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2000



ANNUAL REPORT TO THE PUBLIC

on the **FERNALD**

Environmental Management Project

Prepared by:

OhioEPA

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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CAB	Citizens Advisory Board
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CRG	Cost Recovery Grant
DOE	Department of Energy
FCAB	Fernald Citizens Advisory Board
FRL	Final Remediation Level
IEMP	Integrated Environmental Monitoring Plan
ITRC	Interstate Technology & Regulatory Cooperation Workgroup
NESHAP	National Emission Standard for Hazardous Air Pollutants
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
TSP	Total Suspended Particulates
USEPA	United States Environmental Protection Agency
WAC	Waste Acceptance Criteria
WPRAP	Waste Pit Remedial Action Project



*Aerial of Fernald looking south over the Waste Pits Remedial Action Project.
(Photo courtesy DOE Fernald site photography #7476-437.)*

1.0 INTRODUCTION

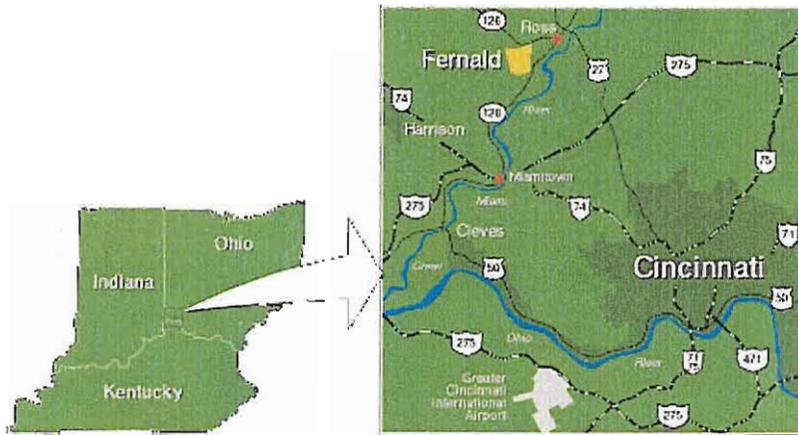
The purpose of this report is to document the State of Ohio's oversight activities at the United States Department of Energy's (DOE) Fernald Environmental Management Project. The report is written by the Ohio Environmental Protection Agency (Ohio EPA) to provide interested parties a single source of information regarding Ohio's regulatory, environmental monitoring, public outreach, and planning activities at Fernald during calendar year 2000.

In 2000, DOE welcomed a new site director, Steve McCracken, formerly of DOE's Weldon Springs Site in Missouri and Fluor Fernald signed a new remediation contract. The following report will highlight remediation and regulatory oversight at Fernald in 2000.

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 DOE Fernald site.

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 made. 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 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 risk assessment 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**.

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

***Estimation of the Impact of the Former Feed Material Production Center (FMPC) on Lung Cancer Mortality in the Surrounding Community*, Centers for Disease Control and Prevention, December 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 the 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 allows Ohio to provide more active oversight through the dedication of staff and resources to the project.

Ohio EPA is the State’s lead agency for implementation of the grant. Ohio Department of Health (ODH) and Ohio Emergency Management Agency (Ohio EMA) provide support in the 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. An important goal of Ohio’s federal facilities program has been enhancing public involvement in decision-making at Fernald.

The following graph represents a profile of the funding provided to the State of Ohio by DOE for oversight at Fernald. Significantly less money was spent during fiscal year 2000 than was provided in the original grants. The dollars saved are the result of efforts by Ohio to efficiently and effectively oversee cleanup efforts at Fernald. Ohio EPA and DOE have established a mechanism to return unexpended funds to DOE for on-going cleanup work.

Significantly less money was spent during fiscal year 2000 than was provided in the original grants.

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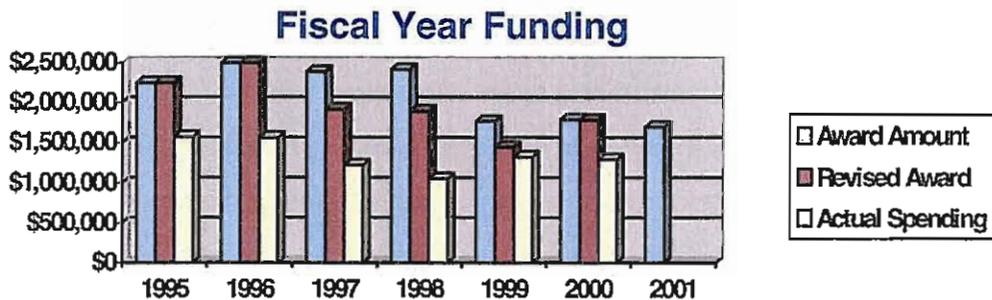


Figure 1 Funding awards and spending since the inception of OFFO.

The distribution of expenditures for fiscal year 2000 is provided in the figure below. Personnel expenditures include salaries, fringes, and indirect costs. Contractual expenditures include medical monitoring, laboratory, and remedial oversight contractor costs. Operating costs, supplies, training, and travel make up the “other” expenditures.

Ohio Spending Categories

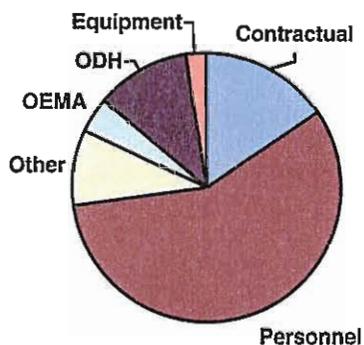


Figure 2 Money is distributed across various program areas.

2.0 ACTIVITIES AND ACCOMPLISHMENTS

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. Ohio continued to work diligently in 2000 to keep up with Fernald's accelerated



cleanup schedule. Major

Ohio EPA brought donor soils from the Spring Valley Wildlife Area to incorporate into an emergent wetland in Area 8 Phase II.

construction activities in the on-site disposal facility (OSDF) and waste pits project continued. Several soils projects were completed this year, including the certification of the old sewage treatment plant and the attainment of the excavation design grade in the southern waste units. Staff from Ohio EPA's Office of Federal Facilities Oversight (OFFO) observed these and other accomplishments as a high volume of field visits improved regulatory oversight. Ohio EPA technical staff reviewed and granted State approval on numerous documents. OFFO staff participated in public meetings that kept the community informed of progress at Fernald. Among the more notable was a series of Future of Fernald public workshops that included an online component to broaden the definition of "public." Ohio continued to work with DOE on several national level issues and to maintain emergency planning operations. Ohio's activities and accomplishments for 2000 are further explained in the following sections.

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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 270 technical documents were reviewed in 2000. Most of these documents related directly to the 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 remediation projects. During the year Ohio EPA conducted approximately 121 site visits/inspections. The inspections focused on OSDF waste placement and enhanced permanent leachate transmission system construction, storm water management, fugitive dust control, southern waste unit excavation, waste pit operations, Advanced Waste Retrieval construction, and other on-site activities.

Large-scale remediation continued in 2000. Waste placement occurred in all three cells of the on-site disposal facility, with cell 1 reaching design height. The treatment facility for the remediation of the waste pits was operational, and waste loading operations and shipping continued throughout the year.

Waste Pits Remedial Action Project (formerly OUI): 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

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waste pits are either in close proximity to, or in contact with, the Great Miami Aquifer and are contributing to ground water contamination.

Waste pit excavations continued throughout the year with thermal drying operations, including water and off-gas treatment. Approximately 30 percent of the contents of pits 1 and 3 were excavated. During 2000, a total of 15 unit trains, containing 98,000 tons of waste, went to Envirocare.

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) is treated to meet the criteria or disposed off-

site. No off-site waste is allowed in the OSDF. The OSDF operated using the interim leachate line in 2000 while design and construction of



the enhanced permanent

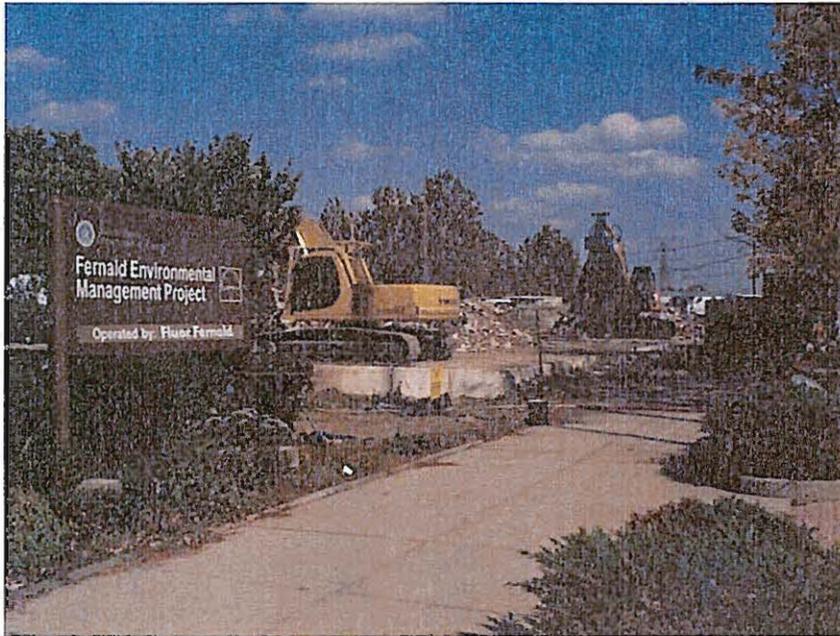
The enhanced permanent leachate transmission system involves removing the former leachate line manholes and replacing them with permanent valve houses.

leachate transmission system began. Over 120,000 cubic yards of soil and debris were placed in cells 1, 2, and 3 during the year. After two years of waste placement, design height for cell 1 was reached, and capping activities will occur in 2001.

Facilities Closure and Demolition Project (formerly OU3): All on-site buildings are being decontaminated and dismantled. All waste, except that which exceeds the

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WAC, will be disposed in the OSDF. During 2000, the removal of the Nuclear Fuel Services storage tanks used in the uranyl nitrate hexahydrate, or UNH project was completed. Demolition of Plant 5 (80 percent complete) and Plant 6 (45 percent complete) continued, with the completion of both facilities expected in 2001. Among



the 13 structures that were dismantled in 2000, the former Inspector General/Industrial Relation and Security Buildings were the most notable. They are among

The demolition of the former security building was a visible sign of progress. the first administration buildings to be demolished. Of the more than 250 structures identified for demolition, 90 have been completed since 1994.

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 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. In 1999 the domes of Silos 1 and 2 were resealed to reduce radon emissions.

USEPA approved the amended Record of Decision for Silos 1 and 2 in 2000. Construction of components for Silos 1 and 2 Advanced Waste Retrieval began, as

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well as construction of the Silo 3 treatment facility. In 2001, proposals for the final remediation of Silos 1 and 2 materials will be received, and the contract awarded.

During 2000, the Silo 3 project was slowed by technical and schedule issues. Rocky Mountain Remedial Services determined they would be unable to fulfill their obligation as specified in the contract and in December of 2000, was released from their contract. The site is currently evaluating options for remediation of Silo 3 contents and will work with regulators and the public to plot a path forward.

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. In 2000 the soils project included excavation, certification, and restoration. Certification of the old sewage treatment plant area was completed in 2000. The design grade was reached as excavation continued in the southern waste units. The area known as the Carolina area, south of the southern waste units, was remediated in the fall. Soil pile 3 was excavated and disposed of in the OSDF. Restoration of a 20-acre tract located in the northwestern corner of the site was completed.

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



Approximately 42 percent of the site is certified as meeting soil cleanup levels.

