

received
7/10/00 ch
RECORD COPY

DOE/OR/07-1893&D1

RECORD COPY
ON-SITE AR FILE

**Initial Assessment of Consideration of On-Site
Disposal of Comprehensive Environmental Response,
Compensation, and Liability Act of 1980 (CERCLA)
Waste
as a Potential Disposal Option
at the Paducah Gaseous Diffusion Plant,
Paducah, Kentucky**



I-05306-0002



This document has received the appropriate
reviews for release to the public.

**Initial Assessment of Consideration of On-Site
Disposal of Comprehensive Environmental Response,
Compensation, and Liability Act of 1980 (CERCLA) Waste
as a Potential Disposal Option
at the Paducah Gaseous Diffusion Plant,
Paducah, Kentucky**

Date Issued—July 2000

Prepared by
Jacobs EM Team
125 Broadway Avenue
Oak Ridge, Tennessee

Prepared for the
U.S. Department of Energy
Office of Environmental Management

BECHTEL JACOBS COMPANY LLC
managing the
Environmental Management Activities at the
East Tennessee Technology Park
Oak Ridge Y-12 Plant Oak Ridge National Laboratory
Paducah Gaseous Diffusion Plant Portsmouth Gaseous Diffusion Plant
under contract DE-AC05-98OR22700
for the
U.S. DEPARTMENT OF ENERGY

CONTENTS

FIGURES	v
TABLES	v
ACRONYMS	vii
EXECUTIVE SUMMARY	ix
1. INTRODUCTION	1
2. SITE BACKGROUND	2
3. DESCRIPTION OF PGDP WASTES	4
3.1 REMEDIATION OF PGDP	4
3.2 FUTURE D&D OF PGDP	5
4. SUMMARY OF ON-SITE DISPOSAL AT OTHER DOE FACILITIES	5
4.1 DESCRIPTIONS OF EXISTING CERCLA WASTE DISPOSAL FACILITIES AT OTHER SELECTED SITES	6
4.2 COST DATA FOR EXISTING CERCLA WASTE DISPOSAL FACILITIES AT OTHER SELECTED SITES	7
4.3 BASIS FOR WAC	9
4.4 SUMMARY OF POTENTIAL ARARs AND TBCs	9
5. POTENTIAL ON-SITE DISPOSAL SCENARIO AT PGDP	10
6. MAJOR CONSIDERATIONS	15
6.1 COST	15
6.2 TRANSPORTATION RISK	16
6.3 RELIABILITY OF DISPOSAL OUTLETS	16
6.4 REMEDIATION OF PGDP	16
6.5 JOBS	17
6.6 ENVIRONMENTAL EQUITY	17
6.7 STAKEHOLDER ACCEPTANCE	17
6.8 SCHEDULE	17
6.9 SUITABILITY OF PGDP WASTES FOR ON-SITE DISPOSAL	18
6.10 SITING/DESIGN REQUIREMENTS	18
7. CONCLUSIONS	19
8. REFERENCES	19
APPENDIX	A-1

FIGURES

1	Potential PGDP on-site disposal cell design components based on the Oak Ridge on-site disposal facility	14
2	Cross section from the conceptual design of the Oak Ridge on-site disposal facility	15

TABLES

1	Overview of DOE CERCLA disposal facilities	7
2	Summary table of burdened unit costs	8
3	Postclosure activities matrix for DOE CERCLA disposal facilities	9
4	WAC for on-site disposal	10

ACRONYMS

ARAR	applicable or relevant and appropriate requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	<i>Code of Federal Regulations</i>
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
FFA	Federal Facility Agreement
FS	feasibility study
KAR	Kentucky Administrative Requirements
LLW	low-level (radioactive) waste
LTSM	long-term surveillance and maintenance
NEPA	National Environmental Policy Act of 1969
NESHAPS	National Emission Standards for Hazardous Air Pollutants
NPL	National Priorities List
NRC	U.S. Nuclear Regulatory Commission
ORR	Oak Ridge Reservation
OSHA	Occupational Safety and Health Administration
OU	operable unit
PCB	polychlorinated biphenyl
PGDP	Paducah Gaseous Diffusion Plant
QA	quality assurance
QC	quality control
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act of 1976
RI	remedial investigation
ROD	record of decision
S&M	surveillance and maintenance
TBC	to be considered
TSCA	Toxic Substances Control Act of 1976
USEC	United States Enrichment Corporation
WAC	waste acceptance criteria
WKWMA	West Kentucky Wildlife Management Area

EXECUTIVE SUMMARY

Approximately 600,000 yd³ of waste are expected to be generated during the near-term environmental cleanup of the Paducah Gaseous Diffusion Plant (PGDP) and will require responsible, cost-effective management. One option to consider for management of this waste is the construction and operation of a facility at PGDP that is dedicated to the disposal of most of the PGDP cleanup waste. As a follow-up to preliminary discussions with regulators and public stakeholders, the U.S. Department of Energy (DOE) has performed an initial assessment of on-site disposal of this waste in order to assist in the determination of whether it would be advisable to undertake a CERCLA evaluation of a site-wide waste disposal strategy that would include consideration of on-site, as well as off-site, disposal of PGDP CERCLA waste.

The objective of the initial assessment is to provide sufficient information to enable an informed decision as to whether to proceed to the next evaluation step. It is DOE's conclusion from the initial assessment that further in-depth examination of a site-wide waste disposal strategy for PGDP which includes consideration of on-site, as well as off-site disposal, is warranted. This conclusion results from the potential cost-effectiveness and other potential advantages of on-site disposal at PGDP, based upon analysis and experience with on-site disposal of CERCLA waste at other DOE sites. DOE proposes to conduct this study using the CERCLA evaluation and documentation process.

Based on analyses performed at other DOE sites, on-site disposal of PGDP waste is predicted to be less expensive than off-site disposal and could facilitate faster, more aggressive remediation of PGDP. The risk from transporting waste for disposal would be less than with off-site disposal. Construction and operation of the estimated \$78 million facility would create up to 100 jobs in Kentucky. Finally, on-site disposal would provide a greater level of certainty that long-term disposal capacity would be available for PGDP waste, since state equity issues and reliance on commercial facilities introduce some uncertainty as to the continuing availability of adequate off-site disposal capacity.

There are challenges to be met in identifying a suitable site location for a potential on-site disposal facility. A comprehensive siting study is part of the proposed detailed next-step evaluation. Based on experience at other DOE facilities, stakeholder concerns could include siting of the facility (site suitability, consistency with future land use determinations, and environmental impacts), the design and long-term performance of the facility, the waste that will be disposed, and waste acceptance criteria (WAC) for an on-site facility. The CERCLA evaluation being proposed would include a public involvement program.

The proposed CERCLA evaluation would not focus solely on on-site disposal, but rather would include consideration of a range of alternatives for site-wide management of CERCLA waste. A description of the expected evaluation process, including a discussion of anticipated activities and initial assumptions, is provided in the Appendix to this document. Additionally, the proposed CERCLA evaluation would also assess the possibility of constructing one disposal facility that could be expanded to accommodate most of the CERCLA wastes expected to be generated throughout the life cycle of PGDP (i.e., 600,000 yd³ of near-term remediation waste, plus an additional estimated 2.5 million yd³ of building debris and related waste resulting from decontamination and decommissioning (D&D) of the currently-active gaseous diffusion plant facilities at some time in the future). Any on-site facility would only accept CERCLA waste. No non-CERCLA waste would be eligible for disposal in the on-site facility.

