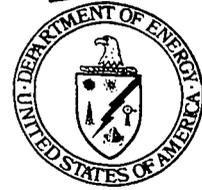




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JUN 23 1998

DOE-0906-98

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Mr. Tom Schneider, Project Manager
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Dear Mr. Saric and Mr. Schneider:

TRANSMITTAL OF FINAL HABITAT AREA PROJECT WORK PLAN

Enclosed is the final Habitat Area Project Work Plan, Operable Unit 4 Supplemental Project. All Department of Energy (DOE), U.S. Environmental Protection Agency (U.S. EPA), and Ohio Environmental Protection Agency (OEPA) comments have been incorporated. The only revision from the previous draft submitted to you is the addition of an item in the legend to Figure 1 of the work plan.

If you have any questions or require additional information, please contact Kathleen Nickel at (513) 648-3166.

Sincerely,

Johnny W. Reising
Fernald Remedial Action
Project Manager

FEMP:Nickel

Enclosure: As Stated

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HABITAT AREA PROJECT WORK PLAN OPERABLE UNIT 4 SUPPLEMENTAL PROJECT

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO



JUNE 1998

U.S. DEPARTMENT OF ENERGY
FERNALD AREA OFFICE

40300-WP-0003
REVISION 0
FINAL

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LIST OF ACRONYMS AND ABBREVIATIONS

ASCOC	area-specific constituent of concern
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CU	certification unit
DOE	U.S. Department of Energy
DOI	U.S. Department of Interior
EPA	Environmental Protection Agency
FDF	Fluor Daniel Fernald
FEMP	Fernald Environmental Management Project
FRL	final remediation level
NRRP	Natural Resource Restoration Plan
NRT	Natural Resource Trustees
PSP	Project Specific Plan
S&H	Safety and Health
SCEP	Soil Characterization and Excavation Project
SEP	Sitewide Excavation Plan
SER	Society for Ecological Restoration

1.0 INTRODUCTION

As part of a dispute resolution regarding missed milestones for the Fernald Vitrification Facility, the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy - Fernald Environmental Management Project (DOE-FEMP) have agreed to perform five environmental projects. One of the projects involves the creation of a "Wild Bird/Wild Flower Sanctuary" on a tract of undeveloped land on the west side of the FEMP property. This work plan establishes a conceptual design and implementation approach for the installation of this supplemental project at the FEMP. Design drawings and planting specifications are attached. In this report, the Wild Bird/Wild Flower Sanctuary will be referred to as the park, and the area to be occupied by the park will be referred to as the site.

The park will be established on approximately 13 acres on the west side of Paddys Run previously leased to a farmer for use as a pasture. The site will include two major components: a Public Access Area and a Research and Demonstration Area. The Public Access Area will occupy approximately 1 acre of high land adjoining Paddys Run Road, including a four-car parking lot and a short trail crossing examples of restored plant communities typical of southwestern Ohio. These plant communities will include old field, various deciduous forest types, hedgerows, tallgrass prairie, and tallgrass savanna. The trail and parking lot will be open during daytime hours to FEMP employees, school children, local residents, and other visitors. Interpretive signs will be posted along the trail to educate the public as to the ecological functions and value of each habitat.

The trail will lead to two wooden platforms overlooking the Research and Demonstration Area. The Research and Demonstration Area will occupy approximately 11 acres of lowlands and slopes adjoining Paddys Run. It will be divided into a series of individual plots that will be assigned to researchers with universities or local agencies interested in restoring various regional ecosystems. These individual restoration projects will be conducted under separate work plans. They will not be accessible to the public, but the public will be able to view and appreciate them from the overlooks.

Figure 1 illustrates the conceptual layout of the park. The Soil Characterization and Excavation Project (SCEP) will coordinate implementation of the park and associated activities.

1.1 RELATIONSHIP TO OTHER ACTIVITIES

Establishment and maintenance of the park will be coordinated with several other activities within the overall SCEP project. These activities will include soil certification, coordination with other supplemental environmental projects, and integration into the Natural Resource Restoration Plan (NRRP).

1.1.1 Soil Certification

Before construction activities to establish the park can begin, the site must be certified to ensure that soil final remediation levels (FRLs) are met. The park will be located in a perimeter area along the western border of the FEMP. Since no contamination is known or expected in that area, Approach E in the Sitewide Excavation Plan (SEP) will be used to certify this portion of the site. Section 3 provides further detail regarding soil certification.

1.1.2 Research Grants Supplemental Environmental Project

As previously stated, revegetation performed by DOE-FEMP will be limited to the Public Access Area. Restored areas that will be viewed from the overlooks will be implemented through a supplemental project that establishes a research grant program. Under that supplemental project, local universities and, potentially, other organizations will restore plots of tallgrass prairie, riparian forest, and other natural habitats on plots in the Research and Demonstration Area. Research in these plots will benefit future restoration efforts at the FEMP. A stand of American chestnut trees will also be planted in the area as a separate project. Figure 2 shows where these various research efforts will be located in relation to the park.

These restoration projects will be coordinated with the establishment of the Public Access Area to maximize viewing opportunities. The combination of establishing the park and carrying out the research grants program will serve as a pilot-scale demonstration of ecological restoration activities proposed on a sitewide level in the NRRP, which is described in more detail below.

1.1.3 Natural Resource Restoration Plan

The NRRP is a conceptual sitewide restoration plan that is a result of negotiations between DOE-FEMP, the Ohio Environmental Protection Agency (Ohio EPA), and the U.S. Department of Interior (DOI) through the Natural Resource Trusteeship process. The Comprehensive Environmental

Response, Compensation, and Liability Act (CERCLA) Section 107 designates Natural Resource Trustees (NRTs) to collect monetary damages for injuries to natural resources incurred as a result of a release of hazardous substances. DOE, DOI (working with the U.S. Fish and Wildlife Service), and the State of Ohio (as represented by Ohio EPA) are the NRTs for the FEMP. Currently, the NRTs are considering the use of sitewide restoration to settle existing and potential natural resource damage claims. The park and the research grant program are in accordance with the objectives of the sitewide restoration plan as proposed in the NRRP.

1.2 EXISTING SITE CONDITIONS

The park will be designed to complement rather than replace the existing natural features of the site. These natural features were inventoried in September 1997 by the ecologists who subsequently prepared the plan. This section describes the findings for the inventory.

1.2.1 General Description

The site comprises approximately 13 acres of undeveloped land on the western edge of the FEMP property. It is bounded to the west by Paddys Run Road, a two-lane paved rural roadway, and to the east by Paddys Run. The channel of Paddys Run is roughly 10 to 20 feet wide, but it is intermittent and normally dries out for part of the year. The site lies within a meander of Paddys Run, which forms much of the east and south boundaries of the site. A deciduous woodlot borders the site to the north. Until recently, the site was leased to a farmer by DOE-FEMP and used to graze cattle. It is enclosed by a woven wire fence along Paddys Run Road and by single strand electric fencing elsewhere.

The site is part of a predominantly rural, agricultural landscape. A mosaic of cropland, deciduous hedgerows, and small patches of successional hardwood forest lie west of Paddys Run Road. The road marks the western boundary of land owned by DOE-FEMP; thus property to the west is privately owned. Although not anticipated in the near future, this property may eventually experience suburban development. This potential future development was considered in design of the park.

Land north, south, and east of the site is owned by DOE-FEMP. Other DOE-FEMP land situated between Paddys Run and Paddys Run Road is a mixture of grazing pasture and patches of deciduous forest. Land on top of the bluffs east of Paddys Run supports the former DOE production facilities.

The Public Access Area will occupy approximately 1 acre of the site in the southwestern corner. A metal farm gate presently provides access from Paddys Run Road to the future location of the Public Access Area.

1.2.2 Topography

The site generally slopes from west to east, with the highest elevations at Paddys Run Road and the lowest elevations at the banks of Paddys Run. Most slopes on the site are gentle, under 10 percent in grade. A few short and steep slopes are as much as 25 percent in grade.

That part of the site designated for the Public Access Area comprises a nose-like ridge extending eastward from Paddys Run Road. This ridge slopes downward to the east, north, and south. The ridge abruptly terminates approximately 160 feet east of Paddys Run Road, where it slopes abruptly to the east and northeast toward the floodplain of Paddys Run. The ridge likewise slopes abruptly along its southern edge, leading to a deep gully that carries an intermittent stream flowing eastward toward Paddys Run.

1.2.3 Vegetation

Most of the site is characteristic of grazed pasture. A few isolated honeylocust (*Gleditsia triacanthos*) and American elm (*Ulmus americana*) trees occur in widely scattered locations. Several honeylocust saplings, other deciduous saplings, and multiflora rose (*Rosa multiflorum*) bushes have established along the woven wire fence along Paddys Run Road, forming a deciduous hedgerow. Small patches of deciduous forest occupy short, steep slopes. These forest patches are dominated in places by American elm, black locust (*Robinia pseudoacacia*), and other successional hardwoods. All of these forest patches are open to grazing and have almost no woody understory other than multiflora rose. Many of the American elms have recently died (most probably) from Dutch Elm Disease, creating several gaps in the canopies of these forested patches.

A narrow strip of riparian forest separates the edge of the pasture from the banks of Paddys Run. This riparian forest is dominated by red maple (*Acer rubrum*), American sycamore (*Platanus occidentalis*), and other bottomland hardwood trees. More extensive zones of riparian forest border Paddys Run immediately north and south of the site.

That part of the site designated for the Public Access Area supports pasture grasses everywhere except for the short, steep slopes leading from the ridge to the lower lands near Paddys Run. These slopes support deciduous forests dominated by American elm. Elsewhere on the site, many of the American elms have recently died, creating gaps in the forest canopy. Other trees in these small slopeside forest patches include black cherry (*Prunus serotina*), red mulberry (*Morus rubra*), hackberry (*Celtis occidentalis*), box elder (*Acer negundo*), and swamp white oak (*Quercus michauxii*). Other forest patches on the site, are open to grazing and contain little woody understory other than multiflora rose.

1.2.4 Soils

Soils throughout the site are mapped by the Soil Conservation Service as deep with no serious limitations to the establishment of trees. All of the soils are described as ranging from slightly acid to slightly alkaline, a range conducive to establishment of almost all plants indigenous to southwestern Ohio. Soils on the gently sloping uplands in the western part of the site are mapped as Fincastle silt loam, while soils in the mostly level floodplain adjoining Paddys Run are mapped as Genesee loam (SCS 1982).

Fincastle soils are described in the soil survey as deep, nearly level, and somewhat poorly drained. Such soils are not generally hydric or indicative of wetlands, but they do favor plants tolerant of occasional surface soil saturation. However, the description notes that areas mapped in the Fincastle soil series often contain inclusions of soils in the well-drained (but otherwise similar) Xenia series. Based on the apparent good drainage observed throughout the sloping lands on the site, soils in these areas more likely function as Xenia soils. Soils in the Xenia series are well suited to establishment of a broad spectrum of plants other than those associated with the wettest and driest of sites.

Genesee soils are described as deep, nearly level, well drained soils typical of floodplains. Soils in the Genesee series are well suited to establishment of a broad spectrum of plants other than those associated with the wettest and driest of sites.

