Department of Energy
Carlsbad Area Office
P. O. Box 3090
Carlsbad, New Mexico 88221

WIPP File

MAR 2 0 1995

Dear Colleague:

This letter identifies an error in the document entitled "Performance-Based Waste Acceptance Criteria Preliminary Baseline Assumptions" (DOE/CAO-941046) regarding a requirement for inclusion of rigid plastic liner in 55-gallon drums as mandated for Department of Transportation (DOT) 7A, Type A containers. The use of rigid liners is addressed in Section II. B. on page 14 of the final document dated October 24, 1994. The inclusion of rigid liners in not a requirement and therefore should not be interpreted as prohibiting the substitution of other materials.

Any future revisions or guidance pertaining to the Performance-Based Waste Acceptance Criteria Preliminary Baseline Assumptions will reflect this change.

Please replace page 14 in your document with the corrected page 14 enclosed with this letter.

If you have any questions please contact Mr. Don Watkins of my staff at (505)234-7478.

Mark L. Matthews

Mark L. Matthews, P.E.
Manager
National TRU Program Office

Enclosure

II. Reduction of Plastics

A. Bagless Posting

Bagless posting is a term used to describe the loading of waste containers without the use of smaller bagout bags that have been used throughout the DOE complex for most debris and heterogenous waste matrices. The bagless posting method includes physically attaching waste drums or containers to the glovebox process lines. This process permits loading wastes directly into the drum without the required individual bagout bags.

Each generator will evaluate the costs associated with implementation of the bagless posting method as a means to reduce waste generation and plastics in the final WIPP inventory. Although the quantity of plastics to be reduced may be minimal, this system should be evaluated to determine the amount of plastics which may be effected.

B. Replacement of Rigid Liners

Rigid 55-gallon plastic drum liners are currently widely used throughout the DOE complex for DOT 7A, Type A containers to protect the integrity of the drums and extend their storage life. Since there is no regulatory or health and safety requirement for the use of rigid liners, they could be replaced with another material in order to reduce plastics. This alternative will be evaluated to determine the cost and degree of plastic reduction associated with removal of the liners.

III. Reduction of Cellulosics

Cellulosic waste materials are not usually generated as a result of a specific process line. Therefore, reduction of these waste materials will be very difficult to quantify and measure. Reductions in the cellulosic inventory will be considered as a future waste generation requirement and costs of this reduction, which may require treatment, will be considered in the evaluation.

IV. Reduction of Rubbers

The reduction of rubber waste forms will be evaluated as a reduction in future generation practices. The cost and feasibility of this reduction will be determined through comparisons of treatment alternatives versus reduction of other waste forms which exhibit gas generation potentials.

Performance-Based Waste Acceptance Criteria Preliminary Baseline Assumptions

U.S. Department of Energy
Carlsbad Area Office
Carlsbad, New Mexico

October 24, 1994

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ACRONYMS AND ABBREVIATIONS

CAO	Carlsbad Area Office
CCDF	Complementary Cumulative Distribution Function
CFR	Code of Federal Regulations
D&D	Decontamination and Decommissioning
DOE	Department of Energy
DOT	Department of Transportation
EA	Engineered Alternatives
EATF	Engineered Alternative Task Force
ER	Environmental Restoration
NRC	Nuclear Regulatory Commission
PA	Performance Assessment
PBWAC	Performance-Based Waste Acceptance Criteria
RCRA	Resource Conservation and Recovery Act
SNL	Sandia National Laboratories
SPM	Systems Prioritization Method
SWB	Standard Waste Box
TRU	Transuranic
WAC	Waste Acceptance Criteria
WIPP	Waste Isolation Pilot Plant
WTWBIR	WIPP Transuranic Waste Baseline Inventory Report

Performance-
Based Waste Acceptance Criteria
Preliminary Baseline Assumptions

Background

The Department of Energy's (DOE's) strategy for the management of transuranic (TRU) and TRU mixed wastes has focused on the development of the Waste Isolation Pilot Plant (WIPP). The WIPP repository is designated to receive DOE defense wastes that meet the established criteria for acceptance. As a national strategy [DOE, 1993], DOE does not intend to treat candidate wastes unless treatment or processing are necessary to meet the safety, health, and regulatory criteria for transport and disposal at WIPP. The WIPP WAC has evolved over the past 10 years to include criteria and requirements in support of the Waste Characterization program and other related compliance programs. In aggregate, the final health, safety and regulatory criteria for the waste will be documented in the Disposal WAC.

The current WIPP WAC Revision 4.0 [DOE, 1991] is based primarily on transportation requirements [NUPAC, 1992], operational safety criteria as documented in the Final Safety Analysis Report [DOE, 1990], and requirements established by the Environmental Protection Agency's Office of Solid Waste, as documented in the Conditional WIPP No Migration Determination for the WIPP Test Phase. Long-term performance-based waste acceptance criteria (PBWAC) have not been applied to the WIPP inventory baseline that will be the foundation of the performance assessment (PA) required for permit applications [Sandia, 1992].

The Carlsbad Area Office (CAO), working through its scientific advisor, Sandia National Laboratories, has developed the Systems Prioritization Method (SPM) as a process for establishing priorities for current and proposed experimental activities, engineered alternatives, WAC, and other activities to ensure that compliance is demonstrated. PA models are the mechanism for a compliance demonstration, and the exercise of those PA models, by way of the SPM, will be used to determine which characteristics of the wastes are critical to support a long-term demonstration of compliance.

The SPM process will be used to identify the quantity of waste characteristics allowable in WIPP while minimizing treatment and processing requirements. Potential waste characteristics and selected alternatives identified through SPM will be represented in relevant regulatory submittals. The SPM process addresses these waste characteristics and determines the relationship of the total inventory with other repository systems. This is accomplished through application of a decision-tree approach to finding alternative pathways to meet compliance requirements. Decision trees provide a framework for identifying the combination of activities (e.g., experimental programs, engineered alternatives, and waste characteristics) that affect quantitative performance measures for the WIPP disposal system to maximize the likelihood of meeting the quantitative performance requirements. By evaluating variations in these waste characteristics, the SPM can determine the likelihood that alternative scenarios meet quantitative performance requirements of the disposal system.

Introduction

The purpose of this document is to identify the inventory characteristics and associated criteria to be evaluated by WIPP compliance programs for potential implementation at generator facilities. The inventory characteristics addressed in this document are preliminary. As SPM runs are completed, additional or modified characteristics may be identified that warrant analysis to determine impacts to disposal system performance. The specific objectives of this document include:

- Describing the Performance-Based approach to compliance as applied to the SPM.
- Identifying potential waste inventory characteristics for inclusion in the SPM process.
- Providing a mechanism for information exchange and recommendations from DOE generators sites and external stakeholder organizations regarding modifications to the WIPP inventory baseline and the feasibility thereof.

The alternative scenarios for evaluation through SPM will be designed to include review and comment by regulators sites, and participating stakeholder organizations. This interaction will provide a mechanism for including the concerns identified by stakeholder input for evaluation in the WIPP compliance program.

The WIPP disposal system consists of three major components that together support the total disposal system for isolation of waste for the established compliance period. The following components define the disposal system:

- The natural barriers within the disposal unit/controlled area.
- The engineered barriers including the underground facility.
- The waste inventory defined and categorized by physical and chemical characteristics.

The first component of the disposal system was addressed through the site selection process. The second component is defined by the results and data derived from the experimental programs along with potential applications as a result of the engineered alternatives study. This document addresses the third component, namely the characteristics of waste forms and packages that define the chemical and physical nature of the inventory of waste for disposal at WIPP. For purposes of the PBWAC, waste form modifications have not been considered in inventory alternatives. These modifications will be included in the SPM process through the engineered alternatives program.

The PBWAC concepts and the associated terminology can often be confusing to the reader. The following definitions will assist in understanding the objectives of this document.

Waste Characteristics. The waste parameters identified in the WIPP Transuranic Waste Baseline Inventory Report (WTWBIR) which are important for inclusion in performance assessment modeling. Table 1.0 includes a list of these characteristics.

Preliminary Baseline Assumptions. These assumptions are relative to the inventory of waste characteristics to be included in the SPM process. They will be included in long-term modeling beginning with the WIPP baseline as documented in the WTWBIR. Assumptions will also include variations to that baseline to address alternatives for determination of the most favorable inventory.

Disposal Waste Acceptance Criteria. The final restrictions or limitations on waste characteristics implemented to support compliance with all applicable regulatory and safety guidelines. These criteria will apply to the operational period of WIPP.

Figure 1 displays the relationship of these components with the SPM and PA models. The experimental programs identified by the three lower circles provide the data sets that support the performance evaluation. These experimental programs include the engineered systems such as seals and backfills, the natural host rock systems, and the waste system. The performance of these systems are included in the PA models, which as a function of SPM evaluate multiple variations of the disposal inventory and potential engineered alternatives. In consideration of the multiple variations, SPM will be used to identify the inventory of waste that can meet the disposal standards in a feasible manner.

