United States General Accounting Office

GAO

Report to Congressional Requesters

July 1996

NUCLEAR WASTE

Uncertainties About Opening Waste Isolation Pilot Plant

G A O

75 years 1921 - 1996

GAO/RCED-96-146

GAO

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

Resources, Community, and
Economic Development Division

B-271790

July 16, 1996

Congressional Requesters

The Department of Energy (DOE) plans to begin, in April 1998, a $19 billion[1] program to permanently dispose of about 176,000 cubic meters of transuranic[2] waste primarily generated and currently stored at six facilities. The waste is to be permanently stored in the Waste Isolation Pilot Plant (WIPP), a planned geologic repository near Carlsbad, New Mexico. However, DOE must first obtain from the Environmental Protection Agency (EPA) a certificate of compliance with its disposal regulations for radioactive waste and meet the requirements of the Resource Conservation and Recovery Act of 1976, as amended (RCRA), for handling and disposing of hazardous waste.

Interested in the feasibility of opening WIPP on DOE's schedule and the Department's readiness to begin disposal operations, the requesters asked GAO to assess the prospects for opening WIPP in 1998 and determine how well DOE is positioned to begin filling the repository in its first few years of operation as well as over the longer term.

Results in Brief

For two reasons, the prospects for opening WIPP by April 1998 are uncertain. First, a wide disparity exists between DOE's mid-1995 draft application for a certificate of compliance and EPA's criteria for reviewing a compliance application. The application lacked details on the repository site, on the inventory of anticipated waste, and on future human activities that could compromise the capability of the repository to contain the waste; also, the application did not address many of EPA's compliance criteria. Second, as of May 1996, DOE was still working to complete all of the scientific and technical activities that are essential to the preparation of a complete compliance application. To open WIPP on schedule, DOE needs to submit the application in October 1996; receive a certificate of compliance from EPA in October 1997; and, also by October 1997, obtain favorable RCRA-related decisions from EPA and the state of New Mexico. DOE, however, is optimistic that it will obtain all of the required regulatory approvals as planned because, it says, all remaining work is known, planned, and on schedule.

[1]Unless otherwise indicated, all dollars are expressed in constant 1995 dollars.

[2]Transuranic waste is equipment, scrap materials, and other trash that is contaminated with radioactive elements, such as plutonium, having atomic numbers higher than uranium.

If, as DOE expects, it opens WIPP by mid-1998, it would, for the first years of operation, dispose of waste at less than the design rate of the repository. Disposal operations in these years will be constrained by the limited number of transportation containers that are available and the lack of facilities and equipment at current storage sites for preparing the waste for shipment to and permanent disposal in WIPP.

Looking farther into the future, DOE estimates that it will cost about $11 billion over several decades to develop and operate, at sites where transuranic waste is now stored, the facilities and equipment that are needed to prepare transuranic waste for shipment to and disposal in WIPP. In addition, the Department expects to spend almost $8 billion on waste transportation and disposal operations at WIPP over a 35-year period. How soon DOE will be able to bring these facilities on line and operate them at planned rates depends, to a great extent, upon its ability to obtain funds for these purposes at a time when the Department faces competing priorities for limited funds. Delays in developing these facilities could force DOE to extend the period for shipping the waste to WIPP and emplacing the waste in the repository beyond 35 years. Each additional year of waste emplacement operations at WIPP could cost about $130 million.

Background

The production and maintenance of nuclear weapons produces a variety of waste by-products, including transuranic waste. DOE is storing almost 100,000 cubic meters of transuranic waste, primarily at six sites, and expects to generate another 78,000 cubic meters of the waste over the next several decades as it cleans up its nuclear facilities. About 97 percent of the existing volume of transuranic waste is stored in standard 55-gallon steel drums and other types of containers. This waste, which typically consists of contaminated equipment, tools, protective clothing, and scrap materials, is called “contact-handled” waste because it can be handled with limited precautions to protect workers from radiation. The remaining volume of waste is called “remote-handled” waste because it emits higher levels of penetrating radiation that requires special shielding, handling, and disposal procedures.

In 1979, the Congress authorized DOE to develop WIPP expressly to demonstrate the safe disposal of radioactive wastes resulting from U.S. defense activities and programs.[3] By the end of 1988, DOE had constructed

[3]Department of Energy National Security and Military Applications of Nuclear Energy Authorization Act of 1980 (P.L. 96-164).

all surface facilities, shafts leading to the underground disposal area, and 7 of 56 planned disposal rooms. DOE had not, however, established a clear link between its scientific program to conduct underground tests at WIPP with transuranic waste and its plans to demonstrate compliance with EPA's disposal regulations.[4]

In October 1992, the Congress passed the Waste Isolation Pilot Plant Land Withdrawal Act. Among other things, the act authorized DOE to conduct testing at WIPP with limited quantities of contact-handled waste after EPA had (1) approved DOE's testing and waste retrieval plans, (2) issued final disposal regulations for radioactive wastes, (3) determined DOE's compliance with the terms of EPA's "no migration" determination, and (4) found that the planned tests would provide data "directly relevant" to a certification of compliance with the disposal regulations or with RCRA. Also, before DOE may dispose of transuranic waste in WIPP, DOE must apply for and obtain from EPA a certification of WIPP's compliance with the agency's disposal regulations. In conjunction, EPA was required to establish the criteria for issuing a certificate of compliance to DOE. Finally, DOE may not begin disposing of waste in WIPP until 180 days after it has received a compliance certificate from EPA.

DOE must also meet the requirements for disposing of hazardous wastes as defined under RCRA because, the Department estimates, over 60 percent of its stored transuranic waste also contains hazardous waste. The land disposal restrictions in EPA's regulations implementing RCRA generally prohibit the disposal of untreated hazardous waste unless the agency makes a "no migration" determination. To receive such a determination for WIPP, DOE must demonstrate that there will be essentially no migration of hazardous waste from the repository's boundary for as long as the waste remains hazardous. Also, because New Mexico is authorized by EPA to carry out a state RCRA program, DOE must obtain a permit from New Mexico for the design, maintenance, operation, and closure of WIPP. If DOE meets New Mexico's requirements, the state expects to issue a draft permit for public comment by late summer 1996 and a final permit by June 1997.[5] In addition to these key requirements, DOE must comply with other applicable federal environmental laws, such as the Federal Facility Compliance Act of 1992, which pertains to the treatment and disposal of waste at the sites where the waste is stored and/or generated.

[4]For a discussion of this issue, see Nuclear Waste: Change in Test Strategy Sound, but DOE Overstated Savings (GAO/RCED-95-44, Dec. 27, 1994).

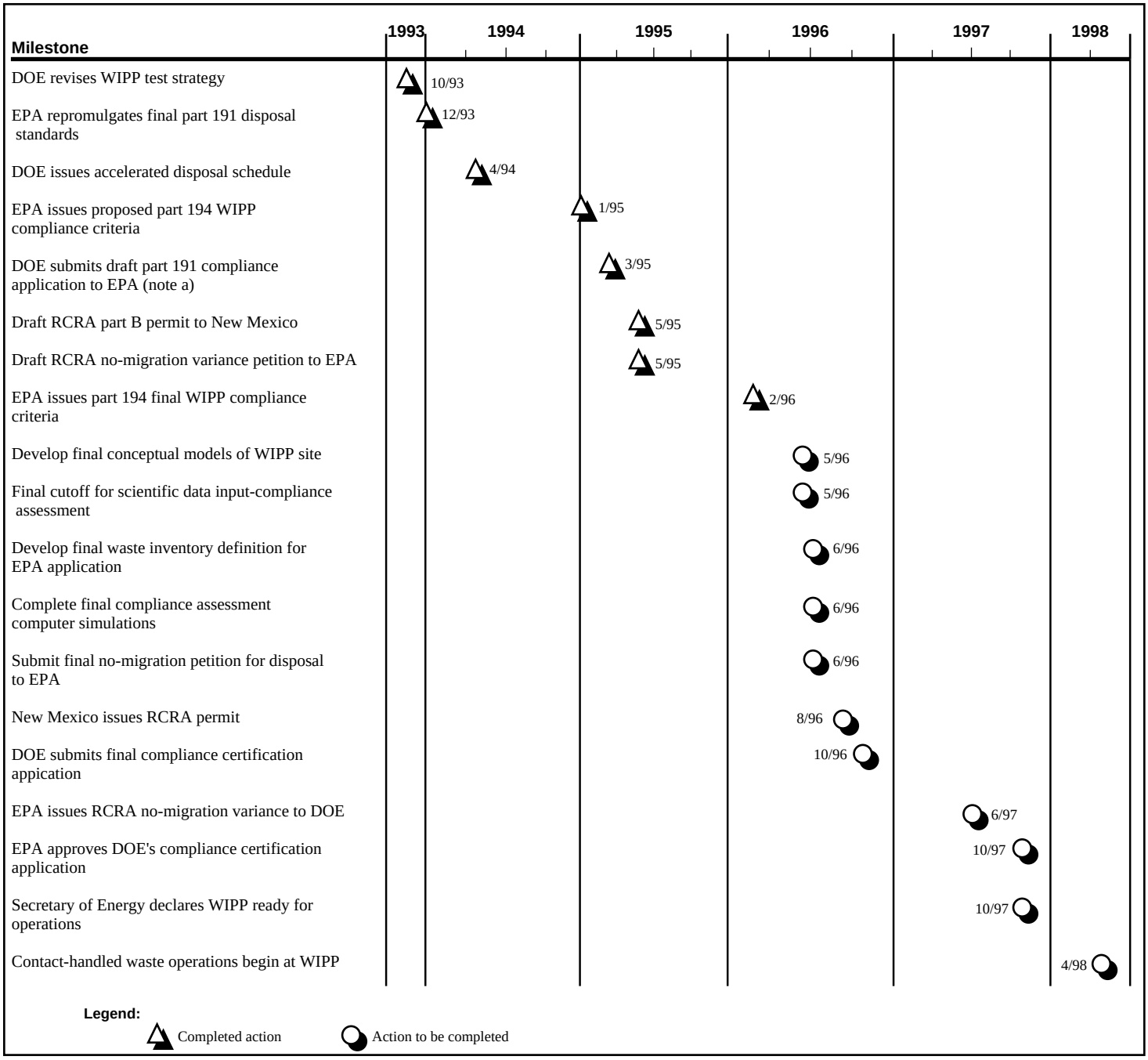
[5]The permit is jointly issued by New Mexico and EPA's Region VI office because EPA also has certain RCRA responsibilities.

In 1993, DOE and EPA concentrated on the details of the planned waste disposal tests at WIPP and the relevance of the tests to a future compliance determination. At that time, DOE expected to complete the tests, apply for and receive a compliance certificate, and begin disposing of waste in the repository in 2000. In October 1993, however, DOE announced that by substituting waste tests conducted in laboratories for the planned tests in WIPP, it could open the repository 2 years earlier. The accelerated schedule has created a more dynamic, higher-risk environment for completing preparations for both the compliance application and disposal operations because more interdependent activities had to be conducted in parallel, rather than in sequence, with little time available to make adjustments on the basis of the results of individual activities.

Prospects for Opening WIPP in Mid-1998 Are Uncertain

It is unclear whether DOE can accomplish all of the work needed to comply with EPA's regulations for disposing of transuranic waste at WIPP on a schedule that would enable the Department to open the repository in April 1998. (See fig. 1 for DOE's most recent schedule.) One reason is the disparity between the contents of DOE's draft application for a certificate of compliance and EPA's disposal regulations and the related criteria for deciding whether to issue the certificate. In addition, DOE was in the process of analyzing the results of the completed and ongoing scientific research that is to feed into the compliance application before it can submit a complete application.

Figure 1: DOE's Schedule for Opening WIPP



(Figure notes on next page)

Note a: DOE submitted the draft application to EPA in two parts: one in March 1995 and the remaining part in July 1995.

Source: GAO's presentation of data from DOE's Carlsbad Area Office.

Disparity Between Draft Application and Regulatory Requirements

DOE, in its 1995 draft application, did not address many of EPA's compliance criteria. This situation occurred, in part, because DOE submitted the draft application to EPA shortly after the agency had issued its proposed criteria for public comment in January 1995, well before EPA issued the final criteria in February 1996.[6] Although the WIPP Land Withdrawal Act required EPA to issue the final criteria within 2 years of its enactment, or by October 30, 1994, the delay in issuing the criteria occurred, in part, because of the agency's emphasis in 1993 on reviewing DOE's plans for the tests with waste at WIPP and on issuing the agency's disposal regulations. In addition, according to the director of EPA's WIPP program, the agency took some additional time to complete the criteria so that it could ensure that the public had an adequate opportunity to participate in developing the criteria. When DOE eliminated the proposed tests in the WIPP underground, however, timely issuance of the compliance criteria became important to achieving DOE's accelerated timetable for opening WIPP.

In April 1994, when DOE announced that it planned to begin operating WIPP in mid-1998, it assumed that EPA would issue the final compliance criteria in January 1995 and that DOE would submit a draft compliance application to EPA 2 months later. EPA, however, did not issue the proposed criteria for public comment until January 1995 and, at that time, estimated that it would take at least 1 year to issue the final criteria. Nevertheless, DOE submitted part of its draft compliance application to EPA in March 1995 and the remaining part of the application 4 months later.

DOE recognized and informed EPA, the state of New Mexico, and other parties that its draft application was incomplete but sought these parties' comments to help it prepare to submit its final compliance application in December 1996 and receive a certificate of compliance 1 year later. (In October 1995, DOE amended its schedule, including moving the planned date for submitting its final application to October 1996.) In remarks prefacing the draft application, DOE noted that because EPA had issued the

[6]In April 1996, New Mexico filed a petition in the U.S. Court of Appeals for the District of Columbia Circuit, for judicial review of EPA's compliance criteria on the basis that the agency, in issuing the criteria, had committed ". . . multiple violations of the principles of notice-and-comment rulemaking. . . ." The alleged violations include "major" changes to the final rule made after the end of the public comment period and based on data and information not disclosed during the comment period. New Mexico v. EPA, No. 96-1107 (D.C. Cir. filed Apr. 8, 1996). Similar petitions were filed that month by other parties, including the state of Texas.

proposed compliance criteria a few months earlier, the Department was not able to follow all of the criteria in preparing the draft application. DOE also noted that the draft application did not include details on many of the subjects addressed in the draft criteria. Among other things, these subjects included the results of experiments in progress to support the final calculations on WIPP's performance as a repository, information on the potential barriers to the release of the waste materials from the repository, seals for the shafts leading from the surface to the underground area, and the active institutional controls planned for the site after the repository is closed. Finally, DOE stated that its draft application did not contain analyses demonstrating that WIPP could meet the requirements of EPA's disposal regulations for protecting groundwater from radioactive materials.

