

**DEPARTMENT OF ENERGY
ANNUAL REPORT ON THE STATUS OF
ENVIRONMENTAL, SAFETY, AND HEALTH
CONDITIONS AT THE PADUCAH AND PORTSMOUTH
GASEOUS DIFFUSION PLANTS
FOR FISCAL YEAR 1999**



**U.S. Department of Energy
Oak Ridge Operations
Oak Ridge, Tennessee 37830**

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U.S. Department of Energy
Oak Ridge Operations
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ACRONYMS

AEA	Atomic Energy Act of 1954, as amended
AHA	Activity Hazard Analyses
AOC	Area of Concern
ATSDR	Agency for Toxic Substances and Disease Registry
CAS/CMS	Cleanup Alternatives Study/Corrective Measures Study
CAAS	Criticality Accident Alarm System
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	<i>Code of Federal Regulations</i>
CMI	corrective measures implementation
CSOU	Comprehensive Sitewide Operable Unit
CY	calendar year
D&D	decontamination and decommissioning
DF&O	Director's Findings and Orders
DMSA	DOE Material Storage Area
DNFSB	Defense Nuclear Facilities Safety Board
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DP	Office of Defense Programs
DUF ₆	depleted uranium hexafluoride
DU	Depleted Uranium
EA	Environmental Assessment
EE/CA	Engineering Evaluation and Cost Analysis
EF	Enrichment Facilities
EIS	Environmental Impact Statement
EM	Environmental Management (when referring to the program)
EM	Office of Environmental Management (when referring to DOE Program Office)
EPA	Environmental Protection Agency
EPAct	Energy Policy Act of 1992
ER	environmental restoration
ES&H	environmental, safety, and health
ETTP	East Tennessee Technology Park
FEMP	Fernald Environmental Management Project
FFA	Federal Facility Agreement
FFCA	Federal Facility Compliance Agreement
FS	Feasibility Study
FY	fiscal year
GDP	gaseous diffusion plant
HEU	highly enriched uranium
IGWMP	Integrated Groundwater Monitoring Plan
ISCOR	in situ chemical oxidation and recirculation
ISMS	Integrated Safety Management System
ITRD	Innovative Treatment Remediation Demonstration
KDEP	Kentucky Department for Environmental Protection

KPDES	Kentucky Pollutant Discharge Elimination System
LANL	Los Alamos National Laboratory
LEU	low-enriched uranium
LWC	lost workday case
MD	Office of Fissile Materials Disposition
M&I	management and integration
MINATOM	Russian Federation's Ministry of Atomic Energy
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
NCS	Nuclear Criticality Safety
NCSA	Nuclear Criticality Safety Approval
NCRP	National Council on Radiation Protection and Measurements
NE	Office of Nuclear Energy, Science and Technology
NEPA	National Environmental Policy Act
NN	Office of Nonproliferation and National Security
NOV	Notice of Violation
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRC	U.S. Nuclear Regulatory Commission
NTS	Noncompliance Tracking System
NU	normal uranium
O&M	Operations and Maintenance
OAC	Ohio Administrative Code
ORA	Operational Readiness Assessment
ORO	Oak Ridge Operations
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
OVM	Organic Vapor Monitor
PAAA	Price-Anderson Amendments Act
PACE	Paper, Allied-Industrial, Chemical, and Energy Workers International Union
PCB	polychlorinated biphenyl
PEIS	Programmatic Environmental Impact Statement
PEL	Permissible Exposure Limit
PGDP	Paducah Gaseous Diffusion Plant
PORTS	Portsmouth Gaseous Diffusion Plant
PPO	Permanent Presence Office
PSAP	Personnel Security Assurance Program
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RIIs	recordable illnesses and injuries
RO	Regulatory Oversight
ROA	Regulatory Oversight Agreement
ROD	Record of Decision
RWP	Radiological Work Permit
SAR	Safety Analysis Report
SER	Safety Evaluation Report

SPIRA	Special Applications Portable Infrared Analyzer
SSR	site safety representative
STOP	Safety Team of Paducah
SWMU	solid waste management unit
TCE	trichloroethylene
TCLP	Toxicity Characteristic Leaching Procedure
TRE	Toxicity Reduction Evaluation
TSCA	Toxic Substances Control Act
TUa	Toxicity Units Acute
UF ₆	uranium hexafluoride
UMC	Uranium Management Center
USEC	United States Enrichment Corporation
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound
WAC	Weapons Authorization Card
WAG	Waste Area Group
WM	waste management

EXECUTIVE SUMMARY

The Energy Policy Act of 1992 (EPAct) amended the Atomic Energy Act of 1954 to require that the U.S. Department of Energy (DOE) transfer or lease certain functions associated with its uranium enrichment operations to the United States Enrichment Corporation (USEC), a government corporation created pursuant to the EPAct. In addition, the EPAct required that regulatory oversight authority over the leased portions of the Gaseous Diffusion Plants (GDPs) be transferred from DOE to the U.S. Nuclear Regulatory Commission (NRC) and that USEC prepare a plan for transferring ownership of USEC to private investors within 2 years of the lease date. In furtherance of this mandate, DOE leased certain portions of the Paducah Gaseous Diffusion Plant (PGDP) near Paducah, Kentucky, and the Portsmouth Gaseous Diffusion Plant (PORTS) near Piketon, Ohio, to USEC on July 1, 1993. Transfer of regulatory oversight authority for the leased portions of the GDPs from DOE to NRC occurred on March 3, 1997. On July 28, 1998, approximately 16 months after transfer of regulatory oversight authority from DOE to NRC, USEC became a private corporation, USEC, Inc., through an initial public offering.

This report, covering fiscal year (FY) 1999, is the third annual report on the status of environmental, safety, and health (ES&H) conditions of the nonleased portions of the GDPs for which DOE retains regulatory oversight responsibility. It is prepared in furtherance of the EPAct mandate that NRC consult with DOE and the U.S. Environmental Protection Agency in preparing a report to Congress on the status of ES&H conditions at DOE's gaseous diffusion uranium enrichment facilities. This report also provides information on the status of DOE ES&H initiatives for the GDPs during FY 1999 including (1) activities of the highly enriched uranium (HEU) refeed, suspension and removal,

and transparency implementation programs conducted by DOE; (2) activities to develop and implement plans and strategies for the long-term management of DOE-owned depleted uranium hexafluoride (DUF_6) and other uranium materials; and (3) other DOE ES&H initiatives. The report also discusses the status of the DOE Regulatory Oversight Program for designated leased, but not NRC-certified, portions of PORTS as well as modifications to the *Lease Agreement Between the United States Department of Energy and the United States Enrichment Corporation* for FY 1999. The report briefly describes the Memorandum of Understanding employed by DOE and NRC to ensure effective and efficient cooperation in their joint oversight of activities conducted at the GDPs.

This annual report demonstrates the effectiveness of ES&H protection at the GDPs under DOE regulatory oversight. During FY 1999, environmental releases and discharges for which DOE was responsible at PGDP and PORTS were within established regulatory limits except for three Kentucky Pollutant Discharge Elimination System permit exceedances at one outfall at PGDP. These exceedances were related, in part, to runoff from the cylinder storage yards containing painted DUF_6 cylinders. Although these permit exceedances had no significant environmental impact, DOE implemented a Toxicity Reduction Evaluation plan. No additional exceedances of this nature occurred during the remainder of the reporting period.

During FY 1999, the Environmental Restoration (ER) and Waste Management (WM) programs at PGDP and PORTS met all regulatory deadlines. PGDP and PORTS continued making good progress toward eventual site cleanup through their ER and WM activities. For example, PGDP (1) completed remedial actions for Waste Area Groups 1 and 7, which include the C-746-K inactive sanitary landfill and other areas; (2) treated approximately 174 million gallons of contaminated groundwater;

(3) completed the remediation process on two 10,000-gallon underground storage tanks installed during the 1950s; (4) obtained regulatory approval for the remediation plans for application of the Lasagna™ soil remediation technology at Solid Waste Management Unit 91; (5) treated, shipped, or disposed of more than 4,935 tons of waste; and (6) initiated engineering evaluations for the removal of 65,000 tons of scrap metal. During the same period, PORTS (1) completed field activities on three ER pilot projects to evaluate different treatment technologies; (2) completed a phytoremediation project; (3) began capping a landfill; (4) disposed of approximately 2,000 tons of sludge and soils from remediation projects; and (5) treated or recycled approximately 230 tons of waste and wastewater.

This annual report also provides information reflecting the status of safety and health conditions for those areas at the GDPs under DOE regulatory oversight. The calendar year 1998 radiation exposure averages for PGDP and PORTS personnel were 10 mrem and 0.95 mrem per person per year, respectively. These averages should be contrasted with the average annual background radiation levels per person of 30 mrem from cosmic radiation, 30 mrem from terrestrial sources, 40 mrem from food, 200 mrem from naturally occurring radon sources, and the 5,000 mrem occupational exposure limit set by federal law in 10 CFR 835. In FY 1999, DOE and its prime contractors and subcontractors at PGDP had five recordable injuries and illnesses (RIIs) but no Lost Workday Cases (LWCs). During this period, DOE and its prime contractors and subcontractors at PORTS had eight RIIs, including two LWCs.

In FY 1999, 22 incidents at PGDP and 15 incidents at PORTS associated with activities in the nonleased areas were significant enough to be classified as reportable occurrences by DOE. At PGDP, no harm to the environment or to people resulted from these incidents. At PORTS, one

incident resulted in minor injuries to a contractor. Important lessons learned were derived from these incidents, applied at the GDPs, and distributed throughout the DOE complex.

During FY 1999, DOE continued with major initiatives to enhance safety and environmental protection at both PGDP and PORTS. In response to an initiative of the President and the Secretary of Energy, DOE's Enrichment Facilities (EF) Program completed the removal of DOE-owned HEU materials stored at the PORTS site. The removal of these HEU materials significantly reduces ES&H risks and safeguards and security operating costs at PORTS. DOE also continued with initiatives related to the storage of cylinders containing DUF₆. In April 1999, DOE issued a final Programmatic Environmental Impact Statement (PEIS) that identified the recommended alternative for dispositioning the inventory of DUF₆ in storage at PGDP, PORTS, and the East Tennessee Technology Park (formerly K-25) in Oak Ridge, Tennessee. The PEIS was followed by issuance of the Record of Decision in August 1999. DOE's EF Program is responsible for management of DUF₆, a byproduct of uranium enrichment, generated at PGDP and PORTS from the start of production in the 1950s. Also in FY 1999, the DOE Oak Ridge Operations Office created the Uranium Management Center (UMC) to serve as the single focal point for the management of all DOE potentially reusable uranium materials throughout the DOE complex. The UMC will provide a coordinated, cost-effective, and efficient program for management of the nation's surplus uranium resources.

During FY 1999, certain DOE EF, ER, and WM program activities in the DOE nonleased areas at the GDPs continued to experience funding reductions or limitations that impact the performance of ES&H-related work. Although no Notices of Violation (NOVs) or noncompliances have been identified as a result of funding reductions, these situations are impacting the EF

DUF₆ cylinder management project, cylinder storage yard construction, and schedules for completion of ER and WM site cleanup work at the GDPs.

In addition to its oversight of the nonleased areas of PGDP and PORTS, DOE regulates USEC HEU-related activities in designated leased, but not NRC-certified, areas at PORTS. During FY 1999, DOE conducted more than 60 inspections of HEU-related activities in these areas. As a result of these inspections, DOE issued one NOV to USEC. The NOV involved a failure to meet Nuclear Criticality Safety (NCS) requirements. During the same period, DOE issued three noncited violations to USEC. These noncited violations involved failure to meet NCS and emergency preparedness requirements. Because of USEC's prompt and aggressive corrective actions, DOE exercised enforcement discretion and categorized these violations as noncited violations. In addition to its inspection activities, DOE reviewed several USEC-proposed plant changes at PORTS and Compliance Plan

changes for both GDPs and performed the necessary safety evaluations before approving these changes. In response to FY 1999 Congressional legislation, actions were taken to extend, under the Regulatory Oversight Agreement between DOE and USEC, DOE's oversight of the federal arming and arrest authority for the plant protective forces at both GDPs. Finally, DOE continued effective and responsible administration of the Lease Agreement between DOE and USEC during FY 1999.

In conclusion, this report presents the determination that in those instances where regulatory violations occurred, actions were taken to notify appropriate authorities, identify the cause of the violation, and institute corrective measures. Such responsiveness enabled DOE to maintain adequate and effective ES&H protection in both the nonleased and leased, but not certified, areas at the GDPs for which it retained regulatory oversight responsibility during FY 1999.

1. BACKGROUND

For more than 50 years, the U.S. Department of Energy (DOE) and its predecessor agencies operated the nation's uranium enrichment enterprise at facilities near Oak Ridge, Tennessee; Paducah, Kentucky; and Portsmouth, Ohio. The original purpose of the uranium enrichment operations, which are regulated under the Atomic Energy Act of 1954 (AEA), as amended, was to supply enriched uranium to the U.S. nuclear weapons programs. Today, however, the uranium enrichment operations produce enriched uranium primarily for commercial customers to operate nuclear power plants. The Oak Ridge Gaseous Diffusion Plant, which was built during the World War II Manhattan Project, ceased production in 1985 and was permanently shut down in 1987. The Paducah Gaseous Diffusion Plant (PGDP), located in Paducah, Kentucky, which began operations in 1952, and the Portsmouth Gaseous Diffusion Plant (PORTS), located near Piketon, Ohio, which began operations in 1954, operated under DOE and its predecessor agencies until July 1993, at which time the United States Enrichment Corporation (USEC) assumed responsibility for uranium enrichment operations at both facilities.

On October 24, 1992, the Energy Policy Act of 1992 (EPAct) amended the AEA to require that DOE transfer certain functions associated with its uranium enrichment operations to USEC, a government corporation created pursuant to the EPAct. On July 1, 1993, in furtherance of this mandate, DOE leased to USEC those portions of the gaseous diffusion plants (GDPs) that are required for uranium enrichment. In the *Lease Agreement Between the United States Department of Energy and the United States*

Enrichment Corporation (hereinafter referred to as the Lease), dated July 1, 1993, and in other subsequent agreements, DOE and USEC established the roles and responsibilities for each organization at both GDPs.

To promote the privatization of DOE's uranium enrichment operations, the EPAct also required that within 2 years after the transition date of July 1, 1993, USEC prepare a plan for transferring ownership of USEC to private investors. Pursuant to this requirement, USEC submitted a plan entitled *Plan for the Privatization of the United States Enrichment Corporation* to the President and Congress in June 1995. On April 26, 1996, the USEC Privatization Act was enacted.¹ This act directed the USEC Board of Directors to establish a for-profit private corporation to receive the assets and obligations of USEC, to continue the operations of the government corporation, and to secure the maximum proceeds to the United States from the sale of the United States' interest in USEC. On July 28, 1998, USEC became a private corporation, USEC Inc., through an initial public offering.

The EPAct assigns responsibility to DOE for the payment of any costs of decontamination and decommissioning (D&D), response actions, or corrective actions at the GDPs related to preexisting conditions (i.e., conditions existing before lease of the GDPs to USEC). With this assignment, DOE retains responsibility for environmental restoration and legacy waste management at the GDP sites and for the operation of the nonleased facilities used for the storage of DOE-owned source and special nuclear material such as the cylinder storage yards for

¹42 U.S.C. § 2297(h).

depleted uranium hexafluoride (DUF₆) generated before July 1, 1993.²

The EAct also required that regulatory oversight authority over the leased portions of the GDPs be transferred from DOE to the U.S. Nuclear Regulatory Commission (NRC). This transfer occurred on March 3, 1997. However, under the EAct, DOE retains possession of, and regulatory responsibility for, all highly enriched uranium (HEU) and oversight authority over the nonleased portions of the GDPs.

1.1 REGULATORY RESPONSIBILITIES

The EAct assigns safety and safeguards and security regulatory responsibility at the leased (i.e., USEC-operated) portions of the GDPs involving low-enriched uranium (LEU) activities to NRC. In furtherance of this assignment, the EAct required that within 2 years of the date of its enactment, NRC establish by regulation (1) safety and safeguards and security standards for the GDPs and (2) a certification process to ensure that USEC complies with these standards. This certification process is in lieu of any requirement for a license. Thus, the EAct made NRC regulation of the GDPs conditional on the issuance of new regulations, which were promulgated in September 1994. However, the EAct required DOE to lease the GDPs to USEC on July 1, 1993, more than a year before the

deadline for establishing safety and safeguards and security regulations. This schedule created an interim period between the lease of the GDPs to USEC and assumption of regulatory oversight by the NRC on March 3, 1997. During this period, there was a need for continued regulatory oversight of safety and safeguards and security at the GDPs until NRC assumed regulatory oversight responsibility. Consequently, DOE developed a Regulatory Oversight Agreement (ROA) with USEC that became the basis for DOE oversight of safety and safeguards and security for the leased areas of the GDPs during this period.

The ROA consists of those performance-based standards extracted from the DOE Orders that are related to nuclear safety and safeguards and security. These standards are considered essential for continued safe and secure operation of the GDPs. The ROA is included as a part of the Lease (Exhibit D to the Lease), and its standards are commensurate with the standards that were promulgated by NRC in Title 10 of *Code of Federal Regulations* (CFR), Part 76 (10 CFR 76), "Certification of Gaseous Diffusion Plants." Originally used to regulate the USEC-leased portions of the GDPs during the interim period, the ROA continues to be used by DOE to regulate HEU-related activities at PORTS and will be used to regulate the federal arming and arrest authority of the protective force personnel at both GDPs beginning in fiscal year (FY) 2000. (See Section 2.3.1.) The ROA also contains provisions for DOE appraisals and inspections of the leased facilities, for issuance of Notices of Violation (NOVs) in response to failures to meet ROA standards, and for USEC self-assessments of compliance with ROA standards. Provisions also are included for enforcement actions—including civil penalties and curtailment or shutdown of operations—in response to violations. Because the ROA requirements were deemed adequate for continued safe and secure operation of the GDPs, DOE exempted USEC

²*Ibid.* With the signing of the USEC Privatization Act, the liability of the United States and the Secretary of Energy was modified. The United States assumed responsibility for liabilities arising out of the operation of USEC until the date of privatization [unless otherwise provided in a Memorandum of Agreement (MOA)]. The disposal of depleted uranium generated by USEC between July 1, 1993, and the date of privatization is the responsibility of the Secretary of Energy. Pursuant to a June 30, 1998, MOA between DOE and USEC, DOE agreed to accept additional depleted uranium generated by USEC after privatization. (See Sections 6.1.3 and 6.2.3.)

and the leased portions of the GDPs from the regulations that DOE promulgated to implement the Price-Anderson Amendments Act (PAAA).

The EAct also made provision for the possibility that USEC initially might not be able to comply with the safety and safeguards and security standards established by NRC. To address this contingency, the EAct permitted NRC to approve continued USEC operation of the GDPs if NRC approved DOE-prepared plans³ for bringing the GDPs into compliance with any unsatisfied provisions of the NRC regulations. On November 26, 1996, NRC certified USEC's operation of the GDPs to be in compliance with 10 CFR 76 with the exception of the noncompliances identified in the NRC-approved Compliance Plans. Following a transition period, NRC began regulation of most USEC operations in the leased areas at the GDPs on March 3, 1997.

DOE retains responsibility for the environmental, safety, and health (ES&H) protection and safeguards and security for the portions of PGDP and PORTS that are not leased to USEC and for those portions of PORTS that are leased to USEC that contain HEU material. Thus, at PGDP, regulatory oversight responsibility is divided into two programs: (1) NRC oversight of leased areas and (2) DOE oversight of nonleased areas. At PORTS, regulatory oversight responsibility is divided into three programs based on the location and type of activity being performed. These consist of (1) NRC oversight of leased areas, (2) DOE oversight of leased areas involving HEU, and

(3) DOE oversight of nonleased areas. In the near future, DOE will assume responsibility for interim regulation of the federal arming and arrest authority of the protective force personnel at PGDP and PORTS under the ROA. (See Section 2.3.1.) Although regulatory responsibilities at the GDPs are divided between DOE and NRC, DOE maintains overall ownership responsibilities for the sites.

DOE regulates nonleased areas at the GDPs under DOE Orders and applicable PAAA regulations. DOE regulates HEU-related activities that occur in designated leased areas at PORTS (i.e., in Buildings X-326 and X-705) under the ROA. It will continue to regulate the HEU-related activities in designated leased areas under the ROA until (1) all the HEU material has been downblended (diluted) into LEU in the PORTS LEU cascade, (2) HEU refeed activities are completed, (3) all cylinders that contain HEU material are cleaned or shipped offsite, and (4) the associated areas are transitioned to NRC regulation. The HEU refeed activities in the designated leased area of the X-326 Building were completed and the area was transitioned to NRC regulation in CY 1998. All designated leased areas where HEU-related activities occur are scheduled to transition to NRC regulation by April 30, 2000. However, DOE will continue to regulate indefinitely any "as-found" HEU material in leased areas at PORTS under the ROA.