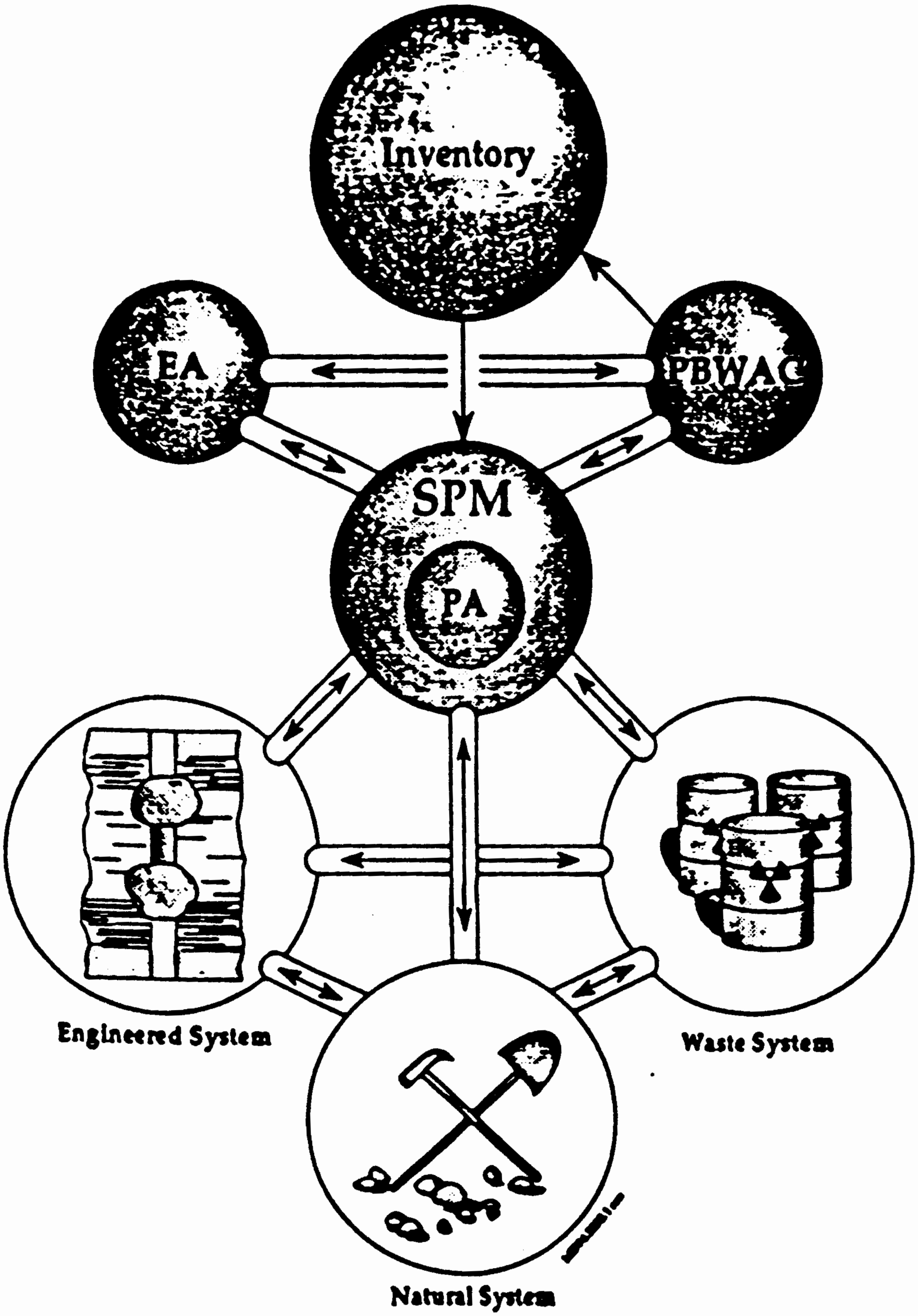


Figure 1. Relationship of the WIPP Systems Prioritization Method with Primary Components That Support a Compliance Determination

I. Performance-Based Approach to Compliance

The DOE strategy for demonstration of long-term compliance includes the implementation of WAC that incorporate minimal waste form restrictions while achieving the goal of demonstrating compliance. The performance-based approach will identify the alternative limitations or restrictions on waste forms or categories required to achieve compliance at WIPP. These restrictions will be determined through evaluations of waste characteristics (e.g., metals, cellulosics, plastics) that could affect the ability of WIPP to achieve compliance. Consequently, restrictions on the quantity of specific waste materials to be emplaced at WIPP may be required. The criteria that define the applicable restrictions for the acceptable inventory, determined through PA and SPM, are referred to as the PBWAC.

The PBWAC is not a stand-alone document to be implemented at DOE generator facilities but will be a subset of the final WAC. The PBWAC is a compliance approach to maximize the allowable inventory in WIPP while identifying the waste characteristics that must be restricted prior to receipt at WIPP.

The disposal WAC will include all the regulatory and programmatic requirements associated with the complete waste disposal system. The WAC will include applicable restrictions such as permit conditions for waste characterization and acceptance prior to shipment to WIPP for disposal. The final WAC will provide the basis for waste certification requirements necessary to certify the wastes for receipt at WIPP. Figure 2 displays the relationship of the three primary components that contribute criteria to the final WAC. These three components include the following:

- Facility safety and transportation system criteria that govern the transport, handling and emplacement aspects of the disposal process.

- Performance-based criteria as determined through the PA and SPM processes.

- Regulatory requirements, including 40 CFR 191, 264, and 268.6, are briefly described in the next section of this document. These general regulatory requirements will be implemented during the permitting process resulting in a final set of inputs to be defined in the final WAC.

Implementation of inventory management is an integrated function of these three sets of inventory discriminators. The basis for this management process, while implemented at individual generator sites, is established by the CAO through the WAC and disseminated through the CAO's National TRU Program Office.

There will be two fundamental applications of these potential restrictions to the WIPP waste inventory: (1) existing waste currently in storage at DOE generator facilities; and (2) future generated inventories.

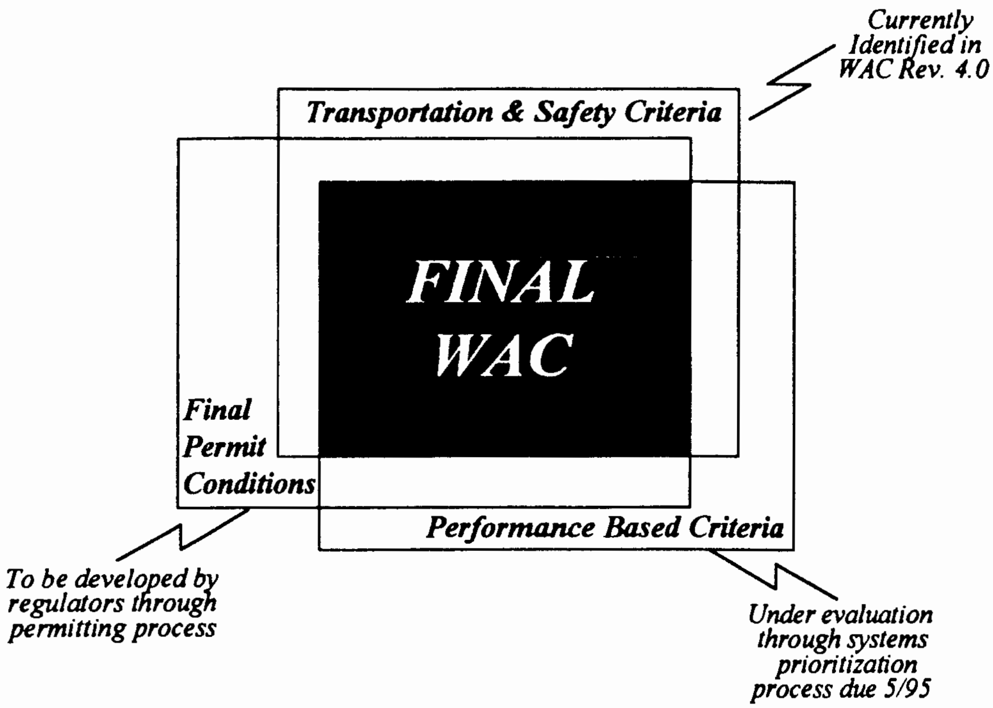


Figure 2. Components of the Final WIPP Waste Acceptance Criteria

Currently Stored Inventories

Application of the PBWAC to existing inventories will define the initial programmatic requirements necessary to implement the DOE's national strategy for TRU waste management. These requirements are based on the restrictions that must be implemented to meet the criteria established in the final WAC. Waste forms that do not meet these criteria may require treatment (engineered alternatives) or processing prior to WIPP certification. PBWAC are anticipated to be the least restrictive criteria applied to the currently stored inventory.

Future Inventories

The criteria defined by the results of the SPM and final permit conditions will provide waste generation and packaging guidance for the DOE complex. These criteria and restrictions will focus on waste management procedures and practices to minimize the characterization, treatment, and processing requirements that may be necessary to meet WIPP certification requirements. Future waste streams will be certified for acceptance at WIPP pursuant to the final WAC, which will include performance-based criteria.

II. Current Inventory Baseline Assumptions

The current inventory baseline assumptions are defined by the existing waste inventory along with waste generation projections through the WIPP operational period. The baseline is consistent with the national TRU strategy, which includes treatment only as necessary to meet WIPP WAC. The WIPP baseline assumes that a WIPP compliance demonstration can be achieved with the current inventory without modification of the waste forms beyond that required to meet Rev. 4.0 of the WIPP WAC. That is, the WIPP Transuranic Waste Baseline Inventory Report (WTWBIR), which describes the inventory of wastes currently in storage, will lead to a successful compliance demonstration [DOE, 1994]. The WTWBIR also includes estimates of 25 year inventory projections based on the Integrated Database in order to account for total inventory capacity. The WTWBIR has been developed from the best available information and process knowledge provided by the DOE TRU waste generator/storage facilities. Only preliminary data have been included regarding ongoing environmental restoration (ER) and decommissioning and decontamination (D&D) work at DOE facilities.

The WTWBIR describes the process for grouping individual waste streams with similar physical and chemical properties into waste profiles, based on the waste matrix codes assigned by the generator sites. Waste profiles with similar codes are then summed across the DOE complex to provide the estimated total volumes and total waste material parameters. The individual waste streams are also evaluated to estimate the occurrence values of waste material parameters (e.g., cellulosics, plastics, iron-based metals/alloys, etc.) that have been identified as being potentially important in the WIPP performance evaluation for compliance.

If the inventory described in the WTWBIR is demonstrated to enable the WIPP disposal systems to meet the compliance standards, the WAC would include a baseline envelope defined by the waste characteristics in the WTWBIR. However, if a waste characteristic is demonstrated to result in adverse impacts to the repository beyond compliance thresholds, that characteristic may require restriction or modification to within the envelope of acceptable quantities as identified through SPM or some other activity, such as an engineered alternative.

There are three primary regulations that govern the long-term disposal of TRU wastes for the WIPP Project. Compliance with these regulations includes the submission of a petition and permit applications to address the operational and long-term performance aspects of waste disposal at WIPP. These regulations include:

- ***40 CFR 191***—Environmental Radiation Protection Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level, and Transuranic Radioactive Wastes (Subparts B and C). This regulation requires the evaluation of the radionuclide inventory to determine the potential for releases through disturbed and undisturbed scenarios.

- ***40 CFR 268.6***—Under the Land Disposal Restrictions, a petitioner requesting exemption from the prohibitions of Subpart C must demonstrate that no migration of hazardous constituents from the disposal unit will occur as long as the wastes remain hazardous. This regulation requires waste analysis to describe the chemical and physical characteristics of the proposed inventory to be included in the petition.

- ***40 CFR 264***—The general waste analysis requirements of 40 CFR 264.13 govern the management of hazardous wastes with regard to the short-term or operational periods along with the post-closure period. In the case of WIPP, DOE anticipates that the inventory description supporting the compliance with 40 CFR 268 will address the requirements of this regulation.

The inventory to be included in the permit applications must quantitatively address the constituents regulated under the respective statutes. Therefore, the inventory descriptions must include the regulated characteristics and those characteristics that have the potential to directly affect the performance of the repository.