In January 1996, after reviewing the draft application, EPA advised DOE that the application lacked the necessary detail for an appropriate and thorough review for technical adequacy. Although the agency refrained from commenting on the draft application's completeness, it provided DOE with over 370 detailed comments on apparent deficiencies in the application. For example, the agency said the application lacked the necessary detail on the characteristics of the WIPP site, the waste to be disposed of in the repository, and barriers to the release of radioactive materials from the repository that DOE might engineer to enhance the repository's performance. (See app. I for examples of the deficiencies in DOE's draft application that were observed by EPA and New Mexico's Environmental Evaluation Group.[7])

Other parties that are likely to provide comments to EPA on DOE's application for a certificate of compliance also expressed concern that DOE's draft application was incomplete. The 1992 WIPP Land Withdrawal Act provided special status to New Mexico, the Environmental Evaluation Group, and the National Academy of Sciences. The act required DOE to provide these parties with free and timely access to the data on health, safety, or environmental protection issues at WIPP and authorized the parties to evaluate and publish analyses of DOE's regulatory compliance activities. In a March 1996 report, the Environmental Evaluation Group stated that the draft application could not be considered an adequate draft document for demonstrating compliance with EPA's disposal regulations because the application lacked substantial features that would be

[7]The Environmental Evaluation Group, established in 1978 as an interdisciplinary group of scientists and engineers to perform an independent technical evaluation of the WIPP project on behalf of the state of New Mexico, is funded by DOE.

expected in the final application.[8] According to the Group, the document resembled the framework rather than a draft of an application because it lacked a logical presentation of the proofs of compliance with EPA's disposal regulations. Even the most basic information, the Group said, is absent from the draft application.

Among other deficiencies, the Environmental Evaluation Group stated, the application did not adequately describe the waste that DOE would dispose of in WIPP or discuss the problems that the Department had been encountering in documenting the physical, chemical, and radiological characteristics of this waste. Thus, the Group pointed out, the assessments of the repository's performance described in the application were based on "assumed" rather than actual characteristics of the waste.

In October 1995, New Mexico also commented to EPA on DOE's draft application. In many cases, the state said, information was either lacking or so preliminary that the state could not meaningfully comment on DOE's treatment of various issues.

Moreover, EPA's final criteria contained provisions that DOE, in commenting on the draft criteria, had objected to and other provisions that were not in the agency's draft criteria. DOE will have to address these provisions in its final application. One example concerns the assumptions that DOE must use in addressing the likelihood and possible types of human intrusion at WIPP, such as mining and drilling. EPA's final criteria established assumptions about the types and frequency of mining and drilling that DOE will have to use in its final application. What the appropriate assumptions are had been an area of contention among DOE, EPA, and others, including the Environmental Evaluation Group. For this reason and because DOE has not yet addressed the issue of human intrusion in accordance with EPA's final criteria, the Department's analyses of the mining and drilling issues in its final application are likely to receive close review by EPA and other parties who may be commenting on the application.

Scientific Work Incomplete

DOE will have to resolve many issues over the next several months if it is to submit, by October 1996, an application for a certificate of compliance that will withstand the scrutiny of EPA, which will review, and other parties, which may comment on, the completeness and quality of the application. According to the Assistant Manager for Regulatory Compliance at DOE's

[8]Review of the WIPP Draft Application to Show Compliance With EPA Transuranic Waste Disposal Standards (EEG-61, Mar. 1996).

Carlsbad Area Office, the Department was making substantial progress toward completing an application for a certificate of compliance on schedule. In addition, the director of EPA's Radiation Protection Division said that DOE is giving priority to issues the agency raised in its review of the draft application.

Whether DOE can successfully resolve the outstanding issues in the next few months is uncertain because DOE's final technical positions on WIPP have been evolving since the submission to EPA of the draft compliance certification application. According to the assistant manager for regulatory compliance in DOE's Carlsbad Area Office, the Department intends to send EPA sections of its final application for early review and comment over the next several months to facilitate EPA's review of the completeness of the application when DOE submits the application to EPA in October 1996. The assistant manager also stated that the application will document DOE's current technical positions on WIPP. As of early May 1996, the Director of EPA's WIPP Center told us that the EPA staff had received one section of the application dealing with the site's characteristics and geological features.

However, for sections of the final application that document DOE's compliance with the disposal regulations, DOE was making the final decisions about the details of the conceptual and computational models that it will use to simulate and assess the performance of the repository over the required 10,000-year period. The performance assessment is critical to demonstrating that neither radioactive nor hazardous materials will migrate from the repository's boundary. At the same time, DOE was feeding the current results from completed and ongoing research projects into the performance assessment calculations, parts of which have already begun.

In addition, to satisfy EPA's compliance criteria, DOE is implementing a program to ensure that its key scientific and regulatory compliance programs and activities meet generally accepted standards of quality in the nuclear industry. Some of the data DOE has collected predate the Department's adoption of the quality standards that EPA has prescribed in its final compliance criteria. Therefore, DOE is now attempting to demonstrate, using the procedures permitted by the criteria, that the data to be used in the compliance application, which the Department collected before it implemented the required quality assurance program, meet the quality assurance standards for existing data. According to DOE's Carlsbad Area Office, about 10 percent of the data that the Department collected in prior years would, to the extent that the data are used to support the final

WIPP compliance analysis, have to be qualified by either of two approaches. The first approach is to demonstrate that the data were collected under standards that were equivalent to DOE's current quality assurance program. The second approach is to use alternative means of qualification, such as peer review, that are permitted by EPA. These officials added that the qualification work is currently on schedule to support the submission of the final application to EPA.

Finally, in February 1995, DOE asked the National Academy of Sciences' Committee on WIPP to evaluate the key scientific studies and modeling supporting DOE's ongoing assessments of the repository's performance. The Committee's study would provide DOE with feedback on several important aspects of the assessment program, such as the hydrology of the rock formations where the repository is situated, the use of peer review and expert judgment in DOE's scientific program, and studies of the potential effects on the repository's performance of gases that might be generated from waste materials. As of May 1996, the Committee anticipated issuing its report late in July of 1996. Officials at DOE's Carlsbad office stated that until they have received and reviewed the Committee's report, they do not know what actions they might have to take if the Committee finds deficiencies in DOE's research program or recommends that DOE perform additional research. Moreover, DOE has already cut back the scope of its research program, and by the time the Committee releases its report, DOE expects to be nearly finished with its calculations of WIPP's compliance with EPA's disposal regulations.

DOE Will Have Limited Disposal Capability in the First Years of WIPP's Operations

For the first several years of WIPP's operations, DOE expects to dispose of contact-handled waste at less than one quarter of the design disposal rate of the repository. The disposal operations in these years will be constrained by the number of transportation containers that are available and the lack of facilities and equipment at the storage sites for preparing waste for shipment and disposal. DOE does not expect to begin disposing of remote-handled waste until 2002.

DOE estimates that it has about 97,000 cubic meters of contact-handled transuranic waste in storage and projects that it will generate almost 56,000 cubic meters more of this waste. (See table 1.) More than 98 percent of the total anticipated volume of contact-handled waste is stored or will be generated at six facilities.

Table 1: Existing and Projected Volumes of Contact-Handled Transuranic Waste

In cubic meters

Storage site	Existing	Projected	Total
Hanford, Washington	11,028	34,909	45,937
Idaho	64,158[a]	0	64,158
Los Alamos, New Mexico	10,953	7,351	18,304
Oak Ridge, Tennessee	1,326	256	1,582
Rocky Flats, Colorado	1,869	3,205	5,074
Savannah River, South Carolina	6,551	8,946	15,497
Subtotal	**95,885**	**54,667**	**150,552**
All others	1,160	1,241	2,401
Total	**97,045**	**55,908**	**152,953**

[a]Includes 24,903 cubic meters of low-level radioactive waste that is contaminated with transuranic elements and is commingled with contact-handled transuranic waste stored at the site. DOE intends to treat both the low-level and transuranic waste in a treatment facility and then dispose of the residual waste in WIPP.

Source: GAO's presentation of data from the Transuranic Waste Baseline Inventory Report, Revision 2 (DOE/CAO-95-1121, Dec. 1995).

DOE's Carlsbad Area Office plans to ship contact-handled waste to WIPP from the Idaho, Rocky Flats, and Los Alamos sites in 1998 and from the Savannah River site in 1999. Thereafter, the office may also make shipments from other storage sites. The office expects to make almost 1,300 shipments to WIPP at an accelerating rate over the approximately 5-year period ending December 31, 2002. (See table 2.) During that same period, the repository is expected to be operationally capable of receiving and disposing of over 1,900 shipments of waste. Thus, the planned disposal rate is about two-thirds of the expected capability to dispose of waste in WIPP through 2002.

Table 2: Planned Shipments to and Operational Capabilities of WIPP Through 2002

Number of shipments

Year	Planned shipments	Operational capability	Unused capability
1998	64	64	0
1999	198	200	2
2000	197	350	153
2001	425	566	141
2002	412	740	328
Total	**1,296**	**1,920**	**624**

Source: GAO's presentation of data from DOE's Carlsbad Area Office.

One constraint on DOE's initial disposal capability is the number of available transportation containers. Several years ago, when DOE expected to begin operating WIPP earlier as a test facility, the Department procured 15 containers for transporting contact-handled waste. Since then, DOE has concentrated its budget for WIPP on the scientific and technical issues that need to be resolved to demonstrate compliance with EPA's disposal regulations and has not procured additional containers. DOE expects to acquire more containers in 2000—enough to make 10 shipments per week to WIPP by the end of that year—and to have a total of 60 containers by 2002—enough to make 17 shipments per week.

A second operational constraint is the extent to which DOE's storage sites are limited in their ability to prepare contact-handled waste for shipment and disposal. Waste managers at each site must be able to (1) retrieve the waste and put it in temporary storage areas; (2) characterize, or identify the constituents of, the waste; (3) identify the waste that meets the criteria for shipping and disposal; (4) treat the waste, as necessary, to make it suitable for shipment and disposal; and (5) package the waste for shipment and load the transportation containers onto transport vehicles. At present, according to DOE's Carlsbad Area Office, only the Idaho and Rocky Flats sites are capable of completing these steps for a limited amount—about 4,500 cubic meters—of the existing 97,000 cubic meters of contact-handled waste.

Each of DOE's major storage sites needs facilities for characterizing, repackaging, treating, and/or loading waste for transportation. At some sites, waste managers are taking interim measures, such as identifying the waste that does not require treatment, to prepare enough waste for

shipment and disposal to meet the Department's obligations for managing wastes under the Federal Facility Compliance Act and its schedule for opening WIPP. At Los Alamos, for example, waste managers expect to have mobile characterization and transportation loading equipment in place by 1998; therefore, DOE's Carlsbad office estimates that the site may have about 600 cubic meters of waste ready to ship in 1998. If funds are made available for the necessary equipment at the Rocky Flats site, the site's waste managers expect to have about 1,000 cubic meters of waste ready for shipment and disposal in 1998. (See app. II for a discussion of each of the six major storage sites.)

In connection with the Idaho site, DOE recently agreed, in a settlement of litigation with Idaho, to ship 3,100 cubic meters—about 15,000 drums—of contact-handled waste from Idaho by the end of 2002. Making two shipments a week from this facility—up to about 4,370 drums of waste per year—could enable DOE to meet its agreement with the state. It is uncertain, however, if DOE will be able to prepare the waste for shipment at that rate. As recently as September 1995, site officials estimated that they would have only about 700 drums of waste ready by June 1998. Since then, however, these officials have reinterpreted DOE's criteria covering the requirements that waste must meet to qualify for shipment to and disposal in WIPP. As a result, they now expect that by mid-1998 they will be able to certify that at least 2,000 drums of waste meet all of the criteria for shipment and disposal and that subsequently they will be able to certify another 3,500 drums per year.

For remote-handled waste, DOE does not expect to have the essential facilities and equipment in place for preparing and shipping the waste to WIPP until at least 2002. Most of the stored waste is at Oak Ridge, but DOE expects to generate much more of this waste at its Hanford site (see table 3).

Table 3: Existing and Projected Volumes of Remote-Handled Transuranic Waste

In cubic meters

Storage site	Existing	Projected	Total
Hanford	201	21,521	21,722
Idaho	200	0	200
Los Alamos	93	34	127
Oak Ridge	1,832	344	2,176
Rocky Flats	0	0	0
Savannah River	0	0	0
Subtotal	**2,326**	**21,899**	**24,225**
All other sites	608	34	642
Total	**2,934**	**21,933**	**24,867**

Source: GAO's presentation of data from the Transuranic Waste Baseline Inventory Report, Revision 2.

DOE's schedule for disposing of remote-handled waste may present an operational problem at WIPP, particularly if DOE is unable to begin disposing of the waste at Hanford for many years. By 2002, at the earliest, DOE may have a new facility at its Oak Ridge site that is ready to begin retrieving and preparing almost 800 cubic meters of remote-handled sludge for disposal in WIPP. The Department has no firm plans, however, for when and how it will prepare to recover, treat, and dispose of the remaining remote-handled waste at Oak Ridge. At Hanford, moreover, site officials do not have plans for preparing remote-handled waste for disposal; however, they expect to begin disposing of this waste within 20 years. The latter waste will largely consist of equipment that is now part of the system of underground tanks that store high-level radioactive waste from the earlier production of plutonium at the site. Currently, site officials expect that most of the remote-handled waste may eventually be decontaminated and disposed of at the site and that only about 3,470 cubic meters of this waste will be shipped to and disposed of in WIPP. DOE is negotiating milestones that will affect the shipment of transuranic waste with the state of Washington and EPA.

DOE designed WIPP so that remote-handled waste would be disposed of in the walls of storage rooms before contact-handled waste is placed in these rooms. Because of the delay in disposing of remote-handled waste, less of the repository's storage area will be available when DOE is ready to dispose of this waste. According to DOE's manager of remote-handled waste, the Department is reviewing alternatives that would make up for the loss of

disposal space for remote-handled waste in the initial years of WIPP's operations. He added that an alternative would not be ready in time for inclusion in DOE's compliance application to EPA; therefore, if DOE wants to pursue an alternative disposal approach, it would seek an amendment to the compliance certificate after WIPP opens. Moreover, if DOE is not able to dispose of all of the remote-handled waste within the walls of the waste-storage rooms for contact-handled waste, it may have to mine new storage areas in the repository specifically for disposing of remote-handled waste. This effort would increase the cost of operating the repository.

