United States General Accounting Office 33861

GAO

Report to the Chairman, Subcommittee on Environment, Energy, and Natural Resources, Committee on Government Operations
House of Representatives

March 1986

# NUCLEAR WASTE

# Department of Energy's Transuranic Waste Disposal Plan Needs Revision



GAO/RCED-86-90

GAO

**United States**
**General Accounting Office**
**Washington, D.C. 20548**

**Resources, Community, and**
**Economic Development Division**

B-221801

March 21, 1986

The Honorable Mike Synar
Chairman, Subcommittee on Environment,
Energy, and Natural Resources
Committee on Government Operations
House of Representatives

Dear Mr. Chairman:

On March 14, 1985, you asked us to review certain aspects of the Department of Energy's defense transuranic waste program. Specifically, you asked whether the Department's June 1983 Defense Waste Management Plan includes the permanent disposal of and costs for all defense transuranic waste and the status of the Department's efforts to resolve environmental and safety issues concerning its permanent disposal. This report provides the information you requested.

Unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days from the date of its issuance. At that time, we will send copies to the Secretary of Energy and make copies available to others upon request.

Sincerely yours,

J. Dexter Peach
Director

# Executive Summary

Transuranic (TRU) waste is discarded tools, rags, machinery, paper, sheet metal, and glass containing man-made radioactive elements that can be dangerous if inhaled, ingested, or absorbed into the body through an open wound. TRU elements remain radioactive for thousands of years, posing a long-term threat to the environment and the public. The Department of Energy (DOE) generates TRU and other radioactive waste from its weapons production, research, development, and testing activities.

In June 1983 DOE submitted a Defense Waste Management Plan—a one-time legislative requirement—to the President for transmittal to the Senate and House Committees on Armed Services. The legislation required DOE to set out its plans for the permanent disposal of TRU and high-level waste. Concerning TRU waste activities, DOE was to provide—but not be limited to—a thorough program and cost analysis for the permanent disposal of TRU waste in interim storage. For this report, GAO focused on the TRU waste activities because the Chairman, Subcommittee on Environment, Energy, and Natural Resources, House Committee on Government Operations, requested that GAO determine

- whether the Plan covers the permanent disposal of all DOE's TRU waste,
- whether the Plan identifies all costs for the permanent disposal of TRU waste, and
- the status of DOE's efforts to resolve environmental and safety issues related to the permanent disposal of TRU waste. (See p. 16.)

## Background

Prior to 1970 the federal government buried TRU waste in shallow pits, 4 to 20 feet below the ground. In 1970 the Atomic Energy Commission determined that TRU waste should be stored at six DOE facilities until DOE decided on a safe, permanent disposal method. (See p. 9.)

DOE estimates that through December 1985 it accumulated about 429,000 cubic meters (five 55-gallon drums are needed for 1 cubic meter) of TRU waste: 171,000 cubic meters buried prior to 1970, 177,000 cubic meters of soil contaminated primarily by the buried waste, and 80,000 cubic meters stored since 1970. In addition, DOE expects to generate about 6,000 cubic meters of TRU waste annually through the year 2015. DOE officials believe current TRU waste estimates are more reasonable than those shown in the Plan; therefore, GAO relied on current information for this report.

In late 1979 the Congress authorized DOE to build a research and development facility to demonstrate the safe, permanent disposal of radioactive waste. DOE selected a site in New Mexico for the facility—known as the Waste Isolation Pilot Plant (WIPP). DOE expects to begin WIPP's research phase in October 1988. For 5 years DOE plans to put TRU waste in WIPP on a regularly scheduled basis and decide in 1993, after assessing its environmental and safety impacts, whether to make WIPP a permanent repository. (See p. 11.)

## Results in Brief

GAO found that the Plan does not provide the Congress with complete inventory and cost data or details on environmental and safety issues related to the permanent disposal of TRU waste. For example,

- The Plan does not fully explain DOE's position concerning the permanent disposal of pre-1970 buried waste and is silent concerning contaminated soil, which together represent 81 percent of DOE's TRU waste inventory. Further, the Plan does not disclose that some TRU waste, such as large equipment and huge concrete structures, may not meet WIPP's disposal criteria.
- The Plan's $2.8 billion costs are understated. At least $300 million were not included and another $1.5 billion was combined with high-level waste costs and not readily identifiable as TRU program costs. Further, the Plan does not include costs for disposing of buried waste, contaminated soil, and TRU waste that may not be accepted at WIPP. DOE could not provide cost estimates for these activities.
- The Plan provides no details on the environmental and safety issues related to the permanent disposal of TRU waste, nor does it discuss the types of or timing for environmental analyses needed before WIPP starts operating.

## Principal Findings

### Disposal of TRU Waste

The 1983 Plan focuses on the permanent disposal of TRU waste stored since 1970. For pre-1970 buried waste, the Plan noted that DOE would monitor it, take remedial action as necessary, and reevaluate its safety periodically. However, the Plan does not discuss the extent or types of remedial action DOE would take or the permanent disposal options for this waste. Further, the Plan does not mention TRU-contaminated soil. According to DOE officials, the Plan does not elaborate on these issues

because DOE considers these wastes to be disposed. This response is inconsistent with (1) DOE's historic position (dating back to 1970) that shallow land burial is not an acceptable long-term disposal method and (2) DOE's current actions to assess alternatives for long-term buried waste disposal. (See p. 20.)

The Plan also does not indicate that between 10 and 26 percent of stored TRU waste (8,000 to 21,000 cubic meters) and some future-generated TRU waste may not meet WIPP's disposal criteria and may instead stay at six storage sites across the nation. Officials stated that these wastes were excluded from the Plan because DOE did not know how much waste would not be acceptable for WIPP. (See p. 22.)

## Cost Estimates

Because the Plan does not fully address all TRU waste, its cost estimates exclude the associated permanent disposal costs. DOE officials could not provide cost estimates but believe they could be substantial, depending on the disposal method DOE selects. In addition, GAO found that the Plan's cost estimate for the TRU program is understated because it omits (1) about $270 million to dispose of TRU waste generated after 1988 and (2) about $31 million to decommission TRU processing facilities. Further, about $1.5 billion of TRU waste costs were not separately discernible because they were commingled with costs for the high-level waste program. (See p. 26.)

## Environmental and Safety Issues

The Plan provides no insight into the types or relevancy of environmental issues to be resolved or the types of or timing for environmental analyses needed prior to WIPP's start-up. In June 1983 DOE had already begun efforts to resolve TRU waste environmental and safety issues and prepare analyses to comply with National Environmental Policy Act requirements. DOE continues to assess a number of issues to ensure WIPP's structural integrity, the safe transportation of TRU waste, and the safe disposal of buried waste and contaminated soil. According to officials, DOE will continually monitor and evaluate WIPP's integrity throughout its operating life but expects to resolve TRU waste transportation issues by mid-1986 and buried waste disposal issues by late 1994. DOE officials could not estimate when they would address contaminated soil. (See p. 30.)

# Recommendations

GAO recommends to the Secretary of Energy that DOE revise the Plan and submit it to all legislative, authorization, appropriations, and oversight

committees. The Plan should include more definitive information on DOE's plans for the permanent disposal of buried waste, contaminated soil, and waste that may not go to WIPP, complete and clear cost estimates, and details on the related environmental and safety issues that need to be resolved. (See p. 36.)

## Agency Comments

GAO did not obtain written agency comments on this report. GAO did, however, discuss the facts presented with DOE headquarters and field office officials. Clarifications suggested have been incorporated where appropriate.