The WTWBIR includes an assessment of the waste characteristics important to long-term performance that will define the final WIPP inventory. Revision 0 of the WTWBIR does not provide the Resource Conservation and Recovery Act (RCRA) data necessary for operational or short-term compliance evaluations. The RCRA inventory will be documented in the permit applications. The RCRA source terms will be evaluated in release scenarios through the PA process. The WTWBIR inventory was derived primarily from three data bases including with supplemental information for specific waste streams. The currently stored inventory represents approximately one-third of the total disposal capacity of WIPP. The remaining inventory to be generated will include waste forms similar to those in the WTWBIR and may contain an increase in DOE ER- and D&D-type waste streams. As additional data become available concerning the future D&D and ER programs, the WTWBIR will be updated.

III. Alternative Inventory Variations in the SPM Process

The SPM process provides a rational approach to evaluating proposals for activities and developing alternative strategies related to a demonstration of compliance. These activities include gathering information regarding engineered alternatives, experimental programs, and waste data to support development of the final WIPP WAC. The output of SPM provides the basis for decision making with respect to the programmatic approach to a compliance demonstration, given that certain activities are undertaken, and the feasibility in terms of costs in time and dollars necessary for implementation is evaluated. Decision analysis provides a logical approach to developing this information and presenting it in a form that aids in determination of the most favorable option.

The SPM process includes performance measures that can be compared to regulatory requirements. One such measure is a complementary cumulative distribution function (CCDF) that represents the probability distribution of releases to the accessible environment [Hora, 1994]. In Figure 3, such a CCDF is shown relative to the 40 CFR 191 quantitative containment requirements. Any CCDF that contacts or crosses the limits for containment would represent a non-compliant result. If the compliance CCDF is plotted below the regulatory CCDF, as indicated in Figure 3, WIPP will have demonstrated compliance with this regulation (40 CFR 191) pursuant to the performance criteria.

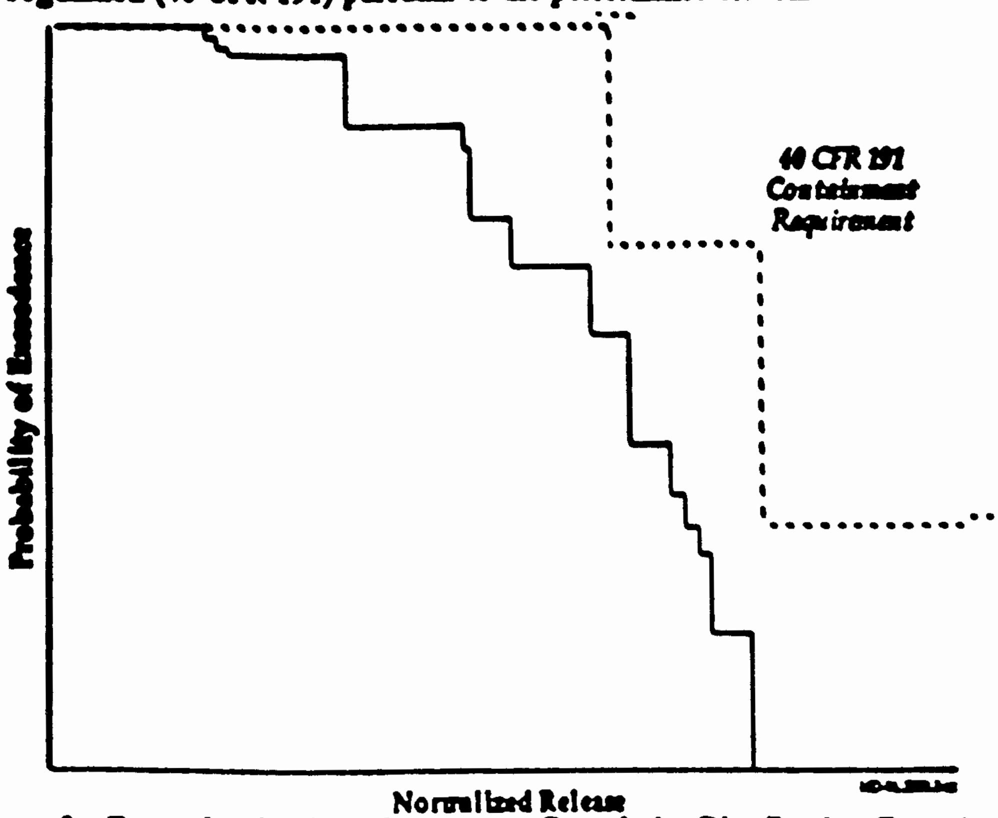


Figure 3. Example of a Complementary Cumulative Distribution Function and the 40 CFR 191 Containment Requirements.

While the regulatory limit is fixed by statute, the PAs CCDF's position is determined through evaluation of data and information regarding WIPP processes and behavior. Changing our state of knowledge through data acquisition or modification of the WIPP disposal systems or WAC can move the CCDF either left or right. An increase in an inventory characteristic (e.g., corrodible metals), which may adversely impact the repository through gas generation, could potentially move the WIPP compliance line closer to the statute thresholds. However, a decrease in corrodible metal content would realize a greater certainty of compliance with this regulation.

The SPM process will evaluate multiple proposed activities, such as experiments and variations in the inventory, in order to assess the combined effects of these activity sets on repository performance. The effects of implementing several activities cannot be judged from individual effects alone. Instead, an integrated evaluation must be conducted.

Alternative variations in the total waste inventory will be assessed in the SPM. Implementation of a waste management system designed to optimize repository performance will include a focus on individual waste constituents within that total inventory. This information will feed directly into a waste stream specific plan for waste emplacement.

Such a load management plan will be the mechanism for DOE to control wastes generated and packaged for evaluation of acceptability and shipment to WIPP. The inventory will be limited to a specified quantity of waste with each critical characteristic based on the total allowable WIPP inventory. Each facility will control the waste generating processes to ensure that parametric restrictions on waste characteristics are consistent with the guidance in the final WAC. WIPP will be responsible for monitoring and approving the associated certification processes to ensure that load management objectives are consistent with shipping schedules and criteria. A Load Management System Program Plan will describe the procedures and support programs to be implemented to control the inventory to be disposed of at WIPP.

The load management system may be simplified if SPM determines only minimal restrictions on physical waste characteristics are required to achieve compliance. However, if several parameters are identified as requiring control, a schedule for shipping will be necessary to blend the restricted characteristics with other wastes using load management principles. The scope of this system will not be entirely known until final PA modeling is complete.

Potential Inventory Alternatives

To initiate formulation of a PBWAC, SPM activity sets must be designed to include waste characteristics that impact the compliance measure (CCDF). Thus, waste characteristics that represent input variables to the PA models are the key characteristics for PBWAC. If compliance is not demonstrated using the inventory as defined in the baseline (WTWBIR), alternative inventories will be evaluated through SPM. The activity sets will be developed based on existing data in the WTWBIR as baseline input that will be augmented with values less than the total inventory (e.g., 0–10%, 0–20%, 0–30%, ..., etc.) of that characteristic. The decision analysis will be used to identify the optimum inventory in terms of the waste characteristics. Ultimately, the acceptable inventory will be defined by iterations of the SPM process.

There are three primary considerations that must apply to the characteristics before evaluation in the SPM process. These include the following:

- All inventory characteristics must be measurable by the generator facilities to allow load management and WAC certifications to be feasible.

- The inventory characteristics must be controllable by the generator facilities and remain consistent with WIPP programmatic objectives for receipt of TRU wastes from DOE defense activities.

- The inventory characteristics must be associated with waste streams defined by the waste generators in order to effectively implement restrictions identified through the SPM process.

Table 1.0 (DOE, 1994) displays the waste material parameters or characteristics that will be included in performance modeling for WIPP. Notice all eleven parameters are required to address mechanical characteristics, but only four parameters are needed to assess the majority of gas generation potentials. These four parameters will be the focus of the potential alternatives which may be necessary for limitation.

Waste/Container Material Parameter	**Input Variable in Current**	
	Gas Generation	**Mechanical Characteristics**
Iron-Based Metals/Alloys	YES	YES
Aluminum-Based Metals/Alloys		YES
Other Metals		YES
Other Inorganic Material		YES
Celluosics	YES	YES
Plastics	YES	YES
Rubber	YES	YES
Solidified Inorganic Matrix		YES
Solidified Organic Matrix		YES
Soils*		YES
Packaging Materials	YES	YES

Table 1.0 Waste material parameters or characteristics to be included in performance assessment modeling as identified in the WTWBIR.

* Identified as also contributing to colloidal generation to be evaluated through SPM.

The SPM process will evaluate the iron-based metals, cellulosics, plastics, and rubber based on the gas generation potentials inherent in these waste characteristics. These characteristics will be varied to evaluate the impacts to the repository as an alternative to reducing gas generation. To evaluate the feasibility of the alternative, cost estimates will be included to assist the decision process. The costs associated with reducing these parameters will be assessed by CAO through coordination with the generator facilities. This input will be used to weigh the impacts of implementation as an alternative to treatment or applicable repository modification (e.g. engineered alternatives).

I. Metal Reduction

The reduction of iron-based metals due to corrosion can significantly impact the performance of the repository due to gas generation. Gas generation from corrosion can be controlled through limitations of the actual metal wastes or the restrictions on the WIPP support systems that contribute to the generation processes. The following restrictions on corrodible metals will reduce the gas generation potentials, and are expected to provide greater certainty of a compliance demonstration.

A. Replacement of Steel Drums and Standard Waste Boxes (SWBs)

The quantity of corrodible steel to be emplaced in WIPP can be substantially reduced by replacing the currently used steel drums and SWBs with alternative, non-ferrous materials. Developing an alternative container requires significant time for design, pilot development, testing to Department of Transportation (DOT) standards, regulatory authorization by the Nuclear Regulatory Commission (NRC), production development, and implementation at the generator facilities. The CAO will work with the generator facilities to develop the design specifications in consideration of the handling and site-relevant issues pertaining to the proposed changes in containers.

In 1991, the Engineered Alternative Task Force (EATF) evaluated the advantages and impacts of implementing alternative, non-ferrous TRU waste containers. Five classes of materials were evaluated, including metals, ceramics, cements, coatings, and polymers. The EATF concluded that there are non-ferrous materials that could be used in developing a container that will meet DOT and WIPP requirements, thus reducing the gas generation due to corrosion. Implementation of an alternative container could expect to take up to 4-8 years depending on the material chosen. The CAO will evaluate the costs and impacts associated with implementation of an alternative container. Impact assessment will include a determination of the reduction in numbers of drums to be used given an estimated generation rate through 2018. The amount of corrodible metals will be quantified by the assumptions regarding date of implementation. For example, initiation of the alternative container by 2002 would result in a reduction of a specific number of drums given a constant generation rate. A cost variance would be associated with this alternative to support the decision analysis by DOE. Cost impacts to a generator will not include the difference in cost of the actual containers but the costs associated with implementation of an alternative. Container costs will be assessed by CAO following evaluation and selection of alternative materials.

