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1998



ANNUAL REPORT TO THE PUBLIC

on the FERNALD Environmental Management Project

Prepared by:



Ohio Environmental Protection Agency
OFFICE OF FEDERAL
FACILITIES OVERSIGHT



State of Ohio

Ohio Environmental Protection Agency

Ohio Department of Health

Ohio Emergency Management Agency

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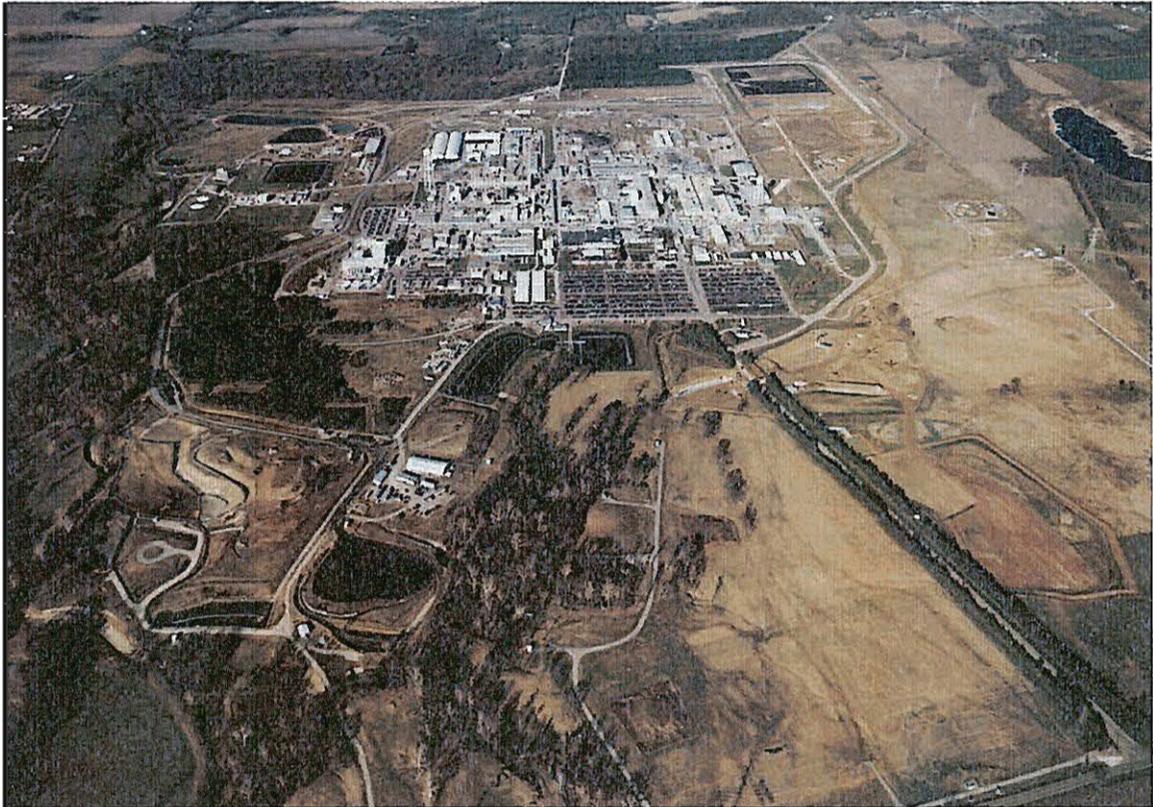
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ACRONYMS LIST

AIP	Agreement in Principle
CAMEO	Computer Aided Management of Emergency Operations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CRG	Cost Recovery Grant
D&D	Decontamination and Dismantlement
DOE	Department of Energy
FCAB	Fernald Citizens Advisory Board
FLHP	Fernald Living History Project
FRESH	Fernald Residents for Environmental Safety & Health
FRL	Final Remediation Level
GIS	Geographic Information System
GPS	Global Positioning System
IEMP	Integrated Environmental Monitoring Plan
ITRC	Interstate Technology & Regulatory Cooperation Workgroup
NRDA	Natural Resources Damage Assessment
ODH	Ohio Department of Health
Ohio EMA	Ohio Emergency Management Agency
Ohio EPA	Ohio Environmental Protection Agency
OFFO	Office of Federal Facilities Oversight
OU	Operable Unit
OSDF	On-Site Disposal Facility
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
TSP	Total Suspended Particulates
USEPA	United States Environmental Protection Agency
WAC	Waste Acceptance Criteria



*The Fernald Environmental Management Project is located 18 miles northwest of Cincinnati.
(Photo courtesy of Fluor Daniel Fernald.)*

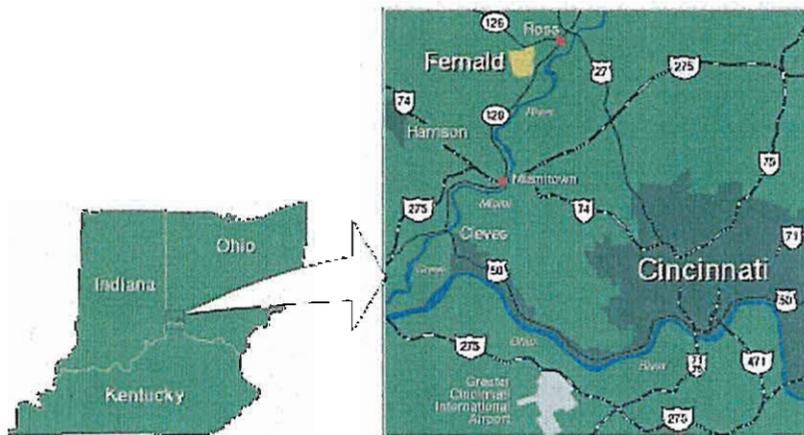
1.0 INTRODUCTION

The purpose of this report is to document the State of Ohio's oversight activities at the United States Department of Energy's (DOE) Fernald Environmental Management Project. The report is written by the Ohio Environmental Protection Agency (Ohio EPA) to provide interested parties a single source of information regarding Ohio's regulatory, environmental monitoring, public outreach, and planning activities at Fernald during calendar year 1998. In addition, this report completes one of Ohio's commitments under the DOE/Ohio federal funding grant.

INTRODUCTION

1.1 SITE BACKGROUND

The site, formerly known as the Feed Materials Production Center, is a 1050-acre facility located in a rural, residential area 18 miles northwest of Cincinnati. The



facility was constructed in the early 1950s and production began in 1952 with National Lead of Ohio as the operator.

Graphic courtesy of Fluor Daniel Fernald.

Uranium metal products for the nation's defense programs, including slightly enriched and depleted uranium, were made at Fernald. Smaller amounts of thorium metal were also produced. Production stopped in July 1989 to focus resources on environmental restoration. In December 1989, the site was added to the United States Environmental Protection Agency's (USEPA) National Priorities List. In 1991, DOE officially ended production and the site was renamed the Fernald Environmental Management Project. Fluor Daniel Fernald assumed responsibility for cleanup from Westinghouse in 1992.

During production numerous contaminants were released and disposed which affected surrounding soil, ground water and surface water. According to an independent dose reconstruction study, an estimated 340 tons of uranium were released during production at Fernald. The study also estimates 170,000 curies of radon were released from the K-65 silos*. A different study published in 1998 estimated the number of lung cancer deaths occurring between 1951 and 2088 may be increased by 1% to 12% from Fernald-related radiation exposures**.

*These estimates are reconstructions of past releases and are based on incomplete data. The review of historic data was conducted by Radiological Assessments Corporation (*The Fernald Dosimetry Reconstruction Project*, August 1996).

***Draft Risk Assessment*, Centers for Disease Control and Prevention, March 1998.

1.2 FUNDING

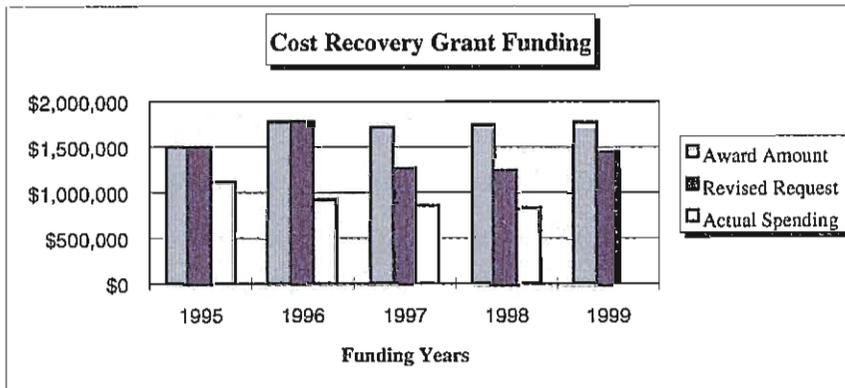
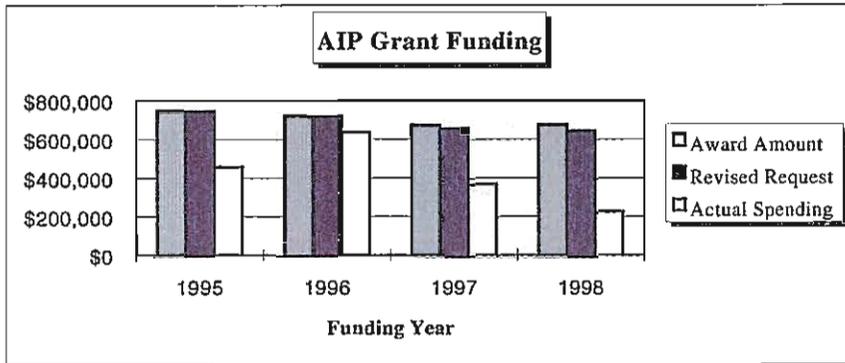
Ohio EPA has a long-standing regulatory role at Fernald. The 1988 Consent Decree between DOE and the State of Ohio provided a mechanism for recovery of costs associated with regulatory oversight. In 1993, the Cost Recovery Grant (CRG) was finalized to provide these costs in a financial assistance award, eliminating the need for annual reimbursement. This arrangement allowed Ohio to provide more active oversight through dedication of additional staff and resources to the project.

Ohio EPA is the State's lead agency for implementation of the CRG. Ohio Department of Health (ODH) and Ohio Emergency Management Agency (Ohio EMA) provide support in health physics and emergency preparedness planning, respectively. Ohio EPA conducts regulatory oversight for implementation of the Resource Conservation and Recovery Act (RCRA), the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and other environmental laws and regulations. In addition to regulatory activities, Ohio EPA conducts public outreach and environmental sampling under the CRG. Enhancing public involvement in decision making has been an important goal of Ohio's CRG program.

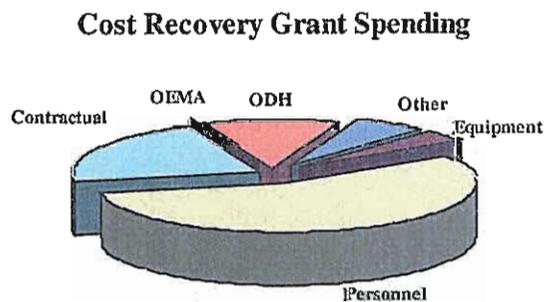
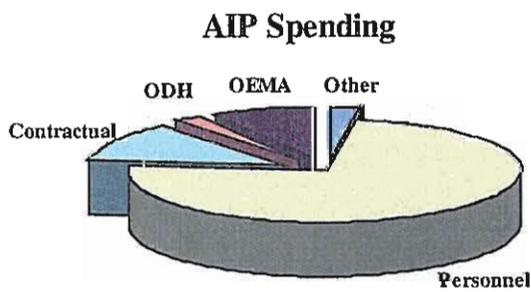
From 1994 through July 1998, Ohio and DOE maintained an Agreement in Principle (AIP) to provide funding for non-regulatory activities of the State agencies. Since nearly all activities at Fernald have been brought under the umbrella of CERCLA remediation, the parties agreed to end the AIP and continue the functions under the CRG.

The following graphs represent profiles of the funding provided to the State of Ohio by DOE under the AIP and CRG for oversight at Fernald. Significantly less money was spent during fiscal year 1998 than was provided in the original grants. The dollars saved are the result of efforts by Ohio to streamline costs and increase efficiency.

INTRODUCTION



The distribution of expenditures for fiscal year 1998 is provided in the figures below. Personnel expenditures include salaries, fringes, and indirect costs. Contractual expenditures include medical monitoring, laboratory analytical, and remedial oversight contractor costs. Operating costs, supplies, training, and travel make up the “other” expenditures.



2.0 ACTIVITIES AND ACCOMPLISHMENTS

Ohio continued to work diligently in 1998 to keep up with Fernald's accelerated cleanup schedule. Major construction activities in the on-site disposal facility (OSDF) and southern waste units were initiated. Erosion control projects, including Paddys Run bank stabilization, bioengineering and the addition of bendway weirs, added to the work at Fernald. The takedown of the Boiler Plant complex was another visible sign of cleanup. These and other accomplishments were observed by staff from Ohio EPA's Office of Federal Facilities Oversight (OFFO) as increased field visits improved regulatory oversight. Ohio EPA and ODH technical staff reviewed and granted State approval on numerous documents. To assist in these and other regulatory functions, Geographic Information (GIS) and Global Positioning systems (GPS) were fine-tuned for more accurate and efficient applications. OFFO staff participated in numerous public meetings that kept the community informed of progress at Fernald. Ohio continued efforts to maintain high quality emergency planning operations and to work with DOE on numerous national level issues.

The overall strategy for remediation of the Fernald site continues to be a balanced approach, which includes removing the most contaminated materials for off-site disposal, while disposing of the less contaminated, high volume materials on-site. Substantial efforts will be made in 1999 to ensure the balanced approach is maintained by initiating shipments from the Waste Pit Remedial Action Project. Ohio's activities and accomplishments for 1998 are further explained in the following sections.

ACTIVITIES AND ACCOMPLISHMENTS

2.1 REGULATORY OVERSIGHT

The site first began remedial investigation activities as part of a 1986 Federal Facility Compliance Agreement between USEPA and DOE. In 1988 a Consent Decree between the State of Ohio and DOE was signed, which also required completion of the CERCLA cleanup. Following a listing on the 1989 National Priorities List, a CERCLA Consent Agreement was signed by USEPA and DOE in 1990. Although separate agreements requiring cleanup exist, Ohio EPA and USEPA work together on all aspects of the project.

