Waste Retrieval Plan for the Waste Isolation Pilot Plant

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United States Department of Energy
WIPP Project Site Office
Carlsbad, New Mexico
PREFACE

As required by Public Law 102-579, the U.S. Department of Energy (DOE) has prepared this plan for retrieving the radioactive waste it plans to use in experiments conducted during a test phase at the Waste Isolation Pilot Plant (WIPP). The WIPP, located near Carlsbad in southeastern New Mexico, has been authorized by the Congress to demonstrate the safe disposal of transuranic radioactive waste produced in U.S. defense activities and programs. Public Law 102-579, signed by the President on October 30, 1992, is known as the Waste Isolation Pilot Plant Land Withdrawal Act (LWA). The Act withdraws the land at the WIPP site from public use; it also specifies, among other things, requirements for the test phase and disposal phase and for shipping transuranic waste to the WIPP.

A test phase at the WIPP is designed to collect data and to assess compliance with the disposal regulations to be issued by the U.S. Environmental Protection Agency (EPA) and with the Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act (RCRA). These determinations must be made before waste disposal at the WIPP can begin. The test-phase data will also be useful in showing compliance with other regulatory requirements. To collect the needed data and to make the compliance determinations, the DOE has planned a program of regulatory-compliance analyses, scientific investigations, laboratory tests, and underground tests with actual transuranic waste. During this test phase, containers of transuranic waste will be loaded into instrumented bins and emplaced in one of the underground disposal rooms at the WIPP. Tests with a waste-filled alcove(s) - a specially excavated room underground - will also be conducted. After emplacement these wastes will be monitored, and samples taken from them will provide relevant data for analyses conducted to demonstrate compliance with the regulations. If the test phase is successfully completed, regulatory compliance can be demonstrated, and other requirements specified by the LWA are met, the DOE will start disposal operations at the WIPP.

The LWA requires that the transuranic waste used in experiments at the WIPP be fully retrievable and specifies the conditions under which the waste is to be retrieved. Accordingly, in this plan, the term "retrieval" means the removal of transuranic waste and the container in which it has been retained and any contaminated material from the underground for off-site shipment to interim storage locations.

The waste-retrieval provisions of the LWA provide the bases on which the plan was constructed. Other bases for this plan are the waste-retrieval provisions in the agreements between the DOE and the State of New Mexico. These agreements are the Consultation and Cooperation Agreement, Working Agreement, Stipulated Agreement, and Supplemental Stipulated Agreement. An additional basis for this plan is the DOE procedure WIPP-DOE-71, which sets requirements on the design of the WIPP, including requirements derived from the need to maintain retrievability.
The plan addresses the process by which a retrieval decision would be made (Chapter 3), the operations necessary to carry out retrieval (Chapter 4), the steps that have been taken to establish at the WIPP a condition of readiness to conduct retrieval (Chapter 5), plans for development that could facilitate retrieval (Chapter 6), and interim-storage location(s) to which the waste could be shipped after retrieval (Chapter 7). It begins by providing background information on the WIPP (Chapter 1) and describing the various activities the DOE plans to conduct during the test phase (Chapter 2). A glossary and a list of acronyms are included for the convenience of the reader.

Before beginning any retrieval (except for the demonstrations and activities required for maintaining the readiness to retrieve), the DOE will prepare an implementation plan that will detail the planned retrieval operations. Such an implementation plan is required by the Consultation and Cooperation Agreement with the State of New Mexico as amended in 1988, and the No-Migration Determination issued in 1990 by EPA. The retrieval implementation plan will detail the specific procedures and activities involved in waste retrieval.

Although the discussions of the test phase and of retrieval operations are comprehensive, no attempt is made in this document to present a detailed plan for testing or detailed procedures for retrieval operations or a Consultation and Cooperation-driven implementation plan. This information is available in the Test Phase Plan for the Waste Isolation Pilot Plant (DOE, 1993a) and in detailed operating procedures developed for the WIPP.

A previous version of this plan, Revision 0, was issued in May 1990. Providing the overall DOE plan for the retrieval of waste during the test phase, it was reviewed during the process that led to the granting of a conditional no-migration determination (NMD) by the EPA in November 1990. The EPA stated that the retrievability of waste placed in the WIPP during the test phase is central to the EPA's finding. Therefore, the EPA reviewed both the technical feasibility of retrieval and the practicability of the DOE's retrieval plan. The EPA concluded in the no-migration determination that the retrieval of wastes from the WIPP "can be accomplished safely and that the DOE's commitment to retrieving waste and placing it above ground, if it proves necessary, is satisfactory."

This new version of the plan, Revision 1, updates the previous plan. It summarizes the DOE's current plans for the underground tests with actual transuranic waste and adds information gained during an activity called the "integrated system checkout," which has been completed for bin tests with dry waste. It describes a recent improvement that will enhance safety during the test phase and waste retrieval if retrieval is necessary -- that is, a state-of-the-art roof-support system in the underground room chosen for the bin tests.

As directed by the Act, the DOE is submitting this waste retrieval plan to the Administrator of the EPA. The Administrator is to determine, in a single rulemaking procedure, whether the plan should be approved. The standard for approving this waste retrieval plan is a determination by the Administrator that the plan provides for the "satisfactory retrieval of all transuranic waste emplaced during the test phase" should retrieval be required. The Administrator's approval or disapproval is to be published as a final rule not later than ten months after the LWA was enacted. If this plan is not
approved, the DOE may submit a revised plan to the Administrator, but a rulemaking by the EPA would again be required for approval.

This retrieval plan may be revised as appropriate to reflect changes in legislation, policy, regulations, and to address developments in the test program or determinations of regulatory compliance. In accordance with the LWA, modifications submitted by the DOE to the EPA must be considered by the Administrator of the EPA by rulemaking.
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## TABLE OF CONTENTS

**EXECUTIVE SUMMARY** .......................................................... ES-1

1.0 BACKGROUND INFORMATION .................................................. 1-1
  1.1 The mission of the WIPP .................................................. 1-1
  1.2 Transuranic wastes ....................................................... 1-1
  1.3 Description of the WIPP .................................................. 1-2
  1.4 Development in phases ................................................... 1-5
    1.4.1 The early phases: siting, design, and validation ............. 1-5
    1.4.2 The construction phase ........................................... 1-6
    1.4.3 The test phase .................................................... 1-6
  1.5 Applicable regulations .................................................. 1-7
  1.6 Involvement by the State of New Mexico, the U.S. Environmental Protection Agency and other regulatory bodies, and oversight groups .............. 1-7
  1.7 Scope of the Waste Retrieval Plan ................................... 1-8

2.0 THE TEST PHASE FOR THE WIPP ............................................. 2-1
  2.1 Statutory requirements .................................................. 2-1
    2.1.1 Requirements for transporting waste to the WIPP ............. 2-1
    2.1.2 Test phase plan and waste retrieval plan approval .......... 2-2
    2.1.3 Other requirements .............................................. 2-2
  2.2 Demonstrations of regulatory compliance ................................ 2-3
  2.3 The experimental program .............................................. 2-3
    2.3.1 Activities included in the program ............................ 2-3
    2.3.2 Bin tests with transuranic waste ............................... 2-4
    2.3.3 Alcove test(s) with transuranic waste ........................ 2-13

3.0 STATUTORY REQUIREMENTS FOR WASTE RETRIEVAL AND THE DECISION PROCESS LEADING TO RETRIEVAL ........................................ 3-1
  3.1 Statutory requirements for retrievability and conditions requiring retrieval .................................................. 3-1
  3.2 Noncompliance with final disposal regulations .................... 3-2
    3.2.1 Status of Subpart B .............................................. 3-2
    3.2.2 Remedial and corrective actions ................................ 3-2
    3.2.3 Decision process .............................................. 3-3
  3.3 Engineering modification or repackaging for permanent disposal ........ 3-4
    3.3.1 Engineering modification ................................. 3-4
    3.3.2 Repackaging for permanent disposal .......................... 3-4
    3.3.3 Decision process .............................................. 3-4
### TABLE OF CONTENTS

*(Continued)*

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.4</td>
<td>Protect the public health and safety and the environment</td>
<td>3-5</td>
</tr>
<tr>
<td>3.4.1</td>
<td>Noncompliance with environmental regulations</td>
<td>3-5</td>
</tr>
<tr>
<td>3.4.2</td>
<td>Determination of waste retrievability</td>
<td>3-6</td>
</tr>
<tr>
<td>4.0</td>
<td>WASTE-RETRIEVAL OPERATIONS</td>
<td>4-1</td>
</tr>
<tr>
<td>4.1</td>
<td>General waste-retrieval responsibilities</td>
<td>4-1</td>
</tr>
<tr>
<td>4.2</td>
<td>Generally applicable procedures and controls</td>
<td>4-2</td>
</tr>
<tr>
<td>4.2.1</td>
<td>Administrative controls</td>
<td>4-2</td>
</tr>
<tr>
<td>4.2.2</td>
<td>Personnel protection</td>
<td>4-3</td>
</tr>
<tr>
<td>4.2.3</td>
<td>Radiation monitoring</td>
<td>4-3</td>
</tr>
<tr>
<td>4.3</td>
<td>Retrieval of waste used in bin tests</td>
<td>4-4</td>
</tr>
<tr>
<td>4.3.1</td>
<td>Conditions expected at the time of retrieval</td>
<td>4-4</td>
</tr>
<tr>
<td>4.3.2</td>
<td>Retrieval activities underground</td>
<td>4-7</td>
</tr>
<tr>
<td>4.3.3</td>
<td>Retrieval activities at the surface</td>
<td>4-11</td>
</tr>
<tr>
<td>4.4</td>
<td>Retrieval of waste from alcoves</td>
<td>4-15</td>
</tr>
<tr>
<td>4.5</td>
<td>Retrieval of site-derived waste</td>
<td>4-18</td>
</tr>
<tr>
<td>4.6</td>
<td>Time needed for waste retrieval</td>
<td>4-18</td>
</tr>
<tr>
<td>4.6.1</td>
<td>Time needed for retrieving the waste used in bin tests</td>
<td>4-18</td>
</tr>
<tr>
<td>4.6.2</td>
<td>Time needed for retrieving the waste used in alcove tests</td>
<td>4-22</td>
</tr>
<tr>
<td>5.0</td>
<td>READINESS FOR WASTE RETRIEVAL</td>
<td>5-1</td>
</tr>
<tr>
<td>5.1</td>
<td>Safety and environmental protection</td>
<td>5-1</td>
</tr>
<tr>
<td>5.1.1</td>
<td>Radiation and industrial safety</td>
<td>5-1</td>
</tr>
<tr>
<td>5.1.2</td>
<td>Room stability, mine safety, and maintenance of underground openings</td>
<td>5-1</td>
</tr>
<tr>
<td>5.1.3</td>
<td>Environmental protection</td>
<td>5-2</td>
</tr>
<tr>
<td>5.2</td>
<td>Physical equipment</td>
<td>5-5</td>
</tr>
<tr>
<td>5.2.1</td>
<td>Ventilation</td>
<td>5-5</td>
</tr>
<tr>
<td>5.2.2</td>
<td>Lighting</td>
<td>5-5</td>
</tr>
<tr>
<td>5.2.3</td>
<td>Power supply</td>
<td>5-5</td>
</tr>
<tr>
<td>5.2.4</td>
<td>Equipment</td>
<td>5-6</td>
</tr>
<tr>
<td>5.3</td>
<td>Quality assurance</td>
<td>5-6</td>
</tr>
<tr>
<td>5.4</td>
<td>Training</td>
<td>5-7</td>
</tr>
<tr>
<td>5.4.1</td>
<td>General readiness of personnel</td>
<td>5-7</td>
</tr>
<tr>
<td>5.4.2</td>
<td>Drum handling</td>
<td>5-7</td>
</tr>
<tr>
<td>5.4.3</td>
<td>Bin handling</td>
<td>5-8</td>
</tr>
<tr>
<td>5.4.4</td>
<td>Handling of standard waste boxes</td>
<td>5-8</td>
</tr>
<tr>
<td>5.4.5</td>
<td>Mockups</td>
<td>5-8</td>
</tr>
</tbody>
</table>
# TABLE OF CONTENTS

(Continued)

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.5</td>
<td>Demonstrations of retrieval</td>
<td>5-9</td>
</tr>
<tr>
<td>5.5.1</td>
<td>Mock demonstration of the retrieval of remotely handled transuranic waste</td>
<td>5-9</td>
</tr>
<tr>
<td>5.5.2</td>
<td>Mock demonstration of the retrieval of contact-handled transuranic waste</td>
<td>5-9</td>
</tr>
<tr>
<td>5.5.3</td>
<td>Operational readiness review</td>
<td>5-10</td>
</tr>
<tr>
<td>5.6</td>
<td>Annual demonstration</td>
<td>5-10</td>
</tr>
<tr>
<td>6.0</td>
<td>DEVELOPMENT PROGRAM</td>
<td>6-1</td>
</tr>
<tr>
<td>6.1</td>
<td>Overpacks for waste boxes</td>
<td>6-1</td>
</tr>
<tr>
<td>6.2</td>
<td>Brine stabilization</td>
<td>6-1</td>
</tr>
<tr>
<td>6.3</td>
<td>Handling of contaminated salt</td>
<td>6-2</td>
</tr>
<tr>
<td>6.4</td>
<td>Use of robotics</td>
<td>6-3</td>
</tr>
<tr>
<td>7.0</td>
<td>INTERIM STORAGE OF RETRIEVED WASTE</td>
<td>7-1</td>
</tr>
<tr>
<td>7.1</td>
<td>Interim storage at a DOE waste-management facility</td>
<td>7-1</td>
</tr>
<tr>
<td>7.2</td>
<td>Interim storage at properties controlled by the Department of Defense</td>
<td>7-1</td>
</tr>
<tr>
<td>7.3</td>
<td>Interim storage at a privately owned site</td>
<td>7-2</td>
</tr>
<tr>
<td>7.4</td>
<td>Selection of interim-storage site(s)</td>
<td>7-2</td>
</tr>
<tr>
<td>7.5</td>
<td>Implementation plan</td>
<td>7-3</td>
</tr>
</tbody>
</table>

REFERENCES | R-1 |

LIST OF ACRONYMS | A-1 |

GLOSSARY | G-1 |
EXECUTIVE SUMMARY

The U.S. DOE has prepared this plan to meet the requirements of Public Law 102-579, the Waste Isolation Pilot Plant (WIPP) LWA. The purpose is to demonstrate readiness to retrieve from the WIPP underground transuranic radioactive waste that will be used for testing should retrieval be needed.

The WIPP, a potential geologic repository for transuranic wastes generated in national-defense activities, has been constructed in southeastern New Mexico. Because the transuranic wastes will remain radioactive for a very long time, the WIPP must reasonably ensure safe performance over thousands of years. The DOE therefore decided to develop the facility in phases, to preclude premature decisions and to conduct the performance assessments needed to demonstrate long-term safety. Surface facilities for receiving waste have been built, and considerable underground excavation, 2150 feet below the surface, has been completed. The next step is a test phase, including underground experiments called "bin tests" and "alcove test(s)" with contact-handled transuranic waste. The objective of these waste tests is to collect relevant data about the gas-generation potential and volatile organic compound (VOC) source term of the waste for developing a basis for demonstrating long-term safety by compliance with the applicable disposal regulations (40 CFR 191, 264 and 268). The test phase will end when a decision is made to begin disposal in the WIPP or to terminate the project if regulatory compliance cannot be determined and demonstrated. Authorization to receive transuranic waste at the WIPP for the test phase is given by the WIPP LWA provided certain requirements are met.

For the bin tests, the waste will be contained in two types of specially designed metal bins. The type 1 bin is a low pressure bin designed to operate at pressure between 0 and 0.5 psig and has a design pressure of 6.1 psig. The type 1 bins are 4 feet square and 3 feet high. Type 1 bins are gastight and equipped with rupture discs to prevent exceeding the design pressure. The nominal capacity of a bin is 5 drum-volume equivalents of loose contact-handled transuranic waste. To provide additional protection against releases of radioactive material, each bin will be contained in an overpack metal box. This overpack is a commonly used waste container (a standard waste box). When the standard waste box is fitted with a modified lid, the overpack metal box is called a radiation control boundary (RCB) container or overpack. The RCB overpacked bins may be stacked two high and will be supported by a rack (RCB platform) that is about 6 inches high and can be adjusted to maintain the bins nearly level over the several years of testing. The type 2 bin design is currently being developed. The type 2 bin will be used for pressurized humid and brine inundated conditions. The bin operating pressure will range up to lithostatic conditions (nominally 2200 psig). This will allow the possible generation of flammable gases to develop unimpeded by operator action.

The tests will begin with type 1 dry bins containing as-received waste. The humidity in these bins will then be raised to approximately 74 percent relative humidity in order to simulate the conditions that will exist in the disposal rooms after the room has been filled with waste, sealed, and the ventilation system is shut off. These are the type 1 humid bins. In other bins, to be designed, both brine from the Salado Formation and backfill material
will be added. Enough brine will be added to "inundate" the waste in the bins to completely cover the waste. These to be designed bins are to be designated as type 2 bins.

The tests will include some bins with simulated waste and some reference bins that are empty. The simulated waste will resemble the actual waste, but it will be nonradioactive. Tests with this waste will provide information that cannot be obtained with actual transuranic waste because the waste materials must be examined without any containment, at close range. In addition, they will allow the brine in the bins to be sampled and analyzed.

The bin-test program consists of three tiers of experiments: (1) specifically planned tests, (2) conditionally planned tests, and (3) contingency tests. The specifically planned tests are those individually identified as relevant to reduce uncertainty and increase confidence in the ability to predict (1) gas-generation rates and species and (2) release rates for volatile organic compounds. The DOE plans to conduct these tests with 19 bins of actual transuranic waste, 6 bins of simulated waste, and 8 reference bins, for a total of 33 bins. Both type 1 and type 2 bins are planned to be used in these tests. The conditionally planned tests are tests that will be conducted if the results from the specifically planned tests have not adequately reduced the level of uncertainty about gas generation and release rates. These tests will be conducted with up to 25 additional bins of actual transuranic waste and up to 4 additional bins of simulated waste, for a total of up to 29 additional bins. Contingency tests may be conducted due to one or more of the following:

- Unexpected results from the planned tests
- Additional tests mandated by regulatory bodies
- To further investigate engineered modifications of the waste form to enhance the predicted performance and facilitate the demonstration of compliance.

It is not possible to predict at present how many and what type of bins would be used in contingency tests, although the LWA imposes a 0.5% (by capacity) cap on the amount of waste that can be transported to WIPP during the test phase.