B. Reduction of Metal Containing Wastes Acceptable at WIPP

The WTWBIR assumes that the metal inventory to be received at WIPP includes the total corrodible metals currently in storage, along with projected inventories over the next 25 years. The inventory is then scaled to attain the total WIPP capacity of 6.2 million cubic feet. Given this assumed generation rate, the WIPP Project can evaluate the impacts of gas generation by reducing metal inventory through application of acceptance restrictions for metal containing wastes. Inventory variations of the actual metal wastes may not be among the priorities for mitigative actions for reduction of metals. However, the cost and impacts of such an alternative must be considered for inclusion in SPM models. The CAO will evaluate the best available information to assess the amount of metals that can be reduced due to waste minimization, low-level waste classifications, or potential engineered alternatives.

C. Reduction of Corrodible Metal Support Systems in the WIPP Repository

The WIPP repository and its support systems currently include a significant amount of metals necessary to conduct disposal operations. The CAO will review current operational procedures and evaluate applicable support systems for implementation of alternative materials and procedures for disposal.

Current operating procedures include waste handling with 7-packs of drums which may contain drums that are empty due to TRUPACT-II shipping requirements. The CAO will evaluate the feasibility and cost associated with removal of these empty drums in support of metal reduction in the repository. WIPP will also assess the quantity of metals to remain in the repository following disposal due to contamination or facility support. The equipment anticipated to be disposed of in WIPP will be documented to ensure the quantity of metals are included in SPM modeling.

D. Reduction of Metals as Required to Support the Remote-Handled Waste Program

The current strategy for RH-TRU waste emplacement includes the use of a ferrous-based shield plug to protect workers from potential post-disposal radiation exposures. The shield plugs, each weighing 4215 lbs (1911 kg), will be emplaced following the RH canister in each of the 7,954 horizontal boreholes located in the walls of each room. The amount of corrodible steel could be substantially reduced by developing an alternative non-ferrous shield plug for each of these boreholes. Alternative shield plugs would require design, development, and testing by the CAO prior to implementation into the operating procedures for RH waste disposal.

II. Reduction of Plastics

A. Bagless Posting

Bagless posting is a term used to describe the loading of waste containers without the use of smaller bagout bags that have been used throughout the DOE complex for most debris and heterogenous waste matrices. The bagless posting method includes physically attaching waste drums or containers to the glovebox process lines. This process permits loading wastes directly into the drum without the required individual bagout bags.

Each generator will evaluate the costs associated with implementation of the bagless posting method as a means to reduce waste generation and plastics in the final WIPP inventory. Although the quantity of plastics to be reduced may be minimal, this system should be evaluated to determine the amount of plastics which may be effected.

B. Replacement of Rigid Liners

Rigid 55-gallon drum liners are currently requirement for inclusion into DOT 7A, Type A containers. The requirement for use of these liners stemmed from the criteria to ensure that the waste drums were retrievable for up to 20 years while in storage. Modification of this criteria would require configuration changes currently applied to the TRUPACT-II and site packaging documentation. This alternative will be evaluated to determine the cost and degree of plastic reduction associated with changing procedures and standards for eliminating use of the rigid liner.

III. Reduction of Cellulosics

Cellulosic waste materials are not usually generated as a result of a specific process line. Therefore, reduction of these waste materials will be very difficult to quantify and measure. Reductions in the cellulosic inventory will be considered as a future waste generation requirement and costs of this reduction, which may require treatment, will be considered in the evaluation.

IV. Reduction of Rubbers

The reduction of rubber waste forms will be evaluated as a reduction in future generation practices. The cost and feasibility of this reduction will be determined through comparisons of treatment alternatives versus reduction of other waste forms which exhibit gas generation potentials.

Summary

The potential variations identified in this document will represent the changes in the inventory characteristics that may be necessary for a compliance demonstration. First order cost estimates will be developed to accompany each variation to assess the feasibility of each option. Additional variations may be necessary to further address these characteristics or to add other waste matrices that have been identified as adversely impacting repository performance.

References

Hora, Stephen C., 1994, "Decision Analysis with the Systems Prioritization Process," University of Hawaii at Hilo.

NUPAC, 1992, "Safety Analysis Report for the TRUPACT-II Shipping Package (SARP)," Docket No. 71-9218, Revision 9.

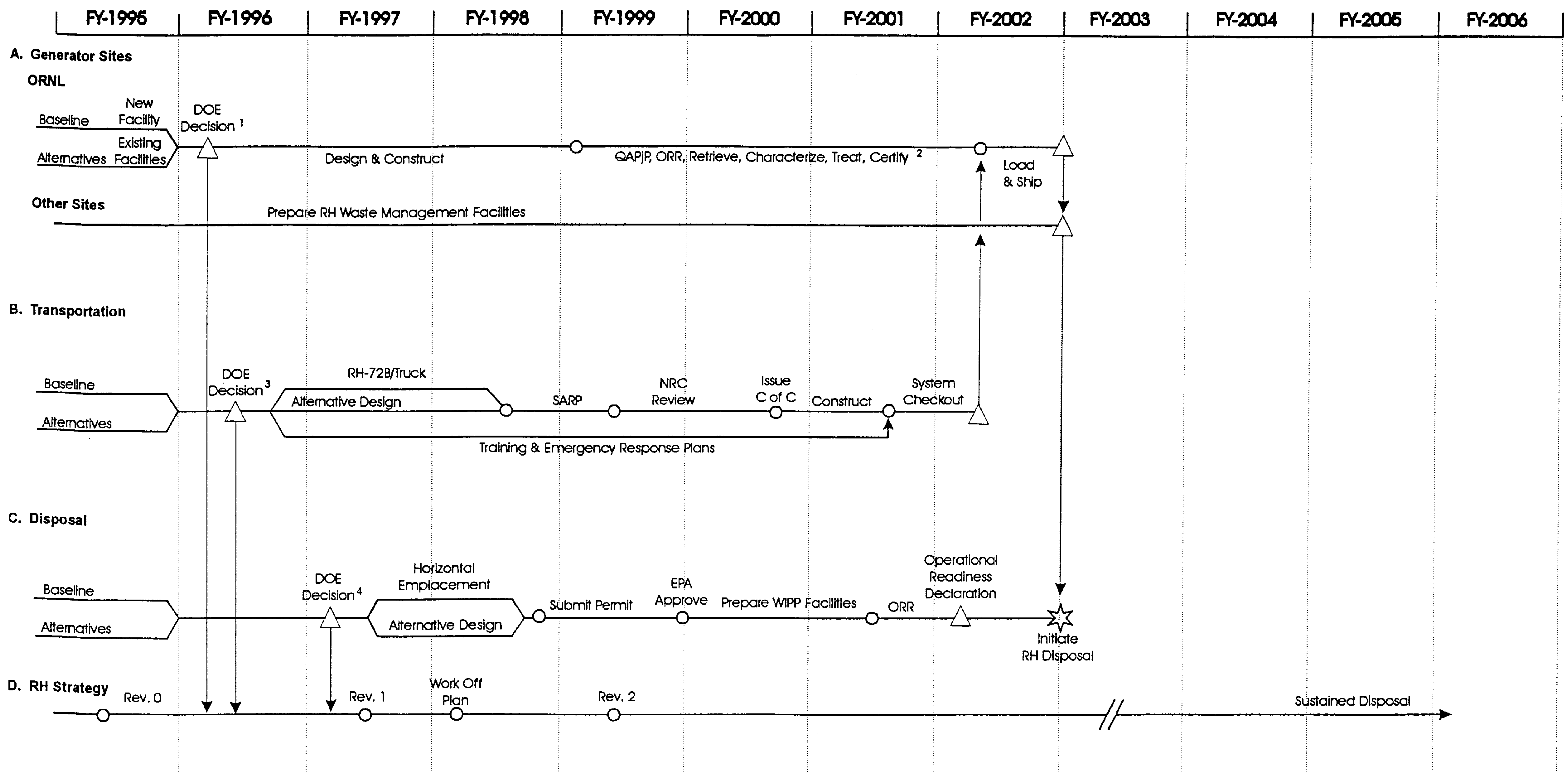
Sandia, 1992, "Preliminary Performance Assessment for the Waste Isolation Pilot Plant, December 1992 Volume I: Third Comparison with 40 CFR 191, Subpart B," SAND92-0700/1, Sandia National Laboratories, Albuquerque, New Mexico, December.

DOE, 1990, "Final Safety Analysis Report, Waste Isolation Pilot Plant, Carlsbad, New Mexico, WP02-9, Revision 0, Westinghouse Waste Isolation Division, May.

U.S. Department of Energy, 1991, "Waste Acceptance Criteria for the Waste Isolation Pilot Plant," WIPP/DOE-069, Revision 4.0, December.

U.S. Department of Energy, 1993, "U.S. Department of Energy Interim Mixed Waste Inventory Report: Waste Streams, Treatment Capacities and Technologies, 6 Volumes," DOE/NBM-1100, April.

U.S. Department of Energy, 1994, "Waste Isolation Pilot Plant Transuranic Waste Baseline Inventory Report," CAO-94-1005, Revision 0, June



Notes 1. According to the DOE's "Overview of Proposed Site Treatment Plans," the new TRU Processing Facility is not scheduled to be on line until after 2015, but strategy for initial disposal is designed to ensure waste availability by 2002.
2. Several waste management operations must be completed during this time frame; some of the activities run in parallel.
3. The DOE decision on transportation may be the baseline and/or the alternative.
4. The DOE decision for disposal configuration may be the baseline and/or the alternative.

Figure 1. Schedule for Initial Disposal of RH-TRU Waste

specific facilities and needed modifications, schedules for upgrades and construction, and funding requirements. With these results, the DOE will determine in Fiscal Year 1996 whether the existing facilities at Oak Ridge National Laboratory can provide sufficient certified waste in a cost-effective manner to initiate disposal in Fiscal Year 2002 (Figure 1).

In addition, DOE's strategy is to ship waste from Los Alamos National Laboratory, and possibly the Idaho National Engineering Laboratory, during the period prior to full operations. At Los Alamos National Laboratory 16 canisters (about 16 cubic meters) have been loaded and partially characterized. Los Alamos National Laboratory also has prepared a hot cell facility (Wing 9), which will process an additional 70 canisters (about 64 cubic meters) of RH-TRU waste. At the present time Idaho National Engineering Laboratory is evaluating alternatives for RH-TRU waste packaging and certification and may be able to prepare a few canisters of RH-TRU waste using hot cell facilities at Argonne National Laboratory-West or elsewhere at Idaho National Engineering Laboratory.

Therefore, should DOE decide that a new TRU Processing Facility, rather than existing facilities, is necessary at Oak Ridge National Laboratory, the goal of initial disposal will be met by disposing of waste from Los Alamos National Laboratory and Idaho National Engineering Laboratory.

