UPPER MISSISSIPPI RIVER SYSTEM-ENVIRONMENTAL MANAGEMENT PROGRAM (UMRS-EMP)

DEFINITE PROJECT REPORT (DPR) WITH INTEGRATED ENVIRONMENTAL ASSESSMENT

CUIVRE ISLAND

HABITAT REHABILITATION AND ENHANCEMENT PROJECT (HREP)

POOL 26
MISSISSIPPI RIVER
LINCOLN & ST. CHARLES COUNTIES, MISSOURI

FINAL

JULY 1994

US Army Corps
of Engineers
St. Louis District
Partners in Progress

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CUIVRE ISLAND HREP

EXECUTIVE SUMMARY

The Cuivre Island Habitat Rehabilitation and Enhancement Project is part of the Upper Mississippi River System-Environmental Management Program. The project is located on the Missouri side of the Mississippi River, in Pool 26, about 5 miles downstream of Lock & Dam No. 25. The project area consists of Cuivre Island, Cuivre Slough, Turkey Island chute, and a mainland tract adjacent to Cuivre Island.

The project area includes land owned by the Federal government, the State of Missouri, and private landowners. The U.S. Army Corps of Engineers acquired about 70% of the western portion of the island to mitigate for habitat losses associated with the Melvin Price Locks and Dam. The Missouri Department of Conservation acquired the remainder of the island and a tract on the mainland for boat access to Cuivre Slough. The St. Louis District has issued a license to the Missouri Department of Conservation (MDOC) to manage Corps land on Cuivre Island for fish and wildlife purposes.

Problems occurring at the project area are high rates of sedimentation in the Cuivre Slough side channel and Turkey Island chute, sedimentation on Cuivre Island, lack of deep water in Cuivre Slough during winter and summer, limited water control capability on Cuivre Island, and loss of marsh habitat in the vicinity of the project area.

The objectives of this project are to restore habitat diversity to benefit fish and wildlife species by: maintaining and improving side channel habitat by preventing river-borne sediment from filling side channels, providing overwintering and summer habitat for fish in side channels, increasing habitat quality and quantity of artificially flooded habitats for wetland-dependent wildlife, increasing diversity of wetland types, and maintaining and improving habitat quality and quantity of bottomland forest within the project area.

The measures available to address the problems include: dredging of side channels, lakes, and sloughs; dike and levee construction; side channel openings and closures; aeration and water control systems; agitation dredging techniques; timber or tree stand improvement measures; reforestation of cropland; and acquisition of wildlife lands for wetland restoration and protection.

This report documents the formulation of specific management measures and evaluates them as to their acceptability to the non-Federal sponsor (MDOC), their completeness, their effectiveness, and their cost per habitat benefit efficiency.

The recommended plan consists of 6 measures: improvements to the green tree reservoir on Cuivre Island, construction of 6 dikes on Cuivre Island in Cuivre Slough, removal of a portion of a submerged dike in Cuivre Slough, tree stand improvements and reforestation measures on Cuivre Island, and propwash dredging of Turkey Island chute.

Habitat enhancements from the project are estimated to provide a net gain of 788 average annual habitat units (AAHUs) for wildlife and 266 AAHUs for fishes. Initial costs for the project are estimated to be about $1,473,000, and annual operation, maintenance and rehabilitation costs are about $17,000.

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CUIVRE ISLAND HREP

1. INTRODUCTION

A. PURPOSE OF REPORT. The purpose of this Definite Project Report (DPR) is to present a detailed proposal for the restoration of fish and wildlife habitat resources at the project area. This includes rehabilitation and enhancement of wetlands. This report provides planning, engineering, and sufficient construction details of the Recommended Plan to allow final design and construction to proceed subsequent to approval of this document. The Environmental Assessment (EA) for the project is integrated with this DPR. A section is devoted to the Finding of No Significant Impact (FONSI).

B. PROJECT AUTHORITY. The authority for this Definite Project Report is provided by the 1985 Supplemental Appropriations Act (Public Law 99-88) and Section 1103 of the Water Resources Development Act of 1986 (Public Law 99-662). The proposed project would be funded and constructed under this authorization. Section 1103 reads as:

> Section 1103. UPPER MISSISSIPPI RIVER PLAN.
>
> (a)(1) This section may be cited as the "Upper Mississippi River Management Act of 1986".
>
> (2) To ensure the coordinated development and enhancement of the Upper Mississippi River system, it is hereby declared to be the intent of the Congress to recognize that system as a nationally significant ecosystem and a nationally significant commercial navigation system. Congress further recognizes that the system provides a diversity of opportunities and experiences. The system shall be administered and regulated in recognition of its several purposes.
>
> . . .
>
> (e)(1) The Secretary, in consultation with the Secretary of the Interior and the states of Illinois, Iowa, Minnesota, Missouri, and Wisconsin, is authorized to undertake, as identified in the Master Plan -
>
> (A) a program for the planning, construction, and evaluation of measures for fish and wildlife habitat rehabilitation and enhancement;
>
> . . .

C. GENERAL POLICY ON COST SHARING.

- Study costs through the preparation of the final DPR are 100% Federally funded.
- Engineering and design, supervision and administration, and construction costs are shared 75% Federal / 25% non-Federal.
- Operation, Maintenance & Rehabilitation are borne 100% by the local sponsor.

D. HISTORY OF UMRS-EMP.

The following text in this Section and Sections E and F is taken almost directly from the U.S. Army Corps of Engineers, North Central Division's Upper Mississippi River System-Environmental Management Program Midterm Evaluation Report, August 1992.

The Upper Mississippi River System-Environmental Management Program (UMRS-EMP) had its origins in a controversy that developed in conjunction with the Corps of Engineer's proposal in the early 1970's to construct twin 1,200-foot locks at the Locks and Dam 26 replacement project. Some individuals and groups perceived a conflict between further development of the navigation system and maintenance of the environmental values of the Upper Mississippi River System. The GREAT (Great River Environmental Action Team) studies were implemented so that channel maintenance activities could be conducted with minimal negative environmental impacts, and positive impacts where possible.

In 1978 Public Law 95-502 authorized the Locks and Dam 26 Replacement Project (with one 1200-ft lock) and directed the Upper Mississippi River Basin Commission to prepare a Comprehensive Master Plan for the Management of the Upper Mississippi River System. The Master Plan was completed on January 1, 1982; it recommended a second lock, 600 ft in length at the new L&D 26, and an environmental management program with an initial 10-year timeframe. The environmental recommendations contained in the plan were tied to past, present, and future deterioration of fish and wildlife habitat of the river system, and were not to be considered as "mitigation" for any past or future lock construction.

According to the Master Plan report, the environmental recommendations were to be implemented by the U.S. Fish and Wildlife Service (USFWS) as the lead agency. However, the second lock and the Environmental Management Program were authorized for implementation by the U.S. Army Corps of Engineers by P.L. 99-88, the Supplemental Appropriation Act of 1985, and P.L. 99-662, the Water Resources Development Act of 1986, Section 1103.

A General Plan for implementation of the UMRS-EMP was completed by the North Central Division, U.S. Army Corps of Engineers (NCD), in January 1986. The U.S. Fish and Wildlife Service, Region 3, and through the Upper Mississippi River Basin Association (UMRBA), the five affected states (Illinois, Iowa, Minnesota, Missouri, and Wisconsin) also

participated in the development of the General Plan.

In October 1990, the Water Resources Development Act of 1990 was signed into law (P.L. 101-640). Section 405 of the Act amended Section 1103 of P.L. 99-662 (included in Appendix A), and in essence, extended the authorization period an additional 5 years. Therefore, the EMP is authorized for a 15-year period, through FY 2002.

E. PURPOSE AND ELEMENTS OF EMP.

The purpose of the Upper Mississippi River system Environmental Management Program is to ensure the coordinated development and enhancement of the Upper Mississippi River System, recognizing its several purposes. Thus, the EMP is a means for supporting "environmentally sustainable development" of the UMRS, i.e., development that meets the needs of the present without compromising the ability of future generations to meet their needs. More specifically, the EMP is the vehicle for implementing certain actions recommended in the Master Plan and specified in Section 1103 of P.L. 99-662.

Elements of the Upper Mississippi River System Environmental Management Program include:

- Habitat Rehabilitation and Enhancement Projects
- Long Term Resource monitoring
- Computerized Inventory and Analysis System
- Recreation Projects
- Economic Impacts of Recreation Study
- Navigation Traffic Monitoring

F. PROJECT SELECTION PROCESS

(1) Partnerships. A special partnership has been forged among the participants in the EMP. Congress placed Federal management responsibility for the program with the U.S. Army Corps of Engineers. In implementing the program, the Corps actively coordinates with the U.S. Department of the Interior; the Upper Mississippi River Basin Association (UMRBA); and the five states of Illinois, Iowa, Minnesota, Missouri, and Wisconsin.

The North Central Division of the Corps of Engineers manages the program and is guided in its policies by the Headquarters office of the U.S. Army Corps of Engineers. Three District offices, St. Paul (NCS), Rock Island (NCR), and St. Louis (LMS), manage the habitat projects within their boundaries and work directly with states and the USFWS on individual projects.

The U.S. Fish and Wildlife Service within the Department of Interior, in cooperation with the UMR basin states, executes the LTRMP element of the EMP. In addition, the Service participates in the planning of all projects on refuge lands and completes Coordination Act requirements for non-refuge habitat projects.

The five states and the Fish and Wildlife Service actively screen, make recommendations on, and participate in the development of habitat projects. Some projects involve state and local cost sharing with the Federal government, further emphasizing the partnership approach of the EMP. State personnel, primarily biologists, also staff six LTRMP field stations.

(2) Project Eligibility Criteria. Coordination with the States and the Fish and Wildlife Service during the preparation of the General Plan and several Annual Addenda led to an examination of the Comprehensive Master Plan for the Management of the Upper Mississippi River System. The Master Plan, completed by the Upper Mississippi River Basin Commission in 1982, was the basis of the recommendations enacted into law in Section 1103. The Master Plan report and the General Plan identified examples of potential habitat rehabilitation and enhancement techniques. Consideration of the Federal interest and Federal policies has resulted in the following findings set forth in Annual Addenda:

First Annual Addendum. "The Master Plan report. . . and the authorizing legislation do not pose explicit constraints on the kinds of projects to be implemented under the UMRS-EMP. For habitat projects, the main eligibility criteria should be that a direct relationship should exist between the project and the central problem as defined by the Master Plan, i.e., the sedimentation of backwaters and side channels of the Upper Mississippi River System (UMRS). Other criteria include geographic proximity to the river (for erosion control), other agency missions, and whether the condition is the result of deferred maintenance . . ."

Second Annual Addendum. The types of projects that are definitely within the realm of

Corps of Engineers implementation authorities include the following:

- backwater dredging
- dike and levee construction
- island construction
- bank stabilization
- side channel openings/closures
- wing and closing dam modifications
- aeration and water control systems
- waterfowl nesting cover (as a complement to one of the other project types)
- acquisitions of wildlife lands (for wetland restoration and protection) Note: By letter of 5 February 1988, the Office of the Chief of Engineers directed that such projects not be pursued.

A number of innovative structural and non-structural solutions that address human-induced impacts, particularly those related to navigation traffic and operation and maintenance of the navigation system, could result in significant long-term protection of UMRS habitat. Therefore, proposed projects which include such measures will not be categorically excluded from consideration, but the policy and technical feasibility of each of these measures will be investigated on a case-by-case basis and the measures will be recommended only after consideration of system-wide effects.

(3) Project Selection. In the past, projects have been nominated and ranked for inclusion in the St. Louis District's habitat projects program by the respective state conservation agencies, and the USFWS, based on agency management objectives. Within the last several years, the St. Louis District of the U.S. Army Corps of Engineers has ranked Cuivre Island as seventh in priority of completion, preceded by: Clarksville Refuge, Mo.; Dresser Island, Mo.; Pharrs Island, Mo.; Swan Lake, Il.; Stump Lake, Il.; and Osborne Side Channel, Il.

G. PROJECT LOCATION. The project area is primarily Cuivre Island, located at the mouth of the Cuivre River at the Mississippi River, river miles 233 to 239. Cuivre Island is approximately 4 miles south and downstream of Lock and Dam 25 at Winfield, Missouri. The county line between Lincoln and St. Charles Counties is roughly midway through Cuivre Island. Plate 1 shows the project location with respect to the states of Missouri and Illinois and the Upper Mississippi River System. Plate 2 shows the project limits that include Phelan's Island, Cuivre Island, Cuivre Slough (extending downstream past much of Peruque Island), Turkey Island Slough, and a mainland area on the Missouri side and on either side of an entrance road off of Dalbow Road.

2. EXISTING CONDITIONS.

A. Physical Setting. The 1,750-acre project area consists of Cuivre Island (about 1,400 acres), Cuivre Slough (a side channel between Cuivre Island and the mainland), a chute between Cuivre Island and Turkey Island (about 70 acres), and about 102 acres of cropland and wetland on the mainland adjacent to Cuivre Island. The area is predominantly bottomland hardwoods.

The project area includes land owned by the Federal government, the State of Missouri, and private landowners. The U.S. Army Corps of Engineers acquired approximately 862 acres of the island (See Plate 3) to mitigate for habitat losses associated with the Lock and Dam No. 26 (Replacement) (renamed the Melvin Price Lock and Dam) and to provide an area for the general public to use. P.L. 95-502 authorized the Chief of Engineers (U.S. Army Corps of Engineers) to replace at federal expense land inundated by L&D26 (R) on an acre-for-acre basis.

The Missouri Department of Conservation acquired approximately 377 acres of the island, and 102 acres on the mainland (see Plate 3). An entrance off of Dalbow Road bisects this MDOC-owned mainland portion, and terminates in a public access boat ramp.

The acreages for the project area and its component habitat types were derived from planimetering of maps, and varies from some acreages obtained from legal descriptions.

B. Water Resources. The minimum water surface elevation at the island is 419.0 feet NGVD. Generally, stages at the island are nearly equal to the tailwater elevation at Lock and Dam 25. Elevation-duration and elevation-frequency relationships for Lock and Dam 25 tailwater are shown on Plates 4A and 4B. The primary backwater area of the project is Cuivre Slough which divides Cuivre Island from the mainland portion of the floodplain. Most of the time the water surface elevation of the slough is equal to the Mississippi River elevation except during significant headwater rainfall events on the Cuivre River watershed. The Cuivre River, with a drainage area of 1,230 square miles, flows into Cuivre Slough across from Mississippi River Mile 236.4.

C. Geology and Soils.

(1) Geology. Throughout eastern Missouri the Kimmswick rock unit is predominantly a light-gray to gray-brown, medium-to massive-bedded, coarsely crystalline and fine -to medium-grained calcarenite. In the subsurface of north-central and northwestern Missouri the formation is dolomite. Chert is a minor constituent and is usually found in the lower part of the formation in this area. The thickness of the formation in eastern St. Charles and St. Louis Counties is 90 to 125 feet.

(2) Soils. Information regarding the soils for this project are taken from two sources; SCS - Soils Survey St. Charles County Missouri and Soil Borings taken in August

1991.

(a) SCS-Soil Survey. The Portage - Carlow - Kampsville association consists of soils on the Mississippi River flood plain. This association is nearly level, very poorly drained to somewhat poorly drained and formed in clayey and silty alluvium. Differences in the soils are largely a result of the texture of the materials in which they formed. Differences in elevation are slight. In general, the lowest areas are along the river channel, but the landscape inclines gradually toward the surrounding uplands. This association covers about 15 percent of St Charles county and the entire Cuivre Island area. It is about 32 percent Portage soils, 31 percent Carlow soils, and 9 percent Kampsville soils.

The Portage soils are very poorly drained. The are in board depressional areas. The surface layer is a black clay. The subsurface layer is very dark gray clay in the upper part and very dark grayish brown clay in the lower part. The subsoil is dark gray and dark grayish brown clay. This soil group is located on the landside of Cuivre Slough.

The Carlow soils are poorly drained. They are in low lying areas and on low natural levees. Typically, the surface layer is a very dark grayish brown silty clay loam. The subsurface layer is very dark grayish brown silty clay. The subsoil and underlying material are dark gray silty clay. This soil group is found nearly everywhere on and adjacent to Cuivre Island.

The Kampsville soils are somewhat poorly drained. They are on low natural levees. Typically, the surface layer is a dark grayish brown silt loam. The subsurface layer is grayish brown silt loam. The subsoil is a grayish brown and dark grayish brown mottled silty clay loam. The underlying material is grayish brown, mottled silty clay loam. This soil group was not present in the immediate project area.

Most of the acreage of this association is used for cultivated crops, mainly soybeans and wheat. Many areas near the Mississippi River that flood frequently remain in woodland. Some areas have levees and are flooded in the fall to provide shallow water habitat for migratory waterfowl. Wetness is the major concern in management for crops. Artificial drainage is needed to remove excess water. Row crop varieties that require a short growing season generally grow well because of the wet conditions during the spring and fall. These soils are suitable for trees. Many low-lying areas along the major rivers and on islands remain in woodland. Cottonwood, black willow, and silver maple are predominant. Wetness is a severe limitation to the use of equipment in this area.

(b) Soils Borings. In August of 1991, four exploratory borings were taken at selected locations on Cuivre Island between the Mississippi River and the Cuivre Slough (see Plate 24). These borings ranged in depth from a maximum 78.5 feet at CI-1 (Pump Station location) to a minimum 20 feet at CI-5 (Turkey Lake culvert location).

In general, the soils encountered from the ground surface down to approximately 15

to 20 feet were clays (either CL or CH) underlain by sands (either SP or SW) down to rock. Boring CI-1 was drilled to rock which was found 75 feet below the ground surface. Borings CI-2 and CI-3 were terminated at 25 feet while boring CI-5 was terminated at 20 feet.

Soils information obtained from these four borings included; soil classification, ground water depth, standard penetration tests, torvane and pocket penetrometer readings. Undisturbed samples (push tubes) were taken in the clay soils and torvane and pocket penetrometer readings were taken from the bottom of the tubes before they were waxed and stored for later testing. Generally the clays were a soft to medium strength soil (.25 - .75 TSF) at 5 - 10 feet of depth, except at CI-1 where the soil strength at 10 feet was stiff (1.25 - 1.50 TSF), and a soft to medium strength soil at 15 feet for borings CI-2 and CI-3. The SPT's for the sands indicated a loose to medium (<10 - 30 blows/ft.) sand between 15 - 25 feet and medium to dense >30 - 40 blows/ft.) sand from 30 - 50 feet. Ground water depth varied from a minimum of 4 feet (CI-5) to a maximum of 11 feet (CI-1). See Plates 25 - 28.

D. Water Quality. Sedimentation throughout the years has caused most of the interior and backwater areas to become very shallow. In the summer months, during times of low flows, these shallow waters become stagnant. The temperature of the water is elevated in relation to ambient river temperatures. The nutrient enriched sediments induce algal blooms which cause excessive diel variations in dissolved oxygen concentrations. These variations in dissolved oxygen concentrations and associated change in Ph are at times outside the tolerance limits of aquatic biota. During the winter months, these shallow waters can become ice covered. If the ice cover is of sufficient duration, the oxygen in the water will become depleted with resultant fish kills.

E. Habitat Types and Vegetation. In the vicinity of the project area, the alluvial floodplain of the Mississippi River lies entirely in Missouri (with bluffs on the Illinois side), and it is about 4-5 miles wide.

Prior to settlement, a diversity of terrestrial natural communities dominated this flat landscape. Bottomland forests were extensive and occurred along the Mississippi and Cuivre Rivers. Marshes occupied large, topographical depressions on the floodplain. Wet prairies generally surrounded the marshes and extended to the forests. A variety of aquatic natural communities was interspersed among the terrestrial components, and included small lakes, isolated oxbows, and meandering rivers and creeks. Floodwaters of the Mississippi and Cuivre Rivers repeatedly inundated much of the floodplain on an annual basis. A mosaic of habitat types characterized the Mississippi River, and included the main channel, islands, side channels, chutes, sand and mud flats, and backwaters. Bottomland forest often was the dominant vegetation of islands, but its continuity was frequently broken by interior sloughs.

Since settlement, conversion to cropland has been the chief factor responsible for the disappearance or reduction of many of the natural communities of the floodplain in the vicinity of the project. To achieve this conversion, a complex system of private levees and drainage ditches was built, crisscrossing much of the floodplain. Today, only infrequent

flood events are capable of inundating the floodplain by overtopping this system of levees. Bottomland forests still occur along the Mississippi and Cuivre Rivers, but in many places they are limited to thin strips. Wet prairies are virtually gone, and the small lakes have disappeared. Some marshes remain, but artificial hydrological regimes imposed by private waterfowl hunting clubs have left them degraded. Row cropping is practiced on the higher elevations of some islands.

Currently, the project site consists of four major habitat types: bottomland forest, slough, cropland, and side channel. Bottomland forest and slough habitats are considered wetlands because of the soils, plant species, and hydrology that are present. All cropland within the project area has been classified as prior converted cropland by the Soil Conservation Service, and is not considered wetland subject to Section 404 of the Clean Water Act. See Plate 2 for locations of habitat types.

(1) Bottomland forest. Bottomland forest covers 1267 acres of the 1407-acre Cuivre Island. This habitat type is also found on a portion of the mainland tract. Ground elevations within the forest on Cuivre Island range from a high of about 435 feet NGVD at the north (upstream) end of the island to a low of about 426 feet NGVD at the south (downstream) end.

At the project area, silver maple and cottonwood are the dominant tree species in bottomland forest. Willow, silver maple, and green ash are common at the lower elevations. Pin oak, elm, hickory, pecan, sycamore, bur oak and cottonwood are more typical of the higher elevations. Box elder and sugarberry are common transitional species between the two species associations. Forest vegetation typically occurs in horizontal layers consisting of canopy, subcanopy, understory, and groundcover elements, but at Cuivre Island the subcanopy and understory components are weak, indicating an overall low level of natural regeneration. Groundcover species include a variety of herbaceous plants and grasses. Narrow bands of willow and silver maple surround the interior sloughs on Cuivre Island.

Extensive logging occurred on Cuivre Island in the past. Hard mast species such as oaks, pecan, and hickories were apparently removed without regard for future regeneration, and only isolated remnant stands exist. Field surveys conducted in February and June 1994 indicate that the flood of 1993 has killed about 60 percent of the trees on the island. Nearly all sugarberry, box elder, and elm have died. More than half of all pin oak, hickory, and perhaps sycamore are gone. The least affected species include silver maple, green ash, cottonwood, pecan, and bur oak. Silver maple seedlings that germinated in the spring of 1994 are growing over much of the island, with densities highest at the lower elevations. Tree species diversity has declined because of the 1993 flood.

(2) Sloughs. Sloughs occur within the interior of the island, and consist of five separate water bodies linked together by a network of natural depressions and man-made ditches. Turkey Lake, Big Twin, Little Twin, Flat Lake, and Bernard Slough are all long and narrow, and vary in size from about two to 12 acres. Altogether these sloughs total 30

acres. The normal water surface elevation in each of these waterbodies is about 424 feet NGVD. At this elevation, average water depth varies from about one to three feet. As summer progresses, water in these sloughs evaporates, revealing mud flats. These sloughs become directly connected to the Mississippi River only when Pool 26 reaches an elevation of about 426 feet NGVD or higher, at which time water backs up into the interior of the island from the south end. Slough habitat also occurs on the mainland portion of the project area as an old oxbow of the Cuivre River.

During the growing season, floating duckweed usually covers the water surface of the interior sloughs. Also present are a few woody species, such as buttonbush and the invading willow and silver maple, and a thin covering of emergent vegetation. A thick stand of buttonbush is found in the old oxbow channel of Cuivre River.

(3) Cropland. Cropland occupies 68 acres of the mainland portion of the project area. This cropland is divided into two parcels (46 and 22 acres) by an old oxbow of Cuivre River. Ground elevations of these two parcels range from 434 to 435 feet NGVD. On Cuivre Island, cropland is found at two locations. A 76-acre tract lying near the island's north end has ground elevations ranging from 430 to 435 feet NGVD. The second area of cropland, located toward the south end of the island, covers 34 acres. It ranges from 427 to 432 feet NGVD in elevation.

Small-grain crops are usually planted in cropland. A small portion of the crops are left unharvested as food for wildlife. In fallow years, smartweeds and cocklebur are the dominant invading weeds.

The project site does not contain any prime, unique, statewide or locally important farmland (see Appendix H). Therefore, the Farmland Protection Policy Act is not applicable to this project. The act requires Federal agencies to identify alternative sites to lessen adverse impacts to such lands when a proposed project involves the conversion of such lands to nonagricultural uses.

(4) Side Channel Habitat. Side channel habitat comprises Cuivre Slough, which is about 5.25 miles long. With an average width of about 250 feet, this habitat type consists of about 160 acres. At the project site, the normal elevation of Pool 26 is 422 feet NGVD. The channel bottom of Cuivre Slough ranges in elevation from about 412 to 420 feet NGVD (as determined during a hydrographic survey conducted during spring 1991). At normal pool, Cuivre Slough is connected at both ends to the Mississippi River, and water depth ranges from two to ten feet. With an average bottom elevation of about 414-416 feet NGVD, the average water depth is about six to eight feet at normal pool. High spots in the channel bottom are found at several locations, including the slough's northern (upstream) end, about 0.75 mile downstream from the northern end, at the confluence of Cuivre River, and about 0.5 mile above the slough's southern (downstream) end.

The side channel between Cuivre Island and Turkey Island is about 1.5 miles long

and 400 feet wide. Within this 70-acre side channel, about 40 acres are dry at normal pool because of accumulated sediment. The other 30 acres consist of shallow backwater habitat. This side channel essentially conveys no flow at normal pool because the upper end is shut off from the river by accumulated sediment.

Virtually no aquatic vegetation occurs in either side channel. Small willows and cottonwoods are present on point bars within these areas.

F. Management. The St. Louis District issued a license to the Missouri Department of Conservation (signed in June 1994) to manage Corps land on Cuivre Island for fish and wildlife purposes. Likewise, MDOC manages state-owned land within the project area for the same purpose. The aggregate of the Corps and state-owned land is known as the Cuivre Island Wildlife Area.

A formal resource management plan for the Cuivre Island Wildlife Area was completed (Appendix I). The nature of the wildlife area - its location, topography, soils, habitat types, and hydrology - dictates that management focus on wetland habitats. The goal of wetland habitat management on MDOC lands, as expressed in the agency's state wetland management plan, is "to maintain productive and diverse systems that meet the long-term needs of a broad array of wetland fish and wildlife populations" (MDOC 1989:48). To meet this goal, managed areas are to provide a diversity or mosaic of wetland habitats, including, when possible, moist soil areas, flooded and upland cropland, semi-permanent marsh, bottomland forest (and green tree reservoirs), and permanent sloughs and oxbows.

In the interim, MDOC manages the diverse wildlife area to provide predictable wildlife habitat for wetland-dependent species. The current management emphasis is on providing food and cover for migratory birds, especially waterfowl. To provide food and cover for waterfowl, water manipulations are conducted annually on a portion of Cuivre Island. These manipulations involve the seasonal flooding and dewatering of moist soil areas, cropland, and a stand of living trees within the bottomland forest.

The living trees are shallowly flooded during their period of dormancy (fall, winter, and early spring) to create a green tree reservoir. This reservoir provides feeding and resting habitat for waterfowl migrating during the fall and spring. Resident wood ducks also use the reservoir for feeding and brood-rearing habitat. During the fall migration, waterfowl eat a variety of plant seeds and tubers, but in flooded timber they often concentrate on mast, especially the acorns produced by oak trees. To a lesser degree, they also feed on invertebrates that live in shallowly flooded habitats. During the spring migration, waterfowl concentrate on invertebrates found in flooded habitats, and eat little plant material. Food in the form of small grains is grown on the island and mainland, and some of the cropland on the island is also seasonally flooded to benefit these birds, as well as migrant rails and shorebirds. Moist soil management is conducted on the island's interior sloughs, where natural and artificial plants are grown as food for migratory waterfowl. Permanent water in slough habitat on the mainland (old oxbow of Cuivre River) is maintained for a variety of

resident wetland wildlife. This area provides habitat for wading birds, fish, furbearers, reptiles, amphibians, invertebrates, wood ducks, and other waterfowl.

The size of the green tree reservoir is determined by the island's terrain - no low levees exist to impound water. With the onset of tree dormancy, river water is pumped by a portable pump to flood the island's interior sloughs and adjacent forest to a shallow depth (ideally 6 to 18 inches). The reservoir is attained when water reaches the elevation of about 426 feet NGVD. It then encompasses the 30 acres of sloughs and about 60 acres of adjacent bottomland forest. Any additional pumping only sends water off the island via a ditch-like depression at the south end. Water is also pumped onto the island's southern tract of cropland. There a dike-like structure holds water on about 17 acres at an elevation of about 429 feet NGVD. Before tree dormancy is broken in early spring, the reservoir is drained by gravity flow to the river via the south end of the island (when river conditions permit).

To produce moist soil food plants for waterfowl in the island's interior sloughs, water is allowed to gravity drain in the spring or summer to expose mud flats. Within the mud, seeds of naturally occurring herbaceous plants germinate and grow. Japanese millet is artificially seeded onto the mudflats in summer to supplement the production of native species. Migrant shorebirds also benefit from these exposed mudflats.

Because the wildlife area was only recently acquired, there have been only four potential years (1988-1991) for habitat management. The green tree reservoir has been established only once due to commitment of pumping equipment at other management areas. Likewise, artificial seeding of moist soil areas has been possible for only two years. Spring and summer flooding occurred in two years, preventing the creation of mudflat conditions necessary for seed germination.

No activities have been implemented to directly benefit fisheries, except for an unsuccessful pilot program to place and maintain sunken cedar trees in the Mississippi River along the east side of Cuivre Island.

G. Animals. Terpening et al. (1975) reported the occurrence or suspected occurrence of 416 species of birds, mammals, and amphibians and reptiles in floodplain habitats of Pools 24, 25, and 26 of the upper Mississippi and lower Illinois Rivers.

(1) Birds. About 285 species of birds are known to use or probably use floodplain habitats of Pools 24-26 (Terpening et al. 1975). The most diverse orders are the perching or song birds, shorebirds and gulls, waterfowl, herons and egrets, and vultures and hawks. In reference to waterfowl, the Mississippi River and floodplain is the center of a major flight corridor in North America for millions of migrating waterfowl. About 20 species of ducks and geese stop during fall and spring migrations to rest, feed, and seek sanctuary in wetlands and deepwater habitats of Pools 25 and 26 and adjacent floodplain (Havera 1985). The mallard is the most abundant duck. The wood duck is an additional species that usually resides year-round in the project area. With regard to herons and egrets,

a large rookery is located just east of the project area on a forested island in the Mississippi River. The great blue heron and great egret raise young here, and these two species most likely include the interior sloughs on Cuivre Island among their foraging habitat. Besides waterfowl, the most common game birds include wild turkey, mourning dove, bobwhite quail, American woodcock, and crow.

(2) Mammals. About 50 species of mammals inhabit or are expected to inhabit the study area (Terpening et al. 1975). Common species include opossum, raccoon, muskrat, mink, fox, beaver, squirrel, cottontail, white-tailed deer, and a variety of bats and mice.

(3) Amphibians and Reptiles. About 75 species of amphibians and reptiles have distributions which currently (or historically) include the study area (Terpening et al. 1975). Cuivre Island and vicinity is used by a variety of turtles, snakes, skinks, frogs, and toads.

(4) Fish. A diverse fish fauna comprised of 107 species in 28 families is found in Pools 24, 25, and 26 of the Upper Mississippi and lower Illinois Rivers (Colbert et al. 1975; Sheehan et al. 1990). The five most diverse families are minnows and carps (30 species), suckers (16 species), sunfishes (13 species), perches and darters (11 species), and freshwater catfishes and bullheads (9 species). A number of these fishes prefer to spawn in backwater and side channel habitats where the current is slow and the bottom is muddy or silty. Members of the sunfish family generally prefer to spawn in backwater areas, and adults of these species also use these areas as general habitat. Because Cuivre Slough is a side channel or form of backwater, it is regarded as good spawning habitat. The interior sloughs on Cuivre Island also serve as spawning areas, as does the side channel between Turkey Island and Cuivre Island.

In winter, certain species of fishes, such as channel catfish, bluegill, largemouth bass, and black crappie, are unable to tolerate the cold temperatures and currents of channel habitats. This is especially true of young-of-the-year fishes of these species (Sheehan et al. 1990). Backwaters provide a refuge from harsh winter conditions by offering warmer temperatures and no current. Within the project area, there is no optimal overwintering habitat for these species, chiefly because most of the aquatic habitat consists of flowing side channels, such as Cuivre Slough. Due to sedimentation at its upper end, the side channel between Turkey Island and Cuivre Island does not convey flow at normal pool, and may offer overwintering habitat.

The most commercially important fishes of Pools 24, 25, and 26 are carp, buffalo, freshwater drum, and catfish (St. Louis District 1988; UMRCC 1989, 1990, 1991). Commercial fishing occurs in the main channel border area on the riverside of Cuivre Island. Important sport fishes of the Upper Mississippi River are numerous, and include all members of the sunfish family as well as white bass, freshwater drum, sauger, channel catfish, yellow perch, walleye, and bullhead (St. Louis District 1988). Because many of the sport fishes use

Cuivre Slough, it is a popular location for sport fishing.

(5) Other Animals. No native mussels are known to occur in Cuivre Slough. The zebra mussel, a non-native species from Europe, has become introduced very recently into Pools 24-26. Insects and other invertebrates are common and comprise an important component in the diet of many species of migrating waterfowl, especially in the spring.

H. Threatened and Endangered Species. Federally threatened and endangered species are addressed in Appendix G.

Missouri has listed at the state level several species as either endangered or rare with current or historical distributions that include the project area (Wilson 1984, MDOC 1991). Those that currently inhabit the vicinity of the project area include the western fox snake (Elaphe vulpina), which prefers natural marshes, and the great egret (Casmerodius albus), which lives in a rookery on an island immediately east of the project area. Species that are known historically from the environs of the project area include two that prefer marshes - the eastern massasauga (Sisturus catenatus), a rattlesnake, and the king rail (Rallus elegans), a bird in the crane family. The alligator gar (Lepisosteus spatula), a riverine fish, is also known historically from this vicinity of the Mississippi River. The eastern massasauga is being considered for possible addition to the Federal list of endangered and threatened species.