1. INTRODUCTION

The Paducah Gaseous Diffusion Plant was placed on the National Priorities List (NPL) in May 1994. As a consequence of being placed on the NPL, DOE was required to commence remedial investigation (RI) of the PGDP Site, in accordance with CERCLA Section 9620(e)(1), and enter into an interagency agreement governing the cleanup of the facility pursuant to CERCLA Section 9620(e)(2). DOE, the Environmental Protection Agency (EPA), and the Commonwealth of Kentucky entered into the Federal Facility Agreement for PGDP (PGDP FFA) in 1998. It is anticipated that approximately 600,000 yd³ of waste will be generated as a result of the response and remedial actions currently planned to be conducted under the PGDP FFA. This waste will require responsible, cost-effective management. An option for the management of the waste to be generated under these CERCLA actions would be an on-site facility dedicated to the disposal of the PGDP CERCLA-generated wastes.

As a follow-up to preliminary discussions with regulators and public stakeholders, DOE has performed an initial assessment of on-site disposal as a possible option to be considered as a component of an overall site-wide waste disposal strategy. The objective of the initial assessment is to provide sufficient information to enable an informed decision as to whether to carry this action to the next evaluation step, which would be to undertake a CERCLA evaluation of a site-wide waste disposal strategy that would include consideration of on-site, as well as off-site, disposal of PGDP CERCLA waste.

The CERCLA evaluation and documentation process has resulted in selection of on-site disposal of remediation waste at six of DOE's facilities across the country. In each of the six cases, before selection was made, it was necessary to demonstrate that the on-site facilities being considered would perform effectively over the long-term. Three of these facilities (the Oak Ridge Reservation [ORR] in Tennessee, the Fernald Environmental Management Project in Ohio, and the Weldon Spring Site Remedial Action Project in Missouri) are within 320 miles of PGDP and share similar hydrologic conditions with PGDP (DOE 2000a). These facilities are used for comparative evaluation in this initial assessment.

At each of the six facilities where on-site disposal was selected, DOE considered the potential advantages of on-site disposal of remediation wastes as compared with off-site disposal at commercial or DOE facilities. At the volumes of remediation waste predicted at other DOE sites, off-site disposal is more costly, with the cost savings for on-site disposal being much greater at the higher waste volumes. Off-site disposal also presents additional transportation risks, in general, primarily from vehicular accidents. On the other hand, on-site disposal has greater local land use

impacts. Land is disturbed during construction and operation. Following closure of the facility, the site will be restricted into perpetuity (DOE 1998a). Generally, WAC for DOE's disposal facilities in the eastern United States are more restrictive than criteria for their facilities in the West (DOE 1998b). For a site such as PGDP, these more restrictive criteria would likely translate into some wastes requiring off-site disposal, notwithstanding the availability of on-site disposal capacity.

This initial assessment presents information that has led to DOE's conclusion and proposal in Chapter 7 regarding evaluation of a site-wide disposal strategy for disposition of CERCLA-generated wastes at PGDP, including consideration of both on-site and off-site disposal options. DOE performed the initial assessment by evaluating a potential on-site disposal scenario at PGDP, primarily based upon DOE's experience at other sites. This scenario was developed using approximate volumes and characteristics of expected wastes requiring disposal and expected facility siting and design requirements. Results from pertinent on-site disposal analyses performed at other DOE sites were summarized and applied to the scenario to assess expected effectiveness and potential advantages of PGDP on-site disposal.

2. SITE BACKGROUND

PGDP is located about three miles south of the Ohio River near the Kentucky-Illinois border and about 15 miles west of the city of Paducah (population approximately 27,000). PGDP is located on 3423 acres of DOE-owned land. The primary operations associated with the uranium enrichment process conducted at PGDP are located on 748 acres inside the plant security fence. Of the remaining acreage outside of the fence, 1986 acres are leased to the Kentucky Department of Fish and Wildlife as a part of the West Kentucky Wildlife Management Area (WKWMA). The remaining land (689 acres) is designated as a buffer zone (DOE 1996; Bechtel Jacobs 2000).

The plant was constructed from 1951 to 1954 on a portion of the former Kentucky Ordnance Works site, a World War II munitions production facility. Uranium enrichment operations began in 1952. Union Carbide Corporation operated PGDP from 1951 until 1984, when Martin Marietta Energy Systems, Inc. (which later became Lockheed Martin Energy Systems, Inc.) was contracted by DOE to operate the plant.

In 1993, the United States Enrichment Corporation (USEC) was established by Congress to take responsibility for production of enriched uranium. USEC leased the PGDP uranium enrichment production facilities from DOE to carry out this responsibility. In 1998, DOE contracted Bechtel

Jacobs Company LLC as its management and integration contractor responsible for directing its environmental management and waste management programs at PGDP. The facility continues to produce enriched uranium for commercial nuclear power reactors (DOE 1999a).

PGDP includes uranium processing facilities, a steam plant, electrical switchyards, cooling towers, cleaning and decontamination facilities, waste and wastewater treatment plants, maintenance and laboratory facilities, and various other support operations. PGDP is the largest employer in the region, currently employing more than 2000 people, including agency and contractor employers at the site.

The region around PGDP is characterized as an area of fairly-level topography with gently-rolling hills and knobs. The area contains numerous streams, rivers, and lakes, with elevations typically ranging from more than 700 ft to less than 300 ft above sea level. The site is located within the drainage areas of Bayou and Little Bayou Creeks, which meet about three miles northwest of the site and discharge into the Ohio River. During the dry season, much of the flow in both creeks results from controlled effluent releases from PGDP. The facility is situated above an aquifer that provides water to private and residential wells.

The site is bordered by WKWMA, a recreational resource used by hunters and fishermen. North of the Paducah Site, the Tennessee Valley Authority operates the Shawnee Power Plant that provides electricity for commercial use. Land usage within the vicinity of PGDP is predominantly rural and lightly populated with sparsely-located residences and farms.

During past PGDP operations, hazardous substances generated as byproducts from the enrichment process were released into the environment. These releases were typically associated with burial grounds, spill sites, landfills, scrap metal piles, surface impoundments, and underground storage tanks. Primary contaminants of concern are radionuclides, organic solvents, and polychlorinated biphenyls (PCBs) (DOE 1996, 1999a).

For purposes of remediating PGDP, four operable units (OUs) have been defined. These OUs are the Groundwater OU, Surface Water OU, Surface Soils OU, and the Burial Grounds OU. Once cleanup actions at these four OUs have been completed, a Comprehensive Site-Wide OU final action will be conducted in conjunction with facility D&D, to evaluate any remaining contamination and the cumulative effects from all media (DOE 1999d). Details of the remediation strategy are presented in *Site Management Plan for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 1999c). Wastes anticipated from the implementation of this remedial strategy are discussed in the following chapter.