As part of Ohio's oversight role at the Fernald site, approximately 150 technical documents were reviewed and commented on and/or approved in 1998. Most of these documents related directly to the on-going remediation of the facility including design packages, implementation plans, certification reports, and work plans. In addition to these regulatory reviews, Ohio EPA focused significant effort on field oversight of ongoing remediation projects. During the year Ohio EPA conducted approximately 150 site visits/inspections. The inspections focused on OSDF construction, storm water management, fugitive dust control, southern waste unit excavation, and other on-site activities. Ohio EPA conducted a National Pollutant Discharge Elimination System permit inspection as well as several informal stormwater inspections over the course of the year.

This year represented the first full year of large-scale remediation. A second cell was completed in the on-site disposal facility and waste placement occurred in both cells #1 and #2. The majority of the inactive flyash pile was excavated, segregated and properly prepared for disposal. The ground water remediation system including new extraction wells and injection wells operated throughout the year. Decontamination and dismantlement (D&D) of production area buildings continued. The contract for remediation of the waste pits was awarded and construction of a treatment facility started. The year represented a major step in the remediation of the Fernald site.

ACTIVITIES AND ACCOMPLISHMENTS

Waste Pits Remedial Action Project (formerly OU1): The six waste pits contain approximately one million tons of soils and waste, including uranium, thorium, and other radioactive and chemical contaminants. The pits range in size from a football field to a baseball diamond, and vary in depth from 13 to 30 feet. Two of the pits have water covers, one has a synthetic cap, and the other pits have soil covers. The waste pits are either in close proximity to, or in contact with, the Great Miami Aquifer and are contributing to ground water contamination.

The waste pit contents will be excavated, thermally dried, and shipped by rail to Envirocare of Utah. During 1998, activities included the design and construction of the treatment facility by IT Corp. In addition, railcars and locomotives were purchased and received. First loadout of waste into railcars will occur in early 1999.

On-Site Disposal Facility Project (formerly OU2, OU3, OU5): Contaminated material including soil and debris are being disposed in the OSDF. Any waste that exceeds the OSDF waste acceptance criteria (WAC) will be treated to meet the criteria or disposed off-site. No off-site waste will be allowed in the OSDF. During 1998, cell #2 was constructed including the liner and leachate collection systems. First waste placement in cell #2 occurred in November.



A representative from the Waste Acceptance Organization uses a manifest system to document every truckload of waste going into the OSDF.

Waste disposal operations including building debris and soils occurred throughout the construction season within cell #1. Approximately 227,400 yds³ of soil and debris were transferred to the OSDF for disposal. This was the first year of operations for the new Waste Acceptance Organization, which was created to ensure waste going

ACTIVITIES AND ACCOMPLISHMENTS

into the OSDF complied with the WAC. The organization performed extremely well in its first year by overseeing segregation at the point of generation, manifesting waste, and inspecting placement operations.

Facilities Closure and Demolition Project (formerly OU3): All on-site buildings are being decontaminated and dismantled. All waste, except that which exceeds the WAC, will be disposed in the OSDF. During 1998, D&D of two major complexes, Plant 9 and the Boiler Plant, was completed. Safe shutdown, including the removal of holdup materials and de-energizing plants, continued and will be complete in early 1999.

Silos Project (formerly OU4): There are four concrete silos at Fernald that were constructed to store radioactive materials. Two of them, referred to as the K-65 silos, contain high radium-bearing residues, one contains lower-level dried uranium residues, and one has never been used. To reinforce the structurally flawed K-65 silos, a soil berm was added in the 1960s and enlarged in the early 1980s. In 1991, bentonite clay was injected into the tops of the two K-65 silos to cap the high radium residues and reduce radon emissions from the silos. The silos continue to retain the potential to release significant volumes of radioactive contaminants.

The 1997 dispute resolution over delays in the Vitrification Pilot Plant resulted in separate strategies for the different silos. For Silo 3 an Explanation of Significant Difference was completed. Rocky Mountain Remediation Services was selected to remediate Silo 3 contents using chemical stabilization. Their process design is scheduled to occur in 1999. A Record of Decision (ROD) Amendment will be completed for the K-65 Silos (1 and 2). In order to support the revised Feasibility Study required by the ROD Amendment, proof of process testing was initiated on four technology types for the K-65 silo waste. Proof of process testing will be completed in early 1999. A proposal to accelerate retrieval of the K-65 waste and transfer it to new tanks was developed in 1998. A contract will be awarded for this work in early 1999.

ACTIVITIES AND ACCOMPLISHMENTS

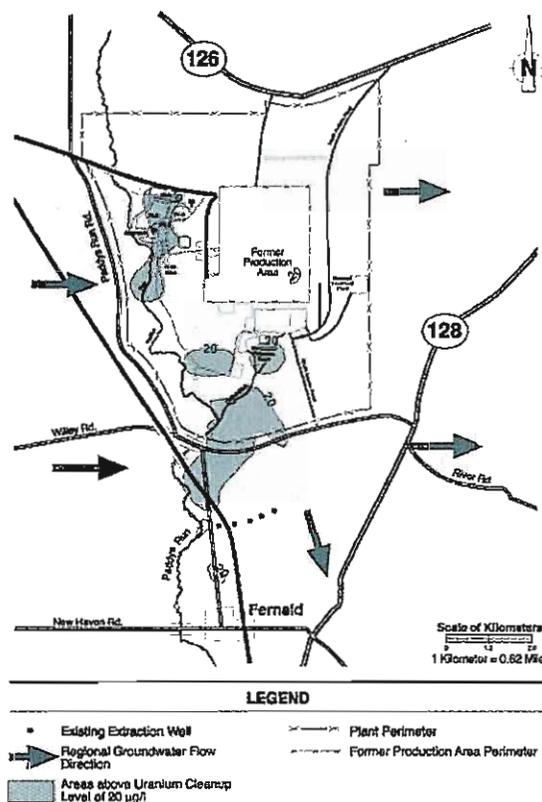
Soils Characterization and Excavation Project (formerly OU2 & OU5):

Contaminated soils are being excavated with disposal of those soils meeting the waste acceptance criteria in the OSDF. Soils Project activities in 1998 included excavation, certification, stabilization, and restoration. The majority of the inactive flyash pile was excavated during the construction season. The pile was a significant source of contamination to the Great Miami Aquifer and included below and above WAC soils. Several other smaller piles of soil were transferred to the OSDF. Materials from the active flyash pile were used as the protective layer in the bottom of OSDF cell #2. Approximately 223,000 yds³ of soil and debris were excavated during 1998.

Certification of areas attaining the final remediation levels (FRL) was first completed in 1998. Sampling, analysis, and statistical testing occurred for both remediated areas as well as those areas not requiring remediation. Approximately 250 acres of the site have been certified as meeting cleanup levels.

Aquifer Restoration and Waste Water Project (formerly OU5):

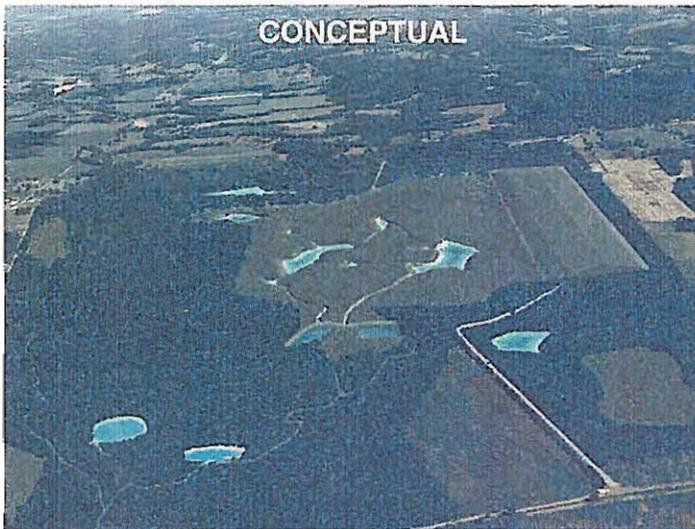
The Fernald site is located over the Great Miami Aquifer, which is designated a sole source aquifer and considered a valued natural resource. Ground water is contaminated with uranium approximately one mile south of the site in what is referred to as the “south plume.” DOE provided bottled water for residents in the plume area from February 1991 until 1996 when a public drinking water system became operational. In 1993, the south plume removal action was started to slow off-site migration of the uranium plume.



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The Great Miami Aquifer is being remediated by a combination of ground water extraction and injection. The use of reinjection wells as part of the ground water remediation is a demonstration project. The reinjection wells were started in 1998 along with several new extraction wells.

Natural Resource Damage Assessment (NRDA): Ohio EPA is the authorized agency to act as natural resource trustee for the State of Ohio. The trustees' role is to act as guardians for public natural resources impacted by Fernald. Other trustees for Fernald include DOE and the Department of Interior. The goal of the Fernald trustees is to integrate natural resource restoration activities into the CERCLA remediation efforts at the site. Another goal of the trustees efforts is to have the restoration activities result in settlement of the State of Ohio's NRDA claim against DOE. During 1998 the Natural Resource Restoration Plan was completed in draft final form. A public comment period was held on the restoration plan along with an Environmental Assessment completed by DOE on final land use.

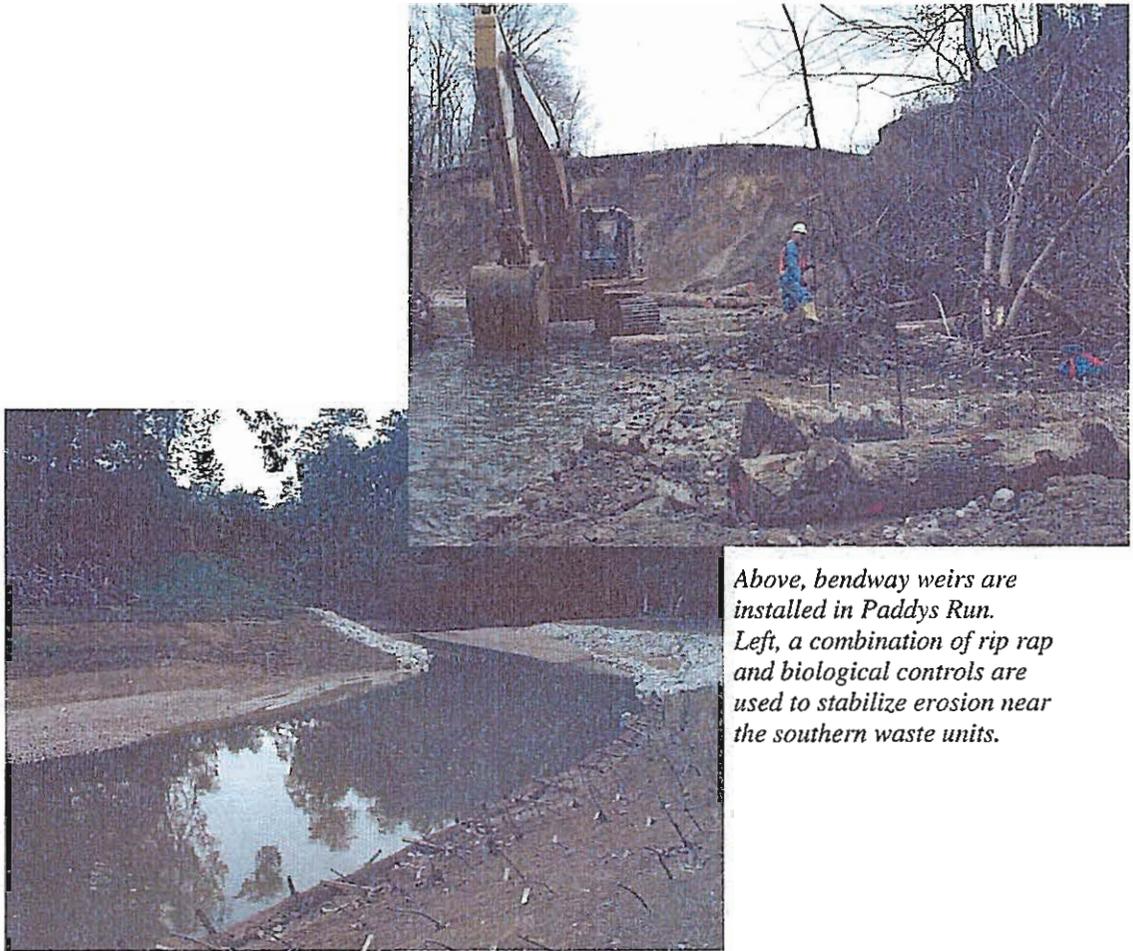


Computer generated view of a restored Fernald site. The OSDF can be seen in the upper right, along with wetlands, prairies and forests. (Photo courtesy of Fluor Daniel Fernald.)

accessible habitat area was completed in 1998. The other research projects will continue into 1999.

In addition to the specific NRDA activities, several natural resource supplemental projects required by the USEPA Silos Project Dispute Resolution were initiated in 1998. The projects included developing an ecological park; and researching invasive species control and reforestation techniques. The publicly

ACTIVITIES AND ACCOMPLISHMENTS



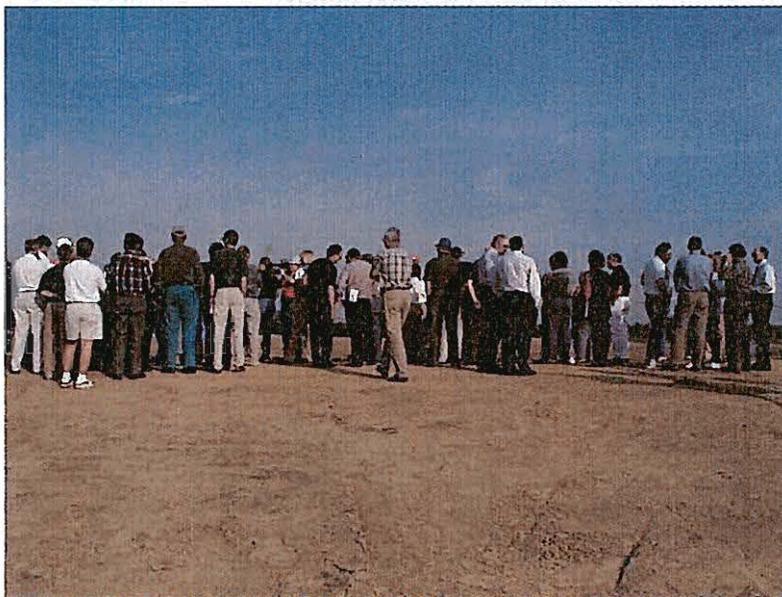
Above, bendway weirs are installed in Paddys Run. Left, a combination of rip rap and biological controls are used to stabilize erosion near the southern waste units.