# Contents

## Figures



### Abbreviations

| | |
|---|---|
| ADM | action description memorandum |
| D&D | decontaminate and decommission |
| DOE | Department of Energy |
| DWMP | Defense Waste Management Plan |
| EA | environmental assessment |
| EIS | environmental impact statement |
| FEIS | final environmental impact statement |
| GAO | General Accounting Office |
| IDB | integrated data base |
| JIO | Joint Integration Office |
| NEPA | National Environmental Policy Act of 1969 |
| RCED | Resources, Community, and Economic Development Division |
| TRUPACT | Transuranic Package Transporter |
| TRU | transuranic |
| WIPP | Waste Isolation Pilot Plant |

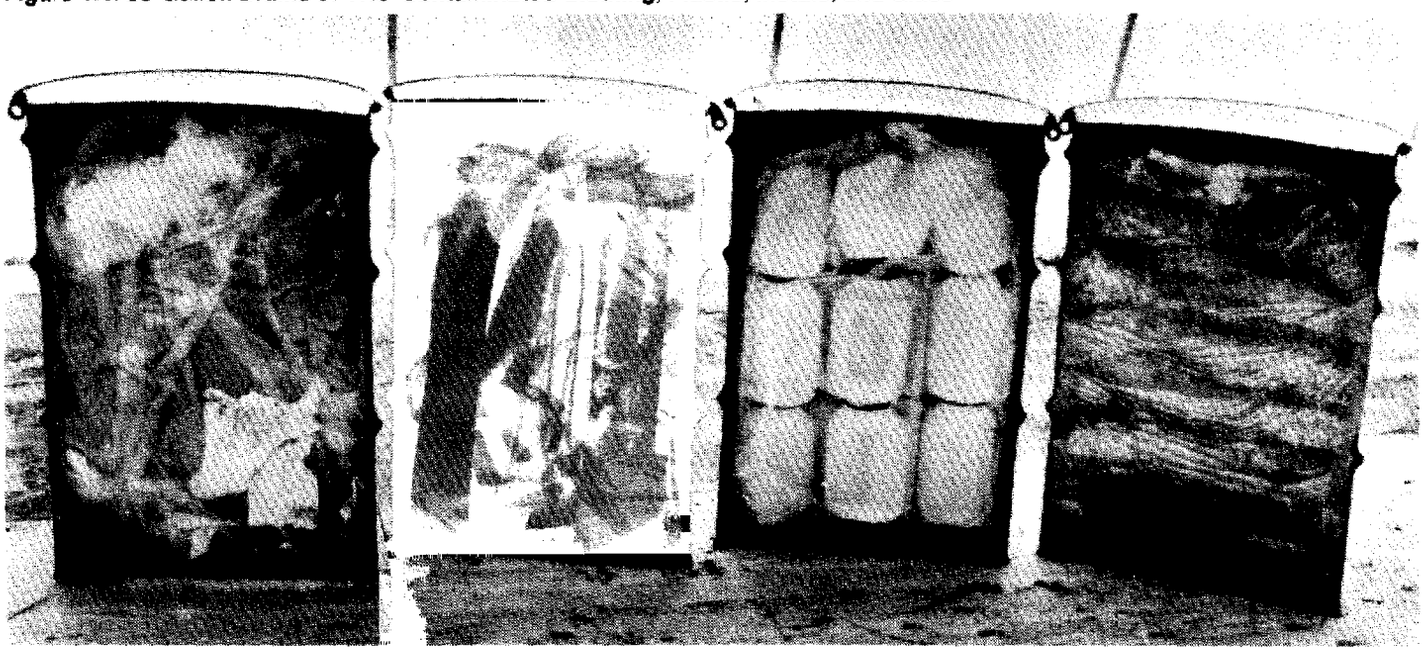
# Introduction

Transuranic (TRU) waste is discarded material contaminated with man-made radioactive elements having atomic numbers greater than uranium, such as plutonium, neptunium, americium, curium, berkelium, and californium. TRU waste emits alpha radiation. Unlike some radiation that requires extensive shielding, alpha radiation can be stopped by a sheet of paper. However, like all radiation, alpha radiation can be dangerous if inhaled, ingested, or absorbed into the body through an open wound. Further, TRU elements decay slowly and can remain radioactive for thousands of years. Thus, proper disposal of TRU waste to keep its radioactive elements from contaminating the environment—air, water, and soil—and the general public has become an important issue.

The Department of Energy (DOE) generates TRU waste from its defense weapons production, research, development, and testing activities along with two other types of radioactive waste—high-level and low-level waste. (For purposes of this report, TRU waste refers to DOE's defense TRU waste.) High-level waste generally refers to the highly radioactive liquid by-product that is produced from reprocessing spent or used nuclear reactor fuel. Low-level waste refers to trash—tools, paper, and rags—that typically contains small amounts of radioactivity in large volumes. TRU waste is generally discarded machinery, tools, filters, rubber gloves, paper, rags, sheet metal, glassware, and dried or cemented sludge from fuel reprocessing. Although the TRU waste form is similar to that of low-level waste, TRU waste is more dangerous because it contains radioactive elements that are long-lived. Consequently, the radioactive hazards of TRU waste fall somewhere between high-level and low-level waste.

About 99 percent of DOE's TRU waste volume can be "contact-handled"—handled without protective shielding. Much of the contact-handled TRU waste is stored in 55-gallon metal drums, although some is too large to be put in drums. The remaining 1 percent must be "remote handled"—requiring extensive shielding during handling and transportation—because it has been contaminated with radioactive elements that emit beta or gamma radiation. An example of DOE's contact-handled TRU waste is shown in figure 1.1.

Figure 1.1: 55-Gallon Drums of TRU-Contaminated Clothing, Plastic, Metals, and Glass

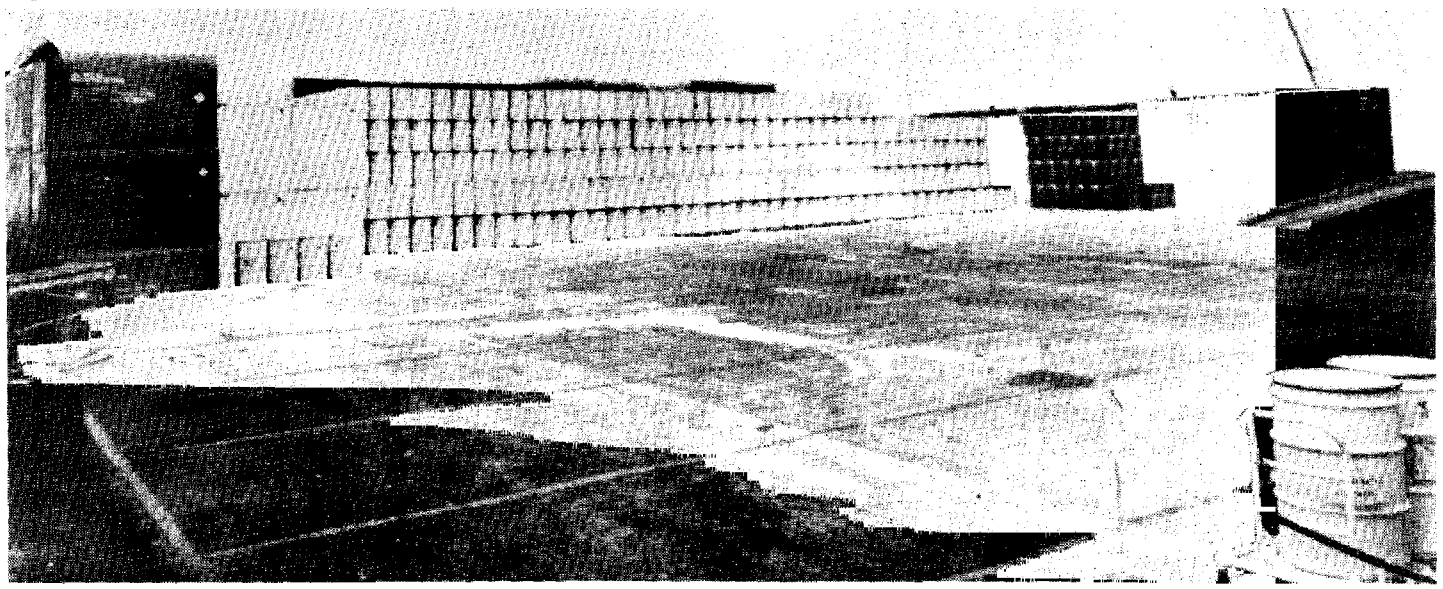


## Changes in Approach to TRU Waste Disposal

Until 1970 DOE had no waste classification for TRU. As a result, TRU waste was buried with low-level waste in shallow pits, 4 to 20 feet below the ground. In 1970 the Atomic Energy Commission—a predecessor to DOE—decided that TRU waste was potentially dangerous at certain radiation levels because it had a longer half-life (the time required for radioactivity to decay to half its initial activity) than low-level waste. Therefore, the Commission determined that TRU waste should not be disposed of with low-level waste in shallow pits and began requiring that TRU waste with radiation levels greater than 10 nanocuries (a measure of the amount of radiation emitted for a specific quantity of material) per gram be packaged and set aside or stored for retrieval in containers that could last 20 years or more pending its permanent disposal. Examples of DOE's buried and stored TRU waste are shown in figures 1.2 and 1.3.