I. Recreation / Aesthetic Resources. Recreational uses of the Cuivre Island Wildlife Area include primarily sport fishing, hunting, and recreational boating. The present facilities include a road, boat ramp, and parking lot. No facilities exist for picnicking or camping. Access to Cuivre Island is made by boat.

The wildlife area is in a rural area dominated by agricultural activities and private waterfowl hunting clubs. Bottomland forest exists along the Mississippi and Cuivre Rivers in a somewhat continuous but fragmented fashion. The mainland portion of the wildlife area is agricultural. The extensive forest cover on Cuivre Island provides a much more natural setting. The river and floodplain environment is attractive to the visiting public, and to adjacent landowners who live along the upper half of Cuivre Slough.

The island is open for hunting and fishing under the rules and regulations of the state of Missouri. Trapping is allowed on the island under special permit, but few are requested. In fact, there were no requests for trapping permits in this area during 1990. There are 5 interior lakes that are managed by the use of a portable pump. Archery only hunting is allowed on the mainland area. The wildlife area is used for occasional bird watching.

J. Socioeconomic Resources. The project area is approximately four miles east of Old Monroe, Missouri (population 242 in 1990 census), and about 5 miles north of suburban St. Charles County, which is centered along Interstate 70. The immediate surrounding area is utilized as woodlands and cultivated fields with a few homesteads. The city of O'Fallon,

Missouri (population 18,698 in 1990 census) is located approximately eleven miles south of the project area and is a growing incorporated area in which manufacturing, trade and service industries are all present.

The local economy has traditionally been based on agricultural activities, but as development has moved northward toward the project area, industry and small businesses have increasingly become important. There are no residences on Cuivre Island, although there is some farming and an abandoned hunting clubhouse. There are about 20 homes on private property along the Missouri side and the upper half of Cuivre Slough. In Illinois on the opposite side of the Mississippi River, the local economy is based mainly on agricultural activities, such as row crops, live stock, and orchards.

K. Cultural Resources.

General Land Office (GLO) survey records indicate that the island dates to presettlement times. The existence today of some relatively large trees and large stumps of culled oaks attest to the historic antiquity of the island. Although relatively old, its use during historic and prehistoric times is not known. No sites have been previously filed with the Archaeological Survey of Missouri (ASM) for the island, nor for the associated mainland portion. This is due to the fact that no surveys evidently have been conducted on the island and on the adjacent mainland segment.

The island itself consists of ridge-and-swale topography and is largely forested. There are, nonetheless, two agricultural fields, one at the northern end of Cuivre Island and another near the southern end. The field at the southern end and forested portions of the island between the Mississippi and Big Twin Lake were examined in early March 1993 by staff members of the Corps' Environmental Planning Section. The field and wooded sections are in fact covered with relatively thick deposits of recent alluvium, indicative of the aforementioned sedimentary buildup that has led to losses of aquatic and wetland habitats on the island. Because of the thick deposits of recent sediments, it would seem therefore that a cultural resources survey of the increased amount of low area to be inundated would be fruitless. The chances are that few, if any cultural resources would occur in such low situations. And if they do, the thick blanket of recent sediments should serve to protect these resources.

The two agricultural fields on the contiguous mainland are bisected by an old channel of Cuivre River. They are referred to as Area 1 and Area 2, comprising 22 acres and 46 acres respectively. Despite the relatively poor surface visibility conditions, several chipped stone prehistoric artifacts have been observed scattered about in Area 2. During the brief reconnaissance survey of the Cuivre Island area in early March, 1993, the Corps' archaeologists noted that some prehistoric artifacts also were scattered about in places within Area 1.

L. Air Quality. St. Charles and Lincoln Counties are classified as attainment areas

(MDNR 1993). Air pollutants currently do not exceed national ambient air quality standards.

3. FUTURE WITHOUT PROJECT CONDITIONS.

A number of assumptions were made about what the project area and vicinity would be like 50 years in the future without any project. The chief assumption was that Pool 26 would continue to be managed as it is now, and that there would be no change in normal pool elevation. With regard to the adjacent floodplain, it was assumed that landuse surrounding the project area would remain essentially the same - predominantly cropland, with remnants of terrestrial and aquatic natural communities. For the four habitat types at the project site, the following assumptions were made.

- It will take bottomland forest on Cuivre Island a long time to recover from the effects of the flood of 1993. Site visits conducted in February and June 1994 indicate that about 60 percent of the trees on the island were killed by this flood. It is expected that at least 100 years will pass before the forest grows back to a form similar to that which existed prior to this event. In the interim, tree species diversity is expected to continue to decline. Silver maple is expected to become much more common than it is already. Vines are expected to overgrow areas open to sunlight and suppress the growth of any seedlings colonizing these areas. It is estimated that about 40 years will pass before this blanket of vines disappears and is replaced by new trees. Meanwhile, the value of the island's forest as a resource to wildlife will diminish significantly.

- The interior sloughs on the island will for the most part be converted to bottomland forest. One of the major causes of aquatic habitat degradation in the Upper Mississippi River is sedimentation (UMRCC 1993). Sedimentation is occurring throughout the navigation pools, and many important aquatic habitats are becoming shallower, with resulting declines in biological diversity. Woody encroachment consisting of willow, cottonwood, and silver maple trees can be observed on recently accreted aquatic areas scattered along the entire length of the Mississippi River within the St. Louis District.

- Private cropland on the mainland will remain in cultivation, as will state-owned cropland within the project area. Cropland owned by the Federal government on Cuivre Island will be reforested.

- Side channel habitat will undergo very notable changes in habitat quantity and quality from continuing sedimentation. The upstream end of a number of side channels in the St. Louis District are in the process of closing due to sedimentation. Humes (1974) predicted that Cuivre Slough side channel will close off at the upstream end, merging the island with the mainland. It is feared that once sediment buildup in Cuivre Slough side channel reaches a critical point, future sedimentation will occur rapidly and conversion to terrestrial habitat will be irreversible.

Cuivre Slough side channel. The St. Louis District estimates the overall loss of side channel habitat to be about 99 of 162 existing acres, with 63 acres remaining. Sediment

carried by the Mississippi River would initially close off the upper entrance of the side channel, and then the entire 76-acre upper half of the side channel (that portion upstream of the confluence with Cuivre River) would close up. Aquatic habitat remaining in this section of the side channel would be limited to a series of isolated pools, connected only during times when the Mississippi or Cuivre Rivers are high.

With no flow from the Mississippi River coming down the side channel at low to normal pool conditions, two changes would occur to the lower half of the side channel (that portion downstream of the confluence of Cuivre River). First, about 23 acres of the lower portion of the slough are also expected to fill in with sediment. This will occur because the side channel will narrow to accommodate flow only from Cuivre River. Second, average channel depth in the lower side channel would become reduced due to deposition of sediment carried by Cuivre River. This sediment is periodically flushed out of the side channel today by Mississippi River flows passing through the entire side channel.

Turkey Island Chute or side channel. Sediment carried by the Mississippi River would also close up this area. In 50 years, the existing 30 acres of open water would be converted to terrestrial habitat, and the entire side channel would be covered by forest composed of willow, cottonwood, and silver maple. Sedimentation already is very apparent in this area.

In the future-without condition, sedimentation would reduce the availability of fishing, bird watching and boating access to the island from the Missouri shore. Hunting access by boat would be adversely impacted also.

4. RESOURCE PROBLEMS AND OPPORTUNITIES.

Problems occurring at the wildlife area at the present time, and in the future without any project, were defined by an interagency team. The problems are described in terms of specific physical conditions and their adverse impacts on local biological resources.

A. High Rates of Sedimentation. Side channel and backwater habitats in upper Pool 26 have declined in areal extent, depth, and quality due to excessively high rates of sedimentation. The average rate of sedimentation in backwater areas of Pool 26 has been estimated to be about 1 to 2 inches per year (GREAT II 1980). At the downstream end of Pool 26, Simons et al. (1988) estimated 0.5 inches per year for the period 1970-1985 at Brickhouse Slough side channel. Measurements at the project site have not been taken to estimate the local rate of sedimentation.

The detrimental effects of high sedimentation rates on backwater and side channel habitats are of major concern to MDOC as a resource manager. Water depths decrease as bottom elevations are raised by sedimentation. With sufficient time, these aquatic areas may become filled with sediment, undergoing a gradual conversion to forested terrestrial habitat. Unless new side channel and backwater areas are concurrently being created, there is a net loss in area of these habitats.

Declines in quality of aquatic habitat occur due to a variety of secondary adverse effects. For example, if areas become too shallow under conditions of no flow, dissolved oxygen levels in summer and winter may drop below the minimum required for fish survival. Also, sedimentation is accompanied by increased turbidity levels, which can often limit the development of aquatic plant communities by blocking the passage of sunlight for photosynthesis, and by creating bottoms too soft for such plants to establish successful root systems. Without aquatic plant communities, invertebrate faunas found in aquatic habitats subject to sedimentation are often poor in species diversity and abundance. Deposits of sediment can also smother the eggs of fish which prefer to spawn on silty or muddy substrates, thus inhibiting successful reproduction.

Reductions in areal extent of Cuivre side channel habitat and slough habitat on Cuivre Island have been minor. However, the areal extent of side channel between Cuivre and Turkey Islands has been reduced significantly. In addition, reduction of water depth within both side channels has been significant at some locations.

(1) Sedimentation in Side Channels.

Cuivre Slough side channel. One of the primary problems associated with this project is the decline in depth and quality of Cuivre side channel occurring as a result of sediment deposition. Below the confluence of the Cuivre River and the side channel, deposition is less due to the periodic flushing by high flows from the Cuivre River. Upstream of the

confluence, backwater effects from the Cuivre River and minimal flow conveyed through the side channel by the Mississippi River have allowed sediments to fill the side channel to the point where during normal conditions it is not possible to navigate a john boat through this upper reach.

Sediment carried into Cuivre side channel from the Mississippi and Cuivre Rivers is being "trapped" and deposited at three locations, creating high spots. The first high spot is at the side channel's northern (upstream) end, where sediment from the river is naturally deposited because of the reduction in velocity of flows entering the side channel. The second is found about 0.75 mile downstream from the northern end, where the submerged remnant of an old dike exists. At normal pool, water depth at the first and third high spots is about 3 feet, and about 2 feet at the second. Under low to normal pool conditions, the first or uppermost high spot has an overriding influence on the side channel's discharge capacity.

The effects of sedimentation on quantity of side channel habitat are expected to be dramatic. About 2.75 miles (or 61 percent) of Cuivre Slough side channel is expected to be filled with sediment 50 years from now.

Side channel between Cuivre and Turkey Islands. Sedimentation at this site is more advanced than at Cuivre side channel. Currently, about 60 percent of this site consists of sand bars covered with young willow and cottonwood. Virtually no flow passes through this side channel at normal pool because of the buildup of sediments at the upper end. Existing open water is on the average only a few feet deep. Fifty years from now, this site is expected to be completely filled in.

(2) Sedimentation on Cuivre Island. Sediment deposition is degrading Cuivre Island's interior sloughs and bottomland forest by raising bottom or ground elevations. The interior sloughs have already become more shallow, and sediment deposition in bottomland forest is most noticeable around the perimeter of the island. No field measurements have been taken to quantify the rate of sedimentation on the island. A recent site visit showed that the flood of 1993 deposited on average several inches of silt over this area.

B. Lack of Deep Water in Cuivre Slough Side Channel During Winter. During the normally low pool conditions in winter, there is virtually no overwintering habitat (water depth greater than 8 feet) within the side channel.

MDOC's guideline for successful overwintering of fishes is a minimum water depth of 8 feet. At this depth, winter fish kills are unlikely to occur because dissolved oxygen levels are likely to remain high enough to sustain overwintering fish. At the upper entrance to Cuivre Slough side channel, the average minimum pool elevation during winter is 420 feet NGVD (range 419 to 422, period of record 1941-1989). Assuming a pool elevation of 419 feet NGVD, the elevation of the side channel bottom required to achieve a water depth of at least 8 feet is 411 feet NGVD. Within the 160-acre side channel, there is less than one acre of water having a depth greater than 8 feet at this pool elevation (as determined from the

1991 hydrographic survey maps).

C. Limited Water Control Capability on Cuivre Island. The potential for optimum habitat management on Cuivre Island is limited by inefficient water control management due to various factors, including a lack of protection from river flooding, the inability to dewater when the river is high, a lack of dedicated pumping equipment, existing pumping capacity that is too small, a sediment-choked water distribution system, an insufficient number of water control structures, and water control structures that are in bad condition.

River flooding reduces the reliability of moist soil food plant production within the interior sloughs. The project area is unprotected from flooding by the Mississippi and Cuivre Rivers. At the present time, this is a problem only on Cuivre Island. For germination and growth of moist soil plants to occur, a gradual withdrawal of water from these sloughs is required during the late spring or summer. Flooding during this drying period interferes with food plant production, by either prohibiting seed germination, or drowning immature plants.

Inability to dewater when the river is high. At the present time, the seasonal green tree reservoir is drained in spring by gravity flow. When Pool 26 has an elevation at or near that of the reservoir, drainage is not possible.

Lack of dedicated pumping equipment. Portable pumping equipment has been brought by MDOC to Cuivre Island for only one of four potential years (1988-1991) of habitat management. According to MDOC, other nearby wildlife areas have priority over Cuivre Island for pumping equipment.

Pump capacity is too small. The pump that has been used on Cuivre Island by MDOC recharges the seasonal green tree reservoir in about 30 days. MDOC prefers a 20-day recharge period, which would provide a wider "margin of safety" for getting the reservoir recharged.

Sediment-choked water distribution system. The water recharge ditch leading from the present pumping site toward the five interior sloughs contains much sediment deposited by flood flows. Likewise, the distribution and drainage system connecting the sloughs, as well as the main drainage way leading to the south end of the island, also contain sediment. Water distribution and drainage are impaired because of this build up of sediment. Of concern to MDOC is the resulting inability to entirely drain the five interior sloughs in the summer. Subsequent exposure of mud flats for moist soil plant production is not optimal.

Insufficient number of water control structures. At the present time, the size of the seasonal green tree reservoir is limited by the lack of a water control structure in the ditch-like depression at the south end of the island. Under existing conditions, the reservoir attains an elevation of about 426 feet NGVD. Once this elevation is reached, any additional water pumped into the reservoir is lost via the ditch-like depression to the river. The potential to

create a larger reservoir, and hence more migrational habitat for waterfowl and brooding habitat for resident wood ducks, is not met.

Existing water control structures in bad condition. A water control structure is located at the point where each of the five interior sloughs is connected to the water distribution/drainage system. Most of these structures are in bad condition. For example, some flap gates are missing, and pieces of plywood have been added as replacements. These structures do not function effectively, and they are not reliable. Successful habitat management is not as reliable as it could be.

D. Loss of Marsh Habitat in Vicinity of Project Area. No marsh habitat presently exists within the project area. Remnants of marsh are located within five miles. They are the focal point of private hunting clubs, which have imposed artificial hydrological regimes directed at migratory waterfowl.

More than 90 percent of Missouri's historical wetlands have been lost due to man's activities (MDOC 1989). Within a 30-mile radius of the project area, about 70 percent of historical wetlands on the Mississippi floodplain within St. Charles and Lincoln Counties, Missouri, have been lost to agricultural conversion and other uses (St. Louis District 1991). Much of this historic wetland habitat was marsh. To counteract these losses, MDOC has recommended in its state wetlands management plan the establishment of semi-permanent marsh habitat on public lands in northeast Missouri, where the project area lies (MDOC 1989). Marshes consisting of equal proportions of open water and perennial emergent, such as cat-tail, bulrush, and bur-reed, are important to a variety of wetland species (MDOC 1989). The king rail, American and least bittern, red-winged blackbird, and marsh wren nest and raise young here, and the wood duck and hooded merganser also use marshes as brood-rearing habitat. Various invertebrates inhabiting marshes serve as food sources for these birds. Other characteristic animals include the muskrat, mink, bullfrog, western painted turtle, and common watersnake.

E. Decline in Quality and Quantity of Bottomland Forest on Cuivre Island. The flood of 1993 has significantly diminished habitat quality and quantity of bottomland forest on the island. About 60 percent of the trees were killed by this event. Tree species diversity has decreased also. Sugarberry, box elder, and elm were nearly completely eliminated, and pin oak, hickory, and sycamore suffered extensive losses. Without any active management, the forest resource will take a long time to recover.

5. PROJECT OBJECTIVES.

The objectives and goals of this project are to meet the established management goals, and to address the identified problems.

The management goal is to restore riverine habitat diversity to benefit fish and wildlife species. The goal and objectives were reached through participation by the Missouri Department of Conservation, the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, the River Science Center, and the University of Missouri School of Forestry, Fisheries and Wildlife. These objectives should be compatible with any operational management plan created to meet the Corps' obligation to mitigate for the loss of wildlife habitat due to the construction of the Melvin Price Locks and Dam.

Table 1. Project Objectives.

Project Objective
Maintain and improve side channel habitat by preventing river-borne sediment from filling side channel.
Provide overwintering habitat for fish in side channel.
Increase habitat quality and quantity of artificially flooded habitats for wetland-dependent wildlife.
Increase diversity of wetland types within project area.
Maintain and improve habitat quality and quantity of bottomland forest within project area.

6. PLANNING CONSTRAINTS.

There are constraints that prohibit some problems from being included as planning opportunities, or limit the type of potential solutions that can be developed for study.

MDOC imposed two constraints. First, the upper end of Cuivre Slough side channel must remain open to the Mississippi River. Private landowners living on the mainland along the west bank of the upper side channel must retain access for their recreational boats to the river via the upper end.

Second, the project must not include construction of any dike or levee designed to keep river-borne sediment out of the project area. Typically, these structures envelop large areas on islands or the mainland, and they are usually located parallel to the river and along the bank. The high cost typically associated with this feature is prohibitive from MDOC's point of view.

Several institutional constraints also narrowed the scope of planning opportunities. Modification of existing pool management to provide additional benefits to fish and wildlife resources was identified as outside the scope of this project. Also, the study cannot address and recommend solutions to sedimentation caused by river-borne sediment from upstream of the project area because this problem is regional and outside the scope of the EMP program.

7. PLAN FORMULATION.

The approach to the development and evaluation of project Management Measures was as follows. First, formulation and evaluation criteria were established (see EVALUATION OF MANAGEMENT MEASURES for criteria). Second, various and rather general measures were developed to address the project objectives. Third, Management Measures were more specifically developed utilizing one or more of the general measures, and fourth, the Management Measures along with the no action plan were evaluated by the criteria and their overall potential benefits.

The principal purpose of plan formulation is to develop a plan that would provide the best use, or combination of uses, of water and land resources to meet the project objectives. Much discussion by the project participants and design effort centered on achieving the desired project objectives with the lowest first costs, and yet minimal maintenance requirements. Providing designs that would decrease the amount of sedimentation into Cuivre Slough and yet still allow access through the slough for recreational boaters was of particular concern. The designs for the entire project area were developed to best meet the sometime conflicting desires of the project participants, based on their past and growing experiences. The selected design project life of 50 years was an early product of the plan formulation process that helped guide the detailed design efforts.

A. MEASURES AVAILABLE. Measures considered to meet objectives were: dredging, dikes/levees, hillside sediment control structures, interior closure structures, water control structures and island groupings. Table 2 associates available measures with the project objectives.

Table 2. Measures Available.

Objective			Measure
maintain and improve side channel habitat by preventing river-borne sediment from filling side channel	provide a uniform, average depth in side channel of 5-7 feet at normal pool (bottom elevation 415-417)	eliminate conditions causing localized accumulations of river-borne sediment in interior of side channel	remove submerged remnants of old dikes
		remove localized accumulations of sediment in interior of side channel	dredge
		allow flows in side channel to flush out localized accumulations of sediment	no action
		increase discharge capacity of side channel	construct dike to eliminate point bar construct dike to funnel more flow into side channel
provide overwintering habitat for fish in side channel	provide areas of deep water (> 8 ft deep)		dredge construct short hard-point dikes construct pairs of dikes
increase habitat quality and quantity of artificially flooded habitats for wetland-dependent wildlife	increase predictability of wetland conditions in green tree reservoir, moist-soil and cropland areas for migratory and resident birds, especially waterfowl	increasing water control capability	install permanent pumping system clean out silt-clogged water distribution system replace water control structures in bad condition install larger pump
	increase acreage of green tree reservoir and floodable cropland area		construct water control structure at natural outflow drainage point
increase diversity of wetland types within wildlife area	create semi-permanent marsh		excavate construct low-level ring levee
maintain and improve habitat quality of bottomland forest within wildlife area.	initiate management program for bottomland forest		reforestation implement tree stand improvements

B. MANAGEMENT MEASURES CONSIDERED. Management measures were evaluated based on engineering considerations, local restrictions or constraints, and on their contribution to project goals and objectives. Management Measures which were eliminated due to engineering considerations or to local restrictions were not subject to further evaluation. However, all remaining Management Measures were further evaluated using the following approach.

The ability of each Management Measure to make desired changes to aquatic or terrestrial habitat was measured using procedures described in Appendix B. Briefly, these procedures assessed habitat quantity and habitat quality for three conditions - existing, future without the alternative, and future with the alternative. For each future condition, habitat quantity and quality were combined or integrated to produce a unit of measure called the habitat unit. The effect of an alternative was defined as the difference in habitat units between the future condition with the alternative and the future condition without any alternative. This output was annualized over a 50-year project life. The output in habitat units is provided in Appendix B for all Management Measures.

Construction costs and operation and maintenance costs for each alternative were also annualized. A ratio of annualized habitat units and associated dollars was calculated for each alternative. This ratio provided the cost per habitat unit for each measure, and allowed for the identification of the least-cost alternative.

Seventeen Management Measures were considered, and include the following:

(1) Management Measure 1. No action. With this measure, no project would be implemented using Federal funds. Specific details of future conditions with no action have been described in previous sections.

(2) Management Measure 2. Create marshland on the mainland area. With this plan, cropland on the state-owned mainland area will be developed into marshland. This will be accomplished by scraping about one foot of the earthen material from the interior of the existing cropland and utilizing the material to construct a low levee around the perimeter. Water will be contained within the marsh or leveed areas year round, and will be provided for by an electric submersible pump and well. The possibility of transporting levee material to the site from a borrow pit off site was originally considered but quickly dismissed as not cost effective. The possibility of using sheet metal piling as a possible levee material was briefly explored but also dismissed as not cost effective. Also judged as cost ineffective was the possibility of excavating a depression to create marshland. See Plate 5.

(3) Management Measure 3. Develop marsh on the mainland area (as in Management Measure 2) but include acquisition of new land (No plate). If Management Measure 2 is acceptable to the sponsor, and shown to yield high habitat benefits for the cost, then the possibility of acquiring additional land to develop marshes would be explored.

(4) Management Measure 4. Green Tree Reservoir (GTR). Install pump and clean out ditches on Cuivre Island. Existing facilities for green tree reservoir management include a system of ditches, culverts, and gates that were constructed to divert water into the five interior lakes. There is an existing pad for a portable pump located on the eastern bank of the island that allows water from the Mississippi River to be pumped into the ditches. This system was constructed by the hunting club that originally owned Cuivre Island as a means of attracting more migrating waterfowl to the island. Over the years this system has fallen into disrepair. The ditches have filled with sediment and the system of culverts and gates has become non-operational at many locations. It is proposed that this system be rehabilitated by cleaning out the ditches, constructing a segment of new ditch, and replacing existing culverts and gate valves with new components. The existing pump pad would be replaced with a permanent pump station.

In addition, a new water control structure would be constructed to enlarge the surface area of the green tree reservoir. A larger reservoir could be created by raising the water level above its existing elevation of 426 feet NGVD. Typically, water would be pumped in beginning in October, reaching the target elevation by November 1, and held to the target elevation until mid-February. Then dewatering would commence and would be completed prior to trees breaking dormancy, which usually occurs in early March. The placement of a gate valve at the southern end of Cuivre Island would allow for impounding or draining this area when required.

According to the prevailing management of green tree reservoirs across the state by the Missouri Department of Conservation, the reservoir would be established six of every seven years, and on the seventh year it would be kept dry. The timing of fall flooding and spring drawdowns would vary from one year to the next, as would the surface elevation of the water. For example, fall flooding could commence anytime during the period 1 October - 15 November, and spring drawdown anytime during the period 15 February - 1 March. The variability in timing and depth of the reservoir is an attempt to mimic the hydrology of natural river flooding, so as to minimize stress and mortality on the flooded trees, as well as to attract different types of wetland-dependent birds, such as waterfowl and shorebirds. See Plates 6, 7, and 8.

(5) Management Measure 5. Deepen Cuivre Slough with hard point dikes. This would involve placing short dikes along the right bank (mainland side) of the slough. These dikes would be constructed in close enough proximity to each other such that the scour holes that develop at the end of each dike would connect and develop into a deeper channel throughout this section of slough.

(6) Management Measure 6. Use towboat propwash to deepen the side channel habitat. Engineering Manual 1110-2-5025 describes prop-wash agitation as a recognized agitation dredging technique. Prop-wash agitation dredging has been successfully used in coastal harbors, river mouths, river channels, and estuaries. It is a method intended for use in loose sands and in maintenance dredged material consisting of uncompacted clay

and silt.

As an experimental method of removing sediment from the side channel it was proposed that during a period of highwater a towboat run through a section of the slough several times. The Missouri Department of Conservation proposes that by keeping the towboat engines operating at a high revolution per minute, continuous operation over an area will cause the re-suspension of sediment. The current's increased velocity during the high water condition will then carry the sediment from the slough back to the main channel and eventually downstream. Several local marinas use this method of propwash to remove sediment from the mouths of their marinas. A section of side channel between Cuivre Island and Peruque Island has been proposed as a site for this measure. See Plate 10.

(7) Management Measure 7. Create wintering holes for fish. After receiving negative comments to Management Measure 5 from the attendees of the August 15, 1991 public meeting, the planning team met and revised the concept of deepening Cuivre Slough. Management Measure 5 was reviewed, modified, and broken into Management Measures 7, 8, and 9. Management Measure 7 provides wintering holes for fish in the side channel through the construction of pairs of dikes (one of each pair on opposite banks of the slough). Generally, this measure would call for fewer dikes than hard points called for in Management Measure 5. See Plate 11.

(8) Management Measure 8. Add two dikes at upper end of Cuivre Slough. One dike would serve to eliminate a sand bar on the mainland bank, and the other would channel more water into Cuivre Slough to remove accumulated sediment. These dikes would enlarge the cross-sectional area of the side channel and increase the amount of water that can pass through it per unit time. See Plate 12.

(9) Management Measure 9. Remove portion of submerged dike in Cuivre Slough at Phelan's Island. This dike will be notched by removing approximately one half of the dike at the centerline of the slough within the confines of the slough to an elevation of about 408.0 feet NGVD. The submerged dike acts as a sediment trap, and its removal would allow the current to assist in removing accumulated sediment. The material removed from the notch will be placed downstream of and parallel to the remaining portions of the dike on each bank. See Plate 13. (Earlier in plan formulation, it was believed that another submerged dike existed in Cuivre Slough downstream of the mouth of Cuivre River. However, no records have been located substantiating the existence of a dike in this location.)

(10) Management Measure 10. Sink cedar trees in Mississippi River along Cuivre Island to improve fish habitat. (No Plate).

(11) Management Measure 11. Sink cedar trees in Cuivre Slough to create fish habitat. (No Plate).

(12) Management Measure 12. Dredge Cuivre Slough to deepen the slough and to create overwintering fish habitat. See Plate 14.

(13) Management Measure 13. Create 400 acres of wetland on north part of Cuivre Island by the construction of 1.4 miles of a low levee with a gravity drain. This measure is considered relatively inexpensive because of the levee's short length and low height. See Plate 15.

(14) Management Measure 14. Construct closure structures between Phelan's Island and Turkey Island, between Phelan's Island and Cuivre Island, and between Turkey Island and Cuivre Island to restore side channel habitat. See Plate 16.

(15) Management Measure 15. Create forest clearings on Cuivre Island, and plant with mast tree species. In the draft report for this project, this management measure involved the implementation of tree stand improvements (TSI). Under the old measure, additional small clearings (< 2 acres) in bottomland forest on Cuivre Island would be created to improve bottomland forest species abundance and diversity, and to improve wildlife habitat. Because the flood of 1993 killed many trees on the island, resulting in the eventual creation of forest openings, the old measure was abandoned.

The modified or new measure was developed in June 1994 to lessen the adverse effect of the 1993 flood on the bottomland forest resource. Ten 8-acre clearings will be created on the island in areas of dead sugarberry and hackberry that are adjacent to live remnant stands of mast tree species, such as pin oak, hickory, and pecan. These clearings will be scattered across the island, and are likely to be long and narrow as dictated by local topography. The exact physical location of these clearings has yet to be determined. Within each area, small trees (8 inches diameter at breast height or smaller), vines and brush will be mechanically cleared primarily to reduce shading, but also to make room for mechanical planting equipment. Larger trees will remain undisturbed to provide snag habitat and partial shade for seedlings to be planted. Each clearing will be sprayed with an herbicide to kill tree seedlings that could compete with seedlings to be planted. A groundcover of wheat, switchgrass, and redtop will be established within each clearing to further reduce the potential for competition from woody species like cottonwood and silver maple. However, it is expected that some individuals of woody invaders will survive to maturity, and this is desirable because they will complement the species to be planted.

Hard mast species to be planted are native to Cuivre Island, and include oaks (pin, swamp white, bur), pecan, and shagbark and shellbark hickory. Planting of these mast species at or above the low end of the elevational gradient of sugarberry and hackberry should ensure successful survival in terms of tolerance to flooding. The low end of the elevational gradient for sugarberry and hackberry has been determined by the Rock Island District through experience to be a good point at which to begin plantings of mast tree species (Swenson, 1994). Material to be planted will consist of seedlings in 2-gallon containers, and they will be planted at least 15 feet apart and 20 feet from any forest edge.

Planting seasons will include spring (1 March - 15 April) and fall (1 October - 15 November). Oak seedlings will be revisited at year 10 to 12 to release them from shady conditions created by the canopy, by removing the overhead growth to allow sunlight to reach the ground. See Plate 17.

(16) Management Measure 16. Reforestation of cropland. Regenerate bottomland forest on Cuivre Island by planting trees on two existing cropland areas to improve bottomland forest species abundance and diversity, and to improve wildlife habitat. Natural regeneration was determined to not be desirable because the seed source on the island in terms of hard mast species, such as the oaks and hickories, is not adequate, especially after the flood of 1993.

A ground cover of wheat, switchgrass, and redtop will be established first in areas to be planted to minimize the potential for competition from woody invaders such as cottonwood and silver maple. Twenty percent of a cropland area is to be planted every 10 years, beginning at the edge of a field and then moving to the middle. Planted areas are to be at least 100 feet wide, and bare-root seedlings will be placed on a 20 by 20 foot spacing. Tree species to be planted are native to Cuivre Island, and include oaks (pin, swamp white, bur), pecan, shagbark and shellbark hickory, redbud, persimmon, dogwood, and hawthorne. Although it is not native to the area, some bald cypress will be planted at the lowest elevations to provide a unique forest habitat type.

For the north cropland area (elevation 430-436 feet NGVD), there will be no restrictions on tree species to be planted there, as it is completely above the target elevation of the green tree reservoir (429 feet NGVD), and subject only to occasional flooding from the Mississippi. However, at the south cropland area (elevation 427-432 feet NGVD), about half the area is below 429 feet NGVD, and therefore subject to up to two feet of flooding by the green tree reservoir. Species to be planted below 429 feet NGVD include swamp white oak, pin oak, bur oak, persimmon, pecan, and bald cypress. The inclusion of these species is based on an ongoing study conducted by the National Biological Survey (LTRM pool 26 office) of bottomland forest response to the flood of 1993 (Nelson, 1994). Within the south cropland area above 429 feet NGVD, there will be no restriction on species to be planted. See Plate 18.

(17) Management Measure 17. Towboat propwash as a means of deepening the slough. Same as Management Measure 6, although at a different location: the chute between Cuivre Island and Turkey Island. Would be conducted on lower 1/3 of chute, approximately 2,000 feet long by 350 feet wide. See Plate 19.

C. SUMMARY OF MANAGEMENT MEASURES . The plan formulation process identified the following Management Measures to address the project objectives.

Table 3. Summary of Management Measures.

Management Measure	Description
1	No action.
2	Develop marshes on the existing State-owned mainland area by using electric submersible pump and well.
3	Develop marshes on additionally acquired mainland area by using electric submersible pump and well.
4	GTR. Install permanent pump, clean ditches, and install or replace water control structures on Cuivre Island.
5	Increase the depth of Cuivre Slough by placing hard point dikes along mainland bank of Cuivre Slough.
6	Use towboat propwash as a means of deepening chute or slough between Cuivre and Peruque Islands.
7	Provide wintering holes for fish by adding pairs of dikes in Cuivre Slough.
8	Add two dikes at upper end of Cuivre Slough by Phelan's Island to direct flow into Cuivre Slough.
9	Remove portion of submerged dike in Cuivre Slough at Phelan's Island, mile 238.2R.
10	Sink cedar trees in Mississippi River along Cuivre Island to create habitat.
11	Sink cedar trees in Cuivre Slough to create habitat.
12	Dredge Cuivre Slough.
13	Create 400 acres of wetland on north part of Cuivre Island by the construction of 1.4 miles of low levee with a gravity drain and pump.
14	Construct three closure structures: between Phelan's Island and Turkey Island, between Phelan's Island and Cuivre Island, and between Turkey Island and Cuivre Island.
15	Create ten 8-acre forest clearings and plant with mast tree species.
16	Reforestation of cropland.
17	Propwash Experiment at Turkey Island chute.

8. EVALUATION OF MANAGEMENT MEASURES.

The Management Measures identified in the previous section are evaluated according to the four criteria in Table 4 as to their overall potential benefits. The surviving Management Measures in combination will form the basis for the recommended plan.

Table 4. Evaluating Criteria.

Acceptability	:	The extent to which a Management Measure is acceptable to the sponsoring agencies in meeting their operational and management goals and priorities, and is compatible with existing laws, regulations, and public policies.
Effectiveness	:	The extent to which a Management Measure is "engineeringly" feasible and workable.
Completeness	:	The extent to which a Management Measure addresses the intended project objectives.
Efficiency	:	The extent to which a Management Measure is cost effective (cost per Average Annual Habitat Units).

