ENGINEERING APPENDIX

TABLE OF CONTENTS

Section **Page**

TABLE OF CONTENTS (cont'd)

Section **Page**

TABLE OF CONTENTS (cont'd)

Section **Page**

TABLE OF CONTENTS (cont'd)

Section **Page**

ATTACHMENTS

LIST OF TABLES

LIST OF FIGURES

ENGINEERING APPENDIX

PREPARATION OF NATURE APPRECIATION FACILITIES DESIGN, ECONOMIC, AND ENVIRONMENTAL ANALYSIS FOR A LIMITED REEVALUATION REPORT (LRR) 1,750-ACRE BOTTOMLAND ACQUISITION, FOURCHE BAYOU BASIN, LITTLE ROCK, ARKANSAS

1.0 INTRODUCTION

1.1 Authorization

The proposed action, acquisition of the 1,750-acre area known as Fourche Bottoms and the development of a nature appreciation area, was authorized by Section 401(a) of the Water Resources Development Act of 1986.

1.2 Project Location

Fourche Bottoms is a 1,750-acre tract of land located in the Fourche Bayou Basin (Figure 1). The Fourche Bayou Basin is located in central Arkansas and extends from the Fourche Mountains of the Ouachita Province eastward into the Arkansas River alluvial plain. The basin is about 24 miles long with an average width of seven miles.

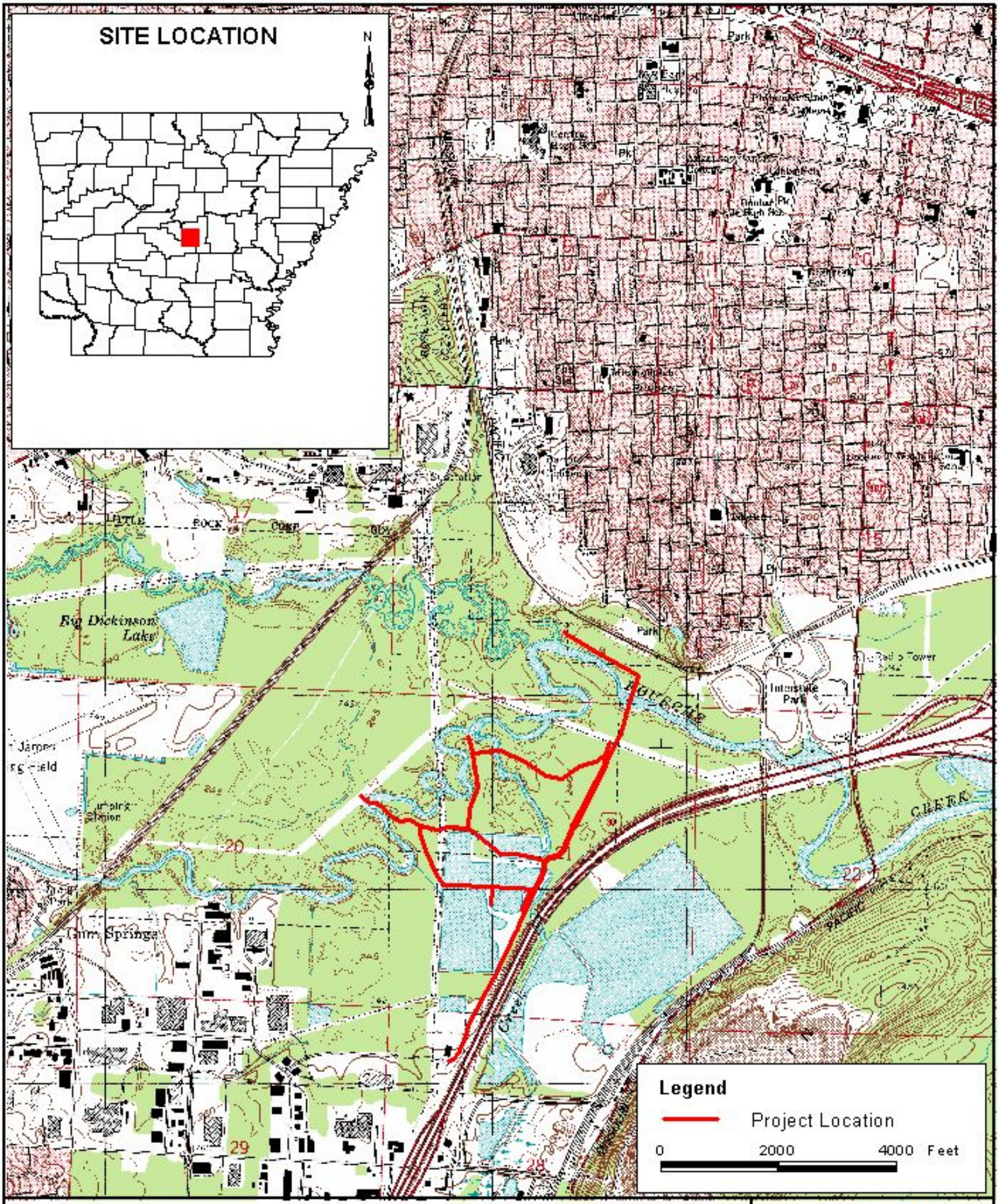
Fourche Bottoms is located in the northeastern portion of the Fourche Bayou Basin, on the outskirts of the City of Little Rock (Figure 2). The area is dominated by bottomland hardwoods and riverine swamps and is subject to periodic inundation during intervals of heavy precipitation.

All of the recreation facilities are located within the 1,750-acre environmental preservation area with the exception of a narrow strip owned by the city where the first segment of the access road leads into the bottomland acres. The strip encompasses the utility road that goes between a trucking firm and the interstate to access the bottoms. The strip is without significant environmental values. Thus, this acreage was excluded for the environmental protection acquisition. In accord with ER 1105-2-100 and EP 1165-2-502, the strip could be acquired as recreation land for access. The value of this land is included in the nature appreciation facilities cost.

1.3 Purpose and Scope

1.3.1 Purpose of Study

The purpose of the study is to acquire a 1,750-acre tract in the Fourche Bayou Basin and to subsequently construct a nature appreciation facility on that tract to showcase the intrinsic and natural beauty of the area.



PROJECT LOCATION MAP

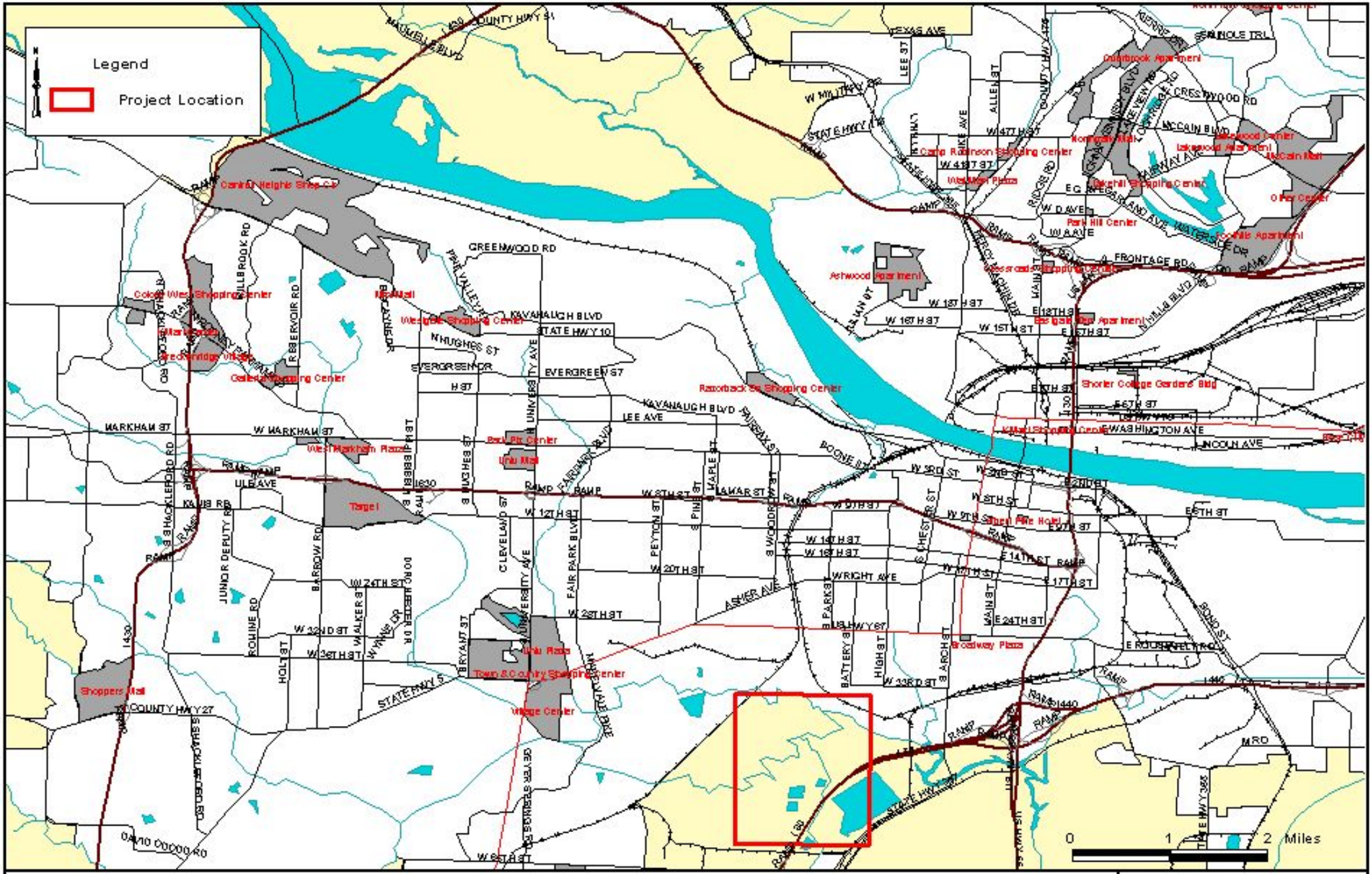
Public Draft Engineering Appendix
Acquisition of Fourche Bottoms
and Development of Nature Appreciation Facility

USGS 1:250,000 Little Rock Quadrangle

Gulf Engineers & Consultants, Inc.

Figure:	1
Date:	October 2004
Scale:	1:24,000
Source:	USGS/GEC

Figure 1. Project Location Map



PROJECT VICINITY MAP

Public Draft Engineering Appendix
Acquisition of Fourche Bottoms
and Development of Nature Appreciation Facility

GEC
Gulf Engineers & Consultants, Inc.

Figure:	2
Date:	September 2004
Scale:	1:72,000
Source:	GEC

Figure 2. Project Vicinity Map

Fourche Bottoms is a unique and valuable ecosystem. This 1,750-acre tract comprises the last remaining significant tract of natural bottomland hardwood forest in the Fourche Creek watershed. In recent years, Fourche Bottoms has become surrounded by industrial development. Acquisition of the tract would protect it from further encroachment by development and assist in the protection of existing natural resources from detrimental effects associated with development (e.g., deterioration in air and water quality, degradation in habitat quality, etc.).

Additionally, the Fourche Creek watershed provides drainage to most of Pulaski County and part of Saline County. Fourche Bottoms, in turn, provides floodwater storage from the Fourche Creek drainage. Acquisition of the site would ensure that the floodwater storage capacity of the site would be retained indefinitely.

Upon acquisition of the 1,750-acre tract, the U.S. Army Corps of Engineers proposes to construct a nature appreciation facility with amenities such as an access road, foot trails, information signs, plant labels, restrooms, parking areas, and boardwalks and bridges into wet or swampy areas.

1.3.2 Scope of Study

This study is based on the results of on-site inspections, engineering, and environmental analysis, in accordance with the authority of Section 401(a) of the Water Resources Development Act of 1986. The study and recommended alternatives for Fourche Bottoms have focused on structural modifications to create a nature appreciation facility for the project area. The proposed modifications include: construction of a single-track access roadway with pullouts; installation of toilet facilities; construction of a boardwalk trail and boardwalk overlook; and construction of a 0.5-mile Americans with Disabilities Act (ADA) accessible trail. These modifications were developed into alternatives that were formulated with due regard to all pertinent tangible and intangible benefits and costs. Selection of the preferred alternative involved consideration of all factors, including those expressed by local interests, concerned agencies, and the State of Arkansas.