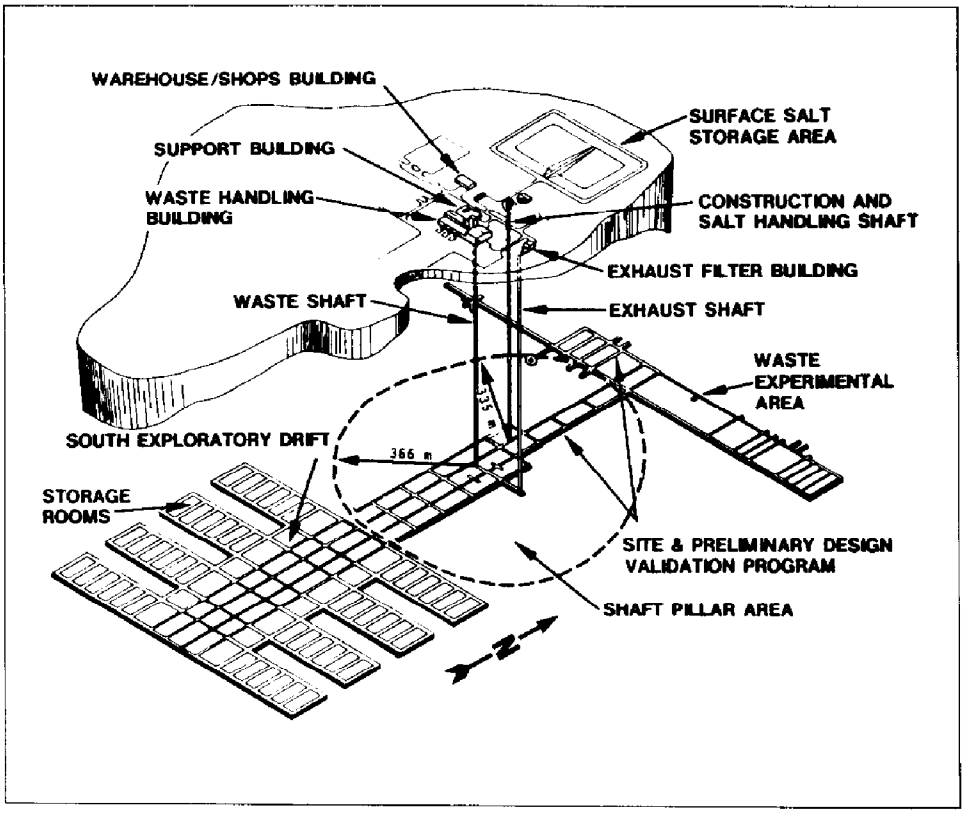
**Figure 1.2: Buried TRU Waste**

**Figure 1.3: Stored TRU Waste**



The Department of Energy National Security and Military Applications of Nuclear Energy Authorization Act of 1980 (Public Law 96-164) authorized DOE to build a research and development facility to demonstrate the safe, permanent disposal of radioactive waste from defense activities and programs. DOE selected a site near Carlsbad, New Mexico, for this facility. Construction of the project—known as the Waste Isolation Pilot Plant (WIPP)—was started in 1981 following 5 years of site suitability studies. WIPP will consist of a series of shafts and rooms about 2,150 feet below the ground in a salt formation with about 100 acres for TRU waste disposal. An above-ground view of WIPP is shown in figure 1.4.

Figure 1.4: Above-Ground View of WIPP




DOE expects to begin WIPP's 5-year research and development phase in October 1988 to demonstrate the safe disposal of TRU waste. DOE will also conduct experiments with limited amounts of defense high-level waste at WIPP. DOE, however, will not permanently store the high-level waste at WIPP. For purposes of this report, we focused only on the TRU waste activities.

Between October 1988 and 1993, DOE plans to put TRU waste in WIPP on a regularly scheduled basis and then assess its environmental and safety impacts before deciding whether to retrieve the waste or make WIPP a permanent repository. Although the research and development phase is designed to extend through 1993, DOE officials told us that the decision to make WIPP a permanent repository could be made at any time during the 1988-1993 period. Further, prior to October 1988 DOE will complete a contingency plan should it decide to retrieve the waste from WIPP in 1993.

If WIPP becomes a permanent repository, DOE plans to operate it at least through 2015; after that time, DOE may decide to close or expand it depending on DOE's TRU waste disposal needs. Although DOE considers WIPP to be experimental, DOE officials are confident that WIPP will be successful and will become the permanent repository for TRU waste.

In 1982 DOE increased the definitional limit of TRU waste from greater than 10 nanocuries per gram to greater than 100 nanocuries per gram. This action resulted from a TRU waste workshop held in August 1982 to determine whether the 10-nanocuries-per-gram limit could be safely increased. The workshop, consisting of officials from DOE, the U.S. Environmental Protection Agency, and individuals from the nuclear and scientific communities, concluded that the limit could safely be raised to 100 nanocuries per gram. Also in late 1982, the Nuclear Regulatory Commission adopted a regulation (10 C.F.R. §61.55) using 100 nanocuries per gram as the concentration above which TRU waste would not generally be acceptable for near-surface disposal.

DOE's TRU waste has been buried and stored at six waste storage sites across the country: Hanford, Washington; Idaho National Engineering Laboratory, Idaho; Los Alamos National Laboratory, New Mexico; Nevada Test Site, Nevada; Oak Ridge National Laboratory, Tennessee; and Savannah River Plant, South Carolina. These six storage sites receive TRU waste generated at the sites and from other TRU waste generators, such as the Rocky Flats Plant in Golden, Colorado; Lawrence Livermore National Laboratory in Livermore, California; and Mound in Miamisburg, Ohio.

Within DOE's Office of the Assistant Secretary for Defense Programs, the Office of Defense Waste and Byproducts Management has overall defense waste management responsibilities. Within this office, the Waste Research and Development Division Director and TRU waste program manager have overall policy and technical responsibilities. The Office of Defense Waste and Byproducts Management has delegated day-to-day management responsibility to DOE's Albuquerque Operations Office. To carry out its responsibility, the Albuquerque office has established the Joint Integration Office (JIO) consisting of DOE officials and contractors to coordinate TRU waste program activities.

## Defense Waste Management Plan

In June 1983 DOE submitted its Defense Waste Management Plan (DWMP)—a one-time requirement mandated by The Department of Energy National Security and Military Applications of Nuclear Energy

Authorization Act of 1982 (Public Law 97-90)—to the President for transmittal to congressional committees. The act stated that the President shall submit to the Senate and House Committees on Armed Services a report setting forth his plans for the permanent disposal of high-level and TRU waste resulting from atomic energy defense activities. For this report, we focused on the TRU waste portion of the DWMP.

The act also stated that DOE's report shall include—but not be limited to—a thorough and detailed program management plan and cost estimates for the permanent disposal of TRU waste for each state where this waste is in interim storage. According to its officials, DOE took a very strict interpretation of the legislative mandate; that is, if the act did not specifically require certain information, then DOE did not include it. As a result, DOE did not address the permanent disposal of pre-1970 buried waste or soil contaminated by that waste. Nevertheless, officials believe that DOE went beyond the legislative mandate because, in addition to setting out DOE's objectives, milestones, and costs for the permanent disposal of stored TRU waste, the DWMP also discussed DOE's plans for the TRU waste to be generated in the future.