3. DESCRIPTION OF PGDP WASTES

This chapter presents a summary-level description of the anticipated CERCLA-generated wastes at PGDP. For this initial assessment, predicted waste types, estimated quantities, and approximate percentages of soil and debris were compiled from the Waste Generation Forecast, current drafts of response action documentation (such as engineering evaluations/cost analyses), and discussions with staff members familiar with anticipated future waste generation activities at PGDP. It is recognized that information regarding wastes will be continually updated and that final waste volumes and characteristics will differ from these predictions. The compiled waste information is the best available at this time and is appropriate for this initial assessment. The waste volumes/characteristics will be used to predict design requirements and components and to estimate the size of a potential disposal facility at PGDP for CERCLA-generated waste (see Chapter 5).

For the purposes of this assessment, it was assumed that wastes will be generated under two programs:

- 1) Approximately 600,000 yd³ of waste from the near-term remediation of PGDP (including minor D&D actions); discussed below in Section 3.1.
- 2) Approximately 2.5 million yd³ of waste from the future D&D of the currently-active gaseous diffusion plant facilities; discussed below in Section 3.2

Wastes from the future D&D of the currently-active gaseous diffusion facilities are included in this assessment, in order to enable DOE to evaluate the possibility of constructing one disposal facility that could be expanded to accommodate most of the CERCLA wastes generated throughout the life cycle of PGDP. For this evaluation, it is assumed that all of the D&D will be performed under CERCLA. The following specific waste types are not included in this assessment: PGDP wastes generated outside the two programs mentioned above (for example, legacy [stored] and operations wastes), DOE wastes generated outside Kentucky, waste forms prohibited from shallow land disposal (such as liquids), waste types prohibited by regulations (such as transuranic wastes), and all other non-CERCLA waste.

3.1 REMEDIATION OF PGDP

DOE anticipates that approximately 600,000 yd³ of waste will be generated during the near-term remediation of PGDP. This waste is expected to be about 60 percent debris (building rubble, concrete, scrap metal and soil containing non-soil materials) and 40 percent soil. This waste is

expected from five major sources: the Burial Grounds OU, the Surface Water and Surface Soils OUs, D&D of the C-340 and C-410 Buildings, D&D of 16 inactive facilities, and the scrap metal removal action.

3.2 FUTURE D&D OF PGDP

For this initial assessment, a total of 2.5 million yd³ of waste is estimated to result from the future D&D of the currently-active gaseous diffusion plant. It is assumed that the D&D would be conducted under CERCLA. The estimate was based on experience from D&D of a similar facility, the Oak Ridge K-25 Plant, and includes building rubble, process equipment, concrete foundations, and soil (to be removed to access foundations). It should be noted that this estimate of waste types assumed that no decontamination would be performed. Decontamination would result in more sanitary wastes and reduce the quantities of the other waste types. Furthermore, the volume of waste estimated could be reduced by reindustrialization of some of these facilities. This volume will be used in Chapter 5 to estimate the size of a facility that could be expanded to accommodate most of the waste from the life cycle of PGDP (i.e., the 600,000 yd³ of near-term remediation waste, plus the 2.5 million yd³ of waste from future D&D of the currently-active plant).

4. SUMMARY OF ON-SITE DISPOSAL AT OTHER DOE FACILITIES

As part of the initial assessment, information on three other DOE waste disposal facilities (Oak Ridge, Fernald, and Weldon Spring) was reviewed. These three sites also used the CERCLA evaluation and documentation process. This information is relevant to the initial assessment because these sites are in the same general region as PGDP, and like PGDP, receive abundant rainfall and have shallow water tables. Additionally, like PGDP, the Fernald disposal facility is situated above an aquifer that provides drinking water to private and residential users. The facilities at these three sites are designed to dispose of large volumes of soil and debris containing low concentrations of long-lived radionuclides. It is expected that any on-site disposal scenario evaluated for PGDP would involve a facility designed with similar components as these three facilities.

The comparative information used here is presented in *Cost Engineering Report on Environmental Restoration Waste Disposal Facilities* (DOE 2000a) and *A Comparative Analysis of DOE Environmental Restoration Disposal Facilities* (DOE 1998b). Information on these three facilities includes waste volumes/facility size, costs, basis of WAC, primary applicable or relevant and appropriate requirements (ARARs), and long-term institutional controls and surveillance and

maintenance requirements. The public and regulators supported on-site disposal at each of these sites. Because each site is unique, direct comparison of cost and technical metrics should be performed with caution.

4.1 DESCRIPTIONS OF EXISTING CERCLA WASTE DISPOSAL FACILITIES AT OTHER SELECTED SITES

The disposal facilities at Oak Ridge, Fernald, and Weldon Spring are all of similar design and construction. Because they are designed to isolate long-lived radionuclides from the environment, the disposal facilities incorporate both natural and man-made barrier materials.

The Oak Ridge disposal facility, which is currently in the very early stages of construction, will be an aboveground structure, designed and constructed to be compliant with the requirements of the Resource Conservation and Recovery Act of 1976 (RCRA). Clean fill dikes will provide stable lateral containment, and also protect against erosion and inadvertent intrusion by humans or animals. The cell will be constructed on a geologic buffer, a clay barrier that will assist in the isolation of waste from the environment. The liner system will be a series of layers of clay and flexible plastic membranes to prevent the leakage of wastes from the bottom of the cell. Between the liner system and the waste will be a leachate collection/detection system. The cover will be approximately 16-ft thick and will minimize infiltration of water into the cell and deter human, plant, and animal intrusion into the waste (DOE 1998a). The Oak Ridge disposal facility is scheduled to start receiving wastes in late 2001.

The Fernald disposal facility is an aboveground structure composed of eight cells. A 5-ft-thick liner system composed of clay barriers and flexible plastic membranes, and containing a leachate collection and detection system, isolates the waste from the environment. The cover is approximately 9-ft thick and is composed of clay layers, a geosynthetic clay layer, a biointrusion layer, and a drainage layer. The Fernald disposal facility began accepting wastes in December 1997 (DOE 2000b).

The Weldon Spring disposal facility is also an aboveground structure with a perimeter clean-fill dike. The liner system is composed of clay layers and flexible plastic membranes, a geosynthetic clay layer, and primary and secondary leachate collection systems. The 8-ft-thick cover consists of multiple layers, including a radon barrier of silty clay, a plastic membrane and geosynthetic clay liner, a drainage layer, and a biointrusion layer. The Weldon Spring disposal facility was constructed in the area formerly occupied by chemical plant and production buildings. Temporary storage of wastes was required prior to starting facility operations in 1998 (DOE 1998d).

Fernald and Weldon Spring disposal facilities have large waste volumes to be disposed of in a relatively short time period. Oak Ridge has uncertain waste volume and a longer period for disposal. To facilitate planning, the Oak Ridge disposal facility has been contracted for construction in two phases: an initial 400,000 yd³ and a cell expansion to be determined at a later date. Table 1 provides a summary of pertinent facility parameters of the three disposal facilities.

Table 1. Overview of DOE CERCLA disposal facilities

Site	ROD date	Operating life	Disposal volume (yd ³ × 10 ⁶)	Cell footprint (acres)	Cover thickness (ft)
Oak Ridge	November 1999	2001–2030	0.4–1.7	22–44	16
Fernald	June 1995	1998–2006	2.5	70	8.5
Weldon Spring	September 1993	1998–2001	1.5	44	8

CERCLA = Comprehensive Environmental, Response, Compensation and Liability Act
DOE = U.S. Department of Energy

ft = feet
yd = yard
ROD = Record of Decision

4.2 COST DATA FOR EXISTING CERCLA WASTE DISPOSAL FACILITIES AT OTHER SELECTED SITES

For comparative purposes, costs were separated into four categories: capital, operations, closure, and postclosure. A summary by operation and category is provided in Table 2. All the costs are relative to the waste type, site conditions, and method of implementation.