A bioengineering project was completed in Paddys Run near the southern waste units. The project was aimed at preventing additional erosion of Paddys Run towards the waste units. A combination of rip rap and biological controls was used. The effort successfully controlled the erosion problem near the southern waste pits. Another erosion control project used logs to form bendway weirs along an area in Paddys Run experiencing severe outside bend erosion.

ACTIVITIES AND ACCOMPLISHMENTS

2.2 PUBLIC OUTREACH

Ohio EPA's public outreach program is designed to supplement monitoring and oversight activities by involving the public in important environmental decisions. Since every decision at Fernald ultimately affects the public, their inclusion and understanding of the cleanup process is essential. Person to person contact, along with quick, open responses from technical staff to public inquiries ensure the public is included in Ohio EPA's decision-making. In 1998, OFFO investigated and



responded to numerous public and media information requests. OFFO's Internet web site continues to enhance communications with the public. Several site tours were held, including one with Ohio EPA's Director.

Fernald tour participants view progress at the OSDF in May.

Meetings

OFFO representatives fully participate in all DOE and community sponsored public meetings and workshops, and give presentations where requested or appropriate. The following list includes groups with which Ohio staff regularly participates.

- Fernald Residents for Environmental Safety and Health
- Fernald Citizens Advisory Board
- FCAB committee activities
- Community Reuse Organization
- Fernald Living History Project
- Fernald Health Effects Subcommittee
- Interstate Technology & Regulatory Cooperation Workgroup (ITRC)
- Site Technology Coord. Group

ACTIVITIES AND ACCOMPLISHMENTS

In 1998, the Fernald Citizens Advisory Board (FCAB) consolidated four committees, waste disposition, environmental monitoring, natural resources, and transportation into two, on-site issues and off-site issues. Ohio EPA staff regularly participate in these FCAB committee meetings and in the full bimonthly meetings of the FCAB, in ex-officio capacities, as well as in special events such as the CAB Low Level Waste Seminar and tour of the Nevada Test Site.

Ohio EPA regularly participates in meetings and promotional efforts of the Fernald Living History Project (FLHP).

This project involves community members and site workers in an effort to record and preserve the various perspectives that are a part of their environmental history. In 1998, the



group actively sought independent funding sources, encouraged community interest, discussed project implementation, and developed a promotional video. In February, OFFO created an email list server for the FLHP. In October, OFFO developed an Internet web site for the FLHP and continues to provide server space and maintenance of the web site. In December, OFFO provided editorial, printing, and mailing services for the group's first newsletter and survey.

OFFO also played an instrumental role as Fernald Natural Resource Trustee in future land use discussions. A public workshop was held in September to initiate discussions on the Fernald Natural Resource Restoration Plan at which OFFO presented information as a Trustee. OFFO also created a fact sheet, *Fernald Natural*

ACTIVITIES AND ACCOMPLISHMENTS

Resource Restoration Plan, and made regular updates to the web site on natural resource projects and activities.

In addition to these Fernald-specific groups, Ohio EPA staff also participated in numerous DOE national groups including ITRC, the State and Tribal Governments Working Group, and the Environmental Management Advisory Board.

Publications:

- *1997 Annual Report to the Public on the Fernald Environmental Management Project*
- *Ohio EPA Field Notes* is a new column in the FRESH bimonthly newsletter; contributions from various staff

Fact Sheets:

- Quarterly environmental monitoring results fact sheets
- *Fernald Natural Resource Restoration Plan*
- FLHP newsletter and survey
- Revised Fernald fact sheet
- Revised Fernald Team reference sheet

Presentations:

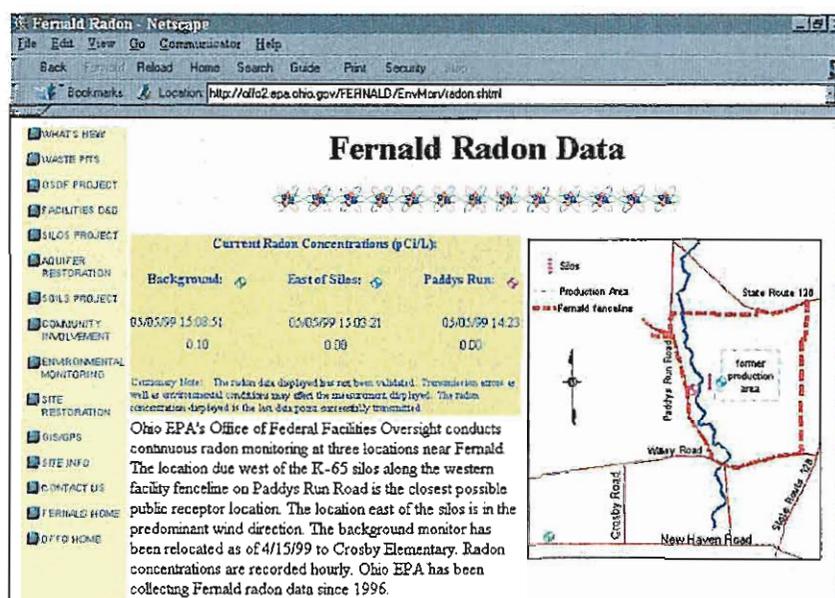
- *Natural Resource Restoration at Fernald*, presented at the Ohio Federal Facilities Forum, May
- *Cleaning up Fernald, Ohio EPA's Role*, presented at the Field Office Business Forum, May
- *Natural Resource Restoration*, presented at Fernald public meeting, September
- *Radioactive Cleanup and State Oversight at Fernald*, presented at ITRC Workgroup, November
- Fernald presentation to graduate students at Miami University

ACTIVITIES & ACCOMPLISHMENTS

On the Internet

OFFO's Fernald web site continues to be a valuable resource for providing information to both internal and external users. During the year, OFFO responded to numerous public information requests from the Internet. Users can quickly view information about the Fernald cleanup and contact Ohio EPA staff with further questions. The sharing of Fernald successes and problems worldwide may assist other cleanup sites conducting similar activities.

In 1998 many updates and changes were made to the web site. A new layout allows for easier navigation, quicker download times, and more effective file management. A real-time radon monitoring data



The radon page gives viewers hourly updates from Ohio EPA's Fernald area monitors.

page with hourly updates from three locations has been on-line for most of 1998. In March OFFO issued a press release to announce the radon Internet site. OFFO created a web site for the community based Fernald Living History Project advisory group. This site will continue to be hosted and maintained by OFFO. Additionally, the web server continues to host multiple web sites, including the district site and the Hamilton County Environmental Action Commission site. The OFFO web site can be accessed at <http://offo2.epa.state.oh.us>.

ACTIVITIES & ACCOMPLISHMENTS

2.3 GIS AND GPS

Geographic Information System

The Geographic Information System, or GIS, is a computer based mapping system capable of storing, manipulating, and analyzing geographical information. OFFO is developing and using a GIS for two important reasons: first, the system provides powerful analytical capabilities; second, the system completes many existing tasks more effectively.

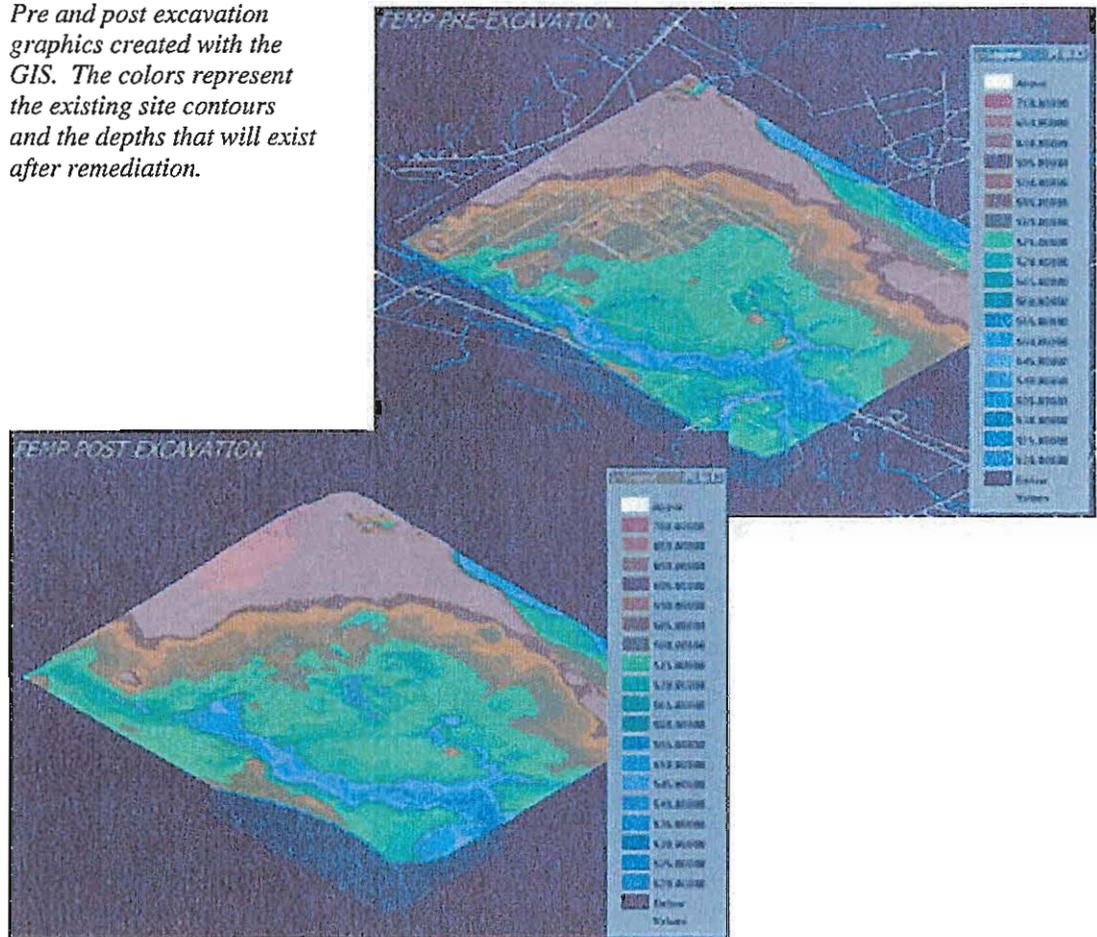
Not all relationships between data at the Fernald site are obvious. Due to the complex nature of contaminant transport, relationships may exist between parameters which would not be realized without the analytical capabilities of the GIS. The system allows technical staff to associate all existing data on waste materials and contamination with site information such as topography, stratigraphy, surface drainage features, and geology. These associations can then be analyzed and presented on maps that display visual correlations. These comparisons cannot be made easily without the GIS's ability to manipulate and integrate various types of data. GIS provides the tools necessary to effectively use the tremendous volume of data that has been collected at Fernald.

Availability of the GIS allows OFFO to perform independent analysis and review of DOE contractor generated data, models, maps, and designs. OFFO's independent analysis has increased regulatory confidence and the efficiency of design reviews. This system helps OFFO provide more efficient and cost-effective oversight for the DOE cleanup of the Fernald site.

In the past year, GIS has been used primarily to assess contaminant distribution in several areas at Fernald where cleanup activities were occurring. The GIS was also used to generate graphics for public presentations like the following pre and post excavation graphics generated from site-wide terrain models. These graphics were used to demonstrate where several deep excavations on the site might become ponds as part of the natural resource restoration activities at Fernald.

ACTIVITIES & ACCOMPLISHMENTS

Pre and post excavation graphics created with the GIS. The colors represent the existing site contours and the depths that will exist after remediation.

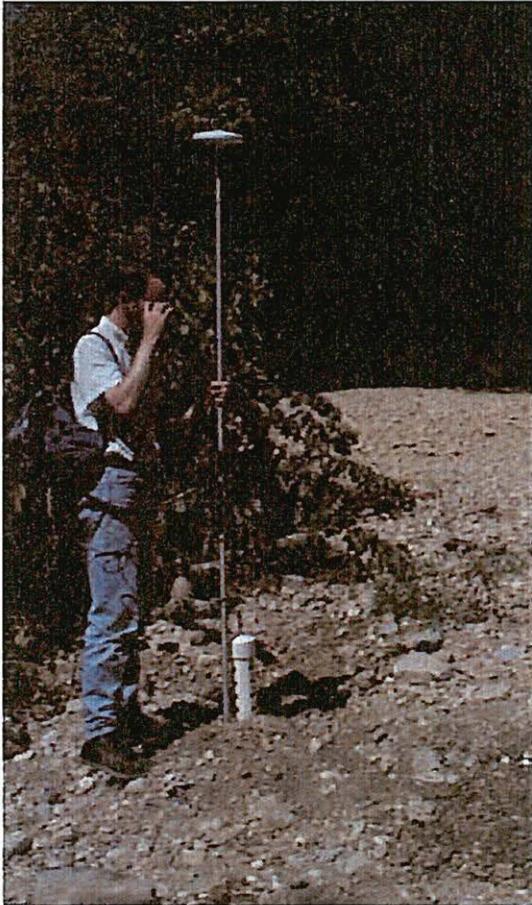


Global Positioning System

Ohio EPA's Fernald team uses a Global Positioning System, or GPS, to enhance oversight activities, especially, the environmental monitoring program. GPS uses a series of satellites and a base station to reliably pinpoint geographic locations.

In 1998, OFFO continued to use the GPS to determine environmental monitoring sampling locations. The geographic data from Ohio EPA's environmental monitoring program is entered into our local database for use with the GIS. Data acquired with the GPS was used to create sampling location maps for fact sheets. As one of only a few GPS base stations in the State of Ohio, OFFO made base station data available to several divisions within Ohio EPA as well as to USEPA in Cincinnati via the OFFO web site.

ACTIVITIES & ACCOMPLISHMENTS



New GPS equipment has greatly decreased the time it takes to collect location data.