The soil survey shows a narrow belt separating the Fincastle from the Genesee soils as Hennepin silt loam, with 35-60 percent slopes. Slopes in this range occur only in the southern part of the site, in the area designated for the Public Access Area. Hennepin soils are described as deep, well drained, and typically found on slopes along streams. The soil survey recommends species typical of upland forests,

such as red oak (*Quercus rubra*), white oak (*Quercus alba*), and green ash (*Fraxinus pennsylvanicum*) for tree planting on Hennepin soils. Consistent with this recommendation, the plan calls for interplanting saplings of various oak and other upland forest species among the successional hardwood forest already present on these slopes.

Soils in that part of the site designated for the Public Access Area are mapped in the Fincastle series (the nose-like ridge) and the Hennepin series (the short, steep side slopes leading from the ridge to the floodplain. The floodplain at the bottom of the slopes is mapped in the Genesee series, but it lies just outside of the area proposed for the Public Access Area.

1.2.5 Hydrology and Wetlands

No part of the site was identified as wetland during a sitewide wetland delineation of the entire FEMP property completed in 1993 (DOE 1993). None of the three soil series mapped on the site (Fincastle, Hennepin, or Genesee) are classified as hydric soils. Although not identified as wetlands or waters of the United States in the 1993 wetland delineation, two steep but narrow swales were observed in September 1997 at the bottom of the slopes leading down from the ridge designated for the Public Access Area. One, located at the bottom of a swale northeast of the ridge, was dry when inspected in September 1997 and likely contains water for only brief periods following heavy rains. The other was saturated in September 1997.

1.2.6 Viewsheds

This qualitative visual resource analysis was conducted to identify key viewing positions and viewsheds and to identify incompatible settings, landscapes, or facilities that could affect the site and the design of the park.

Viewsheds associated with the site are dominated by gently rolling slopes, hedge rows, croplands, and Paddys Run. Because the site's topography slopes from west to east, with the highest elevations at Paddys Run Road and the lowest elevations at the banks of Paddys Run the site forms an amphitheater-like bowl. The site's topography is therefore very well-suited as a venue for viewing native habitats and demonstration plots, since the viewer will be able to look down at the entire park from the site's high point, near the gravel parking area.

The views vary depending if the viewer is at the top of the site, near the gravel parking area, or inside the gully. When inside the gully, the viewer would likely see grassland, upland and riparian forests, or Paddys Run. Therefore, the following characterization of viewsheds at the site is discussed from the vantage point of a viewer at the site's high point, near the gravel parking lot.

The viewshed looking due north from this point reveals scattered trees and grazed grassland. The viewshed looking northeast reveals a riparian forest and a woodland bluff in the foreground and a water tower associated with the FEMP Former Production Area in the background. The water tower is the only structure in the production area that can be seen from the park. The viewshed looking due east includes a deciduous riparian forest and Paddys Run.

Looking southeast from the site is a riparian deciduous forest and Paddys Run. The viewshed due south provides another glimpse of Paddys Run and a sparsely treed grassland. The southwesterly viewshed reveals glimpses of Paddys Run Road and an existing hedgerow.

The viewshed due west of the site's high point reveals an existing hedgerow Paddys Run Road and telephone poles associated with the road in the foreground. A railroad right-of-way and cropland is visible in the background when looking due west.

2.0 COMPONENTS OF THE PROJECT

The park project will involve three major components: installation of structures and hardscape (Section 2.1), establishment of regionally indigenous vegetation (Section 2.2), and maintenance (Section 2.3). The sections below summarize the actions that will be taken for each of these components. Vegetation planting will be contracted separately from the construction of the structures. Drawings and are attached to this work plan.

2.1 INSTALLATION OF STRUCTURES

Several structures will be constructed to facilitate use of the Public Access Area, including a small parking lot, a short trail, overlook platforms, and interpretive signs. In addition, a woven wire security fence will be installed around the perimeter to establish boundaries for the public-accessible area. Figure 1 shows the conceptual layout of the park and the location of these structures.

Bird boxes and feeders will be installed in strategic locations throughout the project area to attract avian wildlife. The installation and maintenance of the bird boxes and filling of feeders will be carried out by an employee volunteer organization. The seed will be purchased with project funds.

2.1.1 Parking Lot and Access

A small crushed limestone gravel parking lot is planned to accommodate automobile access from Paddys Run Road. The size of the parking lot will be approximately 2,800 ft², enough room for about four cars. The layout has been designed to minimize grading requirements. The lot slopes slightly to the southeast to assist drainage and storm water runoff. To ensure that vehicles are not driven beyond the parking lot, a series of poles approximately two feet high will be installed around the perimeter of the gravel.

A one-lane entrance will be installed from Paddys Run Road to the parking area at the location of an existing opening in the FEMP perimeter fence. Current plans call for the access to be graded to the road elevation and paved, with a stormwater culvert installed underneath to ensure no alterations of drainage patterns along Paddys Run Road. The access will meet all Hamilton County specifications. DOE-FEMP will ensure that all requirements and specifications for installation and use of the access

road will be met, including elevations and dimensions, line painting, traffic signs, line-of-sight distances, etc.

To control access to the parking lot during closed hours, a gate will be installed at the entrance. DOE-FEMP Security will lock the gate at dusk each evening and open it at dawn during perimeter security rounds.

2.1.2 Trails and Signs

A short trail will be installed from the parking lot to the habitat overlooks. The trail will be located to allow users the choice of walking directly to the overlooks or walking through several restored habitats. DOE-FEMP will construct the trail with mulch to a width of five feet. Where required, steps will be installed to aid in access and to control erosion. The existing grade will be cut and railroad ties (or equivalent) will be placed parallel to slope contours.

Several interpretive signs will be installed within the Public Access Area. These signs will provide information on the history of the FEMP and the purposes of the park, as well as information on the various restored habitats and associated wildlife species.

The park trail has been designed not only to provide access to the overlooks and pedestrian circulation, but to give users an opportunity to view and experience habitats from a variety of vantage points. Before entering the trail, a user will see the diverse wildflowers and hedgerow vegetation abutting the parking lot. Proceeding clockwise around the trail circuit, the first plant community the viewer will experience will be a restored successional hardwood forest. Once the planted saplings in that restored forest attain some size (after 5 to 10 years), the trail will appear to enter the forest and be visually isolated from the parking lot. Once inside the forest, a turn-off trail will offer the viewer an opportunity to divert from the main trail circuit to the Northern Overlook. Views from the overlooks are described in Section 2.1.3.

Once past the turn-off for the Northern Overlook, the viewer will experience a restored beech-maple forest on the slope to the north (left) and an unobstructed view of the tallgrass prairie to the right. Because the beech-maple forest saplings will be planted under an existing canopy of successional hardwoods, the forest experience on the slope will be available to trail users immediately even though

several years will have to pass before the forest floristically resembles a beech-maple forest. The tallgrass prairie will appear from this point on the trail as a pleasant forest opening of dense grasses and wildflowers. The background from this vantage point will be the tallgrass prairie savanna, and the visual effect to the trail user will be of prairie fading gradually into forest. This visual effect was likely common to early visitors to southwestern Ohio before the original vegetation was cleared for agriculture.

The trail will then turn southeasterly, past the entrance to the Western Overlook. The overlook will provide a view of the wetland shrubs in the gully beneath it and old field vegetation on the terrace-like ridge beyond. The placement of this section of trail and the overlook at the top of a slope between two areas of existing deciduous forests frames a viewshed featuring an unobstructed easterly view of old field vegetation, a narrow gully planted with wetland shrubs, and the Research and Demonstration Area.

The southerly segments of the trail will provide users with a view of beech-maple and oak-hickory forest on the slopes to the east and south and tallgrass prairie savanna to the north. From this vantage point, the viewer will see the tallgrass prairie gradually emerging from the trees (once the planted saplings have grown for 5 to 10 years). Because the beech-maple and oak-hickory forest restorations will be established under the cover of existing hardwood forest cover, the visual effect of a forest will be immediate, although an appearance of floristic richness may take several years of growth by planted saplings.

To the west, the trail will ascend up a 20 percent slope to return to the parking lot. Users ascending this slope will view four distinct landscapes: tallgrass savanna, tallgrass prairie, old field scrub, and successional hardwood forest. Old field scrub will visually dominate the view to the west, and the inherent density of this scrubby vegetation (once planted materials have grown for 5 to 10 years) will help to screen viewers from traffic noise on Paddys Run Road. The revegetation layout for other areas around the parking lot also includes at least a 5-foot vegetation buffer to separate trail users from automobile traffic.

2.1.3 Overlooks

Two overlooks will be constructed to provide stations for wildlife and habitat viewing and to showcase the Research and Demonstration Area. As stated in Section 2.1.2, the overlooks will exhibit several different restored habitats in the Research and Demonstration Area that will be undertaken through the research grant supplemental projects. The overlooks will be placed at the top of slopes at the edge of the Public Access Area. The two locations proposed for overlook construction have been selected to offer the best viewsheds of the Research and Demonstration Area. Access to the overlooks will be provided by the trail discussed in Section 2.1.2.

Each overlook will be constructed as a wood deck with railings on all but one side. DOE-FEMP has designed the Northern Overlook, including that segment of the trail connecting the parking area to the Northern Overlook, to be wheelchair accessible.

2.1.4 Research and Demonstration Area

The existing woven wire fence separating the future location of the Research and Demonstration Area from Paddys Run Road will be retained. An existing farm gate near the northern boundary of the site will be retained to vehicular access to the plots from Paddys Run Road. Only authorized personnel will be allowed to use this gate. Strips of existing pasture turf will be retained between plots to provide access. These grassy strips will be mowed as necessary to allow vehicular passage. Usage of the strips is expected to be very light; hence no paving is planned. As stated previously, details for establishment and maintenance of the individual plots in the Research and Demonstration Area will be developed in future work plans prepared by the parties assigned the plots.

2.2 REVEGETATION

The revegetation effort for the Public Access Area will consist of planting native trees, shrubs, and grasses and wild flowers to represent several different habitats native to southwestern Ohio. Figure 1 shows the locations of each plant community targeted for display within the Public Access Area. This section discusses general restoration objectives for each plant community targeted for inclusion in the Public Access Area, general issues regarding the plant material that will be used to establish indigenous vegetation in the Public Access Area, and the Research and Demonstration Area, where plots will be independently revegetated by individual researchers and other interested parties.

2.2.1 Plant Communities Targeted for Display in Public Access Area

Hedgerow: Narrow hedgerows of deciduous trees, saplings, and shrubs commonly separate open fields throughout the agricultural landscape of southwestern Ohio. Eastern redcedar (*Juniperus virginiana*), an evergreen with dense foliage and a distinctly conical shape, is often present as a sapling or small tree. Hedgerows provide valuable habitat for birds and mammals favoring old field and forest edge habitats. The hedgerows also provide corridors that encourage the movement of wildlife across agricultural landscapes and provide visual relief from the monotony of open fields.