3.2 Transportation System

The DOE's strategy includes the evaluation of alternative packagings and modes of transport, and the selection of the preferred approach for initial disposal (Figure 1). The DOE recognizes that the design and fabrication of a single packaging capable of transporting all RH-TRU waste is relatively cost intensive. More cost-effective options that could transport portions of the inventory may be available or may be developed. Thus, in recognition of a wide array of wastes in the inventory and the need for cost-effectiveness, DOE has initiated an alternatives study in preparation for initial disposal. The goal is to develop a system that ensures the safe, economical, and efficient delivery of RH-TRU waste to WIPP.

Alternative packagings that will be evaluated include:

- Shielded containers with unshielded packaging.
- Unshielded containers with shielded packaging.

Alternatives in the first category require remote-handling capabilities. Several commercially available casks have been identified that could be used to ship RH-TRU waste to WIPP. The GE 2000, a shielded cask with a volume slightly larger than a 55-gallon drum, and the B3 cask that holds one 55-gallon drum are two of the specific alternatives being considered.

Alternatives in the second category would allow the disposal of RH-TRU waste as if it were CH-TRU waste. Once the waste is shielded to an external dose rate of less than 200 millirem, it is considered as CH-TRU waste at WIPP. Using drums shielded with steel or depleted uranium, for example, waste could be transported to WIPP in TRUPACT-IIs or other Type B containers.

In addition to packaging, the mode of transporting the package provides other possibly cost-effective alternatives. Specific alternatives to the baseline that will be evaluated include: (1) maximum rail transport, with truck from sites where rail is not available (Los Alamos National Laboratory); (2) rail transport from large-quantity generators (Oak Ridge National Laboratory, Hanford Site) and truck transport from small-quantity generators; (3) combined RH- and CH-TRU waste shipments by rail; and (4) initial truck transport, changing to rail transport when sustained disposal is reached.

Three criteria will be used to evaluate transportation system alternatives:

- **Risk**. Alternatives will be compared to the baseline risk of using the RH-72B, with truck transportation. For packaging alternatives, risk will consider technical, regulatory, and environment, safety, and health impacts.

- **Throughput rate and volume disposed**. Alternatives will be first compared against increasing the probability of meeting the waste work-off plan for initial disposal. Second, the alternatives will be evaluated for their ability to increase flexibility to accommodate the work-off plan or improve the interface with CH-TRU waste disposal. Third, the total volume of RH-TRU waste disposed, given the transportation system alternatives, will be assessed.

- **Cost**. The cost of the transportation fleet, plus the cost of the shipping hardware will be estimated and compared to the baseline transportation system. Hardware includes the container, packaging, and trailer, if required.

Following DOE's selection of the preferred packaging and mode of transportation, specific transportation routes will be confirmed. Loading and packaging facilities at the generator/storage sites will also be identified. Emergency response systems for personnel and local community response teams for the corridors will be developed, and training conducted for the corridor routes.

3.3 WIPP Disposal System

The DOE's strategy for initial disposal is to conduct an alternative disposal configuration assessment to ensure that the maximum amount of RH-TRU waste will be disposed of during the operating lifetime of WIPP (Figure 1).

The disposal of CH-TRU waste will begin in Fiscal Year 1998, and initial disposal of RH-TRU waste is scheduled for Fiscal Year 2002. Since the disposal technical baseline specifies the emplacement of RH-TRU waste canisters into the walls of each room before the emplacement of CH-TRU waste, the four-year lag in the first shipment of RH-TRU waste relative to CH-TRU waste may diminish the overall RH-TRU waste capacity of the repository (by about 500 cubic meters [17,700 cubic feet]). Thus, alternatives in repository design and operations are being considered so that the waste volumes allowed under the WIPP Land Withdrawal Act can be achieved. The goals of the alternatives evaluation also are to reduce the life-cycle cost of RH-TRU waste disposal, reduce the impacts to CH-TRU waste throughput rates, and reduce the impacts to the generator/storage sites, without sacrificing safety and regulatory requirements.

Two variables dictate disposal system designs -- disposal configuration and disposal packaging. Variations to the baseline disposal configuration of emplacing canisters in horizontal boreholes in the room walls are being considered and include:

- Emplace shielded RH-TRU waste packages in the CH-TRU waste stack;
- Emplace packages in vertical boreholes in the floors of the rooms;
- Emplace multiple packages in horizontal or vertical boreholes;
- Emplace packages in trenches that have been mined in the floors; and
- Modify the baseline repository layout and place packages in newly mined rooms, panels, drifts, and/or horizons.

Three alternatives to the disposal packaging are being considered: (1) unshielded Type A packaging (30- or 55-gallon drums, Standard Waste Boxes, or ten-drum overpacks); (2) shielded Type A packaging that is similar to a CH-TRU waste Type A packaging; and (3) newly designed Type A packaging that would be compatible with the baseline (or modified) disposal system.

The disposal configuration and packaging alternatives will be jointly evaluated against three criteria:

- **Risk**. This criterion will rate each alternative against the WIPP Final Safety Analysis Report baseline accident scenarios in the areas of personnel and industrial safety, environmental safety and public health, and as-low-as-reasonably-achievable considerations.
- **Throughput rates and volume disposed**. This criterion will assess how alternatives would impact mining operations, CH- and RH-TRU waste throughput rates and ultimate volumes disposed, support system operations,

facility and equipment maintenance functions, and the effect on generator/storage sites.

- **Cost**. Each alternative will be considered against the costs associated with new facilities or modifications, startup costs, and system operation and maintenance.

Following this initial evaluation of disposal configuration and packaging, DOE will initiate an engineering study of one or two of these alternatives to enhance, simplify, or replace the current baseline system.

Following modification of the baseline, DOE's strategy is to undertake and complete activities related to RH-TRU waste operations that will ensure that the disposal system is prepared for initial waste receipt and emplacement (Figure 1). Disposal system activities include re-establishment of the WIPP RH-TRU facilities and equipment, training and certification of RH-TRU operations personnel, and completion of the RH-TRU waste permit modifications and operational readiness review. These activities are necessary as the RH-TRU waste facilities, systems, and start-up activities were halted before completion in 1989. The RH-TRU waste handling system now requires completion, repairs, and upgrading to initiate the start-up program.

3.4 Revision to the Strategy

The evaluation of alternatives to the current baseline will result in a series of decisions by DOE. These decisions include: (1) selection of existing facilities at Oak Ridge National Laboratory or new facilities to package and certify waste; (2) selection of the optimal packaging and mode of transportation; and (3) selection of an optimal disposal configuration to ensure that the allowable limits of RH-TRU waste can be disposed of. These decisions, which are key milestones to reach initial disposal, are shown on Figure 1. As these decisions are made, DOE also will update this RH-TRU waste disposal strategy document.

4.0 STRATEGY FOR SUSTAINED DISPOSAL

In addition to the strategy for initial disposal, a long-term strategy is being developed to provide a systemwide planning approach that will ensure efficient and sustained disposal of RH-TRU waste. The strategy is based on an iterative planning approach that allows DOE to objectively re-examine previous RH-TRU waste management decisions using new information, thus providing a flexible mechanism to accommodate changes in the system. The strategy is systemwide in that it is designed to consider each of the relevant systems: (1) the waste management system at the generator/storage sites, (2) the transportation system, and (3) the WIPP disposal system. The strategy is efficient and sustained in that it will evaluate the system components against criteria to improve system performance (for example, alternative disposal configurations or total life-cycle system costs) and will consider system components together (for example, compatibility of alternative RH-TRU waste packaging with waste handling equipment at WIPP). The overall sustained disposal strategy is depicted graphically as a logic network on Figure 2. Each system strategy (labelled A, B and C on Figure 2) is discussed in Appendix A and illustrated on Figures A-1 through A-3. Appendix A elaborates on the overall strategic approach within each system, providing (1) an overview of how the specific system process works; (2) a review of how the efficiency of the system is considered and of the key features of the system strategy; and (3) general and system-specific criteria that will be used in the decisionmaking process.

The strategy for sustained disposal requires an understanding of the RH-TRU waste inventory, disposal technical baseline, and resultant waste work-off plan (see Section 2). Using these basic elements, the overall strategic decisionmaking process is to:

- Assess whether the waste management plans at the generator/storage sites can accommodate the transportation system, the disposal technical baseline and the waste work-off plan, and whether improvement in these plans (or their facility operations) can be realized.

- Assess whether the transportation system can accommodate the disposal technical baseline and the waste work-off plan, and whether improvements in the transportation system can be identified and implemented.

- Assess whether the WIPP disposal system can accommodate the disposal technical baseline and the waste work-off plan, and whether improvements in the disposal system can be identified and implemented.

- Modify the disposal technical baseline and/or the waste work-off plan when they cannot be accommodated by, or when improvements can be implemented in, the site waste management, transportation, and disposal systems.