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remediation. Approximately 15 percent of the site was certified in 2000. Forty-two percent of the site is now certified as meeting the final cleanup levels for soils.

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 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.

The Great Miami Aquifer is being remediated by a combination of ground water extraction and reinjection. The use of reinjection wells as part of the ground water remediation was a one year demonstration project completed in 1999. In 2000, regulatory agencies granted approval to continue the ground water reinjection project. Approximately 1.42 billion net gallons of ground water were extracted from the Great Miami Aquifer and 790 net pounds of uranium removed. More than 2 billion gallons of water were treated at the advanced wastewater treatment plant.

Resource Conservation and Recovery Act (RCRA): Site management of all hazardous waste, (including mixed waste) is subject to regulation under RCRA. Ohio EPA’s Division of Hazardous Waste Management monitors RCRA compliance. Ohio EPA performed its annual Compliance Evaluation Inspection at Fernald on March 7, 2000. The site was found to be in substantial compliance with hazardous waste rules and regulation. Fernald continues to reduce the amount of hazardous/mixed waste stored on-site. During 2000, the site shipped 184,830 pounds of hazardous/mixed waste off-site for treatment and disposal. An additional 59,915 pounds of hazardous/mixed waste water were treated for disposal via the site’s Advanced Waste Water Treatment System. The site removed one active RCRA storage unit (KC-2 Warehouse / Building 63) from the facility’s RCRA Part B Permit Application, because all hazardous/mixed waste had been removed from this storage unit.

2.2 RESTORATION

Ohio EPA is the designated Fernald Natural Resource Trustee for the State of Ohio. Other Trustees for the Fernald site include DOE and the Department of Interior represented by the US Fish & Wildlife Service. Trustees act as guardians for public natural resources impacted by the Fernald site. One goal of the Trustees is to integrate natural resource restoration into the ongoing CERCLA remediation activities at the site. Another goal of the Trustees is to have the restoration activities lead to settlement of the State of Ohio's Natural Resource Damage Assessment (NRDA) claim against DOE. Over 800 acres of the site will undergo natural resource restoration to include native grasslands, riparian buffers, forests, and wetlands.

During 2000, the Trustees worked toward resolution of NRDA claims and settlement of the State of Ohio's lawsuit. Negotiations continued on the revision of a Memorandum of Understanding amongst the Trustees. In addition, Trustees focused on developing concepts for better restoration monitoring which would allow for the use of adaptive management in the construction and maintenance of restoration projects.

Restoration Projects: Ecological restoration projects during 2000 included restoration activities in area 8 phase II and area 1 phase I wetland mitigation area. Other areas such as the radium hotspot, area 2 phase I Carolina area, and area 2 phase I active flyash pile were graded to final contours and stabilized using a mixture of native grasses and flowers.

The area 8 phase II restoration included a number of different habitat types: the riparian forest along Paddys Run was expanded; beech/maple and mixed mesophytic forest patches were planted; and two ponds, an emergent wetland, and a vernal pool were constructed. This project was an excellent example of using field observations to adjust restoration to optimize hydrology and topography. Based upon field visits, the Trustees were able to agree to relocate a savanna patch to a better location and to optimally place the vernal pool in a location where spring rainfall accumulated. Ohio

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EPA provided wetland donor soils that brought in plant material and



macroinvertebrates. This effort was based upon the success of our on-going research in area 1 phase I on the impact of donor soils in wetland mitigation. By the end of one growing season the two ponds were fully vegetated and teeming with aquatic life. Other notable first year successes included the blooming of seeded flowers

Before and After: The area 8 phase II restoration effort provided a number of different habitat types at Fernald. Above, Ohio EPA introduced donor plants to the ponds in the spring of 2000. Right, by summer the donor plants, including this burreed plant, were well established.



and grasses in a number of areas within the project, timely installation of vegetation, and interesting observations of wildlife, including kingfishers and coopers hawk.

Area 1 phase I wetland mitigation restoration focused on recovering from the drought of 1999. The construction and planting of the wetland during a severe drought year had a significant impact that will likely take the wetland years to recover. Both this project and area 8 phase II endured significant damage to woody vegetation from deer browsing and rubbing. Efforts to control deer damage have shown limited effectiveness. Year 2000 activities included raising headwall heights to retain water and saturate basins, replanting lost woody vegetation and reseeding uplands and basins. Despite the impacts of the drought the wetland was a major stopping point for waterfowl during the spring of 2000. Blue-winged teal, wood ducks, and mallards were a few of the observed waterfowl. Mallards successfully hatched a brood of

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chicks. Blue birds, wrens, and tree swallows successfully used nesting boxes. Numerous species of amphibians and macroinvertebrates are well established within the wetland and actively reproducing.

In addition to active full scale restoration projects, remediation efforts incorporate ecological restoration in the post-excavation final grading plans. By incorporating restoration within the remediation effort, areas are stabilized more quickly, dollars are saved, and soil disturbance is minimized. Following construction, excavations are contoured to become ponds or wetlands, berms are constructed to control runoff, while at the same time retaining water for future wetlands, and seeding is completed with native grasses and flowers appropriate for the conditions. Remediation was completed in the following areas with ecological restoration incorporated into the final grading: 1) radium hot spot – large mudflat, wetland with upland prairie grass; 2) Carolina area – numerous small basins within a riparian corridor; 3) soil pile three footprint – seeded in prairie and wet prairie mix as part of a research project; and 4) active flyash pile footprint – seeded in prairie mix, replaced stormwater basin with a pond.

Restoration Research and Monitoring: During 2000, Ohio EPA participated in two restoration research projects on site. Ohio EPA was involved in review and oversight of several other research projects funded by DOE and implemented by local universities. More information on DOE funded restoration research projects can be found on our website (offo2.epa.state.oh.us) and on DOE Fernald's website (www.fernald.gov). Ohio EPA's primary research was an on-going study in cooperation with the University of Dayton, to look at the impacts of placing donor soil plots within the wetland mitigation project. This was the second year of the study, which looked at both vegetative and soil microbiological impacts and differences using donor wetland and prairie soils within the wetland project. In both 1999 and 2000, the vegetative community on donor soil treatment plots was significantly better than the control plots within the wetland basins. The vegetation was assessed using the Modified Floristic Quality Index, which evaluates the

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Ohio EPA and University of Dayton researchers measure vegetative growth of donor soil plots.

community based upon native/non-native plants and values of conservatism for each plant. Soil studies showed that donor soil was significantly higher in soil moisture, organic matter, microbial activity, and biomass. The

study also showed that soil amendments (woodchips and municipal compost) used in some basins were effective in increasing moisture retention, organic matter, and stimulating the soil microbial community.* Significant migration of vegetation from the donor plots positively impacted the vegetative cover of the basins. At one location vegetation spread eight meters from the donor soil plot.

The second research project is aimed at optimizing the vegetation to be used on the OSDF cap. The research plots were installed on the footprint of the former soil pile 3. Parameters to be evaluated include cover crops (ReGreen, annual rye), soil amendments, and pelletized soil inoculum. All plots were seeded with upland prairie grass and flower mixture using a seed drill. Plots will be measured for vegetative percent cover and seeding success. This research will continue and be used to make a final determination on seeding specifications for the OSDF cap in the fall of 2001.

* Snyder, S and C. Friese, 2001. Monitoring the Soil Microbial Community in Wetland Mitigation: Development of a Microbial Functional Index at the Fernald Superfund Site, Hamilton County, Ohio. Ohio EPA Report.

2.3 PUBLIC OUTREACH

Ohio EPA's public outreach program includes open, ongoing, formal, and informal communication with stakeholders, site personnel, and other regulators. Steady and interactive communication enables all parties to better understand all views on an issue. 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. This type of public outreach results in a diverse



In 2000, OFFO staff gave numerous presentations to schools and other organizations on using native plants for restoration at Fernald.

collection of opinions and values enabling regulators to make better cleanup decisions. OFFO's public outreach program supplements our monitoring and oversight activities by fostering early public involvement in important environmental decisions. In 2000, OFFO investigated and responded to numerous public and media information requests. OFFO's Internet web site continues to enhance communications with the public. OFFO representatives toured Fernald with various groups including Senator Dewine's staff, Tennessee state officials, and members of the Interstate Technology & Regulatory Cooperation Workgroup.

Meetings

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

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

In 2000, the FCAB committee structure was changed again. In September, the group decided that the remediation committee would no longer meet. The stewardship committee and full board would each meet monthly, with the exception of August and



At the Future of Fernald workshops the FCAB led the community in discussing options for future use of the 1050-acre Fernald facility.

December. Ohio EPA staff continues to regularly participate in the monthly FCAB stewardship committee and full board meetings, in ex-officio capacities. Ohio EPA also participated in special events such as the Future of Fernald workshops, and national CAB Stewardship Conference in Denver.

Future use discussions moved under the guidance of the FCAB Stewardship committee. OFFO continued to play an instrumental role as Fernald Natural Resource Trustee in future land use discussions. OFFO presented information and

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participated in workgroups at the Future of Fernald workshops in April, May and September. An OFFO representative facilitated the first and second ever on-line 'breakout sessions' for those attending the public meeting via the Internet. The stewardship committee used public input from these meetings to develop a vision statement for the site.

The future vision of Fernald is:

A community resource that serves the ongoing information needs of area residents, education needs of local institutions, and reinterment of Native American remains. We envision a safe, secure, and partially accessible site, integrated with the surrounding community, that effectively protects human health and the environment from all residual contamination and fully maintains all aspects of the ecological restoration.

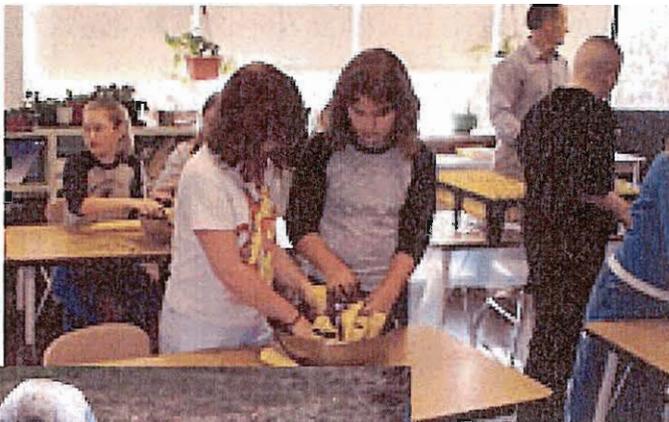
Ohio EPA regularly participates in meetings and promotional efforts of the Fernald Living History Project. This project involves community members and site workers in an effort to record and preserve the various perspectives that are a part of their environmental history. Tom Schneider, Ohio EPA's Fernald Team Leader was interviewed for the project in November. University of Cincinnati, working with the living history group, continued efforts to implement the \$50,000 grant received in 1999 from the Ohio Environmental Education Fund for a project during calendar years 2000-2001. This project, Linking Community with Environment, will include a summer workshop in June 2001 for area junior and senior high school teachers relating the environmental history of Fernald and its impact on surrounding communities. Workshop materials and a web site will be available for teachers to adapt and use in other Ohio communities whose environment has been impacted by formerly used federal facilities. Linking Community with Environment also includes 25 additional video interviews of Fernald community members. In 2000 OFFO continued to maintain an email list and web page for the Living History Project.

For the second consecutive year, Ohio EPA hosted an outreach event teaching school children near Fernald about using native plants for the restoration effort at Fernald. In February, staff went to Ross and Crosby Middle Schools and Morgan Elementary to teach students about the wetland restoration effort at Fernald and help the children plant their own seeds. The students tended to the seedlings throughout the spring. In May, Ohio EPA staff along with DOE and Fluor Fernald staff helped the students

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plant the seedlings in the northeast wetland at the Fernald site. In June, OFFO also provided 200 wildflower seedlings and helped plant at Fernald's 'Take Your Kid to Work Day.'