At the same time, NRC regulates USEC operations in the leased areas according to 10 CFR 76, other applicable NRC regulations, the USEC certification applications, and the certificates of compliance issued to USEC by NRC. Currently, the areas regulated by NRC at the GDPs comprise a much larger portion of the operations than those regulated by DOE.

³The DOE-prepared plans, entitled *Plan for Achieving Compliance with NRC Regulations at the Paducah Gaseous Plant* and *Plan for Achieving Compliance with NRC Regulations at the Portsmouth Gaseous Diffusion Plant*, are commonly referred to as the Compliance Plans.

1.2 MEMORANDUM OF UNDERSTANDING

In October 1997, DOE and NRC signed a Memorandum of Understanding (MOU) entitled *Memorandum of Understanding Between the Department of Energy and the Nuclear Regulatory Commission—Cooperation Regarding the Gaseous Diffusion Plants*. This MOU, which replaced a previous MOU for the interim period, defines the responsibilities of DOE and NRC regarding continuing cooperation at the GDPs after NRC assumption of regulatory oversight responsibility for USEC activities. The MOU also clarifies the framework for coordination regarding issues that may involve DOE and NRC areas of responsibility. According to this MOU, DOE not only remains responsible for regulatory oversight of the HEU-related activities at PORTS that take place in designated leased areas [i.e., in Buildings X-326 (now complete) and X-705] but also will continue to review and, where appropriate, approve USEC-proposed modifications to the PGDP and PORTS Compliance Plans before their submittal to NRC for final approval. In addition to the recognition of these continuing DOE responsibilities, DOE and NRC (1) agreed to exchange information and technical support, (2) defined responsibilities for emergency response, (3) described the manner in which issues identified during an inspection by either agency would be referred to the other, and (4) defined responsibilities for coordination of activities. The security roles and responsibilities of DOE and NRC after NRC assumption of regulatory oversight responsibility for USEC activities are defined in the *Agreement Defining Security Responsibilities at the Paducah and Portsmouth Gaseous Diffusion Plants Between the Department of Energy's Office of Safeguards and Security and the Nuclear Regulatory Commission*, which DOE and NRC formalized in March 1995.

2. DOE REGULATORY OVERSIGHT PROGRAM STATUS

Although NRC assumed regulatory oversight responsibility for the majority of the leased areas of the GDPs on March 3, 1997, DOE retains nuclear safety and safeguards and security oversight authority under Exhibit D of the Lease Agreement (i.e., the ROA) for the limited number of operations in the leased, but not NRC-certified, areas at PORTS that involve HEU material.⁴ During FY 1999, these operations involved dispositioning excess HEU by cleaning cylinders that contained residual amounts of HEU and downblending the HEU byproduct into LEU in segregated areas of Building X-705. The leased, but not certified, portions of PORTS that remain under DOE regulatory oversight authority are scheduled to be transitioned to NRC regulation by April 30, 2000, or when USEC certifies that the total quantity of special nuclear material (other than inaccessible residual holdup) within all leased areas is within the possession limits in the NRC certificate of compliance for USEC operations at PORTS. During FY 1999, actions were taken to extend DOE's regulatory oversight authority under the ROA to include (1) the federal arming and arrest authority for the plant protective forces at the GDPs and (2) activities associated with uranium enriched to greater than or equal to 10% assay ²³⁵U discovered or made accessible in the USEC-leased portions of PORTS. (See Sections 5.1.1 and 5.1.3.)

The DOE Oak Ridge Operations (ORO) Regulatory Oversight (RO) Manager manages the DOE RO Program for the (1) leased, but not certified, portions of PORTS that contain HEU

⁴The NRC Certificates of Compliance for PGDP and PORTS limit USEC's possession of enriched uranium. At each site, possession of uranium enriched to 20% or greater in ²³⁵U is limited to less than 1000 grams; possession of uranium enriched to 10% or greater, but less than 20%, in ²³⁵U is limited to less than 10,000 grams.

material enriched to greater than or equal to 20% assay ^{235}U and (2) the leased portions of PORTS that contain accessible uranium enriched to greater than or equal to 10% assay ^{235}U . In the near future, the RO manager will manage activities at both GDPs related to the federal arming and arrest authority for the protective force personnel. The RO Manager schedules and coordinates all RO Program activities, including inspections and enforcement actions. The RO Manager is authorized to modify the ROA whenever he/she determines that changes are required either to protect public health and safety or to promote the common defense and security. (The ROA also includes a change control process whereby USEC may propose changes to the ROA.) In addition to DOE staff in Oak Ridge, the RO Program maintains a DOE site safety representative (SSR) at PORTS. This SSR provides day-to-day surveillance and inspection of HEU-related activities to help assure USEC's compliance with the ROA.

Sections 2.1 through 2.4 discuss the activities of the DOE RO Program in FY 1999.

2.1 INSPECTIONS

DOE conducts routine, special, and functional area inspections in the leased, but not certified, facilities at PORTS. In accordance with the ROA, DOE may issue NOVs and impose civil penalties if these inspections identify ROA violations. The amount of a civil penalty is based on the severity of the violation. The DOE RO Manager assigns one of three severity levels to the violations. Severity Level I violations are violations that significantly increase the hazard to plant workers or the risk of off-site consequences; they are the most serious violations. Severity Level II violations are violations that moderately increase the hazard to plant workers or the risk of

off-site consequences and are serious or recurring violations. Severity Level III violations are significant violations that do not indicate any overall degradation in nuclear safety or safeguards and security programs. Corrective actions associated with both cited and noncited violations are tracked to closure by the DOE SSR.

During FY 1999, DOE conducted more than 60 inspections of activities in the leased, but not certified, portions of PORTS. The majority of these inspections were routine announced and unannounced inspections conducted by the DOE SSR primarily in the X-705 decontamination and uranium recovery facility where HEU cylinder cleaning is performed. These DOE inspections focused primarily on the following functional areas of plant operations related to HEU activities: Managerial Controls and Oversight, Operations, Radiation Protection, Nuclear Criticality Safety (NCS), Emergency Preparedness, and Security. During these inspections, DOE selectively examined procedures and records, interviewed personnel, and observed activities in progress. These inspections included examination of one event report related to a December 9, 1998, fire in the X-326 building; 65 HEU-related problem reports; and the follow-up of previously identified inspection findings.

In FY 1999, DOE issued one NOV to USEC. This violation involved failures to adhere to NCS labeling and spacing requirements in the 5-inch-cylinder cleaning area of the X-705 West Annex at PORTS. This violation was categorized as a Severity Level III violation. In addition, three noncited violations were issued to USEC during this period. Two of the noncited violations involved NCS posting and marking requirements in the X-705 West Annex. The other noncited violation involved multiple examples of

emergency preparedness deficiencies related to Facility Emergency information packets in the X-705 West Annex. Because of USEC's prompt and aggressive corrective actions, DOE exercised enforcement discretion by categorizing these violations as noncited violations and encouraged USEC to continue self-identification and prompt remediation of any noncompliances. Because these violations were identified in a shared area at PORTS, DOE notified NRC in accordance with the October 1997 MOU. The DOE inspections, inspection reports, and NOV issued for activities in leased, but not certified, facilities at PORTS are summarized in Appendix A, "Summary of DOE Regulatory Oversight Program Inspection Reports."

In February 1999, DOE conducted a special review of the Emergency Preparedness program under DOE's ROA jurisdiction at PORTS. Heater equipment fires in the X-705 facility and the December 9, 1998, fire in the X-326 Building prompted the DOE RO Manager to initiate this review. Interviews of personnel and reviews of training records, procedures, and other relevant programmatic elements were conducted. As a result of the noncited violation related to emergency preparedness and findings of this review, a follow-up inspection was conducted in March 1999. The noncited violation and all inspection follow-up items related to the February 1999 special review were reviewed and closed following prompt USEC corrective actions.

In September 1999, DOE participated in a Full Participation Emergency Management exercise at PORTS. The exercise involved federal (i.e., DOE and NRC), state, and local agencies as well as site contractor organizations responsible for operations at PORTS. During the exercise, DOE observed activities in the Emergency

Operations Center, the Joint Public Information Center, and the field. The exercise simulated an emergency response to two fires located in the X-333 building at PORTS. A report on the performance of the exercise was pending at the end of FY 1999.

2.2 SAFETY EVALUATIONS AND OPERATIONAL READINESS ASSESSMENTS

Section 3.3.2.6 of the ROA requires USEC to obtain DOE consent and written approval for any proposed plant change that involves an Unreviewed Safety Question or a change in the authorization basis for USEC operations at PORTS regulated by DOE. The safety evaluation report development process specified in DOE Order 5480.23, *Nuclear Safety Analysis Reports*, is used by the DOE RO Manager to document DOE approval of USEC's proposed plant changes under Section 3.3.2.6 of the ROA.

During FY 1999, DOE prepared several Safety Evaluation Reports (SERs) and one Operational Readiness Assessment (ORA) in response to USEC requests for approval of changes in operations in the X-705 facility at PORTS. In November 1998, DOE approved the certification of two additional First Line Managers for the chemical cleaning of HEU cylinders in the X-705 facility at PORTS. DOE issued a revised SER entitled *Department of Energy Safety Evaluation Report for the Portsmouth Gaseous Diffusion Plant, Cleaning of 5-inch, 8-inch, and 12-inch Highly Enriched Uranium Cylinders and Blending of HEU Heel Material in the X-705 Building* to document this approval. In August 1999, DOE approved an increase in the ²³⁵U mass, allowed in an 8-inch HEU cylinder during cleaning, from 1,350 to

1,500 grams. An SER entitled *Department of Energy Safety Evaluation for the Portsmouth Gaseous Diffusion Plant, 8-Inch Cylinder U²³⁵ Heel Material Gram Limit Increase in the X-705 Building* documented this approval.

In September 1999, DOE evaluated a USEC-proposed "heel" reduction process for HEU cylinders using the Special Applications Portable Infrared Analyzer (SPIRA) buggy equipment and issued an ORA entitled *Department of Energy Operational Readiness Assessment Report for Heel Reduction in Highly Enriched Uranium Cylinders at the Portsmouth Gaseous Diffusion Plant*, dated September 10, 1999. The heel-reduction process involves (1) using the SPIRA buggy equipment to add nitrogen, fluorine and/or chlorine tri-fluoride gases to an 8-inch cylinder containing more than the allowable ²³⁵U mass of 1,500 grams and (2) collecting uranium hexafluoride (UF₆) into a 5-inch cylinder, thus reducing the heel mass in the 8-inch cylinder. DOE approved the use of this heel-reduction process in the West Annex of the X-705 facility with an SER entitled *Department of Energy Safety Evaluation for the Portsmouth Gaseous Diffusion Plant, Special Applications Portable Infrared Analyzer Buggy for 8-Inch Cylinder U²³⁵ Heel Material Removal in the X-705 Building*, dated September 10, 1999.

These SERs and ORA are part of the safety basis for DOE approval of continued operations by USEC in leased, but not certified, areas at PORTS regulated by DOE. The DOE SERs and ORA provide assurance that USEC operations in these areas of PORTS are conducted in accordance with nuclear safety and safeguards and security requirements of the ROA.

During FY 1999, DOE also performed several other safety evaluations associated with the DOE review and approval of USEC-requested changes to the Compliance Plans. (See Section 2.4.)

2.3 SAFEGUARDS AND SECURITY ACTIVITIES

2.3.1 Arming and Arrest Authority

In the FY 1999 Energy and Water Development Appropriations bill,⁵ Congress amended the USEC Privatization Act to address the federal arming and arrest authority of the plant protective forces at PGDP and PORTS. DOE is in the process of implementing these amendments to the Privatization Act by assuming regulatory authority for the plant protective force activities under the provisions of the ROA to the extent required to permit DOE to issue Weapons Authorization Cards (WAC). These cards, issued pursuant to the AEA of 1954, as amended,⁶ will authorize protective force personnel to carry firearms and, in certain specified situations, to make arrests at the GDPs.

During FY 1999, the focus of the implementation effort was at PGDP, where protective force personnel do not have federal arming and arrest authority. At PORTS, the protective force personnel currently have federal arming and arrest authority under DOE for protection of Categories I and II special nuclear materials. However, when these materials are removed from the PORTS site in the near future, the federal arming and arrest authority for the PORTS protective force personnel will transition to regulation under the ROA, as at PGDP. The NRC intends to promulgate rule making for nuclear facilities giving NRC authority and responsibility to issue federal arming and arrest authority under the AEA. When the NRC assumes this responsibility, the use of the ROA for DOE oversight of implementation of this Congressional legislation will cease.

⁵Pub. L. No. 105-245, October 7, 1998.

⁶Codified at 42 U.S.C. 2201(k).

A revision to Section 3.18, "Security," of the ROA, was issued in April 1999. This revision identifies the DOE requirements that USEC must meet for DOE to issue WACs at PGDP and PORTS. After a DOE assessment of the USEC protective force program at PGDP, USEC provided a Security Plan to DOE entitled *Arming and Arrest Authority Security Plan for the Paducah and Portsmouth Gaseous Diffusion Plants*, Revision 0, in July 1999 to meet the revised Section 3.18 requirements of the ROA. DOE approved the USEC Security Plan in August 1999. Following a DOE assessment of the implementation of the USEC Security Plan, DOE will issue an updated ROA revision and WACs to the protective force personnel at PGDP in early FY 2000.

2.3.2 Security Plans

In partial fulfillment of DOE's responsibilities under the December 1993 Joint Statement of Understanding⁷ between NRC and DOE, the DOE RO Program Manager is responsible for review and approval of USEC Safeguards and Security Plans and related information applicable to activities conducted under the ROA. The DOE oversight ensures that appropriate safeguards and security controls are in place for these activities at the GDPs.

In May 1999, DOE approved the *X-705 Security Plan*, Revision 2, to incorporate changes that were required to recategorize and protect the nonleased X-705 E-area as a DOE Category IV area and to remove one material surveillance requirement for the leased, but not certified, X-705 West Annex as a DOE Category III area.

⁷Joint Statement of Understanding Between the Nuclear Regulatory Commission and the Department of Energy on Implementing the Energy Policy Act Provisions on Regulation of Gaseous Diffusion Uranium Enrichment Plants. (See Section 5.1.)

In August 1999, DOE approved the Security Plan entitled *Arming and Arrest Authority Security Plan for the Paducah and Portsmouth Gaseous Diffusion Plants*, Revision 0, that establishes the USEC program for the protective force personnel at the GDPs to meet the revised DOE ROA requirements related to the arming and arrest authority as described in Section 2.3.1.

During FY 1999, DOE reviewed and approved a revised USEC Personnel Security Assurance Program (PSAP) that incorporated DOE comments and implemented DOE's PSAP requirements at PORTS. However, following the reduction in the quantities of HEU at PORTS and the downgrading of the X-345 facility to a Category III facility (see Section 5.1.3), PSAP requirements were no longer needed at PORTS. Therefore, in September 1999, USEC terminated the PSAP program.

2.4 COMPLIANCE PLAN ACTIVITIES

Following the promulgation of 10 CFR 76, it became apparent that there were portions of the regulations with which USEC could not immediately comply. For NRC to permit continued USEC operation of the GDPs, the EPAct required that DOE prepare plans for bringing the leased areas of the GDPs into compliance with any unsatisfied provisions of NRC regulations. The existence of these noncompliances does not indicate a difference in the overall level of health, safety, and safeguards and security protection provided to workers and the public under DOE oversight versus that provided under NRC oversight. Rather, these noncompliances reflect either (1) areas where full compliance with existing DOE requirements had not been achieved or (2) differences between the NRC and DOE regulatory approaches used to ensure adequate protection of the health and safety of workers and the public and to promote the common defense and security.

DOE prepared Compliance Plans⁸ for submittal with the USEC applications for initial certification of PGDP and PORTS. These plans were initially submitted to NRC on April 24, 1995. Revisions to accommodate USEC application changes and commitments to NRC were submitted through August 1996.⁹ Final applications were submitted by USEC to NRC in August 1996, and NRC issued the initial Certificates of Compliance to USEC on November 26, 1996. On April 15, 1998, USEC submitted applications for renewal of the initial Certificates of Compliance for PGDP and PORTS. In the second quarter of FY 1999, NRC issued the first renewal of the Certificates of Compliance to USEC.

The Compliance Plans address the noncompliances identified by USEC before certification and provide the following: (1) a description of the noncompliance, (2) a reference to USEC's application commitment with which USEC had not yet complied, (3) a justification for continued operations, and (4) a description of the plan of action and schedule for achieving compliance with NRC regulations. The Compliance Plans were revised as USEC revised its applications and identified additional noncompliances.¹⁰ No new Compliance Plan issues were identified in the April 15, 1998, applications for renewal of certification to operate, although modifications to and the

reopening of a few original Compliance Plan issues have been requested by USEC through Certificate Amendment Requests to the NRC in FY 1999.

The dates by which compliance with NRC regulations will be achieved range from 1996 through 2002 for the various noncompliances, depending on the specific upgrade actions that are required. During the fall of 1996 and continuing through February 1997, DOE verified completion of approximately half of the actions required to achieve compliance. On February 24, 1997, DOE advised NRC that it had reviewed those action items scheduled for completion prior to March 3, 1997 (with the exception of action items that had been delayed by USEC). When NRC assumed regulatory oversight on March 3, 1997, additional Compliance Plan issues were completed by USEC as part of the transition. Responsibility for reviewing and verifying completion of all remaining open action items in the Compliance Plans transferred to NRC at that time.

In the October 1997 MOU between DOE and NRC (described in Section 1.2 of this report), both parties agreed that USEC must obtain DOE approval of any modifications to the Compliance Plans before submittal of the requested modifications to NRC for review and final approval. As illustrated in Table 1, during FY 1999, DOE reviewed 11 USEC-submitted change requests including the reopening of three Compliance Plan issues at PORTS. Following a review period, and in some cases, on-site safety evaluations, DOE approved all changes requested in FY 1999.

3. LEASE MODIFICATIONS

As stated previously, pursuant to the EPAct, DOE leased portions of PGDP and PORTS to USEC on July 1, 1993. DOE and USEC subsequently agreed that DOE, in its role as

⁸See Footnote 3.

⁹NRC's initial certification of USEC's operation at each GDP was based on USEC's application for certification, which included Rev. 3A of the DOE-prepared Compliance Plan for each GDP.

¹⁰For a discussion on the types of noncompliances, the reader is referred to the report entitled *Department of Energy Input to the Nuclear Regulatory Commission's Annual Report to Congress Regarding the Status of Health, Safety, and Environmental Conditions at the Paducah and Portsmouth Gaseous Diffusion Plants*, DOE/ORO/2059, dated October 1997.

Table 1. Modified Compliance Plan Issues Approved by DOE in FY 1999

Plant	Issue	Title	Date Approved
PORTS	A.4	Possession of Uranium Enriched to Greater Than 10% ²³⁵ U	10/13/98
PGDP	46	Criticality Accident Alarm System - Horn Audibility	10/29/98
PGDP	50	Criticality Accident Alarms for Nearby Buildings	10/29/98
PORTS	A.2	Receipts Based on Measured Values	12/14/98 ¹¹
PGDP	36	Seismic Capability of Buildings C-331 and C-335	1/8/99
PORTS	8R ¹²	Nuclear Criticality Safety Approval Documents	4/14/99
PORTS	9R	Nuclear Criticality Safety Approval Implementation	4/14/99
PORTS	23R	Plant Changes and Configuration Management	4/14/99
PORTS	8R ¹³	Nuclear Criticality Safety Approval Documents	5/5/99
PORTS	23R ¹⁴	Plant Changes and Configuration Management	5/10/99
PORTS	23R ¹⁵	Plant Changes and Configuration Management	5/12/99

¹¹Approved by the DOE RO Program; however, it was noted that there may be HEU Transparency Implementation Program implications associated with this request, and the issue was referred to the head of the DOE HEU Transparency Implementation Program for final approval.

¹²"R" indicates that the Compliance Plan Issue was reopened and included a modified Description of Noncompliance to reflect the current status of the noncompliance, a Justification for Continued Operations, and a Plan of Action and Schedule.

¹³This Compliance Plan modification was requested after the initial DOE approval; DOE reviewed the requested modification and approved it.

¹⁴See Footnote 13.

¹⁵See Footnote 13.

landlord of the leased facilities at the GDPs, would maintain the controlled copy of the Lease, including the facility lease status drawings and the DOE Material Storage Area (DMSA) drawings. On December 30, 1998, Revision III of Exhibit A to the Lease, which identifies leased areas at both GDPs, was approved. Revision I of the *Paducah Gaseous Diffusion Plant Facility Lease Status* drawing, No. C5EC90000A046, and Revision I of the *Portsmouth Gaseous Diffusion Plant Facility Lease Status* drawing, No. CX-761-1040.01-A, were approved and signed in May 1999. Major changes to Exhibit A and the lease status drawings include the following:

- Deleasing approximately 198 acres (formerly common ground) to DOE at PGDP.
- Deleasing the C-200A Security and Fire Training Trailer to DOE at PGDP.
- Deleasing the C-616-E Chromium Sludge Lagoon to DOE at PGDP.
- Deleasing approximately 476 acres (formerly common ground) to DOE at PORTS.
- Deleasing the X-106 Fire Training Building at PORTS.
- Color coding the perimeter roads, access roads, and railroads at both GDPs on the facility lease status drawings to reflect these areas as common ground leased to USEC.