The woven wire fence along Paddys Run Road already supports some hedgerow vegetation. This existing hedgerow vegetation will be supplemented by interplanting additional trees, shrubs, and wildflowers. The hedgerow will serve both as a gateway to the park and as a screen that secludes park users from the traffic on Paddys Run Road and from any future development on the private land west of Paddys Run Road. A line of existing American elm trees directly east of the proposed location for the Northern Overlook will be similarly interplanted with additional trees and shrubs to create a hedgerow. The new trees will serve to replace the American elms as they gradually die off from Dutch Elm Disease.

Old Field: Agricultural fields in the eastern United States, including southwestern Ohio, become dominated by annual weeds immediately after abandonment. After one or two years, the annual weeds become replaced by perennial grasses and forbs, which in subsequent years are increasingly invaded by woody shrubs and tree seedlings. The floristics of old field vegetation are very diverse even within localized regions, but an example of an old field in southwestern Ohio might include patches of broomsedge (*Andropogon virginicus*), various goldenrods and asters (*Solidago* sp. and *Aster* sp.), various blackberries (*Rubus* sp.), and scattered eastern redcedars, flowering dogwoods (*Cornus florida*), and black locusts.

Old field will be established on terrace-like upland areas directly in front of the two overlooks. The old field vegetation will not block the view of the Research and Demonstration Area from the overlooks. Because old field vegetation establishes naturally after only one or two growing seasons, initial establishment will simply involve cessation of grazing. A few eastern redcedar, flowering dogwood, and eastern redbud (*Cercis canadensis*) saplings will be planted in widely scattered locations over the old field areas to accelerate the establishment of these later stage components of old field vegetation.

The pasture grasses and some of the dominant herbaceous vegetation of old fields sometimes prevent the establishment of these woody components for many years.

Old Field Scrub: As more and more saplings and shrubs become established in old fields, dense clusters of eastern redcedars and various deciduous trees, especially black locust, form in places. Such clusters often form earlier close to older hedgerows or pasture trees. Old field scrub will be established in an area south of the parking area and close to Paddys Run Road. Several existing mature honeylocust, red maple, and American elm trees will be incorporated into the scrub. Several dense clusters of eastern redcedar and blackberries will be planted. It is hoped that the dense scrub vegetation in this area will help screen the southern parts of the trail from Paddys Run Road and the private land to the west.

Several dead American elms stand in this area, and a very large red maple is experiencing some crown die-back. The dead elm trees and, if possible, dead limbs on the red maple will be left in place to provide roosting sites for birds. The trail has been purposefully routed to avoid crossing this area so that the dead trees and limbs do not have to be removed for safety reasons.

Successional Hardwood Forest: As hardwood trees progressively invade old fields through the natural successional process, they eventually form a forest. Most successional forests in southwestern Ohio are dominated by hardwoods with few evergreen trees, unlike some parts of the United States where pines dominate the successional forests. Successional forests are a common landscape feature throughout much of southwestern Ohio and other areas in the eastern United States where marginal agricultural lands have been abandoned. The hardwoods in these forests are typically fast growing and require full sun to establish. Common examples include black locust, American elm, black cherry, and hackberry. They thus fail to reproduce once they have formed a forest, and the forests instead become invaded by "climax" tree species such as red and white oak, hickories, and American beech.

Tallgrass Prairie: Even though the predominant presettlement vegetation of southwestern Ohio was deciduous forest, isolated patches of tallgrass prairie are thought to have occurred (Packard 1997). Tallgrass prairie was dominated by perennial grasses such as big bluestem (*Andropogon gerardii*) and Indian grass (*Sorghastrum nutans*) with a diversity of broad-leaved forbs. Most of the area inside of the loop formed by the trail has been designated for establishment of tallgrass prairie. Since most of

the areas outside of the trail have been designated for various forest plantings, the tallgrass prairie will occupy a small forest clearing.

The planned approach for preparing soil for tallgrass prairie establishment was based on information developed by the Society for Ecological Restoration (Packard 1997), as adapted to a very small site. Because Eurasian grasses presently occupy the site proposed for tallgrass prairie, these grasses will be initially treated with a broad-spectrum postemergence herbicide prior to seeding. The prairie seed mix will then be broadcast over the dead grass cover and hand-raked into the upper inch of soil. Other options considered for preparing the prairie site included plowing and burning. Plowing was rejected because it would render the site prone to soil erosion until the prairie grasses established. Burning is favored by many prairie restorationists but was rejected because of the small size of the site and proximity of existing desirable forest cover.

Tallgrass Savanna: Transitions between tallgrass prairie and deciduous forest in the presettlement vegetation are thought to have been gradual rather than abrupt. Intermediate (ecotone) communities included tallgrass savanna, a tallgrass prairie with widely scattered oak trees, and oak woodland, a forest-like stand of oaks undergrown by tallgrass prairie grasses and forbs. The most characteristic tree of savannas was bur oak (*Quercus macrocarpa*), a tree with thick bark that could withstand the frequent light fires that occurred on the prairies. However, other oaks such as black oak (*Quercus velutina*) and white oak (*Quercus alba*) were also common. These trees were not as fire resistant as bur oak but were capable of vigorously resprouting following top kill by fire.

The park has been designed to include tallgrass prairie without trees in the northern part of the loop created by the trail and tallgrass savanna with widely scattered trees among the prairie grasses in the southern part of the loop. Most of the trees that will be planted among the prairie grasses will be bur oak, to simulate a presettlement savanna. Large nursery-raised saplings of bur oak may not be commercially available, thus seedlings may have to be used. The design also calls for planting a few shagbark hickory (*Carya ovata*) trees in this area.

Beech-Maple Forest: Upland forests in the presettlement vegetation of Ohio were thought to have been of the beech-maple association on mesic sites with loamy soils and of the oak-hickory association on drier sites with coarse (sandy) soils. Typical dominant trees in beech-maple forest include American

beech (*Fagus grandifolia*), sugar maple (*Acer saccharum*), and tulip poplar (*Liriodendron tulipifera*); and common associate trees included red maple, American elm, red oak, and black cherry (*Prunus serotina*) (Facemire et al. 1990).

Existing successional hardwood forest patches dominated by American elm on steep slopes immediately northeast and east of the trail are targeted in the park design for conversion to beech-maple forest. No existing trees will be removed from these areas. Instead, saplings of trees typical of beech-maple forest will be interplanted among the existing trees. As these saplings grow and the short-lived successional hardwoods die, the matured saplings will assume dominance in a pattern resembling the natural successional process. This process will be accelerated by the continued die-off of American elms from Dutch Elm Disease. The dead elms will be left in place to provide roosts for birds. After the elms fall to the ground, the dead trunks will provide habitat for some small mammals and insects.

Oak-Hickory Forest: As noted above, oak-hickory forests typically occurred in the presettlement vegetation of Ohio on drier sites with coarse (sandy) soils. Dominant trees were various species of oak (*Quercus* sp.) and hickory (*Carya* sp.), often in combination of more mesophytic species typical of beech-maple forests.

A patch of oak-hickory forest will be established in the Public Access Area by interplanting another patch of existing successional hardwood forest in the same manner as described for beech-maple forest. The designated patch occupies a steep slope immediately south of the proposed trail. As a south-facing slope, this slope is likely somewhat drier than the slopes designated for beech-maple forest. Saplings of trees typical of oak-hickory forest will be interplanted among the existing trees. As these saplings grow and the short-lived successional hardwoods die, the matured saplings will assume dominance in a pattern resembling the natural successional process. This process will be accelerated by the continued die-off of American elms from Dutch Elm Disease. The dead elms will be left in place to provide roosts for birds. After the elms fall to the ground, the dead trunks will provide habitat for some small mammals and insects.

Palustrine Scrub-Shrub Wetland Vegetation: No part of the site provides enough area of poor drainage to establish blocks of indigenous wetland vegetation. However, the two swales described in Section 1.5 do provide an opportunity to display a few of the indigenous trees and shrubs of the wetlands of

southwestern Ohio. The northeastern swale is directly northeast of the proposed Western Overlook. Thus, shrubs rather than trees would be appropriate for this swale so as to not obscure the view.

Palustrine Scrub-Shrub wetlands are not extensive in southwestern Ohio and typically represent a successional stage to Palustrine Forested Wetlands in wetland areas that have been disturbed. Thus the wetland shrubs that will be planted in the swale will primarily serve to display the plant species rather than to simulate a common natural system. As noted in Section 2.5, this swale is dry much of the year and may not meet the hydrological requirements to be a wetland. However, the shrubs designated for planting there will survive when planted in mesic well-drained soils until they become shaded by trees.

Palustrine Forested Wetland Vegetation: Palustrine forested wetlands dominated by deciduous trees tolerant of seasonal saturation are a common landscape feature in southwestern Ohio. Examples of typical trees include red maple, black willow, and green ash. Unfortunately, the site for the park did not offer a large enough area of seasonally saturated soil to establish such a forest. However, the narrow intermittent stream in the gully does provide an opportunity to establish a few wetland trees for display purposes. Such streams are typically bordered by wetland trees even if the adjoining forest is upland.

2.2.2 Soil Preparation Considerations

Soil preparation for installing the trees, shrubs, and wildflowers will be limited to excavation and backfill of standard-sized planting pits. Adequate natural topsoil is already present throughout the site. This limited surface disturbance will minimize impacts to existing grass and leaf duff needed to prevent soil erosion, especially on the slopes. Fertilization is not generally recommended for most ecological restoration efforts, as it results in unnaturally high soil concentrations of plant nutrients that tend to encourage exotic weed growth.

2.2.3 Plant Material Considerations

Trees: All of the tree species proposed for planting in the Public Access Area (Figure 1) are indigenous to southwestern Ohio (Hightshoe 1988). Other factors considered in the selection of these species include value to wildlife, appropriateness to the desired plant community, aesthetics, probable success of transplanting, and likely availability as saplings from commercial nurseries specializing in native plant material. American elm and American chestnut were not selected for planting in the Public

Access Area, but it is possible that researchers may attempt to establish one or both of these highly disease susceptible native trees in the Research and Demonstration Area. No honeylocusts will be planted within 25 feet of the trail, overlooks, or parking lot because of their hazardous thorns, but existing honeylocusts will not be removed unless they are found to present a windfall hazard. Honeylocusts will be included in successional hardwood forest and hedgerow plantings distant from the trail because they provide specialized habitat required by certain wildlife species such as the loggerhead shrike (*Lanius ludovicianus*).

Most trees shown on Figure 1 for the Public Access Area will be planted using balled and burlapped or container grown stock between 1 and 1.5 inches in caliper (trunk diameter one inch off of the ground). Saplings of this size will be about 4 to 6 feet tall and should be individually visible. With the routine protective measures prescribed in the specifications, few if any seedlings should be lost to physical injury from wildlife, snow, or other factors. Properly planted, balled and burlapped or container grown stock should experience very little transplant shock, and most saplings should attain a rapid growth rate by the second growing season following planting.

Trees of certain subcanopy species will be balled and burlapped or container grown and a minimum of 3 feet in height. No caliper minimum will be specified. Examples of subcanopy trees that will be planted in the park include eastern redcedar (*Juniperus virginiana*), eastern redbud (*Cercis canadensis*), and flowering dogwood (*Cornus florida*).