1.4 Cost Sharing

The local sponsor is the City of Little Rock, Arkansas. Policy Guidance Letter (PGL) No. 48, Cost Sharing for Specifically Authorized Environmental Projects, sets forth U.S. Army Corps of Engineers policy regarding the cost sharing for construction (implementation) of specifically authorized projects and separable elements for ecosystem (environmental) protection and restoration and implements Section 210 of the Water Resources Development Act of 1996. Section 210 established that environmental protection and restoration be cost shared by the non-Federal sponsor at 35 percent, the current cost sharing for projects authorized after 12 October 1996. PGL 48 states that ecosystem restoration projects authorized by prior legislation will be cost shared in accordance with the provisions of the authorizing legislation.

Thus, the cost sharing for the 1,750-acre Fourche Bottoms acquisition would be 25 percent non-Federal and 75 percent Federal as provided by the percentages of costs in the authorizing legislation, Section 401 of WRDA 1986. The nature appreciation facilities as recreational features would be cost shared 50-50 as established by Section 103 of WRDA 1986, as amended.

Section 103 also provides that the sponsor is required to pay 100 percent of the costs for operation, maintenance, repair, replacement, and rehabilitation.

1.5 Prior Studies

Several reports have been previously issued regarding the acquisition of Fourche Bottoms:

- *National Resource Conservation Service; Soil Survey of Pulaski County, Arkansas* (U.S. Department of Agriculture; September 1975);
- *Feasibility Report and Environmental Impact Statement for Water Resource Development, Volumes I-III* (U.S. Army Corps of Engineers, October 1979);
- *Fourche Bayou Basin; Vicinity of Little Rock, Arkansas; General Memorandum No. 1; General, Volumes I and II* (U.S. Army Corps of Engineers, September 1985);
- *Ecological Report: Fourche Creek Study Area, Pulaski County, Arkansas* (Wetland Science Applications, October 1995);
- *Fourche Creek Park; Site Analysis and Conceptual Master Plan* (City of Little Rock, Department of Parks and Recreation, April 30, 1996); and
- *Preliminary Assessment; Potential HTRW Sites at Fourche Bottomland Acquisition Acreage* (U.S. Army Corps of Engineers, February 1998).

2.0 GENERAL ENVIRONMENTAL SETTING

2.1 Climate

Summers in central Arkansas are moderately long and hot, with periods of high humidity. Winters are short and generally mild, with occasional polar and artic-type breaks. The area occasionally experiences high winds, and relative humidity ranges from moderate to high. The average daily temperature is 82 degrees Fahrenheit (ºF) in summer and 41ºF in winter; mean annual temperature is 62ºF. Precipitation in the area is relatively uniform throughout the year, with heavier amounts usually occurring in spring and lesser amounts occurring in summer. The region experiences an average annual precipitation of 48.66 inches.

2.2 Hydrology

Located in south Little Rock, Fourche Creek is a 6,000-acre wetland ecosystem that drains and filters 98 percent of the city's stormwater runoff.

Fourche Bottoms experiences occasional rapid inflows from Coleman Creek, Rock Creek, and Fourche Creek above the mouth of Rock Creek. The average ground elevation in the project area is 240 feet (ft) elevation. Water levels are estimated to rise approximately 15 ft across the site in a 100-year flood, attaining a level of 257.3 ft above sea level. The 10-year flood level is

252.5 ft. The areal extent of both the 10- and 100-year floodplains spans the project site, reaching from the base of the interstate and railroad levees on the east, west, and north, to the interior of Southside Park. Both flood levels encroach upon the industrial and residential property to the south of the project area.

Fourche Bottoms is characterized by the flat alluvial portion of the Fourche Bayou Basin. The tract is bounded upstream by University Avenue and downstream by Confederate Boulevard. Fourche Bottoms acts as a natural reservoir for the area by retaining runoff from sudden inflows, thereby significantly reducing peak discharges at the downstream end from precipitation events. During storm events in the late 1970s, the attenuating effect of Fourche Bottoms resulted in peak discharges at least 70 percent lower than peak inflows.

Ground water yields in the vicinity of Fourche Bottoms range from less than 10 U.S. gallons per minute (gpm) in the uplands to approximately 1,000 gpm near the mouth of Fourche Creek. Ground water in the project area generally contains calcium bicarbonate or sodium bicarbonate. Iron concentrations vary from less than 0.1 to greater than 50 parts per million (ppm).

The Little Rock District Corps of Engineers provided the following information on flood inundation at the project site.

Fourche Bottoms has historically functioned as three ponding areas prior to relief opening modifications:

- Ponding Area 1 - from University Avenue (River Mile 13.135) downstream to the Union Pacific Railroad near Worth James Airfield (River Mile 11.500);

- Ponding Area 2 - from the Union Pacific Railroad near Worth James Airfield (River Mile 11.500) downstream to the Union Pacific Railroad near Arch Street Pike (River Mile 7.700); and

- Ponding Area 3 - from the Union Pacific Railroad near Arch Street Pike (River Mile 7.700) downstream to Confederate Boulevard at Biddle Shops (River Mile 4.555).

Table 1 indicates the average number of days that the water level in Fourche Bottoms is expected to be above the 240-foot elevation in Ponding Area 2 (the site of the major facilities and trails in the proposed nature appreciation facility).

Table 1. Frequency of Water Levels Above the 240-Foot Elevation in Ponding Area 2

Month	Days Above 240-ft Elevation
January	5
February	5
March	8
April	7
May	6

Month	Days Above 240-ft Elevation
June	2
July	1
August	1
September	2
October	3
November	5
December	8

Source: USACE, 2003.

2.3 Biological Resources

2.3.1 Vegetation

The dominant vegetation communities in the project area are bottomland hardwoods and riverine swamps, with other habitat types interspersed along the fringe of the area. The riverine swamp areas, closely associated with the Fourche Creek corridor, are dominated by bald cypress and water tupelo. The bottomland hardwood areas occur around the edge of the riverine swamp habitats and include plant species such as willow oak, hackberry, or cedar elm.

2.3.2 Wetlands

Wetlands are defined by the Corps as areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstance do support, a prevalence of vegetation typically adapted for life in saturated soil conditions [33 CFR 328.3 (b)]. These wetlands generally include marshes, swamps, lacustrine and palustrine habitats, littoral zones (shallow open waters) and similar areas.

The riverine swamp, pond areas, and some of the bottomland hardwood have been categorized as wetland habitat. Although the pond areas may not technically qualify as wetland habitat, they may be considered “waters of the United States” and are therefore included.

2.3.3 Fisheries

Fish species found in Fourche Creek include shiners, sunfishes, catfish, chain pickerel, bullheads, crappie, largemouth bass, and spotted bass. However, quality game fish are difficult to locate in the lower reaches of the creek due to degraded conditions in water quality.

No state or federally listed fish species are known to occur in the project area.

2.3.4 Wildlife

Fourche Bottoms is supported by both riverine swamp and bottomland hardwood habitats. These habitats, in turn, support a varied assortment of wildlife. Several species of wading birds are common in the area as well as various migratory birds and songbirds. Duck species such as

mallards, teals and wood ducks are commonly found in the area. Mammals occurring in the project site include swamp rabbits, white-tail deer, mink, raccoons, opossums, fox and gray squirrels, and beavers, among others. Fourche Bottoms also provides habitat for a wide variety of turtles (e.g., common snapper, mud turtle, soft-shelled turtle, slider, and box turtle), frogs (e.g., cricket frogs, spring peepers, tree frogs, leopard frogs, wood frogs, green frogs, and bullfrogs), and snakes (e.g., copperheads, cottonmouths, garter snakes, water snakes, king snakes, and hognose snakes).

2.3.5 Wading Birds

The frequent inundation of Fourche Bottoms provides an ideal habitat for wading birds. Several species of wading birds including great blue herons and egrets are common in the area.

No state or federally listed species of wading birds are known to occur in the project area.

2.3.6 Threatened and Endangered Species

Federally Listed Species

Table 2 provides amplifying information on federally listed species that occur in Pulaski County.

Table 2. Threatened and Endangered Species for Pulaski County

Common Name	Scientific Name	Status
Fat pocketbook	*Potamilus capax*	E
Red-cockaded woodpecker	*Picoides borealis*	E
Interior least tern	*Sterna antillarum*	E
Bald eagle	*Haliaeetus leucocephalus*	T

Source: USFWS, 2002.

The fat pocketbook mussel is found primarily in river systems in the Midwestern and southeastern United States. The species inhabits slow-moving water bodies with a mud or sand substrate. Primary threats to the species are dredging operations and water impoundments.

The red-cockaded woodpecker occurs primarily in the southern United States. The species inhabits pine forests, and nests and roosts in tree cavities. The red-cockaded woodpecker shows a marked preference for old trees, particularly those infected with red heart disease, which destroys the integrity of cell walls in the interior tissue of trees. The species is endangered by habitat loss resulting primarily from deforestation.

The interior least tern is found throughout most of the United States. Populations within the interior are typically found near riverine systems. Nesting typically occurs on riverine sandbars or salt flats exposed during low water periods. The species was once heavily hunted for its plumes. Current threats to the species include habitat loss from natural and artificial processes and flooding of breeding grounds.

The bald eagle is found throughout North America. The species primarily inhabits forests adjacent to significant water bodies (e.g., coastal areas, bays, rivers, and lakes). The species is threatened by habitat loss, biocide contamination, and illegal shooting.

In a letter dated January 30, 2003, the USFWS stated that no federally listed or proposed threatened or endangered species or critical habitat occur in the project area.

State Agency Listed Species

The Arkansas National Heritage Program (ANHP) was consulted in 1995 to determine the presence of any species listed by the agency within the study area. The ANHP determined that three listed species were known to occur in the general vicinity of Fourche Creek. The listed species are the flat floater mussel (*Anodonta suborbiculata*), white-topped sedge (*Rhynchospora colorata*), and showy prairie gentian (*Eustoma grandiflorum*). No records of any of these species within the project area were located. Additionally, none of the species was observed during a field investigation.

2.4 Historic Conditions

Access to the project area has been limited historically due to heavy forestation and frequent flooding. In recent history the project area has been surrounded by industrial and residential growth, although such growth has not yet heavily encroached upon the area.

The wetlands and surrounding floodplain in the project area have served as floodwater storage for the Greater Little Rock area. More recently, land within the project area has been used as a route for major utility lines and transportation corridors. Additionally, the project area is often used as an unauthorized local dumping ground.

The project area is the only remaining portion of the surrounding watershed that has maintained its historic condition as natural bottomland hardwood forest. The project area remains a significant resource for local wildlife as it has for recorded history.

2.5 Environmental Justification

U. S. Army Corps of Engineer ecosystem restoration activities include the restoration of ecosystem function, structure, and dynamic processes with the end goal of a naturalistic, functioning self-regulating system. In accordance with ER 1165-2-501, Civil Works Ecosystem Restoration Policy, "Protection may be included as part of Civil Works ecosystem restoration initiatives, when such measures involve efforts to prevent future degradation of an ecosystem's structure and functions." The federal objectives are established under the guidance of the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (P&G). The following analysis will describe monetary and non-monetary benefits. This will serve to view the project based on non-monetary outputs compatible with P&G selection criteria; however, it will not demonstrate the national economic development (NED) benefits.

2.5.1 Background

The Fourche Creek watershed has a 109,000-acre drainage basin to include 90% of the drainage of the city of Little Rock, Arkansas. The Fourche Bayou Basin consists of nearly 1,750 acres of bottomland forest and over 650 acres of wetlands that play a vital role in retention and filtration of water resources in the drainage basin. This has resulted in flood damage reduction and enhanced water quality for the surrounding area. Fourche Creek drains directly into the Arkansas River and has numerous miles of tributaries. Environmental resources of importance in the Fourche Bayou Basin consist of flora, fauna, unique habitats, recreational opportunities, and aesthetic qualities. Adding to the significance of this area is its location in metropolitan Little Rock, Arkansas.

A green belt such as Fourche Bayou, with its approximately 650 acres of wetlands, provides a welcome break for viewers from square miles of developed land covered by residences, businesses, and infrastructure facilities. It is believed to be the largest urban wetland in the United States. It is a remarkable aesthetically pleasing site nested in the heart of a sprawling urban environment (figures 3 and 4). Between 1780 and 1980 Arkansas lost 90 percent of its bottomland-forested hardwoods and 72 percent of its wetlands. The remaining wetlands are critical to maintain this scarce and every decreasing ecosystem. Arkansas' remaining wetlands are some of the most valuable in the country because of their importance in the national spectrum.