In addition, the Management Measures are evaluated by the criteria in the order that the criteria appear in the table above. This provides for a logical winnowing process whereby unacceptable and unworkable measures are removed from consideration early.

Table 5. Evaluation of Management Measures as to Acceptability.

Management Measure	Description	Acceptability High - Medium - Low	Reasons for Receiving Acceptability Rating
1	No action.	Low	Not acceptable to MDOC because project goals and objectives are not met. MDOC believes that there is an opportunity to perform a relatively small amount of work to garner large amounts of habitat benefits. In addition, a large portion of Cuivre Island was selected and purchased by the Federal Government as a mitigation area for L&D26(R). The remainder of the Island is owned by the State of Missouri. It makes sense to manage the entire island under one plan developed under the Environmental Management Program.
2	Develop marshes on the existing State-owned mainland area by using electric submersible pump and well.	Initially High	Initially proposed by MDOC as being a component of their agency's state wetland management plan.
3	Develop marshes on additionally acquired mainland area by using electric submersible pump and well.	Low	State is unwilling to incur costs of acquiring additional property to include in this project. Federal funds through the Environmental Management Program can not be used to acquire property.
4	GTR. Install permanent pump, clean ditches, and install or replace water control structures on Cuivre Island.	High	Initially proposed by MDOC as being a component of their agency's state wetland management plan.
5	Increase the depth of Cuivre Slough by placing hard point dikes along mainland bank of Cuivre Slough.	Low	Management Measure 5 was not considered due to the negative public response to the plan when presented at the August 15, 1991 public meeting.

Table 5. Evaluation of Management Measures as to Acceptability.

Management Measure	Description	Acceptability High - Medium - Low	Reasons for Receiving Acceptability Rating
6	Use towboat propwash as a means of deepening chute or slough between Cuivre and Peruque Islands.	High	Initially proposed by MDOC, but rejected later after site visits indicated that the substrate consisted of a gravel too coarse to be displaced by propwash.
7	Provide wintering holes for fish by adding pairs of dikes in Cuivre Slough.	High	Initially proposed by MDOC.
8	Add two dikes at upper end of Cuivre Slough by Phelan's Island to direct flow into Cuivre Slough.	High	Initially proposed by MDOC.
9	Remove portion of submerged dike in Cuivre Slough at Phelan's Island, mile 238.2R.	High	Initially proposed by MDOC.
10	Sink cedar trees in Mississippi River along Cuivre Island to create habitat.	Low	A MDOC pilot program showed that this measure was infeasible after towboat propwash tore out the sunken trees.
11	Sink cedar trees in Cuivre Slough to create habitat.	Medium	Relatively shallow water depths combined with pool fluctuations and recreational boat use made this measure infeasible.
12	Dredge Cuivre Slough.	Low	MDOC considers dredging to be too costly for the potential benefits.
13	Create 400 acres of wetland on north part of Cuivre Island by the construction of 1.4 miles of low levee with a gravity drain and pump.	Low	The State determined that the sandy soil at this portion of the island was too permeable to retain water, and therefore this measure was considered infeasible.

Table 5. Evaluation of Management Measures as to Acceptability.

Management Measure	Description	Acceptability High - Medium - Low	Reasons for Receiving Acceptability Rating
14	Construct three closure structures: between Phelan's Island and Turkey Island, between Phelan's Island and Cuivre Island, and between Turkey Island and Cuivre island.	High	Initially proposed by MDOC.
15	Create ten 8-acre forest clearings and plant with mast tree species.	High	The flood of 1993 killed about 60 percent of the trees on Cuivre Island, tree species diversity has decreased, and the value of the island's bottomland forest as a resource to wildlife is expected to be low for the next 50 years.
16	Reforestation of cropland.	High	Due to man's activities, regional and state-wide losses of bottomland forest are high. Local losses are significant as a result of the flood of 1993.
17	Use towboat propwash as a means of deepening chute or slough between Cuivre and Turkey Islands.	High	Appears to be a cost-effective means to remove sediment from chutes and backwater areas and to create deep-water, over-wintering fishery habitat.

Table 6. Evaluation of Management Measures as to Effectiveness.

(Management Measures found unacceptable [rating of Low] in Table 5 have been removed)

Management Measure	Description	Effectiveness High - Medium - Low
2	Develop marshes on the existing State-owned mainland area by using electric submersible pump and well.	High
4	GTR. Install permanent pump, clean ditches, and install or replace water control structures on Cuivre Island.	High
6	Use towboat propwash as a means of deepening chute or slough between Cuivre and Peruque Islands.	Low (Channel substrate at this site consists of newly accreted gravel too large to be resuspended and carried away.)
7	Provide wintering holes for fish by adding pairs of dikes in Cuivre Slough.	High
8	Add two dikes at upper end of Cuivre Slough by Phelan's Island to direct flow into Cuivre Slough.	High
9	Remove portion of submerged dike in Cuivre Slough at Phelan's Island, mile 238.2R.	High
14	Construct three closure structures: between Phelan's Island and Turkey Island, between Phelan's Island and Cuivre Island, and between Turkey Island and Cuivre island.	Low (Since initial development of this Measure, flow through these side channels almost nonexistent at normal pool due to sediment buildup.)
15	Create ten 8-acre forest clearings and plant with mast tree species.	High
16	Reforestation of cropland.	High
17	Use towboat propwash as a means of deepening chute or slough between Cuivre and Turkey Islands.	High

Table 1A. Repeating the Project Objectives found in Table 1.

Project Objective Number (for use in Table 6)	Project Objective
1	Maintain and improve side channel habitat by preventing river-borne sediment from filling side channel.
2	Provide overwintering habitat for fish in side channel.
3	Increase habitat quality and quantity of artificially flooded habitats for wetland-dependent wildlife.
4	Increase diversity of wetland types within project area.
5	Maintain and improve habitat quality and quantity of bottomland forest within project area.

Table 7. Evaluation of Management Measures as to Completeness.

(Management Measures found ineffective [having a rating of Low] in Table 6 have been removed)

Management Measure	Description	Overall Completeness High - Medium - Low	Completeness High - Medium - Low	Project Objective Number (from Table 1A above)
2	Develop marshes on the existing State-owned mainland area by using electric submersible pump and well.	High	Low	1
			Low	2
			Medium	3
			High	4
			Low	5
4	GTR. Install permanent pump, clean ditches, and install or replace water control structures on Cuivre Island.	High	Low	1
			Low	2

Table 7. Evaluation of Management Measures as to Completeness.

(Management Measures found ineffective [having a rating of Low] in Table 6 have been removed)

Management Measure	Description	Overall Completeness High - Medium - Low	Completeness High - Medium - Low	Project Objective Number (from Table 1A above)
			High	3
			Medium	4
			Medium	5
7	Provide wintering holes for fish by adding pairs of dikes in Cuivre Slough.	Medium	Medium	1
			High	2
			Low	3
			Low	4
			Low	5
8	Add two dikes at upper end of Cuivre Slough by Phelan's Island to direct flow into Cuivre Slough.	Medium	High	1
			Medium	2
			Low	3
			Low	4
			Low	5
9	Remove portion of submerged dike in Cuivre Slough at Phelan's Island, mile 238.2R.	Low	Medium	1
			Low	2
			Low	3
			Low	4
			Low	5
15	Create ten 8-acre forest clearings and plant with mast tree species.	Medium	Low	1
			Low	2
			Medium	3

Table 7. Evaluation of Management Measures as to Completeness.

(Management Measures found ineffective [having a rating of Low] in Table 6 have been removed)

Management Measure	Description	Overall Completeness High - Medium - Low	Completeness High - Medium - Low	Project Objective Number (from Table 1A above)
			Low	4
			High	5
16	Reforestation of cropland.	Medium	Low	1
			Low	2
			Medium	3
			Low	4
			High	5
17	Propwash Experiment.	Medium	High	1
			High	2
			Low	3
			Low	4
			Low	5

Table 8. Evaluation of Management Measures as to Efficiency.

Mgmt. Measure	Description	Alt. Inc.	Management Measure Increments	Initial Cost ($)	Annualized Initial Cost ($)	Annual OM&R Cost ($)	Annualized Initial + OM&R Cost ($)	AAHU (All Species)	Efficiency (Annual Cost divided by AAHU)
2	Develop marshes on the existing State-owned mainland area by using electric submersible pump and well.	2A	Use one half of Area 2	313,000	25,586	3,900	29,486	87	339
		2B	Use all of Area 2	463,000	37,846	6,107	43,953	202	218
		2C	Use all of Area 1 and Area 2	763,132	62,381	8,888	71,269	280	255
4	GTR. Install permanent pump, clean ditches, and install or replace water control structures on Cuivre Island.	4A	pump water to elev. 427.0	625,000	51,089	8,121	59,210	222	267
		4B	pump water to elev. 428.0†	625,000	51,089	9,715	60,804	402	151
		4C	pump water to elev. 429.0	880,000	71,934	11,309	83,243	584	143
		4D	pump water > elev. 429.0	Because of the topography and ground elevations on the island, it was considered infeasible to pump to higher than elev. 429.					
7	Provide wintering holes for fish by adding pairs of dikes in Cuivre Slough.	7A	1 pair of dikes	43,800	3,581	592	4,173	1	4,173
		7B	2 pairs of dikes	61,300	5,011	828	5,839	2	2,920
		7C	3 pairs of dikes	76,300	6,237	1,029	7,266	3	2,422
		7D	4 pairs of dikes	89,100	7,284	1,198	8,482	4	2,121
		7E	5 pairs of dikes	98,900	8,084	1,332	9,416	5	1,883
		7F	6 pairs of dikes	106,500	8,706	1,433	10,139	6	1,690
		7G	>6 pairs of dikes	This increment would have too many dike-pairs, possibly causing adverse affects on flow through Cuivre Slough. Also, there was an overall desire to limit costs and observe results before placing too many dikes in slough.					
8	Add two dikes at upper end of Cuivre Slough by Phelan's Island to direct flow into Cuivre Slough.	Only two dikes would be required for this increment.		43,800	3,580	592	4,172	241	17
9	Remove portion of submerged dike in Cuivre Slough at Phelan's Island, mile 238.2R.	-		16,000	1,308	0	1,308	155	8

Table 8. Evaluation of Management Measures as to Efficiency.

Mgmt. Measure	Description	Alt. Inc.	Management Measure Increments	Initial Cost ($)	Annualized Initial Cost ($)	Annual OM&R Cost ($)	Annualized Initial + OM&R Cost ($)	AAHU (All Species)	Efficiency (Annual Cost divided by AAHU)
15	Tree Stand Improvements (TSI).	15A	Small and scattered clearings within 1/3 of forest.	2,520	206	127	333	44††	8
		15B	Small and scattered clearings within 2/3 of forest.	5,100	417	257	674	91††	7
		15C	Small and scattered clearings over entire forest.	7,560	618	382	1,000	135††	7
15 Mod.	Mgmt. Measure 15 was modified following the draft DPR: Create ten 8-acre forest clearings on Island and plant with mast tree species.	15M	-	116,640	9,534	1,998	11,532	98	118
16	Reforestation of cropland.	16A	Reforestation of south cropland.	1,428	117	705	822	38	22
		16B	Reforestation of north cropland.	3,192	261	1,576	1,837	62	30
		16C	Reforestation of south and north cropland.	4,620	378	2,281	2,659	106	25
17	Propwash Experiment.	Approximately lower 1/3 of chute between Cuivre Island and Turkey Island.		3,000	245	506	751	8	94

† OM&R costs interpolated between 4A & 4C.

†† AAHU value is no longer valid; it is applicable only for forest conditions existing before the 1993 flood. This value can not be directly compared with the AAHU value for Management Measure 15M, which was developed in response to the 1993 flood's detrimental effects on tree survival and species diversity.

Table 9. Discussion of Operation and Maintenance for Management Measures in Table 8.

Management Measure 2. Marsh units on the mainland will be filled with water pumped from a well to an average depth of 2-3 feet (up to 436.5 feet NGVD). The units will hold water year round. They will be dewatered every fourth year to control the invasion of undesirable vegetation. Water will be let out by gravity flow during the spring, and when conditions are dry enough the interior will be disced to eliminate perennial plants. The units will be recharged with water during the fall. To counteract the loss of marsh water by underseepage to the river, it is assumed that maintenance pumping will consist of pumping one day (eight hours) every two weeks during the year.
Management Measure 4. The green tree reservoir on Cuivre Island will be filled with water pumped from the river to the target elevation (increments vary from 427 to 429 feet NGVD). The reservoir will exist during the year for a 5-6 month period. Pumping typically will begin in early October, and the recharge period is limited to 20-30 days (continuous pumping). The green tree reservoir will be established six of every seven years, with the seventh year kept "dry" to minimize stress on forest trees; this 7 year cycle is currently used by the Missouri Department of Conservation for green tree reservoir management in the state. Stress on forest trees will also be minimized by varying the timing of fall flooding and spring dewatering, as well as the reservoir's surface elevation, from year to year. Dewatering of the reservoir is by gravity flow during most years, and typically will begin by mid-February. It is estimated that dewatering in the spring will require pumping once every five years due to high river conditions. To counteract the loss of water from the reservoir to the river through underground seepage, it is assumed that maintenance pumping will consist of pumping one day (eight hours) every two weeks over a four month period. Pumping for moist soil management is included in the costs shown in Table 8.
Management Measure 7. No operations and maintenance activities are needed other than periodic replacement of stone.
Management Measure 8. No operations and maintenance activities are needed other than periodic replacement of stone.
Management Measure 9. No operations and maintenance activities are needed for this measure.
Management Measure 15 (as modified after draft DPR). During initial project construction, a groundcover will be established in each clearing. This groundcover in between the tree seedlings will be mowed twice annually for the first three years. At about year ten or twelve, seedlings such as oak will need to be released from any shady conditions that would eventually lead to their mortality. Any overhanging canopy will need to be cleared to allow direct sunlight to reach the ground.
Management Measure 16. During initial project construction, and for each successive 10-year planting, a groundcover will be established on cropland to be planted with trees. This groundcover between the tree seedlings will be mowed annually, and herbicide will be applied twice a year to control undesirable herbaceous vegetation. Mowing and herbicide applications will occur each year for a period of six years following each planting to ensure that tree seedlings have a good chance of survival.
Management Measure 17. This agitation dredging will be repeated every five years, using 2 days of pushboat's time, 8 hours per day.

9. RECOMMENDED PLAN.

A. SUMMARY OF RECOMMENDED PLAN. The selected plan of action is composed of Management Measures 4C, 7F (modified), 9, 15 (modified), 16 and 17.

Management Measure 2 is not recommended because of its high development cost for the size of the marsh area (see response from MDOC, dated January 26, 1994 (Appendix D).

Management Measure 8 is not recommended because the local sponsor decided not to support this measure following a meeting with adjoining landowners on April 27, 1994. Similarly, Management Measure 7F was reduced from 6 pairs of dikes to 6 dikes--eliminating all dikes protruding from the mainland side of Cuivre Slough (see Plate 11A).

Management Measure 15 was modified after the draft DPR was completed.

Table 10 summarizes the costs and benefits of the Management Measures of the recommended plan.

Table 10. Recommended Plan.

Man. Meas	Description		Initial Cost ($)	Annualized Initial Cost ($)	Annual OM&R Cost ($)	Annualized Initial + OM&R Cost ($)
4C	GTR. Install permanent pump, clean ditches, and install or replace water control structures on Cuivre Island.	pump water to elev. 429.0	880,000	71,934	11,309	83,243
7F	Provide wintering holes for fish by adding pairs of dikes in Cuivre Slough.	6 dikes from Cuivre Island.	53,250	4,353	1,029	5,382
9	Remove portion of submerged dike in Cuivre Slough at Phelan's Island, mile 238.2R.		16,000	1,308	0	1,308
15	Create ten 8-acre forest clearings and plant with mast tree species.		116,640	9,534	1,998	11,532
16C	Reforestation of cropland.	Reforestation of south and north cropland.	4,620	378	2,281	2,659
17	Propwash Experiment.	Lower 1/3 of chute between Cuivre Island and Turkey Island.	3,000	245	506	751
		Totals	1,073,510		17,123	

Habitat enhancements from the recommended Management Measures are estimated to provide a net gain of 788 (was 825) average annual habitat units (AAHUs) for wildlife and 266 (was 410) AAHUs for fishes.

B. REASONS FOR RECOMMENDING MANAGEMENT MEASURES.

Table 11. Reasons for Recommending Management Measures .

Management Measure	Measure	Reasons for Recommending
4C	GTR. Install permanent pump, clean ditches, and install or replace water control structures on Cuivre Island, and pump to elev. 429.0	Meets all evaluation criteria, and has the highest efficiency (lowest annual cost per average annual habitat unit) of increments of this measure.
7F	Provide wintering holes for fish by adding 6 dikes in Cuivre Slough.	Meets all evaluation criteria. When this measure was 6 pairs of dikes, it had the highest efficiency (lowest annual cost per average annual habitat unit) of increments of this measure. Was modified in May 1994 by local sponsor to avoid any easment problems.
8	Add two dikes at upper end of Cuivre Slough by Phelan's Island to direct flow into Cuivre Slough.	Meets all evaluation criteria.
9	Remove portion of submerged dike in Cuivre Slough at Phelan's Island, mile 238.2R.	Meets all evaluation criteria.
15 Modified	Create ten 8-acre forest clearings and plant with mast tree species.	Meets all evaluation criteria.
16	Reforestation of both south and north cropland.	Meets all evaluation criteria. Has intermediate level of efficiency for this measure's increments. Preferred over increment having highest efficiency because of this increment is more complete in addressing objectives.
17	Propwash Experiment in lower 1/3 of chute between Cuivre Island and Turkey Island.	Meets all evaluation criteria. Prop-wash dredging has been successfully used in coastal harbors, river mouths, river channels, and estuaries, although it is experimental for riverine habitat rehabilitation. Has low initial and annual costs.

C. PROJECT FEATURES. Components, items of concern, and structural features of the recommended plan are further described:

(1) Pump Stations. The Cuivre Island pump station has been sized to fill the wetlands area in 30 days. This is the site management filling criteria which requires the greatest pumping capacity. Management Measure 4 provides for a 10,000 gpm pump to allow the water level of the lakes and wetlands on the island to be brought to elevation 429.0. The pump will be started and stopped manually and will have automatic low water cutoff. Power will be brought to the island and to the pump station site by overhead wiring. Immediately at the pump station, the power wiring will be brought to the structure by underground cable. The electrical equipment will be mounted inside a 5-ft. parapet on the station. The pump station details are shown on Plate 8.

The water source for the island wetlands will be the Mississippi River. Because this project area is located downstream and in near proximity to Lock and Dam 25 the water surface levels will fluctuate minimally and can easily supply water for a surface intake pump.

The Missouri Department of Conservation desires to fill the reservoir in "increments" so that fall-migrating waterfowl encounter a continuous supply of food resources. Newly flooded substrate offers food in the form of mast (such as oak acorns) to dabbling ducks which prefer to feed in shallow water. When the food supply becomes depleted, an additional slug of water is added to flood a new area of substrate. The target elevation of the reservoir is attained after 4-5 successive additions of water. The MDOC has found a period of 30 days to be responsive to the needs of migrating waterfowl.

(2) Water Control Structures. Water at the Cuivre Island wetlands area is controlled by the pump station located on the eastern end of the island and a series of gate valves at each lake and at the southern end of the island. Water from the pump station is pumped into the series of ditches which connect the five existing lakes on the island. As the water level exceeds the normal pool of the lakes (424.5 NGVD) the water is allowed to naturally meander through the woodlands creating the wetlands. The pump station also has the capability to reverse flow and pump the level down if needed.

In addition, the gated culvert at the southern end of the island can be used to drain the wetlands down to 426.0, or allow water to back in when the Mississippi River pool elevation is above 426.0 and above the level of the water in the ditch. Construction will include two 36-inch gated culverts at separate locations, three 36-inch non-gated culverts at separate locations, and two 36-inch non-gated culverts at another location (see Plate 7).

(3) Ditch Rehabilitation. The existing ditches on Cuivre Island will be cleaned of debris and sediment to a bottom elevation of 420.0 NGVD. This elevation is one foot lower than the bottom elevation of the culvert pipes to allow for future sediment buildup and construction irregularities. Ditch side slopes will be at a 1:3 slope. The material removed from the ditches will be deposited along the edge of the ditches to form a access

road to each of the lakes. This road is designed to be capable of carrying a four wheel utility motorcycle.

(4) Dike Construction. The series of six dikes that are to be constructed within Cuivre Slough are of a simple design. Each dike will be constructed with a ten foot crown and have approximately fifty feet of root attachment into the mainland or island. The lengths of dikes vary (see Appendix E, Table E-1). Type "A" rock is to be used in construction.

(5) Dike Removal. See Appendix E.

(6) Create forest clearings and plant with mast tree species. The exact location of these clearings will be determined prior to the plans and specifications stage.

(7) Reforestation. Twenty percent of the north and south cropland areas will be planted every ten years. This means 8 acres for the north area, and about 3-4 acres for the south area.

(8) Propwash Experiment. Approximately 2,000 feet-long section of chute or slough between Cuivre Island and Turkey Island has been chosen as the testing site of an experimental method of resuspending river sediment. By operating a tugboat over this test site several times, the effects of the downward force of a tugboat's propwash in resuspending sediment can be determined. The sediment will be washed out of the side channel and into the Mississippi River. This test area will be surveyed immediately prior to and after the test to assure accurate data. In future years annual surveys will be accomplished to determine if the resuspension has long lasting effects and whether this method is cost effective. It is estimated that an average of two feet of sediment will be removed from the 16-acre area (about 52,000 cubic yards).

D. CONSTRUCTION METHODS.

(1) Foundation Considerations. Boring CI-1 was drilled in the vicinity of the proposed pump station on Cuivre Island. Subsurface information obtained from the borehole indicate that the foundation soils of clay and sand are capable of supporting the pump station and its appurtenances. However based on the preliminary design for the pump station some ground water control (a dewatering system) or pressure relief measures will be required during construction. The dewatering system will be contractor designed, installed and operated. It is anticipated that two to four deep wells will be required during the construction of the pump station.

At the three other locations where gated culverts are proposed, subsurface information does not indicate a settlement problem. Estimated settlements are within acceptable limits for gated culvert pipes. Ground water and surface water at these locations will be controlled

with a dewatering system designed and operated by the contractor.

(2) Site Access. Access to Cuivre Island is only possible by boat. Therefore, all construction equipment associated with the island wetlands will have to be barged to the island from the MDOC boat ramp. For the dike construction in the slough, barge access within the slough will be prohibited except during periods of high water due to the shallow depth of the slough.

(3) Construction Materials. Only common construction materials are required for this project.

E. REAL ESTATE REQUIREMENTS. Cuivre Island is jointly owned by the Corps of Engineers (866.57 acres) and the Missouri Department of Conservation (MDOC) (377 acres). The Corps' ownership is to be licensed by MDOC under a fish and wildlife enhancement license; hence, no additional real estate requirements or credit will be necessary for project facilities on the island portion of the project. A Real Estate Design Memorandum (REDM) will not be required for this project.

F. COMPATIBILITY OF RECOMMENDED PLAN WITH MITIGATION AUTHORITY. The recommended plan is compatible with the authority used to obtain Cuivre Island as mitigation for losses of terrestrial habitat associated with construction of the Melvin Price Locks and Dam. Implementation of the plan will not compromise the integrity of the island's terrestrial habitat. Expansion of the green tree reservoir will not lead to the conversion of habitat from terrestrial to aquatic.

10. FUTURE WITH PROJECT CONDITIONS.

A. Physical Setting. There will be minor alterations to topography due to dike construction and cleanout of the ditch system on Cuivre Island.

B. Water Resources. The quantity of surface water on Cuivre Island will increase seasonally due to improvement of the green tree reservoir.

C. Geology and Soils. The project will not affect the geology or rate of sedimentation on the soil of Cuivre Island.

D. Water Quality With Project. The overall reduction in the sedimentation rate is a significant water quality enhancement by itself. The cleaning out and deepening of the water distribution system for the green tree reservoir in the interior of the island will lessen the summer time diel variations of temperature and Ph and will enhance the aquatic biota. The scour holes at the lower ends of the dikes in the side channel will provide deep water habitat that should, during normal winters, prevent oxygen depletion and the resultant fish kills.

Because of the large agricultural land use in the Cuivre River drainage basin and the duck hunting popularity of the area, sediment samples were analyzed for pesticides and metals. The results of the analysis indicated no detection of metals and insignificant concentrations of pesticides. The disturbance of these sediments during project construction should have no significant impact.

Water quality certification under Section 401 of the Clean Water Act is not needed for the propwash sediment resuspension experiment (MDNR, 1991). Construction items or activities which do require such authorization include mechanized landclearing; any excavation on land; dredging in Cuivre Slough; construction of disposal areas, water control structures, pump station, and stone dikes.

E. Habitat Types and Vegetation.

(1) Bottomland Forest. Construction activities will result in the loss of 20 acres of bottomland forest on Cuivre Island. Fourteen acres will be used as disposal areas and access roads during ditch cleanout, and six acres for enlargement of existing ditches and creation of a new ditch.

This minor loss of forest will be offset by the conversion of 110 acres of cropland on Cuivre Island to bottomland forest by planting of hard and soft mast tree species. This conversion will occur over a 50-year period, with 20 percent of the 110 acres planted every 10 years. Likewise, the planting of 80 acres of bottomland forest clearings on Cuivre Island with hard mast tree species is also expected to increase the overall quality of the forest resource on the island. Assuming that about 800 of the nearly 1,300 acres of forest was

killed by the flood of 1993, these 190 acres of tree plantings will provide a good start in the reestablishment of the forest. It is hoped that these plantings will allow the forest to eventually become self-sustaining. The value of the forest will increase for resident and migratory wildlife species, such as waterfowl, deer, turkey, and squirrel, by providing more mast in the form of nuts and acorns. The project area's hydrology in terms of river flooding and green tree reservoir management is not incompatible with the selection of tree species to be planted.

The structural improvements for better green tree reservoir management on Cuivre Island will not lead to flooding during the growing season. Flooding will still be targeted for the nongrowing or winter season when trees are dormant. The structural improvements will allow for the pool elevation of the reservoir to be raised from 426 to 429 feet NGVD, thereby increasing the area of flooded bottomland forest from 55 to as many as 402 acres (Table B-6). The area covered by water up to two feet deep, which is generally the range of depth preferred by migrating waterfowl, will increase from 61 to 280 acres (Table B-15). By increasing the pool elevation from 426 to 429 feet NGVD, the greatest depth of standing water in timber will increase from 4 to 7 feet. The overall depth of the green tree reservoir is expected to slowly diminish over time as sediment carried by flood waters is periodically deposited on the island.

In Missouri, green tree reservoir management can slowly shift the species composition of bottomland forests to more water-tolerant species (Fredrickson 1979), and it can also impair the regeneration and survival of pin oak trees (Heitmeyer et al. 1989). To lessen these effects, Heitmeyer et al. (1989) suggest that flooding regimes in green tree reservoirs should not be constant from year to year, but changes in duration, depth, and timing of flooding should be made from year to year to imitate more natural conditions. MDOC will implement variable flooding regimes from year to year to minimize these adverse impacts. Within the area on Cuivre Island influenced by green tree reservoir management, artificial flooding during the dormant season (fall-winter-early spring) is not expected to cause tree mortality, but a slight shift toward a wetter plant community is anticipated. Silver maple and green ash may become more common. A decrease in pin oak regeneration and survival may be expected also, especially at the lower elevations within the reservoir.

(2) Sloughs. The interior sloughs on Cuivre Island and the old oxbow of Cuivre River on the mainland will not be physically altered by the project. On Cuivre Island, the ditch cleanout work and gravity drain improvements will allow for the drainage of interior sloughs to create mud flats and implement moist soil management.

(3) Cropland. Of the 188 acres of cropland within the project area, 110 acres on Cuivre Island will be lost to replanting of bottomland hardwoods. Raising the elevation of the green tree reservoir from 426 to 429 feet NGVD will not lead to the seasonal flooding of additional cropland. Cropland not affected by the project will remain planted in small grains. The project will not affect any prime, unique, statewide or locally important farmland (see Appendix H).

(4) Side Channel Habitat. Removal of the submerged dike remnant is expected to help prevent the upper half of the side channel from closing due to the deposition of river-borne sediment. This structural improvement is expected to allow incoming sediments to pass on down through and exit the side channel. Rather than lose about 90 acres of side channel habitat within the next 50 years, the project is expected to maintain more than half the current 160 acres of aquatic habitat. Scour holes created by the six stone dikes will provide winter and summer habitat for riverine fishes. These structures will occupy a total of about 1 acre of side channel habitat.

Removal of sediment from the side channel between Cuivre and Turkey Islands by propwash will keep 16 acres of this 70-acre area open as backwater habitat. Aquatic vegetation in both side channels is expected to remain sparse.

F. Management. From a natural resource perspective, management of the project area by the Missouri Department of Conservation will be somewhat broadened. On Cuivre Island, tree plantings will be implemented in bottomland forest to improve forest species composition and wildlife habitat. Green tree reservoir management on the island will continue as before, as will moist soil management of the island's interior sloughs, but more predictably from year to year. Cropland unaffected by the project will continue to be planted in small grains. In general, public use of the wildlife area will remain as it is now, with opportunities for such recreational activities as hunting, fishing, and boating.

G. Animals. In Appendix B, habitat benefits of all management measures were quantified using two methods, one for wildlife, and one for fish. The evaluation for wildlife assessed habitat conditions in terms of twelve species, including ten birds and two mammals. Habitat conditions for fish were assessed in terms of seven species. The effect of the recommended plan on these evaluation species, as well as other species, is summarized below.

(1) Birds. The ten evaluation species and the groups they represent are: least bittern, green-backed heron (herons and egrets); Canada goose, mallard, wood duck (waterfowl); king rail, American coot (cranes and allies); northern parula, prothonotary warbler (songbirds, specifically Neotropical migrants); lesser yellow legs (shorebird).

The mallard and wood duck, the target of management efforts at the green tree reservoir on Cuivre Island, are expected to benefit substantially from the proposed improvements to green tree reservoir management (Table B-11). The green-backed heron, northern parula, and prothonotary warbler should receive significant habitat benefits also. Very slight benefits are projected for the Canada goose, and no change in habitat value is expected for the least bittern, lesser yellowlegs, king rail, and American coot. No evaluation species showed a net loss in habitat value. Improvements to green tree reservoir management should benefit such other species as great blue heron, black-crowned night heron, hooded merganser, red-headed woodpecker, and red-winged blackbird.

Reforestation of cropland on the island, and mast tree plantings in forest clearings, are expected to benefit the green-backed heron, wood duck, northern parula, and prothonotary warbler (Table B-13).

(2) Mammals. The evaluation species include two large, semi-aquatic rodents, the muskrat and beaver. The beaver is anticipated to receive significant habitat benefits from the proposed improvements to green tree reservoir management, reforestation, and tree plantings in forest clearings (Tables B-11,12,13). The habitat evaluation projected a slight increase in habitat benefits for the muskrat on Cuivre Island. Other mammals as mink, river otter, and raccoon should benefit also.

(3) Amphibians and Reptiles. The evaluation method did not assess habitat conditions for any reptiles or amphibians. They are not the focus of any specific management objective. For future projects, a habitat suitability model for a representative species may be incorporated into the evaluation method. The enlarged green tree reservoir should benefit a wide variety of frogs, snakes, turtles, and skinks. Enlargement of the reservoir is not expected to lead to increased predation on reptiles and amphibians by fish.

(4) Fish. The seven evaluation species and the groups they represent are: black bullhead, catfish (freshwater catfishes and bullheads); carp (minnows and carps); crappie, largemouth bass, bluegill (sunfishes); gizzard shad (herrings). The habitat evaluation focused on Cuivre side channel and the side channel between Cuivre and Turkey Islands.

Substantial habitat benefits are expected to accrue to gizzard shad, catfish, black bullhead, and carp. The habitat evaluation did not project any habitat benefits for the crappie, largemouth bass, or bluegill, but this projection was judged by the evaluation team of biologists to be biologically unsound, and due to a shortcoming in the habitat suitability index models for these species. All species of fish that use these side channels will benefit from the proposed measures, as these measures are expected to prevent them from closing due to river-borne sedimentation.

(5) Other Animals. Aquatic conditions in the expanded green tree reservoir should provide habitat for a variety of aquatic invertebrates, including insects and crayfish.

H. Threatened and Endangered Species. See Appendix G for the St. Louis District's Biological Assessment describing the project's effect on Federally threatened and endangered species.

With regard to species listed at the state level as either endangered or threatened, the project will not affect those that prefer marsh habitat, such as the western fox snake, eastern massasauga, and king rail, because no existing marsh habitat will be affected, nor will marsh habitat be created. The alligator gar, a riverine fish, will not be affected because it is rarely encountered in Pool 26. The project is expected to benefit the great egret by providing more

efficient moist-soil management within the island's interior sloughs. Increased moist-soil plant production in these aquatic areas is expected to improve conditions for resident fish, which are eaten by this bird.

I. Recreation / Aesthetic Resources. The project does not include any features that would directly facilitate recreation. Opportunities for recreational fishing, hunting, and boating within the project area may be affected during the construction process. Hunting on the island and mainland probably will be temporarily prohibited. Fishing and boating in Cuivre side channel probably will be unavailable in the vicinity of dikes under construction. In the long term, hunting and sport fishing is expected to improve because habitat conditions for wildlife and riverine fishes are expected to improve.

Construction activities will have minor adverse impacts on the aesthetic quality of the project area during the duration of the work. The most visible activities will occur within Cuivre side channel, especially those above the confluence with Cuivre River where private landowners have homes along the mainland bank. Construction activities on Cuivre Island will not be visible except from the main channel of the Mississippi River. In the long term, the aesthetic quality of the island is expected to improve with the conversion of 110 acres of cropland to bottomland forest. The seven stone dikes will detract from the natural appearance of Cuivre side channel.

J. Socioeconomic Resources. The project is not expected to affect development occurring in either St. Charles or Lincoln Counties. At a very local scale, the private landowners now living on the mainland along the upper half of Cuivre side channel should benefit from the project. Because the proposed work is expected to keep the upper half of the side channel from closing with sediment, the side channel and its recreational opportunities and aesthetic qualities will be preserved.