In early 1998, OFFO acquired new GPS hardware and software that expands data collection capabilities and substantially reduces data collection times. With the new equipment, data collection time has decreased from 30 minutes to 5 minutes per Fernald location with no loss of accuracy. Post processing and manipulation of field data has become much easier to perform with the new software.

The new GPS equipment will be used in 1999 to map locations associated with an upcoming wetland mitigation research project OFFO is conducting with the University of Dayton. The project involves transferring soil from various

donor locations to the stripped soils at Fernald to replenish the microbial community. GPS equipment will be used extensively to mark locations where the donor soils have been introduced and where pre-project sampling will take place.

2.4 EMERGENCY MANAGEMENT PLANNING

Ohio EMA reviewed the State Hazmat Plan/DOE Annex and worked on revisions to the plan and the state's Hazardous Materials Memorandum of Understanding. Ohio EMA continued to enter updated facility information into the state resource directory, the duty officer's handbook, and the Computer Aided Management of Emergency Operations (CAMEO) database. Ohio EMA continued to attend the clean-up status meetings and the Cooperative Planning and Training meetings for Fernald. Along with Ohio EPA and ODH, Ohio EMA continued to work on developing sampling procedures for releases at DOE sites. The agency worked with DOE and other state agencies on combining the AIP and CRG. The agency also reviewed the Fernald Remedial Action Reports and the Transportation and Disposal Plan for the site. Ohio EMA participated in the Fernald public tour in May and was briefed on the site clean-up status.

Throughout the year notification drills were conducted and Ohio EMA participated in these drills. Ohio EMA continued to prepare for site emergencies by improving its preparedness posture through training and upgrading the Ohio Emergency Operations Center, which included beginning to review operational systems for Y2K compliance. Ohio EMA personnel attended several hazardous materials courses and attended various seminars related to response and emergency planning. Ohio EMA, sponsored a CAMEO Windows Train-the-Trainer course, and taught an introductory CAMEO course in Hamilton County at the University of Cincinnati.

Under the DOE grant provisions, Ohio EMA provided pass-through funds to the Hamilton and Butler County Emergency Management Agencies to be used for Fernald-specific issues. They used the funds for such initiatives as preparing hazards assessments, participating in emergency response organizations, conducting exercises and drills, digitizing site-specific information, participation in periodic communications checks, upgrading their Emergency Operations Center, and monitoring the periodic tests of the Fernald warning system.

ENVIRONMENTAL MONITORING

3.0 ENVIRONMENTAL MONITORING

The State of Ohio has conducted environmental monitoring at Fernald since 1985. Monitoring is performed to evaluate potential impacts from remedial actions to the public and the environment, and the success of ongoing cleanup activities. During 1998, on- and off-site releases were monitored through the sampling of environmental media, including ground water, surface water, sediment, soil, biota, and air.

Ohio EPA reviewed and commented on DOE's Integrated Environmental Monitoring Plan (IEMP) in 1998. This included four quarterly status reports and one annual report covering all 1998 monitoring activities. The IEMP integrates monitoring associated with various regulatory oversight programs, such as RCRA and CERCLA, with the current monitoring program required by DOE orders. The IEMP streamlines monitoring resources by combining monitoring for remediation projects, decontamination, and demolition operations into one program. As a result of DOE's changes, Ohio EPA conducted most of the off-property environmental monitoring at Fernald.

Ohio EPA continued its independent and split sampling program in 1998. Independent sampling allows Ohio EPA to evaluate suspected impacts from remedial activities, evaluate additional sampling locations and analytical parameters not currently monitored by DOE, and respond to specific citizen requests. Ohio EPA is also able to audit DOE's compliance with the waste acceptance criteria. Split sampling provides a comparison of data between Ohio EPA and Fernald.

ODH provided data validation for OFFO's sampling program. A discussion of sampling activities and results for each media is provided in Sections 3.1 through 3.6. Summary data from Ohio EPA's sampling program are included in the Appendices of this report. Complete data packages may be viewed by contacting Ohio EPA.

3.1 PRIVATE WELLS

Ohio EPA continued to monitor three private wells in 1998 for total uranium. OFFO split sampled the wells quarterly with DOE/Fluor Daniel Fernald. One independent private well sample was taken at the request of a homeowner.

The 1998 private well sampling locations are shown on the off-site sampling map in Appendix A. Private wells BOK14, BKM13, and NKM12 are located down gradient of Fernald and within the uranium plume. The request well, REQT4, is east of Fernald.

Private well water is analyzed for total uranium, which is the primary contaminant of concern at Fernald. The USEPA proposed drinking water standard for total uranium is 20 µg/l. The ground water final remediation level for total uranium at Fernald is also 20 µg/l. Local background for total uranium in ground water, as determined in the *OU5 Remedial Investigation* (October, 1994), ranges up to 3.1 µg/l. The highest total uranium concentration detected from the three monitored wells during 1998 was 45 µg/l found in well BKM13. Well BOK14 was consistently within background in 1998. Appendix B contains the private well sampling data.

OFFO has been split sampling the three wells with Fluor Daniel Fernald since 1994. These wells have historically shown some fluctuation in their levels of total uranium concentrations. This is mostly due to seasonal changes that occur in the

The aquifer remediation system at Fernald includes extraction, treatment and injection after meeting drinking water standards. Injection wells were introduced to the system in 1998, along with additional extraction wells. More wells will be added as above ground remediation efforts progress.

water table. Quarterly monitoring provides needed information to confirm seasonal fluctuations and any contaminant migration resulting from cleanup activities which may impact these private wells.

ENVIRONMENTAL MONITORING

3.2 SURFACE WATER

Routine monitoring changed from quarterly to a bimonthly schedule in 1998. Forty-nine surface water samples were taken in 1998, compared with 35 in 1997. Routine samples were analyzed for total uranium, radium-226, and radium-228. In addition to the routine monitoring, the following samples were taken:

- Three samples were taken on January 13 at the southern waste units where a field tile drains into sediment basin 2 (BSN2DT). There was concern about this flow entering the unlined basin. Subsequently,



efforts to line the basin *Sampling drainage tile at southern waste units.*

were expedited. Samples were analyzed for total uranium and technetium-99.

- Two samples were taken during a storm event in January. The samples were taken at the outfall from the temporary sediment basin in the northeast corner of the site and at the run on from the adjoining property along the east fence line (NESDTRP). Samples were analyzed for total uranium and technetium-99.
- One sample was taken on May 29, downstream of the Willey Road Bridge in

Construction activities taking place in Paddys Run during 1998 include the placement of rip rap to support an eroding bank at the silos (January), the placement of logs to act as bendway weirs on an eroding bank upstream of the silos (February), and a bioengineering project using biological products and rip rap to prevent additional erosion into the southern waste units (May through July).

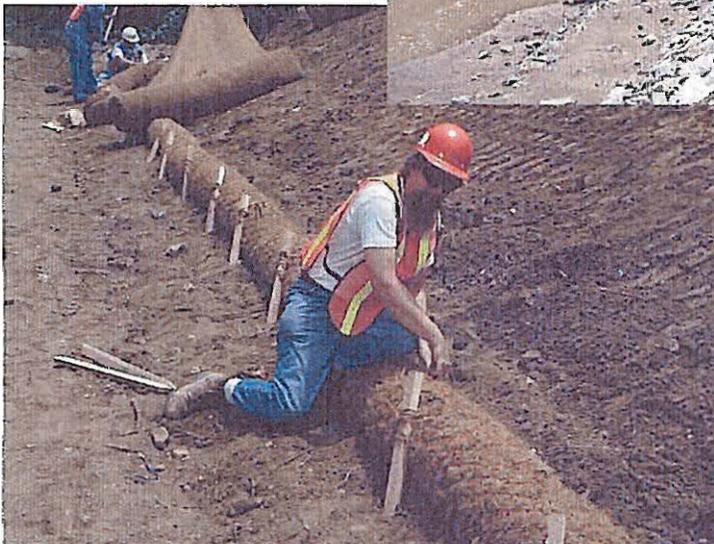
Paddys Run (PR1.75). This was after a small fuel spill occurred from equipment working upstream in Paddys Run. The sample

was analyzed for total petroleum hydrocarbons, total uranium, radium-226, and radium-228.

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- One sample was taken at the Willey Road Bridge on June 12 (PR1.8), downstream from the equipment operating in Paddys Run to monitor potential contaminants in increased sediment loads. The sample was analyzed for total uranium, radium-226, and radium-228.
- One sample was taken on August 24 in Paddys Run (PR2.2) where there was flow that appeared to be entering from the wheel wash area of the southern waste units. Drainage from the wheel wash area was subsequently reconfigured. The sample was analyzed for total uranium, radium-226, and radium-228.

The map in Appendix A shows all 1998 surface water sampling locations. Location codes reflect the river and the river mile of the sampling location. GM26.2 and PR7.2 are background locations on



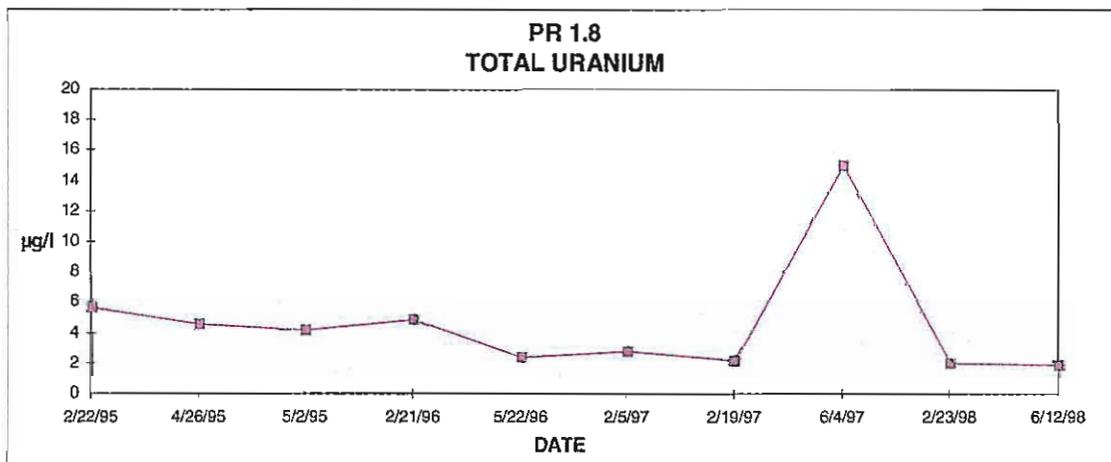
Above, construction equipment in Paddys Run during the bioengineering project near the southern waste units. Left, coconut (coir) logs are used as part of the Paddys Run bioengineering project.

the Great Miami River and Paddys Run, respectively. Bimonthly samples were taken in addition to the above mentioned events. PR3.3 is located on Paddys Run below the confluence of the drainage ditch from the northern portion of the production area. This is also where the state threatened Sloan's crayfish is found. Location PR1.8 is at the Willey Road Bridge on Paddys Run off site, near the southern boundary of the

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site. PR0.2 is located at the Route 128 bridge and is fed primarily by ground water. Location GM24.6 is directly downstream of the National Pollutant Discharge Elimination System outfall from Fernald in the Great Miami River. Location GM21.4 is approximately three miles downstream of the effluent at the bridge in New Baltimore.

No sample results exceeded the FRLs. The final remediation levels for total uranium, radium-226, and radium-228 in surface water in Paddys Run and the Great Miami River are 530 $\mu\text{g/l}$, 38 pCi/l, and 47 pCi/l, respectively.



With the exception of a short time in late winter/early spring, Paddys Run at the property line (PR1.8) was generally dry. The two samples taken at this location (2/23/98 and 6/12/98) continued to demonstrate low levels of total uranium.

The December 21 sample at PR3.3 showed an unusually high total uranium result (150 $\mu\text{g/l}$ versus 1 to 2 $\mu\text{g/l}$ generally). The contract laboratory was unable to run a confirmatory sample because of lack of remaining material. Results from this area will not be available from DOE/Fluor Daniel Fernald until mid 1999. It is possible that there is an error in this result, we will monitor the results from this location in early 1999. See Appendix C for all surface water sampling results.

3.3 SEDIMENT

Six independent routine samples were collected in 1998. Three additional locations were sampled for miscellaneous reasons. The first of the three was taken in July with DOE/Fluor Daniel Fernald. The split sample was taken to check data consistency between Ohio EPA and DOE. The other two samples were taken in August upstream and downstream from the confluence of Paddys Run and the southern waste units drainage ditch. There was flow that appeared to be from the wheel wash area of the southern waste units entering Paddys Run (which was dry at this location). A total of nine sediment samples were analyzed in 1998. Samples were analyzed for total uranium, radium-226, isotopic thorium, and cesium-137.

The maps in Appendix A shows all 1998 sediment sampling locations. The location split with DOE/Fluor Daniel Fernald was taken at the confluence of Paddys Run and the Great Miami River (GM20.29). The other two non-routine samples were taken in Paddys Run at PR2.2 and PR2.21. Routine independent samples were co-located with surface water sampling locations, with the addition of PR4.6 at the Morgan Ross Road bridge (the DOE/Fluor Daniel Fernald background station). Location PR7.2 had a gravel and cobble substrate, and did not have sufficient sediment to be sampled.

All sediment sampling results were low and did not approach the FRLs. Final remediation levels for sediment at Fernald have been established for the following analytes (*OU5 Record Of Decision*,

December 15, 1995): total uranium (210 µg/g), radium-226 (2.9 pCi/g), thorium-228 (3.2 pCi/g), thorium-230 (18,000 pCi/g), thorium-232 (1.6 pCi/g), and cesium-137 (7 pCi/g). No sediment sample resulted in any analyte above the FRL. Results are summarized in Appendix D.

The total uranium final remediation level for sediment is 210 µg/g. Ohio EPA's highest result for 1998 was 21 µg/g from location GM24.6, which is directly downstream of the Fernald effluent discharge

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3.4 SOIL

In 1998, Ohio EPA concentrated on monitoring site soil conditions at Fernald. OFFO conducted several sampling events to evaluate compliance with the waste acceptance criteria by characterizing staged soils prior to the disposal in the OSDF. Other samples were collected to delineate the extent of lead contamination and to determine whether the soil was RCRA regulated waste.