The alcove test(s) will use transuranic waste in 55-gallon steel drums, in packs of seven drums. The drums will be equipped with filtered vents for pressure relief if necessary. The drums will contain only unmodified, as received contact-handled transuranic waste, without additives or brine. The tests will replicate, as closely as possible, the environment expected to be present in the WIPP during waste-disposal operations. The plan calls for using one alcove, which will be a closed-end room, approximately 13 feet high, 25 feet wide, and 100 feet long. To improve stability, rockbolts will be installed in the alcove and its access drift before any waste is emplaced, with the exception of the seal region. The alcove will have a gas test system designed for maintenance-free operation within the sealed alcove.

Before the alcove test(s) is started a gas barrier will be installed in the entrance to the alcove to seal the alcove off and minimize the escape of gases from the alcove. The
current design for this barrier uses a reinforced concrete and steel sleeve with three separate metal bulkheads equipped with doors.

The WIPP LWA specifies that the waste emplaced underground for testing is to be retrieved under the following conditions:

- The Secretary of Energy determines or the Administrator of the Environmental Protection Agency (EPA) certifies that the WIPP does not comply with the disposal regulations.

- The transuranic waste needs to be retrieved for engineering modification or for repackaging for permanent disposal.

- Retrieval is necessary to protect the public health and safety and the environment.

- The Administrator of the EPA finds, at any time, that the WIPP does not comply with Subpart A of 40 CFR Part 191 and the environmental laws cited in Section 9 of the LWA (the Clean Air Act, the Safe Drinking Water Act, the Solid Waste Disposal Act [SWDA as implemented by RCRA], the Toxic Substances Control Act, and the Comprehensive Environmental Response, Compensation, and Liability Act) as well as all regulations promulgated and all permit requirements under these environmental laws.

- The Secretary of Energy determines that the transuranic waste used for experiments at the WIPP cannot remain retrievable and corrective action is not possible.

If retrieval is needed, all retrieval operations will be conducted in accordance with approved procedures. All retrieval operations will require radiation work permits. These permits establish radiation conditions, protective-equipment requirements, and other radiation-protection requirements. All personnel working in waste-retrieval operations must complete radiation worker training and be designated as radiation workers.

Because the test rooms will be frequently surveyed and monitored for radiation (see below), radioactive contamination is not expected to be present. Continuous air monitors will be used to monitor airborne radioactivity in work areas and in exhaust airstreams. These instruments will monitor for alpha and beta radiation. To detect surface contamination with radioactive material, direct smear surveys will be performed.

All waste bins will be retrieved and transported to the surface without being removed from the radiation-control overpack. This will provide added protection against releases of any radioactive material. On arrival at the surface, the RCB overpacked bins will be transferred from the hoist and moved to the contact-handled-waste bay in the waste-handling building. Here the lid of the RCB overpack will be removed, the bin will be
removed from the overpack and surveyed to ensure that it is not contaminated. If the bin contains brine, the brine will be stabilized to comply with transportation regulations, and the bin will then be placed in a new overpack (a standard waste box).

Retrieval from alcoves will begin with an additional evaluation of the condition of the drifts and the alcove entrance to supplement the ongoing underground openings maintenance program. The alcove will be depressurized through a high-efficiency particulate air filter. After depressurizing, the alcove will be supplied with fresh air from the mine ventilation system. Personnel wearing protective clothing and respirators will then enter the alcove to survey the conditions inside.

The seven-packs of waste drums will be removed individually with a forklift and surveyed for contamination. If they are clean, the seven packs will be loaded on the underground transporter and shipped to the surface; if not, the drums will be decontaminated or overpacked, then shipped to the surface.

Readiness for retrieval has been ensured by a variety of measures, including safety analyses, the implementation of environmental-protection measures, the provision and maintenance of physical systems, training, and annual demonstrations. Adequate ventilation, electrical power, and lighting are provided. The ventilation system is kept operable at all times and is instrumented to provide for continuous verification that the system is functioning properly. If the normal power supply is lost, retrieval operations will cease. AC power to support critical systems can be generated at the site with two diesel generators, which produce sufficient power to operate one hoisting system, three fans for underground ventilation, and central monitoring systems. The physical equipment needed for retrieval is kept in a state of readiness. It includes communications devices and radiation monitors.

Workers have been trained in the skills required for retrieval, most of which are required for other operations at the WIPP. An important part of training for retrieval is therefore the normal qualification program at the WIPP. This program requires personnel to demonstrate an in-depth knowledge of system operating characteristics as well as the ability to perform the operations safely and according to procedures. To maintain the required skill level, the WIPP has ongoing refresher training and requalification programs.

Training includes hands-on exercises with radiation-detection instruments, protective clothing, and respiratory equipment and practical demonstrations with actual operating procedures. Waste handlers must complete an extensive qualification program that includes the operational training needed for waste-handling operations from the receipt of waste to emplacement underground. Because the skills needed for handling waste during retrieval are identical with the skills needed for other waste-handling operations, no separate qualification program for waste retrieval is necessary.

Operational readiness reviews include a review for dry-bin tests, which was completed in August 1991 and included a readiness demonstration of waste retrieval. These reviews use a systematic approach to address the readiness of management controls, personnel, systems and equipment, as well as the environmental, safety, and quality-assurance programs.
for the WIPP test phase. Since there are no separate management controls, safety programs, and quality-assurance programs for waste retrieval, the readiness of these items are not discussed in this plan.

Before the start of each new phase of the testing program a formal operational readiness review, including an integrated systems checkout, will be conducted. This readiness review will focus on the differences between the new phase and the in-progress phases. Included in this assessment will be the review of the retrieval operations associated with that specific test. Once readiness is declared for the new test, waste-retrieval readiness will be maintained by periodic demonstrations.

To ensure an ongoing readiness for retrieval and to comply with legislative requirements, the DOE will conduct annual waste-retrieval demonstrations and make a determination of retrievability. The WIPP LWA requires the DOE to demonstrate annually that a sample of transuranic waste is retrievable. The Act directs that, in conducting this demonstration, the DOE is not to take any action "to affect the test phase." To comply with this statutory requirement to not affect the testing, the annual waste-retrieval demonstration will be conducted with simulated or mock waste.

If the State of New Mexico determines that there is an insufficient basis for the annual determination of retrievability or that the annual demonstration does not ensure that the waste emplaced for testing will be retrievable, it may invoke the conflict-resolution provisions of the Agreement for Consultation and Cooperation.

To enhance its retrieval-related capabilities, the DOE is conducting development activities directed at 1) developing an overpack for standard waste boxes (no overpack for these boxes is currently available) to allow all wastes to be shipped in overpacked containers should the need for offsite shipment be needed; 2) methods for stabilizing the brine that will be injected into some bins for experimental purposes; 3) evaluating methods for removing contaminated salt; and 4) exploring how industrial robotics and automation systems can facilitate WIPP underground operations both during waste emplacement for disposal and during waste retrieval.

If it is necessary to retrieve the transuranic waste used in underground tests at the WIPP, the waste will be transported from the WIPP site to an interim-storage location. Interim storage could be provided at (1) DOE waste-management facilities, (2) properties controlled by the Department of Defense (DOD), or (3) a privately owned storage site. The choice of site would be constrained by the requirements of two Federal statutes: the National Environmental Policy Act (NEPA) and the RCRA. Within one year of initiation of test phase waste emplacement shipments to WIPP, DOE will identify an emergency storage site(s) if retrieval is needed. By August 1996, DOE will identify an interim storage site(s) if retrieval is needed. Consistent with EPA's NMD and the Consultation and Cooperation (C & C) Agreement, DOE will prepare an implementation plan to detail the procedures and activities involved in waste retrieval.
1.0 BACKGROUND INFORMATION

This chapter provides background information on the WIPP program, describing its mission, transuranic wastes, the phased development of the WIPP; the design and layout of the WIPP; applicable regulations; and involvement by the State of New Mexico, regulatory bodies, and oversight groups.

1.1 THE MISSION OF THE WIPP

The U.S. DOE was authorized in 1979 (by Public Law 96-164) and funded by the Congress to develop a facility for demonstrating the safe disposal of transuranic (TRU) and mixed wastes generated in national-defense activities. The WIPP LW A of 1992 provided additional authorization to continue the Project under a stipulated statutory process. This facility, called the WIPP, has been developed in New Mexico and is operationally ready to start a phase of testing directed at demonstrating compliance with regulations concerned with safety both in the near term and the long term. If regulatory compliance is demonstrated and a decision to start disposal is made, following the provisions specified in the LW A, the WIPP will be used for the permanent disposal of transuranic wastes generated since 1970.

1.2 TRANSURANIC WASTES

Transuranic wastes are wastes containing alpha-emitting radionuclides of atomic number greater than 92 (e.g., the isotopes of plutonium) and half-lives longer than 20 years in concentrations greater than 100 nanocuries per gram of waste. They have been generated at various DOE sites in national-defense activities, such as the production and use of plutonium and uranium in the fabrication of nuclear weapons. Since 1970, they have been stored at the sites where they were generated or are in special storage facilities at the Idaho National Engineering Laboratory and the Nevada Test Site.

Most of the transuranic waste (about 97 percent by volume of anticipated stored material) is called "contact-handled transuranic waste" because it emits mostly alpha radiation and generates little heat. Since alpha radiation is not penetrating, the waste can be safely handled without shielding other than that provided by the waste container. This contact-handled transuranic waste is packaged in 55-gallon steel drums or in metal boxes. For the waste to be classified as contact handled, the maximum radiation level (the dose rate) at the surface of the waste container cannot exceed 200 millirem per hour. However, the average radiation level at the surface is expected to be much lower—less than 10 percent of the allowed maximum (i.e., about 20 millirem per hour). The maximum fissile-material content of contact-handled transuranic waste is 200 equivalent grams of plutonium-239 for a 55-gallon drum and 350 grams for standard waste boxes. The contact-handled waste comes in a variety of forms, ranging from unprocessed laboratory trash (e.g., paper, glassware, gloves, boots) to solidified sludges from the treatment of liquids used in the reprocessing of nuclear fuel for the recovery of plutonium and uranium.
The remaining 3 percent of transuranic waste is called "remotely handled transuranic waste." In addition to alpha particles, this waste emits penetrating radiation (beta particles and gamma rays). The surface radiation level on containers of this waste exceeds 200 millirem per hour, and therefore the waste is handled and transported in lead-shielded casks. The WIPP LWA specifies that no transuranic waste received at the WIPP may have a surface radiation dose rate higher than 1000 rem per hour and no more than 5 percent by volume of the remotely handled transuranic waste received at the WIPP may have a surface dose rate higher than 100 rem per hour.

For the test phase, the DOE will use only contact-handled transuranic waste. No remotely handled transuranic waste will be used in any of the tests in accordance with the LWA.

About 60 percent of the transuranic waste stored or expected to be generated contains chemicals and materials classified as hazardous in regulations implementing the RCRA. Examples of these hazardous substances are solvents (e.g., carbon tetrachloride) and heavy metals (cadmium, lead). The transuranic waste that contains these substances is called "transuranic mixed waste" or simply "mixed waste." In this plan, however, for brevity and convenience the term "transuranic waste" is generally used to mean all contact-handled transuranic waste, and the term "transuranic mixed waste" is used only when it is necessary to distinguish between waste with and without hazardous chemicals.

The quantity of transuranic waste currently in storage is approximately 2.3 million cubic feet (DOE, 1992). The total capacity of the WIPP, as specified in the WIPP LWA, is 6.2 million cubic feet.

1.3 DESCRIPTION OF THE WIPP

The WIPP facility has been constructed in Eddy County in southeastern New Mexico, about 26 miles southeast of Carlsbad; its location is shown in Figure 1-1. The site encompasses 10,240 acres of land owned by the Federal Government. This land had been administered by the U.S. Department of the Interior, Bureau of Land Management, but in October 1992 it was withdrawn from the public domain by the Waste Isolation Pilot Plant LWA (Public Law 102-579), which transferred jurisdiction over the land to the Secretary of Energy. The site is in a sparsely populated area, with about 25 people living within 10 miles of the WIPP boundary. The surrounding land is used for livestock grazing, potash mining, and exploration for oil and gas.

As shown in Figure 1-2, the WIPP consists of both surface and underground facilities and four connecting shafts. The purpose of the surface facilities is to provide security and safeguards and to accommodate routine operations, administration, and continuing scientific studies. The surface facilities were designed and constructed to service full-scale operations, and they can therefore easily accommodate the test phase, including waste retrieval.
Figure 1-1. WIPP Site Location
Figure 1-2. WIPP Surface and Underground Facilities and Shafts
The principal surface structure is the waste handling building, which is dedicated to support the primary WIPP operations: receiving and inspecting waste containers, maintaining a detailed inventory of the waste, and preparation for transfer to the underground. This building is divided into an area for contact-handled transuranic waste, a separate area for remote-handled transuranic waste, and a support area. The area designated for contact-handled waste will be used to receive the transuranic waste to be used in the underground tests. It will also be used in retrieving the waste should retrieval prove to be necessary.

The underground facilities are 2150 feet below the surface in the bedded salt of the Salado Formation. They include a 12-acre area for conducting scientific investigations and experiments in which no actual waste is used, a mining area with equipment and maintenance facilities, an area in which the transuranic waste will be emplaced for permanent disposal if the test phase is successful and a disposal decision is made, and four major interconnecting tunnels that are used for ventilation and traffic. The waste-disposal area is to cover 100 acres and will be divided into eight blocks, or panels, of disposal rooms. At present only one of the panels has been excavated. One room in this panel as well as a specially excavated smaller room called "alcove" will be used for experiments with actual contact-handled transuranic waste during the test phase.

The design and projected operations of the WIPP, including the many provisions that have been made for protecting health and safety and the environment, are described in detail in the Final Safety Analysis Report (FSAR) (WP 02-9).

1.4 DEVELOPMENT IN PHASES

Because the transuranic waste will remain radioactive for a very long time, the WIPP must ensure reasonable safe performance over many thousands of years. Therefore, the DOE has decided to develop it in phases, in order to preclude premature decisions and to conduct the performance assessments needed to determine long-term safety.

1.4.1 The early phases: siting, design, and validation

The process began with a siting phase during which several sites were evaluated and a preferred site was selected; extensive surface-based testing was conducted to collect the information needed to evaluate the suitability of the site; a repository was designed; and safety analyses were conducted. During this phase the host rock for the facility was selected—the bedded salt of the Salado Formation—and extensive studies on the geologic, hydrologic, geochemical, and rock-mechanics properties of the rocks at the site were conducted. The siting phase ended in 1980 with the publication of an Environmental Impact Statement (EIS) (DOE, 1980), showing that the WIPP would be safe both in the near term and over the thousands of years required for waste isolation. In the absence of any federal regulations specific to an underground repository for transuranic waste, the safety analysis compared predictions of the WIPP's long-term performance against radiation-protection standards developed for the nuclear industry.
Proceeding in a conservative manner, the DOE then made a decision to begin another phase of study and evaluation. During this phase, known as the site and preliminary design validation (SPDV), two shafts were constructed, an underground testing area was excavated, and various experiments were conducted, but none with transuranic waste. Geologic, hydrologic, and other geotechnical investigations were continued, expanding the database, and methods for assessing the long-term safety performance of the WIPP were advanced.

1.4.2 The construction phase

The SPDV validation was followed by the construction phase, which consisted of continued collection of data about the site, continued development and refinement of the tools needed for assessing performance, and the construction of the WIPP. The surface facilities needed to receive waste were built, and considerable underground excavation was completed, including rooms for further experimentation and some rooms designed for permanent waste emplacement. This phase ended with the publication of a final supplemental EIS (DOE, 1990a) that used the data collected since 1980 to examine the potential near- and long-term impacts of the WIPP and an FSAR (WP 02-9).

The geotechnical data collected during the construction phase indicated that some of the characteristics of the site (e.g., permeability) differed significantly from the earlier assumptions based on more limited data collected in surface-based studies. However, the extensive analyses of long-term performance (reported in the supplemental EIS), including analyses conducted under pessimistic assumptions, did not identify any significant impacts on public health and safety. Having evaluated these analyses, the DOE announced its decision (DOE, 1990b) to proceed with the next step in the development of the WIPP—a test phase that includes testing with actual transuranic waste. In this Record of Decision (ROD, DOE, 1990b), the DOE made a commitment to prepare another supplemental EIS at the end of the test phase that will analyze the long-term performance of the WIPP in light of information gained from the testing. This supplemental EIS would be the basis for the Secretary's Record of Decision (DOE, 1990b) on whether or not to proceed with the disposal phase.

A significant development during the construction phase was the promulgation by the U.S. EPA of environmental standards for the management and permanent disposal of transuranic wastes (40 CFR Part 191). In addition, the EPA ruled that the WIPP was subject to the regulations implementing the RCRA, which are concerned with the disposal of wastes that are hazardous because they contain toxic elements or chemicals. These developments were the driving force for the decision to conduct a test phase rather than to start disposal.

1.4.3 The test phase

The test phase (see Chapter 2) encompasses (1) performance assessments and other regulatory-compliance determinations; (2) tests and investigations conducted to provide the basis for determinations of compliance, including tests with transuranic waste; and (3) the
process by which the decision will be made whether transuranic wastes can be emplaced in the WIPP for permanent disposal. The purpose of the test phase is to develop relevant information for assessing the long-term safety of TRU and mixed waste disposal.

As defined in the WIPP LWA, the test phase will begin when the first shipment of transuranic waste is received for underground testing at the WIPP. Other components of the test phase—scientific investigations in the underground excavations at the WIPP, laboratory studies, and performance-assessment activities—are already under way. (Many of them continue from phase to phase, and scientific investigations will be conducted even during the disposal operations if disposal is allowed to begin.) The test phase will end when a decision is made to begin disposal operations in the WIPP or to terminate the project if LWA requirements are not met.

1.5 APPLICABLE REGULATIONS

The key regulations for the WIPP are the environmental standards promulgated by the EPA as 40 CFR Part 191 and the regulations implementing the Solid Waste Disposal Act as implemented by RCRA. These regulations are "key" because the DOE will not be able to start WIPP disposal operations until it determines and demonstrates compliance with them, under the provisions of the LWA. In addition, specific provisions for compliance with environmental laws and regulations during the test phase are included in the WIPP LWA (see Chapter 2).