The proposed project would have minimal or no impacts on the following Section 122 (Rivers and Harbors Act) socioeconomic categories: aesthetic values, transportation, public health and safety, community cohesion, community growth and development, business or home relocations, land use, property values, tax revenues, regional growth, employment, business activity, food supply, navigation, flooding effects, or energy sources. Therefore, typical impacts of cost-shared projects in small communities would not be expected. Socioeconomic impacts would potentially be experienced in these areas: temporary effects on noise levels and longer term effects on aesthetic values and recreational opportunities.

(1) Noise Levels. The immediate vicinity around the project area would be temporarily disrupted by construction activities. Some disturbance may occur from noise and human activity associated with construction activities and the transportation of materials to the sites. These impacts are temporary and adverse impacts to the general public would be insignificant.

(2) Aesthetic Values. The initial construction would have minimal adverse

impact on aesthetic values because of the presence and operation of the construction equipment placing dike material near homes located along the slough bank. However, the location of the project away from major highways would minimize any short-term visual impacts associated with the construction activities. Propwash resuspension of sediment, the placement of new dike material within the slough, and the removal of the existing dike will cause a turbidity plume, which may temporarily reduce the aesthetic quality of the area. Over the long term, the project is expected to have a positive effect by adding to the visual diversity of the site.

(3) Recreational Opportunities. Recreational opportunities due to the construction of this project should increase slightly. Public use of the Cuivre Island area is permitted in accordance with the Wildlife Code of Missouri. The enhancement of fish habitat and improved navigation within the slough will probably result in an increase in angling. Hunters presently use Cuivre Island and are expected to continue in the future without any noticeable increase in numbers.

K. Cultural Resources. No previously undisturbed part of the island owned by the Corps of Engineers will be affected by earthmoving and/or construction activities associated with the implementation of Management Measure 4. However, a much larger area of Cuivre Island will be subject to inundation. Because of the small extent of any existing cultural resources, and the unlikelihood of disturbance caused by the recommended plans, a Phase I survey for historic properties of the island should not be conducted. The State Historic Preservation Officer approved of the recommended plan on March 3, 1994 (see Appendix M).

L. Air Quality. Fumes and dust will be generated by heavy equipment during the construction process. Operation of the green tree reservoir will not generate fumes because the pumps to be used for water management are driven by electricity. The project is not expected to adversely affect air quality of St. Charles or Lincoln Counties.

M. Compliance with Environmental Laws and Regulations. The degree of compliance of the proposed project with environmental laws and regulations is presented in Table 13.

N. Adverse Environmental Effects Which Cannot be Avoided. Adverse impacts which cannot be avoided include the clearing of bottomland forest to create disposal areas for sediment dredged from ditches on the island, the placement of dredged material (sediment) from the ditches into bottomland forest wetlands, the loss of cropland due to replanting of bottomland forest, the loss of side channel habitat in Cuivre slough due to construction of dikes, and the resuspension and flushing of sediment from the side channel between Cuivre and Turkey Islands due to propwash agitation.

O. Short-term Uses of Environment Versus Long-term Productivity. Local short-term uses of the environment are limited to disturbances created during the construction

process, such as tree clearing, disposal of dredged material, construction of ring levees and rock dikes, and creation of staging areas for construction equipment. The maintenance and enhancement of long-term biological productivity is the basic goal of this project. Productivity of the green tree reservoir on the island will be enhanced once the proposed improvements to water control are implemented. Aquatic productivity in the side channel is expected to be maintained because measures are proposed to keep them from filling with sediment. The short-term uses of the project area are minor in comparison to the expected increase in biological productivity.

P. Irreversible or Irretrievable Resource Commitments. Should the proposed project be implemented, there will be irreversible or irretrievable resource commitments. These would include initial construction costs (mostly Federal), and operation, maintenance, and rehabilitation costs (entirely Missouri Department of Conservation).

Table 12. Magnitude of Probable Environmental Impacts Associated with Implementation of Preferred Management Measure.

PARAMETER	INCREASING BENEFICIAL IMPACT <----------			NO APPRECIABLE EFFECT	INCREASING ADVERSE IMPACT ---------->		
	SIGNIFICANT	MODERATE	MINOR		MINOR	MODERATE	SIGNIFICANT
SOCIAL EFFECTS							
Noise Levels					X		
Aesthetic Values					X		
Recreational Opportunities			X				
Public Health and Safety				X			
Transportation				X			
Community Cohesion				X			
Community Growth and Development				X			
Business and Home Relocations				X			
Existing/Potential Land Use				X			
Controversy				X			
ECONOMIC EFFECTS							
Property Values				X			
Tax Revenues				X			
Public Facilities and Services				X			
Regional Growth				X			
Employment				X			
Business Activity				X			
Farmland/Food Supply				X			
Commercial Navigation				X			
Energy Needs and Resources				X			
Flooding				X			
NATURAL RESOURCE EFFECTS							
Air Quality					X		
Terrestrial Habitat		X					
Wetlands	X						
Aquatic Habitat	X						
Habitat Diversity and Interspersion		X					
Biological Productivity		X					
Quality of Surface Water				X			
Water Supply				X			
Groundwater				X			
Soils				X			
Threatened or Endangered Species				X			
CULTURAL RESOURCE EFFECTS							
Prehistoric/Historic Architectural/Archaeological Values				X			

Table 13. Degree of Compliance of Selected Plan with Environmental Statutes and Requirements.

Federal Laws, Executive Orders, and Policies	Degree of Compliance [1]
Analysis of Impacts on Prime and Unique Farmland (CEQ Memorandum, 11 Aug 80)	full compliance
Archaeological and Historic Preservation Act, 16 U.S.C. 469, et seq.	full compliance
Clean Air Act, as amended, 42 U.S.C. 7401, et seq.	full compliance
Clean Water Act (Federal Water Pollution Control Act), 33 U.S.C. 1251, et seq.	full compliance[2]
Coastal Zone Management Act, 16 U.S.C. 1451, et seq.	not applicable
Endangered Species Act, 16 U.S.C. 1531, et seq.	full compliance
Environmental Effects Abroad of Major Federal Actions (Executive Order 12114)	not applicable
Estuary Protection Act, 16 U.S.C. 1221, et seq.	not applicable
Farmland Protection Policy Act, 7 U.S.C. 4201, et seq.	full compliance
Federal Water Project Recreation Act, 16 U.S.C. 460*l*-12, et seq.	not applicable
Fish and Wildlife Coordination Act, 16 U.S.C. 661, et seq.	full compliance
Floodplain Management (Executive Order 11988)	full compliance
Land and Water Conservation Fund Act, 16 U.S.C. 460*l*-4, et seq.	not applicable
Marine Protection, Research, and Sanctuaries Act, 16 U.S.C. 1401, et seq.	not applicable
National Environmental Policy Act, 42 U.S.C. 4321, et seq.	full compliance
National Historic Preservation Act, 16 U.S.C. 470, et seq.	full compliance
Protection of Wetlands (Executive Order 11990)	full compliance
Rivers and Harbors Act, 33 U.S.C. 403, et seq.	full compliance[2]
Watershed Protection and Flood Prevention Act, 16 U.S.C. 1001, et seq.	not applicable
Wild and Scenic Rivers Act, 16 U.S.C. 1271, et seq.	not applicable

[1] The degree of compliance falls into one of two categories:

Full compliance - the project meets all the requirements of the statute at the present time.

Not applicable - the statute does not apply to the project.

[2] Full compliance will be achieved when permits are issued under provisions of Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act, and when Missouri State certification in given in accordance with Section 401 of the Clean Water Act.

11. FINDING OF NO SIGNIFICANT IMPACT (FONSI).

CUIVRE ISLAND
HABITAT REHABILITATION AND ENHANCEMENT PROJECT
POOL 26, MISSISSIPPI RIVER,
ST. CHARLES AND LINCOLN COUNTIES, MISSOURI

1. I have reviewed and evaluated the documents concerning the proposed rehabilitation and enhancement of the Cuivre Island project area.

The purpose of the project is to restore habitat diversity to benefit fish and wildlife species by: maintaining and improving side channel habitat by preventing river-borne sediment from filling side channels, providing overwintering and summer habitat for fish in side channels, increasing habitat quality and quantity of artificially flooded habitats for wetland-dependent wildlife, and maintaining and improving habitat quality and quantity of bottomland forest within the project area.

2. Prior to my decision, I evaluated pertinent data and information which led to the development of various potential Management Measures. I have reviewed the steps in the evaluation process that produced the recommended plan.

3. All Management Measures have been studied, and major findings of this investigation include the following:

a. The "No Action" measure was evaluated but subsequently rejected. This measure would do nothing to address study objectives;

b. The recommended plan is a viable, acceptable and effective combination of measures to address study objectives.

4. The possible consequences of the recommended plan have been studied for physical, environmental, cultural, social, and economic effects. Major conclusions of this study are as follows:

a. It is expected that substantial habitat benefits will accrue to wetland wildlife and river fishes of the project area;

b. The green tree reservoir on Cuivre Island will improve in habitat quantity and quality because of improved water management capabilities;

c. Habitat quality of bottomland forest on Cuivre Island will improve after implementation of tree plantings in forest clearings;

d. The physical integrity of Cuivre side channel is expected to be improved. The project is anticipated to protect over half of the side channel from conversion to semi-terrestrial habitat due to sedimentation from the Mississippi River;

e. Quantity and quality of winter and summer habitat for riverine fishes in Cuivre Slough is expected to increase also;

f. The recommended plan will not adversely affect any Federally threatened or endangered species;

g. The recommended plan will not adversely affect any historical properties;

h. The recommended plan will have no significant adverse effects on physical, social, or economic conditions within the project area and surrounding communities.

5. Based on my analysis and evaluation of the alternative courses of action presented in the Environmental Assessment, I have determined that the rehabilitation and enhancement of the Cuivre Island project area will not have major adverse environmental effects, but will have important beneficial effects on the quality of the environment. Therefore, no Environmental Impact Statement (EIS) will be prepared prior to proceeding with this action.

1 Sep 94
Date

THOMAS C. SUERMANN
Colonel, U.S. Army
District Engineer

12. PROJECT REQUIREMENTS.

A. PROJECT COOPERATION AGREEMENT. See Appendix J for the Project Cooperation Agreement.

B. COST SHARING.

(1) Draft and Final DPR. Preparation of these planning documents will be 100 percent Federal cost.

(2) Work following the Final DPR. In accordance with the Water Resources Development Act (WRDA) of 1986 (Public Law 99-662) funding for the first costs of all of the proposed project will be 75 percent Federal and 25 percent Local Sponsor (MDOC). No distinction is being made as to whether features of the project lie on Federal property or on State-owned property. First costs are defined as engineering and design (Plans & Specifications following Final DPR), construction costs, and construction management costs.

It was the incorrect assumption through the Draft DPR phase of this study that the Federal Government would bear 100% of first costs for features that lay on Federal property according to WRDA '86, Section 906(e)(3), "when such activities are located on lands managed as a national wildlife refuge." However, it was determined that the Federally-owned portion of Cuivre Island is not "managed as a national wildlife refuge" because it is not part of the National Wildlife Refuge System administered by the U.S. Fish and Wildlife Service.

Table 14. Table of Cost Sharing.

Mgmt. Measure	First Costs† Estimated for Evaluation of Mgmt. Measures††		First Costs from MCACES†††		Cost Share based on MCACES Estimate	
					Federal *75%*	State *25%*
4C		880,000		869,441	652,081	217,360
7F		53,250		30,109	22,582	7,527
9		16,000		17,757	13,318	4,439
15		116,640		134,320	100,740	33,580
16		4,620		5,174	3,881	1,293
17		3,000		5,544	4,158	1,386
	Total	1,073,510	PED	259,000	194,250	64,750
			CM	151,750	113,813	37,937
			Total	1,473,095	1,104,823	368,272

Notes:

† First costs include contingencies, Engineering & Design, Supervision and Administration of construction, and construction costs.

†† This column of cost estimates (from Appendix I) used during plan formulation and is shown next to the MCACES cost estimates for comparison only.

††† Microcomputer-Aided Cost Engineering System (MCACES). This column is a summary of the cost estimate prepared for this final DPR and included in Appendix M. Costs shown for each Management Measure include initial construction costs and contingencies only. Planning, Engineering and Design (PED), and Construction Management (CM) costs are shown separately--not included in each measure.

C. OPERATION, MAINTENANCE AND REHABILITATION. After construction of the project, annual operation, maintenance and rehabilitation (OM&R) of the project would be the responsibility of, and cost-shared 100% by the Missouri Department of Conservation (MDOC) (per Section 107(b) of the Water Resource Development Act of 1992). OM&R would be conducted for the project life of 50 years.

An O&M manual detailing the operations and maintenance requirements would be prepared by the Corps during the plans and specifications phase. Development of the manual would be coordinated with MDOC.

Although the costs for operation, the costs for maintenance, and the rehabilitation costs were determined separately, they have been combined into one figure for each Management Measure, and are shown in Table 10.

(1) Operations and Maintenance. Table 9 discusses the operation of many of the Management Measures. The shaded rows contain Management Measures of the recommended plan.

(2) Rehabilitation. Rehabilitation or replacement applies primarily to the Green Tree Reservoir, Management Measure 4. All rehabilitation is assumed to be performed once--25 years after construction, and is included in the OM&R figures in Table 10. Listed separately: the drainage structure gates, riser, and staff gages have an estimated rehabilitation cost of $49,000; the pump station structure, gates, pipe, and pump have an estimated rehabilitation cost of $139,000; the culverts have an estimated rehabilitation cost of $12,500.

D. PERFORMANCE EVALUATION. Table 15 lists the general types, purposes, and responsibilities of project evaluation. Plans to monitor this project for performance evaluation purposes were designed to measure the degree of attainment of project objectives. Therefore, for each objective, an appropriate monitoring parameter was specified. The specific parameter to be measured for each objective is shown in Table 16.

In addition to these parameters, other types of field observations will be conducted. The habitat evaluation methods described in Appendix B (Wildlife Habitat Appraisal Guide for terrestrial habitat, Fisheries Habitat Appraisal Guide for aquatic habitat) will be reapplied at the project site during target years 1 and 5 to determine how habitat quality as assessed by these methods has changed after construction is completed. Likewise, actual numbers of waterfowl using the project site in the fall will be estimated by aerial census and ground counts. Interviews with sport fishermen will be conducted to determine if fishing has improved.

Table 15. Monitoring and Performance Evaluation Matrix.

Type of Activity	Purpose	Responsible Agency	Implementing Agency	Funding Source	Remarks
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Pre-project Monitoring	Identifies and defines problems at HREP site. Established need for proposed project features.	Sponsor	Sponsor	Sponsor	Attempts to begin defining baseline.
Baseline Monitoring	Establishes baselines for performance evaluation.	Corps	Field station or sponsor thru Cooperative Agreements or Corps.	LTRM	See Plate 20 and Plate 23.
Data Collection for Design	Includes identification of project objectives, design of project, and development of performance evaluation plan.	Corps	Corps	HREP	Comes after the fact sheet. This data aids in defining the baseline.
Construction Monitoring	Assesses construction impacts; assures permit conditions are met.	Corps	Corps	HREP	Environmental protection specifications to be included in construction contract documents. Inter-agency field inspections will be accomplished during project construction phase.
Performance Evaluation Monitoring	Determines success of project as related to objectives.	Corps (physical), sponsor (biological).	Field station or sponsor thru Cooperative Agreement, sponsor thru O&M, or Corps.	LTRM	Comes after construction phase of project.
Analysis of Biological Responses to Projects	Determine critical impact levels, cause-effect relationships, and effect on long-term losses of significant habitat.	USFWS	USFWS (EMTC)	LTRM	Problem Analysis and Trend Analysis studies of habitat projects.
	Demonstrates success or failure of habitat	Corps	Corps/USFWS/ (EMTC)/Others	LTRM	Biological Response Study tasks beyond scope of Performance Evaluation, Problem Analysis, and Trend Analysis.

Table 16. Post-Construction Monitoring For Project Performance Evaluation.

Goals	Objectives	Management Measures	Monitoring Plan		
			Unit of Measure	Method	Target years for Data Collection (50-year project life, construction completed at 0) [1]
Restore riverine habitat diversity to benefit fish and wildlife species.	Maintain and improve side channel habitat by preventing river-borne sediment from filling side channel.	Cuivre side channel: Remove portion of submerged dike;	Depth (tenths of a foot) of sediment deposition.	Corps conducts hydrographic survey, determines depth of sediment deposition.	-1, 0, 5
			Area (acres) of side channel lost to sedimentation.	Corps obtains aerial photography (at same pool elevation across time), measures acres lost.	-1, 0, 5
		Turkey side channel: Conduct propwash resuspension of sediment.	Depth (tenths of a foot) of sediment deposition.	Corps conducts hydrographic survey, determines depth of sediment deposition.	-1, 0, 4, 5
			Area (acres) of side channel lost to sedimentation.	Corps obtains aerial photography (at same pool elevation across time), measures acres lost.	-1, 0, 5
	Provide overwintering habitat for fish in Cuivre side channel.	Construct six dikes.	Area (acres) and depth (feet) of scour holes.	Corps conducts hydrographic survey, determines area and depth.	-1, 0, 5
	Increase habitat quality and quantity of artificially flooded habitats on Cuivre Island for wetland-dependent wildlife.	Install permanent pumping system; Install larger pump; Clean out silt-clogged ditches; Replace old water control structures.	Presence/absence, duration, and timing of green tree reservoir.	Sponsor collects data on presence/absence, timing and duration of green tree reservoir (comparing actual with proposed operation plan).	0, 1, 2, 3, 4, 5
		Construct new water control structure.	Elevation (NGVD) of green tree reservoir's water surface.	Sponsor collects data on reservoir's surface elevation.	0, 1, 2, 3, 4, 5
	Maintain and improve habitat quality and quantity of bottomland forest on Cuivre Island.	Reforest cropland.	Percent survival of planted seedlings.	Sponsor conducts quantitative vegetation sampling of reforested areas.	5
		Create forest clearings and plant with mast tree seedlings.	Percent survival of planted seedlings.	Sponsor conducts quantitative vegetation sampling of planted areas.	5

[1] As presently funded, the EMP-HREP program will terminate in the year 2002. If the program were to be extended beyond this date, monitoring would be expanded into the future for all measures. Target years would potentially include years 10, 20, 30, 40, and 50 for all measures. In addition, monitoring of propwash sediment resuspension would reoccur every five years, and data would be collected for green tree reservoir management every year.

E. STEPS PRIOR TO PROJECT CONSTRUCTION. After submittal of the Final DPR through the U.S. Army Engineer Division, Lower Mississippi Valley for review, approval can be granted by the North Central Division for HREP projects with estimated construction costs of $2 million or less. North Central Division would request funds for plans and specifications from Headquarters, U.S. Army Corps of Engineers. The current schedule is to prepare plans and specifications (final design) in fiscal year 1995. A construction contract would be advertised by the competitive bid process and would likely be awarded in fiscal year 1995. Construction would be completed in fiscal year 1996.

13. PARTICIPANTS, COORDINATION, PUBLIC VIEWS AND COMMENTS.

Participants in project planning included the Missouri Department of Conservation, the U.S. Fish and Wildlife Service, and the St. Louis District, Corps of Engineers. The U.S. Fish and Wildlife Service was a cooperating agency throughout the process required by regulations developed by the Council on Environmental Quality for the implementation of the National Environmental Policy Act (40 CFR 1500-1508).

The study participants met at the project site and other locations to discuss the project objectives and designs, and correspondence was initiated between the agencies to coordinate the development of the project. Drafts of this report were sent to the USFWS and the State of Missouri for review and comment. The comments received and the results of meetings with these agencies were used to formulate the selected plan and prepare this report.

A public meeting was held on August 15, 1991, in Elsberry, Missouri. Over forty people attended.

The February 1994 Draft Definite Project Report/Environmental Documentation was sent to the agencies and interests listed in Appendix N on April 22, 1994.

A public meeting with adjoining landowners was held in Old Monroe, Missouri on April 27, 1994.

The U.S. Fish & Wildlife Service's draft Coordination Act Report was mailed to the members of the distribution list on May 12, 1994.

The Public Notice of the application for Department of Army Permit was mailed to the members of the distribution list on July 18, 1994. The project proposal is processed under provisions of Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act, and for Missouri State certification in accordance with Section 401 of the Clean Water Act.

14. RECOMMENDATIONS.

I have weighed the accomplishments to be obtained from this rehabilitation project against its cost and have considered the alternatives, impacts, and scope of the proposed project. In my judgment, the proposed project is a justified expenditure of Federal funds.

I recommend that the Commander, North Central Division, U.S. Army Corps of Engineers approve this habitat rehabilitation and enhancement project.

The total estimated first cost of this project is $1,473,095, with a Federal share of $1,104,823.

I further recommend that funds be allocated as soon as possible for preparation of plans and specifications and subsequent project construction.

THOMAS C. SUERMANN
Colonel, U.S. Army
District Engineer

11. FINDING OF NO SIGNIFICANT IMPACT (FONSI).

CUIVRE ISLAND
HABITAT REHABILITATION AND ENHANCEMENT PROJECT
POOL 26, MISSISSIPPI RIVER,
ST. CHARLES AND LINCOLN COUNTIES, MISSOURI

1. I have reviewed and evaluated the documents concerning the proposed rehabilitation and enhancement of the Cuivre Island project area.

The purpose of the project is to restore habitat diversity to benefit fish and wildlife species by: maintaining and improving side channel habitat by preventing river-borne sediment from filling side channels, providing overwintering and summer habitat for fish in side channels, increasing habitat quality and quantity of artificially flooded habitats for wetland-dependent wildlife, and maintaining and improving habitat quality and quantity of bottomland forest within the project area.

2. Prior to my decision, I evaluated pertinent data and information which led to the development of various potential Management Measures. I have reviewed the steps in the evaluation process that produced the recommended plan.

3. All Management Measures have been studied, and major findings of this investigation include the following:

a. The "No Action" measure was evaluated but subsequently rejected. This measure would do nothing to address study objectives;

b. The recommended plan is a viable, acceptable and effective combination of measures to address study objectives.

4. The possible consequences of the recommended plan have been studied for physical, environmental, cultural, social, and economic effects. Major conclusions of this study are as follows:

a. It is expected that substantial habitat benefits will accrue to wetland wildlife and river fishes of the project area;

b. The green tree reservoir on Cuivre Island will improve in habitat quantity and quality because of improved water management capabilities;

c. Habitat quality of bottomland forest on Cuivre Island will improve after implementation of tree plantings in forest clearings;

d. The physical integrity of Cuivre side channel is expected to be improved. The project is anticipated to protect over half of the side channel from conversion to semi-terrestrial habitat due to sedimentation from the Mississippi River;

e. Quantity and quality of winter and summer habitat for riverine fishes in Cuivre Slough is expected to increase also;

f. The recommended plan will not adversely affect any Federally threatened or endangered species;

g. The recommended plan will not adversely affect any historical properties;

h. The recommended plan will have no significant adverse effects on physical, social, or economic conditions within the project area and surrounding communities.

5. Based on my analysis and evaluation of the alternative courses of action presented in the Environmental Assessment, I have determined that the rehabilitation and enhancement of the Cuivre Island project area will not have major adverse environmental effects, but will have important beneficial effects on the quality of the environment. Therefore, no Environmental Impact Statement (EIS) will be prepared prior to proceeding with this action.

1 Sep 94
Date

THOMAS C. SUERMANN
Colonel, U.S. Army
District Engineer

12. PROJECT REQUIREMENTS.

A. PROJECT COOPERATION AGREEMENT. See Appendix J for the Project Cooperation Agreement.

B. COST SHARING.

(1) Draft and Final DPR. Preparation of these planning documents will be 100 percent Federal cost.

(2) Work following the Final DPR. In accordance with the Water Resources Development Act (WRDA) of 1986 (Public Law 99-662) funding for the first costs of all of the proposed project will be 75 percent Federal and 25 percent Local Sponsor (MDOC). No distinction is being made as to whether features of the project lie on Federal property or on State-owned property. First costs are defined as engineering and design (Plans & Specifications following Final DPR), construction costs, and construction management costs.

It was the incorrect assumption through the Draft DPR phase of this study that the Federal Government would bear 100% of first costs for features that lay on Federal property according to WRDA '86, Section 906(e)(3), "when such activities are located on lands managed as a national wildlife refuge." However, it was determined that the Federally-owned portion of Cuivre Island is not "managed as a national wildlife refuge" because it is not part of the National Wildlife Refuge System administered by the U.S. Fish and Wildlife Service.

Table 14. Table of Cost Sharing.

Mgmt. Measure	First Costs† Estimated for Evaluation of Mgmt. Measures††		First Costs from MCACES†††		Cost Share based on MCACES Estimate	
					Federal *75%*	State *25%*
4C		880,000		869,441	652,081	217,360
7F		53,250		30,109	22,582	7,527
9		16,000		17,757	13,318	4,439
15		116,640		134,320	100,740	33,580
16		4,620		5,174	3,881	1,293
17		3,000		5,544	4,158	1,386
	Total	1,073,510	PED	259,000	194,250	64,750
			CM	151,750	113,813	37,937
			Total	1,473,095	1,104,823	368,272

Notes:

† First costs include contingencies, Engineering & Design, Supervision and Administration of construction, and construction costs.

†† This column of cost estimates (from Appendix I) used during plan formulation and is shown next to the MCACES cost estimates for comparison only.

††† Microcomputer-Aided Cost Engineering System (MCACES). This column is a summary of the cost estimate prepared for this final DPR and included in Appendix M. Costs shown for each Management Measure include initial construction costs and contingencies only. Planning, Engineering and Design (PED), and Construction Management (CM) costs are shown separately--not included in each measure.

C. OPERATION, MAINTENANCE AND REHABILITATION. After construction of the project, annual operation, maintenance and rehabilitation (OM&R) of the project would be the responsibility of, and cost-shared 100% by the Missouri Department of Conservation (MDOC) (per Section 107(b) of the Water Resource Development Act of 1992). OM&R would be conducted for the project life of 50 years.

An O&M manual detailing the operations and maintenance requirements would be prepared by the Corps during the plans and specifications phase. Development of the manual would be coordinated with MDOC.

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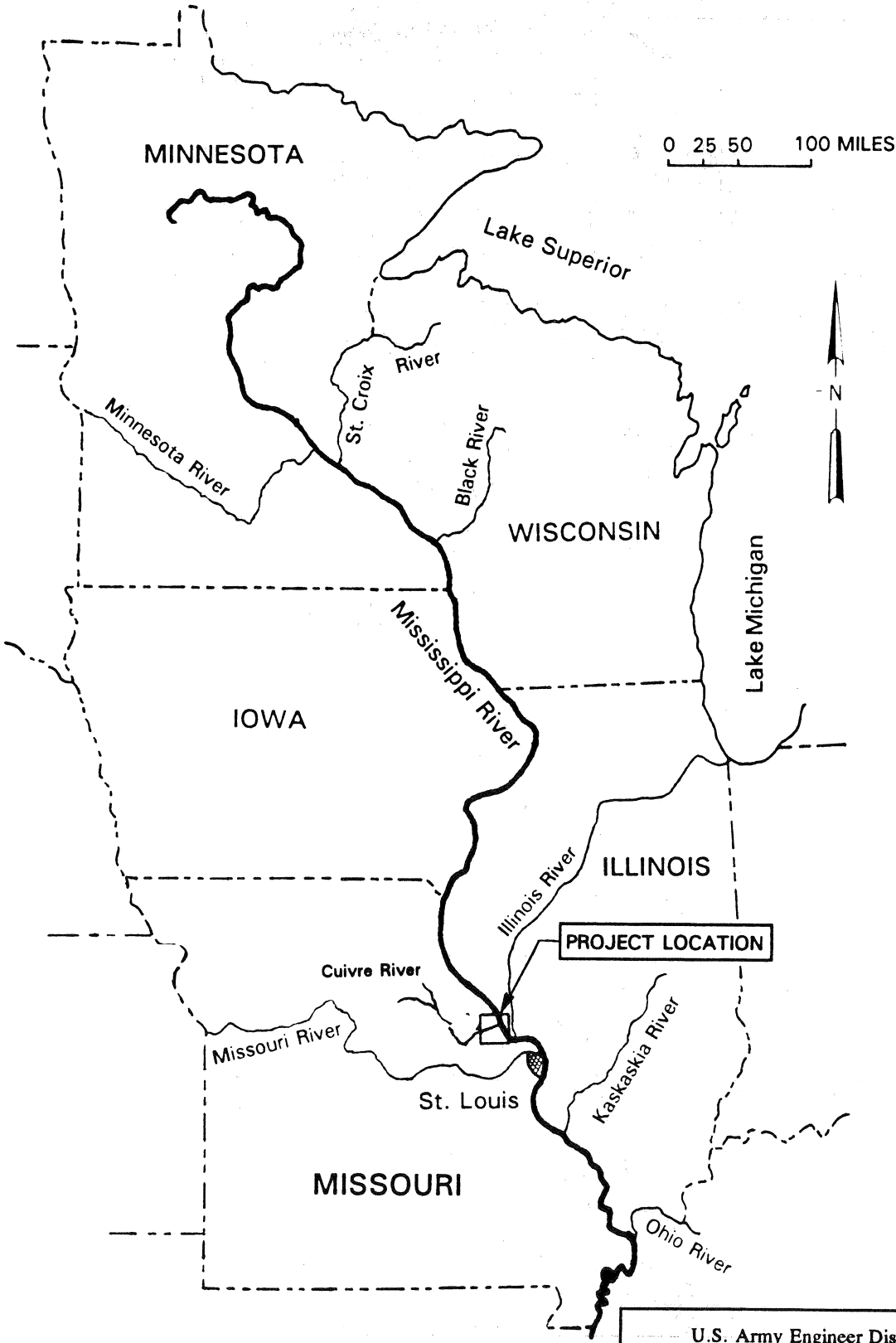
THOMAS C. SUERMANN
Colonel, U.S. Army
District Engineer

Appendix A - Plates

Plate 1. Location Map.
Plate 2. Project Limits.
Plate 3. Tract Ownership.
Plate 4. Lock & Dam 25 Tail Water, Green Tree Reservoir Operational Plan.
Plate 4A. Lock & Dam 25, Stage Duration Curve.
Plate 4B. Lock & Dam 25, Stage Frequency Curve.
Plate 5. Management Measure 2, General Plan, Marshes on Mainland.
Plate 6. Management Measure 4, Green Tree Reservoir.
Plate 7. Management Measure 4, Site Plan, Green Tree Reservoir.
Plate 8. Management Measure 4, Pump Station Plan and Profile Views.
Plate 9. Management Measure 5, Deepen Cuivre Slough by Hard Points.
Plate 10. Management Measure 6, Propwash Experiment.
Plate 11. Management Measure 7, Wintering Holes in Slough by Dike Work.
Plate 11A. Modification of Management Measure 7F, Wintering Holes in Slough by Dike Work.
Plate 12. Management Measure 8, Placing Dikes at Upper End of Slough.
Plate 13. Management Measure 9, Remove Remnant of Submerged Dike.
Plate 14. Management Measure 12, Dredge Cuivre Slough.
Plate 15. Management Measure 13, Construct Levee to Create 400 Acres of Wetland.
Plate 16. Management Measure 14, Construct Closure Structure Between Islands.
Plate 17. Management Measure 15, Tree Stand Improvements (TSI).
Plate 18. Management Measure 16, Reforestation.
Plate 19. Management Measure 17, Propwash Experiment.
Plate 20. Sedimentation and Monitoring Plan.
Plate 21. Locations of Sample Tracts for WHAG Habitat Assessment.
Plate 22. Sample Site Reaches for AHAG Habitat Assessment.
Plate 23. Site Locations for Baseline Water Quality Monitoring.
Plate 24. Soil Boring Locations.
Plate 25. Soil Boring Log CI-1.
Plate 26. Soil Boring Log CI-2.
Plate 27. Soil Boring Log CI-3.
Plate 28. Soil Boring Log CI-5.