OFFO conducted seven soil sampling events in 1998 and collected a total of 33 samples from Fernald. Each sampling event had a specific compliance objective. See the Appendix for sampling locations and data results.

- In the first sampling event, ten split samples were collected from the Area 1 Phase 1 west impacted stockpile to determine WAC compliance (A1P1WIS). Sample results were below the WAC for total uranium and technitium-99, and the stockpile was considered suitable for disposal in the OSDF.
- The next soil investigation was conducted on the inactive flyash pile in Area 2 Phase 1 of the southern waste units (SW5). Historical data indicated the need for confirming above WAC total uranium and technicium-99 concentrations. All technitium-99 results were very low. Five out of seven samples were well above the WAC and FRL for total uranium (1030 mg/kg and 50 mg/kg, respectively) and reanalysis confirmed the initial results. It was determined that hot spots found in the inactive flyash pile would be removed to soil pile 7 pending off-site disposal.
- In the third sampling event, OFFO split six soil samples from the south field firing range (A2P1PB). DOE's sampling focused on lead delineation above the FRL of 400 mg/kg. RCRA contaminants were analyzed to ensure proper disposal. Ohio EPA's results confirmed DOE's FRL and Toxicity Characteristic Leaching Procedure, or TCLP delineation. The results confirmed the need to treat the soil as RCRA characteristic hazardous waste.
- Soil pile 5, located in the former production area (SP5), was set up as a staging area for soil and debris containing ≤ 150 mg/kg total uranium. Four contaminants of concern were selected to characterize soil pile 5 for WAC attainment: total

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uranium, technetium-99, bis (2-chloroisopropyl) ether, and 4-nitroaniline. OFFO and DOE split samples using a Geoprobe® at random depth intervals in the pile. Sample results verify total uranium and technitium-99 concentrations were below WAC.

- During 1998, OFFO conducted three independent inspections and sampling

events from trucks hauling excavated materials from the southern waste units to the OSDF (SWU-WAC). Once in the southern waste units, a randomly



Above, a truckload of soil from the southern waste units is stopped by Ohio EPA en route to the OSDF. Selected soil is dumped onto staging area for sampling. Soil was staged here until 24-hour lab analysis was complete.

Right, Ohio EPA remedial action coordinator samples soil for uranium WAC certification.



selected truck was dumped, sampled, and the load remained staged until the analysis was completed. OFFO's contract lab agreed to provide 24-hour turn-around time for the analysis of these types of samples. All three analyses were within WAC limit and the truckloads were taken to the OSDF for disposal.

Ohio EPA will continue to work with DOE and Fluor Daniel Fernald in 1999 to monitor site soil conditions and evaluate WAC characterization prior to disposal in the OSDF.

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3.5 BIOTA

Fish Tissue

With more than ten years of monitoring fish and not detecting any site related increases in total uranium, DOE/Fluor Daniel Fernald has discontinued monitoring fish in the Great Miami River. Ohio EPA sampled fish in the Great Miami River during 1998 as part of its monitoring program. Following the guidance of the “Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance,” (DOE January, 1991) Ohio EPA will sample fish periodically (at least once every five years) to confirm low levels.

In 1998, Ohio EPA sampled fish from three locations. The upstream background station is separated from the site by two dams (GM38.5). Ohio EPA also sampled stations at the effluent pipe (GM24.6) and the confluence with Paddy’s Run (GM20.29), consistent with historical sampling conducted by DOE/Fluor Daniel Fernald. Refer to Appendix A for the location of the fish samples.



Fish collection on the Great Miami River.

Sampling took place on September 15, near the end of the fish growing season. Fish feed actively through the summer months and much less during the winter. Autumn sampling allows measurement of the maximum contaminant uptake of the fish.

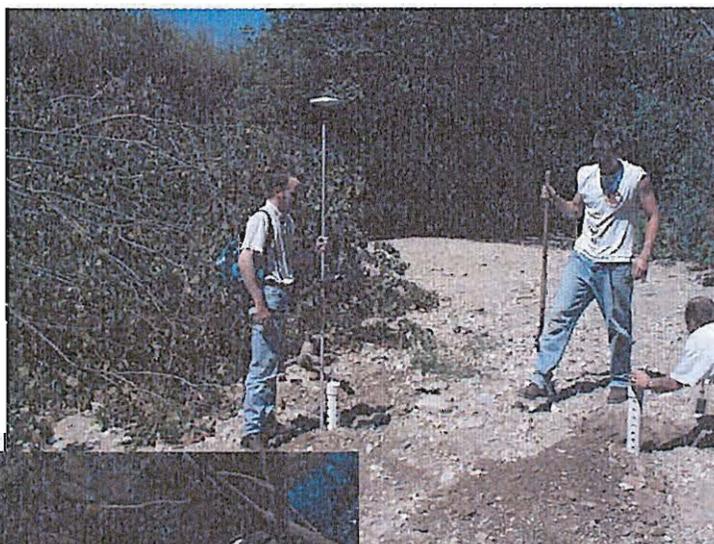
Common carp, were filleted and the fillets analyzed for total uranium. The results are summarized in Appendix F. The results from 1998 are in agreement with what has been seen historically both upstream and downstream from the site. The average total uranium content of fish in the family of the common carp (Cyprinidae) has been

0.013 pCi/g upstream of the site and 0.014 pCi/g downstream of the site (from the 1992-1995 Site Environmental Reports).

Hyporheic Organisms

It has been difficult to assess any impacts on the aquatic biota in Paddys Run because the stream changes from a permanent stream coming onto the site and to an intermittent stream leaving the site. This is caused by the streambed cutting through the glacial till and connecting to the ground water as it travels through the site. In an attempt to assess impacts to aquatic organisms, Ohio EPA initiated a study of hyporheic organisms in 1998. These are organisms that live in the zone between the bottom of the stream and the ground water.

Twenty-five samplers were set out on August 26, 1998. These were set five to a location, across the stream. Three locations were on-site in



Above, the samplers were divided into three equal chambers. They were placed in the substrate so that the top chamber would be in the water column. Sample locations were recorded using GPS. Left, each of the chambers was emptied into a separate container and preserved with formalin for future analysis.

Paddys Run, and two were off-site in Dry Run. The samplers were retrieved on December 8, 1998 and the contents are currently being analyzed for organisms. Further information will be available in the 1999 report.

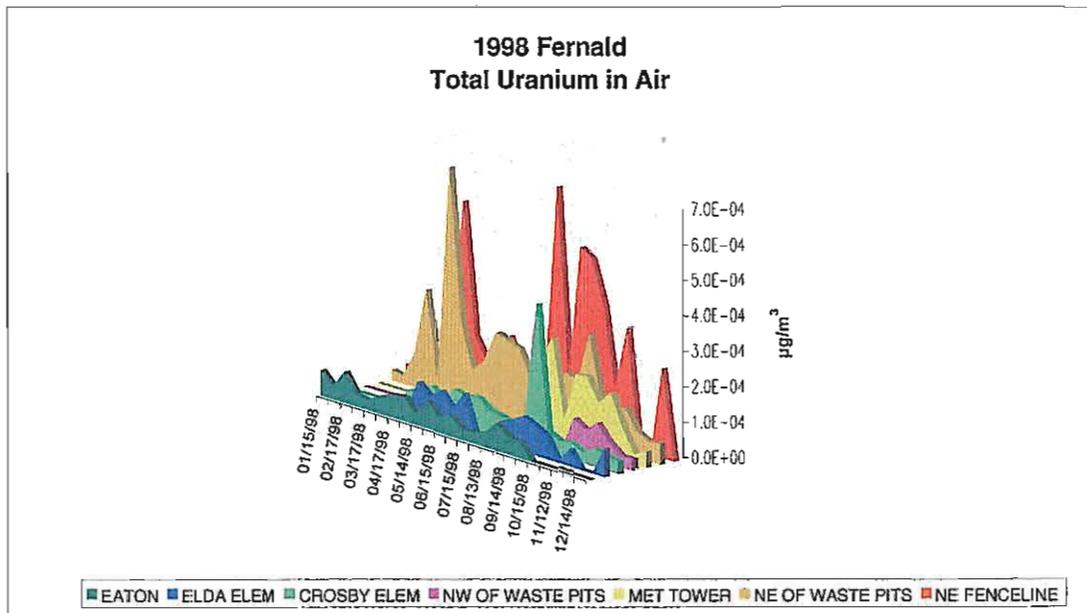
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3.6 AIR

Ohio EPA conducts air monitoring and surveillance at Fernald. Ohio EPA operated seven high volume air samplers for the collection of particulate samples and three radon monitors for the continuous monitoring of radon-222 gas. The objectives of Ohio EPA air sampling are to verify the effectiveness of the DOE environmental air monitoring network and to measure environmental impacts from remediation.

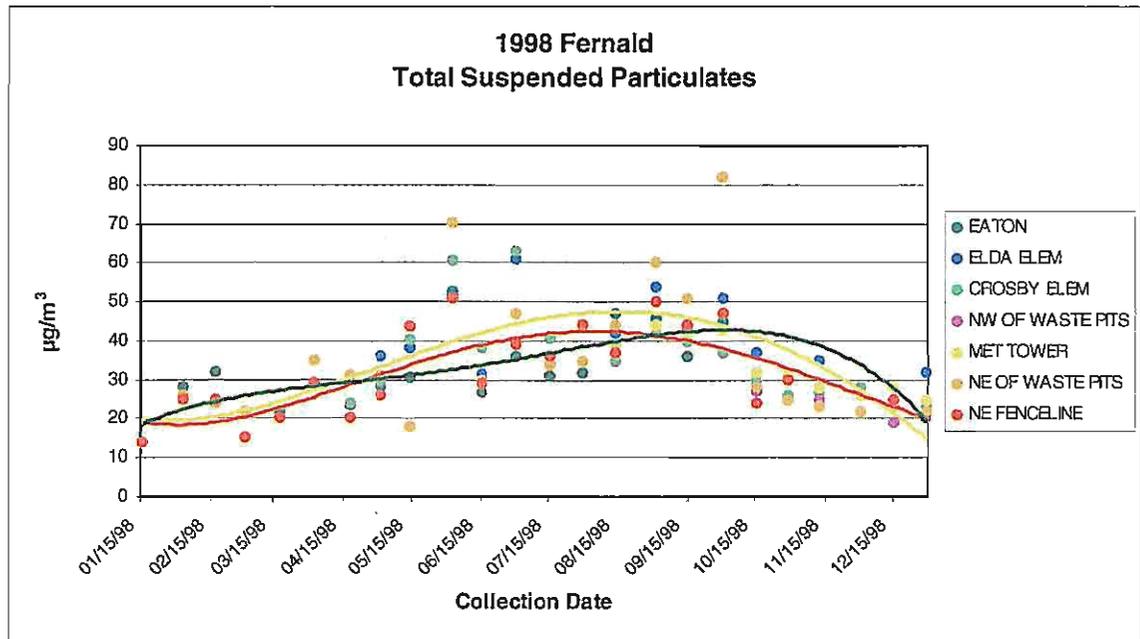
High Volume Air Sampling

Ohio EPA conducts high volume air sampling to determine concentrations of selected particulate contaminants present in the air from Fernald activities. These samplers are strategically located to measure total uranium, total suspended particulates (TSP), and other target radionuclides present in the air. Four air samplers are located on-site, two are located at nearby schools, and one background sampler was located 28 miles north in Eaton. These locations were chosen based on the potential impacts from specific activities, prevailing wind direction, availability of utilities, locations of public interest, and points where maximum concentrations may be measured. The locations are shown on the maps in Appendix A. The following figures display the total uranium and TSP concentrations measured at Ohio EPA air sampling locations for Fernald. The data can be found in Appendix G.



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Ohio EPA compares on-site location total uranium concentrations with both off-site location concentrations and the concentrations listed in National Emission Standard for Hazardous Air Pollutants (NESHAP) for radionuclides. The on-site concentrations were greater than the off-site concentrations, and all concentrations were less than the NESHAP concentrations.



The curved lines have been added to demonstrate the cyclic trend of TSP concentrations. TSP concentrations tend to increase during the summer months with dryer weather and increased remediation activity and decrease through the winter months when the rainfall has increased and remediation activity has decreased.

The following projects are monitored with Ohio EPA's high volume air samplers:

Waste Pit Remedial Action Project: Ohio EPA has high volume air samplers located northeast and northwest of the waste pits, (FNAPS01 and FNAPS04 respectively). The northeast waste pit sampler has been operational since July 1996, while the northwest waste pit sampler became operational at the end of September 1998. Total uranium and TSP samples are collected from each of these locations biweekly. Beginning in September 1998, a monthly sample was analyzed for

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isotopes of thorium and radium-226 to collect “baseline” data at these locations prior to full-scale operations of the waste pits remediation project.

The 1998 average total uranium concentration measured at the northeast waste pit location was approximately 10% less than the 1997 average concentration. The average total uranium concentration measured northwest of the waste pits, from September through December, was nearly identical to background concentrations measured during the same time period. These results reflect the limited remediation activities in the area during 1998.

The northeast waste pit location 1998 average TSP concentration was the same as the 1997 concentration. Both waste pit samplers measured TSP concentrations within a few percentage points of the background location in 1998. Again, these results can be attributed to the limited activities in the area.

On-Site Disposal Facility: The location of FNAPS02 is on Fernald’s east fence line slightly north of the OSDF. Samples have been collected from this location since August 1996. Total uranium and total suspended particulate samples are collected from this location biweekly.

The 1998 average total uranium concentration was approximately 60% greater than the 1997 average and three to four times greater than the concentrations measured off-site. These increases were expected during construction and subsequent placement of waste in the OSDF. The measured concentrations remain well below the NESHAP standard.

The 1998 average TSP concentration was actually lower than in 1997, and was either less than or identical to the concentrations measured off-site. The difference in these values may be due to Fernald’s efforts to control fugitive dust.

Southern Waste Units: FNAPS03A, is north-northeast of the southern waste units

near the site Meteorological Tower. Samples have been collected from this location since the end of July 1998. Total uranium and total suspended particulate samples are collected from this location biweekly.

The 1998 average total uranium concentration was approximately one and one half times higher than background, but remained well below the NESHAPs standards. These higher than background concentrations may be due to the extensive activities in the southern waste units during 1998 and the fact that the monitoring location is near the center of the site.

The average 1998 TSP measurements are nearly identical to those measured off-site and at background. Again, these measurements may be due to Fernald's efforts in controlling fugitive emissions.

