1.0 Site Background

Abbreviated Timeline

1951	Construction of the Feed Materials Production Center began.
1952	Uranium production started.
1986	EPA and DOE signed the Federal Facilities Compliance Agreement, which initiated the remedial investigation/feasibility study process.
1989	Uranium production was suspended. The Fernald site was placed on the National Priorities List, which is the list of CERCLA sites most in need of cleanup.
1990	As part of the Amended Consent Agreement, the site was divided into operable units for characterization and remedy determination.
1991	Uranium production formally ended. The site mission changed from uranium production to environmental remediation and site restoration.
1996	The last operable unit's record of decision was signed, signifying the end of the 10-year remedial investigation/feasibility study process. (The Operable Unit 4 Record of Decision was later re-opened.)
1999	Excavation of the waste pits was initiated and the first rail shipment of waste material was transported to Envirocare of Utah, Inc. Safe Shutdown was completed ahead of schedule.
2000	The Record of Decision Amendment for Operable Unit 4 Silos 1 and 2 Remedial Actions was signed by EPA.
2001	On-site disposal facility Cell 1 was capped. Remediation of the southern waste units was completed.
2002	The Silos 1 and 2 Radon Control System began operations and successfully reduced radon levels within the silos. The off-site transfer of nuclear product material was completed. The on-site disposal facility conducted waste placement into Cells 2, 3, 4, and 5.

In 1951 the Atomic Energy Commission (predecessor of the U.S. Department of Energy [DOE]) began building the Feed Materials Production Center on a 1,050-acre (425-hectare) tract of land outside the small farming community of Fernald, Ohio. The facility's mission was to produce "feed materials" in the form of purified uranium compounds and metal for use by other government facilities involved in the production of nuclear weapons for the nation's defense.

Uranium metal was produced at the Feed Materials Production Center from 1952 through 1989. During that time over 500 million pounds (227 million kilograms [kg]) of uranium metal products were delivered to other sites. Due to these production operations, releases to the surrounding environment occurred, resulting in contamination of soil, surface water, sediment, and groundwater on and around the site.

CERCLA Remedial Process

In broad terms, the process of cleaning up sites under CERCLA consists of the following general phases:

Site Characterization – During this phase, contaminants are identified and quantified, and the potential impacts of those contaminants on human health are determined. This phase includes the remedial investigation and the baseline risk assessment.

Remedy Selection – During this phase, cleanup alternatives are developed and evaluated and, with the input of stakeholders, a remedy is selected. Activities include the feasibility study and proposed plan. After public comments are received, a remedial alternative is selected and documented in a record of decision.

Remedial Design and Remedial Action – This phase of the CERCLA process includes the detailed design and implementation of the remedy.

The CERCLA process ends with certification and site closure. A five-year review process is triggered by the onset of construction for the first operable unit remedial action that will result in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure. Of all the operable units, the site preparation construction to support the Waste Pit Remedial Action Project under the Operable Unit 1 Record of Decision (DOE 1995b) was the first such action. This construction began on April 1, 1996. The First Five-Year Review Report for the site was submitted to and approved by the EPA in 2001. These reviews ensure that the remedy remains effective and continues to be protective of human health and the environment.

Long-term Stewardship will take place at the Fernald site following completion of CERCLA activities. This means that DOE will assume the long-term monitoring and maintenance of the FCP after site closure in order to ensure continued protection of human health and the environment. The previously mentioned five-year review process will continue in order to provide long-term stewardship information to the public.

In 1991 the mission of the site officially changed from uranium production to environmental cleanup under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) as amended. The site was renamed the Fernald Environmental Management Project (FEMP). Today the site is called the Fernald Closure Project (FCP) to reflect the current mission. Fluor Fernald, Inc. manages the remediation and restoration of the site under the terms of a prime contract with DOE. Regulatory oversight is provided by Region V of the U.S. Environmental Protection Agency (EPA) and the Southwest District Office of the Ohio Environmental Protection Agency (OEPA).

In the 1980s environmental monitoring activities began at the site. The goal was to assess the impact of production operations and monitor the environmental pathways through which residents of the local community might be exposed to contaminants from the site (exposure pathways). The environmental monitoring program provided comprehensive on- and off-property surveillance of contaminant levels in surface water, groundwater, air, and biota. The goal was to continuously measure the levels of contaminants associated with uranium production operations, and report this information to the regulatory agencies and stakeholders.

Since the conclusion of the site's uranium production mission and completion of the CERCLA remedy selection process, the focus is on the safe and efficient implementation of environmental remediation activities and facility decontamination and dismantling operations. In recognition of this shift in emphasis toward remedy implementation, the environmental monitoring program was revised in 1997 to align with the remediation activities planned for the Fernald site. The site's environmental monitoring program for 2002 is described in the Integrated Environmental Monitoring Plan (IEMP), Revision 2 (DOE 2001c). The IEMP is updated at a minimum of every two years to keep pace with the site's monitoring needs as remediation progresses.

The 2002 Site Environmental Report summarizes the findings from the IEMP monitoring program and provides a status on the progress toward final site restoration. This report consists of the following:

Summary Report This summary report (Chapters 1 through 7) documents the results of environmental monitoring activities at the Fernald site in 2002. It includes a discussion of remediation activities and summaries of environmental data from groundwater, surface water and treated effluent, sediment, air, and natural resources monitoring programs. It also summarizes the information contained in the appendices.

Appendices The detailed appendices provide the 2002 environmental monitoring data for the various media, primarily in the form of graphs and tables. The National Emission Standards for Hazardous Air Pollutants (NESHAP) (40 Code of Federal Regulations 61 Subpart H) (EPA 1985) compliance report is also included. The appendices are generally distributed only to the regulatory agencies. However, a complete copy of the appendices is available at the Public Environmental Information Center, which is located near the access point for the site in Trailer 210, and is open Tuesdays and Thursdays or by appointment.

The remainder of this introductory chapter provides:

- A brief overview of the current environmental remediation operations and a description of its current cleanup mission, organization, and major remediation activities.
- A description of environmental monitoring activities at the Fernald site.
- A description of the physical, ecological, and human characteristics of the area.

1.1 The Path to Site Closure

In 1986 the Fernald site began working through the CERCLA process to characterize the nature and extent of contamination at the site, establish risk-based cleanup standards, and select the appropriate remediation technologies to achieve those standards. To facilitate this process, the site was organized into five operable units in 1991. The purpose of the operable unit concept under CERCLA is to organize site components based on their location and/or the potential for similar technologies to be used for environmental remediation. The remedy selection process culminated in 1996 with approval of the final records of decision for each of the five operable units. However, the Record of Decision Amendment for Operable Unit 4 Silos 1 and 2 Remedial Actions was issued in July of 2000.

Following approval of the initial records of decision, work began on the design and implementation of the operable unit remedies. In order to align sitewide responsibilities and regulatory obligations of each operable unit and to most efficiently execute remedial design and remedial action, the site established integrated project organizations in 1996. Realignment into project organizations reflected the actual work processes and operations necessary to complete remediation while meeting the requirements of the records of decision. Table 1-1 describes each operable unit and its associated remedy and provides a crosswalk between each operable unit and the project organizations responsible for implementing each remedy. When a project organization is mentioned in this document, references to the applicable operable unit are included, as identified in the Table 1-1 description.

1.2 Environmental Monitoring Program

Exposure Pathways

An **exposure pathway** is a route by which materials could travel between the point of release (a source) and the point of delivering a radiation or chemical dose (a receptor). At the Fernald site, two **primary exposure pathways (liquid and air)** have been identified. A primary pathway is one that may allow pollutants to directly reach the public and/or the environment. Therefore, the liquid and air pathways provide a basis for environmental sampling and information useful for evaluating potential dose to the public and/or the environment.

Secondary exposure pathways have been thoroughly evaluated under previous environmental monitoring programs. Secondary exposure pathways represent indirect routes by which pollutants may reach receptors. An example of a secondary pathway is produce. Through the food chain, one organism may accumulate a contaminant and then be consumed by humans or other animals. The contaminant travels through the air to the soil, where it is absorbed into produce through the roots, and is consumed by humans or animals. An evaluation of past monitoring data has shown that secondary exposure pathways at the Fernald site are insignificant routes of exposure to off-site receptors. Therefore, the IEMP's main focus is on the primary exposure pathways.