Trees of certain taprooted, slow growing species may be planted as seedlings because larger stock is either not available or prohibitively expensive. Examples include various hickories (*Carya* sp.) and bur oak (*Quercus macrocarpa*). If saplings of these species are found not to be available, then ten seedlings will be planted in the approximate vicinity of each tree shown in the attached drawing for the unavailable species.

Shrubs: As for the trees, all of the shrub species selected for planting (Figure 1) are indigenous to southwestern Ohio and appropriate to the targeted plant community. All shrubs shown on the attached drawing will be planted as balled and burlapped or container grown stock, with a minimum height of 3 feet.

The plan does not call for removal of the multiflora rose which is common throughout much of the site. Instead, it is hoped that the cessation of grazing and growth of planted and volunteer trees and shrubs will ultimately shade out this aggressive and exotic shrub species. In the meantime, the multiflora rose will be left in place to stabilize soils and provide fruit for wildlife, two desirable properties of this otherwise weedy species.

Wildflowers/Forbs: Each dot shown on the attached drawing for a wildflower (such as around the parking lot or in old field or hedgerow areas) or a forb (in the tallgrass prairie and tallgrass prairie savanna) will be planted using peat-potted stock. Such stock is relatively inexpensive (generally less than \$5/stem) and provides an immediate effect in the first growing season following planting. Seeding of wildflowers was considered but rejected in order to ensure that a diversity of showy wildflowers would be visible to park users during the first growing season. Furthermore, seeding would have required additional soil preparation and stronger measures to control existing turf and weeds.

Wildflowers will be planted at the locations shown on the attached drawing. It is expected that several old field wildflowers will volunteer throughout most areas of the park. Especially in areas designated for old field and old field scrub, the natural establishment of common wildflowers is being counted upon to complement the planted vegetation. Many of the most ecologically and aesthetically desirable old field wildflowers are of Eurasian origin. No attempt will be made to eliminate volunteer wildflowers of Eurasian origin from old field area unless they are also aggressive weeds and threatening nearby woody vegetation.

Grasses: Prairie grasses will be seeded. Seed will be obtained from commercial sources specializing in prairie restoration. A combination of big bluestem, little bluestem, Indian grass, side oats grama, and Canada wild rye will be planted at the densities shown on Table 1. The recommended seeding rates for the tallgrass prairie grasses are based on several sources and are conservatively high to help ensure rapid establishment of dominant indigenous grasses during the first growing season. Essentially, the recently agreed-to rates for seeding guidelines at the Fernald site have been doubled. Rapid establishment of the dominant prairie grasses is important to reduce competition from annual weeds and to generate immediate public interest in the park.

The Eurasian pasture grass turf presently occupying the tallgrass prairie site will be treated with a broad-spectrum postemergence herbicide in preparation for seeding the prairie grasses. The site will not be plowed. The prairie seed mix will then be broadcast over the dead grass cover and hand-raked into the upper inch of soil. The prairie grasses will be seeded in Fall 1998 and then the nursery raised forbs will be planted in the following growing season (1999). The schedule will provide an opportunity to evaluate how well the seeded grasses germinated in the spring. The forbs can be planted any time after the grass germination is found to be satisfactory. The grass does not have to attain any minimum height or other stage of development.

2.3 MAINTENANCE

DOE-FEMP will assume all maintenance activities in the Public Access Area until a sitewide long-term maintenance agreement is established for the entire FEMP property. DOE-FEMP will maintain the fence and gate to the Research and Demonstration Area and will mow the access strips between research plots as necessary. However, maintenance of vegetation within the plots will be the responsibility of the researchers.

Fences and Gate to Public Access Area: DOE-FEMP will maintain these structures as necessary to achieve necessary security. Vegetation will not be removed from the fences unless an ecologist with DOE-FEMP determines that the vegetation must be removed to prevent damage to the fence. Any Japanese honeysuckle that establishes on the fence will be immediately removed upon discovery, as this aggressive and exotic vine can rapidly weight a wire fence down and destroy it. Herbicides will not be applied for the purpose of preventing growth of vegetation under the fence.

Parking Lot: Annual application of a broad spectrum herbicide by a licensed applicator may be necessary to prevent the establishment of annual weeds in the gravel parking lot. New gravel will be applied as necessary to prevent rutting or erosion of the soil under the parking lot.

Trail: New wood chip mulch will be added as necessary to maintain a continuous mulch cover over the trail. The entire trail will receive a new mulch layer annually, and additional spot applications may be necessary as exposed areas on the trail are discovered. The railroad ties (or equivalent) used on the trail will be inspected annually and any ties found to contain rot will be promptly replaced. Any railroad tie found at any time to present a safety hazard will be immediately replaced.

Although not anticipated, herbicide application may be necessary to prevent the establishment of annual weeds in the mulch on the trail. If so, the herbicide will be applied by a licensed applicator under the direction of a DOE-FEMP ecologist to minimize damage to adjoining vegetation.

Overlooks: A new coat of sealer or other wood preservative will be applied annually to each of the overlooks. Each overlook will be inspected annually by an engineer to determine if it must be repaired or replaced to maintain safety.

Trees and Shrubs: Trees and shrubs will be inspected by a DOE-FEMP ecologist immediately after planting, daily for the next two or three days, and weekly through the end of the first growing season. This ecologist will prescribe supplementary waterings as necessary to prevent wilting and may prescribe additional supplementary actions to protect against insects or wildlife. As is typical for ecological restorations, trees and shrubs will not be staked, but the ecologist may call for staking certain trees as necessary to prevent damage from wind.

It is expected that most trees and shrubs will be planted in the fall, after September 15, a time typically characterized by cooler temperatures and frequent rainfall. Scheduled watering of the project will not be necessary once vegetation is established. The plant materials selected for this project are hardy and self-maintaining. If trees and shrubs are planted prior to September 15, supplemental waterings will likely be necessary until moister weather conditions prevail.

The planting specifications will call for mulching a ring of soil around each planted tree or shrub to discourage competition from annual weeds. This should prevent the need for weeding until the trees and shrubs become well established. Past this stage, the mulch rings will not be maintained. Although it is hoped that additional weed control is not necessary, a DOE-FEMP ecologist may prescribe additional action on an as-needed basis. Such action may involve hand weeding or spot spraying of postemergence herbicides. Field personnel will take care not to injure the planted saplings and seedlings during these weed control activities.

Tallgrass Prairie and Savanna: DOE-FEMP will maintain the tallgrass prairie and tallgrass prairie savanna with periodic mowing. Mowing will be conducted as needed. During the first growing season, mowing may be required a number of times. After the first season, mowing will be scheduled

annually for the next couple of years and then less frequently as needed. Once the tallgrass prairie vegetation is well established, occasional infrequent mowing will be necessary to prevent the establishment of woody shrubs and saplings through the natural successional process. The presettlement vegetation is thought to have required periodic fire and grazing (by bison and other wild animals) to avoid succession to forest, especially in the more humid eastern range of these communities (Packard 1997). All of the forbs that will be planted in the tallgrass prairie (and tallgrass prairie savanna) are perennial plants whose tops die back after the growing season and whose roots grow new tops the following growing season. Thus mowing outside of the growing season should not adversely affect them. If mowing becomes necessary during the growing season, after the forbs have been initially planted, the locations of the forbs will be marked by pin flags so that those locations can be avoided. Because of the small size of the project, all mowing will be done by walk-behind power mowers rather than tractors or riding mowers. The initial planting of the forbs will be scheduled immediately following the first mow in Spring 1999.

Prescribed (controlled) burning is a common practice of maintaining tallgrass prairie restorations by simulating the periodic wildfires that prevented the establishment of woody vegetation in prairies in Ohio prior to settlement (Packard 1997). But this practice will not be used in the Public Access Area because of the small size of the restored prairie area and the need to protect adjoining forest vegetation. Any use of prescribed burning by researchers in plots in the Research and Demonstration Area will require approval from DOE-FEMP. Maintenance personnel will collect grass clippings to prevent a thatch layer buildup.

3.0 SUPPORT ACTIVITIES

While the park project is considered to be separate from remedial activities at the FEMP, several remedial action support activities must be completed prior to the implementation of field work. This section describes the approach for soil certification pursuant to the SEP and revisions to the on-property grazing lease agreements.

3.1 SOIL CERTIFICATION

The park, including the Research and Demonstration Area (which collectively have been termed Area 8, Phase I or A8PI), will be certified through Approach E, which is described in Section 4.5 of the SEP. Approach E is the approach used for off-property and unimpacted on-property areas where no soil contamination is known or expected. Based on existing data and the remote location of the area to be certified, the SCEP determined the Area-Specific Constituents of Concern (ASCOCs) to be the primary radiological COCs (total uranium, radium-226, radium-228, thorium-228, and thorium-232). Approach E for A8PI is described in more detail below.

A8PI sampling and analysis is divided into two phases: precertification and certification. Project Specific Plan (PSP) No. 50.03.74.01 has been developed for precertification activities. This plan calls for a real-time scan of the entire area using mobile NaI detectors. The results of these measurements will be used to determine the location of certification units (CUs) and the location of HPGe readings.

A certification design letter and certification PSP were developed and submitted to the agencies after precertification activities were completed. The letter specified that 16 physical samples would be collected from each CU to determine COC concentrations. Sampling efforts will be initiated in April 1998. SCEP will present the results in a Certification Report, which will be submitted to the agencies for approval. Once the agencies approve the Certification Report, FDF may commence with construction activities.

3.2 REVISION TO LEASE AGREEMENT

The park is located on property that until recently was leased by DOE-FEMP to a nearby landowner for grazing. Lease agreements between DOE and landowners are signed annually in February. With construction of the public access area scheduled for next year, a revision of the next lease agreement

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40300-WP-0003, Revision 0
June 2, 1998

was necessary. DOE-FEMP, in cooperation with the lessee, restricted access to the land that will be used to establish the park (including the Research and Demonstration Area) in March 1998.

4.0 PROJECT MANAGEMENT AND OVERSIGHT

The SCEP within the Soil and Water Project has management responsibility for the park. The SCEP will ensure that all applicable policies, procedures, and regulations will be met in the planning and implementation of the park. As such, the applicable requirements and their integration into the park are described below.

4.1 ENVIRONMENTAL COMPLIANCE

Based upon review of applicable or relevant and appropriate requirements and to be considered criteria listed in the SEP, DOE has determined that no environmental permits or notifications will be required to conduct the park in its current form. Applicable environmental control requirements for the project will be limited to the installation of erosion and sedimentation controls in accordance with the requirements specified in RM-0039, FEMP Stormwater Pollution Prevention Plan, and the control and abatement of fugitive dust emissions in accordance with RM-0047, Fugitive Dust Control Requirements.

Given the limited amount of soil disturbance associated with the project, project-specific erosion and sedimentation controls will consist of silt fence installed at the locations shown on the attached project drawings. Erosion and sedimentation controls will be inspected on a weekly basis under the RM-0039 construction inspection program.

Fugitive dust control requirements specified under RM-0047 were developed from Ohio EPA's fugitive dust control best available technology determination. Project-specific fugitive dust controls will consist primarily of water spray on exposed/working soil surfaces. Visual emission monitoring will be conducted and documented in accordance with the requirements specified in RM-0047.

