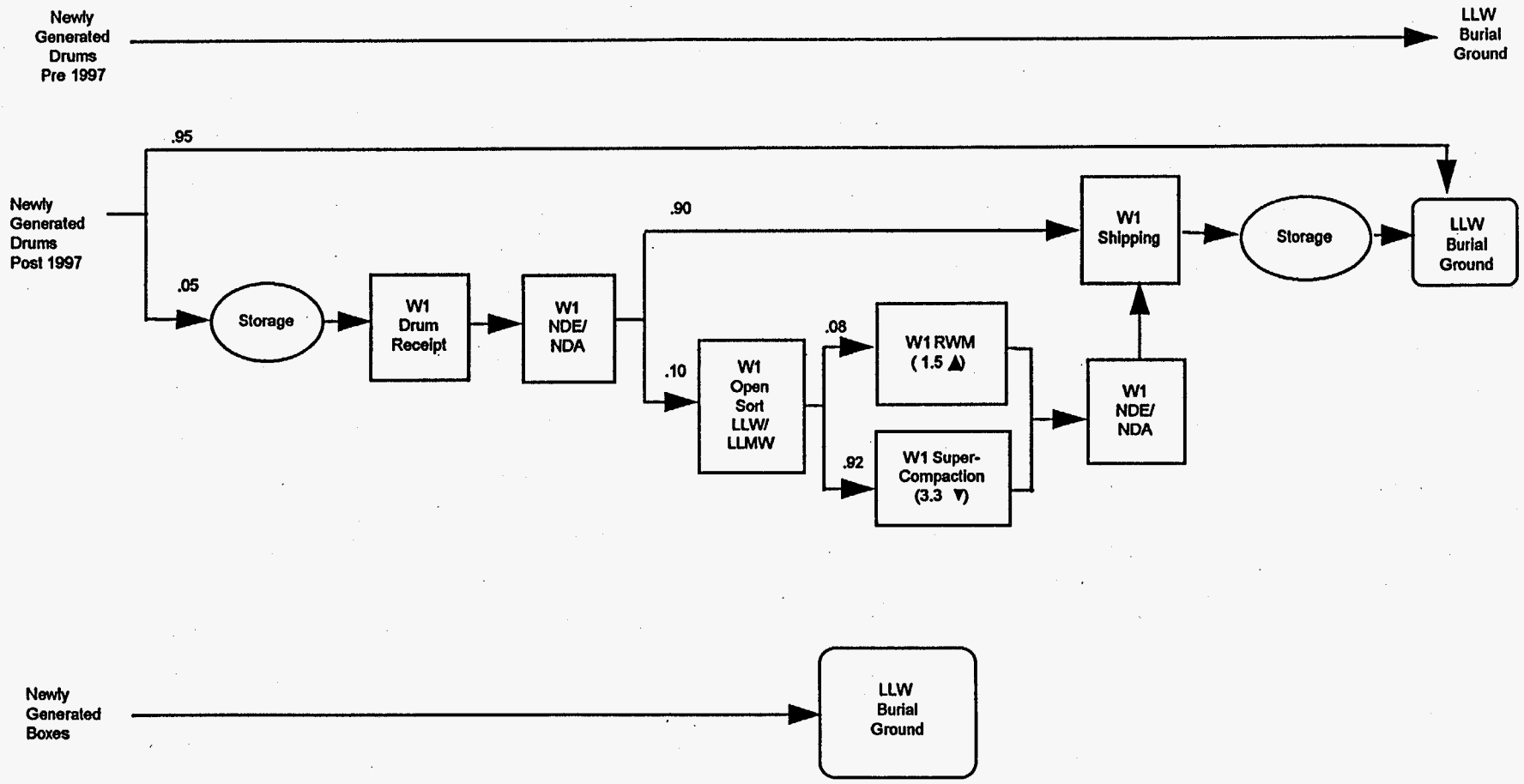

FIGURE 7.5 CH_LLW_I

7.1 LOW-LEVEL WASTE

7.1.1 CH_LLW_I

Figure 7.5 illustrates the currently expected routing of newly generated CH_LLW_I. All newly generated CH_LLW_I in boxes is assumed to be sufficiently characterized and will be routed directly to the LLW burial ground for disposal. For newly generated CH_LLW_I in drums, however, a 5% sample will be sent to storage to await verification within WRAP 1 after it opens in 1997. The other 95% will remain at the generator until the sample is certified and the entire lot is accepted. Upon acceptance of the sample, the portion of the waste lot held by the generator and the sample will both be shipped to the LLW burial ground. All wastes accepted prior to the WRAP I startup in 1997 will be sent directly to the LLW burial ground.

Assumptions

- WRAP 1 will receive only 5% of all newly generated CH_LLW_I in drums for verification, whereas the generator holds the remainder of the batch at the generator facility until the waste lot is accepted. Once accepted, the 95% fraction will go directly to the LLW burial ground (WHC-IP-1159, Rev. 0).

- Only 10% of the verification sample (0.5% of the total volume) will be routed to the open/sort station (Weidert et al. 1993).

- It is estimated that 8% of the waste from the open/sort station will be noncompliant items. These items will be sent to restricted waste management where they will be treated or repackaged, resulting in a 1.5:1 volume increase. The remaining 92% will be sent to supercompaction, where the waste will undergo a 3.3:1 volume decrease (Weidert et al. 1993).