In addition to these Fernald-specific groups, Ohio EPA



Ohio EPA joined with Fernald staff and local middle schools to plant native wildflowers in the area 1 phase I wetland.

staff also participated in numerous DOE national groups including ITRC, the State and Tribal Governments Working Group, DOE's Openness Advisory Panel, the Association of State and Territorial Solid Waste Management Officials, and the Environmental Management Advisory Board.

Publications

- *1999 Annual Report to the Public on the Fernald Environmental Management Project*
- *Comparison of Hyporheic Organisms in Two Intermittent Streams to Assess a Local Disturbance*, a manuscript prepared by Joe Bartoszek on the hyporheic study at Fernald, was mailed to the editors of several professional journals for review and consideration.

Fact Sheets:

- Quarterly environmental monitoring results fact sheets

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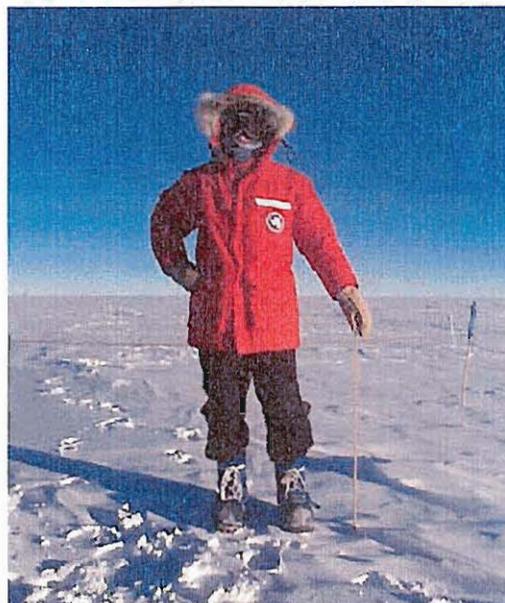
Presentations

- Fernald wetland research poster presentation at the Stander Symposium at the University of Dayton, March
- *Ohio EPA's role at Fernald*, presented to an Environmental Ecology class at the University of Dayton, April
- *Science and Stewardship: a State Regulator's Perspective*, presented at USDOE's Environmental Management Science Program conference in Atlanta, April
- *Native Plant Restoration*, presented at the Chillicothe Garden Club, August
- *Ohio EPA Perspectives on Long-Term Stewardship*, presented at the Long Term Stewardship Conference at the University of Cincinnati, September
- *Radionuclide Team Update*, presented at the ITRC workgroup fall meeting, October
- *Native Plants in Restoration and Education*, presented to the Pickaway County Master Gardeners group, November
- *Stewardship & Technology Challenges for Future Mgt. of Radiologically Contaminated Sites*, presented to the Land Transfer and Long-term Management of Contaminated Federal Facilities Conference in San Francisco, December
- Fernald presentations to graduate students at Miami University, April, June, and November
- Numerous South Pole presentations, January and December

Much media attention and community outreach efforts were placed on Kelly Kaletsky, an OFFO employee who took a 10-month leave of absence from the agency to winter-over at the South Pole. Press releases for his departure in January and return in November were sent to news outlets in Ohio. This generated extensive media coverage for the agency on TV, radio and print news throughout the year. An Internet web site was created and maintained to follow Kelly's South Pole adventure. Viewers of the web site were kept up-to-date with a photo album, journal, and

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question and answer sections. Students throughout Ohio, including SWDO's adopt-a-school, Eastmont Elementary, along with classrooms as far away as South Carolina corresponded with Kelly during his adventure. Upon his return, Kelly visited several schools and other organizations to discuss his stay at the South Pole.



Kelly Kaletsky served as a meteorologist at the South Pole during his leave of absence.

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 2000 the real-time radon monitoring data page was enhanced and continued to provide hourly updates from three locations around Fernald. Enhancements were made to improve speed and accessibility of information. At the end of 2000 efforts were initiated to overhaul the entire OFFO web site. This effort will continue into 2001. Ohio EPA provided online information for the restoration effort, waste pit activities, and other research and remediation projects. Additionally, the web server continues to host multiple web sites, including sites for the community based Fernald Living History Project, the southwest district office of the Ohio EPA, the Hamilton County Environmental Action Commission, and the new South Pole Connection website. The OFFO web site can be accessed at <http://offo2.epa.state.oh.us> for more information on Fernald.

2.4 EMERGENCY PLANNING

Ohio Emergency Management Agency reviewed the State Hazmat Plan/DOE Annex and worked on revisions to the plan and the state's Hazardous Materials Memorandum of Understanding. The memorandum was finalized and signed by the Governor in May of 2000. Ohio EMA continues to work with other state agencies through regularly scheduled meetings on the implementation of the State's Incident Command System during emergencies, including incidents at DOE facilities. Ohio EMA continued to enter updated facility information into the state resource directory, the duty officer's handbook, and into the Computer Aided Management of Emergency Operations, or CAMEO, database. Ohio EMA staff received training from Fernald on the Hotspot '98 and the Empirical Radon Model computer programs for response to radiological incidents at Fernald.

Ohio EMA worked with Fernald to gather information on shipments and disseminate the information to county emergency management agencies. The agency continued to attend the progress briefings and the Cooperative Planning and Training meetings for Fernald. Ohio EMA took part in notification drills with the Fernald site.

By improving its preparedness posture through training and upgrading the Ohio Emergency Operations Center, Ohio EMA prepared for site emergencies. Agency personnel attended several hazardous materials courses and attended various seminars related to response and emergency planning. County personnel attended the Local Emergency Planning Committee Conference in August.

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. Funds were used to prepare hazards assessments, participate in emergency response organizations, conduct exercises and drills, digitize site-specific information, participate in periodic communications checks, upgrade Emergency Operations Centers, and monitor 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 and appraise the success of ongoing cleanup activities. During 2000, on- and off-site releases were monitored through the sampling of ground water, surface water, sediment, biota, and air.

Ohio EPA reviewed and commented on DOE's Integrated Environmental Monitoring Plan (IEMP) in 2000. The reviews included three quarterly status reports and one annual report covering all 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 1998 revision of the IEMP, Ohio EPA conducts most of the off-property environmental monitoring at Fernald.

Ohio EPA continued its independent and split sampling programs in 2000. 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. DOE's compliance with the waste acceptance criteria is also independently monitored. Split sampling provides a comparison of data between Ohio EPA and Fernald.

ODH continued to provide data validation for OFFO's sampling program in 2000. A discussion of sampling activities and results for each media is provided in Sections 3.1 through 3.5. 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 2000 for total uranium. OFFO split sampled the wells quarterly with DOE/Fluor Fernald. The 2000 private well sampling locations are shown on the off-site sampling map in Appendix A. Private wells BOK-14, BKM-13, and NKM-12 are located down gradient of Fernald. These residents are all on public water and the wells are used for monitoring purposes only.

Private well water is analyzed for total uranium, which is the primary contaminant of concern in groundwater at Fernald. The USEPA drinking water standard for total uranium was set in 2000 at 30 µg/l, a change from the long proposed limit of 20 µg/l. The ground water final remediation level for total uranium at Fernald is being evaluated to reflect this change. 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 monitoring wells during 2000 was 110 µg/l found in well NKM-12. Well BOK-14 was consistently within background in 2000. Appendix B contains the private well sampling data.

OFFO has been split sampling the three wells with Fernald since 1994. These wells have historically shown some fluctuation in their total uranium concentrations. This is mostly due to seasonal changes in the water table. Some increased concentrations have been noted in well NKM-12 since re-injection began in 1998. With Fernald's re-injection and extraction system, treated water is re-injected, pushing the contaminated ground water past the private well and toward extraction wells.

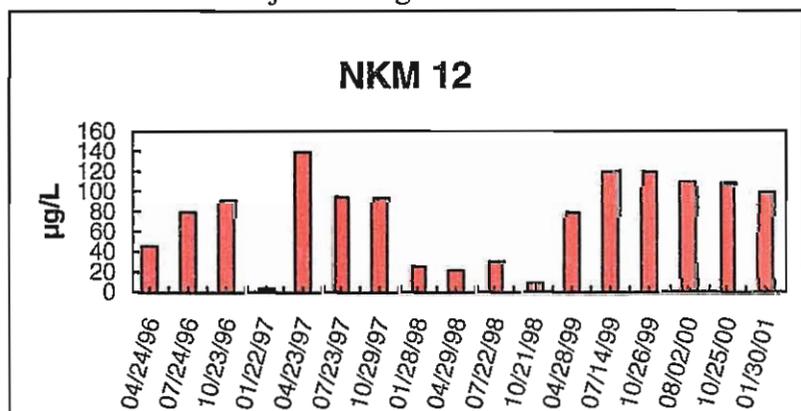


Figure 3 Uranium concentrations will decrease as water is cleaned up.

ENVIRONMENTAL MONITORING

3.2 SURFACE WATER

Thirty-seven surface water samples were taken in 2000, compared with 36 in 1999. Routine samples were analyzed for total uranium, radium-226, and radium-228. In addition to the routine monitoring in 1999, samples were taken in January and October at the storm sewer outfall ditch (SSOD0.1), and in October at the pilot plant drainage ditch (PPDD0.05). The map in Appendix A shows all 2000 surface water sampling locations. Location codes reflect the river mile of the sampling location. GM26.2 and PR7.2 are background locations on the Great Miami River and Paddys Run, respectively. Appendix C contains the surface water sampling data.

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. No sample results exceeded the FRLs.

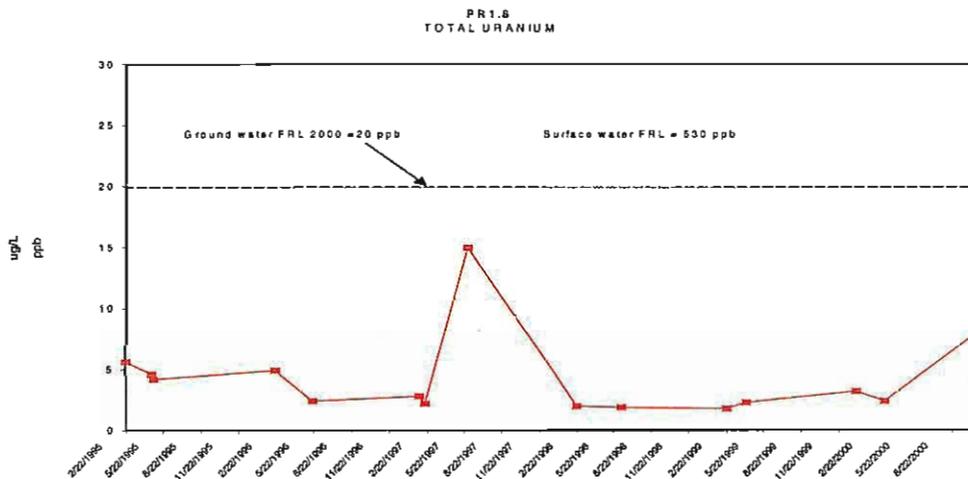


Figure 4 Sample results for total uranium in Paddys Run at the FEMP property line. The FRL for total uranium in surface water in 530 micrograms per liter ($\mu\text{g/L}$) or parts per billion (ppb). The FRL for ground water is currently 20 ppb but will be raised to 30 ppb in 2001 to be the same as the USEPA maximum contaminant level for total uranium in drinking water .