DOE Needs New Facilities and Equipment to Achieve Anticipated Disposal Rate

Looking beyond the first few years of WIPP's operations to the 25- to 35-year[9] period over which DOE expects to ship waste to WIPP and emplace the waste in the repository for permanent disposal, DOE will not be able to significantly increase the rate at which it emplaces transuranic waste in WIPP until it has (1) developed the facilities and equipment at each site for retrieving, processing, and packaging the waste for shipment and (2) procured more numbers and varieties of transportation containers. In a 1995 report projecting the potential costs of cleaning up its nuclear sites, DOE estimated that the required investment in facilities and containers for transuranic waste and related operations over several decades will cost more than $11 billion.[10] In addition, DOE estimated that the waste transportation and disposal operations at WIPP could cost almost $8 billion, for a total cost of about $19 billion to manage and dispose of transuranic waste. According to DOE's Carlsbad Area Office, a 1996 updated version of the baseline cost report now being prepared will increase the estimated cost to about $29 billion.

The Idaho site illustrates the need for DOE to develop the ability to characterize, treat as necessary, and prepare larger quantities of waste for shipment before it can begin to make significant headway in disposing of the contact-handled waste stored at the site. Officials at that site estimate that about 58 percent of the waste is stored in boxes that are incompatible with existing waste characterization facilities. Other major storage sites, except for Los Alamos, are in similar situations.

[9]The stated operating life of WIPP varies among DOE documents. DOE's 1995 draft safety analysis report for WIPP and application to New Mexico for a RCRA permit both state that the design operating life of WIPP is 25 years but could be extended if necessary. However, the 1994 and 1995 strategic plans for WIPP and some other documents prepared by DOE refer to an operating life of 35 years or more.

[10]Estimating the Cold War Mortgage: The 1995 Baseline Environmental Management Report (DOE/EM-0232, Mar. 1995).

DOE will also need to develop other types of transportation containers for much of its contact-handled waste. DOE estimates that about 26 percent of the waste can be efficiently transported in the existing type of container. About 41 percent of the waste is expected to be too heavy for efficient transport in the existing type of container. DOE plans to develop and procure new containers for this waste. DOE has not yet decided how it will transport the remaining amount of contact-handled waste.

How soon DOE can bring these essential facilities and equipment on line and operate them depends upon the availability of funds at a time when DOE faces significant competing priorities for limited funds. For fiscal years 1996 through 2000, DOE expects to reduce its overall budget by more than $14 billion when compared with earlier budget projections. This reduction includes $4.4 billion in its environmental management programs.

It is unclear what the precise implications of DOE's planned or other budget reduction proposals are for the timing and extent of WIPP's operation and for DOE's ability to prepare the existing and projected inventories of waste for shipment to and disposal at WIPP. Tighter future budgets could further restrain DOE's ability to prepare, ship, and dispose of transuranic waste at the planned rates. In these circumstances, WIPP is likely to remain open, at a less-than-optimal operating level, for many years beyond the currently planned operating life of 35 years. According to DOE's estimate of the annual cost to operate WIPP, each additional year that DOE must operate the repository could cost about $130 million.

Agency Comments and Our Evaluation

We provided a draft of our report to DOE and EPA for their review and comment. DOE provided written comments on this report, which appear in appendix III. We also met with the Directors of EPA's Division of Radiation Protection and WIPP Center (within the agency's Office of Radiation and Indoor Air) and the agency's Engineer Director, Permit and States Program Division, Office of Solid Waste, to obtain their comments on this report.

DOE said the tone of our draft report was pessimistic, while the Department is optimistic about its transuranic waste management program. DOE is optimistic, it said, because all work is known, planned, and on schedule; the success rate in accomplishing scheduled activities and milestones is 100 percent. Specifically, DOE pointed to its filing of a draft compliance application with EPA as evidence of the success of its strategy to achieve the maximum amount of input to the final application.

We recognized in our report that DOE had met its past milestones, such as submitting a draft compliance application to EPA, for opening WIPP. In our view, however, the effectiveness of the Department's efforts to open WIPP depends on its ability to submit an application for a compliance certificate to EPA that is of sufficient completeness and quality to enable the agency to issue a certificate to DOE within the 1-year period specified in the WIPP Land Withdrawal Act. Whether DOE will meet this requirement remains to be seen.

DOE also said our draft report failed to recognize that its plans to bring WIPP to full operation meet the resource needs of the Department and exceed all requirements at the storage sites that stem from agreements between DOE and the states. If, over the first 5 years of WIPP's operation, DOE is successful in shipping and disposing of the quantities of waste currently planned, then it should meet the short-term requirements of the sites where the waste is stored. As our report discusses, however, there is some uncertainty about the Department's ability to meet its short-term disposal objectives and even greater uncertainty over the long term. For example, tight budgets in future years could restrain DOE's ability to dispose of transuranic waste at currently planned rates.

Finally, DOE provided other specific clarifying comments that we incorporated as appropriate.

The EPA officials agreed with our report and suggested changes intended to clarify the agency's role and authority in regulating WIPP. We incorporated these suggested changes in the report as appropriate.

We performed our review at WIPP and at the offices of DOE and the state of New Mexico in Albuquerque, Carlsbad, and Santa Fe. We also visited DOE's storage sites for transuranic waste in Colorado, Idaho, Tennessee, and Washington. Finally, we also performed our review at the headquarters of DOE and EPA in Washington, D.C. We conducted our review from June 1995 through May 1996 in accordance with generally accepted government auditing standards. (See app. IV for details of our scope and methodology.)

As arranged with your offices, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days after the date of this letter. At that time, we will send copies to the appropriate congressional committees; the Secretary of Energy; the Administrator of

EPA; and the Director, Office of Management and Budget. We will also make copies available to others on request.

Please call me at (202) 512-3841 if you or your staff have any questions. The major contributors to this report are listed in appendix V.

Victor S. Rezendes
Director, Energy, Resources,
and Science Issues

List of Requesters

The Honorable Floyd D. Spence
Chairman, Committee on National Security
House of Representatives

The Honorable Don Young
Chairman, Committee on Resources
House of Representatives

The Honorable Dan Schaefer
Chairman, Subcommittee on Energy and Power
Committee on Commerce
House of Representatives

The Honorable Jon Kyl
United States Senate

The Honorable Michael Bilirakis
House of Representatives

The Honorable Michael D. Crapo
House of Representatives

The Honorable J. Dennis Hastert
House of Representatives

The Honorable Jon Kyl
United States Senate

The Honorable Carlos J. Moorhead
House of Representatives

Contents

Letter		1
Appendix I Examples of the Gap Between EPA's Regulatory Requirements and DOE's Efforts to Meet the Requirements		22
	Containment of Waste in the Repository	22
	Engineered Barriers	23
	Waste Characterization	26
	Waste Emplacement	27
	Disposal Assurance Requirements	28
	Quality Assurance Standards	29
	Human Intrusion	30
Appendix II Preparedness of DOE's Facilities to Ship Transuranic Waste to WIPP		33
	Idaho Site	33
	Rocky Flats Environmental Technology Site	36
	Los Alamos National Laboratory	38
	Oak Ridge Site	40
	Hanford Site	42
	Savannah River Site	43
Appendix III Comments From the Department of Energy		45
Appendix IV Scope and Methodology		59
Appendix V Major Contributors to This Report		61
GAO Related Products		64
Tables	Table 1: Existing and Projected Volumes of Contact-Handled Transuranic Waste	11

Table 2: Planned Shipments to and Operational Capabilities of WIPP Through 2002 12
Table 3: Existing and Projected Volumes of Remote-Handled Transuranic Waste 14

Figure

Figure 1: DOE's Schedule for Opening WIPP 5

Abbreviations

DOE	Department of Energy
EPA	Environmental Protection Agency
RCRA	Resource Conservation and Recovery Act
WIPP	Waste Isolation Pilot Plant

Examples of the Gap Between EPA's Regulatory Requirements and DOE's Efforts to Meet the Requirements

Before the Department of Energy (DOE) can dispose of transuranic waste in the Waste Isolation Pilot Plant (WIPP), it must obtain, among other things, the Environmental Protection Agency's (EPA) certification that the repository will comply with the agency's regulations for disposing of transuranic waste in WIPP. The disposal regulations specify the requirements for containing the waste, protecting individuals and groundwater from radiation, and providing additional assurances to reduce the likelihood of a release of radiation from the repository. As mandated by the Land Withdrawal Act of 1992, EPA developed the compliance criteria to clarify the requirements of the disposal regulations and required DOE to provide the agency with specific types of information in the Department's compliance application. The compliance criteria implement the containment, individual protection, groundwater protection, and assurance requirements of the disposal regulations. In addition, the criteria contain public participation requirements describing how the agency will involve the public in the certification rulemaking process and general requirements covering subjects such as the extent to which the waste needs to be characterized (analyzed to determine its contents) before it is disposed of, guidance on the computer models and codes that simulate the repository's performance, and demonstrations that the data and assumptions developed by DOE have been adequately peer reviewed.

According to EPA and others, DOE's mid-1995 draft application for a certificate of compliance did not include sufficient detail to address the elements of the agency's disposal regulations and proposed criteria of January 1995. Also, the final compliance criteria of February 1996 contained provisions that either DOE had objected to in commenting on the draft criteria or that EPA had not included in the draft criteria.

Containment of Waste in the Repository

EPA commented that DOE's draft application lacked adequate technical information and emphasis on the capability of the repository site to adequately isolate the waste from the surrounding environment. For example, EPA noted that although the application described the geology of the site, the application did not show how this information has been transformed into the mathematical models that are used to assess how the repository would perform over the 10,000-year period covered by the containment requirements of the disposal regulations. EPA also raised questions about the hydrology of the site. The agency said, for example, that it appeared that the hydrologic properties of the Dewey Lake rock formation—a layer of rock between the surface of the site and the

underground repository—are not well documented and that additional study of that formation may be warranted before it can be ruled out as a potential pathway for contaminants to escape the repository area.

Engineered Barriers

In commenting on DOE's draft application, EPA stated that the application contained only a limited discussion of how DOE might use engineered barriers to develop adequate confidence that WIPP would comply with the agency's disposal regulations.[1] For its part, DOE believes that the agency's interest in engineered barriers goes beyond what is necessary to demonstrate compliance with the regulations. New Mexico's Environmental Evaluation Group has sided with EPA because, in the Group's view, DOE has not adequately considered the advantages of engineered barriers in the repository. Subsequently, DOE decided that it will use additional engineered barriers at WIPP to comply with EPA's disposal regulations. The effectiveness of the planned engineered barriers will be addressed by DOE in its final compliance application and by EPA and others in their reviews of the application.

EPA's proposed and final compliance criteria include provisions that implement its assurance requirement on engineered barriers. EPA is requiring DOE to study the available options for engineered barriers at WIPP and submit this study as part of its compliance application. Consistent with this requirement and the containment requirements in the agency's disposal regulations, DOE must analyze the performance of the complete disposal system, including any planned engineered barriers, and EPA must consider this analysis when evaluating compliance with both the containment and assurance requirements. EPA stipulated that DOE must evaluate the benefits and detriments of engineered barrier alternatives and consider specific factors, such as the effectiveness of the barriers in preventing or substantially delaying the movement of radioactive contaminants to the accessible environment and the effect of the barriers on the total costs of disposal. Also, EPA is requiring DOE to study and describe any engineered barrier(s) for existing waste that is already packaged, not yet packaged, or in need of re-packaging and, to the extent practicable, waste to be generated in the future.

[1]EPA, in its disposal regulations, defines a barrier as any material or structure that prevents or substantially delays the movement of water or radionuclides toward the accessible environment. Barriers may be natural, such as the rock formation in which WIPP is located, or engineered, such as a waste container, material placed over and around waste containers, or a waste form having special physical and/or chemical characteristics. To qualify as an engineered barrier, a barrier must significantly decrease the mobility of radioactive materials in the repository.

During EPA's rulemaking on its proposed compliance criteria, DOE objected to the proposed requirements related to engineered barriers because, in the Department's view, the requirements have no basis within the agency's disposal regulations. DOE was concerned that the engineered barrier requirements would make the agency's regulations more stringent than the agency had intended when it developed the regulations and could be interpreted as requiring barriers beyond those necessary to demonstrate a "reasonable expectation" of compliance with the regulations.

Before EPA issued the proposed compliance criteria in January 1995, DOE had informally agreed with EPA to study engineered barriers. After EPA included the requirement for the study of engineered barriers in its proposed criteria, DOE questioned why the agency needed to prescribe the study in its regulations when the Department had already begun to perform the study. DOE also questioned the role the study would have in EPA's process for considering DOE's application for a certificate of compliance, because the performance of such a study was not a part of the basis for developing the regulations. DOE added that it intended to use this study to make decisions about the need for additional engineered barriers to meet EPA's assurance requirements. The study would not, DOE said, aid in the selection of the engineered barriers needed to comply with EPA's containment requirements. Finally, although the Department generally agreed with EPA's approach of assessing the benefits and detriments of engineered barriers, it expressed concern that the proposed criteria provided no meaningful basis for selecting engineered barriers other than the outcome of the benefit/detriment analysis.

In September 1995, DOE released its engineered barrier study. The study, according to officials of DOE's Carlsbad Area Office, evaluated the types, applicability, cost, and benefit of using engineered barriers at WIPP. DOE concluded from the study that engineered barriers, other than planned shaft seals, would be of little benefit in demonstrating that WIPP complies with EPA's disposal regulations. Therefore, the Carlsbad office decided to use only those engineered barriers that it believed were necessary to appreciably add to the assurance of compliance with EPA's disposal regulations and/or to meet other specific regulatory requirements.

According to officials of EPA's WIPP Center, the agency expects to complete its review of DOE's study in June 1996. EPA, however, noted that it will not be evaluating the merits of DOE's engineered barrier study as a "stand alone" effort but, rather, in the context of DOE's total compliance application submission. Because DOE has not finished its final compliance

calculations and associated sensitivity analyses, it is too early to tell what the relative contribution of the barriers studied by DOE will have on EPA's compliance determination or if the contribution would appreciably enhance confidence in DOE's final results.