However, under current conditions the area is under constant attack from urban sprawl and development. The City of Little Rock has worked with numerous partners to maintain the flood retention and water filtration function of the area, but often losses ground. Poor construction practices along the creek result in an increase to turbidity. The constant transfer of surrounding area to impervious surface (parking lots, bare soil, mowed areas, and buildings) has greatly increased the flow regime and pollutants into the Creek. Development on old landfills nearby has led to reintroduction of the pollutants into the watershed from runoff. The increased flow and pollutants are degrading the function of the wetland and reducing the flood retention capacity.

2.5.2 Analysis

Fourche Bayou Basin bottomland hardwood wetlands are functioning at a moderate rate. Pulaski County, Arkansas conducted an evaluation of its surrounding wetlands. Using a rating scale ranging from 1(low) to 10 (high) Fourche's wetlands received a rating of 6. (For comparison, the Dark Hollow's 112 acres of wetlands in the city of North Little Rock were rated from 2-5.) Two other areas in Pulaski County, Rosenbaum (40 acres) and Faulkner Lake (600 acres), located north and downstream of the mouth of Fourche Creek on the Arkansas River, each received a rating of 8. The greatest impact leading to the degradation of the wetland function in Fourche Creek and the surrounding area is the infringement from development along the wetlands. (*Ecological Report: Fourche Creek Study Area, Pulaski County, Arkansas* [*Wetland Science Applications, October 1995*])

10M006 to 10L003 (District 201)
Fourche Creek (Looking Downstream)

10M006 to 10L003 (District 201)
Fourche Creek (Looking Upstream)

Figure 3. Characteristic Photographs of Fourche Creek

Figure 4. Characteristic Photograph of Fourche Creek

Audubon Arkansas has established seven permanent water quality stations on Fourche Creek within the Fourche Bayou Basin. During their two-year sampling period they have detected increases in turbidity and spiked values of metals downstream of old landfills and adjacent to recent development in Southwest Little Rock. During a HTRW study conducted by the U.S. Army Corps of Engineers, lead was found in the creek. The source of the lead is believed to be an old landfill. If left undisturbed the lead may be contained. However, if the property is not preserved under this program it will remain vulnerable to expansion and possible introduction of new contaminants into the watershed. Protecting the Fourche Bayou Basin through purchasing lands and setting it aside from development will improve the function of the wetland by reducing sedimentation from erosion and keeping capped pollutants buried.

Based on these facts we have addressed the quality of the wetland in two factors: increased function of flood retention capacity; and increased water quality (reduce introduction of contaminants) through the protection of this bottomland forest by preserving it and limiting its use.

These two factors were then considered to arrive at a value expressed from 0.1 to 1.0 based on professional judgment (0.1 being poor and 1.0 being optimum). A modified Habitat Evaluation Procedures (HEP) analysis was then performed to determine the change in habitat value that would occur with the “no action” and the other three acquisition alternatives. Table 3 depicts the

change in habitat units over a period of analysis of 40 years. The HEP software calculates the average annual habitat units (AAHU's) over the project life. One should note that the no action alternative will result in the loss of wetland habitat value over the project life for both the 1,342 acres and 408 acre tracts involved. The analysis is important because it reflects the influence that the tracts of land have on the future wetland values of the other tracts.

Table 3. Change in Habitat Units by Acquisition Alternative

No Action Alternative									
ACRES	**TIME YEAR 0**		**TIME YEAR 10**		**TIME YEAR 20**		**TIME YEAR 40**		**AAHU's**
	HSI	**HU**	**HSI**	**HU**	**HSI**	**HU**	**HSI**	**HU**	
1,342	0.6	805.2	0.5	671	0.4	536.8	0.3	402.6	**571**
408	0.3	122.4	0.2	81.6	0.1	40.8	0.1	40.8	**62**
Acquisition Alternative 1 Purchase 1,750 acres									
ACRES	**TIME YEAR 0**		**TIME YEAR 10**		**TIME YEAR 20**		**TIME YEAR 40**		**AAHU's**
	HSI	**HU**	**HSI**	**HU**	**HSI**	**HU**	**HSI**	**HU**	
1,342	0.6	805.2	0.7	939.4	0.8	1073.6	0.9	1207.8	**1,037**
408	0.3	122.4	0.4	163.2	0.5	204	0.5	204	**184**
Acquisition Alternative 2 Purchase 1,342 acres									
ACRES	**TIME YEAR 0**		**TIME YEAR 10**		**TIME YEAR 20**		**TIME YEAR 40**		**AAHU's**
	HSI	**HU**	**HSI**	**HU**	**HSI**	**HU**	**HSI**	**HU**	
1,342	0.6	805.2	0.6	805.2	0.5	671	0.5	671	**720**
408	0.3	122.4	0.3	122.4	0.2	81.6	0.1	40.8	**87**
Acquisition Alternative 3 Purchase 408 acres									
ACRES	**TIME YEAR 0**		**TIME YEAR 10**		**TIME YEAR 20**		**TIME YEAR 40**		**AAHU's**
	HSI	**HU**	**HSI**	**HU**	**HSI**	**HU**	**HSI**	**HU**	
1,342	0.6	805.2	0.5	671	0.5	671	0.5	671	**688**
408	0.3	122.4	0.4	163.2	0.4	163.2	0.5	204	**168**

Source: USACE, 2004.

2.5.3 Incremental Cost Analysis

Table 4 depicts the combined change (output) in AAHU's for the 1,342 acres and 408 acres under each alternative with the corresponding costs, incremental output, incremental cost, and then incremental cost per output.

Acquisition Alternative 1, or acquisition of the entire 1,750 acres, would result in the greatest increase to the wetland values and functions. This is due to the fact that the greatest number of contiguous acres would be acquired. The 1,342 acres of land would be protected from future encroachment by development and the 408 acres would increase in wetland values. The

purchase of the 408 acres would enhance the value of the 1,342 acres, because they are located downstream of a large portion of the 408 acres. Without the 408 acres, the creation of pockets of a buffer strip around the creek is better than no buffers, but this would still result in some intrusion from industrial encroachment.

Table 4. Combined Change in AAHU's by Alternative

Plan	Output	Cost	Cost/Output	Incremental Output	Incremental Cost	Incremental Cost/Output
No Action (Baseline)	0	$0	$0	0	$0.00	$0
Acquisition Alternative 2 (1,342 acres)	174	$850,000	$4,885	174	$850,000	$4,885
Acquisition Alternative 3 (408 acres)	223	$1,800,000	$8,072	49	$950,000	$19,388
Acquisition Alternative 1 (1,750 acres)	588	$2,650,000	$4,507	365	$850,000	$2,329

Source: USACE, 2005.

Acquisition Alternative 2, or acquisition of only the 1,342 acres already acquired by the city, would result in a long-term loss in wetland function and value as development would continue in the surrounding pockets of private domain land including the 408-acre tracts. Since the land was acquired, reports by Audubon have indicated that development and poor construction practices have resulted in increased turbidity in Fourche Creek. Acquiring the first 1,342 acres was critical to protection of the area, but will not alone result in the greatest long-term increase in values and functions. The 408 acres of land, if not acquired, will also be vulnerable to development and will decline in wetland value over the period of study.

Acquisition Alternative 3, or acquisition of only the additional 408 acres, would result in a short-term increase in wetland value and function, but would have little long-term impact as a stand alone alternative. This area includes land that is currently generally of lower ecological value as it is closest to the fringe of industrial development. A portion of it is a former dairy farm, and another portion is adjacent to the landfill that is hoping to expand. While the current ecological value is lower than the ecological value of the 1,342 acres in Acquisition Alternative 2, it has greater potential for improvement through preservation. Also, it is critical acreage for ensuring the complete success as projected by Acquisition Alternative 1.

2.5.4 Additional Considerations

Regulatory programs (Section 404, Flood Plain Management, etc.) can affect the use of these wetlands. However, the potential for land alterations is beyond regulatory control and would significantly degrade this significant and scarce resource. In addition, the city of Little Rock's flood plain ordinances would not preclude excavation or filling in the flood plain fringe, the area outside the designated floodway, as long as the flood capacity is not changed. Therefore, although the city has purchased some property now, the status quo would only be maintained, at

best, in terms of wetland value. In the long term it may even sustain a small amount of degradation. Improvements would only be seen through purchase of land for preservation. This is the only way to create a contiguous buffer and prevent long-term destruction of an extremely valuable and rare resource. It is also assumed that the city and numerous partners like Audubon Arkansas would continue to use the area as a living classroom and increase awareness of this valuable resource. This should also contribute to improvements in land practices and reduce erosion and pollution.

3.0 BASE CONDITION

3.1 Condition of the Existing Facility

3.1.1 Location

All of the recreation facilities are located within the 1,750-acre environmental preservation area with the exception of a narrow strip owned by the city where the first segment of the access road leads into the bottomland acres. The strip encompasses the utility road that goes between a trucking firm and the interstate to access the bottoms. The strip is without significant environmental values. Thus, this acreage was excluded for the environmental protection acquisition. In accord with ER 1105-2-100 and EP 1165-2-502, the strip could be acquired as recreation land for access. The value of this land is included in the nature appreciation facilities cost.

3.1.2 Description

Fourche Bottoms is a unique and valuable component to the surrounding ecosystem. This 1,750-acre tract comprises the last remaining significant tract of natural bottomland hardwood forest in the Fourche Creek watershed. Additionally, the Fourche Creek watershed provides drainage to most or Pulaski County and part of Saline County. Fourche Bottoms, in turn, provides floodwater storage from the Fourche Creek drainage.

Access

The project area is accessible by car at the southeast corner, from the east end of 60th Street. The approach passes by light industrial properties and enters the site through a gate for which local utilities have a key. This entry leads to the interior of the proposed nature appreciation area, which lies southeast of the southern fork of Fourche Creek. The access road provides views to the west across existing borrow pits, then passes northward through bottomland forest to the creek.

Roads: Existing roads provide routes to desirable areas of the project site; consequently major clearing to provide circulation is not necessary. The roads within the project area are maintained by local utility companies. Conditions of these roads vary, however. The entrance road in the southeast begins as a well-graded gravel tract. In the direction of the creek on the north end, however, the road becomes an earthen path. In wet weather the road becomes muddy and develops deep ruts, requiring four-wheel drive vehicles for safe passage. In high water, the road

washes out at the culvert that carries runoff under the interstate. The connecting dirt road that traverses east to west across the peninsula bridging the borrow pits is moderately passable. The road becomes virtually non-existent beyond the power line right-of-way to the creek.

Utilities: Several utility rights-of-way transect the project area. Electrical power lines with overhead wires occupy the most prominent right-of-way, a wide cut swath through the bottomland forest. The sanitary sewer corridors are narrower. The sewer lines are underground for the majority of their extent and are detectable by above-grade manholes that follow the roads and rights-of-way and are visible where the line crosses Fourche Creek.

These rights-of-way are not suitable for vehicular use because of large quantities of broken stumps of woody vegetation left behind by rough clearing by bush hog.

Existing utility information was provided by the City of Little Rock Department of Sewage and Water. Sanitary sewer lines (two 24-inch diameter pipes) parallel the existing access road to Fourche Creek (Figure 5). Plan drawings of existing facilities indicate the two 24-inch lines combine into a single 36-inch sanitary sewer near the southeast portion of the project site. If flush toilets are selected for use, sewer service will not be an issue.

Potable water is currently unavailable at the project site. Information provided by the City of Little Rock indicates an existing 12-inch diameter cast iron water main south of West 60th Street. This existing water line provides potable and fire service water to the light industries along 60th Street. Existing water service ends approximately 250 feet from the proposed entrance/access road to Fourche Creek.