Refer to Chapter 6 for information pertaining to 2002 dose calculations from all pathways.

Characterization activities were conducted at the Fernald site for nearly 10 years through the remedial investigation phase of the CERCLA process. The initial environmental evaluations performed during the remedial investigation/feasibility study process were used to select the final remedy for Operable Unit 5, which addressed contamination in soil, groundwater, surface water, sediment, air and biota (produce) – in short, all environmental media and contaminant exposure pathways affected by past uranium production operations at the site. The selected remedy for Operable Unit 5 defined the site's final contaminant cleanup levels and established the extent of on- and off-property remedial actions necessary to provide permanent solutions to environmental concerns posed by the site.

The Operable Unit 5 remedy included plans for both removing the contamination that might be released through these exposure pathways, and monitoring these pathways to measure the site's continuing impact on the environment as remediation progresses. The characterization data used to develop the final remedy were also used to focus and develop the environmental monitoring program documented in the IEMP. Following are descriptions of the IEMP's key elements:

- The IEMP defines monitoring activities for environmental media, such as groundwater, surface water and treated effluent, sediment, air (including air particulate, radon, and direct radiation), produce, and natural resources. In general, the primary exposure pathways (liquid and air) are monitored and the program focuses on assessing the collective effect of sitewide emissions on the surrounding environment.

- The IEMP establishes a data evaluation and decision-making process for each environmental medium. Through this process, environmental conditions at the site as a whole are continuously evaluated. These evaluations sometimes affect decisions made about the implementation of remediation activities. For example, environmental data are routinely evaluated to identify any significant trends that may indicate the potential for an unacceptable future impact to the environment if action is not taken. This information is communicated to the appropriate remediation project organization(s) so that corrective actions can be taken before conditions become unacceptable.

TABLE 1-1
OPERABLE UNIT REMEDIES AND ASSOCIATED PROJECT ORGANIZATION RESPONSIBILITIES

Operable Unit	Description	Remedy Overview	Project Organization Responsibilities
1	- Waste Pits 1-6 - Clearwell - Burn pit - Berms, liners, caps, and soil within the boundary	Record of Decision Approved: March 1995 Excavation of materials with constituents of concern above final remediation levels (FRLs), waste processing and treatment by thermal drying (as necessary), off-site disposal at a permitted facility, and FCP remediation.	<u>Waste Pits Remedial Action Project</u> is responsible for rail upgrades; excavation of Operable Unit 1 waste units; pre-treatment of wastewater as necessary to meet Aquifer Restoration Project waste water acceptance criteria; waste processing and drying; and loading, rail transport, and off-site disposal of contaminated soil and debris that exceed the waste acceptance criteria for the on-site disposal facility. (Note: Some of the activities with this project are being performed by Shaw Environmental.) <u>Soil and Disposal Facility Project</u> is responsible for directing excavation and certification of contaminated soil beneath the waste pits, as well as at- and below-grade remediation facilities. <u>Aquifer Restoration Project</u> is responsible for final treatment of contaminated runoff, perched water collected during waste pit excavation, and processing wastewater discharges. Each project is responsible for transporting remediation wastewater to the head works of the advanced wastewater treatment facility for treatment. <u>Decontamination and Demolition Project</u> is responsible for decontamination and dismantling of Operable Unit 1 remediation facilities.
2	- Solid waste landfill - Inactive flyash pile - Active flyash pile (now inactive) - North and south Lime Sludge Ponds - Other South Field disposal areas - Berms, liners, and soil within the operable unit boundary	Record of Decision Approved: May 1995 Excavation of all materials with constituents of concern above FRLs, treatment for size reduction and moisture control as required, on-site disposal in the on-site disposal facility, off-site disposal of a small fraction of excavated material that exceeds the waste acceptance criteria for the on-site disposal facility and lead-contaminated soil from the South Field firing range, and remediation.	<u>Soil and Disposal Facility Project</u> is responsible for excavating and disposing of waste from all Operable Unit 2 subunits and certifying the footprints. This project is also responsible for the ongoing design, construction and maintenance, and closure of the on-site disposal facility that will contain Operable Unit 2 subunit wastes, Operable Unit 5 soil and debris, and Operable Unit 3 debris. <u>Waste Acceptance Organization</u> is responsible for field oversight of soil excavations, for reviewing and signing manifests for impacted material delivered to the on-site disposal facility for placement, and for rejecting any unacceptable shipments. <u>Aquifer Restoration Project</u> is responsible for treating contaminated runoff and perched water collected during excavation of Operable Unit 2 subunit wastes. This project is responsible for leachate and leak detection monitoring at the on-site disposal facility and for treating leachate from the on-site disposal facility. Each project is responsible for transporting remediation wastewater to the head works of the advanced wastewater treatment facility for treatment.
3	Former production area, associated facilities, and equipment (includes all above- and below-grade improvements) including, but not limited to: - All structures, equipment, utilities, effluent lines, and K-65 transfer line - Wastewater treatment facilities - Fire training facilities - Scrap metals piles - Drums, tanks, solid waste, waste product, feedstocks, and thorium	Record of Decision Approved: September 1996 Adoption of Operable Unit 3 Interim Record of Decision; alternatives to disposal through the unrestricted or restricted release of materials, as economically feasible for recycling, reuse, or disposal; treatment of material for on- or off-site disposal; required off-site disposal for process residues, product materials, process-related metals, acid brick, concrete from specific locations, and any other material exceeding the on-site disposal facility waste acceptance criteria; and on-site disposal for material that meets the on-site disposal facility waste acceptance criteria.	<u>Decontamination and Demolition Project</u> is responsible for decontamination and dismantling of all above-grade portions of buildings and facilities at the Fernald site. <u>Soil and Disposal Facility Project</u> is responsible for excavation and certification of soil beneath facilities and for removal of at- and below-grade structures. This project is also responsible for design, construction, and closure of the on-site disposal facility that will contain Operable Unit 2 subunit wastes, Operable Unit 5 soil, and Operable Unit 3 debris. <u>Waste Acceptance Organization</u> is responsible for reviewing facility decontamination and dismantling planning documents. This organization is also responsible for field oversight of debris sizing, segregation of on-site disposal facility material categories, and prohibited items; completing field tracking logs; completing manifests for material bound for the on-site disposal facility; and compiling final records of decontamination and dismantling debris placed in the on-site disposal facility. <u>Aquifer Restoration Project</u> is responsible for treating decontamination and other wastewaters during decontamination and dismantling activities and processing wastewater discharges. Each decontamination and dismantling project is responsible for transporting remediation wastewater to the head works of the advanced wastewater treatment facility

TABLE 1-1
(Continued)