1.6 INVOLVEMENT BY THE STATE OF NEW MEXICO, THE U.S. ENVIRONMENTAL PROTECTION AGENCY AND OTHER REGULATORY BODIES, AND OVERSIGHT GROUPS

After WIPP was authorized by the Congress (Public Law 96-164), the DOE and the State of New Mexico entered into an agreement for consultation and cooperation. (Agreement for Consultation and Cooperation Between Department of Energy and the State of New Mexico on the Waste Isolation Pilot Plant, June 30, 1981). This agreement was amended on November 30, 1984, and updated on April 18, 1988. The agreement specifies various requirements imposed on the DOE in regard to the development and operation of the WIPP and provisions for the State's involvement in the WIPP program, including provisions for oversight and concurrence. The agreement has specific requirements for waste retrievability and requires the DOE to conduct separate demonstrations of the retrievability of contact-handled and remotely handled transuranic wastes. New Mexico exercises its oversight and monitoring functions through various State Agencies, such as the New Mexico Environment Department and the New Mexico Bureau of Mines.

Specific provisions for the involvement of the State in the WIPP test phase are included in the LWA. For example, the State is to receive, from the DOE, biennial documentation of continued compliance with the Solid Waste Disposal Act, to evaluate the performance-assessments reports that the DOE is required to prepare every 2 years, and to review the DOE's basis for annually determining waste retrievability during the test phase.
Several Federal agencies are assigned specific regulatory and oversight responsibilities by the LWA, with the dominant role being given to the U.S. Environmental Protection Agency (EPA), see Chapter 2). The others are the Mine Safety and Health Administration (MSHA) and Occupational Health and Safety Administration (OSHA), (U.S. Department of Labor); National Institute of Occupational Safety and Health (NIOSH), (U.S. Department of Human and Health Services [HHS]); Nuclear Regulatory Commission (NRC); and the Bureau of Mines (BOM), (U.S. Department of the Interior); the responsibilities of MSHA and BOM, which are relevant to this plan, are further discussed in Chapter 5.

Since the late 1970s, the WIPP program has been under the oversight of the Environmental Evaluation Group (EEG), an independent body of technical experts, established by the Congress. The EEG has reviewed and commented on all major program developments and documents, and its recommendations have had a significant effect on the program. EEG employees have access to the WIPP underground workings and are able to monitor activities conducted there. The EEG is expected to provide continuing oversight during the test phase and is given specific responsibilities by the LWA.

In addition, the WIPP program has been repeatedly reviewed by the National Academy of Sciences, which has specific review responsibilities for the WIPP test phase under the LWA. The DOE will also involve the Defense Nuclear Facility Safety Board (DNFSB) in reviewing the operational safety of all WIPP activities. External oversight also includes safety inspections by the State Mine Inspector from the New Mexico BOM. Also, the DOE frequently calls on the technical expertise of outside experts. During the test phase such expertise will be used in evaluating the safety and results of the experimental program.

1.7 SCOPE OF THE WASTE RETRIEVAL PLAN

The LWA requires that the transuranic waste used in experiments at the WIPP be fully retrievable and specifies the conditions under which the waste is to be retrieved. Section 10(a)(1)(A), (B), and (C) of the LWA specifies three explicit "events" that would require waste retrieval: 1) the Secretary or the Administrator determines that WIPP does not comply with the final disposal regulations; 2) the transuranic waste needs to be retrieved for engineering modification or for repackaging for permanent disposal; or 3) such retrieval is necessary to protect the public health and safety and the environment.

The LWA also addresses specific conditions for waste retrieval under Sections 9(b)(2), 9(c)(2), and 10(b). These include, under Sections 9(b)(2) - during the test phase, and 9(c)(2) - during the disposal phase, a determination by the EPA Administrator that WIPP fails to comply with other environmental laws and regulations (as set forth in Section 9(a)(1) of the LWA) and under 10(b), a determination by the Secretary of Energy that the TRU waste used in experiments at WIPP cannot remain retrievable and corrective action is not possible. These conditions are considered to be a subset of the third event explicitly specified in Section 10(a)(1)(c) of the LWA, i.e., retrieval necessary to protect the public health and safety and the environment. This plan addresses only retrieval for these purposes. It does not address the temporary relocation of individual waste containers from
one underground area to another or temporary removal of individual waste containers for any reason; such relocation or removal is considered normal operating practice and will be conducted in accordance with existing operating procedures, which are cited in this plan. Nor is this plan intended to address the retrieval of waste emplaced in the WIPP for permanent disposal, as provided for in the Act. During the test phase the DOE will work with the EPA to determine what planning is needed for the contingency of retrieving waste emplaced for disposal.
2.0 THE TEST PHASE FOR THE WIPP

This chapter describes the test phase for the WIPP. It begins by summarizing the requirements and provisions of the WIPP LWA. It then discusses the experimental program included in the test phase, focusing on tests planned for the WIPP underground with transuranic waste.

Over the next several years, the DOE will conduct at the WIPP a test phase consisting of an experimental, or testing, program and regulatory-compliance determinations, including assessments of long-term performance. Much of the test-phase effort will be a continuation of activities that were begun when the WIPP site was selected and have been under way ever since. However, the test program will include tests that have not been conducted to date—namely, tests with transuranic waste.

2.1 STATUTORY REQUIREMENTS

Authorization to start receiving transuranic waste at the WIPP for the test phase is given by Public Law 102-579, signed by the President on October 30, 1992. This law, called the "WIPP LWA" because it withdraws the Federal lands on which the WIPP is located from the public domain, addresses a broad range of concerns related to the WIPP, including the test phase, disposal operations, compliance with disposal regulations, compliance with environmental laws and regulations, waste retrievability, mine safety, economic assistance and miscellaneous payments to the State of New Mexico, transportation, and access to information. The paragraphs that follow summarize the provisions most directly pertinent to the test phase.

2.1.1 Requirements for transporting waste to the WIPP

The LWA specifies that no transuranic waste may be transported to the WIPP for the test phase unless the following requirements are met:

1. Final disposal regulations have been issued and published (see Chapter 3).

2. The U.S. EPA has determined that the DOE has complied with the terms and conditions of the "no-migration" determination pertinent to the RCRA.

3. The DOE has issued and the U.S. EPA has approved, by rule, a test phase plan and a retrieval plan.

4. The U.S. Department of Labor has reviewed the emergency-response training for the WIPP and concurred that the training programs comply with the applicable Federal regulations (29 CFR 1910.120).
5. The DOE has certified, through safety-analysis documents, that the safety of test-phase activities at the WIPP can be ensured through procedures that would not compromise the type, quantity or quality of data collected from the tests.

6. The DOE has issued a plan for ensuring the stability of underground rooms for testing and the U.S. Department of Labor has reviewed the plan and concurred that the underground rooms in which transuranic waste may be emplaced for testing will remain sufficiently stable and safe to permit uninterrupted testing "for the duration of such activities."

In addition, no waste may be transported to or from WIPP except in packages whose design has been certified by the NRC and determined by the NRC to satisfy its Quality Assurance requirements.

2.1.2 Test phase plan and waste retrieval plan approval

As mentioned in item 3 above, the DOE is required to prepare and to submit to the U.S. EPA for review a test phase plan and a waste retrieval plan. A notice that these plans have been submitted is to be published in the Federal Register, and the public is to have an opportunity for access to the plans.

The EPA, in a single rulemaking procedure, must determine whether to approve the Test Phase Plan for the Waste Isolation Pilot Plant (DOE, 1993a) in whole or in part, and whether to approve or disapprove this Waste Retrieval Plan. If either of the plans is not approved, the DOE may submit to the EPA a revised plan for review and approval. The DOE may also modify the plans in the future, but both revisions and modifications require EPA approval by rulemaking.

2.1.3 Other requirements

The LWA requires all transuranic waste emplaced in the WIPP during the test phase to be retrievable and specifies the circumstances under which the transuranic waste must be retrieved. The retrievability of all the emplaced waste is to be determined one year after the initial emplacement of waste and every year thereafter during the test phase. Having made the determination in consultation with the EPA, the DOE is to publish the results in the Federal Register. In addition, in conjunction with this determination, the DOE has to conduct an annual demonstration, not taking any action to affect the test phase, that a sample of transuranic waste is retrievable. If the waste is found to be not retrievable or is not expected to remain retrievable, the DOE may take corrective action to ensure retrievability. If corrective action is not possible, the waste must be retrieved, and the State of New Mexico and the EPA may take action to ensure the retrieval or removal of all transuranic waste in the WIPP.
2.2 DEMONSTRATIONS OF REGULATORY COMPLIANCE

The DOE will conduct analyses of compliance with the EPA regulations that apply to (1) the preclosure phases of the WIPP (the test, disposal, and decommissioning phases) and (2) the long-term performance after closure. For the preclosure phases, environmental and safety analyses will be performed; for the postclosure phase, performance assessments will be conducted, as described in the Test Phase Plan for the Waste Isolation Pilot Plant (DOE, 1993a). All of the testing activities planned for the test phase are directed at supporting these regulatory-compliance analyses.

Every two years, in accordance with the LWA, the DOE will submit to the EPA documentation of continued compliance with applicable environmental laws and regulations (except for the final disposal regulations). Similarly, the DOE will biennially submit to the State of New Mexico documentation of continued compliance with the RCRA.

2.3 THE EXPERIMENTAL PROGRAM

2.3.1 Activities included in the program

The purpose of the experimental program, which is frequently referred to as the test program, is to support a credible and defensible demonstration of regulatory compliance. The scope and purpose of the program are described in detail in the Test Phase Plan for the Waste Isolation Pilot Plant (DOE, 1993a). The type of studies included in this program include the following:

1. Experiments with transuranic waste.

2. Studies of the WIPP underground (disposal room and drift system), including laboratory studies, modeling, and underground studies at the WIPP.

3. Studies of sealing systems and rock mechanics, including laboratory studies, model development and modeling, seal design, and experiments at the WIPP.

4. Studies of the natural barriers provided by the host rock for the WIPP (the Salado Formation.)

5. Studies of the natural barriers provided by rock units other than the Salado Formation, with emphasis on the Culebra member of the Rustler Formation, which lies above the Salado.

The studies encompassed by items 1 through 5 are discussed and explained in the Test Phase Plan for the Waste Isolation Pilot Plant (DOE, 1993a). The studies included in item 1 are divided into three categories: waste characterization at the site where the waste is generated or stored; laboratory studies with transuranic waste; and experiments with transuranic waste underground at the WIPP. The latter are the activities directly pertinent to this retrieval plan and are described in some detail below.
2.3.2 Bin tests with transuranic waste

**Purpose and need**

Transuranic waste contains various materials from which gases can evolve; they include paper and other cellulosic materials, plastics, rubber materials, and other organic materials; corroding steels, aluminum, and noncorroding metals; solid inorganic materials; inorganic sludges; and cements. In order to determine regulatory compliance, performance assessment requires, among other data, information about various mechanisms for gas evolution over time, including the evolution of hydrogen from the corrosion of metals; the evolution of hydrogen and oxygen through the radiation-induced decomposition of brine or water in the waste; and the evolution of carbon dioxide, methane, nitrogen, and hydrogen sulfide from the bacterial decomposition of organic materials. The data on these mechanisms should be obtained under realistic repository conditions, and hence most of these tests will reproduce the oxygen-free environment that is expected to develop in the WIPP underground as time passes.

To obtain information relevant to regulatory compliance, the DOE will conduct bin tests with contact-handled transuranic waste in underground disposal rooms at the WIPP. These tests will allow the DOE to study gas-generation mechanisms and rates on a larger scale than that possible in the laboratory. They will also provide an opportunity to observe waste interactions—both synergistic and antagonistic—that may not be observable in the smaller-scale laboratory tests. The results of the bin tests will be used to further refine the gas-generation models used in performance assessments.

**Regulatory requirements**

The EPA has granted a "no-migration" determination that will allow the DOE to emplace untreated hazardous waste in the WIPP for the underground testing. The conditions and limits imposed by the EPA for this determination include the following (EPA, 1990):

1. No waste may be emplaced in the WIPP for purposes other than testing to support certification of compliance with disposal regulations.

2. All wastes used in the test program must be removed if the DOE cannot demonstrate that the permanent disposal of transuranic mixed waste in the WIPP will meet the standards of 40 CFR 268.6.

3. All wastes used in the test program must be readily retrievable.

**The sources and content of the waste to be used in bin tests**

The waste for the tests are currently planned to come from the Rocky Flats Plant and the Idaho National Engineering Laboratory. It is currently stored in metal containers (55-gallon drums or boxes).
Some of the waste will have a high organic content; this waste includes combustible solidified organic materials, organic filters, leaded rubber, organic materials solidified in cement, and mixed organic wastes. Wastes with a low inorganic content will also be used; this waste consists of graphite waste, equipment, metals, glass, inorganic solids, and pyrochemical salts. Inorganic sludges and inorganic particulates solidified in cement will also be tested.

Waste characterization and packaging

Each container of waste to be used in the experimental program must meet the waste-acceptance criteria that have been established for the WIPP (DOE, 1989). Each container will therefore be characterized at the storage location to determine its content. The characterization will consist of visual examinations, examination by x-raying, gravimetry, and the sampling of gases collected in the headspace of the drum. Knowledge of the process that produced the waste (e.g., the reprocessing of fuel from defense reactors) will contribute to this characterization process. The DOE Waste Characterization Program Plan (DOE, 1991a) describes in detail how the waste will be characterized.

After characterization, the waste will be removed from its container and transferred to a metal bin, specially designed for the experimental program and lined with heavy plastic. (The bins, shown in Figure 2-1, are described later in this section.) Each bin will be given a unique identifier in bar code for use in tracking the waste inventory at the WIPP.

Each bin will be overpacked in a metal box (a standard waste box) and shipped to the WIPP site in a specially designed shipping container called TRUPACT-II. These containers have been demonstrated to provide safe transportation for radioactive materials under both normal and accident conditions and have been approved by the U.S. NRC.

General description of the bin tests

The complexity of the bin tests ranges from simple tests with only a few waste materials to complex tests that intentionally combine as many individual waste materials as possible. The simple tests will be designed to provide information about gas generation at the mechanistic level. The complex tests will attempt to determine how interactions between waste materials affect gas generation; they will look at synergistic and antagonistic interactions.

The tests will begin with dry bins containing as-received waste. In some of these bins, the inside humidity will be raised (to approximately 74 percent relative humidity) by circulating the air inside the bin through a bubbler filled with simulated Salado brine. The objective is to simulate the conditions that will exist in the disposal rooms after the room has been filled with waste, sealed, and the ventilation system is shut off. These are the so-called humid bins.
Figure 2-1. Bin
In other bins, both brine from the Salado Formation and backfill material will be added. The backfill material will consist mostly of crushed salt with additives like bentonite clay or gas-scavenging materials. Enough brine will be added to these bins to completely cover the waste, and therefore these bins are called "inundated bins."

In addition to the actual transuranic waste, the tests will use some bins with simulated waste and some bins that are empty (reference bins). The empty, or reference, bins will be used to obtain information on the bin itself and its components, such as the behavior of its paint coating or the interaction between the paint and the plastic liner of the bin. The simulated waste will resemble the actual waste, but it will be nonradioactive. Tests with this waste will provide information that cannot be obtained with actual transuranic waste because the waste materials can be examined in detail without any containment. In addition, the tests with simulated waste will allow the brine in the bins to be sampled and analyzed. Examples of the information expected to be obtained are effects on the surfaces of metals and the response of solid materials to brine.

**Equipment for testing: bins, overpacks, instrumentation**

The waste will be contained in two types of specially designed metal bins. Type 1 bins are low pressure bins (0-0.5 psig operating pressure) and are 4 feet square and 3 feet high (Figure 2-1). The bins have an internal volume of 42.4 cubic feet and a nominal capacity of 5 drum-volume equivalents of loose contact-handled transuranic waste. The bins are made of mild-steel plate (A36 mild steel) that is 0.25 inch thick to establish the humid conditions expected in the repository after the test room ventilation is secured and the test room is sealed. An external humidification system has been added to the type 1 bin system. To facilitate safe and efficient handling, the bins are equipped with lifting devices. The lifting devices are designed, manufactured, and tested in accordance with the WIPP Hoisting and Rigging Manual (WP 10-4).

The type 2 bin design is currently being developed. This bin will be used in bin testing for pressurized humid and brine inundated conditions. The bin operating pressure will range up to lithostatic conditions (nominally 2200 psig). Unlike operation of the type 1 bin, the type 2 bin will not be vented during operation. The generation of flammable gases within the waste will be allowed to occur unimpeded by operator action or constrained by bin design pressure. The type 2 bin will simulate repository conditions in the long-term.

During the type 1 bin tests, the bin will remain in the overpack (the metal waste box) in which it was shipped. The purpose is to provide both primary and secondary confinement for radioactive material. On arrival at the WIPP, the lid of the overpack will be replaced with a special lid designed to accommodate connections between the access ports in the bin and the various instruments to be used in the tests. The overpacked bins may be placed singularly as shown in Figure 2-2, or stacked two high on a test stand that holds instrumentation. The bottom of the test stand is a platform that is about 6 inches high and can be adjusted to maintain the bins nearly level over the several years of testing. The test
HUMIDIFICATION SYSTEM
FINAL (90%) DESIGN REVIEW
92-07

Figure 2-2. Type 1 Bin
platform will be 3 feet from the wall, and sufficient space will be left between stacks to provide access to instrumentation and support equipment.

Each type 1 bin has a number of access ports that can be used to purge with inert gases, monitor the pressure, provide pressure relief, sample gases, and inject tracer gases. Also, each bin is equipped with the following remotely read instruments: thermocouples, differential pressure gauges, valves for relieving gas pressure, gas flow and volume gauges, solid-state oxygen detectors. These instruments will be connected by cable to a data-acquisition system. With the exception of the thermocouples, all instrumentation for the tests will be mounted on the outside of the overpack enclosing the bin. The instrumentation will be connected to the bin with hoses that pass through gastight seals in the overpack. The bins are gastight. The design leak-rate criterion for the type 1 bin gasket (Figure 2-1) is to limit oxygen inleakage to 2 parts per million per year. To prevent exceeding the design pressure, the bins are equipped with rupture discs. Protection against releases of radioactive material is provided by high-efficiency particulate air filters. To protect against releases of hazardous volatile organic compounds, carbon-composite filters are installed downstream of the particulate filters.

Discharges from rupture discs will be piped to a system designed to monitor volatile organic compounds. This system will collect all gases emanating from a bin and route them through a carbon sorption unit that has an efficiency of 95 percent, as required by the EPA's conditions for the test phase (EPA, 1990). The EPA requires a sampling system to be installed in the exhaust shaft; this system must be in place and operating 30 days before any waste is received. Other sampling locations will be the entry and exit to the panel in which the test room is located and the air-intake shaft.