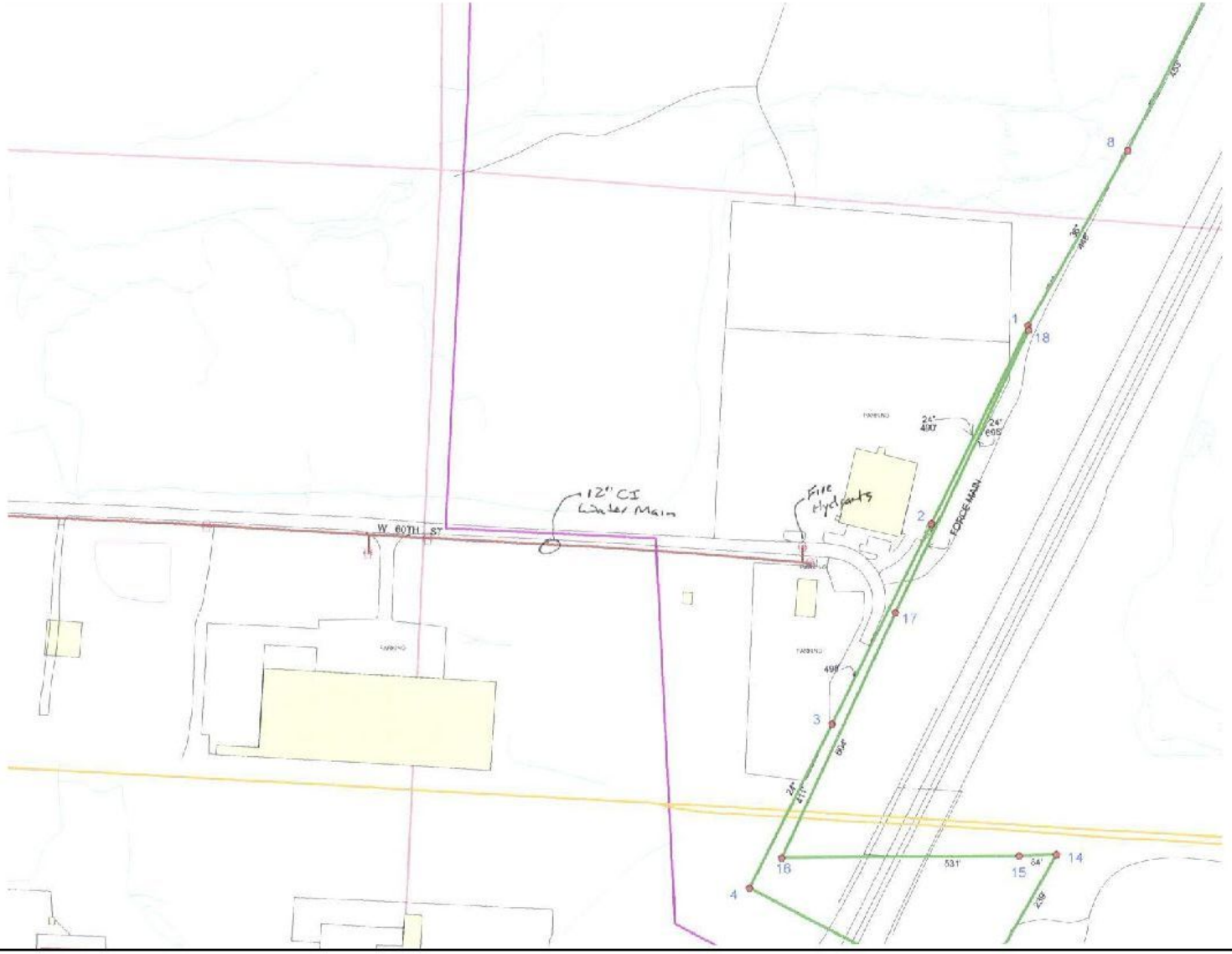
Railroads: Two active Missouri Pacific Railroad lines traverse the project area. One line runs along the site's northern boundary; the other line transects the southwest corner of the southwest corner of the project site. These railroad lines are restrictive barriers for automobile and pedestrian access and circulation. The tracks are elevation on embankments above the surrounding bottomland, and on bridges across watercourses. Trains traveling at high speeds frequently utilize the lines.

3.1.3 Current Annual Maintenance Activities and Costs

Entergy, the electrical provider, maintains the trees and shrubs along the right-of-way using a cycle maintenance program. A cycle refers to the number of growing seasons between prunings. Fourche Bottoms is on a five-year cycle meaning that Entergy allows the trees to grow for four growing seasons, then prunes before the fifth growing season. Little Rock Parks and Recreation does not currently maintain the area.

3.1.4 Programmed Improvements and Costs

There are no known improvements for the Fourche Bottoms area.



EXISTING SEWER AND WATER FACILITIES

Public Draft Engineering Appendix
Acquisition of Fourche Bottoms
and Development of Nature Appreciation Facility

GEC
Gulf Engineers & Consultants, Inc.

Figure: 5
Date: September 2004
Scale: NTS
Source: City of Little Rock

3.2 Biological Resources

The dominant vegetation communities in the project area are bottomland hardwoods and riverine swamps, with other habitat types interspersed along the fringe of the area. The riverine swamp, pond areas, and some of the bottomland hardwood have been categorized as wetland habitat. The project area is inhabited by a variety of fish, wading birds, migratory songbirds, mammals, amphibians, and reptiles.

No federally listed fish species or wading birds are known to occur in the project area.

A request was submitted to the USFWS in 2002 for the notification of any wildlife management areas, swamps and marshes, wetlands, habitats for threatened and endangered species, and/or other sensitive ecological areas located within the project area. The USFWS submitted a Coordination Act Report (CAR) on 3 September 2004 in which it stated that no federally listed, threatened, or endangered species are currently known to occur in the project impact area, and that the proposed action would not impact any listed species. The CAR is included as Attachment A in the Supplemental Environmental Impact Statement.

No state listed species are known to occur in the project area.

3.3 Cultural Resources

Significant cultural resources are protected under the National Historic Preservation Act of 1966 and the Archaeological Resource Protection Act of 1979.

Archaeologists have found evidence indicating the presence of Native Americans in the Fourche Bayou Basin as long ago as 3,000-10,000 years Before Present. The Arkansas Archaeological Survey has indicated that artifacts from the Archaic and later periods have been found within one to two miles of the proposed project site. It is believed that early cultures utilized Fourche Creek as a transport route between the Ouachita Mountains (where novaculite stone was collected for tools) and the Delta lands (the site of many early settlements). In the 18th century the area in the general vicinity of the project site was occupied by the Quapaw tribe. The tribe occupied a reservation east of the project area from 1818-1824.

Archaeological sites within the project boundaries have likely been buried by thousands of years of sedimentary deposits; recovery of such sites is likely unfeasible.

A field survey of the project area was recently conducted by Historic Preservation Associates (HPA). No sites reflecting early historic or prehistoric activities were located within the project area. HPA prepared a report, *Fourche Creek Nature Appreciation Facilities Historic Properties Review*, which provides details of the results of the survey.

3.4 Future Development

Audubon Arkansas and Little Rock Parks and Recreation do not currently have plans for future development until the acquisition of the 1,750-acre tract. Upon acquisition of the 1,750-acre

tract, the U.S. Army Corps of Engineers proposes construction of a nature appreciation facility with amenities such as foot trails, information signs, plant labels, a restroom, access road, parking area, and boardwalks and bridges into wet or swampy areas.

The acquisition of the tract would protect it from further encroachment by development and assist in the protection of natural resources of the site from detrimental effects associated with development (e.g., deterioration in air and water quality, degradation in habitat quality, etc.). Tract acquisition would also ensure that the floodwater storage capacity of the site would be retained indefinitely.

4.0 FUTURE WITHOUT PROJECT CONDITION

4.1 Condition of the Existing Facility (No Improvements)

4.1.1 Description

Fourche Bottoms is a unique and valuable component to the surrounding ecosystem. This 1,750-acre tract comprises the last remaining significant tract of natural bottomland hardwood forest in the Fourche Creek watershed. In recent years, Fourche Bottoms has become surrounded by industrial development. Without improvements, there would be further encroachment by development and decreased protection of natural resources at the site from detrimental effects associated with development (e.g., deterioration in air and water quality, degradation in habitat quality, etc.).

Additionally, the Fourche Creek watershed provides drainage to most of Pulaski County and part of Saline County. Fourche Bottoms, in turn, provides floodwater storage from the Fourche Creek drainage. Without the proposed acquisitions, there would be no certainty that the floodwater storage capacity of the site would be retained.

4.1.2 Estimated Impact Upon Annual Maintenance Activities and Costs

Entergy, the electrical provider, would still maintain the trees and shrubs along the right-of-way using a cycle maintenance program. A cycle refers to the number of growing seasons between prunings. Fourche Bottoms is on a 5-year cycle meaning that Entergy allows the trees to grow for four growing seasons, then prunes before the fifth growing season. Little Rock Parks and Recreation would not maintain the area.

4.1.3 Programmed Improvements

BFI Waste Services proposes to expand its Fourche Bottoms landfill. It would use dirt excavated from a 40-acre area to cap the landfill. Eighty three acres would be used for offices and a park with sports fields, a lake, wetlands, and wildlife habitat as reported in the Arkansas Democrat Gazette on April 3, 2005. After the landfill is closed in 14 years, nature trails would be built. Other development may encroach on the Fourche Bottoms area.

4.2 Biological Resources

4.2.1 Vegetation

The current vegetation community may be lost or dramatically change in species diversity and dominance due to encroaching development.

4.2.2 Wetlands

The encroaching development would affect the ability of wetlands to support a prevalence of vegetation typically adapted for life in saturated soil conditions in the current condition.

Although the riverine swamp, some of the bottomland hardwood, and the pond areas have been categorized as wetland habitat, the potential development would alter the structure of the current environment by potentially diminishing water quality. The ponds as well would be adversely affected.

4.2.3 Fisheries

Because of development, fish species would dramatically change in population size, diversity and dominance. The lower reaches of the creek already have decreased fish populations due to degraded conditions in water quality.

4.2.4 Wildlife

The wildlife population dynamics of Fourche Bottoms would change due to development. As above, wildlife would change in population size, diversity and dominance.

4.2.5 Wading Birds

With encroaching development, the water dynamics including water quality and fish species would change effecting wading birds of Fourche Bottoms.

4.2.6 Threatened and Endangered Species

Without the implementation of the project condition, federally and state listed species may be affected by potential development.

4.3 Cultural Resources

As no sites of significant cultural resources are known to exist within the project area, without-project conditions would have no significant impact on cultural resources.

4.4 Future Development

Audubon Arkansas and Little Rock Parks and Recreation do not currently have plans for future development. BFI Waste Services proposes to expand its Fourche Bottoms landfill. It would use dirt excavated from a 40-acre area to cap the landfill. Eighty three acres would be used for offices and a park with sports fields, a lake, wetlands, and wildlife habitat as reported in the Arkansas Democrat Gazette on April 3, 2005. After the landfill is closed in 14 years, nature trails would be built.

In recent years, Fourche Bottoms has become surrounded by industrial development. Without preservation, there would be further encroachment by development and decreased protection of natural resources from detrimental effects associated with development (e.g., deterioration in air and water quality, increased sedimentation, degradation in habitat quality, etc.). Additionally, there would be no certainty that the floodwater storage capacity of the site would be retained.

5.0 OBJECTIVES AND CONSTRAINTS

5.1 Objectives

The primary objectives for this project are to preserve the remaining natural setting of the Fourche Bayou Basin, to provide floodwater storage, and to provide a nature appreciation facility on the site to showcase the abundant natural resources and beauty of the area.

5.2 Problems and Constraints

During the formulation of alternative plans to meet the project objective, several problems and constraints were identified. These issues influenced the types of measures considered, led to new measures that would resolve problems caused by a plan, or resulted in the rejection of certain measures.

5.2.1 Access

Access to the site is limited. Two interchanges from Interstate 30 provide approaches to the east and southeast sides of the project site. Automobile access to the west side of the project area is restricted by railroad levees and a landfill. The project area can be accessed from the west via Mabelvale Pike, through Benny Craig Park, and also through Fourche Creek via watercraft.

5.2.2 Potential Cultural Resources

Cultural resources are abundant in the vicinity of the project area, given the proximity to the city of Little Rock, a key site in the history of the settlement of Arkansas. The Fourche Bayou Basin, which contains the project area, is the site of 28-recorded archaeological sites. These sites are believed to represent a small portion of the total number of cultural resource sites of significance. A field survey of the project area was conducted by Historic Preservation Associates (HPA). No sites reflecting early historic or prehistoric activities were located within the project area. HPA has prepared a report on the results of the survey.

5.2.3 Business Facilities

A well-maintained light industrial park is located on the entrance road on the southeastern border of the project area. No business facilities are located within the proposed nature appreciation facility.