Operable Unit	Description	Remedy Overview	Project Organization Responsibilities
4	- Silos 1 and 2 (containing K-65 residues) - Silo 3 (containing cold metal oxides) - Silo 4 (empty and never used) - Decant tank system - Berms and soil within the operable unit boundary	Record of Decision Approved: December 1994 Record of Decision Amendment for Silos 1 and 2 Approved: July 2000 Silo 3: Explanation of Significant Differences Approved: March 1998 Removal of Silo 3 materials for off-site disposal (modification of the on-site treatment requirement is pending an amendment to the Record of Decision requiring regulatory approval). Removal of Silos 1 and 2 residues and decant sump tank sludges with on-site stabilization of materials, residues, and sludges followed by off-site disposal; and decontamination and demolition to the extent possible, of silos and remediation facilities. Excavation of silos area contaminated above the FRLs with on-site disposal for contaminated soils and debris that meet the on-site disposal facility waste acceptance criteria; and site restoration. Concrete from Silos 1 and 2, and contaminated soil and debris that exceed the on-site disposal facility waste acceptance criteria will be disposed of off site.	Silos 1 and 2 Project is responsible for transfer of Silos 1 and 2 residues to temporary transfer tanks, treatment, and transport off site. Waste treatment systems will be completed to support the final remediation of the silos. Silo 3 Project is responsible for Silo 3 content removal, treatment, and transport off site. Soil and Disposal Facility Project is responsible for certification, excavation, and disposition of contaminated soil beneath the silos and for removal of subsurface structures (i.e., sub-grade silo decant system). The project is also responsible for design, construction, and closure of the on-site disposal facility that will contain Operable Unit 2 subunit wastes, Operable Unit 5 soil, and Operable Unit 3 debris. Aquifer Restoration and Wastewater Project is responsible for treating decontamination and other wastewaters during decontamination and demolition activities, and for tracking wastewaters as well as any contaminated storm water generated from the Silos 1 and 2 and Silo 3 Projects. Each project is responsible for capturing and transporting remediation wastewater to the head works of the advanced wastewater treatment facility for treatment. Decontamination and Demolition Project is responsible for decontamination and dismantling of all Operable Unit 4 remediation facilities and associated above-ground piping.
5	- Groundwater - Surface water and sediments - Soil not included in the definitions of Operable Units 1 through 4 - Flora and fauna	Record of Decision Approved: January 1996 Explanation of Significant Differences was approved in November 2001, formally adopting EPA's Safe Drinking Water Act Maximum Contaminant Level for uranium of 30 μg/L as both the FRL for groundwater remediation and the monthly average uranium effluent discharge limit to the Great Miami River. Extraction of contaminated groundwater from the Great Miami Aquifer to meet FRLs at all affected areas of the aquifer. Treatment of contaminated groundwater, storm water, and wastewater to attain concentration and mass-based discharge limits and FRLs in the Great Miami River. Excavation of contaminated soil and sediment to meet FRLs. Excavation of contaminated soil containing perched water that presents an unacceptable threat, through contaminant migration, to the underlying aquifer. On-site disposal of contaminated soil and sediment that meet the on-site disposal facility waste acceptance criteria. Soil and sediment that exceed the waste acceptance criteria for the on-site disposal facility will be treated, when possible, to meet the on-site disposal facility waste acceptance criteria or will be disposed of at an off-site facility. Also includes site restoration, institutional controls, and post-remediation maintenance.	Aquifer Restoration Project is responsible for designing, installing, and operating the extraction/re-injection systems for Great Miami Aquifer groundwater restoration. This project is responsible for groundwater monitoring in the Great Miami Aquifer; reporting on the progress of aquifer restoration; designing, constructing, and operating all treated effluent discharge systems; and treating and discharging contaminated groundwater, storm water, and remediation wastewaters at the Fernald site. This project is also responsible for operation, maintenance, and monitoring of the on-site disposal facility leachate collection system and leak detection system. Soil and Disposal Facility Project is responsible for certification of sitewide soil; excavation and disposition of contaminated soil, sediment, perched groundwater and at- and below-grade structures; and final site restoration. The project is also responsible for design, construction, maintenance, and closure of the on-site disposal facility that will contain Operable Unit 2 subunit wastes, Operable Unit 5 soil, and Operable Unit 3 debris. Waste Acceptance Organization is responsible for reviewing Soils and Disposal Facility Project planning documents. This project is also responsible for oversight of field excavations; segregating on-site disposal facility material categories and segregating prohibited items; completing field tracking logs; completing manifests for material bound for the on-site disposal facility; and compiling final records of soil and at- and below-grade debris placed in the on-site disposal facility. Decontamination and Demolition Project is responsible for decontamination and dismantling of all Operable Unit 5 remediation facilities necessary through the site completion phase following the completion of aquifer remediation.

- Recognizing that the type and pace of remediation activities will change over the life of the cleanup effort, the IEMP was developed as a "living document" allowing for adjustment of the program as site remediation progresses. The IEMP is reviewed annually and revised every two years to ensure that the monitoring program adequately addresses changing remediation activities.

- The IEMP consolidates routine reporting of environmental data into mid-year data summary reports and a comprehensive annual report.

1.3 Characteristics of the Site and Surrounding Area

The natural setting of the Fernald site and nearby human communities were important factors in selecting the final remedy, and remain important in the continuous evaluation of the environmental monitoring program. Land use and demography, local geography, geology, surface hydrology, meteorological conditions, and natural resources all impact monitoring activities and the implementation of the site remedy.

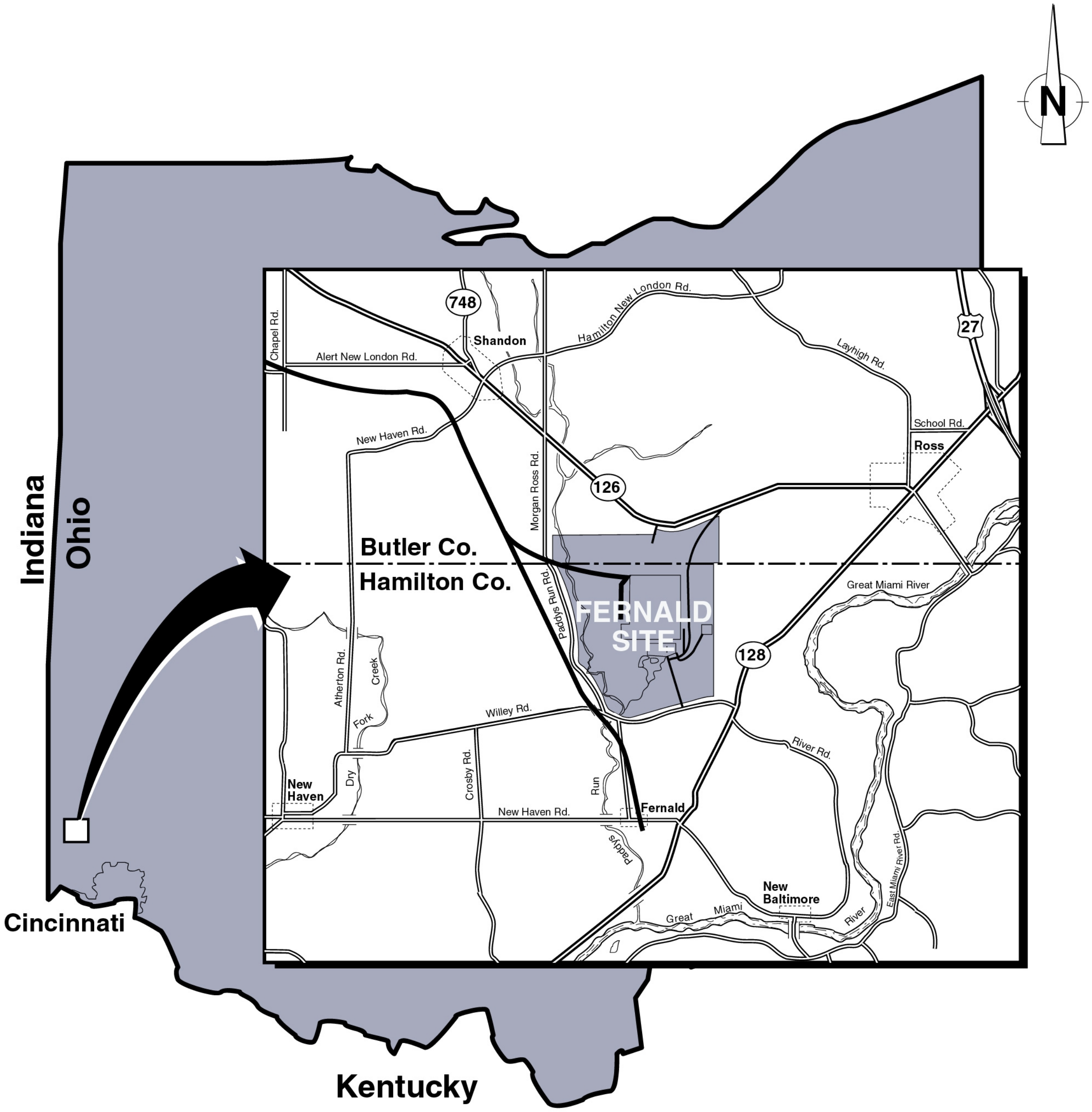
1.3.1 Land Use and Demography

Economic activities in the area rely heavily on the physical environment. Land in the area is used primarily for livestock and crop farming, and gravel pit excavation operations. There is also a private water utility pumping groundwater, primarily for industrial use, approximately 2 miles (3.2 kilometers [km]) east of the Fernald site.

