Executive Summary

The *2009 Fernald Preserve Site Environmental Report* provides stakeholders with the results from the Fernald, Ohio, site's environmental monitoring programs for 2009; a summary of the U.S. Department of Energy's (DOE's) activities conducted on site; and a summary of the Fernald Preserve's compliance with the various environmental regulations, compliance agreements, and DOE policies that govern site activities. This report has been prepared in accordance with DOE Order 450.1A, *Environmental Protection Program*, and the "Integrated Environmental Monitoring Plan," which is Attachment D of the *Comprehensive Legacy Management and Institutional Controls Plan* (LMICP) (DOE 2009a).

The Fernald Preserve has been successfully remediated, and only the continued operation of the groundwater remedy and the care and maintenance of the on-site disposal facility (OSDF) are ongoing components of remediation.

During 2009, activities at the Fernald Preserve included:

- Prescribed burns, which were conducted for the first time.
- Ecological restoration activities as well as inspections, care, and monitoring of the site and the OSDF to ensure that provisions of the LMICP are fully implemented.
- Environmental monitoring activities related to air, surface water, and groundwater.
- Collection and treatment of leachate from the OSDF.
- Extraction and treatment of contaminated groundwater from the Great Miami Aquifer (Operable Unit 5).
- Operation of the Fernald Preserve Visitors Center, and associated outreach and educational activities.
- Construction of two new public hiking trails and a site overlook.

The following sections highlight the results of environmental monitoring activities conducted during 2009.

Liquid Pathway Highlights

Groundwater Pathway

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

- Determine hydraulic capture is maintained, track the restoration of the total uranium plume including non-uranium constituents, and evaluate water quality conditions in the aquifer that may indicate a need to modify the design or the operation of restoration modules.
- Meet compliance-based groundwater monitoring obligations.

During 2009, active restoration of the Great Miami Aquifer continued. Approximately 140 monitoring wells were sampled semiannually to determine water quality. Aquifer water elevations were measured quarterly in approximately 170 monitoring wells. The following highlights describe the key findings from the 2009 groundwater data:

- 2,447 million gallons (9,262 million liters) of groundwater were extracted from the Great Miami Aquifer, and 585 pounds (lb) (265 kilograms [kg]) of uranium were removed from the aquifer in 2009.
- The results of the 2009 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 OSDF indicates that all of the individual cell liner systems are performing as expected and within the specifications outlined in the approved OSDF design.

Surface Water and Treated Effluent Pathway

Surface water and treated effluent are monitored to determine the effects of Fernald Preserve activities on Paddys Run (an intermittent stream), 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 2009, 21 surface water and treated effluent locations and two sediment locations were sampled at various frequencies. The following highlights describe the key findings from the 2009 surface water, treated effluent, and sediment monitoring programs:

- In 2009, 586 lb (266 kg) of uranium were discharged in treated effluent to the Great Miami River, which was below the limit of 600 lb (272 kg) per year. Approximately 78 lb (35 kg) of uranium were released to the environment through uncontrolled storm water runoff. Therefore, the total amount of uranium released through the treated effluent and uncontrolled surface water pathways during 2009 was estimated to be 664 lb (301 kg).
- Analytical results of 32 surface water samples collected in 2009 exceeded the final remediation level (FRL) for total uranium, the site's primary contaminant. Three of the 32 exceedances were from SWD-05, and 29 are related to SWD-09 established to monitor the maintenance action completed west of the former Waste Pit Area. The surface water found at locations SWD-05 and SWD-09 does not flow off property. There were no FRL exceedances for any other constituent.
- Compliance sampling, consisting of sampling for nonradiological pollutants from uncontrolled runoff and treated effluent discharges from the Fernald Preserve, is regulated under the state-administrated National Pollutant Discharge Elimination System (NPDES) program. A new permit covering site discharges was issued by the Ohio Environmental Protection Agency and became effective in April 2009. Discharges were in compliance with effluent limits identified in the NPDES permit 100 percent of the time during 2009.
- There were no FRL exceedances for any sediment result in 2009.