5.2.4 Utilities

The project area is intersected by utility rights-of-way containing electrical power lines and storm sewer corridors. Entergy is the electrical utility provider within this project area and provides maintenance of vegetation along the rights-of-way using a cycle maintenance program. The electrical power lines are suspended and occur in deforested cut swaths. The storm sewer corridors are primarily underground, with above grade access manholes.

5.2.5 Noise

The project area is bounded by two lines of the Missouri Pacific Railroad on the west and Interstate 30 on the southeast. Railroad activity results in loud but intermittent noise activity. Interstate traffic creates noise that, while constant, dissipates rapidly with distance. The interior of the project area is relatively free of noise.

5.2.6 HTRW Concerns

Engineer Regulation (ER) 1165-2-132 obliges the Corps of Engineers to assume responsibility for the reasonable identification and evaluation of all hazardous, toxic, and radioactive waste (HTRW) contamination within the vicinity of the proposed action. A preliminary assessment of potential HTRW sites within the Fourche Bottoms acquisition area was prepared in February 1998. The executive summary of this preliminary assessment and a map of all sites of concern are included as Attachment A.

The investigation of potential HTRW sites examined 2,100 acres of bottomland proposed for purchase through a cost-sharing agreement between the city of Little Rock and the Corps of Engineers. The area was divided into sectors for reporting and examination purposes. Sites that posed little to no threat to the human and natural environment were eliminated from further consideration. Sixteen sites were identified that would require further investigation before the acquisition of the designated acreage would take place. These sites are presented in Table 5.

Samples were collected from these sites in a 2002 investigation performed by the Corps. The *Fourche Creek Bottomlands Environmental Investigation,* published in September 2002, contains the results of the investigation. Of the 16 sites surveyed, two (sites 5.2 and 6.1) were found to contain items of significant HTRW concern. The areas around these two sites were subsequently eliminated for consideration for acquisition. Out of the area investigated, 1,750 acres were identified as being suitable for acquisition. The *Fourche Creek Bottomlands Environmental Investigation* is included as Attachment B.

Table 5. HTRW Sites Recommended For Additional Investigation

Sector	Site	Location description
1	1.1	South of automobile salvage operations west of University Avenue
2	2.1	Machine Tools Inc. on Mabelvale Pike
	2.2	Elrod's Imports on Mabelvale Pike
3	3.1	Glen Daniel Transmission on Mabelvale Pike
	3.2	Twin City Trucking on Mabelvale Pike
	3.3	Discolored discharge from Quality Foods
	3.4	Septic discharge from Quality Foods
	3.5	Oil release from Odum Sausage
	3.6	Ponds south of Wessel Brothers
	3.7	Down-gradient from Jimelco Site
4	4.1	Septic discharge from Brown Packing Company
	4.2	Oil release (2 locations) from Pirelli Tire
	4.3	Discharged paint material north of 60th Street
5	5.1	South of Arkla Gas compressor station
	5.2	Closed landfill west of Interstate Park
6	6.1	Particulate accumulation south of quarry

Source: USACE-LRD, Preliminary Assessment; Potential HTRW Sites at Fourche Bottomland Acquisition Acreage, February 1998.

5.2.7 Water Quality Concerns

Although high water quality can be found in the upper reaches of Fourche Creek, water quality degrades in the direction of Fourche Bottoms. The poor water quality in the lower reaches of Fourche Creek is attributed to runoff from the surrounding urban area. Water quality in the lower reaches is further aggravated by regional topography. The basin occupies a topographic low, which results in the temporary impoundment of runoff waters and the subsequent deposition of *in situ* trash, debris, and silt.

Samples taken near the site of the proposed action show elevated levels of phosphorus, fecal coliform bacteria, biochemical oxygen demand (BOD), and turbidity as well as decreased levels of dissolved oxygen. Urban runoff and sewage contamination are often associated with these conditions.

The Arkansas Department of Economic Quality (ADEQ) has two monitoring stations on Fourche Creek: Station ARK0130, located at I-430 Bridge in Little Rock, and Station ARK013, located at I-440 Bridge in Little Rock. The data presented in tables 6 through 9 was collected from ARK0130; both stations exhibit similar data.

The United States Geological Survey (USGS) and other agencies collected samples for water quality analysis of Fourche Creek in October 2002 in observance of 30th anniversary of the Clean Water Act. Samplings were collected at Hindman Park in southwestern Little Rock; the data from sample analysis is presented in Table 10.

Table 6. Water Quality Data for Fourche Creek (I)

Date Collected	12/8/1998							
Aluminum:	301.1	µg/L	**Arsenic:**	BDL	µg/L	**Barium:**	34.5	µg/L
Beryllium:	BDL	µg/L	**Boron:**	17.6	µg/L	**Cadmium:**	BDL	µg/L
Calcium:	13.6	mg/L	**Chromium:**	BDL	µg/L	**Cobalt:**	BDL	µg/L
Copper:	1.59	µg/L	**Iron:**	496.7	µg/L	**Lead:**	0.30	µg/L
Magnesium:	3	mg/L	**Manganese:**	48.4	µg/L	**Nickel:**	BDL	µg/L
Potassium:	2.5	mg/L	**Selenium:**	BDL	µg/L	**Silver:**		µg/L
Sodium:	5.3	mg/L	**Vanadium:**	BDL	µg/L	**Zinc:**	4.9	µg/L
Hardness:	46	mg/L						
Date Collected	2/16/1999							
Aluminum:	137.0	µg/L	**Arsenic:**	BDL	µg/L	**Barium:**	30.3	µg/L
Beryllium:	BDL	µg/L	**Boron:**	10.0	µg/L	**Cadmium:**	BDL	µg/L
Calcium:	11.5	mg/L	**Chromium:**	0.61	µg/L	**Cobalt:**	BDL	µg/L
Copper:	1.26	µg/L	**Iron:**	330.5	µg/L	**Lead:**	BDL	µg/L
Magnesium:	3.1	mg/L	**Manganese:**	90.2	µg/L	**Nickel:**	BDL	µg/L
Potassium:	1.8	mg/L	**Selenium:**	BDL	µg/L	**Silver:**		µg/L
Sodium:	4.1	mg/L	**Vanadium:**	BDL	µg/L	**Zinc:**	4.1	µg/L
Hardness:	41	mg/L						
Date Collected	4/20/1999							
Aluminum:	131.3	µg/L	**Arsenic:**	BDL	µg/L	**Barium:**	28.6	µg/L
Beryllium:	BDL	µg/L	**Boron:**	15.4	µg/L	**Cadmium:**	BDL	µg/L
Calcium:	9.6	mg/L	**Chromium:**	BDL	µg/L	**Cobalt:**	BDL	µg/L
Copper:	1.33	µg/L	**Iron:**	463.5	µg/L	**Lead:**	0.30	µg/L
Magnesium:	2.7	mg/L	**Manganese:**	87.0	µg/L	**Nickel:**	BDL	µg/L
Potassium:	BDL	mg/L	**Selenium:**	BDL	µg/L	**Silver:**		µg/L
Sodium:	4.1	mg/L	**Vanadium:**	BDL	µg/L	**Zinc:**	2.9	µg/L
Hardness:	35	mg/L						
Date Collected	6/8/1999							
Aluminum:	155.7	µg/L	**Arsenic:**	BDL	µg/L	**Barium:**	31.0	µg/L
Beryllium:	BDL	µg/L	**Boron:**	21.4	µg/L	**Cadmium:**	BDL	µg/L
Calcium:	14.0	mg/L	**Chromium:**	BDL	µg/L	**Cobalt:**	BDL	µg/L
Copper:	0.54	µg/L	**Iron:**	580.6	µg/L	**Lead:**	BDL	µg/L
Magnesium:	2.9	mg/L	**Manganese:**	116.7	µg/L	**Nickel:**	BDL	µg/L
Potassium:	1.2	mg/L	**Selenium:**	BDL	µg/L	**Silver:**		µg/L
Sodium:	4.4	mg/L	**Vanadium:**	BDL	µg/L	**Zinc:**	1.2	µg/L
Hardness:	47	mg/L						
Date Collected	8/24/1999							
Aluminum:	BDL	µg/L	**Arsenic:**	1.12	µg/L	**Barium:**	26.2	µg/L
Beryllium:	BDL	µg/L	**Boron:**	25.3	µg/L	**Cadmium:**	BDL	µg/L
Calcium:	17.6	mg/L	**Chromium:**	BDL	µg/L	**Cobalt:**	BDL	µg/L
Copper:	BDL	µg/L	**Iron:**	241.0	µg/L	**Lead:**	BDL	µg/L
Magnesium:	4.1	mg/L	**Manganese:**	83.4	µg/L	**Nickel:**	BDL	µg/L
Potassium:	2.4	mg/L	**Selenium:**	BDL	µg/L	**Silver:**		µg/L
Sodium:	5.5	mg/L	**Vanadium:**	BDL	µg/L	**Zinc:**	19.7	µg/L

Table 6 (cont'd). Water Quality Data for Fourche Creek (I)

Date Collected	10/23/2001							
Hardness:	61	mg/L						
Aluminum:	BDL	µg/L	**Arsenic:**	BDL	µg/L	**Barium:**	42.5	µg/L
Beryllium:	BDL	µg/L	**Boron:**	28.3	µg/L	**Cadmium:**	BDL	µg/L
Calcium:	12.7	mg/L	**Chromium:**	BDL	µg/L	**Cobalt:**	BDL	µg/L
Copper:	1.34	µg/L	**Iron:**	198.0	µg/L	**Lead:**	BDL	µg/L
Magnesium:	3.0	mg/L	**Manganese:**	134.0	µg/L	**Nickel:**	BDL	µg/L
Potassium:	1.5	mg/L	**Selenium:**	BDL	µg/L	**Silver:**		µg/L
Sodium:	4.8	mg/L	**Vanadium:**	BDL	µg/L	**Zinc:**	3.7	µg/L
Hardness:	44	mg/L						
Date Collected	1/29/2002							
Aluminum:	BDL	µg/L	**Arsenic:**		µg/L	**Barium:**	VOID	µg/L
Beryllium:	BDL	µg/L	**Boron:**	VOID	µg/L	**Cadmium:**		µg/L
Calcium:	8.4	mg/L	**Chromium:**		µg/L	**Cobalt:**		µg/L
Copper:		µg/L	**Iron:**	168.0	µg/L	**Lead:**		µg/L
Magnesium:	2.2	mg/L	**Manganese:**	69.8	µg/L	**Nickel:**		µg/L
Potassium:	0.9	mg/L	**Selenium:**		µg/L	**Silver:**		µg/L
Sodium:	6.1	mg/L	**Vanadium:**		µg/L	**Zinc:**	VOID	µg/L
Hardness:	30	mg/L						
Date Collected	3/26/2002							
Aluminum:	136	µg/L	**Arsenic:**	BDL	µg/L	**Barium:**	27	µg/L
Beryllium:	BDL	µg/L	**Boron:**	12.8	µg/L	**Cadmium:**	BDL	µg/L
Calcium:	7.1	mg/L	**Chromium:**	0.49	µg/L	**Cobalt:**	0.5	µg/L
Copper:	1.54	µg/L	**Iron:**	305	µg/L	**Lead:**	BDL	µg/L
Magnesium:	1.7	mg/L	**Manganese:**	55.5	µg/L	**Nickel:**		µg/L
Potassium:	0.7	mg/L	**Selenium:**	BDL	µg/L	**Silver:**		µg/L
Sodium:	2.5	mg/L	**Vanadium:**	BDL	µg/L	**Zinc:**		µg/L
Hardness:	25	mg/L						
Date Collected	5/22/2002							
Aluminum:	BDL	µg/L	**Arsenic:**		µg/L	**Barium:**	32.3	µg/L
Beryllium:	BDL	µg/L	**Boron:**	16.7	µg/L	**Cadmium:**		µg/L
Calcium:	12.1	mg/L	**Chromium:**		µg/L	**Cobalt:**		µg/L
Copper:		µg/L	**Iron:**	410	µg/L	**Lead:**		µg/L
Magnesium:	3.1	mg/L	**Manganese:**	107	µg/L	**Nickel:**		µg/L
Potassium:	1.2	mg/L	**Selenium:**		µg/L	**Silver:**		µg/L
Sodium:	4.2	mg/L	**Vanadium:**		µg/L	**Zinc:**	2.7	µg/L
Hardness:	43	mg/L						
Date Collected	7/30/2002							
Aluminum:	BDL	µg/L	**Arsenic:**	1.24	µg/L	**Barium:**	34.6	µg/L
Beryllium:	BDL	µg/L	**Boron:**	29.1	µg/L	**Cadmium:**	BDL	µg/L
Calcium:	16.6	mg/L	**Chromium:**	BDL	µg/L	**Cobalt:**	BDL	µg/L
Copper:	1.02	µg/L	**Iron:**	179.0	µg/L	**Lead:**	BDL	µg/L
Magnesium:	3.7	mg/L	**Manganese:**	32.0	µg/L	**Nickel:**	BDL	µg/L
Potassium:	2.3	mg/L	**Selenium:**	BDL	µg/L	**Silver:**		µg/L
Sodium:	5.4	mg/L	**Vanadium:**	BDL	µg/L	**Zinc:**	10.2	µg/L
Hardness:	57	mg/L						

Source: ADEQ, 2003.

