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INTEGRATED ENVIRONMENTAL MONITORING PLAN

FERNALD CLOSURE PROJECT
FERNALD, OHIO

JANUARY 2005

U.S. DEPARTMENT OF ENERGY

FINAL

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LIST OF ACRONYMS

ALARA	as low as reasonably achievable
AMS	air monitoring station
ANSI	American National Standards Institute
ARAR	applicable or relevant and appropriate requirement
ASL	analytical support level
AWWT	advanced wastewater treatment facility
BAT	best available technology
BTV	benchmark toxicity value
CAWWT	converted advanced wastewater treatment facility
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfm	cubic feet per minute
CFR	Code of Federal Regulations
Ci/g	Curies per gram
cm	centimeter
CMT	continuous multi-channel tubing
COC	constituent of concern
COEC	constituent of ecological concern
CWA	Clean Water Act
D&D	decontamination and dismantling
DCF	dose conversion factors
DOE	U.S. Department of Energy
EMP	Fernald Site Environmental Monitoring Plan
EPA	U.S. Environmental Protection Agency
FCP	Fernald Closure Project
FFA	Federal Facility Agreement
FFCA	Federal Facility Compliance Agreement
FRL	final remediation level
FY	fiscal year
GPMPP	Groundwater Protection Management Program Plan
HAMDC	highest allowable minimum detection concentration
IEMP	Integrated Environmental Monitoring Plan
m^3	cubic meters
MCL	maximum contaminant level
MDC	minimum detectable concentration
µg/L	micrograms per liter
mg/L	milligrams per liter
m/min	meters per minute
mrem	millirem
MS/MSD	matrix spike/matrix spike duplicate
NEPA	National Environmental Policy Act

LIST OF ACRONYMS
(Continued)

NESHAP	National Emissions Standards Hazardous Air Pollutant
NPDES	National Pollutant Discharge Elimination System
NRMP	National Resource Monitoring Plan
NRRP	Natural Resource Restoration Plan
NRT	Natural Resource Trustee
NTU	nephelometric turbidity units
O&M	operations and maintenance
OAC	Ohio Administrative Code
OEPA	Ohio Environmental Protection Agency
ORC	Ohio Revised Code
OSDF	on-site disposal facility
OU	operable unit
pCi/g	picoCuries per gram
pCi/kg	picoCuries per kilogram
pCi/L	picoCuries per liter
$pCi/m^2/sec$	picoCuries per square meter per second
pCi/m^3	pico-curies per cubic meter
PRG	preliminary remediation goal
PRRS	Paddys Run Road Site
RCRA	Resource Conservation and Recovery Act
SCQ	Sitewide CERCLA Quality Assurance Project Plan
SWIFT	Sandia Waste Isolation Flow and Transport
TLD	thermoluminescent dosimeter
U.S.C.	United States Code
VAM3D	Variability Saturated Analysis Model in 3 Dimensions
WPP	Waste Pits Project

SECTION 1

1.0 INTRODUCTION

1.1 BACKGROUND

The U.S. Department of Energy's (DOE's) Fernald Closure Project (FCP) has completed its remedial investigation/feasibility study obligations, and final records of decision for all five Fernald site operable units are now in place. Since 1997, the project's focus has been on the safe and efficient execution of site remediation, including facility decontamination and dismantling; the design and construction of waste processing and disposal facilities; waste excavation and shipping; and continuation of groundwater remediation. In recognition of this increased focus on remedy implementation, DOE developed an integrated environmental monitoring strategy tailored to the near-term cleanup actions and the post-closure activities planned for the Fernald site. The monitoring strategy was initially documented in the first issue of the Integrated Environmental Monitoring Plan (IEMP) in 1997 followed by updated monitoring programs in subsequent revisions (in 1999, 2001, and 2003) based on the planned two-year revision cycle. The biennial revision cycle continues to be essential to adjust the IEMP monitoring programs as cleanup progresses, particularly under the current 2006 site closure schedule.

As with past IEMP revisions, this IEMP revision directs environmental monitoring program elements toward sitewide remediation activities and incorporates any new regulatory requirements for sitewide monitoring, reporting, and remedy-performance tracking activated by the formal applicable or relevant and appropriate requirements (ARARs) identified in the Fernald site's remedy selection documents. The emphasis of this revision of the IEMP is on tailoring the sitewide monitoring needs to those activities being conducted in 2005 and 2006. The IEMP also serves as the reporting link for selected project-specific emission control monitoring activities that will accompany remediation during Fernald site cleanup.

The basis for the current understanding of environmental conditions at the Fernald site is the extensive site environmental data that have been collected. The data were collected over a 10-year period through the remedial investigation process required under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended, combined with seven years of subsequent routine environmental monitoring data collected through the IEMP. Analysis of the remedial investigation data resulted in the selection of a final remedy for the Fernald site's environmental media, with the issuance of the Final Record of Decision for Remedial Actions at Operable Unit 5 (DOE 1996b) in January of 1996. Operable Unit 5 includes all environmental media, contaminant transport pathways, and environmental receptors (soil, groundwater, surface water, sediment, air, and biota) at and around the Fernald site that have been affected by past uranium production operations. The remedy for Operable Unit 5 defines final sitewide cleanup levels and establishes the general areal extent of on- and off-property actions necessary to mitigate environmental impacts caused by site production activities.

The IEMP is a formal remedial design deliverable required to fulfill Task 9 of the Remedial Design Work Plan for Remedial Actions at Operable Unit 5 (DOE 1996c). This revision to the IEMP (Revision 4) provides an update to the original IEMP (approved in August of 1997) as required by the Remedial Design Work Plan and DOE Order 5400.1 (DOE 1990) (Note: In January 2003, DOE Order 450.1 went into effect, superceding DOE Order 5400.1. The intent of the DOE Order 450.1 is met through existing DOE contractual requirements, established FCP programs, and the closure mission of the site. Until such time that the FCP contract is modified, DOE Order 5400.1 will continue to be referenced in the IEMP.)

1.2 PROGRAM OBJECTIVES AND SCOPE

As cleanup actions continue and post-closure activities are initiated/conducted, the need for accurate, accessible, and manageable environmental monitoring information continues to be essential. The IEMP has been formulated to meet this need and will serve several comprehensive functions for the site by:

- Maintaining the commitment to a remediation-focused environmental surveillance monitoring program that is consistent with DOE Orders 5400.1 and 5400.5 (DOE 1993), and continues to address stakeholder concerns. Both orders are listed as "to-be-considered" criteria in all Fernald site records of decision and are, therefore, key drivers for the scope of the monitoring program.

- Fulfilling additional sitewide monitoring and reporting requirements activated by the CERCLA ARARs for each Fernald site record of decision, including determining when environmental restoration activities are complete and cleanup standards have been achieved

- Providing the mechanism for assessing the performance of the Great Miami Aquifer groundwater remedy, including determining when restoration activities are complete

- Providing a reporting mechanism for many environmental regulatory compliance monitoring activities (i.e., on-site disposal facility groundwater monitoring; Federal Facility Compliance Agreement [FFCA] and elements of the National Pollutant Discharge Elimination System [NPDES] discharge reporting; and the air pathway-specific dose estimates required under National Emissions Standards for Hazardous Air Pollutants [NESHAP] Subpart H) with the environmental reporting for DOE Order 5400.1

- Providing a reporting interface for various project-specific, emission-control monitoring activities that, because of ARARs, will be implemented at project locations under approved project-specific remedial design plans.

Under the IEMP, data showing the environmental conditions at the Fernald site are collected, maintained, and evaluated. Contaminant releases attributable to remedial activities at the Fernald site are also evaluated and compared against established thresholds. DOE fulfills its obligation to document most environmental monitoring information under the umbrella of the IEMP reports. The monitoring program is also designed to appraise and report on the effectiveness of the administrative and engineering emission controls.

The IEMP is organized according to the principal environmental media and contaminant migration pathways routinely examined under the program. For each of the media comprising the program, evaluations of the regulatory drivers and pertinent DOE policies that govern environmental monitoring were conducted. Findings were made regarding those drivers that have sitewide implications and those that are project-specific in scope (and therefore fall outside the domain of the IEMP). These evaluations were used to define, for each medium, the ARAR-driven administrative boundaries that separate the project-specific emission control monitoring activities from those sitewide environmental monitoring activities that are the responsibility of the IEMP. The results of these evaluations are presented in detail for each respective media in Sections 3.0 through 6.0.

The schedule (as of September 2004) and regulatory drivers were evaluated to define the 2005 and 2006 IEMP scope for each environmental medium, and a medium-specific plan was prepared to define detailed program implementation requirements. The details and results of this evaluation are presented in Sections 3.0 through 6.0.

1.5 ROLE OF THE IEMP IN REMEDIAL ACTION DECISION MAKING

As indicated in Section 1.2, one of the primary responsibilities of the IEMP is to help ensure that the Fernald site's cumulative environmental emissions resulting from the implementation of multiple, concurrent, remedial action projects at the site do not exceed the regulatory-based limits or result in unacceptable off-site conditions. Fundamental to this role is the recognition that each remedial action project at the Fernald site is expected to be implemented and operated in full compliance with its project-specific, emission-control requirements for the respective environmental pathways of concern. It is thus the responsibility of the individual remedial design documents (required by the CERCLA Remedial Design Work Plans for each of the five operable units) to convey the project-specific measures for satisfying worker health and safety, process control, and environmental protection requirements accompanying each remedial action project. Under this fundamental expectation, the IEMP can serve to provide independent oversight assurance that there are no undesirable compounding environmental effects resulting from the concurrent implementation and operation of otherwise fully compliant individual projects.

In light of this oversight responsibility, the data generated through the IEMP support a number of management decisions regarding the progressive implementation strategy, sequence, and overall management control of the individual remedial action projects. This subsection highlights: (1) the key management decisions that will be supported by the IEMP; (2) the organizational responsibilities for making the decisions; (3) the framework and criteria needed to facilitate the decisions; and (4) the communication process for internally conveying the results of the decisions to the respective project organizations and externally to the Fernald site's stakeholders. Each of the environmental media sections of this plan (Sections 3.0 through 6.0) provides detailed discussions of the specific IEMP data use and decision-making criteria that are relevant to that particular medium.

Additionally it is important to note that monitoring will be conducted following the completion of cleanup as required to assess the continued protectiveness of the remedial actions. The IEMP will specify the type and frequency of environmental monitoring activities to be conducted during remedy implementation, and ultimately, following the cessation of remedial operations as appropriate. The IEMP will delineate the Fernald site's responsibilities for sitewide monitoring of surface water and sediment over the life of the remedy, and ensure that FRLs are achieved at project completion. The IEMP will also serve as the primary vehicle for determining to EPA and OEPA's satisfaction that remedial action objectives for the Great Miami Aquifer have been attained. In addition to these FRL attainment responsibilities, the IEMP will also define sitewide remedial monitoring requirements for air.

1.5.1 What are the Management Decisions that the IEMP Will Support?

In its role of compiling the information necessary to assess cumulative sitewide impacts, the IEMP supports the following key management decisions:

- From an environmental media perspective, are environmental restoration activities complete such that cleanup standards are achieved and monitoring can be ceased or reduced?
- From a sitewide perspective, is the Fernald site maintaining compliance with its various regulatory requirements for emission control and environmental monitoring?
- Are there any trends in the sitewide environmental monitoring data that indicate the potential for an unacceptable future condition?
- In the event of a regulatory non-compliance situation or potentially unacceptable cumulative trend, what activities or projects are the principal contributors to the situation?
- What specific response actions must be taken to address the situation, and which projects are affected?
- What communication with regulatory agencies or other concerned stakeholders is necessary as a result of the situation and/or decisions made?

The response action decisions necessary to address potentially undesirable cumulative effects could involve:

- Upgrading project-specific emissions controls (beyond those that are regulatory-based) for one or more projects to further reduce cumulative emissions
- Slowing the pace of activities within one or more remedial projects for a specified period of time
- Altering the number or variety of active projects underway at a particular time
- Continued monitoring of cumulative data trends.

As discussed in the next subsection, Fernald site decision makers will be conducting ongoing evaluations of the data generated by both the projects and the IEMP to ensure satisfactory operating conditions are maintained during remedy implementation and through post-closure.

SECTION 3

Ultimately, the IEMP is used to document the approach of determining when the various modules can be removed from service, once remedial action objectives for the Great Miami Aquifer provided in the Record of Decision for Remedial Actions at Operable Unit 5 are achieved. The IEMP will later serve to verify the completion of the aquifer restoration. The sampling strategy used to verify completion will be described in future revisions to the IEMP.

Along with this performance-based responsibility, the IEMP serves to integrate several former compliance-based groundwater monitoring or protection programs:

- OEPA Director's Findings and Orders for property boundary groundwater monitoring to satisfy RCRA facility groundwater monitoring requirements
- Private well sampling
- Groundwater Protection Management Program Plan.

As discussed in Section 3.7, these activities were brought together under a single reporting structure to facilitate regulatory agency review of the progress of the Operable Unit 5 groundwater remedy.

3.2 SUMMARY OF REGULATORY DRIVERS, DOE POLICIES, AND OTHER FERNALD SITE-SPECIFIC AGREEMENTS

This section presents a summary evaluation of the regulatory-based requirements and policies governing monitoring of the Great Miami Aquifer. The intent of the section is to identify the pertinent regulatory drivers, including ARARs and to-be-considered requirements, for the scope and design of the Great Miami Aquifer groundwater monitoring system. These requirements are used to confirm that the program design satisfies the regulatory obligations for monitoring that have been activated by the Operable Unit 5 Record of Decision, and to achieve the intentions of other pertinent criteria, such as DOE Orders and the Fernald site's existing agreements that have a bearing on the scope of groundwater monitoring.

The results of the analysis are also used to define, as appropriate for these media, the administrative boundaries between the IEMP and the project-specific source control monitoring conducted by other organizations.

3.2.1 Approach

The analysis of the regulatory drivers and policies for groundwater monitoring was conducted by examining the suite of ARARs and to-be-considered requirements in the five approved CERCLA operable unit records of decision to identify the subset with specific groundwater monitoring requirements. The Fernald site's existing compliance agreements issued outside the CERCLA process (such as the September 10, 1993, OEPA Director's Findings and Orders [OEPA 1993]) were also reviewed.

3.2.2 Results

The following regulatory drivers, compliance agreements, and DOE policies were found to govern the monitoring scope and reporting requirements for remedy performance monitoring and general surveillance of the protectiveness of the Great Miami Aquifer groundwater remedy:

- The CERCLA Record of Decision for Remedial Actions at Operable Unit 5, which requires the extraction and treatment of Great Miami Aquifer groundwater above FRLs until the full, beneficial use potential of the aquifer is achieved, including use as a drinking water source. The FRLs are established by considering chemical-specific ARARs, hazard indices, and background and detection limits for each contaminant. Many Great Miami Aquifer FRLs are based on established or proposed Safe Drinking Water Act maximum contaminant levels (MCLs), which are ARARs for groundwater remediation. For FCP-related contaminants that do not have an established MCL under the Safe Drinking Water Act, a concentration equivalent to an incremental lifetime cancer risk of 10^{-5} for carcinogens or a hazard quotient of 1 for non-carcinogens was used as the FRL, unless background concentrations or detection limits are such that health-based limits could not be attained. (In these cases the background or detection limit became the FRL.) The FRLs will be tracked throughout all affected areas of the aquifer and will be the basis for determining when the Great Miami Aquifer restoration objectives have been met. By definition, the Operable Unit 5 Record of Decision incorporates the requirements of the FCP's existing CERCLA South Plume Removal Action (which was the regulatory driver for the former Design Monitoring and Evaluation Program Plan and the Groundwater Monitoring and Reporting Program).

- Per the CERCLA Remedial Design Work Plan for Remedial Actions at Operable Unit 5, monitoring will be conducted following the completion of cleanup as required to assess the continued protectiveness of the remedial actions. The IEMP will specify the type and frequency of environmental monitoring activities to be conducted during remedy implementation, and ultimately, following the cessation of remedial operations as appropriate. The IEMP will delineate the Fernald site's responsibilities for sitewide monitoring over the life of the remedy, and ensure that FRLs are achieved at project completion. The IEMP will also serve as the primary vehicle for determining to EPA and OEPA's satisfaction that remedial action objectives for the Great Miami Aquifer have been attained.

- The September 10, 1993, OEPA Director's Findings and Orders, which required groundwater monitoring at the Fernald site's property boundary to satisfy RCRA facility groundwater monitoring requirements, have been superceded by Directors Final Findings and Orders, issued September 7, 2000. The September 7, 2000 Directors Final Findings and Orders specify that the site's groundwater monitoring activities will be implemented in accordance with the IEMP. The revised language allows modification of the groundwater monitoring program as necessary via the IEMP revision process without issuance of a new order.

- DOE Order 5400.1, General Environmental Protection Program, which establishes the requirement for a Groundwater Protection Management Program Plan (GPMPP) for DOE facilities. The required informational elements of a GPMPP are fulfilled by the Remedial Investigation (DOE 1995e) and Feasibility Study reports for Operable Unit 5. The groundwater monitoring program requirement is being fulfilled by the IEMP. This also satisfies DOE Manual 435.1 (DOE 2001c), which refers to DOE Order 5400.1.

- DOE Order 5400.5, Radiation Protection of the Public and Environment, which establishes radiological dose limits and guidelines for the protection of the public and environment. Demonstration of compliance with these limits and guidelines for radiological dose is based on calculations that make use of information obtained from the FCP's monitoring and surveillance program. This program is based on guidance in the Environmental Regulatory Guide for Radiological Effluent Monitoring and Environmental Surveillance (DOE 1991). The FCP's private well sampling program for the Great Miami Aquifer (that was previously in the Fernald Site Environmental Monitoring Plan [DOE 1995c]) is conducted to satisfy the intention of this DOE Order with respect to groundwater. While most private well water users in the affected area are now provided with a public water supply, a limited private well sampling activity will be maintained to supplement the groundwater monitoring network provided by monitoring wells. A dose assessment is no longer required due to the availability of a public water supply.

- The 1986 Federal Facilities Compliance Agreement, which requires that the FCP maintain a sampling program for daily flow and uranium concentration of discharges to the Great Miami River and report the results quarterly to the EPA, OEPA, and Ohio Department of Health. The sampling program conducted to address this requirement has been modified over the years and is currently governed by an agreement reached with EPA and OEPA in early 1996 with modifications documented and approved through biennial IEMP revisions. For groundwater, this agreement is specifically related to the South Plume wellfield to quantify the amount of uranium removed and total volume of groundwater extracted.

The groundwater monitoring plan provided in this IEMP has been developed with full consideration of the regulatory drivers described above. Each of these drivers and the associated monitoring conducted to comply with these drivers are listed in Table 3-1. Table 3-1 also lists each regulatory requirement for the on-site disposal facility groundwater monitoring program and the associated project-specific plan. Sections 3.7 and 7.0 outline the current and long-range plan for complying with the reporting requirements contained in the IEMP drivers.

Project-specific groundwater monitoring is required only for one project—the on-site disposal facility. The IEMP will not be used as the mechanism for conducting on-site disposal facility performance monitoring within the glacial overburden and the Great Miami Aquifer. A leak detection monitoring program plan, which includes both leachate and groundwater monitoring as part of a leak detection program, was submitted separately from the IEMP and approved by EPA and OEPA in 1997. The on-site disposal facility monitoring requirements include the regulatory drivers, the ARARs, and to-be-considered criteria that have a bearing on the design and execution of a groundwater monitoring program for the on-site disposal facility and are as follows:

- Ohio Solid Waste Disposal Facility Groundwater Monitoring Rules, Ohio Administrative Code (OAC) 3745-27-10, which specify groundwater monitoring program requirements for sanitary landfills. These regulations describe a three-tiered program for detection, assessment, and corrective measures.

TABLE 3-1

FERNALD SITE GROUNDWATER MONITORING PROGRAM REGULATORY DRIVERS AND RESPONSIBILITIES

	DRIVER	ACTION
IEMP	CERCLA Record of Decision for Operable Unit 5	The IEMP describes routine monitoring to ensure remedy performance and to evaluate impacts of remediation activities to the Great Miami Aquifer. The IEMP will be modified toward completion of the remedial action to include a sampling plan to certify achievement of the FRLs.
	OEPA Director's Final Findings and Orders; RCRA/Hazardous Waste Facility Groundwater Monitoring	The IEMP describes routine monitoring at wells located at the property boundary to ensure remedy performance and to evaluate impacts of remediation activities to the Great Miami Aquifer.
	DOE Order 5400.1, Groundwater Protection Management Plan. Also satisfies DOE M 435.1 which refers to DOE Order 5400.1	The IEMP describes routine monitoring to ensure remedy performance and to evaluate impacts of remediation activities to the Great Miami Aquifer.
	DOE Order 5400.5, Radiation Protection of Public and Environment	No longer required.
	Federal Facilities Compliance Agreement, Radiological Monitoring	The IEMP describes the routine sampling and reporting of the South Plume wellfield in terms of the total volume extracted and the amount of uranium removed.

- Continue to fulfill DOE Order 5400.1 requirements to maintain an environmental monitoring plan for groundwater
- Continue to address concerns of the community regarding the progress of the aquifer restoration.

Following active remediation, monitoring will be conducted to check for rebound and to certify cleanup. Design considerations for rebound and certification groundwater monitoring will be incorporated, where necessary, into later revisions to the IEMP. The following section provides the design considerations required to monitor remedy performance in 2005 and 2006.

3.4.2 Design Considerations

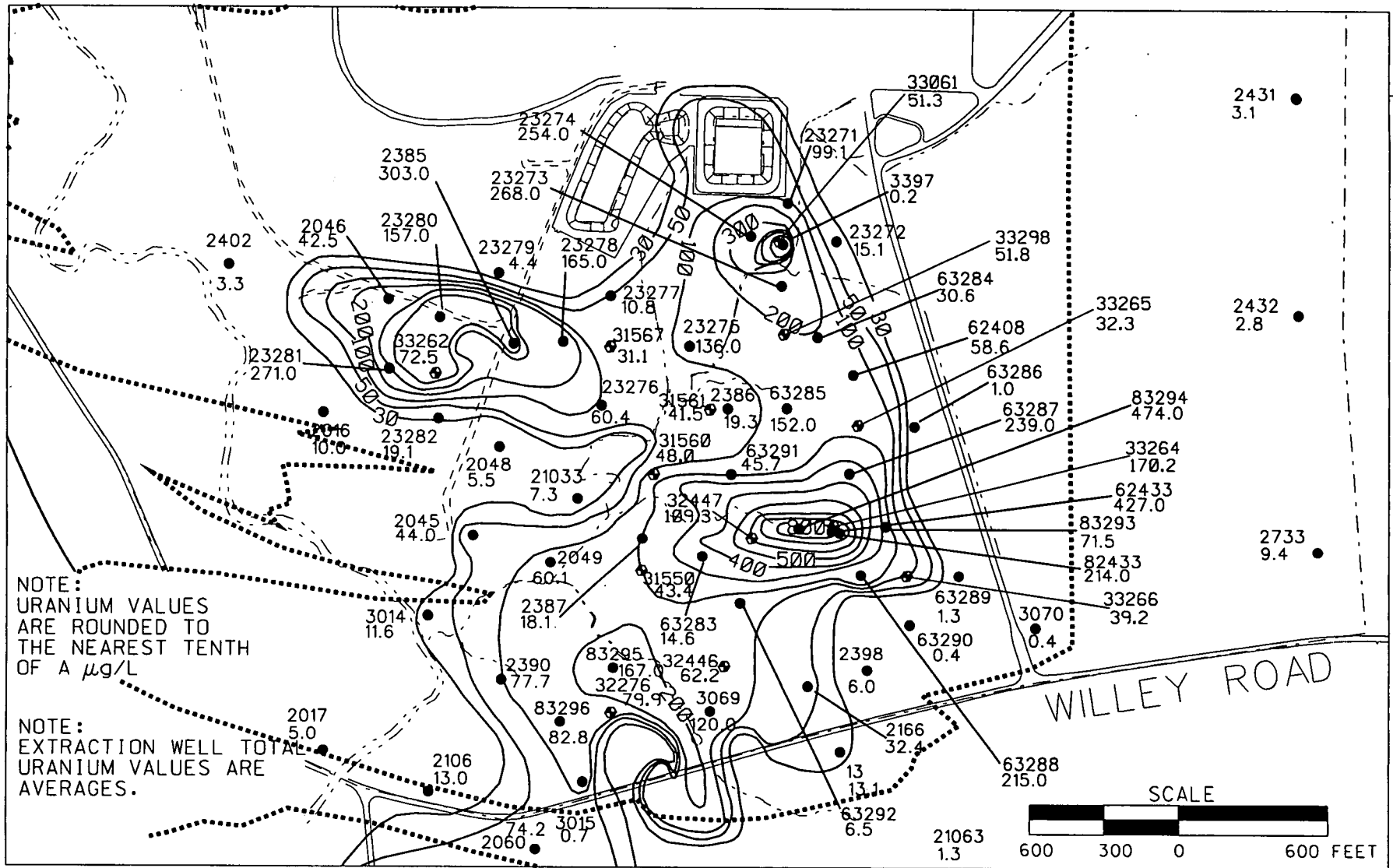
3.4.2.1 Background

The Great Miami Aquifer is contaminated with uranium and other constituents from the Fernald site. An evaluation of the nature and extent of contamination in the Great Miami Aquifer can be found in the Remedial Investigation Report for Operable Unit 5. Uranium is the principal COC.

Figures 3-2A and 3-2B show the maximum total uranium plume map (30 μg/L uranium or higher) as of the second half of 2003. These maps represent a compilation of several different monitoring depths within the aquifer, and illustrates the maximum lateral extent of the plume at all depths. Over the majority of the plume, the top of the plume is situated at the water table. In some regions of the aquifer though, the top of the plume is situated below the water table. More detailed presentations of the geometry of the uranium plume can be found in Appendix G of the Baseline Remedial Strategy Report, Remedial Design for Aquifer Restoration (Task 1) (DOE 1997a); the Conceptual Design for Remediation of the Great Miami Aquifer in the Waste Storage and Plant 6 Areas (DOE 2000a); and the Design for Remediation of the Great Miami Aquifer South Field (Phase II) Module (DOE 2002b).

The primary sources of contamination at the Fernald site that contributed to the present geometry of the uranium plume include: (1) the waste pits in the waste storage area; (2) the inactive fly ash pile that was present in the South Field area; (3) former production activities, and (4) the previously uncontrolled surface water runoff from the former production area that had direct access to the aquifer through the Pilot Plant Drainage Ditch, Storm Sewer Outfall Ditch, and Paddys Run.

A groundwater remediation strategy that relies on pump-and-treat technology is being used to conduct a concentration-based cleanup of the Great Miami Aquifer. The restoration strategy focuses primarily on the removal of uranium, but has also been designed to limit the further expansion of the plume, achieve removal of all targeted contaminants to concentrations below designated FRLs, and prevent undesirable draw-down impacts beyond the Fernald site property.



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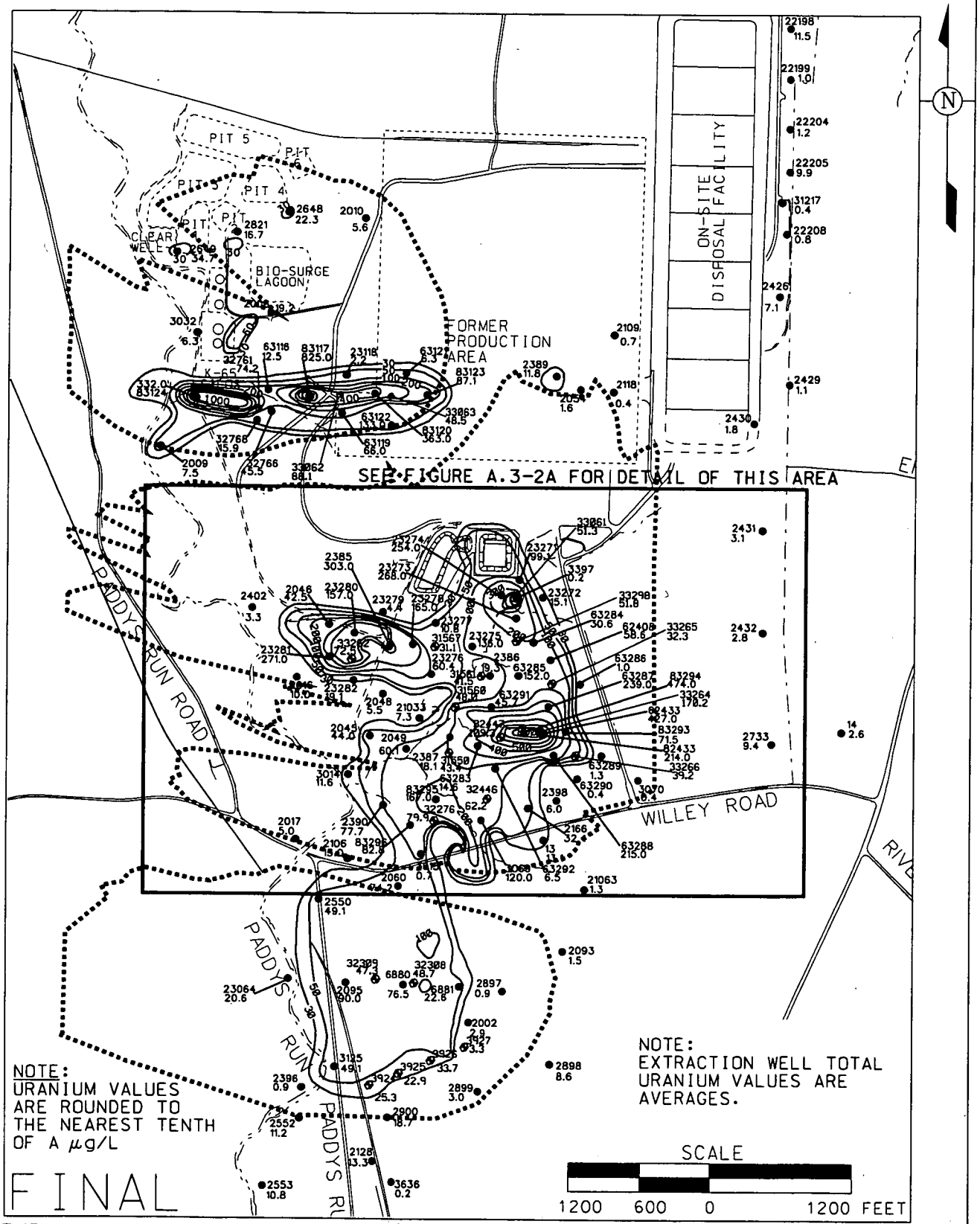
STATE PLANAR COORDINATE SYSTEM 1983

FIGURE 3-2A. MONITORING WELL DATA AND MAXIMUM TOTAL URANIUM PLUME IN SOUTH FIELD THROUGH THE SECOND HALF OF 2003

04-JAN-2005



LEGEND:
- FERNALD SITE BOUNDARY
- 10-YEAR, TIME-OF-TRAVEL REMEDIATION FOOTPRINT
- 5.1 TOTAL URANIUM CONCENTRATION MEASURED IN THE SECOND HALF OF 2003
- —— 30 —— URANIUM CONTOURS BASED ON 30 µg/L FRL, MAXIMUM GEOPROBE RESULTS, AND MAXIMUM TOTAL URANIUM DATA THROUGH THE SECOND HALF OF 2003
- ● MONITORING WELL
- ⊕ EXTRACTION WELL

FIGURE 3-2B. MONITORING WELL DATA AND MAXIMUM TOTAL URANIUM PLUME THROUGH THE SECOND HALF OF 2003

Pumping prior to the start of the actual remediation began in August of 1993 with the startup of five extraction wells in the South Plume. The wells were installed and operated as part of a removal action to prevent the further southern migration of the uranium plume while the Remedial Investigation of the plume was being completed and a remediation system was being designed.

The design of the aquifer remediation system has evolved via the issuance of several different design documents. The first aquifer remediation design was presented in the Operable Unit 5 Feasibility Study. The design consisted of 28 extraction wells pumping for 27 years. It is this design that is contained in the Operable Unit 5 Record of Decision. A commitment was also made in the Operable Unit 5 Record of Decision to pursue technological advances that might decrease the remediation time. A technology that was pursued was treated groundwater re-injection. Groundwater modeling was conducted to determine if adding re-injection wells to the remediation would facilitate a quicker cleanup. The groundwater modeling showed that a faster cleanup could be realized by using re-injection if several other actions were also realized. These other actions included:

- Other operable units completing their accelerated cleanup objectives so that surface access is available for aquifer remediation wells
- The accelerated removal of sources to allow extraction wells to be located closer to the center of uranium plumes
- Modeled geochemical and hydraulic parameters being consistent with aquifer conditions.

An aquifer remediation design, which included re-injection, was presented in the Baseline Remedial Strategy Report, Remedial Design for Aquifer Restoration. This design called for 37 pumping wells and 10 re-injection wells. The predicted cleanup time was modeled at 10 years. The pumping and re-injection wells were subdivided into five area specific restoration modules:

- The South Plume Module
- The South Field Module
- The Waste Storage Area Module
- The Plant 6 Module
- The Re-Injection Demonstration Module

Although groundwater modeling showed that re-injection expedited the cleanup, the technology was unproven at the Fernald site. Of concern was the cost of keeping the wells operational (industry experience showed that these wells tend to plug). A demonstration was needed to prove that the re-injection wells could be operated efficiently at the Fernald site. The decision was made to tie the demonstration into the remedy design presented in the Baseline Remedial Strategy Report. If successful, the impact to the remedy would be immediate.

In the summer of 1998, the first wells for the aquifer remediation became operational and marked implementation of the aquifer remedy design presented in the Baseline Remedial Strategy Report. Implementation of the Baseline Remedial Strategy Report design included a groundwater re-injection demonstration that was conducted from September 2, 1998, to September 2, 1999. At the request of the FCP, the evaluation of re-injection technology at the Fernald site was sponsored by the DOE's Office of Science and Technology Subsurface Contaminants Focus Area. The re-injection demonstration was successful and re-injection was incorporated into the aquifer remedy.

Changes to the aquifer remedy design for the Waste Storage Area and Plant 6 modules were implemented in 2002 based on findings and groundwater modeling results presented in the Conceptual Design for Remediation of the Great Miami Aquifer in the Waste Storage and Plant 6 Areas. Characterization efforts conducted in support of the design showed that the uranium plume in the Plant 6 area had dissipated eliminating the need for extraction wells in this area. Therefore, an aquifer restoration module is no longer planned for the Plant 6 area; however, groundwater monitoring in the Plant 6 area will continue under the IEMP.

Characterization efforts conducted in support of the waste storage area design also showed that the uranium plume in the waste storage area was smaller than what was characterized during the remedial investigation/feasibility study, and that the waste storage area uranium plume in the vicinity of the confluence of Paddys Run and the Pilot Plant Drainage Ditch needed to be redefined and extended to the east. In light of these findings, a new restoration module for the waste storage area was modeled and designed. The number of wells needed in the design to remediate the waste storage area went from 10 (Baseline Remedial Strategy Report design) down to five (modified module design). The details concerning this design are presented in the document Design for Remediation of the Great Miami Aquifer in the Waste Storage and Plant 6 Areas (DOE 2001a). Three of the extraction wells began pumping in 2002. The remaining two extraction wells will be installed as part of the Waste Storage Area (Phase II) Design. The Waste Storage Area (Phase II) Design will be completed in early 2005 and any additional extraction wells specified in that design will be installed and operating by late 2005.

Changes to the aquifer remedy design for the South Field module were implemented in 2003 based on findings presented in the Design for Remediation of the Great Miami Aquifer, South Field (Phase II) Module. Characterization efforts conducted to support the design showed that uranium concentrations beneath western portions of the Southern Waste Units were much lower than in previous years. The lower concentrations were attributed to source removal, natural flow of clean groundwater from the west into the area, the continued flushing of clean recharge water through Paddys Run to the underlying aquifer, increased flushing of clean recharge water through deep surface excavations in the inactive flyash pile, and remedial pumping of the extraction wells to the east of this area. The modified design for Phase II of the South Field Module went from nine new extraction wells and five new re-injection wells (Baseline Remedial Strategy Report design) down to four new extraction wells, one new re-injection well, conversion of an existing extraction well into an injection well, and an injection basin (modified module design).

The most recent aquifer remedy design change was implemented in 2004 to address changing water treatment needs and to stop well-based re-injection. With site closure in 2006, several water treatment flows will be eliminated or reduced (e.g., remediation wastewater, sanitary wastewater, storm water runoff) from the scope of the treatment operation. Elimination or reduction of these flow streams provided an opportunity to reduce the size of the water treatment facility that would remain to service the aquifer restoration after site closure. Reducing the size of the treatment facility prior to site closure in 2006 will reduce the amount of impacted materials that may need future off-site disposal. In 2004, consensus was reached on a decision to "carve down" the AWWT into a smaller, converted AWWT facility (CAWWT). During and after CAWWT construction, groundwater treatment capacity will be limited so that treated groundwater will not be available to support well-based re-injection and continue to meet uranium discharge requirements. Therefore, in September 2004 well-based re-injection was stopped to facilitate construction of the CAWWT.

Groundwater modeling presented in the Comprehensive Groundwater Strategy Report (DOE 2003a) predicts that continued use of large-scale re-injection using current re-injection wells would shorten the aquifer remedy by three years (comparison of Alternatives 1 and 6). These results indicate limited benefit to maintaining the infrastructure for large-scale, well-based re-injection when viewed in relation to water treatment facility scale down activities, and supports the decision to stop re-injection. Therefore, the decision was also made in 2004 not to restart well-based re-injection once the CAWWT was operational.

Other operational strategies to enhance the aquifer remedy are being explored, such as inducing recharge to the Great Miami Aquifer through the Storm Sewer Outfall Ditch. A phased testing approach is being pursued for the Storm Sewer Outfall Ditch that involves measuring induced flow rates into the Storm Sewer Outfall Ditch, measuring seasonal runoff flow into the Storm Sewer Outfall Ditch, and possibly conducting site-specific infiltration tests at key locations in the bed of the Storm Sewer Outfall Ditch.

The phased testing will result in a decision in early 2005 to either incorporate the Storm Sewer Outfall Ditch recharge strategy into the site remedy or to conduct further testing following completion of Storm Sewer Outfall Ditch source removal activities. A baseline flow test is scheduled to begin in the fall of 2004 to determine if the Storm Sewer Outfall Ditch is capable of accepting an induced flow of 500 gpm. Clean groundwater will be pumped into the Storm Sewer Outfall Ditch from a construction well located on the east side of the FCP property. This baseline test will be limited to the clean (northeast) branch of the Storm Sewer Outfall Ditch. If the baseline test is successful and plans are made to use the Storm Sewer Outfall Ditch strategy in the groundwater remedy, a flow rate higher than the 500 gpm will be considered, but logistics involving a source of clean water and meeting established discharge limits at the Parshall Flume will need to be evaluated also. A treatment capacity of 500 gpm is being reserved to treat storm water so it cannot be dedicated to re-injection. Water treatment priorities are defined in Section 5.2 of the Operations and Maintenance Master Plan (OMMP) for Aquifer Restoration and Wastewater Treatment, Revision 2, Draft. At a minimum, additional flow measurements will be made in the spring of 2005 to quantify how much water above and beyond the 500 gpm induced flow that the Storm Sewer Outfall Ditch will also accept from natural seasonal runoff. Site-specific infiltration tests through the bed of the Storm Sewer Outfall Ditch may also be conducted. If the baseline 500 gpm flow test is not successful, additional flow testing will be conducted, but not until Storm Sewer Outfall Ditch excavation activities in the northwest branch of the Storm Sewer Outfall Ditch are completed. Additional flow testing in the Storm Sewer Outfall Ditch would then involve both the northwest and northeast branches of the Storm Sewer Outfall Ditch. The flow rate for this additional testing will be a minimum of 500 gpm, but could be higher based on logistics involving an additional source of clean water and meeting established discharge limits at the Parshall Flume and the ability of the Storm Sewer Outfall Ditch to accept the water. If this later flow testing is successful, then the Storm Sewer Outfall Ditch recharge strategy will be added to the aquifer remedy.

3.4.2.2 The Modular Approach to Aquifer Restoration in 2005 and 2006

Restoration of the Great Miami Aquifer is being accomplished by using a series of area-specific groundwater restoration modules and a centralized water treatment facility (refer to Figure 3-1).

In 2005 and 2006 the South Field Extraction Module, South Plume Module, and Waste Storage Area (Phase I) Module will all be operational. The Waste Storage Area (Phase II) Module will be designed and placed into operation in 2005. Figure 3-3 shows the location of the extraction wells that comprise these modules.