Bins for the experimental setup described above are available. For experiments with the humid bins (type 1), the experimental setup requires some modification, and the design of this modified equipment is near completion. For the inundated-bin tests, a special type 2 bin designed for high internal pressures is needed. A program to develop the experimental setup for these tests has been started. It includes establishing the test requirements and criteria; establishing design criteria for the equipment necessary to support the tests; developing and evaluating conceptual designs, including a mock-up configuration for development testing; developing a prototype configuration and subjecting it to extensive functional testing; performing a final design review; procuring a production model for final testing; and performing an integrated systems checkout to establish readiness for the experimental program.

**Location and configuration of bin tests**

The bin tests will be conducted in the waste-disposal area (see Figure 2-3), using a test room (room 1) in panel 1 (see Figure 2-4). This test room is 33 feet wide, 300 feet long, and 13 feet high. A row of bins will run along the walls, down the length of the room.

Two sheds have been installed at the entrance to the test room. One will be used by the health-physics personnel who will perform periodic radiation surveys of the bins, to
Figure 2-3. Waste Disposal Area
Figure 2-4. Test Room
ensure that there is no contamination on the surface. The other shed houses the computer-based data-acquisition system, which will be connected to the instrumentation on the bins.

In 1991, a state-of-the-art supplementary roof-support system was installed in the test room. In addition, various instruments have been installed to measure geomechanical conditions as part of a geotechnical engineering program (see Chapter 5).

**Planned bin tests**

The bin-test program consists of three tiers of experiments: (1) specifically planned tests, (2) conditionally planned tests, and (3) contingency tests.

**Specifically planned tests**

The specifically planned tests are those individually identified as relevant to reduce uncertainty and increase confidence in the ability to predict (1) gas-generation rates and species and (2) release rates for volatile organic compounds. The DOE plans to conduct these tests with 19 bins of actual transuranic waste, 6 bins of simulated waste, and 8 reference bins, for a total of 33 bins. Both type 1 and type 2 bins will be used in these tests.

**Conditionally planned tests**

The conditionally planned tests are tests that will be conducted if the results from the specifically planned tests have not adequately reduced the level of uncertainty about gas generation and release rates. These tests will be conducted with up to 25 additional bins of actual transuranic waste and up to 4 additional bins of simulated waste, for a total of up to 29 additional bins. All of these bins with actual transuranic waste are likely to be type 2 bins.

It is expected that twelve of these bins with actual waste will be used to examine the effects of waste modifications. The bins will be divided into three groups: cellulosic waste, metallic waste, and mixed waste, and two different engineered modifications for each type will be investigated. For each modification, one humid and one inundated bin will be used.

It is expected that nine of the bins included in the conditionally planned tests will be used to investigate the statistical variability of interactions in wastes containing large and small quantities of sludges. It is also expected that the last four bins with actual waste will be used to investigate binary gas-generation mechanisms not addressed in the specifically planned tests.

**Contingency tests**

Contingency tests may be conducted due to unexpected results from the planned tests, additional tests mandated by regulatory bodies, or to further investigate engineered modifications of the waste form to enhance the predicted performance and facilitate the
demonstration of compliance. It is not possible to predict at present how many and what type of bins would be used in contingency tests. If such tests are necessary, the Test Phase Plan for the Waste Isolation Pilot Plant (DOE, 1993a) and this Waste Retrieval Plan will be revised as appropriate to present the DOE's plans for such tests.

2.3.3 Alcove test(s) with transuranic waste

The DOE plans to conduct, underground at the WIPP, a test(s) with sufficient transuranic waste to approximate a disposal room. This test(s) will be conducted in a specially excavated area—the test alcove. The quantity of waste used in this test will be approximately 1050 drums and the alcove will not be backfilled.

Purpose and need

The alcove test(s) are designed to collect data on the amounts and types of volatile organic compounds and other gases that will be released into the alcove. The objective is to reduce the considerable uncertainties associated with data collected during generator site gas sampling from 55-gallon steel drums of TRU mixed waste. The information about gas releases is needed to determine whether working conditions will be safe for people working in the vicinity of the filled disposal rooms during waste disposal. Information is also needed about the concentration of gases in air that will be released to the environment through the ventilation system.

Description of the test arrangement

The alcove test(s) will use transuranic waste in 55-gallon steel drums. The drums will be equipped with filtered vents for pressure relief if necessary. The drums will contain only unmodified, as received contact-handled transuranic waste, without additives or brine. The test(s) will replicate, as closely as possible, the environment expected to be present in the WIPP during waste-emplacement operations. The plan calls for using one alcove, assuming ready availability of all the needed waste types. A second alcove may be used as a contingency for this test to accommodate later waste types (such as sludges).

The test alcove (see Figure 2-5) will be a closed-end room, approximately 13 feet high, 25 feet wide, and 100 feet long, and will most likely be located in the panel 1 area of the underground. It will have one-third the length of a WIPP disposal room (300 feet) and will be considerably narrower than a disposal room (25 versus 33 feet). The narrower configuration is also expected to increase the stability of the mined alcove. The access drift to the alcove will be mined to a height of 13 feet, a width of 14 feet, and a length of 170 feet to facilitate sealing the alcove.

To improve stability, rockbolts will be installed in the alcove and its access drift before any waste is emplaced. To monitor the ambient temperature, nine thermocouples will be installed and monitored. Seven thermocouples will be located along the walls of the alcove, and one thermocouple will be installed in each inlet and outlet duct of the gas-recirculation system.
Figure 2.5. Test alcove

WIPP in Situ TRU
Test Waste Alcove, Plan View

Void Area (allows for salt creep)

TEST ALCOVE WITH SEVEN PACKS PLACED 2' FROM SIDE WALLS

CH TRU Waste in 7-Packs

Alcove Gas Barrier Bulkheads (3)

Alcove Gas Barrier Liner
The alcove will have a gas test system designed for maintenance-free operation within the sealed alcove. All equipment that may require routine maintenance will be isolated from the alcove through valving, with the exception of the duct-isolation valves themselves. This gas test system will be required to ensure adequate mixing of gases for true representative sampling; circulate alcove gases through an oxygen-scavenging catalyst when necessary; permit the injection of tracer gases, air, or nitrogen when required; permit the monitoring of alcove gases for contamination with radioactive particulates.

To meet these requirements, the accessible portion of the gas test system outside the alcove gas barrier (see below) will be instrumented and provided with ports to accommodate remote-reading absolute-pressure gauges, valves for controlling and relieving pressure in the alcove, remote-reading gauges for monitoring gas flow to measure the volume of gas released through the control and rupture discs, solid-state oxygen sensors, instruments for detecting or sampling airborne radioactive materials, gas-sampling ports, gas-injection ports, and connections to the oxygen-scavenging system.

**Gas barrier**

Before the alcove test(s) can be started, a gas barrier must be installed in the entrance to the alcove to seal the alcove off and minimize the escape of gases from the alcove. Currently, this barrier design consists of a steel-and-concrete liner and a series of three circular bulkheads inside the liner. The bulkheads will allow personnel entry within the alcove gas barrier (AGB), if necessary. Passthrough ports will be provided in each bulkhead to accommodate cables for instruments and the inlet and outlet ducts of the gas test system. The alcove gas barrier, including bulkheads, will be designed to allow the alcove to be maintained at a positive pressure of 0.25 to 1.00 pound per square inch of differential pressure. The desired pressure will be maintained by relieving alcove pressure or injecting nitrogen gas to increase pressure.
3.0 STATUTORY REQUIREMENTS FOR WASTE RETRIEVAL AND THE DECISION PROCESS LEADING TO RETRIEVAL

This chapter describes the conditions, specified in the LWA, that would require the DOE to retrieve the waste used in underground experiments at the WIPP. It covers regulatory compliance, possible remedial or corrective actions, and the decision process that would lead to waste retrieval.

3.1 STATUTORY REQUIREMENTS FOR RETRIEVABILITY AND CONDITIONS REQUIRING RETRIEVAL

The WIPP LWA specifies that the waste used in underground experiments at the WIPP is to be retrievable and requires the DOE to conduct annual demonstrations and determinations of retrievability. The DOE's plans for these demonstrations are given in Chapter 5.

The Act also specifies that the waste emplaced underground for testing is to be retrieved under the following conditions:

- The Secretary of Energy determines or the Administrator of the EPA determines that the WIPP does not comply with the disposal regulations.
- The transuranic waste needs to be retrieved for engineering modification or for repackaging for permanent disposal.
- Retrieval is necessary to protect the public health and safety and the environment.

- The Administrator of the EPA finds, at any time, that the WIPP does not comply with Subpart A of 40 CFR Part 191 and the environmental laws cited in Section 9 of the LWA (the Clean Air Act, the Solid Waste Disposal Act [SWDA, as implemented by RCRA], the Safe Drinking Water Act, the Toxic Substances Control Act, and the Comprehensive Environmental Response, Compensation, and Liability Act) as well as all regulations promulgated and all permit requirements under these environmental laws.

- The Secretary of Energy determines that the transuranic waste used for experiments at the WIPP cannot remain retrievable and corrective action is not possible.
3.2 NONCOMPLIANCE WITH FINAL DISPOSAL REGULATIONS

For the WIPP to begin disposal operations, the EPA must certify the WIPP's compliance with the EPA's final disposal regulations in Subpart B of 40 CFR Part 191. Subpart B consists of standards for performance over the long term, after the WIPP has been filled and permanently closed. Subpart B limits the cumulative radionuclide releases to the accessible environment for 10,000 years after closure, specifies limits for the annual radiation dose that can be delivered to individual members of the public, and specifies requirements for protecting ground water after closure under conditions expected at the site.

3.2.1 The status of Subpart B

In 1987, a U.S. court of appeals remanded to the EPA the individual-protection requirements (40 CFR 191.15) and the ground-water-protection requirements (40 CFR 191.16) and vacated and remanded to the EPA all of Subpart B of 40 CFR Part 191. However, the DOE and the State of New Mexico agreed, in a modification to the Agreement for Consultation and Cooperation (DOE and the State of New Mexico, 1981, as modified), that the DOE's plans for regulatory compliance would be based on the 1985 standard until the standard is repromulgated.

The WIPP LWA requires the EPA to issue final disposal regulations for the WIPP not later than 6 months from the date of enactment (i.e., by April 30, 1993). Furthermore, the LWA specifies that the Subpart B, as issued in 1985, is in effect except for the remanded sections (40 CFR 191.15 and 16) and except for sites characterized under Section 113(a) of the Nuclear Waste Policy Act (NWPA). Proposed regulations were issued by the EPA on February 10, 1993. And not later than October 30, 1993, the EPA is to propose criteria that the EPA will use for certifying compliance with Subpart B. The final criteria are to be issued by October 30, 1994.

The DOE has developed a strategy for complying with Subpart B. It is conducting a performance-assessment program directed at developing and refining the analytical tools needed for predictions of performance over the long term. Plans for conducting this program are included in the Test Phase Plan for the Waste Isolation Pilot Plant (DOE, 1993a).

3.2.2 Remedial and corrective actions

Consideration of remedial or corrective actions is designed into the performance-assessment program. These actions may include guidance for the experimental program or the other scientific investigations conducted during the test phase, including specifications of information needs and the associated parameters. Performance assessment will also evaluate the effects of engineered changes in waste forms, such as supercompaction, or in waste containers. Engineered modifications of the WIPP underground configuration will also be evaluated if it is determined that modifications are needed for compliance.
3.2.3 Decision process

The decision process begins when the DOE has sufficient confidence in the results of performance assessment and formally compares the results against the EPA's disposal requirements in 40 CFR Part 191. This will happen when the complete set of scenarios with probabilities of occurrence has been defined; the compliance-assessment system is considered adequate and is supported by adequate documentation; the data sets have undergone quality assurance and the computational models have been validated to the extent possible; the final analyses are complete; peer reviews by external experts have affirmed that the analyses are adequate; and an adequate administrative record has been prepared.

If the results of the performance assessment show that, even with the remedial actions mentioned in Section 3.2.2, compliance cannot be achieved, then the DOE will terminate the project, retrieve the waste, and decommission the WIPP facilities. If the results show compliance, the DOE will submit to the EPA Administrator an application for certification of compliance with the final disposal regulations.

Recognizing the difficulties associated with demonstrating performance over 10,000 years, the EPA specified in its guidance for implementing Subpart B that "complete assurance" is not expected. What is required is a "reasonable expectation" that a repository would meet the probabilistic release limits specified in Subpart B. The EPA requires a rational decision, based on "the record before the implementing agency" (i.e., the DOE in the case of the WIPP), incorporating both quantitative analyses and qualitative judgment.

To arrive at "reasonable expectation," the DOE will conduct a formal review process independent of the research and analysis processes. Formal examination of the evidence and conclusions supporting various elements of the analysis would be accomplished through quantitative reviews by peers of the researchers and analysts and would then be documented. These reviews will take place as the understanding of the disposal system and the methodology evolve through each year's preliminary assessment of compliance. The documentation of the review would include recommendations about the status of the understanding of the disposal system and its performance. This documentation will become part of the administrative record, along with the technical reports and information and quality-assurance files considered in the review. Once the final assessments have been completed, a qualitative review of the administrative record will provide the basis for a decision on whether a reasonable expectation of compliance with each requirement exists.

The Administrator of the EPA will evaluate the DOE's application for certification of compliance and shall certify by rule whether WIPP will comply with the final disposal regulations. If the Administrator does not certify WIPP's compliance, the DOE will retrieve the waste and ship it off the site for interim storage (see Chapter 7). If the State disagrees with the Secretary's application, the State may invoke the conflict resolution provisions of the Agreement for Consultation and Cooperation (DOE and State of New Mexico, 1981, as modified). If the Administrator certifies, the DOE will start making preparations for
beginning transuranic-waste disposal in the WIPP, provided that the other requirements specified in the LWA are met.

3.3 ENGINEERING MODIFICATION OR REPACKAGING FOR PERMANENT DISPOSAL

Section 10(a)(1)(B) of the LWA specifies the requirement that waste be retrieved from WIPP in the event that engineering modifications are needed or for the purpose of repackaging the waste for permanent disposal.

3.3.1 Engineering modification

During the test phase, contact-handled transuranic waste as it currently exists will be tested and evaluated for compliance with disposal regulations through performance assessment analyses. Further testing with modified waste forms will be conducted if it appears that waste modifications will be necessary to achieve compliance with the disposal regulatory requirements (i.e., 40 CFR 191 Subparts B and C and/or RCRA). Testing with alternative waste forms would allow the DOE to evaluate appropriate actions necessary to bring waste in compliance with the disposal regulatory requirements. In the event DOE determines that engineering modifications are needed to assure compliance with disposal regulatory requirements, test waste will be retrieved and shipped to off-site treatment facilities for the necessary waste form modifications.

3.3.2 Repackaging for permanent disposal

All waste used for bin testing during the test phase will be repackaged prior to permanent disposal at WIPP after all prerequisites, necessary approvals and certifications are completed for the commencement of the disposal phase. If necessary for permanent disposal, the alcove test waste will be retrieved for repackaging as well. Repackaging activities may include the removal of all instrumentation hardware used during waste testing, the placement of waste in acceptable waste containers, and other necessary packaging activities for permanent disposal.

3.3.3 Decision process

The decision to retrieve waste for shipment to off-site treatment facilities for any needed waste form modifications will occur once DOE has sufficient confidence in the results of its performance assessment analyses as compared to the requirements of the disposal regulatory requirements. The decision process will begin once final analyses are complete; the compliance assessment system is supported by adequate documentation; data sets and computational models have been validated in accordance with acceptable quality assurance procedures; and an adequate administrative record has been prepared.

A similar decision process will be utilized for determining whether or not retrieval of alcove test waste is necessary for permanent disposal. All bin test waste will be repackaged prior to permanent disposal.
3.4 PROTECT THE PUBLIC HEALTH AND SAFETY AND THE ENVIRONMENT

3.4.1 Noncompliance with environmental regulations

The LWA requires the DOE to submit to the EPA, starting no later than two years after the enactment of the LWA and every two years thereafter, documentation of continued compliance with Subpart A of 40 CFR Part 191, the Clean Air Act, the Solid Waste Disposal Act (SWDA, as implemented by RCRA), the Safe Drinking Water Act, the Toxic Substances Control Act, the Comprehensive Environmental Response, Compensation, and Liability Act, all other applicable Federal laws pertaining to public health and safety and the environment, and all regulations and permit requirements under these laws. These laws are specified in Section 9 of the LWA.

In addition, starting no later than two years after the enactment of the LWA and every two years thereafter, the DOE will also submit to the State of New Mexico documentation of continued compliance with the Solid Waste Disposal Act.

To demonstrate compliance with the Solid Waste Disposal Act, as amended by the RCRA, and the regulations implementing it (40 CFR Part 264, and 40 CFR Part 268), the DOE will rely on a dual approach which involves short and long term compliance. Demonstrations of compliance for the short term (the test, disposal, and decommissioning phases) will rely on predictions based on waste characteristics, the data collected during the test phase (see Chapter 2), and the data collected by the monitoring system installed in accordance with the VOC Monitoring Plan for Bin-Room Tests (WP 12-6). To collect these data, the DOE has implemented a comprehensive program for monitoring VOCs in the transuranic waste. To support this program, a quality-assurance program has been established and operating procedures have been prepared.

Environmental monitoring at the WIPP site has been conducted since the mid-1970s. Environmental baseline data have been collected, and monitoring equipment is in place and operating. This will facilitate documenting compliance with the laws and regulations cited in the LWA. Furthermore, detailed plans for environmental compliance have been developed and are documented in the following:

- **Groundwater Monitoring Program Plan** (WP 02-1)
- **Environmental Compliance Assessment Program (ECAP) Plan** (WP 02-2)
- **Environmental Procedures Manual** (WP 02-3)
- **Operational Environmental Permit Compliance Plan** (WP 02-4)
- **Nonradioactive Hazardous Materials Environmental Compliance Manual** (WP 02-5)
Included in these plans and manuals are specifications for corrective, mitigating, and remedial activities should such activities be needed.

For Subpart A of 40 CFR 191, the documentation of compliance will be the Final Safety Analysis Report for the WIPP. For most of the other laws, the documentation will focus on showing compliance with the conditions specified in the permits obtained by the DOE under these laws and regulations.

Within six months of receiving the documentation of continued compliance, the EPA and the State of New Mexico must determine whether the WIPP complies with the SWDA, and the EPA must determine whether WIPP complies with all of the other environmental laws specified in Section 9 of the LWA. If the EPA, or the State, as appropriate, determines noncompliance, it shall request from the DOE a remedial plan. Such a plan is to be submitted within six months of a determination of noncompliance. For the near term, the remedial actions for the most probable causes of exceeding the monitoring setpoints for volatile organic compounds are documented in the VOC Monitoring Quality Assurance Program Plan (WP 12-7). Other corrective actions will be implemented case by case. For the long term, the corrective action is modifying the waste by some treatment process.