Table 2. Summary table of burdened unit costs^a

Unit cost (\$/yd ³)	Oak Ridge ^b	Fernald	Weldon Spring
Capital	46.94	63.84	74.22
Operations	46.62	12.03	9.14
Closure	20.08	16.87	7.21
Postclosure (30-year LTSM)	24.22	10.10	32.12
Total	137.86	102.84	122.69

^aReference Cost Engineering Report on Environmental Restoration Waste Disposal Facilities, DOE, February 2000

^bBased on 1.1 million yd³

\$ = dollar
LTSM = long-term surveillance and maintenance
yd = yard

Capital costs include the cost of regulatory (CERCLA)/design documents, procurement, construction, and construction management, including quality assurance (QA)/quality control (QC), oversight, and related overhead and engineering support. Although Oak Ridge forecasts lower capital cost than the other sites, no “lessons-learned” reason was specified in the cost report.

Operating costs include the cost of disposal facility operations, air and groundwater monitoring, leachate management, special-handling of materials, and management oversight. Costs do not include waste excavation, transportation, packaging, or treatment. Operating costs were directly comparable to the disposal rate per period for each facility. Fernald and Weldon Spring are high-volume and short-duration facilities; Oak Ridge is a low-volume and long-duration facility. Therefore, Oak Ridge is the most costly to operate.

Closure costs include cap construction and construction management, including QA/QC, oversight, and related overhead and engineering support. Considering costs on a per-yd³-of-waste basis (although the Oak Ridge facility cover is nearly twice as thick as the Fernald and Weldon Spring covers), Oak Ridge and Fernald costs are approximately equal; Weldon Spring is significantly less than the others. However, considering a cost per landfill-cap-thickness, Fernald is twice the cost of Oak Ridge or Weldon Spring. This could be due to additional closure costs to assure protection of the regional sole source aquifer beneath the Fernald facility.

Postclosure costs (long-term surveillance and maintenance [LTSM]) include air and groundwater monitoring, facility surveillance and maintenance (S&M), leachate management, and reporting. Oak Ridge and Weldon Spring project higher postclosure costs than Fernald.

Long-term protection is a postclosure commitment at each of the three DOE disposal facilities. This commitment begins with completion of the final disposal cell cover and transfer of the closed facility by the operating contractor to DOE. Table 3 identifies postclosure activities for the three DOE disposal facilities. Weldon Spring will depend on a layer incorporated into the disposal cell to passively treat leachate by geochemically attenuating radioactive contaminants. The other sites are expected to actively manage leachate (collection and treatment).

Table 3. Postclosure activities matrix for DOE CERCLA disposal facilities

Site	Environmental monitoring	LTSM	Leachate management	Replacement*	Management and reporting
Oak Ridge	✓	✓	✓	✓	✓
Fernald	✓	✓	✓	✓	✓
Weldon Spring	✓	✓		✓	✓

*Includes replacement of fences, signs, groundwater wells, etc. Does not include replacement of disposal cell.

CERCLA = Comprehensive Environmental, Response, Compensation and Liability Act

DOE = U.S. Department of Energy

LTSM = long-term surveillance and maintenance

DOE Order 5400.5 requires DOE to control properties, such as closed disposal cells, until they can be released for unrestricted use. Because each of these facilities will contain long-lived radionuclides, DOE has committed to extended LTSM. The primary driver for the estimate of postclosure costs is the length of time assumed for the LTSM. Oak Ridge, Fernald, and Weldon Spring have estimated costs for 100, 30, and 35 years of LTSM, respectively. For comparison purposes, costs presented in this section have been standardized to 30 years for each site.

4.3 BASIS FOR WAC

WAC development for a disposal facility is an iterative process that varies from site to site based on state and EPA requirements and interpretations. The focus of this summary is the radiologically-contaminated waste that is anticipated to be generated. For wastes other than radioactive waste, all facilities are expected to operate under the same parameters as other DOE and commercial facilities that dispose of the same wastes. For example, RCRA and the Toxic Substances Control Act (TSCA) requirements would be incorporated into the WAC; additionally, free liquids, pyrophoric materials, incompatible waste streams, etc., will be prohibited, and void spaces will be minimized as waste is placed. WAC considerations for the three DOE facilities are presented in Table 4.

Table 4. WAC for on-site disposal

Site	Primary contaminants	Total U WAC (pCi/g)	Hypothetical receptor location	Time of compliance (years)	Radiological protection standard
Oak Ridge	U, ⁹⁹ Tc	582	Public/facility boundary	0-1000 1000-10 ⁵	1 × 10 ⁻⁵ 1 × 10 ⁻⁴
Fernald	U, ⁹⁹ Tc	713	Public/aquifer beneath facility	0-1000	20 mg/L U 40 CFR 141
Weldon Spring	U, ²³⁰ Th	<2300	N/A	200-1000	40 CFR 192

CFR = Code of Federal Regulations

g = gram

< = less than

L = liter

μg = microgram

mg = milligram

N/A = not applicable

pCi = picocurie

Tc = technetium

Th = thorium

U = uranium

WAC = waste acceptance criteria

4.4 SUMMARY OF POTENTIAL ARARs AND TBCs

Remediation under CERCLA must comply with ARARs identified for the specific response action. Location-specific, action-specific, and chemical-specific ARARs are identified to ensure that human health and the environment are protected. Since each of these disposal facilities will dispose of (or are disposing) waste from uranium enrichment processes, requirements selected as ARARs

at Oak Ridge, Fernald, and Weldon Spring are generally consistent. ARARs and TBC DOE Orders are listed below.

- The radioactive waste management requirements in DOE Order 435.1, "Radioactive Waste Management," and the public protection standards in DOE Order 5400.5, "Radiation Protection of the Public and Environment" were identified as TBCs at Oak Ridge and Fernald. Since Weldon Spring is disposing of 11e(2) waste, both the radioactive waste management requirements and public protection standards in 40 CFR 192 were also identified as ARARs.
- The LLW disposal requirements in 10 CFR 61, U.S. Nuclear Regulatory Commission (NRC), and state regulations were identified as ARARs at Oak Ridge.
- 40 CFR 61, "National Emission Standards for Hazardous Air Pollutants (NESHAPS) for Radionuclides," 40 CFR 260-280, and EPA RCRA requirements or the state equivalent were identified at all three facilities.
- While TSCA requirements are identified as ARARs at Oak Ridge and Weldon Spring, a waiver of the TSCA requirement for a 50-ft buffer between the bottom of the landfill and the top of the water table [40 CFR 761.75(b)(3)] was received for these facilities. Fernald did not require this waiver because TSCA waste was not to be disposed of in the Fernald facility. Additional waivers such as land disposal restrictions for storage or treatment and NESHAPs for asbestos storage were also received at Weldon Spring. Treatment and storage were not included in the scope of on-site disposal at Oak Ridge. Fernald also received a waiver of a state of Ohio requirement prohibiting waste disposal over a sole source aquifer.