Off-Site Locations: The air sampler located at Crosby Elementary school, AMS11, which is 2.3 miles west-southwest of Fernald became operational in March 1998. The sampler located at Elda Elementary School in Ross, AMS13, which is 2.4 miles east-northeast of Fernald, became operational in May. DOE formerly operated both locations. The background sampler, located near the City of Eaton, 28 miles north of Fernald, OHAPSBK, has been Ohio EPA's background location since June 1996. High volume sampling at this location was ceased in October 1998. The Crosby Elementary sampler was successfully evaluated for its appropriateness as a background monitoring location. Total uranium and total suspended particulate samples are collected from each of these locations biweekly. A monthly sample from Crosby Elementary is analyzed for isotopic thorium and radium-226. The results from these three locations are consistent and are considered indicative of background concentrations.

Radon Sampling

Ohio EPA collects continuous, or "real-time," hourly measurements of radon-222 concentrations in ambient air. The three locations are:

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- FNRDN01, located west of the silos along Paddys Run Road
- FNRDN02, located east of the silos along the border of OU4 and the former production area
- OHRDNBK (background), located 28 miles north in the City of Eaton

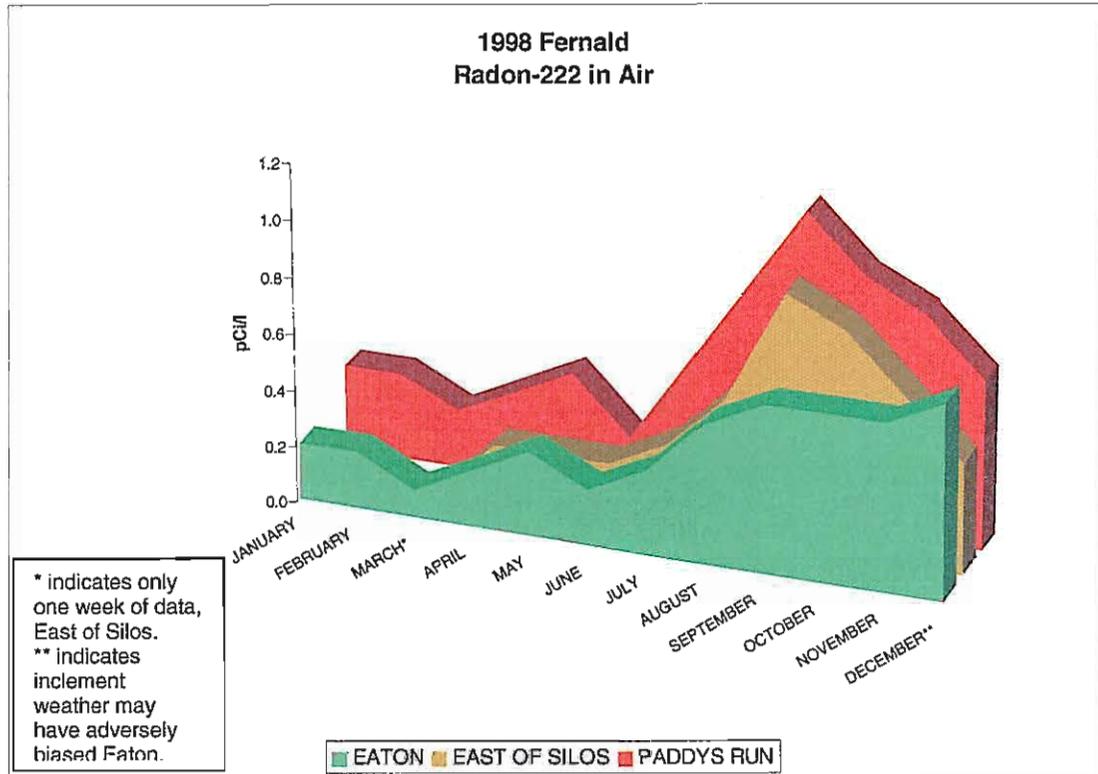
The most recent hourly data can be viewed on the OFFO web site at <http://offo2.epa.state.oh.us/FERNALD/EnvMon/radon.shtml>. The locations of these stations are illustrated on the maps in Appendix A.

The primary source of radon at Fernald is the K-65 silos. These silos contain high concentrations of radium bearing wastes from former production activities. The radium in the silos decays to radon-222, which is continuously released into the air. There are also less significant sources of radon at Fernald, including the waste pits and silo 3. Ohio EPA uses continuous radon monitors to measure the concentrations. The locations were chosen primarily for their proximity to the K-65 silos, and to provide a method for verifying the effectiveness of DOE's radon monitoring network.

The radon monitoring results for the three radon monitoring locations are shown in Appendix G Table 3. The data indicates that average monthly radon concentrations from the monitors located east of the silos and the location along Paddys Run Road are typically less than 1 pCi/l, and are well below the DOE Order 5400.5 limit of 3.0 pCi/l annual average at the facility fence line.

Ohio EPA has compared the results from the locations east and west of the silos to the results from the background location, OHRDNBK. A statistical analysis of 1998 data as a whole indicates no statistical difference between the Paddys Run Road location and background. However, third quarter data indicated an increasing trend at the fence line location. This increase in radon concentration will be watched carefully in 1999. The average monthly radon concentrations are illustrated in the figure below.

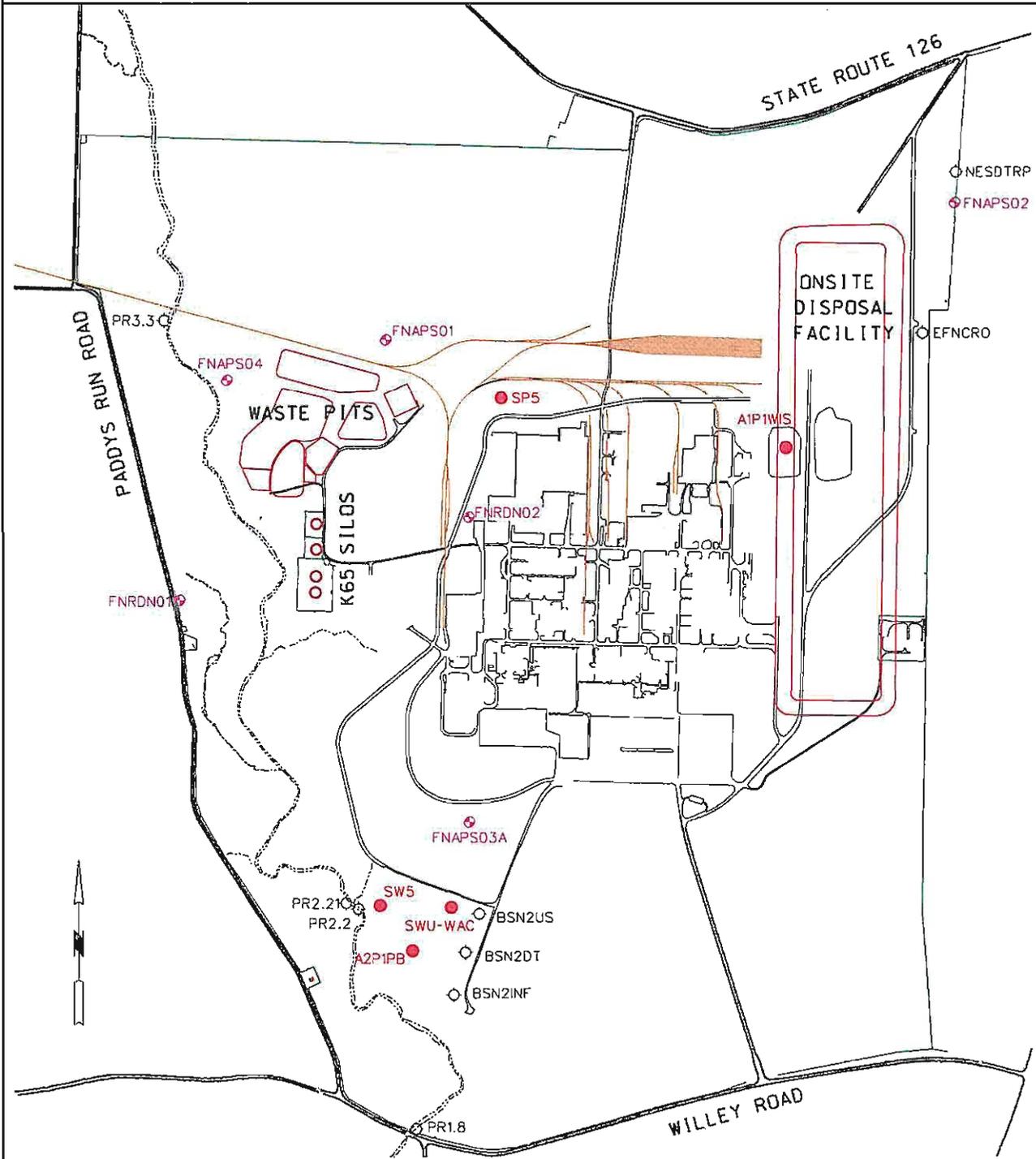
ENVIRONMENTAL MONITORING



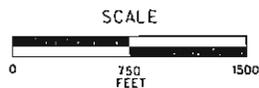
Although the background concentrations measured by Ohio EPA are within the ranges expected for ambient environmental radon, they may not be typical for the Hamilton County/Butler County area. Ohio EPA will evaluate data from a location nearer to Fernald and will likely change the background location in 1999.

APPENDICES

1998 OHIO EPA ON-SITE SAMPLING LOCATIONS



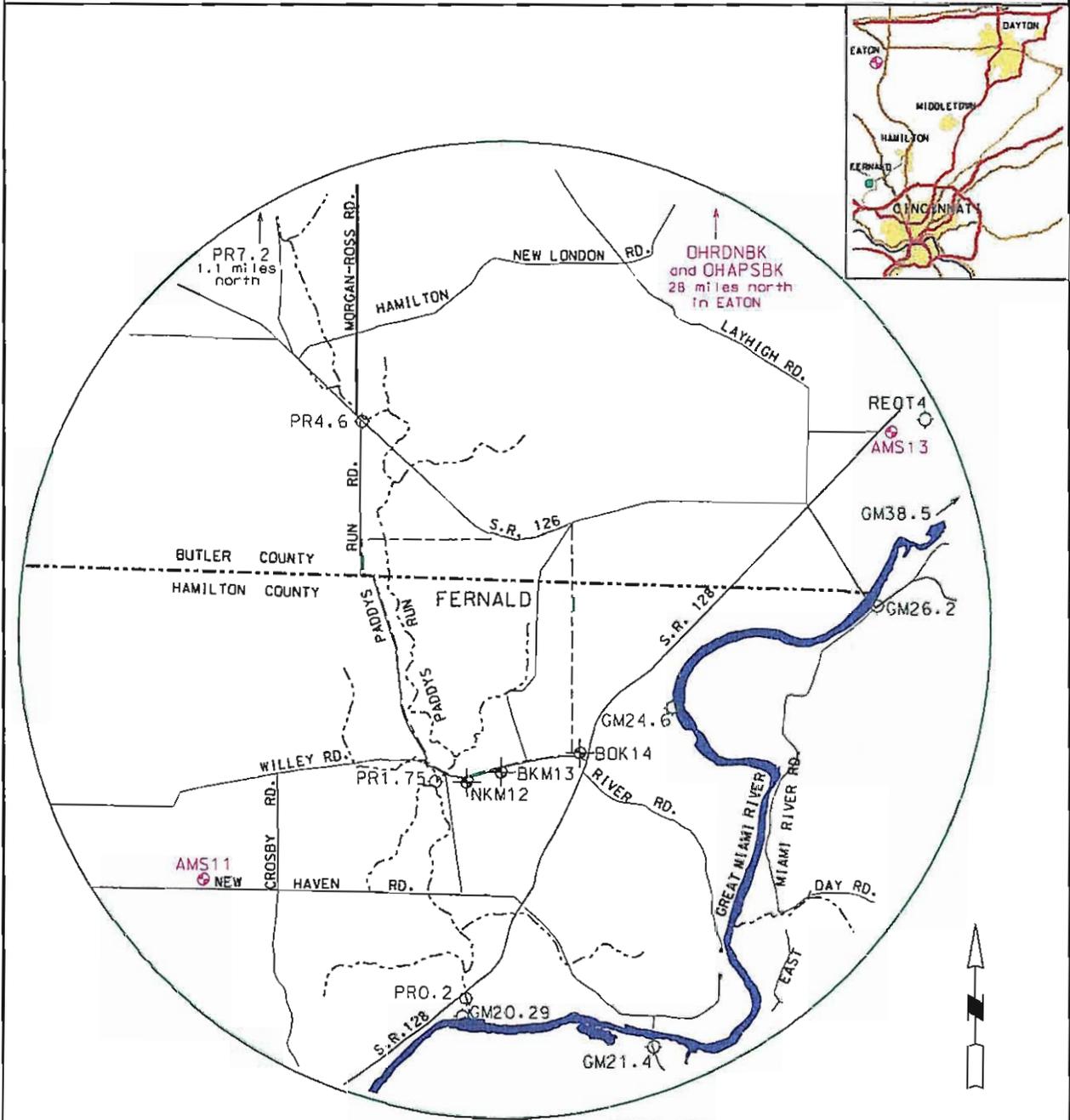
PROJECTION: STATE PLANE
 ZONE: OHIO SOUTH
 UNITS: FEET
 DATUM: NAD 27
 Q:/FEMP/98RPT/FINAL/ANNLRPT98.DGN



LEGEND	
	FERNALD FENCELINE
	PADDYS RUN AND TRIBUTARIES
	RAILROAD
	SURFACE WATER/SEDIMENT LOCATION
	AIR LOCATION
	SOIL LOCATION

OhioEPA
 OFFICE OF FEDERAL FACILITIES OVERSIGHT

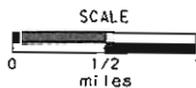
1998 OHIO EPA OFF-SITE SAMPLING LOCATIONS