New Mexico's Environmental Evaluation Group has been critical of DOE's consideration of engineered barriers at WIPP. The Group disagrees with DOE's position that EPA's compliance criteria impose additional requirements on DOE. In the Group's view, the criteria provide a basis for DOE to select or reject various engineered barrier alternatives. The Group also maintains that DOE's definition of an "engineered barrier," as stated in the Department's draft compliance application, is inconsistent with the definitions used by other agencies, such as the definition the Nuclear Regulatory Commission uses in connection with DOE's proposed repository at Yucca Mountain, Nevada. According to the Group, although DOE repeatedly stated in its draft application that it will use "multiple barriers" at WIPP, the only barriers that DOE is known to be planning are seals for the shafts leading to the underground repository. The Group called DOE's effort a "minimal" approach and pointed out that on the Yucca Mountain repository project, the Commission does not consider shaft seals to be an engineered barrier. The Group also believes that DOE's essentially sole reliance on the calculations for the repository's performance to decide whether or not to implement engineered barriers at WIPP is contrary to the well-established principle within the nuclear industry of multiple and redundant barriers to isolate nuclear materials.

Finally, the Group has urged DOE to backfill the waste-filled storage rooms and tunnels with crushed salt that was mined from the underground repository and is now stored on the surface. The Group believes that backfilling the repository can serve useful purposes, such as reducing the generation of gases and minimizing settlement and fracturing in the rock formations overlying the repository.

In April 1996, an assistant manager of DOE's Carlsbad Area Office told us that the Department has decided to follow the Group's recommendation. DOE will, he said, place bags of magnesium oxide around the sides and over the top of the containers of waste in underground storage rooms at WIPP. This approach, he added, will control gas formation in the repository and reduce the possibility that harmful transuranic materials might become dissolved in brine that could seep into and then out of the repository and find its way into the groundwater. According to the Group's deputy director, in May 1996 the Group was in the process of discussing

the backfill issue with DOE's Carlsbad office but had not yet decided whether to fully support DOE's choice of backfill material.

Waste Characterization

EPA criticized DOE's draft compliance application for its lack of detail on the expected characteristics and components of the transuranic waste that would be disposed of at WIPP.[2] Subsequently, in April 1996 DOE disclosed its plans for controlling the types and quantities of transuranic waste to be shipped to WIPP for disposal and to address waste characteristics and components in its analysis of compliance with EPA's compliance criteria.

EPA's proposed criteria required that DOE identify in its compliance application the chemical, radiological, and physical characteristics and components of all transuranic waste to be disposed of at WIPP. In commenting on DOE's draft application, the agency noted that DOE had made assumptions—rather than provide actual data—about the characteristics and components of the waste, such as the types and quantities of radioactivity, amounts of moisture in waste containers, and quantities of other materials contained in the waste containers, that could affect the repository's long-term performance. EPA also stated that DOE had not (1) identified the waste characteristics that are important to the long-term performance of the repository; (2) discussed the relationships that the characteristics of the waste may have to important processes, such as the generation of gases over time in the storage rooms; and (3) identified the uncertainties associated with these relationships. According to EPA, however, the inclusion of such information is essential to an assessment of WIPP's performance as a repository. Furthermore, EPA stated, DOE had not explained how it would control and track the types of waste disposed of in the repository from the time the waste is characterized to the time it is emplaced in WIPP to ensure that only waste with the characteristics and components that have been found acceptable for disposal are actually emplaced in the repository.

EPA's final criteria require DOE to identify and assess, in its compliance application, the effects on the repository's performance of only those waste characteristics and components that might actually influence the containment of waste in the disposal system. Under this requirement, DOE is to ensure that all of the characteristics and components of the waste that could influence its containment in the repository have been

[2]EPA described waste characteristics as features describing the physical, chemical, or radiologic properties and behavior of some or all of the containers of waste. The agency described waste components as an amount of a type of waste present in the total inventory, expressed as a volume, weight, or in curies (a measure of radioactivity).

systematically identified and evaluated. Once DOE has identified (1) by physical samples, knowledge of the waste streams from the operations of DOE's nuclear facilities or (2) by other means, the waste's significant characteristics and components, EPA's criteria require that DOE limit, control, and quantify these characteristics and components.

Until recently, DOE had not stated how it intends to implement these criteria. In 1993, DOE proposed using assessments of the repository's performance as a tool for identifying the waste's characteristics and components having the greatest influence on performance. This is a concept in which DOE would, using performance assessments as a starting point, "screen" waste streams at storage sites to establish an envelope of, or boundaries on, the characteristics and components that are acceptable for disposal. By comparing the data on the characteristics and components of the waste in storage or expected to be generated in the future with the envelope, DOE could identify those wastes that are acceptable for disposal at WIPP. However, in late 1995, DOE canceled this activity because, according to officials of DOE's Carlsbad office and Sandia National Laboratories (DOE's principal scientific contractor for WIPP), the Department now anticipates that all the waste that it has planned to dispose of in WIPP will be acceptable for disposal.

In April 1996, DOE took a first step toward addressing EPA's concerns by identifying the criteria that DOE will use to identify the waste that is acceptable for disposal in WIPP. Furthermore, according to officials in DOE's Carlsbad Area Office, in May 1996 the Department revised its baseline inventory report for transuranic waste across the DOE complex to include information on the waste characteristics and components that will be included in the performance assessment for WIPP. They added that in July and August of 1996, a panel of outside experts will perform a peer review of the Department's efforts to identify the waste characteristics and components consistent with the provisions in EPA's compliance criteria. EPA's Director of its WIPP Center, however, told us that DOE had not yet provided the Center with a copy of this report; moreover, DOE has yet to complete another part of its analysis of waste characteristics and components to be submitted with its final compliance application to EPA. Thus, it is too early to ascertain whether the recent initiatives by DOE will be responsive to EPA's concerns.

Waste Emplacement

EPA stated that the absence of a plan for emplacing both contact- and remote-handled waste in the underground repository was a major

omission in DOE's draft application. DOE had designed WIPP so that it would insert containers of remote-handled waste in the walls of disposal rooms before stacking containers of contact-handled waste in these rooms. In the application, DOE stated that for the purpose of assessing the repository's performance, it assumed that contact-handled and remote-handled waste would be distributed equally among all storage rooms. EPA noted, however, that it did not appear that DOE would have much, if any, remote-handled waste ready to ship to WIPP in 1998. Therefore, according to EPA, the actual distribution of both types of waste within the repository may differ from the distribution of waste that DOE had assumed in its draft application. EPA concluded that DOE should have addressed in the application how the late arrival of remote-handled transuranic waste would affect the disposal operations at the repository and the long-term performance of the repository.

In its final criteria, EPA stated that if DOE does not include a waste-loading scheme in its compliance application, the Department must assume, in assessing the repository's performance, that waste containers are randomly emplaced in the repository rather than, as DOE had assumed in its draft application, that the various characteristics and components of the waste would be evenly distributed throughout the repository.

Disposal Assurance Requirements

EPA and the New Mexico Environmental Evaluation Group stated that the draft application did not provide detailed descriptions of how DOE intends to implement one or more of the assurance requirements of the agency's disposal regulations. For one of these assurance requirements—maintaining active institutional control of the site for as long as practicable—EPA said the lack of information in DOE's draft application precluded an evaluation of the technical adequacy of the subject. Likewise, the agency said, DOE's application lacked detailed monitoring plans for the site.

The Environmental Evaluation Group took exception to both EPA's and DOE's positions on implementing the assurance requirement in the agency's criteria that address disincentives for extracting natural resources in the area of the repository. The resource disincentive assurance requirement states that a repository should generally not be located in an area where previous mining for resources has occurred, a reasonable expectation of future exploration exists, or a significant concentration of a rare material occurs, unless DOE can show how the favorable characteristics of the site offset these disadvantages. The Group said that the WIPP site fails all three

of these resource disincentive criteria because there is a significant concentration of potash, oil, and gas reserves in the vicinity of WIPP. Accordingly, the Group said, DOE should have provided documentation of the favorable compensating characteristics of the site. In the compliance application, the Group recommended, DOE should recognize the existing characteristics of the site and consider all plausible human intrusion scenarios instead of debating the favorable site characteristics and the degree to which these characteristics compensate for the presence of resources. Finally, the Group noted that the location of WIPP within an area that is rich in resources is another reason to include engineered barriers in the design of the repository.

In the final compliance criteria, EPA decided that DOE would not have to provide a separate analysis of the favorable compensating characteristics at WIPP if the Department can demonstrate compliance with the agency's containment requirements. The basis for the agency's position was that the assessments of the repository's performance, properly done, would consider all types of human intrusion and any mitigating factors that might affect compliance. The Group, however, disagreed with EPA's position on the basis that EPA, in its disposal regulations, had intended that the assurance requirement be an added measure to enhance confidence that the containment requirements would be met. In addition, New Mexico's assistant attorney general had similar concerns about DOE's and EPA's treatment of resource disincentives in the draft application and the final compliance criteria, respectively.

Quality Assurance Standards

EPA stated that DOE's draft application lacked sufficient evidence of an adequately designed and implemented program to ensure that the information and analyses that will be included in the compliance application meet the standards for quality. EPA said that the draft lacked information describing the method(s) used to implement a quality assurance program and to verify that the program is being implemented properly. For example, the agency noted, DOE omitted information on the training of workers on quality procedures; records of audits, surveillance, and resolution of nonconformance and corrective actions; and document control. EPA also highlighted the shortcomings in DOE's software quality assurance requirements, such as the lack of documentation of computer software and codes, that it had brought to DOE's attention several months before the Department submitted the draft application. And EPA expressed concern about certain of DOE's processes to establish that the data collected before DOE had implemented an approved quality assurance

program are acceptable for use in an application for a certificate of compliance.

DOE must satisfy a rigorous set of quality assurance procedures generally adopted by the nuclear industry covering virtually all aspects of WIPP, including the scientific and modeling studies in support of the final performance assessment. These requirements stem from, among other things, EPA's compliance criteria for WIPP. Important quality assurance measures include the standards related to work processes; control of engineering designs; document control and management; procurement; inspection and testing; sample management and control; planning and performing scientific investigations; peer review of scientific studies and modelling efforts; software quality assurance; and documentation, control, and qualification of information.

Since October 1993, when DOE decided to accelerate its schedule for opening WIPP, the Department and its contractors have been implementing quality assurance measures related to the Department's effort to establish that WIPP meets all of the regulatory requirements for disposing of transuranic waste. As of May 1996, however, DOE still needed to complete several important quality-assurance-related activities before it will be prepared to submit an application for a certificate of compliance. One key activity is demonstrating that the scientific data collected before DOE had implemented the quality assurance program that EPA requires are of satisfactory quality for use in supporting DOE's application for a certificate of compliance. According to Carlsbad Area Office's Quality Assurance Manager, about 10 percent of the scientific information that Sandia National Laboratories has collected was under a quality assurance program that did not fully meet the current program's requirements. Therefore, to the extent that DOE would use this information in support of the WIPP compliance application, the data will have to be qualified for their intended use by alternative means acceptable to EPA.

Finally, officials of DOE's Carlsbad Area Office stated that they have made improvements to comply with EPA's compliance criteria and are on schedule to complete the qualification of information necessary to submit DOE's final compliance application in October 1996.

Human Intrusion

EPA is requiring DOE to consider two potential pathways for future human intrusion into a repository at WIPP that, in DOE's view, go beyond the intent of the disposal regulations and add to the cost of demonstrating

compliance with the regulations but contribute little to protecting public health and safety. Specifically, to account for the presence of potash mining in the vicinity of WIPP, the agency's final criteria require that DOE, in assessing the performance of the repository, address the effects of excavation mining after the repository has been filled and closed. Although EPA had stated in its proposed criteria that it was not requiring consideration of mining in its compliance criteria, it included mining in the final criteria because, it said, mining could alter the properties of certain rock formations above the underground repository. These requirements address the potential changes in the hydrogeology of the rock formations—specifically, groundwater travel time—the size and shape of mines, and when mining might occur.

EPA is also requiring DOE to consider the effects of two types of drilling for resources: "shallow drilling," which is drilling to depths above the level at which waste would be disposed of in the repository, and "deep drilling," which is drilling to depths below the disposal level. EPA established criteria that require DOE to use past human activities to predict future activities. The agency requires that the rate of drilling over the last 100 years[3] be calculated in the Delaware Basin, which is the geographical area within which WIPP is located. Included in the basis for calculating the drilling rates are any existing leases of drilling rights that can reasonably be expected to be developed in the near future. Once DOE calculates the rate of drilling, it is required to use this rate to predict the rate of drilling that may occur over the 10,000-year period of analysis which the disposal regulations require. The fixed rate is to be based on both exploratory boreholes drilled and developmental (production) boreholes and is to be held constant as the types of resources change over time. Furthermore, EPA required DOE to assume that after WIPP is closed, boreholes drilled nearby would affect the properties of the disposal system for the remainder of the regulatory period. Thus, DOE's assessments of the repository's performance must take into account the hydrologic effects of drilling on the disposal system and on the creation of any new pathways for the release of radioactive materials from the repository.

Finally, EPA is requiring that DOE consider the consequences of events and processes associated with all types of resource extraction activities, including solution mining and fluid injection for secondary recovery of depleted oil reserves. EPA limited consideration of these activities to the resource exploitation that has actually occurred in the vicinity of WIPP and

[3]EPA believes that reliable drilling information is obtainable for this period of time.

the existing plans and leases for future drilling in the area for these purposes.

In commenting on the proposed compliance criteria, DOE stated that it should only have to consider human intrusion from exploratory drilling, and not production- or development-related drilling, in its compliance application. On the basis of DOE's interpretation of EPA's disposal regulations and their underlying technical basis, mining was not an activity intended for consideration in an assessment of the repository's performance. DOE noted that EPA, when developing the disposal regulations, clearly stipulated that the most severe form of human intrusion to be considered in performance assessments was "intermittent and inadvertent" exploratory drilling for natural resources. In DOE's view, the inclusion of human-initiated events and processes other than exploratory drilling when calculating the frequency of human intrusion is therefore inconsistent with the technical assumptions on which EPA based its disposal regulations. Furthermore, DOE stated that addressing these other types of human intrusion in its compliance application would add to the time and cost required to demonstrate compliance with the disposal regulations but would provide few benefits in terms of protecting public health and safety.