Worker protection requirements are not covered by ARARs; therefore, DOE ensures worker safety through a combination of DOE Orders, Occupational Safety and Health Administration (OSHA) requirements, and commercial codes and standards.

5. POTENTIAL ON-SITE DISPOSAL SCENARIO AT PGDP

This chapter uses the summary-level information and assumptions pertaining to the wastes that are predicted to be generated at PGDP discussed in Chapter 3, and information on other DOE on-site disposal facilities discussed in Chapter 4, to formulate a potential on-site disposal scenario at PGDP.

This scenario is solely intended to support the initial assessment by identifying potential disposal facility components and to provide a basis from which to identify the major considerations that are presented in the following chapter. Any subsequent assessment of on-site disposal at PGDP would be included in a future CERCLA evaluation of a site-wide waste management strategy.

Included in this potential disposal scenario are: the expected siting and design requirements, expected on-site facility components, predicted size of the facility, and estimated cost of the facility. In order to evaluate the possibility of constructing one disposal facility that could be expanded to accommodate most of the waste generated through the life cycle of PGDP, two disposal facility sizes are estimated. The smaller has the capacity for only the 600,000 yd³ of CERCLA waste that is predicted from the near-term remediation of PGDP, and the larger includes the additional 2.5 million yd³ of waste predicted from the future D&D of the currently-active gaseous diffusion plant. Therefore, the larger facility would be designed for a total of 3.1 million yd³ of CERCLA waste.

A potential on-site disposal facility at PGDP would be sited and designed in accordance with all applicable technical requirements. The identification of these requirements (ARARs) would be a cooperative effort between DOE and the regulators during the CERCLA evaluation, and approval of the ARARs would be documented by the record of decision (ROD). The ROD would also contain ARAR waivers, as appropriate.

A potential disposal facility would be expected to receive low-level radioactive waste (LLW), hazardous wastes subject to regulation under RCRA, wastes subject to regulation under TSCA, and mixed wastes, which are a combination of LLW and wastes subject to regulation under RCRA and/or TSCA. For this reason, the Kentucky Administrative Requirements (KAR) for solid (401 KAR 048), hazardous (401 KAR 034 and 401 KAR 037), and radiological (902 KAR 100) wastes are potential ARARs. Also, the siting and design of a disposal facility would have to be compliant with the technical requirements of RCRA and TSCA (or receive variances or waivers). DOE Orders, primarily DOE Order 435.1, would impose technical and performance requirements on the facility. An assessment of NEPA values, including ecological, historical and cultural impacts, socioeconomic impacts, and environmental-justice issues would be incorporated, to the extent practicable, into the CERCLA evaluation.

Based on experience at other DOE sites and knowledge of the PGDP Site, the depth to groundwater (DOE 1997) would probably not support construction of a below-grade disposal cell. Therefore, a potential PGDP on-site disposal facility would likely be composed of an aboveground disposal cell surrounded by clean fill dikes. Clean fill dikes would provide stable lateral containment and protect against erosion and inadvertent intrusion by humans or animals. It is anticipated that the PGDP disposal facility would be constructed on a geologic buffer, a clay barrier (either natural or

constructed) that would meet performance requirements to assist in the isolation of waste from the environment.

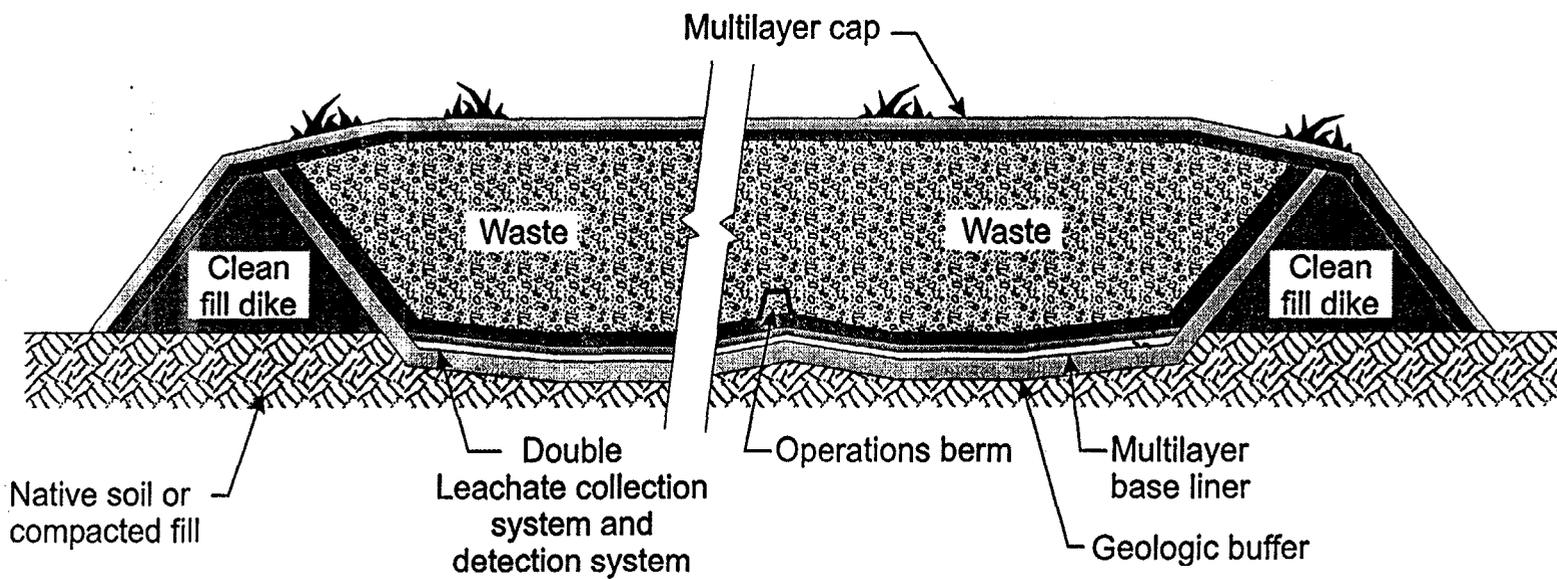
To meet the requirements of RCRA, which would be an ARAR, the waste would be underlaid by a double leachate collection/detection system. This passive drainage system would remove liquids from the bottom of the cell for treatment. The waste cell would be covered with an engineered, multi-layered cover. This cover, probably constructed similar to those covering cells protecting uranium mill tailings sites, would minimize infiltration of water into the cell; deter human, plant, and animal intrusion into the waste; resist erosion; and be capable of being maintained. Figure 1 shows potential PGDP disposal cell design components based on the Oak Ridge on-site disposal facility.

A potential PGDP on-site disposal facility would likely be similar to the Oak Ridge on-site disposal facility. More detail on the Oak Ridge facility is contained in Chapter 7 of *Remedial Investigation/Feasibility Study for the Disposal of Oak Ridge Reservation Comprehensive Environmental Response, Compensation, and Liability Act of 1980 Waste* (DOE 1998c). Figure 2 shows a cross section from the conceptual design of the Oak Ridge on-site disposal facility.

During operations, support facilities such as access control, temporary staging, and decontamination facilities would be located adjacent to the disposal cell. A workforce of up to 100 is predicted during construction. Disposal cell operations are predicted to require about 25 workers. All construction activities and disposal cell operations would be conducted in accordance with applicable health and safety requirements (primarily OSHA).