PROJECTION: STATE PLANE
 ZONE: OHIO SOUTH
 UNITS: FEET
 DATUM: NAD 21
 D:\EMP\98RPT\FINAL\LANDUSE98.DGN



OFFICE OF FEDERAL FACILITIES OVERSIGHT



LEGEND	
---	COUNTY LINE
- - -	FERNALD PROPERTY BOUNDARY
⊕	PRIVATE WELL
○	SURFACE WATER/FISH/SEDIMENT
⊗	AIR MONITOR

TABLE 1

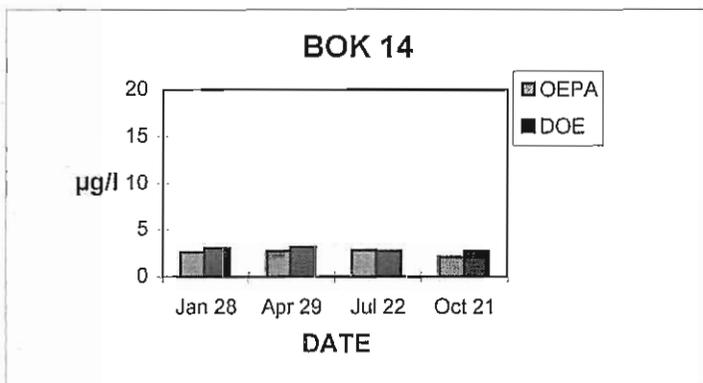
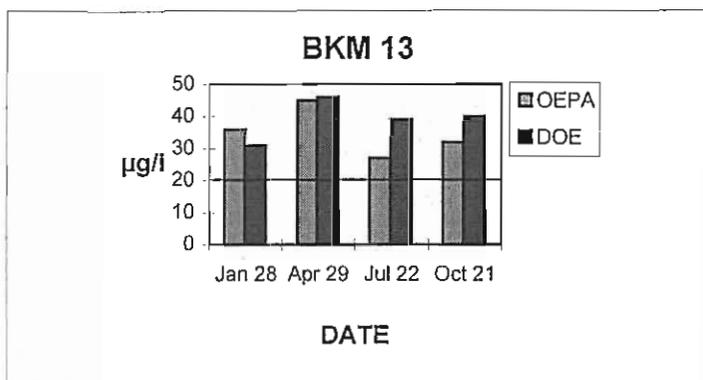
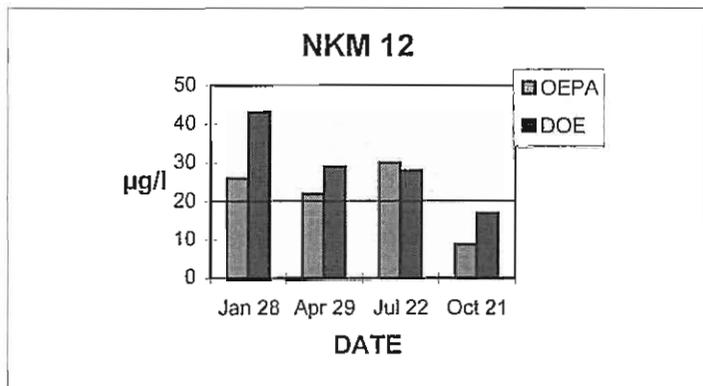
PRIVATE WELLS			
LOCATION CODE	COLLECT DATE 1998	OEPA TOTAL U $\mu\text{g/l}$	DOE TOTAL U $\mu\text{g/l}$
NKM12	Jan 28	26	43
NKM12	Apr 29	22	29
NKM12	Jul 22	30	28
NKM12	Oct 21	8.8	17
BKM13	Jan 28	36	31
BKM13	Apr 29	45	46
BKM13	Jul 22	27	39
BKM13	Oct 21	32	40
BOK14	Jan 28	2.6	3
BOK14	Apr 29	2.7	3.1
BOK14	Jul 22	2.8	2.7
BOK14	Oct 21	2.1	2.7
REQT4	Jul 22	1	NS

Note:

$\mu\text{g/l}$ = micrograms per liter

NS = not sampled

Total Uranium Final Remediation Level = 20 $\mu\text{g/l}$
for ground water



APPENDIX C

TABLE 1

SURFACE WATER							
LOCATION CODE	LOCATION DESCRIPTION	COLLECT DATE	TOTAL U µg/l	Ra-226 pCi/l	Ra-226 +/- error	Ra-228 pCi/l	Ra-228 +/- error
PR0.2	Paddys Run/Mile 0.2	Feb 23	2.2	0.072	0.033	2.3	0.64
PR0.2	Paddys Run/Mile 0.2	Apr 7	3.2	0.19	0.039	4.2	0.93
PR0.2	Paddys Run/Mile 0.2	May 18	3.8	<0.12	NA	2.3	0.97
PR0.2	Paddys Run/Mile 0.2	Jul 15	2.4	<0.055	NA	3.2	0.84
PR0.2	Paddys Run/Mile 0.2	Aug 24	3	0.15	0.048	1.4	0.82
PR1.75	Paddys Run/Mile 1.75	May 29	1.6	<0.065	NA	3.3	1.3
PR1.8	Paddys Run/Willey Bridge	Feb 23	2	0.12	0.033	3.8	0.86
PR1.8	Paddys Run/Willey Bridge	Jun 12	1.9	<0.038	NA	1.4	0.84
PR2.2	Paddys Run/Mile 2.2	Aug 24	22	<1.7	NA	3	1.3
PR3.3	Paddys Run/RR Bridge	Feb 23	1.4	0.1	0.031	3.3	0.77
PR3.3	Paddys Run/RR Bridge	Apr 7	1.3	0.22	0.042	3.7	0.92
PR3.3	Paddys Run/RR Bridge	May 18	0.6	0.062	0.11	NS	NA
PR3.3	Paddys Run/RR Bridge	Jul 15	0.67	0.013	0.042	1.9	0.68
PR3.3	Paddys Run/RR Bridge	Aug 24	0.93	<0.089	NA	2.9	1
PR3.3	Paddys Run/RR Bridge	Oct 19	9.3	0.19	0.049	5.4	2.3
PR3.3	Paddys Run/RR Bridge	Dec 21	150 *	0.034	0.031	0.8	0.69
PR7.2	Paddys Run/Mile 7.2	Feb 23	0.98	0.042	0.027	4.9	1
PR7.2	Paddys Run/Mile 7.2	Apr 7	1.1	0.09	0.027	3.4	0.87
PR7.2	Paddys Run/Mile 7.2	May 18	0.9	<0.1	NA	<3.9	NA
PR7.2	Paddys Run/Mile 7.2	Jul 15	0.31	0.11	0.034	2.1	0.69
PR7.2	Paddys Run/Mile 7.2	Aug 24	0.33	<0.081	NA	2.6	0.94
PR7.2	Paddys Run/Mile 7.2	Oct 19	0.78	0.24	0.062	2.7	1.1
PR7.2	Paddys Run/Mile 7.2	Dec 21	0.64	0.052	0.027	1.3	0.75
GM21.4	New Baltimore Bridge	Feb 23	1.8	0.27	0.051	1.6	0.55
GM21.4	New Baltimore Bridge	Apr 7	1.9	0.19	0.041	3.5	0.88
GM21.4	New Baltimore Bridge	May 18	1.8	<0.13	NA	<0.13	NA
GM21.4	New Baltimore Bridge	Jul 15	1.2	0.25	0.053	2.4	0.75
GM21.4	New Baltimore Bridge	Aug 24	1.2	0.16	0.049	4.1	1.1
GM21.4	New Baltimore Bridge	Oct 19	1.6	0.43	0.079	4.6	1.4
GM21.4	New Baltimore Bridge	Dec 21	2.7	0.14	0.045	1.7	0.91
GM24.6	Down Stream FEMP Effluent	Feb 23	1.7	0.16	0.038	1.1	0.55
GM24.6	Down Stream FEMP Effluent	Apr 7	2	0.2	0.049	3.2	0.81
GM24.6	Down Stream FEMP Effluent	May 18	1.9	0.22	0.11	<1.5	NA
GM24.6	Down Stream FEMP Effluent	Jul 15	1.4	0.22	0.057	1.5	0.63
GM24.6	Down Stream FEMP Effluent	Aug 24	1.5	0.16	0.064	2.9	0.98
GM24.6	Down Stream FEMP Effluent	Oct 19	1.6	0.37	0.087	4	1.3
GM24.6	Down Stream FEMP Effluent	Dec 21	2.4	0.22	0.044	0.87	0.81
GM26.2	Venice Bridge - background	Feb 23	2	0.16	0.047	3.1	0.84
GM26.2	Venice Bridge - background	Apr 7	1.9	0.12	0.045	2.9	0.77
GM26.2	Venice Bridge - background	May 18	1.8	0.16	0.081	<1.5	NA
GM26.2	Venice Bridge - background	Jul 15	1.3	0.22	0.058	1.7	0.71
GM26.2	Venice Bridge - background	Aug 24	1.3	0.065	0.053	4	1.1
GM26.2	Venice Bridge - background	Oct 19	1.5	0.45	0.1	4.6	1.3
GM26.2	Venice Bridge - background	Dec 21	1.6	0.24	0.06	0.43	0.76

Note:

µg/l = micrograms per liter

pCi/l = picocuries per liter

* requested reanalysis but insufficient sample remained

NA = not applicable

Total Uranium Final Remediation Level = 530 µg/l for surface water

Ra-226 Final Remediation Level = 38 pCi/l for surface water

Ra-228 Final Remediation Level = 47 pCi/l for surface water

Uncertainty is equal to the total error at 2 sigma (95%) confidence level.

TABLE 2

SURFACE WATER							
LOCATION CODE	LOCATION DESCRIPTION	COLLECT DATE 1998	OEPA TOTAL U $\mu\text{g/l}$	DOE TOTAL U $\mu\text{g/l}$	OEPA Tc-99 pCi/l	OEPA Tc-99 /- error	DOE Tc-99 pCi/l
BSN2US	Basin 2 upstream	Jan 13	25	29	11	7.3	ND
BSN2INF	Basin 2 influent	Jan 13	190	162	1.7	6.1	ND
BSN2DT	Basin 2 drainage tile	Jan 13	180	155	3.6	6.3	ND
NESDTRP	NE sediment trap	Jan 22	11	NS	NS	NA	NS
EFNCRO	East fence run on	Jan 22	2	NS	NS	NA	NS

Note:

$\mu\text{g/l}$ = micrograms per liter

pCi/l = picocuries per liter

ND = not detected above the minimum detectable activity

NS = not sampled or sample not analyzed for parameter

NA = not applicable

Total Uranium Final Remediation Level = 530 $\mu\text{g/l}$ for surface water

Technetium-99 Final Remediation Level = 150 pCi/l for surface water

Uncertainty is equal to the total error at 2 sigma (95%) confidence level.

TABLE 3

SURFACE WATER			
LOCATION CODE	LOCATION DESCRIPTION	COLLECT DATE 1998	OEPA TPH mg/l
PR1.75	Paddys Run mile 1.75	May 29	<1.1

Note:

TPH = Total Petroleum Hydrocarbons

mg/l = milligrams per liter

APPENDIX D

TABLE 1

SEDIMENT							
LOCATION CODE	COLLECT DATE 1998	OEPA TOTAL U $\mu\text{g/g}$	DOE TOTAL U $\mu\text{g/g}$	OEPA Ra-226 pCi/g	OEPA Ra-226 +/- error	OEPA Ra-228 pCi/g	OEPA Ra-228 +/- error
PR0.2	Jul 15	2.4	NS	0.77	0.19	0.88	0.31
PR1.8	Jul 15	2.7	NS	0.52	0.14	0.35	0.17
PR2.2	Aug 24	0.8	NS	0.38	0.064	0.39	0.094
PR2.21	Aug 24	1.6	NS	0.53	0.07	0.29	0.077
PR3.3	Jul 15	0.85	NS	0.4	0.1	0.56	0.21
PR4.6	Jul 15	0.76	NS	0.5	0.14	0.41	0.25
GM20.29	Jul 1	1.5	0.676	0.34	0.055	0.31	0.084
GM24.6	Jul 15	21	NS	0.63	0.14	0.44	0.25
GM26.2	Jul 15	0.92	NS	0.53	0.1	0.55	0.23

LOCATION CODE	COLLECT DATE 1998	OEPA Th-228 pCi/g	OEPA Th-228 +/- error	OEPA Th-230 pCi/g	OEPA Th-230 +/- error	OEPA Th-232 pCi/g	OEPA Th-232 +/- error
PR0.2	Jul 15	0.77	0.11	1.6	0.19	0.8	0.11
PR1.8	Jul 15	0.37	0.064	0.78	0.1	0.32	0.052
PR2.2	Aug 24	1	0.22	0.85	0.17	0.9	0.17
PR2.21	Aug 24	0.36	0.24	0.68	0.18	0.4	0.13
PR3.3	Jul 15	0.45	0.072	0.71	0.094	0.47	0.068
PR4.6	Jul 15	0.59	0.1	0.82	0.12	0.55	0.09
GM20.29	Jul 1	0.64	0.094	1.1	0.15	0.59	0.085
GM24.6	Jul 15	0.65	0.11	1.4	0.18	0.71	0.11
GM26.2	Jul 15	0.63	0.17	0.89	0.17	0.67	0.14

Note:

$\mu\text{g/g}$ = micrograms per gram

pCi/g = picocuries per gram

NS = no sample or sample not analyzed for parameter

Total Uranium Final Remediation Level = 210 $\mu\text{g/g}$ for sediment

Uncertainty is equal to the total error at 2 sigma (95%) confidence level.

TABLE 1

SOIL - WEST STOCK PILE				
LOCATION CODE	COLLECT DATE 1998	OEPA Total U mg/kg	OEPA Tc-99 pCi/g	OEPA Tc-99 +/- error
A1P1WIS-8-2-R	Mar 19	28	0.57	0.17
A1P1WIS-8-4-R	Mar 19	21	0.41	0.16
A1P1WIS-11-2-R	Mar 19	21	0.59	0.18
A1P1WIS-11-4-R	Mar 19	31	0.63	0.17
A1P1WIS-14-1-R	Mar 23	24	0.48	0.15
A1P1WIS-14-3-R	Mar 23	28	0.32	0.15
A1P1WIS-28-1-R	Mar 19	30	0.59	0.19
A1P1WIS-29-1-R	Mar 19	20	0.41	0.16
A1P1WIS-20-3-R	Mar 23	19	0.39	0.16
A1P1WIS-20-4-R	Mar 23	21	0.44	0.16

Note:

mg/kg = milligrams per kilogram

pCi/g = picocuries per gram

Total Uranium Waste Acceptance Criteria = 1030 mg/kg for on-site soil

Technetium-99 Waste Acceptance Criteria = 30 pCi/g for on-site soil

Uncertainty is equal to the total error at 2 sigma (95%) confidence level.