To make a determination that the remedial plan is inadequate, the EPA must do so by rulemaking. If the EPA does not receive such a plan within six months of the determination of noncompliance or the EPA determines the plan is inadequate, the DOE must retrieve the waste from the WIPP.

For the long term, compliance with the "no migration" requirement of 40 CFR 268.6 will have to be determined. To make this determination, the DOE plans to use the performance-assessment process described in Section 2.2, with the adjustments needed for predicting the behavior of the hazardous constituents in the waste. The DOE will prepare and submit a No-Migration Variance Petition (NMVP) to the EPA for the disposal phase and an amended RCRA Part B permit application to the New Mexico Environment Division (NMED) for the disposal phase. The EPA must grant an NMD and NMED must grant the amended permit.

### 3.4.2 Determination of waste retrievability

The LWA requires the DOE to ensure that the transuranic waste emplaced in the WIPP for experiments will remain fully retrievable and to make an annual demonstration of retrievability. Starting one year after the start of emplacement of waste and every year...
thereafter during the test phase, the DOE, after consultation with the EPA, is to publish in the Federal Register a notice of its determination of retrievability.

The DOE has established the following criteria for a successful demonstration of retrievability:

- The demonstration will verify that the physical conditions of the test room and the access to the test room allows retrieval operations to be conducted safely.
- The demonstration will verify that waste can be retrieved without the evolution of unsafe conditions.
- The demonstration will verify the validity of the operating procedures developed for retrieval.
- The demonstration will verify the proficiency of the operators to perform waste-retrieval activities and that needed resources are available.
- The demonstration will utilize as low as reasonably achievable (ALARA) principles of distance, exposure, time and shielding in conjunction with simulated exposure levels based on the contents of the container, which will verify that the radiation exposure received by WIPP employees involved in retrieval operations does not exceed allowable radiation exposure in accordance with the WIPP Dosimetry Program and Procedures Manual (WP 12-3) and WIPP Radiological Controls Manual (WP 12-5).

If the DOE determines that the waste cannot remain retrievable and that corrective action is not possible, the EPA and the State of New Mexico may take action to ensure that the waste is retrieved. The State may invoke the conflict-resolution provisions of the Consultation and Cooperation Agreement if it determines that there is an insufficient basis for the DOE’s annual determination of retrievability or that the demonstration of retrievability does not ensure that the wastes will be retrievable. The DOE’s plans for conducting the annual retrievability demonstration are summarized in Chapter 5.
4.0 WASTE-RETRIEVAL OPERATIONS

This chapter discusses the operations that will be performed if waste is to be retrieved and cites the procedures that will be followed. It describes generally applicable procedures and controls and then presents separate discussions for the retrieval of bin waste, alcove waste, and waste generated at the WIPP. It also presents retrieval time estimates.

For the purposes of this plan, the term "waste retrieval" means the removal of transuranic waste and the container in which it has been retained and any contaminated material from the underground for off-site shipment to interim storage locations. It does not mean removal for the purpose of relocating the waste to another underground location in order to take corrective action (e.g., to improve the stability of a room); nor does it mean removal for a temporary transfer to the waste handling building, again for corrective action. If the waste is retrieved, it will be transferred to the surface and shipped off the site to an interim-storage location(s) (Chapter 7). However, depending on the conditions set by the State of New Mexico in response to WIPP's RCRA Part B application, it is expected that the test waste may be temporarily stored for up to one year at the WIPP site before shipment. This chapter presents a comprehensive plan that includes all operations involved in waste retrieval, including offsite shipment.

Different operations will be required for retrieval from the bin-test room and from the test alcove. These operations are therefore discussed in separate sections, avoiding redundancy where possible. Before describing these operations, it is useful to present the DOE's general waste-retrieval responsibilities as well as generally applicable procedures and controls.

4.1 GENERAL WASTE-RETRIEVAL RESPONSIBILITIES

The DOE has several general responsibilities regarding the retrieval of waste under the conditions listed above. These responsibilities are summarized below. Responsibilities specific to any of the conditions listed above are discussed in the subsequent sections.

- Comply with the waste-retrieval provisions of the WIPP LWA.

- Comply with the waste-retrieval provisions of the Working Agreement for Consultation and Cooperation with the State of New Mexico.

- Provide access to the WIPP for the BOM, the MSHA, the State, and the EPA for the purposes of conducting mine-safety and waste-retrievability evaluations.

- Ensure that no transuranic waste is emplaced in the WIPP for testing before completing a demonstration of retrieval specific for that type of test as part of an on-site integrated systems checkout.
• Ensure that WIPP retrieval readiness is fully maintained.

• Designate the destination (interim storage site) of the retrieved waste before starting retrieval operations.

• Determine what waste-acceptance criteria will be applied by the interim storage site and develop a plan for ensuring compliance with these criteria.

• Ensure that any retrieval operations are conducted in a manner that will minimize impacts on the health and safety of the general public and WIPP employees as well as the quality of the environment.

4.2 GENERALLY APPLICABLE PROCEDURES AND CONTROLS

4.2.1 Administrative controls

All retrieval operations will be conducted in accordance with approved procedures. The generally applicable procedures include the following:

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<thead>
<tr>
<th>Title</th>
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<tbody>
<tr>
<td>Bin Retrieval</td>
<td>WP 05-WH1902</td>
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<tr>
<td>CH Waste Package Retrieval</td>
<td>WP 05-110</td>
</tr>
<tr>
<td>Surface Contamination Surveys: Alpha and Beta-Gamma Radiation</td>
<td>WP 12-504</td>
</tr>
<tr>
<td>Direct Radiation Surveys</td>
<td>WP 12-505</td>
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<tr>
<td>On-Site Sampling for Airborne Radioactivity</td>
<td>WP 12-508</td>
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<tr>
<td>Removal and Disposal of Contaminated Salt</td>
<td>WP 12-554</td>
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<tr>
<td>TRUPACT-II Loading</td>
<td>WP 05-WH1001</td>
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<tr>
<td>Loading the TRUPACT-II Trailer</td>
<td>WP 05-WH1005</td>
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<tr>
<td>Shipment of Radioactive Materials</td>
<td>WP 06-102</td>
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<tr>
<td>TRUPACT-II Payload Transportation Certification</td>
<td>WP 05-WH1032</td>
</tr>
<tr>
<td>TRUPACT-II Payload Assembly Transportation Certification</td>
<td>WP 05-WH1033</td>
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Other procedures, which have a more limited applicability, will be cited in the relevant sections.

All retrieval operations will require radiation work permits. These permits establish radiation conditions, protective-equipment requirements, and other radiation-protection requirements (health-physics procedures) for both routine and nonroutine operations.
4.2.2 Personnel protection

All personnel working in waste-retrieval operations must complete radiation worker training and be designated as radiation workers. The training program is described in Chapter 5, which also discusses retrieval demonstrations and mockups.

All retrieval operations will be conducted in a manner designed to ensure compliance with the principle of keeping radiation exposures as low as reasonably achievable. Retrieval workers will be issued thermoluminescent dosimeters to measure their exposures to radiation. These dosimeters will be processed monthly unless the recorded exposures warrant more frequent processing. The requirements are documented in the WIPP Radiological Controls Manual (WP 12-5). In addition, retrieval workers will be issued digital dosimeters (chirpers) or direct-reading (pencil) radiation dosimeters. These dosimeters will be read and recorded daily.

Certain retrieval operations, such as the removal of instrumentation, may require workers to spend considerable time near waste containers. This circumstance may warrant the establishment of daily dose limits in keeping with the principle of keeping radiation exposures as low as reasonably achievable.

Because the test room will be frequently surveyed and monitored for radiation (see below), radioactive contamination is not expected to be present. If no contamination is detected in the radiation surveys (see below), protective clothing and respirators will not be necessary. However, if contamination is detected, all personnel engaged in retrieval operations in the particular room or alcove will be required to wear protective clothing as specified by the radiation work permit. Protective clothing and respirators will be readily available in the vicinity of retrieval operations.

4.2.3 Radiation monitoring

Continuous air monitors will be used to monitor airborne radioactivity in work areas and in exhaust airstreams. These instruments will monitor for alpha and beta radiation.

To detect surface contamination with radioactive material, surveys will be performed. The instruments used in these surveys have high sensitivity and are capable of detecting radiation at the low levels expected in the WIPP (i.e., capable of detecting gamma radiation with an energy level as low as 60,000 electron-volts (60 keV)). Surveys of the accessible waste containers will be performed before starting retrieval operations and periodically during the retrieval process as other waste container surfaces are exposed with handheld instruments and smears counted on alpha-and-beta bench counters.

Smears will be used to check for removable contamination on the waste containers. The smears will be immediately checked for gross contamination, using a portable alpha-particle detector. The smears will subsequently be counted in alpha/beta counters to quantify contamination levels. Every waste container will be checked for surface
contamination, and no containers will be removed from their emplacement area unless they have been certified to comply with surface-contamination limits.

The radiation surveys will be conducted in accordance with the following WIPP operating procedures: Surface Contamination Surveys: Alpha and Beta-Gamma Radiation (WP 12-504); Direct Radiation Surveys (WP 12-505); and On-Site Sampling for Airborne Radioactivity (WP 12-508), as appropriate.

4.3 RETRIEVAL OF WASTE USED IN BIN TESTS

As stated in the FSAR, all bins will be retrieved from the underground at the end of the test phase, except for those tests that will be continued through the disposal phase that will provide information relevant to demonstrating continued compliance with the applicable regulatory requirements. These bins will be retrieved when the tests have been terminated. These bins will be removed from Radiological Control Boundaries (RCBs) and placed in standard waste boxes. Depending on the results of the disposal decision, the bins will be transported off site or returned to the underground for disposal.

As described in Chapter 2, the transuranic waste used in the bin tests will be contained in specially designed metal bins enclosed in a RCB. The bins will be arranged in two rows and placed on RCB platform support stands.

The principal procedure governing the retrieval of the waste used in bin tests is Bin Retrieval (WP 05-WH1902). Procedures applicable to specific operations, such as the removal of instrumentation, will be cited in the relevant sections below.

The retrieved wastes will be shipped off the site for interim storage pending permanent disposal. Before shipment, temporary surface storage can be provided at the WIPP site. The RCRA Part B permit application for the WIPP (DOE, 1993b) designates the contact-handled-waste bay of the waste handling building as a storage facility in which retrieved waste could be stored for up to one year after retrieval operations are completed. However, the DOE plans to start offsite shipment as soon as practicable, concurrently with the retrieval of the waste bins from the underground. The objective is to minimize the accumulation of waste awaiting shipment.

To be ready for offsite shipment, the DOE will designate the interim-storage site(s) of the retrieved waste in accordance with the schedule discussed in Chapter 7. The DOE will also determine in advance what waste-acceptance criteria will be applied by the interim storage site(s) and develop a plan for ensuring compliance with these criteria.

4.3.1 Conditions expected at the time of retrieval

The test program will be conducted in a manner designed to provide safe conditions not only for the work related to testing but also for retrieval if retrieval should be necessary. As described in Chapter 2, the bins of waste will be enclosed in a metal container that provides a "radiation-control boundary," or RCB. If any radioactive material is released
from the bin, it will be contained inside the RCB, and contamination on the exterior of the RCB is unlikely. However, radiation surveys will be periodically conducted to check for contamination on the outside of the RCB or on instrumentation, and if radiation is detected, the item or area will be decontaminated in accordance with a radiation work permit specifically developed for that instance. Similarly, if contamination is detected at any time, the source will be identified and confined or removed. The extent of contamination will be determined, and the contamination will be cleaned up.

The bins will be equipped with high-efficiency particulate air filters in the instrumentation ports and connected to a gas-monitoring system (the VOC monitoring system) that will collect and filter any gases that might be released. The ventilation system will be operating throughout the test program, thus precluding any buildup of toxic gases in the test room. In addition, the air will be continuously monitored for radioactivity.

Detailed information about the waste inventory in the room will also be available. Before being shipped to the WIPP, the waste in each bin will be characterized at the site where it is generated or stored. Each bin will carry a unique identifier in bar code. This bar code will be affixed in three different places on each bin and repeated on the RCB container when the waste is prepared for emplacement in the WIPP. Information on the contents of each waste bin will be stored in a computer data base used to track the inventory of waste at the WIPP. Operating procedures require this data base to be updated, by typing in certain specified information, each time a waste bin is moved from its assigned underground location. Although access to the test room will be strictly controlled, tamper-indicating devices will be installed on the lid of each RCB container.

As can be seen from the photograph in Figure 4-1, the test room is spacious, allowing easy access to the bins, and well lit. The room will be kept clean and free of clutter. The configuration of the overpacked bins in the test room will be precisely known. Moreover, the precise condition of the test room with respect to ground control will be known. The floors in accessible areas of the test room will be worked throughout the test phase to keep them in the desired condition. Sections of the floor will be removed and backfilled with reconstituted salt to allow the floor to better accommodate the natural movement of the salt. This will allow uninhibited operation of the forklifts and other equipment during the test phase and will facilitate retrieval. Retrieval will also be facilitated by the underground-openings maintenance program, whose objective is to keep all underground excavations accessible and safe.

Utilities and equipment will be available for retrieval operations (see Chapter 5). This includes sufficient lighting, electrical and pneumatic power, and communications. The different detectors needed to detect various kinds of radiation (alpha or beta and gamma) will also be available and operable, including instruments with sufficient sensitivity to detect the low radiation levels expected in the test room. Heavy equipment (forklifts and the underground transporter) will be kept in operating condition, and the necessary equipment and tools will have been staged in the vicinity of the test room to be readily available for retrieval operations. This equipment includes protective clothing and respirators for personnel, a vacuum equipped with a high-efficiency filter, and forklift attachments.
Figure 4-1. Room 1 Panel 1
Personnel from the disciplines that would be involved in retrieval operations include health physicists and technicians, waste-handling operators, experimental operation technicians, quality-assurance personnel, and supervisors. On-call support personnel will include additional health-physics technicians; radiation-safety technicians; and personnel from engineering, maintenance, facility operations, emergency response, environmental protection, and industrial hygiene. These personnel have been trained in the detailed operating procedures for retrieval. In addition, demonstrations of retrieval have been conducted and will be repeated annually.

4.3.2 Retrieval activities underground

Before any retrieval operations are begun inside the test room, the types and quantities of wastes to be retrieved will be established.

A ventilation-control bulkhead has been installed at the north end of the test room in panel 1 (see Figure 4-2). Since panel 1 will be occupied throughout the experimental program, the radiological conditions will be known and controlled. Furthermore, since the bins will be in the RCB overpack containers (see Chapter 2), an additional contamination barrier will not be required.

Before any retrieval activities are started, the continuous air monitors (see Figure 4-2) will be verified to be operational, and extensive radiation surveys of the RCB containers enclosing the waste bins will be conducted, as described in Section 4.2.3, to ensure that no unknown areas of contamination exist. These surveys will cover all areas of the container except the bottom, which will be inspected later, after the RCB container has been lifted. In addition to counting at the smear location, instrumentation for contamination monitoring (see Figure 4-3) will be set up near the south end of the test room to count smear samples taken from the surfaces of the RCB containers.

All waste bins will be retrieved and transported to the surface without being removed from the RCB containers. This will provide added protection against releases of any radioactive material.

Before retrieval, each bin will be sampled for gasses (i.e., carbon monoxide, methane, hydrogen, carbon dioxide) in accordance with the procedure titled Underground Bin Sampling (WP 05-WH1806) and depressurized in accordance with Bin Equipment Removal for Retrieval (WP 05-WH1912). All instrumentation and external plumbing on the radiation-control overpack will be removed, as specified in the above-cited procedure for equipment removal (WP 05-WH1912).

For test bins that may be stacked, retrieval will begin at the top of each two-bin stack. A forklift equipped with a special lifting fixture will engage the lifting "eyes" on the RCB container and raise it. The bottom surface of the RCB container will then be surveyed for contamination. If the bottom surface is clean, the RCB container will be transported to the underground transporter (Figure 4-4), and this process will be repeated for the bottom bin.
Figure 4-3. Radiation Inspection Room
Figure 4-4. Underground Transporter
The underground transporter, which can haul two overpacked bins at a time, will move them to the waste hoist, which will transfer the overpacked bins to the waste-handling building at the surface. If the bottom is contaminated, it will be decontaminated according to a radiation work permit before being loaded onto the transporter. A radiation work permit is used to allow access to a radiation area to perform work under administrative control.

After both overpacked bins in a stack have been removed, the bin platform will be checked for contamination and removed. If no contamination is detected, the platforms are removed from the test room by forklift and treated as scrap metal. If surveying indicates that any of this equipment is contaminated, the equipment will be decontaminated or disposed of as site-derived waste (see Section 4.5).

The procedure described above will be repeated for each two-bin stack until all waste bins and support stands have been removed.

If the bin contains brine, it will be necessary to stabilize the brine. Brine stabilization is needed for compliance with transportation regulations, which prohibit the transportation of radioactive materials containing more than 1 percent free liquids. The DOE is considering several options for brine stabilization, as discussed in Chapter 6. The stabilization will be verified through analysis, testing, or inspection, or some combination of such methods before the bins are loaded into TRUPACT-II shipping containers. Only minimal quantities of liquids other than the brine injected for experiments are expected to be present in the bins because no wastes containing free liquids in excess of 1 percent are allowed to be shipped to the WIPP.

4.3.3 Retrieval activities at the surface

On arrival at the surface, the RCB overpacked bins will be transferred by forklift from the hoist to the dock area of the contact-handled-waste bay in the waste-handling building (see Figure 4-5). Here the lid of the overpack will be removed, as specified in the procedure Bin Retrieval (WP 05-WH1902). The bin will be removed from the RCB overpack and survey to ensure that it is not contaminated. The bin will then be placed in a clean overpack (a standard waste box), and the lid of the box will be installed to complete the packaging of the bin.

The TRUPACT-II is a rugged container designed especially for transporting transuranic waste to the WIPP and certified by the NRC. As described in the Final Supplementary Environmental Impact Statement (FSEIS) (DOE, 1990a), it is designed to provide safe waste transportation by being able to contain the waste both under normal transportation conditions and in severe transportation accidents (see Figures 4-6 and 4-7).