Officials of EPA's Radiation Protection Division agreed with DOE that inadvertent and intermittent drilling for resources would be the most severe type of human intrusion likely to be encountered at WIPP, but they said that this does not mean that less severe types of human intrusion should be discounted in the performance assessment. The officials stated that DOE's inclusion and consideration of less severe types of human intrusion will result in a more complete and credible compliance application by DOE.

Preparedness of DOE's Facilities to Ship Transuranic Waste to WIPP

For the first few years of WIPP's operations, DOE will have a limited capability at its six primary storage sites to determine if transuranic waste satisfies the technical criteria for transportation and disposal and to prepare this waste for shipment. In fact, DOE will not be ready to begin disposing of remote-handled waste until at least 2002 and will not be able to begin disposing of most of this waste for about 20 years. The six sites are the Idaho site, the Rocky Flats site (Colorado), Los Alamos National Laboratory (New Mexico), the Oak Ridge site (Tennessee), the Hanford site (Washington), and the Savannah River site (South Carolina). Over the longer term, DOE must develop facilities and equipment at all six sites to prepare the waste for shipment if it is to dispose of all stored and projected quantities of transuranic waste over the repository's 35-year operating life. According to DOE's Baseline Environmental Management Report of 1995,[1] these facilities and equipment may cost about $11 billion to develop and operate.[2]

Idaho Site

The Idaho site's nuclear activities began in 1949 with testing of nuclear reactors and, subsequently, reprocessing spent nuclear fuel and receiving and storing the nuclear waste generated at other locations, such as Rocky Flats in Colorado. The nuclear wastes managed at the site include transuranic waste, low-level waste, and high-level waste. In addition, DOE stores spent nuclear fuel from the Navy's nuclear reactor program and other sources at the site.

DOE's Baseline Environmental Management Report states that environmental management activities over the 91-year period from 1995 through 2085 could cost about $29 billion. These environmental activities include stabilizing the nuclear materials and facilities, restoring the environment, managing the wastes, managing various environmental activities, and providing site-wide services such as environmental monitoring and security. Of that amount, the cost of preparing transuranic waste for disposal is estimated to be about $1.35 billion through 2050. The administration's budget for fiscal year 1997 requests almost $111 million for waste management at Idaho. About $22 million, or 20 percent, would go for transuranic waste activities, primarily to bring the storage of the

[1]Estimating the Cold War Mortgage: The 1995 Baseline Environmental Management Report (DOE/EM-0232, Mar. 1995). This report discusses the activities and potential costs required to address the waste, contamination, and surplus nuclear facilities that are the responsibility of DOE's environmental management program.

[2]Unless otherwise stated, all costs are expressed in constant 1995 dollars.

waste into compliance with the regulatory requirements and to accelerate the characterization and certification of waste.

Waste Volume

The site has 39,255 cubic meters of contact-handled transuranic waste in storage.[3] Commingled with this waste is about 25,000 cubic meters of alpha low-level waste that contains transuranic elements[4] that DOE will not allow to be disposed of at the site. Thus, the total amount of contact-handled waste that the site will ship to the repository is about 65,000 cubic meters. However, site managers intend to treat, as appropriate, both types of waste, which is expected to reduce the volume of waste eventually shipped to and disposed of at WIPP to substantially less than 65,000 cubic meters. In addition to the contact-handled transuranic waste, the site has about 200 cubic meters of remote-handled waste.

Readiness to Ship Transuranic Waste Through 2002

Between mid-1998 and the end of 2002, DOE expects to ship and dispose of enough transuranic waste from the site—3,100 cubic meters—to meet the requirements of a recent settlement of litigation with Idaho. However, whether the Department can achieve this short-term objective is uncertain.

In an October 16, 1995, settlement agreement resolving litigation between Idaho and the federal government over planned federal shipments of spent fuel and nuclear waste to the site, the parties agreed that DOE would ship about 65,000 cubic meters of transuranic waste (including the alpha-emitting low-level waste) from the site. The agreement states that (1) by April 30, 1999, the first shipments shall be made from the site; (2) by December 31, 2002, not less than 3,100 cubic meters of the waste shall be shipped out of the state; (3) after January 1, 2003, a running average (the average over any 3-year period) of at least 2,000 cubic meters per year shall be shipped out of the state; and (4) by December 31, 2002, DOE should complete the construction of a facility (and, by March 31, 2003, begin operating it) to treat mixed (waste containing both radioactive and

[3]Estimates of transuranic waste volumes have changed and continue to change over time at various storage sites. For consistency among sites, we used the estimates of the volume of transuranic waste currently stored and projected to be generated as reported by the sites to DOE's Carlsbad Area Office and included by that Office in its Transuranic Waste Baseline Inventory Report of December 1995. These estimates do not represent the volume of waste expected to be shipped to and disposed of in WIPP because treatment and repackaging of the waste, as appropriate, is expected to change the volume of the waste.

[4]Transuranic waste has designated minimum concentrations of radioactivity per gram. Waste contaminated with transuranic elements that has concentrations of alpha-emitting radioactivity below the level specified for transuranic waste is typically classified as low-level waste. Although alpha-emitting particles are unable to penetrate human skin, they may be harmful if inhaled.

hazardous components) transuranic and low-level waste. Failure to meet any of these deadlines would require DOE to stop shipping its spent fuel to the site.

To achieve the short-term stipulation in the settlement agreement, DOE will need to have an adequate supply of contact-handled waste ready for shipment to and disposal at WIPP. This means that DOE will have to retrieve containers of waste—55-gallon drums—from existing storage areas, characterize the contents of the drums, and identify those drums of waste that meet the technical criteria for transportation and disposal. The drums of waste that do not meet the acceptance criteria for either transportation or disposal will eventually have to be treated and/or repackaged to make the waste acceptable. In all, DOE will have to identify about 15,000 acceptable drums of contact-handled waste and ship these drums to WIPP to remove 3,100 cubic meters of transuranic waste from Idaho by the end of 2002.

On the bases of our discussions with site officials and our review of the documents we obtained from these officials, it is uncertain whether DOE will be able to prepare and ship enough contact-handled waste to meet its agreement with the state. As of March 1995, DOE had characterized about 640 drums of contact-handled waste at the site. About 420 of these drums, however, did not meet the waste acceptance criteria that were then in effect but which have been superseded by new criteria.[5] In September 1995, site managers of transuranic waste estimated that by June 1998, they will have identified about 700 drums of waste that meet the final criteria for transportation to and disposal in WIPP.

Subsequently, in April 1996, the manager of transuranic waste at the site revised the estimate of the waste that the site expects to have certified as acceptable for shipment by mid-1998. According to this DOE official, the site now anticipates that at least 2,000 drums of waste will be certified as acceptable for transportation to and disposal in WIPP when the repository opens. Also, the site now expects to have the capability of characterizing and certifying waste at the rate of about 3,200 drums per year once WIPP opens. In large part, he said, the increase in the projected rates of characterization and certification is due to (1) an ongoing effort to develop scientific evidence to convince the Nuclear Regulatory Commission, which must approve transportation containers, that the types of waste that can be safely shipped in the containers can be expanded, (2) a relaxation of

[5]According to a DOE official at the site, the Department had characterized about 15,000 drums of waste by 1989 to a version of waste acceptance criteria then in effect. About 8,000 of the drums, he added, did not meet those criteria.

waste acceptance criteria for particulates in the waste, and (3) a less conservative view of the amount of waste that can be certified. In connection with the latter reason, for example, the latest changes in the waste acceptance criteria allowed DOE to take a less restrictive interpretation of the amount of free liquids allowed in each drum.

According to this official, if the new approach is successful, the site should be able to sustain this rate of waste characterization and certification and reach the short-term goal of shipping about 15,000 drums to WIPP by the end of 2002.

Outlook for the Longer Term

Because most of the contact-handled waste and much of the commingled low-level waste are expected to require treatment before these wastes can be shipped to and disposed of in WIPP, the site needs a treatment facility to meet the stipulation that, beginning in 2003, it must ship an average of 2,000 cubic meters of transuranic waste per year from Idaho. According to a June 1995 summary of the status of the transuranic waste prepared by site officials, only about 20 percent of the estimated volume of stored contact-handled waste will not require some form of treatment or repackaging. About 53 percent of the contact-handled waste is not expected to meet the transportation criteria because the waste is in boxes and the contents need to be repackaged.

To provide the facilities and equipment that are needed to prepare these wastes for shipment and disposal, DOE plans to contract with a private company for waste processing services. The private company would build and operate a facility for characterizing, treating, packaging, and certifying drums and boxes of transuranic and low-level waste. DOE expects that it will award this contract in September 1996 and that the facility will begin operating in 2003. Site officials, however, cannot yet estimate how many drums of waste would be available for shipment each year after the facility is operational, the technologies to be used in the facility, or the cost to purchase waste processing services from a private company in comparison with the construction and operation of a federally owned facility.

Rocky Flats Environmental Technology Site

With the end of the production of nuclear weapon components several years ago, the new mission of Rocky Flats has been environmental management and possible economic development. The mission involves remediation, waste storage, treatment and disposal, consolidation of

materials, deactivation of buildings, and decommissioning. According to DOE's Baseline Environmental Management Report, the total cost of environmental management at the site could be about $36.6 billion over a 66-year period. Of that amount, about $9.6 billion is for waste management, including about $2.2 billion for transuranic waste management.

Waste Volume

The site currently has 1,869 cubic meters of contact-handled transuranic waste, and DOE projects that the site will generate an additional 3,205 cubic meters for disposal in WIPP. The stored waste includes both transuranic waste and over 800 cubic meters of plutonium residues. At one time, DOE had intended to recover the plutonium from these residues for reuse. Because weapons production activities have ended at the site, however, DOE has decided that the residues are now waste and may be disposed of in WIPP. This approach, DOE says, implements a recommendation of the Defense Nuclear Facility Safety Board. The Board, which provides independent oversight of DOE, recommended that because the plutonium residues are potentially unstable in their present condition, DOE expedite a program for putting the residues in a stable condition for storage. The residues may need to be processed and repackaged to put them in a more stable condition for storage and for disposal at WIPP.

Under the Federal Facility Compliance Act, Colorado issued DOE a compliance order calling for the Department to begin shipping mixed transuranic waste from Rocky Flats at or before the end of 1998. The order also precludes DOE, after it begins shipping the waste, from storing newly generated mixed waste, including mixed transuranic waste, for more than 2 years without the state's approval. Mixed waste from stabilizing and repackaging residue, however, was not part of the order; rather, it was part of a separate agreement between DOE and the state.

Readiness to Ship Transuranic Waste Through 2002

As of September 1995, the site had characterized about 500 drums of contact-handled transuranic waste using older waste acceptance criteria which have been superseded. At that time, DOE anticipated that the site would have about 1,000 drums of waste characterized by mid-1998; however, not all of those drums would meet the acceptance criteria for transportation to WIPP.

DOE now anticipates that the site will have 5,000 drums (about 1,043 cubic meters) of waste ready for shipment to WIPP by the time WIPP opens in 1998

if (1) the schedule for processing the potentially unstable plutonium residues is met and (2) enough drums of transuranic waste can be characterized and certified. For the residues, the objective is to stabilize the waste by venting residue drums to minimize the risk of hydrogen accumulating and creating pressure in the drums and treat and/or repackage salts, combustibles, and miscellaneous residues on an accelerated basis. For stored transuranic waste, DOE believes that 60 percent of the drums may be certifiable without repackaging and further processing. DOE expects to have about 600 drums of transuranic waste partially characterized by September 1996 and additional characterization methods will be required.

If funding were available for additional equipment, DOE officials said, they would have 5,000 drums or more of waste available when WIPP opens.

Outlook for the Longer Term

More problematic for the site is the treatment of the remaining 40 percent of the drums of transuranic waste that waste managers estimate is unacceptable for disposal in its current condition. According to a 1995 DOE report on the Rocky Flats transuranic waste program, construction of a treatment facility for this waste has been delayed from 2002 to 2007. Because of this delay, the site does not expect to process this waste until the period from 2012 though 2022. In April 1996, DOE officials told us they are working to develop a plan for removing special nuclear materials and transuranic waste from the site by 2015. Implementing such a plan, they estimated, would cost an additional $10 million per year, or a total of over $51 million, more than their current budget.

Los Alamos National Laboratory

The Los Alamos National Laboratory was established in 1943 to design, develop, and test nuclear weapons. The laboratory's current mission remains focused on national defense but now also includes research in fields such as space physics and biomedicine. The ongoing plutonium processing operations continue to generate transuranic waste. According to DOE's Baseline Environmental Management Report, the environmental management activities at the laboratory could cost about $4.4 billion over the 36-year period from 1995 through 2030. This cost estimate includes $507 million for preparing the transuranic waste for disposal.

Waste Volume

Los Alamos has 10,953 cubic meters of contact-handled transuranic waste, and another 7,351 cubic meters is projected for a total of 18,304 cubic

meters. For the most part, DOE's projection of waste to be generated is based on the transuranic waste that will be produced at a plutonium processing facility. The laboratory's waste manager said that the plutonium facility is expected to generate about 500 drums of contact-handled waste in fiscal year 1996 and could generate as much as 1,000 drums per year in the future.

Readiness to Ship Transuranic Waste Through 2002

By October 1996, according to the laboratory's waste manager, 500 drums of waste will be certified as acceptable for shipment to and disposal at WIPP according to DOE's most current waste acceptance criteria. Also, the laboratory expects to have 3,000 drums certified and ready for shipment by the time WIPP opens. The manager said that the laboratory had certified about 3,000 drums of waste as meeting earlier waste acceptance criteria that have since been superseded. Additional characterization measures will have to be performed on 2,500 of these drums to determine if they meet the current acceptance criteria for transportation. The laboratory, however, does not have the equipment needed for some of the essential characterization work. The laboratory expects to obtain mobile equipment that will take certain gas samples from drums at the rate of almost 5,000 drums per year. If any drums fail this test, the laboratory will need to treat the waste by repackaging or other means.

When WIPP opens, according to the waste manager, the site expects to be prepared to make two shipments per week to WIPP for 50 weeks per year. For each shipment, a tractor-trailer would haul three shipping containers loaded with a total of 35 drums. (The maximum capacity of three shipping containers is 42 drums.) This would amount to about 3,500 drums per year. He said the laboratory is studying whether to remove 16,000 drums of transuranic waste from storage under an earthen cover for characterization beginning in 1996. If the laboratory is able to characterize those drums in the near future, the total amount of waste ready for shipment to WIPP could be as high as 10,000 drums.

