EXECUTIVE SUMMARY

PURPOSE

This Annual Site Environmental Report is prepared to summarize environmental activities, primarily environmental monitoring, at the U.S. Department of Energy (DOE) Portsmouth Gaseous Diffusion Plant (PORTS) for calendar year 2010. The report fulfills a requirement of DOE Order 231.1A, *Environment, Safety and Health Reporting*, for preparation of an annual summary of environmental data to characterize environmental management performance. The Annual Site Environmental Report also provides the means by which DOE demonstrates compliance with the radiation protection requirements of DOE Order 5400.5, *Radiation Protection of the Public and the Environment*.

SITE AND OPERATIONS OVERVIEW

PORTS, which produced enriched uranium via the gaseous diffusion process from 1954 to 2001, is one of three uranium enrichment facilities originally built in the United States; the other two were constructed in Oak Ridge, Tennessee and Paducah, Kentucky, respectively. PORTS is located on 5.9 square miles in Pike County, Ohio. The county has approximately 27,700 residents.

DOE is responsible for decontamination and decommissioning (D&D) of the gaseous diffusion process buildings and associated facilities, environmental restoration, waste management, and management of other non-leased facilities at PORTS. DOE contractors LATA/Parallax Portsmouth, LLC (LPP), Theta Pro2Serve Management Company, LLC (TPMC), Wastren-EnergX Mission Support, LLC (WEMS), and Uranium Disposition Services, LLC (UDS) managed DOE programs at PORTS in 2010. WEMS assumed responsibility for the facility support services contract on March 16, 2010.

LPP was responsible for the following activities: 1) environmental restoration of contaminated areas; 2) monitoring and reporting on environmental compliance; 3) disposition of legacy radioactive waste; 4) D&D of inactive facilities; 5) disposition of highly enriched uranium; and 6) operation of the site's waste storage facilities. TPMC or WEMS provided facility support services including the following: 1) maintenance of facilities, grounds, and roadways; 2) janitorial services; 3) security access for DOE facilities; 4) training; 5) records and fleet management; and 6) information technology/network support for DOE operations.

UDS was responsible for the initial operation of the Depleted Uranium Hexafluoride (DUF_6) Conversion Facility at PORTS, surveillance and maintenance of DUF_6 cylinders, and environmental compliance and monitoring activities associated with operation of the DUF_6 Conversion Facility. DUF_6, which is a product of the uranium enrichment process, is stored in cylinders on site. The DUF_6 Conversion Facility converts DUF_6 into uranium oxide and hydrogen fluoride, which are shipped off site. The uranium oxide is disposed as waste, and the hydrogen fluoride is sold for reuse. Initial hot functional testing of the DUF_6 Conversion Facility was in progress in 2010 with larger-scale operation of the facility anticipated in 2011.

On August 17, 2010, DOE announced that Fluor-B&W Portsmouth LLC (FBP) had been awarded a contract for D&D of PORTS. The contract includes D&D of the three gaseous diffusion process buildings and over 100 other associated facilities, as well as environmental remediation, compliance, and other activities that were a part of the LPP contract. FBP assumed responsibility for operations included in the D&D contract in 2011.

In 1993, DOE leased the uranium enrichment production and operations facilities at PORTS to the United States Enrichment Corporation (USEC). In 2010, the gaseous diffusion production facilities at PORTS were leased by USEC Government Services (a subsidiary of USEC) under the cold shutdown program.

Cold shutdown activities include removing lube oils and oil contaminated with polychlorinated biphenyls (PCBs) from equipment and removing uranium hexafluoride deposits within the gaseous diffusion process equipment to prepare the facilities and equipment for D&D. In 2010, USEC Government Services began the process of returning the gaseous diffusion process buildings to DOE. The X-326, X-330, and X-333 Process Buildings, as well as other support buildings and areas, were returned to DOE on September 30, 2010.