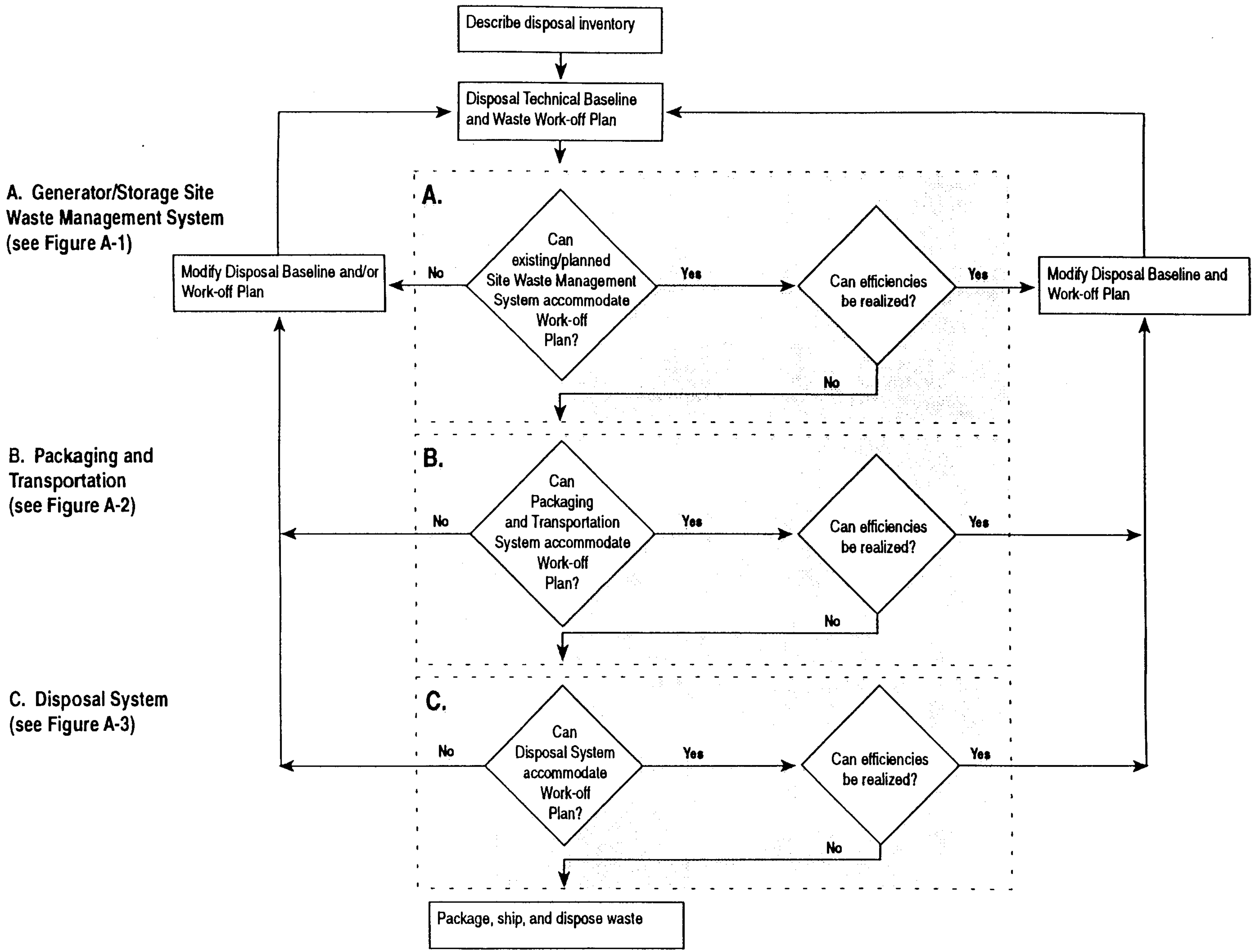


Figure 2. WIPP RH-TRU Waste Disposal Strategy

The assessment of the overall system will be an iterative, ongoing improvement process that will be conducted throughout the operating life of WIPP. The results of the assessments will be evaluated using three principal criteria: risk, cost, and TRU waste throughput and volume disposed, including ability to accommodate fluctuations in demands of the transportation system and the generator/storage site waste management system (Table 2).

The assessments will be conducted systemwide. For example, if the outcome of the assessment for transportation results in an improvement (efficiency), a modification will need to be made to the disposal technical baseline and waste work-off plan, and all system components will be reassessed. This value-engineering (i.e., improvement) process will ensure that disposal will be sustained through the life of the facility.

Table 2. Criteria Applicable to the System Efficiencies Assessment

Risk	- Reduction in system component risk - Reduction in environment, safety & health risk
Cost	- Decrease in total system costs - Change in cost to meet annual budget requirement - Change in spending rate to meet long-range spending goals
Throughput and Volume Disposed	- Change to meet WIPP disposal system demands - Change to meet transportation system demands - Change to meet generator/storage site system demands

5.0 IMPLEMENTATION OF THE STRATEGY

The DOE already has implemented portions of the strategy for initial disposal. Studies are underway at Oak Ridge National Laboratory to determine whether it would be cost- and schedule-effective to use modified existing facilities to certify and package RH-TRU waste for initial disposal. The transportation system alternatives and alternatives for emplacing waste are under evaluation. These latter two evaluations are intended to reduce total life-cycle system cost, reduce risk to the public and workers from exposures, and ensure that throughput rates are met and the volume of RH-TRU waste disposed is maximized to allowable limits.

In response to these studies, in Fiscal Years 1996 and 1997 DOE will (1) decide whether existing facilities at Oak Ridge National Laboratory or new facilities to package and certify waste are necessary; (2) select the optimal packaging and mode of transportation for initial disposal; and (3) select an optimal disposal configuration to ensure that the allowable limits of RH-TRU waste can be disposed. These decisions will be used to identify funding requirements for the three primary systems and schedules for implementation. As these decisions are made, DOE will update this dynamic RH-TRU waste disposal strategy document.

Following the implementation of decisions for initial disposal, DOE will implement the strategy for sustained disposal by initiating assessments of the generator/storage site waste management, transportation, and WIPP disposal systems.

6.0 REFERENCES

DOE (U.S. Department of Energy), 1991. *TRU Waste Acceptance Criteria for the Waste Isolation Pilot Plant*, WIPP-DOE-069, Rev. 4, Carlsbad, NM.

DOE, 1994, *WIPP Regulatory Compliance Strategy and Management Plan for Demonstrating Compliance to Long-Term Disposal Standards*, DOE/CAO-94-2003, Carlsbad, NM.

DOE (U.S. Department of Energy), 1995, *U.S. Department of Energy Waste Isolation Pilot Plant Transuranic Waste Baseline Inventory Report*, DOE/CAO-94-1005, Rev. 1, Carlsbad, NM.

DOE (U.S. Department of Energy) and State of New Mexico, 1987. *Second Modification to the July 1, 1981, Agreement for Consultation and Cooperation on the WIPP.*

Lippis, J., 1994. Carlsbad Area Office internal correspondence related to site surveys.

Westinghouse Waste Isolation Division, 1994. *Waste Isolation Pilot Plant CH-TRU Waste Handling System Computer Simulation Study*, Carlsbad, NM.

Federal Facility Compliance Act of 1992, Public Law 102-386.

WIPP Land Withdrawal Act, Public Law 102-579.

40 CFR Part 191, *Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level, and Transuranic Radioactive Waste.*

40 CFR Part 194, "Draft Criteria for the Certification and Determination of the Waste Isolation Pilot Plant's Compliance with Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level, and Transuranic Radioactive Wastes."

40 CFR Part 264, *Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities.*

40 CFR Part 268, *Land Disposal Restrictions.*

APPENDIX A

SUSTAINED DISPOSAL DECISION PROCESS

A.1 Generator/Storage Site Waste Management System Decision Process

The DOE's strategy for the management of RH-TRU waste at the generator/storage sites is to assess whether the sites' waste management systems can accommodate the baseline-derived work-off plan, or whether improvements to the components can be realized (Figure A-1). This assessment can have three outcomes: (1) the sites' waste management systems are efficient and the disposal technical baseline and waste work-off plan are acceptable (outcome A.1 on Figure A-1); (2) the sites' waste management systems cannot meet the demands of the work-off plan and requirements, and modifications to either the baseline or the work-off plan are necessary (path A.3 through A.17 on Figure A-1); or (3) the sites' facilities systems are inefficient, modifications are worthwhile, and the baseline will be modified (path A.18 through A.28 on Figure A-1). This generator/storage site waste management system strategy is an ongoing and iterative process that will be conducted throughout the operating life of WIPP.

The first outcome of the assessment process causes no change to the generator/storage sites' waste management systems; the disposal technical baseline and work-off plan are accepted (A.1 on Figure A-1), leading to similar assessments of the transportation system (Figure A-2 in Section A.2). For the second and third outcomes, detailed assessments of the five primary components of the sites' waste management systems are undertaken and will result in a modification to the disposal technical baseline and/or the waste work-off plan. The five primary components are the RH-TRU waste inventory, RH-TRU waste storage facilities, characterization facilities, other waste handling facilities, and regulatory aspects. These detailed assessments of components will require the identification and ranking of alternatives, the selection of an alternative, and the initiation of activities (or regulatory modifications) leading to the design and implementation of the selected alternative. Although the detailed assessments resulting from the second and third outcomes are similar, the criteria used to conduct each assessment are different. For outcome two, the criteria simply consider whether the components of the sites' waste management systems can meet the demands imposed by the work-off plan (for example, 350 certified canisters of RH-TRU waste per year). For outcome three, however, the efficiencies of the sites' waste management systems are judged by the three basic criteria presented in Table 2 in Section 4.

The inventory component (A.3 and A.18 on Figure A-1) includes the waste forms, waste quantities, and documentation of all existing and projected future RH-TRU waste of each of the DOE generator/storage sites. Much of this information is included in the *WIPP Baseline Inventory Report* (DOE, 1995). The assessment of waste forms involves consideration of the current chemical and physical properties of the particular waste stream, the reasons for

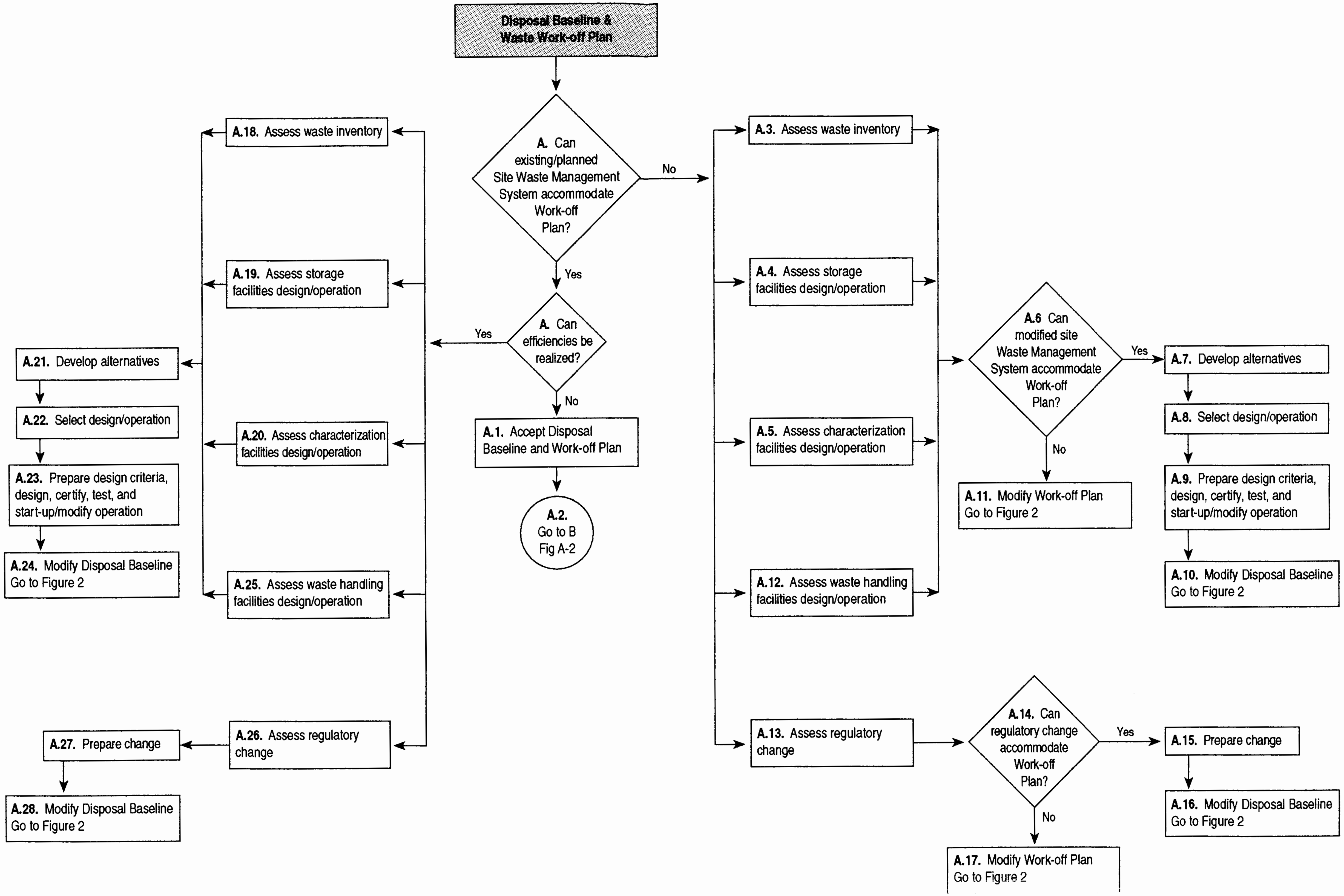


Figure A-1. Generator/Storage Site Waste Management System Decision Process its incompatibility with the packaging, transportation, and disposal systems, and what processes might be developed and applied to change the chemical or physical properties as appropriate to assure compatibility. If, for example, it is determined that a particular waste stream is not compatible with the waste acceptance criteria because it is liquid, then a facility to solidify the waste would be needed and plans for its development would be prepared.