4.2 SAFETY AND HEALTH

One person from the Occupational Safety and Health Department will be assigned to the construction of the park on a part-time basis. The Safety and Health (S&H) Representative will be responsible for integrating health and safety into all aspects of the project.

Safety and Health requirements for the construction phase of the project will be communicated in a Project Specific Health and Safety Matrix or Traveler Packet, FDF Work Permit, and associated permits, such as a Radiological Work Permit in accordance with RM-0021, Safety Performance Requirements Manual, and SH-0001, Development and Issue of Project Specific Health and Safety Requirements. Additionally, the S&H Representative assists in implementation of safety measures, and evaluation of process changes for safety compliance. The S&H Representative conducts thorough preconstruction inspections of the work site and periodic walk-throughs once construction activities have begun.

FDF Fire Protection will provide consultation and guidance regarding fire protection and Life Safety Issues. As appropriate, Fire Protection provides necessary emergency response personnel and equipment for emergencies which could adversely affect people, property, or the environment. The FEMP Fire Protection functional area shall provide guidance to ensure that fire hazard issues are properly addressed and proper safeguards are in place for all activities associated with this project.

The S&H representative assigned to this project is responsible for integration and compliance with fire protection requirements as defined in PL-3020, FEMP Emergency Plan, and in RM-0013, Fire Protection Requirements Manual.

4.3 QUALITY ASSURANCE

Activities related to the implementation of the park will be conducted in accordance to the SCEP Quality Assurance Job-Specific Plan which is described in the Sitewide Excavation Plan (SEP), Appendix E. SCEP QA personnel will ensure compliance to the Quality Assurance Job-Specific Plan by performing surveillances and inspections necessary to verify work plan and construction design requirements. Objective evidence of assessments will be documented and become part of the park project records.

4.4 WASTE MANAGEMENT

During construction activities, field personnel will generate wastes. Management of waste streams will be coordinated with SCEP Waste Disposition Support Services through the Project Waste Identification Document process.

5.0 SCHEDULE

The schedule of deliverables and field activities is shown on Table 2. The limiting factors for the schedule are the certification process and the seasonal requirements for vegetation planting. Certification is dependent on several factors, including generation and regulatory review of PSPs and reports, coordination of field work with other certification efforts, and data analysis. The current schedule for certification accounts for these factors.

Planting of trees and shrubs may be conducted in parallel with construction activities. After the parking area overlooks are installed, landscaping can be undertaken around the structures. Seeding of grasses will occur after all other activities are completed. In this way, DOE-FEMP will take advantage of the optimal fall planting time frame (October-November).

As stated above, effective revegetation efforts are dependent on the timing of in-field planting. To ensure germination of seeds and survival of trees and shrubs, planting is limited to the spring and fall. Therefore, the schedule reflects an attempt to time revegetation efforts with construction activities in the Fall of 1998. If it appears that revegetation cannot be completed by December 1, 1998, SCEP will reschedule all revegetation activities for March 1, 1999.

5.1 ESTIMATED COST

The estimated cost for the park is \$173,000 (1997 dollars). This figure includes estimates for all permitting, design, and construction costs.

REFERENCES

Facemire, C., et al., 1990, "Biological and Ecological Characterization of the Feed Material Production Center," Miami University, Oxford, Ohio.

Packard, S., and Mutel, C.F., eds., 1997, "The Tallgrass Restoration Handbook," Society for Ecological Restoration, Island Press, Washington, D.C.

Soil Conservation Service, 1982, "Soil Survey of Hamilton County, Ohio," U.S. Department of Agriculture.

U.S. Department of Energy, 1993, "Wetlands Delineation Report of the FEMP," Final, Fernald Environmental Management Project, DOE, Fernald Field Office, Cincinnati, Ohio.

TABLE 1
NATIVE GRASS MIX FOR TALLGRASS PRAIRIE RESTORATION

Scientific Name	Common Name	Lbs/Acre Pls
<i>Andropogon gerardii</i>	Big Bluestem	6
<i>Sorghastrum nutans</i>	Indian Grass	4
<i>Schizachyrium scoparium</i>	Little Bluestem	4
<i>Bouteloua curtipendula</i>	Side Oats Grama	2
<i>Elymus canadensis</i>	Canada Wild Rye	4

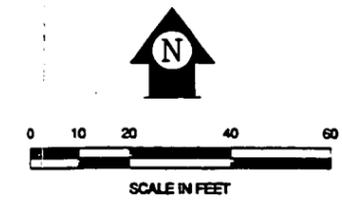
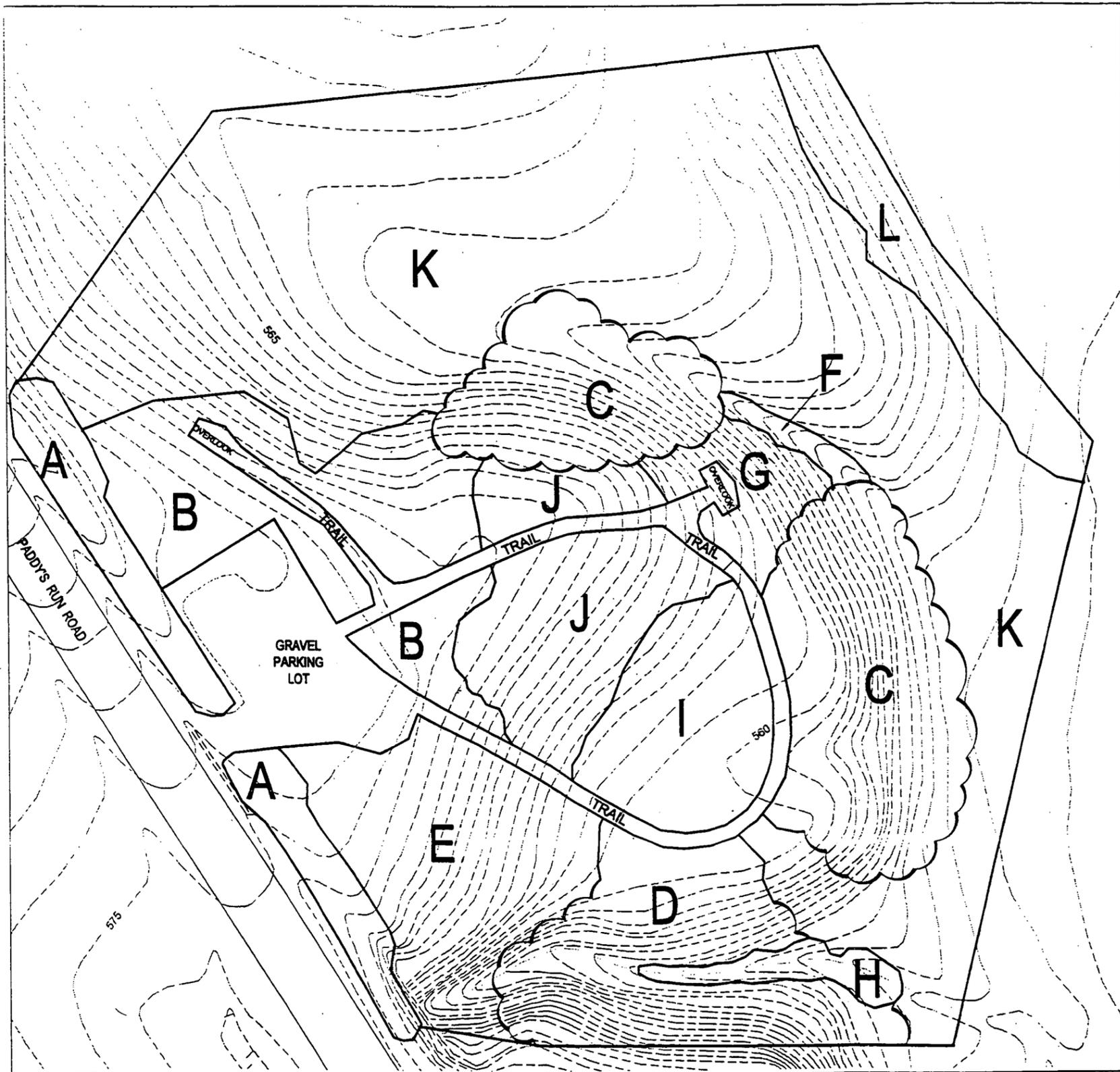
TABLE 2
SCHEDULE OF DELIVERABLES

Event	Date
Submit work plan to U.S. and Ohio EPA	December 31, 1997
Submit final work plan to U.S. and Ohio EPA	April 13, 1998
Contract Award	August 1, 1998
Submit Certification Report for Area 8, Phase I	August 31, 1998
Commence Construction	October 1, 1998

FIGURE 1
Conceptual
Layout of Park

LEGEND

- AREA A: FENCE & HEDGEROW ALONG PADDYS RUN ROAD
- AREA B: SUCCESSIONAL HARDWOOD FOREST
- AREA C: EXISTING FOREST CONVERTED TO BEECH-MAPLE FOREST
- AREA D: EXISTING FOREST CONVERTED OAK-HICKORY FOREST
- AREA E: OLD FIELD SCRUB-SHRUB
- AREA F: PALUSTRINE SCRUB-SHRUB VEGETATION - NORTH GULLY
- AREA G: UPLAND SCRUB-SHRUB ON SLOPE TO NORTH GULLY
- AREA H: PALUSTRINE FORESTED VEGETATION - SOUTH GULLY
- AREA I: TALLGRASS SAVANNA
- AREA J: TALLGRASS PRAIRIE
- AREA K: OLD FIELD VEGETATION
- AREA L: EXISTING HEDGEROW



36

NO.	REVISIONS	DATE	DWN.BY	APPD.	REF. DWG. NO.
B	ISSUED FOR REVIEW				
A	ISSUED FOR REVIEW				

NOTE:
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 DRAWING.
 DO NOT REVISE
 MANUALLY.

**CONFIGURATION
 MANAGEMENT
 DRAWING**

APPROVALS	
CIVIL & STR.	SAFETY ENGR.
ELECTRICAL	FIRE PROTECT.
ENGINEER	WASTE MANAGE.
INSTRUMENTAL	SECURITY
MECHANICAL	CRU
CHECKED	
APPROVED	

Tetra Tech NUS, Inc.