USEC, Inc. (the parent company of USEC) is developing a gaseous centrifuge uranium enrichment plant at PORTS. USEC, Inc. leases buildings from DOE, but the gaseous centrifuge uranium enrichment plant is a commercial enterprise of USEC, Inc. and is not pursuant to a DOE contract. The USEC, Inc. Lead Cascade, which is a small-scale demonstration centrifuge for uranium enrichment, has been operating since 2006. The commercial scale American Centrifuge Plant (ACP) is under development, but was on hold at the end of 2010 pending receipt of additional funding. Both of these facilities (the Lead Cascade and the ACP) are housed in existing buildings at PORTS.

With the exception of Chapter 2, Compliance Summary; Chapter 4, Environmental Radiological Program Information; and Chapter 5, Environmental Non-Radiological Program Information, this report does not cover USEC, Inc. and USEC Government Services operations at PORTS because their operations are not subject to DOE Orders. USEC, Inc. and USEC Government Services data are included in these chapters to provide a more complete picture of the operations in place at PORTS to detect and assess potential impacts to human health and the environment resulting from PORTS activities.

ENVIRONMENTAL COMPLIANCE

DOE and/or the responsible DOE contractor have been issued permits for discharge of water to surface streams, air emission permits, and a permit for the storage of hazardous waste. DOE is also responsible for preparing a number of reports for compliance with environmental regulations. These reports include: an annual groundwater monitoring report; an annual hazardous waste report; an annual PCB document log; an annual summary of radionuclide air emissions and the associated dose to the public from these emissions; a biennial report of specified non-radiological air emissions; a monthly report of National Pollutant Discharge Elimination System (NPDES) monitoring data; a quarterly radiological discharge monitoring report for NPDES outfalls; an annual hazardous chemical inventory; and an annual toxic chemical release inventory.

USEC, Inc. and USEC Government Services are responsible for compliance activities directly associated with their operations and have been issued air emission permits for several boilers and other sources of air emissions and water discharge permits for several holding ponds and water treatment facilities. USEC, Inc. and USEC Government Services are also responsible for management of wastes generated by their current operations.

DOE and DOE contractors at PORTS did not receive any Notices of Violation for inspections conducted during 2010. However, DOE received a Notice of Violation in April 2010 from an inspection conducted by U.S. EPA and Ohio EPA in June 2009. Chapter 2 provides more information about this Notice of Violation.

ENVIRONMENTAL PROGRAMS

D&D, Environmental Restoration, Waste Management, and Public Awareness Programs are conducted at PORTS to protect and inform the local population, improve the quality of the environment, and comply with federal and state regulations.

In 2009, DOE received $118 million in funding under the American Recovery and Reinvestment Act (ARRA) for five projects at PORTS that involved environmental remediation, D&D of inactive facilities,

or materials disposition. These projects, which were completed or near completion at the end of 2010, were: environmental remediation (source removal) at the X-701B Holding Pond; D&D of the X-533 Switchyard Complex, X-633 Cooling Towers Complex, and X-760 Chemical Engineering Building; and repackaging and disposition of excess uranium materials.

D&D Program

In 2010, D&D of the PORTS gaseous diffusion process buildings and associated facilities began with the award of the D&D contract to FBP and signing of the *April 13, 2010 Director's Final Findings and Orders for Removal Action and Remedial Investigation and Feasibility Study and Remedial Design and Remedial Action (which includes the September 12, 2011 Modification thereto),* also called the D&D Orders. The D&D Orders are a legal agreement between the Ohio Environmental Protection Agency (Ohio EPA) and DOE that governs the process for D&D of the buildings and other areas that are no longer in use at PORTS. In addition to the D&D projects funded by ARRA (X-533 Switchyard Complex, X-633 Cooling Towers Complex, and X-760 Chemical Engineering Building), D&D of several small facilities was underway at the end of 2010. The planning and investigation process was underway for D&D of the process buildings and for site-wide waste disposition at the end of 2010.