The site reported apparent increases in turbidity from the north drainage ditch into Paddys Run in 1999. This drainage ditch empties into Paddys Run at approximately river mile 3.4, just upstream of the railroad bridge. Our samples at PR3.3, just downstream of the railroad bridge, appeared to show an increasing trend in total

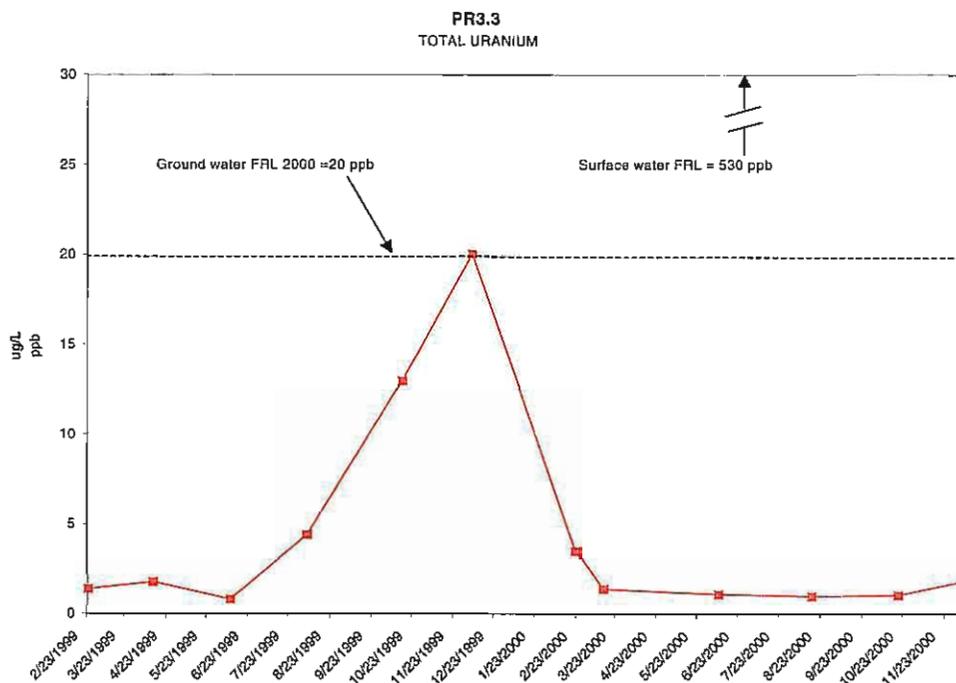


Figure 5 Sample results for total uranium downstream of the north drainage ditch. Although the results were always far below the Final Remediation Level (FRL) of 530 micrograms per liter ($\mu\text{g/L}$) or parts per billion (ppb), Fluor Fernald took action in response to the increase to 20 ppb. Their response has resulted in a decrease in total uranium at this station during 2000.

uranium, although levels were still significantly below the FRL (530 $\mu\text{g/l}$). The site has investigated what may be causing this. Some potential sources were identified and during 2000 total uranium levels decreased at PR3.3.

All Ohio EPA locations (including the background stations) have shown what appears to be an increasing trend in radium 228 over time. We believe this is an anomaly of the laboratory analysis as the same trend occurs in the background locations, there is no apparent reason that all sampling locations would experience these levels of radium 228 (e.g. 13.1 pCi/L at our background location in the Great Miami River), and our results are not confirmed by co-located samples taken by Fluor Fernald. All of their results have been below 1 pCi/L. We are currently investigating this issue with our laboratory.

ENVIRONMENTAL MONITORING

3.3 SEDIMENT

Sediment samples were taken at six locations in 2000. A total of seven sediment samples were analyzed in 1999, nine in 1998, ten in 1997, and nine in 1996. Samples were analyzed for total uranium, radium-226, and isotopic thorium. The sample from PR4.6 was also analyzed for cadmium.

The map in Appendix A shows all 2000 sediment sampling locations. Most samples were co-located with surface water. Location PR7.2 had a gravel and cobble substrate, and did not have sufficient sediment. PR4.6 at the Morgan Ross Road Bridge, the DOE/Fluor Fernald background station, was sampled in place of PR7.2.

Final remediation levels for sediment at Fernald have been established for the following analytes (OU5 Record Of Decision, December 15, 1995): total uranium (210 $\mu\text{g/g}$); radium-226 (2.9 pCi/g); thorium-228 (3.2 pCi/g), 230 (18000 pCi/g), and 232 (1.6 pCi/g); and cadmium (71 mg/kg). No sediment sample had any analyte above the final remediation level. Results are summarized in Appendix D.

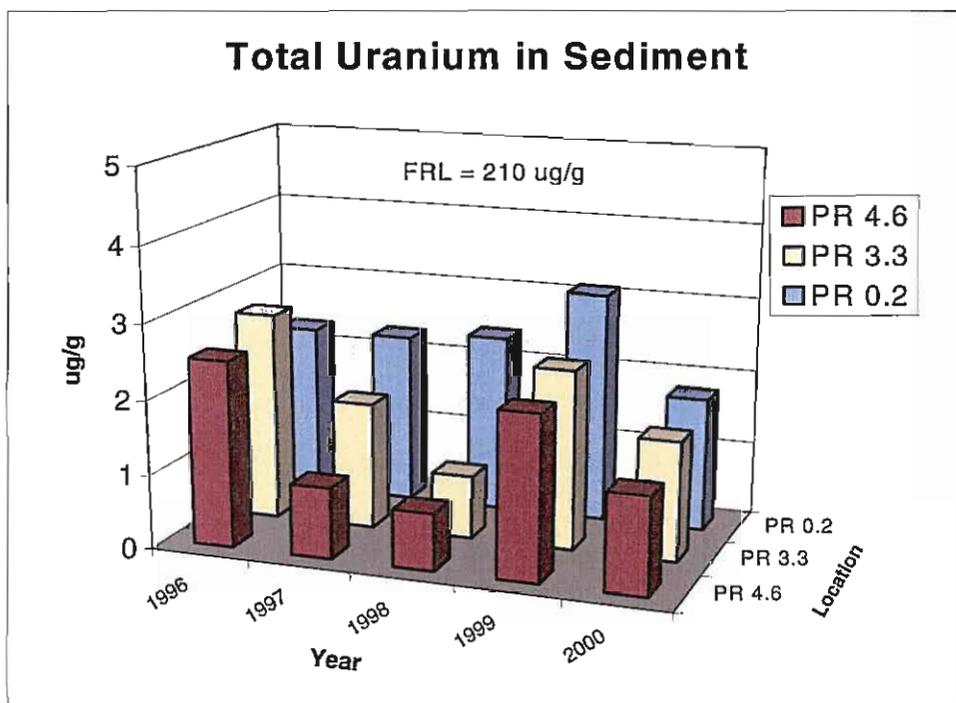


Figure 6 Total uranium levels in sediment in Paddys Run have remained far below the Final Remediation Level (FRL) of 210 micrograms per gram ($\mu\text{g/g}$).

3.4 BIOTA

During 2000, Ohio EPA sampled fish tissue downstream of the Fernald effluent. Ohio EPA will continue to sample fish periodically (at least once every five years). Fish were sampled on October 26, near the end of the 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.



Fish samples are periodically taken from the Great Miami River.

Common carp were filleted and the fillets analyzed for total uranium. The results are summarized in Appendix E. The results from 2000 (0.103 pCi/g dry weight) are within the historical range

for fish from both upstream and downstream of the site, although higher than average. The average total uranium content of fish in the family of the common carp (Cyprinidae) has been 0.013 pCi/g upstream and 0.014 pCi/g (dry weight) downstream of the site (data taken from the 1992-1995 DOE Fernald Annual Site Environmental Reports).

3.5 AIR

Ohio EPA conducts air monitoring and surveillance at Fernald. Ohio EPA operated six 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, and two are located in nearby communities. 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. Projects specifically targeted include the Waste Pit Remedial Action Project (WPRAP), the on-site disposal facility, and the southern waste units. Our off-site samplers are located in Crosby and Ross townships. The locations are shown on the maps in Appendix A. Results are summarized in Appendix F.

Ohio EPA compares on-site concentrations with off-site location concentrations and the concentrations listed in the National Emission Standard for Hazardous Air Pollutants (NESHAP) for radionuclides.

Waste Pit Remedial Action Project: Ohio EPA monitors total uranium, TSP, thorium isotopes, and radium-226 concentrations in air at two sampling locations adjacent to the waste pits. These air samplers are located northeast and northwest of the waste pits, (FNAPS01 and FNAPS04, respectively). Significant differences have been observed in 2001 between these samplers and our background sampler, located in Crosby Township. These locations indicate elevated concentrations of total uranium and thorium-230. Fernald is currently evaluating engineering controls that

may help reduce the emissions from WPRAP activities. All of the measured concentrations were less than NESHAP standards.

The 2000 average total uranium concentration measured at both waste pit locations appear to be increasing for the second consecutive year. Both locations had total uranium concentrations significantly greater than the concentrations measured off-site. The concentrations were still less than a calculated, NESHAP-based, concentration for natural uranium in air ($1.75 \times 10^{-2} \mu\text{g}/\text{m}^3$). The increase was expected and reflects the effects from the full-scale remediation of the waste pits. Elevated concentrations will likely continue throughout the remediation of this area. Ohio EPA will continue to monitor these locations to ensure that control measures are in place to keep emissions as low as reasonably achievable.