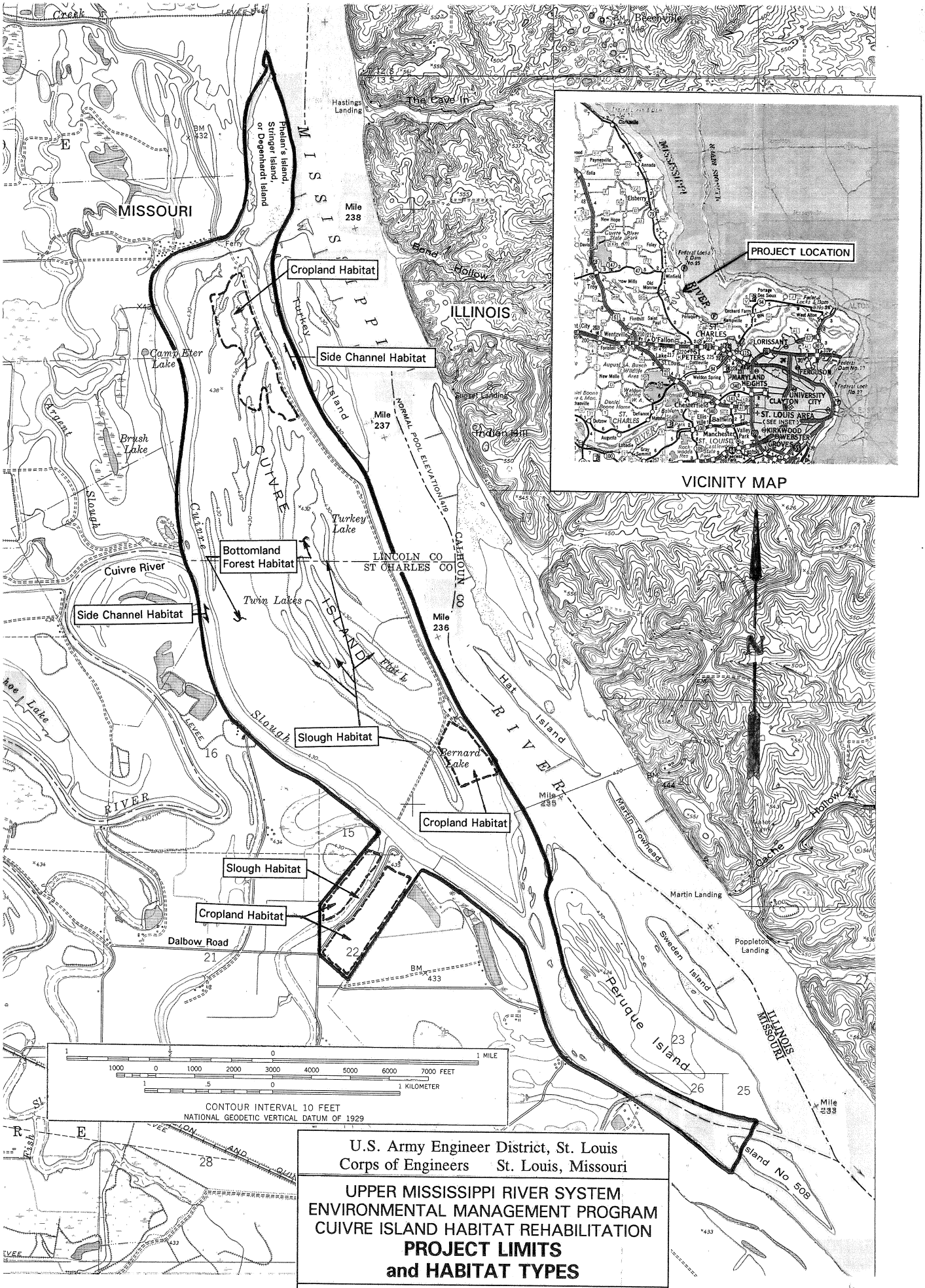


U.S. Army Engineer District, St. Louis
Corps of Engineers St. Louis, Missouri

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
CUIVRE ISLAND HABITAT REHABILITATION

LOCATION MAP

PLATE 1

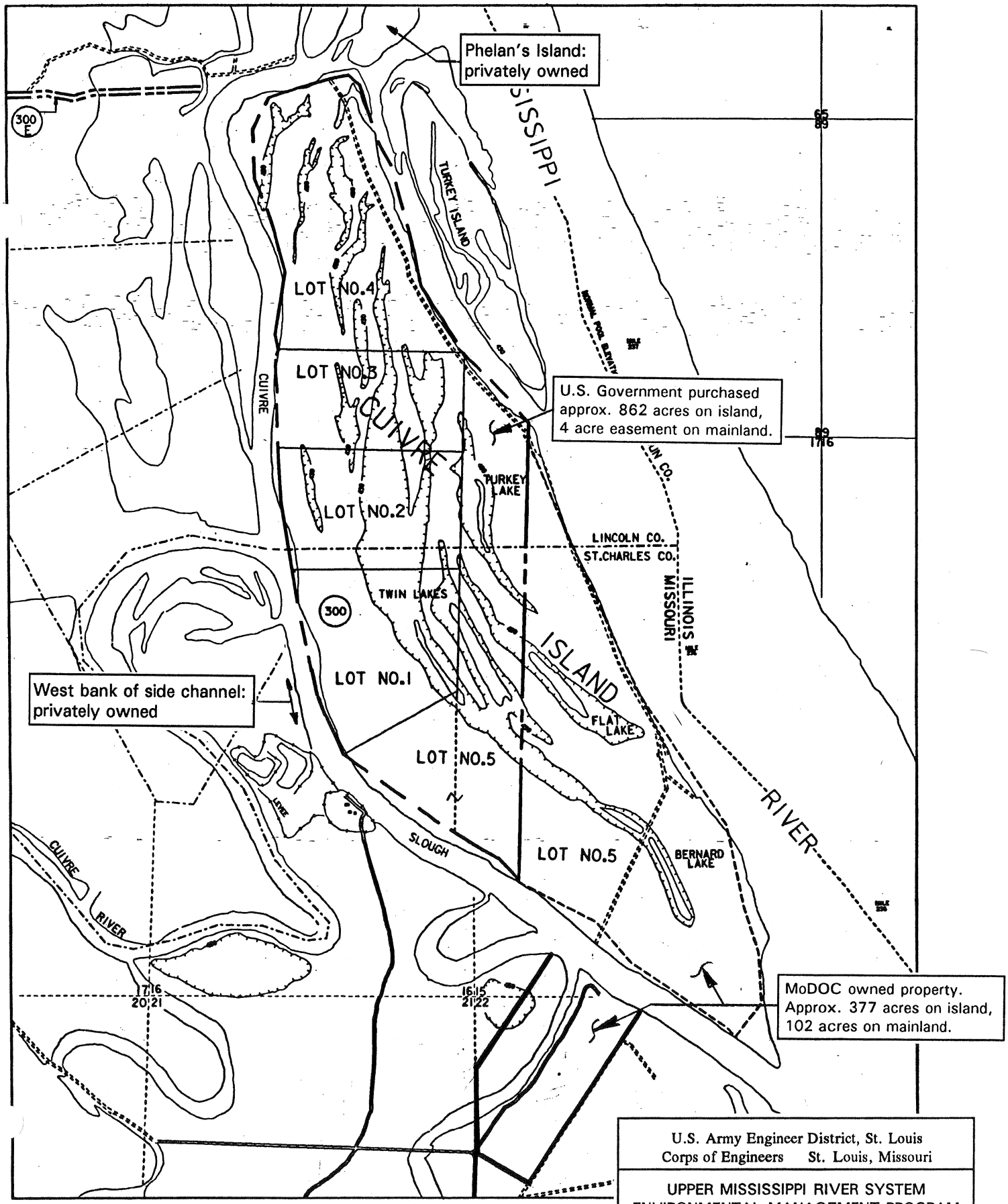


U.S. Army Engineer District, St. Louis
Corps of Engineers St. Louis, Missouri

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
CUIVRE ISLAND HABITAT REHABILITATION

PROJECT LIMITS and HABITAT TYPES

Prepared by: Dave Kirkpatrick **PLATE 2**



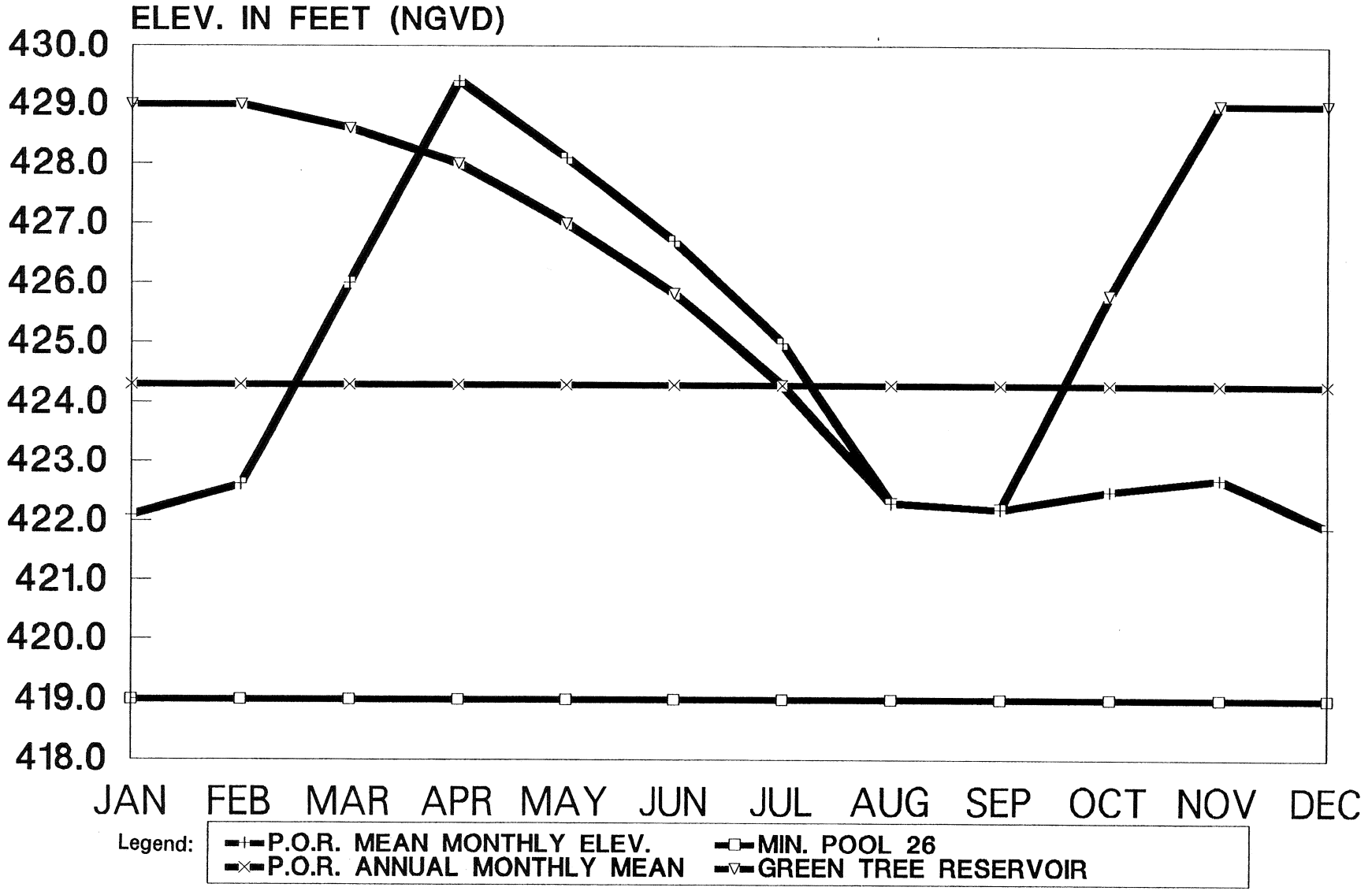
U.S. Army Engineer District, St. Louis
Corps of Engineers St. Louis, Missouri

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
CUIVRE ISLAND HABITAT REHABILITATION

TRACT OWNERSHIP

PLATE 3

LOCK & DAM 25 T.W.
Period of Record (P.O.R) 1941 - 1990



U.S. Army Engineer District, St. Louis
Corps of Engineers St. Louis, Missouri

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
CUIVRE ISLAND HABITAT REHABILITATION
LOCK & DAM 25 TAIL WATER
GTR OPERATIONAL PLAN

PLATE 4

46 8000

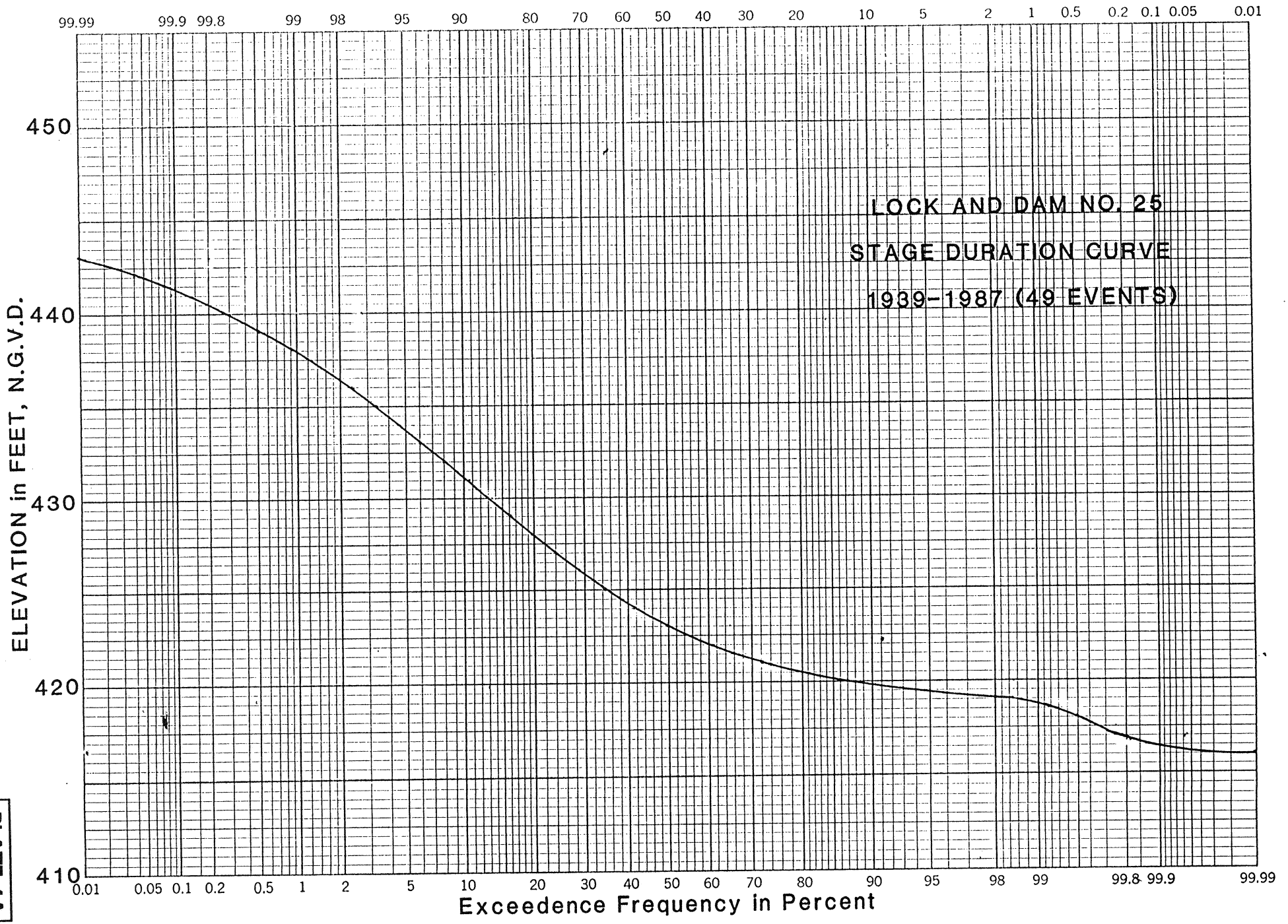


PLATE 4A

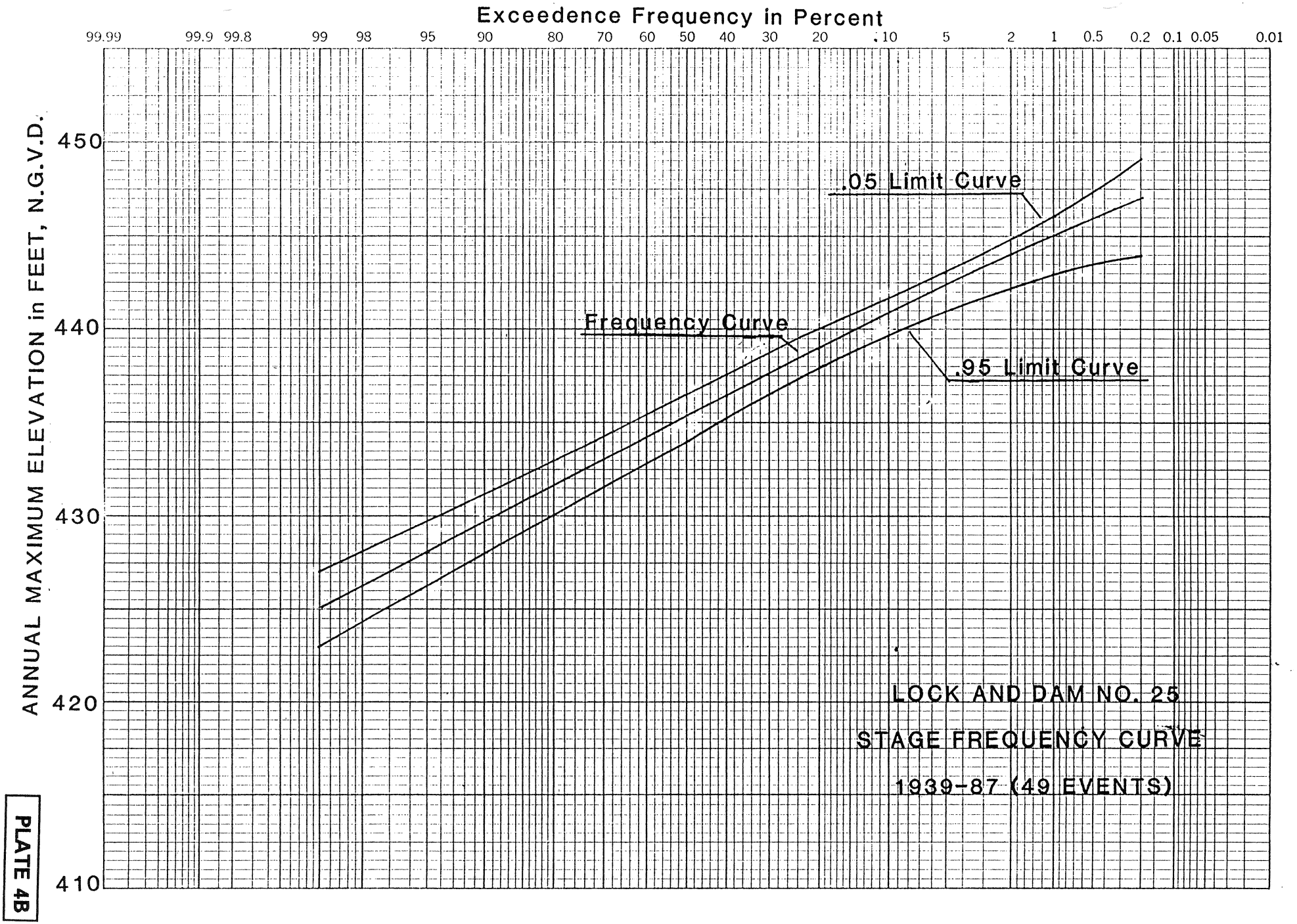


PLATE 4B

CUIVRE SLOUGH

AREA 1

AREA 2

BORROW AREA

BORROW AREA

BORROW AREA

LEVEE

LEVEE

LEVEE

PLAN
SCALE: 1" = 200'
200' 0 200'

N

BORROW AREA 1

428.8

430

36" GRAVITY DRAIN W/ SLUICE GATE

2 - 24" DIA. C.M.P. CULVERTS RAISE ROAD TO PROVIDE 2' MIN. COVER OVER CULVERTS

429.7

REVETMENT

36" GRAVITY DRAIN W/ SLUICE GATE

CRUSHED STONE ROAD

℄ 10" PLASTIC PIPE

POWERPOLE

SUBMERSIBLE 1000 G.P.M. PUMP AND WELL

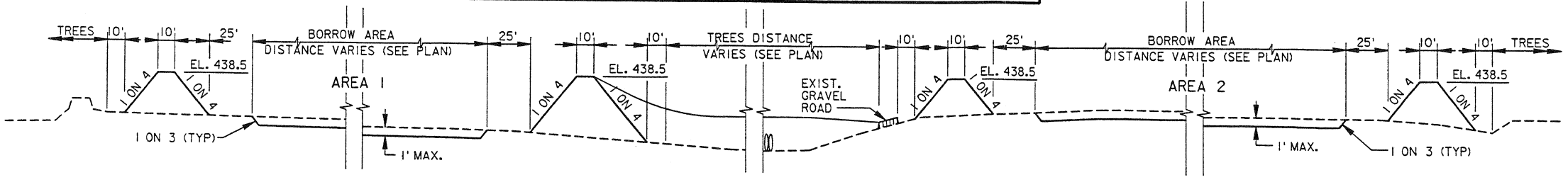
434

REVETMENT

BORROW AREA 2

BUTTERFLY VALVES

SCALE: 1" = 50'
50' 0 50'



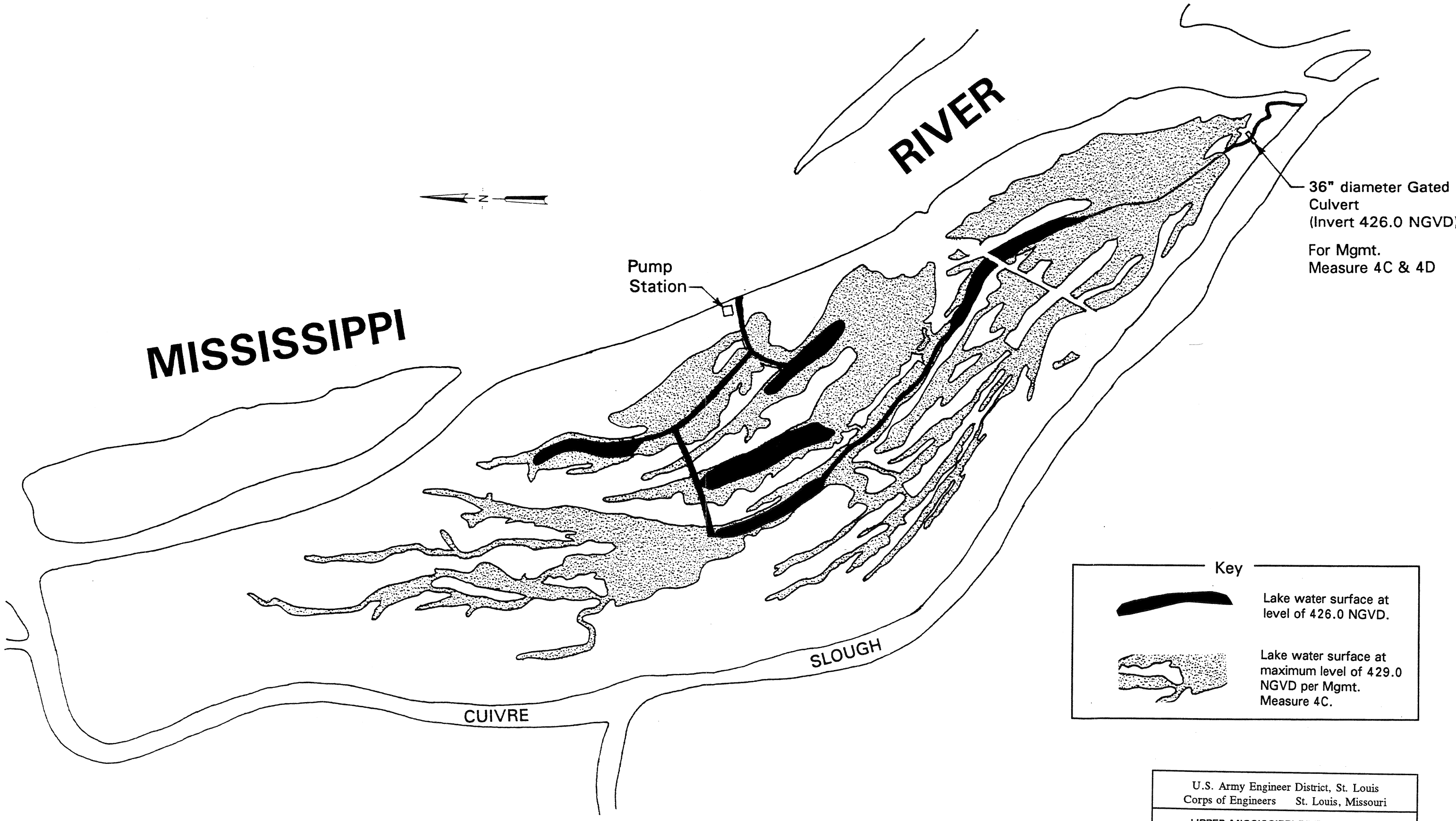
TYPICAL SECTION
NO SCALE

U.S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

UPPER MISSISSIPPI RIVER BASIN
DEFINITE PROJECT REPORT
POOL 26, LINCOLN COUNTY, ILLINOIS
ENVIRONMENTAL MANAGEMENT PROGRAM
CUIVRE ISLAND
HABITAT REHABILITATION PROJECT

MANAGEMENT MEASURE 2
GENERAL PLAN
MARSHES ON MAINLAND

DATE: X | DESIGN FILE: UECDCAL2 | **PLATE 5**



Key

Lake water surface at level of 426.0 NGVD.

Lake water surface at maximum level of 429.0 NGVD per Mgmt. Measure 4C.

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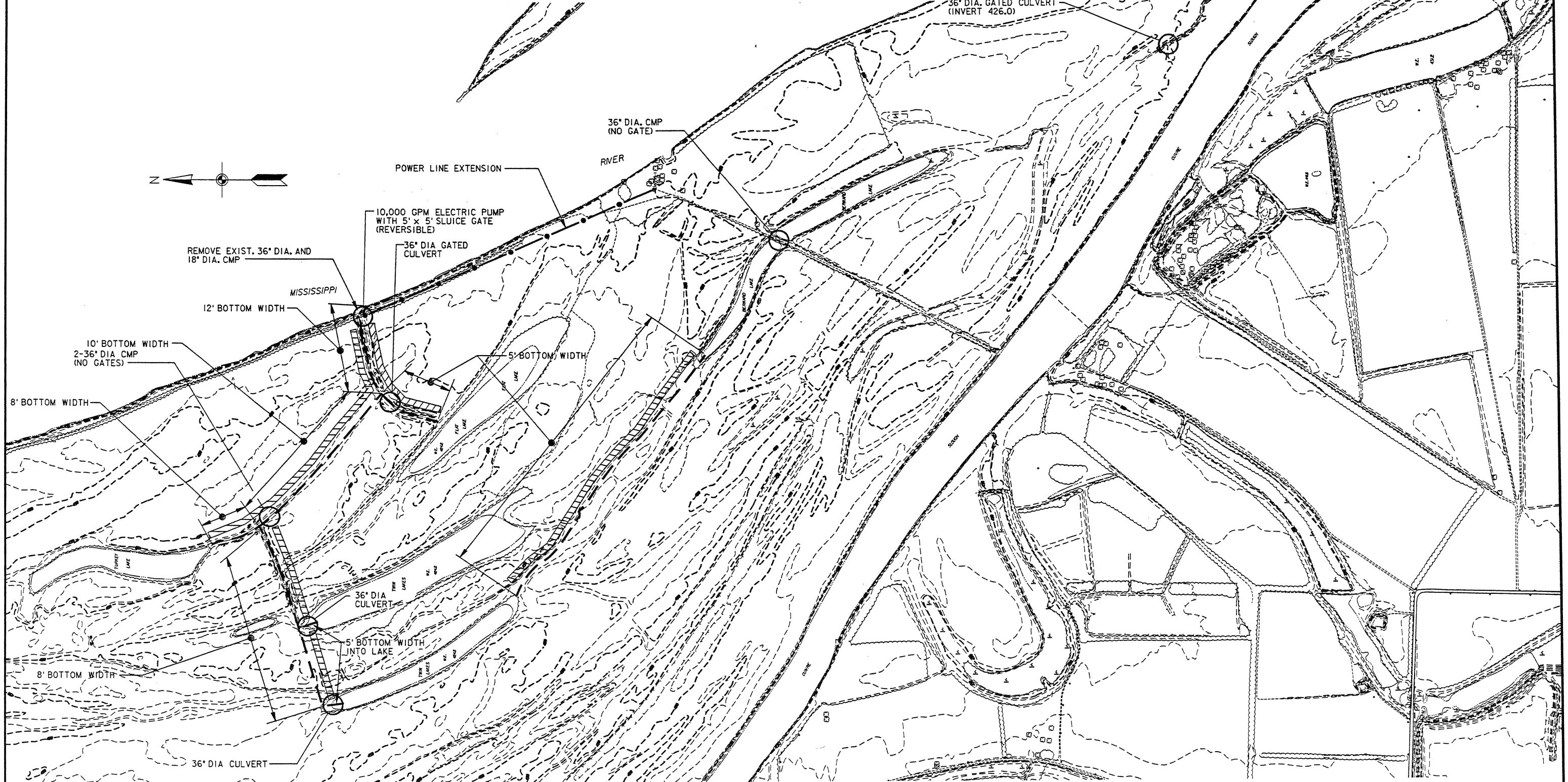
ENVIRONMENTAL MANAGEMENT PROGRAM
CUIVRE ISLAND HABITAT REHABILITATION

MANAGEMENT MEASURE 4
GREEN TREE RESERVOIR

PLATE 6



SCALE: 1" = 400'
400' 0 400'

LEGEND

- DRAINAGE DITCH
- DISPOSAL AREA
- POWER LINE EXTENSION

NOTES:
1. DRAINAGE DITCH SIDE SLOPES WILL BE 1 ON 3.
2. DRAINAGE DITCH INVERT ELEVATIONS WILL BE 421.0
3. DISPOSAL OF DRAINAGE DITCH MATERIAL WILL BE ADJACENT TO THE DITCHES.

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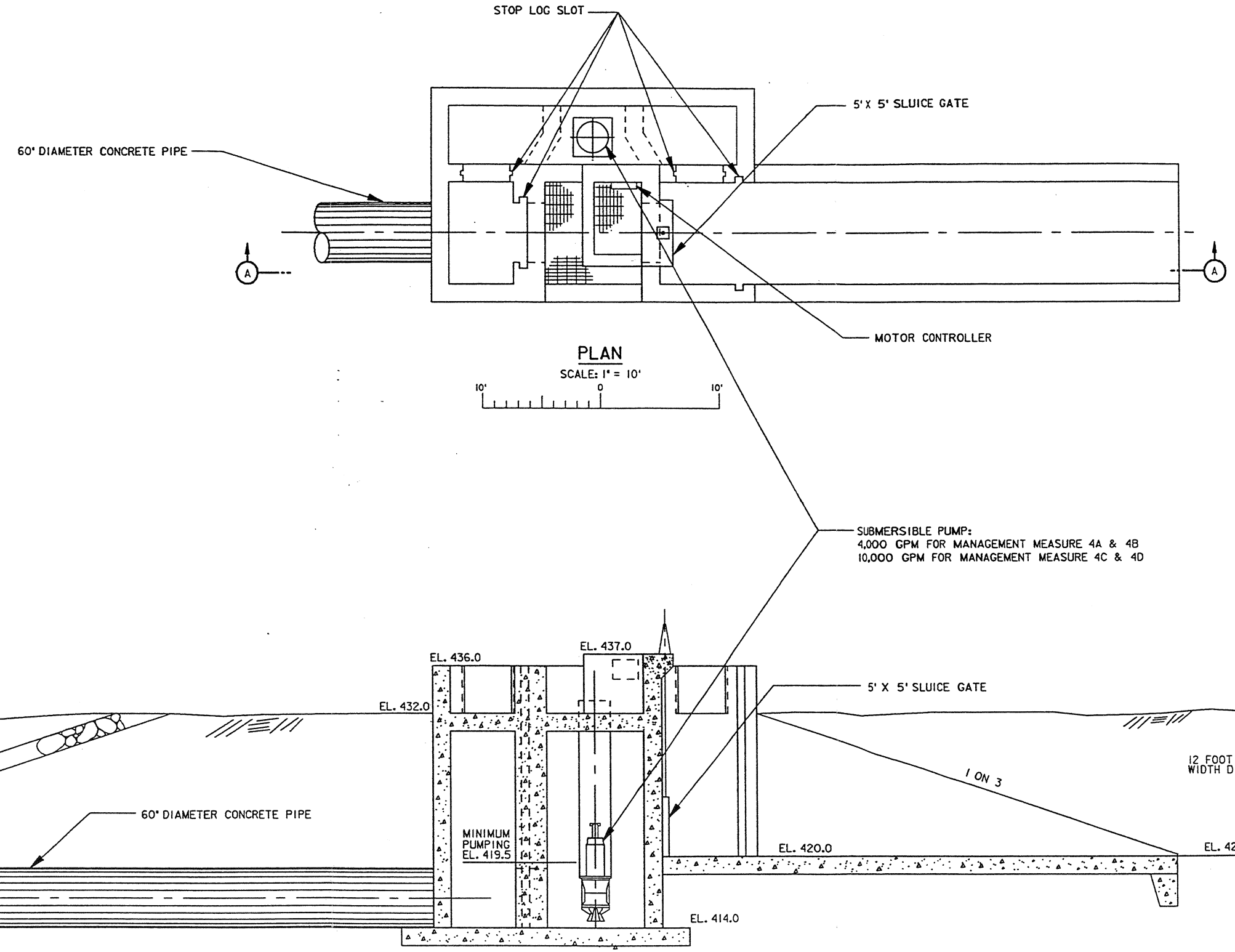
ST. LOUIS, MISSOURI

UPPER MISSISSIPPI RIVER BASIN
DEFINITE PROJECT REPORT
POOL 26, LINCOLN COUNTY, ILLINOIS
ENVIRONMENTAL MANAGEMENT PROGRAM
CUIVRE ISLAND
HABITAT REHABILITATION PROJECT

MANAGEMENT MEASURE 4
SITE PLAN
GREEN TREE RESERVOIR

DATE: X | DESIGN FILE: UECDCAL7.DGN | PLATE 7



PLAN

SCALE: 1" = 10'

10' 0 10'

SECTION A-A

SCALE: 1" = 10'

10' 0 10'

NOTE: DIMENSIONS SHOWN ARE FOR MANAGEMENT MEASURE 4C & 4D. MANAGEMENT MEASURE 4A & 4B WOULD HAVE 48 INCH DIA. RIVER SIDE PIPE AND A 4' X 4' SLUICE GATE.