The newly overpacked bin will be weighed, certified, and loaded into the TRUPACT-II in accordance with the procedure TRUPACT-II Loading (WP 05-WH1001). A TRUPACT-II container, briefly described below, can carry two overpacked bins, provided the payload remains within the design limits of the TRUPACT-II. The TRUPACT-II
TEMPORARY STORAGE AREA

Waste Handling Building (WHB)

TEMPORARY STORAGE AREA
RADIOLGICALLY CONTROLLED AREA
RADIOLOGICAL BUFFER AREA

SCALE

Figure 4.5. Waste Handling Building
Figure 4-6. Diagram of the TRUPACT-II
Figure 4-7. Photograph of the TRUPACT-II
container will be moved through an airlock to the trailer-loading yard and installed onto the trailer in accordance with the procedure, Loading the TRUPACT-II Trailer (WP 05-WH1005). Once loading is completed, the applicable procedure for shipment is Shipment of Radioactive Materials (WP 06-102).

Pertinent information on the waste bins and the particular TRUPACT-II into which they were loaded will be entered into the WIPP computerized waste-tracking system, from which these data will also be added to the WIPP waste information system. Before the loaded trailer is permitted to leave the WIPP site, quality-assurance personnel will verify the shipping documentation and verify that both the WIPP waste-tracking system and the WIPP waste information system have been properly updated.

As already mentioned, the RCRA Part B permit application for the WIPP (DOE, 1993b) designates the contact-handled-waste bay of the waste handling building as a storage facility (see Figure 4-5). This bay can accommodate all of the transuranic waste to be used during the test phase. The DOE therefore plans to use this area and only this area for temporary surface storage. If retrieval operations experience a temporary interruption, such as an interruption due to the unavailability of the waste hoist, retrieval in the underground will be stopped in order to prevent the accumulation of waste in an area other than the contact-handled-waste bay. However, if it is necessary to relocate the waste to another underground location in the event of test room instability or a similar condition, then the waste will be moved to a stable underground location after appropriate authorizations from the EPA and the State of New Mexico.

Figure 4-8 is a flow chart depicting the retrieval of bin-test waste.

### 4.4 RETRIEVAL OF WASTE FROM ALCOVES

The decision to retrieve waste emplaced in an alcove at the end of the test phase has not been made. The results of performance assessment or any conditions imposed by the EPA will serve as the principal input to this decision; therefore, the decision to retrieve waste placed in an alcove is expected to be made at the end of the test phase. Also, the DOE is committed to continuing the alcove test(s) through the disposal phase if relevant information is still being obtained for demonstrating continued compliance with applicable regulatory requirements. This decision to continue the alcove test(s) is also likely to be made at the end of the test phase.

To help plan for retrieval, the following information will be provided to the responsible persons: (1) the waste inventory in the drums; (2) the concentration of volatile organic compounds in the headspace of the alcove obtained during testing; (3) the presence of any airborne radioactive materials; and (4) the configuration of the drums inside the alcove. Detailed operating instructions for retrieval are given in the Waste Handling Operations Manual (WP 05-1). If monitoring of the alcove indicates no airborne contamination, retrieval preparations up to the opening of the gas barrier will be conducted without protective clothing or respiratory protection.
CONDUCT RADIOLOGICAL SURVEY OF ROOMS

IS CONTAMINATION PRESENT?

YES

ESTABLISH ANTI-C AND RESPIRATOR PROTECTION

DECONTAMINATE

DISCONNECT INSTRUMENTATION FROM THE RCB

WP1912

DISMANTLE BIN RACK AND INSTRUMENT RACK

SMEAR SURVEY

IS RCB OR BIN CONTAMINATED?

NO

DECONTAMINATE OR FIX

LOAD UNTO U/G TRANSPORTER

TRANSPORT SWB TO WEIGHING STATION

LOAD SWB INTO TRUPACT-II

LOAD TRAILER

WWW/WWTS VERIFICATION AND UPDATE

SHIP

WASTE HOIST TRANSPORT TO THE SURFACE

ON THE SURFACE

TRANSPORT RCB TO DOCK

REMOVE BIN AND DECONTAMINATE IF REQUIRED

PLACE BIN IN CLEAN SWB

Figure 4-8. Retrieval of Bin-Test Waste
The alcove will be depressurized through the high-efficiency particulate filter installed in the gas test system. This system will be aligned to exhaust and depressurize through the installed filter into the mine. When the alcove has been depressurized, the gas test system will be aligned to supply fresh mine air to the alcove and exhaust back into the mine ventilation. The fan in this system will then be started, and the alcove will be purged until a habitable atmosphere is established in the alcove. Safety personnel will verify the existence of a habitable atmosphere. The general direction of airflow in the alcove will be from the front to the back of the alcove.

Once a habitable atmosphere has been established, personnel will be allowed to enter the alcove in order to better assess the conditions inside. If the surveys show detectable contamination, protective clothing and respirators will be used as appropriate. Continuous monitoring of work areas and sampling of alcove exhaust ventilation for radioactive contamination will continue throughout the retrieval process.

The final activities conducted in preparation for retrieval will be the removal of the bulkheads and the instrumentation cabling up to the face of the waste stack and the installation of additional lighting to meet industrial safety standards.

Inside the alcove, the drums will have been stacked in packs of seven. These seven-packs of drums will be removed individually, using a 6-ton forklift with a special drum handler. The seven-packs will then be surveyed for contamination. If they are radiologically clean, the seven-packs will be put on the underground transporter, which can carry four seven-packs, and moved to the hoist for transfer to the surface.

The waste inventory in the alcove will be tracked through the WIPP waste tracking system. As seven-packs or individual drums are retrieved from the waste stack and transferred to the surface, the waste inventory tracking system will be updated and verified.

If any contamination is detected, a contamination-control zone will be established, in accordance with the WIPP Radiological Controls Manual (WP 12-5), at the door of the innermost bulkhead in the alcove's gas barrier. An additional forklift will be called into service for the transfer of drums or boxes across the barrier. Seven-packs containing contaminated drums will be separated to accommodate overpacking of the drums into the standard waste boxes. The contaminated containers removed from the affected alcove will be overpacked in a standard waste box, which can hold four drums if the drums are not significantly deformed. The forklift operating at the face of the waste stack will engage the double drum handler. The plastic wrapping holding the seven-packs together will be cut away to allow the forklift to engage a single drum or two drums. Upon removal from the stack, the drum or drums will be surveyed on the previously unexposed surfaces, overpacked, and transferred across the administratively controlled contamination barrier to a second forklift for transport to the underground transporter. All wrapping and other residue from the seven-pack will be treated as site-derived waste.
The remaining steps in this retrieval operation will be conducted in the same way as described above for the retrieval of bins. Figure 4-9 is the flowchart for the retrieval of alcove waste.

4.5 RETRIEVAL OF SITE-DERIVED WASTE

Radioactive wastes generated during the experimental program or during retrieval will be handled in accordance with Operation of Liquid Radwaste System (WP 05-003) or WIPP Site-Generated (Derived) Solid Radwaste Management (WP 05-004), depending on whether the waste is liquid or solid. The quantity of these wastes is expected to be small because the only sources of these wastes will be the calibration of instruments and infrequent abnormal events like the contamination of the waste bins. The quantity of such waste generated during the experimental program is expected to be about 3 cubic feet per year, or less than half the capacity of a 55-gallon drum. During the experimental program, these wastes will be placed and stored in 55-gallon drums provided in the test area. Any free liquids in the waste will be solidified. If the test phase is successful and the WIPP is allowed to begin permanent disposal, this waste will be disposed of in the WIPP together with the transuranic waste.

Waste retrieval would add to the quantity of the site-derived waste. The additional waste would come from decontamination and from dismantling of the RCB container and instrument racks. Because of its size, the dismantling waste would be packaged in standard waste boxes, which are larger than drums. Like the retrieved transuranic waste, this site-derived waste would be shipped off the site for interim storage or disposal.

4.6 TIME NEEDED FOR WASTE RETRIEVAL

The time needed for retrieving the transuranic waste has been estimated. The estimates for retrieving the waste bins is based on demonstrations conducted during an integrated systems checkout in 1991. The estimates for retrieval from an alcove are based on engineering judgement. The retrieval time period starts from the initiation of retrieval activities and terminates prior to loading in the TRUPACT-II (see Table 4-1).

4.6.1 Time needed for retrieving the waste used in bin tests

Two waste-retrieval modes were evaluated for the bin tests: retrieval under emergency conditions and retrieval under normal conditions. Given the measures taken to ensure the stability of the test room and the alcove, emergency retrieval is not expected to be needed. The emergency mode would be used if retrieval time were a critical safety factor.

For retrieval under normal conditions, a final sampling is performed in accordance with the procedure titled Underground Bin Sampling (WP 05-WH1806), the bin is depressurized in accordance with Bin Equipment Removal for Retrieval (WP 05-WH1912), and all instrumentation and external plumbing on the radiation-control overpack are disconnected and removed in a deliberate manner. It is assumed that the waste handlers
Figure 4-9. Retrieval of Alcove Waste
Figure 4-9. Retrieval of Alcove Waste
(Continued)
work one shift per day, five days per week. If the retrieval needs to be expedited, the work week will be extended to a maximum of three shifts per day, seven days per week.

In the emergency mode no final sample is taken, the instrumentation is disconnected quickly, and the bins are moved from the test room. Waste handlers will work extended work weeks up to three shifts per day, seven days per week.

Table 4-1 lists the activities involved in retrieving the waste used in the bin tests.

**Table 4-1. Activities involved in retrieving waste bins used in underground testing**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Frequency of Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perform radiation survey of test room.</td>
<td>Once per test room</td>
</tr>
<tr>
<td>Take final bin sample.*</td>
<td>Once per bin</td>
</tr>
<tr>
<td>Disconnect instrumentation.</td>
<td>Once per bin</td>
</tr>
<tr>
<td>Perform radiation survey of bin</td>
<td>Once per bin</td>
</tr>
<tr>
<td>Allow bin to depressurize.*</td>
<td>Once per bin</td>
</tr>
<tr>
<td>Contain contamination, if needed.</td>
<td>Once per bin</td>
</tr>
<tr>
<td>Remove bin from test room and place on underground transporter.</td>
<td>Once per bin</td>
</tr>
<tr>
<td>Transport bins to waste hoist.</td>
<td>Once per two bins</td>
</tr>
<tr>
<td>Hoist bins to the surface.</td>
<td>Once per two bins</td>
</tr>
<tr>
<td>Move bins from the hoist to the waste handling building.</td>
<td>Once per two bins</td>
</tr>
<tr>
<td>Remove the lid of the bin overpack.</td>
<td>Once per bin</td>
</tr>
<tr>
<td>Load bin into a clean overpack (a standard waste box).</td>
<td>Once per bin</td>
</tr>
</tbody>
</table>

*Activity not performed under emergency conditions.

Estimated retrieval time for 19 bins (specifically planned) under normal retrieval conditions is 4.6 weeks and 1.1 weeks under emergency retrieval conditions. Estimated retrieval time for 44 bins (conditionally planned) under normal retrieval conditions is 10.6 weeks and 2.6 weeks under emergency retrieval conditions. These retrieval time estimates
are a linear function and retrieval times for additional bins can be calculated using the following formula:

**Normal retrieval conditions:** (five-day work week, one shift per day)

Number of bins \( \times 0.243 \) = retrieval time in weeks

**Emergency retrieval conditions:** (seven-day work week, three shifts per day)

Number of bins \( \times 0.060 \) = retrieval time in weeks

4.6.2 Time needed for retrieving the waste used in alcove tests

For the test alcove(s), retrieval times were estimated for normal conditions (no radiological contamination) and for contaminated drums. For the retrieval of drums with no contamination, a regular work week (five days per week, one shift per day) would be used. For the retrieval of contaminated drums, an extended work-week (seven days per week, three shifts per day) would be used. Table 4-2 lists the activities expected to be necessary in retrieving waste from an alcove and gives the frequency of performance.

**Table 4-2. Activities involved in retrieving waste from the test alcove**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Frequency of performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perform initial radiation survey.</td>
<td>Once per alcove</td>
</tr>
<tr>
<td>Perform radiation survey of drums.</td>
<td>Once per seven-pack</td>
</tr>
<tr>
<td>Remove seven-pack.</td>
<td>Once per seven-pack</td>
</tr>
<tr>
<td>Clean seven-pack.</td>
<td>Once per seven-pack</td>
</tr>
<tr>
<td>Overpack contaminated drums in standard waste box.*</td>
<td>Once per seven-pack</td>
</tr>
<tr>
<td>Load on transporter.</td>
<td>Once per seven-pack or two standard waste boxes</td>
</tr>
<tr>
<td>Transport to waste hoist.</td>
<td>Once per 4 seven-pack or two standard waste boxes</td>
</tr>
<tr>
<td>Hoist to waste handling building.</td>
<td>Once per 4 seven-pack or two standard waste boxes</td>
</tr>
<tr>
<td>Overpack drums in standard waste boxes.</td>
<td>Once per seven-pack</td>
</tr>
<tr>
<td>Clean standard waste boxes.*</td>
<td>Once per seven-pack</td>
</tr>
</tbody>
</table>

*Step needed in the case of contamination only.
Estimated retrieval time of waste from an alcove, after bulkhead removal, is 5.5 hours per seven-pack under normal retrieval conditions and 13.5 hours per seven-pack if contamination is present. Therefore, for the specifically planned alcove test (1050 drums), the estimated time for retrieval is 20 weeks under normal retrieval conditions and 12 weeks if contamination is present.
5.0 READINESS FOR WASTE RETRIEVAL

This chapter explains how the WIPP is ready to retrieve waste and the plans for maintaining this readiness. The readiness for retrieval is based on assessments of safety; improving room stability; providing environmental monitoring; providing proper ventilation, lighting, power supplies, communications, and equipment; training personnel in retrieval operations; and conducting actual demonstrations of the retrieval techniques.

The DOE has taken a number of steps to establish readiness for waste retrieval. These steps cover a broad range, including such things as ensuring that the physical conditions underground are suitable for safe retrieval operations, providing the necessary equipment, training workers, establishing and testing operating procedures, establishing administrative controls, performing integrated systems checkouts, analyzing potential hazards and risks, and conducting simulated retrieval operations. The most important of these activities are briefly described in this chapter. A comprehensive discussion can be found in the 1991 addendum to the Final Safety Analysis Report, or FSAR (WP 02-9).

5.1 SAFETY AND ENVIRONMENTAL PROTECTION

5.1.1 Radiation and industrial safety

Safety assessments of normal retrieval operations have been completed and are documented in Chapter 6 of the 1991 addendum to the FSAR (WP 02-9).

As discussed in Sections 5.2 and 5.2.4, both the equipment used for retrieval and the operations for handling waste during retrieval will be the same as those for waste emplacement. Accordingly, for waste retrieval, no additional accidents other than those that have already been analyzed for waste emplacement can be postulated. These accidents have been analyzed, and the results are documented in Chapter 7 of the FSAR addendum (WP 02-9).

Safety requirements and requirements for worker protection are detailed in various manuals that have been prepared specifically for the WIPP, including the WIPP Radiological Controls Manual (WP 12-5), the WIPP Industrial Safety Manual (WP 12-8), and the WIPP/DOE Chemical Hygiene Plan (DOE, 1991b).

5.1.2 Room stability, mine safety, and maintenance of underground openings

A state-of-the-art supplementary roof-support system was installed in the test room (DOE, 1991c). The design of this system was examined by an independent group of rock-mechanics experts from the U.S. BOM, the MSHA, universities, and private industry (DOE, 1991c). The design was based on suggestions from an independent Geotechnical Peer Review Panel (DOE, 1991d). The installation was completed in December 1991, and the test room roof support is now fully operational. The experts expect that this support system
will extend the useful life of the room by at least 7 years from the time of installation (DOE, 1991c). In addition, because it is highly instrumented, the system will also provide extensive data on the behavior of salt in the underground workings.

The support system, shown in Figure 5-1, is designed to support and contain the detaching salt slab; it is not designed in any way to prevent the creep of salt into the room. It consists of 26 steel channel sets installed laterally across the room on 7.8- to 10-foot centers. Each support set is secured by 11 steel anchor bolts that are 13 feet long and are resin anchored within stable rock above the anhydrite "b" clay horizon (Figure 5-2). The system is designed so that the load on each bolt can be monitored and adjusted to accommodate continuous roof deformation.

The roof area between the channel sets is covered by a network of steel-wire lacing ropes laced underneath a mat of welded wire mesh and expanded metal. This mat, held in place by the channel support sets, will contain any rocks falling between the channel support sets.

The safety of the WIPP underground is inspected not less than four times each year by the MSHA. MSHA also has the responsibility for reviewing and concurring with an underground stability plan developed by the DOE to ensure that the mined rooms in the WIPP underground, in which waste will be emplaced for testing, will remain sufficiently stable and safe to permit uninterrupted testing for the duration of such tests. Also, the BOM of the Department of the Interior will prepare an annual evaluation of the safety of the WIPP. These agencies are assigned formal oversight responsibilities by the WIPP LWA. In addition, the New Mexico State Mine Inspector performs an inspection of the WIPP underground at least two times per year.

Contributing to safe retrieval operations would be the DOE's program of underground-openings maintenance. Its objectives include documenting conditions in all underground openings and developing a detailed excavation history of the underground openings. Specific activities for maintaining the openings have been identified.

5.1.3 Environmental protection

A comprehensive environmental-compliance program (see Chapter 3) has been implemented at the WIPP, including the installation of monitoring systems for air, surface water, and ground water. These systems will be available for monitoring retrieval operations if retrieval is necessary.

In accordance with the conditions imposed by the U.S. Environmental Protection Agency (EPA, 1990) in granting the "no-migration" determination for underground testing with transuranic waste, the DOE has developed and implemented an air monitoring plan that meets the specifications given in 40 CFR 268.6.
Figure 5-1. Room 1 Panel 1
Supplementary Roof Support System
Figure 5-2. Anchor Bolts
5.2 PHYSICAL EQUIPMENT

5.2.1 Ventilation

The ventilation system for the WIPP underground is designed to provide viable working conditions and confinement of radioactive materials. Whenever radioactivity above a predetermined level is detected in the air stream, the ventilation rate is reduced and directed through high-efficiency particulate air filters. The system receives intake air from three shafts and exhausts the air through the fourth shaft. The system includes five ventilation fans at the surface. Airflow is directed and controlled through the use of ventilation doors, bulkheads, and regulators. The minimum velocity of the airstream is 60 feet per minute, and the volume per person is 300 cubic feet per minute. Several of the surface exhaust fans can be connected to the backup power supply if normal power is lost. The ventilation system is instrumented to provide for continuous verification that the system is functioning properly.