The deleased acreage at the GDPs was determined by USEC to be nonessential to uranium enrichment operations. Upon deleasing, regulatory responsibility for this acreage returned to DOE from NRC.

4. DOE ENVIRONMENTAL, SAFETY, AND HEALTH POLICY

A fundamental policy of DOE is that work at its sites, including the nonleased portions of PGDP and PORTS for which DOE has oversight responsibility, must be conducted in a manner that (1) protects the safety and health of the workers and the public and (2) safeguards the environment. Attention to ES&H concerns, therefore, is an integral part of DOE's planning, budgeting, and work activities. Within DOE, functional areas have been established to help DOE sites implement an overall ES&H program. To assist in ES&H program implementation, nine safety and health and seven environmental functional areas have been defined.

Safety and Health Functional Areas. These functional areas include site activities that are directed toward protection of the health and safety of the public and employees and that are required by federal, state, regional, or local law or regulation; Executive Order; or DOE Order.

- Emergency Preparedness—includes all activities that are intended to provide the final barrier for ensuring the safety and health of workers and the public and for protecting property and the environment in the event of an emergency.
- Fire Protection—includes all activities that are intended to prevent, detect, and suppress fires.
- Industrial Hygiene—includes all activities that are intended to provide protection to workers from chemical, physical, biological and physiological hazards.
- Industrial Safety—includes all activities that are intended to protect workers from occupational injury and illness.

- Occupational Medical Services—includes all activities that are intended to provide a comprehensive occupational medical program.
- Nuclear Safety—includes all activities that serve to maintain or improve the level of safety involved with radioactive and fissionable materials that exist in such form and quantity that a nuclear hazard potentially exists to the employees or the general public.
- Radiation Protection—includes all activities that are intended to control exposures of workers and the public to radioactivity.
- Transportation Safety—includes all activities that are intended to ensure safe packaging and transportation.
- Management and Oversight—includes all activities that are intended to coordinate, direct, integrate, and control safety and health activities across multiple safety and health functional areas of a facility's ES&H program.
- Protection of Water Quality—includes activities relating to compliance with the Clean Water Act and the Safe Drinking Water Act to protect groundwater and surface waters.
- Environmental Restoration—includes activities whose primary purpose is compliance with regulations promulgated under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Superfund Amendments and Reauthorization Act, or Resource Conservation and Recovery Act (RCRA) for remedial investigation and remedial actions required to clean up radioactive, hazardous, or mixed waste contamination.
- Pollution Prevention and Waste Minimization—includes all sitewide and facility waste generator-specific activities that are predominantly associated with waste minimization and pollution prevention.
- Waste Management—includes those activities addressing the treatment, storage, and disposal of wastes.
- Management, Oversight, and Reporting—includes those activities that are intended to coordinate, direct, and integrate environmental activities across multiple environmental functional areas.

Environmental Functional Areas. These functional areas include site activities that are directed toward protection of air, water, and other environmental media and that are required by federal, state, or local law or regulation; enforcement action (including NOVs); Compliance Agreement; Executive Order; or DOE Order.

- Protection of Air Quality—includes activities designed to assess and monitor air quality and to control air contaminant emissions in compliance with the Clean Air Act.
- Control of Toxic Substances—includes activities that comply with federal, state, or local regulations to control the use and management of materials regulated because of their known or suspected toxic or hazardous characteristics.

DOE's ES&H policy demonstrates DOE's commitment to protect and promote the health and safety of its workers and the public and to protect the environment. In those areas at the GDPs for which DOE retains regulatory oversight responsibility, DOE applies its ES&H policy through the Integrated Safety Management System (ISMS) program of its management and integration (M&I) contractor. Organizationally, DOE personnel at PGDP and PORTS consist of a Site Manager and staff who provide site management and oversight.

Section 5 of this report presents DOE's ES&H initiatives, and Section 6 presents the status of ES&H conditions for those portions of the GDPs for which DOE had oversight responsibility during FY 1999.

5. DOE ENVIRONMENTAL, SAFETY, AND HEALTH INITIATIVES

The following sections provide an overview of the ES&H initiatives undertaken to address specific situations at the PGDP and PORTS sites. Section 5.1 describes the manner in which DOE-owned HEU materials at the PORTS site are dispositioned, while Section 5.2 describes DOE's planned approach for handling and disposing of the large quantities of DUF₆ for which it is responsible. Section 5.3 describes uranium management activities, including the new Uranium Management Center, which is being developed to assist DOE in managing its uranium inventory. Section 5.4 discusses other ES&H initiatives, including the implementation of the ISMS program at the two sites.

5.1 HIGHLY ENRICHED URANIUM DISPOSITION

In November 1991, the Secretary of Energy directed the suspension of HEU production at PORTS, which was the only remaining facility in the United States producing HEU. As a result of past HEU production, excess HEU material remained in storage at PORTS. DOE retains responsibility for this excess HEU as reflected in the December 1993 *Joint Statement of Understanding Between the Nuclear Regulatory Commission and the Department of Energy on Implementing the Energy Policy Act Provisions on Regulation of Gaseous Diffusion Uranium Enrichment Plants*. Regarding the ultimate disposition of this excess HEU, DOE efforts during FY 1999 have been directed toward its

reduction and removal from PORTS, as described in Sections 5.1.1, 5.1.2, and 5.1.3. Activities conducted to support the HEU Purchase Agreement between DOE and the Russian Federation through HEU transparency activities performed at PGDP and PORTS are described in Section 5.1.4.

5.1.1 Highly Enriched Uranium Agreements

On April 20, 1998, pursuant to the requirements of the USEC Privatization Act, DOE and USEC entered into an MOA entitled *Memorandum of Agreement for Transfer of Natural Uranium and Highly Enriched Uranium and for Blend-down of Highly Enriched Uranium*. This MOA describes the manner in which "DOE shall transfer to USEC without charge up to 50 metric tons of enriched uranium and up to 7,000 tons of natural uranium from DOE's stockpile." The MOA also describes the manner in which DOE will transfer and USEC will accept the uranium and defines the DOE and USEC safeguards and security responsibilities for enriched uranium. In the MOA, DOE and USEC agree that 7 metric tons of HEU oxides at PORTS will be available for delivery no later than the end of FY 1999. Shipment of these HEU oxides from PORTS was completed in June 1999.

On January 8, 1999, the *USEC and DOE Agreement for Disposition of Uranium Enriched to Ten (10) Percent or Greater Assay at the Portsmouth Gaseous Diffusion Plant (PORTS)* was signed. This agreement states that "USEC cannot, at any time, possess quantities of uranium that will cause the total quantity to exceed Nuclear Regulatory Commission (NRC) Category III limits. This requirement is in effect the entire time the NRC Certificate of Compliance is in effect." This agreement supplements the December 1993 Joint Statement of Understanding between NRC and DOE in which, in the case of 20% or greater assay ²³⁵U, "DOE retains title to and possesses such uranium and will be solely

responsible for providing for, establishing, and maintaining nuclear safety, safeguards and security controls applicable to such uranium." The agreement was entered into by DOE and USEC "to provide a framework for the efficient and cost effective management and disposition of uranium enriched to 10% or greater assay ^{235}U at the Portsmouth gaseous diffusion plant (PORTS)."

5.1.2 Highly Enriched Uranium Refeed and Cylinder-cleaning Program

The HEU refeed program at PORTS was completed in July 1998. The purpose of the HEU refeed activities was to downblend excess HEU in the form of UF_6 gas into LEU to be sold commercially for peaceful purposes. The HEU, which originally was produced for U.S. military purposes during the Cold War, was declared excess to the nation's defense needs. In the December 1994 MOA between DOE and USEC entitled *Memorandum of Agreement Relating to the Transfer of Functions and Activities from the Department of Energy to the United States Enrichment Corporation*, both parties agreed that DOE would provide this material to USEC for refeed and downblending.

Approximately 14 metric tons of HEU were safely refeed into the enrichment cascade and downblended into LEU by USEC from May 1995 to July 1998. This amount represented a significant reduction in the quantity of HEU at PORTS. After refeeding, the HEU cylinders contained small residual quantities of HEU (heel) material. These cylinders are being chemically cleaned to remove the heel material for downblending and disposition. The HEU cylinder cleaning effort is conducted in designated leased, but not certified, portions of Building X-705 at PORTS under DOE regulatory oversight.

To complete a Compliance Plan commitment related to USEC's possession limits for uranium

enriched to 10% or greater in ^{235}U , approximately 370 (5-inch-, 8-inch-, and 12-inch-diameter) cylinders are scheduled to be cleaned at PORTS by March 31, 2000. Because of operational start up difficulties, USEC requested and DOE and NRC approved an extension to the Compliance Plan date for completion of the cylinder cleaning from December 31, 1998, to March 31, 2000. (See Section 2.4.) Approximately 940 other HEU cylinders have been cleaned off-site at a contractor's facility.

Under DOE regulatory oversight, HEU cylinder cleaning commenced at PORTS in May 1998. Of the 367 cylinders that were required to be cleaned to meet the Compliance Plan commitment, one-hundred-three 5-inch, sixty-four 8-inch, and fourteen 12-inch (i.e. a total of 181) cylinders have been cleaned by USEC by the end of FY 1999. In May 1999, USEC began using multishift operations to expedite cleaning of the remaining HEU cylinders. The USEC HEU refeed and cylinder-cleaning and the DOE HEU suspension and removal efforts (see Section 5.1.3) support the overall effort to remove stored HEU from the PORTS site.

A byproduct of the cylinder-cleaning process is uranyl nitrate solution. USEC downblends this solution to less than 10% ^{235}U enrichment in the West Annex of Building X-705 under DOE regulatory oversight. USEC then processes the uranyl nitrate solution for final disposition in the leased portion of the X-705 facility under NRC regulatory oversight.

5.1.3 Highly Enriched Uranium Suspension and Removal Program

The DOE HEU Suspension and Removal Program addresses the overall disposition of HEU at PORTS. This program is designed to accomplish the following: (1) safely suspend HEU operations and shut down HEU equipment

in Building X-326; (2) modify equipment and systems to preclude production of HEU and perform maintenance in X-326 that is necessary for continued LEU production ("legacy maintenance"); (3) modify the configuration of shutdown equipment to minimize long-term surveillance and maintenance requirements; and (4) remove stored HEU materials from PORTS, including uranyl nitrate hexahydrate-, uranium oxide-, and HEU-contaminated materials. The removal of these stored HEU materials will reduce the related ES&H risks and is expected to reduce safeguards and security operating costs at PORTS.

As described previously, portions of the HEU Suspension and Removal Program are regulated by DOE under the ROA. Three PORTS facilities are directly affected by the HEU Suspension and Removal Program. These facilities include the X-326 process facility, where HEU refeed activities are complete; the X-705 decontamination and uranium recovery facility; and the X-345 special nuclear material storage facility. Buildings X-326 and X-705 are critical to the ongoing LEU mission; therefore, USEC leases these facilities from DOE. HEU-related activities in these buildings continue to be regulated by DOE under the ROA. Building X-345 is retained by DOE. Activities that are conducted in this building are regulated in accordance with DOE Orders and PAAA regulations.

Operations related to removing HEU-bearing materials from cascade equipment in Building X-326 and downblending these materials to LEU (HEU suspension) are complete. After removal of HEU-bearing materials from approximately 200 cells in the cascade to deposit sizes below "safe mass" as determined by NCS analysis, 158 cells were placed in permanent shutdown condition. The permanently shutdown HEU cells in Building X-326 were buffered with dry air/nitrogen to ensure that NCS requirements

were met. Surveillance and maintenance of the 158 shutdown cells continues. Periodic nondestructive assay surveys are being performed to ensure that no unacceptable migration of remaining inaccessible HEU deposits occurs.

DOE continued to implement the plan for the disposition of HEU-bearing materials that it issued in March 1996. In late 1997, approximately 400 kg of uranium oxides were shipped to the Oak Ridge (Tennessee) Y-12 Plant for interim storage. The remaining uranium oxides stored in the X-345 facility (about 7 metric tons) were authorized for shipment to a commercial downblending facility under an approved MOA between DOE and USEC. (See Section 5.1.1.) On August 31, 1998, USEC selected a downblending vendor. Shipment of the HEU oxides, which started on September 15, 1998, was completed on June 23, 1999.

In February 1998, a large portion of the HEU-bearing materials classified as RCRA waste that was previously stored in the X-326 L-Cage facility was shipped to Los Alamos National Laboratory (LANL) for treatability studies. Because LANL was unable to complete the treatability studies within the RCRA-regulated 1-year time limit required by the New Mexico Environmental Department, LANL returned 68 containers of HEU mixed waste to PORTS in June 1999. The treatability studies report has not been received from LANL, and no additional studies are planned. The 68 containers will continue to be stored in the X-326 L-Cage facility at no additional safeguards and security operating cost until final disposition.

A large portion of HEU-bearing material that is not classified as RCRA waste, consisting largely of HEU trapping materials, was shipped to a contractor for HEU recovery and downblending to LEU for possible resale. These shipments were completed in January 1998, and processing was completed in December 1998.

Commercial sale of the downblended LEU product is scheduled to be completed by June 30, 2000. At that time, any remaining LEU product will be returned to PORTS for storage and eventual sale.

In April 1999, an initiative of the President and Secretary of Energy was established to remove remaining stored quantities of DOE-owned HEU-bearing materials to permit downgrading of the X-345 facility to a Category III security level by September 30, 1999. This initiative involved the shipment of UF₆ contained in hoke tubes and 2-S and 5A/5B type cylinders to a contractor for interim storage. This initiative also included the removal of HEU-bearing materials from in-place traps in the X-345 High Assay Sampling Area and the shipment of these materials to the interim storage contractor. A large portion of the materials covered by this initiative are standards for nuclear material accountability equipment calibration being held until the end of the HEU Suspension and Removal Program and for possible use under the HEU Transparency Implementation Program. Shipments to the interim storage contractor were completed on August 18, 1999.

Following the removal of stored HEU materials, DOE's M&I contractor conducted a confirmatory survey of the X-345 facility to determine the location and quantity of any remaining residual material. The results of the confirmatory survey were provided to DOE for review and approval. Upon receipt of DOE approval, the X-345 facility was downgraded to a Category III facility on September 27, 1999.

Under the provisions of the January 8, 1999, agreement between DOE and USEC regarding HEU disposition,¹⁶ DOE will store and manage

¹⁶USEC and DOE Agreement for Disposition of Uranium Enriched to Ten (10) Percent or Greater Assay at the Portsmouth Gaseous Diffusion Plant (PORTS).

USEC equipment, containers, and material containing uranium enriched to 10% or greater in ²³⁵U that resulted from DOE legacy operations at PORTS. Under NRC regulation, USEC cannot, at any time, possess quantities of uranium that will cause the total quantity possessed by USEC across all leased and certified areas to exceed NRC Category III limits. Because DOE has regulatory jurisdiction over accessible uranium enriched to 10% or greater in ²³⁵U, activities involving this material in USEC-leased areas will be conducted in accordance with the ROA. HEU-related activities in nonleased facilities (e.g., enriched uranium in DMSAs) will continue to be conducted in accordance with the nuclear safety and safeguards and security requirements of the DOE Orders and PAAA regulations applicable to such uranium. Also, in the January 8, 1999, agreement, DOE agreed to accept USEC-owned or -leased equipment, containers, and material containing uranium enriched to 10% or greater in ²³⁵U provided that such acceptance will not violate DOE standards, DOE Orders, U.S. Environmental Protection Agency (USEPA) regulations, or Ohio EPA regulations or orders. Storage normally will be in enriched uranium DMSAs or other DOE areas meeting appropriate regulatory and safeguards and security requirements. DOE has also agreed to store up to 3,000 liters of liquid cleaning solutions that are generated from equipment cleaning operations and that are not regulated as hazardous waste under RCRA until USEC can dispose of the liquid.

5.1.4 Highly Enriched Uranium Transparency Implementation Program

The HEU Transparency Implementation Program, originally established within DOE's Office of Nuclear Energy, Science and Technology (NE), is responsible for implementing all transparency measures related to the HEU Purchase Agreement between DOE and the Russian Federation's Ministry of Atomic

Energy (MINATOM).¹⁷ The HEU Government-to-Government Umbrella Agreement was signed on February 18, 1993, and provides for the purchase of 500 metric tons of HEU from dismantled Russian weapons over a period of 20 years. Since the signing of this initial agreement, an MOU, an HEU Purchase Contract, and a Protocol to the MOU have been signed to delineate terms of the agreement. In addition, a total of 16 annexes to the Protocol have been signed at Transparency Review Committee meetings. These annexes define the rights of each party to provide confidence that each party is abiding by the terms of the agreement.

During the fall of 1998, the HEU Transparency Implementation Program direction was transferred from NE to DOE's Office of Nonproliferation and National Security (NN) to more formally recognize the program's alignment with NN's national security aspects. Within NN, the program reports to the Office of International Nuclear Safety and Cooperation.

The GDPs have continued to play key roles in several aspects of the DOE HEU Transparency Implementation Program. The HEU material covered under terms of the agreement is sent to the United States as LEU suitable for use as fuel in light-water reactors. The HEU is blended with slightly enriched uranium in Russian facilities and shipped to the United States as LEU for sale by USEC, which acts as agent for the U.S. government. The material arrives at PORTS as UF₆ in 30B cylinders,¹⁸ in which it is stored until its sale to utilities and subsequent shipment to fuel fabricators. During calendar year (CY) 1999

(through September 30), PORTS has received approximately 255 30B cylinders from Russian blending facilities. Since CY 1995, PORTS has received a total of 1,247 30B cylinders.

Under terms of the HEU Purchase Agreement, DOE and MINATOM are allowed to establish Permanent Presence Offices (PPOs) at certain facilities where personnel can monitor prescribed activities to provide confidence that each side is abiding by the terms of the agreement. In the United States, MINATOM has established a PPO at PORTS. Thus far, MINATOM has maintained only a sporadic presence at PORTS, and no Russian delegation has been at PORTS this fiscal year. However, office space is maintained and other services are on standby to support this activity.

PGDP has played a key role in the testing and demonstration of some nonintrusive instrumentation for monitoring UF₆ gas flow and enrichment. This equipment was developed in DOE's national laboratories for installation in Russian blending facilities as a means of providing confidence that the downblending of HEU is actually occurring. To demonstrate the equipment in actual use to a Russian delegation, a UF₆ flow loop simulating the flow conditions in Russian blending facilities was fabricated and installed in the PGDP purge cascade. A high-level delegation consisting of U.S. Department of State, DOE, Russian Federation Ministry of Atomic Energy, Gosatomnadzor (equivalent to the NRC), and Ural Electrochemical Integrated Enterprise personnel visited PGDP in June 1998 to witness the operation of the instrumentation. This was the first visit of Russian Federation personnel to PGDP. After this successful demonstration, the UF₆ flow loop was removed from the PGDP purge cascade and the loop decontaminated and decommissioned in January 1999, thus completing PGDP's role in this phase of the project.

¹⁷Transparency measures are those measures employed by DOE to provide confidence to the United States that the downblending of Russian HEU is occurring in accordance with the agreement.

¹⁸A 30B cylinder can contain a maximum net weight of approximately 2.3 metric tons of UF₆.

5.2 DEPLETED URANIUM HEXAFLUORIDE LONG-TERM MANAGEMENT

DOE is responsible for approximately 739,000 metric tons of DUF₆ located at PGDP, PORTS, and East Tennessee Technology Park (ETTP). The DUF₆ is contained in approximately 61,000 cylinders, the majority of which are located at PGDP. While most cylinders have a 14-ton capacity, other smaller cylinders are also used to store the DUF₆. Although DOE maintains an active cylinder management program, many of the cylinders have shown evidence of external corrosion. This corrosion is believed to be the result of past storage practices. DOE's current management program includes routine inspections of the cylinders, performance of cylinder maintenance and repairs as required, and painting of cylinders. DOE's previously existing DUF₆ management plan provided for DOE to continue safe storage of the cylinders, use the DUF₆ should a feasible alternative be found, and, if no use had been found for the DUF₆ by 2010, to take steps to convert the DUF₆ to triuranium octaoxide (U₃O₈). Under this plan, the conversion was estimated to commence in 2020, and U₃O₈, a more chemically stable compound representing a lower ES&H risk, would be stored until a determination was made that it should be disposed of as a low-level radioactive waste.

5.2.1 Final Programmatic Environmental Impact Statement

Stakeholders near the sites, however, have expressed concerns regarding the plan to delay conversion of the DUF₆ until 2020. In addition, because the perceived demand for potential uses of the uranium has diminished and because DOE is no longer responsible for the production of enriched uranium, DOE began work in 1994 on the DUF₆ Programmatic Environmental Impact Statement (PEIS) to reexamine its management strategy for the DUF₆.

Public scoping meetings were held to obtain public comments on DOE's proposed alternative management strategies to be addressed in the PEIS. DOE published the draft PEIS in December 1997. Approximately 600 public comments were received during the 120 day public comment period. The PEIS examines the environmental consequences of alternative strategies of long-term storage, use, and disposal of the DUF₆ inventory.