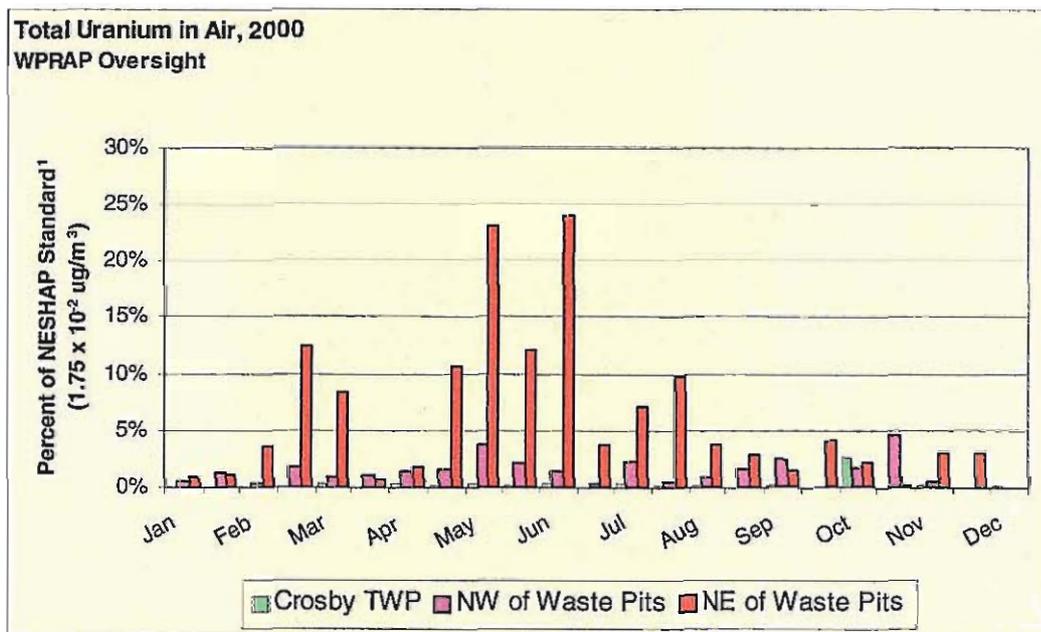
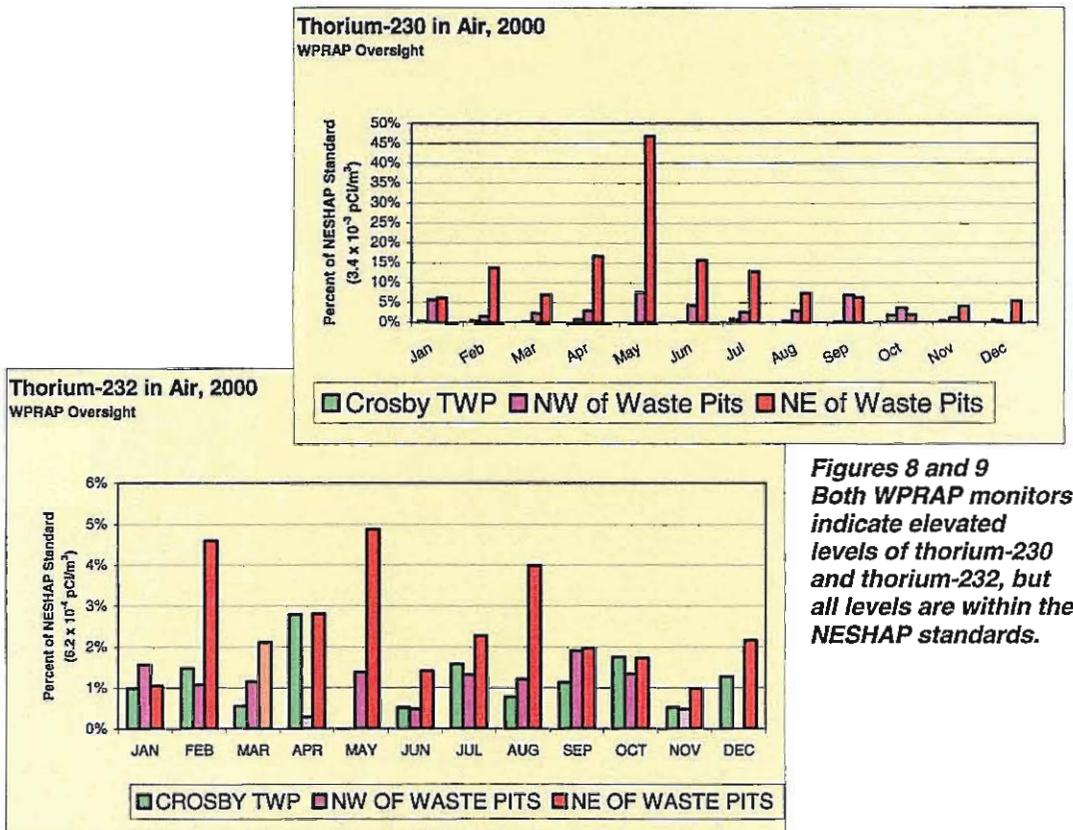


Figure 7 The WPRAP total uranium results are shown as a percentage of the NESHAP standard.

Isotopes of thorium (thorium-232, 230, and 228) were also analyzed at the waste pit locations. Thorium-230 concentrations were elevated at both WPRAP locations compared to the concentrations measured at the background location. Thorium-232 concentrations at FNAPS01 were also elevated compared to the background location. All of the thorium concentrations measured in 2000 were less than the NESHAP

ENVIRONMENTAL MONITORING

concentrations. As mentioned earlier, Fernald is taking steps to decrease emissions from the WPRAP. In August 2000, Ohio EPA began sampling at all locations for isotopes of thorium to ensure that fence line impacts were less than regulatory limits and that Fernald control measures were effective. The thorium-230 and thorium-232 results are shown in the figures below.



Radium-226 concentrations in air were also measured at the waste pit monitors in 2000. The results were similar to the results measured during 1999 and were similar to the concentrations measured at the background location.

The 2000 average TSP concentration at both locations was nearly the same as 1999 and was lower than the background location. These concentrations may be attributed to the aggressive program at Fernald to minimize fugitive emissions.

On-Site Disposal Facility: The location of FNAPS02 is on Fernald's east fence line slightly north of the OSDF. Total uranium and total suspended particulate samples

are collected from this location semi-monthly. A monthly composite sample for isotopes of thorium was added to the analytical suite in August 2000, in response to elevated concentrations being measured at the WPRAP project. This location was out of service from September until the end of the year due to power supply issues.

The 2000 total uranium concentrations were approximately the same as the concentrations measured in 1999 and significantly greater than the concentrations measured off-site. Waste placement in the OSDF as well as other remediation activities on site have caused these concentrations to remain elevated. The measured concentrations remain well below the NESHAP standard.

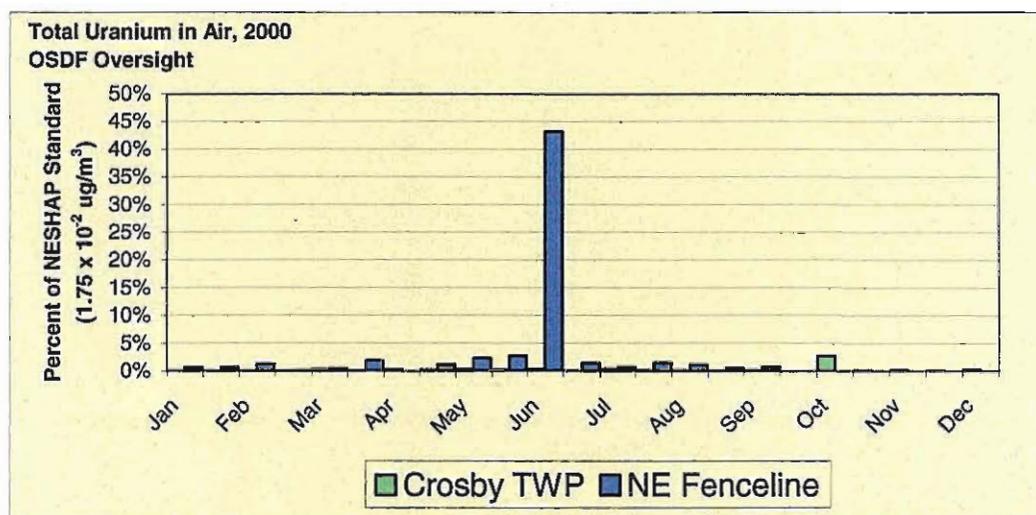


Figure 10 One air monitor near the OSDF had a sample that was almost half of the total uranium NESHAP standard.

The 2000 average TSP concentration remains essentially the same as 1999, and was similar to the concentrations measured off-site.

Southern Waste Units: FNAPS03A, is north-northeast of the southern waste units near the site meteorological tower. Total uranium and total suspended particulate samples are collected from this location semi-monthly. Sampling for isotopes of thorium was initiated in August due to observed increases in thorium-230 concentrations at the WPRAP samplers.

The 2000 total uranium concentrations were slightly higher than the concentrations

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measured in 1999 and higher than the concentrations measured at background. The concentrations remained well below the NESHAP standards. These higher than background concentrations may be due to continuing activities in the southern waste units during 2000 and the fact that the monitoring location is near the center of the site. The total uranium concentrations for the southern waste units sampler are shown below.

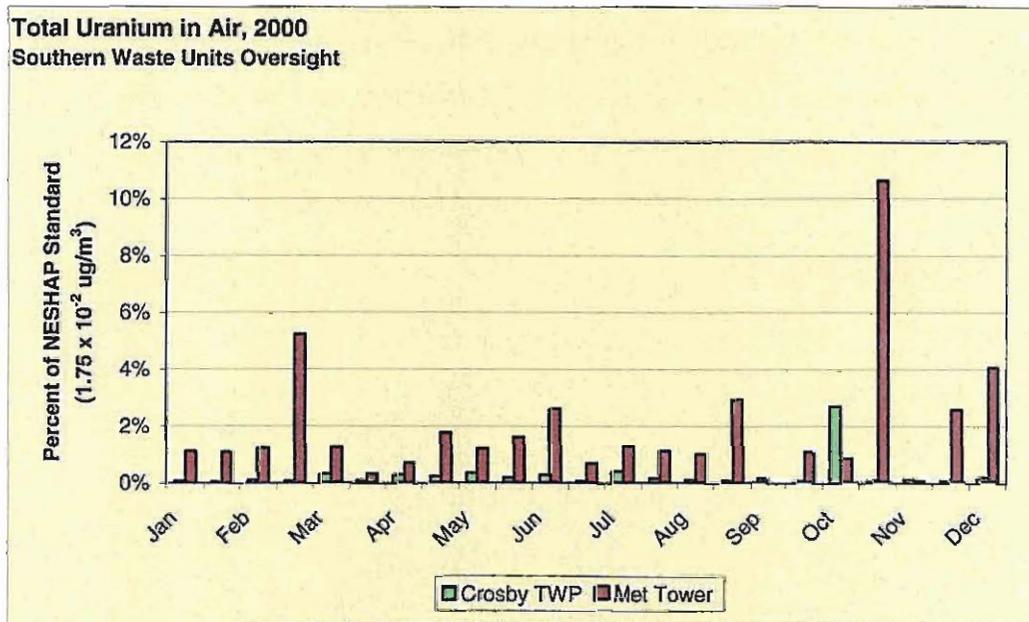


Figure 11 The highest recorded total uranium level in the southern waste units was about 90% below the NESHAP standard.

The average 2000 TSP measurements are similar to those measured at the background location and comparable to the concentrations measured in 1999. Again, these measurements may be due to Fernald's efforts in controlling fugitive emissions.

Off-Site Locations: The air sampler located in Crosby Township, AMS11, which is approximately 2.3 miles west-southwest of Fernald, serves as the background monitoring location for Ohio EPA at Fernald. The other off-site sampler is located in Ross Township, AMS13, and is 2.4 miles east-northeast of Fernald. DOE formerly operated both locations. Total uranium and total suspended particulate samples are collected from each of these locations semi-monthly. A monthly sample from Crosby Township is analyzed for isotopic thorium and radium-226. The results from these locations are consistent and are considered indicative of background concentrations.

Annual Composites: All of the samples from each of the six sampling locations are composited into a single sample for an annual composite sample. This method of analysis allows for detection of isotopes that may not have been detectable on a semi-monthly basis. The annual composites are analyzed for total uranium, isotopic uranium, isotopic thorium, and radium-226. A gamma spectroscopy analysis is also performed to detect gamma-emitting isotopes that are not part of the routine analytical suite.

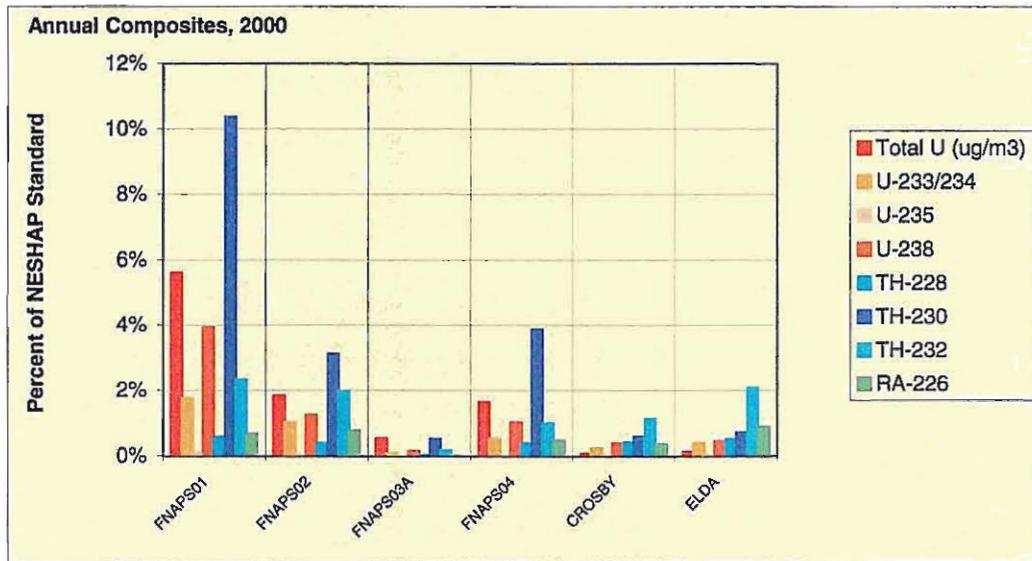


Figure 12 The WPRAP samplers had the highest concentrations.