The DWMP states that the objective for TRU waste is to end interim storage and achieve permanent disposal. The DWMP also

- sets out the activities and facilities needed at each of the six storage sites to carry out DOE's TRU waste disposal plans;
- establishes major milestones from 1983 through 2015 for each of the storage sites and WIPP;
- discusses supporting (generic) technology development activities to reduce TRU waste generation and develop and/or improve waste processing, instrumentation, packaging, and transportation; and
- presents DOE's estimated costs for the TRU waste program through 2015 totaling about $2.8 billion (in 1984 dollars).

When DOE prepared the DWMP, not all of its decisions concerning TRU waste disposal had been made. DOE pointed out that these decisions will depend on completion of the National Environmental Policy Act of 1969 (NEPA) (Public Law 91-190) process, authorization and appropriations of funds, and agreements with states, as appropriate. In transmitting the DWMP to the Congress, DOE stated that as new information is developed or new technical options become available, the DWMP will need to be adjusted. DOE had, according to its officials, expected to update information in the DWMP annually. Lacking a specific legislative requirement, however, these officials believed that DOE would not be able to obtain

the Office of Management and Budget's concurrence to issue the updates. As an alternative, DOE is preparing an in-house TRU program implementation plan to reflect programmatic and cost changes.

## Objectives, Scope, and Methodology

On March 14, 1985, the Chairman, Subcommittee on Environment, Energy, and Natural Resources, House Committee on Government Operations, requested an evaluation of DOE's TRU waste program. On the basis of subsequent discussions with the Chairman's office, we were asked to address specifically (1) whether the DWMP covers the permanent disposal of all DOE's TRU waste, (2) whether the DWMP identifies all the costs for the permanent disposal of TRU waste, and (3) the status of DOE's efforts to resolve environmental and safety issues related to the permanent disposal of TRU waste.

We interviewed DOE headquarters officials responsible for the oversight and management of the TRU waste program. These officials included the Deputy Director of the Office of Defense Waste and Byproducts Management, the TRU waste program director (during our review this individual was reassigned to other responsibilities), and the TRU waste program manager. We also interviewed Albuquerque Operations Office, JIO, and storage site officials. In addition, we contacted officials at 9 TRU waste generators that produce about 99 percent of DOE's TRU waste to ascertain their plans and costs for TRU waste. These generators were the six storage sites where TRU waste is also generated; the Rocky Flats Plant in Golden, Colorado; Lawrence Livermore National Laboratory in Livermore, California; and Mound in Miamisburg, Ohio.

To determine whether the DWMP includes all DOE's TRU waste, we reviewed the DWMP and supporting documentation. We also identified DOE's TRU waste inventory through discussions with DOE headquarters, Albuquerque office, and waste site officials, and by reviewing various DOE inventory data documents. We then compared this information with that in the DWMP. The data sources we reviewed included DOE's integrated data base (IDB) publication, Spent Fuel and Radioactive Waste Inventories, Projections, and Characteristics, and Long-Range Master Plan for Defense Transuranic Waste Management, both published annually. The IDB updates inventory data through December 31 of the previous year. For example, the December 1985 IDB shows data through December 1984. The long-range master plan provides a framework for TRU waste management planning during the transition period from interim storage to permanent disposal and covers research and development activities, facility design and construction, and operational aspects

of TRU waste management. It also identifies goals, objectives, and major program milestones.

To determine whether the DWMP identifies all costs for the permanent disposal of DOE'S TRU waste, we tried to obtain DOE headquarters and waste site documentation supporting the cost estimates specified in the DWMP. DOE could provide only limited documentation; therefore, we had to rely on statements made by DOE headquarters, Albuquerque office, waste site, and generator officials to determine the specific costs either included or excluded from the DWMP. Further, since documentation was limited, we could not determine the reasonableness of the DWMP's cost estimates. We had expected to obtain, analyze, and report on cost data more current than those in the DWMP. However, revised DWMP cost estimates will not be available until April 1986.

To determine the status of DOE's efforts to resolve environmental and safety issues related to the permanent disposal of TRU waste, we reviewed (1) DOE's efforts to comply with NEPA, (2) the final environmental impact statement for WIPP, and (3) studies conducted by the National Academy of Sciences and the state of New Mexico's Environmental Evaluation Group (funded by DOE to conduct independent technical evaluations of WIPP's environmental and safety issues). We then met with officials of the Environmental Protection Agency, the Nuclear Regulatory Commission, the Department of Transportation, and the Council on Environmental Quality to discuss issues related to their specific areas of expertise. We also met with the Staff Director of the Board on Radioactive Waste Management, National Research Council, which is part of the National Academy of Sciences, to discuss WIPP's integrity as a TRU waste repository and environmental and safety issues relating to TRU waste disposal. Further, we toured WIPP and interviewed WIPP officials regarding project construction, operation, and environmental and safety issues.

In addition, we contacted environmental, transportation, and radiological health and safety officials in the six states where DOE's TRU waste storage sites are located. We obtained their views on environmental and safety issues concerning WIPP and the activities related to the disposal of TRU waste. To obtain a broader perspective of state concerns, we also contacted the National Governors Association in Washington, D.C., and National Council on State Legislatures, headquartered in Denver, Colorado.

We also met with a limited number of public interest groups, such as

- in the state of Washington, the Hanford Oversight Committee, an organization composed of about 52 groups specifically dedicated to monitoring DOE's activities at the Hanford facility;
- in Idaho, the Snake River Alliance, a group concerned with ensuring that a clean environment exists at the Idaho storage site;
- in New Mexico, the Southwest Research Information Center, whose purpose is to provide information to the public on key environmental and social issues that affect the quality of life in the Southwest and throughout the United States;
- in Nevada, Citizens Alert, a group that has been actively following DOE's efforts to dispose of TRU and high-level waste;
- in Tennessee, the Tennessee chapter of the Sierra Club, which has been monitoring radioactive issues; and
- in South Carolina, the Palmetto Alliance, which has been monitoring nuclear and environmental activities in the state.

At the national level we contacted the Environmental Policy Institute. We then met with DOE headquarters and field officials to discuss the concerns raised. Since DOE's efforts to resolve environmental and safety issues are ongoing, we did not determine the adequacy of its actions to resolve the concerns raised.

As requested by the Chairman's office, we did not obtain written comments on this report. We did, however, discuss the facts presented with DOE officials at headquarters, the six waste storage sites, and the Albuquerque Operations Office, including JIO officials. Clarifications offered were included where appropriate. We also recognize that some of the information presented in this report may not have been available at the time the DWMP was prepared. We have noted this where appropriate. Our review was conducted between May and December 1985 and was performed in accordance with generally accepted government auditing standards.

# DWMP Does Not Fully Address the Permanent Disposal of a Major Portion of TRU Waste

As pointed out in chapter 1, DOE was—at a minimum—required to describe its objectives, milestones, and costs for the permanent disposal of TRU waste for each state in which this waste is in interim storage. DOE met this requirement but also included its permanent disposal plans for TRU waste to be generated in the future. However, DOE did not fully address the permanent disposal of 81 percent of DOE's current TRU-contaminated waste inventory— buried waste and contaminated soil. In addition, the DWMP does not indicate that some stored and future-generated TRU waste may not go to WIPP but may stay at the storage sites.

DOE classifies TRU-contaminated waste by the following categories:

- Stored waste is TRU waste that has been stored in a retrievable manner since 1970 (about 80,000 cubic meters).[1]
- Newly generated waste is TRU waste produced after October 1988 that will be shipped directly to WIPP by the generators (about 6,000 cubic meters annually).
- Buried waste is TRU waste placed in shallow pits before 1970 (about 171,000 cubic meters).
- Contaminated soil is soil that has been contaminated by the buried waste, liquid radioactive waste drained into the ground prior to 1970, and accidental radioactive spills (about 177,000 cubic meters).
- Difficult-to-certify waste is TRU waste that may not go to WIPP because of its unusual size, weight, or properties (between 10 to 26 percent of stored waste, or 8,000 to 21,000 cubic meters).

Table 2.1 shows the TRU waste that DOE accumulated as of December 1985.