TABLE 2

SOIL - INACTIVE FLYASH PILE				
LOCATION CODE	COLLECT DATE 1998	OEPA TOTAL U mg/kg (dry)	OEPA Tc-99 pCi/g (dry)	OEPA Tc-99 +/- error
SW5-41-24R	Apr 15	1900	4.1	0.58
SW5-42-33R	Apr 15	16000	7	0.94
SW5-43-37R	Apr 14	9300	0.3	0.17
SW5-43-38R	Apr 14	15000	0.48	0.23
SW5-43A-33R	Apr 14	31	0.42	0.22
SW5-44-20R	Apr 13	24	0.6	0.21
SW5-44-7R	Apr 13	2000	1.2	0.26

Note:

mg/kg = milligrams per kilogram

pCi/g = picocuries per gram

Total Uranium Final Remediation Level = 82 mg/kg for on-site soil

Technetium-99 Final Remediation Level = 30 pCi/g for on-site soil

Uncertainty is equal to the total error at 2 sigma (95%) confidence level.

APPENDIX E

TABLE 3

SOIL - FIRING RANGE			
LOCATION CODE	COLLECT DATE 1998	TOTAL LEAD mg/kg	LEAD TCLP µg/l
A2P1PB-25-3	Apr 20	13.1	<27.9
A2P1PB-26-3	Apr 20	17.1	77.1
A2P1PB-27-3	Apr 15	267	<27.9
A2P1PB-28-2	Apr 20	432	458
A2P1PB-29-2	Apr 20	2690	687
A2P1PB-30-4	Apr 20	18.2	131

Note:

mg/kg = milligrams per kilogram

µg/l = microgram per liter

Final Remediation Level for lead = 400 mg/kg

Toxicity Characteristic Leaching Procedure standard for lead = 5000 µg/l

TABLE 4

SOIL PILE 5						
LOCATION CODE	COLLECT DATE 1998	OEPA TOTAL U mg/kg	DOE TOTAL U mg/kg	OEPA Tc-99 pCi/g	OEPA Tc-99 +/- error	DOE Tc-99 pCi/g
SP5-11-3-R-Y	Apr 23	33	26	0.74	0.18	3.4
SP5-16-2-R-Y	Apr 27	58	38	4.7	0.64	6.5
SP5-16-3-R-Y	Apr 27	55	40	0.57	0.17	0.93
SP5-11H-4-R-Y	Apr 27	76	NS	0.96	0.21	NS
SP5-1-1-R-Y	Apr 27	150	82	0.65	0.18	1.1

Note:

mg/kg = milligrams per kilogram

pCi/g = picocuries per gram

NS = no sample or sample not analyzed for parameter

Total Uranium Final Remediation Level = 82 mg/kg for on-site soil

Technetium-99 Final Remediation Level = 30 pCi/g for on-site soil

Uncertainty is equal to the total error at 2 sigma (95%) confidence level.

TABLE 5

SOIL - SOUTHERN WASTE UNITS		
LOCATION CODE	COLLECT DATE 1998	OEPA U-238 pCi/g
SWU-WAC-01	Jul 29	7.7
SWU-WAC-02	Jul 29	2.6
SWU-WAC-03	Aug 18	50
SWU-WAC-04	Aug 18	8.2
SWU-WAC-05	Oct 27	4.4
SWU-WAC-06	Oct 27	4

Note:

pCi/g = picocuries per gram

TABLE 1

FISH			
LOCATION CODE	COLLECT DATE 1998	TOTAL U (WET) $\mu\text{g/g}$	TOTAL U (DRY) $\mu\text{g/g}$
GM38.5	Sep 15	0.00061	0.00223
GM24.6	Sep 15	0.00036	0.00121
GM20.29	Sep 15	0.00054	0.00211

Note:

$\mu\text{g/g}$ = micrograms per gram

APPENDIX G

TABLE 1

AIR - TOTAL URANIUM								
START DATE	STOP DATE	FNAPS01 $\mu\text{g}/\text{m}^3$	FNAPS02 $\mu\text{g}/\text{m}^3$	FNAPS03A $\mu\text{g}/\text{m}^3$	FNAPS04 $\mu\text{g}/\text{m}^3$	AMS11 $\mu\text{g}/\text{m}^3$	AMS13 $\mu\text{g}/\text{m}^3$	OHAPSBK $\mu\text{g}/\text{m}^3$
12/30/97	01/15/98	2.9E-05	3.5E-05	NS	NS	NS	NS	7.1E-05
01/15/98	02/02/98	2.0E-05	1.4E-05	NS	NS	NS	NS	3.5E-05
02/02/98	02/17/98	9.7E-05	6.6E-05	NS	NS	NS	NS	8.6E-05
02/17/98	03/02/98	2.9E-04	5.1E-05	NS	NS	NS	NS	3.2E-05
03/02/98	03/17/98	3.5E-05	1.2E-04	NS	NS	NS	NS	2.8E-05
03/17/98	04/01/98	6.5E-04	5.5E-04	NS	NS	5.0E-05	NS	5.0E-05
04/01/98	04/17/98	2.3E-04	1.8E-04	NS	NS	5.9E-05	NS	6.3E-05
04/17/98	05/01/98	9.9E-05	1.2E-04	NS	NS	8.2E-05	1.0E-04	6.8E-05
05/01/98	05/14/98	1.4E-04	1.3E-04	NS	NS	5.2E-05	6.9E-05	3.2E-05
05/14/98	06/02/98	2.2E-04	2.1E-04	NS	NS	9.2E-05	9.8E-05	7.6E-05
06/02/98	06/15/98	2.1E-04	9.3E-05	NS	NS	8.3E-05	5.4E-05	4.3E-05
06/15/98	06/30/98	2.0E-04	1.8E-04	NS	NS	9.3E-05	1.1E-04	5.9E-05
06/30/98	07/15/98	1.3E-04	1.2E-04	NS	NS	6.6E-05	NS	3.1E-05
07/15/98	07/30/98	8.4E-05	6.7E-04	NS	NS	6.0E-05	NS	3.0E-05
07/30/98	08/13/98	1.4E-04	1.4E-04	2.1E-04	NS	5.1E-05	6.3E-05	4.0E-05
08/13/98	08/31/98	1.8E-04	5.2E-04	2.8E-04	NS	6.0E-05	7.8E-05	7.6E-05
08/31/98	09/14/98	1.6E-04	5.0E-04	6.0E-05	NS	4.1E-04	9.8E-05	4.8E-05
09/14/98	09/30/98	3.0E-04	3.8E-04	2.0E-04	NS	5.7E-05	8.3E-05	4.5E-05
09/30/98	10/15/98	1.3E-04	1.5E-04	2.0E-04	9.6E-05	4.1E-05	6.5E-05	NS
10/15/98	10/29/98	1.0E-04	3.3E-04	1.4E-04	7.4E-05	4.6E-05	NS	NS
10/29/98	11/12/98	1.3E-04	NS	1.8E-04	1.0E-04	2.9E-05	4.7E-05	NS
11/12/98	11/30/98	7.2E-05	NS	9.1E-05	6.0E-05	5.1E-05	NS	NS
11/30/98	12/14/98	5.5E-05	2.5E-04	2.6E-05	3.2E-05	4.1E-05	NS	NS
12/14/98	12/29/98	5.9E-05	NS	4.5E-05	3.2E-05	3.7E-05	7.8E-05	NS

Note:

$\mu\text{g}/\text{m}^3$ = micrograms per cubic meter

NS = not sampled

TABLE 2

AIR - TOTAL SUSPENDED PARTICULATES								
START DATE	STOP DATE	FNAPS01 $\mu\text{g}/\text{m}^3$	FNAPS02 $\mu\text{g}/\text{m}^3$	FNAPS03A $\mu\text{g}/\text{m}^3$	FNAPS04 $\mu\text{g}/\text{m}^3$	AMS11 $\mu\text{g}/\text{m}^3$	AMS13 $\mu\text{g}/\text{m}^3$	OHAPSBK $\mu\text{g}/\text{m}^3$
12/30/97	01/15/98	14	14	NS	NS	NS	NS	14
01/15/98	02/02/98	26	25	NS	NS	NS	NS	28
02/02/98	02/17/98	24	25	NS	NS	NS	NS	32
02/17/98	03/02/98	22	15	NS	NS	NS	NS	22
03/02/98	03/17/98	20	20	NS	NS	NS	NS	22
03/17/98	04/01/98	35	29	NS	NS	29	NS	29
04/01/98	04/17/98	31	20	NS	NS	24	NS	24
04/17/98	05/01/98	31	26	NS	NS	30	36	28
05/01/98	05/14/98	18	44	NS	NS	40	38	31
05/14/98	06/02/98	70	51	NS	NS	60	52	53
06/02/98	06/15/98	30	29	NS	NS	38	32	27
06/15/98	06/30/98	47	39	NS	NS	63	61	36
06/30/98	07/15/98	34	36	NS	NS	41	NS	31
07/15/98	07/30/98	35	44	NS	NS	35	NS	32
07/30/98	08/13/98	44	37	39	NS	35	42	47
08/13/98	08/31/98	60	50	44	NS	42	54	46
08/31/98	09/14/98	51	44	42	NS	40	43	36
09/14/98	09/30/98	82	47	43	NS	37	51	45
09/30/98	10/15/98	28	24	32	27	30	37	NS
10/15/98	10/29/98	25	30	31	25	26	NS	NS
10/29/98	11/12/98	23	NS	28	25	27	35	NS
11/12/98	11/30/98	22	NS	26	22	28	NS	NS
11/30/98	12/14/98	23	25	28	19	23	NS	NS
12/14/98	12/29/98	22	NS	25	20	23	32	NS

Note:

$\mu\text{g}/\text{m}^3$ = micrograms per cubic meter

NS = not sampled

TABLE 3

AIR - THORIUM				
MONTH	LOCATION	Thorium-228	Thorium-230	Thorium-232
1998	CODE	pCi/m ³	pCi/m ³	pCi/m ³
SEP	FNAPS01	3.6E-05	4.1E-05	2.9E-05
SEP	FNAPS04	NS	NS	NS
SEP	AMS11	1.7E-05	3.2E-05	1.5E-05
OCT	FNAPS01	7.3E-06	1.4E-05	7.3E-06
OCT	FNAPS04	-2.3E-06	9.2E-06	5.7E-07
OCT	AMS11	4.8E-06	1.5E-05	1.1E-05
NOV	FNAPS01	2.3E-05	1.1E-05	1.1E-05
NOV	FNAPS04	6.9E-06	7.5E-06	7.8E-06
NOV	AMS11	1.3E-05	1.0E-05	5.8E-06
DEC	FNAPS01	8.9E-06	1.5E-05	4.0E-06
DEC	FNAPS04	4.6E-06	1.1E-05	5.3E-06
DEC	AMS11	7.4E-06	1.1E-05	8.8E-06

Note:
 pCi/m³ = micrograms per cubic meter
 NS = not sampled

TABLE 4

AIR - RADON									
MONTH 1998	FNRDN01			FNRDN02			OHRDNBK		
	pCi/l			pCi/l			pCi/l		
	MONTHLY AVG	DAILY MAX	HOURLY MAX	MONTHLY AVG	DAILY MAX	HOURLY MAX	MONTHLY AVG	DAILY MAX	HOURLY MAX
JAN	0.3	0.8	1.5	NS	NS	NS	0.2	0.6	1.2
FEB	0.3	0.8	1.7	NS	NS	NS	0.2	0.3	0.8
MAR *	0.2	0.4	1.5	0	0.3	1.7	0.1	0.4	1.1
APR	0.3	0.7	1.6	0.2	0.7	1.9	0.2	0.5	1.3
MAY	0.4	0.7	1.7	0.2	0.7	1.7	0.3	0.6	1.6
JUN	0.2	0.6	1.4	0.2	0.5	1.4	0.2	0.4	1.1
JUL	0.5	1.2	2.7	0.3	0.6	2.1	0.3	0.6	1.6
AUG	0.8	1.3	3.4	0.5	1.1	2.6	0.5	0.8	1.8
SEP	1.1	1.7	3.8	0.9	1.4	3	0.6	1	2.5
OCT	0.9	1.8	3.5	0.8	1.6	3.1	0.6	1.5	2.9
NOV	0.8	1.6	3.7	0.6	1.4	3.3	0.6	1.3	2.8
DEC **	0.6	1.5	3.1	0.4	1.9	2.8	0.7	1.8	4

Note:
 pCi/l = picocuries per liter
 NS = not sampled
 * = FNRDN02 was in operation for approximately 1 week
 ** = inclement weather at Eaton

OTHER RESOURCES

DOE Public Environmental
Information Center (PEIC)
Delta Building
10995 Hamilton-Cleves Highway
Harrison, OH 45030
(513) 648-7480

DOE-FN Public Information
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Cincinnati, OH 45253
(513) 648-3153
contact: Gary Stegner, Director

Fluor Daniel Fernald Public Affairs
P.O. Box 538704
Cincinnati, OH 45253
(513) 648-4898
contact: Jeff Wagner, Director

U.S. EPA -- Region V
77 West Jackson Blvd.
Chicago, IL 60604
(312) 886-0992
contact: Jim Saric, Remedial Project
Manager

Fernald Health Effects Subcommittee
NIOSH
5555 Ridge Ave., Mail Stop R44
Cincinnati, OH 45213
(513) 841-4400
contact: Dr. David Pedersen

Fernald Citizens Advisory Board
P.O. Box 544
Ross, OH 45061
(513) 648-6478
contact: Jim Bierer, Chair

Community Reuse Organization
P.O. Box 38
Ross, OH 45061
(513) 648-4168
contact: David McWilliams, Chair

Fernald Residents for Environmental
Safety and Health
P.O. Box 129
Ross, OH 45061-0129
(513) 738-8055 (phone and fax)
contact: Lisa Crawford, President

Fernald Living History Project
Attention: Sharon Stanton
P.O. Box 538704
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Cincinnati, OH 45253-8704
(513) 648-3275
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