Outlook for the Longer Term

According to the laboratory's manager for transuranic waste, no new facilities will be required to prepare transuranic waste for shipment and disposal if, as planned, DOE obtains from the Environmental Protection Agency a "no migration" variance in accordance with the agency's regulations for implementing the Resource Conservation and Recovery Act. If, however, DOE is unsuccessful in obtaining the variance, he added,

then new facilities would be required to treat mixed transuranic waste to make the waste suitable for disposal in WIPP.

Oak Ridge Site

The Oak Ridge site in eastern Tennessee is comprised mainly of a national laboratory, a manufacturing and developmental engineering plant, and a retired plant for enriching uranium. The activities at the site include, among other things, nuclear weapons component disassembly and material storage, nonweapons research, environmental restoration, and waste management. According to DOE's Baseline Environmental Management Report, the total cost of the environmental management activities over a 71-year period could be about $38 billion. This cost estimate includes about $2.6 billion over the next 51 years for managing transuranic waste. In April 1996, DOE's contractor at the site said the first revision to the Baseline Environmental Management Report will reduce the estimate for transuranic waste to about $850 million.

Waste Volume

The site has 1,326 cubic meters of contact-handled waste, and an additional 256 cubic meters are projected for a total of 1,582 cubic meters. More importantly, Oak Ridge has most of DOE's stored remote-handled transuranic waste. The site has 1,832 cubic meters of remote-handled waste, and another 344 cubic meters is projected for a total of 2,176 cubic meters. The remote-handled waste consists of about 800 cubic meters of sludge, stored in underground tanks, and solids such as paper, glass, plastic tubing, shoe covers, wipes, filters, and discarded equipment. The solid remote-handled waste is typically contained in cylindrical concrete casks. In September 1995, the state of Tennessee issued an order under the Federal Facility Compliance Act requiring DOE to comply with a plan for the treatment of mixed waste, including mixed transuranic waste. For transuranic waste, the order requires (1) initial treatment of the remote-handled sludge by June 30, 2002, and shipment of this waste to WIPP starting in September of that year; (2) initial shipment of solid remote-handled and contact-handled transuranic waste by March 2015; and (3) final shipment of all transuranic waste from the site by 2023.

Readiness to Ship Transuranic Waste Through 2002

DOE does not expect to ship contact-handled transuranic waste for disposal in WIPP until after 2002. As of September 1995, the site had 822 drums of waste characterized to the WIPP waste acceptance criteria that were then in effect but which have been superseded. The site projects that by the time WIPP opens, 900 drums of contact-handled waste will have been

characterized, but not all of this waste will meet the transportation requirements for shipment to WIPP. In any event, according to the manager of transuranic waste, the remote-handled sludge is the site's first priority for treatment and disposal because this waste constitutes a greater risk than the contact-handled waste and the state has given remote-handled sludge priority in its compliance order.

Outlook for the Longer Term

According to the Baseline Environmental Management Report and the original site treatment plan, DOE intended to build a waste processing facility for transuranic waste at an estimated cost exceeding $1 billion. However, the site's manager of transuranic waste told us that budget cuts have eliminated plans for the facility. Furthermore, until the state issued its compliance order, DOE had anticipated building the facility much later than 2002. In addition, the manager said, the treatment plan relied on an unproven technology. In September 1995, DOE completed a study of more than 20 alternative treatment methods for remote- and contact-handled waste at the site. The study concluded that the most feasible alternative for the remote-handled sludge was solidifying the sludge with cement. The study also estimated that the necessary facilities and technologies would cost $226 million net present value ($693 million escalated) for processing the remotely-handled sludge by cementation and processing remotely handled and contact-handled solids by sorting and compaction.

DOE expects to issue an invitation for bid in January 1997 for a private facility to process the remote-handled sludge. If funding for the site's transuranic waste program is not reduced in the coming years, he said, the facility should be available in time to meet the deadline in the state's compliance order for disposing of remote-handled waste. He added that the rate at which the new facility could prepare this waste for shipment to WIPP is unknown. The rate, in part, would depend on the capabilities of the containers that DOE will design and procure for transporting remote-handled waste. The manager pointed out that if the waste is solidified by adding concrete, the volume will increase and the radioactivity will be diluted to the point where the waste might not be classified as transuranic waste. He added, however, that officials in DOE's Carlsbad office have assured the site that the waste would be accepted for disposal because it contains transuranic waste. Also, there are currently no firm plans for treating and processing the solid remote-handled waste and the contact-handled waste at the site.

Hanford Site

The original mission of the Hanford site—to produce plutonium for nuclear weapons—ended in 1989. The primary mission at the site now and for the foreseeable future is environmental management. According to DOE's Baseline Environmental Management Report, the total cost of environmental management activities over the 66-year period from 1995 through 2060 could amount to $73 billion. Of this amount, about $42 billion would be spent for waste management activities, including over $3.2 billion for the management of existing and projected transuranic waste through 2050.

Waste Volume

DOE estimates that about 11,028 cubic meters of contact-handled transuranic waste is stored at the site and that it will generate another 34,909 cubic meters of this waste. The Department also estimates that it has 200 cubic meters of remote-handled transuranic waste in storage. This waste typically consists of debris such as metals, plastics, rubber, clothing, rags, and glass. Moreover, DOE projects that it will generate 21,521 cubic meters of remote-handled waste in the future, primarily consisting of contaminated equipment that is currently part of the network of underground tanks at the site in which high-level radioactive waste is stored. The high-level waste was produced as a by-product of reprocessing production reactor fuel to recover plutonium for weapons purposes.

The amount of remote-handled waste that may actually be generated in the future is uncertain. Earlier projections by DOE have been as low as 4,000 cubic meters and as high as 45,000 cubic meters. The actual amount may depend, in part, on the selection of technologies for cleaning up the network of underground storage tanks. For example, site managers now believe that most of the equipment that they had projected would be remote-handled waste may eventually be decontaminated and disposed of at the Hanford site. For this reason, they have recently lowered their estimate of projected remote-handled waste from 21,521 to 3,470 cubic meters.

Readiness to Ship Transuranic Waste Through 2002

DOE does not expect to prepare any contact-handled transuranic waste for shipment to and disposal in WIPP until 2002. The basic reason is that transuranic waste management is relatively low on the list of priorities for environmental management activities at the site. For example, over 300 other projects at the site have higher priority than processing contact-handled waste for shipment and disposal. Furthermore, DOE has no current plans for preparing remote-handled waste for shipment and

disposal; however, according to officials of DOE's Carlsbad Area Office, ongoing negotiations among DOE, EPA, and the state of Washington should lead to plans for managing all stored and projected transuranic waste at the site.

The facilities and equipment planned for retrieving the contact-handled waste from earthen-covered storage have been designed, but construction is on hold due to a lack of funds. The latest estimate is that the construction of the facility, which DOE estimates will cost $35 million, may begin in 2002. The Department recently constructed a facility for characterizing, repackaging, and certifying low-level and contact-handled waste generated and stored at the site. For the next several years, however, DOE intends to use this facility to process mixed low-level waste and dispose of this waste at the site. Due to a lack of funds, DOE does not expect to begin processing contact-handled waste until at least March 2002, and then only if the funds for this purpose are obtained beginning in that year. Moreover, some contact-handled waste may require incineration to meet the standards for disposal in WIPP. To fulfill this potential requirement, DOE will have to either construct an incineration facility at the site, use an off-site vendor's facility, or use another DOE facility.

Outlook for the Longer Term

The plans that DOE once had to develop facilities and equipment that are needed to retrieve and process contact-handled waste for disposal have been placed on indefinite hold due to a lack of funds. Thus, it is uncertain at this time when DOE will be able to begin preparing contact-handled waste for shipment and disposal in significant quantities. As discussed earlier, transuranic waste is relatively low on the site's list of environmental management priorities. Moreover, although DOE had once planned to construct facilities for processing remote-handled waste for shipment and disposal, these plans have been canceled due to a lack of funds. DOE now expects that its ongoing negotiations with EPA and the state of Washington will lead to plans for managing, within the next 20 years, the large quantity of remote-handled waste projected to be generated at the site.

Savannah River Site

DOE's Savannah River Site was developed in the 1950s to produce nuclear materials for national defense, medical uses, and the space program. The emphasis is shifting from producing nuclear materials to environmental management. According to DOE's Baseline Environmental Management

Report, the total cost of environmental management activities over the 61-year period from 1995 through 2055 could be about $68 billion. This amount includes over $800 million through 2050 to manage the transuranic waste now stored and expected to be generated at the site.

Waste Volume

DOE, in its most recent inventory of the transuranic waste stored at its sites, estimated that 6,551 cubic meters of contact-handled transuranic waste are stored at the site.[6] The Department projects that the site will generate 8,946 cubic meters more of this type of waste, for a total of 15,497 cubic meters. DOE's current estimates of the transuranic waste at the site include a very small amount of remote-handled waste in storage.

Readiness to Ship Transuranic Waste Through 2002

The site intends to begin shipping transuranic waste to WIPP in 1999. All transuranic waste is expected to require detailed characterization, but the existing capability for this process is limited. To date, the site has emphasized the retrieval, repackaging, and temporary storage of these wastes pending detailed characterization. Also, treatment of some or all transuranic waste to make the waste acceptable for shipping and disposal will likely be required, but a treatment facility has not yet been included in the waste management plans. Finally, no facilities at the site are capable of loading transuranic waste into DOE's existing fleet of shipping containers, and some of the waste is not suitable for shipment in these containers.

Outlook for the Longer Term

According to the site's manager of transuranic waste, DOE will need to develop extensive facilities at the site to retrieve, characterize, treat, package, and ship about 75 percent of the transuranic waste. In fact, mixed waste shipments may not begin until about 2012, according to the site's proposed treatment plan.

[6]According to the manager of transuranic waste at the site, while there are about 10,000 cubic meters of transuranic waste in storage, up to half of this waste may eventually be reclassified as low-level radioactive waste.

Comments From the Department of Energy

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

June 3, 1996

Mr. Victor Sgobba
Senior Evaluator
United States General Accounting Office
441 G Street, NW
Washington, DC 20548

Dear Mr. Sgobba:

The Department of Energy and the Carlsbad Area Office appreciate the opportunity to review and comment on the Draft GAO Report (GAO/RCED-96-146) NUCLEAR WASTE, "Uncertainties About Opening Waste Isolation Pilot Plant." Our specific comments are attached. They address inaccuracies in data, statements, or misinterpretations; and furthermore, they provide official DOE policy on issues and programs.

If I can provide additional information or answer any questions, please contact me at (505)234-7300.

Sincerely,

George E. Dials
Manager

Enclosure

cc:w/enclosure
Jim Turi, EM-36
M. Daugherty, CAO
C. Holman, CAO

printed on recycled paper

WASTE ISOLATION PILOT PLANT (WIPP)
CARLSBAD AREA OFFICE

DOCUMENT REVIEW RECORD

DOCUMENT NAME: GAO - "Uncertainties About Opening Waste Isolation Pilot Plant"

REVISION: Draft (GAO/RCED-96-146)

DOCUMENT DATE: none

General Comments

We found the tone of the Draft report to be both negative and pessimistic as to the past record of activity and planned future programs when, in fact, the DOE is positive and optimistic about the Program. This is based on the fact that all work is known, planned, and on schedule with a "to-date" success rate of 100% in accomplishing scheduled activities and milestones. We feel the Draft Report should acknowledge this outstanding performance in order to present a balanced assessment.

WIPP Program Concerns

In the section of this report entitled "Prospects for Opening WIPP in mid-1998 Are Doubtful" the author cites two specific reasons for pessimism; "disparity between the contents of the DOE's draft application for a certification of compliance and EPA's disposal regulations and related criteria for deciding whether to issue the certificate" and the need "to complete ongoing scientific studies and analyses that are to feed information into the compliance application before it can submit a complete application".

In illuminating the point regarding the disparity between the draft application and the newly established criteria, the author clearly points out that the CAO noted areas of incompleteness in the draft, especially with regard to a set of draft criteria published only two months before the submittal date and pointed this out to the EPA and other reviewers in the transmittal letter and preamble to the draft. The author correctly notes that the "DOE recognized that its draft application was incomplete but sought EPA's comments at that time to help it prepare to submit its final compliance application 1 year later". The author further noted that the EPA responded with a set of comments on the draft application numbering 370. What the author does not acknowledge is that those comments represent a clear example of the success of the DOE strategy in submitting the draft application. Likewise for the comments obtained from other WIPP stakeholders. Such comment, and the response to that commentary, are a cornerstone of the DOE strategy to maximize the input to the Final Compliance Certification Application. This

strategy is a clear example of the efficiency (in terms of cost savings compared to an single iterative review of a final application) and quality assurance (provide the best possible integration of inputs to insure completeness and technical adequacy) of the final application to be submitted in October 1996.

In illuminating the point regarding completing the scientific studies and analyses so that information is fed into the compliance application the author bases his conclusion on the fact that substantial work remains to be completed. The author uses Figure 1 to illustrate the work remaining to be completed. Unmentioned is the fact that Figure 1 clearly illustrates that substantial work to date has been accomplished on time and within budget. Figure 1 also shows that the work was accomplished to date on an accelerated schedule in a totally integrated program. If recent past performance is to be any barometer of future results, it would be only fair to note a more optimistic view based on this record to date.

Throughout the report, the author continuously refers to the fact that CAO will operate WIPP at a reduced rate even if all the regulatory barriers are achieved assuming adequate funding for planned activities is not available. This report has failed to recognize that the ramp-up to full WIPP operations has been well planned, and recent initiatives by the DOE ensures adequate funding to support the operational increases. DOE has scoped a ramp-up process that meets the resource needs of the DOE complex and exceeds all requirements at the TRU waste sites stemming from agreements with their respective state representatives. The CAO ramp-up considers waste availability at the sites, transportation requirements including shipping containers and routing, new or upgraded facility needs for waste characterization and certification, and resource requirements at WIPP. The ramp-up was designed to be cost effective and reduce the mortgage of the TRU waste system to the American public by purchasing shipping containers in time to meet the opening of TRU waste routes across the nation. CAO assures all stakeholders that the ramp-up of the CAO activities will remove waste from the TRU waste site at a rate that meets their schedules. Mobile systems will be available to TRU waste sites and will be used in place of constructing the expensive fixed facilities referred to in the GAO report and are assumed to be required.