DOE would conservatively assess performance of the disposal cell using models to predict contaminant levels (dose) at a receptor scenario for a time of compliance that had been agreed to by the regulators. An assessment of the dose (risk) would then be estimated and compared to a risk level also approved by the regulators. Only engineered barriers made of natural materials would be input into this modeling. Using an iterative process, the performance modeling, which would be dependent on the design of the cell, would be used to establish WAC. The WAC would be physical and contaminant-specific limitations on the waste being considered for disposal. (Physical limitations are primarily required to prevent compromising the physical integrity of the disposal cell.) It is assumed that 10 to 20 percent of the waste being generated during remediation would not meet these limitations and would require off-site disposal.

Waste volume estimates from Chapter 3 (600,000 yd³ from the near-term remediation and an additional 2.5 million yd³ from the future D&D of the gaseous diffusion plant) were used to estimate the size of the site for a potential on-site disposal cell at PGDP.



Note: For illustration purposes only



Fig. 1

Potential PGDP on-site disposal cell design components based on the Oak Ridge on-site disposal facility

DOCUMENT ID: 35H830
0125 90/PGDPPA

DRAWING ID:
00-15580.CDR

DRAWING DATE:
June 12, 2000 SB

Based on the volume estimates, a disposal cell of approximately 43 or 79 acres, respectively, would be required. The addition of acreage for a perimeter road and support facilities would bring the total sizes of the site to approximately 70 acres (for the 600,000 yd³ of waste scenario) or 110 acres (for the 3.1 million yd³ of waste scenario).

The cost of a potential disposal facility at PGDP was estimated using unit costs for the three disposal facilities discussed in Chapter 4 (see Table 2). For the 600,000 yd³ of waste scenario, the unit costs for the two lower-volume facilities (Oak Ridge and Weldon Spring) were averaged, with the resulting unit cost of \$130/yd³. This unit cost was multiplied by the 600,000 yd³ to obtain an estimated cost of approximately \$78 million. For the 3.1 million yd³ of waste scenario, the unit cost for Fernald (\$103/yd³) was multiplied by the 3.1 million yd³ to obtain a rough estimate cost of \$319 million. Fernald is the highest-volume of the three facilities and it was thought that its unit costs were most relevant to a high-volume facility at PGDP. The unit cost is lower at Fernald because higher volume yields a cost efficiency.

The reader is cautioned that these are initial estimates and that future site-specific estimates could differ substantially, based on factors such as the cost of facility construction, length of period of operations, method of implementation, and contracting strategy.

6. MAJOR CONSIDERATIONS

This chapter briefly describes and discusses what appear to be the major considerations with respect to potentially constructing an on-site facility for disposal of waste from remediation of the PGDP.

6.1 COST

All three of the DOE facilities discussed in Chapter 4 concluded that on-site disposal was more cost-effective than off-site disposal. The volumes predicted for disposal were between 400,000 and 1.7 million yd³ at Oak Ridge, 2.5 million yd³ at Fernald, and 1.5 million yd³ at Weldon Spring. The volumes predicted at PGDP (600,000 yd³ plus 2.5 million yd³, for a total of 3.1 million yd³) are comparable to the volumes evaluated at the other sites.

In its *Addendum to Remedial Investigation/Feasibility Study for Disposal of Oak Ridge Reservation Comprehensive Environmental Response, Compensation, and Liability Act of 1980*

Waste (DOE 1998c), Oak Ridge performed a sensitivity analysis to reevaluate the results of the on-site versus off-site disposal cost comparison in the RI (RI)/FS (DOE 1998a). The sensitivity analysis indicated that at volumes less than 140,000 yd³, off-site disposal was more cost-effective; at volumes greater than 140,000 yd³, on-site disposal was more cost-effective. The 140,000 yd³ volume is approximately one-quarter of the lower amount predicted for PGDP. Also, cost estimates performed at Oak Ridge indicated that greater total savings would occur for a larger volume of waste (DOE 1998a). Based on this information, it is predicted that on-site disposal of the PGDP remediation waste would be more cost-effective than off-site disposal.

6.2 TRANSPORTATION RISK

Statistically, truck transport of 1.1 million yd³ of Oak Ridge waste to off-site disposal facilities was predicted to result in 111 injuries and ten deaths. Rail transport was predicted to result in nine injuries and less than one death. On-site disposal was predicted to result in about two injuries and less than one death (with these primarily resulting from the transport of wastes ineligible for on-site disposal to off-site disposal facilities) (DOE 1998a).

Risk of injuries and deaths from the transport of remediation wastes to an on-site disposal facility is less than that for transport to off-site disposal facilities. Transportation risk is estimated by multiplying the probability of an injury or death due to an accident (based on mode-specific statistics for a specified area) by the number of miles to be covered. Millions of miles of waste transport would be required for off-site disposal of PGDP waste.

6.3 RELIABILITY OF DISPOSAL OUTLETS

The Oak Ridge evaluation (DOE 1998a) concluded that on-site disposal would provide a greater level of certainty that long-term disposal capacity would be available for ORR waste. In part, this is because state equity issues and reliance on commercial facilities would introduce some uncertainty into the continuing availability of off-site disposal. A similar conclusion could be reached following an evaluation of site-wide management options for PGDP remediation wastes.

6.4 REMEDIATION OF PGDP

The potential reliability and expected lower costs of on-site disposal could make excavation and disposal remedies more cost-effective. However, initial remediation activities at PGDP would

not be able to take full advantage of an on-site disposal facility if sequencing/scheduling of the disposal cell construction is not coordinated with these remediation actions.

6.5 JOBS

Based on an estimate performed in Oak Ridge (DOE 1998a), a workforce of up to 100 would be predicted for construction of an on-site disposal facility at PGDP. This workforce would vary with project phases. Disposal cell operation would be predicted to require about 25 workers.

6.6 ENVIRONMENTAL EQUITY

Agreements among states for the shipment and disposal of wastes involve the issue of environmental equity; that is, the balance of benefits associated with activities that generate waste and the burden of life cycle waste management. Central to equity issues are the elements of reciprocity, equitable federal allocation of monetary resources, and protection of human health and the environment. For example, stakeholders in states that dispose of DOE waste and states along transportation routes to these disposal facilities may assert that Kentucky should retain the DOE waste generated from Kentucky-based operations. Conversely, Kentucky stakeholders may argue that all this waste should not be disposed of in the state because it was generated by a federal agency, and all states have benefited directly or indirectly from PGDP operations.

6.7 STAKEHOLDER ACCEPTANCE

The stakeholders would be included throughout the entire CERCLA evaluation of a site-wide remediation waste management strategy.

6.8 SCHEDULE

The PGDP FFA includes a schedule that has been agreed to by DOE and the regulators for the CERCLA remediation of the plant. Based on past experience at other DOE sites, it appears that a disposal facility at PGDP could be operational early in calendar year 2004. Adherence to the current FFA schedule would mean some waste that could be disposed of on site would either be disposed of off site or require storage until on-site capacity would be available.

6.9 SUITABILITY OF PGDP WASTES FOR ON-SITE DISPOSAL

It would not be cost-effective to construct a facility at PGDP that could not receive a high percentage of the PGDP waste.