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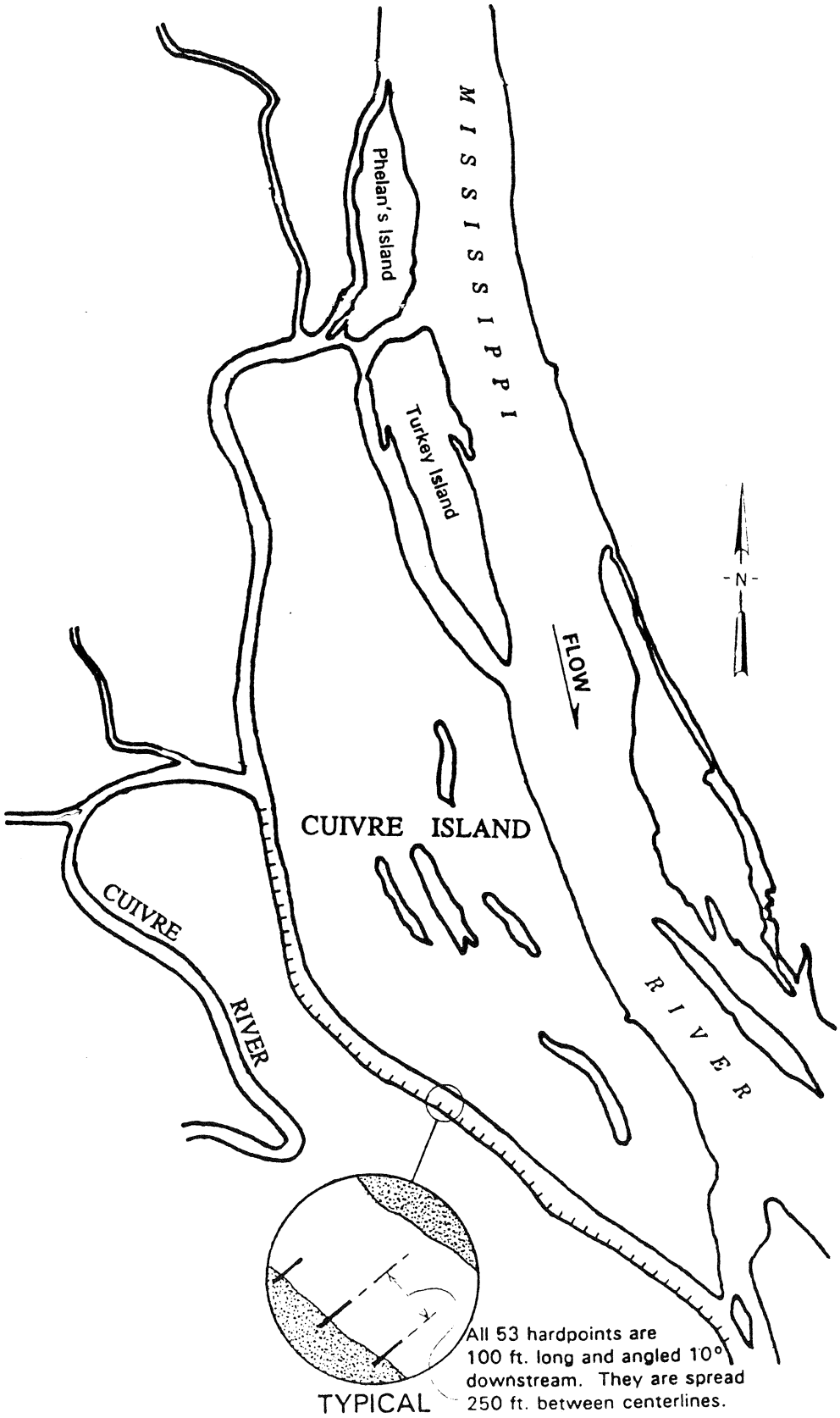
ST. LOUIS, MISSOURI

UPPER MISSISSIPPI RIVER BASIN
POOL 26, LINCOLN & ST. CHARLES COUNTIES, MO
ENVIRONMENTAL MANAGEMENT PROGRAM
CUIVRE ISLAND HABITAT REHABILITATION
MANAGEMENT MEASURE 4

PUMP STATION PLAN AND SECTION

PLATE 8



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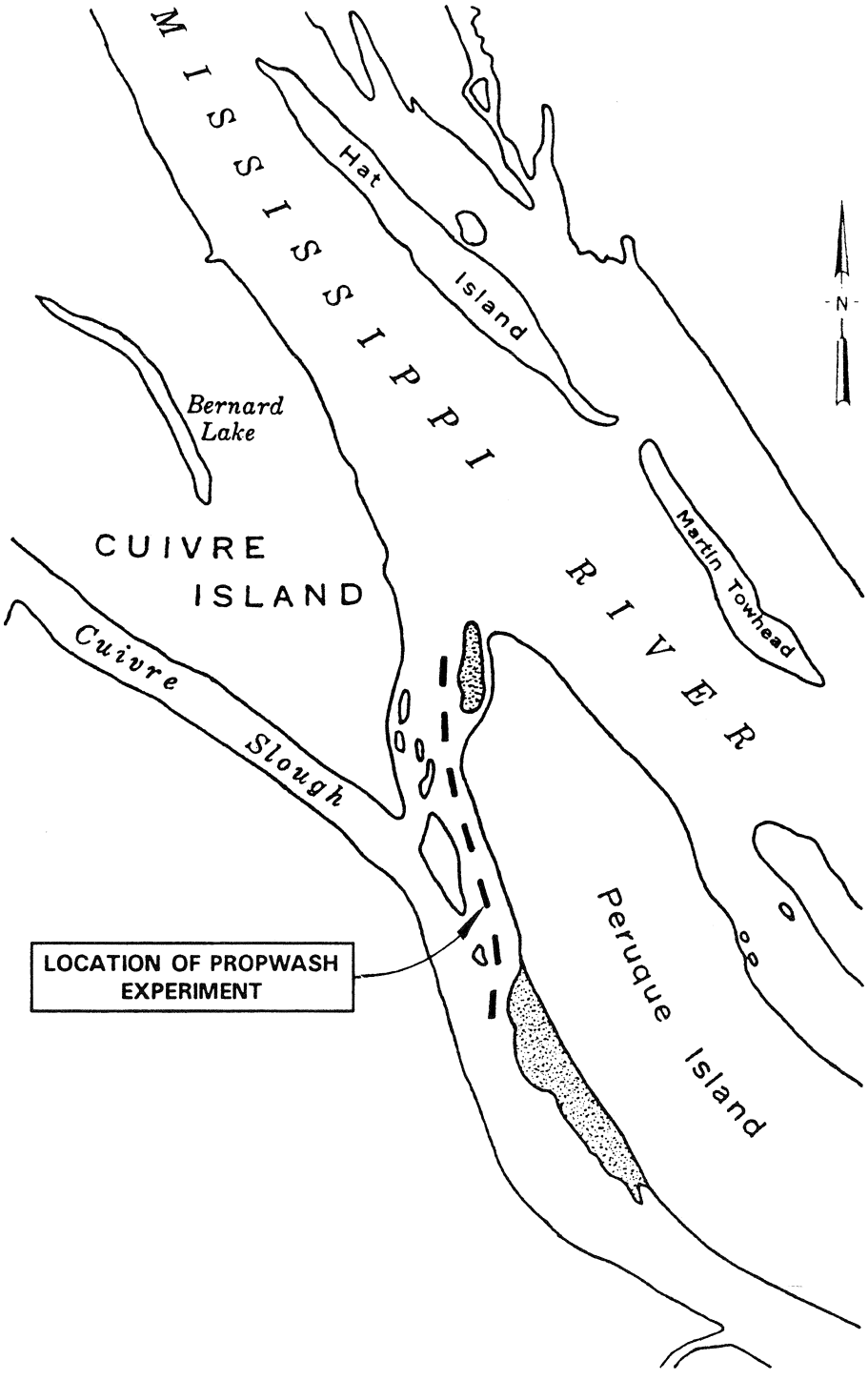
UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
CUIVRE ISLAND HABITAT REHABILITATION

MANAGEMENT MEASURE 5
DEEPEN CUIVRE SLOUGH BY HARD POINTS

PLATE 9



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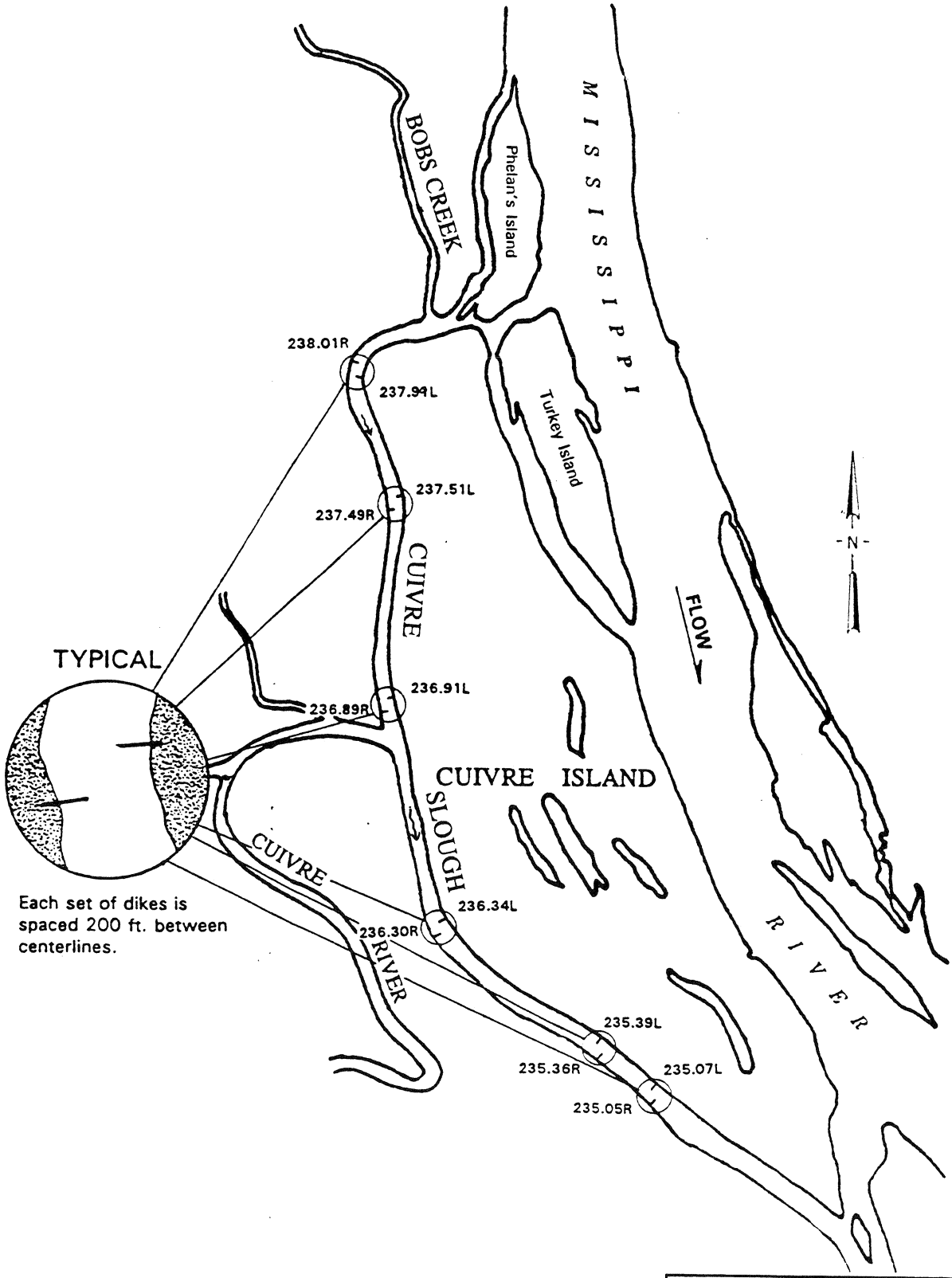
ENVIRONMENTAL MANAGEMENT PROGRAM
CUIVRE ISLAND HABITAT REHABILITATION

MANAGEMENT MEASURE 6
PROPWASH EXPERIMENT
BETWEEN CUIVRE IS. AND PERUQUE IS.

PLATE 10



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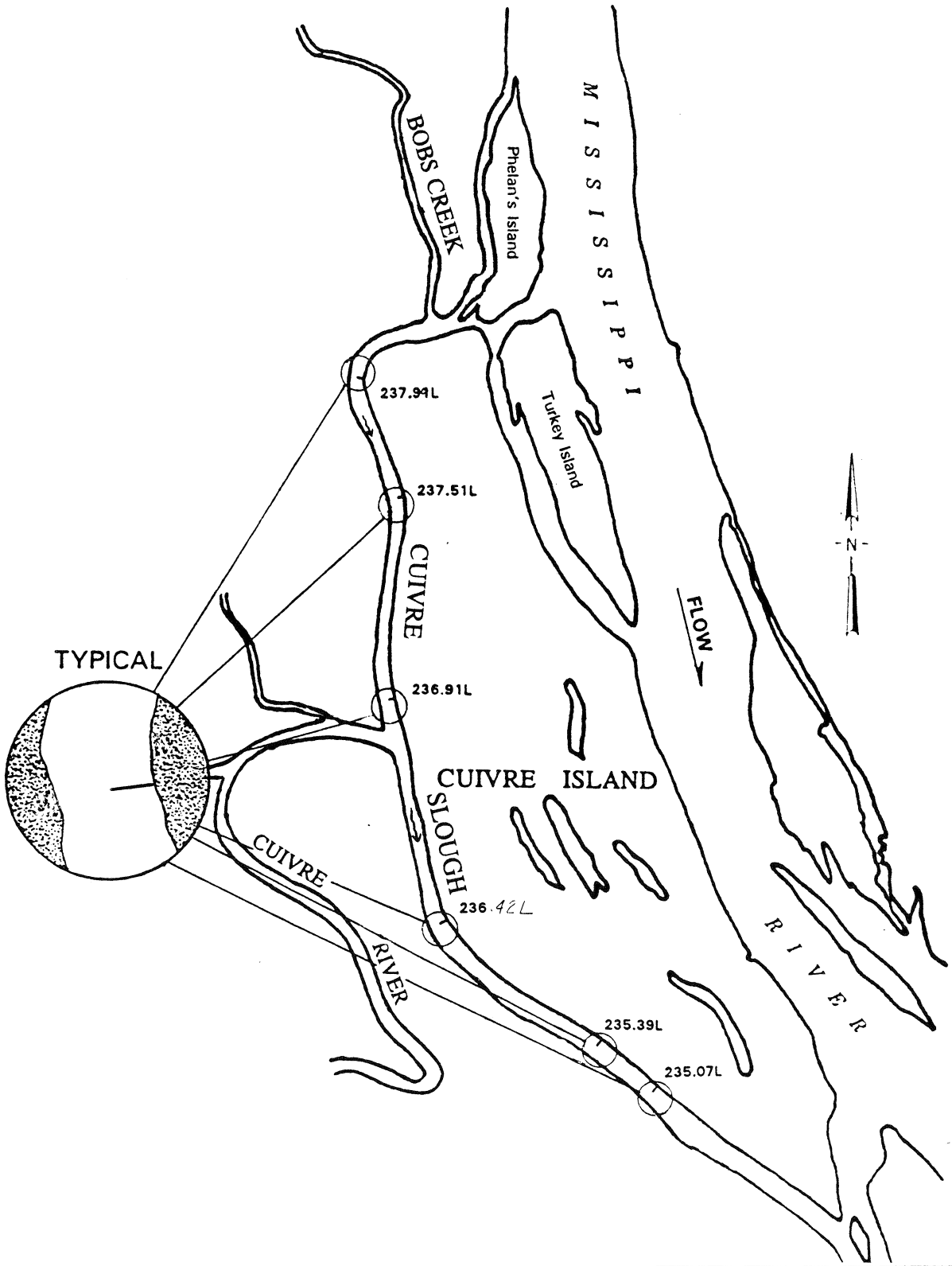
ENVIRONMENTAL MANAGEMENT PROGRAM
CUIVRE ISLAND HABITAT REHABILITATION

MANAGEMENT MEASURE 7
WINTERING HOLES IN SLOUGH BY DIKE WORK

PLATE 11



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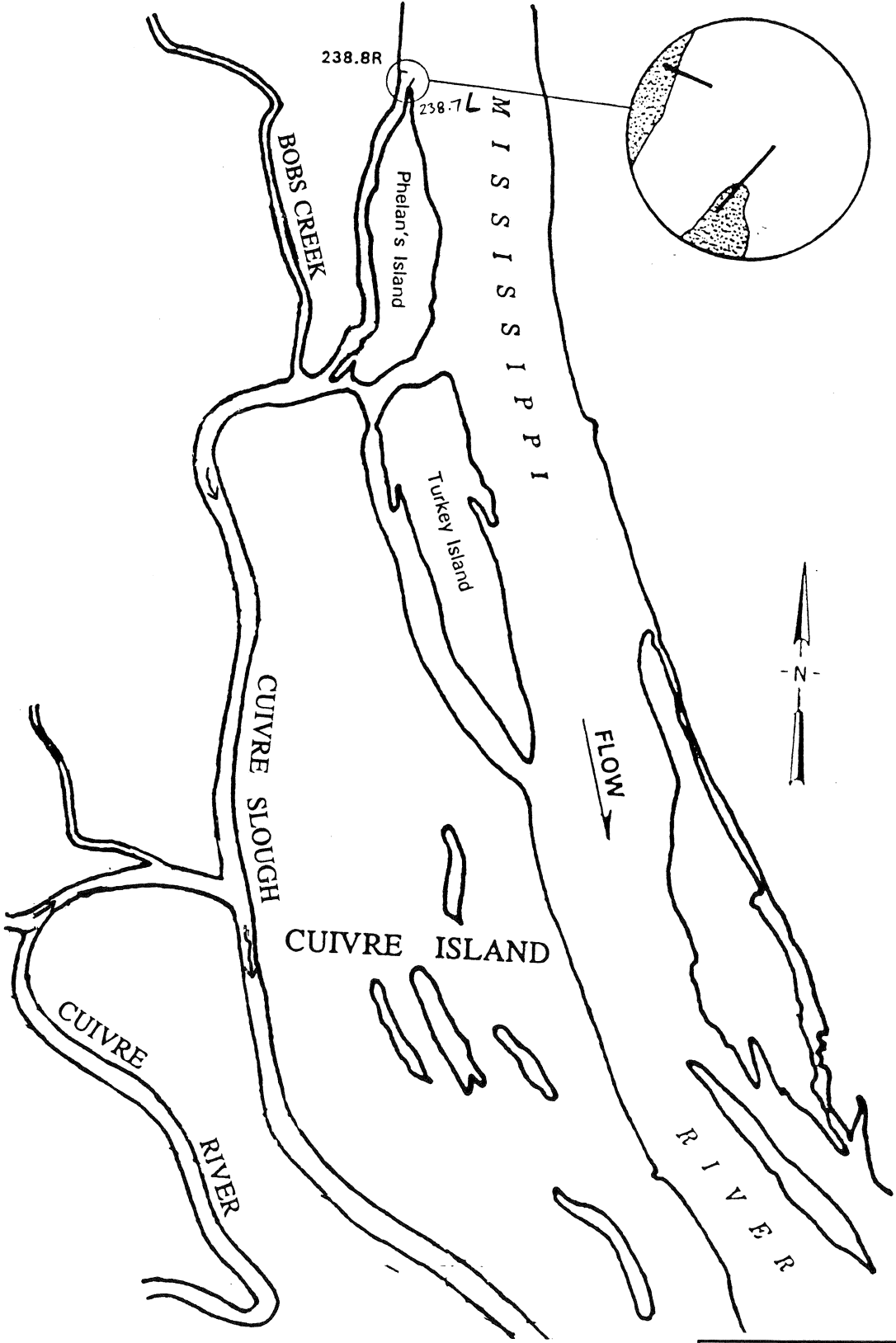
UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
CUIVRE ISLAND HABITAT REHABILITATION

MODIFICATION OF MANAGEMENT MEASURE 7F
WINTERING HOLES IN SLOUGH BY DIKE WORK

PLATE 11A



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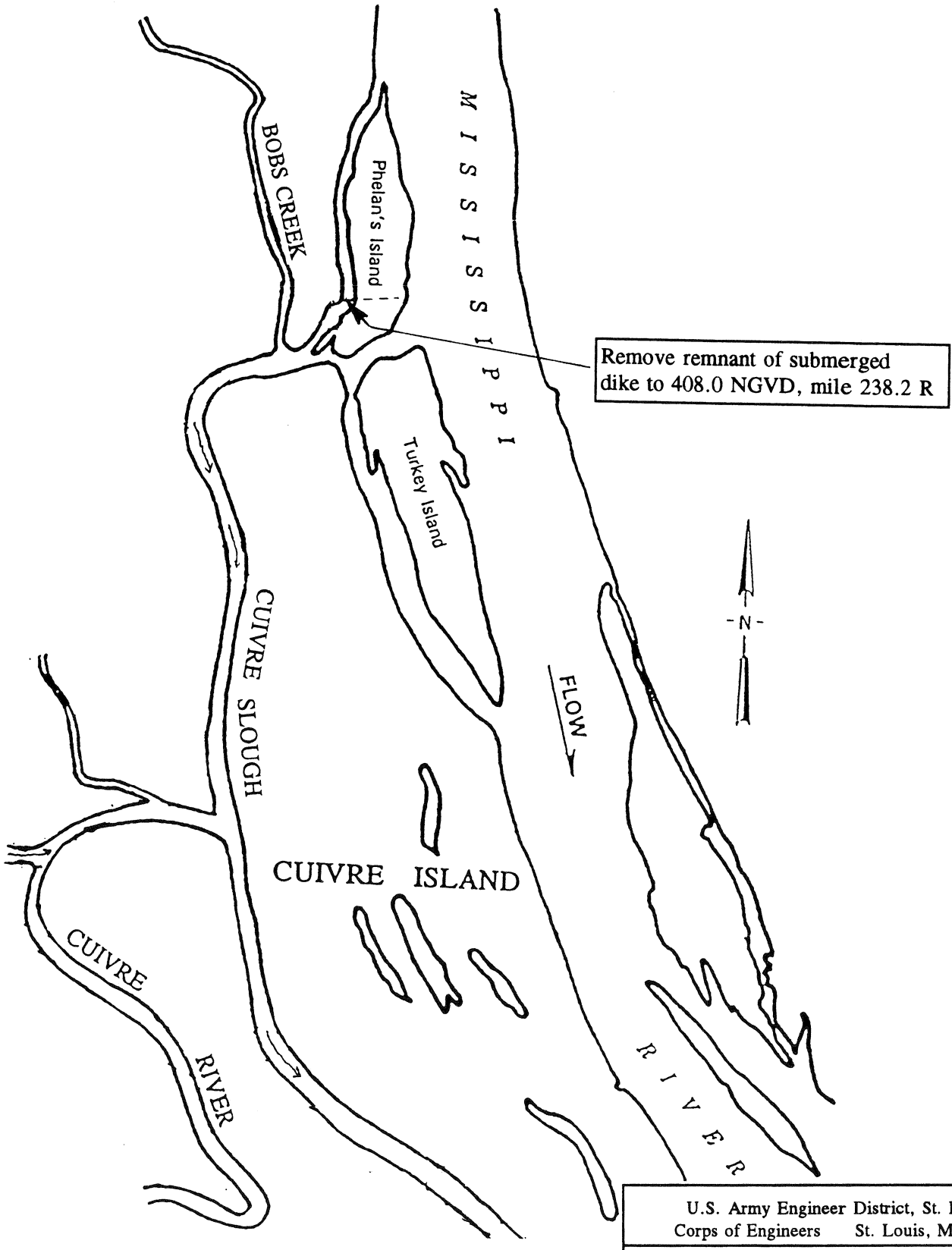
UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
CUIVRE ISLAND HABITAT REHABILITATION

MANAGEMENT MEASURE 8
PLACING DIKES AT UPPER END OF SLOUGH

PLATE 12



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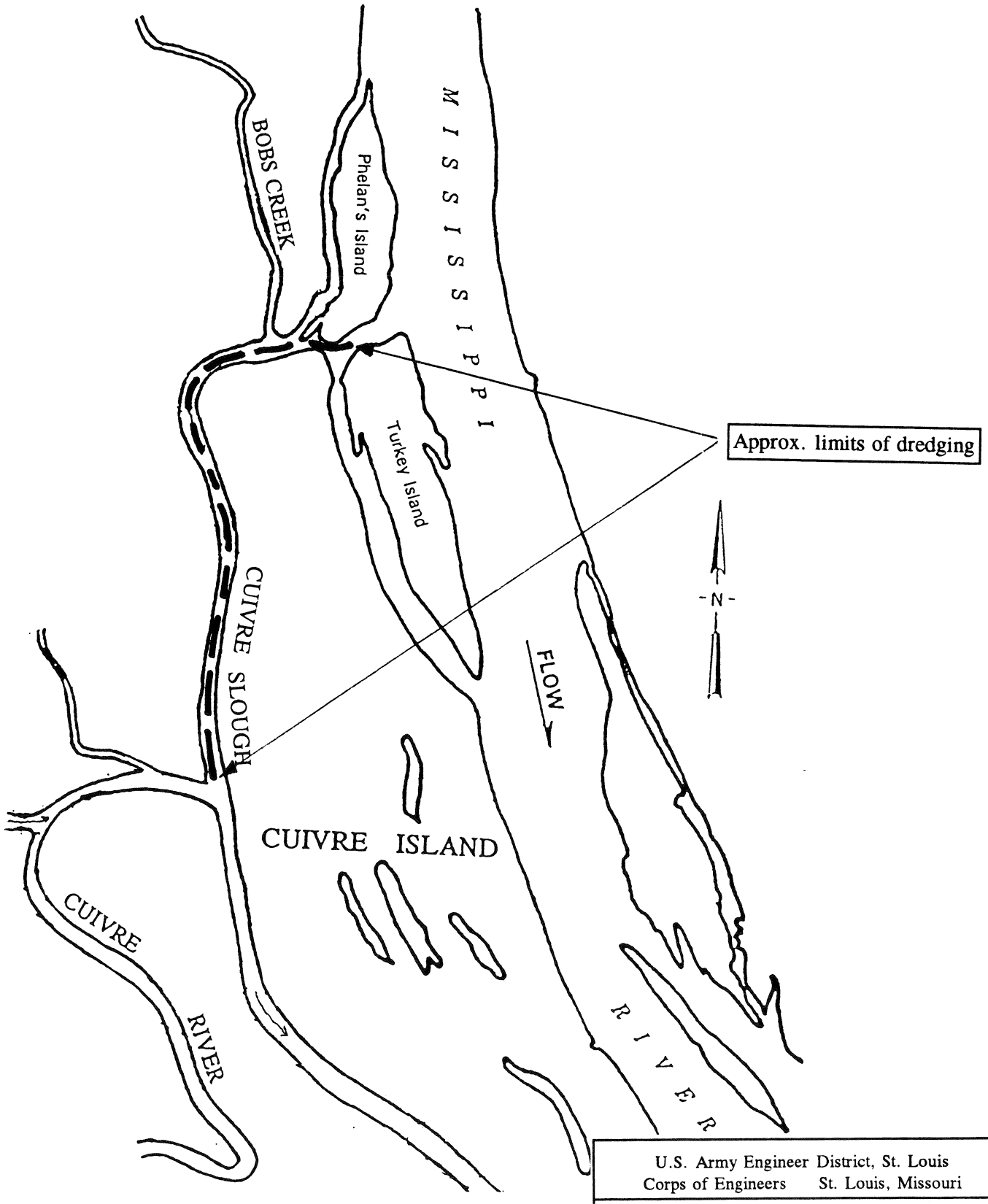
UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
CUIVRE ISLAND HABITAT REHABILITATION

MANAGEMENT MEASURE 9
REMOVE REMNANT OF SUBMERGED DIKE

PLATE 13



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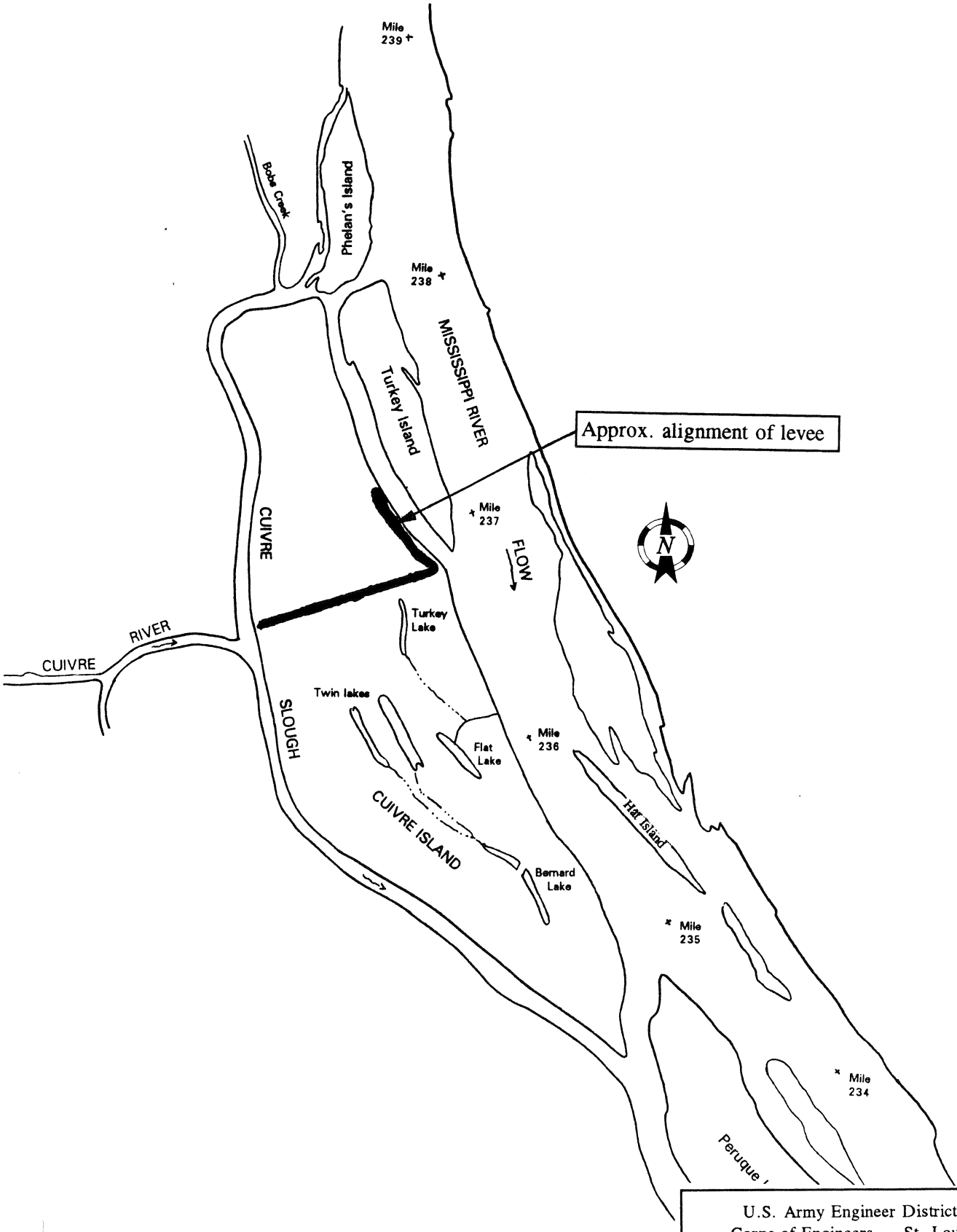
UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
CUIVRE ISLAND HABITAT REHABILITATION

MANAGEMENT MEASURE 12
DREDGE CUIVRE SLOUGH

PLATE 14



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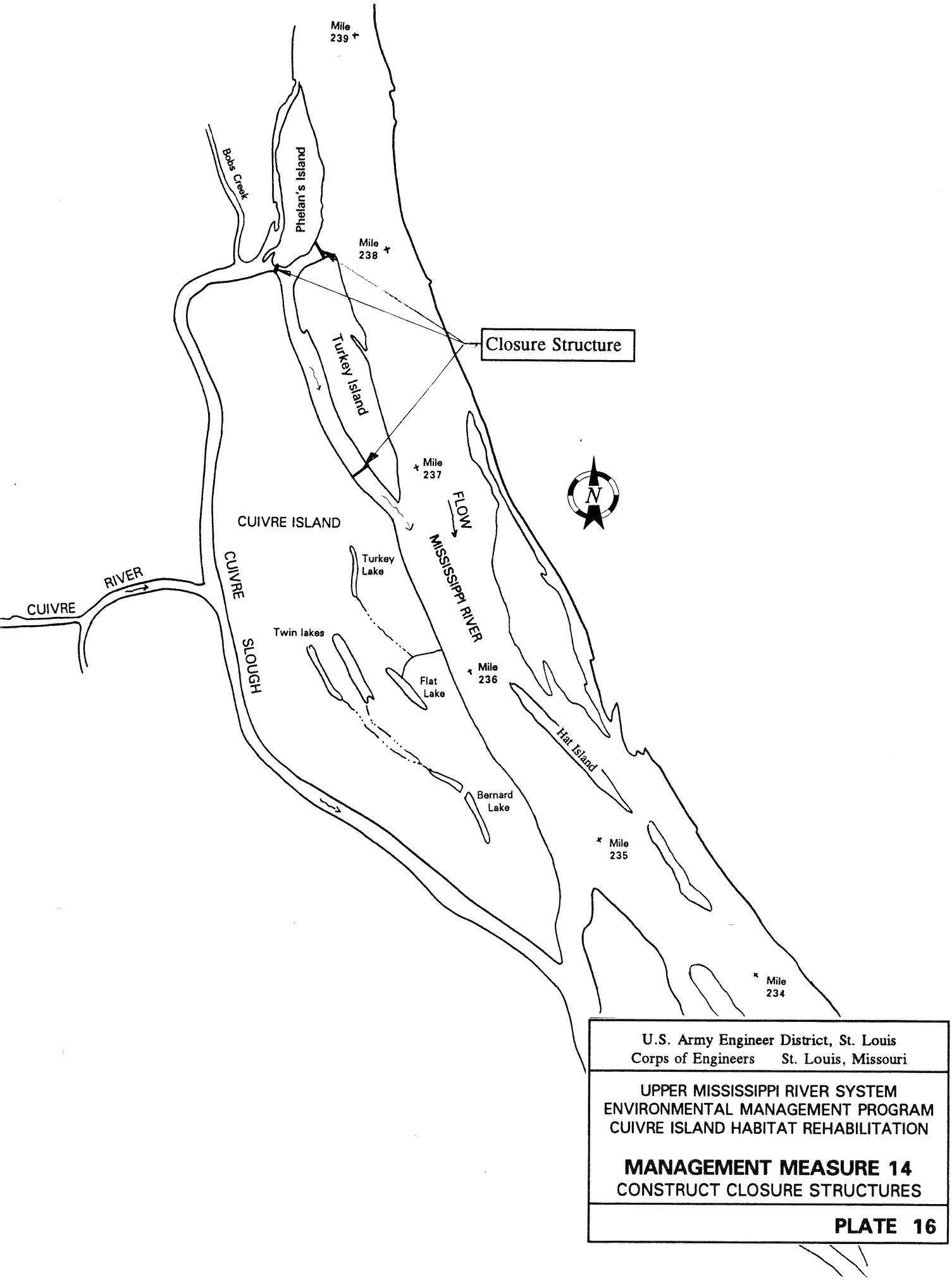
UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
CUIVRE ISLAND HABITAT REHABILITATION

MANAGEMENT MEASURE 13
CONSTRUCT LOW LEVEE
TO CREATE WETLAND

PLATE 15



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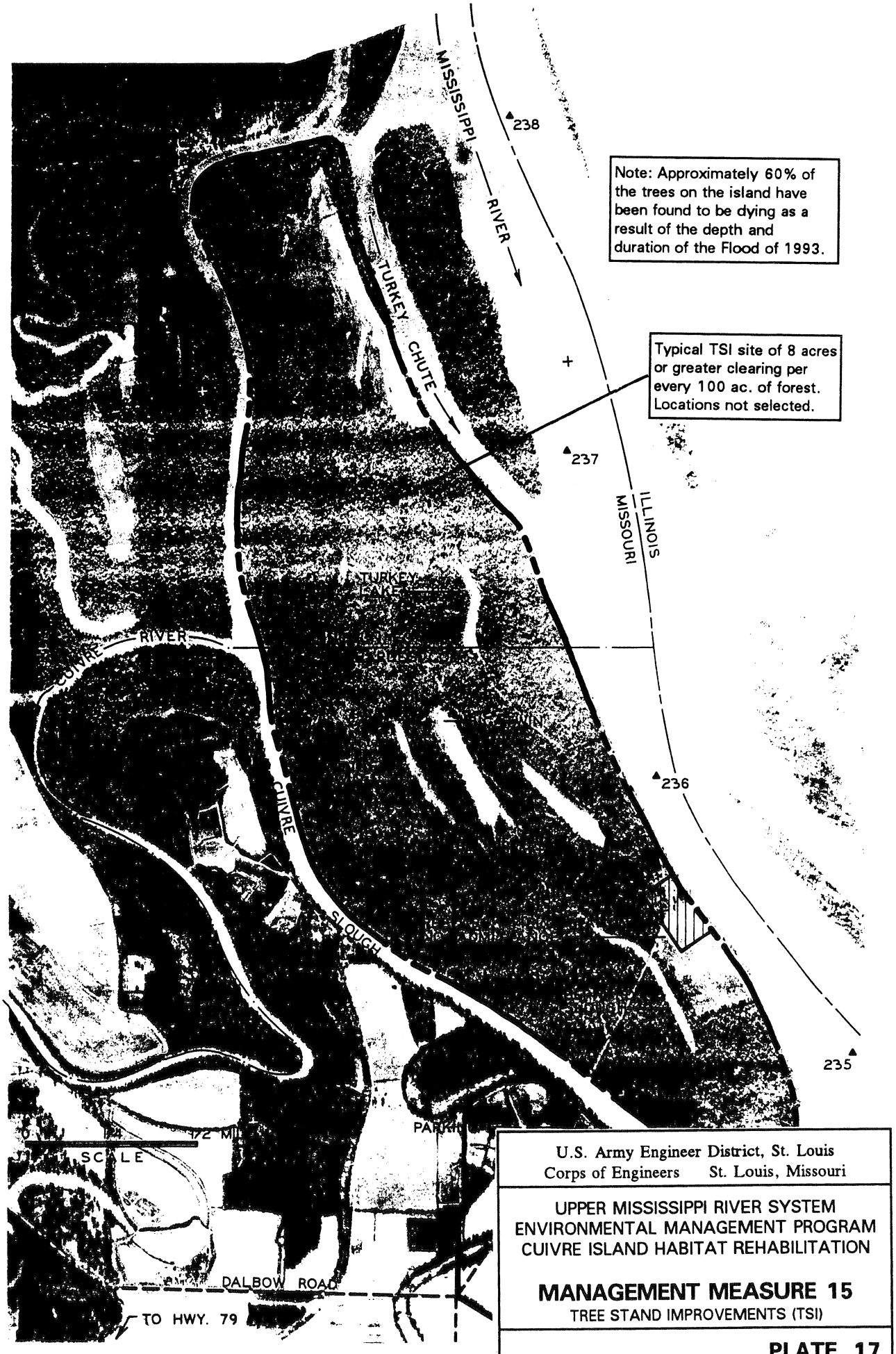
UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
CUIVRE ISLAND HABITAT REHABILITATION

MANAGEMENT MEASURE 14
CONSTRUCT CLOSURE STRUCTURES

PLATE 16



Note: Approximately 60% of the trees on the island have been found to be dying as a result of the depth and duration of the Flood of 1993.