In April 1999, DOE published the *Final Programmatic Environmental Impact Statement (PEIS) for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride*. DOE's preferred management strategy, which was identified in the draft PEIS, was modified based on public comments. DOE's preferred alternative involves converting the DUF₆ inventory as soon as possible, either to uranium oxide, uranium metal, or a combination of both, while allowing for use of as much of the inventory as possible.¹⁹ The PEIS examined DOE's management strategy for DUF₆ and the potential environmental impacts of various alternatives to that strategy. The basic alternatives analyzed included (1) no action, (2) long-term storage as DUF₆ at a consolidated site, (3) long-term storage as uranium oxide at a consolidated site, (4) use as uranium oxide, (5) use as uranium metal, and (6) disposal as uranium oxide. For those alternatives that involve the conversion of DUF₆, hydrogen fluoride would be produced that could be sold for commercial use.²⁰

¹⁹DOE does not anticipate conversion to uranium metal unless a use for the metal product becomes available.

²⁰Additional information relating to the environmental impact of the basic alternatives and DOE's preferred alternative may be found at <http://web.ead.anl.gov/uranium/final/finalpeis.cfm>.

On August 2, 1999, DOE issued its *Record of Decision (ROD) for Long-Term Management and Use of Depleted Uranium Hexafluoride*. In the ROD, DOE selected the alternative identified as the preferred alternative in the final PEIS and noted that "any proposal to proceed with the siting, construction, and operation of a facility or facilities [to convert DUF₆] will involve additional review under [National Environmental Policy Act] NEPA." DOE anticipates that the DUF₆ cylinders currently stored at the ETTP site will be shipped to a conversion facility.

5.2.2 Plan for Conversion of Depleted Uranium Hexafluoride

Pub. L. No. 105-204, signed in July 1998, directs DOE to prepare "a Plan and legislation to ensure that all amounts accrued on the books of the United States Enrichment Corporation for the disposition of depleted uranium hexafluoride will be used to commence construction of, not later than January 31, 2004, and to operate, an onsite facility at each of the gaseous diffusion plants at Paducah, Kentucky, and Portsmouth, Ohio, to treat and recycle depleted uranium hexafluoride consistent with the National Environmental Policy Act."

In response to Pub. L. No. 105-204, DOE issued a *Request for Expressions of Interest for a Depleted Uranium Hexafluoride Integrated Solution Conversion Contract and Near-Term Demonstrations* on March 4, 1999. On March 12, 1999, the *Initial Plan for the Conversion of Depleted Uranium Hexafluoride* was released. DOE issued its *Final Plan for the Conversion of Depleted Uranium Hexafluoride*, in July 1999.²¹ The plan notes that Pub. L. No. 105-204 only set aside the \$373 million accrued by USEC for disposition of DUF₆. In order for DOE to award contracts to begin conversion, these funds will

need to be appropriated by Congress. Decisions regarding funding and execution of the Final Plan for Conversion of DUF₆, which will be made in the course of the federal budget process, may affect the nature and timing of the conversion program.

As a part of an integrated approach to manage the DUF₆ inventory, DOE has developed a program that includes the following components:

- cylinder surveillance and maintenance;
- conversion services that include the design, construction, operation, and D&D of conversion facilities;
- storage of uranium conversion products to include design, construction, operation, and D&D of storage facilities;
- use of conversion products; and
- disposal of end products not used, such as uranium and fluorine compounds, and empty storage cylinders.

According to the Plan, two conversion plants will be constructed, one each at PGDP and PORTS. In addition to meeting the requirements of Pub. L. No. 105-204, the construction of two plants decreases (1) the risk that would otherwise be associated with the transportation of large numbers of DUF₆ cylinders, (2) transportation costs, and (3) concerns that stakeholders may have with the shipment of large numbers of DUF₆ cylinders through their states. The relatively small number of cylinders located at ETTP, however, are to be relocated to the PORTS site for conversion.

DOE believes that the private sector is well equipped to provide the services needed for conversion of the DOE DUF₆ inventory. Responses to the Request for Expressions of

²¹The Plan is available at <http://www.ne.doe.gov/DUF6/finalplan.pdf>.

Interest support this belief. DOE hopes to award one or more contracts (1) to manage the cylinders pending conversion of the DUF₆, (2) to convert the DUF₆, and (3) to store the conversion products. Although financing options have not been finalized, DOE believes that private financing will provide the best options for the project. DOE anticipates that economically recoverable conversion products will be sold and that revenues will be used to offset a portion of the conversion cost. Payment to the contractor(s) is expected to be provided on a fixed-unit-price basis. The uranium metal or oxide product will, however, remain the property of DOE until it is sold or transferred. DOE hopes to award one or more integrated conversion and management services contract(s) in CY 2000, with construction of conversion facilities to commence in 2002. DOE anticipates that the facilities would begin conversion operations in 2004 and that they would be operated for approximately 25 years, for a total life-cycle cost of \$3 billion to \$4 billion. Revenues from the sale of the conversion products may approach \$200 million.²²

Design, construction, operation, and D&D of the conversion plants will be undertaken in a manner that ensures adequate protection of workers, the public, and the environment and will take into account appropriate NRC, U.S. Department of Transportation (DOT), Occupational Safety and Health Administration (OSHA), USEPA, and DOE ES&H requirements and standards. Additionally, environmental permits will be obtained from appropriate state authorities. DOE does not anticipate that any additional legislation will be required in order to implement this Plan, with the exception of legislation to provide funding.

On July 30, 1999, DOE issued Draft Request for Proposal No. DE-RP05-99OR22717 for comment. The draft was issued in order to provide for early stakeholder input. Comments on the draft were submitted by August 20, 1999. DOE plans to issue a revised Draft Request for Proposal for comment in the fall of 1999. DOE is hopeful that early stakeholder input will assure that the concerns and issues of local communities, community reuse organizations, local and state governments, Congress, interested citizens and potential bidders will be addressed successfully.

5.3 URANIUM MANAGEMENT ACTIVITIES

5.3.1 Uranium Management Center

In June 1998, DOE initiated the collection and interim storage of potentially reusable uranium materials from across the DOE complex at a central location. The DOE-ORO Office was given the task to establish a facility for storage of these uranium materials. The Uranium Management Center (UMC) was formed to provide a coordinated, cost-effective, and efficient program for management of the nation's surplus uranium resources.

One major emphasis area for the UMC is the consolidation, stabilization, and interim storage of surplus DOE uranium in preparation for reuse, disposition, sale, or barter. The UMC provides a single focal point for the management of all DOE uranium, thereby improving the potential for sale and coordinating use of government resources. Activities associated with the uranium materials at the UMC include packaging, handling, storage, processing, transportation, disposition, sale, or barter. These services are available from the UMC, as appropriate, to all DOE, other government agency, and commercial customers. The UMC uses existing DOE knowledge,

²²Final estimates are not yet available.

technical expertise, and commercial capabilities, to the extent available, to characterize uranium inventories and increase their market value. The UMC works to foster new commercial development in the uranium industry by increasing the potential reuse and sale of DOE surplus uranium.

A second major emphasis area for the UMC is assisting DOE Program Offices in meeting their objectives related to consolidation and management of DOE LEU, normal uranium (NU), and depleted uranium (DU). These program offices handle DOE activities associated with nuclear materials inventories at multiple sites throughout the DOE complex. The UMC is a central focal point for the DOE Program Offices and provides them with the following uranium consolidation, management, and disposition services:

- Office of Nuclear Energy, Science and Technology (NE)
 - Disposition of LEU, NU, DU at PGDP, PORTS, and ETTP;
 - Business development, marketing, disposition, or sales of research reactor fuel; and
 - Identification, characterization, consolidation, storage, and sales of excess uranium.
- Office of Environmental Management (EM)
 - Accelerated disposition of LEU, NU, and DU at Fernald,
 - Accelerated disposition of LEU at Hanford,²³
 - Reduction of the legacy nuclear materials inventories, and
 - Support nuclear material management studies.

²³Also supports Hanford material disposition plans of the NE, DP, and MD Program Offices.

- Office of Defense Programs (DP)
 - Nuclear Materials Management program,
 - Optimize uranium materials management activities,
 - Conservation of nuclear materials resources, and
 - Central Scrap Metal Office for uranium.
- Office of Fissile Materials Disposition (MD)
 - Management of surplus uranium;
 - Identification, characterization, consolidation, and storage of surplus uranium;
 - Development of nuclear materials information system; and
 - Sales of excess or surplus uranium.
- Office of Nonproliferation and National Security (NN)
 - Nonproliferation and verification activities.

The activities of the UMC will enhance ES&H conditions across the DOE complex by reducing or removing excess uranium materials from multiple DOE sites, such as the Fernald and Hanford sites, and consolidating them at a centralized location in preparation for final disposition, sale, or barter.

During FY 1999, an initiative was undertaken by DOE at PORTS to provide interim storage of uranium materials for the UMC until the material can be permanently stored, disposed, reused, or sold. The UMC Interim Storage Facility located at PORTS is used to temporarily store commercially marketable solid uranium in several forms and enrichments. The uranium is stored in compliance with DOE Orders and PAAA regulations and does not present additional hazards to facility workers, the public, or the environment. The operation and maintenance of this facility are the responsibility of the DOE-ORO UMC and its M&I contractor. Initial uranium materials from the Fernald Environmental Management Project (FEMP), in

Fernald, Ohio, were placed in storage at PORTS during FY 1999. Additional uranium materials from the DOE Hanford site in Richland, Washington, are anticipated to be consolidated at PORTS beginning in FY 2000.

Following completion of Environmental Assessments (EAs) for the interim disposition of the Fernald and Hanford uranium materials, DOE plans to prepare an Environmental Impact Statement (EIS) on the consolidation of reusable DOE uranium materials from various DOE sites in accordance with the NEPA and the DOE NEPA implementing procedures. The EIS is scheduled to support issuance of a ROD in CY 2000.

5.3.2 Storage of Fernald Uranium Materials

Upon completion of an EA under NEPA in April 1999 that evaluated impacts for receipt and storage of the uranium from FEMP, PORTS was selected by DOE for interim storage of this material. Based on this EA, DOE determined that no significant environmental impacts would result from the transfer of the uranium to PORTS.

Approximately 3,800 metric tons of uranium materials from FEMP in the form of normal, depleted, and LEU compounds and metal will be placed in storage at the UMC Interim Storage Facility at PORTS. Potential commercial uses include use as a radiation shielding material and as an agent for special alloy metal applications.

Shipments of the uranium materials from FEMP began arriving at PORTS on June 2, 1999, and will continue until approximately CY 2001. During FY 1999, approximately 1,250 metric tons of uranium materials were shipped from FEMP to PORTS. The schedule will enable

Fernald to meet agreements with the State of Ohio to remove uranium from the site to support site closure milestones. The uranium materials are being stored in the UMC Interim Storage Facility in the X-744G building at PORTS, which is used for storage of similar uranium materials.

5.3.3 Storage of Uranium Materials from Hanford and Universities

Approximately 1,700 metric tons of Hanford uranium materials similar to the Fernald materials and approximately 20 metric tons of LEU on loan from DOE to universities and other organizations are also being considered for interim storage at PORTS. On July 26, 1999, a public meeting was conducted by DOE in Piketon, Ohio, to discuss plans for the storage of these materials at PORTS.

Approximately 2.2 metric tons of LEU were retrieved from Seattle University and placed in storage at the UMC Interim Storage Facility in August 1999. In September 1999, 2.5 metric tons of natural uranium were retrieved from the University of Nebraska and placed in storage at the UMC Interim Storage Facility at PORTS. These uranium materials were lent by the Atomic Energy Commission to the universities in 1970 and 1962, respectively, for educational and research purposes. These uranium materials, which are commercially marketable and are not classified as waste, are packaged in clean containers and do not present additional hazards to facility workers, the public, or the environment.

Uranium materials from Hanford are not expected to begin arriving at PORTS until FY 2000, following completion of an EA for this material. Like the Fernald materials, these uranium materials will be stored for future use or sale by DOE.

5.4 OTHER DOE ENVIRONMENTAL, SAFETY, AND HEALTH INITIATIVES

5.4.1 Secretarial Initiative on Environmental, Safety, and Health Conditions at Paducah

In June 1999, in response to concerns raised in a lawsuit, a team of health physicists was sent to the PGDP site to identify the existence of any imminent threats to public health, worker safety, or the environment. No imminent threats were identified. In August 1999, the Secretary of Energy, Bill Richardson, ordered a full investigation into ES&H conditions at the PGDP site. The two-phased investigation focuses first on issues and concerns from the past 10 years. The second phase will involve examination of longer-term legacy ES&H issues. On September 8, 1999, the Secretary ordered a safety stand-down at the site to permit DOE and its contractor employees and managers to review safety procedures. The stand-down did not identify any imminent hazards to the health and safety of DOE and contractor workers. Employees did indicate interest in receiving more communication and feedback in the area of radiation monitoring programs.

On September 14, 1999, Secretary Richardson announced the investigating team's initial observations.²⁴ At that time, the Secretary noted that while the investigating team did not find any imminent hazards to the workers or the public and confirmed that general radiation hazards are low and that radiation protection programs have improved over the past decade, it identified areas for improvement (e.g., radiological protection, procedures, conduct of operations, and acceleration of cleanup

schedules). In response to the initial observations and concerns elicited during the stand-down, the Secretary identified a series of corrective actions to be taken immediately: (1) an independent review of the contractor's radiation protection program, (2) an examination of existing air monitoring systems used at the site to confirm that these monitors will record any significant DOE contributions to overall site emissions, (3) an expansion of worker training programs, and (4) stationing two full-time DOE facility representatives at the site.

5.4.2 Integrated Safety Management Initiative

DOE is committed to conducting work efficiently and in a manner that ensures protection of workers, the public, and the environment. The ISMS is DOE's approach for accomplishing this goal. Safety Management Systems provide a formal, organized process whereby people plan, perform, assess, and improve the safe conduct of work. DOE policy requires that safety management systems be used to systematically integrate safety into management and work practices at all levels so that missions are accomplished while protecting the workers, the public, and the environment. Direct involvement of workers during the development and implementation of safety management systems is essential for success.

The DOE ISMS establishes a hierarchy of components to facilitate the orderly development and implementation of safety management throughout the DOE complex, including the GDPs. The safety management system consists of six components: (1) the objective, (2) guiding principles, (3) core functions, (4) mechanisms, (5) responsibilities, and (6) implementation. The objective, guiding principles, and core functions are defined by DOE policy and are used consistently in implementing safety management throughout the DOE complex. The mechanisms, responsibilities, and implementation components

²⁴The team observations and corrective actions are available at <http://www.doe.gov/news/releases99/sepppr/PaducahCW.pdf>. As of September 30, 1999, the first phase investigative report had not been released.

are established for all work by the DOE contractor (with approval by DOE) and vary, based on the nature and hazard of the work and the site location. The requirement for DOE contractors to develop and implement an ISMS is established by 48 CFR 970.5204-2, *Integration of Environment, Safety and Health into Work Planning and Execution*.

Consistent with Secretarial direction given on March 3, 1999,²⁵ DOE plans to verify implementation of ISMS at all DOE sites, including PGDP and PORTS, by September 2000. The verification will take place in two phases. Phase I will verify that programmatic elements are in place. Phase II will consist of a field verification. DOE ORO is expected to perform the Phase I and Phase II verifications by December 1999 or January 2000.

The focus of the DOE ORO M&I contractor's implementation of ISMS is to systematically integrate ES&H controls into management and work practices. The M&I contractor for DOE ORO, who is responsible for managing and integrating the activities at PGDP and PORTS, implements the following five integrated safety management functions:²⁶

- define the scope of work,
- analyze hazards,
- develop and implement hazard controls,
- perform work within controls, and
- provide feedback and continuous improvement.

The implementation of the ISMS process has been successfully initiated at the GDPs through FY 1999. At PGDP, for example, the ISMS process is applied in weekly work planning

meetings during which scope, hazards, hazard controls and other related issues are discussed in conjunction with proposed work. Additionally, workers are involved in procedure development, and any subcontract prepared for work incorporates the ISMS principles. The ISMS process is also used for nonroutine work, as was demonstrated by the successful installation of a vented lid on an 85-gallon over-pack with a 55-gallon inner container of corrosive liquid classified as Class C radioactive waste. This installation involved a diverse group of specialists who worked together to identify all safety concerns associated with the activity before completing the work.

Integrated Safety Management is also being effectively implemented at PORTS. This determination was made after a recent internal assessment of the program. Processes currently in place include assignment of team members to each project to promote uniformity and consistency throughout the project. The project team is responsible for defining the scope of work, identifying hazards and implementing effective control measures. A training course entitled "Supervising for Safety" is mandatory for all personnel, including subcontractors. A Project Readiness Review is required to ensure all aspects of a project are in place before project approval. PORTS gained approval from DOE on Phase I implementation and is currently preparing for Phase II verification of the ISMS program in FY 2000.

5.4.3 Paducah Environmental, Safety, and Health Initiatives

At PGDP, the Safety Team of Paducah (STOP) continued to meet monthly throughout the year as it has since its beginning in 1993. The team includes employees representing the DOE Paducah Site Office, DOE's M&I contractor, subcontractors, and USEC. This team identifies and addresses safety issues affecting employees

²⁵Information relating to the Secretary's direction may be found at <http://tis.eh.doe.gov/ism/bbmessage.html>.

²⁶*Integrated Safety Management System Description* dated April 1999, document BJC/OR-87, Revision 1.

both at home and at work. STOP helped to increase awareness of the need for caution in driving on the plant access road and, in coordination with community and statewide initiatives, STOP promoted 100% seat belt usage and correct use of child seats. To identify areas of concern or suggest solutions to existing problems, the parties involved in the M&I contract (DOE, the M&I contractor, and their subcontractors) use one safety suggestion form.

5.4.4 Portsmouth Environmental, Safety, and Health Initiatives

At PORTS, safety is emphasized through personnel awareness by commencing every meeting with a safety topic and by recognizing subcontractors who show outstanding performance toward zero accidents and commitment to safety excellence through a "Safety Subcontractor of the Month" program.

6. ENVIRONMENTAL, SAFETY, AND HEALTH STATUS OF NONLEASED AREAS

The DOE mission at PGDP and PORTS includes Environmental Management (EM), which is under the direction of the Office of Environmental Management, and Enrichment Facilities²⁷ (EF) programs and projects, which are under the direction of the Office of Nuclear Energy, Science and Technology. The EM Program identifies and reduces the ES&H risks at the GDPs through environmental restoration (ER) and waste management (WM) activities. The EF Program manages and reduces ES&H risks at the

GDPs through the following activities:

- (1) management of DUF₆ to ensure safe storage of cylinders and to implement long-term management strategies and plans for this material including conversion and storage of the converted DUF₆,
- (2) management of the polychlorinated biphenyl (PCB) program,
- (3) participation in the NRC certification and regulatory process (e.g., review of all proposed Compliance Plan modifications; oversight of activities in areas that are leased, but not certified; and coordination and information exchange with NRC),
- (4) maintenance of nonleased facilities, and
- (5) administration of the Lease within these programs with USEC.

Integration of ES&H activities within these programs assures that DOE EM and EF activities at the GDPs are conducted in a way that avoids accidents or injuries to workers and the public and avoids harm to the environment. DOE ES&H-related activities at the GDPs include, but are not limited to, environmental protection, environmental restoration, waste management, nuclear safety, engineering, industrial hygiene, industrial safety, radiation protection, transportation safety, risk management, and occupational medicine. The DOE EM and EF Programs at the GDPs are managed by DOE ORO and its M&I contractor.

On April 1, 1998, as part of DOE's contract reform initiative, DOE implemented an M&I contract for the EM and EF work at the Oak Ridge Reservation in Oak Ridge, Tennessee, and at both GDPs. Objectives of the M&I contract, which replaced a management and operating contract, include accelerating cleanup and maximizing cost-effective completion of work. During FY 1999, the M&I contractor issued several major subcontracts involving work at the GDPs in support of the DOE EM and EF Programs. Integrated Safety Management, described in Section 5.4, is the foundation of the M&I contract implementation.

²⁷On September 23, 1999, DOE ORO renamed the Enrichment Facilities Program. The new name is Uranium Programs. For purposes of consistency, this report uses the term EF to refer to the EF Program during FY 99.

6.1 ENVIRONMENTAL, SAFETY, AND HEALTH STATUS OF NONLEASED AREAS AT PADUCAH

During FY 1999, DOE and its contractors and subcontractors made good progress toward completion of their mission at PGDP with no occupational injuries that caused any employee to miss a day of work. DOE met all 78 regulatory deliverables on schedule for FY 1999. These deliverables included reports to the Kentucky Department for Environmental Protection (KDEP) and to the USEPA.

Improved strategies for environmental cleanup and WM were implemented during FY 1999. Environmental cleanup is now focused on sitewide remedial cleanup objectives rather than individual locations. The individual locations requiring investigation and, in some cases, remediation have been incorporated into the sitewide remedial objectives. This approach is expected to save money by reducing documentation costs, with savings to be invested in cleanup. For WM, all waste streams in storage have been ranked according to risk. Wastes that pose a higher risk by remaining in storage have top priority for disposition.