The ventilation system is kept operable at all times and would thus be available for retrieval.

5.2.2 Lighting

The test room is equipped with three rows of double-tube fluorescent lights running the length of the room. The lights are about 10 feet apart and provide illumination ranging from 23 to 27 foot-candles directly under the lights to between 10 and 18 foot-candles in the areas between the lights. The WIPP's Industrial Safety Manual (WP 12-8) has established a minimum illumination level of 10 foot-candles for underground work. This level is comparable to the levels recommended by the Illuminating Engineering Society for general building construction, traffic lanes in parking garages, and warehouses. (No specific underground-illumination requirements other than "adequate illumination" have been established by the OSHA, the MSHA, or the State of New Mexico.)

5.2.3 Power supply

The electrical power needed for retrieval operations will be supplied by the existing WIPP electrical system. Electrical power is delivered to the WIPP site through a 69-kilovolt overland powerline. The incoming power is received and transformed to 13.8 kilovolts and distributed by two main bus systems and is fed from the surface to the underground through three 13.8-kilovolt feeder lines connected to three underground substations, one of which is located in the waste-disposal area.

If the normal power supply is lost, AC power to support critical systems can be generated at the site with two 1100-kilowatt diesel-powered generators. These generators produce sufficient power to operate one hoisting system for egress purposes, three fans used for underground ventilation, and the central monitoring systems. However, as specified in the WIPP FSAR (WP 02-9), loss of normal power required the suspension of all waste handling activities including retrieval.
5.2.4 Equipment

It will be important to keep the physical equipment needed for retrieval in a state of readiness. Generally, the equipment used for retrieval will be the same as that used for waste emplacement. This equipment is described in the Final Safety Analysis Report (WP 02-9), which also described in detail the various facilities, especially the waste handling building, that would be used for waste emplacement and retrieval. However, three kinds of equipment play a particularly important role in retrieval and are briefly described below: forklifts, communications devices, and radiation monitors.

Forklift

The forklift to be used in retrieval needs to be configured for its work. The descriptions of demonstrations later in this chapter point out particular configurations that have been found necessary. A part of maintaining long-term readiness will be ensuring the availability of these forklifts, and it will be necessary to keep more of them on hand than the minimum number required, (i.e., one for normal retrieval operations and two to three for contaminated retrieval operations).

Communications

Communications devices must be kept ready because effective communication is essential to the success of retrieval. The personnel who carry out retrieval will use handheld walkie-talkies as their primary means of communication. Workers in some retrieval operations may not be able to use the walkie-talkies; for example, some workers may wear respiratory-protection equipment that will hinder their ability to communicate orally. Such workers will communicate by means of prearranged hand signals or by written messages.

Radiation monitors

Radiation monitors will also have to be kept ready for use in retrieval. The design of the alcove will permit the use of monitors in the ventilation airflow throughout retrieval. Radiation monitoring will improve the control of contamination and help to make decisions about the need for protective clothing and respiratory protection.

5.3 QUALITY ASSURANCE

Quality-assurance programs that cover the bin tests have been prepared by the principal contractors involved in the testing program (Sandia, 1989; Westinghouse, 1990d). These programs implement the applicable portions of the interim guidelines and specifications issued by the U.S. Environmental Protection Agency (EPA, 1980).

In addition, the DOE has established a quality-assurance program for the pretest waste-characterization activities (DOE, 1990d). Its objective is to ensure that all data
generated in characterizing the transuranic wastes are of acceptable quality and are properly
documented in accordance with ASME NQA-1 and DOE Order 5700.6C.

5.4 TRAINING

5.4.1 General readiness of personnel

The skills required for retrieval are in many respects similar to the skills required for
other operations at the WIPP. An important part of the worker training for retrieval, then,
is the maintenance of workers through the normal qualification program at the WIPP. This
program requires personnel to demonstrate an in-depth knowledge of system operating
characteristics as well as the ability to perform the operations safely and according to
procedures. To maintain the required skill level, the WIPP has ongoing refresher training
and requalification programs.

The WIPP training for radiation workers includes hands-on exercises using applicable
radiation-detection instruments, protective clothing, and respiratory equipment. The training
also includes practical demonstrations with operating procedures. The completion of the
training requirements are documented on formal qualification cards that are maintained in
the central personnel-training records.

The WIPP waste handlers must complete an extensive qualification program. Like the
radiation-worker training, this program includes demonstration of knowledge and practical
skills. The basic certification program for handlers of contact-handled transuranic waste
includes the operational training needed for waste-handling operations from receipt of waste
to emplacement underground. Because the skills needed for handling waste during retrieval
are identical with the skills needed for other waste-handling operations, no separate
qualification program for waste retrieval is necessary. During the initial qualification
process for handlers of contact-handled transuranic waste, the handlers must demonstrate
proficiency in all aspects of waste handling, including two procedures for retrieval: CH
Waste Package Retrieval (WP 05-110) and Bin Retrieval (WP 05-WH1902).

5.4.2 Drum handling

The waste-handling operators have demonstrated the skills necessary for handling
drums. They have handled seven-packs under a variety of conditions and for different
purposes, such as demonstrating for visitors, inspections, and for verifying procedural
changes.

To maintain readiness, on-going training will be conducted for waste-handling
operators. A stack of seven-packs will be made up of drums of various weights with some of
the drums distorted. The seven-packs will be placed in a three-high configuration within
multiple stacks of seven-packs or standard waste boxes. The operators will proceed through
validation of the retrieval procedure to aid in the improvement of their skills. The training
will emphasize the following:
• Removal of intact seven-packs from stacks of drums.
• Breakup of seven-packs and removal of individual distorted and simulated contaminated drums.
• Loading into overpack containers and stabilizing distorted and undistorted drums.
• Loading and unloading of the underground transporter.
• Breakup of seven-packs in the waste handling building.
• Loading of waste into the TRUPACT-II container used for shipment off the site.

5.4.3 Bin handling

Waste-handling operators will be trained to convert the standard waste box used for overpacking a bin to a device providing a "radiation control boundary," or RCB, by installing a specially designed lid that will accommodate the instrumentation and support-system connections to the bin. The bin will remain in the RCB overpack during the installation of the lid. Training sessions will place emphasis on the following:

• Removing overpacks loaded with bins from the stack
• Removing bins from the RCB overpack
• Replacing the special lid of the RCB overpack with an ordinary box lid
• Validating procedural controls

5.4.4 Handling of standard waste boxes

Operators will practice emplacing standard waste boxes in the two-high stacking configuration. (The boxes will be loaded with nonradioactive and nonhazardous material.) Practice sessions for waste-handling operators will focus on

• Removing standard waste boxes from the stack
• Loading the boxes on the underground transporter
• Loading the boxes into TRUPACT-II shipping containers
• Validating procedural controls

5.4.5 Mockups

As part of the training operations, several mockups have been built and more will be built. The mockups have included

• A waste stack consisting of weighted drums in seven-packs and standard waste boxes
• A bin stack consisting of at least two bins stacked two high
• Drums and boxes containing backfill material
• A mockup of a bin for demonstrating brine stabilization
5.5 DEMONSTRATIONS OF RETRIEVAL

To illustrate the current status of the WIPP's readiness to retrieve waste, this section describes the results of the demonstrations that have been performed. The project has already completed reviews of its retrieval readiness for certain wastes. These reviews are briefly described in Section 5.5.3.

The demonstrations that have been done have produced improvements in the planning for retrieval. As an indication of the development of the retrieval planning, this section reviews those demonstrations and summarizes the lessons learned from them. The section also reviews plans for future demonstrations. As a follow-up to these initial demonstrations, the DOE is committed to demonstrating retrieval operations that bound all tests to be conducted with transuranic waste.

5.5.1 Mock demonstration of the retrieval of remotely handled transuranic waste

As documented in a 1987 report the Report of the Remote-Handled Transuranic Waste Mock Retrieval Demonstration (DOE, 1987), two canisters of remotely handled transuranic waste and two canister plugs were retrieved using procedures and equipment that would be used during actual retrieval. No remotely handled transuranic waste will be used at the WIPP during the test phase; nonetheless, the demonstration of its retrieval has been useful. The demonstration went smoothly and took less time than expected (374 minutes for two retrievals versus an expected 520 minutes). The total radiation exposure that would be expected from the operations performed in the demonstrated retrievals was 1.20 millirem per retrieval, which is less than one-fourth of the expected 5.06 millirem.

5.5.2 Mock demonstration of the retrieval of contact-handled transuranic waste

For the demonstration conducted in 1988, room 4 of panel 1 was configured to represent in-situ disposal conditions expected to be encountered late in the retrieval period, assuming that the retrieval period would extend up to 15 years after the start of emplacement. Fifty-seven waste drums and four boxes were retrieved. Some of the containers had simulated external contamination, and therefore most of the retrieval activities were conducted in full protective clothing and respirators. The demonstration confirmed the validity of the procedural requirements, the equipment, and the training of the operators who participated. No unsafe conditions were identified or developed during the demonstration. The demonstration is described in the Final Report for the Contact-Handled Transuranic Waste Mock Retrieval Demonstration (DOE, 1990c).

A contamination barrier was also demonstrated as a practical concept. All drums were removed from the stack singly or in pairs. Removal of intact seven-packs was not demonstrated. Overpacking of drums and waste boxes was demonstrated in a container of different dimensions than those of a standard waste box. The demonstration did not include transportation to the surface or surface activities expected during the retrieval of transuranic mixed waste.
Although the handling of full waste packages was not demonstrated, the demonstration showed that handling full waste packages (i.e., seven-packs) as opposed to single or double drums will reduce time lines and operator doses. It also showed that equipment used in the retrieval area must be mobile and that operators wearing protective clothing and respiratory equipment must be relieved frequently to avoid loss of concentration and fatigue.

### 5.5.3 Operational readiness reviews

During August 1991, the WIPP underwent an extensive operational readiness review by DOE-EM (DOE Office of Environmental Restoration and Waste Management) for dry-bin tests, which examined the readiness of the WIPP to retrieve waste used in dry-bin testing.

The operational readiness review used a systematic approach to address the readiness of management controls, personnel, systems and equipment, as well as the environmental, safety, and quality-assurance programs for the WIPP test phase. Since there are no separate management controls, safety programs, and quality-assurance programs for waste retrieval, the readiness of these items are not discussed in this plan.

Before the start of each new phase of the testing program a formal operational readiness review, including an integrated systems checkout, will be conducted. These readiness reviews will focus on the differences between the new phase and the in-progress phases. Included in this assessment will be the review of the retrieval operations associated with that specific test. Once readiness is declared for the new test, waste-retrieval readiness will be maintained by periodic demonstrations.

### 5.6 ANNUAL DEMONSTRATION

To ensure an ongoing readiness for retrieval and to comply with legislative requirements, the DOE will conduct annual waste-retrieval demonstrations. Acceptance criteria for these demonstrations have been developed and are given in Chapter 3. The WIPP LWA requires the DOE to demonstrate annually that a sample of transuranic waste is retrievable. The Act also directs that, in conducting this demonstration, the DOE is not to take any action "to affect the test phase."

To comply with this statutory requirement not to affect the testing, while at the same time only conducting experiments that will provide relevant data for compliance with the final disposal regulations and SWDA, the DOE plans to conduct the annual waste-retrieval demonstrations with only simulated or mock waste.

The scope of the annual demonstration will include retrieval demonstrations for all tests that are in progress (i.e., dry [type 1], humid or inundated bins [type 2] and alcove) and will demonstrate retrieval operations through the loading of waste into a TRUPACT-II container for offsite shipment. For operational efficiency, the demonstration will consist of integrated operations.
As with the retrieval demonstrations associated with the start of a given test, the EPA, the New Mexico Environment Department and the Environmental Evaluation Group will be invited as observers. After the demonstrations, procedures will be revised with "lessons learned" from the demonstration.

Using the criteria identified in Section 3.5, a report assessing the results of the retrievability demonstration will be prepared and submitted to the Secretary of Energy. The Secretary will then make a determination whether the waste is retrievable after consulting with the Administrator of the U.S. EPA. The LWA requires that this determination be first made one year after the start of waste emplacement for the test phase and once a year thereafter, throughout the test phase. The Secretary will publish in the Federal Register a notice stating whether all waste emplaced underground at the WIPP remains, and will remain, fully retrievable during the test phase. If the determination of retrievability cannot be made, corrective action is allowed.

If the State of New Mexico determines that there is an insufficient basis for the annual determination of retrievability or that the annual demonstration does not ensure that the waste emplaced for testing will be retrievable, it may invoke the conflict-resolution provisions of the Agreement for Consultation and Cooperation.
6.0 DEVELOPMENT PROGRAM

This chapter describes the DOE's current program for developing a variety of capabilities that would have important applications in waste retrieval. It covers the design of overpacks for standard waste boxes, methods being considered for brine stabilization, the treatment of contaminated salt, and the use of robotics.

6.1 OVERPACKS FOR WASTE BOXES

Any waste containers shipped from the WIPP will be overpacked in another container before being loaded into the TRUPACT-II shipping container. TRUPACT-II is a double contained, Type-B packaging, certified by the NRC for shipment of radioactive materials. Overpacking will be the DOE's operating practice for offsite shipments from the WIPP. Contaminated drums will be overpacked in Standard Waste Boxes (SWBs) for shipment. Contaminated SWBs will be overpacked in a Ten Drum Overpack (TDOP) for shipment.

Before shipment, 55-gallon drums will be overpacked in metal standard waste boxes. Some of the transuranic waste is packaged in these standard waste boxes (e.g., the RCB container that encloses each waste bin). Although no overpack is currently available for these boxes, the TDOP has been designed for overpacking SWBs. The design for the TDOP calls for a carbon-steel container with a bolted lid. The TDOP will be similar to the standard waste box itself, but larger to accommodate the SWB. The overpack will be certified to the standards set by the U.S. Department of Transportation for "Type A" shipping containers. The NRC has completed their review of the TDOP and the TDOP should be available in the fourth quarter of 1993.

In order to fit inside the internal containment vessel of the TRUPACT-II, the TDOP is rotated 90°. Clearances and manufacturing tolerances are too narrow for a normal orientation. This TDOP configuration may not be compatible with overhead clearance in the underground disposal rooms. If this is the case, it may be necessary to load the TDOP from a horizontal position rather than a vertical position. Loading the TDOP onto the underground transporter and the conveyance loading car may also require additional engineering changes.

6.2 BRINE STABILIZATION

The DOE is currently evaluating several approaches to stabilizing the brine that will be injected into some bins for experimental purposes. The objective is to eliminate or reduce the free-liquid content of these bins in order to meet transportation regulations or likely waste-acceptance criteria of interim storage sites should offsite shipment be necessary. Even though the bins with brine will also contain 3 cubic feet of backfill (a mixture of crushed salt (70 percent by weight) and bentonite clay (30 percent by weight), the brine solution inside the bin may become trapped in small free-liquid pockets.
Several techniques for stabilizing brine are being considered. One is bin inversion—that is, repeatedly turning or inverting the bin to enhance mixing inside the bin and the absorption of the brine by the backfill. To accelerate brine stabilization, a special material like Aquaset could be added to help absorb the brine.

Another technique is evaporation, which could be achieved by establishing a vacuum inside the bin to a level below the brine's vapor pressure, allowing the liquid to boil off. The vapor would be removed and condensed outside the bin. To speed evaporation, some heat would be added. Evaporation could also be achieved by circulating heated air through the bin. The hot recirculating air would remove brine vapor and provide for its condensation outside the container.

It is also possible to remove the brine by draining. It would require placing the bin in a stable configuration that enhances the collection of brine adjacent to a suitable drain plug or septum. After some time, the liquid brine would be collected, stabilized with cement or a stabilizing material like Aquaset, and disposed of as radioactive mixed waste. Draining could be used in conjunction with other techniques to reduce the overall time for brine stabilization and to enhance effectiveness.

These techniques and combinations of techniques (e.g., draining brine and bin inversion) are being evaluated in terms of efficacy, personnel safety, potential for contamination, time required, and cost. The most promising option identified by this evaluation will be subjected to proof-of-practice testing. The purpose of this testing will be refining procedural controls to ensure effectiveness, determining the size and makeup of the brine-stabilization crew, determining the level of personnel exposure, determining the time needed for the process, and establishing criteria for using x-rays (real-time radiography) to determine when the desired level of stabilization has been achieved. In addition, the tests will help to train personnel and develop skills for safe operation. After the stabilization technique has been selected and the necessary facilities constructed or installed, demonstrations with simulated waste will be conducted to prove the technique and refine its application. Test bins will then be opened and physically examined to compare actual results with predicted results. The projected completion date for the brine stabilization tests is June 1994, which will be prior to shipment of type 2 humid/inundated bins to WIPP.

6.3 HANDLING OF CONTAMINATED SALT

During waste retrieval, some salt in the underground test room or alcove may become contaminated with radioactivity. Corrective action may be needed to remove this contaminated salt. The corrective action requires a systematic approach because the salt surfaces are not smooth, are dry and dusty, are easily scuffed loose, absorb liquids, and may be cracked to a considerable degree at the time of retrieval. Generally, the contaminated salt will be removed and disposed of as detailed in WP 12-554, Removal and Disposal of Contaminated Salt. In most cases, the salt can be picked up with a vacuum cleaner equipped with a particulate filter, and loaded into drums for removal. In cases where the salt is not broken up, the removal of salt is accomplished by manually shoveling, or other mechanical methods, to load contaminated salt into drums for removal.
6.4 USE OF ROBOTICS

The DOE is exploring how industrial robotics and automation systems can facilitate WIPP underground operations both during waste emplacement for disposal and during waste retrieval. For normal disposal operations, the potential uses of robots manipulated by remote control include surveying for alpha contamination, identifying waste containers, moving waste containers from the unloading facility to the disposal rooms, closing disposal rooms after they have been filled with waste, mine mapping, and geotechnical monitoring. Robotics could also be useful under accident conditions to perform functions like firefighting or search-and-rescue missions. And they could be used for gas and radiation surveys if mine reentry is needed.

In April 1992, in a demonstration conducted at the WIPP site, robots were used in simulating waste-retrieval operations in the WIPP underground. In this demonstration, which was filmed for future reference, several machines that could be used for waste retrieval were manipulated by remote control to perform the following operations: surveying the conditions in the disposal room, removing the debris from a cut-up roof-support structure, removing potentially contaminated loose salt, breaking up large salt cores with a hydraulic breaker, operating a backhoe to remove loose salt, operating a hydraulic cut-off saw, retrieving a bin-instrument board, and retrieving a buried waste box.