J. Peyton Doub, CEP
 Richard N. Seiden, AICP
 Lee Robertson
 REV 1, April 1998

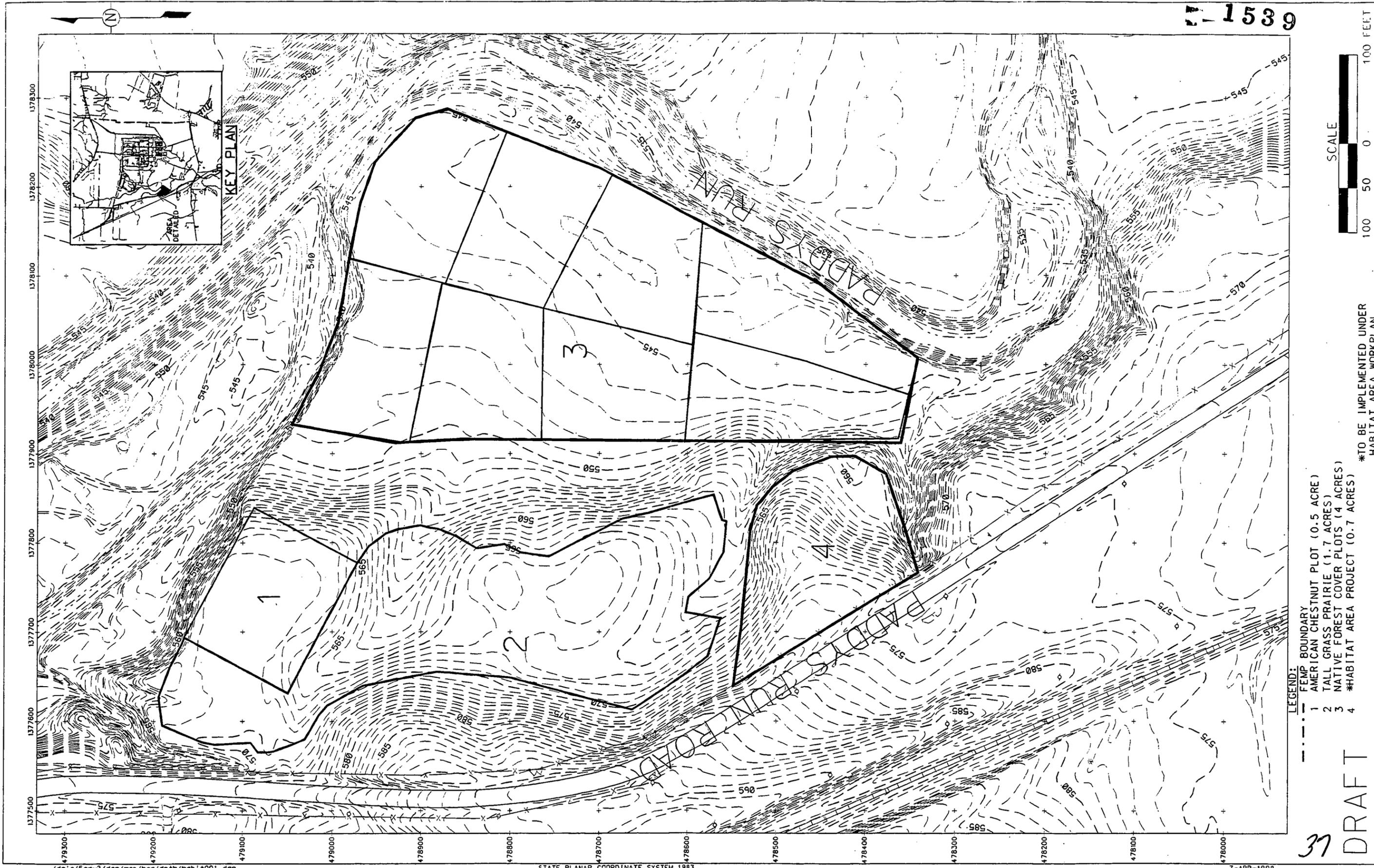
Fernald Environmental
 Management Project

FLUOR DANIEL
FERNALD

U.S. DEPARTMENT OF ENERGY

**Conceptual
 Layout of Park**

FIGURE 1 A



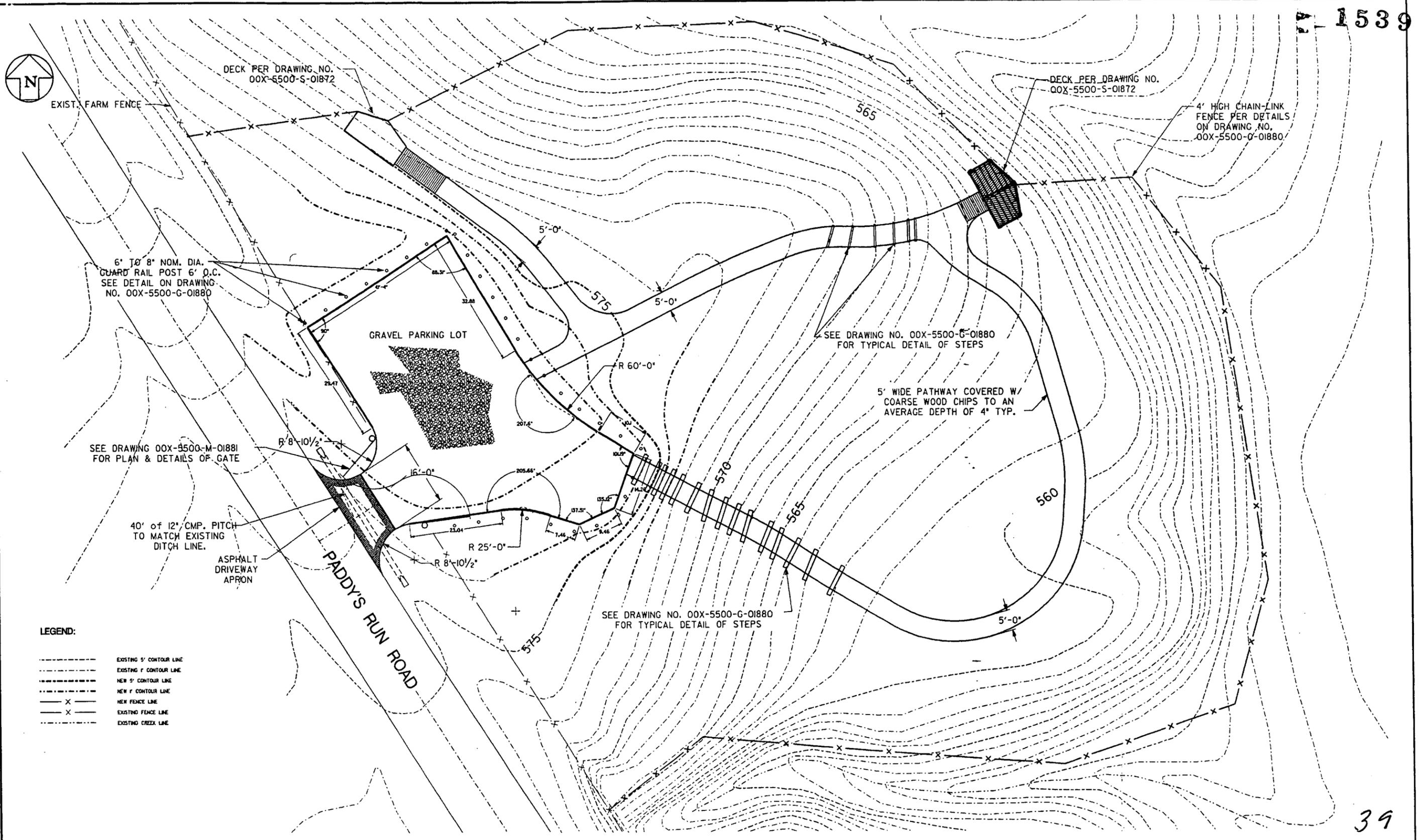
- LEGEND:
- FEMP BOUNDARY
 - 1 AMERICAN CHESTNUT PLOT (0.5 ACRE)
 - 2 TALL GRASS PRAIRIE (1.7 ACRES)
 - 3 NATIVE FOREST COVER PLOTS (4 ACRES)
 - 4 HABITAT AREA PROJECT (0.7 ACRES)

*TO BE IMPLEMENTED UNDER HABITAT AREA WORKPLAN

37 DRAFT

FIGURE 2. ECOLOGICAL RESEARCH PLOTS (AREA 8, PHASE 1)

ATTACHMENT I
DESIGN DRAWINGS



LEGEND:

---	EXISTING 5' CONTOUR LINE
---	EXISTING 7' CONTOUR LINE
---	NEW 5' CONTOUR LINE
---	NEW 7' CONTOUR LINE
---	NEW FENCE LINE
---	EXISTING FENCE LINE
---	EXISTING CREEK LINE

NO.	REVISIONS	DATE	DWN. BY	APPD.	NO.	ISSUED FOR REVIEW	2/10/98	MIKE LOCKE	REF. DWG. NO.

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DESIGN STRUCTURES OR COMPONENTS
EXCEPT BY THE ORIGINAL ENGINEER.
SEE NOTES.

COGNIZANT ENGINEER DATE

APPROVALS

CIVIL & STR.	SAFETY ENG.
ELECTRICAL	MAINTENANCE
ENGINEER	FIRE PROTECT.
INSTRUMENT	WASTE MANAGE.
MECHANICAL	SECURITY
	CRU

CHECKED APPROVED

Fernald Environmental Management Project

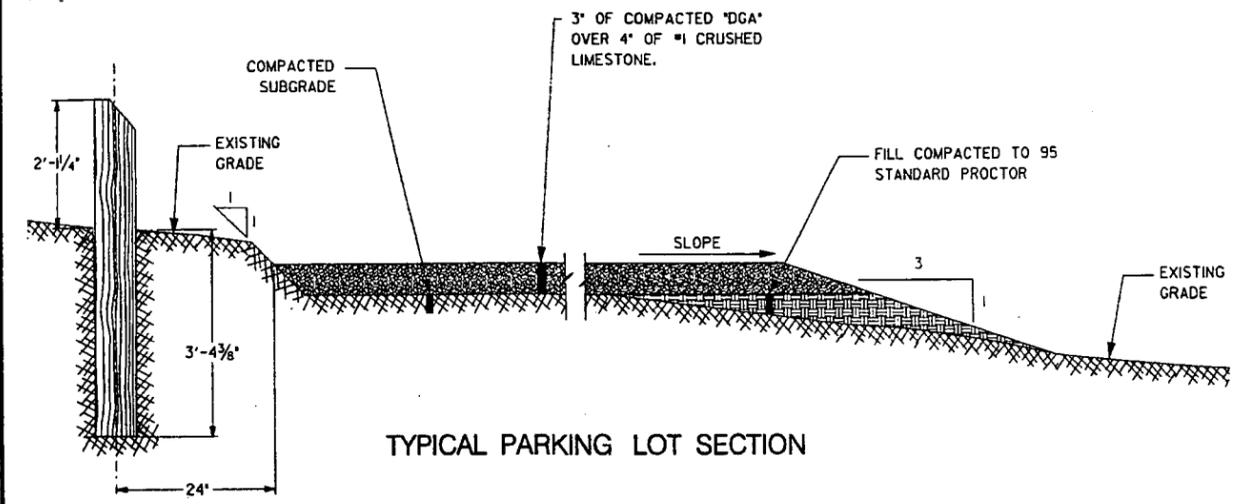
FLUOR DANIEL FERNALD

U.S. DEPARTMENT OF ENERGY

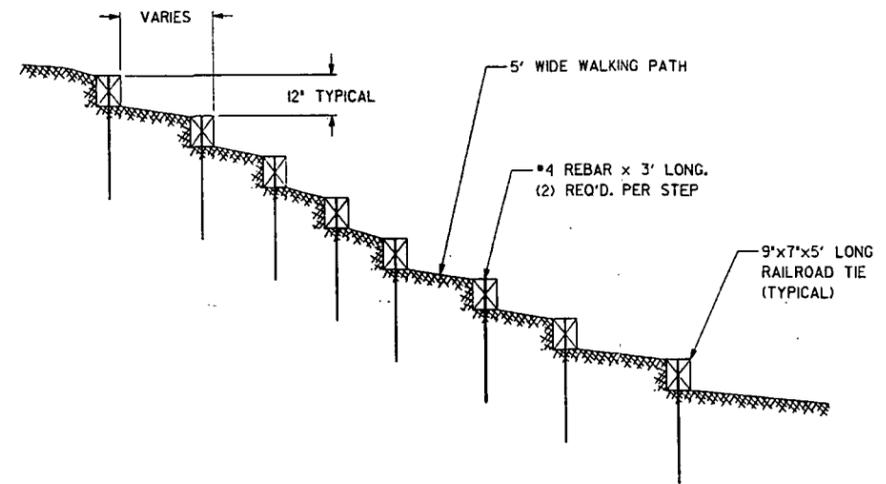
HABITAT PROJECT AREA SITE PLAN
SCALE 1"=10'