The results for analytes of concern that were detectable are shown in Figure 12. Qualitatively, the results are consistent with the semi-monthly and monthly results. The WPRAP samplers had the highest concentrations followed by the OSDF sampler and solid waste units sampler. All of the on-site samplers had higher concentrations than the off-site samplers, but all concentrations were less than the NESHAP standards.

A few inconsistencies were noted in these results, requiring reanalysis of some of the parameters. Any significant differences to the results published in this report, will be provided in the Ohio EPA Quarterly Fact Sheet.

ENVIRONMENTAL MONITORING

Radon Sampling

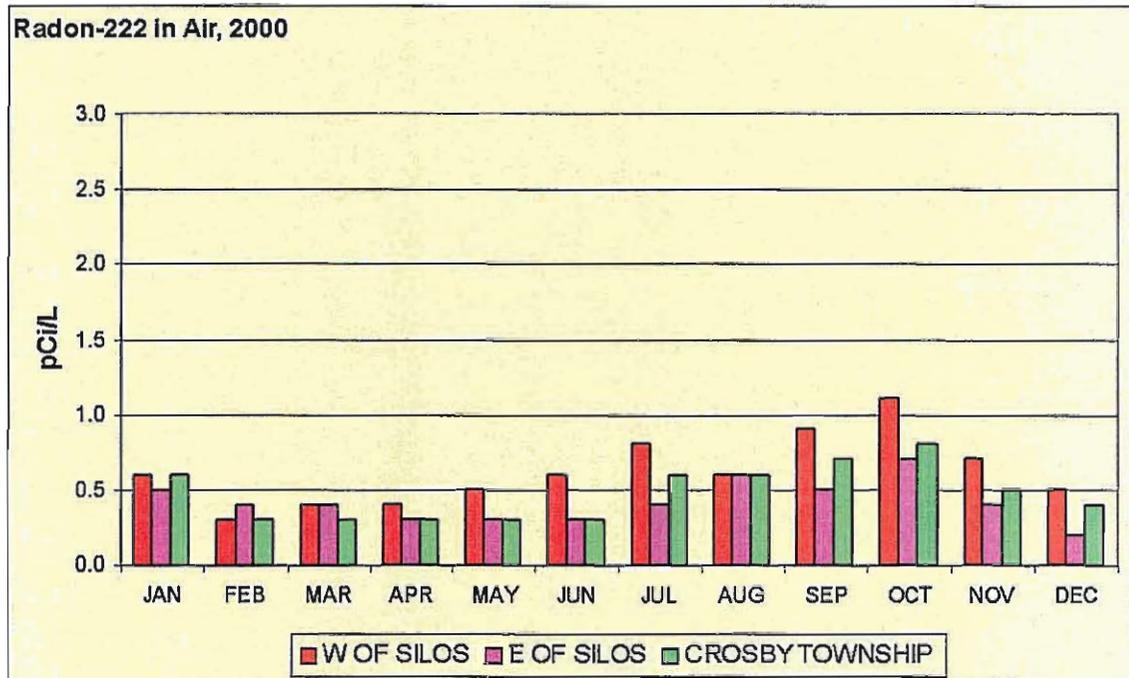
Ohio EPA collects continuous, or “real-time,” hourly measurements of radon-222 concentrations in ambient air. The locations are:

- FNRDN01, located west of the silos along Paddys Run Road;
- FNRDN02A, located east of the silos along the border of OU4 and the former production area, and;
- FNRDN03, located approximately 2 miles west-southwest of Fernald in Crosby Township.

The most recent hourly data is posted “real-time” 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 of radon-222 present in ambient air. 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.

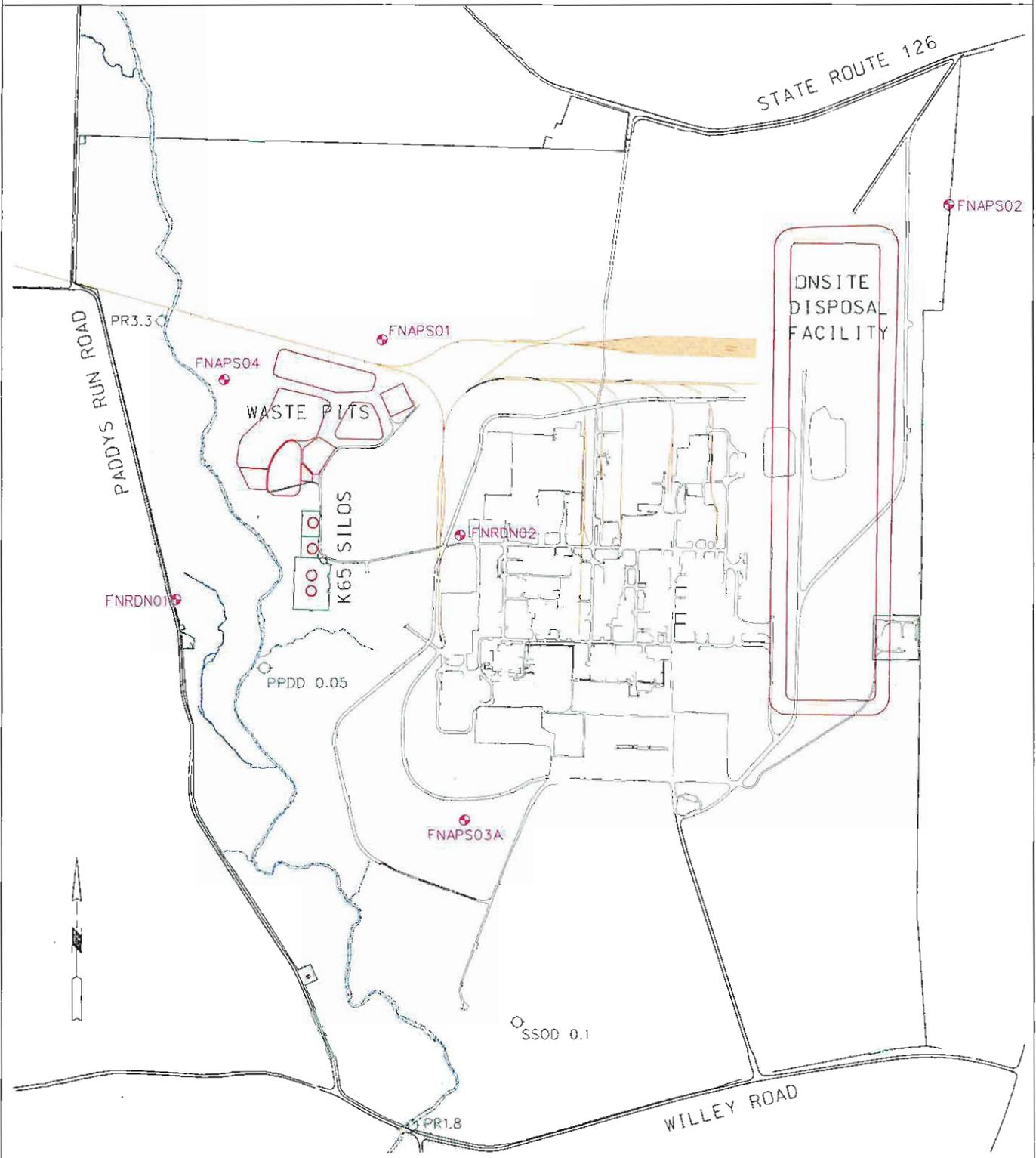
The radon monitoring results for the radon monitoring locations are shown in Appendix G. The data indicates that average monthly radon concentrations from the monitors located east of the silos, FNRDN02A, and the location along Paddys Run Road, FNRDN01, range from 0.1 to 1.1 pCi/l. This range of concentrations is well below the DOE Order 5400.5 limit of 3.0 pCi/l annual average at the facility fence line. The average monthly radon concentrations are illustrated in the following figure.



The monthly average concentrations are very comparable. The Paddy's Run Road location appears to have the highest average concentration of our locations. Statistically, however, the average concentrations are indistinguishable. The phenomenon in August and September 1999, where Crosby Township concentrations exceeded the on-site concentrations did not occur in 2000. The phenomenon is most likely attributed to the drought conditions in the summer of 1999. Ohio EPA will continue to observe and compare the concentrations from our locations to ensure that possible emissions from the site are detected.

The average radon concentrations were all less than the 3.0 pCi/L limit and the on-site locations are less than 0.5 pCi/L greater than background, the limit proposed in Draft 10 CFR 834.

2000 OHIO EPA ON-SITE SAMPLING LOCATIONS



PROJECTION: STATE PLANE
 ZONE: OHIO SOUTH
 UNITS: FEET
 DATUM: NAD 27
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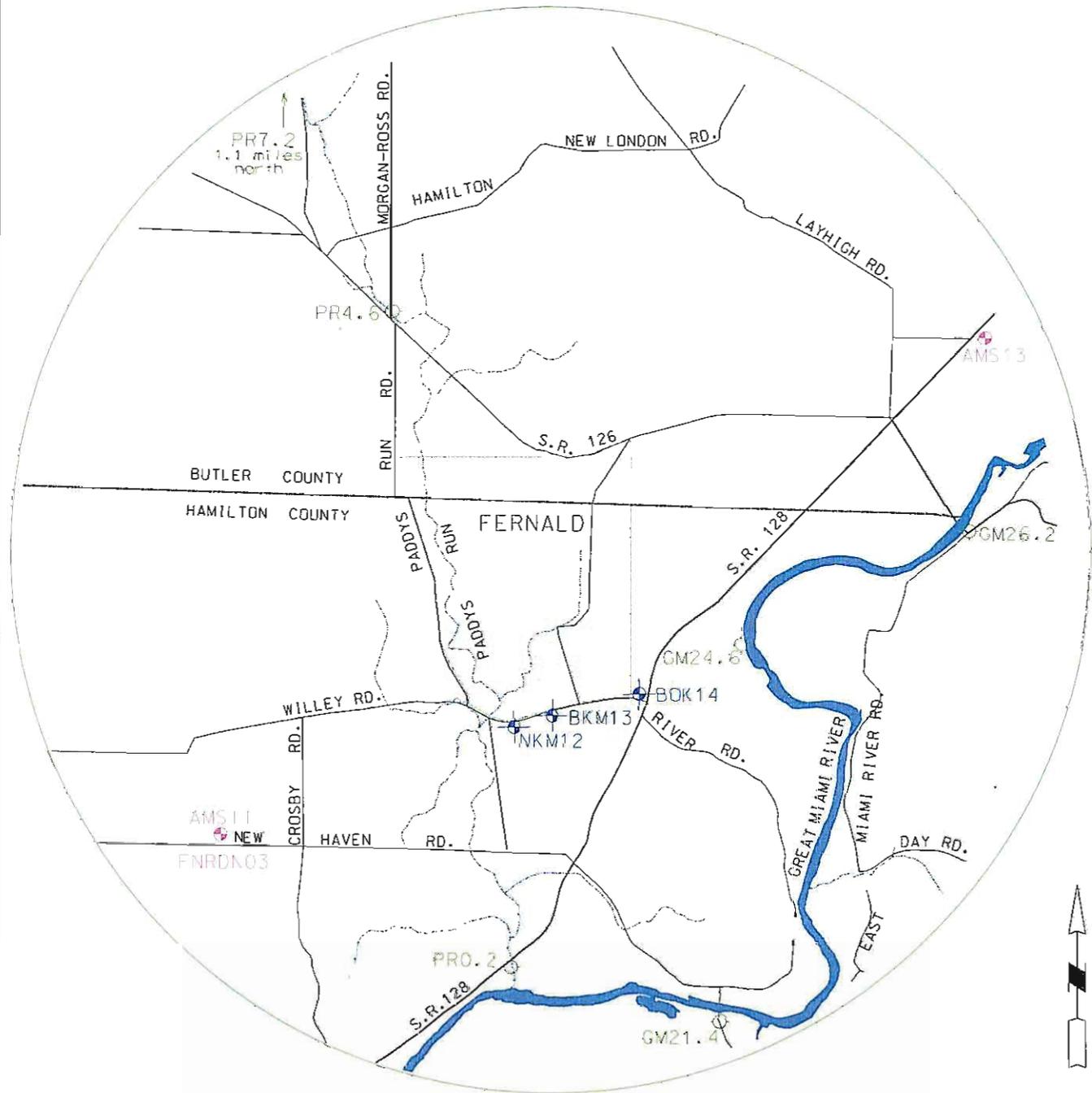