Each generator/storage site that plans to ship RH-TRU waste to WIPP will need to provide adequate storage facilities for the current and projected inventory. The required capacity of each storage facility may change as the WIPP work-off plan changes. RH-TRU waste characterization is required at each site to support waste handling, processing, and certification activities. Assessment of storage facilities design/operations (A.4 and A.19 on Figure A-1) is intended to assure that the generator/storage sites plan and develop sufficient storage capacity to maintain any backlog of RH-TRU waste necessary to accommodate the work-off plan. For example, a particular site's waste management plan may include retrieval and repackaging of RH-TRU waste at a rate of 3 cubic meters (about 3 canisters) per week. The transportation system based on RH-72B casks may be limited to movement of one canister per week to WIPP. Thus this site must provide RH-TRU canister storage capacity for a large fraction of the retrieved waste. If the site's current facility does not offer this required capacity, plans must be developed to modify existing or add new storage facilities.

The requirements of RH-TRU waste characterization may result in dedicated facilities at each site, support facilities at several waste handling locations, or mobile characterization equipment that can be used at several sites. Similarly, the assessment of characterization facilities design/operations (A.5 and A.20) is included to identify the alternatives that will resolve any mismatch between the existing and required characterization capacity and capability. If existing capability is insufficient to characterize certain RH-TRU waste packages, modification alternatives will be identified that could provide the needed capability. Modifications might include development of a new characterization technique or change in operations to match a higher throughput requirement.

Other waste handling facilities may be needed at each RH-TRU waste site to support retrieval, processing, packaging, certification, cask loading and shipping, and possibly other activities. Waste handling facilities design/operations are included as a potentially useful assessment (A.12 and A.25 on Figure A-1) because some sites may have inadequate facilities for cask loading, intra-site transport, or similar waste handling operations. This assessment will assure completeness in the overall evaluation of site facilities required to meet the work-off plan.

Regulatory aspects include federal, state, and local laws and regulations that impact the management of RH-TRU waste. DOE Orders, the Resource Conservation and Recovery Act, the National Environmental Protection Act, and so on may each affect the way a particular site designs and operates its RH-TRU waste facilities. The sites' waste management system assessments (A.13 and A.26 on Figure A-1) must consider potential regulatory change as a means to develop the required compatibility between the work-off plan and a site's waste management plan. For example, a small-quantity site may be prohibited from disposing of its RH-TRU waste because the required processing involves shipment to another state that prohibits acceptance of out-of-state waste. A change or waiver to the receiving state's regulations may be the best means to resolve the problem.

A.2 Transportation System Decision Process

The DOE's strategy for the transportation system decision process, like that described for the generator/storage site waste management system decision process in Section A.1, is to assess whether the system components can accommodate the baseline-derived work-off plan and whether improvements to the components can be realized (Figure A-2). This assessment of the transportation system will result in one of the following three outcomes: (1) the disposal technical baseline requirements can be satisfied, the work-off plan can be met, and the transportation system has been determined to be efficient (B.2 on Figure A-2); (2) the system will not meet requirements and modifications are necessary (path B.3 through B.24 on Figure A-2); or (3) the transportation system can satisfy the demands of the work-off plan, but modification of the system will result in an increase in efficiency (path B.25 through B.37 on Figure A-2). This transportation system strategy is an iterative, ongoing process that will occur throughout the operating life of WIPP.

The first outcome, in which the baseline and work-off plan are acceptable (B.1 on Figure A-2), leads to a similar assessment of the WIPP disposal system (Figure A-3 in Section A.3). The other two outcomes result in detailed assessments of the four major transportation system components: the mode of transportation, design and operation of the transportation system (which includes the containers and packaging), regulatory requirement issues, and container/packaging waste payload criteria. In general, these detailed assessments will require the identification and ranking of alternatives, the selection of an alternative, and the initiation of activities (or regulatory modifications) leading to the design and implementation of the selected alternative. The assessment will result in a modification of the disposal technical baseline (B.12, B.20/B.28, B.31, B.35 on Figure A-2) or in a modification of the work-off plan (B.7, B.13, B.18, B.24 on Figure A-2).

Although the assessments are similar in scope and approach, the criteria used to evaluate the results of the second and third outcomes are different. For the second outcome (B.3 through B.24), the criteria are simply whether the transportation system can ship sufficient waste to meet the waste work-off plan and the disposal system needs (currently 350 canisters per year), or ship waste that the generator/storage sites have certified. Once the transportation system can meet the disposal demand, the assessment considers criteria such as reducing risk and cost and increasing throughput flexibility (Table 2 in Section 4).

The mode of transportation considers truck, rail, or some combination of truck and rail. The assessment of transportation mode (B.3 and B.25 on Figure A-2) will involve an analysis of the total life-cycle system costs, radiological risks to workers and the public, and non-

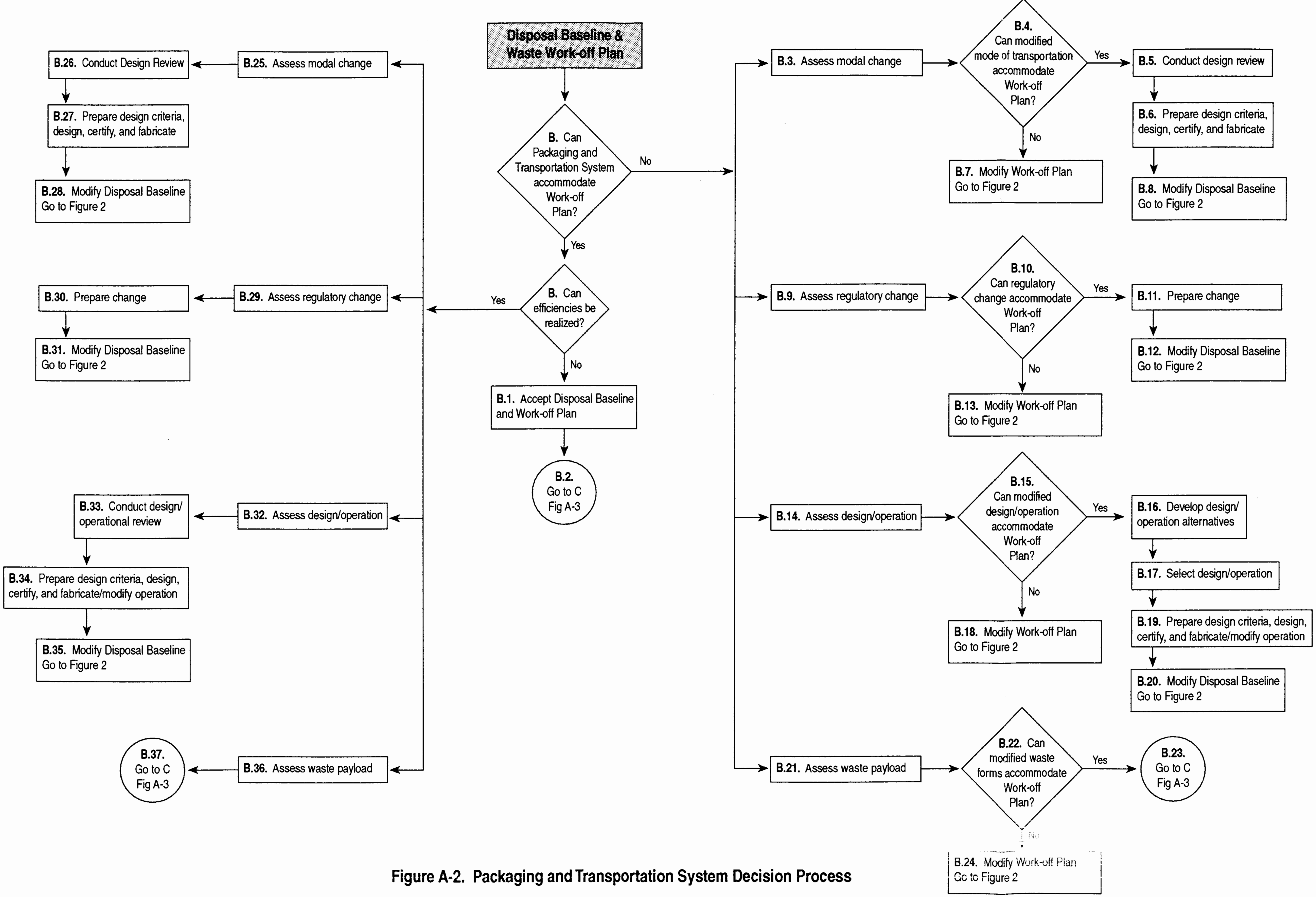


Figure A-2. Packaging and Transportation System Decision Process

radiological injuries and fatalities from the shipping campaign for various modes of RH-TRU waste transport. The analysis will consider selected train routes and highways. The intent of this assessment will be to balance the demands of the disposal system and the generator/storage sites against the opportunity to reduce risk and cost.

The design and operation component of the transportation system (B.14 and B.32 on Figure A-2) includes the canister or drum into which the waste is packaged, the certified Type B shipping cask to transport the canisters or drums, the trailer for transporting the cask, and the associated loading and maintenance tools. Transportation system design and operation also include drivers and operator personnel and the procedures required for loading, transporting, maintenance, and emergency response. The assessment of design and operation will examine alternatives to the RH-72B cask, including commercially available casks, newly designed casks, shielded drums for lower activity RH-TRU waste, or some combination. Key factors in this assessment will include consideration of available and anticipated waste forms, mode of transportation and type of equipment, availability of equipment, the time for initial development of newly designed casks versus disposal system demands (throughput rate), and other factors. This assessment will also consider the effect on the workforce, both for transport and handling at WIPP and the operational and safety procedures.