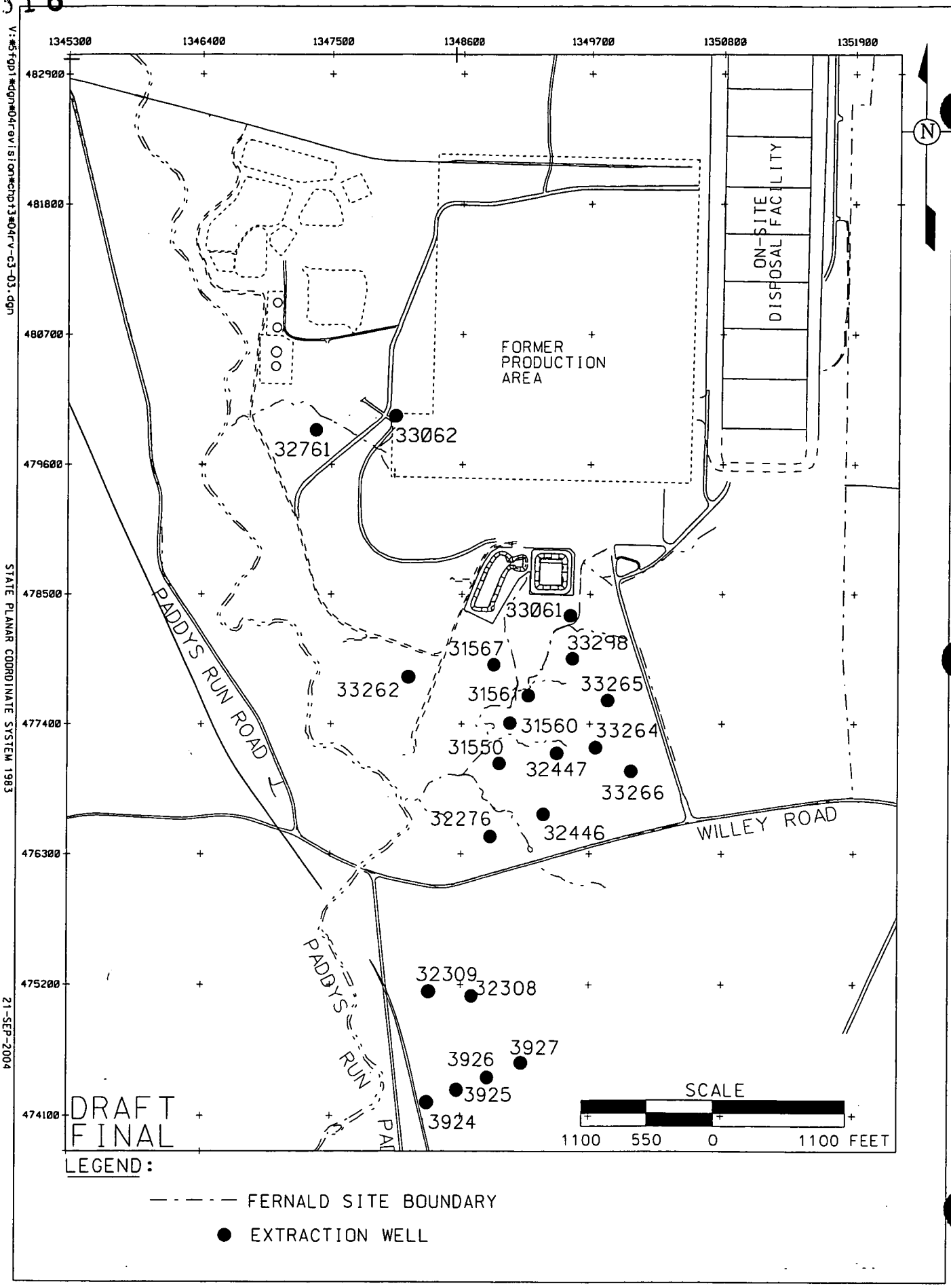


FIGURE 3-3. EXTRACTION WELL LOCATIONS

South Plume Module

Six extraction wells (3924, 3925, 3926, 3927, 32308, and 32309) will be operational in the South Plume Module in 2005 and 2006. Extraction Wells 3924, 3925, 3926, and 3927, which were originally called the South Plume Module, have been in operation since 1993 as part of a removal action. Located at the southern edge of the total uranium plume, the initial South Plume Module, as reported in the Work Plan for the South Contaminated Plume Removal Action (DOE 1992), was installed to create a hydraulic barrier and to prevent the further southern migration of the uranium plume. In 1998 two additional extraction wells (32308 and 32309) became operational just north of the four original South Plume Module wells. These two wells were installed under a project known as the South Plume Optimization Module. The term "South Plume Module" is used to refer to both the original extraction wells installed under the South Plume Module and those installed under the South Plume Optimization Module.

South Field Module

Thirteen extraction wells (31550, 31560, 31561, 31567, 32276, 32446, 32447, 33061, 33262, 33264, 33265, 33266, and 33298) will be operational in the South Field Module in 2005 and 2006. Restoration of the aquifer in the South Field area began in 1998 when 10 extraction wells (31550, 31560, 31561, 31562, 31563, 31564, 31565, 31566, 31567, and 32276) began pumping around the excavation area near the Storm Sewer Outfall Ditch (South Field Extraction [Phase I] Module). Five of the original ten extraction wells (31562, 31563, 31564, 31565, and 31566) are no longer operating:

- Extraction Well 31562 was shut down in 2003 and replaced by a new well (33298)
- Extraction Well 31563 was shut down in 2002 and converted to a re-injection well as part of the South Field (Phase II) project
- Extraction Wells 31564 and 31565 were shut down in 2001 so that additional soil remediation could be conducted in the area
- Extraction Well 31566 was shut down in 1998 to minimize the potential for pulling contamination into a region of the aquifer with finer grain sediment.

The South Field module was expanded in 1999 and 2002. In 1999 Extraction Wells 32446 and 32447 were added and began operating in 2000. Extraction Well 33061 was added and became operational in 2002. In 2003 the module was modified again, this time as part of Phase II. Four new extraction wells (33262, 33264, 33265, 33266), one replacement well (33298), two re-injection wells (33263, 31563), and one injection basin became operational. With the decision made in 2004 to stop well-based re-injection, the two re-injection wells (33263 and 31563) will not be operating in 2005 and 2006. Also, the injection basin will become a passive feature in that water will not be actively pumped to the basin. Figure 3-3 shows the location of the extraction wells that will be operational in 2005 and 2006.

Waste Storage Area Module

Two extraction wells (32761 and 33062) will be operational in the Waste Storage Area Module at the beginning of 2005. In 2004 a third extraction well (Well 33063) was plugged and abandoned to make way for surface excavation operations. A replacement well for Well 33063 is scheduled for installation in 2005. Phase II of the Waste Storage Area Module is also scheduled to be designed and installed in 2005.

The groundwater monitoring program is designed around the remediation modules presented above. For monitoring purposes, the aquifer is divided into five zones referred to as aquifer zones (refer to Figure 3-4). These aquifer zones are used to evaluate the predicted performance (both individually and collectively) at the aquifer restoration modules. Aquifer Zones 1, 2, and 4 contain aquifer remediation modules. Aquifer Zone 0 (the fifth zone) is the area outside the other four aquifer zones. The locations of the extraction wells comprising the restoration modules are as follows:

- The South Plume Module is located in Aquifer Zone 4
- The South Field Extraction (Phases I and II) Module is located in Aquifer Zone 2
- The Waste Storage Area Module is located in Aquifer Zone 1.

Groundwater modeling predicts that aquifer remedy pumping will create a hydraulic capture zone that is larger than the actual dimension of the 30-µg/L total uranium plume. In previous plans, the extent of this capture zone was called the 10-year, uranium-based restoration footprint. The 10-year time reference originated from the 1997 modeling done for the Baseline Remedial Strategy Report that predicted a 10-year cleanup time. As discussed earlier, the current design is modified from the Baseline Remedial Strategy Report design; therefore, the 10-year aquifer restoration footprint originating from the Baseline Remedial Strategy Report is no longer applicable to the remedy. A new 10 year time-of-travel footprint that does not include well-based re-injection operations was presented in the Groundwater Remedy Evaluation and Field Verification Plan, Revision 0, Final. Information concerning how this new footprint was constructed is also presented in that report. The new 10-year, time-of-travel remediation footprint is shown in Figure 3-4 so that its relationship to the aquifer zones can be seen.

3.4.2.3 Well Selection Criteria

Geologic and hydrogeologic properties, predicted and actual groundwater flow, and contaminant distribution within the Great Miami Aquifer (before and during remediation), serve as input to the design and modification of the IEMP groundwater monitoring network. Field measurements and computer simulations were conducted to support initial design efforts. Continued monitoring and modeling (to support module design and changes) are used to assess the adequacy of the monitoring network.

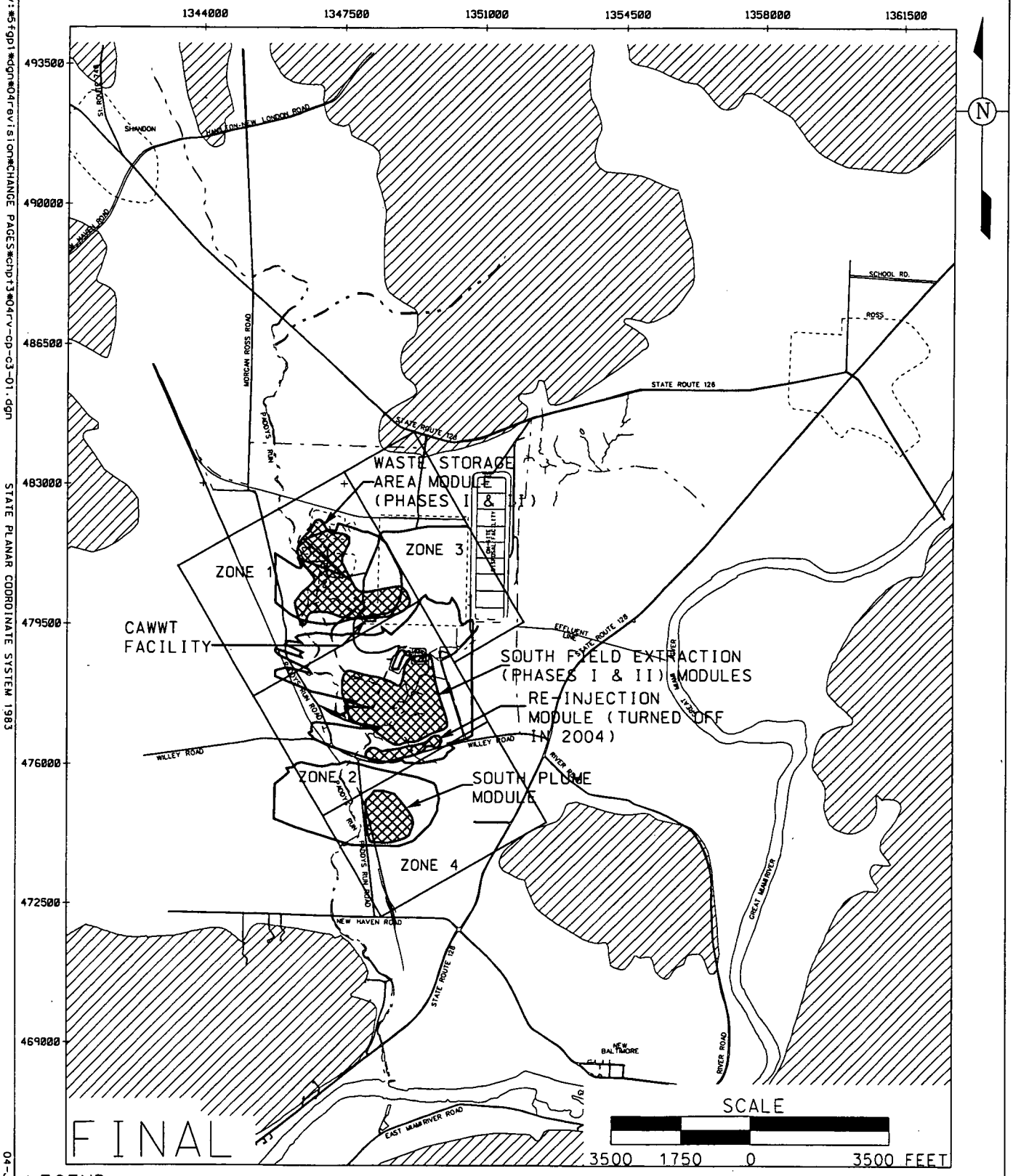


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FIGURE 3-4. GROUNDWATER AQUIFER ZONES AND AQUIFER RESTORATION FOOTPRINT

All available information is reviewed to select appropriate monitoring well locations. The monitoring well locations for the IEMP are selected according to the following criteria:

- Monitor within the projected capture zone of the groundwater restoration operation unless an operational concern (e.g., the close proximity of the South Plume extraction wells to the Paddys Run Road Site plume) requires a monitoring location to be outside of the capture zone.

  Note: Most of the extraction wells planned for the aquifer remedy are installed and operational. A few additional extraction wells are planned for the waste storage area. Additional extraction wells may be installed if conditions indicate that they are needed. Also, pumping rates may change to optimize the operation through time. To be conservative, the monitoring well network will cover the capture zone predicted for all planned pumping wells, not just for the wells in service at the time that monitoring is taking place. This capture zone is not static, but may change over time to reflect new pumping operations.

- Use existing monitoring wells and avoid installing new monitoring wells until determined necessary based on operational knowledge, which will be used to help select new locations

- Provide adequate areal coverage across each remediation module area

- Include monitoring wells, which are needed to meet site-specific monitoring commitments

- Avoid selecting monitoring well locations that would interfere with surface remediation activities such as soil excavations

  Note: This criterion is becoming less of a concern because most of the planned monitoring wells are already in place. At issue, though, is the loss of monitoring wells should excavation activities expand into areas that contain existing monitoring wells. It is anticipated that some monitoring wells in the current network will need to be plugged and abandoned to make way for surface operations, but all efforts will be made to keep existing wells if possible. If wells are lost due to surface operations, replacement wells will be installed, if deemed appropriate at the time.

- Select monitoring well locations that will provide data needed to determine if groundwater model predictions are being achieved

- Select monitoring well locations in consideration of landowner concerns. In the off-property portion of the South Plume, landowner access concerns have, and will continue to have, a bearing on the location and number of monitoring wells in that area. Generally, location of monitoring wells is limited to peripheral areas along the edges of the farm fields. This monitoring well limitation is being addressed through supplemental use of direct push sampling that can be conducted during the times of the year when the fields are not being used for crops.

During 2005 and 2006, 138 wells at the Fernald site will be sampled as identified in the subsections that follow.

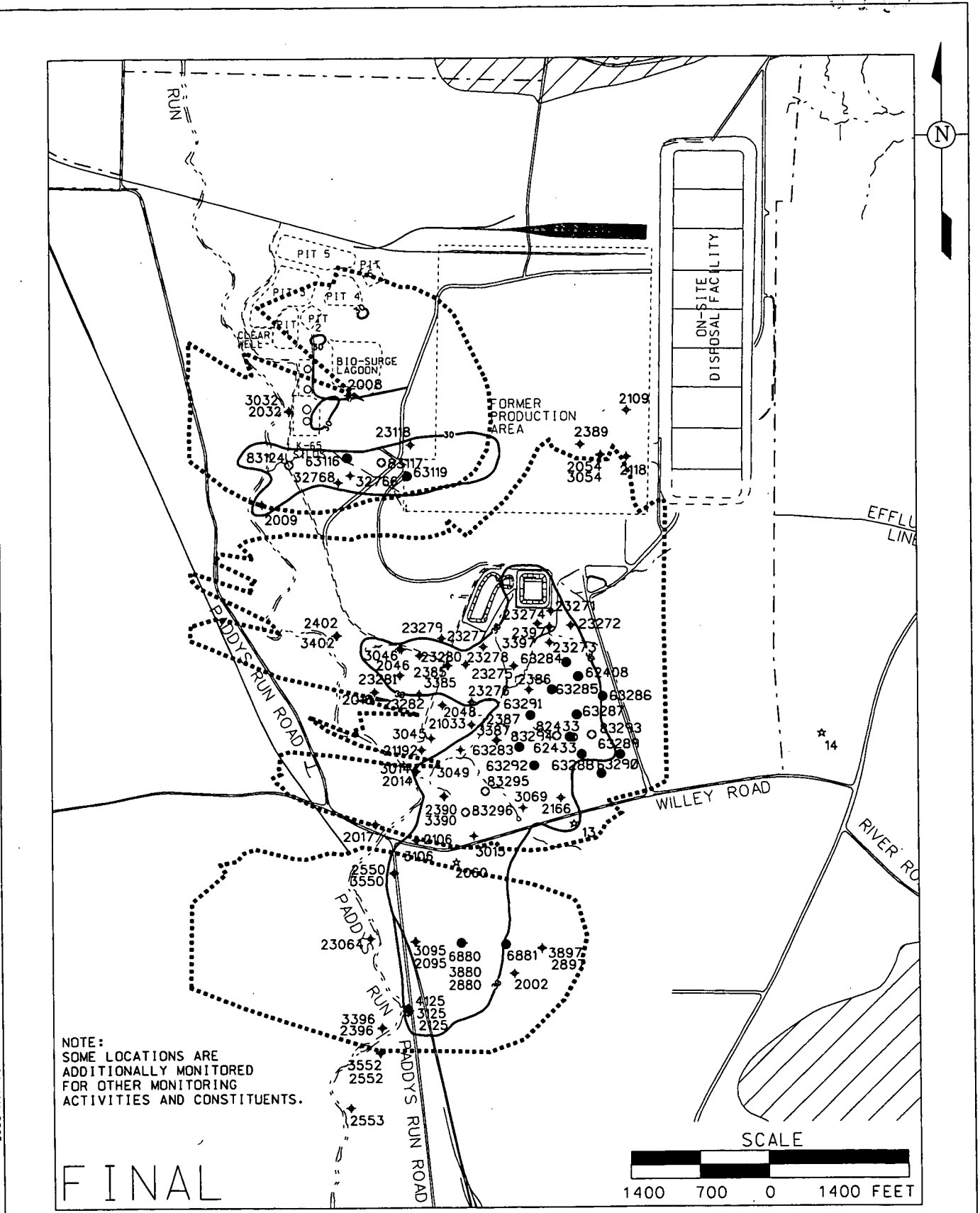

FIGURE 3-5. LOCATIONS FOR SEMIANNUAL TOTAL URANIUM MONITORING ONLY

3.6.2.2 South Field Monitoring

The South Field is located in Aquifer Zone 2 (refer to Figure 3-4). Thirteen extraction wells, (South Field [Phases I and II] Module) are scheduled to be operating in the South Field in 2005 and 2006.

In addition to the monitoring wells being sampled in the South Field for total uranium only (refer to Section 3.6.2.1), two monitoring wells (2045 and 2049) will also be sampled semiannually for boron and total uranium. The rationale for the selection of these wells and this constituent is presented in Section 3.4 and Appendix A. Figure 3-6 shows the locations of these two wells. Following is the sampling table:

SOUTH FIELD MONITORING TABLE
SEMIANNUAL SAMPLING FREQUENCY

General Chemistry	Inorganic	Radionuclide	Organic
NA	Boron	Total Uranium	NA

On September 2, 1999, DOE completed one year of active groundwater re-injection as part of a field-scale demonstration. A report detailing the demonstration was issued to EPA and OEPA on May 30, 2000 (DOE 2000b). Based on the results of the demonstration, re-injection was continued at the Fernald site until the fall of 2004, when the decision was made to stop well-based re-injection. No well-based re-injection is planned for 2005/2006. Also, in situ monitoring for Eh and pH will not take place in 2005-2006.

Direct-push sampling has been conducted annually at seven locations (Wells 12367, 12368, 12369, 12370, 12371, 12372, and 12373) along and south of Willey Road since the Re-Injection Demonstration. Figure 3-7 shows these locations. This annual direct-push sampling will continue in order to track remediation progress. At each direct-push location, a groundwater sample will be collected 1 foot below the water table and at 10-foot intervals beneath the water table until it can be verified that the entire thickness of the 30-µg/L total uranium plume has been sampled.

The 1998 Integrated Site Environmental Report (DOE 1999) reported that chromium VI was not present in the aquifer at the Fernald site and that Eh/pH conditions measured in the aquifer were not oxidizing enough to support the presence of chromium VI. These conclusions were based on sampling that took place at eight well locations where measured total chromium concentrations had recently exceeded the FRL for chromium VI. Eh/pH data presented in the Re-Injection Demonstration Test Report indicate that at least on a transient basis, some Eh/pH measurements (recorded around the re-injection wells during the demonstration) were favorable for supporting hexavalent chromium. This is based on the assumption that oxidation kinetics is instantaneous. Sampling for chromium VI has been conducted twice since 1998 (2001 and 2004) in select monitoring wells near the active re-injection wells. One last monitoring for chromium VI will be conducted in 2006 during the

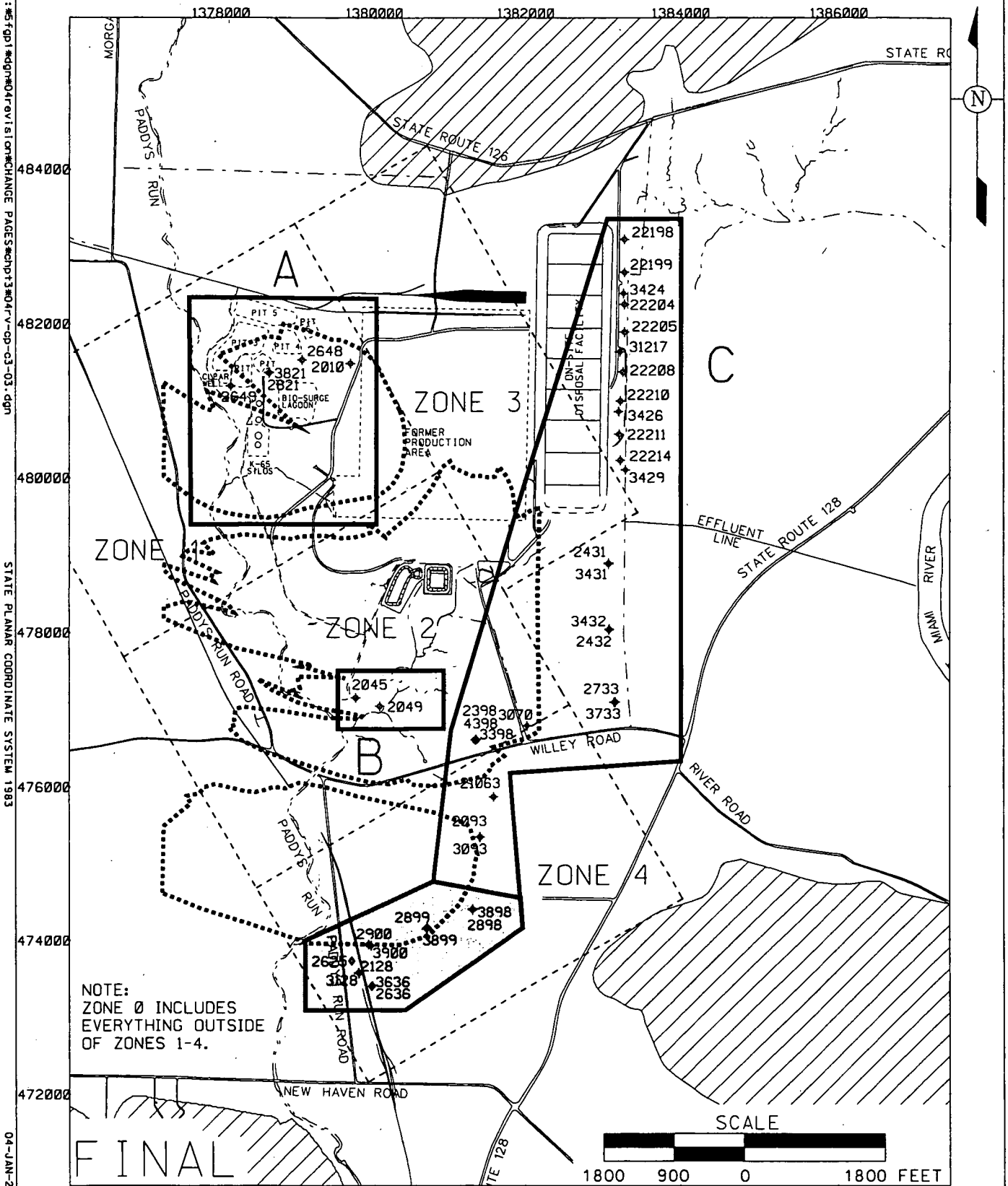

FIGURE 3-6. LOCATIONS FOR SEMIANNUAL MONITORING FOR PROPERTY/PLUME BOUNDARY, SOUTH FIELD, AND WASTE STORAGE AREA

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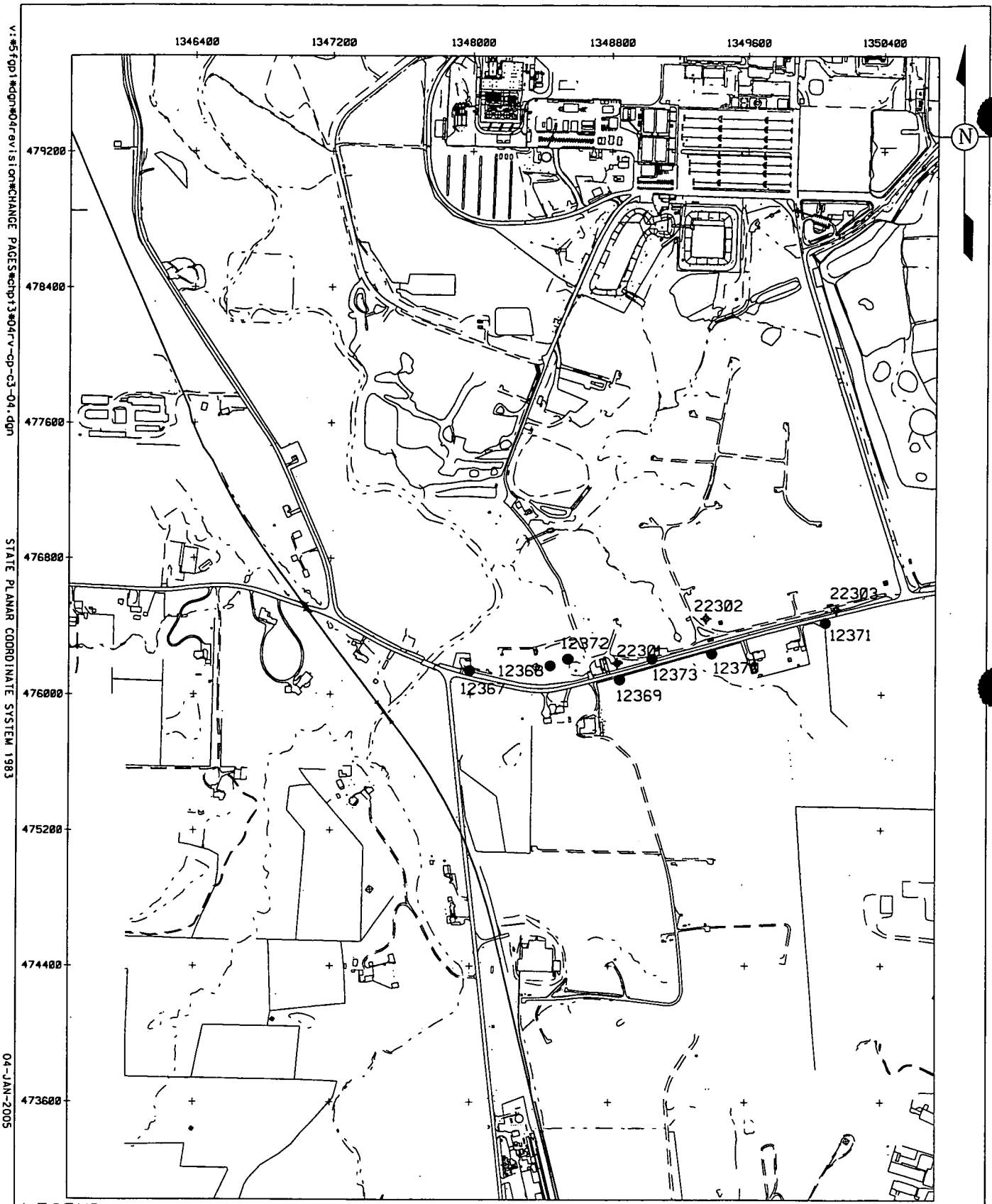


FIGURE 3-7. CHROMIUM VI MONITORING WELLS AND DIRECT-PUSH SAMPLING LOCATIONS

The approximately 170 monitoring wells, which were selected for water level monitoring in 2005 and 2006, are shown in Figure 3-8 and listed below.

Groundwater elevation monitoring locations were selected to provide areal coverage across all areas of the Fernald site with an increasing density of wells in areas surrounding active aquifer restoration wells. Groundwater elevations will be measured quarterly in these wells to provide data for construction of water table elevation maps. These maps will be used to interpret the location of flow divides, capture zones, and stagnation zones created by the operation of remediation wells. Additional monitoring wells and more frequent measurement intervals may be used near aquifer remediation modules as they become operational and as sensitive capture zones or stagnation zones are identified, or if unpredicted fluctuations in contaminant concentrations are observed.

LIST OF GROUNDWATER ELEVATION MONITORING WELLS

80	2383	2897	62433	23280
2002	2384	2898	63116	23281
2009	2385	2899	21194	23282
2010	2386	2900	22198	3011
2014	2387	21033	22199	3014
2016	2389	21063	22200	3015
2017	2390	21064	22201	3017
2032	2394	21065	22203	3032
2043	2396	21192	22204	3045
2044	2397	3046	22205	31217
2045	2398	3049	22206	32304
2046	2399	3054	22207	32305
2048	2402	3065	22208	32306
2049	2424	3069	22209	32307
2051	2431	3070	22210	32766
2052	2432	3095	22211	32768
2054	2434	3106	22212	63119
2065	2436	3125	22213	63283
2071	2446	3385	22214	63284
2091	2544	3387	22299	63285
2092	2545	3390	22300	63286
2093	2546	3396	22301	63287
2095	2550	3398	22302	63288
2096	2552	3402	22303	63289
2098	2553	3550	23064	63290
2106	2625	3552	23118	63291
2107	2636	3821	23271	63292
2108	2648	3880	23272	82433
2109	2649	3881	23273	83117
2118	2679	3900	23274	83124
2119	2702	4424	23275	83293
2125	2733	4426	23276	83294
2126	2821	4432	23277	83295
2128	2880	41217	23278	83296
2166	2881	62408	23279	

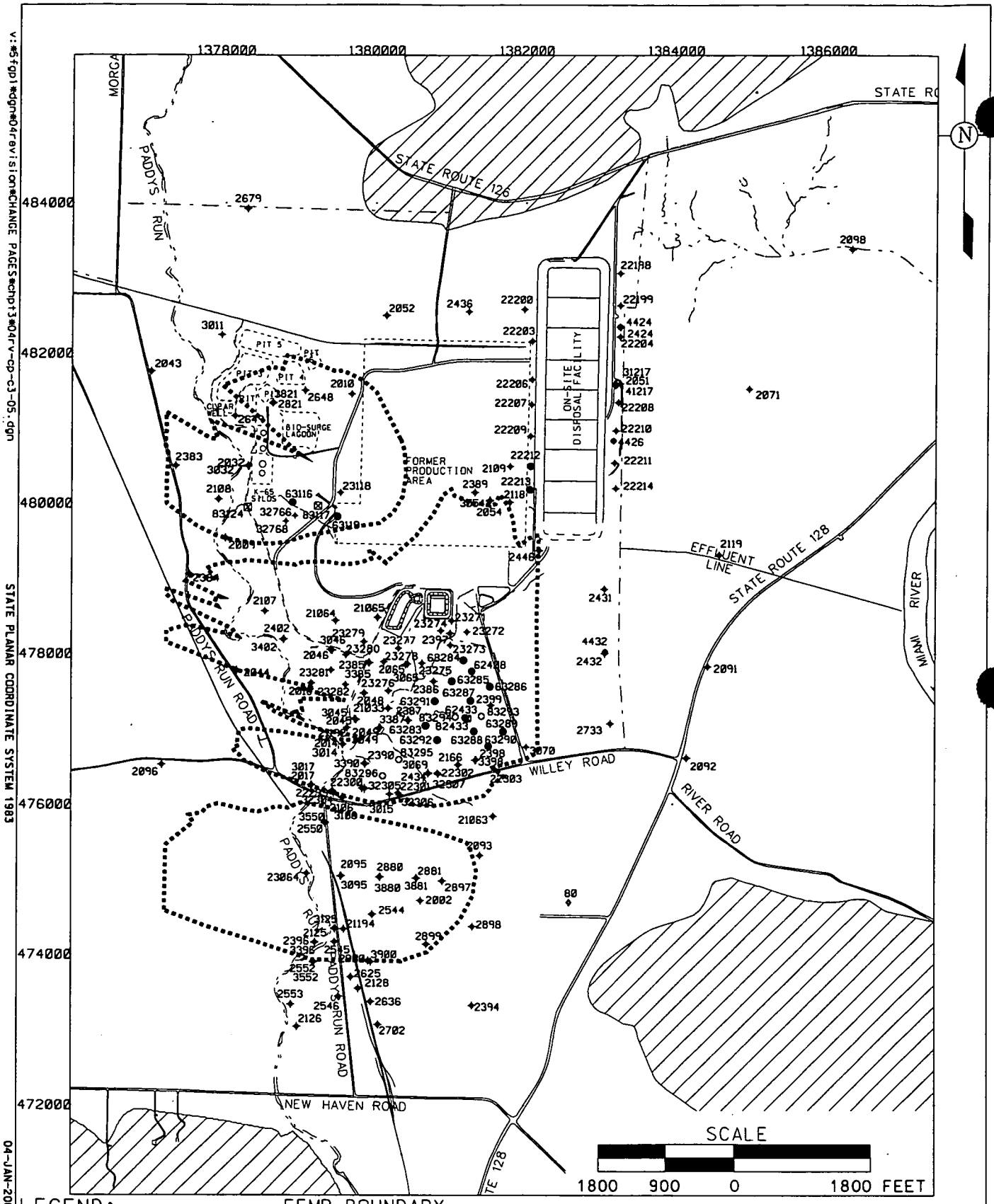


FIGURE 3-8. GROUNDWATER ELEVATION MONITORING WELLS

SECTION 4

4.0 SURFACE WATER AND TREATED EFFLUENT MONITORING PROGRAM

Section 4.0 provides a description of the routine sitewide surface water and treated effluent monitoring to be performed during active remediation of the Fernald site. This includes many compliance-based monitoring and reporting obligations for surface water and treated effluent, and a medium-specific plan for conducting all surface water and treated effluent monitoring activities.

4.1 INTEGRATION OBJECTIVES FOR SURFACE WATER AND TREATED EFFLUENT

Unlike groundwater and sediment, no direct restoration of the Fernald site's surface water resources (i.e., Paddys Run and the Great Miami River) is required to achieve the surface water FRLs specified in the Record of Decision for Remedial Actions at Operable Unit 5. However, because surface water represents both a contaminant transport pathway and a route of exposure for human and ecological receptors, routine monitoring of surface water is necessary to confirm that the Fernald site's point and non-point discharges from other remedial operations to receiving waters fall within established thresholds. The monitoring activities for surface water will thus function as both a surveillance and a compliance tool over the life of remediation at the Fernald site. These measures will help document that the remedial operations are protective of both groundwater (via the surface water cross-medium pathway) and intended surface water uses in the vicinity of the Fernald site.

The IEMP is the designated mechanism for conducting the sitewide surface water surveillance and compliance monitoring downstream from project-specific controls. The IEMP's focus is to accommodate remedial construction and operation activities taking place in 2005 and 2006. Ultimately, the IEMP will be used to verify and document that the conclusion of the sitewide remedial actions result in a condition that no longer poses any long-term threat to human health and/or the environment through the surface water pathway. In this comprehensive role, the IEMP serves to integrate several compliance-based monitoring and reporting programs currently in existence for the Fernald site:

- The discharge monitoring and reporting program related to the site's NPDES Permit
- The radiological monitoring of and reporting for the treated effluent mandated by the FFCA and Operable Unit 5 Record of Decision
- The IEMP Characterization Program which combines portions of the former Environmental Monitoring Program (EMP) that has been ongoing at the Fernald site since the 1950s and was updated in the IEMP, Revision 0 (DOE 1997b), to accommodate surface water monitoring needs during remediation.

As discussed in Section 4.6, these programs have been brought together under a single reporting structure to facilitate review of the performance of the Fernald site's surface water protection actions and measures.

4.2 ANALYSIS OF REGULATORY DRIVERS, DOE POLICIES, AND OTHER FERNALD SITE-SPECIFIC AGREEMENTS

This section presents a summary evaluation of the regulatory drivers governing the monitoring of the Fernald site's point and non-point discharges to Paddys Run and the Great Miami River. The intent of this section is to identify the pertinent regulatory requirements, including ARARs and to-be-considered requirements, for the scope and design of the surface water monitoring program. These requirements will be used to confirm that the program satisfies the regulatory obligations for monitoring that have been activated by the records of decision and will achieve the intentions of other pertinent criteria, such as DOE Orders and the Fernald site's existing agreements and permits, as appropriate, that have a bearing on the scope of surface water and treated effluent monitoring.

The results of the analysis will also be used to define, as appropriate for this medium, the administrative boundaries between the IEMP and the project-specific emission control and uncontrolled runoff monitoring conducted by other organizations.

4.2.1 Approach

The analysis of the regulatory drivers and policies for surface water and treated effluent was conducted by examining the suite of ARARs and to-be-considered requirements in the Operable Unit 5 Record of Decision to identify the subset with specific environmental monitoring requirements. The Fernald site's existing compliance agreements issued outside the CERCLA process (such as the NPDES Permit requirements and the FFCA) were also reviewed.

4.2.2 Results

The following summary of regulatory drivers, compliance agreements, and DOE Orders were found to govern the monitoring scope and reporting requirements for surface water and treated effluent:

- CERCLA Record of Decision for Remedial Actions at Operable Unit 5, which requires remediation of the site such that the surface water pathway is protective of the underlying Great Miami Aquifer and various surface water environmental receptors. The surface water FRLs provided in the Operable Unit 5 Record of Decision considered and incorporated all chemical-specific ARARs and to-be-considered requirements for the protection of human health via the surface water pathway. In addition, treatment performance based limits were established restricting total uranium mass discharged to the Great Miami River to 600 lbs/year and a uranium concentration limit of 30 µg/L as a monthly average. (The concentration limit of 30 µg/L established in the Operable Unit 5 Explanation of Significant Differences Document.)

- Per the CERCLA Remedial Design Work Plan for Remedial Actions at Operable Unit 5, monitoring will be conducted following the completion of cleanup as required to assess the continued protectiveness of the remedial actions. The IEMP will specify the type and frequency of environmental monitoring activities to be conducted during remedy implementation, and ultimately, following the cessation of remedial operations as appropriate. The IEMP will delineate the Fernald site's responsibilities for sitewide monitoring of surface water and sediment over the life of the remedy, and ensure that FRLs are achieved at project completion.

- The current NPDES Permit for the Fernald site, which triggers a variety of site-specific surface water and treated effluent sampling, analysis, and reporting requirements (as specified in OAC 3745-33) for non-radiological discharges.

- The 1986 FFCA, which requires that the Fernald site maintain a continuous sample collection program for radiological constituents at the Fernald site's treated effluent discharge points and report the results quarterly to the EPA, OEPA, and the Ohio Department of Health. The sampling program to address this requirement has been modified over the years and is currently governed by an agreement reached with EPA and OEPA in early 1996 as described in the letter "Phase VII Removal Actions and Reporting Requirements Under the Fernald Environmental Management Project Legal Agreements" from DOE to EPA (DOE 1996a). This agreement became effective May 1, 1996 and has since been modified, documented and approved through biennial revisions of the IEMP. This agreement requires sampling at the Parshall Flume (PF 4001), the Storm Water Retention Basin spillway (SWRB 4002O), and the Storm Water Retention Basin bypasses (SWRB 4002B) for radiological constituents. With approval of the IEMP, Revision 0, in 1997, the sampling program was modified to better assess the impact of the site on the surface water pathway. These details are provided in Section 4.4.2.7.

- DOE Order 5400.1, General Environmental Protection Program Requirements, which requires DOE facilities that use, generate, release, or manage significant pollutants or hazardous materials to develop and implement an environmental monitoring plan. Each DOE site's environmental monitoring plan must contain the design criteria and rationale for the routine treated effluent monitoring and environmental surveillance activities of the facility. The IEMP strategy is responsive to the changing site mission and associated remedial needs and complies with DOE Orders.