LEGEND	
	FERNALD FENCELINE
	PADDYS RUN AND TRIBUTARIES
	RAILROAD
	SURFACE WATER/SEDIMENT LOCATION
	AIR MONITOR



OFFICE OF FEDERAL FACILITIES OVERSIGHT

2000 OHIO EPA OFF-SITE SAMPLING LOCATIONS



PROJECTION: STATE PLANE
 ZONE: 6X10 SOUTH
 UNITS: FEET
 DATUM: NAD 27
 GS://FEMP/98RPT/LANDUSE99.DGN



LEGEND

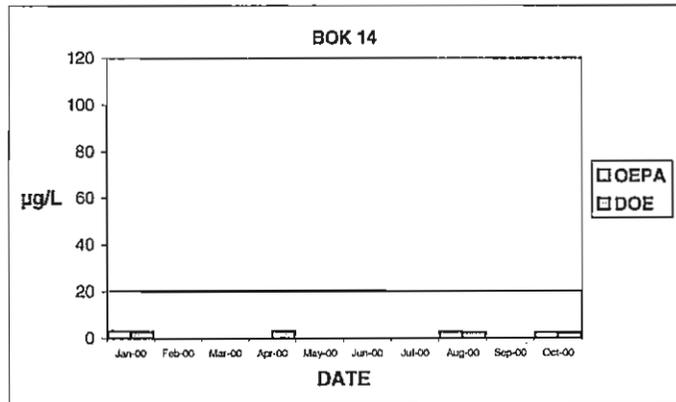
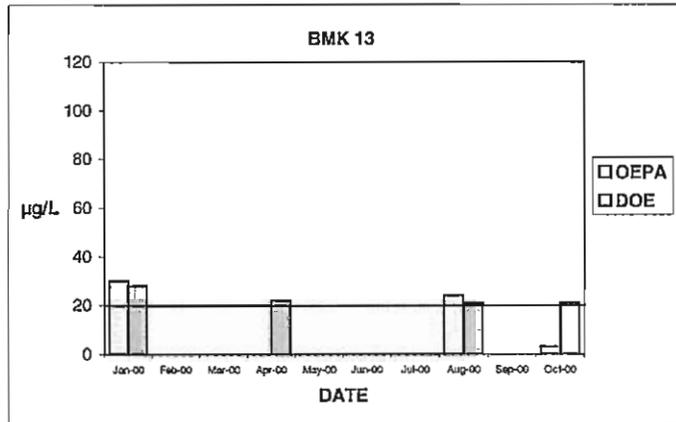
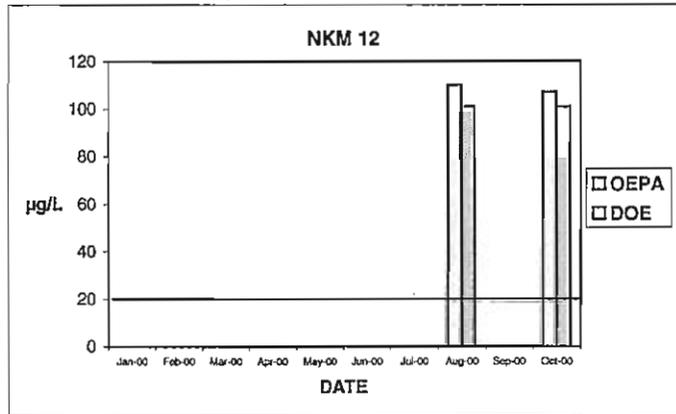
- COUNTY LINE
- - - FERNALD PROPERTY BOUNDARY
- ⊕ PRIVATE WELL
- SURFACE WATER/FISH/SEDIMENT
- ⊕ AIR MONITOR



OFFICE OF FEDERAL FACILITIES OVERSIGHT

PRIVATE WELLS			
LOCATION CODE	COLLECT DATE	OEPA TOTAL U $\mu\text{g/l}$	DOE TOTAL U $\mu\text{g/l}$
NKM12	4/27/2000	NA	NS
NKM12	8/2/2000	110	101
NKM12	10/25/2000	107	101
BMK13	1/26/2000	30	28
BMK13	4/27/2000	NA	22
BMK13	8/2/2000	24	21
BMK13	10/25/2000	3.06	21
BOK14	1/26/2000	3.1	2.9
BOK14	4/27/2000	NA	3.1
BOK14	8/2/2000	2.8	2.5
BOK14	10/25/2000	2.47	2.4

Note:
 $\mu\text{g/l}$ = micrograms per liter
 NA = not available
 NS = not sampled
 Total Uranium Final Remediation Level = 20 $\mu\text{g/l}$ for ground water



APPENDIX C

SURFACE WATER							
LOCATION CODE	COLLECT DATE	TOTAL U $\mu\text{g/L}$	TOTAL U +/- error	Ra-226 pCi/L	Ra-226 +/- error	Ra-228 pCi/L	Ra-228 +/- error
PPDD0.05	10/31/2000	60	6.2	0.207	0.047	10.1	2.4
SSOD0.1	1/4/2000	17	1.8	NS		NS	
SSOD0.1	10/19/2000	9.36	0.96	<0.058		1.81	0.78
PR0.2	2/22/2000	<0.03		0.084	0.032	9.6	2.1
PR0.2	6/7/2000	4.2	0.43	0.2	0.039	2.9	0.97
PR0.2	8/15/2000	2.6	0.27	0.17	0.057	7.6	1.6
PR0.2	10/18/2000	0.869	0.093	0.079	0.033	0.92	1
PR0.2	12/6/2000	24.3	2.5	1.96	0.3	6.6	2
PR1.8	1/4/2000	3.2	0.34	0.15	0.038	6.7	2.1
PR1.8	3/13/2000	2.4	0.28	<0.059		5.3	1.2
PR1.8	10/18/2000	7.86	0.81	<0.058		1.97	0.71
PR3.3	2/22/2000	3.5	0.4	<0.05		3.3	0.83
PR3.3	3/13/2000	1.4	0.16	<0.047		5.2	1.2
PR3.3	6/7/2000	1.1	0.12	<0.094		1.9	0.93
PR3.3	8/15/2000	1	0.11	0.15	0.051	8.9	1.8
PR3.3	10/18/2000	1.06	0.11	<0.15		1.19	0.63
PR3.3	12/6/2000	1.84	0.19	0.293	0.071	8.55	2.7
PR7.2	2/22/2000	2.8	0.33	<0.085		5.1	1.1
PR7.2	6/7/2000	1.1	0.12	0.12	0.037	3.1	1
PR7.2	8/15/2000	1	0.11	0.063	0.033	5.7	1.4
PR7.2	8/15/2000	1	0.11	0.072	0.031	3.4	1.2
PR7.2	10/18/2000	0.864	0.089	<0.084		2.15	0.8
PR7.2	12/6/2000	1.68	0.17	0.227	0.05	5.81	1.7
GM21.4	2/22/2000	1.6	0.19	0.11	0.049	9.6	1.9
GM21.4	6/7/2000	1.9	0.2	0.12	0.04	3.3	1.1
GM21.4	8/15/2000	1.5	0.16	<0.12		9.8	2.1
GM21.4	10/19/2000	1.73	0.18	0.156	0.034	4.99	1.2
GM21.4	12/6/2000	2.27	0.23	0.354	0.11	6.89	2.1
GM24.6	2/22/2000	2.8	0.35	0.25	0.05	4.3	1.3
GM24.6	6/7/2000	2	0.21	0.25	0.046	4.1	1.2
GM24.6	8/15/2000	1.6	0.17	<0.13		2.6	1.6
GM24.6	10/19/2000	2.02	0.21	0.061	0.039	4.37	1
GM24.6	12/6/2000	2.32	0.24	0.329	0.09	6.98	2.3
GM26.2	2/22/2000	0.78	0.09	0.14	0.044	4.7	1
GM26.2	6/7/2000	2	0.21	0.33	0.061	3.6	1.1
GM26.2	8/15/2000	1.5	0.16	<0.11		11	2.2
GM26.2	10/19/2000	1.83	0.19	0.187	0.061	1.54	0.73
GM26.2	12/6/2000	2.25	0.23	0.457	0.1	13.1	3.7

Notes:

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

pCi/L = picocuries per liter

NS = no sample or sample not analyzed for parameter

Total Uranium Final Remediation Level = 530 $\mu\text{g/L}$ 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

SEDIMENT

LOCATION CODE	LOCATION DESCRIPTION	COLLECT DATE	Total U mg/kg	Ra-226 pCi/g	Ra-226 +/- error
PR 0.2	Paddys Run/Route 128 Bridge	6/7/2000	1.8	0.59	0.089
PR 3.3	Paddys Run/RR Bridge	6/7/2000	1.6	0.48	0.072
PR 4.6	Paddys Run/Mile 4.6	6/7/2000	1.3	0.56	0.083
GMR 21.4	New Baltimore Bridge	6/7/2000	1.6	0.76	0.11
GMR 24.6	Down Stream FEMP Effluent	6/7/2000	2.3	0.91	0.13
GMR 26.2	Venice Bridge - background	6/7/2000	1.3	0.45	0.068

LOCATION CODE	LOCATION DESCRIPTION	COLLECT DATE	Th-228 pCi/g	Th-228 +/- error	Th-230 pCi/g	Th-230 +/- error	Th-232 pCi/g	Th-232 +/- error
PR 0.2	Paddys Run/Route 128 Bridge	6/7/2000	0.36	0.11	0.9	0.19	0.34	0.098
PR 3.3	Paddys Run/RR Bridge	6/7/2000	0.33	0.072	0.45	0.09	0.38	0.082
PR 4.6	Paddys Run/Mile 4.6	6/7/2000	0.36	0.066	0.57	0.09	0.36	0.068
GMR 21.4	New Baltimore Bridge	6/7/2000	0.41	0.091	0.46	0.096	0.4	0.091
GMR 24.6	Down Stream FEMP Effluent	6/7/2000	0.61	0.12	0.96	0.16	0.63	0.12
GMR 26.2	Venice Bridge - background	6/7/2000	0.42	0.17	0.66	0.21	0.35	0.13