Document Specific Comments

1. Introduction, Page 1, Paragraph 1, Line 2: The $19 billion estimate was prior to TRU waste streamlining and mortgage reduction considerations. This estimate has been recast and will be published in the TRU Waste Management Plan in September 1996 as well as the baselining effort at DOE Headquarters which will also be published in September 1996. The Baseline Environmental Management Report is a snap-shot in time of the DOE complex. Because of declining budgets, DOE has reviewed and reprioritized activities to obtain the best return on investment. TRU waste activities

have been identified as an area that can be rescoped to provide a greater cost savings but maintain the current DOE mission.

2. Introduction, Page 1, Paragraph 1, Line 3: The WIPP Land Withdrawal Act of 1992 allows DOE to dispose of 6.2 million cubic feet of TRU waste in WIPP. This equates to approximately 175,500 cubic meters instead of 178,000 cubic meters as stated in the report. When used in gross terms, DOE rounds this number to 176,000 cubic meters.

3. Introduction, Page 1, Paragraph 2, Line 3: The document refers to "requesters". It might help the reader to reference the list of requesters at the end of the main document.

4. Results in Brief, Page 2, Paragraph 1, Line 2: The statement of "...a wide disparity exists between DOE's mid-1995 draft application for a certificate of compliance and EPA's criteria for reviewing a compliance application" is true when referencing the Draft Application. In fact, this was announced in the transmittal letter and preamble to the Draft submitted to EPA more than 10 months before EPA published the final criteria (see attached transmittal letter). It was done so as to solicit and obtain both technical and administrative comments from EPA and other reviewers (i.e., EEG) so that the final compliance certification application will be the best quality document possible. Having obtained extensive comments and a final criteria, the CAO is presently in the process of preparing the final document. The final DOE application will be consistant with EPA's requirements for submitting and reviewing compliance applications.

5. Results in Brief, Page 2, Paragraph 2, Line 1: GAO makes a very pessimistic presumption in this paragraph. All indications are that the final application will be submitted on time, and, it is likely that WIPP will open in April 1998. Rewrite the first part of the sentence to be more optimistic and read, "Once regulatory barriers are overcome and DOE opens WIPP as a disposal repository for TRU waste, it would...."

6. Results in Brief, Page 3, Paragraph 1, Line 9: To be more clear, this sentence could be rewritten to add "over the 35 year operational period" after "billion" at the end of the sentence and read, "...operations at WIPP could cost another $8 billion over the 35 year operational period."

7. Background, Page 3, Paragraph 1, Line 3: The current estimates for stored waste in the TRU Waste Baseline Inventory Report is 61,600 not 100,000 cubic meters for both contact- and remote-handled waste. The remainder of the repository capacity has yet to be generated. The projected volumes will come from retrieval, D&D, and ER.

8. Background, Page 4, Paragraph 2, Last Sentence: This is not accurate; DOE had performed all work necessary at the time, however, the EPA standard 40 CFR 191 had been remanded by the United States District Court in Washington, D.C. as a result of litigation in 1987. The final standards were not repromulgated until December 1993. Furthermore the final criteria were not promulgated until February 1996 (e.g., 40 CFR 194). It was in October 1992 that EPA was officially designated as the regulator for WIPP via the WIPP Land Withdrawal Act. CAO suggests striking this sentence.

9. Background, Page 5, Paragraph 2, Line 18: Last part of last sentence. The comment about the Federal Facility Complaince Act of 1992 is correct but it is out of context in this sentence. This paragraph is describing the regulatory requirements for the WIPP facility. The FFCAct does not apply to WIPP. WIPP is impacted by the results of this law through the TRU waste sites.

10. Prospects for Opening WIPP in Mid-1998 are Doubtful, Page 6, Title: Why should WIPP's prospects for opening appear so doubtful to GAO? On the established aggressive Disposal Decision Plan schedule, which was first published in April 1994, no milestone has been missed. Indications are that the Compliance Certification Application will be submitted on schedule; DOE and its science advisor (Sandia National Laboratories) have a high degree of confidence in its success. In fact if one objectively reviews Figure 1 on page 6A, the reader will note that most major milestones necessary for submitting the final Compliance Certification Application are completed or in progress. Thus, the title for this section could read "Prospects for Opening WIPP in Mid-1998 are Risky" instead of "Doubtful". This would tell the reader that CAO's mission is aggressive with a more positive tone.

11. Prospects for Opening WIPP in Mid-1998 are Doubtful, Page 6A, Figure 1: All CAO milestones to date have been met. There is no reason to assume DOE cannot meet the remaining milestones on the schedule. Does GAO have information or insights into issues or actions that may delay DOE's schedule for the remaining Disposal Decision Plan milestones that the CAO is unsure of?

12. Disparity Between Draft Application and Regulatory Requirements, Page 7, Paragraph 1, Line All: The Draft application was submitted in pieces knowing full well the application would need modification after the promulgation of 40 CFR 194. See comment number 4.

13. Disparity Between Draft Application and Regulatory Requirements, Page 7, Paragraph 1, Line All: DOE did not "abandon tests", it was seen as more cost effective to do

laboratory tests above ground in selected national laboratories and gather the same data, rather than doing "Bin and Alcove" tests below ground. The WIPP scientific advisors and the National Academy of Sciences agreed with the concept of laboratory testing confirming that the planned In Situ tests would be costly and technically unnecessary. This change in scope allowed CAO to reduce site staffing, focus the program on regulatory compliance, advance the scheduled WIPP opening date by more than two years, and reduce the projected budget by more than $300 million.

14. Disparity Between Draft Application and Regulatory Requirements, Page 7, Paragraph 1, Line 1: The LWA required EPA to promulgate the rule within one year. This was a milestone missed by EPA causing a delay for DOE. DOE was able to schedule more activities in parallel around this one year slip; it was in no way caused by DOE actions or inactions.

15. Disparity between Draft Application and Regulatory Requirements, Page 8, Paragraph 2, Lines 1 and 2: Rewrite to include additional reviewers and have the sentence read, "DOE recognized and informed EPA, the state of New Mexico, and all other reviewers that its draft application was incomplete but sought EPA's and other's comments at that time...." This will inform the reader that DOE sought comments from reviewers other than EPA.

16. Disparity Between Draft Application and Regulatory Requirements, Page 10, Paragraph 4, Line 5: Add "Final" before "application" making this read, "...these provisions in its Final Application." This allows the reader to make a clear distinction between the Draft Application and the Final Application.

17. Disparity between Draft Application and Regulatory Requirements, Page 11, Paragraph 1, Line 1: EPA criteria requires consideration of all types of drilling activities, not just those related to oil exploration or production. The only new issue in the final critera is mining. Human intrusion drilling scenarios have been evaluated in detail for nearly a decade. Suggest rewritting the sentence to read, "...such as mining and drilling."

18. Disparity between Draft Application and Regulatory Requirements, Page 11: Did GAO review our response? Did GAO solicit feedback on its value from the review groups; i.e., EEG, NMED, and EPA? CAO suggests GAO add a paragraph continuing after the first paragraph prior to the section on Scientific Work Incomplete. It should read, "CAO did in fact respond to comments from the reviewers of the draft Compliance Certification Application. In an accumulative response dated January 23, 1996, the CAO provided copies to all reviewer organizations and focused on actions to correct any agreed shortcomings."

19. Scientific Work Incomplete, Page 11, Paragraph 1, Line All: Does EEG and NMED review and comment on the final application? Or, are they given courtesy copies? The only statutory entity that must scrutinize and judge the completeness and quality of the final Compliance Certification Application is the EPA. The EEG and other WIPP stakeholders will provide an assessment of the final application, both to EPA and DOE as they have done with respect to the draft application.

20. Scientific Work Incomplete, Page 12, Paragraph 2, First Sentence: We recommend this sentence be changed to read, " DOE has been implementing a QA program since 1979 to ensure that its key scientific and regulatory compliance programs and activities meet generally accepted standards of quality assurance in the nuclear industry." It is important to say that we have had a nuclear industry QA program in place for many years and that programmatic changes and improvements have been undertaken to comply with EPA's recently promulgated criteria found in 40 CFR 194.

21. Scientific Work Incomplete, Page 12, Paragraph 2, Second Sentence: The second sentence is confusing and distorts the fact that most of the data has been collected in accordance with the EPA QA standards. We recommend this sentence be changed to read "Some of the data that DOE has collected was not collected in accordance with all of the new compliance criteria."

22. Scientific Work Incomplete, Page 12, Paragraph 2, Line All: For actions defined in this paragraph, these actions are being, or have been taken in accordance with the published schedules.

23. Scientific Work Incomplete, Page 12, Paragraph 2, Line 12: Add "boundaries" after "repository" making this read, "...will not migrate from the repository boundaries." This allows the reader to better understand the language from the WIPP Land Withdrawal Act of 1992 which gives DOE 16 square miles for consideration in the performance assessment calculations.

24. Scientific Work Incomplete, Page 13, Paragraph 1, Line 2: We recommend that this line be changed to read " ... implemented the required quality assurance program meets the quality assurance standards for existing data." This change is important because the existing sentence implies that DOE has more that one process for qualifying existing data, which is not true.

25. Scientific Work Incomplete, Page 13, Paragraph 1, Line 5: Please change the percentage to 10% to be correct. See comment 20.

CAO Document Review of "Uncertainties About Opening Waste Isolation Pilot Plant" - GAO/RCED-96-146

26. Scientific Work Incomplete, Page 13, Paragraph 1, line 8: Please change this to read "...the data is being qualified on schedule." To use words like "would have to be" and "must be qualified" implies that no work has been performed. The work is funded, planned, and on schedule to support the submission of the final application to EPA.

27. Scientific Work Incomplete, Page 13, Paragraph 1, Lines 11 and 12: To make this statement consistent with the words used in 40 CFR 194, we recommend this line read "...acceptable to EPA for the data's use in compliance."

28. DOE Will Have Limited Disposal Capability in the First Years of WIPP's Operations, Page 14, Paragraph 1, Line 4: Transportation is not a constraint. CAO can double shifts, add waste handlers, and add trucks at WIPP. Suggest changing the sentence to read, "...in these years will be constrained primarily by ~~the number of transportation containers that are available and~~ the lack of facilities and equipment at..."

29. DOE Will Have Limited Disposal Capability in the First Years of WIPP's Operations, Page 14, Paragraph 2, Line 1: These numbers for volumes are not consistent with the ones in the introduction of the document. For correct estimates from the TRU Baseline Inventory Report see comment #7, a copy of the TRU Waste Baseline Inventory Report, Revision 3 data summary will be provided to the GAO.

30. Table 1; Existing and Projected Volumes of Contact-Handled Transuranic Waste, Page 15, Note: DOE does not intend to dispose of LLW in WIPP. Waste from the Idaho National Engineering Laboratory will be treated whereby the residual from the process becomes TRU waste before it can be disposed at WIPP.

31. DOE Will Have Limited Disposal Capability in the First Years of WIPP's Operations, Page 15, Paragraph 1, Line 4: This sentence is incorrect. It should be replaced by, "The CAO's current plans anticipate four shipments per week through 1998, with ten shipments per week planned by the end of the year 2000, and 17 shipments per week by the end of the year 2002."

32. DOE Will Have Limited Disposal Capability in the First Years of WIPP's Operations, Page 16, Paragraph 1, Line 1: Add "for the first two years" after "contact-handled waste" making this sentence read, "...DOE could dispose of up to 1,800 cubic meters of contact-handled waste for the first two years of operations..." The reader will begin to have an understanding that CAO intends to ramp-up operations at WIPP consistent with budgets and waste availability.

33. DOE Will Have Limited Disposal Capability in the First Years of WIPP's Operations, Page 16, Paragraph 3, Line 12: Add "Los Alamos National Laboratory" after "Rocky

June 3, 1996 **Page 7**

Flats". LANL currently has the capability to characterize, certify, and load TRU waste to the WIPP waste acceptance criteria. Other sites are developing capabilities that will be ready by the time for shipping. CAO is also investing in mobile systems to accomplish this at sites where it is not economically feasible to build expensive, permanent facilities.

34. Table 2; Existing and Projected Volumes of Remote-Handled Transuranic Waste, Page 18: The number for Hanford's RH waste is not correct with current estimates. The report briefly addresses the current planning on page 19, last sentence of the first paragraph. Hanford has reassessed their remote-handled waste program and is expecting to ship approximately 3,400 cubic meters to WIPP. This change in strategy will be reflected in the next revision of the TRU Waste Baseline Inventory Report.

35. DOE Will Have Limited Disposal Capability in the First Years of WIPP's Operations, Page 20, Paragraph 1, last sentence: This assertion is inaccurate. DOE does not intend to wait 20 years to dispose of Hanford Remote-Handled TRU waste. CAO suggests removing this sentence or modifying this sentence to be consistent with current planning.

36. Engineered Barriers, Page 27, Paragraph 1, Line 2: CAO suggests adding the following after the first sentence on this page. It should read, "CAO conducted a detailed evaluation of the types, applicability, cost, and benefit of using engineered barriers at WIPP. This effort began with a reevaluation of the DOE's 1992 Engineered Barrier report. The published report concluded that engineered barriers, other than planned shaft seals, have little added technical value in terms of WIPP's compliance and that their assurance (confidence) value to DOE stakeholders (who reviewed the options) was minimal. Therefore, CAO decided to utilize only those engineered barriers necessary to meet regulatory mandates and/or add appreciably to the assurance of compliance with EPA's standards. Shaft and panel seals are examples of these types of engineered barriers."

37. Waste Characterization, Page 30, Paragraph 1, Last sentence of first paragraph: This is incorrect. Both the waste characterization procedures and the waste acceptance criteria have been defined. The WIPP Waste Acceptance Criteria, Revision 5, will be the basis for initiating waste shipments to, and acceptance at WIPP. This document was issued on April 4, 1996. The volumes, weights, curies, etc. of waste were identified in the TRU Waste Baseline Inventory Report, Revision 3. This data set of waste parameters was input to the performance assessment in May 1996. Modify this sentence to reflect the most recent activities by CAO.

38. Waste Emplacement, Page 32, Paragraph 1, Sentence 1: This sentence paraphrases the EPA comment and possibly misleads the reader. It may be better to write the sentence to read, "EPA stated that DOE has a plan for emplacing contact-handled TRU waste but the absence of a plan for emplacing remote-handled TRU waste in the underground repository was a major omission in DOE's draft application."

39. Quality Assurance Standards, Page 35, Paragraph 1, Last Sentence: The report needs to add an important piece of missing information after the word "application" in line 20. Include in this paragraph, "DOE revised and reissued (with EPA agreement on the changes) the software QA requirements for the WIPP project on May 22, 1995."