- DOE Order 5400.5, Radiation Protection of the Public and the Environment, which obligates the Fernald site to perform surveillance monitoring of surface water to ensure that radiological dose limits to the public in the DOE Order are not exceeded. Under these requirements, the exposure to members of the public associated with activities at DOE facilities from all pathways must not exceed, in one year, an effective dose equivalent greater than 100 millirem (mrem). Studies in support of the Operable Unit 5 Feasibility Study demonstrated for all media that combined exposure to radiological COCs at their respective FRLs fall well below the DOE dose requirement. Therefore, monitoring designed to track and document the CERCLA FRL-based remediation of the site meets the intent of DOE Order 5400.5.

The surface water and treated effluent monitoring program described in this IEMP has been developed with full consideration of these regulatory drivers. Any necessary project-specific monitoring is determined during preparation and review of the individual remedial design packages. Table 4-1 lists each of these IEMP and project-specific drivers and the associated monitoring conducted to comply with them. Sections 4.6 and 8.0 provide the Fernald site's current and long-range plan for complying with the reporting requirements invoked by these drivers.

TABLE 4-1

FERNALD SITE SURFACE WATER AND TREATED EFFLUENT MONITORING PROGRAM REGULATORY DRIVERS AND RESPONSIBILITIES

	DRIVER	ACTION
IEMP	DOE Order 5400.1, Environmental Monitoring Plan for all media	The IEMP describes treated effluent and surveillance monitoring as required by DOE Order 5400.1.
	DOE Order 5400.5, Radiation Protection of Public and Environment	The IEMP includes a description for routine sampling of Paddys Run and on-site drainage ditches for radionuclides.
	Operable Unit 5 Record of Decision	The IEMP will be modified toward completion of the remedial action to include sampling to certify FRL achievement. IEMP includes monitoring for performance based uranium discharge limits.
	NPDES Permit	The IEMP describes routine sampling of permit-designated effluent discharges and storm water drainage points for NPDES Permit constituents.
	Federal Facilities Compliance Agreement Radiological Monitoring	The IEMP describes the routine sampling at the Parshall Flume (PF 4001), Storm Water Retention Basin spillway (SWRB 4002O), and Storm Water Retention Basin bypass (SWRB 4002B) for radiological constituents.
	DOE Order 5400.1, Environmental Monitoring Plan for all media	The IEMP describes treated effluent and surveillance monitoring as required by DOE Order 5400.1.

4.3 PROGRAMMATIC BOUNDARY FOR THE SURFACE WATER AND TREATED EFFLUENT MONITORING PROGRAM

This section identifies the programmatic boundaries established between the IEMP and the project-specific activities to be conducted by others. The intent behind the boundary definition is to: (1) clearly delineate the scope and geographic extent of the IEMP's monitoring responsibility; and (2) establish a recognized interface between the sitewide focus of the IEMP and the predominant emission control focus of project-specific monitoring.

It is important to emphasize that the IEMP program boundary for each of the Fernald site's environmental media is unique and, for portions of the surface water and treated effluent program, time-dependent. The boundary is the combined result of:

- Regulatory monitoring requirements
- The physical configuration of the site, planned remediation areas (which will change over time) for soil excavation and certification occurring in various areas of the site shown in Figure 4-1, and the associated project-specific controls/monitoring of uncontrolled runoff
- The treated effluent monitoring responsibilities assigned to the IEMP.

- Continue to fulfill DOE Order 5400.1 requirements to maintain an environmental monitoring plan for surface water
- Continue to address the concerns of the community regarding the magnitude of the Fernald site's discharges to surface water (i.e., to Paddys Run and the Great Miami River).

The following section provides the design considerations required to fulfill each of these expectations.

4.4.2 Design Considerations

4.4.2.1 Constituents of Concern

A comprehensive listing of COCs has been developed and provides the suite of parameters that have been evaluated for monitoring. Table 4-2 presents this information. The following is a description of each of the columns in Table 4-2.

- Column 1, Constituent: This column represents the suite of constituents considered for monitoring in the surface water pathway as a result of the remedial investigation/feasibility study process at the Fernald site. It represents the constituents for which a FRL was established in the Operable Unit 5 Record of Decision.
- Column 2, Final Remediation Levels: This column represents the human/health protective remediation levels for surface water that were established in the Operable Unit 5 Record of Decision.
- Column 3, FRL Basis: This column is the basis for establishment of the FRL as defined in the Operable Unit 5 Feasibility Study.
- Column 4, Background Values in Surface Water: This column represents updated background values for Paddys Run and the Great Miami River based on data collected for the IEMP through 2003. The IEMP provides this information for purposes of comparison.

4.4.2.2 Surface Water Cross-Medium Impact

To assess the cross-medium impact that contaminated surface water has on the underlying Great Miami Aquifer, the following design considerations are necessary:

- Samples should be collected at those points near where the glacial overburden has been breached by site drainages. As described in the Operable Unit 5 Remedial Investigation, the majority of the Fernald site is underlain by clay-rich glacial overburden. Where present, this glacial overburden provides a measure of protection to the underlying sand-and-gravel aquifer. However, the glacial overburden has been eroded by site drainages primarily in the lower reaches of Paddys Run and in the Storm Sewer Outfall Ditch (refer to Figure 4-2). Additionally, pre-design groundwater characterization activities in the waste storage and Plant 6 areas confirmed that an area in the Pilot Plant Drainage Ditch adjacent to Paddys Run should be considered as a primary source of infiltration. At these locations, a direct pathway exists for surface water and associated contaminants to reach the underlying sand-and-gravel Great Miami Aquifer.

TABLE 4-2

SURFACE WATER SELECTION CRITERIA SUMMARY

Constituent[a]	FRL[b]	FRL Basis[b]	Number of Background Samples Paddys Run/Great Miami River	95th Percentile Background Level in Surface Water[c,d]			
				Paddys Run		Great Miami River	
				Original	Revised	Original	Revised
General Chemistry (mg/L)							
Fluoride	2.0	A	24/26	0.22	0.272	0.9	0.503
Nitrate/Nitrite	2400	R	26/26	1.7	4.47	6.6	8.28
Inorganics (mg/L)							
Antimony	0.19	A	26/26	ND	0.0012	ND	0.0018
Arsenic	0.049	R	26/26	ND	0.0065	0.0036	0.00826
Barium	100	R	24/25	0.053	0.0546	0.1	0.101
Beryllium	0.0012	A	26/26	ND	0.0003	ND	0.00090
Cadmium	0.0098	B	26/39	ND	0.00087	0.01	0.00375
Chromium VI	0.010	D	26/39	ND	0.00744	ND	0.0104
Copper	0.012	A	26/39	ND	0.00841	0.012	0.0147
Cyanide	0.012	A	25/26	ND	0.0030	0.005	0.0041
Lead	0.010	B	26/39	ND	0.00623	0.010	0.0100
Manganese	1.5	R	25/37	0.035	0.195	0.08	0.115
Mercury	0.00020	D	24/40	ND	0.0001846	ND	0.000175
Molybdenum	1.5	R	26/26	ND	0.00356	0.02	0.00942
Nickel	0.17	A	26/39	ND	0.00844	0.023	0.0131
Selenium	0.0050	A	26/26	ND	0.00260	ND	0.00293
Silver	0.0050	D	26/39	ND	0.000664	ND	0.000348
Vanadium	3.1	R	26/24	ND	0.0204	ND	0.00886
Zinc	0.11	A	26/39	ND	0.0447	0.045	0.049

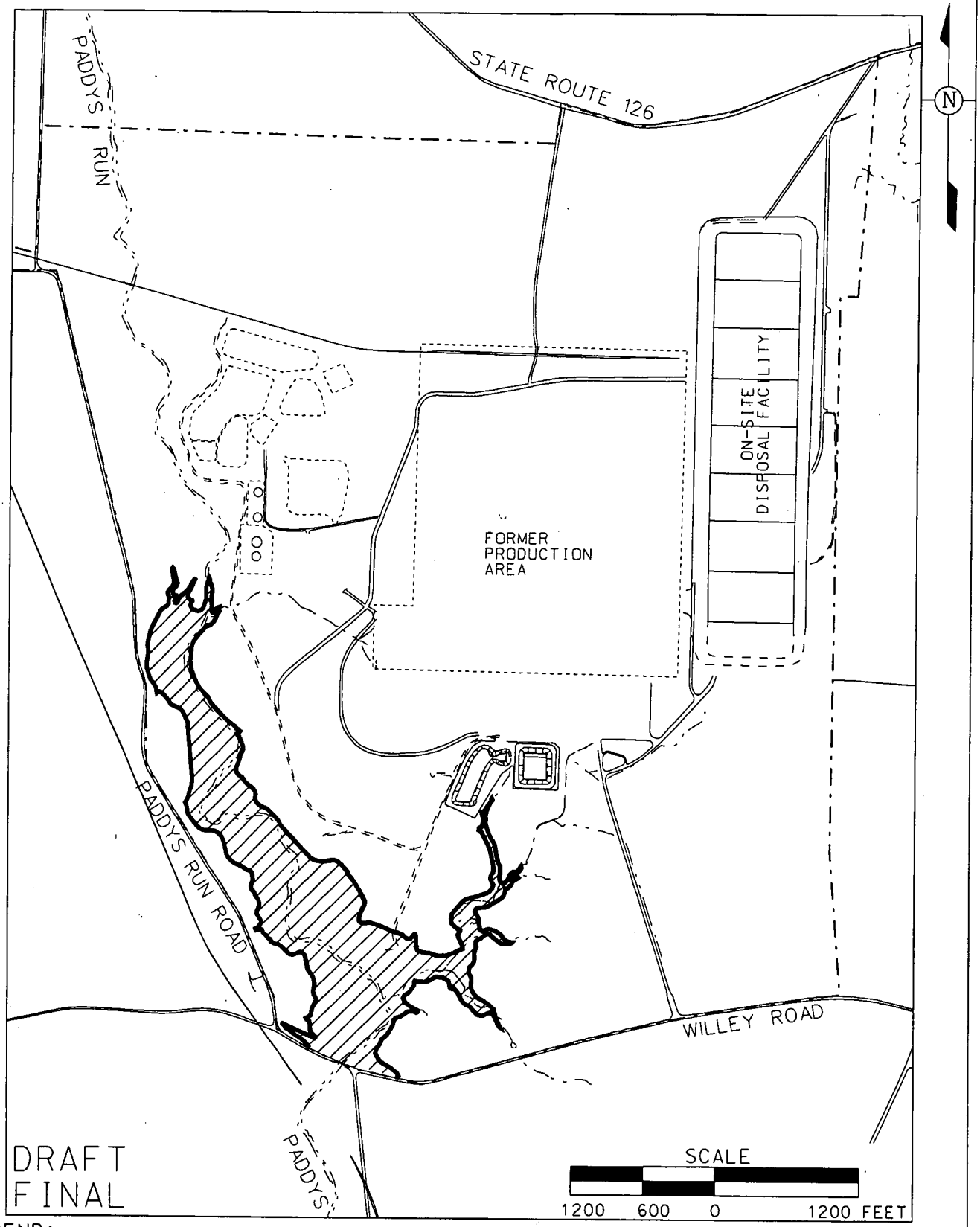
TABLE 4-2
(Continued)

Constituent[a]	FRL[b]	FRL Basis[b]	Number of Background Samples Paddys Run/Great Miami River	95th Percentile Background Level in Surface Water[c,d]			
				Paddys Run		Great Miami River	
				Original	Revised	Original	Revised
Radionuclides (pCi/L)							
Cesium-137	10	R	25/27	3.1	4.738	ND	3.88
Neptunium-237	210	R	24/25	-	0.054	ND	0.086
Lead-210	11	R	25/26	-	2.97	-	2.01
Plutonium-238	210	R	25/26	ND	ND	ND	0.038
Plutonium-239/240	200	R	25/26	0.09	0.093	ND	0.01
Radium-226	38	R	25/25	0.35	0.95	0.41	0.98
Radium-228	47	R	25/26	2.1	3.49	2.2	4.1685
Strontium-90	41	R	25/27	0.96	3.34	ND	1.141
Technetium-99	150	R	25/27	ND	4.65	ND	11.3
Thorium-228	830	R	25/25	ND	0.238	0.62	0.180
Thorium-230	3500	R	25/26	ND	0.483	0.36	0.638
Thorium-232	270	R	25/25	ND	0.133	ND	0.178
Uranium, Total (µg/L)	530	R	21/21	1.1	1.52	1.4	2.13
Pesticide/PCBs (µg/L)							
Alpha-Chlordane	0.31	R	26/26	-	ND	-	ND
Aroclor-1254	0.20	D	25/26	-	ND	-	ND
Aroclor-1260	0.20	D	25/26	-	ND	-	ND
Dieldrin	0.020	D	26/26	-	ND	-	0.0095
Semi-Volatiles (µg/L)							
Benzo(a)anthracene	1.0	D	26/26	-	ND	-	ND
Benzo(a)pyrene	1.0	D	26/26	-	ND	-	ND
bis(2-Chloroisopropyl)ether	280	R	26/26	-	ND	-	ND
bis(2-Ethylhexyl)phthalate	8.4	A	25/26	-	2	-	2.5
Dibenzo(a,h)anthracene	1.0	D	26/26	-	ND	-	ND

TABLE 4-2
(Continued)

Constituent[a]	FRL[b]	FRL Basis[b]	Number of Background Samples Paddys Run/Great Miami River	95th Percentile Background Level in Surface Water[c,d]			
				Paddys Run		Great Miami River	
				Original	Revised	Original	Revised
Semi-Volatiles (µg/L) (cont.)							
3,3'-Dichlorobenzidine	7.7	R	25/24	-	ND	-	ND
Di-n-butylphthalate	6000	R	26/26	-	5.085	-	5.5
Di-n-octylphthalate	5.0	D	26/26	-	1.75	-	ND
p-Methylphenol	2200	R	26/26	-	ND	-	ND
4-Nitrophenol	7,400,000	R	26/26	-	ND	-	ND
Volatiles (µg/L)							
Benzene	280	R	25/26	-	ND	-	0.35
Bromodichloromethane	240	R	25/26	-	ND	-	ND
Bromomethane	1300	R	25/25	-	ND	-	ND
Chloroform	79	A	25/26	-	0.782	-	0.3
1,1-Dichloroethene	15	R	25/26	-	ND	-	ND
Methylene chloride	430	A	25/26	-	1	-	ND
Tetrachloroethene	45	R	25/26	-	0.367	-	ND
1,1,1-Tricholoroethane	1.0	D	25/26	-	ND	-	ND
1,1,2-Tricholoroethane	230	R	25/26	-	ND	-	ND

[a]Shading indicates constituent selected for IEMP surface water analysis at locations other than background and NPDES Permit sample locations.
[b]Derived from Operable Unit 5 Record of Decision, Table 9-5.
A = ARAR values
B = background concentrations
D = analytical detection limit
R = human health risk
[c]ND = non-detected result
- = not applicable/not available
[d]For small data sets (less than or equal to seven samples), the maximum detected concentration is used as the 95th percentile.
[e]FRL based on chromium VI; however, the analytical results are for total chromium.



LEGEND:

- FERNALD SITE BOUNDARY
- APPROXIMATE EXTENT OF FERNALD SITE PROPERTY WHERE GLACIAL OVERBURDEN HAS BEEN REMOVED BY EROSION

FIGURE 4-2. AREA WHERE GLACIAL OVERBURDEN HAS BEEN REMOVED BY EROSION

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STATE PLANAR COORDINATE SYSTEM 1983
07-OCT-2004

- Constituents analyzed should represent those area-specific COCs identified in the Operable Unit 5 Feasibility Study and subsequent fate-and-transport modeling as having the potential for cross-medium impact to groundwater via the surface water pathway.

- Sampling frequency should be such that seasonal fluctuations in contaminant concentrations (as well as fluctuations due to varying flow conditions) can be assessed.

4.4.2.3 Sporadic Exceedances of FRLs

To comply with the requirements of the Operable Unit 5 Record of Decision, all surface water FRLs must be achieved and maintained at the completion of the remedial actions. During remediation, constituents that have occasionally exceeded FRLs should be monitored to document whether the exceedances continue to occur or, as expected, dissipate as remediation progresses. Because active remediation will be occurring in and near on-property drainages, it is appropriate to monitor for exceedances of the FRLs downstream from the remediation areas and upstream from the off-property receptors. Therefore, sample locations should be located at: (1) on-property locations downstream of historical FRL exceedances; (2) the point where Paddys Run flows off the Fernald site property; and (3) the Parshall Flume (PF 4001), where treated effluent is discharged from the Fernald site to the Great Miami River. (Refer to Figure 4-3 for IEMP surface water and treated effluent sample locations.) To determine the concentration of the treated effluent constituents outside the mixing zone in the Great Miami River, a conservative calculation using the 10-year, low-flow conditions is necessary requiring that flow conditions at the Hamilton Dam gauge be periodically reviewed.

To assist in the development of the scope and focus of the IEMP surface water and treated effluent program, a review of the IEMP surface water data is conducted periodically. The last such review was based on data collected under the IEMP program from August 1997 through December 2001. This evaluation was presented and approved by the agencies as a part of the first quarter 2002 IEMP report, and is summarized in Revision 3 of the IEMP. This evaluation identified a number of parameters sampled since 1997 that had not exceeded their respective FRL (or, if an exceedance occurred, an exceedance had not recurred since the fourth quarter of 1998) and, therefore, were eliminated from the IEMP surface water monitoring program. The parameters that continue to experience sporadic exceedances of their respective FRL will be monitored as indicated in Table 4-3.

TABLE 4-3

SUMMARY OF SURFACE WATER AND TREATED EFFLUENT SAMPLING REQUIREMENTS BY LOCATION

Location	Constituent[a]	IEMP Characterization Requirements (reason for selection)[b,c]	NPDES Requirements[c]	OU5 ROD/FFCA[c] Requirements
SWP-01 and SWR-01 (SWR-4801) (Paddys Run and Great Miami River Background)	**General Chemistry:**			
	Ammonia	-	Quarterly[d]	-
	Total hardness	-	Quarterly[d]	-
	Inorganics:			
	Beryllium	Quarterly (B)	-	-
	Cadmium	Quarterly (B)	Quarterly[d]	-
	Chromium, Total	Quarterly (B)	Quarterly[d]	-
	Cobalt	-	Quarterly[d]	-
	Copper	Quarterly (B)	Quarterly[d]	-
	Cyanide	Quarterly (B)	-	-
	Lead		Quarterly[d]	-
	Manganese	Quarterly (B)	Quarterly[d]	-
	Mercury	Quarterly (B)	Quarterly[d]	-
	Nickel		Quarterly[d]	-
	Silver	Quarterly (B)	Quarterly[d]	-
	Zinc	Quarterly (B)	Quarterly[d]	-
	Radionuclides:			
	Radium-226	Quarterly (B)	-	-
	Radium-228	Quarterly (B)	-	-
	Strontium-90	Quarterly (B)	-	-
	Technetium-99	Quarterly (B)	-	-
	Thorium-228	Quarterly (B)	-	-
	Thorium-230	Quarterly (B)	-	-
	Thorium-232	Quarterly (B)	-	-
	Uranium, Total	Quarterly (B)	-	-
SWP-02 (Paddys Run)	**Radionuclides:**			
	Technetium-99	Quarterly (M)	-	-
	Thorium-228[e]	Quarterly (WP)	-	-
	Thorium-230[e]	Quarterly (WP)	-	-
	Thorium-232[e]	Quarterly (WP)	-	-
	Uranium, Total	Quarterly (PC)	-	-
SWP-03 (Paddys Run at Downstream Property Boundary)	**Inorganics:**			
	Beryllium	Quarterly (S)	-	-
	Cadmium	Quarterly (S)	-	-
	Chromium, Total	Quarterly (S)	-	-
	Copper	Quarterly (S)	-	-
	Cyanide	Quarterly (M)	-	-
	Manganese	Quarterly (S)	-	-
	Mercury	Quarterly (M)	-	-
	Silver	Quarterly (M)	-	-
	Zinc	Quarterly (M)	-	-
	Radionuclides:			
	Radium-226	Quarterly (M)	-	-
	Radium-228	Quarterly (S)	-	-
	Strontium-90	Quarterly (M)	-	-
	Technetium-99	Quarterly (M)[f]	-	-
	Thorium-228[e]	Quarterly (WP)	-	-
	Thorium-230[e]	Quarterly (WP)	-	-
	Thorium-232[e]	Quarterly (WP)	-	-
	Uranium, Total	Quarterly (PC)	-	-

TABLE 4-3
(Continued)

Location	Constituent[a]	IEMP Characterization Requirements (reason for selection)[b,c]	NPDES Requirements[c]	OU5 ROD/FFCA[c] Requirements
SWD-01	**Inorganics:**			
(Northeast Drainage)	Mercury	Quarterly (M)	-	-
	Cyanide	Quarterly (M)	-	-
	Radionuclides:			
	Uranium, Total	Quarterly (PC, M)	-	-
SWD-02 (Storm Sewer	**Radionuclides:**			
Outfall Ditch)	Strontium-90	Quarterly (M)	-	-
	Technetium-99	Quarterly (M)	-	-
	Uranium, Total	Quarterly (PC)	-	-
SWD-03	**Inorganics:**			
(Waste Storage Area)	Copper	Quarterly (S)	-	-
	Cyanide	Quarterly (M)		
	Mercury	Quarterly (M)	-	-
	Silver	Quarterly (M)	-	-
	Zinc	Quarterly (M)	-	-
	Radionuclides:			
	Technetium-99	Quarterly (M)	-	-
	Throium-228[e]	Quarterly (WP)	-	-
	Thorium-230[e]	Quarterly (WP)	-	-
	Thorium-232[e]	Quarterly (WP)	-	-
	Uranium, Total	Quarterly (PC)	-	-
PF 4001 (Parshall Flume -	**General Chemistry:**			
Treated Effluent)	Ammonia	-	3/Week[g]	-
	Carbonaceous biochemical oxygen demand	-	2/Week	-
	Fluoride	-	Monthly	-
	Nitrate/Nitrite	-	Monthly	-
	Oil and grease	-	2/Week	-
	Total dissolved solids	-	Monthly	-
	Total residual chlorine	-	3/Week[h]	-
	Total suspended solids	-	Daily	-
	Inorganics:			
	Antimony	-	Monthly	-
	Arsenic	-	Monthly	-
	Barium	-	3/Week	-
	Berylium	-	Monthly	-
	Boron	-	Monthly	-
	Cadmium	Quarterly (S)	3/Week	-
	Chromium, Total	-	3/Week	-
	Cobalt	-	2/Week	-
	Copper	-	3/Week	-
	Cyanide	Quarterly (M)	Monthly	-
	Lead	-	3/Week	-
	Manganese	-	2/Week	-
	Mercury	Quarterly (M)	Monthly	-
	Molybdenum	-	3/Week	-
	Nickel	-	3/Week	-
	Selenium	-	3/Week	-
	Silver	Quarterly (M)	3/Week	-
	Zinc	-	3/Week	-

TABLE 4-3
(Continued)

Location	Constituent[a]	IEMP Characterization Requirements (reason for selection)[b,c]	NPDES Requirements[c]	OU5 ROD/FFCA[c] Requirements
PF 4001 (Parshall Flume - Treated Effluent) (Cont.)	**Radionuclides:**			
	Radium-226	Quarterly (M)	-	-
	Radium-228	-	-	Monthly
	Strontium-90	Quarterly (M)	-	-
	Technetium-99	Quarterly (M)	-	Monthly
	Uranium, Total	Quarterly (PC)	-	Daily
	Semi-Volatiles:			
	Bis (2-ethylhexyl) phthalate	-	Quarterly	-
	Volatiles:			
	Chloroform	-	Quarterly	-
	1,1-Dichloroethane	-	Quarterly	-
	Trichloroethene	-	Quarterly	-
	Other:			
	Flow Rate	-	Daily	-
SWRB 4002O[i] (Storm Water Retention Basin)	**General Chemistry:**			
	Total residual chlorine	-	Daily	-
	Total suspended solids	-	Daily	-
	Inorganics:			
	Beryllium	Quarterly (S)	-	-
	Cadmium	Quarterly (S)	-	-
	Copper	-	Monthly	-
	Cyanide	Quarterly (M, S)	-	-
	Manganese	Quarterly (S)	-	-
	Mercury	Quarterly (M, S)	Monthly	-
	Radionuclides:			
	Radium-226	Quarterly (M)	-	-
	Radium-228	Quarterly (S)	-	-
	Strontium-90	Quarterly (M)	-	-
	Technetium-99	Quarterly (M, S)	-	-
	Uranium, Total	Quarterly (PC)	-	Daily
	Other:			
	Flow rate	-	Daily	-
SWRB 4002B (Treatment Bypass)	**Radionuclide:**			
	Uranium, Total	-	-	Daily during bypass

TABLE 4-3
(Continued)

Location	Constituent[a]	IEMP Characterization Requirements (reason for selection)[b,c]	NPDES Requirements[c]	OU5 ROD/FFCA[c] Requirements
STRM 4003, STRM 4004[j]	**General Chemistry:**			
STRM 4005, STRM 4006	Total suspended solids	-	Semiannually	-
(Drainages to Paddys Run)	**Inorganics:**			
	Copper (4003, 4004, 4006)	-	Semiannually	-
	Lead (4004, 4005, 4006)	-	Semiannually	-
	Mercury	-	Semiannually	-
	Silver (4004, 4006)	-	Semiannually	-
	Radionuclides:			
	Uranium, Total	Quarterly (PC)	-	-
	Other:			
	Fecal coliform	-	Semiannually	-
	Flow Rate	-	Semiannually	-
STP 4601 (Sewage	**General Chemistry:**			
Treatment Plant Effluent)	Carbonaceous biochemical oxygen demand	-	2/Week	-
	Ammonia	-	Every two weeks	-
	Total suspended solids	-	2/Week	-
	Other:			
	Fecal coliform	-	Weekly (May-Oct)	-
	Flow Rate	-	Daily	-
SWR-4902 (Downstream	**General Chemistry:**			
of Fernald site Effluent)	Ammonia	-	Quarterly	-
	Total Hardness	-	Quarterly	-
	Inorganics			
	Cadmium	-	Quarterly	-
	Chromium	-	Quarterly	-
	Cobalt	-	Quarterly	-
	Copper	-	Quarterly	-
	Lead	-	Quarterly	-
	Manganese	-	Quarterly	-
	Mercury	-	Quarterly	-
	Nickel	-	Quarterly	-
	Silver	-	Quarterly	-
	Zinc	-	Quarterly	-

[a]Field parameter readings, taken at each location, include temperature, specific conductance, pH, and dissolved oxygen.
[b]B = background evaluation; M = based on modeling; PC = primary COC; S = sporadic exceedances of FRLs; WP = Waste Pits Excavation Monitoring
[c]"-"indicates the constituent is not included in the sample program.
[d]Refers only to location SWR-01 (NPDES location SWR-4801); constituents sampled quarterly.
[e]Constituent being monitored after excavation of the waste pits to assess thorium releases as a whole.
[f]The basis for the "M" designation is the contribution from an upgradient location (i.e., SWP-02).
[g]Sampled twice a week in winter (November 1 through April 30).
[h]Constituent not sampled from November through April.
[i]Constituents will be analyzed at each overflow event.
[j]New location STRM 4004A has been identified as an alternative sample location for STRM 4004. STRM 4004A will be sampled for the constituents if no flow is observed at STRM 4004 or is otherwise not accessible.

SECTION 5

5.0 SEDIMENT MONITORING PROGRAM

Section 5.0 discusses the monitoring strategy for assessing the impact of remediation activities at the Fernald site on sediments deposited along area surface water drainages. The focus of this program is on sediment outside the areas where surface water and/or sediment controls are in place as a result of the active remediation efforts. This plan discusses the IEMP sampling design and integration with project-specific excavation and sampling activities being conducted in 2005 and 2006, as part of the Stream Corridors Project, to certify sediment in on-property drainages meet FRLs. A medium-specific plan for sediment monitoring activities, a discussion of sediment data evaluation, and the reporting structure are also provided.

5.1 INTEGRATION OBJECTIVES FOR THE SEDIMENT MONITORING PROGRAM

The design considerations for the IEMP sediment monitoring program (discussed in Section 5.4), especially the location of sample points, incorporate information from previous site sediment programs including the IEMP data and information regarding site surface water and sediment controls in place and/or planned during remediation.

Historically, the sitewide sediment pathway has been evaluated under the site's initial environmental monitoring program that began in 1974, and the remedial investigation/feasibility study characterization of sediment that focused on a broader range of constituents (both radiological and non-radiological) in site drainages. The information produced by these programs through 1993 was reported and evaluated in the Remedial Investigation Report for Operable Unit 5 and carried forward into the Feasibility Study Report for Operable Unit 5 for the development of sediment clean up levels. The Record of Decision for Remedial Actions at Operable Unit 5 established health-protective FRLs for sediment. Off-property sediment from the Great Miami River will continue to be collected as part of the IEMP. However, it is anticipated that achievement of on-property sediment FRLs will be accomplished as part of the Stream Corridors Project in 2005/2006 as site soil and sediment are remediated and contaminated source materials are removed.

In order to better define remediation needs in the on-property drainages (Storm Sewer Outfall Ditch, Pilot Plant Drainage Ditch, and Paddys Run), sediment sampling was conducted in 2004 as part of the Stream Corridors Project to confirm the extent of sediment to be excavated, along with any adjacent contaminated soil in a specific area. The Demolition, Soil, and Disposal Project plans to excavate above-FRL sediment and soil in 2005 following the completion of excavation of contaminated soils within each drainage's watershed. The project will conduct excavation control and/or pre-certification sampling during or following excavation in these drainage ways, where necessitated by the pre-design sampling data.

Certification sampling of the on-property stream corridors (Paddys Run, Storm Sewer Outfall Ditch and Pilot Plant Drainage Ditch) will subsequently take place in 2005/2006.

The sediment monitoring program will continue to provide FCP stakeholders with comprehensive sediment data to verify the effectiveness of the FCP's sediment controls during ongoing remediation activities in 2005 and 2006.

5.2 ANALYSIS OF REGULATORY DRIVERS, DOE POLICIES, AND OTHER FERNALD SITE-SPECIFIC AGREEMENTS

This section presents an evaluation of the regulatory drivers governing sediment monitoring during site remediation. The intent of this section is to identify any pertinent regulatory requirements, including ARARs and to-be-considered requirements, for the sediment monitoring program. These requirements will be used to confirm that the design specifications satisfy the regulatory obligations stated below and will achieve the intentions of other pertinent criteria, such as DOE Orders and the Fernald site's existing agreements. The results of the evaluation also are used to define, as appropriate for these media, the programmatic boundaries between the IEMP and project-specific emissions control monitoring conducted by individual project organizations.

5.2.1 Approach

The analysis of the regulatory drivers and policies was conducted by examining the approved CERCLA records of decision to identify any sediment-specific monitoring requirements.

5.2.2 Results

The evaluation of regulatory drivers for sediment monitoring resulted in two regulatory requirements governing the technical scope and reporting for the IEMP sediment monitoring program as well as project-specific monitoring of sediment:

- The CERCLA Record of Decision for Remedial Actions at Operable Unit 5 requires remediation of the site such that the sediment pathway is protective of the underlying Great Miami Aquifer and environmental receptors. The FRLs for sediment are specified in the Operable Unit 5 Record of Decision; however, a specified volume or area of sediment to be remediated was not identified due to the sporadic and isolated detections of contaminants above sediment FRLs. Attainment of sediment FRLs for on-property sediments will be conducted as part of the Stream Corridors Project and attainment sediment FRLs for the Great Miami River sediments will be determined by monitoring at the end of remediation activities, as committed to in the Feasibility Study Report for Operable Unit 5.

- Per the CERCLA Remedial Design Work Plan for Remedial Actions at Operable Unit 5, monitoring will be conducted following the completion of cleanup as required to assess the continued protectiveness of the remedial actions. The IEMP will specify the type and frequency of environmental monitoring activities to be conducted during remedy implementation, and ultimately, following the cessation of remedial operations as appropriate. The IEMP will delineate the Fernald site's responsibilities for sitewide monitoring of surface water and sediment over the life of the remedy, and ensure that FRLs are achieved at project completion.

- The CERCLA Feasibility Study Report for Operable Unit 5 stated that if the concentrations of constituents remain above sediment BTVs after completion of the remedial action, then further investigation and remediation might be warranted. The sediment BTVs listed in the Feasibility Study Report for Operable Unit 5 were identified as contaminant concentrations that are protective of ecological receptors.

DOE Order 5400.1, General Environmental Protection Program, and DOE Order 5400.5, Radiation Protection of the Public, were also evaluated for any to-be-considered criteria that may drive environmental monitoring of sediment. This evaluation concluded that, although sediment sampling has been conducted under previous sampling based on DOE Orders, continued sediment monitoring is not mandated by DOE Orders in light of the current site conditions, planned actions regarding IEMP surface water sampling, and the planned sediment verification sampling both on and off property.

The sediment sampling scope will be continued in 2005 and 2006 through the use of an on-property, project-specific sampling program (i.e., Stream Corridors Project) and sediment sampling as specified in the IEMP along the Great Miami River as in recent years. Sampling conducted to verify on-property FRL attainment will occur under certification design planning conducted by the Demolition, Soil, and Disposal Project following remediation of areas within each of the on-site drainage's watershed. In particular, some excavation under the Stream Corridors Project (Paddys Run, the Pilot Plant Drainage Ditch and the Storm Sewer Outfall Ditch), following sampling and design work, is planned during 2005. In early 2006, certification of the on-property drainage is planned to be complete; therefore, no further on-property sediment monitoring is planned.

Table 5-1 lists the regulatory drivers for sediment monitoring. Sections 5.6 and 8.0 provide the plan for the evaluation and reporting of sediment monitoring data.

5.3 PROGRAMMATIC BOUNDARY FOR THE SEDIMENT MONITORING PROGRAM

The programmatic boundary between the IEMP and project-specific activities has been defined in detail in previous versions of the IEMP. With the conclusion of most soil and sediment remediation planned by the end of 2005, the programmatic boundary is less significant than previous years. The intent behind the boundary definition is to: (1) clearly delineate the scope and geographic extent of the IEMP monitoring responsibility; and (2) establish a recognized interface between the downstream surveillance focus of the IEMP and the predominant emission control and verification (in on-property drainages as part of soil remediation) focus of project-specific monitoring.

TABLE 5-1

FERNALD SITE SEDIMENT MONITORING PROGRAM REGULATORY DRIVERS AND RESPONSIBILITIES

	DRIVER	ACTION
IEMP	Operable Unit 5 Feasibility Study/Operable Unit 5 Record of Decision	The IEMP will be modified toward completion of the remedial action to include sampling to verify FRL achievement.

	DRIVER	ACTION	PROJECT PLAN
PROJECT	Operable Unit 5 Record of Decision Operable Unit 5 Feasibility Study	Sampling of on-site drainages and streams, as necessary, to determine excavation depth, if any, and certify clean for FRLs and BTVs	Sitewide Excavation Plan; Integrated Remedial Design Package

The IEMP sediment sampling program has been confined to the Storm Sewer Outfall Ditch, Paddys Run, and the Great Miami River in past years. For 2005 the IEMP sediment sampling objectives will be largely fulfilled by the project-specific Stream Corridors Project, which will define on-property sampling for stream corridor excavation control and/or certification sampling. The annual sampling of two sediment samples from the Great Miami River will also continue in 2005 and 2006 as described in the IEMP.

Project-specific sediment sampling in 2005 and 2006 will be detailed in excavation control, pre-certification and/or certification sampling plans as part of the Streams Corridor Project and will incorporate the requirements of the Sitewide Excavation Plan (DOE 1998).

5.4 PROGRAM EXPECTATIONS AND DESIGN CONSIDERATIONS

5.4.1 Program Expectations

The expectations for the sediment sampling program during 2005 and 2006 are to:

- Use project-specific sampling plans that will be implemented for excavation control, pre-certification and certification to meet the IEMP monitoring needs to the extent possible, namely that of reporting summary sediment data to stakeholders via the annual environmental report
- Continue monitoring two sample locations in the Great Miami River to confirm that the river is not being impacted by Fernald site remedial actions, including treated discharges from the outfall line.

In 2005 and 2006 the IEMP sediment program will be limited to the Great Miami River sample locations since the remedial actions and certification of the on-property stream corridors sediments will be complete by early 2006. Continued compliance with the Fernald site's NPDES discharge limits precludes any discharge or accumulation of contaminated sediment in the river. It is anticipated that both the verification sampling and historical information from the Great Miami River will confirm that remediation of sediment in the Great Miami River is unnecessary along with fulfilling the Operable Unit 5 Feasibility Study conclusion/recommendation.

5.4.2 Design Considerations

As described in the program expectations above, the program design will primarily rely on project-specific monitoring since these plans will include essentially the same sampling frequency, analytical constituents, sample locations, and ASL as past IEMP sampling programs. The design of the sediment program including project-specific plans will be developed in recognition of the remedial activities planned during 2005 and 2006. These remedial activities include:

- Soil excavation/certification activities in Areas 2, 3A, 3B, 4A, 4B, 5, 6, and 7 including the waste pits area, silos area, and on-property stream corridors (refer to Figure 5-1)
- Continued waste placement activities at the on-site disposal facility
- Operation activities associated with the Operable Unit 4 Accelerated Waste Retrieval Project and Silo 3 Project treatment facility, and activities associated with the Silos 1 and 2 remediation facility.

Additional information concerning site remedial activities is in Section 2.0.

In the past, the IEMP analytical constituents have included total uranium, radium-226, radium-228, thorium-228, thorium-230 and thorium-232. The project-specific sediment sampling and analysis programs for 2005 and 2006 will include the primary and secondary COCs, including most if not all of the radionuclides sampled under the IEMP in the past. The primary radiological COCs include total uranium, radium-226, radium-228, thorium-228, and thorium-232 while the secondary chemical COCs will likely include selected inorganic and organic chemicals, dependent on the final evaluation of pre-design data collected throughout 2004. Additionally, barium, cadmium, iron, lead, and zinc were identified as constituents of ecological concern (COEC) in the Sitewide Excavation Plan, Appendix C. These sediment COECs will be evaluated during the development of the certification design in 2005 to determine if there is a need for sampling and further evaluation.

The approximate schedule for beginning certification activities in the areas comprising the Stream Corridors are as follows: Storm Sewer Outfall Ditch – April 2005, Pilot Plant Drainage Ditch – September 2005, and Paddys Run – September to December 2005. Additionally, excavation control sampling and/or real-time gamma spectroscopy will be performed in advance of certification during excavation of debris and soil from various areas including the southern and northern oxbow areas of Paddys Run, the entire Pilot Plant Drainage Ditch, and sections of the Storm Sewer Outfall Ditch. The sampling density during certification sampling of the Stream Corridors will likely consist of a series of Group 1 certification units (each being 62,500 ft^2) with 12 locations sampled per certification unit. Therefore, this certification sampling density as well as the excavation control sampling or scanning planned for 2005 will be far greater than the 12 IEMP sediment sample locations collected once each year from the Stream Corridors. For comparison purposes, the Stream Corridors area covers approximately 32.3 acres; therefore, more than 270 sample locations will be sampled for certification in 2005. Specific information concerning analytical constituents, sample locations, and schedule will be conveyed to the regulatory agencies in 2005 in the Certification Design Letters for the Stream Corridors.