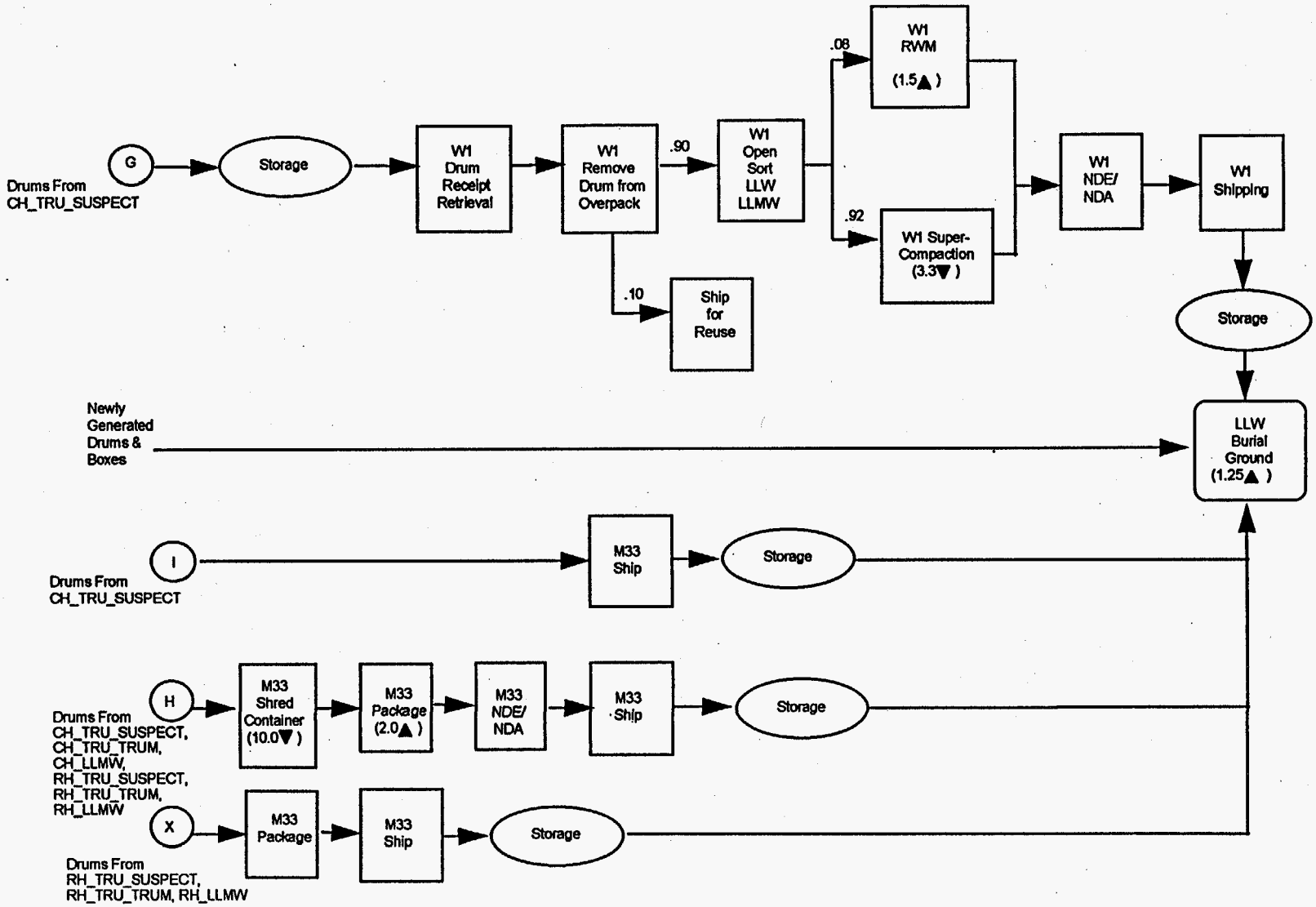

FIGURE 7.6 CH_LLW_III

7.1.2 CH_LLW_III

The current strategy for processing CH_LLW_III is shown in Figure 7.6. All newly generated drums and boxes containing CH_LLW_III will be sent directly to the LLW burial ground. All retrieved drums from the CH_TRU_SUSPECT stream that assay as CH_LLW_III at the trench (stream "G") will be sent to Phase V storage and then to WRAP 1 for processing and a final assay. After assay, the waste will be returned to storage and routed to on-site burial. In addition, a fraction of CH_TRU_SUSPECT that has been processed within the M33 facility will be reclassified as CH_LLW_III (stream "I") and shipped to the LLW burial ground. A function called "Remove Container" within the M33 facility creates several CH_LLW_III streams (stream "H"). Shielding removed from RH streams in the M33 facility are packaged and shipped to the burial ground (stream "X"). All CH_LLW_III will be placed in High Integrity Containers (HICs) at the trench, resulting in a 1.25:1 volume increase.

Assumptions

- All CH_LLW_III will be packaged in HICs at the burial ground. It is assumed this will cause a 1.25:1 waste stream volume increase.

- Retrieved CH_TRU_SUSPECT waste reclassified as CH_LLW_III (stream "G") will have the overpack removed resulting in a 10% stream being shipped for reuse. The remaining 90% of the waste volume is sent on to the WRAP 1 open/sort station.

- Of the CH_TRU_SUSPECT waste reclassified as CH_LLW_III (stream "G") that reaches open/sort, 8% is assumed to go to restricted waste management where it is treated or repackaged with a net volume increase of 1.5:1. The remaining 92% of the waste is sent to supercompaction where it undergoes a net 3.3:1 volume decrease (Weidert et al. 1993).

- CH_TRU_SUSPECT boxes that have been treated in the M33 facility and repackaged into drums (stream "I") will be shipped to the burial ground.

- Waste containers that have been removed within the M33 facility from several incoming waste volumes (stream "H") will be shredded, resulting in a 10.0:1 volume decrease, and packaged, resulting in a 2.0:1 volume increase. The waste will then be assayed and shipped to the burial ground.

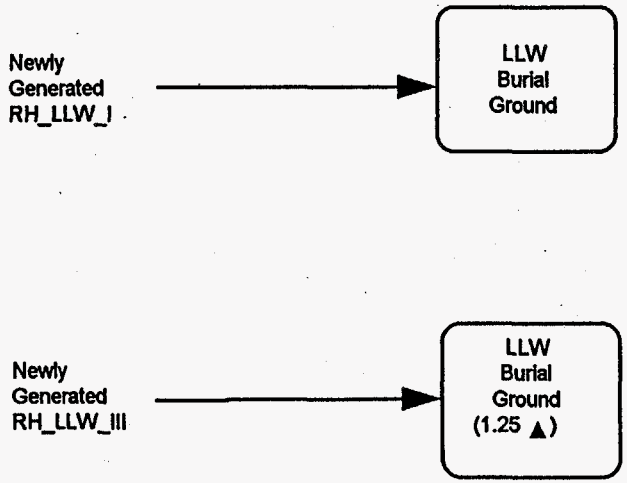

FIGURE 7.7 RH_LLW_I and RH_LLW_III

7.1.3 RH_LLW_I and RH_LLW_III

It is assumed that all newly generated RH_LLW_I and RH_LLW_III in drums and boxes will be sent directly to the LLW burial ground (See Figure 7.7). No verification of these waste volumes will be required. RH_LLW_III will be packaged into HICs at the burial ground, increasing the volume by a factor of 1.25:1. No RH_LLW is expected from retrieval.