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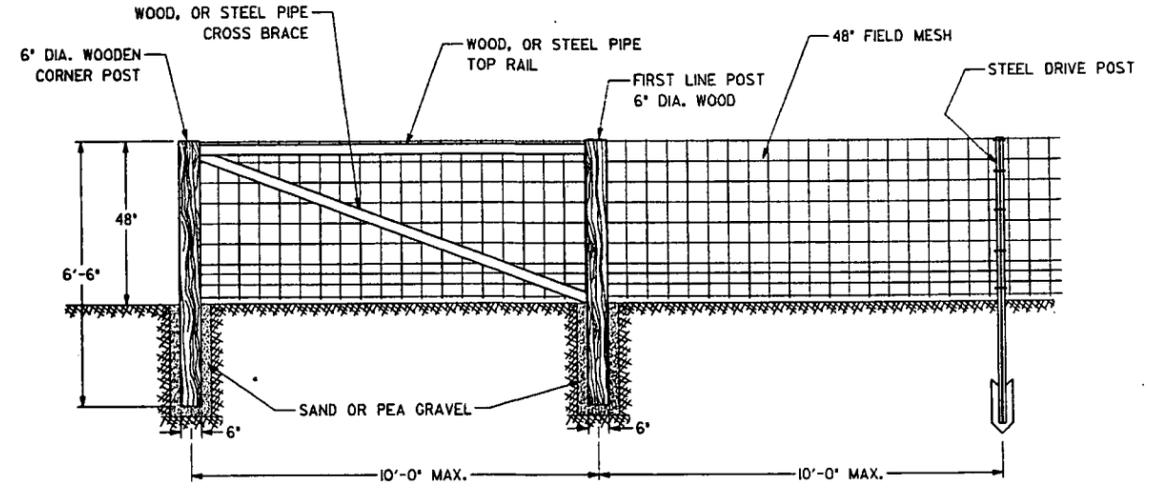
R.E.S. #3389
DATE 1/17/98
DRAWN MIKE LOCKE



TYPICAL PARKING LOT SECTION



TYPICAL WALKING TRAIL STEP DETAILS



TYPICAL FENCE DETAILS

40

NO.	REVISIONS	DATEDWN.	BY	APPD.	NO.	REVISIONS	DATEDWN.	BY	APPD.	REF. DWG. NO.
					A	ISSUED FOR REVIEW	12/01/98	MIKE LOCKE		

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CONFIGURATION MANAGEMENT CONTROL.
SEE NOTES.

COGNIZANT ENGINEER DATE

APPROVALS	
CIVIL & STR.	SAFETY ENG.
ELECTRICAL	MAINTENANCE
ENGINEER	FIRE PROTECT.
INSTRUMENT	WASTE MANAGE
MECHANICAL	SECURITY
	CRU
CHECKED	
APPROVED	

Fernald Environmental
Management Project

**FLUOR DANIEL
FERNALD**

U.S. DEPARTMENT OF ENERGY

HABITAT PROJECT AREA
SECTIONS & DETAILS
SCALE - NONE

R.E.S. #3389
DATE 2/5/98
DRAWN MIKE LOCKE

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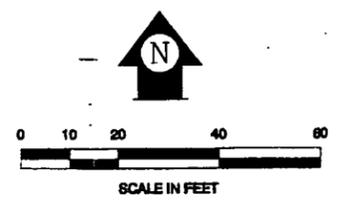
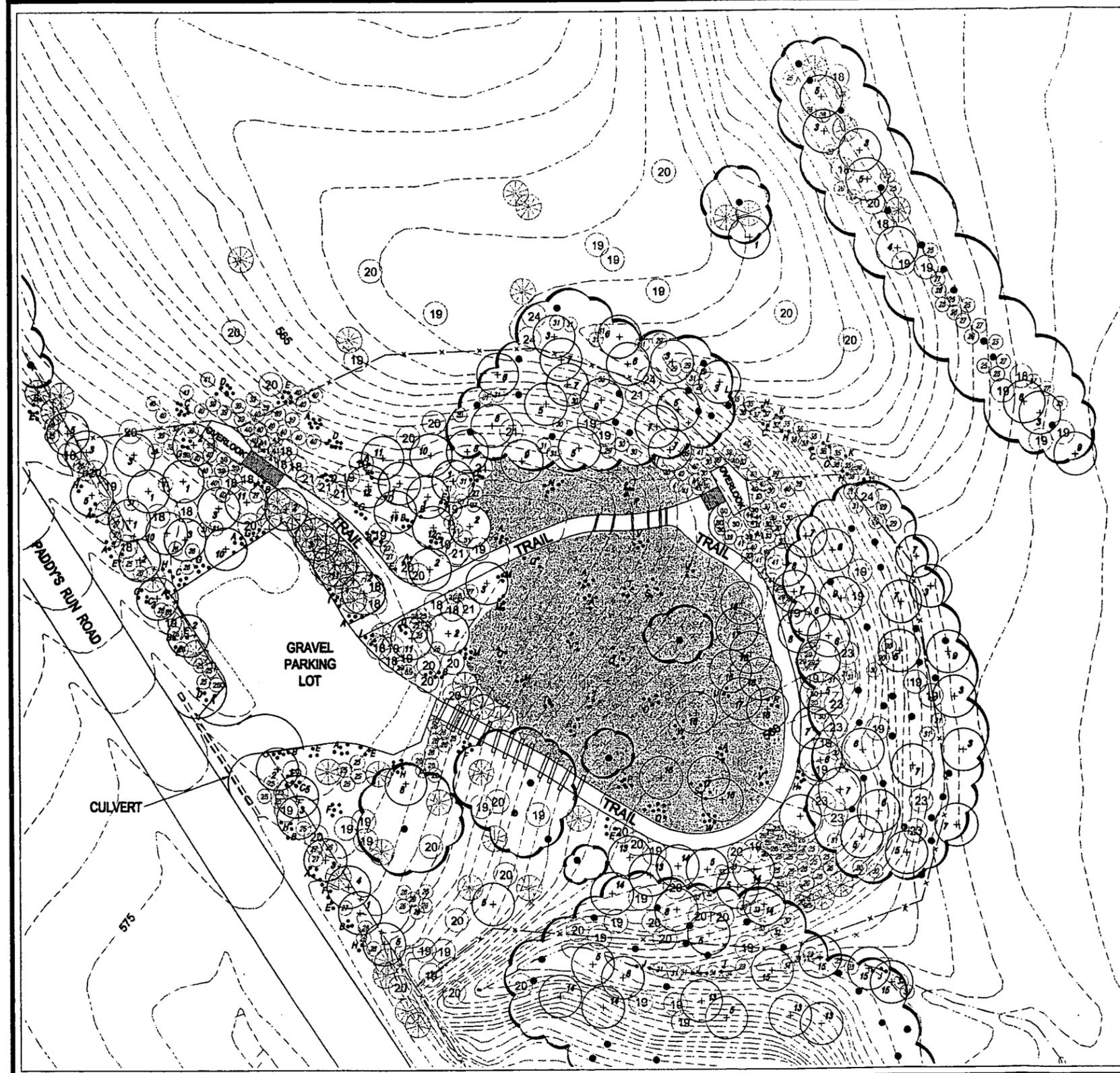
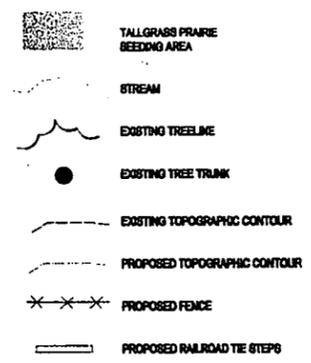
Fernald Wildflower Park