**Table 2.1: DOE's TRU-Contaminated Waste as of December 1985**

| Type of Waste | Volume (cubic meters) | Percent |
|---|---|---|
| Stored | 80,067[a] | 19 |
| Buried | 170,969 | 40 |
| Contaminated soil | 177,480[b] | 41 |
| **Total** | **428,516** | **100** |

[a]19,580 cubic meters more than shown in the June 1983 DWMP because DOE continues to generate and store TRU waste.

[b]DOE's estimates for contaminated soil were given in ranges. The figure shown is DOE's lower, or more conservative, estimate.

Source: IDB, Spent Fuel and Radioactive Waste Inventories, Projections, and Characteristics.

[1]Five 55-gallon drums are needed to contain one cubic meter of TRU waste.

There are two major differences between DOE's December 1985 TRU waste inventory estimates and those in the DWMP. First, DOE's 1985 estimates include contaminated soil. DOE excluded this waste category from the DWMP because, according to officials, DOE did not have reasonably accurate estimates available and did not believe this waste was in interim storage. Second, DOE's 1985 buried waste estimates are at least 1.9 million cubic meters less than the DWMP, which showed buried TRU waste ranging from 2 to 7 million cubic meters. The decrease is not related to the redefinition of TRU waste from 10 to 100 nanocuries but rather to revisions made by the Savannah River and Hanford storage sites. According to officials at these two sites, they initially included the contents of the entire area where TRU waste was buried. As a result, the DWMP inventory estimates not only included TRU waste but also low-level waste. Site officials believe the estimates shown in table 2.1 represent only the TRU waste portion.

DOE headquarters and storage site officials told us that the 1985 TRU waste inventory estimates are more reasonable than those in the DWMP but pointed out that they are still only estimates. They stated that the accuracy of buried waste volumes is questionable because records to support the data are incomplete, inaccurate, and unverifiable; the TRU waste classification did not exist prior to 1970; and TRU waste was not segregated from low-level waste before that time. In addition, estimates of contaminated soil depend, according to these officials, on waste container integrity, radioactivity migration (movement), and contamination control techniques used if DOE decided to retrieve the buried waste. DOE would have to dig up and assay the soil to accurately determine how much has been contaminated above 100 nanocuries. Although DOE does not expect to do this, officials explained that DOE plans to develop instrumentation to better determine the amount of TRU-contaminated soil. Further, DOE officials believe that stored TRU waste estimates are more accurate than the other waste categories but pointed out that these too will change (probably decrease) when the waste is retrieved, examined, and packaged prior to sending it to WIPP. Despite these shortcomings, officials believe the 1985 estimates are adequate for their planning purposes.

Although we recognize the uncertainties in DOE's TRU waste inventory estimates, we concluded that it was more appropriate to use the current data rather than the DWMP data in this report. Therefore, the discussion that follows is based on DOE's 1985 inventory estimates. Table 2.2 shows DOE's TRU waste by storage site as of December 1985.

**Table 2.2: DOE's TRU Waste by Storage Site as of December 1985**

Figures in cubic meters

| Storage site | Stored | Buried | Contaminated soil | Total |
|---|---|---|---|---|
| Hanford | 13,716 | 91,660 | 68,700 | 174,076 |
| Idaho | 54,153 | 57,100 | 56,640 | 167,893 |
| Los Alamos | 6,536 | 11,489[a] | 1,140 | 19,165 |
| Nevada Test Site | 537 | • | • | 537 |
| Oak Ridge | 1,227 | 6,200 | 13,000 | 20,427 |
| Savannah River | 3,898 | 4,520 | 38,000 | 46,418 |
| **Total** | **80,067** | **170,969** | **177,480** | **428,516** |

[a]Includes 3 cubic meters of TRU waste buried at Sandia National Laboratories in New Mexico.

## Buried Waste and Contaminated Soil

The DWMP states that DOE would monitor the buried waste, take remedial actions as needed, and reevaluate its safety periodically, with major evaluations scheduled as necessary or in about 10-year intervals. Other than this, the DWMP does not discuss the permanent disposal of buried waste or indicate that there is soil contaminated with TRU elements primarily because of pre-1970 waste disposal practices. According to DOE officials, the DWMP did not discuss these issues because the National Academy of Sciences and others had found that retrieving buried waste can be more hazardous than leaving it in place. Further, they said that the buried waste and contaminated soil do not present a hazard to the public and are not expected to in the future.

We believe that the DWMP should have fully explained DOE's position on buried waste and contaminated soil and DOE's efforts to ensure its safety and environmental integrity at the buried waste locations. For example, the DWMP does not discuss the extent or types of remedial action that DOE would take or explain how DOE can leave TRU waste buried in shallow pits when it has determined that shallow burial is not an acceptable long-term disposal method. In addition, in 1980 DOE concluded that interim storage of TRU waste at the Idaho site was unacceptable because of the potential dangers of human intrusion and natural disasters, such as volcanic eruptions. These dangers also apply to buried waste and contaminated soil but were not addressed in the DWMP. DOE officials agreed and pointed out that shallow land burial is not an environmentally acceptable disposal method today. However, these officials stated that DOE cannot take major remedial actions until technology is developed, risks are known, and appropriate environmental analyses are completed.

However, the DWMP does not state that DOE efforts were underway to improve and develop methods to safely retrieve the buried waste and contaminated soil. It also does not mention that DOE had retrieved 4,567 cubic meters of buried TRU waste between 1974 and 1978 and had stated in two reports[2] that the waste was retrieved without harm to the workers or the environment. While the retrieval efforts were limited and required workers to use protective clothing and respirators in some cases, they showed that buried waste can be safely retrieved.

One report also showed that 67 percent of the retrieved drums had severely deteriorated and contaminated the surrounding soil. Although DOE concluded that no TRU elements migrated from the ruptured containers, DOE repackaged the material and dug up the soil for ultimate disposal in WIPP. DOE officials told us they expect containers to deteriorate over time but that on-site monitoring shows that the waste is safe. If monitoring results showed otherwise, DOE would take remedial actions. Nevertheless, DOE's retrieval efforts show that waste container deterioration has occurred from TRU waste buried prior to 1970. Therefore, it may not be safe to leave the waste in place.

More importantly, the DWMP does not conclusively show that buried waste and contaminated soil do not present a hazard to the public. In support of its position, DOE officials referred to a 1976 National Academy of Sciences report.[3] The Academy's report, however, did not take a position on the potential hazards to the public of the buried waste and contaminated soil. The report stated that the Academy (1) had little information concerning the rate of movement of TRU elements through soil or the factors that affect the behavior of TRU elements in different types of soil and (2) had no information about the rates of movement of TRU elements through groundwater at atomic energy defense facilities to make such a determination.

In explaining DOE's decision not to discuss buried waste and contaminated soil in the DWMP, DOE officials told us that they believed the DWMP should only address stored and newly generated TRU waste and that they considered the buried waste and contaminated soil to be disposed. DOE's response, however, contradicts its past and current actions. First, in 1970 the Atomic Energy Commission stated that it did not consider buried waste to be permanently disposed. Second, DOE is and has been

[2]Initial Drum Retrieval Final Report, Aug. 1978, and Early Waste Retrieval Final Report, Aug. 1979.

[3]The Shallow Land Burial of Low-Level Radioactively Contaminated Solid Waste, 1976.

studying permanent disposal options for buried waste and contaminated soil. These options include (1) improving its confinement or (2) retrieving the waste, certifying it to meet WIPP's disposal criteria, and sending it to WIPP.

To improve the confinement of buried waste and contaminated soil, DOE is developing grouting and in-situ vitrification technologies. Grouting involves pumping a liquid into the ground that hardens, fills openings in the soil, and keeps the waste from migrating. In-situ vitrification is an in-ground melting process that converts buried waste and contaminated soil into glass and crystalline waste forms. DOE is also studying improved retrieval techniques, such as better excavating equipment. According to officials, Hanford expects to reach a decision on the permanent disposal of buried waste sometime in 1987, but decisions concerning the other storage sites will not be made until late 1994. DOE officials could not estimate if or when a decision would be made concerning contaminated soil. Although DOE officials state that buried waste and contaminated soil are disposed, DOE's actions indicate otherwise.