A more precise estimate of the percentage of PGDP waste that could be disposed on site would be prepared during an FS. This estimate would use available information on the predicted waste, conceptual design of a facility, an agreed-to receptor location and exposure scenario, an assumed method of WAC attainment, and available geologic and hydrologic data for PGDP. The initial estimate would then be used in an evaluation of the cost-effectiveness of on-site disposal at PGDP. The initial estimate of the percentage of PGDP waste that could be disposed of on site would be refined as the facility design advanced and RIs at OUs were generating actual characterization data on the waste to be generated.

6.10 SITING/DESIGN REQUIREMENTS

Two general areas of DOE land were considered in this initial assessment: the 748 acres inside the current plant security fence and the remaining DOE-owned acreage outside the fence. There are challenges to be met in identifying a suitable site location in either general area. For example, locating a site within the plant security fence may require temporary storage of remediation wastes and solving other sequencing/logistic problems. It is possible that potentially-suitable site locations may be found on DOE-owned land outside the security fence. However, any such sites not in the buffer zone (i.e., in WKWMA) are likely to be of concern to regulators and public stakeholders. A comprehensive siting study is part of the detailed, next-step evaluation proposed.

Two of the primary requirements to be considered in siting/design of a potential facility are seismic activity and the presence of floodplains/wetlands. In general, based on experience at other facilities and an initial evaluation of conditions at PGDP, siting and design requirements would not be expected to preclude the siting of a potential disposal facility on PGDP.

It is recognized that PGDP is proximate to the seismically-active New Madrid fault zone. However, DOE has successfully, recently designed and constructed an on-site landfill at PGDP. In this endeavor, questions concerning the landfill design's ability to resist a deep seismic failure were satisfactorily addressed (DOE 1995). It is acknowledged that the "design" earthquake for a potential on-site CERCLA waste disposal facility may be more stringent than that for the landfill. Additionally, the more hazardous nature of the wastes disposed in the CERCLA waste disposal facility would have to be considered in the seismic design. Any CERCLA assessment for potential on-site disposal would have to address these design issues in detail.

DOE requested assistance from the U.S. Army Corps of Engineers in conducting investigations of the presence of wetlands and delineation of 100-year and 500-year floodplains at PGDP (Department of the Army 1994). The results of these studies would form the basis of a siting study for a potential disposal facility at PGDP. Based on experience at other DOE facilities, particularly Oak Ridge, Fernald and Weldon Spring, it would appear that hydrologic conditions at PGDP are not such that they would automatically rule out siting of a potential disposal facility.

7. CONCLUSIONS

DOE has concluded that an in-depth, site-specific study of a site-wide remediation waste disposal strategy to address the disposal of the approximately 600,000 yd³ of waste predicted to be generated during the near-term PGDP environmental remediation and the additional 2.5 million yd³ expected to be generated during the future D&D of PGDP is warranted. Additionally, DOE proposes to conduct the study using the CERCLA evaluation and documentation process. This evaluation will not focus solely on on-site disposal, but rather on a strategy for site-wide waste disposal management, including consideration of both on-site and off-site disposal. The expected evaluation process, including a description of anticipated activities and initial assumptions, is provided in the Appendix to this initial assessment.

If on-site disposal is the remedy selected in the ROD, it is predicted that a facility could be accepting waste early in calendar year 2004.

8. REFERENCES

- Bechtel Jacobs Co. (Bechtel Jacobs Company LLC). 2000. *Paducah Site - 1998 Annual Environmental Report*. BJC/PAD-98. Kevil, KY.
- DOE (U.S. Department of Energy). 2000a. *Cost Engineering Report on Environmental Restoration Waste Disposal Facilities*. Washington, DC.
- DOE (U.S. Department of Energy). 2000b. Updated.
3/2000.<http://www.fernald.gov/cleanupProj/OSDF.html>.

- DOE (U.S. Department of Energy). 1999a. *Engineering Evaluation/Cost Analysis for Drum Mountain at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*. DOE/OR/07-1848&D2. Oak Ridge, TN.
- DOE (U.S. Department of Energy). 1999b. *Feasibility Study Workplan for the Groundwater Operable Unit at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*. DOE/OR/07-1757&D1. Kevil, KY.
- DOE (U.S. Department of Energy). 1999c. *Site Management Plan for Paducah Gaseous Diffusion Plant, Paducah, Kentucky*. (DOE/OR/07-1780&D2). Annual report for fiscal year 1999. Paducah, KY.
- DOE (U.S. Department of Energy). 1998a. *Remedial Investigation/Feasibility Study for the Disposal of Oak Ridge Reservation Comprehensive Environmental Response, Compensation, and Liability Act of 1980 Waste*. DOE/OR/02-1637&D2. Oak Ridge, TN.
- DOE (U.S. Department of Energy). 1998b. *A Comparative Analysis of DOE Environmental Restoration Disposal Facilities*. Draft. ER Disposal Group. Oak Ridge, TN.
- DOE (U.S. Department of Energy). 1998c. *Addendum to Remedial Investigation/Feasibility Study for the Disposal of Oak Ridge Reservation Comprehensive Environmental Response, Compensation, and Liability Act of 1980 Waste*, DOE/OR/02-1637&D2/A1. Oak Ridge, TN.
- DOE (U.S. Department of Energy). 1997. *Groundwater Conceptual Model for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/06-1628&D0. Kevil, KY.
- DOE (U.S. Department of Energy). 1996. *Charting The Course: The Future Use Report*. DOE/EM-0283. Washington, DC.
- DOE (U.S. Department of Energy). 1995. Letter from J. C. Hodges, Site Manager, Paducah Site Office, to C. P. Haight, Director, Division of Waste Management, Kentucky Department for Environmental Protection: Narrative of Deep Seismic Failure Analysis Associated with the New Solid Waste Landfill at the PGDP (November 9).
- U.S. Department of the Army. 1994. *Environmental Investigations at the PGDP and Surrounding Area*. Waterways Experiment Station, Vicksburg, MS and Engineer District Nashville, Nashville, TN.

APPENDIX

**PROPOSED CERCLA EVALUATION OF
SITE-WIDE WASTE DISPOSITION STRATEGY ALTERNATIVES
FOR PGDP REMEDIATION WASTES**

PROPOSED CERCLA EVALUATION OF SITE-WIDE WASTE DISPOSITION STRATEGY ALTERNATIVES FOR PGDP REMEDIATION WASTES

DOE proposes to conduct an evaluation of a site-wide waste disposition strategy for management of waste predicted to be generated by the remediation of PGDP, using the CERCLA evaluation and documentation process. Disposal options, including both on-site and off-site disposal, will be identified and used to assemble disposal alternatives that will be evaluated using the nine CERCLA criteria. This Appendix presents the basis of the CERCLA evaluation being proposed and describes the tasks expected to support the evaluation. Also included are the initial assumptions used to define the scope of the CERCLA evaluation.

BASIS OF THE CERCLA EVALUATION

The CERCLA evaluation that will be used to assess a site-wide waste disposition strategy for remediation wastes at PGDP will be similar to the CERCLA evaluation conducted by DOE in Oak Ridge, Tennessee. The evaluation conducted by DOE in Oak Ridge is considered relevant to PGDP because it is the most recent such evaluation performed; it was conducted in EPA Region 4; it was conducted at a site that has shallow groundwater and receives abundant rainfall; and the applicable requirements for siting, design, and performance are anticipated to be similar to PGDP (in many cases, identical). Some aspects of the Fernald evaluation may also need to be incorporated because, like PGDP, Fernald is situated above an aquifer that provides drinking water to private and residential users.