Downtown Cincinnati is approximately 18 miles (29 km) southeast of the Fernald site, as shown in Figure 1-1. The cities of Fairfield and Hamilton are 6 and 8 miles (10 and 13 km) to the east and northeast, respectively, as shown in Figure 1-2. Scattered residences and several villages including Fernald, New Baltimore, New Haven, Ross, and Shandon are located near the site. Based on the 2000 U.S. Census, there is an estimated population of 20,000 within 5 miles (8 km) of the Fernald site and an estimated 2.8 million within 50 miles (80 km).

1.3.2 Geography

Figure 1-3 depicts the location of the major physical features of the site, such as the buildings and supporting infrastructure. The former production area and various administrative buildings dominate this view. The former production area occupies approximately 136 acres (55 hectares) in the center of the site. The waste pit area and K-65 Silos are located adjacent to the western edge of the former production area. The Great Miami River cuts a terraced valley to the east of the site while Paddys Run, an intermittent stream, flows from north to south along the site's western boundary. In general, the site lies on a terrace that slopes gently between vegetated bedrock outcroppings to the north, southeast, and southwest.



The Fernald site covers about 1,050 acres (425 hectares).

Figure 1-1. Fernald Site and Vicinity

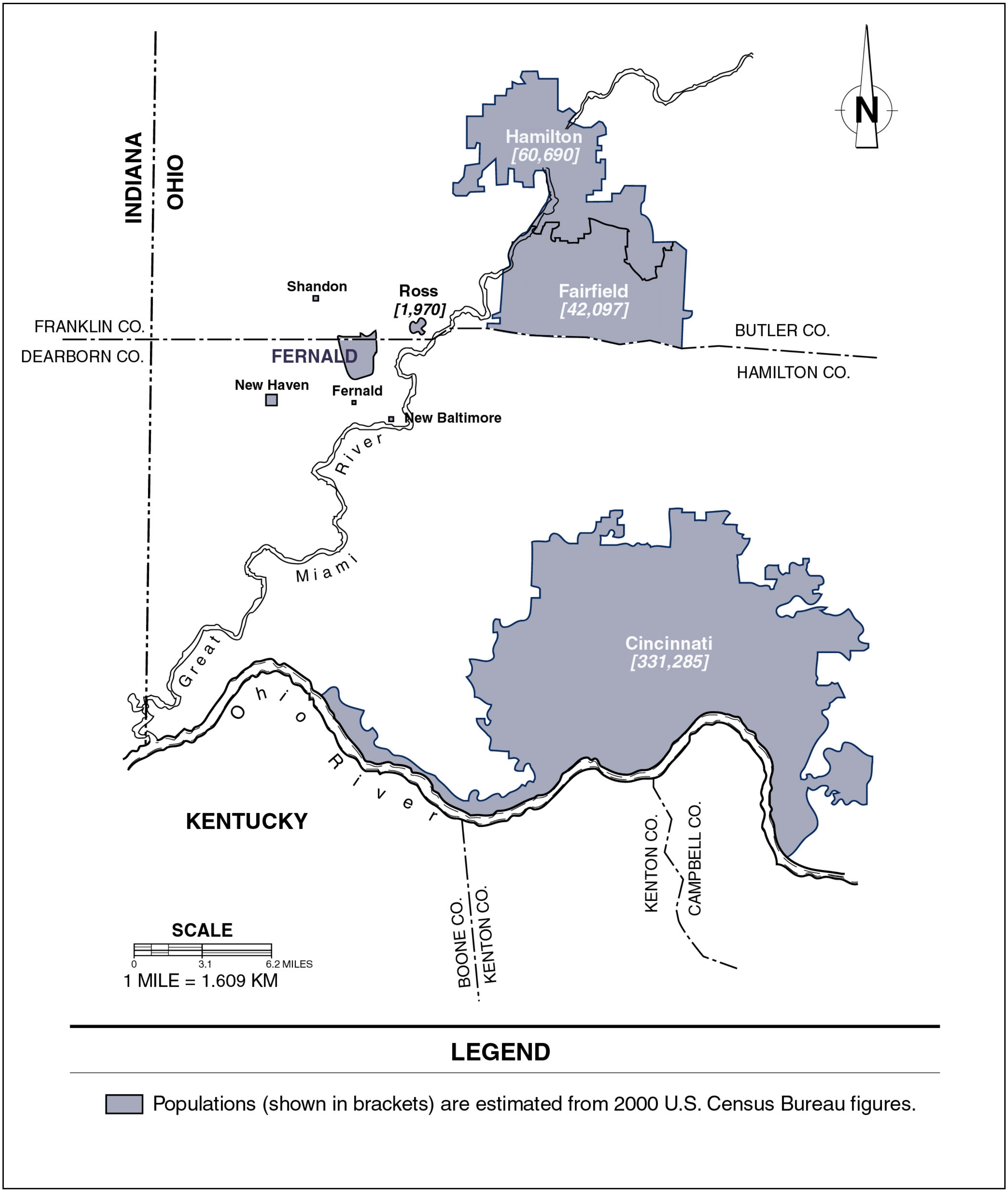


Figure 1-2. Major Communities in Southwestern Ohio

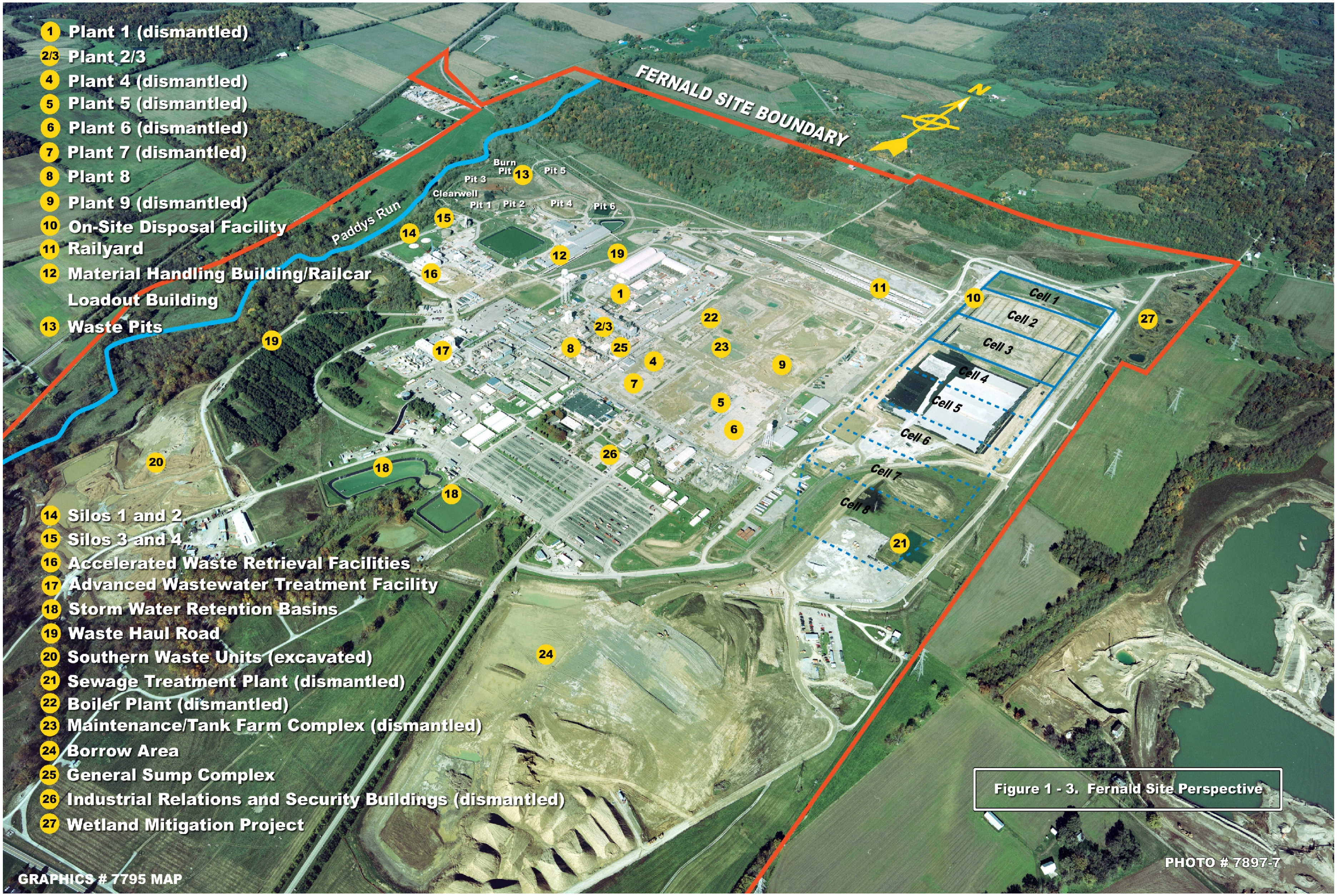


Figure 1 - 3. Fernald Site Perspective

1.3.3 Geology

Bedrock in the area indicates that approximately 450 million years ago a shallow sea covered the Cincinnati area. Sediments that later became flat-lying shale with interbedded limestone were deposited in the shallow sea as evidenced by the abundance of marine fossils in the bedrock. In the more recent geologic past, the advance and retreat of three separate glaciers shaped the southwestern Ohio landscape. A large river drainage system south of the glaciers created river valleys up to 200 feet (61 meters) deep, which were then filled with sand and gravel when the glaciers melted. These filled river valleys are called buried valleys.

The last glacier to reach the area left an impermeable mixture of clay and silt with minor amounts of sand and gravel deposited across the land surface, called glacial overburden. The site is situated on a layer of glacial overburden that overlies portions of a 2- to 3-mile (3-to-5 km) wide buried valley. This valley, known as the New Haven Trough, makes up part of the Great Miami Aquifer. The impermeable shale and limestone bedrock that define the edges and bottom of the New Haven Trough confine the groundwater to the sand and gravel within the buried valley. Where present, the glacial overburden limits the downward movement of precipitation and surface water runoff into the underlying sand and gravel of the Great Miami Aquifer.

The Great Miami River and its tributaries have eroded significant portions of the glacial overburden and exposed the underlying sand and gravel of the Great Miami Aquifer. Thus, in some areas, precipitation and surface water runoff can easily migrate into the underlying Great Miami Aquifer, permitting contaminants to be transported to the aquifer as well. Natural and man-made breaches of the glacial overburden were key pathways where contaminated water entered the aquifer, causing the groundwater plumes that are being addressed by aquifer restoration activities. Figure 1-4 provides a glimpse into the structure of subsurface deposits in the region along an east-west cross section through the site, while Figure 1-5 presents the regional groundwater flow patterns in the Great Miami Aquifer.

1.3.4 Surface Hydrology

The site is located in the Great Miami River drainage basin (refer to Figure 1-6). Natural drainage from the site to the Great Miami River occurs primarily via Paddys Run. This intermittent stream begins losing flow to the underlying sand and gravel aquifer south of the waste pit area. Paddys Run empties into the Great Miami River 1.5 miles (2.4 km) south of the site.

In addition to natural drainage through Paddys Run, surface water runoff from the former production area, the waste pit area, and other selected areas is collected, treated, and discharged to the Great Miami River. Since January 1995, the majority of this runoff has been treated for uranium removal in the advanced wastewater treatment facility before being discharged. The Great Miami River, 0.6 mile (1 km) east of the Fernald site, runs in a southerly direction and flows into the Ohio River about 24 miles (39 km) downstream of the site. The segment of the river between the Fernald site and the Ohio River is not used as a source of public drinking water.

The average flow volume for the Great Miami River in 2002 was 2,788 cubic feet per second (ft^3/sec) (79 cubic meters per second [m^3/sec]). This is based on daily measurements collected at the United States Geologic Survey (USGS) stream gauge approximately 10 river miles (16 river km) upstream of the site's effluent discharge.