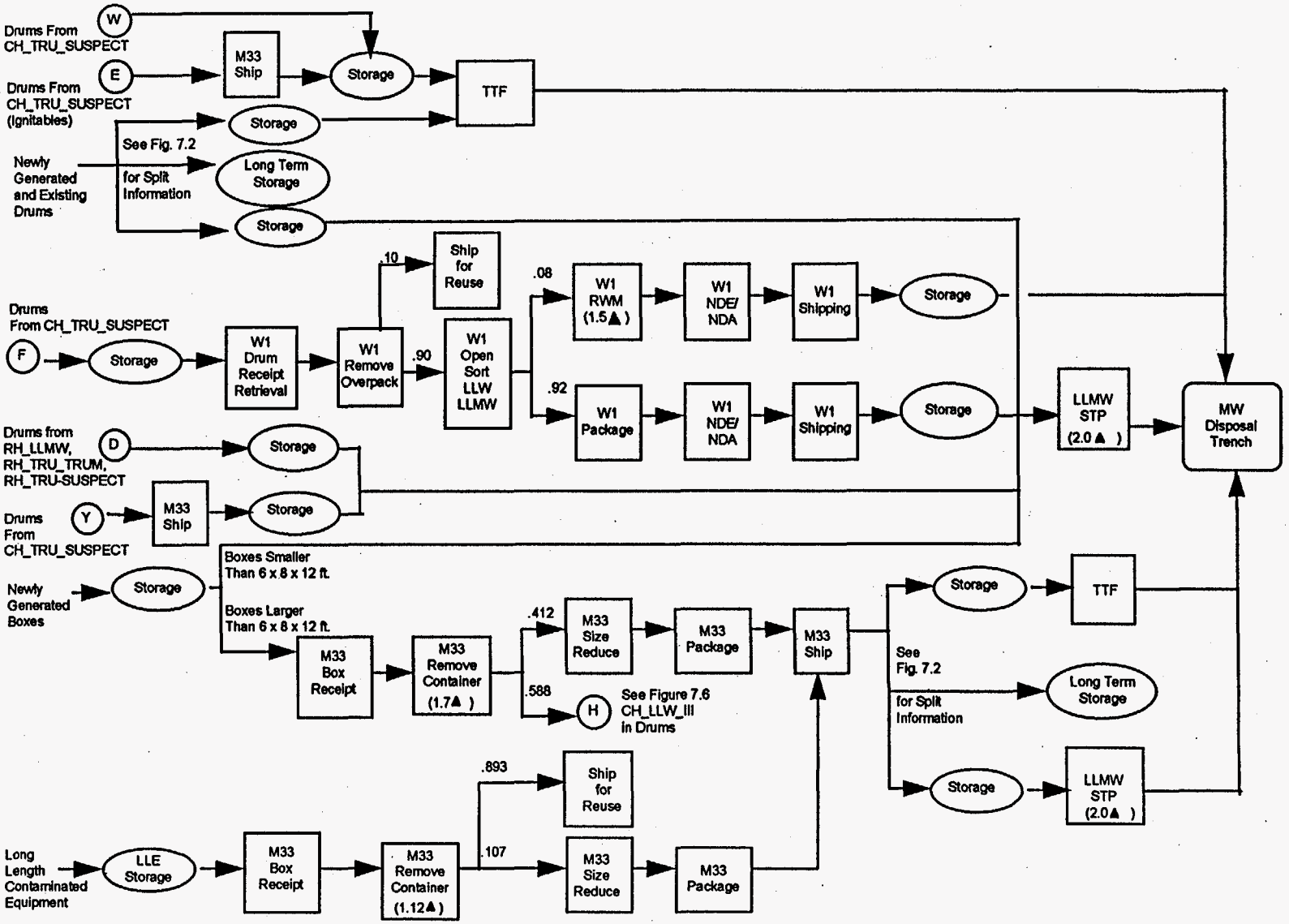

FIGURE 7.8 CH_LLMW

7.2 LOW-LEVEL MIXED WASTE

7.2.1 CH_LLMW

The anticipated routing of CH_LLMW is shown in Figure 7.8. Newly generated CH_LLMW in boxes will be received in Phase V storage and sent to the STP or the M33 facility. Boxed waste routed to the M33 facility undergoes size reduction and will be sent to the STP, LTS, or the TTF for additional treatment. Drums containing CH_LLMW are routed to either the STP, LTS, or the TTF. Long-length contaminated equipment will be size-reduced and processed by the M33 facility and then sent to the TTF, STP, or LTS.

CH_LLMW is also expected to develop from other streams in the system. Shielding and portions of treated metals from RH_LLMW and RH_TRU_TRUM waste streams (stream "D") are expected to be reclassified as CH_LLMW. These streams will require treatment in the STP. CH_LLMW is also expected from retrieval of CH_TRU_SUSPECT, see streams "E," "F," and "Y." The fraction of CH_TRU_SUSPECT reclassified as CH_LLMW requiring thermal treatment (stream "E") will be routed to the TTF, whereas the remaining CH_TRU_SUSPECT reclassified as CH_LLMW (stream "F") will be sorted in WRAP 1 before being sent to the STP for final treatment. All CH_LLMW will be sent to the MW disposal trenches for final disposal.

Assumptions

- Routing newly generated boxes and drums is based on the hazardous constituents and physical waste forms of the waste. Figure 7.2 illustrates the combinations of hazardous constituents and physical waste forms routed to the STP, LTS, and the TTF.

  The STP also has a limited box capacity. All boxes larger than 6 ft x 8 ft x 12 ft must be sent to the M33 facility for size reduction before being routed to the STP, LTS, or the TTF for final treatment (Nester 1994).

- The waste treatment and stabilization processes within the STP are expected to create a 2:1 waste stream volume increase (Carlson et al. 1994).

- Waste volumes sent to the M33 facility are assumed to have the container removed, creating a stream of CH_LLW_III. A 1.7:1 volume increase is assumed to account for packaging the used container. After the volume increase is applied, the stream is split, allowing 58.8% to be treated as a used container (stream "H") and 41.2% to be treated as waste.

- For the purposes of this baseline, it is assumed that the same fraction of LLMW will be sent to the restricted waste management station as is expected for LLW and that the LLMW will incur the same volume increase. Therefore, 8% of the LLMW routed to WRAP 1 will be sent to restricted waste management where it will undergo a 1.5 volume increase. This stream does not require additional treatment in the STP and is sent to disposal via storage. The 92% fraction is packaged and routed to the STP for further treatment. Unlike LLW, LLMW will not be supercompacted to make further processing in the STP easier.

- The long-length contaminated equipment retrieved from the tank farms will be routed to the M33 facility. A 1.12:1 volume increase is assumed as the equipment is removed from the storage boxes. Of this waste volume, 89.3% is container/flexible receiver and will be shipped for reuse. The remaining 10.7% will be size-reduced.