CERCLA TASK DESCRIPTIONS

The following are brief descriptions of the key tasks expected to comprise the proposed CERCLA evaluation:

- *RI/FS*—the RI will include information regarding the physical environment, the estimated volumes of remediation wastes to be disposed, and siting studies performed. The RI work will primarily involve the collection and correlation of information available in other forms and reports. Limited field investigations may also be performed.

The FS will evaluate management alternatives for the remediation and D&D waste. The remedial action objectives (RAOs) are expected to be similar to the RAOs developed for

the Oak Ridge evaluation. The FS will be developed at a level of detail sufficient to select a preferred alternative from three expected alternatives. The alternatives are expected to be no action, off-site disposal, and on-site disposal (which likely would include the off-site disposal of some wastes that cannot be disposed of on site). The RI/FS will identify ARARs and TBCs, which are expected to be similar to the ARARs and TBCs approved during the Oak Ridge evaluation. Disposal alternatives will be developed, screened, and evaluated during detailed analysis.

The content and format of this RI/FS may deviate from standard guidance because of the nature of the evaluation, but it is expected to be similar to *Remedial Investigation/Feasibility Study for the Disposal of Oak Ridge Reservation Comprehensive Environmental Response, Compensation, and Liability Act of 1980 Waste* (DOE 1998a). An evaluation of NEPA values will be incorporated into the CERCLA process in accordance with DOE policy.

- *RI/FS support studies*—These studies will verify predicted waste volumes from both the near-term remediation of PGDP and future D&D of the currently-active gaseous diffusion plant using information from previous and ongoing investigations; assemble and present relevant characterization data from stored and future-generated wastes; identify and screen potential sites for an on-site disposal facility; and present a conceptual disposal cell design and its draft WAC. (Characterization data on stored waste may be used only to support assessments in the event that it is determined to be representative and adequate characterization data do not exist for future-generated waste.)

A draft hazard categorization will be performed in accordance with DOE Order 5480.23, "Nuclear Safety Analysis Reports"; DOE Order 5481.1b, "Safety Analysis and Review System"; DOE Standards; DOE-EM-STD-5502-94, "DOE Limited Standard, Hazard Baseline Documentation"; and DOE-STD-1027-92, "Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports." This hazard categorization will estimate releases of contaminated materials to the environment during waste disposal operations. These predicted releases will be compared to predetermined limits to provide reasonable assurance that accidental releases will not produce significant risks to the environment or the health of exposed workers.

The effort to identify a potential disposal facility site will initially concentrate on the acreage for a facility sized to dispose of waste from both the near-term remediation of PGDP plus the future D&D of the currently-active facilities (a total of 3.1 million yd³). If a 110-acre site cannot be identified, the waste volume from the future D&D will be de-

coupled from the near-term remediation waste and the effort will continue to identify a 70-acre site to dispose of only the waste from the near-term remediation (approximately 600,000 yd³).

- *Public involvement*—DOE will routinely inform the public of progress in development and analysis options for disposing of the wastes generated by the remediation of PGDP. To achieve this objective, DOE will seek advice from the PGDP Site-Specific Advisory Board; provide status updates at stakeholders' meetings; and solicit formal public comment through the CERCLA process. DOE will also provide fact sheets, articles, and news releases, when appropriate. These activities will continue throughout the CERCLA process.
- *Pre-design studies*—These studies will consist of field and laboratory activities and will be conducted in a phased approach with the scope of each subsequent phase dependent on the results of the previous phase. Work to be done in the pre-design study will cover the general categories of geological compatibility of the sites and engineering performance characteristics of the site materials including soil characteristics for the cell area and any soil borrow area.
- *Composite analysis*—DOE Order 435.1, "Radioactive Waste Management," requires an assessment of the potential contribution of radioactive contamination to a hypothetical public receptor from DOE disposal facilities when combined with the potential contributions other underground sources of radioactive contamination in the area. A composite analysis will be developed to perform this assessment and will be reviewed by both DOE and the regulators.
- *Proposed plan*—This document will present the preferred waste disposition strategy and, if it includes on-site disposal, will identify the proposed facility location.
- *ROD*—This document will incorporate the results of the review of the proposed plan and present the selected waste disposition alternative.

ASSUMPTIONS

The following are assumptions used in defining the scope of the CERCLA evaluation of a site-wide remediation waste disposition strategy for the PGDP remediation waste:

- The CERCLA evaluation and documentation process will be followed to evaluate alternatives for the management of PGDP remediation waste. NEPA values will be incorporated into the evaluation process according to DOE policy. D&D of the currently-active gaseous diffusion facilities will be performed under CERCLA.
- Protection of human health and the environment will be ensured using CERCLA guidelines. Long-term performance of a potential on-site disposal facility will consider functional performance. Perpetual institutional controls and a disposal cell cover that complies with 10 CFR 61 will prevent direct intrusion into the waste. Therefore, that hypothetical exposure scenario will not be evaluated.
- In accordance with DOE Order 435.1, and consistent with modeling performed at Fernald, the time of compliance for an on-site disposal facility at PGDP will be 1000 years. The WAC will be developed based on this 1000-year period.
- The selected alternative must meet ARARs and pertinent TBCs or be capable of obtaining waivers of requirements that cannot be satisfied.
- On-site disposal will be considered an "on-site" remedy under CERCLA. Only substantive requirements will be applicable to the alternative. Administrative procedures, such as RCRA permitting, will not be required.
- Compliance with the WAC for waste disposal facilities will be the responsibility of waste generators (the OUs). Therefore, treatment and treatment costs will not be addressed in this evaluation.
- Only minor RI fieldwork (such as sampling and analysis for waste characterization and drilling and sampling for site suitability) may be performed for the RI/FS. However, additional data will likely be required to support predesign activities.
- Only wastes generated by the near-term remediation of PGDP and the future D&D of the currently-active gaseous diffusion facilities will be included in the CERCLA evaluation. Non-CERCLA wastes, such as legacy (stored) and operations wastes; DOE wastes

generated outside Kentucky; waste forms prohibited from shallow land disposal (such as liquids); and waste types prohibited by regulations (such as transuranic wastes) will not be included.

- Consistent with the approach used for Oak Ridge, a volume-weighted, sum-of-fractions approach to waste acceptance will be included in the PGDP on-site disposal alternative. This approach to waste acceptance is described in Chapter 3 of *Addendum to Remedial Investigation/Feasibility Study for Disposal of Oak Ridge Reservation Comprehensive Environmental Response, Compensation, and Liability Act of 1980 Waste* (DOE 1998c).
- One conceptual design will be developed for the on-site disposal alternative. It will have the capability to dispose of the approximately 600,000 yd³ of waste predicted during the near-term remediation of PGDP. It will have a contingency for expansion to dispose of the approximately 2.5 million yd³ of additional waste predicted during future D&D of the currently active gaseous diffusion facilities.

If the FFA schedule protocol is maintained for the CERCLA-process evaluation, and if on-site disposal is a component of the remedial alternative selected in the ROD, it is predicted that a facility could be accepting waste in early calendar year 2004.