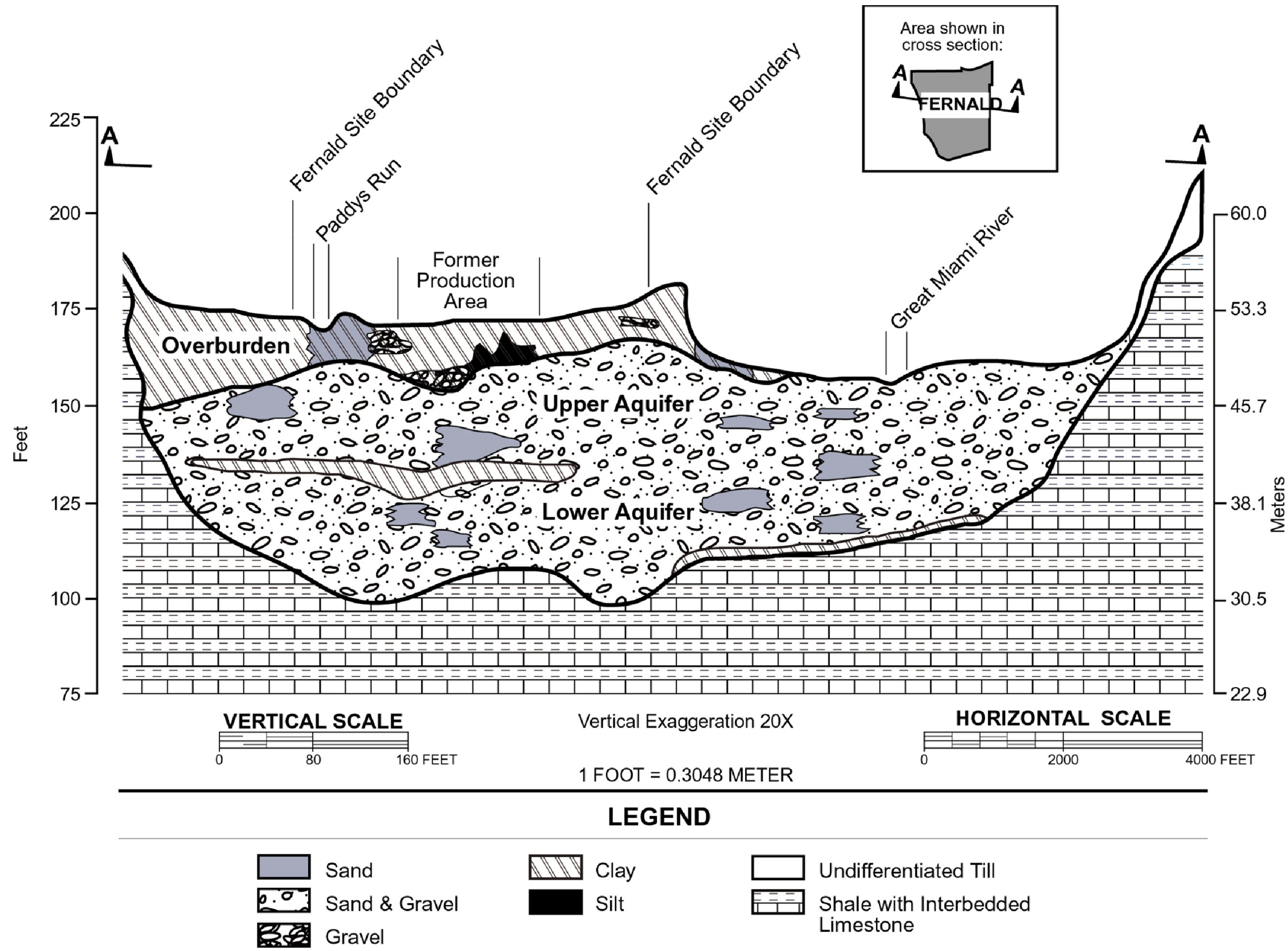


Figure 1-4. Cross Section of the New Haven Trough, Looking North

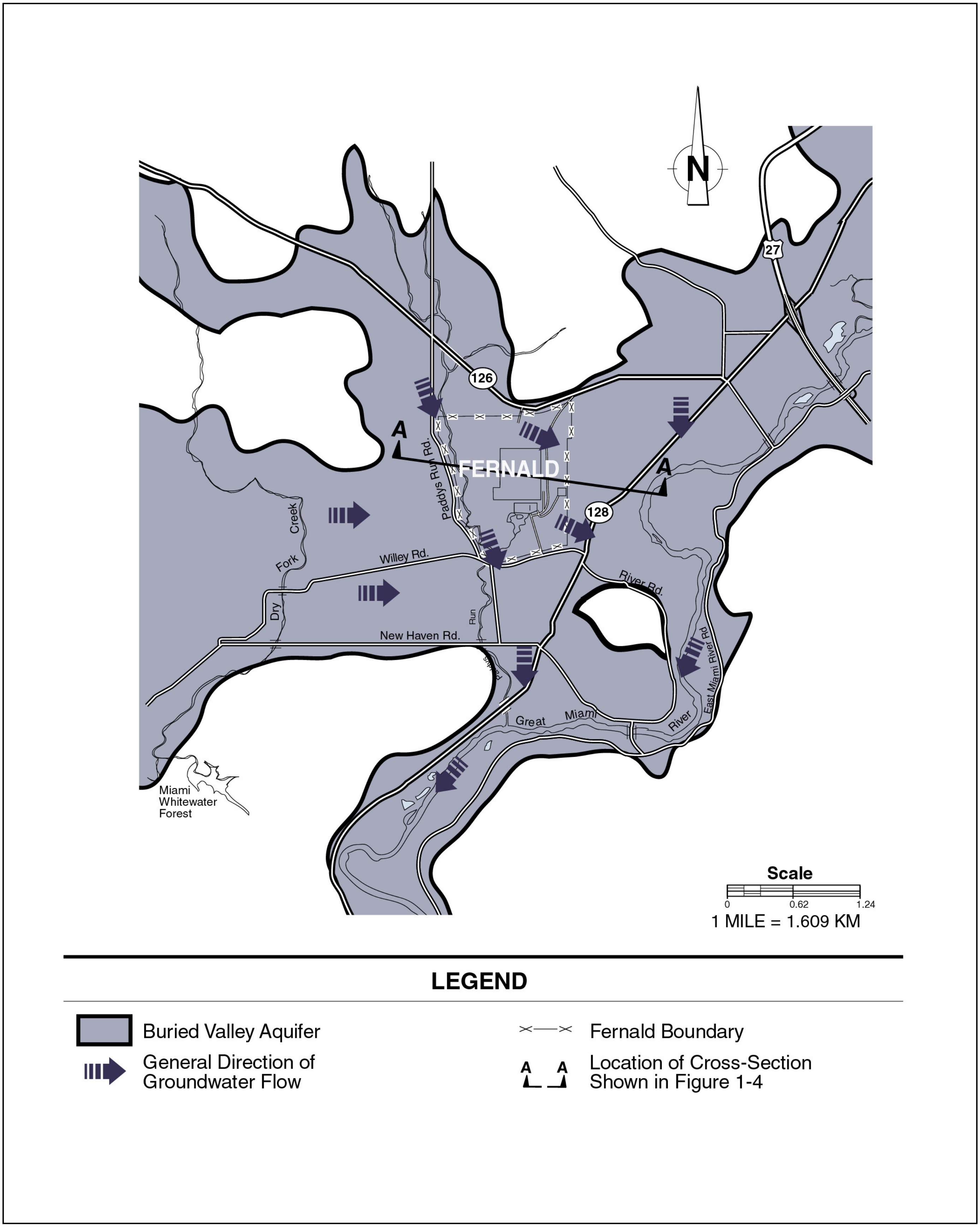


Figure 1-5. Regional Groundwater Flow in the Great Miami Aquifer

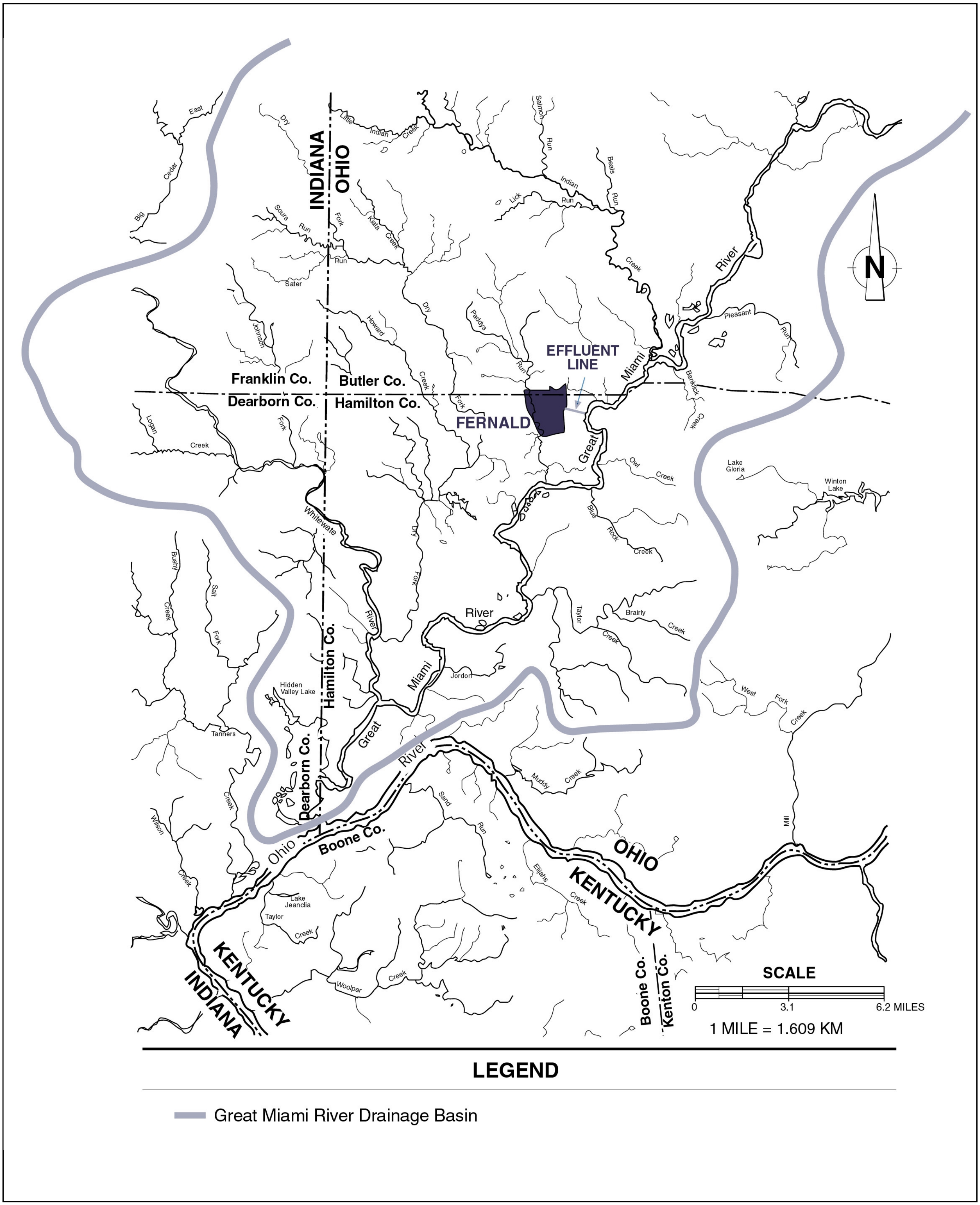


Figure 1-6. Great Miami River Drainage Basin

1.3.5 Meteorological Conditions

Meteorological data are gathered at the Fernald site and used to evaluate site-specific climatic conditions. The environmental monitoring program uses atmospheric models to determine how airborne effluents are mixed and dispersed. These models are then used to assess the impact of operations on the surrounding environment, in accordance with DOE requirements. Airborne pollutants are subject to weather conditions. Wind speed and direction, precipitation, and atmospheric stability play a key role in predicting how pollutants are distributed in the environment and in interpreting environmental data.

Figures 1-7 and 1-8 illustrate the average wind speed and general direction for 2002 measured at the 33-foot (10-meter) and 197-foot (60-meter) levels, respectively, in wind rose format. The prevailing winds were from the west through south-southwest approximately 40 percent of the time at both the 33- and 197-foot (10- and 60-meter) levels. Tables in Appendix C, Attachment 4, of this report present meteorological data for 2002, including wind direction and average speed.

