ES 1.0 Executive Summary

The 2005 Site Environmental Report provides stakeholders with the results from the Fernald site's environmental monitoring programs for 2005, along with a summary of the U.S. Department of Energy's (DOE's) progress toward final remediation of the site. In addition, this report provides a summary of the Fernald site's compliance with the various environmental regulations, compliance agreements, and DOE policies that govern site activities. All information presented in this executive summary is discussed more fully within the body of this report and the supporting appendices. This report has been prepared in accordance with DOE Order 5400.1, General Environmental Protection Program (DOE 1990), and the Integrated Environmental Monitoring Plan (IEMP), Revision 4 (DOE 2005d). Note that in January 2003, DOE Order 450.1 went into effect, superseding DOE Order 5400.1; however, it has been determined that the intent of this order is met through existing DOE Fernald contractual requirements.

During 2005, DOE and Fluor Fernald, Inc., the prime contractor for the Fernald site, made considerable progress toward final cleanup goals established for the site. A wide range of environmental remediation activities continued during the year, including:

- Excavation and shipment of contaminated waste pit material to an off-site disposal facility (Operable Unit 1)
- Large-scale excavation of contaminated soil and materials from the former production area (Operable Unit 5)
- Placement of contaminated soil and debris in the on-site disposal facility (Operable Unit 2)
- Decontamination and dismantlement of former production buildings and support facilities (Operable Unit 3)
- Transfer of material from the silos (Silos 1, 2, and 3) for treatment, packaging, and shipment to an off-site storage facility (Operable Unit 4)
- Extraction and treatment of contaminated groundwater from the Great Miami Aquifer (Operable Unit 5).

Several important milestones toward remediation of the Fernald site were reached in 2005. Demolition of 38 structures brings the total number of structures demolished at the Fernald site to 250 out of a total of 323 structures. Additionally, 55 Fernald site trailers were dismantled and either shipped off-site or demolished in 2005. The construction of the converted advanced wastewater treatment facility was completed during this year. And at the end of 2005, approximately 2.75 million in-place yd^3 (2.10 million m^3) of waste were placed in the on-site disposal facility, 905,000 in-place yd^3 (691,963 m^3) of waste (including excavated material, debris, etc.) were placed during 2005.

The following sections highlight the results of environmental monitoring activities conducted during 2005.

ES 1.1 Liquid Pathway Highlights

ES 1.1.1 Groundwater Pathway

The groundwater pathway at the Fernald site is routinely monitored to:

- Determine capture and restoration of the total uranium plume, as well as non-uranium constituents, and evaluate water quality conditions in the aquifer that indicate a need to modify the design and/or operation of restoration modules

- Meet compliance-based groundwater monitoring obligations.

During 2005, active restoration of the Great Miami Aquifer continued; however, operations were impacted by the construction of the converted advanced wastewater treatment facility, site demolition and decontamination activities, and site soil remediation activities. At the start of 2005, only two of the three groundwater restoration modules were operating (i.e., South Field, South Plume). The third module, the Waste Storage Area Module resumed operations in March 2005 concurrent with the start-up of the converted advanced wastewater treatment facility.

Approximately 140 monitoring wells were sampled semiannually to determine water quality. Water elevations were measured quarterly in approximately 170 monitoring wells. The following highlights describe the key findings from the 2005 groundwater data:

- 1,656 million gallons (6,268 million liters) of water were pumped from the Great Miami Aquifer. As a result of these restoration activities, 602 pounds (273 kilograms [kg]) of uranium were removed from the aquifer.

- Characterization in the waste storage area was conducted to finalize a design for the Waste Storage Area Phase II Module. Characterization indicated that the manganese plume footprint is larger than the uranium plume footprint.

- The results of 2005 groundwater capture analysis and monitoring for total uranium and non-uranium constituents indicate that the design of the groundwater remedy for the aquifer restoration system is appropriate for capture of the plume.

- Pumping of the South Plume/South Plume Optimization Module continued to meet the objective of preventing further southward migration of the southern total uranium plume beyond the extraction wells.

- Leak detection monitoring at Cells 1 through 8 of the on-site disposal facility indicates that all the individual cell liner systems are performing within the specifications outlined in the approved cell design.

ES 1.1.2 Surface Water and Treated Effluent Pathway

Surface water and treated effluent are monitored to determine the effects of Fernald remediation activities on Paddys Run, the Great Miami River, and the underlying Great Miami Aquifer; and to meet compliance-based surface water and treated effluent monitoring obligations. In addition, the results from sediment sampling are discussed as a component of this primary exposure pathway.