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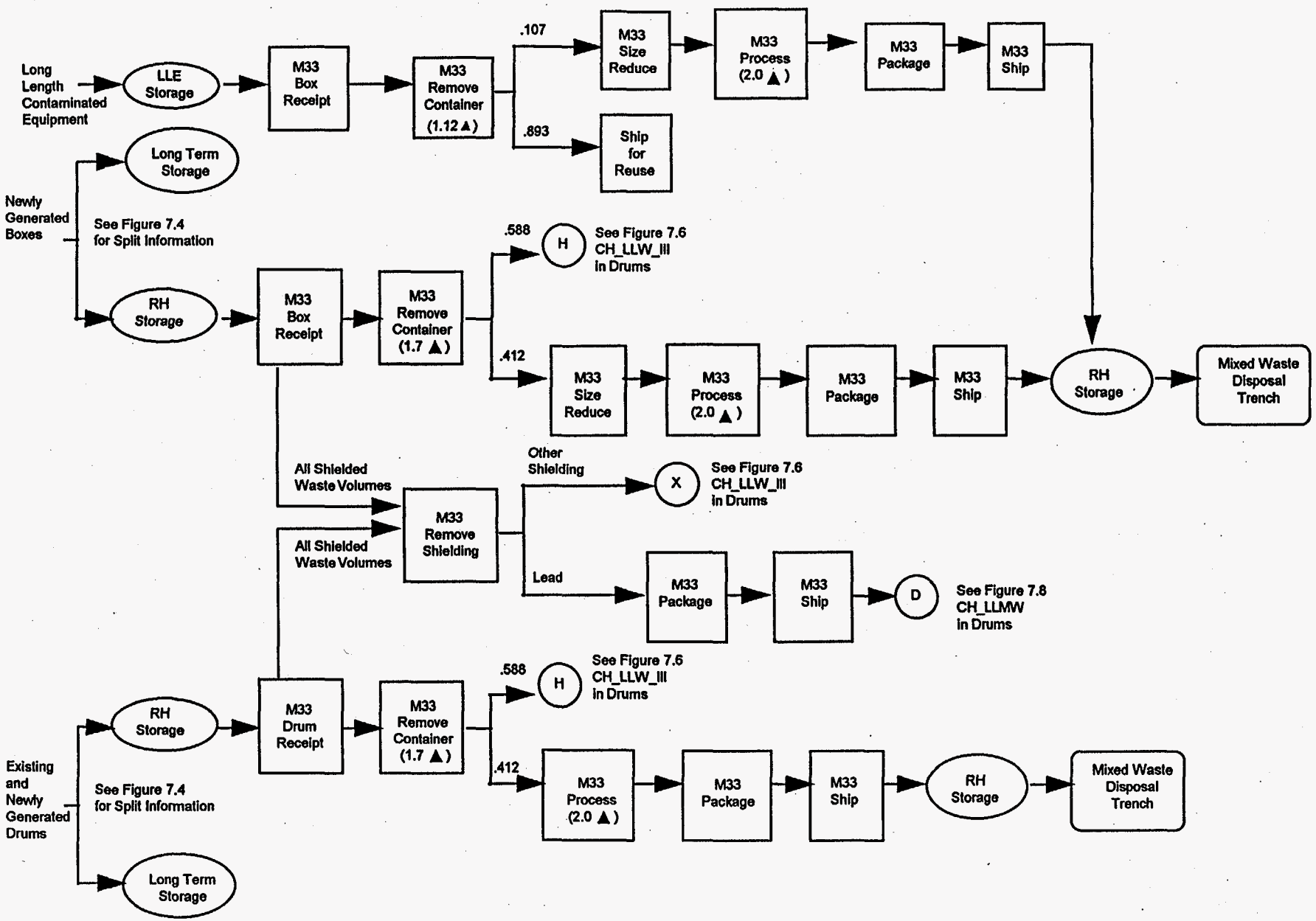

FIGURE 7.9 RH_LLMW

7.2.2 RH_LLMW

Figure 7.9 illustrates the expected routing of RH_LLMW. Waste requiring thermal treatment will be sent to LTS because the planned TTF will not accept remote-handled materials; all other RH_LLMW will be sent to the M33 facility for treatment. All treated mixed waste will be routed to the MW disposal trenches for final disposal.

Assumptions

- All RH_LLMW requiring thermal treatment (See Figure 7.4) will be routed to LTS because the TTF will not accept remote-handled materials. All other newly generated waste will be sent to the M33 facility.

- Waste volumes containing shielding are assumed to be removed from the waste stream. Lead shielding will be reclassified as CH_LLMW (stream "D"), and other shielding will be reclassified as CH_LLW_III (stream "H").

- Waste volumes sent to the M33 facility are assumed to have the container removed, creating a stream of CH_LLW_III. A 1.7:1 volume increase is assumed to account for packaging the used container. After the volume increase is applied, the stream is split, allowing 58.8% to be treated as a used container (stream "H") and 41.2% to be treated as waste.

- Until specific processes within the M33 facility have been identified, streams processed in the M33 facility are assumed to undergo the same volume changes as similar waste streams treated in the STP. Therefore, CH_LLMW treated in the M33 facility is expected to undergo a 2:1 volume increase.

- The long-length contaminated equipment retrieved from the tank farms will be routed to the M33 facility. A 1.12:1 volume increase is assumed as the equipment is removed from the storage boxes. Of this waste volume, 89.3% is container/flexible receiver and will be shipped for reuse. The remaining 10.7% will be size-reduced and processed, resulting in a 2.0:1 volume increase.