The regulatory component (B.9 and B.29 on Figure A-2) includes modifications to permits granted under federal, state, or local laws or other action-forcing documents or agreements, as well as DOE orders. To assess the value of changes to the regulatory requirements, the assessment will concentrate on Certificates of Compliance for containers. These will be evaluated for changes that increase the waste volume shipped, decrease maintenance costs and operator involvement, reduce recordkeeping, modify waste characterization requirements, improve loading efficiency, or result in greater flexibility in use, without sacrificing safety or regulatory compliance. Other requirements will be assessed as necessary.

The fourth transportation component that will be assessed is the waste payload (B.21 and B.36 on Figure A-2). The waste payload is one of the major design inputs for the canister, and an assessment of the dose rate and isotopic content of the waste shipped may allow the use of a container with less or no shielding. This change could result in greater payloads and possible improvements in WIPP disposal operations. Options such as selectively choosing the RH-TRU waste transported, phased shipping, and evaluating the inventory for design input changes may also lead to increases in efficiency. In addition to technical and regulatory information to assess the value of modifications to the transportation system components, each of the above-described assessments will provide information specific to the evaluation criteria shown in Table 2 in Section 4. Thus, the assessments will provide sufficient information to understand the cost and risk implications and effect on RH-TRU waste throughput rate that would result from a change to the packaging system baseline.

A.3 WIPP Disposal System Decision Process

The decision process for the WIPP disposal system begins with an assessment of whether the facility design and operating capabilities accommodate the baseline-derived work-off plan, or whether improvements to the design and operating capabilities can be realized (Figure A-3). This assessment, like those for the generator/storage site waste management system and the WIPP disposal system, can have three outcomes: (1) the disposal system is efficient and the disposal technical baseline and waste work-off plan are acceptable (outcome C.1 on Figure A-3); (2) the disposal system cannot meet the demands of the work-off plan and will not meet requirements, and either the baseline or the work-off plan must be modified (path C.3 through C.23 on Figure A-3); or (3) the disposal system is inefficient, modifications are worthwhile, and the baseline must be modified (path C.24 through C.35 on Figure A-3). This disposal system strategy is an iterative, ongoing process that will be conducted throughout the operating life of WIPP.

The first outcome of the assessment process, in which the disposal technical baseline and work-off plan are acceptable (C.1 on Figure A-3), and the RH-TRU waste is packaged, shipped and disposed of in WIPP (C.2 on Figure A-3). However, the second and third outcomes lead to assessments of the components of the WIPP disposal system. In general, these detailed assessments will require the identification and ranking of alternatives, the selection of an alternative, and the initiation of activities (or regulatory modifications) leading to the design and implementation of the selected alternative. The assessment will result in a modification of the disposal technical baseline (C.6, C.22/C.26, C.32, C.35 on Figure A-3) or in a modification of the work-off plan (C.7, C.11, C.16, C.23 on Figure A-3).

Although these assessments lead to similar outcomes, the criteria used to evaluate the results of each assessment are different. For the second outcome (C.3 through C.23), the criteria consider only whether the components of the WIPP disposal system can meet the demands imposed by the work-off plan (for example, disposal rate of 350 canisters per year). For the third outcome (C.24 through C.35), however, the efficiencies of the WIPP disposal system will be evaluated according to cost, risk reduction, and flexibility to respond to unexpected fluctuations in demands of the transportation system and the generator/storage site waste management system.

Sustained and efficient disposal will require assessments of components of the disposal system, including disposal system waste criteria, transportation system interface, facility operation and design, and regulatory aspects. The disposal system waste criteria, which are a subset of the waste acceptance criteria, include the characteristics of the waste that influence disposal operations and safety at WIPP. These waste criteria include radiation levels, thermal power, Pu-239 equivalency, and physical form. The DOE's approach to the assessment of the disposal waste criteria (C.3 and C.24) is to study specific waste criteria that could be modified to satisfy the demands of the work-off plan or compare disposal system performance. The assessment will analyze each waste criterion to determine a limit that would have a minimum effect on facility operations and the margin of safety, while

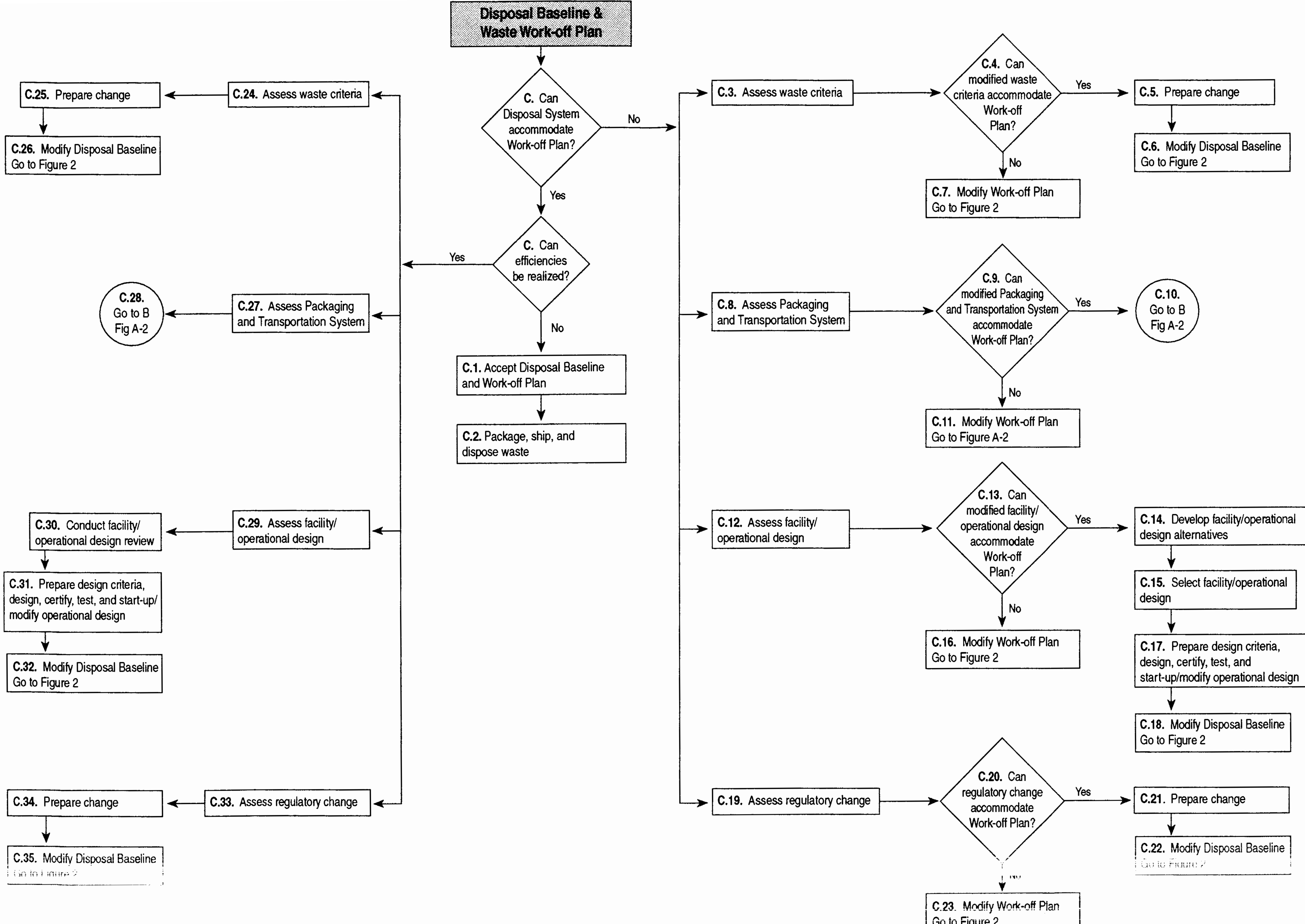


Figure A-3. Disposal System Decision Process

increasing the volume of RH-TRU waste that can be accepted at WIPP. This evaluation would include criticality assessments, risk analyses for potential accident scenarios, structural assessments based on thermal loading, and others.

The transportation system interface component (C.8 and C.27 on Figure A-3) is defined as any aspect of the disposal system that enables receipt of the shipping cask and the removal of the canister from the shipping cask in the Waste Handling Building at WIPP. The assessment of this aspect of the transportation system is described in Section A.2.

The facility operation and design component (C.12 and C.29 on Figure A-3) includes the facilities/materials/equipment that will be used to unload, transport, and dispose of the RH-TRU waste at WIPP; the personnel who perform these tasks and the activities associated with staff qualifications, training, and staffing levels; procedures, including technical operation procedures, emergency response procedures, and quality assurance procedures; and disposal configuration. The assessment of the facility physical features and facility operations will be accomplished by an engineering evaluation of the major components of the disposal system. The major components include the Waste Handling Building, cranes and attachments, hot cell complex and associated equipment, transfer cars, forklifts, hoist, facility casks, and emplacement machines. In conjunction with this assessment, personnel and procedures will be reviewed. Methods such as operational reviews or operational assessments will be the primary means to determine if changes to the process are warranted.

The assessment of facilities/materials/equipment, personnel, and procedures is based on the design disposal configuration and resulting emplacement rate. The assessment of disposal configuration will focus on alternative disposal geometries by considering borehole locations, spacing, number of canisters per borehole, and other factors. As an example of the facility/operational design assessment, the method for emplacement of canisters into the walls might include evaluation of alternative borehole locations to increase the overall RH-TRU volume capacity of WIPP. The assessment will consider the operational interrelationships of these components given a designed RH-TRU throughput rate. The assessment will also consider modifications, upgrades, and new and additional equipment facilities in light of a given RH-TRU waste emplacement rate.

The assessment of regulatory requirements (regulations, orders, agreements) (C.19 and C.33 on Figure A-3) will involve an examination of the existing permit conditions and compliance documentation to ascertain whether changes in the regulatory requirements could be made to meet demand or improve operations. In the context of the disposal system component, the regulatory assessment will consider DOE orders (e.g., modification to safety analysis report) and permit conditions established by external regulatory agencies.

In addition to technical and regulatory information to assess the efficacy of modifications to the disposal system components, each of the above-described assessments will provide information specific to the evaluation criteria identified on Table 2 in Section 4. Thus, the assessments will provide sufficient information to understand the cost and risk implications and effect on RH-TRU waste throughput rate that would result from a change to the disposal system baseline.