Environmental Restoration Program

The Environmental Restoration Program was established by DOE in 1989 to identify, control, and remediate environmental contamination at PORTS. The 1989 Ohio Consent Decree and the 1989 U.S. EPA Administrative Consent Order (as amended in 1994 and 1997) require investigation and cleanup of environmental media at PORTS in accordance with the Resource Conservation and Recovery Act (RCRA) Corrective Action Program. The site was divided into quadrants to facilitate the investigation and cleanup. Corrective actions, also called remedial actions, are underway in each quadrant.

In 2010, the Environmental Restoration Program was responsible for installation of three additional groundwater extraction wells in the X-749/X-120 groundwater plume, investigations of soil and/or groundwater associated with several inactive facilities, initiation of two projects to remediate soil and/or groundwater contamination in the Quadrant II Groundwater Investigative Area and X-740 Waste Oil Handling Facility, and the continued remediation of the western portion of the X-701B area, which was funded by ARRA and began in 2009.

The Environmental Restoration Program also monitors and maintains five closed landfills at PORTS in accordance with Ohio EPA regulations. Samples are collected periodically (most often semiannually) from groundwater monitoring wells around the landfills. The samples are analyzed for chemicals and radionuclides that could be released from the materials that were disposed in the landfills.

Four groundwater treatment facilities are operated by the Environmental Restoration Program to treat contaminated groundwater from the on-site groundwater plumes that are contaminated with industrial solvents, including trichloroethene. These facilities are part of the systems at PORTS that collect contaminated groundwater. The groundwater treatment facilities remove trichloroethene from the water so it can be safely discharged to Little Beaver Creek or the Scioto River in accordance with NPDES permits issued by Ohio EPA.

Waste Management Program

The DOE Waste Management Program at PORTS directs the safe storage, treatment, and disposal of waste generated from D&D of facilities that are no longer in use, past plant operations, ongoing plant maintenance, and ongoing environmental restoration projects. In 2010, over 30,000 tons of waste from DOE activities at PORTS were recycled, treated, or disposed at off-site facilities.

Waste management activities are conducted in compliance with applicable DOE Orders, Ohio EPA regulations, and U.S. Environmental Protection Agency (U.S. EPA) regulations. Waste management requirements are varied and often complex because of the variety of wastes generated by DOE activities at PORTS. The types of waste managed by DOE at PORTS include:

- *Low-level radioactive waste* – radioactive waste not classified as high level or transuranic waste.
- *Hazardous (RCRA) waste* – waste listed under RCRA or waste that exhibits one or more of the four RCRA hazardous characteristics: ignitability, corrosivity, reactivity, and toxicity.
- *PCB wastes* – waste containing PCBs, a class of synthetic organic chemicals. Disposal of PCB-contaminated materials is regulated under the Toxic Substances Control Act.
- *Solid wastes* – Waste that includes construction and demolition debris, industrial waste, and sanitary waste, as defined by Ohio regulations.

Many of the wastes generated by DOE activities at PORTS are a combination of the first three waste types listed above; for example, some wastes are both RCRA hazardous waste and low-level radioactive waste (called mixed waste).

In addition to complying with DOE Orders and Ohio EPA/U.S. EPA regulations, DOE has also implemented supplemental policies for management of DOE waste at PORTS including: minimizing waste generation; characterizing and certifying wastes before they are stored, processed, treated, or disposed; pursuing volume reduction (such as blending and bulking); on-site storage in preparation for safe and compliant final treatment and/or disposal; and recycling.

Public Awareness Program

DOE provides a public Environmental Information Center to allow access to all documents used to make decisions on remedial actions being taken at PORTS. The information center is located just north of PORTS at the Ohio State University Endeavor Center (Room 207), 1862 Shyville Road, Piketon, Ohio 45661. The Information Center is open 9 a.m. to noon Monday and Tuesday, noon to 4 p.m. Wednesday and Thursday, or by appointment (call 740-289-8898). The email address is eic@wems-llc.com. Additional information is provided by the DOE Site Office (740-897-5010) and the Office of Public Affairs (740-897-3486). This Annual Environmental Report and other information can also be obtained from the DOE web site for PORTS at www.pppo.energy.gov or the FBP web site at www.fbportsmouth.com.