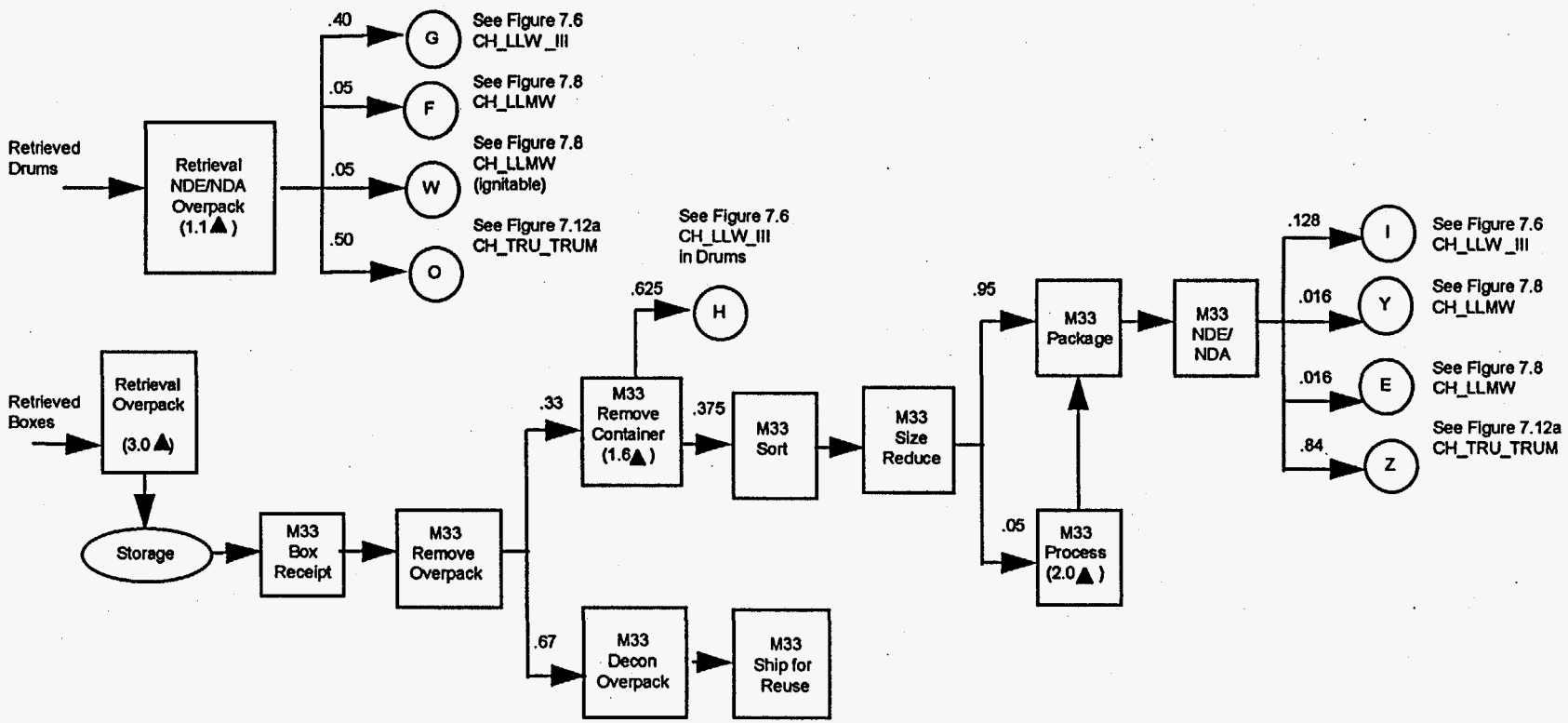

FIGURE 7.10 CH_TRU_SUSPECT

7.3 TRANSURANIC WASTE

7.3.1 CH_TRU_SUSPECT

The planned routing of CH_TRU_SUSPECT is shown in Figure 7.10. Drums will be retrieved from the trenches and placed in overpacks. As part of the drum retrieval process, the waste will receive a complete NDE/NDA examination to aid in precharacterizing it as LLW/LLMW and suspect TRU_TRUM streams. The CH_LLW_III (stream "G") will be sent to WRAP I and eventually to the LLW burial ground. The CH_LLMW requiring thermal treatment (streams "E" and "W") will be sent to the TTF, then routed to the MW disposal trenches. The CH_LLMW (stream "F") will be routed to WRAP 1, sorted, sent to the STP for final treatment, and disposed in the MW disposal trenches. The CH_TRU_TRUM (stream "O") will be sent to WRAP 1 for processing and eventually routed to the WIPP.

Boxes retrieved from the trenches will also be placed in overpacks. All CH_TRU_SUSPECT waste packaged in boxes will be sent to the M33 facility for treatment. Waste exiting the M33 facility will either be CH_TRU_TRUM (stream "Z"), CH_LLMW (streams "Y" and "E"), or CH_LLW_III (stream "I").

Assumptions

- Waste contained in retrieved drums is expected to be 50% TRU_TRUM and 50% LLW. Of the 50% LLW fraction, 20% is expected to be LLMW, or 10% of the total. Pending data acquisitions, it is assumed that the LLW in retrievable storage is CH_LLW_III (since it is"suspect TRU_TRUM," it is more likely to have a higher activity level than most LLW). It is further assumed that half of the LLMW fraction will contain ignitables and require thermal treatment.

- Retrieval will provide a customized overpack for the boxes. Based on analysis performed by Central Engineering, the average overpack volume increase is 3:1. The overpacked boxes will be sent to storage with no NDE/NDA verification (Armacost et al. 1994).

- All boxes go to the M33 facility for processing. It is assumed that one-third of the overpacked waste volume will be treated in the M33 facility, and two-thirds of the overpacked waste volume will be the overpack and will be shipped for reuse.

- Waste volumes sent to the M33 facility are assumed to have the container removed, creating a stream of CH_LLW_III. A 1.6:1 volume increase is assumed to account for packaging the used container. After the volume increase is applied, the stream is split allowing 62.5% to be treated as a used container (stream "H") and 37.5% to be treated as waste.

- Of the waste treated in the M33 facility, 5% is expected to require size reduction and processing resulting in a 2.0:1 volume increase (same as the LLMW). The remaining 95% will require only size reduction prior to assay and reclassification.

- The final assay in the M33 facility will split the total drum output volume into 16% LLW and 84% TRU_TRUM. It is assumed that 20% of the 16% fraction of LLW, or 3.2% of the total, is LLMW. Half of this 3.2% is assumed to require thermal treatment

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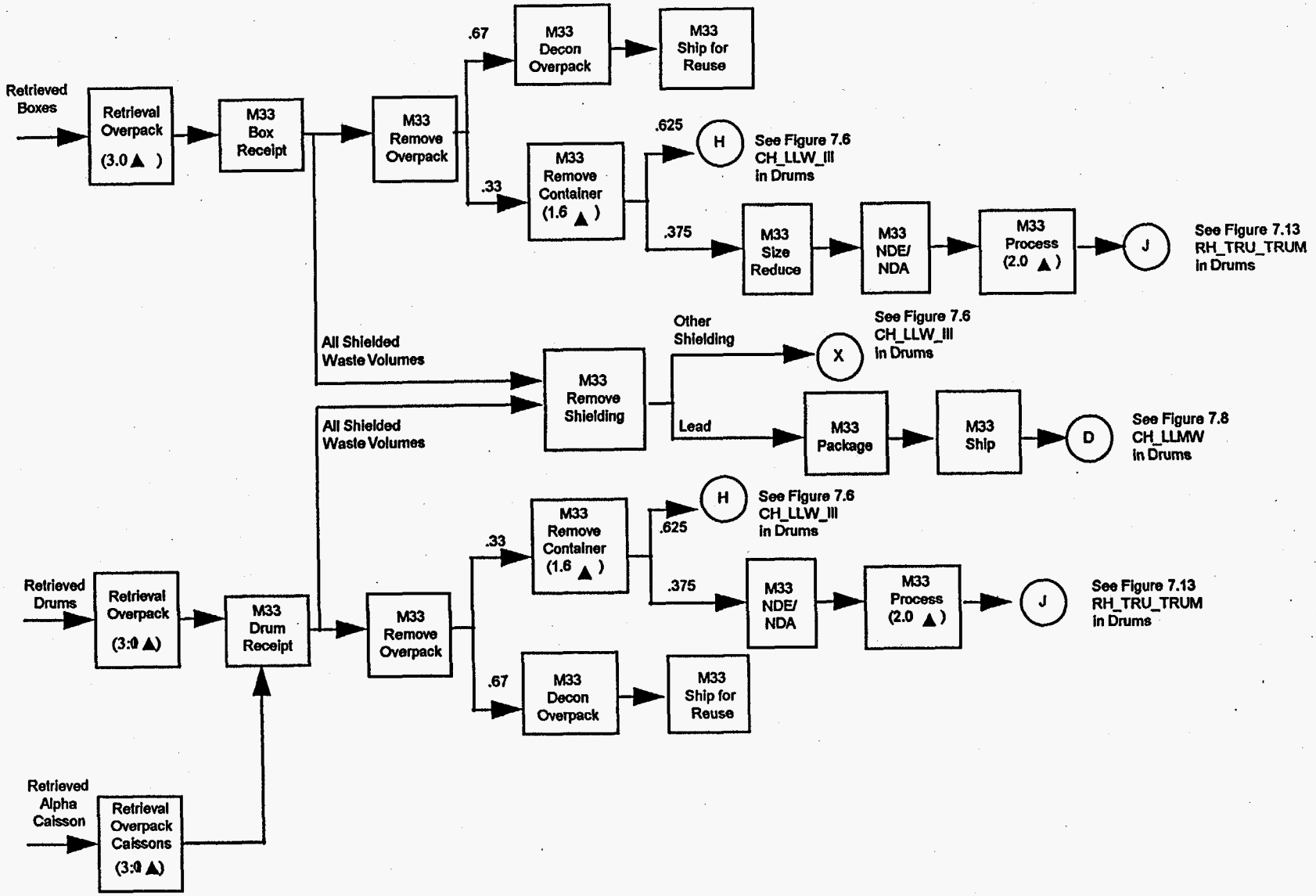