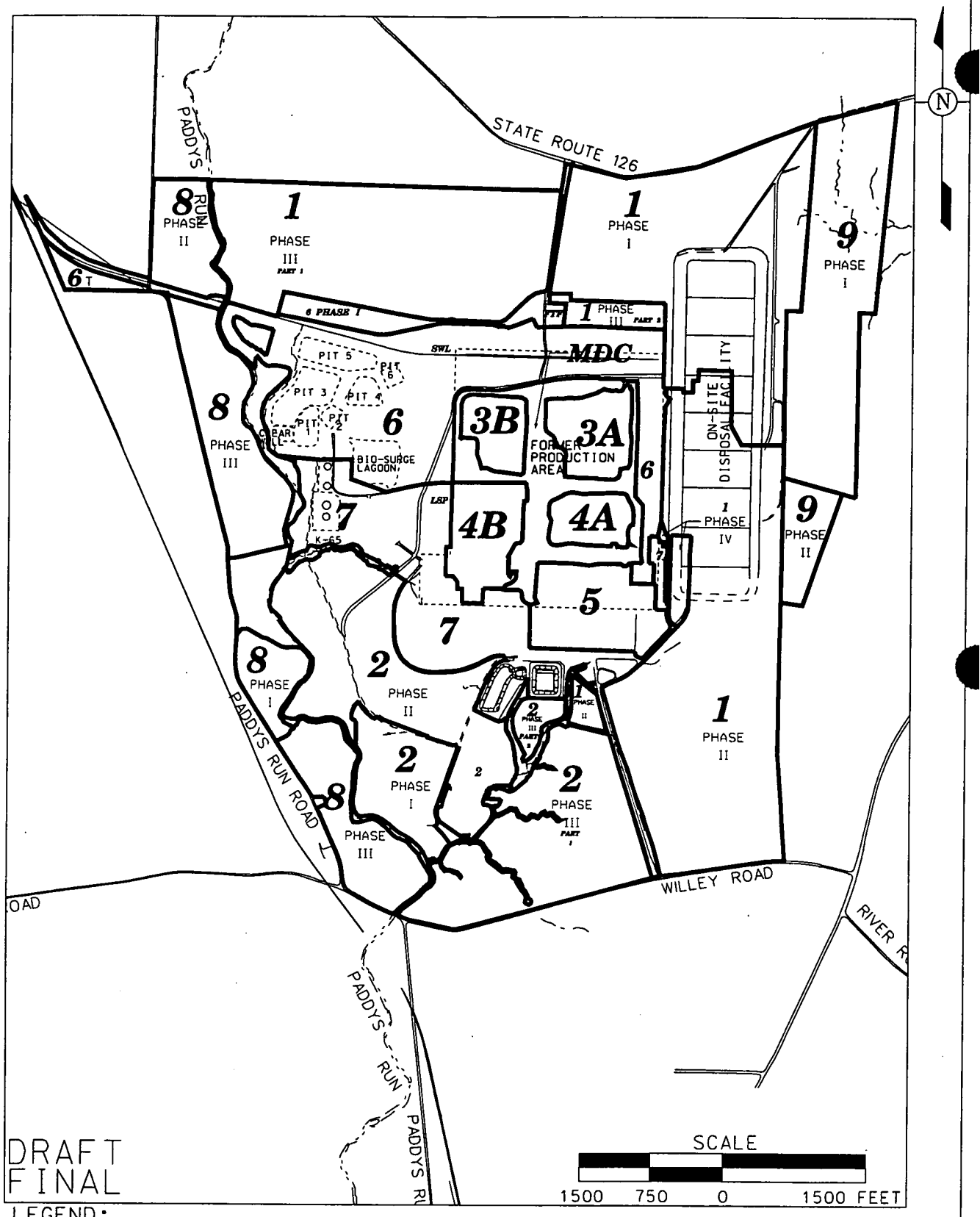

FIGURE 5-1. SITEWIDE REMEDIATION AREAS

Regarding public concerns of contaminated sediment mobilization, it should be noted that controls currently in place (and planned future controls during soil and sediment excavation) for site surface water and sediment runoff from the more highly contaminated areas reduce the contamination leaving the site. This is explained in detail for surface water in Section 4.0.

Based on the sediment data over the past 12 years, sediments from the Fernald site do not currently pose a risk to the public. Since 1991 the only sediment FRL exceedance occurred in a 1996 sediment sample from the Storm Sewer Outfall Ditch for thorium-232 (sample result of 1.8 picoCuries per gram [pCi/g] versus the FRL of 1.6 pCi/g).

Sediment monitoring data for 2005 and 2006 will continue to provide stakeholders with comprehensive data to assess the impact of remediation activities. These data will largely consist of certification sample results from on-property stream corridors. Given the density required for certification sampling, the previous IEMP on-property sample locations will be encompassed in the Stream Corridors Project sampling plans. It is anticipated that sediment samples will not be collected in 2006 from the on-property stream corridors as certification is planned to be complete early 2006. Consistent with recent years, samples will be collected from the two locations on the Great Miami River (one downstream from the outfall line and one background location) annually in 2005 and 2006 (refer to Figure 5-2).

5.5 MEDIUM-SPECIFIC PLAN FOR SEDIMENT MONITORING

This section serves as the medium-specific plan for implementation of the sampling, analytical, and data management activities associated with the limited IEMP sediment monitoring program for 2005 and 2006. This plan pertains to those samples to be collected from the Great Miami River. The majority of sediment samples collected in 2005, specifically from on-property stream corridors, will be addressed in project-specific sampling plans as part of the Stream Corridors Project.

The activities described in this medium-specific plan were designed to provide sediment data of sufficient quality to meet the program expectations and design as stated in Section 5.4.1 and 5.4.2. All sampling procedures and analytical protocols described or referenced herein are consistent with the requirements of the SCQ.

Subsequent sections of this medium-specific plan define the following:

- Project organization and associated responsibilities
- Sampling program
- Change control
- Health and safety
- Data management
- Project quality assurance.

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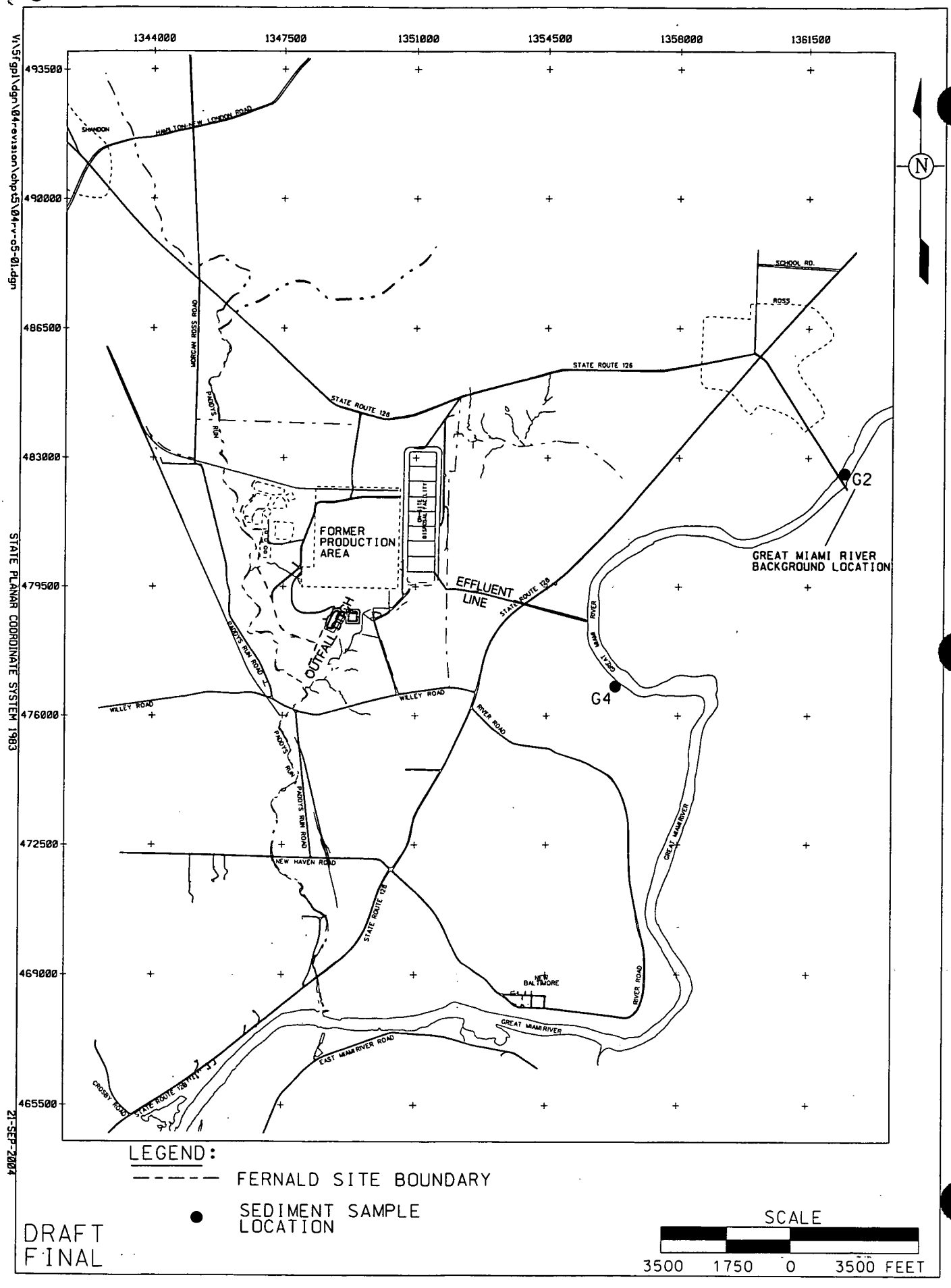
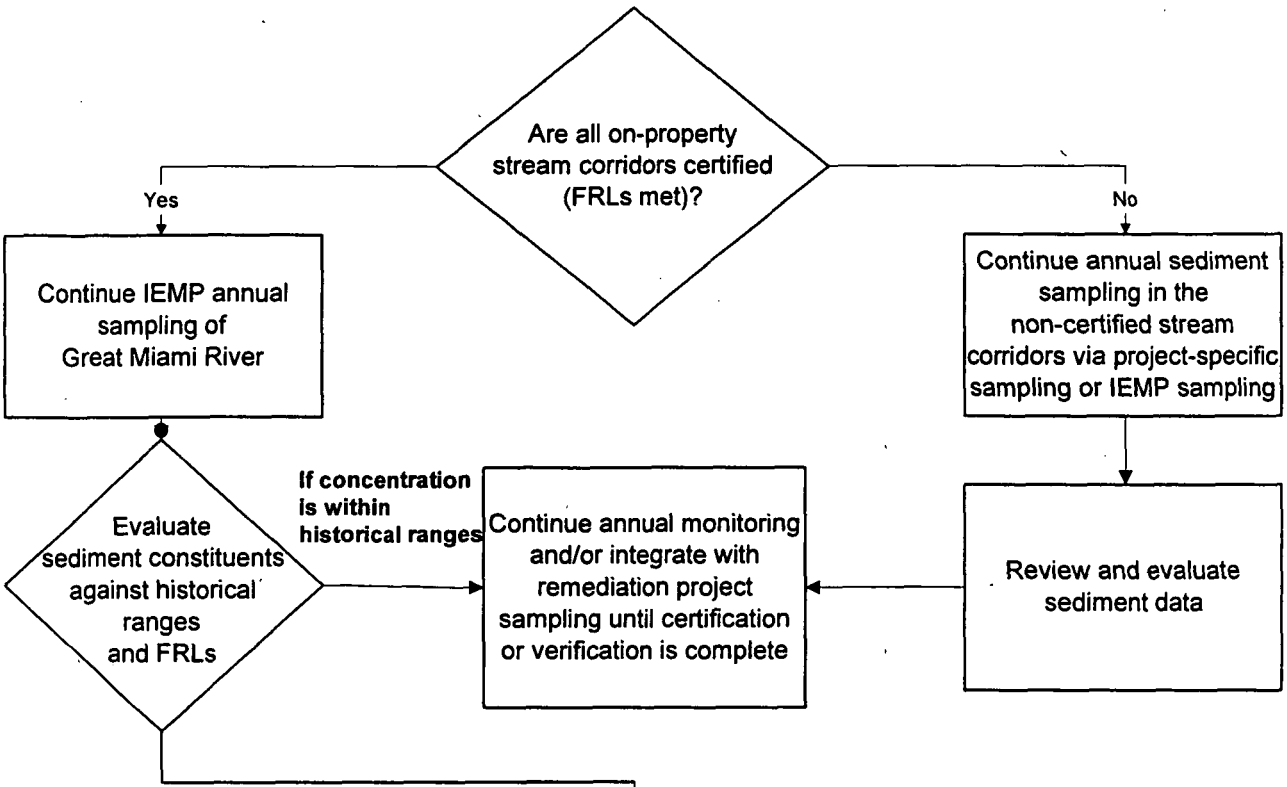


FIGURE 5-2. SEDIMENT SAMPLE LOCATIONS

FIGURE 5-3
IEMP SEDIMENT DATA EVALUATION AND ASSOCIATED ACTIONS



If concentration > historical ranges[a], but < FRLs	
IEMP Actions	Potential Project Actions (as necessary)
• Identify probable sources and alert associated projects as necessary • Continue annual monitoring until verification sampling of Great Miami River is complete • Trend data to determine potential for unacceptable future conditions • Report information to EPA/OEPA in the annual report	Evaluate the need for the following actions with respect to sediment remediation schedule: • Review performance/ inspection data for engineered controls • Review performance/ inspection data for engineered controls • Verify that engineered controls meet design specifications • Repair engineered controls, if necessary

If concentration > FRL	
IEMP Action	Potential Project Action (as necessary)
• Identify probable source areas and alert associated projects • Conduct confirmatory sampling to verify exceedance or coordinate with remediation project • Continue annual monitoring until verification sampling of Great Miami River is complete • Report information to EPA/OEPA in the annual report	Evaluate the need for the following actions with respect to sediment remediation schedule: • Review performance/ inspection data for engineered controls • Determine if engineered controls meet design specifications • Repair engineered controls, if necessary • Estimate duration of source activities • Redesign engineered controls • Quantify release

[a]Historical range established by sediment data collected from 1990 through 2004

5.6.2 Reporting

The IEMP sediment program data will be reported on the IEMP Data Information Site and in the annual site environmental report. Data on the IEMP Data Information Site will be in the format of searchable data sets and/or downloadable data files. The IEMP Data Information Site will be updated when sediment data become available. Due to the volume of data to be generated during certification sampling of the on-property stream corridors, this data set will be presented in summary level form. Additional information on IEMP data reporting is provided in Section 8.3.3.

The annual site environmental report will supplement the IEMP Data Information Site by providing a summary and assessment of the data results, and identifying notable results and/or events related to those data.

The IEMP annual site environmental reports will be issued each June. The IEMP annual site environmental reports will include the following:

- An annual summary of data from the IEMP sediment monitoring program (Great Miami River sample locations) or equivalent data from the project-specific sampling programs (i.e., Stream Corridors Project); graphical presentation of data trends over time for the Great Miami River locations
- Statistical summary (i.e., minimum, maximum, and mean) by constituent for Great Miami River locations
- Summary-level information on the effectiveness of the project-specific sediment control structures (to include sediment control efficiency data, if necessary for interpretation of sitewide impacts).

If necessary, sediment results will be presented prior to the submittal of annual site environmental reports to the EPA and OEPA if significant changes in sediment contaminant concentrations are evident.

Because the IEMP is a living document, a schedule of annual reviews and two-year revisions have been instituted. The annual review cycle provides the mechanism for identifying and initiating any sediment program modifications (i.e., changes in constituents, locations, or frequencies) that are necessary to align the IEMP with the current mix of near-term remediation activities. Any program modifications that may be warranted prior to the annual review will be communicated to EPA and OEPA.

SECTION 6

6.0 AIR MONITORING PROGRAM

Section 6.0 discusses the monitoring strategy for assessing the sitewide impact of the remediation activities on the air pathway. The strategy identifies the activities conducted to satisfy requirements for particulate, radon, and direct radiation monitoring. A medium-specific plan for conducting sitewide and off-property air monitoring activities is provided, along with a plan for reporting air-related activities.

6.1 INTEGRATION OBJECTIVES FOR THE AIR MONITORING PROGRAM

The IEMP air monitoring program objectives for 2005 and 2006 are consistent with program objectives in previous IEMP revisions. The objectives involve physically monitoring the air pathway and providing dose assessments to satisfy 40 CFR 61, Subpart H, and the requirements of DOE Orders for 2005. These assessments will be integrated with the assessments of the other media sampled under the IEMP and provided to regulatory agencies in reports according to the reporting schedule established in Section 6.6 and summarized for all media in Section 7.0.

The air monitoring program describes a monitoring-based approach for demonstrating compliance with the requirements of 40 CFR 61, Subpart H that reflects the nature of emission sources. The primary emission sources for 2005 are expected to be fugitive emissions resulting from a diverse range of activities including building decontamination and dismantling, large-scale excavations, material handling, and waste processing operations. It is difficult to predict or measure emissions from such diffuse sources with certainty. Monitoring at the Fernald site boundary will provide a direct integrated measure of the environmental impact resulting from the full range of planned remediation activities, and therefore, provide a reliable, accurate assessment of dose received by off-site receptors via the air pathway. With the anticipated project completion of all major remediation activities at the end of 2005 (including the completion of decontamination and dismantling, large-scale excavations, and waste processing activities), an approach for a phased reduction of air monitoring activities is needed, as well as transition from a monitoring-based approach for demonstrating compliance with the requirements of 10 CFR 61, Subpart H. Prior to the IEMP annual review, DOE will submit two letters as part of the pre-approval process to the EPA and OPEA. One letter, to be submitted early in 2005, will outline the phased reduction of air monitoring activities based on the completion of various projects while using aspects of the Environmental Regulatory Guide for Radiological Effluent Monitoring and Surveillance. The letter will include specific details; however, the phased approach is also outlined in this IEMP revision.

The second letter, to be submitted later in 2005, will outline the recommended path forward for the removal of site fenceline monitors during the transition from a monitoring-based approach for demonstrating compliance. The annual review of the IEMP will include more specific information regarding the removal

of site fenceline monitors based on EPA approval of the separate submittal (i.e., the letter). The monitors will remain in place until both the EPA and OEPA approve an approach for reduction.

The design of the air monitoring program for 2005 and 2006 was developed in recognition of the potential major sources of emissions and accelerated cleanup schedule initiatives expected to be active during this time period. The major sources and initiatives include:

- Soil excavation/certification activities in Areas 2, 3A, 3B, 4A, 4B, 5, 6 and 7 including the waste pits area, silos area, and on-property stream corridors
- Continued waste placement activities at the on-site disposal facility
- Continued dismantlement and demolition of on-site structures
- Operation activities associated with the Operable Unit 4 Accelerated Waste Retrieval project and Silo 3 Project treatment facility, and radon emission and activities associated with the Silos 1 and 2 remediation facility.

Additional information concerning site remedial activities is contained in Section 2.0.

The focus of the program will be to monitor the collective sitewide effects of remediation activities occurring in 2005 and 2006. The results will be evaluated as frequently as possible to provide necessary feedback to the projects to ensure that cumulative sitewide impacts remain below established thresholds. Ultimately, this information will assist in tracking trends during remediation to help identify changes needed in the air monitoring program emphasis and/or design. A reporting plan is provided in Section 6.6 to combine the results of the air monitoring program and the NESHAP dose assessments into a single reporting mechanism to facilitate regulatory agency review of the sitewide remediation activities and associated emission controls. Appendix C outlines the FCP's plan for demonstrating NESHAP Subpart H compliance and producing required dose assessments during remediation.

6.2 ANALYSIS OF REGULATORY DRIVERS, DOE POLICIES, AND OTHER FERNALD SITE-SPECIFIC AGREEMENTS

This section identifies the pertinent regulatory requirements, including ARARs and to-be-considered requirements, for the scope and design of the air monitoring program. These requirements will be used to confirm that the program satisfies the regulatory obligations for monitoring that have been activated by the records of decision and will achieve the intentions of other pertinent criteria (such as DOE Orders and the Fernald site existing agreements) that have a bearing on the scope of air monitoring. The results of the evaluation are also used to define the programmatic boundaries between the sitewide IEMP responsibilities and the project-specific emissions control monitoring conducted by the individual projects.

6.2.1 Approach

The analysis of the additional regulatory drivers and policies for air monitoring was conducted by identifying the suite of ARARs and to-be-considered requirements in the approved CERCLA records of decision and legal agreements that contain specific air monitoring requirements. This subset was further divided to identify those monitoring requirements with sitewide implications (and therefore fall under the scope of the IEMP) and those that pertain to emission control monitoring that would be the responsibility of the individual remediation projects.

6.2.2 Results

The following regulatory drivers govern the technical scope and reporting requirements for the IEMP's sitewide air monitoring program:

- DOE Order 5400.1, General Environmental Protection Program, which requires DOE facilities that use, generate, release, or manage significant pollutants or hazardous materials to develop and implement an environmental monitoring plan. Each DOE site's environmental monitoring plan must contain the design criteria and rationale for the routine effluent monitoring and environmental surveillance activities of the facility. The IEMP strategy is responsive to the changing site mission and associated remediation needs and complies with DOE Orders.

- DOE Order 5400.5, Radiation Protection of the Public and Environment, which establishes radiological dose limits and guidelines for the protection of the public and environment. Under this requirement, the exposure to members of the public associated with activities from DOE facilities from all pathways must not exceed, in one year, an effective dose equivalent of 100 mrem. For radiological dose due to airborne emissions only, the DOE Order requires compliance with 40 CFR 61, Subpart H limit of an effective dose equivalent of 10 mrem/year to a member of the public. Demonstration of compliance with this standard is to be based on an air monitoring approach. The DOE Order also provides guidelines for radionuclide concentrations in air (known as Derived Concentration Guides) and radon concentration limits for interim storage of sources during remediation. These radon limits are 100 picoCuries per liter (pCi/L) at any given point, 30 pCi/L annual average sitewide, 3 pCi/L annual average above background at the Fernald site boundary, and 20 picoCuries per square meter per second ($pCi/m^2/sec$) flux rate for storage of radon generating wastes (per 40 CFR 61, subpart Q). The guidance document associated with this DOE Order recommends confirmatory air monitoring surveillance, which is incorporated into the IEMP.

- Proposed 10 CFR 834, DOE Facilities Radiation Protection of the Public and Environment, which is similar in intent to DOE Order 5400.5. However, differences include the deletion of the 100-pCi/L limit and 30-pCi/L annual limit; lowering the fenceline limit to 0.5 pCi/L above background; changes to facility and facility boundary definitions; and clarifications to the definition of point of compliance. Because this rule is adopted into the remediation documents for the Silos and Waste Pits Projects as standards that must be met, the 0.5 pCi/L above background requirement has been incorporated into this plan. If the rule is promulgated, a comprehensive compliance strategy will be developed to accommodate the site-specific circumstances relative to meeting the new standards.

- NESHAP 40 CFR 61, Subpart H, which provides national emissions standards for radionuclides other than radon. Per this requirement, emissions of radionuclides (excluding radon) to the ambient air from DOE facilities shall not exceed those amounts that would cause any member of the public to receive in any year an effective dose equivalent in excess of 10 mrem/year. Demonstration of compliance with this standard is to be based on an air monitoring approach.

- Federal Facility Agreement (FFA), Control and Abatement of Radon-222 Emissions, signed November 19, 1991, which ensures that DOE takes all necessary actions to control and abate radon-222 emissions at the Fernald site. This agreement acknowledges that the K-65 Silos (Operable Unit 4) exceed the radon emission of 20 $pCi/m^2/sec$, but allows the FCP to address this exceedance by implementing a removal action to bring radon emissions from the silos to a level as low as reasonably achievable (ALARA), and to attain the NESHAP Subpart Q standard upon completion of final remediation. The removal action work plan included a radon monitoring system, which was previously monitored under the predecessor Environmental Monitoring Plan, and is now incorporated into the IEMP. The FFA also requires demonstration of compliance with the Subpart Q standard (upon completion of remedial actions) for the waste pits, clearwell, and any other sources found to emit radon in excess of 20 $pCi/m^2/sec$.

- DOE Order 5820.2A (DOE 1988), Chapter III.3.k, Environmental Monitoring, which requires low-level radioactive waste disposal facilities to perform environmental monitoring that meets requirements in DOE Order 5400.1 for all media, including the air pathway. This requirement applies to the on-site disposal facility, as it is the only disposal facility at the Fernald site. Instead of a separate monitoring plan for the on-site disposal facility, the air monitoring program for the on-site disposal facility will be integrated and incorporated into the IEMP's air monitoring program.

- Per the CERCLA Remedial Design Work Plan for Remedial Actions at Operable Unit 5, monitoring will be conducted as required following the completion of cleanup to assess the continued protectiveness of the remedial actions. The IEMP will specify the type and frequency of environmental monitoring activities to be conducted during remedy implementation, and ultimately, following the cessation of remedial operations as appropriate. The IEMP will delineate the Fernald site's responsibilities for sitewide monitoring over the life of the remedy, and ensure that FRLs are achieved at project completion. In addition to these FRL attainment responsibilities, the IEMP will also define sitewide remedial monitoring requirements for air.

Upon evaluating the IEMP ARARs in consideration of protection of human health and/or the environment, the 10 mrem/year dose limit was determined to be the most stringent emission limit. Therefore, the 10 mrem/year NESHAP standard provides a reasonable benchmark for ensuring compliance with all other air standards (excluding radon) and ensuring an adequate level of protectiveness.

Twelve other regulatory drivers have air monitoring implications of a project-specific emissions control nature, which fall outside the scope of the IEMP. These requirements pertain to the monitoring of fugitive area emission controls and the monitoring of point source emissions. The project-specific air monitoring drivers for fugitive dust include:

- Permit to Install New Sources, Criteria for Decision by Director, OAC 3745-31-05(A)(3), which requires the use of Best Available Technology (BAT) when installing, modifying, and operating an air contaminant source. The BAT Determination for Remedial Construction Activities at the Fernald site provides a method for using BAT as it applies to fugitive dust sources. During 1997, DOE and OEPA negotiated a BAT determination that established control measures, emission standards, and record keeping requirements for the control of fugitive dust from roads (paved and unpaved), material storage piles, parking areas, and construction areas. This BAT determination has been approved by OEPA and is contained in Fugitive Dust Control Requirements (DOE 2002d).

- Ohio General Provisions on Air Pollution Control, Air Pollution Nuisances Prohibited, OAC 3745-15-07 and Ohio Revised Code (ORC) 3704.01-.05, which prohibits the emission or escape into the open air of smoke, ashes, dust, dirt, grime, acids, fumes, gases, vapors, and odors in such amounts that may cause a public nuisance. Control of such emissions is the responsibility of the projects through source control, as described in the BAT Determination for Remedial Construction Activities at the Fernald site.

- Ohio Emissions of Particulate Matter, Restriction of Emission of Fugitive Dust, OAC 3745-17-08, which provides for the restriction of emission of fugitive dust by the use of control measures. Such control measures include, for example, water or dust suppression chemicals for control of fugitive dust from demolition of buildings or on dirt or gravel roads, the use of hoods or fans to enclose and control fugitive dust, and the use of canvas or other coverings for stockpiles.

The project-specific regulatory drivers for point and other sources include:

- NESHAP 40 CFR 61, Subpart Q, which provides national emissions standards for radon. The standard for this regulation is that no source at a DOE facility shall emit more than 20 $pCi/m^2/sec$ of radon-222, as an average for the entire source, into the air. A source is defined in the regulation as any building structure, pile, impoundment, or area used for storage or disposal that contains sufficient quantities of radium so as to exceed the standard. Staging of material, such as the silo residues, during the implementation of remedial actions does not constitute interim storage under NESHAP subpart Q. To demonstrate compliance with the standard, radon monitoring is conducted at the source. Such source monitoring, with the exclusion of that conducted at the K-65 Silos, will be addressed within project remedial design and remedial action documents. The K-65 Silo headspace and area environmental monitoring will be conducted under the IEMP.

- NESHAP 40 CFR 61, Subpart H, which provides national emissions standards for radionuclides other than radon. This regulation also requires emission measurements at point sources with a potential to discharge radionuclides into the air in quantities which could cause an effective dose equivalent in excess of 1 percent of the standard (10 mrem/year).

- Ohio Particulate Matter Standards, Restrictions on Particulate Emissions from Industrial Processes, OAC 3745-17-11, which describes emission restrictions for particulates from industrial processes. These restrictions apply to operations, processes, or activity other than those subject to fugitive dust regulations in OAC 3745-17-08 (discussed above), and are therefore applicable to process units.

- Particulate Matter Standards, Control of Visible Emissions from Stationary Sources, OAC 3745-17-07(A), which sets visible particulate emission limitations for stacks. Visible particulate emissions from any stack cannot exceed 20 percent opacity, as a six-minute average.

- Air Quality Standards, Control of Emissions of Organic Materials from Stationary Sources, OAC 3745-21-07(G)(2), which sets a discharge limit of 40 pounds of organic material per day, and no more than eight pounds per hour, for any article, machine, equipment, or other contrivance used for applying, evaporating, or drying and photochemically reactive material unless the discharge has been reduced by at least 85 percent.

- Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities, Miscellaneous Units, 40 CFR 264.601 through .603, and OAC 3745-57-91 through 93, which requires that miscellaneous units be designed, operated, and maintained to prevent releases to the air pathway. Monitoring may be necessary to evaluate the effectiveness of air emission controls. Operable Unit 1 remedial actions may require the use of miscellaneous units for the management or treatment of RCRA-regulated hazardous waste.

- Permit to Install New Sources, Criteria for Decision by Director, OAC 3745-31-05(A)(3), which requires the use of BAT when installing, modifying, and operating an air contaminant source. Any treatment units for remediation activities will be designed to include BAT.

- General Provisions on Air Pollution Control, Malfunction of Equipment, Scheduled Maintenance, Reporting, OAC 3745-15-06(A)(1) and (2), which require scheduled maintenance of air pollution control equipment in order to prevent a malfunction. Shutdown of the operating unit, if required to conduct the maintenance, must be accompanied by the shutdown of the associated air pollution sources. Project-specific remedial design and remedial action work plans will include a maintenance program to address this requirement.

- Ohio Standards for Active and Inactive Asbestos Disposal Sites, OAC 3745-20-06 and OAC 3745-20-07(A) and (C), which prohibit visible emissions of asbestos during and after placement. Asbestos management is primarily limited to asbestos removal conducted prior to building demolition and disposal either off-site or in the on-site disposal facility. The visible emission standard for asbestos is closely tied to asbestos management, and is not within the scope of the IEMP.

Table 6-1 lists all of the above requirements and includes each of the air monitoring regulatory requirements to be conducted under the IEMP and the associated monitoring designed to comply with each requirement. Table 6-1 also lists each regulatory driver for project-specific air monitoring, the monitoring conducted to meet the requirement, and the project-specific plan that will describe the monitoring program. Sections 6.6 and 8.0 outline the current and long-range plan for complying with the reporting requirements invoked by the IEMP regulatory drivers.

TABLE 6-1

FERNALD SITE AIR MONITORING PROGRAM
REGULATORY DRIVERS AND RESPONSIBILITIES

	DRIVER	ACTION
IEMP	DOE Order 5400.1, General Environmental Protection Program Environmental Monitoring Plan for all media	The IEMP describes effluent and surveillance monitoring as required by DOE Order 5400.1.
	DOE Order 5400.5, Proposed 10 CFR 834 Radiation Protection of the Public and Environment	The IEMP describes on-site and off-site monitoring for radon and other radionuclides, and monitoring to determine annual dose from the air pathway.
	NESHAP 40 CFR 61, H Emission Standards for Radionuclides (excluding radon)	The IEMP includes an assessment of the annual dose to the public from the air pathway by employing a fenceline monitoring program.
	Federal Facility Agreement Control and Abatement of Radon-222 Emissions	The IEMP includes radon monitoring at the Operable Unit 4 Silos and the Operable Unit 1 waste pits through project completion of the remedial action.
	DOE Order 5820.2A, Radioactive Waste Management	The IEMP fenceline air monitoring includes air monitoring at locations adjacent to the on-site disposal facility.

TABLE 6-1
(Continued)

PROJECT	DRIVER	ACTION	PROJECT PLAN
	NESHAP 40 CFR 61, Q, Emission Standards for Radon for Storage and Disposal Units or Areas	Radon monitoring at Operable Units 1 and 4 storage and disposal units through project completion of remedial action.	Operable Unit 1 Remedial Design/Remedial Action Documents Package; Operable Unit 4 Remedial Design Packages
	OAC 3745-17-11, Ohio Particulate Matter Standards Industrial Processes	Visible emission monitoring for Operable Unit 1 waste pit treatment unit stacks/vents and Operable Unit 4 treatment units, as determined necessary to ensure compliance with the standard.	Operable Unit 1 Remedial Design/Remedial Action Documents Package; Operable Unit 4 Remedial Design Packages
	40 CFR 264.601-.603; OAC 3745-57-91 through 93, Miscellaneous Hazardous Waste Management Units	Monitoring at vents/stacks at Operable Unit 1 hazardous waste treatment of storage units, as determined necessary by modeling.	Operable Unit 1 Remedial Design/Remedial Action Documents Package
	OAC 3745-31-05(A)(3), BAT for New Air Sources	Air monitoring at stacks/vents for Operable Units 1 and 4 treatment units, as determined necessary to ensure compliance with the standard.	Operable Unit 1 Remedial Design/Remedial Action Documents Package; Operable Unit 4 Remedial Design Packages

	DRIVER	ACTION	PROJECT PLAN
PROJECT - FUGITIVE DUST CONTROL	OAC 3745-17-07(a), Ohio Particulate Matter Standards Visible Particulate Emissions for Stacks	Visible emission monitoring for Operable Unit 1 waste pit treatment unit stacks/vents and Operable Unit 4 treatment units, as determined necessary to ensure compliance with the standard.	Operable Unit 1 Remedial Design/Remedial Action Documents Package; Operable Unit 4 Remedial Design Packages
	OAC 3745-21-07(G)(2), Ohio Air Quality Standards for Organics	Air monitoring at stacks/vents for Operable Unit 1 treatment units, as determined necessary by modeling.	Operable Unit 1 Remedial Design/Remedial Action Documents Package
	OAC 3745-31-05(A)(3), BAT for New Air Sources	Visible emission monitoring for roadways and parking areas, and storage piles associated with the Operable Unit 1 waste pits, soil excavation, and on-site disposal facility projects, and other construction activities as determined necessary to ensure compliance with the standard.	BAT Determination for Remedial Construction Activities at the Fernald site
	OAC 3745-15-07; ORC 3704.01-.05, Ohio General Provisions on Air Pollution Control, Prohibition of Public Nuisance	Visible fugitive emission monitoring for waste pit excavation, soil excavation areas, and on-site disposal facility construction and waste placement as determined necessary to ensure compliance with the standard.	BAT Determination; Sitewide Excavation Plan
	OAC 3745-17-08, Ohio Emissions of Particulate Matter Control of Emissions of Fugitive Dust	Visible fugitive emission monitoring for waste pit excavation, soil excavation areas, and on-site disposal facility construction and waste placement as determined necessary to ensure compliance with the standard.	BAT Determination; Sitewide Excavation Plan; On-Site Disposal Facility Impacted Materials Placement Plan, and Borrow Area Management and Restoration Plan
	OAC 3745-17-07(B)(4) through (6), Ohio Emissions of Particulate Matter Roadways, Parking Areas, and Storage Piles	Visible emission monitoring for roadways, parking areas, and storage piles associated with the Operable Unit 1 waste pits, soil excavation, and on-site disposal facility.	BAT Determination; Operable Unit 1 Remedial Action Documents Package; Sitewide Excavation Plan

6.3 BOUNDARY DEFINITION

This section identifies the programmatic boundaries established between the IEMP and the project-specific activities. The intent behind the boundary definition is to clearly delineate the scope of the IEMP's monitoring responsibility and establish a recognized interface between the sitewide focus of the IEMP and the fugitive and point source emission control focus of the project-specific monitoring.

The program boundaries for air monitoring are defined in the following two fundamental areas:

Fugitive Emissions Monitoring

As stated, the air monitoring program presented in the IEMP will serve as the vehicle for demonstrating compliance with the NESHAP Subpart H limit ensuring that no member of the public receives an effective dose equivalent in excess of 10 mrem/year from radionuclide emissions (excluding radon) as a result of Fernald site operations. As such, the air monitoring approach presented in this plan will provide a continual measurement of the collective effectiveness of fugitive and point source emissions from the site relative to this health protective standard. Each project is responsible for controlling fugitive dust to comply with the BAT determination for the Fernald site. The standards and control techniques are provided in Fugitive Dust Control Requirements, which has been approved by OEPA. This procedure outlines the administrative and engineered controls for mitigating fugitive dust. Additional air monitoring at the project level to determine the effectiveness of specific administrative and engineered controls for fugitive dust abatement (above those required under the BAT determination) are not necessary to ensure protection of the public or support compliance with NESHAP, Subpart H. However, the air monitoring information maintained by the projects will be used as necessary to support the data interpretations conducted through the IEMP. Likewise, the air monitoring data collected through the IEMP will be used to provide continual feedback to the remediation projects on the effectiveness of emission controls.

Point Source Monitoring

Point source monitoring (i.e., monitoring stacks and vents) is designated as a remediation project responsibility due to the direct emission and process control nature of this monitoring activity. The technical approach and design of stack monitoring systems will be an integral part of the process control scheme and overall system design for existing and future remediation treatment units (e.g., Waste Pits Project and Silos Projects). The data collected from stack monitoring systems, including radon and particulate data will provide critical information that will serve as process control feedback on unit operations. As such, the individual remediation project responsible for the process must maintain responsibility for the monitoring system design and operation. However, as discussed in Section 1.0, the

data collected from point source emissions will be integrated into the IEMP reporting framework as necessary to support sitewide data interpretations.

6.4 PROGRAM EXPECTATIONS AND DESIGN CONSIDERATIONS

6.4.1 Program Expectations

The IEMP air monitoring program has been designed to collect data sufficient to meet the following expectations for 2005 and 2006:

- Provide a program that will provide a continual assessment of the collective emissions accompanying multiple concurrent remediation projects to determine if the emissions are ALARA, and provide necessary early warning feedback regarding the cumulative sitewide effectiveness of project-specific emission controls relative to applicable protective health standards

- Provide monitoring data sufficient to demonstrate compliance with 40 CFR 61, Subpart H, requirements ensuring that no member of the public receives an annual effective dose equivalent in excess of 10 mrem

- Provide data sufficient to determine compliance with the radon concentration limits of DOE Order 5400.5 and 10 CFR 834

- Provide measurements of direct radiation sufficient to support the annual dose assessment calculations required by DOE Order 5400.5 accounting for all significant exposure pathways

- Provide a program that promotes the continued confidence of the public and is responsive to concerns raised by stakeholders regarding forthcoming remediation activities

- Provide a program capable of assessing trends from year to year so that necessary modifications or adjustments in program focus can be accommodated.

6.4.2 Design Considerations

The air monitoring program is comprised of three distinct components:

- Radiological air particulate monitoring
- Radon monitoring
- Direct radiation monitoring.

Each component of the sitewide air monitoring program is designed to address a unique aspect of air pathway monitoring, and as such, reflects distinct sampling methodologies and analytical procedures.

The following sections and Appendix C provide a detailed discussion on the design of the IEMP air monitoring program.

6.4.2.1 Radiological Air Particulate Monitoring Design Summary

The radiological air particulate monitoring/modeling program for 2005 and 2006 is designed to fulfill the following primary program expectations:

- Provide a continual assessment of the collective emissions accompanying multiple concurrent remediation projects to determine if the emissions are ALARA, and provide necessary early warning feedback regarding the cumulative sitewide effectiveness of project-specific emission controls relative to the health protective NESHAP standard of 10 mrem

- Provide sufficient monitoring data to demonstrate compliance with 40 CFR 61, Subpart H requirements ensuring that no member of the public receives an annual effective dose equivalent greater than 10 mrem.

To meet these expectations during 2005, the program design is based on taking direct measurements of radionuclide concentrations in the environment at the site fenceline and a background location (refer to Figure 6-1). A network of 18 high-volume air monitoring stations have been established, based on the location of potential off-site receptors and in consideration of the 16 primary wind rose sectors (refer to Figure 6-2). The monitoring network encompasses all the current and expected diffuse and point sources at the Fernald site. Because the point of compliance under NESHAP Subpart H is the public receptor location, monitoring locations are designated at the Fernald site boundary in wind rose sectors where potential receptors are located adjacent to the property boundary (primarily in the south and west). In sectors where the closest potential receptors are not immediately adjacent to the Fernald site property boundary (primarily northwest and east), monitors are designated at the Fernald site property boundary in line with these receptor locations. The Environmental Regulatory Guide for Radiological Effluent Monitoring and EPA siting criteria (40 CFR 58, Appendix E) were considered when selecting these locations. It should be noted that while using the alternate method of air monitoring, the point of compliance is the site boundary where the air monitors are physically located.