The PORTS Site Specific Advisory Board, comprised of up to 20 citizens from the local area, provides public input and recommendations to DOE on environmental remediation, waste management, and related issues at PORTS. Additional information about the board can be obtained at www.ports-ssab.org or by calling 740-289-5249.

Public update meetings and public workshops on specific topics are also held to keep the public informed and to receive their comments and questions. Periodically, fact sheets about major projects are written for the public. Additionally, notices of document availability and public comment periods, as well as other communications on the program, are regularly distributed to the local newspaper and those on the community relations mailing list, neighbors within 2 miles of the plant, and plant employees.

ENVIRONMENTAL MONITORING

Extensive environmental monitoring is completed at PORTS to comply with environmental regulations, permit requirements, and DOE Orders, and to address public concerns about plant operations. The *Environmental Monitoring Plan for the Portsmouth Gaseous Diffusion Plant* describes the DOE environmental monitoring programs at PORTS, with the exception of groundwater monitoring. Groundwater monitoring, which also includes related surface water monitoring and residential water supply monitoring, is described in the *Integrated Groundwater Monitoring Plan for the Portsmouth Gaseous Diffusion Plant.* This monitoring is discussed in Chapter 6, Groundwater Programs.

Environmental monitoring includes the collection of samples of air, water, soil, vegetation, and biota (animals and crops) on a regular basis that ranges from weekly (ambient air) to annually (sediment, soil, vegetation, and biota). In 2010, environmental monitoring information was collected for the following programs:

- Ambient air
- Direct radiation
- Discharges to surface water
- Local surface water
- Sediment
- Soil
- Vegetation
- Biota (crops, deer, fish, milk, and eggs).

Samples are analyzed for radionuclides, metals, and/or other chemicals that could be present in the environment due to PORTS activities, although many of these analytes also occur naturally or can be present due to human activities not related to PORTS. Over 1000 samples are collected on an annual basis.

Data collected for these programs in 2010 are consistent with data collected in previous years and indicate that radionuclides, metals, and other chemicals released by PORTS operations have a minimal effect on human health and the environment. The next section, Dose, provides more information about the potential impacts to human health from radionuclides released by PORTS.

DOSE

Potential impacts on human health from radionuclides released by PORTS operations are calculated based on environmental monitoring data. This impact, commonly called a dose, can be caused by radionuclides released into the air and/or water, or radiation emanating directly from buildings or other objects at PORTS. U.S. EPA sets a 10 millirem (mrem)/year limit for the dose from radionuclides released to the air, and DOE sets a 100 mrem/year limit for the dose from radionuclides from all potential pathways (air, water, and direct radiation). A person living in the United States receives an average dose of approximately 311 mrem/year from natural sources of radiation (National Council on Radiation Protection [NCRP] 2009). Figure 1 provides a comparison of the doses from various common radiation sources.

This Annual Site Environmental Report includes radiological dose calculations for the dose to the public from radionuclides released to the environment based on environmental monitoring data collected by DOE, USEC, Inc., and USEC Government Services. The maximum dose that a member of the public could receive from radiation released by PORTS in 2010 is 1.4 mrem, based on a maximum dose of

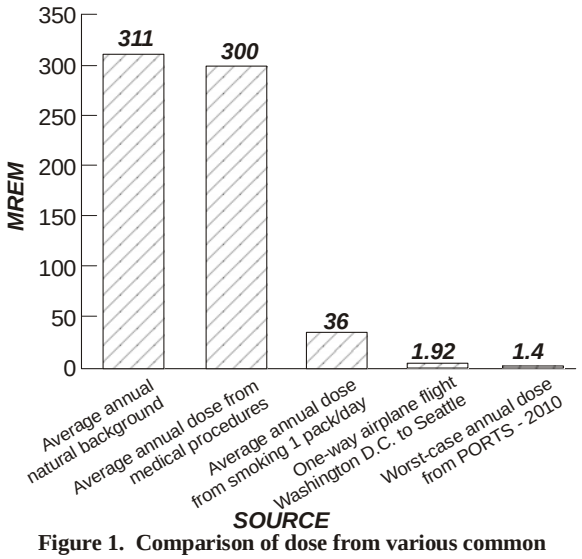

Figure 1. Comparison of dose from various common radiation sources (NCRP 2009).