Table 7. Water Quality Data for Fourche Creek (II)

Date Collected	Ammonia mg/L	NO2 NO3_N mg/L	Ortho-phosphate	Total P mg/L	TKN mg/L	TOC mg/L	BOD mg/L	Turbidity NTU	TSS mg/L	TDS mg/L
10/27/1998	0.03	0.047	0.012	0.027	0.278	6.5	0.7	6	2.5	81
12/8/1998	BDL	0.115	0.017	0.057	0.674	8.3	1.4	23	9	89
2/16/1999	BDL	0.082	0.008	0.027	0.352	4.6		8.1	5.5	75
4/20/1999	0.041	0.081	0.015	0.033	0.305	4.9	1.04		4.5	73
6/8/1999	BDL	0.072	0.008	0.064	0.764	6.05	2.68	7.5	8.5	81
8/24/1999	BDL	0.024	BDL	0.09	1.054	5.86	3.99	12	26.5	91
10/23/2001	BDL	0.046	0.061	BDL	0.48	5.635	1.53	8.6	8	81
1/29/2002	BDL	0.15	0.01	BDL	0.353	4.487	0.55	13	8.5	67
3/26/2002	0.017	0.1	0.013		0.72	6.8	1.26	43	24.3	71
5/22/2002	0.014	0.094	0.006	0.05	0.571	4.379	1.17	9	8	79
7/30/2002	BDL	0.057	BDL	0.883		6.47	Void	8.2	10	96

Source: ADEQ, 2003.

Table 8. Water Quality Data for Fourche Creek (III)

Date Collected	DO mg/L	pH	Water Temp ◦C	Chloride mg/L	Sulfate mg/L	Bromide mg/L	Fluoride mg/L
10/27/1998	17.71	7.03	16	4.46	8.85	BDL	0.15
12/8/1998		6.98	14	5.09	11.4	BDL	0.118
2/16/1999	11.49	7.09	11	4.88	10.7	0.063	0.098
4/20/1999	7.1	7.49		3.44	8.13	0.075	0.131
6/8/1999	8.4	5.64	28	3.48	6.4	0.039	0.217
8/24/1999	9.45	7.73	32	5.53	6.43	0.073	0.329
10/23/2001	5.8	6.86	20	5.43	17.78	0.05	0.13
1/29/2002	9.6	6.08	12	4.32	10.43	0.03	0.11
3/26/2002	9.8	7.29	12	2.93	6.97	BDL	0.12
5/22/2002		7.05	21	4.11	8.46	0.02	0.15
7/30/2002	8.08	7.5	29	4.08	8.42	0.04	0.2

Source: ADEQ, 2003.

Table 9. Fecal Coliform Values for Fourche Creek

Date Collected	Fecal Coliform Colonies/100 mL
4/22/98	100
5/6/98	~8
6/9/98	116
7/15/98	>600
7/29/98	~66
8/26/98	~11
9/10/98	~11
10/1/98	~14
10/27/98	~46
12/8/98	>660
2/16/99	~83
4/20/99	220
6/8/99	~56
8/24/99	~64

Source: ADEQ, 2003.

Table 10. USGS Water Quality Data of Fourche Creek

Parameter	Value
pH (SU)	7.0
Temperature (˚C)	15.0
Turbidity (NTU)	8.6
Dissolved oxygen (mg/L or ppm)	8.5
Fecal coliform bacteria (cols./100 mL)	129

Source: USGS, 2003.

ADEQ has not categorized the waters of Fourche Creek. The *2002 Integrated Water Quality Monitoring and Assessment Report* does not contain any discussion on water quality of Fourche Creek. According to Mr. Bill Keith of the ADEQ Water Division, no fish tissue data exist for the determination of a fish consumption advisory. Mr. Keith stated that if water quality data for Fourche Creek are analyzed according to the *Assessment Criteria*, some conclusions can be drawn about Fourche Creek's supporting conditions. A comparison of the above data with the *Assessment Criteria* supplied in the report *Water Quality Limited Waterbodies-303(d) List-2002* suggests that aquatic life use, primary and secondary contact and agricultural or industrial uses are supported.

6.0 ALTERNATIVES

6.1 Process

The process of alternatives analysis proceeded through a series of steps detailed below:

1. Identification of alternatives;
2. Review and refinement of alternatives;
3. Development of practical alternatives in greater details;
4. Comparative evaluation; and
5. Recommended improvement plan.

The alternatives considered in the analysis were the following:

a. Alternative 1: Existing Alignment and Profile with Single Track Road and Pullouts
b. Alternative 2: Existing Alignment and Profile with Dual Track Road and No Pullouts

6.2 Design Criteria

This section provides a description of the relevant design criteria to be incorporated into the definition and depiction of the study alternatives. The design criteria discussed in this section are as follows:

a. Roadway/Parking
b. Structures
c. Drainage
d. Other

6.2.1 Roadway/Parking

An access road with two parking facilities is proposed for the nature appreciation facility. These features will be in accordance with the guidelines of the American Association of State Highway and Transportation Officials (AASHTO) and will include appropriate ADA parking facilities. Paved surface or an aggregate/crushed stone surface was considered for the access road and parking areas. Because of backwater flooding, poor subgrade, construction and maintenance concerns, and stormwater runoff issues, the aggregate/crushed stone surface was selected for further design consideration. The ADA parking facilities, however, will be paved.

6.2.2 Structures

Required structures for the nature appreciation facility include restrooms (two toilet stalls and one sink each for men and women) and a culvert/bridge under the road. The road bridge/culvert will be in accordance with AASHTO requirements. Restrooms will be in accordance with ADA guidelines. **Note: The restroom and associated utilities was removed as a project feature at the request of the city of Little Rock to lower its share of project costs.**

6.2.3 Other

Other features of the proposed nature appreciation center include foot trails with boardwalks over low areas and water bodies, drinking fountains, signage, and boardwalk overlooks and interpretive kiosks.

ADA provides Accessibility Guidelines for trails designed and constructed for pedestrian use. Under these guidelines, an accessible trail must meet the following minimum technical provisions:

- Clear tread width: 36" maximum.
- Tread obstacles: 2" high maximum (up to 3" high where running and cross slopes are 5 percent or less).
- Cross slope: 5 percent maximum.
- Running slope (trail guide) meets one or more of the following:
    - 5 percent or less for any distance;
    - Up to 8.33 percent for 200' maximum (resting intervals $\leq$ 200' apart);
    - Up to 10 percent for 30' maximum (resting intervals 30');
    - Up to 12.5 percent for 10' maximum (resting intervals 10').
- No more than 30 percent of the total trail length may exceed a running slope of 8.33 percent.
- Passing space provided $\leq$ 100' where trail width is less than 60".
- Signs provided indicating the length of the accessible trail segment.

6.3 Alternative 1

This alternative involves retaining the existing alignment and profile of the access road. The road would be surfaced with aggregate or crushed stone and filled as necessary. The road would be a single-track road with pullouts placed at strategic intervals to allow approaching vehicles to safely pass each other. Two ADA-accessible parking areas with restrooms would be constructed along the roadway. Nature appreciation facilities would be constructed adjacent to the roadway. The facilities would contain approximately three miles of hiking trails, of which 0.5 mile would be ADA accessible; a boardwalk trail, and boardwalk overlooks along borrow ponds; and an open air visitor center/kiosk.

6.4 Alternative 2

This alternative is identical to Alternative 1, with the exception that the access road would be a dual track road without pullouts, allowing approaching vehicles to safely pass each other.

6.5 Required Features

6.5.1 Flush/Composting/Vault Toilet

The Scope of Work identifies a restroom facility (two toilet stalls, one sink each for men and women) to be included in the engineering appendix. Further guidance from the Little Rock District recommended flushing toilets for this facility. Several challenges exist to implement this recommendation. **Note: Due to cost considerations, the flush restroom will not be included.**

Recommendations from park planners suggest not locating interpretive facilities, comfort (restroom) facilities, or parking facilities near the park entrance. Location of these facilities within the park would facilitate a greater immersion experience with regard to the park's natural setting.

In an effort to minimize the length of pipe needed for water service, the recommended flush toilet location lies approximately 3,000 ft from the entrance gate rather than at the cul-de-sac parking near the northernmost utility right-of-way.

The flush toilet facility is proposed to be ADA accessible. However, the 100-year flood level at the project site is approximately 14 ft. In order to accommodate ADA and flooding concerns, the restroom facility's first floor elevation would have to be elevated to 255 ft NGVD (natural ground elevation is approximately 240 ft NGVD). This elevation would require approximately 200 ft of ramps and landings to provide ADA access.

An alternative to this action, if allowed, is slab construction of the restroom in the flood zone. However, monthly inundation from backwater flooding would shorten the functional life of the facility and increase the operation and maintenance cost as well as hasten the replacement of the facility.

A further option/alternative/addition to the flush toilet facility is the emplacement of a vault toilet. The standard for this device must not be less than those established by the American National Standards Institute, Inc. (ANSI) Z4.3-1979 *Minimum Requirements for Non-Water Carriage Disposal Systems* or its subsequent revisions.

Toilet buildings and restrooms provide as much visitor contact as visitor centers. These facilities greatly influence visitors' impressions of the nature appreciation center. Additional criteria considered in siting toilet buildings for Fourche Creek include the following:

- Facilities should be designed suitable to the context, from highly detailed designs in highly developed and visible areas to more utilitarian designs in less developed and less visible areas.

- Vegetation, rock outcrops, boulders, or screens can be used to buffer views of more utilitarian structures.

- Restrooms should be placed locations convenient to parking areas and trailheads and within functional needs of service vehicles.

- Placements that dominate or disrupt attractive views or vistas while allowing visitors easy identification of location should be avoided.

- Restrooms should be located away from stream corridors, rivers, wetlands, or lakes in accordance with state water quality standards.

- To optimize ventilation of vault toilet buildings, an unobstructed airflow should be ensured across the top of the vent pipe and near the wall vent.

- A shut-off valve would be needed on the associated sewer line with an electronic control to shut the valve in the event that the valve becomes submerged before it closes.

- Backflow procedures would be required to seal the park's water lines from their supply during a flood.

- Where possible, toilet buildings should be located downwind of other developments and use areas.

The vault toilet facility proposed at the cul-de-sac parking lot near the northeast corner of the project area would be designed to be ADA accessible but not flood proof. The recommendation for the facility is to provide an environmentally sound and aesthetically pleasing enclosure surrounding readily available ADA accessible Port-o-Lets. The Port-o-Lets would be removed and replaced during and after flood events.

6.5.2 Boardwalk Trail and Interpretive Panel

A boardwalk trail will be constructed along the borrow ponds in the southeastern portion of the project area. An interpretive panel has been proposed for the southernmost borrow pond. The panel would allow visitors to observe waterfowl and other wildlife at close proximity without disturbing them.

6.5.3 0.5-Mile ADA Accessible Trail

Approximately 0.5 mile of the proposed hiking trails will be constructed in accordance with ADA guidelines. The ADA-accessible trail will provide access to the nature appreciation facilities' boardwalks, fishing piers, and interpretive panels located on the borrow ponds as well as provide access to features of key natural and/or aesthetic interest.

7.0 MITIGATION AND MONITORING MEASURES

Mitigation is not anticipated due to the ecosystem restoration purpose of the project. If mitigation requirements are identified, they will be incorporated into the final design.

