Fernald Post Closure Stewardship Technology Project

Jennifer A. Zewatsky[1], Lawrence Stebbins[2], Martin J. Prochaska[3]

Abstract: Environmental remediation at the Fernald Environmental Management Project (Fernald) is nearing completion, but technology needs are still emerging at the site. Long-term post closure monitoring technologies are needed to observe the site and its facilities once cleanup is complete. This effort seeks to deploy technologies and integrated systems that can provide "real-time" monitoring to remote locations autonomously. The remote, real-time, autonomous function of the technologies has at least three key benefits: **1)** it will show whether remedy systems are functioning as designed; if they are not, it will notify personnel when a problem may be developing; **2)** real time systems can provide the public, stakeholders, and regulators with up-to-date access to information on the performance and conditions of the site and its facilities; and **3)** it will lower the long-term mortgage costs associated with monitoring site facilities. This poster will describe the impetus for the PCSTP, its mission, the post closure stewardship technology needs identified at Fernald, the Integrating Stewardship Technology Team (ISTT) concept designed to execute the work scope for this project, and progress made to date.

The PCSTP was developed to fulfill post-closure stewardship technology needs at Fernald. A former uranium processing facility, Fernald has been the site of environmental remediation for over a decade due to residual contamination of soil and groundwater by chemicals and radionuclides. Significant progress has already been made in the environmental cleanup of Fernald and the surrounding area; however, long-term post-closure monitoring is necessary to ensure that the OSDF is performing as designed. Technologies capable of monitoring environmental media will be investigated, demonstrated, and deployed through the PCSTP.

A permanent structure, called the On-Site Disposal Facility (OSDF), is currently being built to store low-level contaminated soil and construction debris. The waste streams designated for the OSDF are not hazardous enough to require off-site shipment to a radioactive material disposal facility; however, they still pose a contamination risk if the OSDF does not operate properly. Remotely-operated monitoring technologies are needed to monitor the integrity of the OSDF and associated components and to predict any potential problems.

The goal of the Fernald Post Closure Stewardship Technology Project is to assist Fernald project management and stakeholders in developing a comprehensive long-term post closure care, inspection and monitoring plan through the identification, demonstration, and deployment of technology that will assure DOE, regulators, and stakeholders that the site and its facilities are secure and performing as designed.

Currently, the PCSTP is focusing on the application of advanced technologies to cost-effectively fulfill the long-term stewardship and monitoring needs of the Fernald OSDF and its associated

[1] Intern, Fluor Fernald Inc., Cincinnati, OH 45246, USA, Ph 513.648.6091, Fax 513.648.6338, jennifer.zewatsky@fernald.gov (corresponding author)
[2] Manager, Technology Programs Group, Fluor Fernald Inc., Cincinnati, OH 45246, USA, Ph 513.648.6218, Fax 513.648.6338, lawrence.stebbins@fernald.gov (corresponding author)
[3] Project Manager, Fluor Fernald Inc., Cincinnati, OH 45246, USA, Ph 513.648.6555, Fax 513.648.6338, marty.prochaska@fernald.gov

components. The OSDF is an engineered waste disposal facility composed of a multi-layer cap and liner system. Successful long-term maintenance and monitoring of the OSDF is of primary importance to the DOE, Fernald, and stakeholders. The timeline for identification of initial OSDF monitoring technologies is short, since construction of the cover system for Cell 1 of the facility is scheduled to begin in 2001.

A number of technology needs have been identified for the OSDF in the areas of monitoring, leachate management, and data reporting. The PCSTP will seek out and evaluate reliable, remote, serviceable/replaceable, self-sustainable, real-time technologies that can: **1)** accurately measure the key parameters selected as indicators of long-term performance of the OSDF; **2)** provide passive treatment of OSDF leachate flow; and **3)** facilitate efficient data collection, integration, management, interpretation, and reporting efforts. Selected technologies will be deployed as appropriate to provide long-term monitoring, leachate treatment, and reporting capabilities as described below:

Monitoring

Cover System Integrity

Warning signs of uneven subsidence, surface erosion, burrowing animals, and slope failure or plugged drainage layer in the cover system, using technologies such as satellite imaging, ground-penetrating radar (GPR) scan, fly-over survey and imbedded water pressure transducers and thermocouples.

Leachate Flow and Quality

Cell-specific leachate flow rates and water quality indicators, using technologies such as remote flow meters and radiological/chemical sensors to be installed inside the OSDF Leak Detection System, Leachate Collection System, and Enhanced Permanent Leachate Transmission System.

Ground Water Quality

Underlying perched groundwater and Great Miami Aquifer quality, using a network of horizontal and vertical monitoring wells with remote sensing capabilities for radiological and chemical parameters under and around the OSDF.

Health of the Ecological Environment

Wildlife habitat and general health and diversity of vegetation, using technologies such as scheduled satellite imaging, fly-over survey, and others.

Effectiveness of Institutional Controls

Conditions of access roadways, fences, signs, storm water management structures/channels, and other facilities accessible to the public, using technologies such as fly-over survey and remote/web-based camera.

Weather

Precipitation, temperature, wind, and seismic conditions, using technologies such as on-site solar/battery-powered remote sensing meteorological/seismic stations.

Leachate Management
Develop and implement a long-term passive treatment system for a reduced leachate flow from the OSDF using geo-chemical and/or biological treatment technologies, after the current waste water treatment facility is no longer available.

Reporting
Establish an integrated data and record repository that can provide timely, easy, and complete access to/interpretation of all the historical information regarding OSDF design and construction, as well as any new monitoring data, using the latest information management technologies. The repository will be accessible by DOE, regulatory agencies, and all other stakeholders.

The Fernald Integrating Stewardship Technology Team (ISTT) is a group of experts, regulators, and stakeholders selected to help Fernald team members execute work related to the PCSTP. ISTT members include leading experts in landfill design, engineering, and construction from DOE national labs, other DOE sites, University of Illinois, University of Cincinnati, University of Wisconsin, Florida International University, DOE-Fernald, Fluor Fernald Inc., and regulatory agencies.

The ISTT represents a broad-based, independent, and objective approach to the evaluation and deployment of innovative technologies at Fernald and is modeled after the highly successful Fernald Large Scale Demonstration and Deployment Project team. The ISTT is responsible for researching, screening, demonstrating, and deploying post-closure stewardship technologies that meet site-specific needs.

The first major task of the ISTT is to identify, demonstrate, and deploy post-closure monitoring technology for the OSDF Cell 1, due to the imminent construction of the Cell 1 cover system. Collaboration among team members is crucial to the success of the ISTT; meetings are held to facilitate the process. Since its initial meeting in November of 2000, the ISTT has developed a list of critical monitoring parameters and technologies available for implementation during Cell 1 construction. Critical parameters are listed in the table below. Procurement and demonstration options are currently being evaluated for the following technologies: pressure transducers and thermocouples, plate and rod systems, GPR targets, and remote sensing benchmarks.

Critical Monitoring Parameters	Selected Technologies
Drainage Layer - Head measurement	Submersible Pressure Transducers
Settlement / Subsidence - Seismic / Surface	Topographic Surveys Plate & Rod Ground Penetrating Radar (GPR) targets
Soil Moisture / Soil-Water Potential	Water content sensors employing a dielectric method
Soil Temperature	Thermal conductivity based matric potential sensors (MPS)
Regular Visual Observation of the cell and its components	Topographic Survey Visual and/or remote sensing Web Cam