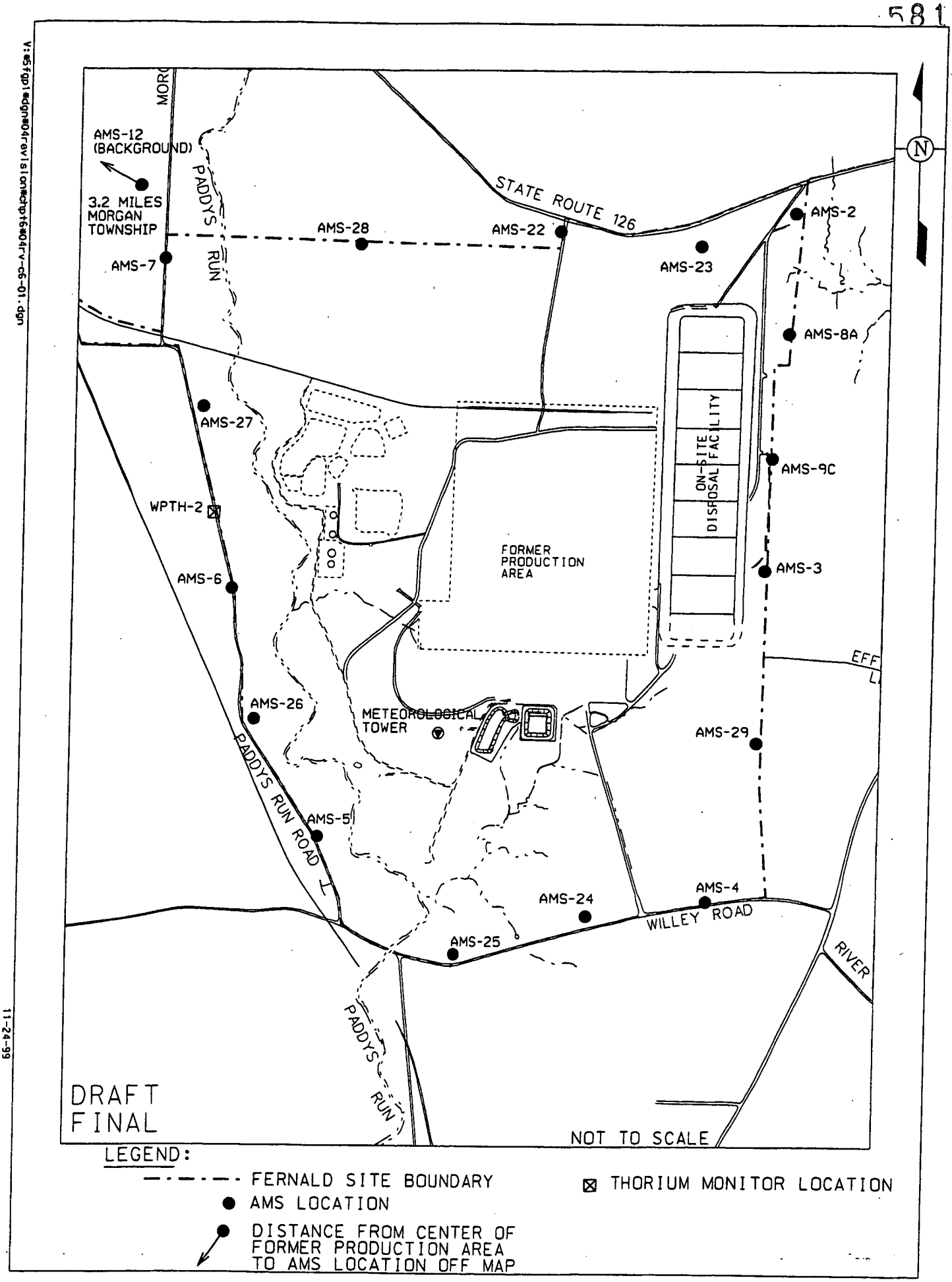


FIGURE 6-1. IEMP AIR MONITORING LOCATIONS

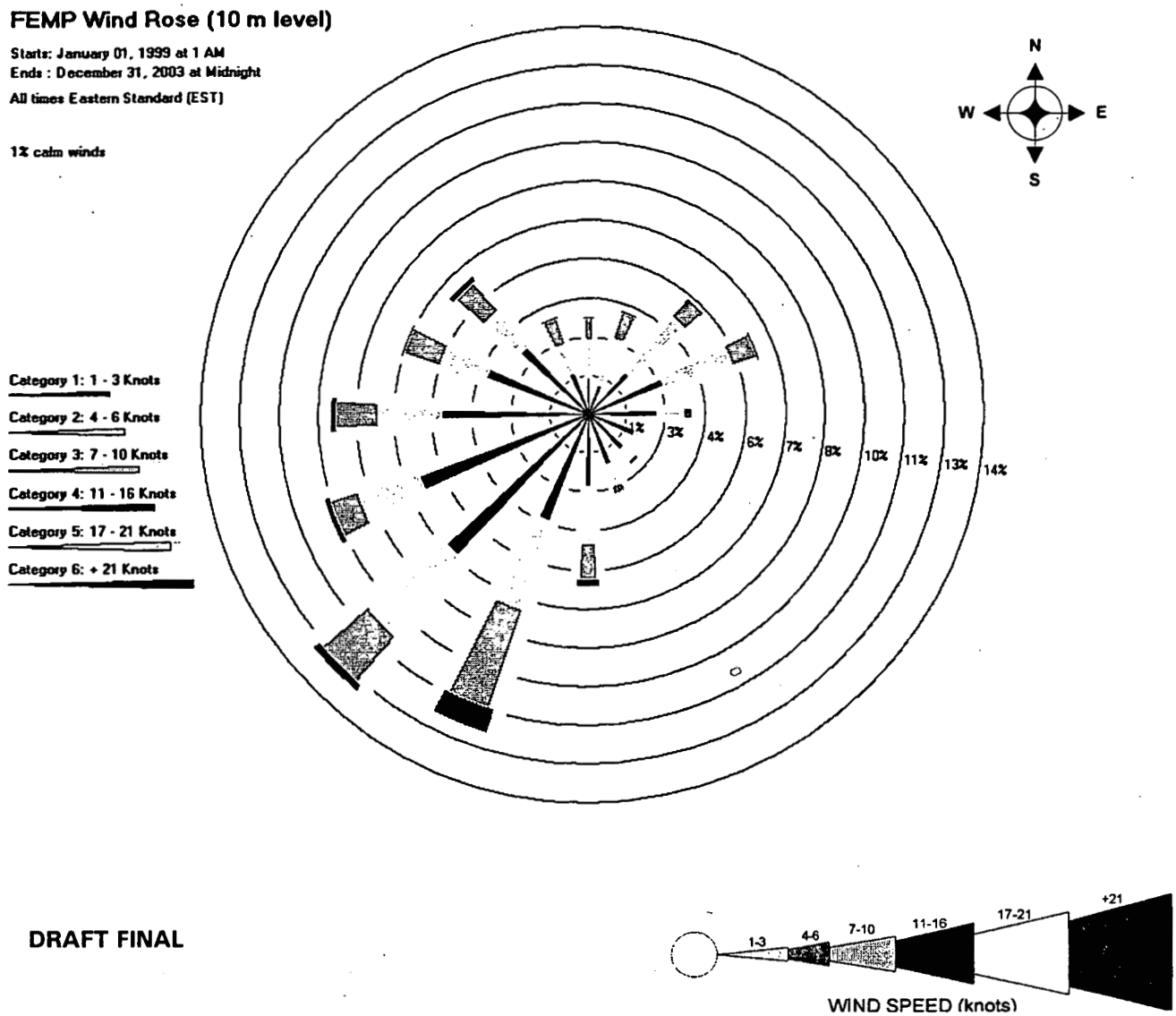


FIGURE 6-2. AVERAGE FERNALD SITE WIND ROSE DATA, 1999-2003

The sampling and analysis plan for air particulate monitoring program is designed to meet the following two fundamental criteria:

- Provide routine analysis that supports a timely evaluation of the effectiveness of sitewide emission controls

- Account for the major contributors to dose as defined in 40 CFR 61.93(b)(5)(ii) for the purposes of demonstrating NESHAP Subpart H compliance.

Based on these criteria, the sampling and analysis frequency for the radiological air particulate monitoring program for 2005 consists of the following:

- Biweekly Uranium and Total Particulate Samples

  Filters will be exchanged biweekly at all air monitoring stations. AMS-2 through AMS-29 will be analyzed for total uranium and total particulate. The data will provide the basis for conducting an ongoing assessment of the effectiveness of sitewide emission controls. The results of this assessment will be routinely provided as feedback to the remediation projects in order to support timely project decision making as necessary. Section 6.6 presents the data evaluation process. Uranium represents the most pervasive contaminant at the site; it can be analyzed quickly, reliably, and inexpensively, and is expected to be one of the major contributors to dose (in addition to thorium) based on the remediation activities scheduled over the next two years.

  The total particulate data will be used to evaluate particulate loading on the filters. The particulate loading will be monitored to ensure that acceptable flow rates are maintained through the filter. If loading becomes excessive due to increased activity at the site and in the surrounding community, then adjustments will be made to the sampling frequency.

- Monthly Thorium Samples

  During certain remediation projects, thorium may surpass uranium as the major contributor to dose. The Waste Pits Project has the potential to generate particulate emissions containing elevated levels of uranium and thorium. Although thorium isotopes are measured on a quarterly frequency at AMS-2 through AMS-29, more frequent analysis for thorium is judged to be necessary to provide regular monitoring of fenceline thorium levels. Based on fenceline monitoring results, thorium-230 has proven to be the major contributor to air inhalation dose from Waste Pits Project emissions. While the application of administrative and engineering controls for fugitive dust abatement will minimize Waste Pits Project emissions, there is a need to confirm thorium emissions remain at low levels during the Waste Pits Project. Therefore, a portion of the biweekly filters from AMS-2 through AMS-29 and WPTH-2 will be used to form a monthly composite sample (except for four months when quarterly composites are collected that will be analyzed for thorium [thorium-228, thorium-230, and thorium-232] at an off site laboratory).

Once the Waste Pits Project is complete, the need for more frequent analysis will be reduced. Therefore, at the project completion of the Waste Pits Project, the project-specific monitor WPTH-2 will be included in the letter for approval outlining phased reductions (refer to Figure 6-1A). When both the Waste Pits Project and the Accelerated Waste Retrieval Project, including Silo 3 remediation, are completed, the need for more frequent thorium analysis should be reduced. Therefore, monthly thorium analysis at fenceline and background monitors AMS-2 through AMS-29 could also be reduced when these projects are complete. These phased reductions will be submitted to EPA and OEPA in a letter regarding demonstration of NESHAP compliance in early 2005.

- Quarterly Composite Sampling

  A portion of each biweekly sample (AMS-2 through AMS-29) will be used to form a quarterly composite sample for each air monitoring station for demonstrating NESHAP Subpart H compliance. The quarterly composite samples will be analyzed at an off-site laboratory for the expected major contributors to dose, including uranium-238, uranium-235/236, uranium-234, thorium-232, thorium-230, thorium-228, and radium-226. The results of the quarterly composite data will be used to track compliance against the NESHAP Subpart H standard and will serve as the basis for demonstrating annual compliance. The data will also be incorporated into the ongoing evaluation of emission controls.

The key isotopes selected for quarterly analysis represent the major contributors to dose based on the following considerations:

- Radionuclides which are stored in large quantities at the Fernald site and which will be handled or processed during the remediation effort (uranium, thorium-230, thorium-232, and radium-226)
- Radionuclides which have been the major contributors to dose based on environmental and stack filter measurements (uranium and thorium-230)
- Radionuclides which, due to their concentration in waste and contaminated soil, will be the major contributors to dose if the waste or soil is released in the form of fugitive dust (uranium, thorium-228, and thorium-230).

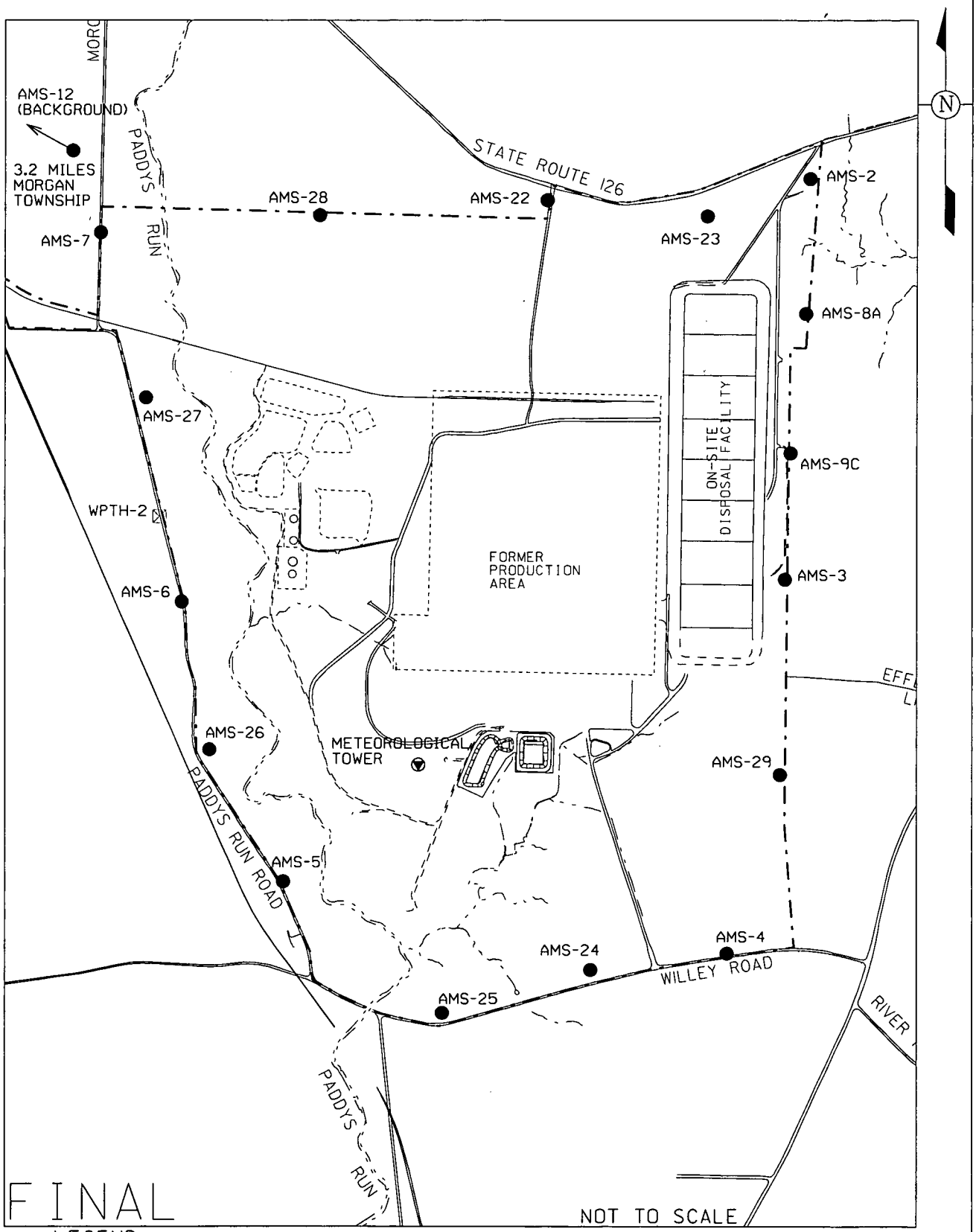
Additional technical information supporting the sampling and analysis plan presented here is provided in Appendix C. Table 6-2 presents a summary of the analytical and sampling information provided above.

TABLE 6-2

SAMPLING AND ANALYTICAL SUMMARY FOR RADIOLOGICAL AIR PARTICULATE SAMPLES

Locations	Constituent	Sample Matrix	Sample Frequency	AS[a]	Detection Level	Container
AMS-2 through AMS-29	Total Uranium	Air	Biweekly	B	2 µg/filter	20 cm x 25 cm polypropylene 0.3 µm filter
AMS-2 through AMS-29	Total Particulate	Air	Biweekly	A	NA[b]	20 cm x 25 cm polypropylene 0.3 µm filter
AMS-2 through AMS-29, and WPTH-2	Thorium-228 Thorium-230 Thorium-232	Air	Monthly (8 times per year)	E	0.4 pCi/filter	NA[b]
AMS-2 through AMS-29	Uranium-234 Uranium-235/236 Uranium-238 Thorium-228 Thorium-230 Thorium-232 Radium-226	Air	Quarterly composite	E	$9x10^{-5}$ pCi/m3 $9x10^{-5}$ pCi/m3 $9x10^{-5}$ pCi/m3 $7x10^{-6}$ pCi/m3 $7x10^{-6}$ pCi/m3 $7x10^{-6}$ pCi/m3 $2x10^{-4}$ pCi/m3	NA[b]

[a]The ASL may become more conservative if it is necessary to meet detection limits or data quality objectives.
[b]NA = not applicable



LEGEND:

- FERNALD SITE BOUNDARY
- AMS LOCATION
- DISTANCE FROM CENTER OF FORMER PRODUCTION AREA TO AMS LOCATION OFF MAP
- THORIUM MONITOR LOCATION RECOMMENDED FOR REMOVAL

FIGURE 6-1A. REDUCED IEMP AIR MONITORING LOCATIONS

6.4.2.2 Radon Monitoring Design Summary

The radon monitoring component of the IEMP program is designed to collect environmental radon measurements in order to gauge emissions from radon-generating materials contained on site. The monitoring design is influenced by the radon concentration limits established in DOE Order 5400.5 and satisfies FFA-mandated monitoring requirements. Continuous environmental radon monitors collect data representing the short-term fluctuations in radon concentrations. These monitors are placed at various locations on site, at the Fernald site boundary, and at an off-site background location. The monitoring locations reflect DOE guidance for siting environmental samplers. Figure 6-3 depicts the locations of continuous alpha scintillation monitors.

Data from the monitors are used to assess compliance with the following limits outlined in DOE Order 5400.5:

- 100 pCi/L at any given location and any given time
- Annual average concentration of 30 pCi/L (above background) over the facility
- Annual average concentration of 0.5 pCi/L (above background) at and beyond the Fernald site boundary.

To assess the appropriateness of the radon monitoring locations during 2005 and 2006, the current and expected radon sources during this period were evaluated. The sources included Silos 1, 2, and 3; the waste dryer; the waste pit material handling building; the railcar loadout building; and the waste pit area. As remediation activities are undertaken at the Fernald site, the radon monitoring program may change to ensure effective radon monitoring as a result of changing work activities.

Based on a review of the current and expected radon sources during 2005 and 2006, the monitoring program uses a network of 31 continuous environmental radon monitors to measure ambient radon concentrations. Monitors are placed near a variety of sources and are used during site-specific project activities that could release radon. The program is mostly concentrated near Silos 1 and 2, waste pit area, and at the site fenceline. An off-site location (AMS-12) that is considered outside the influence of the Fernald site radon sources serves as the background location.

Table 6-3 summarizes the sampling and analysis plan for the radon monitoring program.

TABLE 6-3

SAMPLING ANALYTICAL SUMMARY FOR CONTINUOUS RADON DETECTORS

Constituent	Sample Matrix	Sample Frequency	ASL	Holding Time	Preservative	Detection Level	Detection Method
Radon-222	Air	Continuous/24 hours	A	NA[a]	NA[a]	0.05 to 0.15 pCi/L	Alpha Scintillation

[a]NA = not applicable

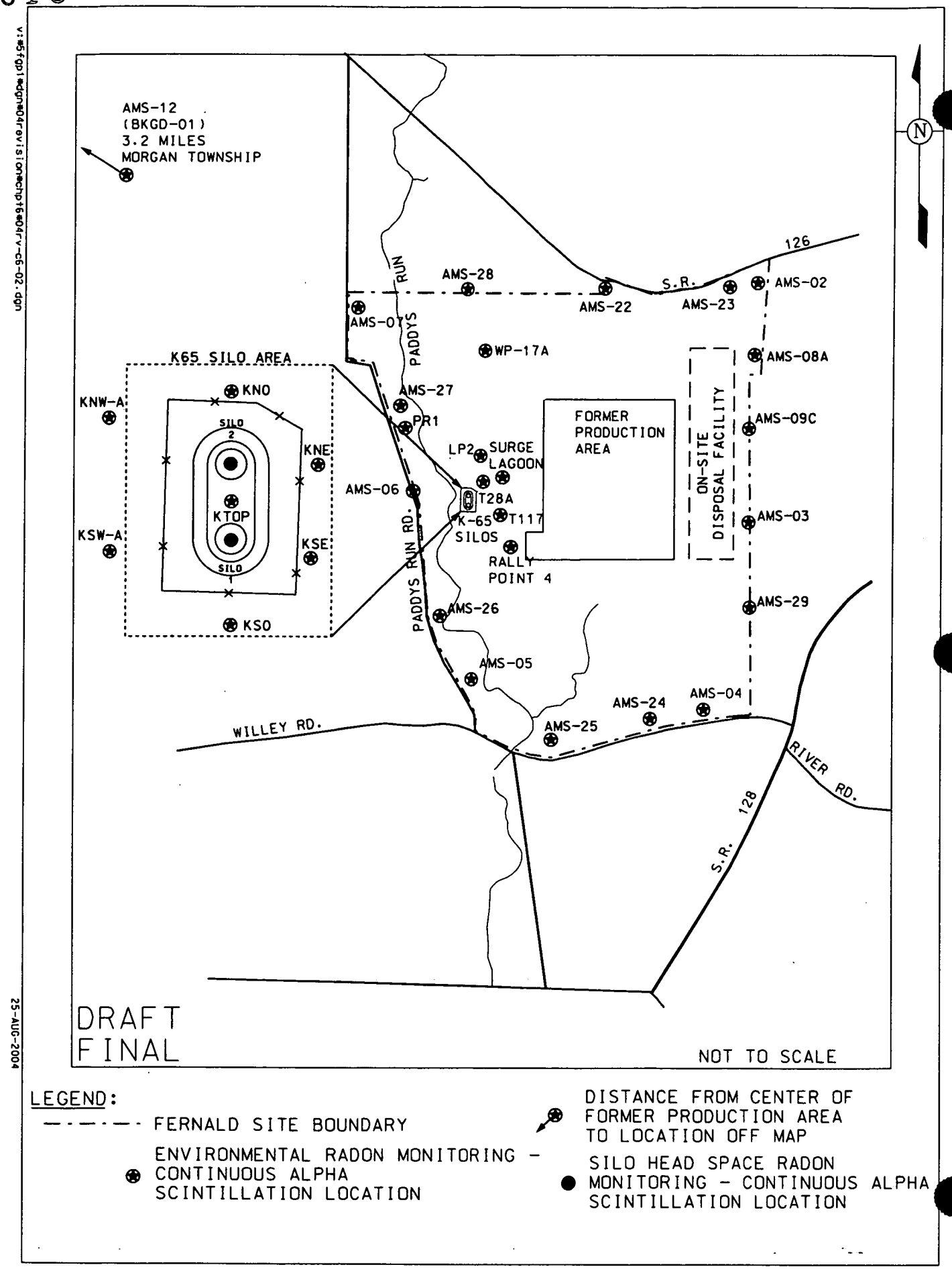


FIGURE 6-3. RADON MONITORING - CONTINUOUS ALPHA SCINTILLATION LOCATIONS

Locations near Silos 1 and 2 and the waste pit area fulfill the need to monitor both the instantaneous ambient 100-pCi/L radon limit as well as the 30-pCi/L annual limit for facilities. Other on-site monitors are placed at FFA mandated locations or established IEMP locations.

Fenceline monitors are co-located with the high-volume air particulate samplers; these locations represent the 16 primary wind rose sectors and provide data for determining compliance with the fenceline radon limit of 3 pCi/L annual average above background.

The monitors provide daily feedback of environmental radon conditions. Hourly data collected from all of the monitors will be summarized monthly to provide the minimum daily average, maximum daily average, and hourly median concentration for the month.

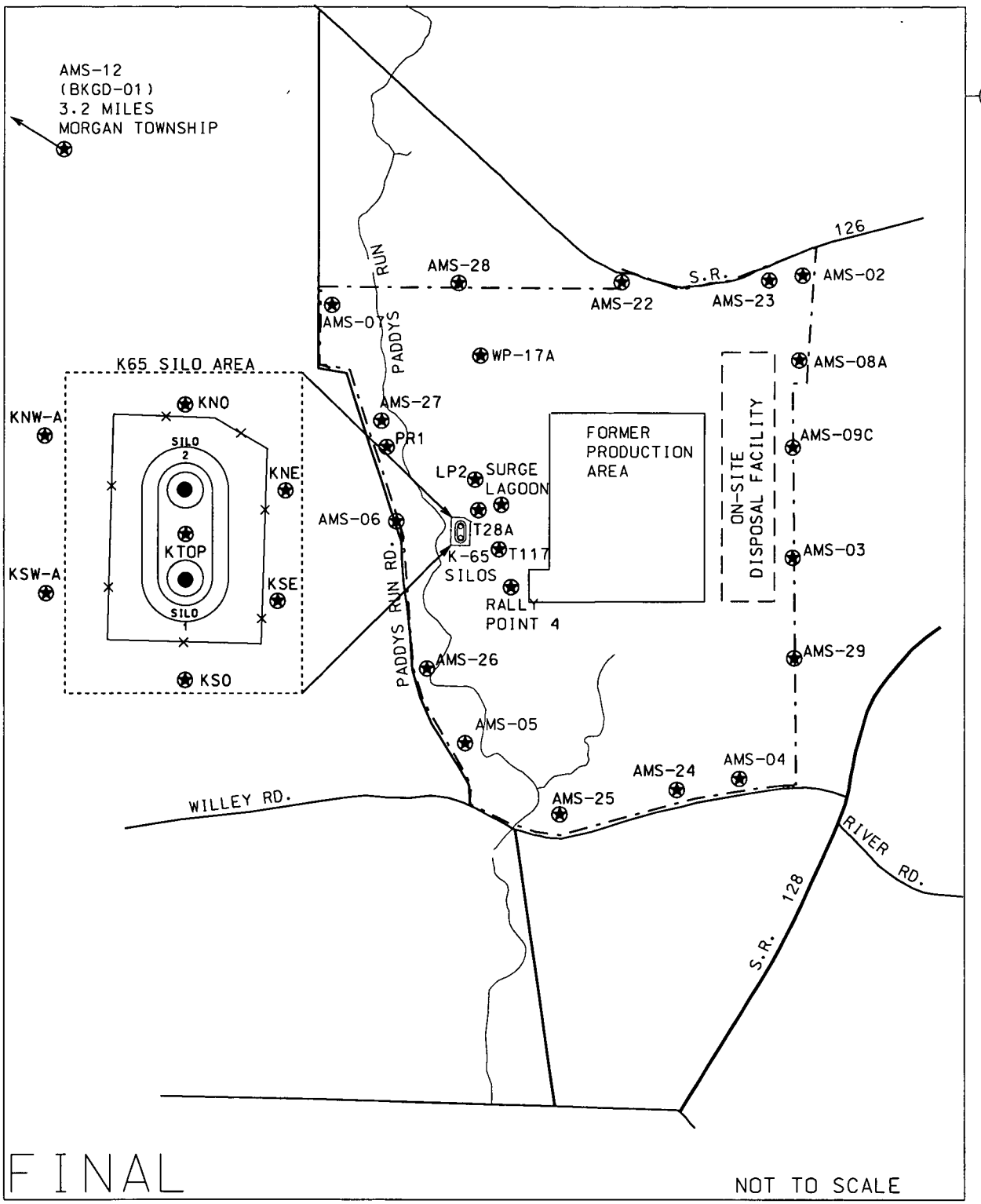
The instrument background is the combination of the laboratory-determined count rate for a specific electronic instrument (also known as electronic noise), and any counts from trace radioactive decay products and impurities found in the scintillation material of the continuous radon monitor as measured in a radon free environment. Instrument background is subtracted from the measurement data prior to comparing data from fenceline and on-site monitors to data from the background monitor. Instrument background corrected data will be presented in IEMP summary reports.

With the project completion of both the Waste Pits Project and the Silos Accelerated Waste Retrieval Projects, the onsite radon monitors (KNE, KNO, KNWA, KSE, KSO, KSWA, KTOP, LP2, Rally Point 4, Bio-Surge Lagoon, T117A, T28A, and WP17A, including Silos 1 and Silos 2 headspace monitoring) and the project-specific radon monitor PR1 will be included in the letter to be submitted to EPA in early 2005 regarding recommended phased reductions (refer to Figure 6-3A). In addition, the approach for removing the remaining fenceline and background radon monitors will be outlined in the letter to be submitted later in 2005 to EPA regarding demonstration of NESHAP compliance and will include the approach for transitioning from a monitoring-based approach for demonstrating ARAR compliance.

6.4.2.3 Direct Radiation Monitoring Design Summary

The direct radiation monitoring component of the IEMP program is designed to collect measurements of environmental radiation levels resulting from radioactive materials on site. This is accomplished using a network of 36 environmental thermoluminescent dosimeters (TLDs). DOE guidance and American National Standards Institute (ANSI) recommendations (ANSI 1975) were considered in selecting monitoring locations.

Silos 1 and 2 are the single largest source of direct (gamma) radiation at the Fernald site. Therefore, TLD locations radiate outward from the silos area with emphasis on the nearby and publicly accessible western boundary of the site. As necessary, current TLD locations will be adjusted and new TLD locations added



LEGEND:

- FERNALD SITE BOUNDARY
- ENVIRONMENTAL RADON MONITORING - CONTINUOUS ALPHA SCINTILLATION LOCATION
- MONITORS RECOMMENDED FOR REMOVAL
- DISTANCE FROM CENTER OF FORMER PRODUCTION AREA TO LOCATION OFF MAP
- SILO HEAD SPACE RADON MONITORING - CONTINUOUS ALPHA SCINTILLATION LOCATION RECOMMENDED FOR REMOVAL

FIGURE 6-3A. REDUCED IEMP RADON MONITORING LOCATIONS

to adequately characterize and monitor the direct radiation in the vicinity of the Accelerated Waste Retrieval Project and the site fenceline.

Additional TLDs are located at air monitoring stations at the Fernald site boundary and at background measurement points. Figure 6-4 identifies the TLD monitoring locations.

The network of TLDs provides a mechanism to measure and track ambient radiation levels at the Fernald site boundary, from gamma-emitting radioactive materials (primarily radium-226, thorium-232, and their decay products) that are handled and processed during remediation.

Three individual TLDs are placed at each location in order to assess the precision of the data. The TLDs are placed one meter above the ground and exchanged quarterly in accordance with industry standards and DOE guidance. The TLDs are processed at the DOE Laboratory Accreditation Program-approved on-site dosimetry laboratory or equivalent vendor laboratory.

With the project completion of the Silos Accelerated Waste Retrieval Project, the on-site TLDs (22, 23A, 24, 25, 26, 43, 44, 45, 46, and 47) will be included in the letter to be submitted to EPA in early 2005 regarding recommended phased reductions (refer to Figure 6-4A).

With the anticipated completion of all major remediation projects near the end of 2005, the approach for removing the remaining network of TLDs (site fenceline and background locations) will be outlined in the letter to be submitted to the EPA regarding NESHAP compliance and will include the approach for transitioning from a monitoring based approach for demonstrating ARAR compliance.

Data from the TLDs are used to assess the direct radiation component of the air pathway dose calculation (refer to Appendix C). Table 6-4 summarizes the sampling and analysis plan for the direct radiation monitoring program.

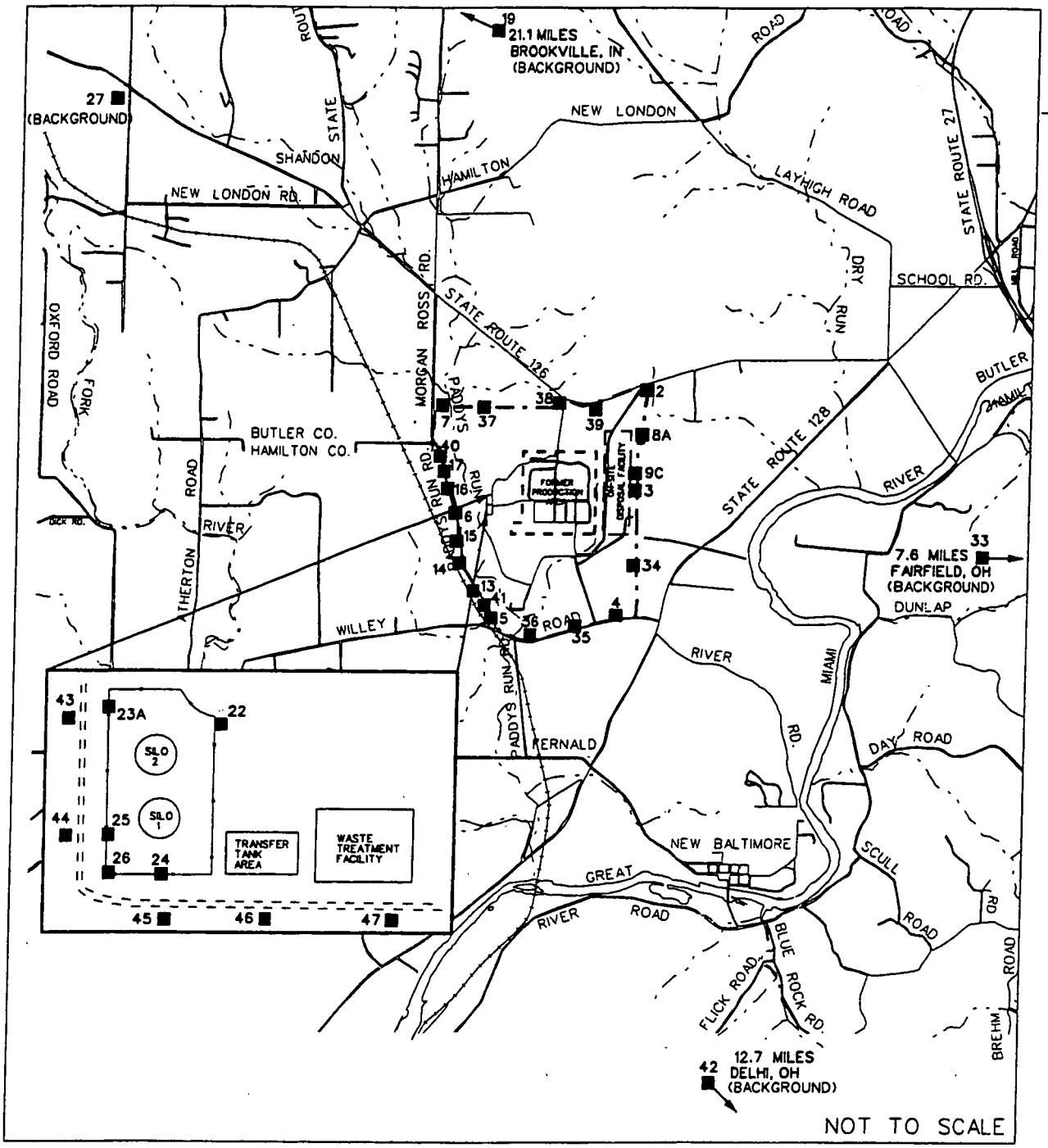
TABLE 6-4

ANALYTICAL SUMMARY FOR DIRECT RADIATION (TLD)

Analyte	Sample Matrix	Sample Frequency	ASL[a]	Holding Time	Preservative	Detection Level	Container
Gamma Radiation (TLD)	TLD	Quarterly	B	NA[b]	NA[b]	5 mrem	NA[b]

[a]The ASL may become more conservative if it is necessary to meet detection limits or data quality objectives.

[b]NA = not applicable



LEGEND:

DISTANCE FROM CENTER OF FORMER PRODUCTION AREA TO SAMPLE LOCATIONS OFF MAP

FERNALD SITE BOUNDARY

DIRECT RADIATION (TLD) MONITORING LOCATION

DRAFT
FINAL

FIGURE 6-4. DIRECT RADIATION (THERMOLUMINESCENT DOSIMETER) MONITORING LOCATIONS

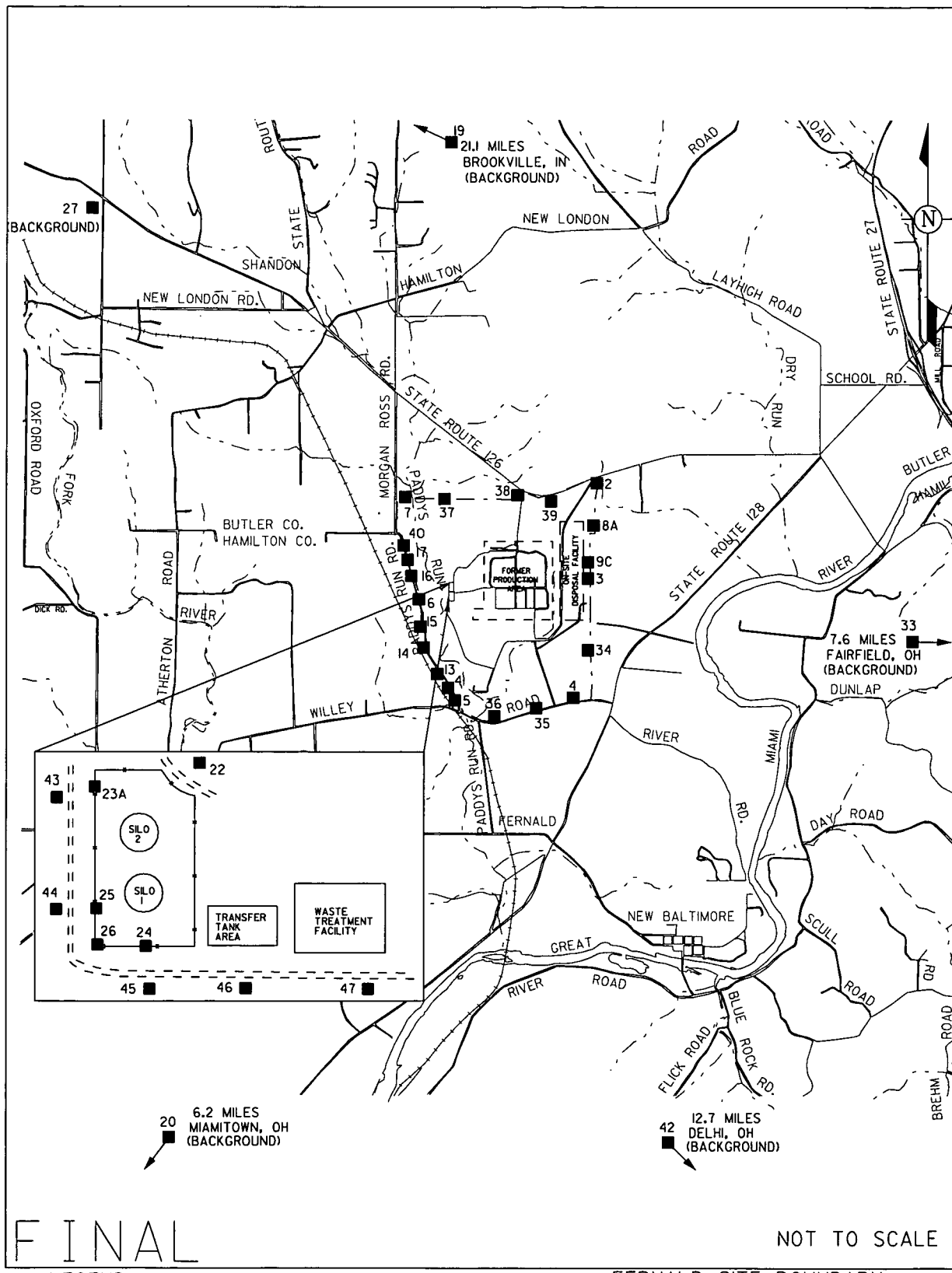


FIGURE 6-4A. REDUCED IEMP DIRECT RADIATION (TLD) MONITORING LOCATIONS

6.4.2.4 Meteorological Monitoring Program Design Summary

Although not a distinct component of the existing sitewide air monitoring program, the meteorological monitoring program is designed to provide data on the atmospheric conditions which influence the dispersion and transport of contaminants in the air pathway. This program provides critical information for the evaluation and interpretation of air monitoring data. The meteorological monitoring program also supports the design and operation of the IEMP air monitoring program and as such, is included in this section.

The meteorological monitoring system consists of a single 60-meter meteorological tower located west of the Storm Water Retention Basin (refer to Figure 6-1). Monitoring instruments record wind speed, wind direction, temperature, barometric pressure, precipitation, relative humidity, and store one-minute and 15-minute average data on the meteorological database. The system has been developed based on the requirements of DOE Order 5400.5 and DOE guidance, and complies with industry standards for calibration and data recovery.

Meteorological data are used in the evaluation and interpretation of environmental data collected from air, radon, and project-specific monitoring. Short-term meteorological data will be used to relate air monitoring results to specific projects, when necessary. For example, if the results from a specific monitor are higher than expected, then the monitoring result would be evaluated using the wind rose developed from meteorological measurements collected during the monitoring period. A remediation project upwind of the monitor during the monitoring period would then be considered a possible source of the higher-than-expected results. In addition to supplying data necessary to support monitoring and surveillance, the meteorological monitoring system serves to support the day-to-day operations for construction, emergency preparedness, and engineering design.

With the anticipated completion of all major remediation projects near the end of 2005, the meteorological monitoring system is scheduled to be removed from service in November 2005. After November 2005, appropriate meteorological data will be obtained from local weather stations through the National Weather Service or the Greater Cincinnati Mesonet (automated local meteorological data), as necessary. Note that the DOE Office of Legacy Management is further investigating the need for a long-term site meteorological system. Additionally, DOE will notify EPA and OEPA prior to removal of the site meteorological tower.

6.5 MEDIUM-SPECIFIC PLAN FOR SITEWIDE ENVIRONMENTAL AIR MONITORING

This section serves as the medium-specific plan for implementation of the sampling, analytical, and data management activities associated with the sitewide environmental air monitoring program. The program

expectations and design presented in Section 6.4 were used as the framework for developing the monitoring approach presented in this section. The activities described herein were designed to provide environmental data of sufficient quality to meet the intended data use as described in the program design in Section 6.4.2. All sampling procedures and analytical protocols described or referenced in this medium-specific plan are consistent with the requirements of the SCQ.