## Difficult-To-Certify Waste

The DWMP states that all stored and newly generated TRU waste will be certified for compliance with WIPP's waste acceptance criteria and then sent to WIPP if it becomes a permanent repository. However, the DWMP does not point out that some difficult-to-certify waste will not meet WIPP's disposal criteria and will be disposed of at the storage sites. DOE estimates that difficult-to-certify waste could amount to 10 to 26 percent of stored TRU waste, or about 8,000 to 21,000 cubic meters.

In 1982 DOE established a WIPP Waste Acceptance Criteria Certification Committee to develop criteria for the types of TRU waste that would be acceptable for WIPP. DOE wanted to ensure that WIPP's operations would be safe and that the TRU waste going to WIPP would meet the criteria established. Committee membership has varied from two to seven people who are DOE or contractor officials. The committee periodically revises WIPP's waste acceptance criteria as DOE's TRU waste disposal plans and technology evolve; the latest revision was in September 1985.

TRU waste must be certified to meet these criteria before it can be put in WIPP. Waste sites and generating facilities are preparing plans that describe how they expect to meet WIPP's waste acceptance criteria. These plans must be provided to the state of New Mexico for comment and be approved by the committee after an inspection of the storage

sites' and generators' facilities. As of December 1985, 10 plans for contact-handled TRU waste had been submitted to the committee and all or parts of 9 had been approved. According to the committee's chairman, contact-handled, certified TRU waste from six locations is now being stored and will be the first waste sent to WIPP.

The WIPP waste acceptance criteria specify the types and forms of waste permitted and limit the size and weight of the container in which the waste will be transported and disposed. For example, free-flowing liquids are prohibited to reduce the dispersibility of radioactive materials in the event of waste container rupture; explosive or compressed gases are prohibited to reduce personnel risk from possible explosions and the potential contamination to workers, the public, and the environment. TRU waste packages cannot exceed 12 x 8 x 8.5 feet or 25,000 pounds to stay within the size limitations of WIPP's handling equipment, facilities, and transportation systems. According to the committee's chairman, the committee can grant exceptions to the criteria, but none are expected.

For stored and newly generated TRU waste to be certified to meet WIPP's acceptance criteria, some will have to be processed; that is, the waste will be shredded to reduce its size or mixed with solids to eliminate free-flowing liquids. At the Idaho and Hanford storage sites, which have about 85 percent of the stored TRU waste volume, DOE estimates that between 25 and 35 percent of this waste will require processing to meet WIPP's waste acceptance criteria.

However, some stored and newly generated waste may be difficult to process and certify because of its unusual size, weight, or properties, such as metal pipes; machine tools; large equipment items; remote controlled, robotic glove boxes; and huge concrete structures. For example, the Hanford storage site has concrete boxes measuring 75.5 feet x 65.5 feet and metal structures that are 9 feet in diameter and 10 feet high. These structures are used to store remote-handled TRU waste. Similar types of structures, such as over-sized glove boxes and TRU waste-contaminated equipment, also exist at the Idaho, Los Alamos, Nevada, and Oak Ridge storage sites. Officials at the Savannah River site believe that all of the stored and newly generated TRU waste at the site can be certified for WIPP.

DOE estimates that between 10 and 26 percent of stored TRU waste, or about 8,000 to 21,000 cubic meters, may be difficult to process, certify, and send to WIPP. Although DOE expects that some TRU waste generated

after 1988 may not meet WIPP's disposal criteria, officials could not estimate how much. According to DOE headquarters and field office officials, one alternative DOE is considering for the permanent disposal of difficult-to-certify waste is putting it in a shaft approximately 120 feet deep at the storage sites. DOE continues to conduct experiments on this disposal option and has not determined the specific design. One experiment at the Nevada Test Site includes a steel liner inside the first 60 feet of the 120-foot shaft. DOE documentation states that the 120-foot depth is sufficient to minimize or eliminate natural environmental intrusion to the waste, such as rain water, burrowing animals, or plant roots, and substantially reduces the possibility of human intrusion. DOE officials believe that ultimately only 1 percent of the TRU waste volume will be a candidate for this type of disposal.

According to the TRU waste program director and manager, in 1983 DOE did not know that some stored waste would not go to WIPP. Therefore, the DWMP did not discuss this possibility. They also said that DOE will not know until September 1987 how much stored and newly generated TRU waste will ultimately stay at the storage sites. At that time, DOE expects to review its options and decide on the best approach to dispose of difficult-to-certify waste. They explained that DOE's objective is to certify and dispose of as much TRU waste in WIPP as possible.

## Conclusions

The DWMP did not fully inform the Congress about the magnitude of the TRU waste problem. As of December 1985, DOE had produced about 429,000 cubic meters of TRU waste. However, the DWMP only provided information on DOE's plans to permanently dispose of about 19 percent of this waste in a geological repository 2,150 feet underground. The DWMP was silent concerning the amount of and permanent disposal method for soil contaminated with TRU elements and waste that could not meet WIPP's disposal criteria. In addition, it did not fully explain DOE's position concerning TRU waste buried prior to 1970 and did not explain how DOE can safely leave 81 percent of TRU waste in shallow pits 4 to 20 feet below the surface while needing a repository 2,150 feet below the surface for 19 percent of the waste.

# Cost Estimates Are Incomplete and Unclear

Documentation to support the DWMP cost estimates is sketchy and in some cases nonexistent. According to DOE headquarters and storage site officials, many of the estimates were based on the suppositions of storage site officials, some of whom have left the TRU program or DOE. Although support for the cost estimates was limited, we found, primarily through discussions with DOE officials, that the DWMP's TRU waste program cost estimate of $2.8 billion from 1983 through 2015 (in 1984 dollars) is understated. It does not include at least $300 million in TRU-related costs or costs to dispose of a major portion of DOE's TRU waste—pre-1970 buried waste, contaminated soil, and difficult-to-certify waste. In addition, about $1.5 billion included in the DWMP was commingled with costs for the high-level waste program and not identifiable as TRU costs.

## Incomplete and Unclear Cost Estimates

The DWMP's $2.8 billion estimate does not include costs for a number of TRU waste-related activities, including

- certifying and packaging newly generated TRU waste after 1988;
- decontaminating and decommissioning (D&D) TRU waste facilities at the storage sites; and
- disposing of buried waste, contaminated soil, and difficult-to-certify waste.

According to the TRU waste program director and other DOE officials, the DWMP did not include about $10 million per year to certify and package newly generated TRU waste. They said that these costs could be as much as $270 million for the period 1988-2015. Officials stated that DOE "purposely excluded" these costs from the DWMP because certifying and packaging newly generated TRU waste are (1) the responsibility of the programs that generate the waste, such as DOE's nuclear energy or defense programs, (2) waste generation and not waste disposal costs, and (3) included in site operating budgets that do not identify them as TRU program costs. Nevertheless, we believe the DWMP should have identified these costs to provide the Congress with the complete perspective of TRU program costs.

The $2.8 billion also does not include costs to D&D TRU waste processing facilities at the storage sites. At the end of their useful life, radioactively contaminated facilities must be D&D. One method is to spray or wash off the contamination with chemicals or acid. According to the TRU waste program director, the program manager, and Albuquerque officials, the

DWMP did not include D&D costs because DOE did not know when the facilities would be closed, if they would be partially or completely closed, or which D&D technology would be used. Further, D&D costs would be included in operating budgets and not separately identified as TRU program costs. However, these officials stated that, as a rule of thumb, D&D costs could be about 10 percent of facility costs. Table 3.1 shows the estimated costs for the TRU waste facilities planned for each storage site as shown in the DWMP (in 1984 dollars) and the estimated D&D costs.

**Table 3.1: DOE's Estimated Cost for D&D of TRU Waste Facilities by Storage Site**

Dollars in millions

| Storage site | DWMP's estimated facility costs | 10% for D&D |
|---|---|---|
| Hanford | $119.9 | $11.99 |
| Idaho | 55.5 | 5.55 |
| Los Alamos | 21.0 | 2.10 |
| Nevada Test Site | • | • |
| Oak Ridge | 48.0 | 4.80 |
| Savannah River | 68.0 | 6.80 |
| **Total** | **$312.4** | **$31.24** |

Although DOE would conduct D&D activities at WIPP after it is closed, the entire site will require perpetual care and institutional oversight for many years. Further, DOE would have to D&D processing facilities at Rocky Flats, Lawrence Livermore, and Mound. Since WIPP will require long-term institutional care and since processing facility costs for these three generators were not included in the DWMP, we could not estimate the related D&D costs.