At present, robot-assisted waste retrieval is in a demonstration engineering stage. It is not necessary for waste retrieval and is not included in the DOE’s current planning for retrieval. However, as they are developed and demonstrated, robot-assisted operations could be included in the retrieval process.
7.0 INTERIM STORAGE OF RETRIEVED WASTE

This chapter describes three alternatives for the interim storage of transuranic waste retrieved from the WIPP: a DOE waste-management facility, a Department of Defense facility, and a private-sector storage site. It also discusses the development of an implementation plan, as well as identifying the schedule for the designation of the interim storage site(s).

If it is necessary to retrieve the transuranic waste used in underground tests at the WIPP, the waste will be stored temporarily at the WIPP site and then moved to an interim-storage location. Interim storage could be provided at (1) DOE waste-management facilities, (2) properties controlled by the DOD, or (3) a privately owned storage site.

7.1 INTERIM STORAGE AT A DOE WASTE-MANAGEMENT FACILITY

The following DOE sites have been previously identified as candidates for the interim storage of DOE transuranic waste: the Hanford Reservation, the Idaho National Engineering Laboratory, the Los Alamos National Laboratory, the Nevada Test Site, the Oak Ridge National Laboratory, the Rocky Flats Plant, the Savannah River Site, and surface storage at WIPP. Transuranic waste is generated at all of these sites except the Nevada Test Site, and transuranic waste is currently stored at all of these sites.

All of these sites have started to prepare action plans for the receipt, handling and interim storage of transuranic waste shipped from another DOE site. At the request of the involved States, the DOE has not completed nor implemented these action plans, and will not do so until the need for waste storage has been established.

7.2 INTERIM STORAGE AT PROPERTIES CONTROLLED BY THE DEPARTMENT OF DEFENSE

The DOE has worked with the DOD to identify possible interim-storage sites at DOD-controlled properties. A decision to use a DOD site for interim storage would be made only after completing a careful examination of DOE and DOD sites and determining that using a DOD site would be the best of the available alternatives.

If the DOE decides to use a DOD site for interim storage, it will provide health-physics personnel to assist in any radiation surveys deemed necessary by the DOD. The DOE will also be responsible for returning the site to its original condition once the waste has been removed for permanent disposal. If the commander or manager of the DOD site used for interim storage determines that extra security measures are required, the DOE will cooperate to determine what security measures would be appropriate and will reimburse the DOD for any costs incurred in providing security for the stored waste.
7.3 INTERIM STORAGE AT A PRIVATELY OWNED SITE

The DOE is exploring the potential for using privately owned and operated sites for interim storage pending permanent disposal and is preparing to award contracts for preliminary siting and planning, as discussed below. The contracts would call for the following services:

- Interim storage at the contractor's facility, including physical protection.
- Repacking or overpacking (if required because of container damage during transportation or storage and directed by the DOE).
- Maintenance and updating of data packages and recordkeeping.
- Storage of the waste in a manner that preserves the integrity of the DOE waste certification.
- Compliance with applicable environmental, safety, and health requirements.
- Compliance with applicable DOE Orders on waste management.

The DOE would retain title to the waste while it is in interim storage and provide oversight, including the following periodic audits and reviews:

- Audits and inspections of storage conditions and records.
- Audits of physical security procedures and records.
- Review of compliance and operational documentation and quality-assurance records.
- Review of proposed changes to contractor procedures and policies.
- Audits and inspections of compliance with environmental, safety, and health requirements.

Contracts for interim storage would be awarded in three phases. The first and second phases would allow multiple contractors to proceed with the preliminary siting, development of management and environmental plans, and permitting and licensing. The third phase would allow for a single contractor to provide storage services. This is the "privatization" phase that will be implemented if the first and the second phases are successful. Fiscal year 1993 has been identified as the earliest when phase I contracts may be awarded. In phase I, contractors will complete plans for project management, quality assurance, environmental protection, permitting, licensing, and siting within 6 months. Conceptual designs and all necessary environmental permits and licensing will be completed within 8 months during phase II of the effort. Phase III would be the construction and operation of the storage facility.

7.4 SELECTION OF INTERIM-STORAGE SITE

The DOE is committing to identify a site(s) for emergency interim storage of retrieved test phase waste within one year of the first shipment of this waste to WIPP, if emergency retrieval is necessary early in the test phase. Also, by August 1996, the DOE will identify an interim storage site(s) if such retrieval is necessary after this date. This commitment is consistent with the DOE's commitment to the NMED in the RCRA Part B permit.
application for the WIPP facility. The decision of where to store retrieved waste from WIPP is constrained primarily by the RCRA as amended. The decision will also be based on the appropriate NEPA documentation and RCRA permitting at the available storage facilities, as well as other programmatic and institutional factors, such as the implementation of the recently enacted Federal Facilities Compliance Act (FFCA) in consultation with the affected states.

The appropriate NEPA documentation, RCRA permit and any other permit or documentation required for compliance with applicable laws and regulations will be in place prior to any storage of transuranic waste retrieved from WIPP.

7.5 IMPLEMENTATION PLAN

The Consultation and Cooperation Agreement between the DOE and the State of New Mexico requires the preparation of a final retrieval plan before the start of retrieval activities. The DOE intends to meet this requirement by preparing an implementation plan after the decision to retrieve has been made. The implementation plan will also satisfy the requirements of the NMD. The NMD requires the submittal by DOE of a detailed schedule (or "plan") for retrieval no later than six months after a determination that the repository cannot meet disposal standards under 40 CFR 268.6 or six months before the expiration of the NMD, whichever occurs first. Before retrieval takes place, the NMD requires public comment on and EPA approval of the plan. In addition, the implementation plan will be coordinated with the WIPP facility RCRA closure plan. This plan will detail the specific procedures and activities involved in waste retrieval. In preparing this plan, the DOE will consider all applicable regulatory requirements to assure compliance.
REFERENCES

40 CFR 191


REFERENCES (Continued)


Environmental Protection Implementation Plan (EPIP). WEC, Carlsbad, New Mexico.


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WP 12-5, *WIPP Radiological Controls Manual*, Revision 0, WEC, Carlsbad, New Mexico.

WP 12-8, *WIPP Industrial Safety Manual*, Revision 0, WEC, Carlsbad, New Mexico.


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WP 02-2, *Environmental Compliance Assessment Program (ECAP) Plan*, WEC, Carlsbad, New Mexico.


WP 02-4, *Operational Environmental Permit Compliance Plan*, WEC, Carlsbad, New Mexico.

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WP 05-003, Operation of Liquid Radwaste System, Revision 3, WEC, Carlsbad, New Mexico.

WP 05-004, WIPP Site-Generated (Derived) Solid Radwaste Management, Revision 2, WEC, Carlsbad, New Mexico.

WP 05-1, Waste Handling Operations Manual, Revision 0, WEC, Carlsbad, New Mexico.

WP 05-110, CH Waste Package Retrieval, Revision 1, WEC, Carlsbad, New Mexico.

WP 05-WH1001, TRUPACT-II Loading, Revision 2, WEC, Carlsbad, New Mexico.

WP 05-WH1005, Loading TRUPACT-II Trailer, Revision 1, WEC, Carlsbad, New Mexico.

WP 05-WH1032, TRUPACT-II Payload Transportation Certification

WP 05-WH1033, TRUPACT-II Payload Assembly Transportation Certification

WP 05-WH1806, Underground Bin Sampling, Revision 3, WEC, Carlsbad, New Mexico.

WP 05-WH1902, Bin Retrieval, Revision 1, WEC, Carlsbad, New Mexico.

WP 05-WH1912, Bin Equipment Removal for Retrieval, Revision 0, WEC, Carlsbad, New Mexico.

WP 06-102, Shipment of Radioactive Materials, Revision 2, WEC, Carlsbad, New Mexico.

WP 10-4, WIPP Hoisting and Rigging Manual, Revision 1, WEC, Carlsbad, New Mexico.

WP 12-3, WIPP Dosimetry Program Manual, Revision 4, WEC, Carlsbad, New Mexico.

WP 12-504, Surface Contamination Surveys: Alpha and Beta-Gamma Radiation, WEC, Carlsbad, New Mexico.

WP 12-505, Direct Radiation Surveys, WEC, Carlsbad, New Mexico.

WP 12-508, On-Site Sampling for Airborne Radioactivity, WEC, Carlsbad, New Mexico.

WP 12-554, Removal and Disposal of Contaminated Salt, Revision 2, WEC, Carlsbad, New Mexico.
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WP 12-6, *VOC Monitoring Plan for Bin-Room Tests*, Revision 0, WEC, Carlsbad, New Mexico.

WP 12-7, *VOC Monitoring Quality Assurance Program Plan*, Revision 1, WEC, Carlsbad, New Mexico.
# LIST OF ACRONYMS

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>AC</td>
<td>Alternating current</td>
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<tr>
<td>ALARA</td>
<td>As Low As Reasonably Achievable</td>
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<td>Anti-C</td>
<td>Anticontamination</td>
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<td>AGB</td>
<td>Alcove Gas Barrier</td>
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<td>Bureau of Mines</td>
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<td>Code of Federal Regulations</td>
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<td>CH</td>
<td>Contact handled</td>
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<td>C&amp;C</td>
<td>Consultation and Cooperation</td>
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<td>DNFSB</td>
<td>Defense Nuclear Safety Board</td>
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<td>Department of Defense</td>
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<td>Department of Energy</td>
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<td>Environmental Evaluation Group</td>
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<tr>
<td>PPM</td>
<td>Parts per million</td>
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<tr>
<td>PSID</td>
<td>Pounds per square inch differential pressure</td>
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<td>Pounds per square inch gauge</td>
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<td>RCB</td>
<td>Radiological control boundary</td>
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<td>Record of Decision</td>
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<td>Standard Waste Box</td>
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<td>Solid Waste Disposal Act</td>
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<td>TDOP</td>
<td>Ten Drum Overpack</td>
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<tr>
<td>TRU</td>
<td>Transuranic (see Glossary, transuranic waste)</td>
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<tr>
<td>TRUPACT</td>
<td>Transuranic package transporter (see Glossary)</td>
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<td>Volatile Organic Compound</td>
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<td>WP</td>
<td>WIPP Procedure</td>
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<td>WWIS</td>
<td>WIPP Waste Information System</td>
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<tr>
<td>WWTS</td>
<td>WIPP Waste Tracking System</td>
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GLOSSARY

accessible environment - The accessible environment means (1) the atmosphere, (2) land surfaces, (3) surface waters, (4) oceans, and (5) all of the lithosphere that is beyond the controlled area (40 CFR 191.12[k]).

alcove - A specially excavated room in the WIPP underground for testing with actual transuranic wastes.

backfill - Material placed around the waste containers, filling the open space in the disposal room.

barrier - Barrier means any material or structure that prevents or substantially delays radionuclides and/or hazardous chemicals toward the accessible environment. For example, a barrier may be a geologic structure, a canister, a waste form with physical and chemical characteristics that significantly decrease the mobility of radionuclides, or a material placed over and around waste, provided that the material or structure substantially delays radionuclides and/or hazardous chemicals. Adaptation of (40 CFR 191.12[d])

bin - A gas-tight box specially designed for tests with transuranic waste at the WIPP.

consolidation - Process by which backfill and waste mass loses pore space in response to the increasing weight of overlying material.

Consultation and Cooperation (C&C) Agreement - An agreement that affirms the intent of the Secretary of Energy to consult and cooperate with the State of New Mexico with respect to state public health and safety concerns. The term "Agreement" means the July 1, 1981, Agreement for Consultation and Cooperation, as amended by the November 30, 1984 "First Modification", the August 4, 1987 "Second Modification", and the March 18, 1988 "Third Modification", or as it may be amended after the date of enactment the LWA, between the State and the United States Department of Energy as authorized by section 213(b) of the Department of Energy National Security and Military Applications of Nuclear Energy Authorization Act of 1980 (Pub. L. 96-164; 93 Stat. 1259, 1265).

contact-handled transuranic waste - TRU waste which has a measured radiation dose rate at the container surface of up to 200 mrem per hour and can be safely handled without special equipment when drummed.

creep - A very slow, usually continuous time-dependent movement of soil or rock; refers to the geologic phenomenon experienced as the gradual flow of salt under high compressive loading.

creep closure - Closure of underground openings, especially openings in salt, by plastic flow of the surrounding rock under lithostatic pressure.
GLOSSARY (Continued)

decontamination - The removal of radioactive contamination from facilities, equipment, or soils by washing, heating, chemical or electrochemical treating, mechanical cleaning, or other techniques.

disposal - The term "disposal" means permanent isolation of transuranic waste from the accessible environment with no intent of recovery, whether or not such isolation permits the recovery of such waste.

disposal regulations - The term "disposal regulations" means the environmental regulations for the disposal of spent nuclear fuel, high-level radioactive waste, and transuranic waste under 40 CFR 191, Subpart B and Section 8 of the LWA.

disposal room - An excavated cavity in the WIPP underground in which transuranic waste will be emplaced if disposal is allowed to begin.

drift - A horizontal passageway in a mine.

Environmental Evaluation Group - An oversight group, established by the Congress, that performs independent technical evaluation to ensure protection of the public health and safety and the environment.

emplacement - At the WIPP, the placing of transuranic radioactive wastes within a repository so as to safely confine them.

gas generation program - A program with the primary objective of developing a gas generation model for use in performance assessment to predict and/or simulate the behavior of a waste disposal room for this phenomenon. It consists of both modeling efforts, together with laboratory and field experiments in support and confirmation of the gas generation model.

hazardous constituent - A compound or element listed as hazardous in 40 CFR 261 and subject to regulation under the RCRA.

host rock - The rock in which radioactive waste is emplaced.

interim storage - Temporary storage of transuranic waste retrieved from the WIPP pending permanent disposal.

interim-storage site - A site at which transuranic waste retrieved from the WIPP is temporarily stored pending permanent disposal.
no-migration determination - The term "No-Migration Determination" means the Final Conditional No-Migration Determination for the Department of Energy Waste Isolation Pilot Plant published by the Environmental Protection Agency on November 14, 1990 (55 Fed. Reg. 47700), and any amendments thereto, pursuant to the Solid Waste Disposal Act (42 U.S.C. 6901 et seq.).

operational safety requirements - Those requirements that define the conditions, safe boundaries and bases thereof, and management or administrative controls required to ensure the safe operation of a facility.

overpack (waste) - A container that encloses another container or the act of enclosing a container.

panel - A group of seven disposal rooms bounded by two pillars and connected by drifts.

performance assessment - A term used to denote all activities (qualitative and quantitative) carried out to 1) determine the long-term ability of WIPP to effectively isolate the waste and ensure long-term health and safety of the public by complying with 40 CFR 191 Subpart B and 40 CFR 268.6, and 2) provide the basis for demonstrating regulatory compliance.

quality assurance - All those planned and systematic actions necessary to provide adequate confidence that a structure, system, or component will perform satisfactorily in service.

quality control - Those quality assurance activities that provide a means to control and measure the characteristics of a structure, system, or component to established requirements.

radioactive waste - A solid, liquid or gaseous material of negligible economic value that contains radionuclides in excess of threshold quantities.

retrievability - Ability to safely take—that is, without loss of control or release of radioactive material—from the WIPP underground the contact-handled transuranic waste used for testing during the test phase.

retrieval - The term "retrieval" means the removal of transuranic waste and the container in which it has been retained and any material contaminated by such waste from the WIPP underground for off-site shipment to interim storage location(s).

retrieval demonstration - An annual demonstration that the transuranic waste used for underground testing at the WIPP is retrievable.

remotely handled transuranic waste - Waste which has a measured radiation dose rate at the container surface of above 200 mrem per hour and must be heavily shielded with lead for safe handling.
room stability - A condition in which the ceiling and walls of the test room or disposal rooms are kept stable by protective measures like roof-support systems.

roof support - Measures taken to protect against rock falls from the ceiling of a test or disposal room.

Salado Formation - A Permian Age sequence of salt with minor amounts of clay and anhydrite. The host unit for the WIPP.

scenario - A particular chain of hypothetical circumstances that might affect the disposal system.

shaft - At the WIPP, a man-made vertical hole that connects the surface facilities with the underground workings and is used for moving workers and materials or ventilation.

sludge - Refers to de-watered contact-handled transuranic wastes containing both organic and inorganic constituents that must meet Waste Acceptance Committee (WAC) criteria for shipment and disposal at the WIPP repository. High sludges refers to CH-TRU where the sludge component constitutes 50% or more of the waste volume; low sludges are the same type of waste that contains less than 50% by volume of sludge.

source term - The kinds and amounts of radionuclides (per 40 CFR 191, Subpart B) or hazardous wastes (per 40 CFR 268) that can be mobilized for transport.

Source Term Program - A program with the primary objective of determining the fraction of the radionuclide and hazard waste inventory which can be potentially transported to the accessible environment from a disposal room in a dissolved, complexed, and/or colloidal form.

Supplemental Stipulated Agreement - The term "Supplemental Stipulated Agreement" means the Supplemental Stipulated Agreement Resolving Certain State Off-Site Concerns Over WIPP, dated December 27, 1982, to the Stipulated Agreement Between DOE and the State in State of New Mexico ex rel Bingaman v. DOE, Case No. CA 81-0363 JB (D. N. Mex.), dated July 1, 1981.

transuranic waste - The term "transuranic waste" means waste containing more than 100 nanocuries of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years, except for:

(A) high-level radioactive waste;

(B) waste that the Secretary has determined, with the concurrence of the Administrator, does not need the degree of isolation required by the disposal regulations; or
GLOSSARY (Continued)

(C) waste that the Nuclear Regulatory Commission has approved for disposal on a case-by-case basis in accordance with 10 CFR Part 61.

**TRUPACT-II** - TRansUranic PACkage Transporter. A shipping container designed to meet all DOE and Department of Transportation (DOT) requirements for shipping contact handled transuranic waste to the WIPP and to provide the protection specified in NRC regulations.

waste handling building - The principal surface structure at the WIPP. It houses facilities for receiving and handling both remotely handled and contact-handled transuranic waste. The latter will be used in receiving waste for the underground tests and also in retrieval if retrieval proves to be necessary.

**WIPP Land Withdrawal Act** - Public Law 102-579, the "Waste Isolation Pilot Plant Land Withdrawal Act," that withdraws the land at the WIPP site from "entry, appropriation, and disposal", transfers jurisdiction of the land from the Secretary of the Interior to the Secretary of Energy, and reserves the land for activities associated with the development and operation of the WIPP.

**Working Agreement** - Appendix B of the Agreement for Consultation and Cooperation which sets forth the working details of that Agreement.