An Ecological Restoration Demonstration Project

Fernald, Ohio

1539

SYMBOL	SCIENTIFIC NAME	COMMON NAME	QUANTITY
TREES			
1	<i>Gleditsia triacanthos</i>	Honeylocust	8
2	<i>Acer rubrum</i>	Red Maple	9
3	<i>Celtis occidentalis</i>	Hickory	16
4	<i>Morus rubra</i>	Red Mulberry	2
5	<i>Quercus rubra</i>	Red Oak	10
6	<i>Acer saccharum</i>	Sugar Maple	12
7	<i>Liriodendron tulipifera</i>	Tulip Poplar	7
8	<i>Fraxinus americana</i>	White Ash	4
9	<i>Fagus grandifolia</i>	American Beech	3
10	<i>Pinus caroliniana</i>	Black Cherry	5
11	<i>Robinia pseudoacacia</i>	Black Locust	2
12	<i>Populus deltoides</i>	Eastern Cottonwood	6
13	<i>Quercus imbricaria</i>	Stagoleaf Oak	6
14	<i>Carya cordiformis</i>	Bitternut Hickory	4
15	<i>Salix nigra</i>	Black Willow	8
16	<i>Quercus macrocarpa</i>	Bur Oak	3
17	<i>Carya ovata</i>	Shagbark Hickory	3
19 SUBCANOPY			
18	<i>Rhus glabra</i>	Smooth Sumac	19
19	<i>Cornus canadensis</i>	Eastern Redbud	50
20	<i>Cornus florida</i>	Flowering Dogwood	34
21	<i>Cotoneaster phoenicopyum</i>	Washington Hawthorn	6
22			
22	<i>Juniperus virginiana</i>	Eastern Redcedar	53
23			
23	<i>Cornus alternifolia</i>	Pagoda Dogwood	9
24	<i>Carpinus caroliniana</i>	American Hornbeam	4
27 SHRUBS			
25	<i>Rosa setigera</i>	Prickly Rose	42
26	<i>Rubus alleghaniensis</i>	Allegheny Blackberry	51
27	<i>Salis helix</i>	Prune Willow	17
28	<i>Sambucus canadensis</i>	American Elder	13
29	<i>Aronia arifolia</i>	Blackberry	16
30	<i>Viburnum acerifolium</i>	Mapleleaf Viburnum	35
31	<i>Lindera benzoin</i>	Spicebush	30
32	<i>Corylus americana</i>	American Filbert	4
33	<i>Quercus emarginata</i>	Jarvis Oak	5
34	<i>Ilex verticillata</i>	Common Winterberry	6
35	<i>Caprilla canadensis</i>	Butcherbush	6
36	<i>Alnus incana</i>	Common Alder	6
37	<i>Rosa pratincola</i>	Swamp Rose	3
38	<i>Ampelopsis</i>	Indigo Bush	4
39	<i>Viburnum prunifolium</i>	Blackhaw Viburnum	27
40	<i>Physocarpus opulifolius</i>	Common Nonesuch	30
41	<i>Rhus aromatica</i>	Fragrant Sumac	22
A • WILDFLOWER			
A	<i>Rubus subterminalis</i>	Small Blackberry Stem	61
B	<i>Echinacea purpurea</i>	Purple Coneflower	32
C	<i>Polygonum pennsylvanicum</i>	Pennsylvania Smartweed	23
D	<i>Aster novae-angliae</i>	New England Aster	31
E	<i>Eupatorium maculatum</i>	Spotted Joe-Pye Weed	34
F	<i>Solidago canadensis</i>	Canada Goldenrod	13
G	<i>Eupatorium perfoliatum</i>	Sonnet	24
H	<i>Veronica novae-angliae</i>	New York Ironweed	28
I	<i>Alium canadense</i>	Hoopding Wild Onion	9
J	<i>Loebelia cardinalis</i>	Cardinal Flower	9
K	<i>Iris versicolor</i>	Blue Flag	3
L	<i>Iris pseudacorus</i>	Yellow Iris	4
M	<i>Asclepias tuberosa</i>	Butterflyweed	14
N	<i>Aster laevis</i>	Smooth Aster	7
O	<i>Scilla maritima</i>	Blue False Indigo	13
P	<i>Baptisia tinctoria</i>	White False Indigo	6
Q	<i>Conoclinium virginicum</i>	Tall Coreopsis	11
R	<i>Eryngium yuccifolium</i>	Rattlesnake Master	7
S	<i>Morone latifolia</i>	Bergamot	10
T	<i>Rudbeckia hirta</i>	Yellow Coneflower	20
U	<i>Silphium integrifolium</i>	Rosinweed	3
V	<i>Solidago rigida</i>	Stiff Goldenrod	15
W	<i>Silphium laciniatum</i>	Compassplant	10



42

NO.	REVISIONS	DATE	DWN/APPD.	REF. DWG. NO.
B	ISSUED FOR REVIEW		L. ROBERTSON	
A	ISSUED FOR REVIEW		M. LOCKE	

NOTE: FLUOR DANIEL FERNALD CADD DRAWING. DO NOT REVISE MANUALLY.

CONFIGURATION MANAGEMENT DRAWING

SYSTEMS, STRUCTURES OR COMPONENTS DELETED ON THIS DRAWING ARE JACKED OUT OF THE CONFIGURATION MANAGEMENT CONTROL. SEE NOTE.

COORDINATING ENGINEER DATE

APPROVALS	
CIVIL & STR.	SAFETY ENG.
ELECTRICAL ENGINEER	MAINTENANCE
INSTRUMENT MECHANICAL	PIPE PROTECT.
	WASTE MANAGE.
	SECURITY
	CRU
CHECKED	
APPROVED	

Tetra Tech NUS, Inc.

J. Peyton Doub, CEP
Richard N. Seiden, AICP
Lee Robertson
REV 1, April 1988

Fernald Environmental Management Project

FLUOR DANIEL FERNALD

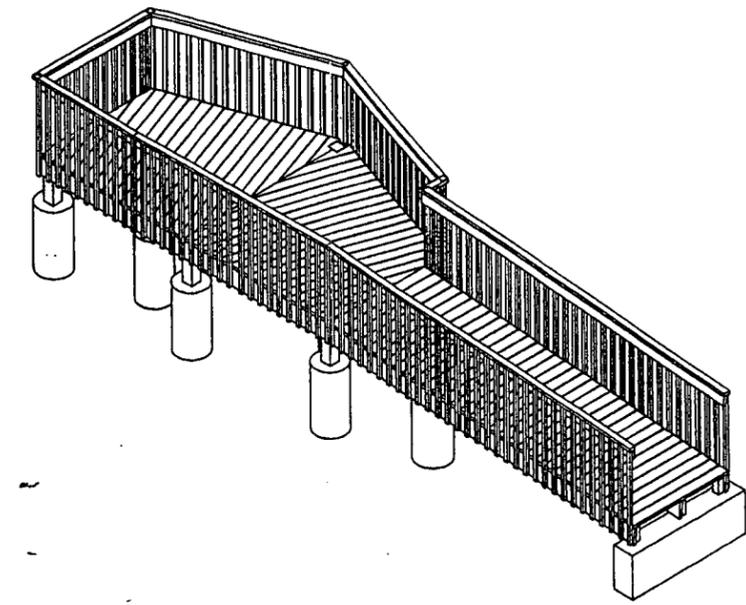
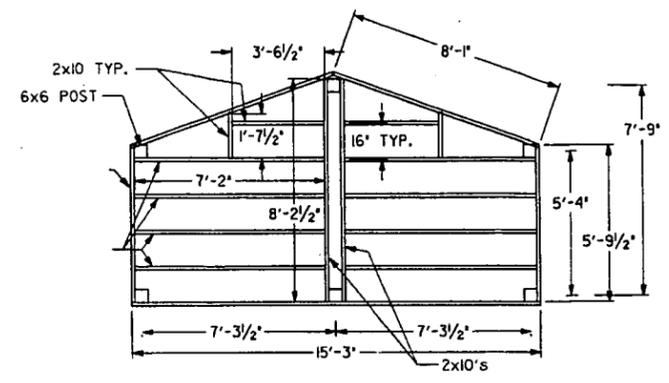
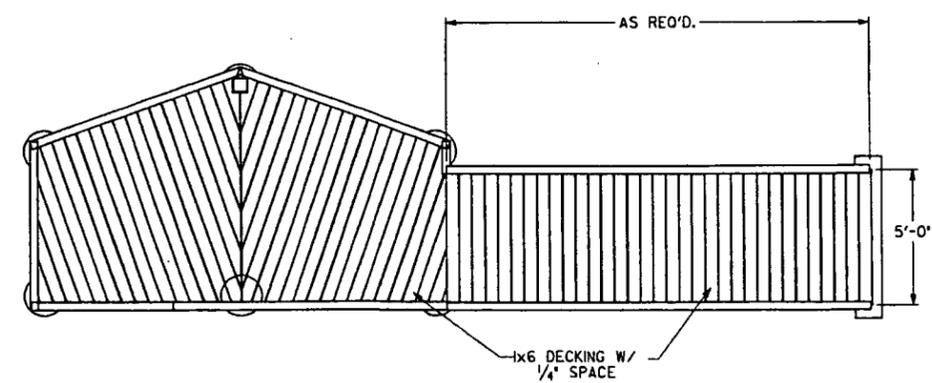
U.S. DEPARTMENT OF ENERGY

HABITAT PROJECT AREA PLANTING LAYOUT

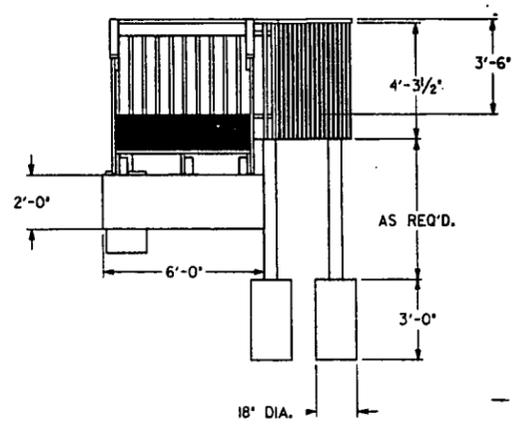
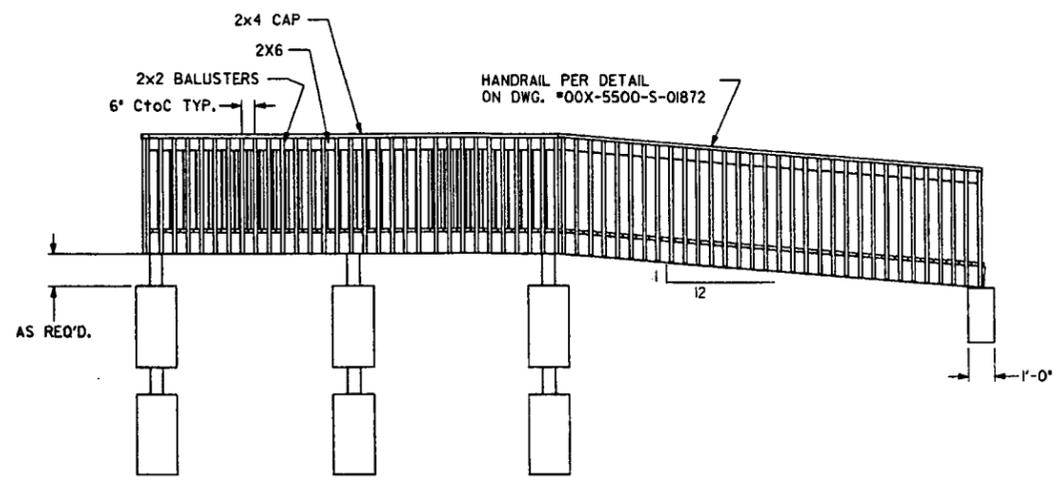
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FRAMING PLAN



GENERAL NOTES:

1. ALL MATERIAL SHALL BE PRESSURE TREATED DIMENSIONAL LUMBER PER AWPB LP-22
2. CONCRETE PIER FOOTINGS SHALL BE 3000 PSI OR GREATER.
3. SAND ALL HAND RAIL CAPS SMOOTH TO REMOVE ANY SPLINTERS OR SNAGS.
4. STAIRS, RAMPS, DECKING AND RAILINGS SHALL BE FASTENED WITH APPROPRIATE LENGTH GALVANIZED DECK SCREWS.

43

NO.	REVISIONS	DATE DWN.	BY APPD.	NO.	REVISIONS	DATE DWN.	BY APPD.	REF. DWG. NO.
				A	ISSUED FOR REVIEW	3/21/98	MIKE LOCKE	00X-5500-S-01872

NOTE:
FLUOR DANIEL
FERNALD CADD
DRAWING.
DO NOT REVISE
MANUALLY.

CONFIGURATION
MANAGEMENT
DRAWING

APPROVALS	
CIVIL & STR.	SAFETY ENG.
ELECTRICAL	MAINTENANCE
ENGINEER	FIRE PROTECT.
INSTRUMENT	WASTE MANAGE.
MECHANICAL	SECURITY
	CRU
CHECKED	
APPROVED	

Fernald Environmental
Management Project
**FLUOR DANIEL
FERNALD**
U.S. DEPARTMENT OF ENERGY

HABITAT AREA PROJECT
VIEWING PLATFORM #2
PLAN & DETAILS
R.E.S. #3389
DATE 3/21/98
DRAWN MIKE LOCKE
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