In addition, because the DWMP did not fully address DOE's plans to dispose of buried waste, contaminated soil, and difficult-to-certify waste, the DWMP did not include associated costs for their permanent disposal. DOE headquarters and field office officials told us the DWMP did not include permanent disposal costs for buried waste because (1) DOE considered the waste disposed and (2) removing all TRU buried waste and contaminated soil would be very costly. Further, the DWMP did not include costs for major remedial actions such as in-situ vitrification and grouting because these technologies were not fully developed and implementation costs were not known. According to these officials, if DOE decided to implement one of these major remedial actions for buried waste, costs could be significant. They pointed out that the DWMP included costs for on-site monitoring and minor remedial actions, such as

water runoff and sedimentation control, at the burial sites. These costs were shown as interim operations costs in the DWMP.

Although the DWMP includes interim operations costs—costs during the transition period from interim storage to permanent disposal—it did not identify the amount specifically applicable to TRU waste-related activities. These activities include the day-to-day management of buried and stored TRU waste. However, in the DWMP DOE combined the costs for these daily activities with similar costs for the defense high-level waste program. On the basis of DOE documentation and discussions with officials, we found that about $1.5 billion of the $5.8 billion interim operations costs identified in the DWMP relate to the TRU program. According to DOE officials, the DWMP did not specifically identify the portion of interim operations costs applicable to TRU waste management activities because these costs are included in site operating budgets and are not broken down by the various program activities.

## Changing Cost Estimates

As of December 1985, DOE was revising its TRU waste program cost estimates. DOE expects to complete this effort by April 1986. However, DOE headquarters and field office officials told us that the revised cost estimates will not include costs for managing and disposing of newly generated TRU waste, D&D of TRU waste facilities, or disposing of buried waste, contaminated soil, and difficult-to-certify waste. These officials added that cost estimates will continue to change as DOE's plans concerning the permanent disposal of TRU waste are finalized and as DOE gains more information through conceptual engineering designs of TRU waste facilities.

For example, in October 1985 DOE completed a cost optimization study that included eight scenarios to minimize TRU program costs. By April 1986 DOE expects to complete a more detailed analysis of one of the scenarios in the cost optimization study. The scenario proposes sending Hanford's and Savannah River's contact-handled TRU waste to the Idaho site for processing, thereby eliminating some of the processing facilities shown in the DWMP. DOE is weighing the savings for reduced construction and operating costs at Hanford and Savannah River against the increased transportation costs from these two sites to Idaho and increased operating costs at Idaho to process the additional waste.

## Conclusions

Cost estimates for the permanent disposal of TRU waste should have been at least $4.3 billion to $4.6 billion as compared to the $2.8 billion

shown in the DWMP. About $1.5 billion of the difference was commingled with high-level waste program costs and was not specifically identified as TRU costs. In addition, about $270 million to dispose of TRU waste generated from 1988 to 2015 and about $31 million to D&D TRU waste facilities were not included in the DWMP. Further, costs for TRU waste could increase significantly depending on the remedial action option DOE selects for waste that could remain at the storage sites—pre-1970 buried waste, contaminated soil, and difficult-to-certify waste.

# DOE's Efforts to Resolve Environmental and Safety Issues Are Ongoing

The DWMP provides no information on the environmental and safety issues to be resolved prior to WIPP's October 1988 start-up date. In 1980 DOE issued a final environmental impact statement for WIPP and the TRU waste stored at the Idaho site. The statement noted that DOE would conduct other environmental analyses for the remaining five storage sites and major TRU waste generators related to retrieving, processing, certifying, and shipping TRU waste. The DWMP did not discuss the types or relevancy of these issues or the types of or timing for NEPA analyses needed prior to WIPP's start-up.

On the basis of studies and discussions with numerous state officials and public interest groups, we found that there are unanswered questions related to the structural integrity of WIPP as a TRU waste repository, the safe transportation of TRU waste to WIPP, and the disposal of buried waste and contaminated soil. For example, some sources expressed concern about cracks and brine pockets found at WIPP that may make it structurally unsound, thereby causing environmental degradation above that projected by DOE in 1980. DOE continues to assess this and other environmental and safety issues and to conduct NEPA analyses. We found that DOE's completion dates for NEPA analyses have slipped by 9 to 18 months, but DOE officials believe the analyses will be completed before WIPP starts up.

## Environmental and Safety Concerns

Studies prepared by DOE and the state of New Mexico, and public interest groups and state officials with whom we met cited a number of environmental and safety concerns regarding the permanent disposal of DOE's TRU waste. These concerns included the following:

- Could waste emplaced in WIPP contaminate the groundwater or migrate off-site and affect the general public? For example, members of the state of New Mexico's Environmental Evaluation Group and the Southwest Research Information Center expressed concern about TRU waste from WIPP getting into the groundwater through cracks in the salt formation and brine deposits that could cause the salt around the waste to dissolve.
- Would DOE or another entity maintain WIPP after 2015 or after it is closed, and what are DOE's plans to adequately prevent sabotage or inadvertent human intrusion to WIPP during its operation and after it is closed?
- How will DOE safely transport TRU waste to WIPP and when will DOE inform the states about the routing plans for TRU waste shipments?

- How will DOE address the problem of transporting TRU waste that produces an explosive gas when the waste is tightly sealed? This type of waste is generated primarily at Savannah River.
- Can the buried waste at the storage sites contaminate groundwater or migrate off-site, thereby affecting the general public? For example, members of the Hanford Oversight Committee told us that they are concerned about TRU-contaminated material at Hanford seeping into nearby aquifers and the Columbia River. In addition, a senior assistant to Idaho's governor told us that the state expects DOE to remove all buried and stored waste from the state.

On the basis of DOE documentation and our discussions with DOE headquarters and field office officials, DOE's efforts to address these concerns include the following actions:

- DOE continually monitors WIPP for cracks and brine pockets and will do so through 2015. In September 1985 DOE found a series of cracks about 2 to 10 feet below the floor of the excavated storage rooms at WIPP. WIPP officials believe the cracks resulted from excavation activities and said that the cracks will eventually seal themselves because natural resealing is a characteristic of salt formations and one reason DOE selected WIPP's site. They added that they will continue monitoring the status of the cracks. DOE's monitoring also identified brine pockets in one area of the salt formation. As a result, DOE changed WIPP's construction plans and excavated in the opposite direction. DOE officials pointed out that, if the brine deposits are as old as the salt—225 million years—and have not yet dissolved the salt, there is strong evidence that the salt will not be dissolved in 10,000 years. In addition, a 1984 study by the National Academy of Sciences, Review of the Scientific and Technical Criteria for the Waste Isolation Pilot Plant (WIPP), concluded that brine pockets do not pose a threat to the integrity of WIPP. According to the study's director, DOE is proceeding in a sensible and logical manner to resolve this and other environmental and safety issues at WIPP.
- In December 1985 DOE submitted a draft facility closure plan to New Mexico officials for review and comment. The plan addressed problems concerning sabotage and inadvertent human intrusion to WIPP after it is closed. DOE expects to finalize the closure plan during fiscal year 1986. In addition, DOE is developing retrieval criteria in the event that its research efforts show that WIPP is not acceptable as a permanent repository for TRU waste. DOE expects to have the criteria completed by April 1986. Once these criteria are approved by the state, DOE will prepare a contingency plan for waste retrieval.