FIGURE 7.11 RH_TRU_SUSPECT

7.3.2 Retrieved RH_TRU_SUSPECT

All retrieved RH_TRU_SUSPECT from trenches and Alpha Caissons will be treated in the M33 facility (see Figure 7.11) for eventual shipment to the WIPP. A CH_LLMW stream of lead shielding is expected to develop from processing the waste, which will be routed to the STP for treatment, then sent to the MW disposal trenches via storage. Other shielding is expected to be classified as CH_LLW_III and sent to the low-level burial ground.

Assumptions

- The retrieval operations will apply shielding internal to the overpack for transportation and storage of boxes. The overall volume increase due to the overpack will be 3:1 (Armacost et al. 1994). It is assumed that the volume increase of overpacking a drum is similar to the 3:1 volume increase associated with overpacking a box.

- It is assumed that one-third of the overpacked waste volume will be treated in the M33 facility, and two-thirds of the overpacked waste volume will be the overpack and will be shipped for reuse.

- Waste volumes containing shielding are assumed to be removed from the waste stream. Lead shielding will be reclassified as CH_LLMW (stream "D"), and other shielding will be reclassified as CH_LLW_III (stream "X").

- Waste volumes sent to the M33 facility are assumed to have the container removed, creating a stream of CH_LLW_III. A 1.6:1 volume increase is assumed to account for packaging the used container. After the volume increase is applied, the stream is split allowing 62.5% to be treated as a used container (stream "H") and 37.5% to be treated as waste.

- Until specific processes within the M33 facility have been identified, streams processed in the M33 facility are assumed to undergo the same volume changes as waste streams treated in the STP. Therefore, RH_TRU_SUSPECT treated in the M33 facility is expected to undergo a 2:1 volume increase.

- After it is processed in the M33 facility, the RH_TRU_SUSPECT waste will be reclassified as RH_TRU_TRUM and sent to the WIPP via storage (stream "J").