6.1.1 Facilities and Acreage

DOE owns the 3,556-acre PGDP reservation and leases the uranium enrichment facilities to USEC. At PGDP, DOE leases 315 buildings and facilities to USEC and retains 134 as nonleased. The nonleased facilities include:

- roads and grounds outside the perimeter security fence on the DOE Reservation and approximately 200 acres of deeded grounds (formerly common ground) inside the fence,
- parcels of land designated for investigation and/or environmental cleanup [solid waste management units (SWMUs)],

- an operating solid waste contained landfill,
- waste storage and treatment facilities,
- two groundwater containment systems,
- two complexes of facilities under surveillance and maintenance in the D&D program,
- nonleased facilities not in use and not yet in the D&D program,
- office and laboratory facilities, and
- storage yards for cylinders containing DUF₆.

6.1.2 Construction Activities

DOE construction activities on the PGDP reservation during FY 1999 included:

- Completion of the DOE cylinder yards fencing project in October 1998, which is expected to save more than \$1 million by reducing security costs over a 5-year period. This project included installation of 5,400 linear feet of fencing, lighting, and patrol roads.
- Construction on the C-745-L-North DUF₆ Cylinder Storage Yard began in May 1999. When complete, the yard will provide approximately 196,000 square feet of concrete-surfaced storage space with an estimated capacity of 4,330 cylinders. Construction is on schedule for completion by March 31, 2000.
- Completion of construction of an enclosed containment structure in the C-752-A RCRA Waste Storage Facility in August 1999 for waste sampling, treatment, and treatability studies. Scheduled to begin operations in FY 2000, it will contain airborne or transferable radiological contamination that may be released during waste sampling or treatment.

- Completion of approximately 50% of the construction work associated with the Lasagna™ soil remediation process. Construction is scheduled to be completed in November 1999. The process will be used under a ROD for cleanup of trichloroethylene (TCE)-contaminated soils at SWMU 91.

6.1.3 Depleted Uranium Hexafluoride Management

The DOE EF Program is responsible for storage, inspection, and maintenance of approximately 450,000 metric tons (~500,000 tons) of DUF₆ in 36,910 steel cylinders at PGDP. DOE has oversight of the DUF₆ pursuant to the AEA. The number of DOE cylinders at PGDP includes the 28,351 cylinders generated between November 1952 and July 1, 1993, and an additional 8,559 cylinders that have been or will be transferred from USEC to DOE in accordance with the 1996 USEC Privatization Act.²⁸ The DOE inventory includes an additional 1,940 cylinders containing natural or slightly enriched uranium.

DOE has improved ES&H and other aspects of cylinder management through its response to a recommendation from the Defense Nuclear Facilities Safety Board (DNFSB). In 1995, the DNFSB issued Recommendation 95-1, *Improved Safety of Cylinders Containing Depleted Uranium*. The recommendation identified concerns with the overall condition and the corrosion rate of the surfaces of the steel cylinders, which are stored outdoors. DOE

responded with an Implementation Plan containing a set of actions and schedule for resolving the concerns. These actions have been either completed or incorporated into procedures for ongoing maintenance and management, as appropriate. Major initiatives in the safe storage of cylinders include:

- Refurbishment of a total of 3,368 of the older cylinders from FY 1996 through FY 1998. Exterior surfaces were blasted with a recyclable steel grit before applying paint to minimize the corrosion rate of the steel. An approximately 4-ft by 12-ft area on the bottom of each cylinder was topcoated with an epoxy mastic for extra protection. No cylinders were painted in FY 1999.
- Constructing new concrete cylinder storage yards and upgrading existing yards from gravel to concrete. The newest concrete cylinder storage yard is the 11-acre C-745-T facility completed in March 1998. Construction of the C-745-L yard began in FY 1999, with completion scheduled for FY 2000. When the entire C-745-L yard is completed, 28 acres of the 60-acre DOE cylinder yard complex will be concrete.
- Improvement in inspection and monitoring of cylinders by stacking them to provide better access for inspectors. In FY 1999, DOE surveillance and maintenance of cylinders included the annual inspection of 2,460 cylinders, quadrennial inspection of 2,964 cylinders, and baseline inspections of 6,729 cylinders.²⁹

²⁸In accordance with the Privatization Act, DOE and USEC signed an MOA during FY 1998 by which about 6,500 additional cylinders at PGDP and 2,600 additional cylinders at PORTS containing DUF₆ generated by USEC from July 1, 1993, through privatization on July 28, 1998, were transferred to DOE. According to a second MOA that was also signed in FY 1998, an additional 2,026 USEC DUF₆ cylinders will be transferred to DOE between the date of privatization and FY 2004.

²⁹All cylinders require at least a quadrennial inspection. The cylinders transferred from USEC received a baseline inspection. A smaller number of cylinders receive annual inspections based upon an identified defect. Each inspection utilizes the same detailed checklist, and results are entered into the Cylinder Inventory Database.

Safe storage of DUF₆ has been, and remains, a significant commitment for DOE. However, the focus has expanded to include converting the DUF₆ to a more stable form either for future use or disposition. (See Section 5.2.) Representatives of the Commonwealth of Kentucky and DOE met June 17, 1999, regarding development of an Agreed Order to assure that DUF₆ cylinders at PGDP will be maintained, painted, and inspected until the material is converted. Ohio and Tennessee have similar Orders in place.

EF work at PGDP cost \$9 million in FY 1999. The proposed budget for FY 2000 is \$17 million. The funding levels have increased to account for planned cylinder yard construction in FY 2000. In recent years, overall expenditures on EF Program work at PGDP, PORTS, and Oak Ridge have declined from approximately \$124 million in FY 1995 to \$64 million in FY 1999. The majority of the decrease has been related to the completion of the HEU Suspension and Removal Program at PORTS. However, other EF Program activities at all three sites have been impacted by this trend. Construction of some cylinder yards will be deferred for the third year in FY 2000. Cylinder painting, cylinder movements, and engineering development activities have also been deferred. As a result, DOE agreements with the prime contractor regarding systems engineering requirements of the cylinder project have not been fully implemented.

6.1.4 Update of Safety Analysis Report

The PGDP 1997 Safety Analysis Report (SAR) Update was issued to the DOE Site Office and DOE ORO on March 30, 1998. This document establishes the authorization basis for operation of nonleased facilities at PGDP. Information in the document was updated from September 30, 1995, to September 30, 1997. The 1995 SAR covered leased and nonleased

facilities; the updated SAR is the first edition to focus on nonleased facilities. The 1997 SAR update concluded that with implementation or continuation of controls identified in the 1995 SAR, the operations in the nonleased facilities and areas can be conducted safely with adequate protection provided for health and safety of the public and employees as well as protection of the environment. DOE is reviewing the 1997 SAR update.

6.1.5 Environmental Restoration

DOE ORO has an aggressive plan to accelerate completion of its EM mission, which includes ER and WM activities. The plan and its assumptions are described in a document titled *Accelerating Cleanup, Paths to Closure, Oak Ridge Operations Office* (DOE/OR/01-1746, R1, published in May 1999).

The regulatory framework for ER at PGDP is the Paducah Federal Facility Agreement (FFA)—a tri-party agreement among DOE, USEPA Region IV, and the Commonwealth of Kentucky that became effective on February 13, 1998. The FFA coordinates CERCLA compliance, administered by USEPA, with the RCRA corrective action program administered by Kentucky. PGDP was placed on the National Priorities List (NPL) on May 31, 1994.

PGDP has identified 211 SWMUs and Areas of Concern (AOCs) subject to investigation under the FFA. Most of these areas are on DOE property either within the security fence or on the DOE Reservation. Off-site contamination has affected groundwater between the plant and the Ohio River to the north and, to a limited distance, downstream surface water and sediments.

To facilitate a logical environmental remediation of PGDP, DOE initially focused on addressing immediate risks and

high-concentration areas associated with off-site contamination:

- Mitigation of immediate risks has been accomplished. Several continuing actions are being performed to ensure that immediate risks remain at acceptable levels. These actions include providing municipal water to residents north of the plant in a designated area; monitoring migration of groundwater contamination; and maintaining signs and fences installed to limit access to contaminated ditches, streams, and lagoons.
- Mitigation of the spread of high-concentration contaminated areas associated with off-site contamination continues. Actions include operation of systems for hydraulic containment of high-concentration portions of the Northwest and Northeast groundwater contamination plumes, maintenance of sediment controls on-site at the scrap metal yards, and use of source treatment measures to reduce the contamination in discharges to an on-site ditch. These actions have been successful in meeting the goals contained in the RODs³⁰ to maintain hydraulic control and reduce migration of the plumes.

When the immediate risks and off-site high concentration contamination areas had been addressed, the remaining SWMUs and AOCs were initially segregated into Waste Area Groups (WAGs) based on common characteristics (such as contaminant types, media and location) for further investigation and remediation. However, in 1998, DOE further refined this strategy and grouped the existing WAGs into larger areas based on site remedial objectives, as explained in

³⁰Record of Decision for Interim Remedial Action of the Northwest Plume at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, DOE/OR/06-1143, and Record of Decision for Interim Remedial Action of the Northeast Plume at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, DOE/OR/06-1356.

detail in Section 3.2 of the *Paducah Site Management Plan* (DOE/OR/07-1780&D2). This change is intended to maximize opportunities to benefit from regional approaches and economies of scale, reduce documentation costs, and provide a better process to evaluate cumulative effects from all media. Based on these objectives, the new strategy establishes a framework for conducting five major operable units (OUs):³¹

1. Groundwater Operable Unit: focuses on investigation and remediation of the groundwater for protection of off-site residents. The recently discovered Southwest plume will be addressed as a part of this OU.
2. Surface Water Operable Unit: focuses on investigation and remediation of the surface waters for protection of recreational users and ecosystems.
3. Burial Grounds Operable Unit: focuses on investigation and remediation of the burial grounds for protection of industrial workers.
4. Surface Soils Operable Unit: focuses on investigation and remediation of the surface soils for the protection of industrial workers.
5. D&D Operable Unit: focuses on characterization and D&D of facilities for the protection of industrial workers.

After the actions agreed to in a ROD for each of the five Operable Units are complete, a Comprehensive Sitewide Operable Unit (CSOU)

³¹An Operable Unit is a discrete action that comprises an incremental step toward comprehensively addressing site remedial problems. This discrete portion of a remedial response manages mitigation, or eliminates or mitigates a release, a threat of a release, or pathway of exposure. Operable Units may address geographical portions of a site, specific site problems or initial phases of an action, or may consist of any set of actions performed over time located in different parts of a site.

project will be undertaken that will include a sitewide baseline risk assessment to evaluate any residual risk remaining at the site after completion of the five OUs. If the CSOU risk assessment concludes that the actions taken collectively provide adequate protection to human health and the environment, a final CSOU Proposed Plan and ROD will be issued, followed by a final remediation report declaring site remediation complete. In the event that the CSOU risk assessment determines additional actions are needed, a Feasibility Study (FS) will be developed with the preferred alternative documented in a Proposed Plan and ROD, followed by the necessary remedial actions.

Consolidation of work scope under this new strategy is expected to result in approximately \$50 million in cost avoidances compared with the original compliance case under the FFA. These cost avoidances are the result of gained efficiencies and reduced documentation costs. Additionally, the consolidation of the work scope will accelerate remedial actions for groundwater and surface water by several years. The new strategy also includes initiatives to reduce long-term Operations and Maintenance (O&M) costs. One particular initiative includes an FS to evaluate remedial alternatives for converting the existing groundwater pump-and-treat system into an in situ passive treatment system, which has the potential to reduce life cycle O&M costs by approximately \$100 million if successful.

The contaminants of primary focus in ER at PGDP are TCE, a common industrial solvent; technetium-99 (^{99}Tc), a radioactive material present in used nuclear reactor fuel that was recycled at the plant periodically during its first approximately 20 years of operation; PCBs, a fire retardant commonly used in oils in electrical systems; and uranium from the enrichment operations at PGDP. Secondary contaminants consist of various metals, organics, and other radionuclides such as americium, plutonium, and

neptunium. The environmental contamination that DOE is in the process of remediating resulted primarily from historical practices no longer in use at PGDP. For instance, PGDP ended its use of TCE as a degreaser in 1993. Reactor "returns," which were the source of ^{99}Tc and the transuranic radionuclides at PGDP, are no longer processed in the enrichment facilities; however, residual ^{99}Tc remains in the process equipment, in decontamination solutions, and in soils, sediments and groundwater. Use of PCBs is controlled and is in the process of being phased out in accordance with the *Uranium Enrichment Toxic Substances Control Act* (TSCA) *Federal Facility Compliance Agreement* (FFCA).

The current scope of the D&D program at PGDP consists of surveillance and maintenance of two complexes of facilities—the C-340 Metals Plant and the C-410 Feed Plant—both of which ceased operations in 1977. DOE surveillance and maintenance activities include maintaining the structures and ensuring residual contaminants are contained.

DOE encourages opportunities to recover assets or reduce costs associated with excess equipment from the D&D of facilities. During FY 1999, DOE shipped 30% of the surplus fluorine cells and support equipment which were previously used at the C-410 Feed Plant facility to manufacture UF_6 feed material and fluorine. By selling these cells and equipment to a commercial fluorine production company, DOE expects to save \$1.4 million in future waste disposal costs.

Other FY 1999 DOE ER accomplishments at PGDP include the following:

- Completed the Remedial Design/Remedial Action process prescribed by the FFA for WAGs 1 and 7. This accomplishment was achieved when the USEPA Region IV and the KDEP approved the *Post Construction and*

Operations and Maintenance Plan for Waste Area Groups 1 and 7 at the Paducah Gaseous Diffusion Plant, DOE/OR/07-1743D1, in May 1999. WAGs 1 and 7 include nine SWMUs; the primary focus is the C-746-K inactive sanitary landfill. Actions completed or ongoing at the C-746-K landfill under a 1998 ROD include: (1) continuation of existing surface water and groundwater sampling, (2) installation of warning and entrance signs, (3) repair of a small area of the cap damaged by flooding, (4) abandonment of two groundwater wells, (5) installation of one new monitoring well, and (6) establishment of deed restrictions. The WAGs 1 and 7 project also included No Further Action on six SWMUs, institutional controls on a fire training area, and deferral of action on the PGDP sewage treatment plant.

- Treated approximately 174 million gallons of contaminated groundwater at the two groundwater treatment systems in FY 1999. The C-612 Northwest Plume Groundwater System has processed approximately 406 million gallons of groundwater contaminated with TCE and ⁹⁹Tc from the start of operations in September 1995 through FY 1999. The C-614 Northeast Plume Groundwater System has processed approximately 213 million gallons of groundwater contaminated with TCE from the start of operations in February 1997 through FY 1999.
- Completed the remediation process on the two 10,000-gallon underground storage tanks that were part of the original 1950s gas station at the plant.
- Obtained regulatory approval for the Remedial Design Report, Remedial Action Work Plan, and Construction/Quality Control Plan for application of Lasagna™ soil remediation technology at SWMU 91, a former UF₆ cylinder drop-test site. Construction of the in

situ soil remediation system started in August 1999. Construction was approximately 50% complete by the end of FY 1999. Operations are scheduled to start in November 1999. The Lasagna™ technology was selected under a 1998 ROD to clean up TCE contamination after the successful national demonstration of the technology at PGDP. The system is expected to run 2 years to achieve targeted cleanup levels.

- Commenced fieldwork on WAGs 3, 8, 28/Data Gaps Project. WAG 3, scheduled for completion in FY 2000, includes three burial grounds; WAG 8, completed at the end of September 1999, includes the four plant switch yards; and WAG 28, which was completed at the end of July 1999, includes locations related to the original construction of the plant. The project also includes collection of groundwater and subsurface soil samples to supplement existing data. The data gaps portion of the project was completed at the end of July 1999. This project will complete all major investigations for the Groundwater Operable Unit.
- Issued the D2 Remedial Investigation Reports for WAGs 6 and 27 in May 1999 and June 1999, respectively. Information in both reports will be used to develop remedial decisions for groundwater contamination.
- Initiated the Innovative Treatment Remediation Demonstration (ITRD) process for the Groundwater Operable Unit FS. The ITRD team included representatives of DOE, regulatory agencies, industry, and national laboratories. It will help to evaluate remedial technologies with potential application to groundwater contamination.

ER costs were \$29 million for FY 1999, with a proposed budget of \$21.8 million for FY 2000. Budget reductions in recent years have resulted in

extensions for completion of the EM program. No noncompliances have resulted from these reduced funds, nor have any impacts to the ES&H conditions been identified. However, projects delayed due to funding limitations included additional fence control related to access control and sales of additional surplus fluorine cells.

6.1.6 Waste Management

DOE is responsible for the characterization, storage, treatment, and disposal of certain wastes at PGDP. These wastes include waste generated before the establishment of USEC on July 1, 1993, ongoing generation of wastes from DOE projects, and a limited amount of the wastes generated by USEC. By FY 2012, DOE plans to dispose of all legacy waste in storage as of the beginning of FY 1999. DOE defines legacy wastes as any DOE waste generated prior to FY 1999 and certain wastes generated by USEC that are identified in the lease between DOE and USEC. These wastes include RCRA, PCB, asbestos, chromium, arsenic, pentachlorophenol, TCE, low-level radioactive, and transuranic wastes.

After characterization to assure the appropriate disposition method, wastes are sent for disposal to DOE's C-746-U Solid Waste Contained Landfill on the PGDP reservation or shipped off-site to approved DOE or commercial treatment and disposal facilities. Wastewater is treated on-site.

The USEPA and Kentucky Division of Waste Management are the regulatory agencies for PGDP WM. Regulations and the DOE Order governing WM include the following:

- RCRA, Part B, Hazardous Waste Management Permit;
- TSCA regulations for PCB wastes;
- DOE Order 5820.2A, *Radioactive Waste Management*; and

- Kentucky solid waste regulations for other wastes.

Agreements related to implementation of these regulations and the Order include the following:

- Site Treatment Plan and associated Agreed Order under the Federal Facilities Compliance Act for characterization, treatment, and disposal of mixed hazardous/radioactive wastes;
- Toxicity Characteristic Leaching Procedure (TCLP) FFCA for TCLP characterization under RCRA for waste generated prior to September 25, 1990; and
- Uranium Enrichment Toxic Substances Control Act (TSCA) FFCA for use, cleanup, storage, treatment, and disposal of PCBs.

DOE WM accomplishments at PGDP during FY 1999 include the following:

- Treated, shipped, or disposed of more than 4,935 tons of DOE waste and USEC waste. All of the USEC waste and most of the DOE waste were either wastewater treated on-site or waste disposed of in DOE's C-746-U Solid Waste Contained Landfill, shipped off-site to DOE's TSCA Incinerator at ETTP, to other DOE facilities, or to approved commercial disposal facilities.
- Set daily and monthly disposal records at the C-746-U Solid Waste Contained Landfill with the disposal of 1,795 tons of waste over 3½ days in June 1999 and a monthly total of 4,000 tons disposed in June. Use of this operating landfill has saved \$15 million to date compared with off-site disposal options.
- Passed every unannounced monthly inspection of the C-746-U Solid Waste Contained Landfill

by the Kentucky Division of Waste Management with all aspects deemed acceptable and no deficiencies cited since the landfill began operation in February 1997.

- Issued the draft Engineering Evaluation and Cost Analysis (EE/CA) for regulatory review. This EE/CA addresses the removal of an estimated 65,000 tons of scrap metal from PGDP. Removal of the scrap is necessary to investigate the SWMUs underneath.

WM costs were \$13.4 million for FY 1999, with a proposed budget of \$16 million for FY 2000. Budget reductions in recent years have resulted in extensions for completion of the EM program. No noncompliances have resulted from these reduced funds, nor have any impacts to the ES&H conditions been identified. However, certain fire protection and electrical upgrade projects have been moved to outyears.

6.1.7 DOE Material Storage Areas

DOE is in the process of consolidating and documenting waste and unused equipment at a total of 148 locations at PGDP designated as DMSAs. The DMSAs are nonleased facilities that are located inside leased buildings and outdoor areas. DOE and USEC established the DMSAs on December 31, 1996, to facilitate NRC certification of the GDPs. Work on the DMSAs has involved documenting the contents, resolving environmental problems with the contents such as draining and disposing of oils from old equipment, and beginning the process of proper segregation and disposal of wastes. During FY 1999, DOE continued to place priority on documenting the contents of DMSAs located inside leased facilities to support USEC's upgrade of seismic reinforcements. In addition, following receipt of a safety evaluation, DOE issued an SER entitled *Safety Evaluation Report for Unreviewed Safety Questions Associated with Department of Energy Material Storage*

Areas—EM&EF-078, in September 1999. An Independent Readiness Assessment was also completed in September, and conditional approval to begin work to address NCS concerns within the DMSAs was issued.

6.1.8 Environmental Status

DOE requires that all its sites conduct and document environmental monitoring and surveillance on the basis of DOE Order 5400.1, *General Environmental Protection Program*. DOE's environmental monitoring at PGDP includes groundwater, surface water, sediment, fish, aquatic organisms, deer, and small mammals. DOE's annual site environmental reports for PGDP document the monitoring results, which verify compliance with permits and applicable laws.