40. Quality Assurance Standards, Page 35, Paragraph 2, lines 5 and 6: Please delete the reference to RCRA QA requirements since RCRA does not have specific QA requirements, only some Quality Control (QC) sampling guidance.

41. Quality Assurance Standards, Page 36, Paragraph 2, Line 6: This program is in progress to demonstrate that scientific data collected is of satisfactory quality for use in supporting DOE's application for a certificate of compliance. This program includes peer review and quality assurance audit efforts of the data. EPA is an observer in the data review process. DOE has made substantial progress to date and will meet the Final Compliance Certification Application schedule. Change the word "many" in this sentence to "few" to more accurately reflect DOE's progress.

42. Quality Assurance Standards, Page 36, Paragraph 2, line 13: Please change "30%" to "10%" to be correct.

Site Specific Comments

DOE Operations Office, Idaho

1. Waste Volume, Page 41, Paragraph 1: Restructure the paragraph to better distinguish how low-level waste with alpha bearing radionuclides is being considered in the volumetric calculations for WIPP from the Idaho National Engineering Laboratory. This paragraph should be rewritten to say, "Because DOE does not allow this type of low-level waste to be disposed of at the site, site managers intent to treat this waste with the contact-handled transuranic waste at the Idaho site and dispose of the treated waste at WIPP. Thus, the total amount of untreated contact-handled waste that the site will ship to the repository is about 65,000 cubic meters. Because of plans to treat the majority of the waste at Idaho, the final volume of treated waste disposed at WIPP will be significantly reduced. In addition to the contact-handled waste, the site has about 200 cubic meters of remote-handled waste."

2. Readiness to Ship Transuranic Waste Through 2002, Page 41, Paragraph 2, Line 8 & 11: Clarify the commingled waste volumes by referencing "untreated" in the paragraph. Line 8 should be written to read, "...3,100 cubic meters of untreated waste shall be shipped...". Line 11 should be written to read, "...2,000 cubic meters of untreated waste per year shall be shipped...".

3. Readiness to Ship Transuranic Waste Through 2002, Page 42, Paragraph 1, Line 4: The spent fuel that is referenced in the DOE agreement with the state of Idaho comes only from DOE. Rewrite the sentence to read, "...deadlines would require DOE to stop shipping DOE spent fuel to the site."

4. Readiness to Ship Transuranic Waste Through 2002, Page 42, Paragraph 3, Line 8: The activities referenced in this paragraph were prior to the settlement agreement. This sentence should be rewritten to read, "In September 1995, prior to issuance of the settlement agreement, site managers of transuranic waste..."

5. Readiness to Ship Transuranic Waste Through 2002, Page 43, Paragraph 2, Line 8: The rate at which the Idaho National Engineering Laboratory now estimates characterizing and certifying waste is 3,200 drums per year. Rewrite the sentence to reflect the new estimate. The sentence should read, "...about 3,200 drums per year once WIPP opens."

6. Outlook for the Longer Term, Page 43, Paragraph 1, Line 3: The introduction to this section directs the reader to think the TRU waste program is paying for multiple low-level waste activities at Idaho. The Advanced Mixed Waste Treatment Facility is a single, joint use facility by the low-level and TRU waste programs. To be more accurate, the last line should be modified to read, "...before it can be shipped to and disposed of in WIPP, the site needs a treatment facility to meet..."

7. Outlook for the Longer Term, Page 44, Paragraph 1, Line 2: This sentence should be changed to be consistent with the previous statements on "untreated" waste. The sentenced should read, "...2.000 cubic meters of untreated transuranic waste per..."

8. Outlook for the Longer Term, Page 44, Paragraph 1: At the end of this paragraph, there should be a final clarification statement indicating to the reader why DOE decided to treat wastes at Idaho. Insert a conclusion sentence that reads, "Studies performed by DOE over the past several years indicate significant cost savings will result from waste treatment at the Idaho National Engineering Laboratory versus segregating TRU wastes from mixed low-level wastes containing alpha bearing radionuclides."

DOE Field Office, Rocky Flats

1. Rocky Flats Environmental Technology Site, Page 44, Paragraph 1: This opening paragraph only moderately depicts the past, present, and future of the site. The Rocky Flats Environmental Technology Site has completely rescoped and redirected their mission since the author completed this report. The budgetary data taken from the Baseline Environmental Management Report is outdated because of the restructuring. CAO and the DOE Field Office at Rocky Flats suggests rewriting the first paragraph to read, "The Rocky Flats site historically produced nuclear and non-nuclear components for the United States weapons program. That mission ended in 1992 when Rocky Flats began transitioning to a new mission of environmental restoration, waste management, and economic conversion. The Rocky Flats Environmental Technology Site's present mission is to clean-up contaminated facilities, production processes, materials, soils, and wastes; and to properly manage, process, treat, store, and dispose all excess material and waste in order to reduce risks to the public, worker, and environment. The near-term envisions the plutonium at the Rocky Flats Environmental Technology Site stabilized, consolidated, containerized, and safely stored while awaiting off-site shipment. All TRU and mixed TRU wastes are consolidated and safely stored until they can be shipped to WIPP for disposal. Shipments of TRU waste will proceed with the opening of WIPP. Most of the buildings, except those with private economic uses, are deactivated and decommissioned."

2. Waste Volume, Page 45, Paragraph 1, Line 1: The volumes in this report are inaccurate. The correct stored volume of waste at RFETS is 2,005 cubic meters. Of that, 841 cubic meters is residues.

3. Waste Volume, Page 45, Paragraph 1, Line 6: The sentence beginning, "Because weapons production activities..." is more accurately written to read, "Since the waste matrices of TRU waste and residues are similar and since the plutonium quantities in the residues are no longer considered to be above the economic discard level, DOE is actively developing the capability to process and repackage residues for safe storage. Additionally, the DOE offices at Rocky Flats and Carlsbad are developing plans that may allow these residues to be disposed at WIPP."

4. Waste Volume, Page 45, Paragraph 2, Line 7 (last sentence): The residues are not part of the Compliance Order issued by the state of Colorado resulting from the Federal Facility Compliance Act of 1992. The residues at RFETS are under their own Federal Facilities Compliance Agreement which predates the State's Federal Facility Compliance Act order. The Federal Facilities Compliance Agreement for residues was signed by DOE and the state of Colorado on April 23, 1993. The Compliance Order

for mixed waste and the Compliance Agreement for residues result from two separate pieces of legislation. DOE understands differentiating between the Federal Facility Compliance Act of 1992 and agreements between DOE and the states called Federal Facilities Compliance Agreements are confusing. This was not DOE's choice of words or acronyms. The Federal Facility Compliance Act of 1992 is an amendment to the Resource Conservation and Recovery Act which in itself is an amendment to the Solid Waste Disposal Act and only concerns mixed waste, and, only the storage and treatment of those mixed wastes. The Federal Facility Compliance Act of 1992 specifically states that any site having agreements with their state on mixed wastes are not required to include them in the Compliance Orders. CAO suggests removing the sentence, "Mixed wastes from stabilizing and repackaging residue, however, was not part of the order."

5. Readiness to Ship Transuranic Waste Through 2002, Page 45, Paragraph 1: The data presented in this paragraph is inaccurate. CAO recommends using the data provided to GAO by Rocky Flats resulting from the site's first opportunity to review this document. The comments were provided to GAO on April 16, 1996.

DOE Operations Office, Richland

1. Waste Volume, Page 52, Paragraph 1, Line 1: Since the author generated this report, Hanford has modified the current inventory of contact-handled wastes on site. Modify this sentence to read, "DOE estimates that about 9,636 cubic meters of contact-handled..."

2. Waste Volume, Page 52, Paragraph 1, Line 7: Since the author generated this report, Hanford has modified the projected inventory of remote-handled wastes. Modify this sentence to read, "DOE projects that it will generate 3,467 cubic meters..."

3. Readiness to Ship Transuranic Waste Through 2002, Page 53, Paragraph 1: A clarifying statement should be added to the end of this paragraph to identify current negotiations between DOE and the state of Washington. Add to the end of the paragraph, "However, DOE is negotiating milestones with the state of Washington and EPA for a schedule which should be completed in June 1996."

4. Readiness to Ship Transuranic Waste Through 2002, Page 53, Paragraph 2, Line 9: The waste type referenced in this sentence should be mixed low-level waste. Add to the sentence, "...facilities to process mixed low-level waste and..."

DOE Operations Office, Savannah River

1. Savannah River Site, Page 54, Paragraph 1, Line 3: The second sentence of this paragraph does not accurately reflect the site's mission. This sentence might better read, "Although the site continues to have a national defense mission, the Savannah River Site is placing a high emphasis on environmental management."

2. Readiness to Ship Transuranic Waste Though 2002, Page 55, Paragraph 1: This paragraph should reflect the intention of the Savannah River Site to ship waste beginning in May 1999. It also states that a treatment facility is not included in the waste management plans, however, the SRS Site Treatment Plan and Compliance Agreement list a treatment facility for TRU waste.

Scope and Methodology

We performed our work at DOE's headquarters in Washington, D.C.; its Carlsbad Area Office in Carlsbad, New Mexico; and at WIPP. We also performed work at the Department's Sandia National Laboratories in Albuquerque, New Mexico; Idaho National Engineering Laboratory, Idaho Falls, Idaho; Oak Ridge National Laboratory, Oak Ridge, Tennessee; Rocky Flats Environmental Technology Site, Golden, Colorado; and Hanford Site, Richland, Washington. In addition, we obtained and reviewed information on management of transuranic waste from DOE officials at its Savannah River site, Aiken, South Carolina, and Los Alamos National Laboratory, near Santa Fe, New Mexico.

To assess the prospects for opening WIPP on DOE's schedule, we interviewed officials and examined the records and reports of the Department of Energy's Office of Environmental Management, its Carlsbad Area Office, and its contractors on WIPP, particularly Sandia. We also interviewed officials and obtained documentation from EPA's Office of Radiation and Indoor Air concerning the agency's disposal regulations and its Office of Solid Waste concerning RCRA-related land disposal regulations. In addition, we met with officials of New Mexico's Environmental Department in Santa Fe concerning the state's procedures for issuing permits under RCRA and obtained documents related to DOE's current permit application.

In addition, we discussed WIPP scientific and regulatory issues with various parties in New Mexico, including the state's Environmental Evaluation Group, the assistant attorney general, and other interested groups. We attended three meetings on WIPP between DOE and EPA and a meeting of the WIPP Committee of the National Academy of Sciences' Board on Radioactive Waste Management. Finally, we discussed the status of the Committee's ongoing study of DOE's research program on WIPP with Committee staff.

To assess whether DOE is positioned to begin filling WIPP in both its first few years of operation and over the longer term, we obtained information about the planned waste management operations at WIPP. We toured the repository and interviewed officials of the Carlsbad Area Office and its contractor for operating WIPP and the waste transportation system. We also reviewed the documents and reports that DOE had prepared on these subjects. To evaluate the readiness of DOE's waste storage sites to prepare and ship transuranic waste to WIPP, we toured the waste storage and preparation facilities at Idaho, Hanford, Rocky Flats, and Oak Ridge and interviewed officials of DOE and its contractors at these sites. We also

interviewed DOE officials at Savannah River and Los Alamos by telephone. In addition, we obtained and reviewed documents from all six sites pertaining to their waste inventories and plans for preparing and shipping waste to WIPP.

We discussed the facts presented in this report with DOE headquarters officials and incorporated their comments where appropriate.

Major Contributors to This Report

Bernice Steinhardt, Associate Director
Dwayne E. Weigel, Assistant Director
Daniel J. Semick, Senior Evaluator
Victor J. Sgobba, Senior Evaluator
Glenn D. Slocum, Senior Evaluator
Susan W. Irwin, Senior Attorney

GAO Related Products

Nuclear Waste: Issues Affecting the Opening of DOE's Waste Isolation Pilot Plant (GA0/T-RCED-95-254; July 21, 1995).

Nuclear Waste: Change in Test Strategy Sound, but DOE Overstated Savings (GAO/RCED-95-44; Dec. 27, 1994).

Nuclear Waste: DOE Assistance in Funding Route Improvements to Waste Isolation Plant (GAO/RCED-92-65FS, Jan. 14, 1992).

Nuclear Waste: Weak DOE Contract Management Invited TRUPACT-II Setbacks (GAO/RCED-92-26; Jan. 14, 1992).

Nuclear Waste: Delays in Addressing Environmental Requirements and New Safety Concerns Affect DOE's Waste Isolation Pilot Plant (GAO/T-RCED-91-67, June 13, 1991).

Nuclear Waste: Issues Affecting Land Withdrawal of DOE's Waste Isolation Pilot Project (GAO/T-RCED-91-38, Apr. 16, 1991).

Nuclear Waste: Storage Issues at DOE's Waste Isolation Pilot Plant in New Mexico (GAO/RCED-90-1, Dec. 8, 1989).

Status of the Department of Energy's Waste Isolation Pilot Plant (GAO/T-RCED-89-50, June 12, 1989).

Status of the Department of Energy's Waste Isolation Pilot Plant (GAO/T-RCED-88-63, Sept. 13, 1988).

Ordering Information

The first copy of each GAO report and testimony is free. Additional copies are $2 each. Orders should be sent to the following address, accompanied by a check or money order made out to the Superintendent of Documents, when necessary. VISA and MasterCard credit cards are accepted, also. Orders for 100 or more copies to be mailed to a single address are discounted 25 percent.

Orders by mail:

U.S. General Accounting Office
P.O. Box 6015
Gaithersburg, MD 20884-6015

or visit:

Room 1100
700 4th St. NW (corner of 4th and G Sts. NW)
U.S. General Accounting Office
Washington, DC

Orders may also be placed by calling (202) 512-6000
or by using fax number (301) 258-4066, or TDD (301) 413-0006.

Each day, GAO issues a list of newly available reports and testimony. To receive facsimile copies of the daily list or any list from the past 30 days, please call (202) 512-6000 using a touchtone phone. A recorded menu will provide information on how to obtain these lists.

For information on how to access GAO reports on the INTERNET, send an e-mail message with "info" in the body to:

info@www.gao.gov

or visit GAO's World Wide Web Home Page at:

http://www.gao.gov

PRINTED ON RECYCLED PAPER

United States
General Accounting Office
Washington, D.C. 20548-0001

Bulk Rate
Postage & Fees Paid
GAO
Permit No. G100

Official Business
Penalty for Private Use $300

Address Correction Requested