0.17 mrem from airborne radionuclides, 0.022 mrem from radionuclides released to the Scioto River, 0.81 mrem from direct radiation from the DUF_6 cylinder storage yards, and 0.39 mrem based on exposure to radionuclides detected at off-site monitoring locations in 2010. This dose calculation uses a worst-case approach; that is, the calculation assumes that the same individual is exposed to the most extreme conditions from each pathway. This dose (1.4 mrem) is significantly less than the 100 mrem/year limit set by DOE for the dose to a member of the public from radionuclides from all potential pathways. The dose to a member of the public from airborne radionuclides released by PORTS (0.17 mrem) is also significantly less than the 10 mrem/year standard set by U.S. EPA.

GROUNDWATER PROGRAMS

Groundwater monitoring at PORTS is performed at RCRA hazardous waste units, solid waste disposal units, and RCRA Corrective Action Program units. The *Integrated Groundwater Monitoring Plan* describes the groundwater monitoring program for PORTS, which has been reviewed and approved by Ohio EPA. In general, samples are collected from wells at 12 groundwater monitoring areas and 13 surface water locations that are part of the groundwater monitoring program. Samples are analyzed for metals, volatile organic compounds, and/or radiological constituents. Constituents detected in the groundwater are then evaluated to assess the potential for each constituent to affect human health and the environment.

Some groundwater monitoring is conducted in order to meet DOE Order requirements. Exit pathway monitoring assesses the effect of PORTS on regional groundwater quality and quantity.

Five groundwater contamination plumes have been identified on site at PORTS in the following areas: X-749/X-120/Peter Kiewit (PK) Landfill (Quadrant I), Quadrant I Groundwater Investigative Area, Quadrant II Groundwater Investigative Area, X-701B Holding Pond (Quadrant II), and X-740 Waste Oil Handling Facility (Quadrant III). The primary groundwater contaminant is trichloroethene. Other monitoring areas may have groundwater contaminated with metals or may be monitored to comply with regulatory requirements for closed landfills. Remediation of groundwater is being conducted primarily under Ohio EPA's RCRA Corrective Action Program.

In 2010, concentrations of trichloroethene continued to decrease in the X-749/X-120/PK Landfill area due to the groundwater extraction wells installed in this area in 2007-2008. Although trichloroethene was still detected in one off-site monitoring well associated with the X-749/X-120/PK Landfill groundwater plume, concentrations of trichloroethene in this off-site well decreased to less than 0.25 micrograms per liter (µg/L – or parts per billion) from concentrations up to 4 µg/L in 2006. Trichloroethene has not been detected in groundwater beyond the DOE property boundary at concentrations that exceed the Ohio EPA drinking water standard of 5 µg/L. In general, the other contaminated groundwater plumes present at PORTS did not change significantly in 2010.

The *Integrated Groundwater Monitoring Plan* also addresses monitoring of residential water supplies near PORTS to verify that site contaminants have not migrated into off-site drinking water wells. Results of this program indicate that PORTS has not affected drinking water wells outside the site boundaries.

QUALITY ASSURANCE AND QUALITY CONTROL

Data reliability is of the utmost importance for monitoring releases and measuring radiation in the environment. To demonstrate that the monitoring and measurement results are accurate, DOE contractors have implemented a quality assurance and quality control program based on guidelines from U.S. EPA, the American Society for Testing and Materials, and other federal and state agencies. DOE and DOE contractors administer numerous quality control activities to verify reliability of the data on a day-to-day basis. DOE and DOE contractors also participate actively in quality control programs administered by agencies outside the site such as U.S. EPA.