Environmental permits for DOE projects and activities at PGDP include the following:

- An air permit under the Clean Air Act from the Kentucky Division of Air, Department for Environmental Protection. This permit, which expires in June 2003, relates specifically to the DUF₆ cylinder coating project operations.³²
- A Solid Waste Disposal permit issued by the Kentucky Division of Waste Management in 1997 for the C-746-U Solid Waste Contained Landfill. This landfill began operation in February 1997 for disposal of nonhazardous, nonradioactive solid waste. The permit expires in November 2006.
- Kentucky Pollutant Discharge Elimination System (KPDES) permit under the Clean Water Act from the Kentucky Division of Water, Department for Environmental Protection. The current KPDES permit is effective April 1,

³²No cylinder painting was done in FY 1999.

1998, through March 31, 2002. This permit includes four KPDES outfalls: (1) 001, includes treated discharge from the C-612 Northwest Plume Groundwater System and the C-616 treatment lagoon leased to USEC, as well as surface runoff from scrap metal storage yards; (2) 015, includes surface water runoff from nonleased areas including the C-404 inactive hazardous waste landfill; (3) 017, includes runoff from the DOE DUF₆ cylinder storage yards; and (4) 019, includes runoff from the C-746-U Solid Waste Contained Landfill.³³

As required by the KPDES permit, DOE submitted a watershed monitoring plan to the Commonwealth of Kentucky within 60 days of the effective date of the permit. This plan, which was implemented in October 1998, provides for monitoring of Little Bayou and Big Bayou creeks, including fish, bioaccumulation, and toxicity monitoring.

In FY 1999, DOE met the conditions of the KPDES permit with the exception of exceedances of permit limits for toxicity at Outfall 017 in October and December 1998 and April 1999. DOE implemented a Toxicity Reduction Evaluation plan, which was approved by the state, to determine the cause. Painting of DUF₆ cylinders (1996–1998) may have contributed to the problem. The outfall has met all permit limits from May through September 1999. Evaluations of alternative paints that do not cause acute toxicity in the surface runoff have been initiated. A paint that does not cause acute toxicity in the surface runoff will be used when the painting operation is restarted.

During FY 1999, the Secretary of the Kentucky Natural Resources and Environmental

Protection Cabinet issued a final order indicating that the state can regulate radionuclide levels in waste disposed of in the C-746-U Solid Waste Contained Landfill; DOE filed suit against Kentucky in U.S. District Court challenging the order.

6.1.9 Safety and Health Status

DOE goals in Safety and Health at PGDP include (1) zero accidents and (2) limiting exposures to chemicals and radiation to “as low as reasonably achievable.” The basis of the Safety and Health requirements supporting these goals includes 10 CFR 835 for radiation protection and the 29 CFR 1910 and 1926 series for industrial hygiene and safety.

DOE and its prime contractors and subcontractors worked a total of 841,747 hours and drove a total of 184,109 miles in government vehicles during FY 1999 with no occupational injuries that caused any employee to miss a day of work. Five recordable injuries and illnesses (RIIs) were experienced during FY 1999, three by subcontractors to the M&I contractor and two by DOE subcontractor employees. In October 1998, an employee fell while entering a building, resulting in back strain. In April 1999, two employees traveling in a DOE vehicle on the plant access road were hit by another vehicle that failed to stop at an intersection, resulting in minor contusions and bruises to both employees. In May 1999, an employee cut his hand while retracting a portable tent during fieldwork. The cut required stitches. In September 1999, an employee performing Health Physics technician work experienced a back strain when lifting survey equipment.

The average radiation exposure for the 530 personnel monitored as part of the DOE radiation protection program during CY 1998 was 10 mrem, compared with the 5,000 mrem occupational exposure limit set by federal law in

³³For a description of the regulatory limits for environmental releases, the reader is referred to DOE Annual Site Environmental Reports (BJC/PAD-5) and the *Environmental Monitoring Plan*, (BJC/PAD-121).

10 CFR 835. No individual received radiological exposures in excess of regulatory limits. This compares with annual background radiation exposure levels per person of 200 mrem from naturally occurring radon, 40 mrem from food, 30 mrem from terrestrial sources, and 30 mrem from cosmic radiation (according to the National Council on Radiation Protection and Measurements, NCRP Report 94, *Exposure of the Population in the United States and Canada from Natural Background Radiation*).

The Agency for Toxic Substances and Disease Registry (ATSDR), based in Atlanta, Georgia, continued preparation of a Public Health Assessment on PGDP during FY 1999. The assessment is required by federal law because PGDP is on the NPL for environmental cleanup. ATSDR, which has sent representatives to DOE public briefings and workshops to stay informed on site activities and stakeholder interests and concerns, plans to issue its draft assessment to the public in FY 2000.

As required by the National Defense Reauthorization Act for 1993, DOE Headquarters awarded a grant to the Paper, Allied-Industrial, Chemical, and Energy Workers International Union³⁴ (PACE) to conduct a Former Worker Medical Surveillance Program at the DOE GDPs in Paducah, Portsmouth, and Oak Ridge. PACE completed Phase I, a needs assessment, during FY 1997 to determine whether it considers any former workers to be at risk for work-related health effects from exposures while employed at the GDPs. In FY 1998, DOE approved PACE's application to conduct a medical surveillance of former workers as Phase II of the study. During FY 1999, PACE completed the medical surveillance of approximately 85 of the 350 former PGDP workers identified for this surveillance.

³⁴Formerly Oil, Chemical & Atomic Workers International Union (OCAW).

6.1.10 Reportable Occurrences

DOE uses an Occurrence Report system on a national basis to communicate incidents at its facilities that need to be shared with all DOE sites and evaluated for lessons learned. Copies of final Occurrence Reports are made available at DOE reading rooms and information centers. Appendix B.1 summarizes the reportable occurrences at PGDP for FY 1999. During FY 1999, a total of 22 Occurrence Reports were filed at PGDP. All but ten of these reports have been finalized; these ten reports were initiated and/or updated during the latter part of FY 1999. All 22 reports were classified as "off-normal" occurrences. Off-normal occurrences are defined as abnormal or unplanned events or conditions that adversely affect or indicate problems in the safety, security, ES&H protection, or operation of a facility. None of the occurrences resulted in harm to people or the environment. However, corrective actions were taken on each incident to prevent recurrences of similar or more serious events. Also, lessons learned were identified and communicated across the DOE complex to help ensure that PGDP and other DOE sites avoid similar problems.

Occurrences and findings from assessments also are assessed to determine whether they are potential noncompliances with PAAA regulations. PAAA provides DOE with the authority to assess civil and criminal penalties for violation of DOE nuclear safety rules, regulations, or orders. During FY 1999, based on preliminary concerns from a DOE EH Office of Oversight Investigation Team, one submittal was entered into the DOE Noncompliance Tracking System (NTS) as a potential noncompliance with 10 CFR 835. This concern, and any others identified in the DOE EH Team's final report, will be assessed. Then, a final decision will be made on whether potential PAAA noncompliances to 10 CFR 835 exist. Revisions will be made, as needed, to the submittal in NTS.

6.1.11 Summary

DOE accomplishments and initiatives to enhance and improve ES&H conditions at PGDP during FY 1999 include, but are not limited to, the following:

- Continued making good progress toward eventual site cleanup.
- Completed remedial actions for WAGs 1 and 7, which include the C-746-K inactive sanitary landfill and other areas.
- Treated approximately 174 million gallons of contaminated groundwater.
- Completed the remediation process on two 10,000-gallon underground storage tanks installed during the 1950s.
- Obtained regulatory approval for the Remedial Design Report, Remedial Action Work Plan, and Construction/Quality Control Plan for application of the Lasagna™ soil remediation technology at SWMU 91.
- Treated, shipped, or disposed of more than 4,935 tons of waste.

6.2 ENVIRONMENTAL, SAFETY, AND HEALTH STATUS OF NONLEASED AREAS AT PORTSMOUTH

During FY 1999, the DOE EM and EF Programs at PORTS have continued to make good progress. The DOE EM Program at PORTS met all 47 regulatory deliverables on schedule during FY 1999.

The DOE EF Program continued to manage DUF₆, HEU, safeguards and security, and maintain nonleased buildings and grounds at

PORTS. The EF Program will include the new DUF₆ conversion facility upon completion.

6.2.1 Facilities and Acreage

DOE owns the 3,714-acre federal reservation at PORTS and leases the uranium enrichment facilities to USEC. DOE leases 274 of the 357 facilities and systems at PORTS to USEC and retains 83 as nonleased facilities and systems. These nonleased facilities and systems include

- portals (vehicular and pedestrian),
- security fencing,
- holding ponds,
- warehouses (active and inactive),
- five groundwater treatment facilities,
- RCRA Part B-permitted Hazardous Waste Storage Facility,
- DUF₆ cylinder storage yards,
- SWMUs,
- administrative facilities,
- facilities leased by DOE to the Ohio Army National Guard, and
- inactive process facilities.

USEC also leases, and is responsible for, the grounds in the immediate vicinity of the GDP facilities within Perimeter Road as well as all roads and railroads. DOE retains, and is responsible for, most of the grounds on the exterior of Perimeter Road and approximately 60% of the grounds inside the Perimeter Road with the exception of areas in the immediate vicinity of GDP facilities.

6.2.2 Construction Activities

From April to June 1999, portions of the X-744G building were completely renovated and modified to prepare for the arrival of shipments of uranium materials from the DOE FEMP site. All materials from previous work projects and debris were removed from the building. The

structure was cleaned, the floors were sealed with a special epoxy coating, and the walls were painted up to 14 feet high. A loading dock was added to the north side of the building, and 85 cubic yards of concrete were added to the entrance to the loading dock. The X-744G renovation turned 70,000 square feet of contaminated Radiological Work Permit (RWP) controlled area into a clean, freshly painted, well lit storage area. Material from Fernald is now stored in a clean, accessible and easily monitored storage area. Since this large area has been renovated, there is a substantial reduction in areas to be surveyed and less chance for personal contamination.

Construction of an expansion of the X-745C West DUF₆ cylinder storage yard is scheduled to begin in October 1999. When complete, the storage yard will provide approximately 3.5 acres of additional storage capacity to relocate DUF₆ cylinders at PORTS. The cylinders, which are currently stored on USEC space, recently reverted to DOE ownership under terms of a DOE/USEC MOA. Construction of the new yard is planned to be completed in March 2000.

A small project to add a handicapped ramp to the DOE Public Environmental Information Center, which is located in a modular complex on the west side of the plant, was completed in May 1999. Students from the local vocational school's carpentry class built the ramp and installed it at the site.

6.2.3 Depleted Uranium Hexafluoride Management

The DOE EF Program is responsible for management of DUF₆ generated at PORTS from the start of enriched uranium production in 1954 until the privatization of USEC in July 1998.³⁵

³⁵See footnote 28.

The DOE DUF₆ cylinder storage yards are some of the more important nonleased areas from an ES&H perspective. DOE stores more than 16,000 cylinders, including approximately 13,400 full DUF₆ cylinders. The remaining cylinders include cylinders with residual materials, empty cylinders, and 2,653 cylinders transferred from USEC upon privatization.

As discussed in Section 6.1.3, DOE has improved ES&H conditions and other aspects of cylinder management through its response to DNFSB recommendation 95-1 and Director's Findings and Orders (DF&Os) with Ohio EPA. In response to concerns about the manner in which DUF₆ cylinders were stored, by the end of FY 1998 all DOE-owned cylinders had been moved and restacked with the exception of the 2,653 full DUF₆ cylinders that were transferred to DOE when USEC was privatized. The goal is to restack 1,000 of the 2,653 cylinders by the end of September 2000 and the remainder in FY 2001. To provide additional information about the current status of cylinders, PORTS performed ultrasonic wall thickness measurements on 150 DOE-managed cylinders during FY 1999. Finally, to provide additional assurance that the cylinders remain in a safe condition, cylinders are visually inspected either annually or quadrennially. PORTS completed annual inspections on 11 cylinders and quadrennial inspections on 5,991 cylinders. Quadrennial inspections far exceeded the goal of 3,725 cylinders by the end of September 1999.³⁶

NE has finalized a Programmatic Environmental Impact Statement (PEIS) to determine a recommended alternative for dispositioning the inventory of DUF₆ in storage at PORTS, PGDP, and ETTP. Several meetings have been held with the public and industry

³⁶Some cylinders have been identified as requiring more frequent inspections than others, thus some cylinders are inspected on an annual rather than a quadrennial basis.

representatives on this program, including a public meeting at PORTS on February 26, 1998, and an industry meeting in Cincinnati, Ohio, on June 29, 1998. The final PEIS was issued in April 1999, and a Record of Decision (ROD) was issued in August 1999. (See Section 5.2.)

DOE issued a Draft Request for Proposals in late July 1999 for the construction of DUF₆ conversion facilities at PGDP and PORTS. Both conversion plants are expected to be operational by December 31, 2004.

EF activities at PORTS were projected to cost \$30.49 million in FY 1999. The proposed budget for FY 2000 is \$15.5 million. The completion of the HEU Suspension and Removal Program under the EF Program will significantly reduce the Safeguards and Security costs to DOE in FY 2000. In recent years, overall expenditures on EF Program work at PGDP, PORTS, and Oak Ridge have declined from approximately \$124 million in FY 1995 to \$64 million in FY 1999. The majority of the decrease has been related to the completion of the HEU Suspension and Removal Program at PORTS. However, other EF program activities at all three sites have been impacted by this trend. Construction of some concrete cylinder yards will be deferred for the third year in FY 2000. Cylinder painting, cylinder movements, and engineering development activities have also been deferred. As a result, DOE agreements with the prime contractor regarding systems engineering requirements of the cylinder project have not been fully implemented.

6.2.4 Update of Safety Analysis Report

The PORTS 1997 SAR Update was issued for approval to the DOE Site Office and DOE ORO on March 30, 1998. This document establishes the authorization basis for operation of nonleased facilities at PORTS. This first revision of the SAR incorporates resolution of

DOE's SER comments relating to the September 30, 1995, version of the SAR. Although the 1995 SAR covered both leased and nonleased facilities, the updated 1997 SAR, at the direction of DOE, focuses on nonleased facilities. The 1997 SAR update concluded that with implementation or continuation of controls identified in the 1995 SAR, operations in nonleased facilities and areas can be conducted safely with adequate protection provided for health and safety of the public and employees as well as protection of the environment. DOE is in the process of reviewing the 1997 SAR update.

6.2.5 Environmental Restoration

The PORTS ER Program has made extensive progress in recent years in remediating contaminated areas of the plant site. Two consent orders signed in 1989, one between DOE and the State of Ohio and the other between DOE and the USEPA, provide the regulatory framework for remedial actions. The Administrative Order by Consent with the USEPA was amended in August 1997 to include the Ohio EPA as a party to the agreement and to delegate day-to-day oversight to the state agency. In March 1999, the Ohio Order was further amended to integrate on-site work covered under various regulations and agreements. This approach avoids duplication and permits more efficient performance of sitewide monitoring, surveillance, and maintenance activities. The cleanup program is being conducted in compliance with RCRA and applicable aspects of CERCLA. PORTS is not an NPL site.

The site is divided into four sections, or quadrants (I through IV), for investigation and remedial action. Under RCRA, the cleanup at PORTS follows a three-phased approach: RCRA Facility Investigations (RFIs), Corrective Measures Studies, and Corrective Measures Implementation (CMI). Since 1990, all four quadrants have been investigated, and all RFIs

have been approved. PORTS is now completing the last two phases of cleanup. As of FY 1999, over 450 soil borings have been taken and sampled, and more than 600 groundwater monitoring wells across the federal reservation have been installed and sampled, thus providing information on the extent of contamination that resulted from the nearly 40 years of plant operations. These investigative studies show that there are five groundwater plumes, all located within the plant boundaries. The main contaminant in these plumes is the chemical solvent TCE that was used for many years in industrial processes at PORTS. TCE has since been replaced with a more environmentally friendly water-based solvent.

As of FY 1999, PORTS has identified 156 release sites. Contaminants include volatile organic compounds (VOCs), uranium, ⁹⁹Tc, and PCBs. Trace levels of transuranic elements (plutonium, neptunium, and americium) have been detected in sediments in Little Beaver Creek and in the on-site X-701B holding pond area.

Operational units, with minimal contaminants and risk, will be evaluated as a part of the final D&D of the plant so as not to interfere with current plant operations. All final Corrective Measures Studies are to be completed by July 2000.

More than 33 cleanup projects have been completed through FY 1999 at PORTS, including remediating lagoons, closing landfills, constructing five groundwater treatment facilities, consolidating and closing waste storage facilities, and conducting soil remediations. Three pilot projects were approved by the Ohio EPA. These projects, initiated in FY 1998, are being conducted to evaluate additional treatment technologies for applicability at PORTS and to remove sources of groundwater contamination. Data from the pilot projects will be reviewed by the Ohio EPA. A report will be issued following

the completion of each pilot project. In addition, the data will be incorporated into the Corrective Measures Study documents for Quadrants I and II.

One of the pilot projects implemented a process called dynamic underground steam stripping to extract subsurface VOCs in an area of groundwater contamination on the east side of the plant. The process rapidly accelerates VOC removal by injecting steam below the surface through multiple wells, thus raising the temperature of the contaminated area to a level above the contaminants' boiling point. This heating vaporizes the VOCs and drives them to centrally located vacuum extraction wells. By using a process called hydrous pyrolysis oxidation in conjunction with the steam stripping, contaminants not removed by the extraction wells can be destroyed in place by oxidation without further treatment. In late January 1999, the actual injection of steam into the subsurface began. On June 12, 1999, pumping and vapor extraction from the well field was terminated under the pilot demonstration. Pending completion of a mass balance of the area for total TCE removed, it is estimated that approximately 68 gallons of TCE was collected (or about 80% of the contaminant was removed) from the 200 feet by 200 feet area in 4½ months at a cost of \$26,000/gallon of TCE collected. This demonstration validated the technology for use in a variety of locations at the site.

Another project tested an in situ chemical oxidation and recirculation (ISCOR) process. The project involves recirculation of groundwater using four pumping wells located at fixed distances from a central injection well. The extracted groundwater is dosed with an oxidant and is reinjected to the subsurface to degrade organic compounds. During 1996, an initial treatability study involving injection and recirculation of an oxidant solution through multiple horizontal and vertical wells was

conducted at PORTS. The new ISCOR pilot project incorporated lessons learned from the previous test and other related laboratory and field data. Field activities for this project, which began in July 1998, were completed in March 1999. Treatment was performed in two locations to demonstrate (1) general area cleanup (X-770 facility) and (2) final remediation design scale (X-626 facility). In both locations, evidence of contaminant delivery was observed and destruction of contaminant verified. This demonstration validated the technology for use in a variety of locations at the site. Additional knowledge was gained on sitewide applicability and design limitations.

A third pilot project tested the effectiveness of a vacuum-enhanced recovery method in extracting contaminants from groundwater and saturated soils at the south end of the plant property. The primary contaminant was TCE. During this project, approximately five vacuum vapor and groundwater extraction wells were installed in stages at various locations to determine (1) the ability of the technology to remove water and generate vapor flow through tight clay soils, (2) the well spacing needed for optimal dewatering in a full-scale project, and (3) the vertical distribution of contamination. The objectives of the pilot project were to provide design parameters for full implementation of the technology at PORTS and to achieve contaminant mass removal in the groundwater plume. Field activities began in mid-August 1998 and were completed in early November 1998. The objectives, to provide design parameters and achieve contaminant mass removal, were effectively met. The final report was issued in February 1999. Data collected from the project indicate that this technology is more effective than conventional pump and treat strategies. Comparisons of this technology with others are made in the Corrective Measures Studies being completed at the site under the RCRA corrective

action process, which factor cost, reliability, and effectiveness over time into the decision process.

Each of these projects was selected to provide essential technical information that will be used to expedite remedial action decisions for treatment of the four remaining groundwater plumes that are located within plant boundaries. Data collected from these demonstrations will also be provided to other DOE sites.

A phytoremediation project was selected as the CMI alternative for Quadrant III and was completed in FY 1999 at PORTS. Phytoremediation uses the natural growth process of plants to treat contaminated soils, and groundwater. At PORTS, 765 hybrid poplar trees were planted to remediate a small TCE-contaminated groundwater plume on the west side of the plant. Fieldwork began in April 1999 and was completed in late May 1999. The trees are expected to remove the contaminants in the plume naturally within 10 years, thus saving more than \$31 million by eliminating the need to construct and operate a conventional groundwater pump-and-treatment system for 30 years.

Also in FY 1999, work began to cap the X-734 Landfill in two phases. Phase I includes capping of the southern portion of the X-734 Landfill closure which was completed in September 1999. Phase II design work on the northern portion was 95% complete by the end of FY 1999 with the final landfill cap construction to be completed in FY 2000.