Typical TSI site of 8 acres or greater clearing per every 100 ac. of forest. Locations not selected.

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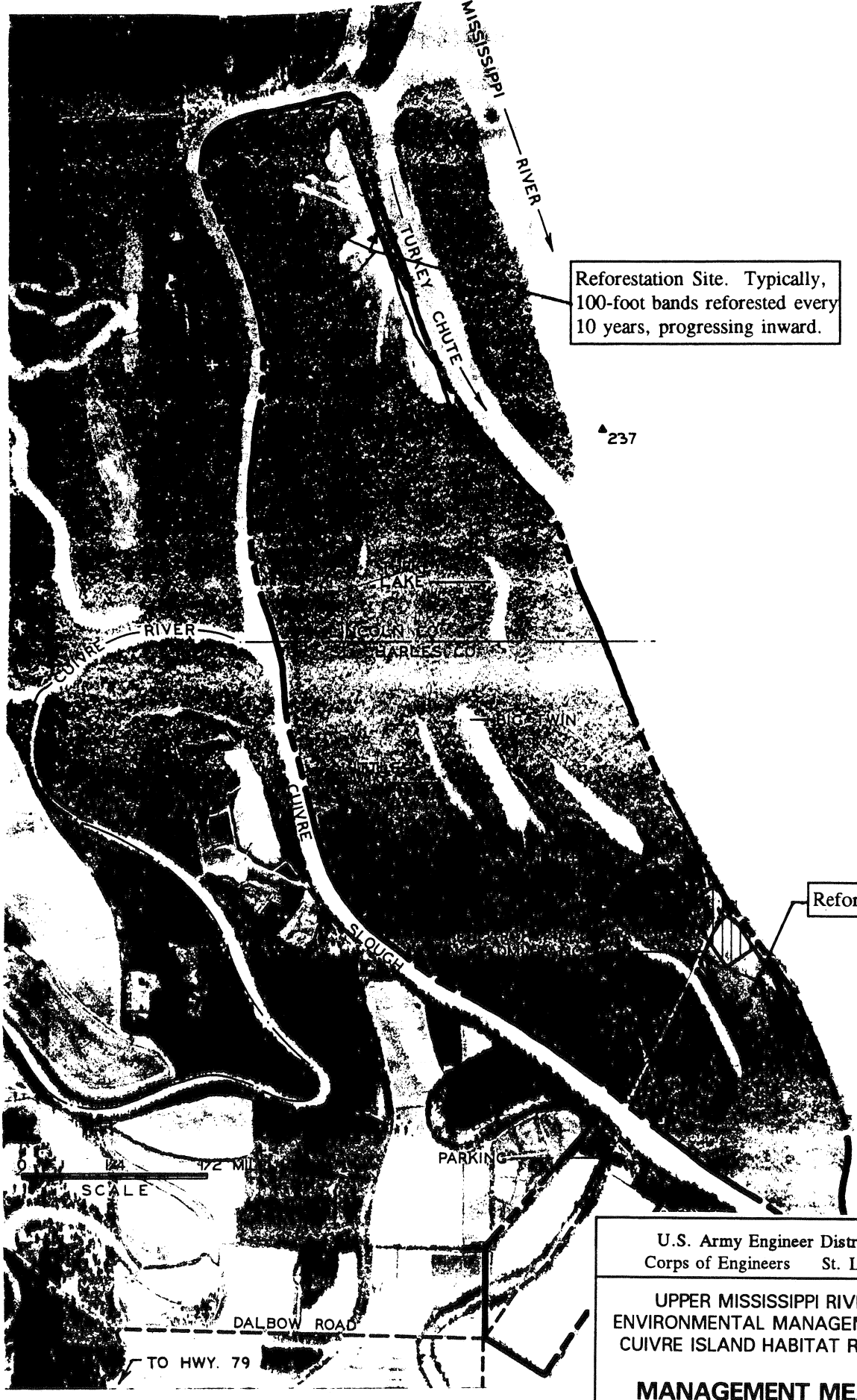
UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
CUIVRE ISLAND HABITAT REHABILITATION

MANAGEMENT MEASURE 15

TREE STAND IMPROVEMENTS (TSI)

PLATE 17



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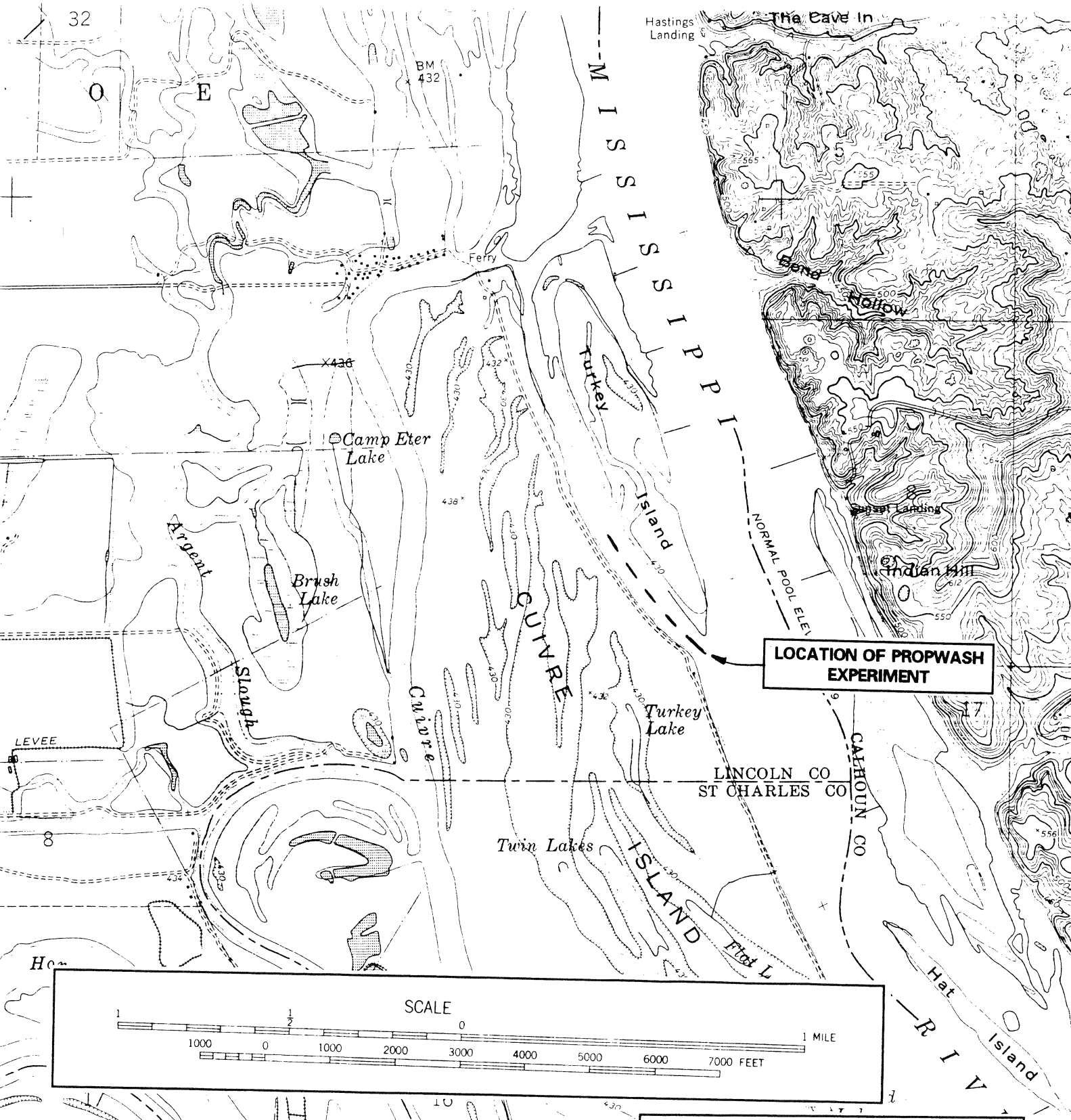
ENVIRONMENTAL MANAGEMENT PROGRAM
CUIVRE ISLAND HABITAT REHABILITATION

MANAGEMENT MEASURE 16
REFORESTATION

PLATE 18



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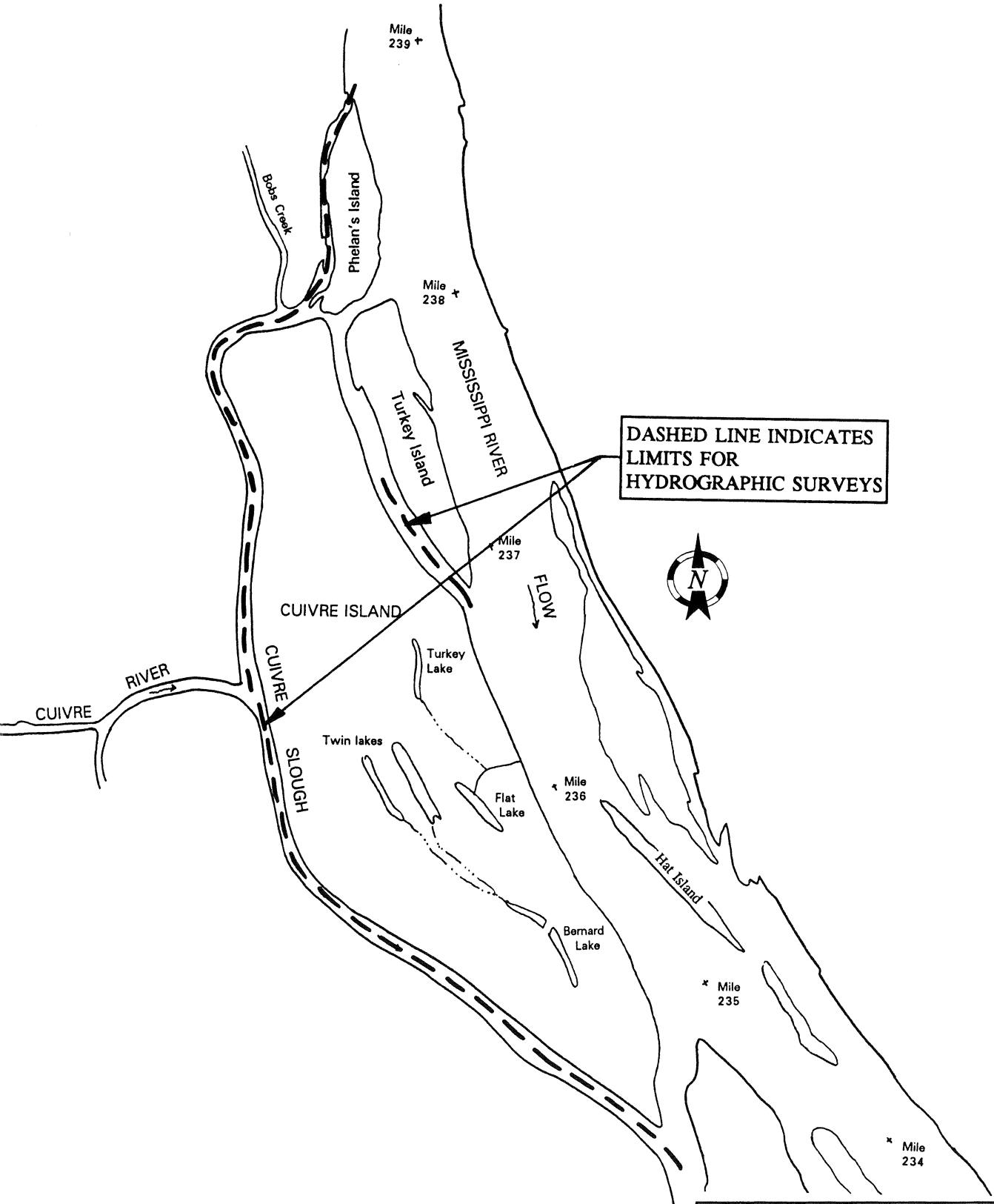
ENVIRONMENTAL MANAGEMENT PROGRAM
CUIVRE ISLAND HABITAT REHABILITATION

MANAGEMENT MEASURE 17
PROPWASH EXPERIMENT
BETWEEN CUIVRE IS. AND TURKEY IS.

PLATE 19



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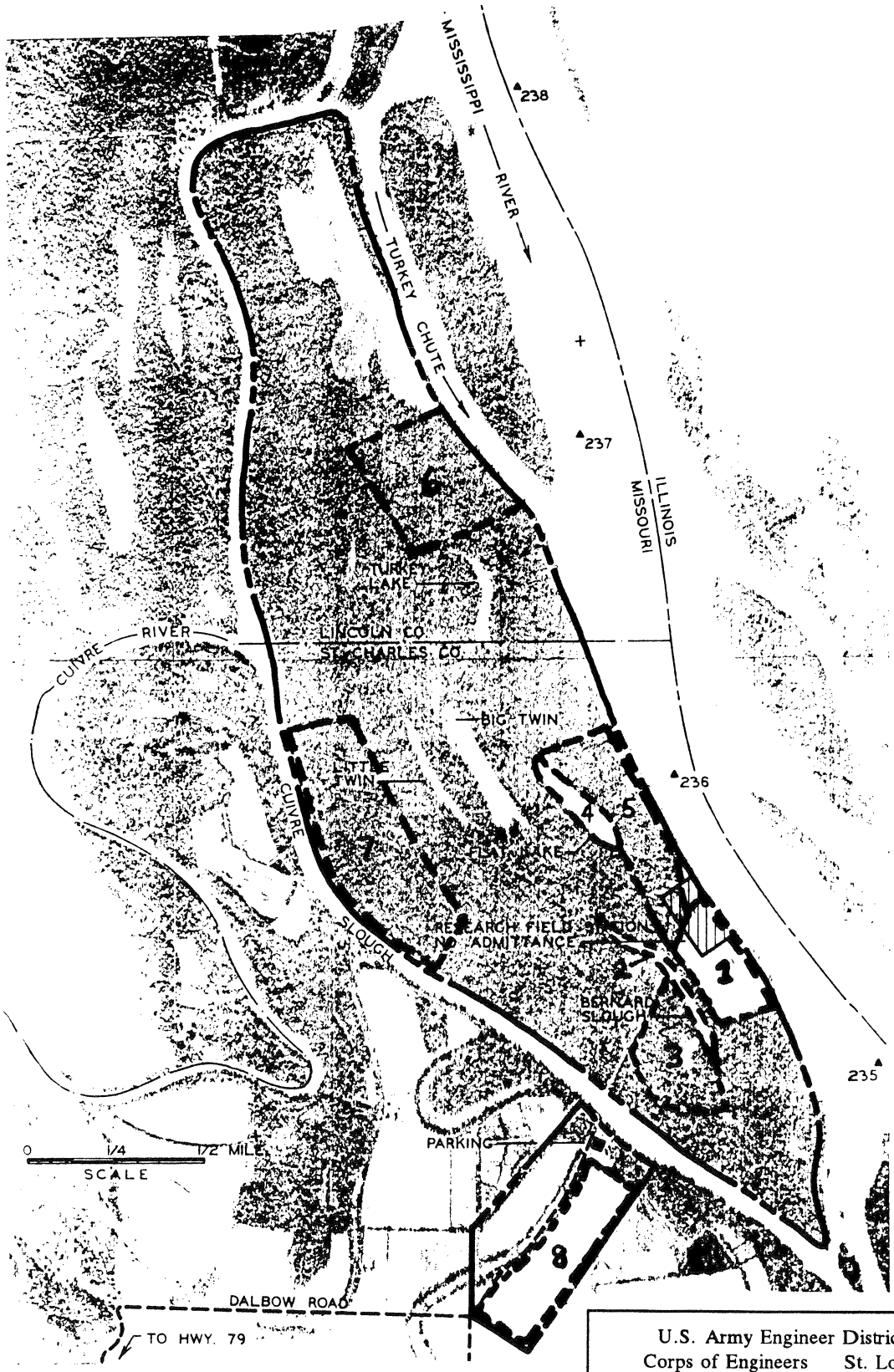
UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
CUIVRE ISLAND HABITAT REHABILITATION

SEDIMENTATION AND MONITORING PLAN

PLATE 20



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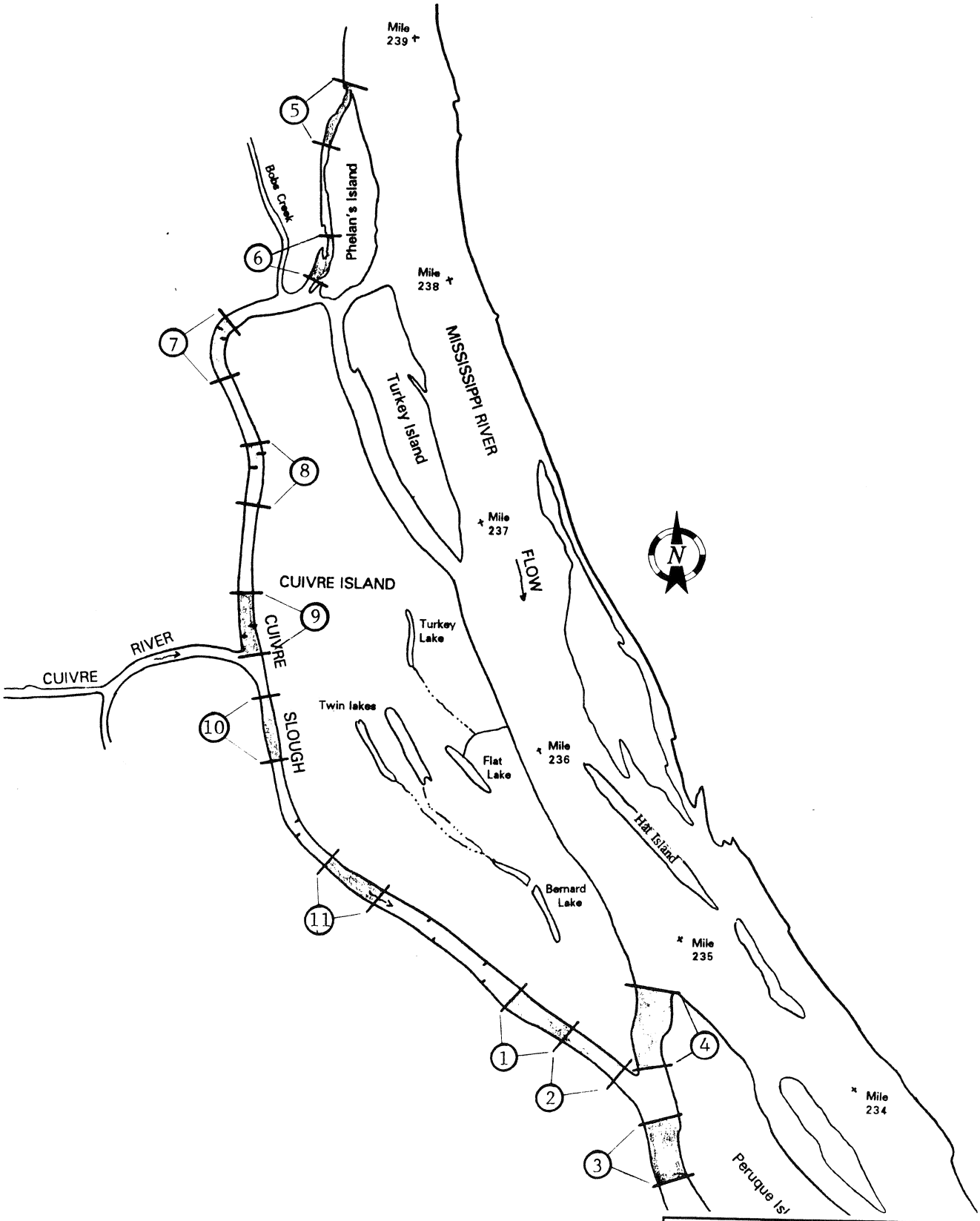
UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
CUIVRE ISLAND HABITAT REHABILITATION

LOCATION OF SAMPLE TRACTS
FOR WHAG HABITAT ASSESSMENT

PLATE 21



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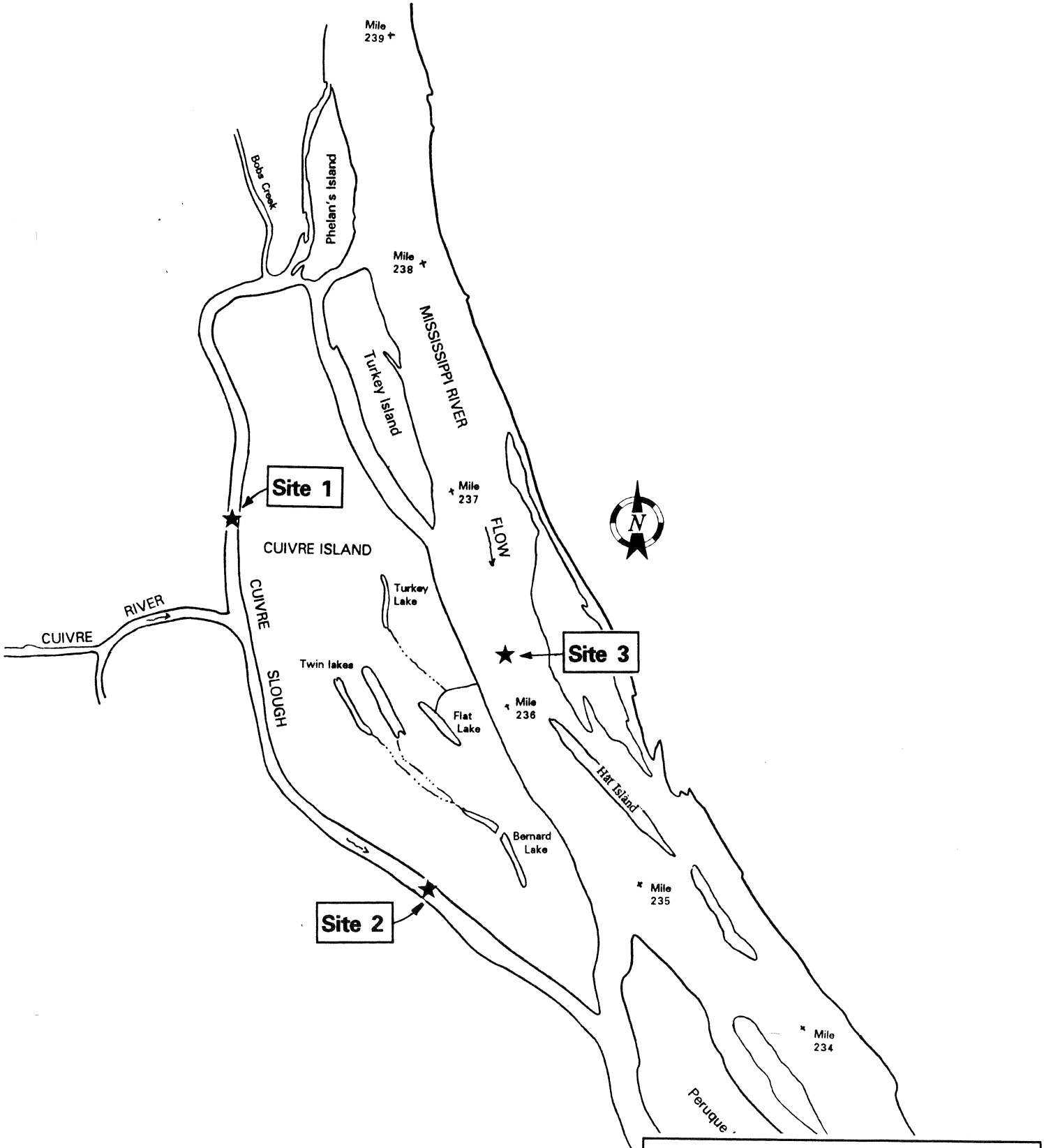
ENVIRONMENTAL MANAGEMENT PROGRAM
CUIVRE ISLAND HABITAT REHABILITATION

SAMPLE SITE REACHES
FOR AHAG HABITAT ASSESSMENT

PLATE 22



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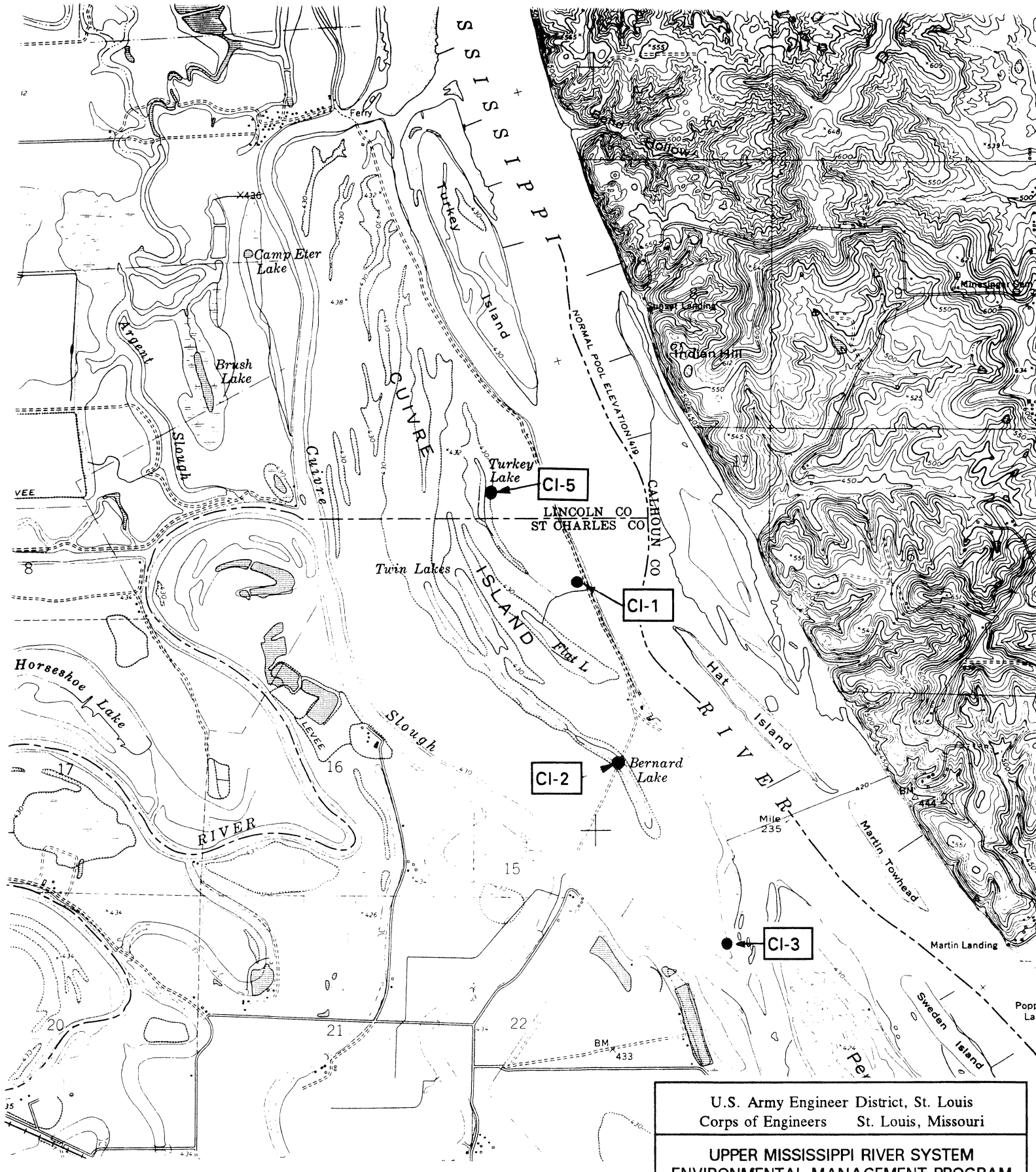
ENVIRONMENTAL MANAGEMENT PROGRAM
CUIVRE ISLAND HABITAT REHABILITATION

SITES FOR BASELINE WATER QUALITY MONITORING

PLATE 23



Note: Locations (not shown) were selected for borings CI-4, 6, and 7, but borings were not taken.

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ENVIRONMENTAL MANAGEMENT PROGRAM
CUIVRE ISLAND HABITAT REHABILITATION

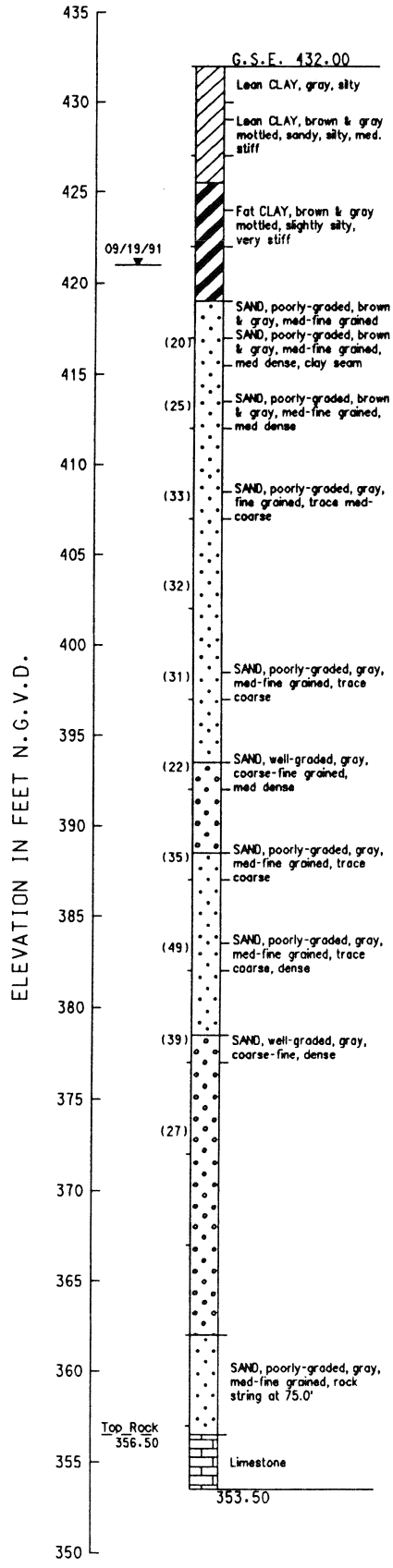
SOIL BORING LOCATIONS

PLATE 24

CI-1

CUIVRE ISLAND
AT PROPOSED PUMPING STA.