The sitewide environmental air monitoring program is comprised of the following three distinct components:

- Radiological air particulate monitoring
- Radon monitoring
- Direct radiation monitoring.

The sampling and analytical aspects of each component are unique; therefore, this medium-specific plan is organized to present a separate discussion of the sampling program for each component. The subsections of this medium-specific plan define the following:

- Program organization and associated responsibilities
- Sampling programs (radiological air particulate, radon, and direct radiation)
- Change control
- Health and safety
- Data management
- Project quality assurance.

6.5.1 Project Organization

A multi-disciplined project organization has been established and assigned responsibility to effectively implement and manage the project planning, sample collection and analysis, and data management activities directed in this medium-specific plan. The key positions and associated responsibilities required for successful implementation are described as follows.

The project team leader will have full responsibility and authority for the implementation of this medium-specific plan in compliance with all regulatory specifications and sitewide programmatic requirements. Integration and coordination of all medium-specific plan activities defined herein with other project organizations are also key responsibilities. All changes to project activities must be approved by the project team leader or designee.

Health and safety are the responsibility of all individuals working on this project scope. Qualified Health and Safety specialists shall participate on the project team to provide radiation protection and industrial hygiene support and assist in preparing and obtaining all applicable permits. In addition, safety specialists shall periodically review and update the project-specific health and safety documents and operating procedures; conduct pertinent safety briefings; and assist in evaluation and resolution of all safety concerns.

Quality Assurance specialists will participate on the project team, as necessary, to review project procedures and activities ensuring consistency with the requirements of the SCQ or other referenced standards and assist in evaluating and resolving all quality related concerns.

6.5.2 Sampling Program - Radiological Air Particulates

This sampling program is designed to collect radiological air particulate data that are representative of ambient air conditions at the Fernald site boundary (refer to Figure 6-1). The data collected under this program will be used to assess the collective effect of concurrent remediation activities on the air pathway; provide continual feedback to the remediation projects on the effectiveness of emission controls; and provide a monitoring basis to support the implementation and track the effectiveness of corrective actions as necessary. As such, field procedures and analytical methods are designed to support the necessary level of data quality.

The monitoring design incorporates a network of 18 high-volume continuous air monitoring stations. Filter media collected biweekly at AMS-2 through AMS-29 and WPTH-2 will be for total particulate analysis; it will be for total uranium at AMS-2 through AMS-29. Isotopic thorium data are collected monthly at ASL B. ASL B provides qualitative, semi-qualitative, and quantitative data with some quality assurance/quality control checks. A portion of each biweekly sample is retained for a quarterly composite sample, which is analyzed at ASL E by an off-site laboratory for those radionuclides expected to be the major contributors to dose. For the quarterly composites, ASL E provides quantitative data with fully defined quality assurance/quality control and complete data packages, including raw data, and requires lower detection levels than ASL B. Section 6.4.2.1 and Appendix C provide greater detail on the sampling design.

Sample analysis will be performed at the on-site laboratory or a contract laboratory, depending on specific analyses required, laboratory capacity, turnaround time, and performance of the laboratory. The laboratories used for analytical testing must be approved in accordance with the criteria specified in Sections 3.1.5 and 12.4, and Appendix E of the SCQ. These criteria include meeting the requirements for performance evaluation samples, pre-acceptance audits, performance audits and an internal quality

assurance program. A list of approved laboratories and current status of each is maintained by the FCP Quality Assurance organization.

6.5.2.1 Sampling Procedures - Radiological Air Particulates

The air filters from the high-volume air monitoring stations are collected and analyzed in accordance with the following procedures, which incorporate the requirements of the SCQ listed below and the Environmental Regulatory Guide for Radiological Effluent Monitoring:

Standard Operating Procedure	
ADM-02	Field Project Prerequisites (DOE 2004f)
SMPL-08	High-Volume Air Monitoring (DOE 2003d)
EQT-18	Calibration of Graseby GMW High-Volume Air Sampler (DOE 2004b)
ADM-09	Air Monitoring Data Review and Analysis (DOE 2004a)
EW-0002	Chain of Custody/Request for Analysis Record for Sample Control (DOE 2004c)

Table 6-5 provides the technical specifications for radiological air particulate monitoring using high-volume air monitoring equipment and filter media.

TABLE 6-5

TECHNICAL SPECIFICATIONS FOR RADIOLOGICAL AIR PARTICULATE MONITORING

Monitor Type	Flow Rate	Filter Type	Gauge/Meters	Indicator
High-volume continuous	45 cfm	Multi-ply polypropylene	Hours Flow Rate Set Point	Low Flow Warning Light

Sample collection is accomplished by using high-volume air monitoring stations that continuously collect samples of airborne particulates. Any changes in flow rate are accounted for by the automatic flow controller in the monitor and are documented on a flow chart recorder that continuously records flow data. Air monitoring equipment must meet the following criteria per DOE guidance and industry practice:

- Environmental air samplers shall be mounted in locked, all-weather stations with the sampler discharge positioned to prevent the recirculation of air
- The air sampling system shall have a flow-rate meter, and the total air flow or total running time should be indicated
- The air sampling rate should not vary by more than 10 percent of the monitor set point of 45 cfm for the collection of a given sample
- Linear flow rate across air particulate filters should be maintained between 20 and 50 meters per minute (m/min)

- Air sampling systems shall be flow-calibrated, tested, and routinely inspected according to written procedures. Flow calibration shall be at least as often as recommended by the manufacturer.

The monitors are inspected and calibrated at least once a year in accordance with recommendations from the manufacturer. All units placed in the field are tracked via a field tracking log that provides information pertaining to when calibrations were last completed and the date of the next scheduled calibration. Fenceline monitors are checked daily to ensure continuous operation.

6.5.2.2 Quality Control Sampling Requirements - Radiological Air Particulates

Quality control samples will be taken according to the frequency recommended in the SCQ. These samples will be collected and analyzed in order to evaluate the possibility that some controllable practice, such as a sampling or analytical practice, may be responsible for introducing bias in the project's analytical results. The following quality assurance samples will be collected under this sampling program:

Air Particulate Samples

- One blank sample will be submitted for analysis with each batch of biweekly filters from AMS-2 through AMS-29 for uranium analyses; one blank sample will be submitted for analysis with each batch of monthly thorium filters from AMS-2 through AMS-29 and WPTH-2 for thorium analyses; and with each set of quarterly composite samples.

- The laboratory is also required to perform analyses on method blanks, matrix spikes, and laboratory control samples as required by the SCQ for the corresponding ASL and analytical method. For the quarterly composite samples analyzed under ASL E, a method blank, duplicate, matrix spike, and laboratory control sample will be analyzed for each batch of samples.

6.5.2.3 Decontamination

The decontamination of the air monitoring equipment is necessary only for those monitors deployed in the former production and waste storage areas. At a minimum, decontamination for these monitors is conducted under the radiological controls program for releasing equipment from the site. Radiological surveys are performed when equipment is required to be released for transport and/or analysis. These surveys are conducted in accordance with established radiological control procedures.

6.5.2.4 Waste Dispositioning

Contact wastes that are generated by the field technicians during field sampling activities are collected, maintained, and dispositioned, as necessary, depending upon the location of waste generation (e.g., the former production area or off site). Radiological control procedures govern the disposal of contact wastes generated during air monitoring activities.

6.5.3 Sampling Program - Radon Monitoring

This sampling program is designed to collect measurements of radon concentrations, considering the radon-generating materials contained on site. Sample locations on site, at the Fernald site boundary, and off site provide representative measurements for assessing compliance with established limits. In addition, data collected will be used to assess radon concentrations both on site and at the fenceline during remediation activities. As such, field procedures and analytical methods are designed to support the necessary level of data quality.

The monitoring design consists of 31 continuous environmental radon monitors. Data are recorded hourly and compiled into daily averages. The data from the monitors are collected at ASL A. Section 6.4.2.2 provides greater detail on sampling design.

6.5.3.1 Sampling Procedures - Radon Monitoring

The continuous environmental radon monitors are operated in accordance with the following procedures that incorporate the requirements of the SCQ and the Environmental Regulatory Guide for Radiological Effluent Monitoring:

Standard Operating Procedure	
ADM-02	Field Project Prerequisites (DOE 2004f)
SMPL-06	Radon Sampling from Headspace of K-65 Silos (DOE 2003h)
SMPL-09	Pylon AB-5, Continuous Environmental Radon Monitoring (DOE 2003f)
SMPL-25	Pylon CRM-2, Continuous Environmental Radon Monitoring (DOE 2002e)
ADM-14	Evaluating Continuous Radon Monitoring Data (DOE 2004e)
ADM-09	Air Monitoring Data Review and Analysis (DOE 2004a)
RP-0026	Control and Labeling of Radioactive Material (DOE 2004d)
EM-0030	Silos Area Emergency Procedure (DOE 2004k)

Sitewide CERCLA Quality (SCQ) Assurance Project Plan	
Section 4	Quality Assurance Objectives
Section 5	Field Activities
Section 6	Sampling Requirements
Section 7	Sample Custody
Section 8	Calibration Procedures and Frequency
Appendix I	Field Calibration Requirements
Appendix K	Sampling Methods

Continuous environmental radon monitors are calibrated as a unit at least once per year (as specified per sampling procedures) with National Institute of Standards and Technology traceable sources. Monitors are tracked upon deployment in the field via an equipment tracking log and field logbooks. The instrument background reading is also recorded for use in data evaluation and reporting. In addition, an equipment maintenance/calibration logbook is used to track and schedule units requiring maintenance and/or calibrations.

Table 6-3 provides a sample and analytical summary for the radon monitoring program. The continuous environmental radon monitors used at the Fernald site are alpha scintillation detectors, consisting of a continuous passive radon detector attached to either a Pylon AB-5 or CRM-2. They are passive devices meaning radon diffuses into the continuous passive radon detector without the aid of a pump. Alpha particles generated by radioactive decay of the radon and its daughters interact with the inside surface of the detector, producing photons of light. The light photons interact with a photo-multiplier tube that generates electrical pulses. The number of pulses in a given time period is proportional to a radon concentration. The monitors are set to collect measurements of one-hour duration.

6.5.3.2 Quality Control Sampling Requirements - Radon Monitoring

Quality control practices for the continuous environmental radon monitors will be maintained per established maintenance and calibration schedules outlined in the applicable operating procedures. Quality control data will be recorded on process control charts and only instruments demonstrating acceptable performance will be used in the field to collect data. At a minimum, the continuous environmental radon monitors will be source checked monthly. Acceptable performance is defined as generating source check results that fall within three standard deviations of the mean expected efficiency in accordance with typical industry standard practices. If the source check results for an instrument fall outside the three standard deviation control limits, then that instrument will not be used again until it is examined, repaired, and calibrated, if necessary.

6.5.4 Sampling Program - Direct Radiation (TLDs)

This sampling program is designed to measure the direct radiation at the Fernald site from locations that are representative of radiological environmental conditions at select locations on site, at the facility fenceline, and in the local community (refer to Figure 6-4). The data collected under this program will be used to assess the collective effect of current remediation activities on the air pathway. As such, field procedures and analytical methods are designed to support the necessary level of data quality.

The monitoring design incorporates a network of 36 TLD locations. Three TLDs are deployed quarterly at each location and submitted for analysis to either the on-site dosimetry laboratory or an equivalent vendor laboratory. External gamma radiation measurements are recorded from each TLD read. All TLDs are analyzed at ASL B.

6.5.4.1 Sampling Procedures - Direct Radiation (TLDs)

The TLDs are collected from environmental monitoring locations in accordance with the following operating procedures that incorporate the requirements of the SCQ and the Environmental Regulatory Guide for Radiological Effluent Monitoring:

Standard Operating Procedures	
ADM-02	Field Project Prerequisites (DOE 2004f)
SMPL-10	Environmental Direct Radiation Monitoring (DOE 2002c)
EW-0002	Chain of Custody/Request for Analysis Record for Sample Control (DOE 2004c)
ADM-09	Air Monitoring Data Review and Analysis (DOE 2004a)

Sitewide CERCLA Quality (SCQ) Assurance Project Plan	
Section 4	Quality Assurance Objectives
Section 5	Field Activities
Section 6	Sampling Requirements
Section 7	Sample Custody
Section 8	Calibration Procedures and Frequency
Appendix I	Field Calibration Requirements
Appendix K	Sampling Methods

Table 6-4 provides a sample and analytical summary for the direct radiation monitoring program. Sample collection is accomplished using Panasonic UD-814 dosimeters or equivalent dosimeters. Environmental TLDs must meet the following criteria as per DOE guidance:

- Environmental TLDs shall be mounted at one meter above ground.
- The frequency of exchange should be based on predicted exposure rates from site operations.
- The exposure rate should be long enough (typically one calendar quarter) to produce a readily detectable dose.
- Annealing, calibration, readout, storage, and exposure periods used should be consistent with the ANSI standard recommendations.

All TLDs placed in the field are tracked via a field tracking log which provides information pertaining to when and where dosimeters were deployed as well as scheduled collection date.

6.5.4.2 Quality Control Sampling Requirements - Direct Radiation (TLDs)

Quality control samples will be collected and analyzed in order to evaluate the possibility that some controllable practice, such as sampling or analytical practice, may be responsible for introducing bias in the project's analytical results. Quarterly data from the three TLDs at each location must agree within 15 percent or will be considered suspect and invalid data. A TLD that repeatedly differs by more than

15 percent from the other two co-located TLDs will be removed from service. The following quality assurance practices will be conducted under this sampling program:

- TLD reader is calibrated semiannually and quality control checks are performed prior to reading each batch of TLDs.
- Quarterly, spiked dosimeters with a known amount of gamma radiation are submitted for analysis (agreement within 25 percent of known dose).
- The FCP will participate in inter-laboratory comparisons conducted by DOE. The comparison studies require the FCP to submit a set of TLDs that are then exposed (along with TLDs from other study participants) to a known amount of environmental radiation. The TLDs are then returned to the FCP for processing. The results from all participants are then compared to known value of radiation and the 30 percent performance specification from ANSI-N545.

6.5.4.3 Decontamination

Decontamination of environmental TLDs is not necessary because the units are self-contained, unless collected from known areas of high contamination. Only the units that hold the TLD and that have been stationed in the former production area are required to undergo cleaning and decontamination if deemed necessary upon a radiological survey. Radiological surveys are performed when equipment and/or samples are required to be released from the former production area for transport and/or analysis. These surveys are conducted in accordance with established radiological control procedures.

6.5.4.4 Waste Dispositioning

Contact waste generated by the field technicians during sample collection activities is collected, maintained, and dispositioned as necessary, depending upon the location of waste generation (e.g., the former production area or off site). Contact waste generated outside of radiological control areas will be placed in a clean trash dumpster. Contact waste generated within radiological control areas will be disposed of in a designated radiological contact waste container.

6.5.5 Change Control

Changes to the medium-specific plan will be at the discretion of the project team leader. Prior to implementation of field changes, the project team leader or designee shall be informed of the proposed changes and circumstances substantiating the changes. Any changes to the medium-specific plan must have written approval by the project team leader or designee, Quality Assurance representative, and the Field Manager prior to implementation. If a Variance/Field Change Notice is required, it will be completed in accordance with Section 15.3 of the SCQ. The Variance/Field Change Notice form shall be issued as controlled distribution to team members and will be included in the field data package to

become part of the project record. During biennial revisions to the IEMP, Variance/Field Change Notices will be incorporated to update the medium-specific plan.

6.5.6 Health and Safety Considerations

The FCP Health and Safety organization is responsible for the development and implementation of health and safety requirements for this medium-specific plan. Hazards (such as physical, radiological, chemical, and biological) typically encountered by personnel when performing the specified field work will be addressed during team briefings.

All involved personnel will receive adequate training to the health and safety requirements prior to implementation of the field work required by this medium-specific plan. Safety meetings will be conducted prior to beginning field work to address specific health and safety issues. All Fluor Fernald employees and subcontractor personnel who will be performing field work required by this medium-specific plan are required to have completed applicable training.

For areas that are subject to more restrictive radiological controls where the potential for exposure is greater, radiation work permits are necessary and will be obtained prior to the field work being performed in those areas. A radiological control technician will be assigned to each field crew performing any activities in an area requiring a radiation work permit.

6.5.7 Data Management

Field documentation and analytical results will meet the IEMP data reporting and quality objectives, conform to appropriate sections and appendices of the SCQ, and comply with specific FCP procedures, such as the Data Validation procedure.

Data documentation and validation requirements for data collected in 2005 and 2006 for the IEMP fall into two categories depending upon whether the data are field- or laboratory-generated. Field data validation will consist of verifying medium-specific plan compliance and appropriate documentation of field activities. Laboratory data validation will consist of verifying that data generated are in compliance with medium-specific plan ASLs. Specific requirements for field data documentation and validation, and laboratory data documentation and validation are in accordance with SCQ and FCP procedures.

There are five analytical levels (ASL A through ASL E) defined in Section 2 of the SCQ. For 2005 and 2006, field data documentation will be at ASL A and laboratory data documentation will be at ASL B. For some air programs, a more conservative ASL is required for laboratory data to meet

regulatory commitments, to meet required detection limits, or to ensure data quality objectives are met. The specific air monitoring ASL requirements are detailed in the sampling programs subsections above and in Appendix C.

At a minimum, 10 percent of the IEMP data will undergo validation to ensure that analytical data are in compliance with the ASL method criteria being requested and in order to meet data quality objectives. The percentage of data validated could increase in order to meet data quality objectives.

Data will be entered into a controlled database using a double-key or other verification method to ensure accuracy. The hard copy data will be managed in the project file in accordance with FCP record keeping procedures and DOE Orders.

6.5.8 Quality Assurance

Assessments of work processes shall be conducted to verify quality of performance, and may include audits, surveillances, inspections, tests, data verification, field validation, and peer reviews. Assessments shall include performance-based evaluation of compliance to technical and procedural requirements, and corrective action effectiveness necessary to prevent defects in data quality. Assessments may be conducted at any point in the life of the project. Assessment documentation shall verify that work was conducted in accordance with IEMP, SCQ, and FCP Quality Assurance Program requirements.

Recommended quarterly quality assurance assessments or surveillances shall be performed on tasks specified in the medium-specific plan. These assessments may be in the form of independent assessments or self-assessments, with at least one independent assessment conducted annually. Independent assessments are the responsibility of designated project Quality Assurance personnel. Self-assessments are performed by project personnel in order to evaluate the overall quality of work performance. The project team leader and Quality Assurance personnel will coordinate assessment activities and comply with Section 12 of the SCQ. The project personnel or Quality Assurance representative shall have "stop work" authority if significant adverse effects to quality conditions are identified or work conditions are unsafe.

Only laboratories on the approved laboratory list will be used for sample analyses in accordance with Section 12 and Appendix E of the SCQ.

6.6 IEMP AIR MONITORING DATA EVALUATION AND REPORTING

This section provides the methods to be used in analyzing the data generated by the IEMP air monitoring/modeling program in 2005 and 2006. It summarizes the data evaluation process and actions associated with various monitoring results. The planned reporting structure for IEMP-generated air monitoring data, including specific information to be reported in the IEMP mid-year data summary and in the annual site environmental report, is also provided.

6.6.1 Data Evaluation

Data resulting from the IEMP air monitoring program will be evaluated to meet the program expectations identified in Section 6.4.1. Based on these expectations, the following questions will be answered for all air monitoring programs:

- Are the program and reporting requirements of DOE Order 5400.1 being met?

DOE Order 5400.1 requires that DOE-FCP implement and report on an environmental protection program for the Fernald site. The air monitoring program is one component of the sitewide IEMP monitoring program. This IEMP and the annual site environmental report fulfill the requirements of this DOE Order.

- Are the program emissions ALARA?

The programs (air particulate monitoring, radon monitoring, and direct radiation monitoring) are designed to provide continual assessments of the collective emissions accompanying multiple concurrent remediation projects in order to determine if the emissions are ALARA, and provide necessary early warning feedback regarding the cumulative sitewide effectiveness of project-specific emissions controls. Early warnings of the effectiveness of emissions controls enable the projects to focus their emission control efforts, in keeping with the ALARA philosophy.

- Are community concerns being met through the air monitoring IEMP program?

The IEMP fulfills the needs of the Fernald community by presenting air monitoring results in the annual site environmental report. DOE makes these reports available to the public at the Public Environmental Information Center.

Specific air program (i.e., radiological air particulate, radon, and direct radiation) evaluation process questions are identified in the following subsection.

6.6.1.1 Radiological Air Particulate Data Evaluation

Based on the expectations in Section 6.4.1, the following questions will be answered for the radiological air particulate program:

- Are the emission control measures executed by the remediation projects effective in maintaining exposures to the public below the annual 10-mrem NESHAP Subpart H standard?

Biweekly uranium and quarterly composite data from air monitoring locations AMS-2 through AMS-29, and monthly thorium data from AMS-2 through AMS-29 and WPTH-2 will be compared to historical air measurements and trend analysis will be performed to assess the collective effectiveness of emission control measures. Basic statistics, such as minimum, maximum, and mean, will be routinely generated per sample location (as the data are received from the laboratory). The data generated from individual sampling events will be trended by sample location over time via statistical methods (when sufficient data have been generated) and statistical methods. Monitoring results will be evaluated in light of project operations active during the period and the associated meteorological conditions (e.g., wind roses, precipitation levels, etc.) in order to correlate monitoring results with upwind project activities. In addition, any project-specific monitoring and operations data will be used to support this data evaluation. If monitoring data indicate an increasing trend which, if sustained, could result in an exceedance of the 10-mrem NESHAP standard, then immediate notification will be made to the projects suspected of contributing to the increased emissions (based on the monitoring locations exhibiting the elevated results, the prevailing meteorological conditions, and project activities conducted during the sampling period) and action will be taken at the project level to further control fugitive emissions. If increasing trends are identified, but indicate the NESHAP standard is not in jeopardy of being exceeded (based on current trend analysis and the anticipated schedule of project activities), then projects will review remediation activities and the application of the sitewide BAT determination for fugitive dust control to ensure all project activities are compliant. Additional fugitive dust controls may be implemented as provided for in the BAT determination based on the project review. Figure 6-5 provides a schematic of the specific decision-making process for the radiological air particulate monitoring program. Additionally, this information will support the collective decision-making process as outlined in Section 1.0.

- Do the results of quarterly composite radionuclide concentrations indicate that the dose limit of NESHAP, Subpart H may be exceeded?

Data evaluation will consist of direct comparison of the quarterly composite data to the NESHAP Subpart H, Appendix E, Table 2 values. If, after considering the planned remediation activities for the rest of the year, the sum of the fractions (measured concentrations divided by the corresponding NESHAP limit) indicates that exceeding the 10-mrem/year limit is likely, then increased emission control measures (modification and/or curtailment of remediation activities) will be initiated.

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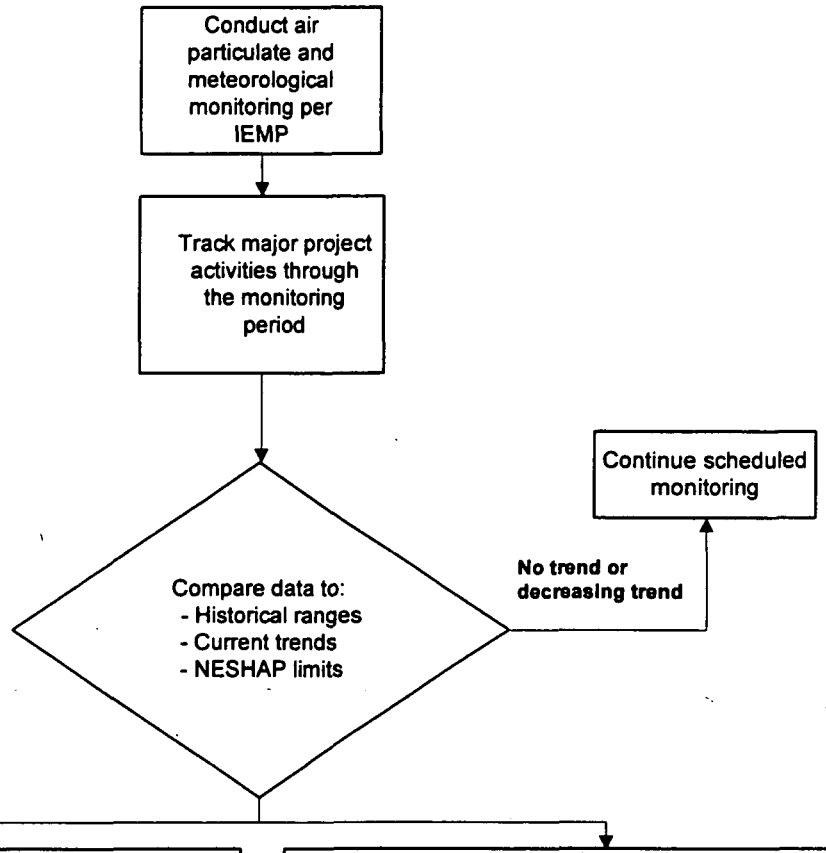
FIGURE 6-5
IEMP AIR PARTICULATE DATA EVALUATION AND ASSOCIATED ACTIONS



If concentration is trending above historical ranges,[a] but not expected to exceed NESHAP limit	
IEMP Actions	Potential Project Actions
Review pertinent project-specific data	Review performance/ inspection data for engineered controls
Identify probable source(s) and alert associated project(s)	Determine if emission controls meet design specifications
Continue scheduled monitoring	Estimate duration of source activities
Report information to EPA/ OEPA in next IEMP mid-year data summary and in the annual report	Repair/enhance emission controls, if necessary

[a] These determinations will be based on the significance of the trend and the projected scope and duration of the source activity.

If concentration is trending above historical ranges,[a] and potential exceedance of NESHAP limit exists	
IEMP Action	Potential Project Action
Review pertinent project-specific data	Review performance/ inspection data for engineered controls
Identify probable source(s) and alert associated project(s)	Determine if emission controls meet design specifications
Evaluate need for increasing sampling frequency and/or analytical regime to track performance of corrective actions	Estimate duration of source activities
Make notification to EPA and OEPA (as necessary) and report information to EPA/OEPA in next IEMP mid-year data summary and in the annual report	Repair/enhance existing emission controls
	Implement additional emission controls as necessary
	Modify project schedule as necessary to limit emission rate

- Are modifications or adjustments in program focus necessary?

The quarterly composite results will be compared to the NESHAP Appendix E, Table 2 values. If the comparison indicates a contaminant other than uranium and thorium is contributing the largest percentage of dose, then modifications to the IEMP air monitoring and analytical schedule may be proposed in order to better monitor the major contributors to inhalation dose. The biweekly total particulate measurements will be used to evaluate the filter loading and may result in changes to the sampling frequency if excessive loading is observed based on total particulate concentrations in conjunction with diminishing flow rates through the filter.

6.6.1.2 Radon Data Evaluation

Data resulting from the radon monitoring program will be evaluated with respect to the program expectations identified in Section 6.4.1 and radon monitoring design summary in Section 6.4.2.2. Based on these expectations, the following questions will be answered through the radon data evaluation processes indicated by the text following each of the questions:

- Are radon concentrations below the limits set in DOE Order 5400.5 and 10 CFR 834?

Data from the alpha scintillation continuous radon monitoring locations will be compared to the annual limits (0.5 pCi/L above background at the site fenceline and 30 pCi/L sitewide), and short-term (100 pCi/L) limits of DOE Order 5400.5. Basic statistics, such as minimum, maximum, and mean, will be generated monthly for the alpha scintillation monitors. The data generated from individual sampling events will be trended by sample location over time via statistical methods (when sufficient data have been generated), graphical methods, and tabular methods. If historic data are available for or near a particular IEMP sample location, then the IEMP-generated trends will be evaluated with respect to the historic trends in order to assess whether current conditions are similar to the past, increasing, or decreasing. Meteorological data (e.g., wind roses and temperature inversions) from the sampling period will be used to determine which radon source is likely to have contributed to the observed data. In addition, any project-specific monitoring and operational data from radon source areas will be used to support this data evaluation. If trends indicate that radon concentrations will exceed DOE Order 5400.5 or 10 CFR 834, then actions shown in Figure 6-6 will be implemented. Integration of radon air monitoring information generated by project-specific monitoring (i.e., the Operable Unit 4 remediation facilities) will occur as necessary in interpreting the sitewide radon data via the IEMP data evaluation process. The findings of data evaluations will be shared with project personnel. Those personnel responsible for Silos 1 and 2, waste pit excavation, and other radon emission sources will be informed of the findings as indicated on Figure 6-6.

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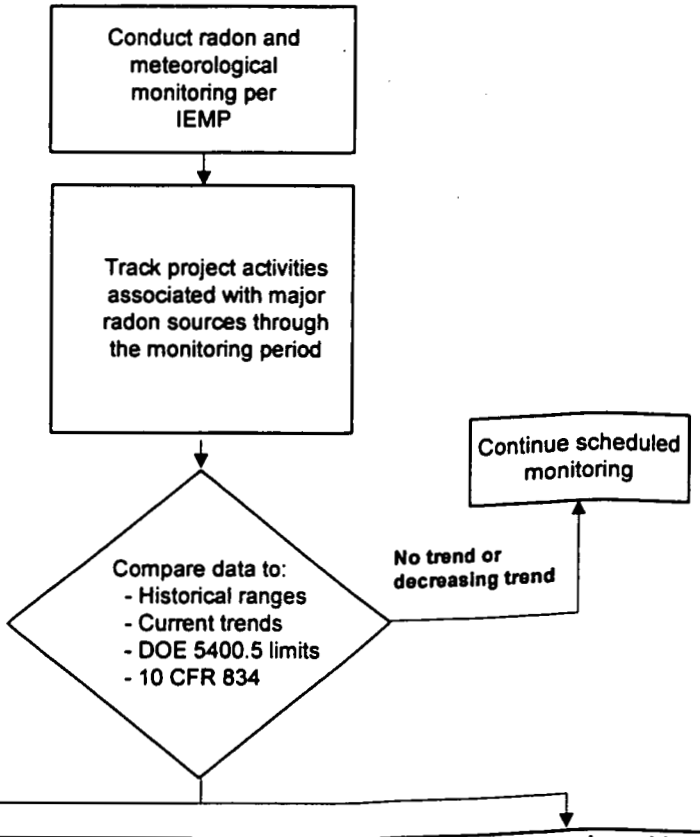
FIGURE 6-6
IEMP RADON DATA EVALUATION AND ASSOCIATED ACTIONS



If concentration is trending above historical ranges,[a] but not expected to exceed DOE Order 5400.5 limits	
IEMP Actions	Potential Project Actions
Review pertinent project-specific data	Review performance/ inspection data for engineered controls
Identify probable source(s) and alert associated project(s)	Determine if emission controls meet design specifications
Continue scheduled monitoring	Estimate duration of source activities
Report information to EPA/ OEPA in next IEMP mid-year data summary and in the annual report	Repair/enhance emission controls, if necessary

If concentration is trending above historical ranges[a] and potential exceedance of DOE Order 5400.5 limits exist	
IEMP Actions	Potential Project Actions
Review pertinent project-specific data	Review performance/inspection data for engineered controls
Identify probable source(s) and alert associated project(s)	Determine if emission controls meet design specifications
Evaluate need for increasing data review frequency to track performance of corrective actions	Estimate duration of source activities
Report information to EPA/ OEPA in next IEMP mid-year data summary and in the annual report	Repair/enhance existing emission controls
	Implement additional emission controls as necessary
	Modify project schedule as necessary to limit emission rate

[a] For those constituents/locations with limited historical data, IEMP data will be compared to background concentrations.

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- Do current radon monitoring and reporting activities comply with FFA/Federal Facilities Compliance Agreement requirements?

Removal Action No. 4 requires that monitoring of the radon concentration in the headspace of Silos 1 and 2 be performed on a continuous basis until the radium-bearing materials inside are removed. In addition to reporting these data, data from all continuous monitors are reported.

- Are modifications or adjustments in the radon program focus necessary?

Changes to the monitoring program will be evaluated based on the expected changing configuration of the primary radon source materials at the site (most importantly the Silos 1 and 2 material), prior to remediation of these materials. Revisions to the program will be proposed through the annual review and biennial revision process as outlined in Section 1.0.

6.6.1.3 Direct Radiation Monitoring Data Evaluation

Data resulting from the direct radiation monitoring program will be evaluated with respect to the program expectations identified in Section 6.4.1 and direct radiation monitoring design summary in Section 6.4.2.3. Based on these expectations, the following questions will be answered through the direct radiation data evaluation processes indicated by the text following each of the questions:

- Do direct radiation levels indicate a significant increase that could contribute to an exceedance of the 100-mrem/year, all-pathway dose limit from DOE Order 5400.5?

The data generated from individual TLD locations will be trended over time via statistical methods (when sufficient data have been generated) and graphical methods. Basic statistics, such as minimum and maximum, will be generated quarterly. Historic TLD monitoring data will be used to assess whether current trends are similar to the past, increasing, or decreasing. In addition, any project-specific and operational data from areas with large sources of direct radiation will be used to support the evaluation and interpretation of TLD results. Data from the TLD locations will be used to assess the direct radiation component of the all-pathway dose (refer to Appendix C). If trends indicate a significant increase above historical ranges that could contribute to an exceedance of the 100-mrem/year, all-pathway dose limit, then actions shown in Figure 6-7 will be implemented. Direct radiation monitoring information generated by project-specific occupational monitoring will be used as necessary in interpreting the sitewide direct radiation data via the IEMP data evaluation process. The findings of the ongoing data evaluations will be shared with project personnel. Those personnel responsible for Silos 1 and 2 and other direct radiation sources will be informed of the findings as indicated on Figure 6-7.

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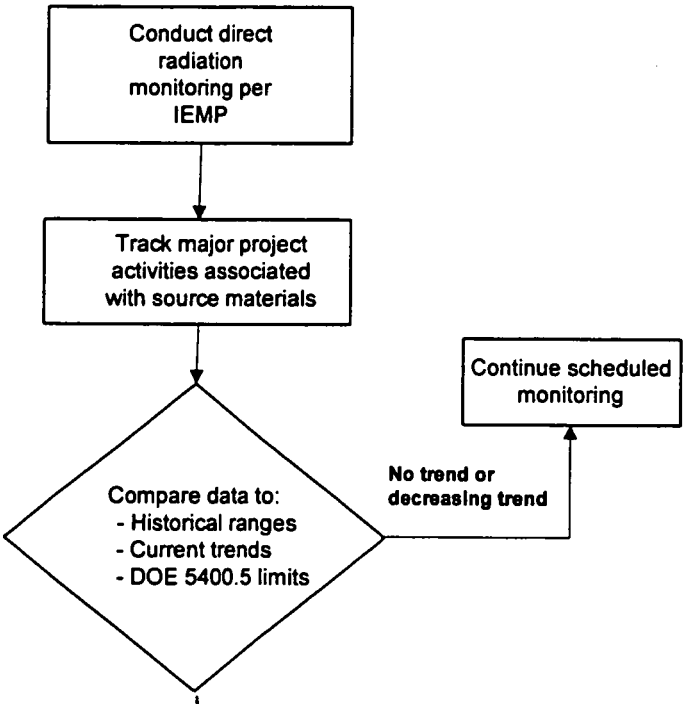
FIGURE 6-7
IEMP TLD DATA EVALUATION AND ASSOCIATED ACTIONS



If radiation levels are trending above historical ranges,[a] but not expected to exceed DOE Order 5400.5 limits	
IEMP Actions	Potential Project Actions
Review pertinent project-specific data	Review performance/ inspection data for engineered controls
Identify probable source(s) and alert associated project(s)	Determine if controls meet design specifications
Continue scheduled monitoring	Estimate duration of source activities
Report information to EPA/ OEPA in next IEMP mid-year data summary and in the annual report	Repair/enhance controls, if necessary

If radiation levels are trending above historical ranges[a] and potential exceedance of DOE Order 5400.5 limits exist	
IEMP Actions	Potential Project Actions
Review pertinent project-specific data	Review performance/inspection data for engineered controls
Identify probable source(s) and alert associated project(s)	Determine if controls meet design specifications
Evaluate need for increasing sampling frequency	Estimate duration of source activities
Report information to EPA/ OEPA in next IEMP mid-year data summary and in the annual report	Repair/enhance existing controls
	Implement additional controls as necessary

[a] These determinations will be based on the significance of the trend and the projected scope and duration of the source activity.

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- Are modifications or adjustments in program focus necessary?

Changes to the direct radiation monitoring program will be evaluated based on the changing configuration of source materials (primarily the Silos 1 and 2 waste materials) at the site, prior to remediation of these materials. Revisions to the program will be proposed through the annual review and biennial revision process as outlined in Section 1.0.

6.6.2 Reporting

The IEMP air monitoring program will meet the reporting requirements for the NESHAP Subpart H, 10 CFR 834, and the FFA compliance, as follows:

- The NESHAP Subpart H report has been incorporated into the annual site environmental report.
- The quarterly FFA reporting is being fulfilled via the IEMP Data Information Site.
- Monthly trending of the annual limit of 0.5 pCi/L above background.

IEMP air program data will be reported on the IEMP Data Information Site in the form of electronic files, in the mid-year data summary, and in the annual site environmental report. Additional information on IEMP data reporting is provided in Section 7.3.3.

The IEMP Data Information Site data are in the form of searchable data sets and/or downloadable data files. This site will be updated every four weeks, as data become available.

The IEMP mid-year data summary will supplement the IEMP Data Information Site by providing and identifying notable results and/or events related to that data. The IEMP mid-year data summary will be submitted in November of each year and will cover January to June.

The annual site environmental report will be issued each June for the previous year. This comprehensive report will discuss a year of IEMP data previously reported on the IEMP Data Information Site and in the mid-year data summary. The air monitoring portion of the annual site environmental report will consist of the following:

- An annual summary of data from the IEMP air monitoring program
- Constituent concentrations for each sample location

- Statistical analysis summary for each constituent, as warranted by data evaluation
- Status of regulatory compliance with NESHAP Subpart H
- Summarization of FFA radon information (primarily headspace and silo area exclusion fence radon levels)
- Information that indicates an impact at or beyond the Fernald site boundary at a location not covered by the IEMP monitoring network
- Information that indicates the exceedance of an ARAR at an on-site location (for example, the radon limit of 100 pCi/L)
- Information that is relevant to explaining significant changes in the data from the IEMP air monitoring network.

Biweekly and monthly air particulate data will continue to be provided to the EPA and OEPA via email as the data become available. Additionally, any notable events or findings related to compliance will be discussed via telephone with regulatory personnel.

Because the IEMP is a living document, a structured schedule of annual reviews and two-year revisions have been instituted. The annual review cycle provides the mechanism for identifying and initiating any air monitoring program modifications (i.e., changes in constituents, locations, or frequencies) that are necessary to align the IEMP with the current mix of near-term remediation activities. Any program modifications that may be warranted prior to the annual review would be communicated to EPA and OEPA.