8.0 RECOMMENDED PROJECT

The recommended project involves retaining the existing alignment and profile of the access road. The road would be paved and filled as necessary. The road would be a single-track road with pullouts placed at strategic intervals to allow approaching vehicles to safely pass each other. Two ADA-accessible parking areas **(one with a restroom)** would be constructed along the roadway. Nature appreciation facilities would be constructed adjacent to the roadway. The facilities would contain approximately three miles of hiking trails, of which 0.5 mile would be ADA accessible; a boardwalk trail, and interpretive panel along borrow ponds; and an open-air visitor center/kiosk (Figure 6).

9.0 FEATURES OF THE RECOMMENDED PLAN

Designs for features of the Recommended Plan are presented in attachments C and D to this Engineering Appendix. Attachment C contains plans and profiles of the proposed roadways and paths. Attachment D contains designs for the nature appreciation facilities structures.

9.1 Description

Upon acquisition of the Fourche Bottoms land tract, a design for the nature appreciation facilities would be implemented. The proposed location of the facilities is between the Missouri Pacific railroad to the west and Interstate Highway 30 to the east and south. Conceptual design and materials would provide the least amount of impact to the habitat designated for proposed activities within Fourche Bottoms. Construction would be subject to best management practices and limitations regarding acceptable weather conditions. Several of the proposed facilities would be created in accordance with ADA standards of accessibility.

Any future trails beyond those detailed in this section are not part of the recommended plan. No equestrian trails are proposed in this Engineering Appendix.

9.2 Roadways

Entry to the facilities would be at the southeast from the east end of 60th Street. This location would provide the facilities with an entrance distinct from surrounding facilities. To minimize impacts, existing roads would be utilized. However, an upgrade in road conditions, including the entrance, may be required due to deteriorated road conditions. Paving and fill would be limited to the extent possible. Two parking lots would be placed at key points along the existing roadway. Parking areas and roads would be designed to minimize the impact to the current hydrologic regime.

9.3 Toilet Facilities

Portable restroom facilities would be located by the main parking area in the northern utility right-of-way. Flush restroom facilities could be located near the entrance of the park to take

advantage of current sewer and water access but were deleted from the plan due to cost constraints.
Permanent restroom facilities would be constructed of typical concrete block above a concrete water table and split face concrete block below this water table. The structure would be roofed with architectural fiberglass shingles. A total of six double hung vinyl clad wood windows would be inset into the rear and side walls. Two acrylic skylights would be emplaced on each side of the roof. Steel doors with wood trim would provide entrance to each restroom. Two toilets and one sink would be installed in each restroom.

The portable restroom stalls would be modified with an environmentally suitable covering or housing to enhance their appearance. Rough sawn overhead and upright lumber is proposed. Both of these restroom facilities would be ADA accessible.

9.4 Boardwalk Bridges

Boardwalk overlook areas would be added to afford visitors the opportunity to view habitat and wildlife in areas that extend into shallow open water. These boardwalk areas would be located at the artificial lakes and along the ADA trail.

The boardwalks would be of picket-rail construction and would be supported by reinforced concrete piers. Vinyl covered wire mesh would be placed between rail posts. An interior width of 5’6” (exterior width 6’) is recommended. Helical piers would be used to anchor the boardwalks into the silt substrate. Anocised aluminum tube interpretive panels would be placed at strategic points along the boardwalks to indicate features of particular interest in the surrounding environment.

9.5 Interpretive Panel

An interpretive panel has been proposed for the southernmost borrow pond. The panel would allow visitors to observe waterfowl and other wildlife at close proximity without disturbing them. The panel would be ADA accessible and would contain an interpretive center to inform visitors of noteworthy features and wildlife visible from the panel.

The interpretive panel would be constructed to allow visitors to view the pond and its associated wildlife while blocking the wildlife’s view of the visitors. The panel would have a back and sides made of cypress with viewing slots arranged to provide a three-sided view of the pond. The panel would be supported on reinforced concrete piers. The panel would offer views from three different directions.

9.6 Fishing Pier (Future Phase by Others)

The fishing pier would be constructed of wood and would be supported by reinforced concrete piers. ADA-accessible fishing stations would be provided on the pier. A roof would be constructed in the center of the pier.

RECOMMENDED PLAN

Public Draft Engineering Appendix
Acquisition of Fourche Bottoms
and Development of Nature Appreciation Facility

LOSCO Little Rock Digital Orthophotos

GEC

Figure: 6
Date: September 2004
Scale:1:10,500
Source: LOSCO/GEC
Map Author: C. Perez

Back of Figure 6

9.7 Parking

Two parking facilities are proposed for the nature appreciation facilities.

The main parking area would be located along the north utility right-of-way (11 car spaces, one ADA car space, two bus spaces, with future parking space that can hold up to 27 car spaces). The parking area would be ovoid in shape. A landscape island would occupy the center of the parking area. Concrete walks would line the outside of the parking area to provide access to vehicles. Curb ramps would be provided along these walks at the sites of ADA parking spaces.

A secondary parking area would be located at the main entrance (nine car spaces, one ADA space, and one bus space). A continuous concrete curb would be constructed along the inside curve of the parking area, and a concrete walk would provide access to vehicles parked along the outside curve. Curb ramps would be provided along these walks at the sites of ADA parking spaces.

In accordance with ADA regulations, the facilities would be accessible to disabled people. Trail access points would be provided at each parking facility.

9.8 Three-Mile Trail

The proposed action calls for approximately three miles of hiking trails, 0.5 mile of which would be ADA accessible. The proposed trail system within the facilities consists of a main loop with an alternate spur. Trails would be designed to emphasize unique and interesting habitats and areas in the project area. Bridges would be provided for crossing the creek or areas that are frequently wet. Environmentally sound construction techniques and materials would be used to reduce impacts to habitat.

9.8.1 Trail Surface Materials

The vast majority of trails are unsurfaced (i.e., native soil). Trails should be surfaced only if absolutely necessary as the process is extremely labor intensive. Other issues to consider when choosing a surface material include: availability of the surface material, cost to purchase the material and install it, life expectancy, accessibility, cost of maintaining the surface, and user acceptance and satisfaction.

Native soil: Soft natural surfaces, including existing soil and vegetation, require less preparation than hard natural surfaces, but rocks, tree roots, and other obstructions require removal. Maintenance consists of correcting drainage problems, repairing eroded areas, and removing new vegetation. If a natural surface is well drained and properly sloped, it will last longer and serve its purpose well.

Wood and bark chips: Wood chips blend well with most natural surroundings and provide a comfortable substrate for foot traffic. However, this surface decomposes rapidly under prolonged exposure to the sun, heat, and humidity, requiring virtually continual maintenance to

maintain proper trail width and depth. Minimum thickness at the time of installation should be no less than three inches, and the entire surface will require replacement every two years.

Crushed stone: Crushed stone, or gravel, provides a smooth, firm, durable surface that is very suitable for trails with high use requirements. Crushed stone surfaces are more easily repaired than asphalt surfaces and the patched areas do not show. Gravel trail surfaces are suitable for a wide range of trail activities. Clay-gravel mixtures provide a trail surface that approaches asphalt or concrete in consistency and helps reduce the spreading seen on gravel-only trails. Sorted or pit run gravel is relatively inexpensive if locally available. This material compacts well and is durable and smooth.

Crushed limestone: Crushed limestone is similar to gravel surfaces. Limestone is generally rolled to provide a smooth surface suitable for most uses. The material must be graded regularly to maintain an even tread, however. Construction procedures are similar to those for gravel surfaces.

Soil cement: Soil cement produces a hard, durable trail surface by shallow mixing of parent material (preferably gravel) with cement and water. When properly "crowned," this tread will shed surface water with little or no erosion. The surface is suitable for heavily used trails.

Road Oyl®: Road Oyl® is an emulsion formulated with pine tree resin solids in suspension. Road Oyl® does not contain petroleum products and is considered an environmentally friendly surface treatment. Consideration of an environmentally suitable surface treatment was requested by the local sponsor. Road Oyl® is designed as a cold applied product and performs best when combined with dense graded aggregated materials. Road Oyl® was applied to the trail surface at the Lorance Creek Natural Area south of Little Rock. This application was the first use of the product in the state of Arkansas. The performance of the product is currently being evaluated. Road Oyl® is costly to produce and difficult to install. Additionally, the product does not appear to adapt well to a high-moisture environment.

Asphalt: Bituminous concrete, or asphalt, trails with a compacted gravel subbase are suitable for Type I foot and bicycle trails. Although development costs are high, annual maintenance cost for paved trails are much lower than for trails with other types of surface treatments.

Concrete: Portland Cement Concrete (PCC) surface depth for Class I recreational trails on natural subgrade or aggregate subbase should be four inches for an 8-ft path and a desirable five inches for a 10-ft path if periodic maintenance trucks use the path. Traverse joints should be cut at 8 ft and 10 ft, respectively. Normally a four-inch thick aggregate subbase or flyash treated subgrade is necessary when soils are of poor quality (i.e., CBR of less than three), are non-uniform, or exhibit high moisture content. Recreational trail pavements should be machine laid. Surface texture is needed but care must be exercised not to create operational problems with too little or too much texture. Broom finish or burlap drag concrete surfaces are preferred over towel finishes.

Other considerations: Designing and selecting pavement sections for recreational trails is in many ways similar to designing and selecting highway pavement sections. At a minimum, a

preliminary soils investigation should be constructed to determine the load carrying capabilities of the native soil and the need for any special provisions. Several basic principles should be followed to recognize some basic differences between the operating characteristics of trails and those of motor vehicles. Although loads on trails are substantially less than highway loads, paths should be designed to sustain without damage wheel loads of occasional emergency, patrol, maintenance, and other motor vehicles that are expected to use or cross the path. Special considerations should be given to the location of vehicle wheel loads on the path. Because wheel loading can cause edge damage that, in turn, will result in the lowering of the effective operating width of the path, adequate edge support should be provided. Edge support can be either in the form of stabilized shoulders in constructing additional pavement width at the edge, or in a thickened pavement edge.

9.9 0.5-Mile ADA Accessible Trail

Approximately 0.5 mile of the proposed hiking trails will be accessible to handicapped people in accordance with ADA guidelines. Proposed future ADA accessible trail will provide access to the boardwalks, fishing piers, and interpretive panels located on the borrow ponds. Additionally, the trail has been designed to pass through areas of unique and interesting habitats.

9.10 Typical Sections

Typical sections are provided in Plan/Profile Sheet 2.

9.11 Alignment

Alignment is provided in Plan/Profile Sheets 3-38. **Note: For cost considerations, the trail will end before crossing the last boardwalk on Path 1 North and 100 feet beyond the start of the last boardwalk on Path 1 South.**

9.12 Other Structures

9.12.1 Open Air Visitors Center/Kiosk

The open-air visitor center/kiosk is proposed as part of the park's signage and would be located along Fourche Creek in the northeast corner of the project area. The open-air design of the visitor center/kiosk would withstand all flood conditions. The kiosk would also be ADA accessible. Energy efficient systems for any exterior lighting would be used when practicable. Educational signage and exhibits would be posted to welcome and familiarize visitors with the habitat, wildlife, and ecological significance of the area. The interpretive panel would be placed on a rough sawn tongue and groove backing supported by rough sawn columns.

10.0 HYDROLOGY AND HYDRAULICS

Changes in the hydrologic regime in the project area can be found in the flood height difference analysis presented in Attachment E of the Engineering Appendix. Any fill required for the

proposed project will be taken as surface removals within the study area. No net loss of storage capacity will occur in the project area as a result of project implementation.

11.0 SURVEY MAPPING AND OTHER GEOSPATIAL DATA

Geospatial data is present in Attachment F to the Engineering Appendix.

12.0 GEOTECHNICAL DATA

Table 11 provides amplifying information about the primary soil series found in the vicinity of the project areas.

Table 11. Project Area Soils

Soil Name	Primary Series	Associated Series
Amy Silt Loam	Amy	Rexor
Amy-Urban Land Complex	Amy	Leadvale
Perry Clay	Perry	Latanier, Moreland, Umbraqualfs
Tiak-Urban Land Complex	Tiak	Leadvale, Smithdale

Source: Soil Survey of Pulaski County, Arkansas, 1975.

Soils in the project area are primarily poorly drained and level. Most of these soils were formed from either coastal plain sediments or from riverine deposits. Permeability ranges from moderate to very slow, with most series experiencing slow permeability. Water capacity is high in all cases.