LOCATION CODE	LOCATION DESCRIPTION	COLLECT DATE	Cadmium mg/kg
PR 4.6	Paddys Run/Mile 4.6	6/7/2000	<0.26

Notes:

µg/g = micrograms per gram

pCi/g = picocuries per gram

mg/kg = milligrams per kilogram

Final Remediation Level for Total Uranium = 210 µg/g for sediment

Final Remediation Level for Radium 226 = 2.9 pCi/g for sediment

Final Remediation Level for Thorium 228 = 3.2 pCi/g for sediment

Final Remediation Level for Thorium 230 = 18,000 pCi/g for sediment

Final Remediation Level for Thorium 232 = 1.6 pCi/g for sediment

Final Remediation Level for cadmium = 71 mg/kg for sediment

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

APPENDIX E

FISH				
LOCATION CODE	COLLECT DATE	ANALYTE	RESULT µg/g (dry)	RESULT µg/g (wet)
GM24.6	10/26/2000	Total U	1.03E-01	0.024

Notes:

µg/g = micrograms per gram

TOTAL SUSPENDED PARTICULATES							
START	STOP	FNAPS01 $\mu\text{g}/\text{m}^3$	FNAPS02 $\mu\text{g}/\text{m}^3$	FNAPS03A $\mu\text{g}/\text{m}^3$	FNAPS04 $\mu\text{g}/\text{m}^3$	AMS-11 $\mu\text{g}/\text{m}^3$	AMS-13 $\mu\text{g}/\text{m}^3$
12/30/99	01/12/00	16.8	23.8	20.9	16.4	23.6	NS
01/12/00	01/27/00	26.7	20.5	24.9	19.3	26.2	NS
01/27/00	02/16/00	22.7	23.9	24.7	21.1	26.8	NS
02/16/00	03/01/00	22.5	19.3	20	17.1	20.4	27.4
03/01/00	03/15/00	77.2	126.9	78.2	95.1	81.4	129.8
03/15/00	03/30/00	64.2	146.2	66.4	135.3	66.6	98.5
03/30/00	04/19/00	21.5	NS	29.7	23.5	28.7	26.9
04/19/00	05/05/00	29.9	32.3	34.6	27.9	40.8	40.4
05/05/00	05/19/00	44.6	47.9	49.7	37.1	47.8	20.0
05/19/00	06/05/00	42.2	35.6	46.5	37.3	38.1	39.2
06/05/00	06/22/00	30.3	36.6	33.3	29.2	32.8	NS
06/22/00	06/29/00	31.5	26.5	29.3	24.9	28.8	66.3
06/29/00	07/13/00	98.0	103.8	93.9	84.0	NA	NA
07/13/00	07/31/00	76.5	81.2	70.0	58.2	NA	NA
07/31/00	08/16/00	26.5	27.1	28.3	14.8	27.1	NS
08/16/00	08/31/00	40.1	34.4	37.9	30.1	33.4	NS
08/31/00	09/13/00	28.8	44.8	NS	22.2	31.1	32.3
09/13/00	10/02/00	36.5	NS	26.8	NS	21.9	21.9
10/02/00	10/16/00	27	NS	31.6	23.7	28.2	26.8
10/16/00	11/02/00	34.5	NS	41.6	31.4	49.1	48.9
11/02/00	11/22/00	20.9	NS	24.7	16.2	25.8	38.3
11/28/00	12/15/00	18.8	NS	23.9	NS	23	NS
12/15/00	01/04/01	NS	NS	27.1	NS	29.7	NS

TOTAL URANIUM IN AIR							
START	STOP	FNAPS01 $\mu\text{g}/\text{m}^3$	FNAPS02 $\mu\text{g}/\text{m}^3$	FNAPS03A $\mu\text{g}/\text{m}^3$	FNAPS04 $\mu\text{g}/\text{m}^3$	AMS-11 $\mu\text{g}/\text{m}^3$	AMS-13 $\mu\text{g}/\text{m}^3$
12/30/99	01/12/00	1.62E-04	1.19E-04	1.95E-04	1.08E-04	9.06E-06	NS
01/12/00	01/27/00	1.93E-04	1.15E-04	1.91E-04	2.04E-04	5.34E-06	NS
01/27/00	02/16/00	6.29E-04	2.26E-04	2.15E-04	6.63E-05	1.29E-05	NS
02/16/00	03/01/00	2.18E-03	1.93E-05	9.16E-04	3.10E-04	9.95E-06	6.01E-05
03/01/00	03/15/00	1.47E-03	8.39E-05	2.18E-04	1.67E-04	5.30E-05	5.82E-04
03/15/00	03/30/00	1.32E-04	3.20E-04	5.87E-05	1.72E-04	1.45E-05	4.15E-05
03/30/00	04/19/00	3.02E-04	NS	1.20E-04	2.34E-04	4.85E-05	4.69E-05
04/19/00	05/05/00	1.85E-03	2.04E-04	3.09E-04	2.93E-04	3.81E-05	8.55E-05
05/05/00	05/19/00	4.03E-03	3.99E-04	2.11E-04	6.62E-04	5.94E-05	3.26E-05
05/19/00	06/05/00	2.10E-03	4.66E-04	2.83E-04	3.71E-04	2.98E-05	1.12E-04
06/05/00	06/22/00	4.19E-03	7.56E-03	4.57E-04	2.46E-04	4.75E-05	NS
06/22/00	06/29/00	6.55E-04	2.53E-04	1.19E-04	6.22E-05	7.48E-06	8.88E-06
06/29/00	07/13/00	1.23E-03	1.29E-04	2.25E-04	4.09E-04	6.85E-05	NS
07/13/00	07/31/00	1.71E-03	2.68E-04	1.96E-04	1.05E-04	2.51E-05	NS
07/31/00	08/16/00	6.47E-04	2.04E-04	1.76E-04	1.63E-04	1.64E-05	NS
08/16/00	08/31/00	4.85E-04	8.83E-05	5.15E-04	2.84E-04	1.18E-05	NS
08/31/00	09/13/00	2.48E-04	1.34E-04	NS	4.31E-04	2.16E-05	1.38E-05
09/13/00	10/02/00	7.01E-04	NS	1.85E-04	NS	4.65E-06	1.21E-04
10/02/00	10/16/00	3.76E-04	NS	1.45E-04	3.15E-04	4.76E-04	2.27E-05
10/16/00	11/02/00	3.20E-05	NS	1.86E-03	8.09E-04	1.05E-05	2.02E-05
11/02/00	11/22/00	5.29E-04	NS	1.42E-05	9.30E-05	2.17E-05	7.41E-05
11/28/00	12/15/00	5.36E-04	NS	4.51E-04	NS	1.36E-05	NS
12/15/00	01/04/01	NS	NS	7.12E-04	NS	2.70E-05	NS

Notes:

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

NS = not sampled

NA = not available

APPENDIX F

THORIUM-228 IN AIR						
MONTH 2000	FNAPS01 pCi/m ³	FNAPS02 pCi/m ³	FNAPS03A pCi/m ³	FNAPS04 pCi/m ³	AMS-11 pCi/m ³	AMS-13 pCi/m ³
JAN	6.55E-06	NS	NS	9.99E-06	6.19E-06	NS
FEB	2.79E-05	NS	NS	1.20E-05	8.33E-06	NS
MAR	<4.26E-05	NS	NS	1.44E-05	6.05E-06	NS
APR	1.80E-05	NS	NS	3.29E-05	2.14E-05	NS
MAY	3.04E-05	NS	NS	1.08E-05	NS	<6.03E-06
JUN	2.28E-05	NS	NS	1.21E-05	<9.48E-06	NS
JUL	2.23E-05	NS	NS	1.11E-05	<7.01E-06	NS
AUG	2.19E-05	3.37E-05	1.44E-05	1.05E-05	<7.45E-06	NS
SEP	1.09E-05	1.08E-04	1.02E-05	1.15E-05	8.28E-06	2.90E-05
OCT	5.61E-06	NS	1.46E-05	1.16E-05	<7.29E-06	1.11E-05
NOV	6.46E-06	NS	1.32E-05	8.46E-06	<1.43E-05	NA
DEC	1.48E-05	NS	7.64E-06	NS	9.28E-06	NS

THORIUM-230 IN AIR						
MONTH 2000	FNAPS01 pCi/m ³	FNAPS02 pCi/m ³	FNAPS03A pCi/m ³	FNAPS04 pCi/m ³	AMS-11 pCi/m ³	AMS-13 pCi/m ³
JAN	2.12E-04	NS	NS	1.96E-04	1.15E-05	NS
FEB	4.68E-04	NS	NS	5.61E-05	1.63E-05	NS
MAR	2.39E-04	NS	NS	8.01E-05	5.77E-06	NS
APR	5.67E-04	NS	NS	1.04E-04	3.00E-05	NS
MAY	1.59E-03	NS	NS	2.59E-04	NS	2.55E-05
JUN	5.35E-04	NS	NS	1.47E-04	<3.93E-06	NS
JUL	4.35E-04	NS	NS	9.11E-05	2.66E-05	NS
AUG	2.52E-04	6.48E-05	2.62E-04	1.02E-04	1.31E-05	NS
SEP	2.17E-04	3.89E-05	3.83E-05	2.39E-04	7.43E-06	2.98E-05
OCT	6.36E-05	NS	3.58E-05	1.22E-04	5.97E-05	1.70E-05
NOV	1.35E-04	NS	2.12E-05	3.77E-05	<1.06E-05	NA
DEC	1.86E-04	NS	3.12E-05	NS	1.88E-05	NS

THORIUM-232 IN AIR						
MONTH 2000	FNAPS01 pCi/m ³	FNAPS02 pCi/m ³	FNAPS03A pCi/m ³	FNAPS04 pCi/m ³	AMS-11 pCi/m ³	AMS-13 pCi/m ³
JAN	6.51E-06	NS	NS	9.66E-06	6.14E-06	NS
FEB	2.85E-05	NS	NS	6.69E-06	9.19E-06	NS
MAR	<1.31E-05	NS	NS	7.15E-06	3.44E-06	NS
APR	1.74E-05	NS	NS	<1.77E-06	1.73E-05	NS
MAY	3.02E-05	NS	NS	8.55E-06	NS	5.70E-06
JUN	8.73E-06	NS	NS	2.97E-06	3.26E-06	NS
JUL	1.41E-05	NS	NS	8.14E-06	9.75E-06	NS
AUG	2.47E-05	9.22E-06	1.16E-05	7.49E-06	4.88E-06	NS
SEP	1.22E-05	3.51E-05	8.10E-06	1.18E-05	7.03E-06	1.35E-05
OCT	1.07E-05	NS	1.57E-05	8.30E-06	1.09E-05	1.41E-05
NOV	6.07E-06	NS	8.26E-06	<2.98E-06	3.24E-06	NA
DEC	1.34E-05	NS	7.37E-06	NS	7.94E-06	NS

Notes:

pCi/m³ = picocuries per cubic meter

NS = not sampled

NA = not available

OTHER RESOURCES

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10995 Hamilton-Cleves Highway
Harrison, OH 45030
(513) 648-7496
diana.rayer@fernald.gov

DOE-FN Public Information
P.O. Box 538705
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
1600 Clifton Rd, Mail Stop E39
Atlanta, GA 30333
(404) 639-2508
contact: Michael Donnelly, CDC
acting designated federal official

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
c/o Steve Depoe
5360 Desertgold Drive
Cincinnati, OH 45247
(513) 556-4459
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