

ES 1.0 Executive Summary

The 2004 Site Environmental Report provides stakeholders with the results from the Fernald site's environmental monitoring programs for 2004, 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 3 (DOE 2003c). 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 2004, 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 waste pit area (i.e., 90 percent complete at the end of 2004) and 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)
- Completion of construction and most of the necessary testing of equipment and facilities for implementation for Silos 1 and 2 remedy, as well as transfer of much of the material from the Silos 1 and 2 to the Transfer Tank Area (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 2004. The last of Fernald's 10 uranium production complexes were demolished. Thirty-five building structures were demolished, bringing the total to 185 of 316 structures. Two new on-site disposal facility cells (Cells 7 and 8) were opened for waste placement. Plans to reduce the size of the site's wastewater treatment infrastructure were approved and implemented.

The following sections highlight the results of environmental monitoring activities conducted during 2004.

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.

In May, EPA and OEPA approved the decision to reduce the size of the advanced wastewater treatment facility.

During 2004, active restoration of the Great Miami Aquifer continued or was initiated within each of the following groundwater restoration modules:

- South Field Module – continued pumping from 13 existing extraction wells.
- South Plume/South Plume Optimization Module – continued pumping from six existing extraction wells.
- Waste Storage Area (Phase I) Module – continued pumping from three existing extraction wells into July. In July, one extraction well was shut down for plugging and abandonment, and the other two extraction wells were shut down for preventative maintenance and to facilitate the construction of the converted advanced wastewater treatment facility (CAWWT). Extraction will resume in 2005 and include a replacement for the well that was plugged and abandoned.
- Re-injection Module – continued injecting water into the aquifer for most of the year via four existing re-injection wells. In September, well-based groundwater re-injection was shut down while the CAWWT was under construction. Based on updated groundwater modeling and the results of cost/benefit analysis, the decision was made in 2004 to permanently discontinue well-based re-injection. Note that in June, EPA and OEPA approved the decision to discontinue the use of well-based re-injection.

In addition, approximately 150 monitoring wells were sampled at various frequencies to determine water quality. Water elevations were measured quarterly in approximately 170 monitoring wells. The following highlights describe the key findings from the 2004 groundwater data:

- 2,446 million gallons (9,258 million liters) of groundwater were pumped from the Great Miami Aquifer and 330 million gallons (1,249 million liters) of water were re-injected into the aquifer. As a result of these restoration activities, 922 pounds (419 kilograms [kg]) of uranium were removed from the aquifer.
- The results of 2004 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. Installation of additional extraction wells was necessary to support the accelerated aquifer remediation schedule. Ongoing refinement of the wellfield configuration will continue based on new monitoring data.

- 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 6 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 2004, 16 surface water and treated effluent locations were sampled at various frequencies and six sediment locations were monitored. The following highlights describe the key findings from the 2004 surface water, treated effluent, and sediment monitoring programs:

- The uranium released to the Great Miami River through the treated effluent pathway was an estimated 509 pounds (231 kg), which was below the limit of 600 pounds (272 kg) per year. Uranium released through the uncontrolled runoff pathway was estimated at 104 pounds (47 kg). Therefore, the total amount of uranium released through the treated effluent and uncontrolled surface water pathways during 2004 was estimated to be 613 pounds (278 kg).
- No surface water or treated effluent analytical results from samples collected in 2004 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 2004.
- There were no FRL exceedances for any sediment result in 2004.

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 fence-line 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 fence line from 2004 airborne emissions (excluding radon) was estimated to be 0.65 millirem (mrem) per year and occurred at AMS-23 along the north-northeastern boundary of the site. This represents 6.5 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 0.8 mrem in 2002 and 0.82 mrem in 2003.

ES 1.2.2 Radon Monitoring

A network of 32 continuous environmental radon monitors was used for determining compliance with the applicable limits during 2004. 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 2004 was 0.3 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.

The annual average radon concentrations in the vicinity of Silos 1 and 2 (Operable Unit 4) during 2004 were comparable to those measured in April 2003 (at which time the Radon Control System [RCS] began operating continually) through the end of 2003. Because of RCS operations, radon concentrations in the vicinity of the silos have decreased sharply. Additionally, there were no exceedances of the DOE limit of 100 pCi/L during 2004.

ES 1.2.3 Direct Radiation Monitoring

Direct radiation measurements were continually collected at 37 locations at the Fernald site and at background locations. The direct radiation levels observed in 2004 indicate that the highest measurements were obtained north-northeast of the site. The direct radiation measurements near Silos 1 and 2 were significantly lower in 2004 than in 2003, primarily due to operation of the RCS.

ES 1.3 Estimated Dose for 2004

In 2004, the maximally exposed individual near the north-northeastern boundary of the Fernald site could have hypothetically received a maximum dose of approximately 11.1 mrem. For comparison purposes, in 2003 it was calculated that the maximally exposed individual living nearest the Fernald site in a west direction could have hypothetically received a maximum dose of approximately 7.33 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 2004 were 0.65 mrem from air inhalation dose and 10.4 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 2004, the following primary activities associated with natural resource monitoring and restoration occurred.

- The Wetland Mitigation Project continued with grading of the basins and spillways, and installation of water control structures. Approximately 1,700 trees and shrubs were planted in addition to installation of approximately 1,600 herbaceous plants.

- The Paddys Run West Restoration Project, which encompasses Area 8 (Phase III) South and North, involved planting over 1,100 trees and shrubs east of Paddys Run Road, and roughly nine acres of tallgrass prairie were seeded within Area 8 (Phase III) South.
- The borrow area restoration continued with the initiation of tree and shrub installation.
- The Paddys Run East Restoration Project, which encompasses all of Area 2 (Phases II and III), focused on plant installation in Area 2 (Phase III). Approximately 1,300 trees and shrubs were installed across the project area.
- The Northern Pine Plantation Restoration Project implemented monitoring that focused on mortality counts and herbaceous cover estimates.

Ecological restoration monitoring continued in 2004, and Sloan's crayfish turbidity monitoring in Paddys Run continued until June 2004. Also, several unexpected discoveries of cultural resources occurred during 2004 remediation activities although none were significant and no impacts to cultural resources occurred.