APPENDIX A

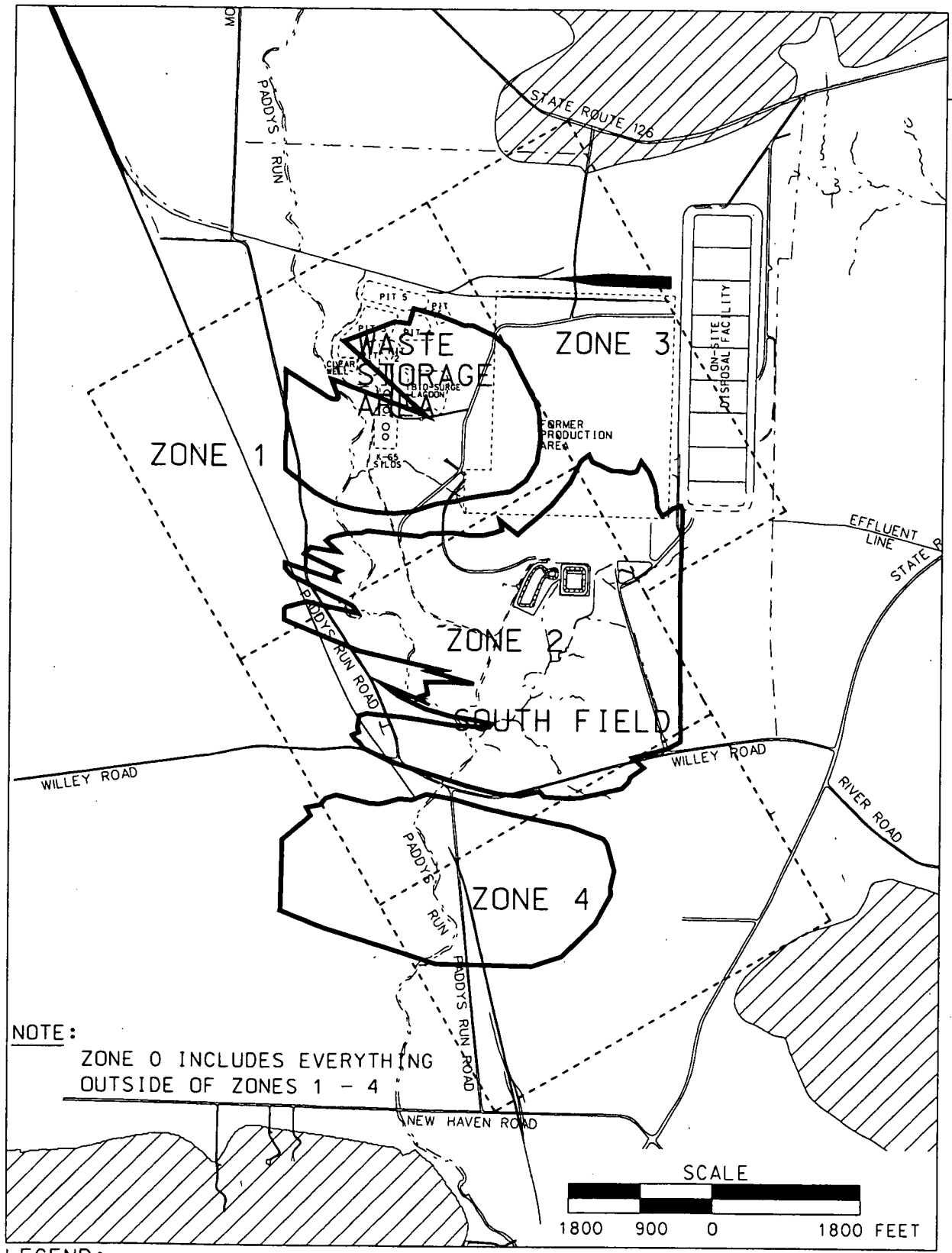

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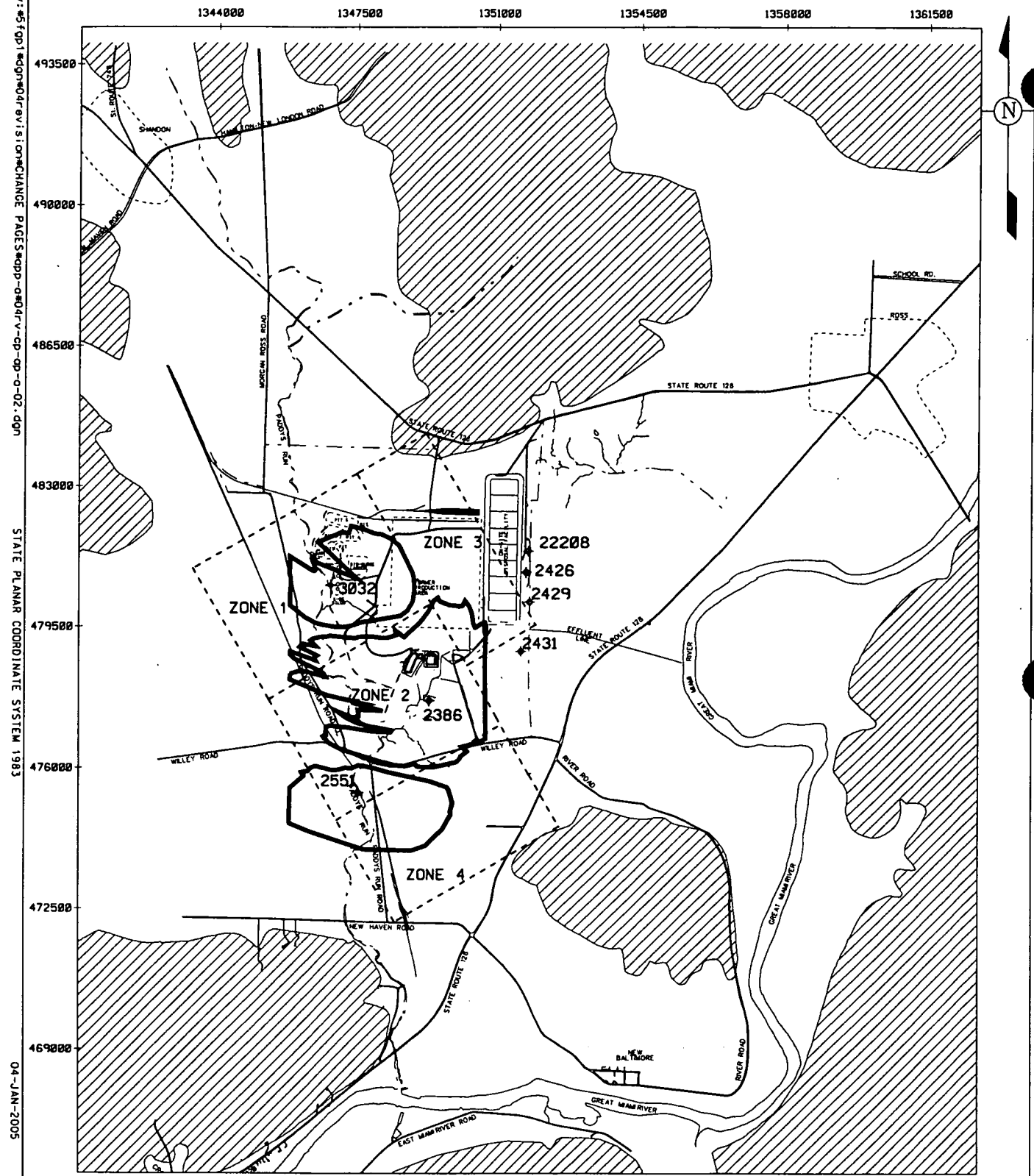
FIGURE A-1. GROUNDWATER AQUIFER ZONES AND AQUIFER RESTORATION FOOTPRINT

5816



LEGEND:

- FERNALD SITE BOUNDARY
- 3120 ✦ MONITORING WELL
- 10-YEAR, TIME-OF-TRAVEL REMEDIATION FOOTPRINT
- BEDROCK HIGHS

NOTE:
ZONE 0 INCLUDES EVERYTHING OUTSIDE OF ZONES 1 - 4

SCALE
3500 1750 0 3500 FEET

FINAL

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STATE PLANAR COORDINATE SYSTEM 1983
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FIGURE A-2. MONITORING WELL LOCATIONS WITH CONCENTRATIONS ABOVE THE FRL FOR ANTIMONY

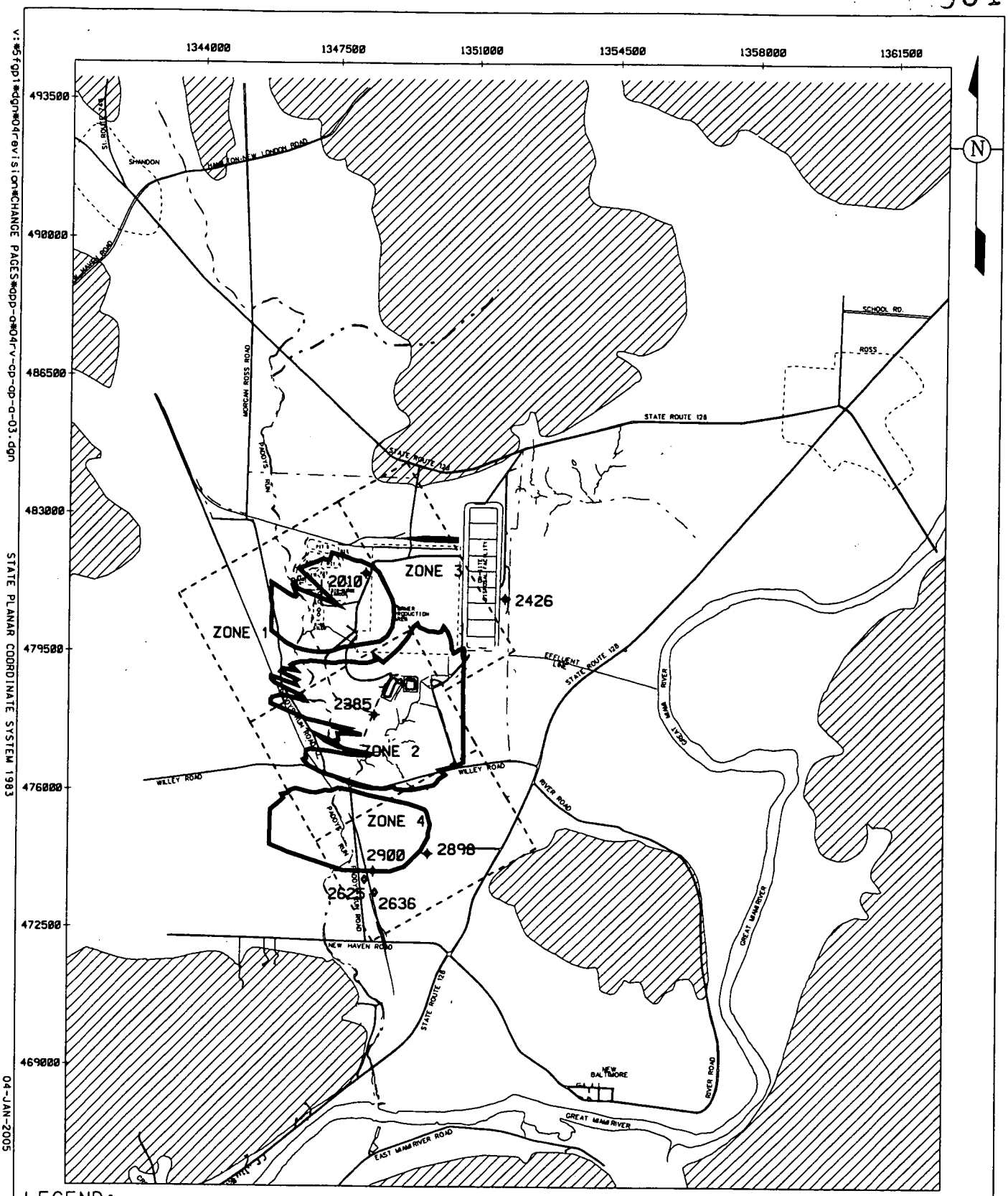

FIGURE A-3. MONITORING WELL LOCATIONS WITH CONCENTRATIONS ABOVE THE FRL FOR ARSENIC

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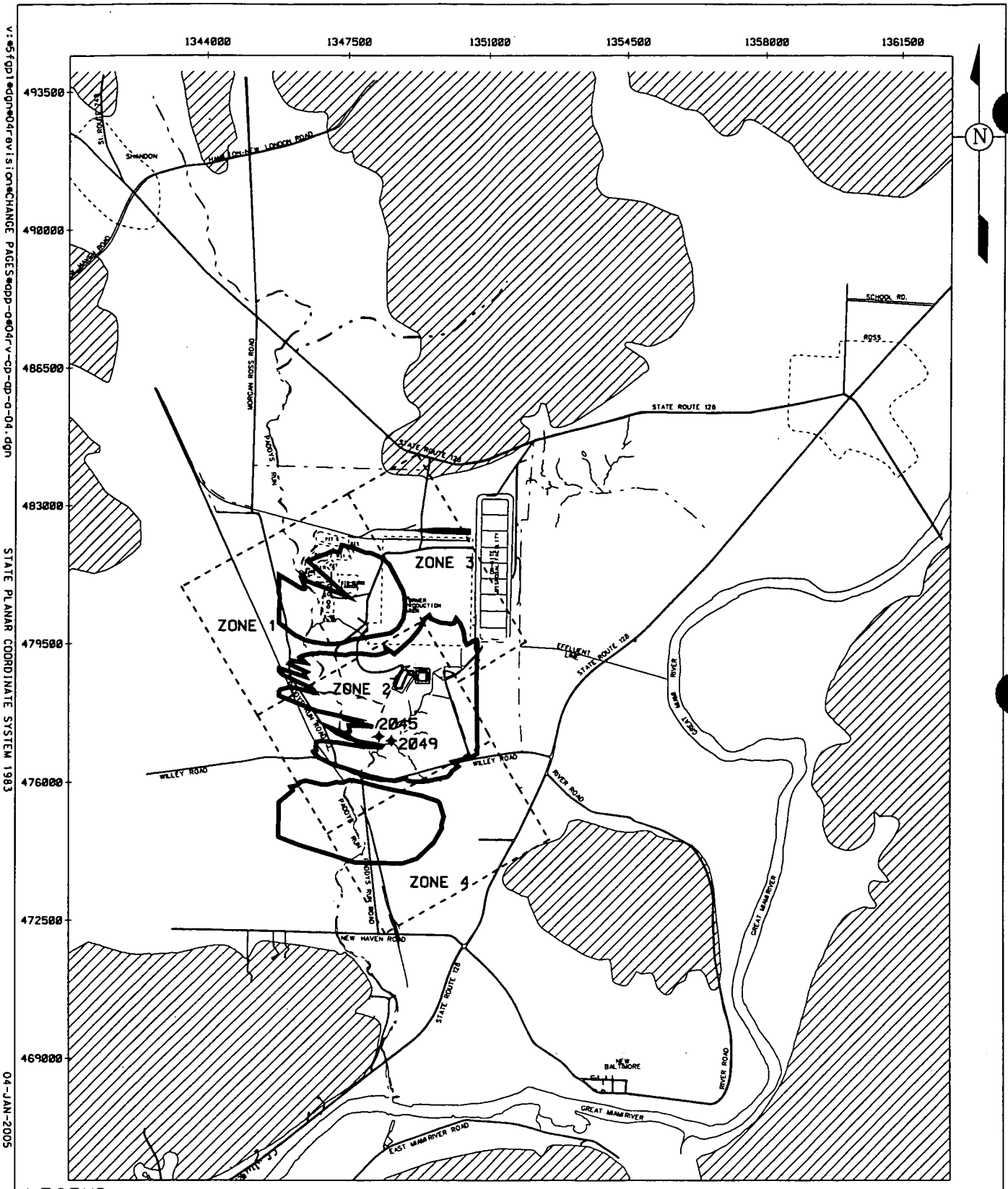

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STATE PLANAR COORDINATE SYSTEM 1983

04-JAN-2005

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FIGURE A-4. MONITORING WELL LOCATIONS WITH CONCENTRATIONS ABOVE THE FRL FOR BORON

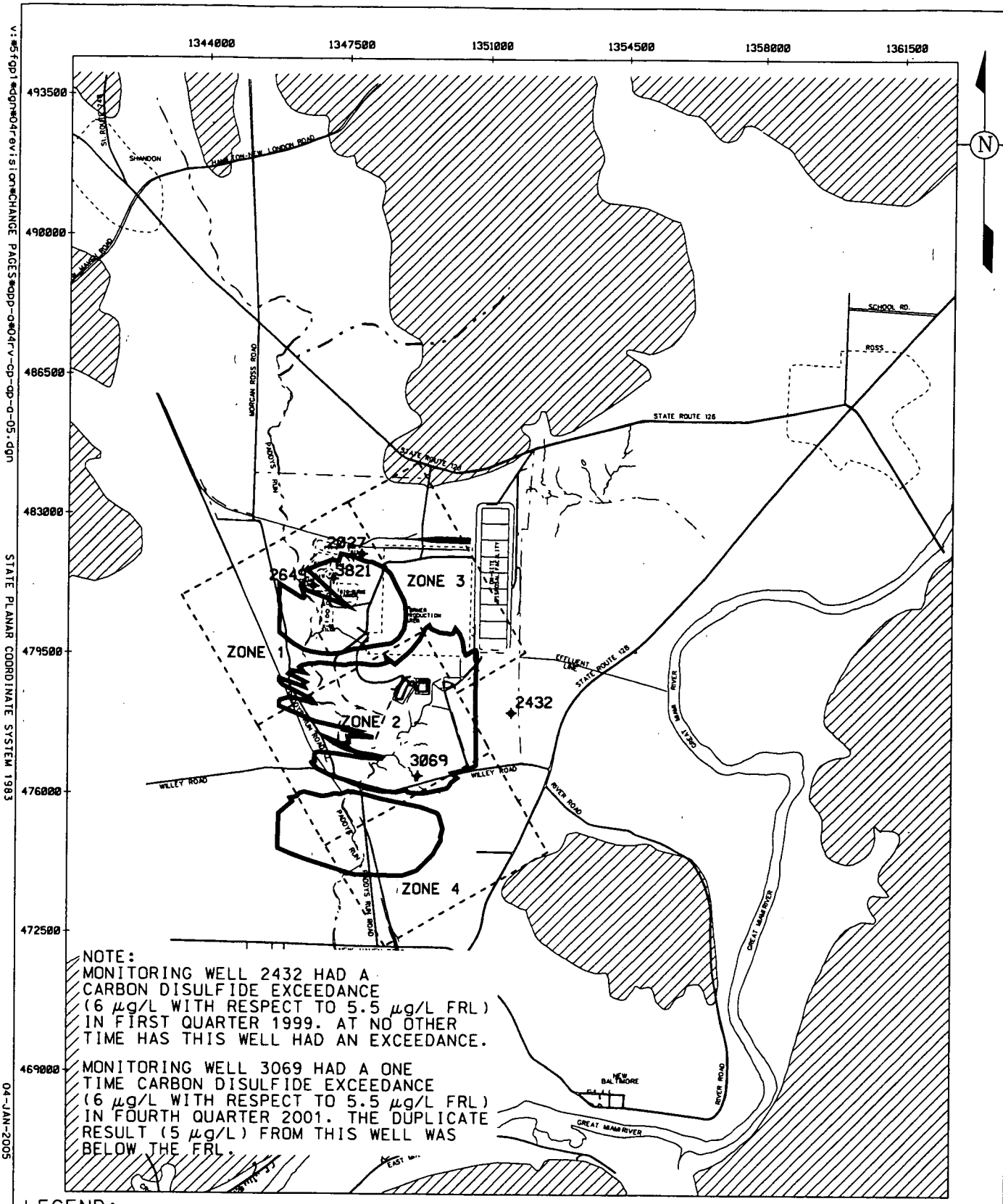
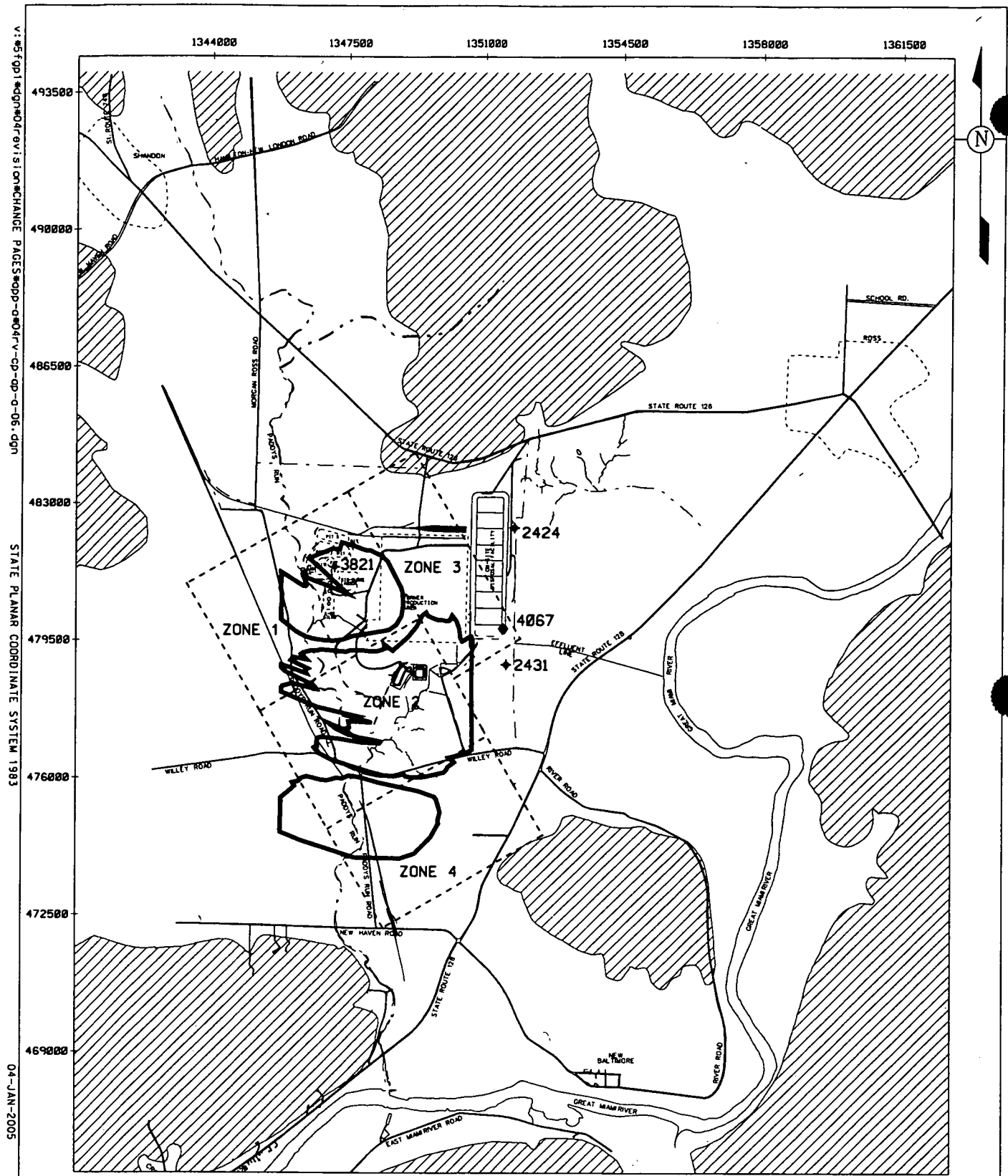


FIGURE A-5. MONITORING WELL LOCATIONS WITH CONCENTRATIONS ABOVE THE FRL FOR CARBON DISULFIDE

5816



LEGEND:

- FERNALD SITE BOUNDARY
- 3120✦ MONITORING WELL
- 10-YEAR, TIME-OF-TRAVEL REMEDIATION FOOTPRINT
- BEDROCK HIGHS

NOTE: ZONE 0 INCLUDES EVERYTHING OUTSIDE OF ZONES 1 – 4

SCALE

3500 1750 0 3500 FEET

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STATE PLANAR COORDINATE SYSTEM 1983

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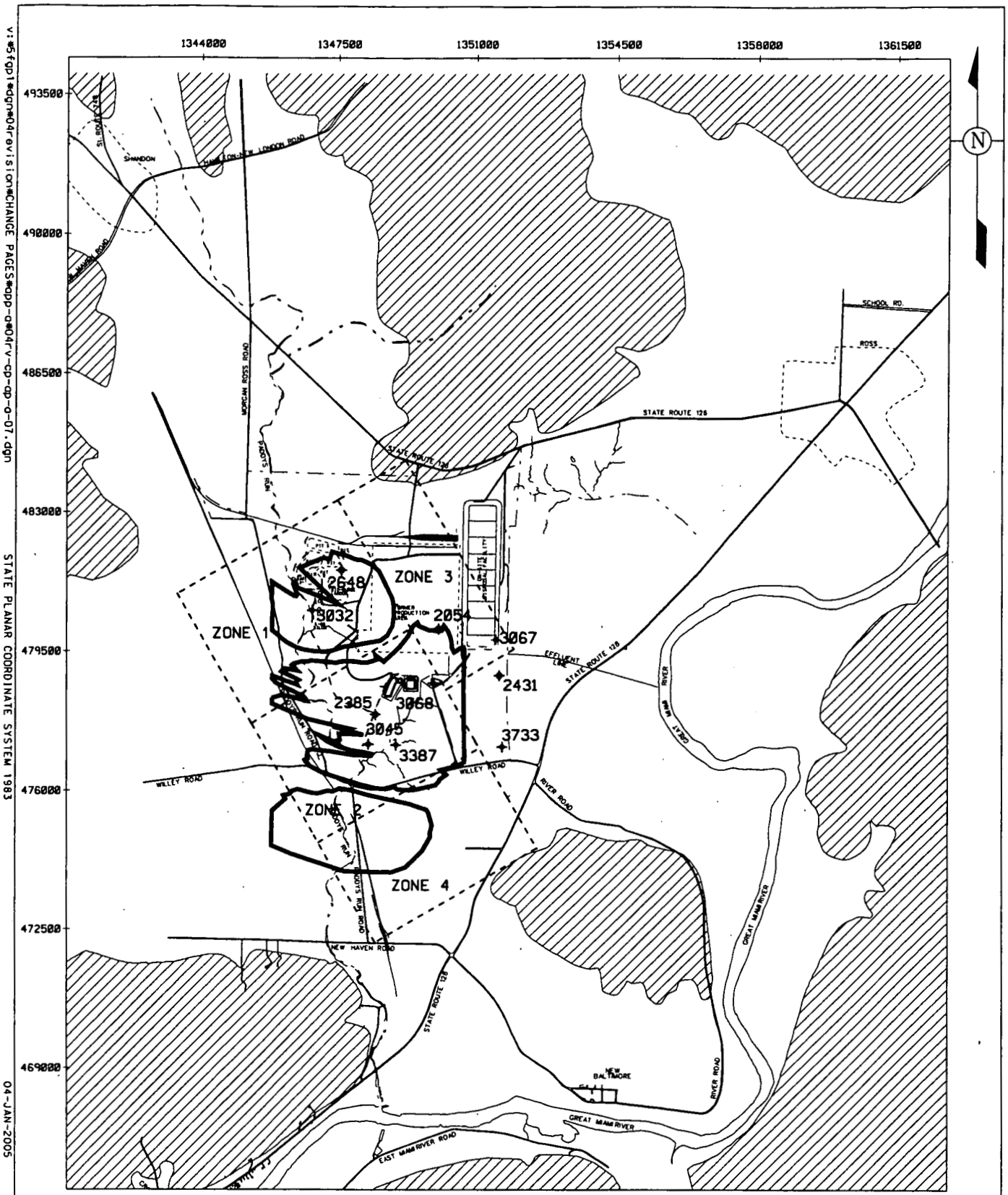
FIGURE A-6. MONITORING WELL LOCATIONS WITH CONCENTRATIONS ABOVE THE FRL FOR FLUORIDE



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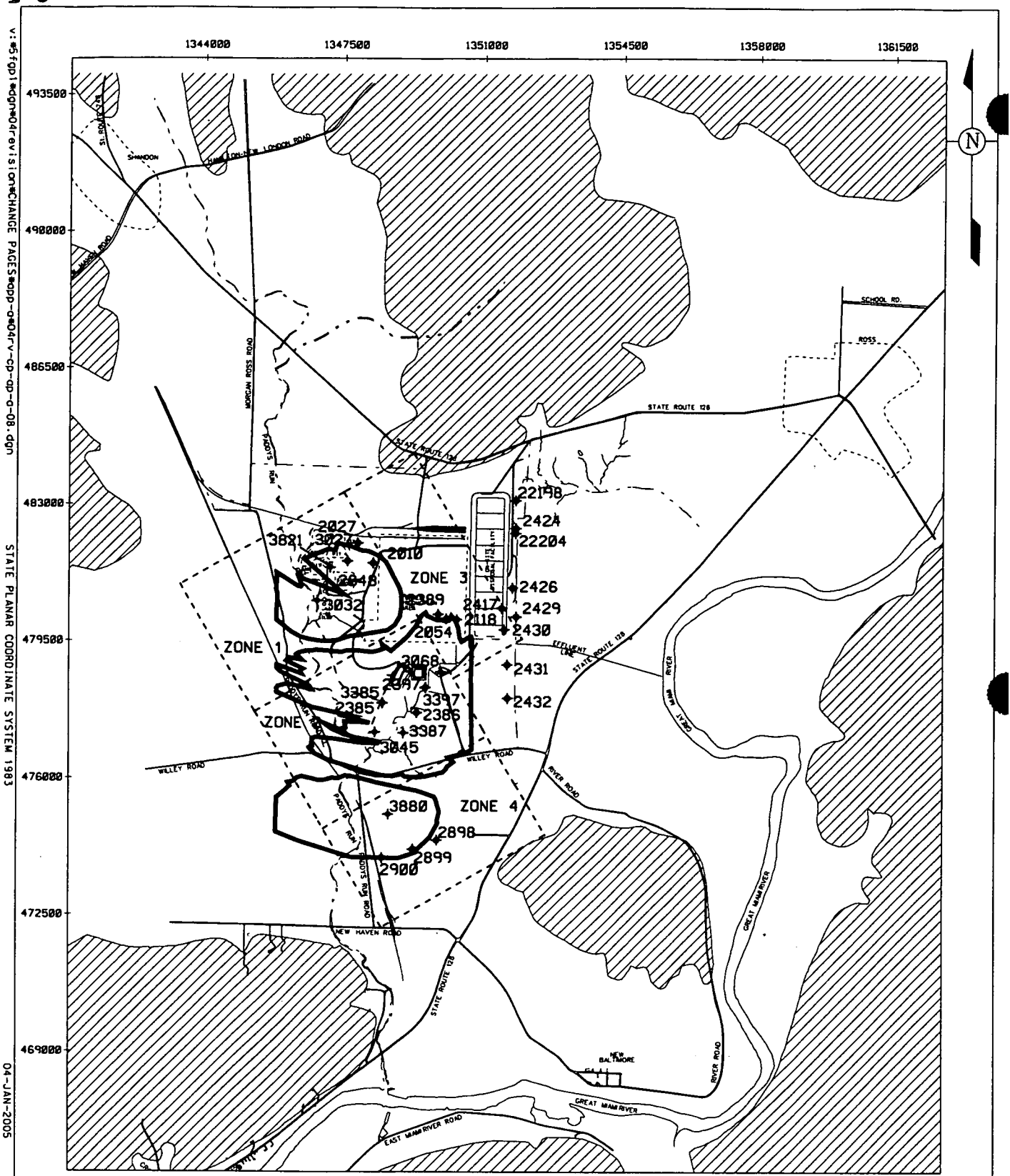
STATE PLANAR COORDINATE SYSTEM 1983
04-JAN-2005

FIGURE A-7. MONITORING WELL LOCATIONS WITH CONCENTRATIONS ABOVE THE FRL FOR LEAD

5816



LEGEND:

- FERNALD SITE BOUNDARY
- 3120 ✦ MONITORING WELL
- 10-YEAR, TIME-OF-TRAVEL REMEDIATION FOOTPRINT
- BEDROCK HIGHS

NOTE: ZONE 0 INCLUDES EVERYTHING OUTSIDE OF ZONES 1 - 4

SCALE

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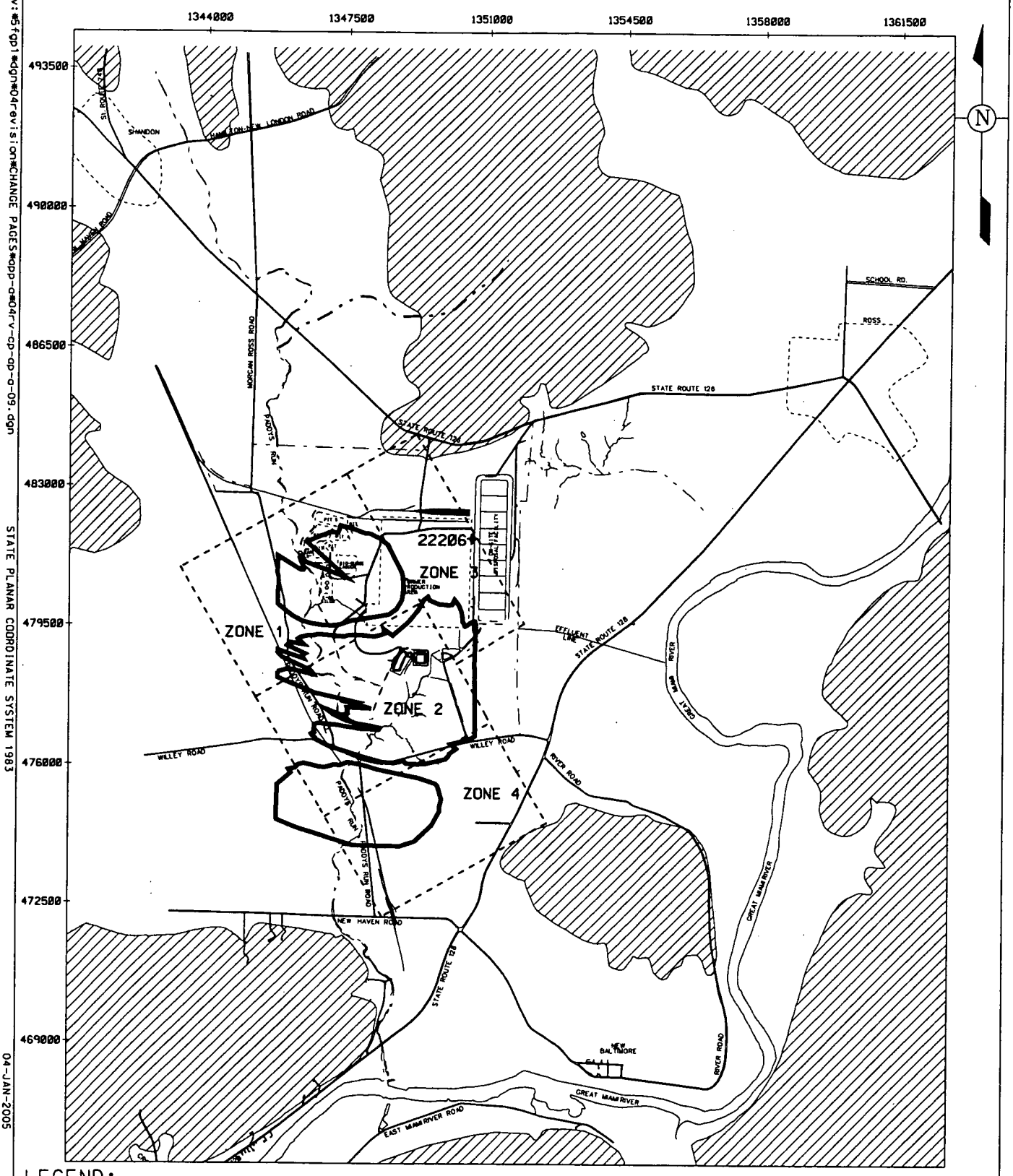
FIGURE A-8. MONITORING WELL LOCATIONS WITH CONCENTRATIONS ABOVE THE FRL FOR MANGANESE



LEGEND:

- FERNALD SITE BOUNDARY
- 3120 ✦ MONITORING WELL
- 10-YEAR, TIME-OF-TRAVEL REMEDIATION FOOTPRINT
- BEDROCK HIGHS

NOTE:
ZONE 0 INCLUDES EVERYTHING OUTSIDE OF ZONES 1 - 4

SCALE
3500 1750 0 3500 FEET

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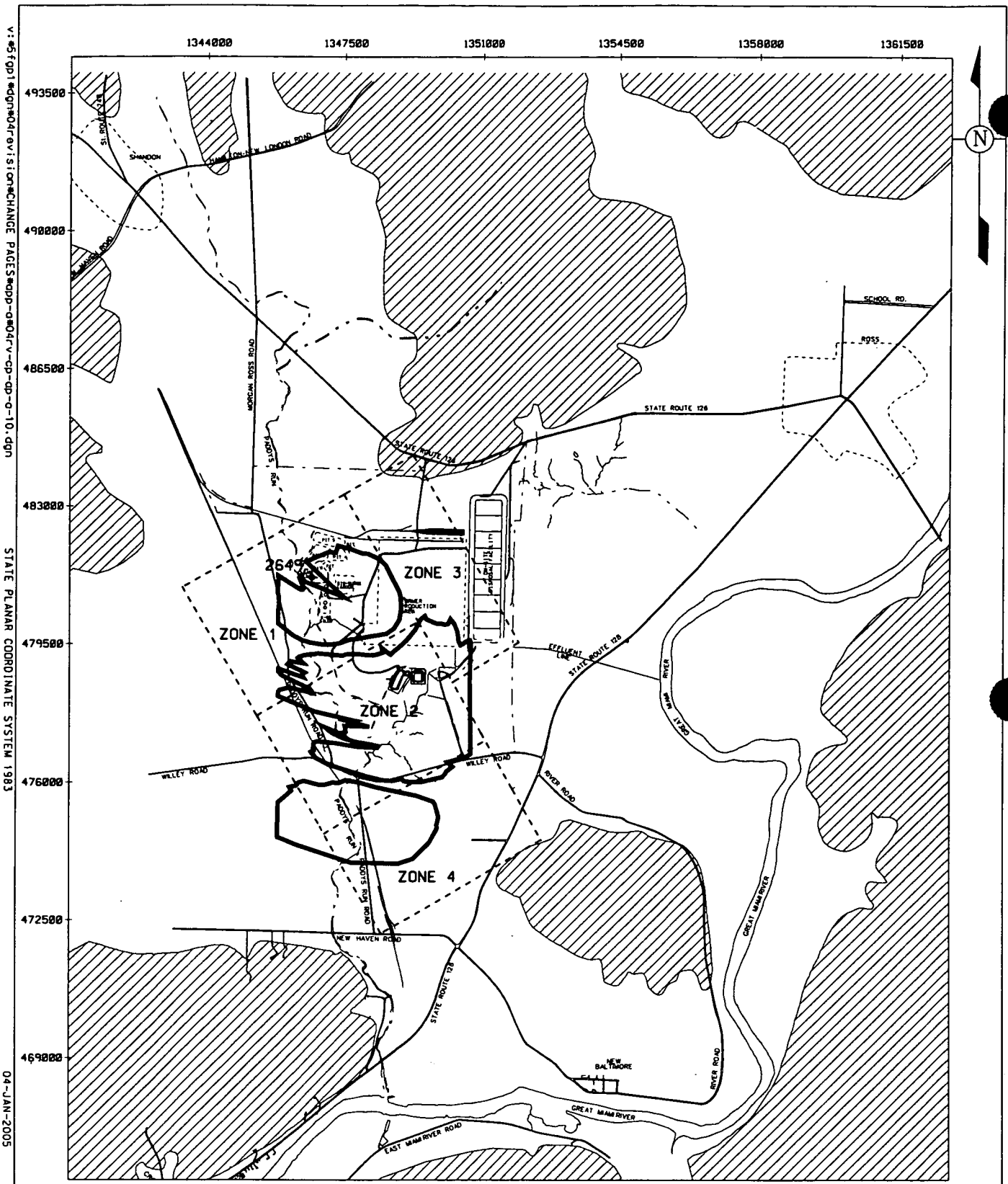
STATE PLANAR COORDINATE SYSTEM 1983
04-JAN-2005

FIGURE A-9. MONITORING WELL LOCATIONS WITH CONCENTRATIONS ABOVE THE FRL FOR MERCURY

5816



LEGEND:

- FERNALD SITE BOUNDARY
- 3120 ✦ MONITORING WELL
- 10-YEAR, TIME-OF-TRAVEL REMEDIATION FOOTPRINT
- BEDROCK HIGHS

NOTE: ZONE 0 INCLUDES EVERYTHING OUTSIDE OF ZONES 1 – 4

SCALE

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FIGURE A-10. MONITORING WELL LOCATIONS WITH CONCENTRATIONS ABOVE THE FRL FOR MOLYBDENUM