In 2002, 48.96 inches (124.4 centimeters [cm]) of precipitation were measured at the Fernald site. This is higher than the average annual precipitation of 41.02 inches (104.2 cm) for 1951 through 2001. Figure 1-9 shows 2002 total precipitation for the area in relation to the annual precipitation amounts recorded from 1991 through 2002. (Precipitation totals from 1990 through 1992 were taken from the measurements made at the Greater Cincinnati/Northern Kentucky International Airport because of a computer software problem at the site's meteorological tower.) Figure 1-10 shows 2002 precipitation by month at the site compared to the Cincinnati area average precipitation by month from 1951 through 2001.

1.3.6 Natural Resources

Natural resources have important aesthetic, ecological, economic, educational, historical, recreational, and scientific value to the United States. Their protection will be an ongoing process at the Fernald site. Studies such as wildlife surveys (Facemire 1990) and the Operable Unit 5 Ecological Risk Assessment (provided as Appendix B of the Remedial Investigation Report for Operable Unit 5 [DOE 1995c]) show that terrestrial and aquatic flora and fauna at the site are diverse, healthy, and similar in abundance and species composition to those populations of surrounding ecological communities. Chapter 7 provides a discussion of the site's diverse ecological habitats and cultural resources.

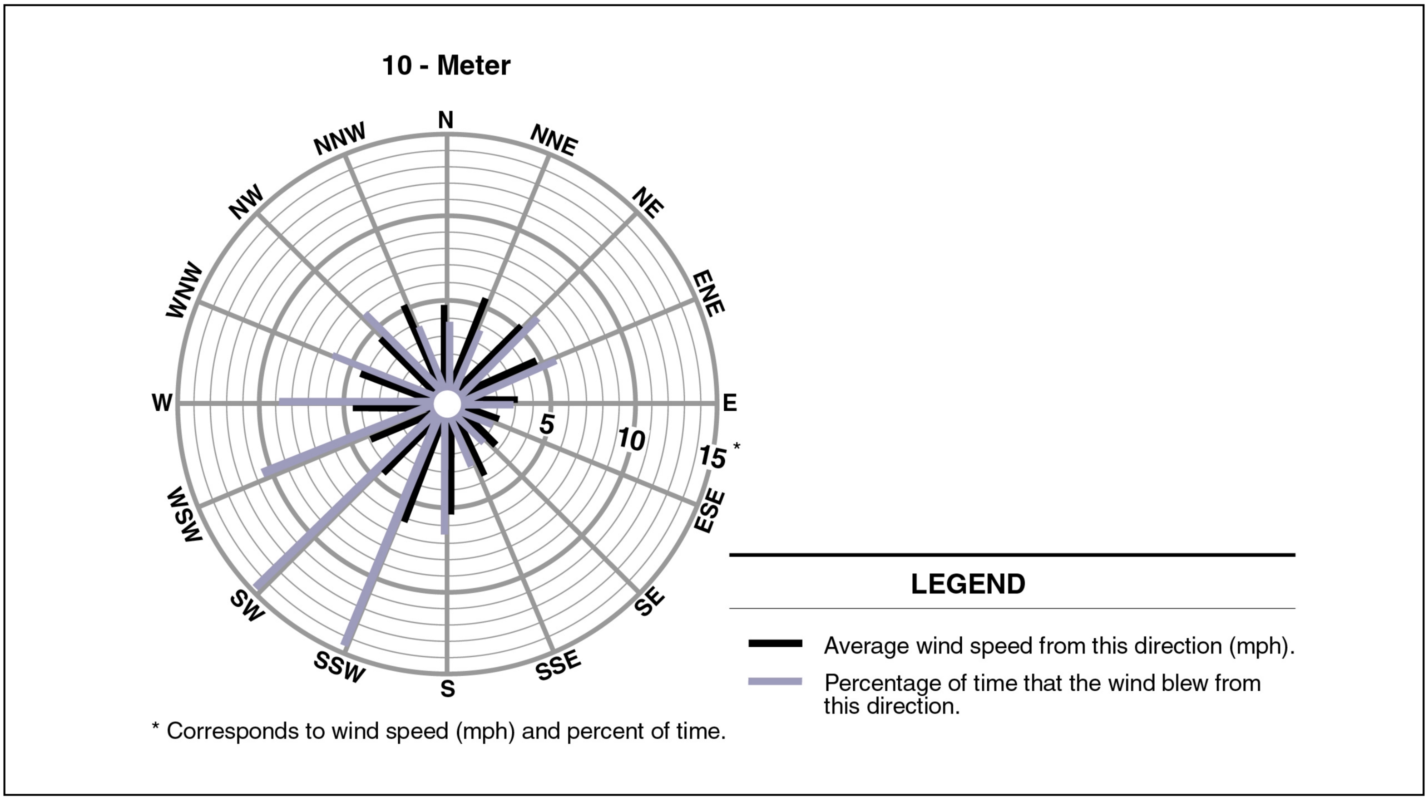


Figure 1-7. 2002 Wind Rose Data, 33-Foot (10-Meter) Height

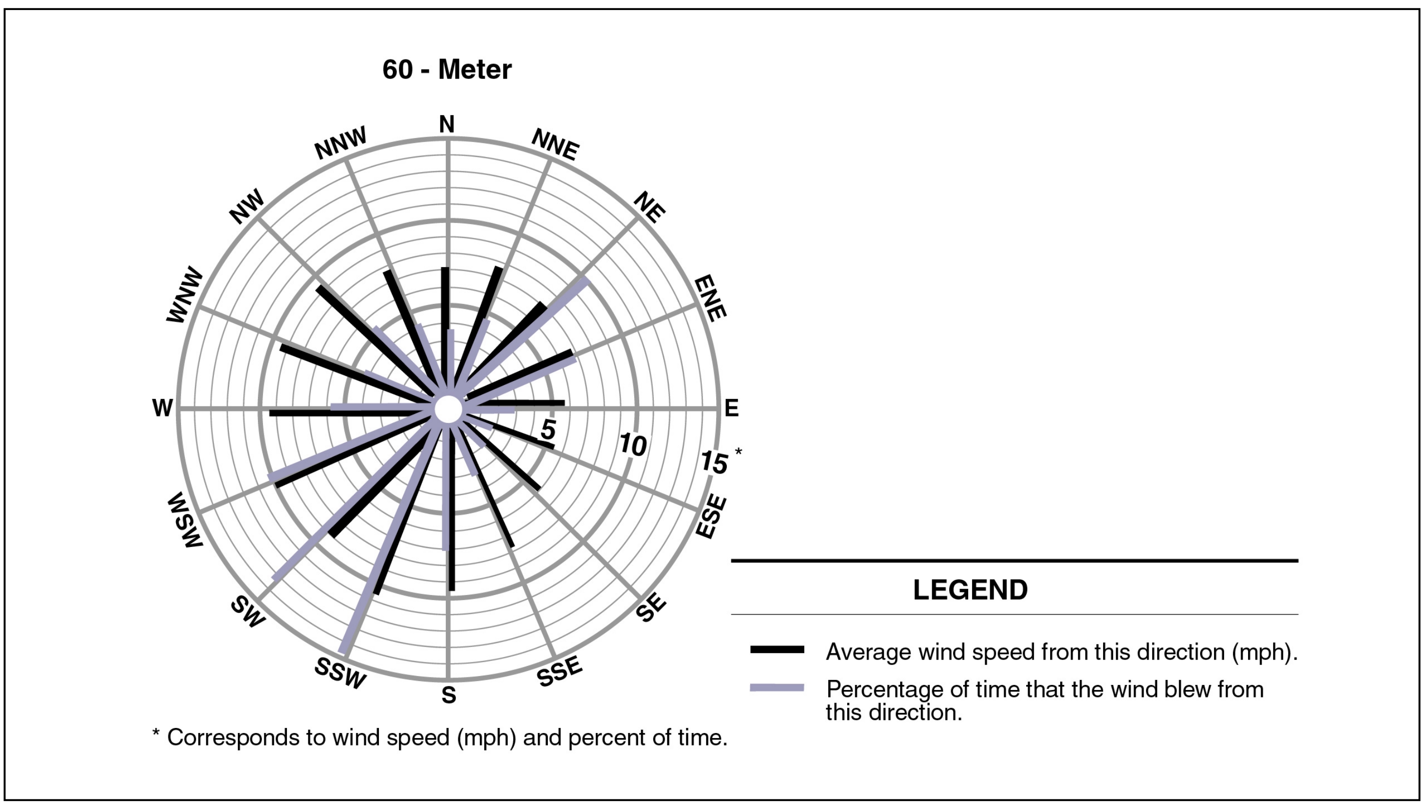


Figure 1-8. 2002 Wind Rose Data, 197-Foot (60-Meter) Height

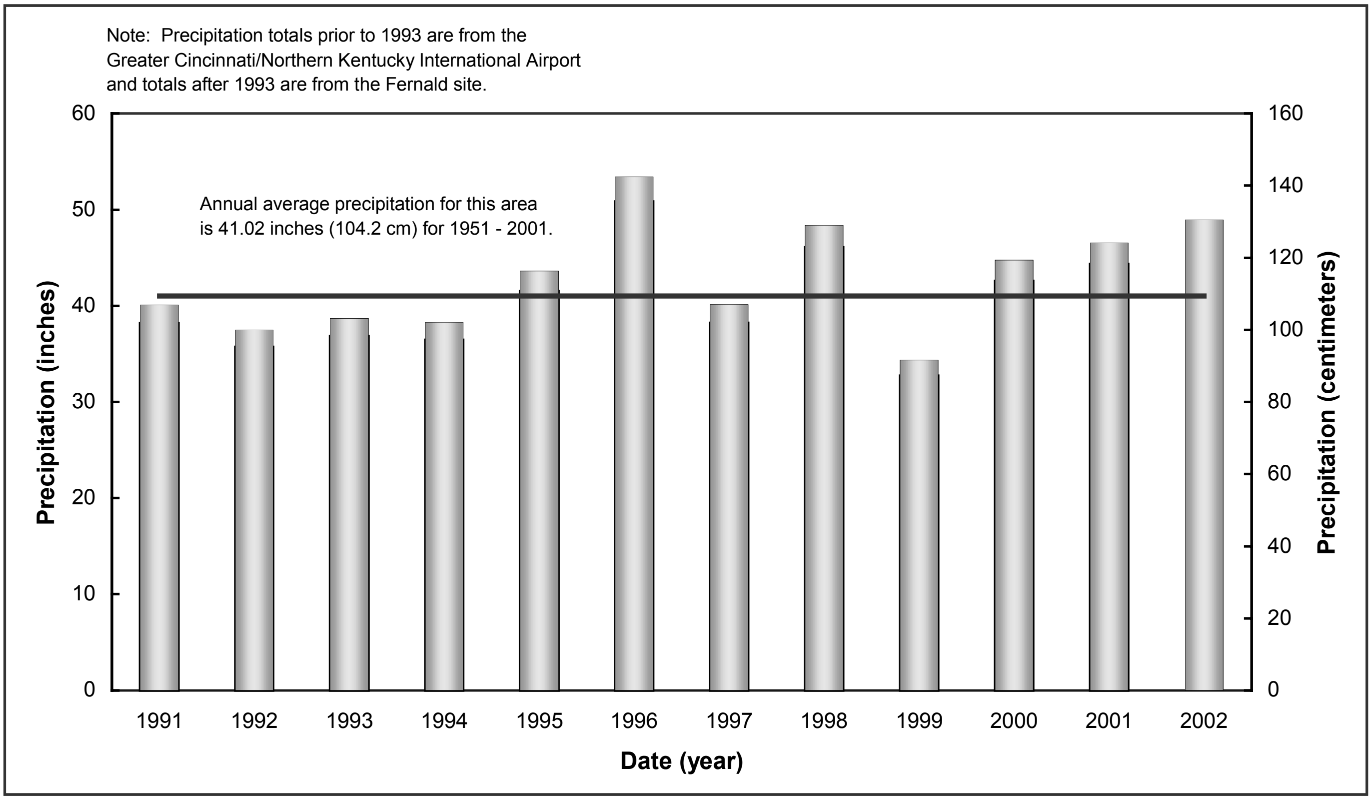


Figure 1-9. Annual Precipitation Data, 1991-2002

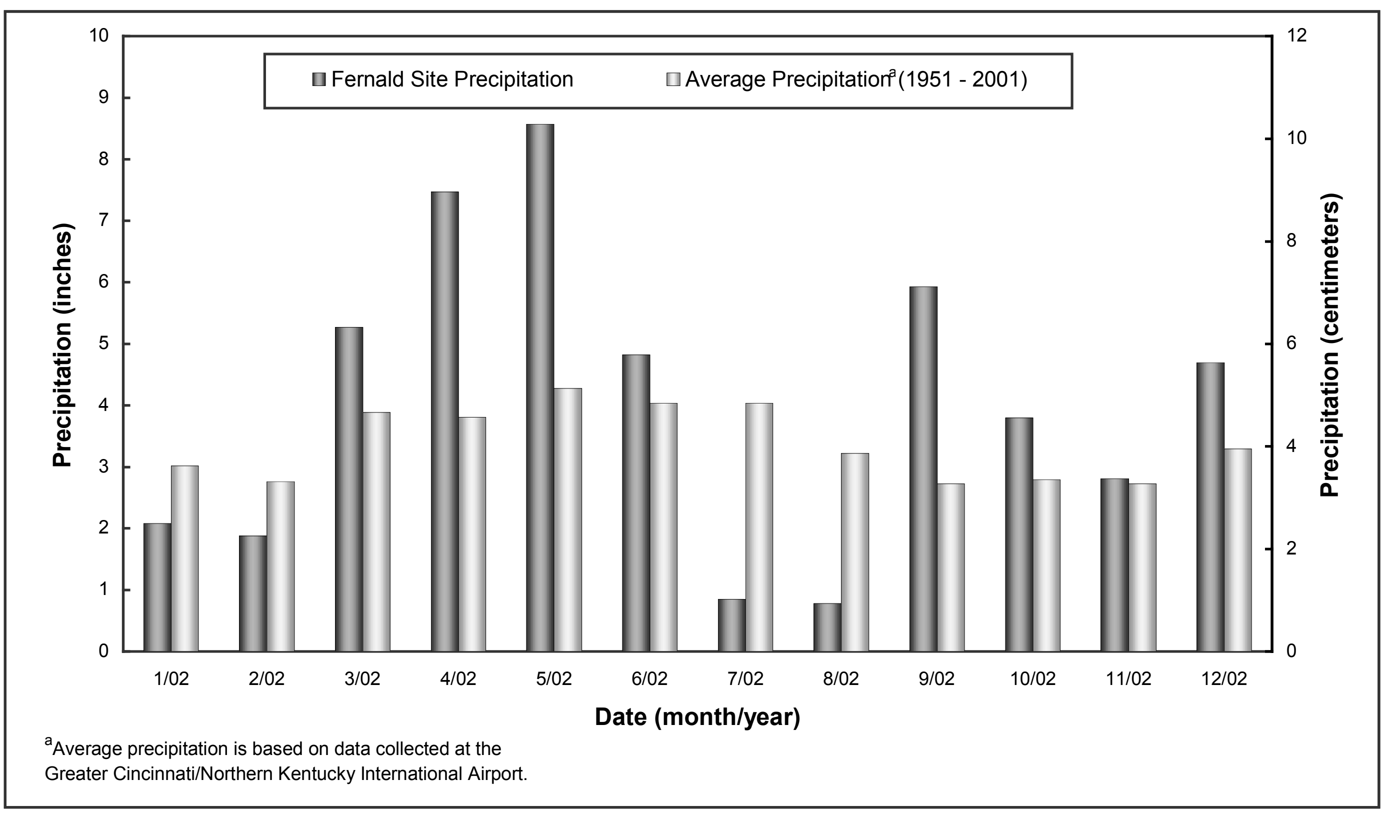


Figure 1-10. 2002 Monthly Precipitation Data

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