- DOE is developing new transportation containers for both contact- and remote-handled TRU waste. DOE currently ships TRU waste between generators and storage sites using trucks and railroad systems approved under an exemption by the Department of Transportation. Although officials believe that these systems are safe, DOE is developing a new, state-of-the-art, Transuranic Package Transporter (TRUPACT), which will be used to ship contact-handled TRU waste, and a cask to ship remote-handled TRU waste and experimental defense high-level waste to WIPP. TRUPACT is designed to be a double-walled, foam-filled, and fire- and puncture-resistant box with tight seals that will contain at least 36 55-gallon drums of TRU waste. DOE plans to complete the design of TRUPACT by April 1986. DOE is also studying a 48-drum transporter but has not yet approved this design. DOE plans to complete the remote-handled cask design by December 1986. In addition, Albuquerque and JIO officials told us that they have met with officials from the six storage-site states to discuss plans for transporting TRU waste to WIPP.
- DOE has initiated studies at Sandia National Laboratories on the problem of gas generation during transport and after disposal in WIPP. DOE expects to complete these studies by April 1986. DOE officials pointed out that all TRU waste containers with a potential for gas generation beyond safe levels will have vents installed to prevent the buildup of explosive levels of gas.
- DOE continuously monitors for seepage or migration of radioactive elements from the waste buried at the storage sites. DOE headquarters and field office officials told us that neither DOE nor the site contractors have found on-site groundwater contaminated with TRU elements. However, we previously reported that radioactively contaminated groundwater existed at three DOE facilities in Ohio: the Feed Materials Production Center at Fernald, Portsmouth Uranium Enrichment Complex at Piketon, and Mound at Miamisburg.[1] DOE and consultant studies partially attributed the radioactive contamination to seepage from low-level waste burial sites at Fernald and an on-site landfill at Mound. Although the radioactive elements found at the three Ohio locations were not TRU elements, our findings indicate that the potential exists for radioactive migration from buried waste. DOE officials pointed out that our Ohio findings have no technical comparability or relevancy to TRU waste and to draw this type of conclusion would require an understanding of radioactive migration, geology, and hydrology. Further, radioactivity migration can occur anywhere and anyplace, according to these officials, but

[1]Environment, Safety, & Health: Environment and Workers Could Be Better Protected at Ohio Defense Plants (GAO/RCED-86-61, Dec. 13, 1985).

they believe DOE has adequate on-site monitoring to protect the environment and the public at its TRU waste sites.

Since DOE's efforts to resolve the environmental and safety issues previously discussed are ongoing, we did not determine the adequacy of its actions. However, the DWMP did not discuss these issues or DOE's efforts to resolve them.

## NEPA Efforts

In October 1980 DOE issued a final environmental impact statement (FEIS) in compliance with NEPA for WIPP and the stored waste at the Idaho site. DOE included the Idaho site because it has the largest volume of stored TRU waste. DOE intended that the FEIS would be the first step in the NEPA process and would provide input for future decisions concerning DOE's management and disposal of TRU waste. The FEIS analyzed alternatives to WIPP, WIPP's operational safety and environmental impacts, waste acceptance criteria, the impact of removing TRU waste stored at the Idaho site, and the consequences of waste processing and transportation. The alternatives covered in the FEIS were to

- continue storing TRU waste at the Idaho site as it is or with improved confinement,
- proceed with WIPP as authorized,
- dispose of TRU waste in the first available repository for high-level waste, or
- delay WIPP and evaluate other candidate sites for TRU waste disposal.

The FEIS concluded that the alternative of leaving the waste stored at the Idaho site was unacceptable in the long-term because it exposes the waste to possible volcanic action or human intrusion. These potential dangers, the FEIS concluded, could result in radiation exposures in excess of allowable limits. The FEIS concluded that the remaining three alternatives were predicted to have little short-term (during construction and operation) or long-term environmental, health, or safety impacts to workers or the general public and that no one alternative was clearly superior environmentally so that it could be selected on environmental grounds alone. Since the last three alternatives could be carried out in a safe and environmentally acceptable manner, DOE decided to proceed with WIPP.

However, the FEIS did not address the disposal of TRU waste stored at sites other than Idaho or the disposal of buried waste and contaminated soil at Idaho and other sites. The FEIS stated that other documents would

address these actions. Further, the FEIS stated that it was not intended to provide sufficient environmental analyses for decisions on actual routes or methods for transporting TRU waste to WIPP or site-specific waste processing facilities. These decisions, according to the FEIS, would be addressed by subsequent analyses in other NEPA documents.

DOE continues to conduct analyses and prepare documents to meet NEPA requirements for the remaining five storage sites and major generators concerning environmental and safety issues related to retrieving, processing, certifying, and shipping TRU waste. These documents include (1) action description memos (ADMs), which identify potential issues or problems to help DOE determine whether additional documentation may be needed, (2) environmental assessments (EAs), which are more rigorous than ADMs and provide evidence and analysis for determining whether an environmental impact statement is needed, and (3) environmental impact statements (EISs), which provide detailed discussions of many potential environmental impacts.

In December 1984 DOE issued a TRU program NEPA strategy and planning document to alert the remaining storage sites and generators to its plans for meeting NEPA's requirements. Table 4.1 shows DOE's planned milestones as set out in that document as well as DOE's revised milestones for completing these actions.

**Table 4.1: DOE's Milestones for Completing Various NEPA Requirements**

| Storage site and generator | NEPA document | Original date | Revised date |
|---|---|---|---|
| Savannah River | ADM | 6/85 | 9/86 |
| Oak Ridge | ADM | 9/85 | 9/86 |
| Los Alamos | ADM | 12/85 | 9/86 |
| Nevada Test Site | ADM | 3/86 | 9/87 |
| Lawrence Livermore | ADM | 3/86 | 9/87 |
| Mound | ADM | 3/86 | 9/87 |
| Hanford | EIS | 4/86 | 5/87 |
| Rocky Flats[a] | | | |

[a]Included in WIPP's FEIS.

We found, however, that the planned environmental analyses for some sites and all the milestones have changed. At a meeting held on August 30, 1985, DOE revised its NEPA strategy. The revised strategy stipulated that the large-volume waste generators—Oak Ridge, Los Alamos, and Savannah River—would prepare ADMs and EAs and the small-volume generators would prepare ADMs. According to officials, DOE

determined—after preparing the ADMs for Oak Ridge, Los Alamos, and Savannah River—that the potential environmental impacts at these three sites necessitated more in-depth analyses. Because the EAs are more extensive than ADMs, the respective milestones were extended 9 to 15 months. In addition, DOE deferred until 1987 the ADMs for the four smaller generators to allow them to pattern their ADMs after the large generators' EAs. As a result, the milestones for the ADMs were extended by 18 months. Nevertheless, DOE officials believe they have sufficient time to complete NEPA analyses before WIPP's October 1988 start-up date.

## Conclusions

DOE's decision to proceed with WIPP to demonstrate the permanent disposal of TRU waste raises a number of environmental and safety issues. These issues relate to WIPP's structural integrity as a TRU waste repository, the safe processing and transportation of TRU waste, and leaving TRU waste buried at the storage sites. Although DOE discussed some of these issues in WIPP's FEIS, the DWMP provides neither insight into the additional NEPA analyses DOE planned to undertake to fully address these issues nor the timing to resolve them.

# Recommendations

The DWMP did not provide the Congress with complete inventory, cost, or environmental and safety information related to the permanent disposal of TRU waste. For example, the DWMP did not address DOE's permanent disposal plans for more than 80 percent of TRU waste that could remain at the storage sites— pre-1970 buried waste, contaminated soil, and waste that will not meet WIPP's disposal criteria. In addition, the DWMP's $2.8-billion cost estimate is understated by at least $1.8 billion and does not include costs for disposing of TRU waste that could remain at the storage sites. Further, the DWMP was silent concerning the environmental and safety issues that need to be resolved prior to WIPP's October 1988 start-up date.

In view of these shortcomings, we recommend to the Secretary of Energy that DOE revise the DWMP and submit it to all legislative, authorization, appropriations, and oversight committees. DOE's revision should include the following:

- specific plans for the permanent disposal of buried waste, contaminated soil, and difficult-to-certify waste;
- cost estimates for the permanent disposal of TRU waste, including the options for buried waste, contaminated soil, and difficult-to-certify waste; processing and certifying newly generated TRU waste; decontamination and decommissioning of TRU waste processing facilities; and interim operations; and
- specific and detailed discussions of environmental and safety issues for the permanent disposal of TRU waste.

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