In 2005, 16 surface water and treated effluent locations were sampled at various frequencies and two sediment locations were monitored. The following highlights describe the key findings from the 2005 surface water, treated effluent, and sediment monitoring programs:

- The uranium released to the Great Miami River through the treated effluent pathway was an estimated 374 pounds (170 kg), which was below the limit of 600 pounds (272 kg) per year. Uranium released through the uncontrolled runoff pathway was estimated at 75 pounds (34 kg). Therefore, the total amount of uranium released through the treated effluent and uncontrolled surface water pathways during 2005 was estimated to be 449 pounds (204 kg).

- No surface water or treated effluent analytical results from samples collected in 2005 exceeded the final remediation level (FRL) for total uranium, the site's primary contaminant. In addition, there were no FRL exceedances for any other constituent.

- Compliance sampling, consisting of sampling for non-radiological pollutants from uncontrolled runoff and treated effluent discharges from the Fernald site, is regulated under the state-administrated National Pollutant Discharge Elimination System (NPDES) program. The current permit became effective on July 1, 2003, and expires on June 30, 2008.

- Discharges were in compliance with effluent limits identified in the NPDES Permit well over 99 percent of the time during 2005.

- There were no FRL exceedances for any sediment result in 2005.

ES 1.2 Air Pathway Highlights

The air pathway is routinely monitored to assess the impact of Fernald site emissions of radiological air particulates, radon, and direct radiation on the surrounding public and environment. In addition, the data are used to demonstrate compliance with various regulations and DOE Orders.

ES 1.2.1 Radiological Air Particulate Monitoring

Data collected from the network of 17 boundary and one background air monitoring stations showed the annual average radionuclide concentrations were all less than 1 percent of DOE-derived concentration guidelines contained in DOE Order 5400.5, Radiation Protection of the Public and the Environment.

The maximum effective dose equivalent at the boundary from 2005 airborne emissions (excluding radon) was estimated to be 0.46 millirem (mrem) per year and occurred at AMS-3 along the eastern boundary of the site. This represents 4.6 percent of the limit of 10 mrem per year established in National Emission Standards for Hazardous Air Pollutants, Subpart H. For comparison, the maximum effective dose was 0.82 mrem in 2003 and 0.65 mrem in 2004.

ES 1.2.2 Radon Monitoring

A network of approximately 30 continuous environmental radon monitors was used for determining compliance with the applicable limits during 2005. The annual average radon concentration recorded at the site's property boundary ranged from 0.3 picoCuries per liter (pCi/L) to 0.6 pCi/L (inclusive of background concentrations). The annual average background concentration measured in 2005 was 0.4 pCi/L. Property boundary results were well below the DOE radon standard of 3.0 pCi/L above background concentrations. In addition, the site's property boundary radon concentrations were below the proposed 10 CFR 834 limit of 0.5 pCi/L.

Long-term comparisons are also performed on average radon concentrations at western property boundary locations and background locations as a basis for comparison to the 0.5 pCi/L annual average limit. In 2005, a marginal difference in radon concentrations was observed between background and western property boundary monitoring locations. Additionally, there were no exceedances of the DOE limit of 100 pCi/L during 2005.

ES 1.2.3 Direct Radiation Monitoring

Direct radiation measurements were continually collected at approximately 30 locations at the Fernald site and at background locations. The direct radiation levels observed in 2005 indicate that the highest measurements were obtained northeast quadrant of the site. This is reflective of the changing conditions at the Fernald site and is a result of decreasing radiation levels near the Silos Project (site's western boundary).

ES 1.3 Estimated Dose for 2005

In 2005, the maximally exposed individual near the eastern boundary of the Fernald site could have hypothetically received a maximum dose of approximately 10.3 mrem. For comparison purposes, in 2004 it was calculated that the maximally exposed individual living nearest the Fernald site in a north-northeastern direction could have hypothetically received a maximum dose of approximately 11.1 mrem. This estimate represents the maximum incremental dose above background attributable to the site and is exclusive of the dose received from radon. The contributions to this all-pathway dose for 2005 were 0.46 mrem from air inhalation dose and 10.2 mrem from direct radiation. This dose can be compared to the limit of 100 mrem above background for all pathways (exclusive of radon) that was established by the International Commission on Radiological Protection and adopted by DOE.

ES 1.4 Natural Resources

Natural resources include the diversity of plant and animal life and their supporting habitats found in and around the Fernald site. During 2005, the following primary activities associated with natural resource monitoring and restoration occurred.

- The Paddys Run corridor, which included conversion of existing leased pastures to early stages of a native prairies and expanding the wooded corridor.
- The borrow area restoration continued with the creation of wetlands and tallgrass prairies across the southeast portions of the Fernald site.
- The former production area, which included regarding areas to create wetlands and open water areas. Approximately 900 native trees and shrubs were planted.
- Wetland Mitigation Project implementation monitoring indicated plant survival is approximately 80 percent.

There were no unexpected discoveries of cultural resources during 2005 remediation activities.