In other actions, the Quadrant I Final Cleanup Alternatives Study/Corrective Measures Study (CAS/CMS) report was submitted to the Ohio EPA on May 28, 1999. The Quadrant II CAS/CMS report was combined with a report for another unit, the X-701B CAS/CMS report. This report, which includes data from the pilot projects, was submitted during the last quarter of

FY 1999. The Ohio EPA issued the Decision Document on Quadrant III on May 18, 1999. The Quadrant III CAS/CMS was the first quadrantwide report to be approved for PORTS. The Quadrant IV CAS/CMS final report was submitted to the Ohio EPA on August 21, 1998.

Continued reductions in funding for ER activities at PORTS could result in extensions to the outyears for completion of the ER program. Even though the proposed budget for FY 2000 is approximately \$5 million higher than the FY 1999 funding of \$21.9 million, with leveled funding the completion of the overall PORTS ER program is expected to slip to FY 2007 in comparison to the originally scheduled completion date of FY 2002.

6.2.6 Waste Management

The mission of the PORTS WM program is to treat, store, and dispose of all legacy DOE waste in compliance with applicable federal, state, and local ES&H regulations in a manner that protects the health and safety of the public, the work force, and the environment. PORTS has implemented ongoing recycling programs that focus on paper products, aluminum cans, and scrap metal.

PORTS has also implemented many noteworthy pollution prevention initiatives, and several of the DOE environmental cleanup activities have resulted in off-site shipment of significant quantities of waste and recycling of materials. In particular, the following activities were completed in FY 1999:

- disposal of 1,090 tons of soils from remediation projects,
- disposal of 950 tons of X-701B sludge,
- recycle of 127.3 tons of radioactively contaminated empty drums,
- recycle of 5.3 tons of fluorescent light bulbs,
- recycle of 4.1 tons of nickel-cadmium batteries,

- treatment of 6.1 tons of PCB mineral oil, and
- treatment of 87.8 tons of wastewater through on-site wastewater treatment facilities.

The budget for WM activities at PORTS was \$16.46 million for FY 1999. For FY 2000, the proposed budget is \$11.06 million. Continuing reductions in budget could result in extensions to the outyears for completion of the WM program.

6.2.7 DOE Material Storage Areas

On December 31, 1996, DOE and USEC entered into two MOAs, one at each GDP, delineating the responsibilities of DOE and USEC regarding DMSAs. Under the Lease, DOE had retained the option to leave certain materials in the leased space. DOE and USEC agreed that DMSAs would be established in response to NRC's request indicating that such a change would facilitate certification of the GDPs. These DMSAs, although located in space formerly leased to USEC, are now located in space retained by DOE and are under the regulatory oversight of DOE. USEC and DOE identified the areas to be established and, under the MOA, established 44 DMSAs at PORTS. The DMSAs are located both inside of USEC-leased buildings and within certain USEC-leased outdoor areas. The DMSAs contain various types and pieces of operating equipment as well as PCB wastes. Since December 31, 1996, DOE has inventoried the non-PCB DMSAs. Inventories for PCB DMSAs are tracked using the PORTS waste tracking data base.

6.2.8 Environmental Status

DOE requires that all its sites conduct and document environmental monitoring and surveillance on the basis of DOE Order 5400.1, *General Environmental Protection Program*. DOE's environmental monitoring program at PORTS includes groundwater and surface water. Approximately 100 monitoring wells are sampled

routinely to maintain compliance, monitor the effectiveness of corrective actions, and track the movement of groundwater plumes. DOE's annual site environmental report for PORTS documents the results, which verify compliance with permits and applicable laws.

Environmental permits for DOE projects and activities at PORTS that do or could potentially require monitoring include:

- National Pollutant Discharge Elimination System (NPDES) permit under the Clean Water Act from the Ohio EPA. The current NPDES permit, which includes six outfalls, was effective September 1, 1995, through March 31, 1999. A renewal permit application was submitted to Ohio EPA prior to the expiration of the permit. Ohio EPA has given DOE written approval to continue operations under the terms of the expired permit until a new permit can be issued. Outfalls 012, 013, and 015 are point source discharges to waters of the state. The effluent from Outfalls 608, 610, and 611 are treated by the X-6619 wastewater treatment facility. This facility is leased by USEC and monitored through USEC Outfall 003 before reaching waters of the state. There were no exceedances during FY 1999. The regulatory limits for environmental releases related to DOE activities at PORTS have not changed since last year.³⁷
- Air permits under the Clean Air Act from the Ohio EPA. As of September 30, 1999, DOE holds three air permits at PORTS, two of which are under appeal with Ohio's Environmental

Board of Review due to radiological limits in the permits. During the first half of FY 1999, three air permits were not renewed, and two permits were withdrawn because DOE no longer operates these sources. Because actual emissions are at levels that cannot be detected by instruments, the emissions are modeled rather than monitored. No violations of air permit limits occurred during FY 1999.

In November 1998, DOE and its M&I contractor finalized a document titled *Integrated Groundwater Monitoring Plan* (IGWMP). The IGWMP integrates into a single, unified document the regulatory and technical requirements for wells and units within a given groundwater contamination AOC. Economies of scale are established for groundwater monitoring by focusing activities over larger areas rather than on individual wells or waste management units within an area. Specifically, the identity and location of the appropriate subset of monitoring wells, the identity of constituents for sampling, and the frequency of sampling are determined on the basis of an evaluation of historical monitoring results, process knowledge, and other information and requirements from previous investigations conducted at PORTS.

The IGWMP was approved by the Ohio EPA on January 27, 1999; however, the IGWMP was approved with a provision that it could not be implemented until the development and negotiation of an Ohio EPA DF&O. It was determined that the DF&O would allow for the integration of the postclosure and corrective action groundwater monitoring. The DF&O was also developed to recognize that a substantial portion of the tasks required under existing approved closure plans for several closed landfill units (X-616, X-735N, X-735S, X-749N, X-749S, and X-749A) have been completed, to provide for the incorporation of the remaining tasks into the approved IGWMP and a Surveillance and

³⁷For a description of the regulatory limits for environmental releases, the reader is referred to the report entitled *Department of Energy Input to the Nuclear Regulatory Commission's Annual Report to Congress Regarding the Status of Health, Safety, and Environmental Conditions at the Paducah and Portsmouth Gaseous Diffusion Plants*, DOE/ORO/2059, dated October 1997.

Maintenance Plan, and to terminate any further obligations under the existing closure plans.

Several exemptions in the DF&O to the requirements contained in the Ohio Administrative Code (OAC) were required to allow the integration of the closure and corrective actions mandated for the integrated units. The exemptions were needed to facilitate the integration process including deferring the timing and procedural requirements applicable to the integrated units. Several exemptions to the requirements contained in the OAC were also required to allow the integration of all required groundwater monitoring at PORTS and the postclosure surveillance and maintenance activities at the closed landfill facilities. Specific exemptions to be granted in the DF&O addressed the submittal of monitoring reports, the submittal of inspection reports, and the schedules for conducting monitoring of selected parameters. Other exemptions addressed the requirements for submitting closure plans and postclosure plans, submitting closure and postclosure certification reports, and the time requirements for submittals and performance of activities. The DF&O sets forth new timeframes for the submittal of documents and for the completion of corrective actions for the integrated units that are consistent with the schedules approved pursuant to the Consent Decree and any corrective actions selected in the Decision Documents for each of the four Quadrants at PORTS. Decision Documents are the terms for final cleanup decisions under RCRA and are similar to a ROD under CERCLA.

Throughout late 1998 and early 1999, DOE and its M&I contractor negotiated the DF&O with the Ohio EPA. The Orders allowed for the implementation of the IGWMP and the Integrated Surveillance and Maintenance Plan to more efficiently perform sitewide groundwater monitoring and surveillance and maintenance activities at the closed landfill facilities at

PORTS. The DF&O was signed by the Director and journalized on March 18, 1999.

6.2.9 Safety and Health Status

The average radiation exposure for DOE's prime contractor and subcontractor employees at PORTS was 0.95 mrem/year, with 156 personnel monitored in CY 1998. Trending was performed, and doses have not varied over the last 5 years and have consistently averaged well below 100 mrem/year compared with the 5,000 mrem occupational exposure limit set by federal law in 10 CFR 835. No individuals received radiological exposures in excess of regulatory limits. For comparison purposes, refer to the discussion of radiation exposure for PGDP in Section 6.1.9.

During the period from October 1, 1998, through September 30, 1999, the DOE prime contractor at PORTS experienced one RII that resulted in one Lost Workday Case (LWC). Subcontractors, including the USEC hourly workforce, experienced seven RIIs, one of which resulted in a LWC. The leading causes of injuries are slips, trips, pinch points, and strains.

6.2.10 Reportable Occurrences

From October 1, 1998, through September 30, 1999, 15 incidents occurred in the nonleased areas at PORTS that were sufficiently serious to be classified as reportable ES&H occurrences by DOE. Fourteen incidents were classified as "off-normal" and one classified as "unusual." Several of the occurrences were determined to be potential noncompliances with PAAA regulations, but none were assessed by DOE as PAAA violations. Four of the reportable occurrences involved violations of NCS procedures or indicated NCS programmatic deficiencies. None of these occurrences resulted in a criticality. This is an improving trend as compared to the previous year results, both in reportable events and NCS-related events.

Reduction of occurrences is a result of additional worker training and emphasis on NCS compliance. Appendix B.2 summarizes the reportable occurrences at PORTS for FY 1999.

6.2.11 Summary

DOE accomplishments and initiatives to enhance and improve ES&H condition at PORTS during FY 1999 include, but are not limited to, the following:

- Good progress in the ER, WM, and EF programs at PORTS.
- Removal of the HEU materials from the site was completed ahead of the September 30, 1999, schedule.
- The total waste inventory has been reduced by more than 4 million pounds in FY 1999 through off-site shipments, recycling, or on-site waste treatment.
- Several environmental restoration projects were completed during the year, including three pilot treatment projects that are providing valuable information for evaluation in the final cleanup alternatives studies.
- No environmental noncompliances occurred at the site.

Continuing reductions in budget could result in extensions to the outyears for completion of the EM program. No NOVs or noncompliances have resulted from these reduced funds, nor have any impacts to ES&H conditions been identified; however, maintenance services to facilities have been reduced, and projected completion schedules are being impacted for ER work.

7. COMPLIANCE WITH APPLICABLE LAWS

During FY 1999, several potential PAAA noncompliances were reported at PGDP and PORTS, as discussed in Sections 6.1.10 and 6.2.10. Some environmental permit violations have occurred in the past year as discussed in Section 6.1.8 and Appendix B.1. PGDP received an NOV in late September relating to a failure to provide timely notification to the KDEP that excavation was going to take place in accordance with the excavation permit. PORTS received an NOV relating to modifications in an ER report to the Ohio EPA. Meetings were held in 1999 with DOE and Ohio EPA to discuss this issue. Incidents occurred at both GDPs involving errors on shipping manifests and exceedances of OSHA exposure limits. These incidents are described in Appendix B. In all these instances, actions were taken to notify appropriate authorities, identify the cause of the violation, and institute corrective measures.

APPENDICES

**A. SUMMARY OF DOE REGULATORY OVERSIGHT
PROGRAM INSPECTION REPORTS**

SUMMARY OF DOE REGULATORY OVERSIGHT PROGRAM INSPECTION REPORTS

Inspection Report No.	Areas Examined	Results
70-7002/98-05 ³⁸	Six HEU-related problem reports and six functional areas (Managerial Controls and Oversight; Operations; Radiation Protection Programs, Systems, Designs, and Permits; Nuclear Criticality Safety; Emergency Preparedness; and Security).	No violations of the Nuclear Safety and Safeguards and Security requirements of the ROA or deviations from commitments made to DOE were identified. Inspection Follow-up Items 70-7002/98-03-05, "Nuclear Criticality Training Issues," and 70-7002/98-03-08, "Root Cause Program," were closed.
70-7002/98-06 ³⁹	One event report, seven HEU-related problem reports and five functional areas (Managerial Controls and Oversight; Operations; Radiation Protection Programs, Systems, Designs, and Permits; Nuclear Criticality Safety; and Security).	No violations of the Nuclear Safety and Safeguards and Security requirements of the ROA or deviations from commitments made to DOE were identified. An unresolved item (70-7002/98-06-01) was established to track closure of revision of NCSA-PLANT-006.A04.
70-7002/99-01 ⁴⁰	Ten HEU-related problem reports and six functional areas (Managerial Controls and Oversight; Operations; Radiation Protection Programs, Systems, Designs, and Permits; Nuclear Criticality Safety; Emergency Preparedness; and Security).	Several activities were identified as being in violation of Nuclear Safety and Safeguards and Security requirements of the ROA. Because of prompt and aggressive corrective actions, no NOV was issued with regard to these activities. Three noncited violations: 70-7002/99-01-01 and 70-7002/99-01-02 relating to NCS posting and labeling concerns and 70-7002/99-01-03 relating to a failure to have up-to-date Emergency Packets were identified. Four Inspector Follow-up Items were identified. These items all related to other concerns associated with Emergency Packets. Three open items were closed: Inspector Follow-Up Items 70-7002/98-03-04, "Nuclear Criticality Safety Approvals (NCSAs) Surveys," 70-7002/98-03-06, "NCSA Prioritization," and 70-7002/98-03-07, "Task 5 of the NCS CAP."

³⁸Includes inspections conducted in September and October 1998.

³⁹Includes inspections conducted in November and December 1998.

⁴⁰Includes inspections conducted in January and February 1999.

**SUMMARY OF DOE REGULATORY OVERSIGHT
PROGRAM INSPECTION REPORTS (cont.)**

Inspection Report No.	Areas Examined	Results
70-7002/99-02 ⁴¹	Ten HEU-related problem reports and six functional areas (Managerial Controls and Oversight; Operations; Radiation Protection Programs, Systems, Designs, and Permits; Nuclear Criticality Safety; Emergency Preparedness; and Security).	No violations of the Nuclear Safety and Safeguards and Security requirements of the ROA or deviations from commitments made to DOE were identified. One noncited violation, 70-7002/99-01-03, "Non-cited Violation, Emergency Packet," was closed. Five previous Inspector Follow-up Items were closed: 70-7002/98-03-03, "Nuclear Criticality Safety Approvals (NCSAs) Spacing Inconsistencies"; 70-7002/99-01-01, "Emergency Packet Phone List"; 70-7002/99-01-02, "Emergency Packet Effective Date"; 70-7002/99-01-03, "Emergency Packet Hazardous Materials List"; and 70-7002/99-01-04, "Emergency Packet Pre-Fire Plan."
70-7002/99-03 ⁴²	Twenty-seven HEU-related problem reports and five functional areas (Managerial Controls and Oversight; Operations; Radiation Protection Programs, Systems, Designs, and Permits; Nuclear Criticality Safety; and Security).	Two activities were identified as being in violation of Nuclear Safety and Security requirements of the ROA. An NOV (70-7002/99-03-01) was issued with regard to a failure to adhere to nuclear criticality safety (NCS) labeling requirements and a failure to maintain NCS spacing requirement in the 5-inch-cylinder cleaning area of the X-705 West Annex. One noncited violation, 70-7002/99-01-01, "Nuclear Criticality Safety Posting," was closed.
70-7002/99-04 ⁴³	Five HEU-related problem reports and five functional areas (Managerial Controls and Oversight; Operations; Radiation Protection Programs, Systems, Designs, and Permits; Nuclear Criticality Safety; and Security).	No violations of the Nuclear Safety and Safeguards and Security requirements of the ROA or deviations from commitments made to DOE were identified. One Unresolved Item, 70-7002/98-06-01, "Unresolved Item, Nuclear Criticality Safety Approval (NCSA) PLANT-006 Issue," was closed.

⁴¹Includes inspections conducted in March and April 1999.

⁴²Includes inspections conducted in May and June 1999.

⁴³Includes inspections conducted in July and August 1999.

**B. SUMMARY OF REPORTABLE OCCURRENCES IN
NONLEASED AREAS AT THE GASEOUS DIFFUSION PLANTS**

1. PADUCAH GASEOUS DIFFUSION PLANT

1. *Loss of Control of Shipment.* On October 14, 1998, DOE's prime contractor became aware that a package consisting of a container of two paint waste samples not intended for shipment had been picked up by a commercial package carrier on the afternoon of October 13, 1998, at PGDP. The carrier returned the package to PGDP the following morning. No DOT regulations were violated by the prime contractor, which was the shipper, because the package was not "offered for transportation in commerce." Corrective actions included preparation of a turnover checklist to be used when preparing a package for shipment to ensure that all necessary paperwork is completed, along with a procedure revision and crew briefings to address changes in the procedure.
2. *Pressurized Container Discovered During Sampling Activities.* On December 15, 1998, during Miscellaneous Metal Debris sampling activities, one side of the lid on a container raised 10–12 inches into the air when the container was opened. No employee injury or contamination occurred. The contents of the container consisted of hoses and absorbent pads coated with a fine powder generated from a breached fluorine cell at the C-410 Feed Plant D&D facility. The waste was generated on August 11, 1997. When the fluorine cell breached, an acidic electrolyte mixture consisting of hydrogen fluoride, potassium bifluoride, lithium fluoride, and condensed steam was spilled on the floor, on the cell steam supply hoses used for heating the fluorine cell, and on the surrounding equipment. Soda ash, a neutralizing media, was added to the electrolyte mixture. Sixteen containers of this miscellaneous metal debris were scheduled for radiological sampling for the evaluation of treatment options. As a corrective action, the PGDP Waste Acceptance Criteria list of potentially pressurized waste streams was updated to include these drums.
3. *Kentucky Pollutant Discharge Elimination System (KPDES) Permit KY0004049 Outfall K017 Exceedance.* On December 31, 1998, Environmental Compliance determined that an exceedance had occurred at Outfall K017, which is located west of the PGDP access road. Following routine compliance sampling of the outfall, a sample was sent to an offsite laboratory for analysis. Results from an acute toxicity test indicated 1.5 Toxicity Units Acute (TUa). A retest was initiated with the next rainfall event, with results measuring 2.2 TUa. Because the toxicity exceeded 1.2 times the TUa limit of 1.0 for both samples, a Toxicity Reduction Evaluation (TRE) is required by the KPDES permit. A TRE plan and implementation schedule has been submitted to the Kentucky Division of Water and is awaiting approval. Update reports indicate that the source of the toxicity is believed to be zinc from paint used in the depleted uranium hexafluoride cylinder recoating project. Toxicity levels in the outfall have since been tested and shown to meet the permit limits. The final occurrence report is pending State approval of the TRE.
4. *Improper Shipment of Hazardous Material from Non-DOE Laboratory to Paducah Gaseous Diffusion Plant.* On April 6, 1999, a shipment consisting of containers of unused sample residuals, liquid laboratory waste, and contaminated personnel protection equipment waste arrived at PGDP. The shipment originated from a non-DOE facility in Utah. Upon arrival in Paducah, an assessment identified several errors in the shipping paperwork, material, and packaging. Errors include incorrectly prepared DOT paperwork, improper DOT descriptions, improper package marking and labeling, improper RCRA identification codes, improper CERCLA identification, incomplete Land

Ban Disposal generator notification requirements, unmarked packages, and improper TSCA waste manifest information. The shipper was notified and paperwork discrepancies were corrected.

5. *Cracks Discovered in Boom of Cylinder Hauler.* During a routine inspection of a DOE NCH-35 cylinder hauler in early February 1999, cracks were discovered in the welds of the guide blocks that guide the hydraulic lines during extension and retraction of the boom. Engineering and Technical Services inspected the cracks and provided guidance on weld repairs. The NCH-35 manufacturer was contacted, and the manufacturer concurred with the recommended weld repair method. Repairs were initiated on April 16, 1999. On April 19, 1999, an inspection was performed which showed that the cracks extended into the boom of the cylinder hauler. It has been determined that the cracks are due to a combination of a defective weld and fatigue of the guide block weld joint on the boom over several years of service. The final report is pending DOE comment resolution.
6. *Field Laboratory Personnel Methylene Chloride Exposure Above OSHA Short-Term Exposure Limits.* On May 27, 1999, it was determined that laboratory personnel working in a mobile field semivolatile laboratory had been exposed to methylene chloride above the 15-minute short-term exposure limit as defined by OSHA 1910.1052. Personnel monitoring using passive dosimeters followed by additional laboratory monitoring using an Organic Vapor Monitor (OVM) and Sensidyne 138 tubes showed elevated readings. The laboratory was temporarily shut down until the problem could be alleviated. It was determined that the fume hood in use was too small to allow adequate work space for the volume of samples being received. Corrective actions included installation of a larger laboratory fume hood, checking face velocities, and performance of confirmatory monitoring. Group meetings were held for all laboratory personnel to discuss the fume hood operations and capacities and to review procedural requirements. An exposure of this type is not believed to have long-term health effects. It is important to identify this exposure and to mitigate it to avoid long-term exposures that could potentially lead to health effects.
7. *Near Miss: Concrete Chip Breaks Front Glass of Track Hoe.* On May 27, 1999, a track hoe with attached concrete breaker was damaged while demolishing reinforced concrete light pole foundations as part of the C-745-L Cylinder Yard construction project. Concrete chips deflected by the breaker hit the front windows of the track hoe. The bottom window was completely destroyed. The top window was shattered, resulting in an 18-inch hole in the glass. No injuries resulted from the incident. Corrective actions included (1) ensuring that breaking areas are flagged and restricted to the equipment and operator only, and (2) placing the light pole foundation in an excavated area or depression to help prevent small concrete chips from becoming projectile hazards during the breaking process.
8. *Small Bottle with Unknown Contents Discovered During Sampling.* On May 28, 1999, a small green glass bottle with an eye-dropper type top was placed in secured storage at PGDP because it contained approximately one-third of an ounce of liquid and crystal mixture of undetermined content. A conservative approach was taken in case the liquid might be shock sensitive. The bottle was found in a sediment sample collected on May 28 from a lagoon on DOE property just outside the northwest corner of the plant fence. The lagoon was being sampled to determine whether it needed to be further investigated for environmental cleanup. Corrective actions for this occurrence included a procedure revision to establish a policy on how to handle unexpected items located

during task performance and a revision of General Employee Training to include a statement on how to handle unexpected items and appropriate contacts to be made.