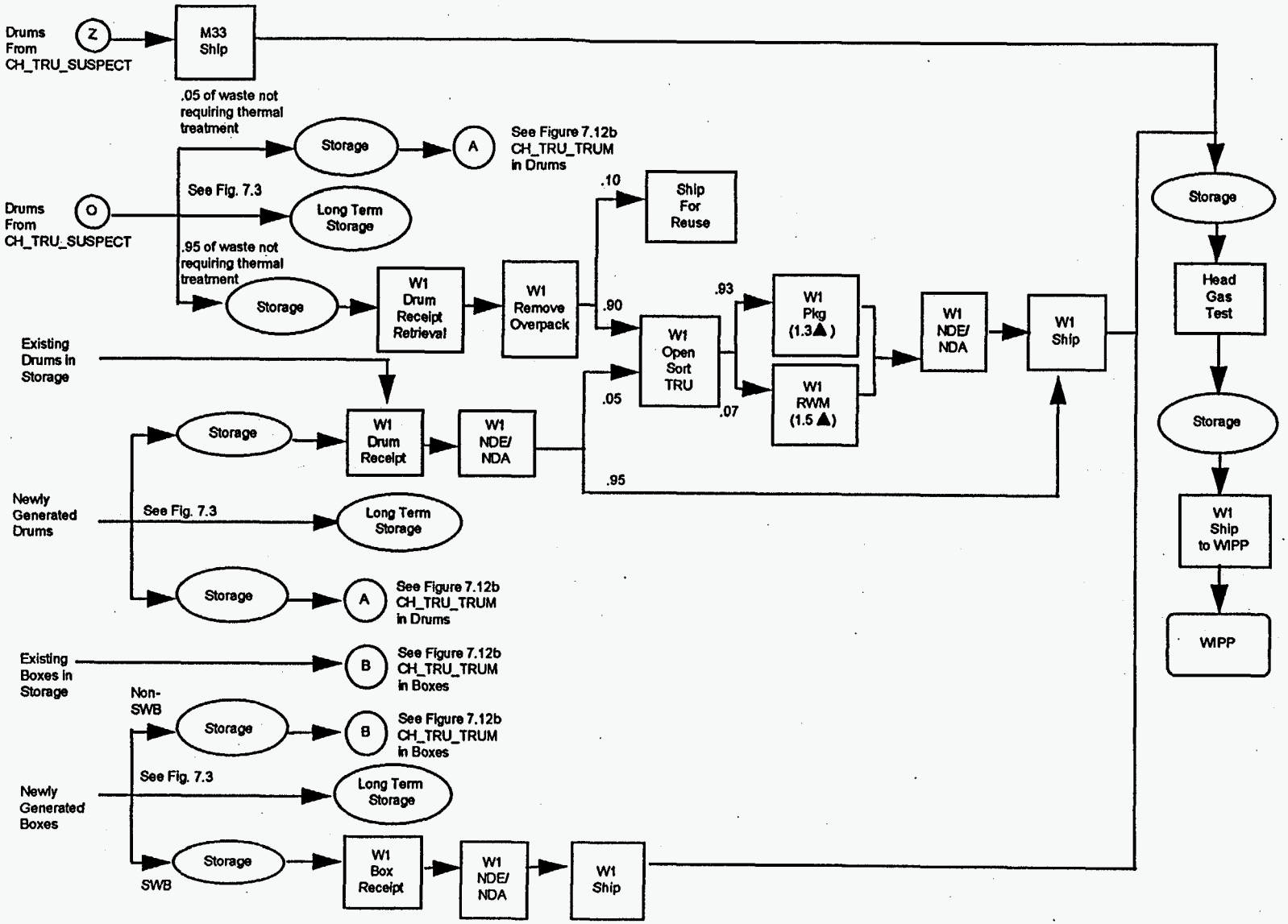

FIGURE 7.12a CH_TRU_TRUM

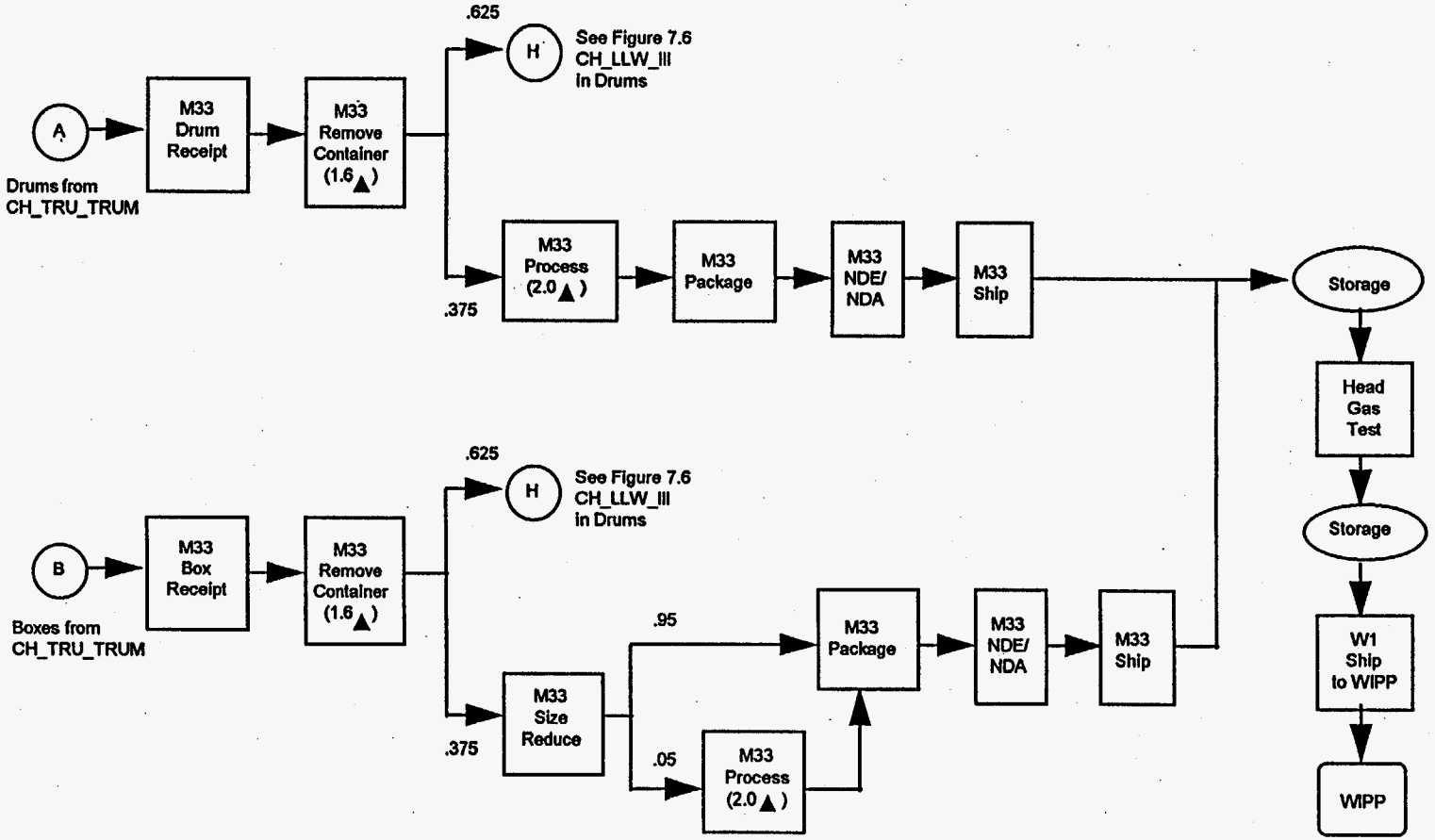

FIGURE 7.12b CH_TRU_TRUM Not Accepted by WRAP 1 and Not Sent to Long Term Storage

7.3.3 CH_TRU_TRUM

Planned routing of CH_TRU_TRUM waste is illustrated in Figures 7.12a and 7.12b. CH_TRU_TRUM waste from the CH_TRU_SUSPECT stream (stream "O"), newly generated CH_TRU_TRUM waste, and existing CH_TRU_TRUM waste will be treated in WRAP 1, the M33 facility, or sent to LTS. All TRU_TRUM waste will be sent to WIPP for final disposal via WRAP 1 and storage.

Assumptions for Drums

- Existing drums will be sent directly to the WRAP 1 facility upon retrieval.

- Newly generated drums and drums from CH_TRU_SUSPECT (stream "O") will be split to either LTS, the M33 facility, or WRAP 1. Waste requiring thermal treatment is routed to LTS because the TTF will not accept TRU_TRUM waste (see Figure 7.3). The remaining waste will be split between WRAP 1 and the M33 facility (stream "A") based on the waste acceptance criteria of WRAP 1.

  For the newly generated drums, the waste not requiring thermal treatment will be split based on the waste attributes (see Figure 7.3). Waste volumes containing particulates and reactives will be sent to the M33 facility (stream "A"). The remaining waste volumes will be sent to WRAP 1.

  For the reclassified CH_TRU_SUSPECT stream (stream "O") not sent to LTS, 5% is expected to be unacceptable for processing in WRAP 1 and must therefore be routed to the M33 facility. All other CH_TRU_TRUM waste will be routed to WRAP 1. A deterministic split of waste routed to the M33 facility and WRAP 1 is necessary because the attributes of retrievable waste do not match the attributes listed in Figure 7.3.

- Retrieved waste (stream "O") arriving in WRAP 1 will be removed from the overpack, resulting in a 10% stream (the overpack) being shipped for reuse. The remaining 90% will be routed to the open/sort station for further processing.

- A 5% sample of newly generated waste sent to WRAP 1 in drums will be routed to the open/sort station. The remaining 95% of the waste will be sent directly to WRAP 1 shipping (Weidert et al. 1993).

- Of the waste volumes routed through the WRAP 1 open/sort station, 93% is expected to be repackaged, and 7% is expected to require RWM treatment (Weidert et al. 1993).

- Waste that is repackaged and waste that is treated at the RWM station within WRAP 1 will incur a 1.3:1 and a 1.5:1 volume increase, respectively (Weidert et al. 1993).

- Drums that are routed to the M33 facility (stream "A") are assumed to have the container removed, creating a stream of CH_LLW_III. A 1.6:1 volume increase is assumed to account for packaging the used container. After the volume increase is applied, the stream is split, allowing 62.5% to be treated as a used container (stream "H") and 37.5% to be treated as waste.

- It is assumed that CH_TRU_TRUM waste processed in the M33 facility will undergo a 2.0:1 volume increase similar to other waste streams processed in the M33 facility.