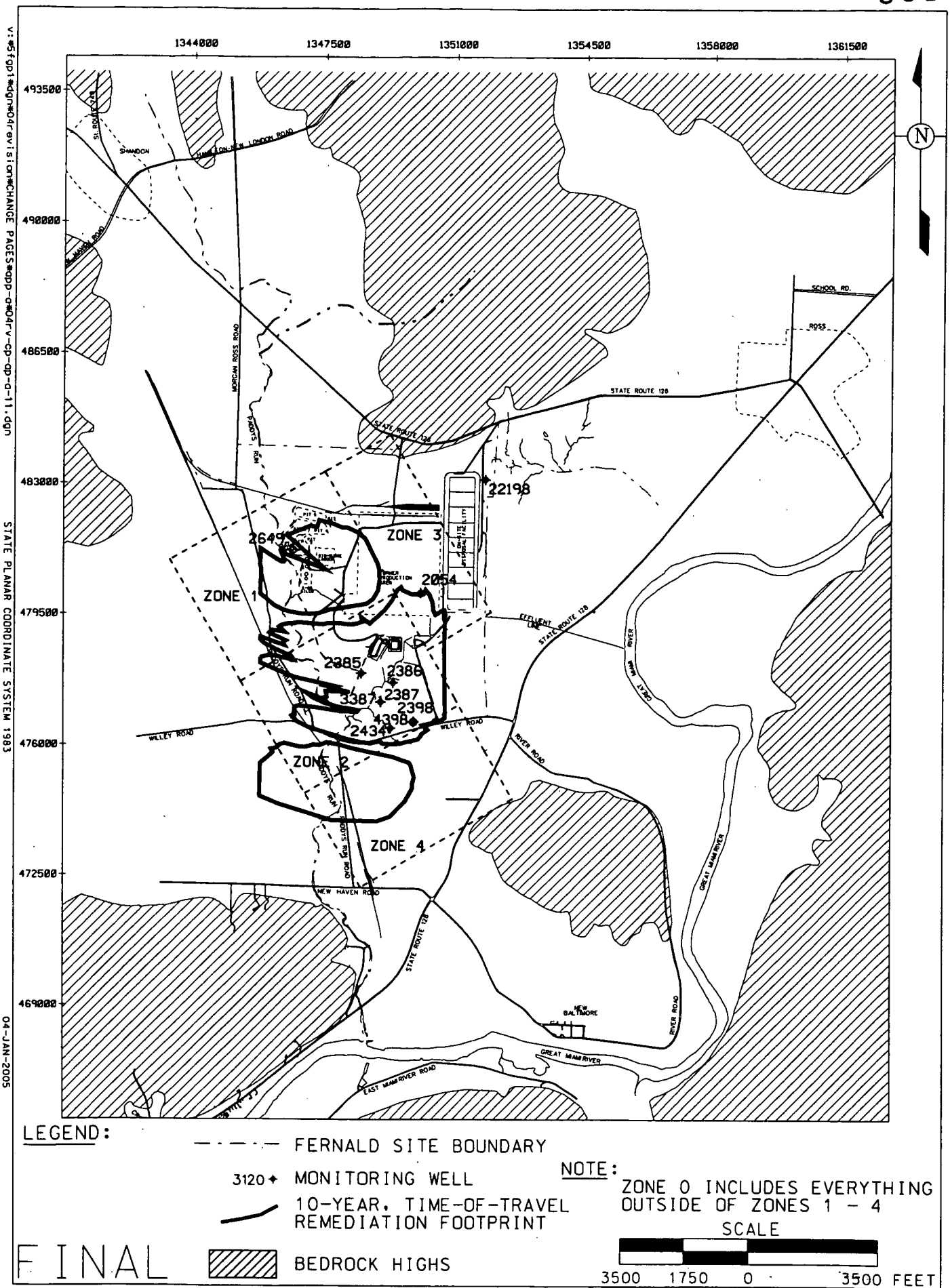
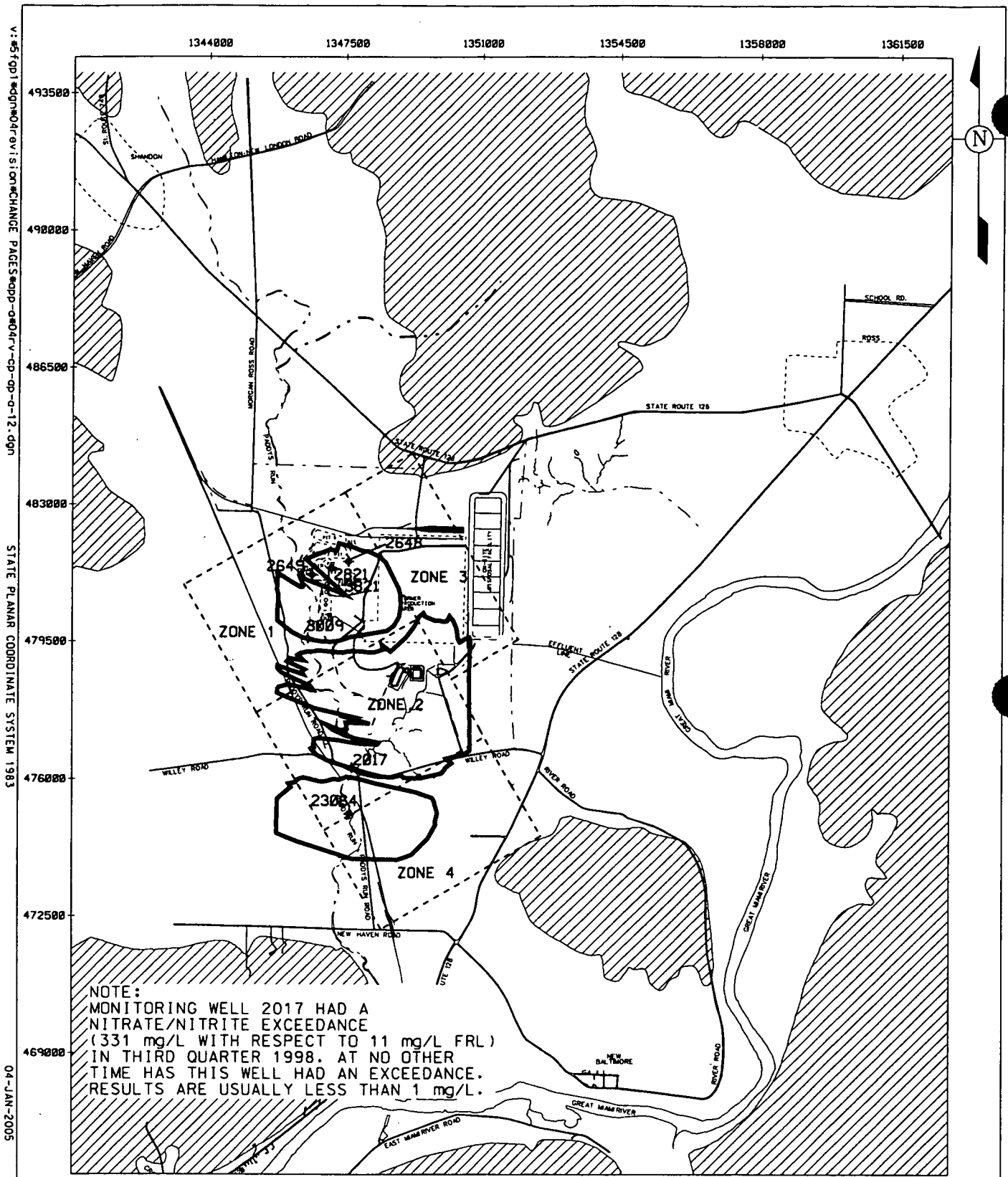


FIGURE A-11. MONITORING WELL LOCATIONS WITH CONCENTRATIONS ABOVE THE FRL FOR NICKEL



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STATE PLANAR COORDINATE SYSTEM 1983

04-JAN-2005

FIGURE A-12. MONITORING WELL LOCATIONS WITH CONCENTRATIONS ABOVE THE FRL FOR NITRATE/NITRITE

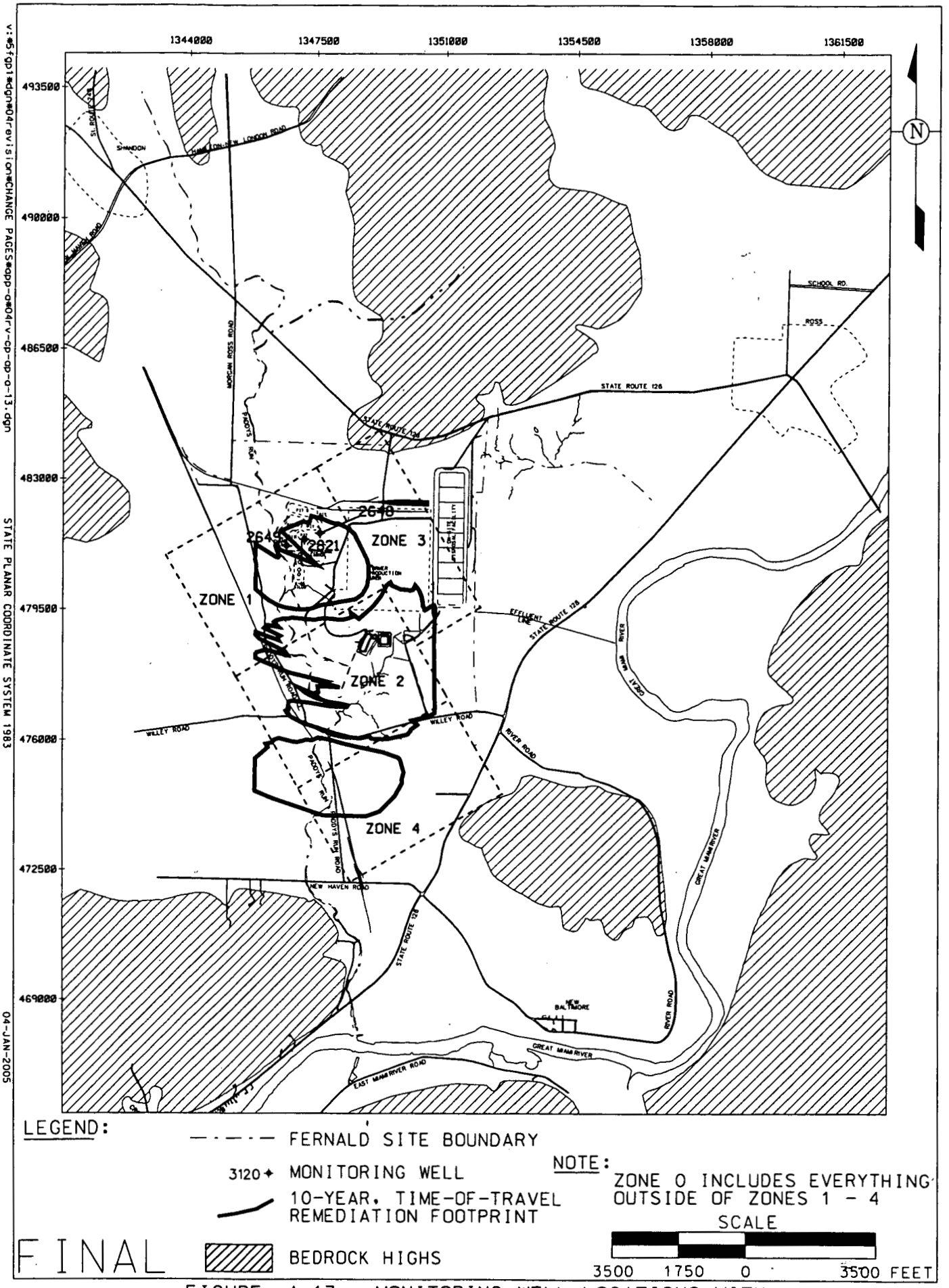

FIGURE A-13. MONITORING WELL LOCATIONS WITH CONCENTRATIONS ABOVE THE FRL FOR TECHNETIUM-99

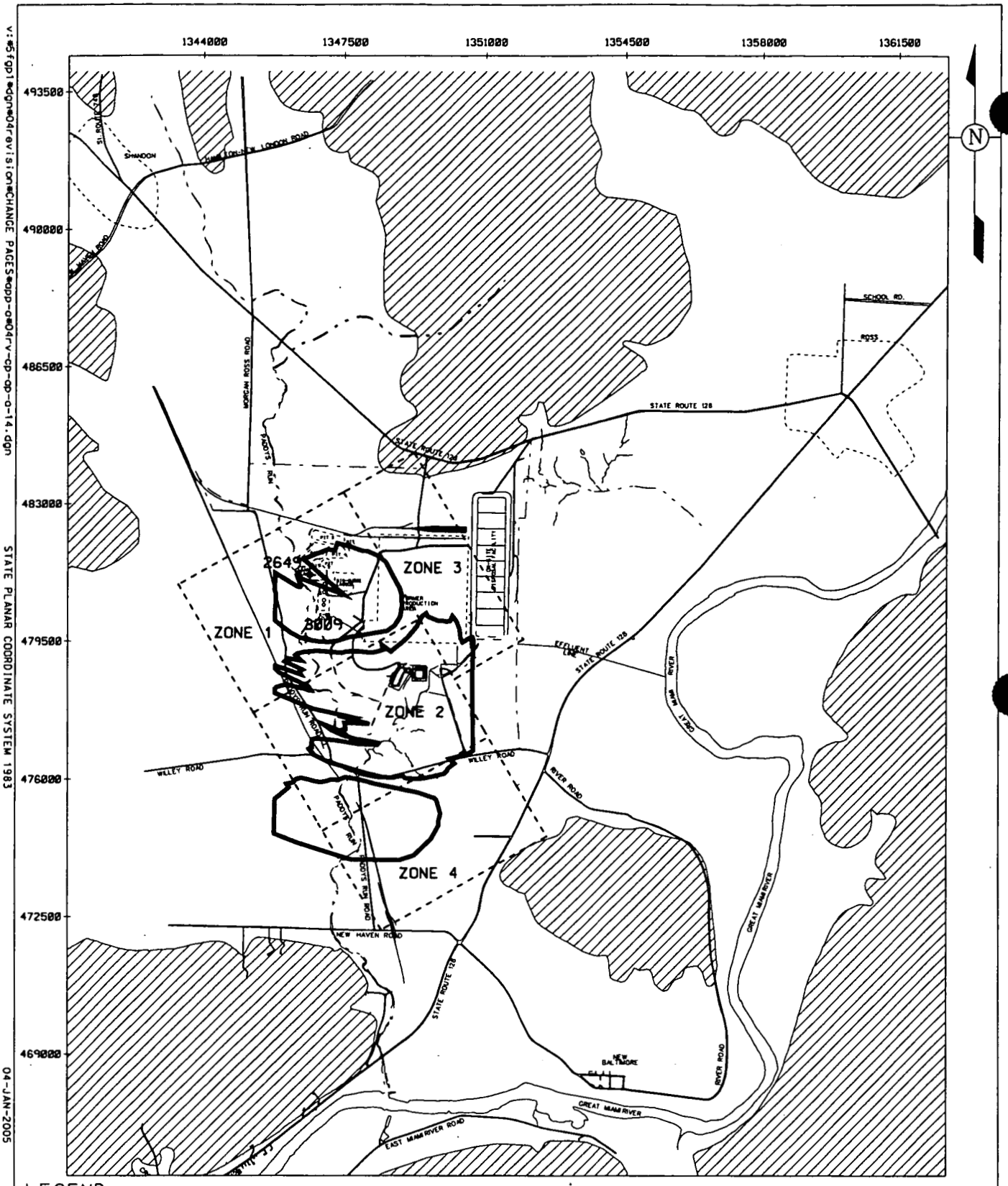

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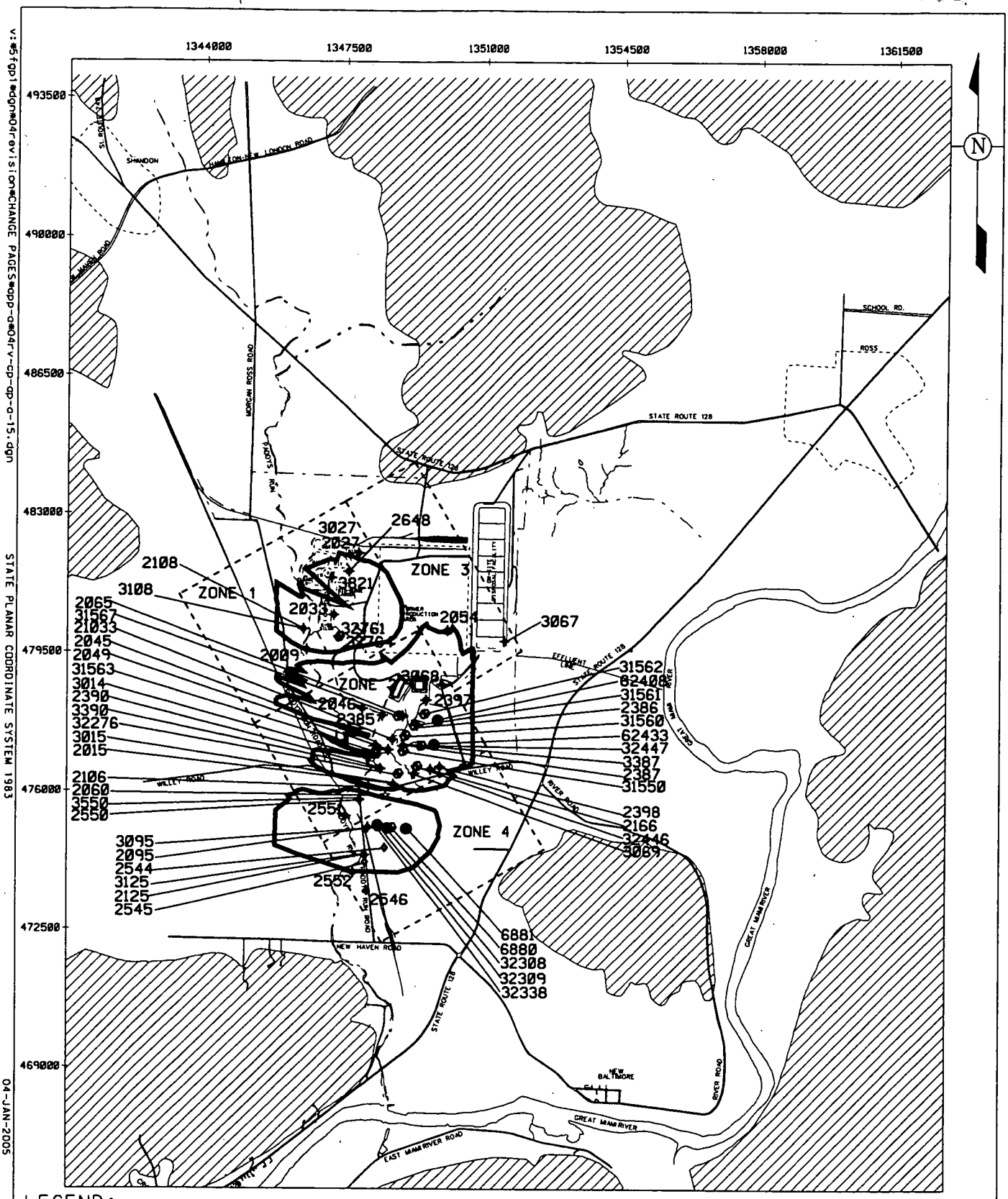
FIGURE A-14. MONITORING WELL LOCATIONS WITH CONCENTRATIONS ABOVE THE FRL FOR TRICHLOROETHENE



LEGEND:

- FERNALD SITE BOUNDARY
- 3120 ✦ MONITORING WELL
- 10-YEAR, TIME-OF-TRAVEL REMEDIATION FOOTPRINT
- BEDROCK HIGHS

NOTE:
ZONE 0 INCLUDES EVERYTHING OUTSIDE OF ZONES 1 - 4

SCALE
3500 1750 0 3500 FEET

FINAL

FIGURE A-15. MONITORING WELL LOCATIONS WITH CONCENTRATIONS ABOVE THE FRL FOR URANIUM, TOTAL

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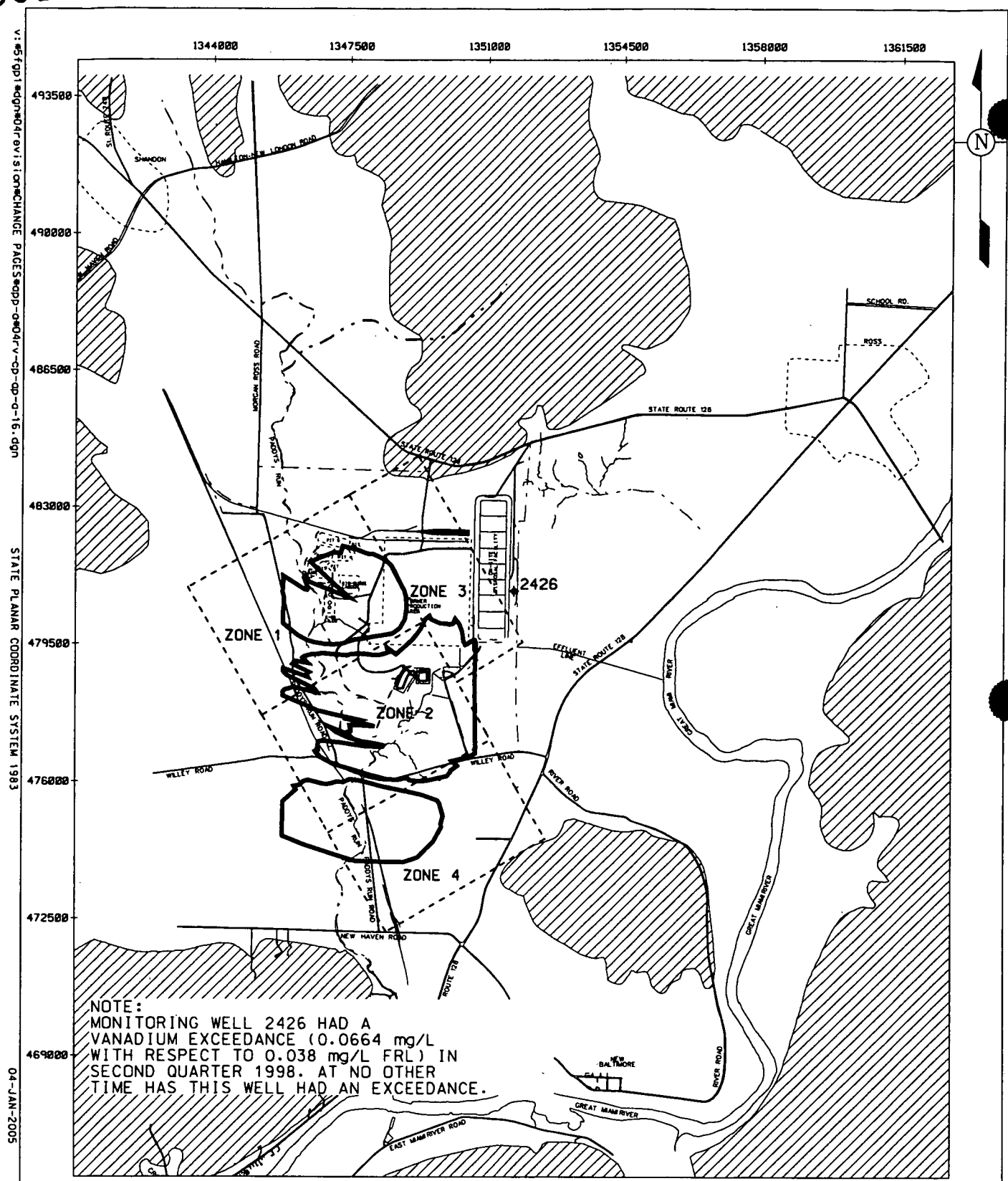

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STATE PLANAR COORDINATE SYSTEM 1983

04-JAN-2005

LEGEND:

- FERNALD SITE BOUNDARY
- 3120 ✦ MONITORING WELL
- 10-YEAR, TIME-OF-TRAVEL REMEDIATION FOOTPRINT
- BEDROCK HIGHS

NOTE:
ZONE 0 INCLUDES EVERYTHING OUTSIDE OF ZONES 1 - 4

SCALE

3500 1750 0 3500 FEET

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FIGURE A-16. MONITORING WELL LOCATIONS WITH CONCENTRATIONS ABOVE THE FRL FOR VANADIUM

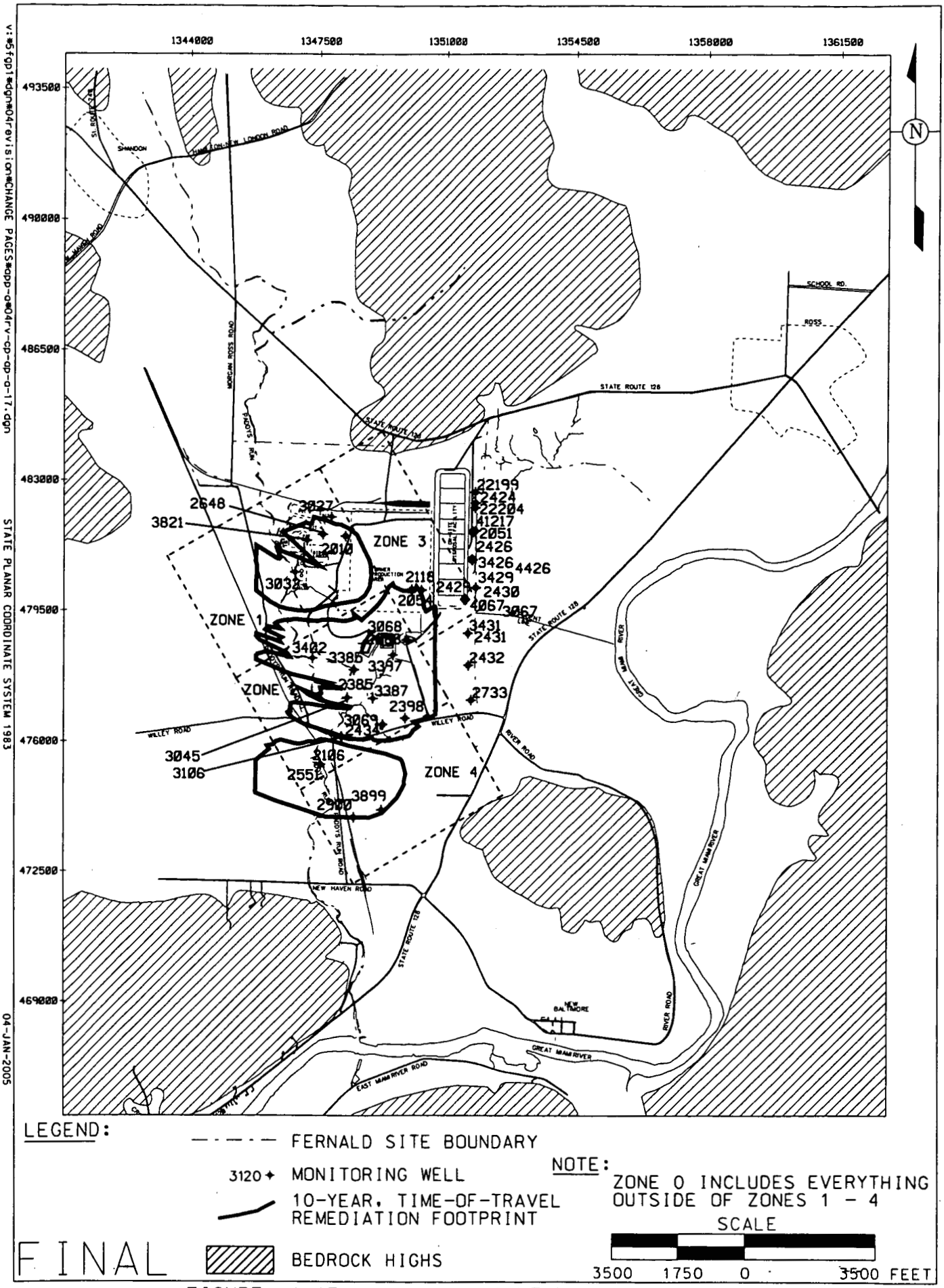

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FIGURE A-17. MONITORING WELL LOCATIONS WITH CONCENTRATIONS ABOVE THE FRL FOR ZINC

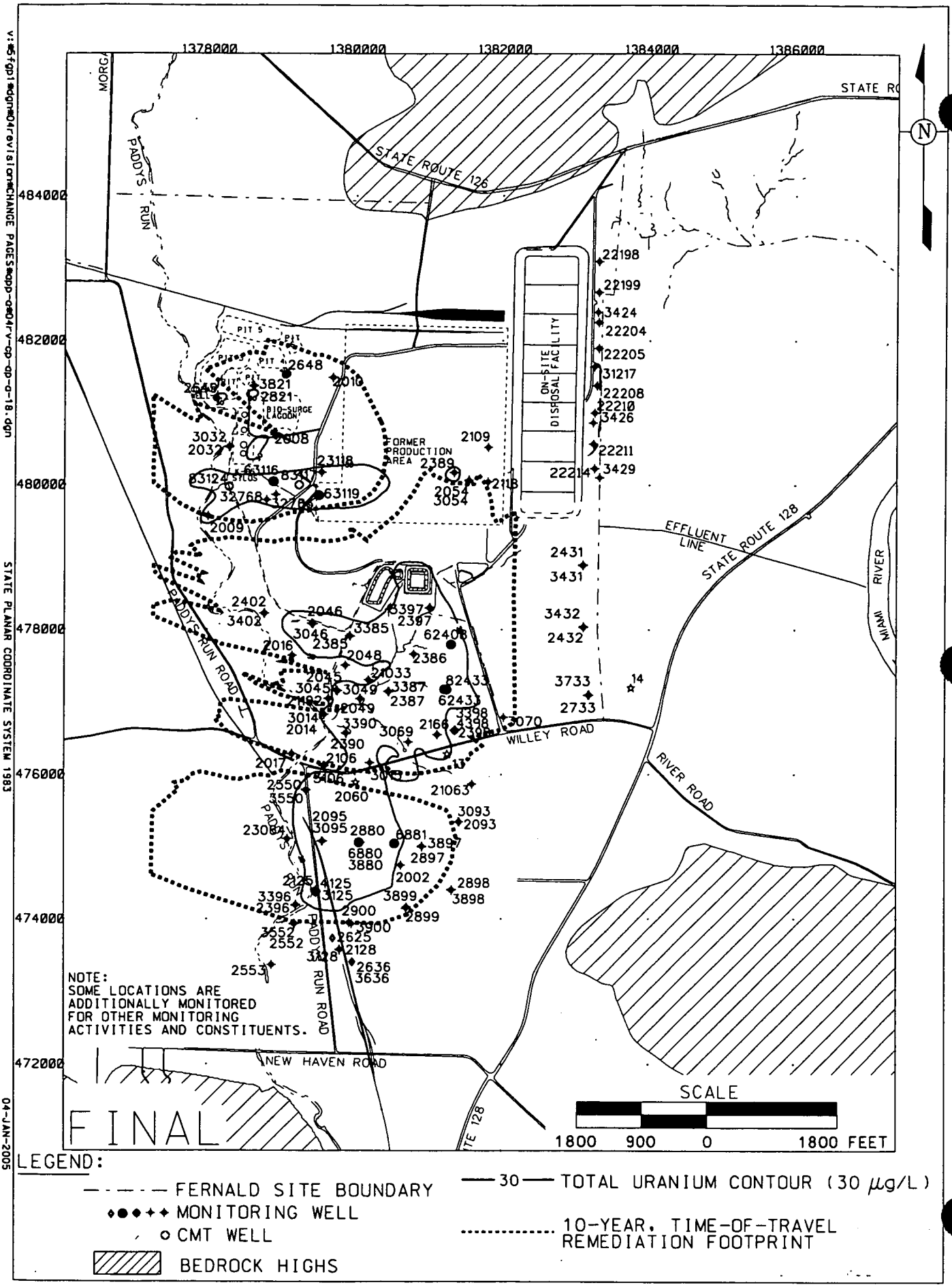

FIGURE A-18. LOCATIONS FOR SEMIANNUAL TOTAL URANIUM MONITORING

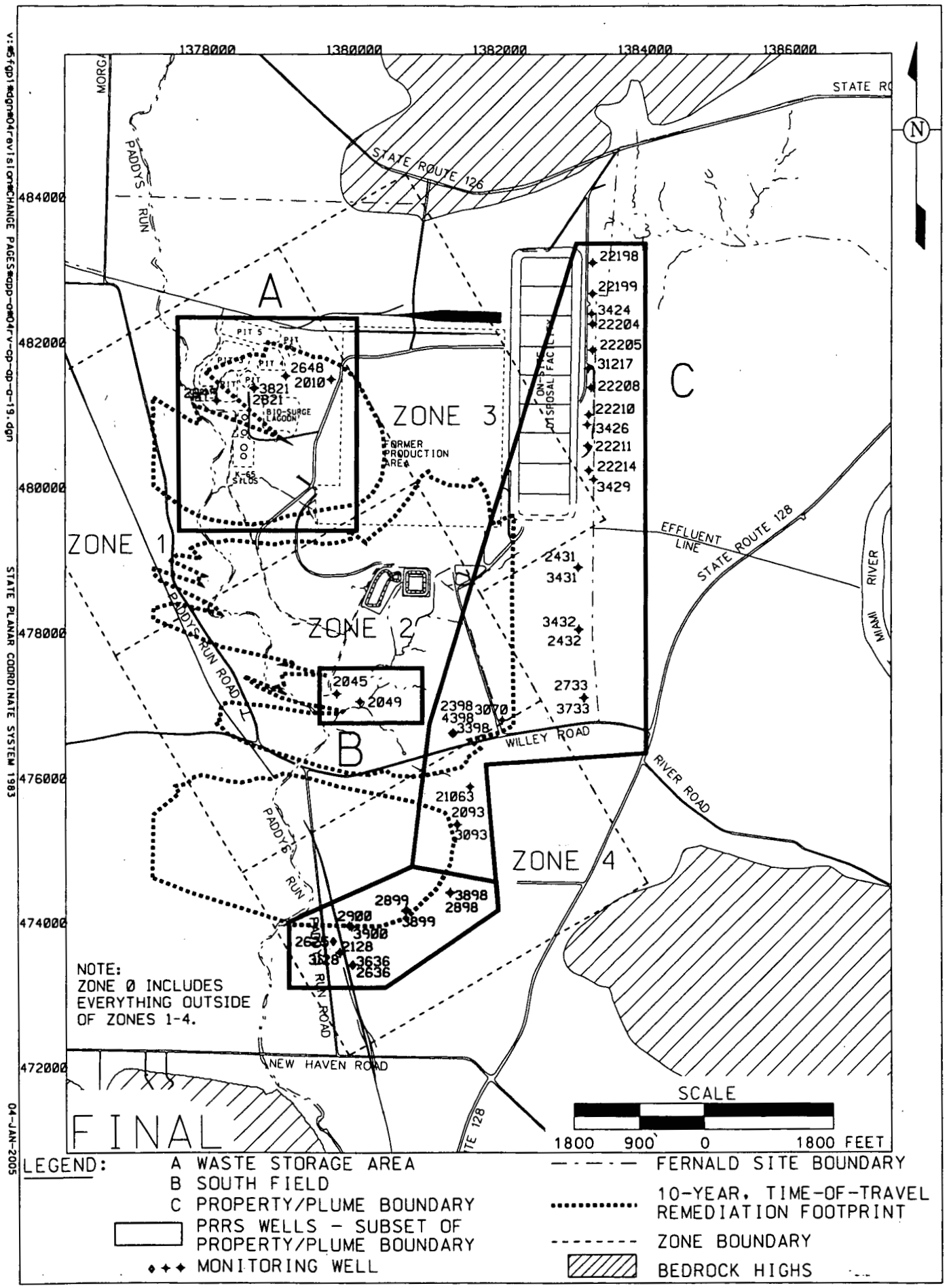

FIGURE A-19. LOCATIONS FOR SEMIANNUAL MONITORING FOR PROPERTY/PLUME BOUNDARY, SOUTH FIELD, AND WASTE STORAGE AREA

APPENDIX C

APPENDIX C
DOSE ASSESSMENT

C.1 INTRODUCTION

This appendix describes the technical approach for conducting the annual radiological dose assessment to meet the intentions of U.S. Department of Energy (DOE) Order 5400.5 (DOE 1993a) and the air pathway compliance determination (for 40 Code of Federal Regulations [CFR] 61 National Emissions Standards for Hazardous Air Pollutants [NESHAP] Subpart H) during the active remediation of the Fernald Closure Project (FCP). The Integrated Environmental Monitoring Plan (IEMP) will be the mechanism for conducting and reporting the annual sitewide radiological dose assessments.

The application of effective source and emission control measures, coupled with appropriate initial planning and ongoing preventive tracking, will form the cornerstone of the FCP's environmental safeguards during remediation. The objective of the dose assessment under the IEMP is to support these safeguards during remediation and to provide appropriate feedback, when necessary. The FCP's current compliance-based method for conducting the site's annual dose assessment (which, by definition, is performed at the end of the calendar year to report the results of past activities) will be supplemented with tracking and evaluating actual monitoring data collected at the Fernald site boundary during the year to identify any need for improving source emission control measures to ensure that the annual NESHAP dose limit is never reached.

C.2 REGULATORY DRIVERS AND REQUIREMENTS

Radiological dose assessments are prepared annually to establish that doses to the public from routine operations and emissions are in compliance with the dose limits set by the U.S. Environmental Protection Agency (EPA) and DOE regulations and orders. Before 1998, radiological dose assessments conducted at the end of the year were based on computer modeling results that used measured and estimated releases of airborne radioactive materials from significant sources. Since 1998, radiological dose assessments have been based on environmental monitoring results in order to provide a more accurate estimate of dose attributable to fugitive emissions. This section describes the various radiological dose limits and guidelines defined in the applicable or relevant and appropriate requirements (ARARs) and other regulatory requirements accompanying the FCP's remediation activities.

5 of 16

In addition to the regulatory drivers for the FCP's annual dose assessment, the need for a dose tracking procedure that can be used as a preventive tool has been identified. Dose tracking is needed to help prevent exceedance of the annual radiological dose limits and to identify the expected significant contributors for each year's combination of remediation activities. Based on the dose tracking results, any additional source control measures or adjustment in project-specific activities can be made as necessary to ensure that the Fernald site's contributions to annual dose remain within prescribed limits.

C.2.1 ARARs and Other Regulatory Drivers

This subsection summarizes the ARARs and other regulatory drivers for the dose assessment and associated dose limits. A sitewide radiological dose assessment is needed to demonstrate compliance with the following limits and guidelines from DOE Order 5400.5, which incorporates dose assessment standards in 40 CFR 61 NESHAP, Subpart H:

- The exposure of members of the public to radiation sources as a consequence of all routine activities at a DOE site shall not cause, in a year, an effective dose equivalent greater than 100 millirem (mrem). This annual effective dose equivalent is defined as the sum of direct external exposure for the year, plus the committed effective dose equivalent for intakes experienced during the year.

- The guideline includes doses from remediation activities and naturally occurring radionuclides released by DOE processes, but not radon and its decay products. All pathways that could significantly contribute to the exposure are to be included in the calculations. Significant exposures are considered to be 1 percent (one mrem) of the 100-mrem dose limit or greater.

- The exposure of members of the public to radioactive materials released to the atmosphere as a consequence of all activities at a DOE site shall not cause, in a year, an effective dose equivalent greater than 10 mrem. Because this guideline implements the dose limits of 40 CFR 61 Subpart H, doses caused by radon-222 and its decay products are not included. The same annual effective dose equivalent definition applies as above.

  Note: The radon effluent guidelines of DOE Order 5400.5 also implement the EPA flux regulations of 40 CFR 61, Subpart Q, which apply to radon-producing wastes during storage or disposal. These guidelines are expressed in terms of radon concentrations in air and radon flux at the surface of radon-producing wastes, not in terms of dose to humans or other organisms.

- The liquid effluents from DOE activities shall not cause private or public drinking water systems to exceed the drinking water radiological limits in 40 CFR 141 which says that effluents must not cause the drinking water radiological limits to exceed any of the following independent limits: man-made beta/gamma-emitting radionuclides at an annual average concentration that would cause an annual dose equivalent of 4 mrem to the total body or any internal organ; combined radium-226 and radium-228 at any time totaling 5 picoCuries per liter (pCi/L); or gross alpha activity (including radium but excluding radon and uranium) of 15 pCi/L at any time.

C.4.1 Project-Specific Interfaces

Project-specific emission monitoring results collected by remediation projects for workers' health and safety concerns will be used to determine significant contributors among the ongoing remedial actions. Therefore, an interface between the IEMP and ongoing remediation projects will be maintained in order to gather project-specific data and to provide feedback for adjusting/implementing source control measures. Data review and evaluation will generally follow the receipt of each set of project-specific monitoring results.

C.4.2 Regulatory Interfaces

The IEMP air monitoring data will be posted to the IEMP Data Information Site. When the monitoring data indicate a need for adjusting or implementing project-specific source control measures, the regulatory agencies will be notified by the specific remediation projects. The modifications and the effectiveness of the improved source control measures will also be documented.

C.4.3 Annual Reporting

The NESHAP Subpart H Annual Report will be issued as part of the annual site environmental report, according to reporting schedule in Section 7.0 of the IEMP. Annual summaries of the monitoring results, calculated doses from airborne emissions and calculated direct radiation dose will be included in the report. Comparisons of the pathway-specific doses and the combined annual radiological doses to the regulatory dose limits will also be presented.

C.5 SUMMARY

Figure C-1 shows the major tasks in the sitewide dose tracking and annual dose assessment processes during the FCP remediation described in this appendix. Table C-5 further summarizes the responsibilities of the IEMP and specific remediation projects to fully implement the sitewide air-pathway dose tracking and annual dose assessment processes.

TABLE C-5

SITEWIDE DOSE TRACKING AND ANNUAL ASSESSMENT TASKS

Tasks	Project Responsibilities
	IEMP
• Annual Sitewide Planning	Evaluate planned remediation activities and source conditions at beginning of the year
• Routine Fenceline Monitoring	Conduct routine air monitoring at background and fenceline locations
• Preventive Tracking/Feedback	Directly compare routine monitoring results to annual dose benchmarks; report and evaluate any exceedances
• NESHAP Compliance Demonstration	Based on actual monitoring data, calculate annual doses at monitoring locations.
• Reporting	Prepare summaries and the annual NESHAP report
	Remediation Project
• Annual Planning	Specify project-specific remedial schedule and activities at beginning of the year
• Maintain Fugitive Dust and/or Emission Source Control	Maintain/improve effective fugitive dust and emission source control measures within the project boundary
• Health and Safety Monitoring	Conduct routine remedial worker health and safety monitoring