Air Pathway Highlights

The air pathway is routinely monitored to assess the impact of Fernald Preserve emissions of radiological air particulates and direct radiation on the surrounding public and environment. In addition, the data are used to demonstrate compliance with various regulations and DOE orders. Six air particulate monitoring locations (one background and five boundary monitors) and eleven dosimeters (four trail locations, five boundary locations, one location at the Visitors Center and one background location) were used in 2009 to determine compliance with the applicable limits.

The five remaining boundary monitors have been used to demonstrate that wind erosion of the remediated soil and air emissions from controlled burns (conducted in 2009) pose no significant threat to the public or the environment. An evaluation of the data collected from the air monitoring stations during the past three years demonstrates that radiological concentrations in air remain low (i.e. at or near background). Based on the data indicating emissions are at or near background and the determination by U.S. Environmental Protection Agency Office of Air and Radiation that three years of air monitoring following closure was appropriate, DOE ended the boundary air monitoring program January 4, 2010.

Radiological Air Particulate Monitoring

Data collected from the air monitoring stations (AMSs) around the boundary of the Fernald Preserve show that the annual average radionuclide concentrations are less than 1 percent of DOE derived concentration guidelines in DOE Order 5400.5, *Radiation Protection of the Public and the Environment*.

The maximum effective dose equivalent for 2009 airborne emissions (excluding radon) at the boundary is estimated to be 0.034 millirem per year (mrem/yr) (0.00034 millisievert per year [mSv/yr]) above background, and occurred at AMS-6 along the western boundary of the site. This represents 0.34 percent of the limit established in Title 40 *Code of Federal Regulations* Part 61, "National Emissions Standards for Hazardous Air Pollutants," Subpart H, which is 10 mrem/yr (0.1 mSv/yr) above background.

Direct Radiation Monitoring

Direct radiation measurements were collected at eleven locations. The direct radiation levels measured in 2009 indicate that the individual measurements obtained in the northeast quadrant of the site are slightly higher than background, but annual averages for on-site and background locations are not significantly different. The highest value for an on-site dosimeter produces a dose of 9 mrem/yr (0.09 mSv/yr) above background to an individual who spends the entire year (24 hours a day) at the location.

Estimated Dose for 2009

In 2009, the maximally exposed individual, standing at the northeastern boundary monitor with the highest above-background reading, could receive a dose of 9 mrem (0.09 mSv). This estimate represents the maximum incremental dose above background attributed to inhalation of particulate and direct radiation and is exclusive of the dose received from radon. The contributions to the estimated dose are 0.034 mrem (0.00034 mSv) from air inhalation and 9 mrem (0.09 mSv) from direct radiation. This dose is 9 percent of the adopted DOE limit, which

is 100 mrem/yr (1 mSv/yr) above background (exclusive of radon), as established by the International Commission on Radiological Protection.

Natural Resources

Natural resources include the diversity of plant and animal life and their supporting habitats found in and around the Fernald Preserve. Ecological activities were conducted sitewide during 2009. Maintenance in ecologically restored areas included construction of several new public hiking trails and an overlook, as well as planting to enhance the biowetland surface flow basin, seeding and erosion repair in several areas, and prescribed burning of prairie areas. Monitoring involved several efforts resulting from agreement among the Fernald Natural Resource Trustees. An enhanced wetland mitigation program was initiated. Activities in 2009 focused on wetland vegetation. Functional monitoring of site wetlands was also conducted. In addition to the expanded monitoring efforts, the Fernald Natural Resource Trustees conducted field walkdowns of ecologically restored areas and developed a path forward for additional maintenance and repair work in several locations.

No major issues were discovered during quarterly site and OSDF inspections, and there were no unexpected discoveries of cultural resources during 2009 construction activities.