9. *Unexpected Legacy PCB Contamination in Paint Waste from Fluorine Cells.* In May 1999, twenty-eight fluorine cells, which had been sold to a private company in September 1998, were removed from the PGDP site. In June 1999, it was determined that the wastewater used in the decontamination of the fluorine cells was contaminated with 71 parts per million (ppm) PCBs. Paint samples were taken from six fluorine cells remaining at the plant site, and wipe samples were taken from the areas adjacent to where the paint had been removed. Results of the paint samples indicate the presence of PCBs above 50 ppm on two of the cells and below 50 ppm on four. Results of samples from the cell piping were all below 50 ppm, and all wipe sample results were less than 10 µg/wipe. This indicates the source is the paint used on the fluorine cells and not a PCB spill. Investigation results have not been finalized.
10. *Near Miss Accident Resulting from Tank Being Dropped.* On June 7, 1999, while an operator was using an all-terrain (ATV) forklift to transport a water poly tank from a flatbed trailer to a field drill site near the trailer, the tank slid off the tines of the forklift, spilling an estimated ten gallons of water. The only damage was to the poly tank valve; there were no personnel injuries. An investigation revealed that the tank was not positioned properly on the forklift and that the tines were not tilted back as required by procedure before the tank was removed from a flatbed trailer. In addition, the investigation revealed that the tanks being used for the job were too large, which left void space that enabled the load to shift, and that the bottoms of the tanks were not tilt-proof. Corrective actions included refresher training on forklift operations, a Health and Safety stand-down, and purchasing new, smaller tanks with tilt-proof bottoms.
11. *Work Stopped Due to Failure to Comply with Activity Hazard Analyses (AHA).* On Saturday, June 19, 1999, as an electrical sub-tier subcontractor was preparing to initiate work associated with a pole-mounted transformer installation, the work was stopped because the sub-tier subcontractor did not have the proper equipment available to conduct the work. Specifically, the subcontractor had failed to bring the necessary grounding equipment to the job site. The subcontractor attempted to verify that electrical lines were deenergized by using a disconnect switch pole ("hot stick") instead of approved test equipment ("glow stick"). This activity was observed and stopped. After it was determined that appropriate test equipment was not available, work activities were suspended for the day. Corrective actions include (1) ensuring that no work will be done without appropriate communication with the M&I's Subcontract Technical Representative, (2) utilizing activity checklists for electrical work to verify that each preparatory step is performed before starting the job, (3) retraining sub-tier subcontractor employees on AHA with increased focus on ISM, and (4) replacing the electrical subcontractor superintendent with a certified/qualified individual.
12. *Near Miss Associated with WAG 8/28 Drilling Activities.* On July 8, 1999, as a well bailer was being lifted with a drill rig apparatus, the load swung toward the drill rig operator. The operator had to move from his work platform to avoid being struck by the slowly moving suspended load. The bailer struck the drill rig, but the rig was not damaged. No injuries resulted from this occurrence. Corrective actions included reviewing proper hoisting and lifting techniques with field crews, revising the AHA to include instructions on orientation and proper lifting techniques of bailers and

pipng in general, requiring pre-task hazard reviews before starting work, and using tag/tie lines as outlined in the ANSI code.

13. *Error in Shipping Documentation for Asbestos Shipments to C-746-U Landfill.* On July 14, 1999, a subcontractor notified Paducah Waste Operations that six shipments of asbestos waste which were made on June 9 and July 1, 1999, had not been properly described on the shipping papers. Each of the six shipments consisted of twenty cubic yards of asbestos and was covered by a separate manifest. The UN/NA identification number on the manifests, which was listed as NA2122, should have been NA2212. All other descriptions and markings were correct. It was determined that the numbers had been transposed when transferring the information from draft paperwork to DOE format. A peer review had been performed on draft paperwork, as the procedure did not specify a peer review of the final version of the documentation. A crew briefing was held to emphasize the necessity of attention to detail, and procedures have been modified to ensure that reviews are performed on the final versions of shipping documentation.
14. *Investigation of Items Left at DOE C-746-U Landfill as Potential Security Threat.* On August 2, 1999, items were found abandoned outside the DOE C-746 Solid Waste Contained Landfill. These items consisted of seven tires, three one-gallon containers, one car battery, and a 3-5 gallon container wrapped in Christmas paper and placed inside a clear plastic bag which was taped shut. The PGDP Emergency Operations Cadre addressed the incident as a potential bomb threat. Because the content of the 3-5 gallon container was questionable, the PGDP security department restricted access to the area pending resolution of the incident. Analysis of the container determined there was no explosive device. Waste manifests were prepared, and the items were properly disposed.
15. *Radioactive Material Discovered at C-746-S Landfill.* On July 15, 1999, subcontractors discovered tar-like material oozing from the ground in an area outside the security fence near the C-746-S and C-746-T landfills. Initial radioactive contamination surveys did not detect any contamination. During monitoring, however, on August 6, the material was determined to exhibit radioactive contamination of 8,600 dpm, which exceeds the DOE limit of 5,000 dpm for material released to the public. The area was covered with a tarpaulin and approximately one to two feet of clean soil. It was also demarcated with stanchions and rope. Corrective actions include the installation of a three-strand barbed wire fence to secure the area of concern near the landfills, and installation of two steel gates at the west entrance road to provide site access control. Other methods of controlling access to the contaminated area are being examined, and an enclosure of some type will be erected. There were no ES&H consequences as a result of this occurrence, and no instances of personnel contamination.
16. *Violation of Excavation/Penetration Permit.* On August 25, 1999, a track hoe operator performing excavation activities at the entrance road to Gate 49 struck a warning tape located 4 to 6 inches underground that marked the presence of a buried telecommunications line. The operator stopped work and notified the M&I's Subcontract Technical Representative. Excavation in the immediate area of the buried telephone line was suspended. Inquiry into the matter revealed that the subcontractor had not contacted the underground utility locator service as required by the excavation permit. The final report has not been issued.

17. *Need for Thermoluminescent Dosimeters (TLDs) Identified.* On April 22, 1999, prior to commencement of construction of a paved yard for storage of DUF_6 cylinders at PGDP, radiation dose readings were collected at the site of the cylinder yard project. [Federal regulations require that workers who are likely to be routinely exposed to radiation in excess of 100 mrem be provided with personnel monitoring. TLDs are used to monitor radiation exposure at PGDP.] The readings indicated that workers were not likely to be exposed to radiation in excess of the 100 mrem per year threshold. Consequently, workers were not issued TLDs. On May 21, 1999, construction of the paved yard began. Additional readings collected on June 4 indicated potential exposure values below the April 22 readings. Readings taken at the request of the DOE ES&H Office of Oversight Investigation team on August 30, 1999, however, indicated that there was a potential for exposure to exceed 100 mrem per year. The source of the radiation is DUF_6 contained within the DUF_6 cylinders. Before starting work on August 31, an information session to review the situation was conducted with subcontractor workers, and additional worker training was conducted. TLDs were issued at this session to workers involved with the cylinder yard construction project who were determined to have the potential to receive greater than the 100 mrem threshold dose. Discrepancies between the readings are under investigation. The final report is pending receipt of investigation results.
18. *Subcontractor Working Without Fall Protection.* On August 31, 1999, a subcontractor employee was observed walking on top of the second tier of 48-inch UF_6 cylinders without fall protection. Work was stopped, and an immediate stand-down was held to discuss the incident. The final report is pending approval.
19. *Subcontractor Lockout-Tagout Violation.* On August 31, 1999, a subcontractor lifted a GeoProbe over active oxygen and propane lines. Although a lockout/tagout permit had been issued by the building owner and signed by the GeoProbe operator, the permit was removed because the building owner needed to have the lines back in service before the lift, which had been delayed, could take place. The building owner notified the M&I contractor and the GeoProbe operator of the lockout/tagout removal. Subcontractor personnel failed to obtain a lockout/tagout of the lines when they were ready to proceed with the lift. A meeting of the M&I contractor, facility owner, and subcontractor managers, and health and safety personnel was conducted at the site immediately after notification, and an investigation was begun.
20. *Discovery of Improperly Stored Classified Documents.* On September 3, 1999, CRD classified information was discovered in an unapproved storage area. Details are classified in incident report PC99-15. Following discovery, the documents were properly secured.
21. *Waste Area Group 3, Solid Waste Management Unit 4 Ground Water Sampling Event.* On September 24, 1999, an M&I subcontractor was using a bailer to take a water sample from an angled hollow stem auger boring in SWMU 4. When the angled boring was at a depth of 83 feet with an approximate vertical depth of 60 feet and as the bailer was being lowered, personnel heard a gurgling sound like the normal sound of a bailer filling with groundwater. Another sound, described as water trickling into the auger or a bubbling sound, was also heard. One worker then asked if others in the immediate area noticed an odor. The Health and Safety Officer, utilizing the OVM,

immediately measured the area around the boring, obtaining a reading of 2,009 ppm. Work was stopped and all personnel immediately evacuated the area. Investigation into the incident is ongoing.

22. *NOV Received for Failure to Comply with Permit Conditions.* On August 30, 1999, as part of the C-745-L Cylinder Yard Renovation project, approximately 275 cubic yards of soil was excavated from the southern edge of SWMU 194 and moved to a spoils stockpile located in the southeastern area of SWMU 193. Although an excavation permit was in place for the work, it was determined on September 1, 1999, that prior notification of this work had not been provided to the KDEP. Work was suspended in the area and KDEP was notified. On September 29, 1999, an NOV was issued by the state for "failure to report planned changes per Conditions III.E.10 and IV.J.1 of the Hazardous Waste Permit."

2. PORTSMOUTH GASEOUS DIFFUSION PLANT

1. *Incorrect Spacing of PCB Polybottles in X-326 DOE Materials Storage Area (DMSA) #1.* On October 1, 1998, an NCS surveillance was conducted in DMSA #1 located in the X-326 Process Building. During this surveillance, five of nine polybottles stored in the polybottle storage rack holding uranium-bearing PCB liquid were found stored from 21 to 22 inches apart, center-to-center spacing. NCSA PLANT006 requires that this material be stored no closer than the minimum 23 inches center to center. This spacing violation resulted in loss of one control; however, a single control was still in place. The root cause was determined to be design error. The rack that holds the polybottles is designed to hold small-diameter containers less than 50 inches high. These racks were not designed specifically to hold 50 inch-tall polybottles even if polybottle sleeves were used. An additional contributing cause was determined to be training deficiency. Personnel were not documented as being trained to the NCSA and operational procedures. At the time of discovery, the NCS engineer corrected the spacing of the affected polybottles. No impact on environment, safety, or health resulted.
2. *Radioactive Contamination Found in DOE Assigned Vehicle.* On October 8, 1998, during a routine final vehicle exit survey, radioactive contamination was found on the floor of a DOE-operated pickup truck. Maximum levels of 250,000 dpm/100 cm² removable contamination were discovered. The radioactivity was determined to be technetium and was isolated on a 100-cm² area of the floor. Radioactive contamination was removed using standard decontamination techniques. The vehicle was released for unrestricted use. Multiple office spaces and clothing of multiple employees were surveyed and no contamination was found. The source of the radiological contamination could not be determined. There was no impact on the environment, safety, or health because the contamination was discovered before the vehicle left the limited/controlled area.
3. *Small-Diameter Container Aisle Spacing Concerns.* On November 12, 1998, a subcontractor performing NCS calculations assumed that the aisle spacing between double rows of small-diameter container holders was at least 6 feet center to center. The NCSA calculations accounted for a 6-foot spacing requirement, but the NCSA requirements section never documented this as a requirement. The subcontractor preparing, reviewing, and approving the NCSA missed this oversight. The NCS staff concluded that double contingency was maintained if an aisle width of at least 5½ feet is maintained between double rows of small-diameter containers or an aisle width of 4 feet and 11 inches is maintained between double rows of small-diameter containers in a facility that does not have concrete walls or whose concrete walls are at least 10 feet away from the array. The NCSA has been revised to incorporate the proper flowdown of the spacing requirement. There was no impact on the environment, safety, or health as a result of this occurrence.
4. *Vehicular Incident.* On January 6, 1999, while responding to a sprinkler alarm in the X-3346 facility, a fire truck and protective services vehicle were involved in a collision. As emergency response personnel approached the entrance to the facility, they realized that the gate to the facility was locked. The driver of the protective forces vehicle attempted to pass the fire truck so that he could unlock the gate; however, the fire truck turned left, and struck the protective forces vehicle, causing it to skid into a steel pipe stand. The driver of the protective forces vehicle was injured and transported to a local area hospital, where he was treated and released. The protective forces vehicle

was extensively damaged; the fire truck sustained minor damage. The direct cause of the accident was determined to be Personnel Error—Inattention to Detail; the root cause was determined to be Personnel Error, Procedure Not Used or Used Incorrectly. An accident investigation team was assigned to investigate the incident, and a complete inspection of the fire truck was performed before it was returned to service. There was no impact on the environment as a result of this occurrence.

5. *Employee Tests Positive for Substance Abuse.* On January 13, 1999, an employee suspected of being under the influence of alcohol consented to a drug/alcohol screening. The employee tested positive for alcohol. Upon obtaining positive results, the employee was escorted from the site and denied access to security areas until an investigation was complete. Disciplinary action was taken and recorded in the employee's personnel file. There was no impact to the environment, safety, or health as a result of this occurrence.
6. *Loose Contamination on Company Clothing.* Upon completion of routine batching of LEU trap material on February 27, 1999, two employees detected radiological contamination on their company-issued clothing. The contamination was at a level exceeding but less than five times the 10 CFR 835 total contamination limits. The clothing was decontaminated. The direct cause was determined to be Personnel Error—Inattention to Detail. The contamination of company-issued coveralls occurred during bulking operations of F-cans of alumina into 55-gallon drums in the X-326 L-cage area. The personnel were not wearing the required personal protective equipment as indicated by the RWP. A letter was issued to all organizations on the PORTS project stressing verbatim compliance with RWPs. Additional training was conducted on the existing Entry Control procedure. No impact on the environment, safety, or health resulted from this occurrence.
7. *Pressurized Drum Lid Release.* On March 5, 1999, waste handlers were removing the drum rings from a drum for waste verification. As the waste handlers loosened the drum ring, the lid blew off and landed approximately 8 feet from the drum. The drum contained carbon blocks used in a fluorine generation process. Operations were ceased and the area was isolated. A radiological survey of operators and floor was performed. No radioactive contamination or elevated chemical concentrations were identified. An equipment/material problem, personnel error, and procedure error were identified as the causes for this occurrence. Several corrective actions were implemented revising operations procedures to include safety precautions, conducting training, and purchasing safety devices to be used on various size containers. No impact on the environment, safety, or health resulted from this occurrence.
8. *X-744G Near Miss.* On May 27, 1999, workers were in the process of dismantling the second of two prefabricated metal buildings within the X-744G facility by unbolting panels from the angle iron bolted to the side walls. Two workers on an aerial lift platform were lifting a single roof panel when the side walls spread causing the remaining roof panels to fall. One worker was caught underneath the panels when they fell and was grazed by a panel. As the worker came out from underneath the panel, he tore his Tyvek suit. The worker was not injured, and a survey was performed to confirm that there was no contamination of his overalls or Tyvek suit. The cause was determined to be deficient work organization and planning and inadequate supervision during the performance of this work. Corrective actions included closer supervision of work activities on this project, development

of a Lessons Learned and use of the Lessons Learned in contractor safety training. There was no impact on the environment, safety, or health as a result of this occurrence.

9. *Eight-Inch UF₆ Cylinder Larger Than NCSA Limits.* On June 29, 1999, an 8-inch UF₆ cylinder shipped from the X-345 South Vault to the X-705 facility for cleaning was found to have a larger outside diameter and inside diameter than expected. The cylinder exceeded the inside diameter allowable for 8-inch cylinders as calculated in the X-345 South Vault NCSA. NCS review determined the loss of one contingency. NCS developed a revision to the NCSA to allow storage of the cylinder in the X-345 South Vault. No impact on the environment, safety, or health resulted from this occurrence.
10. *Southwest Criticality Accident Alarm System (CAAS) Cluster Alarmed in the X-345 South Vault.* On June 29, 1999, the southwest CAAS cluster in the X-345 South Vault alarmed, initiating a facility evacuation and accountability. The X-345 facility was evacuated and accountability was conducted. Appropriate emergency response personnel performed radiation monitoring in the facility. No elevated radiation readings were discovered. An investigation is in progress to determine the cause of the alarm. There was no impact on the environment, safety, or health as a result of this occurrence.
11. *Criticality Accident Alarm System—Plantwide.* On July 2, 1999, it was determined that the sitewide CAAS clusters were not calibrated in accordance with Technical Safety Requirements. As a precaution, the Plant Shift Superintendent declared that the CAAS was inoperative, and an Alert was declared by the owner of the sitewide CAAS. Protective actions were taken in accordance with the Alert, and maintenance completed calibration of the clusters on July 3, 1999. Although the system is managed, repaired, and calibrated by USEC, this incident was entered into the DOE occurrence reporting system for information purposes. There was no impact on the environment, safety, or health as a result of this occurrence.
12. *Contaminated Boot.* On July 27, 1999, a random internal self-assessment activity was conducted by the PCB Program. During this self-assessment activity, three pairs of government-issued work boots were surveyed for radiological contamination. During the survey activities, one pair of stored work boots was found to contain one area of fixed radiological contamination at 15,000 dpm/100 cm² beta/gamma. This contamination was located on the sole of one work boot. The last time the work boots were worn in an area requiring exit radiological monitoring was in December 1998. At that time, the boots were determined to be free of radiological contamination. Random radiological surveys were conducted on other government-issued boots with no additional contaminated items found. Field investigation did not identify any company project, procedural, or environmental conditions or deficiencies which may have caused this event. No root cause determination could be made. There was no impact on the environment, safety, or health as the contamination was fixed on the sole of the worker's boot. This incident was believed to be an isolated incident. No further corrective actions are required.
13. *Misclassification of Sample Shipment to Y-12 Laboratory.* On July 26, 1999, a sample of cleaner (SIOUX A) was shipped to the Y-12 laboratory and was received on July 27, 1999. This material was classified as a Class 9 excepted quantity, and with this classification the volume limit for the

Class 9 excepted material was exceeded. The material should have been classified as a DOT non-regulated shipment. The importance of the 5-day turnaround requirements was reinforced to the transportation specialist and project engineer. There was no impact on the environment, safety or health as a result of this occurrence.

14. *Overflow of HEU Decontamination Wash Solution.* On August 6, 1999, during an inspection of the X-326 L-Cage area, it was noted that a plastic polybottle (GP) container holding decontamination wash solution of HEU (50% assay, 50 grams plus or minus 30 grams), appeared to have overflowed causing solution to run down the side of the container and around the location where the container was being held. This was a loss of containment in a radioactive material area. Upon further investigation, it was discovered that the container contained a saturated cheese cloth that came from the X-705 Annex HEU Cylinder Cleaning Project. It was non-waste and had a radiation level count rate greater than 25,000,000 dpm/100 cm². The release material had dried when discovered. The dose rate was 2.5 mrem/hour beta and less than 0.2 mrem/hour gamma on contact. The dose rate was less than 0.2 mrem/hour beta-gamma at one foot. The condition did not exist on weekly inspection of the area. Determination is that the lid was not on tight enough, and elevated building temperatures caused internal expansion leading to the overflow. The area was bounded off. The localized area of contamination was cleaned and decontaminated. There was no impact on the environment, safety or health as a result of this occurrence.
15. *Elevated Lead Exposure of Employee.* On September 1, 1999, during the initiation of a recycling project for various materials, including lead liners from a chromic acid tank, a field test on the floor surface of the work area identified the presence of lead. Project activity regarding lead liners immediately ceased. The general area and breathing zone samples were collected and sent to a laboratory for analysis for lead. The project manager was verbally notified of the results which indicated that the breathing zone sample was approximately three times the OSHA Permissible Exposure Limit (PEL) for lead. Affected personnel were notified and samples to determine lead levels in their blood were initiated. All personnel tested had blood lead levels within background or normal levels. Enhanced administrative and engineering controls along with additional personal protective equipment were put into place to keep exposure levels below OSHA PEL limits. The project was restarted on September 20, 1999, and completed on September 30, 1999. There was no impact on the environment, safety or health as a result of this unusual occurrence.