Additional geotechnical data is provided in Appendix II of the *Fourche Bayou Basin, Vicinity of Little Rock, Arkansas Design Memorandum No. 1*. The conditions presented in this appendix remain current for the project area.

13.0 OPERATION AND MAINTENANCE

Entergy, the electrical provider, maintains the trees and shrubs along the right-of-way using a cycle maintenance program. A cycle refers to the number of growing seasons between prunings. Fourche Bottoms is on a 5-year cycle meaning that Entergy allows the trees to grow for four growing seasons, then prunes before the fifth growing season.

Operation Maintenance Repair Replacement and Rehabilitation (OMRR&R) quantities and costs for the Fourche Bottoms project for a 50-year period of analysis are estimated. Replacement of the structural items is estimated to occur at 25 years. Replacement of the access road, parking areas, and the ADA trail is estimated to occur at 15 years. The replacement period for the non-ADA trails and the boardwalks is estimated to be 20 years. These assumptions are very conservative because of poor site conditions and recurring backwater flooding. Therefore, each of these project components would require complete replacement at the assumed intervals.

Additionally, it should be noted that the sponsor will be responsible for the project OMRR&R for a period far beyond that of the period of analysis.

Roads and parking areas would require leveling and grading semi-annually at a minimum. Mowing of the access right-of-way, parking lots, and trail system would be required semi-annually.

The sewer line for the toilet buildings would require an electronic control to shut the valve in the event that the valve becomes submerged before it closes. Additionally, backflow procedures would be required to seal the park's water lines from their supply during a flood.

Little Rock Parks and Recreation does not currently maintain the area; however, upon the acquisition of the 1,750-acre tract, the operations and maintenance (O&M) costs will occur. There will be two mowing and cleanups every year costing $250 per acre. This would include the nature appreciation facilities with amenities such as foot trails, information signs, plant labels, restrooms, access road, parking area, and boardwalks and bridges into wet or swampy areas. The cost of the nature trail upkeep is approximately $10,000/mile/year with the occasional cut and debris removal. The occasional cleanup including trash and debris removal would occur after major community events and sporadic flooding. Included in this cost, the gate to the facilities would be closed at dusk and opened each morning. Additionally, the authorized plan provided a concentrated 20-acre area for the human experience - the remaining 1,730 acres had no trails or other recreation facilities and would not have been impacted by recreation activities. The current recommended plan no longer provides for a concentrated 20-acre nature appreciation area, but rather spreads an increased amount of recreation facilities and activities over approximately one third of the total site (approximately 600 acres). Because of this widespread areal extent, the concentration of human impacts would be lessened but would occur over a much larger area. Because of the increased impacts to a much larger area, closing the nature appreciation facilities from dusk to dawn would ameliorate the impacts.

14.0 TRAIL MAINTENANCE

In conjunction with the design and construction of the trail system, a maintenance manual will need to be developed. The manual should address the uniqueness of each route relative to its particular need for surfacing, railings, signage, trash removal and sweeping, tree and shrub pruning, mowing of vegetation and edging, drainage control, re-vegetation, and graffiti control. Several of the items that should be addressed are presented below.

The following items would be performed on a continuous, scheduled basis:

Trail user safety: Safety is central to all maintenance operations and is the single most important trail maintenance concern. Items for consideration include scheduling and documentation of inspections, the condition of railings, bridges and trail surfaces, proper and adequate signage, removal of debris, and coordination with others who may be associated with trail maintenance.

Trail inspections: Trail inspections are integral to all trail maintenance operations. Inspections should occur on a regularly scheduled basis, the frequency of which will depend on the amount

of trail use, location, age, and the type of construction. All trail inspections should be documented.

Trail sweeping: Trail sweeping is one of the most important aspects of trail maintenance, helping to ensure trail user safety. The type of sweeping to be performed depends on trail design and location. Sweeping should be performed on a regular schedule.

Trash removal: Trash removal from trail corridors is important from both a safety and an aesthetic viewpoint and includes the removal of ground debris and emptying of trash containers. Trash removal should take place on a regularly scheduled basis, the frequency of which would depend on trail use and locations.

Tree and shrub pruning: Tree and shrub pruning should be performed for the safety of trail users. Pruning should be performed to establish specifications on a scheduled and as-needed basis.

Mowing of vegetation: Trail maintenance personnel should mow vegetation along trail corridors on a scheduled basis.

Scheduling maintenance tasks: Inspections, maintenance, and repair of trail-related concerns should be regularly scheduled. Inspection and repair priorities should be dictated by trail use, location, and design. Scheduling maintenance tasks is a key item towards the goal of consistently clean and safe trails.

The following items would be performed on an irregular or as-needed basis:

Trail repair: Repair of asphalt or concrete trails should be closely tied to the inspection schedule. Setting priorities for repairs is part of the process. The time between observation and repair of a trail would depend on whether the needed repair is deemed a hazard, to what degree the needed repair will affect the safety of the trail user, and whether the needed repair can be performed by the trail maintenance crew or if contracted services will be required.

Trail replacement: The decision to replace a trail and type of replacement depends on many factors. These factors include the age of the trail and the money available for replacement. Replacement involves a new crushed limestone surface, completely overlaying a crushed limestone or asphalt trail with a new asphalt surface, or replacement of an asphalt trail with a concrete trail.

Weed control: Weed control along trails can be limited to areas in which certain weeds create a hazard to users. Environmentally safe weed removal methods should be used, especially along waterways.

Trail edging: Trail edging maintains trail width and improves drainage. Problem areas include trail edges where berms tend to build up and where uphill slopes erode onto the trails. Removal of this material allows proper draining of the trail surface, allows the flowing action of the water to clean the trail, and limits standby water on trail surfaces.

Trail drainage control: In places where low spots on the trail catch water, trail surfaces should be raised, or drains built to carry the water away. Boardwalks may also be constructed over these areas. Some trail drainage control can be achieved through the proper edging of trails. If trail drainage is corrected near steep slopes, the possibility of erosion must be considered.

Trail signage: Trail signs fall into two categories: safety and information. Trail users should be informed of their location with respect to important trail features and should also be informed of trail safety measures. Signs related to safety are most important; consequently, these signs should receive the highest priority. Information signage can enhance the trail users' experience. A system of trail information signage should also be a high priority.

Re-vegetation: Areas adjacent to trails that have been disturbed for any reason should be re-vegetated to minimize erosion.

Habitat enhancement and control: Habitat enhancement is achieved by planting vegetation (primarily trees and shrubs) along trails. Vegetation can improve trail aesthetics, help prevent erosion, and provide habitat for wildlife. An example of this process is the protection of trees along waterways from damage caused by beavers.

Graffiti control: Effective graffiti control is done through prompt observation and removal. During scheduled trail inspections, graffiti should be noted and removed as soon as possible.

15.0 QUANTITY ESTIMATES

Table 12 presents amplifying information on quantity estimates.

Table 12. Fourche Creek Nature Appreciation Center Quantity Estimates

Item	Unit	Quantity*
9" Concrete Road	SY	1451
Gravel Road	CY	1279
Base Course	CY	643
6' Sidewalk	LF	1042
Crusher Dust	CY	1304
6' Boardwalk#	LF	1115
8' Boardwalk	LF	40
9' Boardwalk	LF	100
Geotextile	SY	30855
30" RCP	LF	152
18" RCP	LF	380
12" RCP	LF	44
Water Line&	LF	3000
Sewer Line&	LF	120
Estimated Cut^	CY	3238

Item	Unit	Quantity*
Estimated Fill^	CY	2480
Parking Lot Demolition/ Clearing	LS	1
Port-o-Let with Structure	LS	1
Restroom with Sewer Connection&	SF	605
Remove Existing CMPs (2 Pipes 24")	LF	60
Helical Pier System Boardwalks	LF	1555
Entrance Landscape	LS	1
Entrance Gate and Fence	LS	1
Entrance Sign	EA	1
Light Poles	EA	3
Kiosk Structure	EA	2
Interpretive Sign	EA	16
Interpretive Sign Frame	EA	10
Identification Sign and Frame	EA	20
Trash Removal	LS	1
Site Entry Planning	LS	1
Landscape at Trailhead/Parking Facilities	LS	1

Note: CY = cubic yard; LS = lump sum; LF = linear foot; EA = each; SF = square foot

*Quantities may change in the course of the design process. #Boardwalk distance reduced by 210 feet.

^Trail shortened by 100 feet. &Removed

Source: GEC/MESA, 2004.

Quantity calculations are provided in Attachment G of the Engineering Appendix.

16.0 COST ESTIMATE

The cost estimate is provided in Attachment H of the Engineering Appendix. **It is estimated that the recreation features costs shown would be reduced by $440,000 with the flush restroom and its utilities removed along with 200-feet of boardwalk and 100-feet of trail and $3,000 added for road access. Also, the land costs would be $195,000 less by excluding the contingency and escalation costs associated with the already acquired land.**

17.0 CONCLUSIONS

The following items are to be included in the report:

- Single-track access road with pullouts at existing roadway elevation;
- Crushed stone surface treatment for all access roads, parking facilities (except ADA parking spaces), and non-ADA trails (the initial portion of the access road is to be concrete);

- Non-flush toilet facility at cul-de-sac parking facility;
- Portland Concrete Cement as surface for ADA trails (ADA trails are to be non-graded, minus ¼ aggregates/crushed stone);
- Boardwalks at trail crossings of low areas; and
- Informational signs/interpretive kiosks/plant labels at sites of interest.

18.0 REFERENCES

Arkansas Department of Environmental Quality, 2003. Surface Water Quality Monitoring Stations Data Files. Internet publication: http://www.adeq.state.ar.us/techsvs/water_quality/monitors.asp#Display

City of Little Rock, 1996. *Fourche Creek Park; Site Analysis and Conceptual Master Plan.* Department of Parks and Recreation, 18 pp.

U.S. Army Corps of Engineers, 1979. *Feasibility Report and Environmental Impact Statement for Water Resource Development, Volumes I-III*. Little Rock District, 3 volumes.

U.S. Army Corps of Engineers, 1985. *Fourche Bayou Basin; Vicinity of Little Rock, Arkansas; General Memorandum No. 1; General, Volumes I and II.* Little Rock District, 2 volumes.

U.S. Army Corps of Engineers, 1998. *Preliminary Assessment; Potential HTRW Sites at Fourche Bottomland Acquisition Acreage.* Little Rock District.

U.S. Department of Agriculture, 1975. *Soil Survey of Pulaski County, Arkansas.* National Resource Conservation Service, 65 pp.

U.S. Department of Agriculture, 1992. *Case Study No. 7: Transportation Potential and Other Benefits of Off-Road Bicycle and Pedestrian Facilities.* Federal Highway Administration, 58 pp.

U.S. Department of Agriculture, 1992. *Case Study No. 14: Benefits of Bicycling and Walking to Health.* Federal Highway Administration, 42 pp.

U.S. Department of Agriculture, 1993. *Case Study No. 15: The Environmental Benefits of Bicycling and Walking.* Federal Highway Administration, 78 pp.

U.S. Department of Agriculture, 1997. *Hand Tools for Trail Work.* USDA Forest Service, 54 pp.

U.S. Department of Agriculture, 1999. *Trail Traffic Counters Update*. USDA Forest Service, 8 pp.

U.S. Department of Agriculture, 2000. *Geosynthetics for Trails in Wet Areas: 2000 Edition.* USDA Forest Service, 18 pp.

U.S. Department of Agriculture, 2001. *Wetland Trail Design and Construction.* USDA Forest Service, 82 pp.

U.S. Department of Transportation, 2000. *Soil Stabilizers on Universally Accessible Trails*. USDA Forest Service, 8 pp.

U.S. Department of Transportation, 2001. *Designing Sidewalks and Trails for Access, Part II of II: Best Practices Design Guide.* Federal Highway Administration, 345 pp.

U.S. Fish and Wildlife Service, 2003. *Lists of Endangered, Threatened, Proposed and Candidate Species for the Southeast Region: County Lists.* Internet publication: http://southeast.fws.gov/es/county%20lists.htm

U.S. Geological Survey, 2003. *Arkansas District USGS News.* Internet publication: http://arkweb.er.usgs.gov/NEWS/news.html

Wetland Science Applications, 1995. *Ecological Report: Fourche Creek Study Area, Pulaski County, Arkansas.*