Assumptions for Boxes

- Existing boxes will be sent to the M33 facility.

- Newly generated boxes routed to LTS will be those that require thermal treatment because the TTF will not accept TRU_TRUM waste (see Figure 7.3). The remaining waste is routed to WRAP 1 or the M33 facility based on box type. Waste in SWBs will be sent to WRAP 1 (Weidert et al. 1993), and waste in containers other than SWBs will be sent to the M33 facility (stream "B").

- No boxes will be opened in WRAP 1. The CH_TRU_TRUM waste in SWBs sent to WRAP 1 will be certified and shipped to storage to await shipment to the WIPP.

- Boxes routed to the M33 facility (stream "B") are assumed to have the container removed, creating a stream of CH_LLW_III. A 1.6:1 volume increase is assumed to account for packaging the used container. After the volume increase is applied, the stream is split allowing 62.5% to be treated as a used container (stream "H") and 37.5% to be treated as waste.

- It is assumed that CH_TRU_TRUM waste processed in the M33 facility will undergo a 2.0:1 volume increase similar to other waste streams processed in the M33 facility.

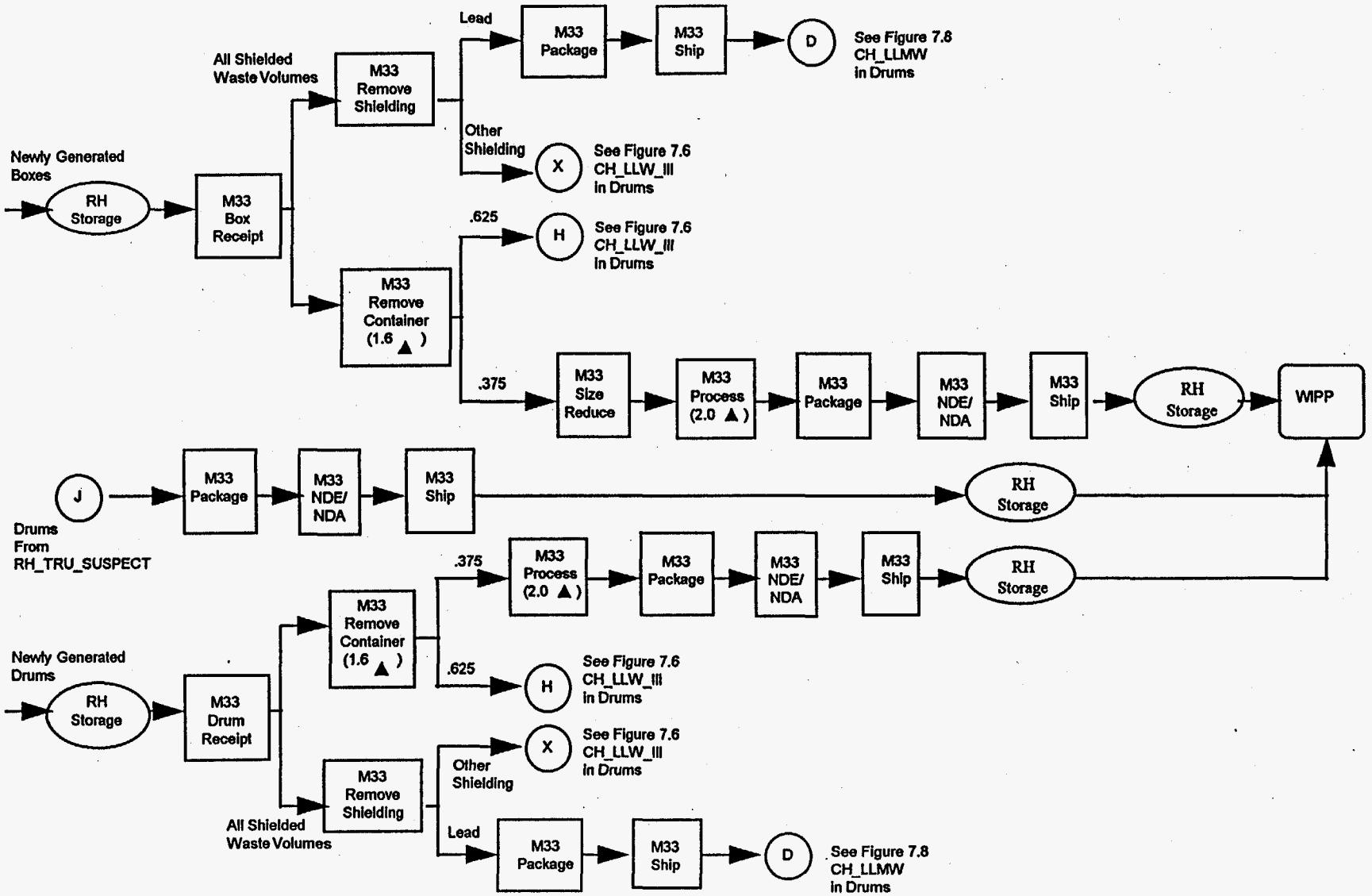

FIGURE 7.13 RH_TRU_TRUM

7.3.4 RH_TRU_TRUM

All RH_TRU_TRUM waste will be processed in the M33 facility (see Figure 7.13) in preparation for disposal at the WIPP. Drums and boxes are processed the same within the M33 facility, except that boxes are size-reduced prior to treatment.

Assumptions for Newly Generated Waste

- Once waste is received in the M33 facility, it is assumed that the shielding will be removed. Lead shielding will be routed as CH_LLMW (stream "D"), and other shielding will be routed as CH_LLW_III (stream "X").

- Waste routed to the M33 facility is assumed to have the container removed, creating a stream of CH_LLW_III. A 1.6:1 volume increase is assumed to account for packaging the used container. After the volume increase is applied, the stream is split allowing 62.5% to be treated as a used container (stream "H") and 37.5% to be treated as waste.

- It is assumed that CH_TRU_TRUM waste processed in the M33 facility will undergo a 2.0:1 volume increase similar to other waste streams processed in the M33 facility.

- After it is processed in the M33 facility, RH_TRU_SUSPECT waste will be reclassified as RH_TRU_TRUM and sent to the WIPP via storage (stream "J").

7.4 GREATER-THAN-CLASS III WASTE

All GTCIII waste volumes will be sent to LTS until disposal requirements have been defined and treatment to meet those requirements is available. See Figure 7.14.

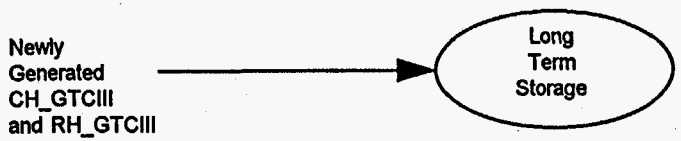

FIGURE 7.14 CH_GTCIII and RH_GTCIII

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