19 AUG 91



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UPPER MISSISSIPPI RIVER SYSTEM ENVIRONMENTAL MANAGEMENT PROGRAM CUIVRE ISLAND HABITAT REHABILITATION
SOIL BORING LOG CI-1
PLATE 25

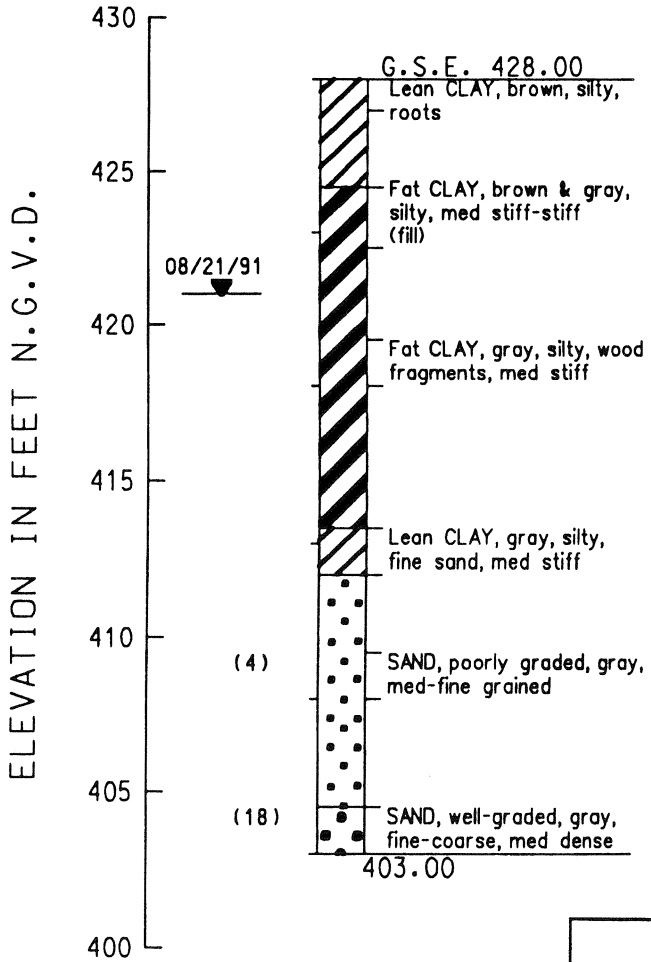
CI-2

CUIVRE ISLAND

EARTH DAM/BRIDGE

CROSSING BERNARD LAKE

21 AUG 91



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UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
CUIVRE ISLAND HABITAT REHABILITATION

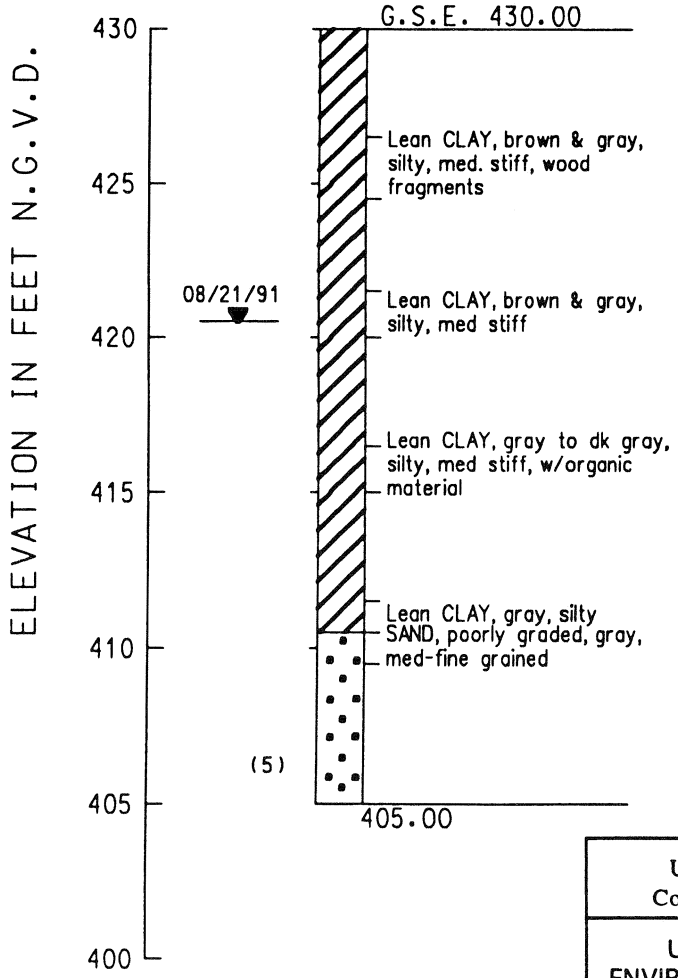
SOIL BORING LOG CI-2

PLATE 26

CI-3

CUIVRE ISLAND
S END OF ISLAND AT DITCH

21 AUG 91



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UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
CUIVRE ISLAND HABITAT REHABILITATION

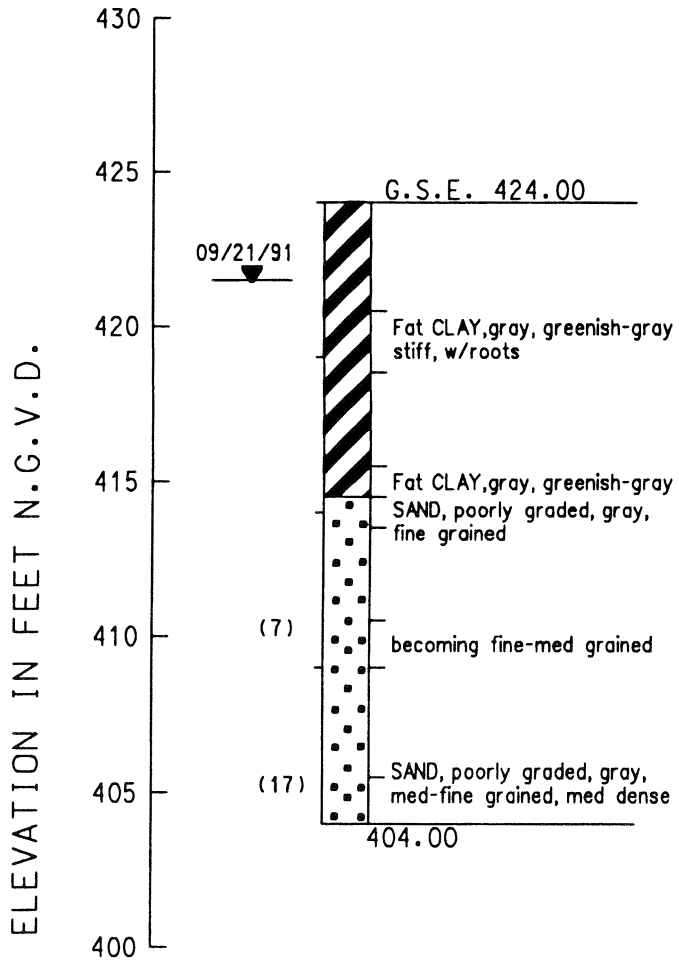
SOIL BORING LOG CI-3

PLATE 27

CI-5

CUIVRE ISLAND
S SIDE OF TURKEY LAKE

21 SEP 91



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UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
CUIVRE ISLAND HABITAT REHABILITATION

SOIL BORING LOG CI-5

PLATE 28

Appendix B - Habitat Evaluation

APPENDIX B - HABITAT EVALUATION
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APPENDIX B - HABITAT EVALUATION
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LIST OF EXHIBITS

Page No.

SECTION I. INTRODUCTION.

This appendix presents an evaluation of habitat conditions for project planning. The evaluation quantifies changes to habitat quality and quantity for a variety of management measures. This type of evaluation is needed because traditional cost-benefit evaluation procedures are not applicable. The habitat unit (HU) is the unit of measure that was used in this evaluation for the Cuivre Island project. This unit of measure has wide acceptance both within and outside the Corps of Engineers.

A habitat unit is the product of habitat quantity and habitat quality. Habitat quantity is usually expressed in acres, and habitat quality by a habitat suitability index (HSI). An HSI is a numerical rating of existing habitat quality against optimum habitat quality, and it ranges from 0 (no quality) to 1 (optimum quality). The effects of various plans or plan features can be compared by multiplying HSIs by acres of habitat for each management measure considered.

For the Cuivre Island project there is a need to evaluate both wildlife and fisheries habitat. At the present time a number of methods are available. These include the U.S. Fish and Wildlife Service's Habitat Evaluation Procedures (HEP), the U.S. Army Corps of Engineers Habitat Evaluation System (HES), and the U.S. Bureau of Reclamation's Habitat Management Evaluation Method. Among the Federal and state agencies, the HEP procedure is the most familiar to all participants in the Environmental Management Program (EMP). Under HEP, habitat quality is described in terms of individual species, whereas the focus of HES is at the community level (a group of species).

The Missouri Department of Conservation and the U.S. Soil Conservation Service have developed an evaluation method based on HEP. This method, the Wildlife Habitat Appraisal Guide (WHAG), represents a regional fine tuning of HEP and is structured to more efficiently input field data. The WHAG is accepted by agencies in the Upper Mississippi River system as the method of choice for evaluation of wildlife habitat for EMP projects, and for this reason it was applied to the Cuivre Island project.

To date, HU methods for wildlife evaluation have received greater support and acceptance among biologists than have methods to evaluate fisheries habitat. Until recently, there was only one fisheries evaluation method available for project planning purposes. This method, the Aquatic Habitat Appraisal Guide (AHAG), follows the format of the Missouri WHAG. The AHAG was jointly developed by the Corps' Rock Island District and Waterways Experimental Station, and still is undergoing revisions. A second method, the Fish Habitat Appraisal Guide (FHAG), was recently developed by the Missouri Department of Conservation. This new method is identical in approach and structure to its wildlife counterpart, the WHAG, except that fisheries habitat is the target of evaluation instead of wildlife habitat. The Cuivre Island project represents the first application of the FHAG by the St. Louis District for EMP planning purposes. The WHAG and FHAG methods both focus on habitat quality in terms of individual species.

References for literature cited in this appendix are not presented within this appendix, but instead are found in Appendix O, Literature Cited and General References.

SECTION II. EVALUATION OF WILDLIFE HABITAT.

1. PROCEDURES.

The exercise of quantifying wildlife habitat within the project area was aimed at 1) identifying habitat deficiencies or opportunities for improvement under existing and future without project conditions, 2) devising management measures to address the deficiencies or opportunities for improvement, and 3) assigning numerical values to each management measure according to its ability to improve habitat conditions over the future without condition.

The measure of output for each management measure, the habitat unit, is defined as the product of habitat quality (described in terms of habitat suitability indices ranging from 0 to 1) and habitat quantity (described in acres). Because the WHAG method rates habitat quality in terms of individual wildlife species, habitat units are also relative to individual species.

Representatives of the U.S. Fish and Wildlife Service, Missouri Department of Conservation, and St. Louis District participated as a team in the evaluation of habitat quality and quantity for existing, future without, and future with conditions.

a. Assessment of quality of wildlife habitat. The team evaluated quality of terrestrial habitats using the Wildlife Habitat Appraisal Guide (WHAG) method. The habitat characteristics and species used for evaluation are presented in EXHIBIT 1. The WHAG manual refers to the information in EXHIBIT 1 as the wetland species characteristic matrix. The matrix includes 54 habitat characteristics and 12 wetland-dependent wildlife species, including 10 birds and two mammals. In the matrix, habitat is categorized into four wetland types - forested wetland, nonforested wetland, wet cropland, and wet grassland. Of the 54 habitat characteristics, only a portion are applicable to each habitat type. Likewise, no habitat characteristic is applicable to all 12 wildlife species.

The team sampled eight tracts within the project area to assess existing conditions for three habitat types (see Plate 21). The team sampled one area of cropland on the mainland (tract 8), and one on Cuivre Island (tract 1). On Cuivre Island, the team sampled two areas of nonforested wetland or interior sloughs (tracts 2 and 4), and four areas of forested wetland or bottomland forest (tracts 3, 5, 6, and 7). The project area does not include any grassland.

Using the matrix, the team rated all applicable habitat characteristics at each sample tract under existing conditions (year 1992). The team also rated each sample tract under future conditions with and without a project for years 1994 and 2043, or two and 50 years in

the future. Year 1994 with the project was defined as one year after project completion. Year 2019 (25 years) was also evaluated for one management measure. The ratings were entered into the WHAG computer software by the St. Louis District to calculate habitat suitability indices for all 12 species, by habitat type and project condition. To save space, ratings are not presented in this appendix.

b. Assessment of quantity of suitable wildlife habitat. The team projected acres of habitat for years 1993 and 2043, with and without a project. The St. Louis District used maps to measure existing acres of cropland, bottomland forest, and interior sloughs proposed for habitat improvements. The District also determined area below the elevations of 426, 427, 428, 429, and 430 feet NGVD on Cuivre Island using maps with 2-foot contour intervals.

c. Identification of proposed management measures to improve conditions of wildlife habitat. First, the WHAG team evaluated results of the assessments of habitat quality and quantity under existing and future without conditions. Using the WHAG's wetland species characteristic matrix, the team then identified variables that could be manipulated to increase habitat quality. Management measures were then developed, based on these variables, to make habitat improvements.

d. Determination of projected effects of proposed management measures on quality and quantity of wildlife habitat. The St. Louis District, using the Corps' Habitat Evaluation System (HES) software developed by the Lower Mississippi Valley Division, determined the projected effect of each management measure on all evaluation species. The computer program multiplied species-specific HSIs (habitat quality) by number of suitable acres (habitat quantity) to obtain habitat units. For each species, the multiplication process was performed on three sets of HSI and acre data to generate habitat unit data for existing, future without, and future with conditions. Target years of 0, 2, 25, and 50 were used to define existing (1992) and future (1994, 2019, 2043) conditions.

The projected effect of a management measure was obtained by subtracting habitat units computed for the future without condition from habitat units computed for the future condition with the management measure. The habitat unit values in this appendix have been annualized. The computer program divided the 50-year cumulative total of habitat units by 50 years to obtain annualized habitat units (AHU).

2. ASSUMPTIONS.

During the assessment of habitat quality and quantity, the team made some assumptions regarding existing and future conditions.

a. In the next fifty years, the island's 30 acres of interior sloughs will change from open water wetlands to wooded wetlands because of sedimentation.

b. For the next 50 years, private waterfowl hunting clubs adjacent to the project area will continue to manage habitat as they do now. Likewise, Cuivre Slough above the confluence with Cuivre River will fill in with river borne sediment, whereas the portion below the confluence will remain open. (The WHAG method assesses wetland and aquatic conditions within a two-mile radius of the project area.)

c. Management practices by MoDOC at the project area will remain the same for the next 50 years. Acres of suitable habitat will not change from existing to future without conditions.

d. The height, frequency, and duration of Mississippi River and Cuivre River floods will not change in the future.

e. Because of higher ground elevations on the mainland, sedimentation due to river borne sediments is not a problem like it is on Cuivre Island.

f. To aid in the evaluation of management measures, target species were chosen by MoDOC to represent the focus of management efforts at the wildlife area. The mallard and wood duck were chosen for Cuivre Island's artificially flooded habitats, which are dominated by the green tree reservoir. The king rail and least bittern were selected for MoDOC's future plans for a semi-permanent marsh on the mainland.

g. Habitat benefits expected from marsh development and improvements to green tree reservoir management will be fully manifested by target year 2 (one year after completion of construction). Benefits from tree stand improvements would also begin accruing at target year 2. Benefits from forest regeneration would not begin until after target year 2.

h. There will be no project on the shared floodplain of the Mississippi and Cuivre Rivers which would restore that area's hydrology and plant communities to a presettlement condition.

3. RESULTS.

a. Existing conditions.

(1) Quality of wildlife habitat. TABLE B-1 presents ratings of habitat quality under existing conditions for eight species of wildlife for the area of the proposed marsh. TABLE B-2 displays similar data for 12 wildlife species for the artificially flooded habitats on Cuivre Island. TABLES B-3 and B-4 show HSIs for tree stand improvements and forest regeneration.

Cropland has low to moderate habitat quality for the mallard and Canada goose on the mainland and Cuivre Island, and no habitat quality for the remaining five birds and one

mammal because the WHAG method defines cropland as unsuitable for them. Moist-soil areas (interior sloughs) on Cuivre Island have minimal habitat quality for five of the eight evaluation species, and low to moderate ratings (0.25 to 0.49) for the remaining three species. Bottomland forest has minimal quality for the mallard and moderate quality for the remaining four species.

(2) Quantity of wildlife habitat. TABLE B-5 presents acres of suitable habitat under existing conditions for all evaluation species on the mainland. TABLE B-6 has such data for Cuivre Island's artificially flooded habitats. TABLES B-7 and B-8 show acres of habitat for tree stand improvements and forest regeneration.

For most evaluation species, the WHAG manual defines cropland as unsuitable habitat. Because cropland is suitable only for the mallard and Canada goose, acres are shown for only these two species in TABLE B-5. The green tree reservoir covers 30 acres of moist-soil areas (the interior sloughs), and 55 acres of bottomland forest, and 5 acres of ditches (TABLE B-6).

b. Future without conditions. Habitat quality and quantity ratings are found in TABLES B-1 through B-8 for all evaluation species under the future condition without any project.

(1) Quality of wildlife habitat. Fifty years in the future without any project, habitat quality is not expected to increase for any evaluation species in cropland, moist-soil areas, or bottomland forest (TABLES B-1 through B-4). Quality of cropland is not expected to change from that of existing conditions. For moist-soil habitat, HSIs decline or remain minimal for nonforest species, and increase for forest species. For bottomland forest, HSIs decline for the heron, wood duck, beaver, parula, and prothonotary warbler (under green tree reservoir management). The mallard HSI for bottomland forest remains minimal.

(2) Quantity of wildlife habitat. The team assumed that acres of suitable habitat would remain constant 50 years in the future without any project (TABLES B-5 through B-8). Exceptions to this include the conversion of interior sloughs to forest on Cuivre Island, and the loss of 25 acres of forest to future maintenance (year 25) of the island's ditch system (TABLE B-6).

c. Habitat variables amenable to manipulation and proposed measures to improve wildlife habitat conditions. In order to identify habitat deficiencies or opportunities for improvement, the team used the wetland species characteristic matrix to compare habitat characteristic ratings for existing and future without conditions. The deficiencies or opportunities were treated as variables.

(1) Mainland. For the cropland on the mainland, the team concluded that the lack of wetland water conditions, whether seasonal or permanent, was the main factor causing poor habitat quality for wetland wildlife species. To fulfill MoDOC's statewide goal

of establishing semi-permanent marsh habitat on appropriate state wildlife areas, the team proposed the creation of marsh using cropland on the mainland portion of the wildlife area. An old oxbow of the Cuivre River separates the cropland into two areas.

Three increments were created for the marsh development. The first involved the creation of marsh using one-half of the larger of the two areas (Area 2). Under the second increment, all of Area 2 would be used. All of Areas 1 and 2 would be used under the third increment.

(2) Cuivre Island. For Cuivre Island, the team concluded that the main factor contributing to poor habitat quality for the mallard and wood duck, the island's target species, was unreliable fall-winter water conditions. By providing better control of water levels every fall and winter, habitat quality for these two waterfowl species would be expected to increase. As a second variable, the team identified an opportunity to increase the area of flooded habitats, especially the green tree reservoir. The team also recognized the opportunity to make forest manipulations (tree stand improvements) and regenerate forest.

To provide optimal reliability of water conditions, a number of structural measures were proposed jointly. These measures include a new pumping unit, cleanout of the water distribution ditches, construction of a new segment of ditch, replacement of existing water control structures in bad condition, and construction of new water control structures to improve efficiency of water management. In developing increments for green tree reservoir management, the improvements to water control were coupled with increases in the reservoir's surface area created by raising the pool elevation by one-foot increments. Increments were developed for surface elevations of 427, 428, 429, and 430 feet NGVD. Raising the pool elevation above 426 feet NGVD requires the construction of a new water control structure in the natural drainage ditch at the south end of the island.

The Missouri Department of Conservation (MoDOC) initially proposed three types of tree stand improvements (TSIs) - creation of small forest openings (<2 acres), creation of cavity trees, and creation of snag trees - as management measures to improve forest conditions on Cuivre Island for wildlife. The WHAG team assessed habitat conditions for these three management measures. Later in the planning process, MoDOC decided to eliminate the creation of cavity and snag trees as management measures. The reasoning was that any new snag or cavity trees would be short-lived because of the predominance of soft-wood species on the island. Likewise, artificial nesting structures were not considered because of their relatively high cost. Three increments were developed for creation of scattered forest openings: implementation throughout one-third of the island's forest, throughout two-thirds of the forest, and throughout all of the island's forest (1,262 acres). In addition to TSIs, forest regeneration through tree planting was proposed for the 110 acres of cropland on Cuivre Island. Three increments were proposed also - the south area of cropland, the north area, and both areas of cropland.

d. Future with project conditions. Habitat quality and quantity ratings are found in

TABLES B-1 through B-8 for all evaluation species under the future condition with a project.

(1) Quality of wildlife habitat. Converting cropland to marsh will yield large increases in habitat quality for all marsh evaluation species but the coot (TABLE B-1). For example, the HSI changes for the two target species, the least bittern and king rail, range from 0.77 to 0.94. On Cuivre Island, it is expected that improving the capability of water control management will provide low to moderate increases in quality of moist-soil, bottomland forest, and cropland habitats under green tree reservoir management for most species (TABLE B-2). The water control management measure is not expected to change habitat quality of moist-soil areas for the coot. Also, this management measure is expected to cause slight initial declines in quality of bottomland forest for the parula and prothonotary warbler. Tree stand improvements (TABLE B-3) will improve habitat quality for only the heron, wood duck, and beaver, and these improvements are only very slight. The future-with HSI for forest openings is based on an additional 10 percent of the forest area being converted and maintained as small (< 2 acre) openings. Regeneration of bottomland forest on cropland by tree planting is expected to increase habitat quality for all forest species but the mallard (TABLE B-4). The future-with condition was evaluated under the assumption that tree plantings in cropland would yield a forest composition of 25-50 percent pin oak or other oaks with small acorns.

(2) Quantity of wildlife habitat. On the mainland, the three increments for marsh development will provide 21, 49, and 68 acres of marsh (TABLE B-5). On Cuivre Island, flooded bottomland forest under the three increments for increased water surface elevation is expected to initially be 128 acres at 427 feet NGVD, 263 acres at 428 feet NGVD, 402 acres at 429 feet NGVD, and 580 acres at 430 feet NGVD (TABLE B-6). Acres affected under the TSI and forest regeneration management measures are given in TABLES B-7 and B-8.

(3) Projected habitat benefits to wildlife evaluation species. TABLE B-9 presents the projected habitat effects of marsh construction on all evaluation species. For Cuivre Island, TABLES B-10 and B-11 show the projected effects of habitat improvements on target and nontarget species. TABLES B-12 and B-13 show the expected benefits from tree stand improvements and forest regeneration.

(a) Mainland. A "burst" of habitat benefits is expected one year after completion of marsh construction. All evaluation species except the Canada goose are projected to benefit. The least bittern and king rail, the two target species, are the two species that benefit most from marsh development. For all species combined, Management Increments 2A, 2B, and 2C will increase benefits by 181%, 424%, and 583% more than the future without any project.

(b) Cuivre Island. Improvements to green tree reservoir management (increments 4A through 4D) are expected to provide habitat benefits to the mallard and wood duck that exceed the future without project condition by 20%, 36%, 53%, and 75%,

respectively (TABLE B-10). Likewise, these four increments will provide habitat benefits to nontarget species that are 4%, 7%, 10%, and 15% greater than the future without condition (TABLE B-11). Not all nontarget species will benefit from management measure 4. The prothonotary warbler is expected to experience a slight loss in habitat value. Habitat value for the least bittern, lesser yellowlegs, muskrat, king rail, and American coot will remain unchanged. Benefits to the Canada goose will also be essentially unchanged.

Increased density of small clearings within bottomland forest will benefit three of the six forest species (TABLE B-12). Increments 15A through 15C will generate benefits that are 2%, 3%, and 5% greater than the future without condition. Regeneration of bottomland forest through tree planting on existing cropland will create a loss in habitat value for the mallard and Canada goose, but a gain for the green-backed heron, wood duck, beaver, northern parula, and prothonotary warbler (TABLE B-13). Increments 16A through 16C will give rise to benefits that are 56%, 91%, and 156% greater than the future without condition.

4. DISCUSSION.

In regard to the mainland marsh, MoDOC desires to maintain about 1.5 to 2 feet of water in each of the proposed management units. TABLE B-14 shows the relationship between water surface elevation in the management units and surface area of marsh by one-foot depth intervals. A water surface elevation of 435 feet NGVD provides the greatest area of marsh (46 acres) with the desired depth of 1.5 to 2 feet. At this surface elevation, an additional 18 acres of marsh would have water depths of 2 to 3 feet. Of the 68 acres within the two management units, 64 acres would be inundated.

The green tree reservoir on Cuivre Island is managed by MoDOC primarily for the mallard and wood duck. When feeding in inundated areas, these dabbling ducks tip forward and submerse their upper body to reach the bottom to find food items, such as acorns. The optimal water depth for these ducks to feed in ranges from 6 to 18 inches. TABLE B-15 displays the relationship between water surface elevation of the green tree reservoir and surface area of flooded timber by 1-foot depth intervals. As the water surface elevation increases from 424 to 430 feet NGVD, so does the number of acres inundated by 0 to 2 feet of water. At the maximum elevation of 430 feet NGVD, it is estimated that 323 acres will be inundated by 0 to 2 feet of water. However, an additional 278 acres of timber will be flooded with water ranging from 2 to 6 feet deep. This table should prove useful in the development of a detailed management plan for the green tree reservoir. The desire to provide additional benefits to waterfowl by increasing water surface elevations will need to be balanced against the potential harm that increased water depths can inflict on the "health" of the bottomland forest.

5. MODIFICATION OF MANAGEMENT MEASURE 15.

Management measure 15 - increasing the density of forest openings on Cuivre Island -

was originally developed to benefit wildlife species that use forest clearings, such as the green-backed heron, wood duck, and beaver, as described in the WHAG wetland species characteristic matrix. Field visits to Cuivre Island in February and June of 1994 indicate that the flood of 1993 has killed about 60 percent of the trees on the island. Consequently, the creation of additional forest clearings is no longer desirable, as numerous large clearings will naturally develop wherever trees have died.

As a result of past logging practices and the flood of 1993, the value of the island's bottomland forest as a resource to wildlife has diminished greatly. Tree species diversity has declined notably, and the hard mast component has been reduced to small remnant stands. For the future-without condition, it is projected that forest openings will develop over more than half the island, and that these openings will become covered with sun tolerant vines that will smother and suppress the growth of any tree seedlings attempting to naturally colonize these clearings. It is projected that it will take about 40 years before the vine-dominated clearings give way to new forest.

To improve this situation, biologists with the federal and state agencies decided in June 1994 that clearings should be created in the dead or dying forest, and mast tree species planted in these clearings, not only to improve wildlife conditions but to improve the "health" of the forest as a resource in itself. Specifically, ten 8-acre clearings will be created across the island in areas of dead sugarberry and hackberry that are situated next to live stands of mast tree species. Site preparation will include the mechanical removal of all woody vegetation having a diameter at breast height of 8 inches or less. Larger trees will be left undisturbed to provide snag habitat and partial shade for seedlings to be planted. Each site will be sprayed with an herbicide to kill tree seedlings that could compete with seedlings to be planted. A groundcover consisting of wheat, switchgrass, and red top will be established within each site to also minimize competition from woody invaders like cottonwood and silver maple. Species to be planted are those native to the area, and include oak (pin, swamp white, bur), pecan, shellbark and shagbark hickory, and will consist of seedlings in 2-gallon containers. Planting will occur in the spring or fall, and seedlings will be placed at least 15 feet apart. At about year 10 or 12, oak seedlings will be released from any shading by removing the canopy above them to allow direct sunlight to reach the ground.

Habitat benefits for this modified management measure 15 have been quantified in average annual habitat units (AAHUs), but because of a shortage of time, existing data from other management measures have been used to derive information for modified management measure 15. Likewise, tables presenting habitat suitability indices (HSIs), acres of suitable habitat, and AAHUs have not been prepared and included in this appendix for modified management measure 15. Such data are presented here in this paragraph. Habitat suitability indices for modified management measure 15 are those that were developed for reforestation of the north and south cropland (see Table B-4, M.M. 16C). The assumption here is that HSIs for existing and future conditions are also 0.1 for the existing bottomland forest on the island. Area to be affected by modified management measure 15 is 80 acres. Using the HES software to compute AAHUs gave the following results by evaluation species: mallard,

no change; heron, +24 AAHUs; wood duck, +13 AAHUs; beaver, +29 AAHUs; parula, +24 AAHUs; prothonotary, +8 AAHUs. Total AAHUs are shown in TABLE B-21.

SECTION III. EVALUATION OF AQUATIC HABITAT.

1. PROCEDURES.

An interagency team consisting of representatives from the USFWS, MoDOC, and Corps evaluated quality and quantity of aquatic habitat for existing, future without, and future with project conditions.

a. Assessment of quality of aquatic habitat. The team evaluated quality of aquatic habitat using the FHAG method. The method is applicable to riverine systems, and like its terrestrial counterpart, it assesses quality of aquatic habitat in terms of a habitat suitability index ranging from 0.1 (lowest) to 1.0 (highest). The method assumes that the most important habitat characteristics are water depth, turbidity, structure or cover, and water velocity. These four variables are treated as limiting factors, meaning they must be present at a minimal level, or else the habitat suitability index drops to or near 0.1. The habitat characteristics and species used for evaluation are presented in EXHIBIT 2 in a matrix.

The matrix includes 23 habitat characteristics, 10 fish evaluation species, and five habitat types - pool, riffle, overflow waters, side channel, and main channel. The only habitat type applicable to the study area is side channel. Sixteen of the 23 habitat characteristics and seven of the 10 fish species are applicable to side channel habitat. The seven species are catfish, crappie, gizzard shad, carp, largemouth bass, bluegill, and black bullhead.

All seven species, including channel and flathead catfish and black and white crappie, were encountered in Pool 26 during fish community sampling in 1990 (Gutreuter 1992). Likewise, all species but the black bullhead were found at Cuivre Island along the main channel border during 1988-89 (Farabee 1992). Electrofishing samples from these two studies showed that gizzard shad was the most abundant species, and bluegill, carp, flathead and channel catfish, and largemouth bass were among the dominant species.

The team sampled 11 reaches of side channel, each one-quarter mile long, within the project area (see Plate 22). Using the matrix, the team rated all applicable habitat characteristics at each sample reach under existing conditions (year 1992). The team also rated each sample reach under future conditions with and without a project for years 1997 and 2043, or five and 50 years in the future. Year 1997 with the project was defined as four years after project completion. The St. Louis District calculated habitat suitability indices by hand for the seven fish species by project condition. To save space, ratings are not presented in this appendix.

b. Assessment of quantity of suitable aquatic habitat. The St. Louis District used

maps to measure acres of existing side channel habitat. The District also projected acres of habitat for years 1997 and 2043, with and without a project.

c. Identification of proposed management measures to improve conditions of aquatic habitat. The team evaluated the assessments of habitat quality for existing and future without conditions. Using the FHAG's species characteristic matrix, the team then identified variables that could be manipulated to increase habitat quality. Management measures were then developed, based on these variables, to make habitat improvements.

d. Determination of projected effects of proposed management measures on quality and quantity of aquatic habitat. The St. Louis District, using the Corps' Habitat Evaluation System (HES) software developed by the Lower Mississippi Valley Division, determined the projected effect of each management measure on all evaluation species. The computer program multiplied species-specific HSIs (habitat quality) by number of suitable acres (habitat quantity) to obtain habitat units. For each species, the multiplication process was performed on three sets of HSI and acre data to generate habitat unit data for existing, future without, and future with conditions. Target years of 0, 5, and 50 were used to define existing (1992) and future (1997, 2043) conditions.

The projected effect of an management measure was obtained by subtracting habitat units computed for the future without condition from habitat units computed for the future condition with the management measure. The habitat unit statistics in this appendix have been annualized. The computer program divided the 50-year cumulative total of habitat units by 50 years to obtain annualized habitat units (AHU).

2. ASSUMPTIONS.

During the assessment of habitat quality and quantity, the team made some assumptions regarding future project conditions:

Future-without-project Conditions

a. In 50 years, the portion of Cuivre Slough above the confluence with Cuivre River will fill in with river borne sediment. Cuivre Slough was projected to close at its upper end by Humes (1974), who studied the formation and growth of the island located at the upriver end of the slough. This island formed in about 1950, and is immediately upriver of Cuivre and Turkey Islands. Humes referred to this island as Degenhardt Island, and expected it to grow and merge with the Missouri shoreline "in a short time" (ibid., p. 39). For purposes of the habitat evaluation, the team assumed that there would be a complete loss of existing aquatic habitat in the upper half of the slough. However, marginal aquatic habitat probably would be present in the form of a series of small, shallow pools with no flow at normal pool conditions.

b. Once the upper half of Cuivre Slough becomes closed, the amount of water

passing through Cuivre Slough at normal pool will be reduced by at least one-half. Flow exiting the lower end of Cuivre Slough would then consist of what comes from Cuivre River.

c. Because Cuivre Slough below the confluence of Cuivre River will carry the same amount of flow as Cuivre River, its width will be reduced through accretion to that of the Cuivre River upriver of the confluence. Coarser sediments carried by Cuivre River will be transported down the slough and deposited at its junction with the Mississippi River.

d. At the lower end of the project area, the chute between Peruque and Cuivre Islands will close within the next 50 years due to sedimentation.

e. Interior sloughs on Cuivre Island will be lost to sedimentation, thus changing to terrestrial habitat.

f. Over the next 50 years, the height, frequency, and duration of Mississippi River and Cuivre River floods in the vicinity of the project area will not significantly change due to development.

g. There will be no project on the shared floodplain of the Mississippi and Cuivre Rivers which would attempt to restore that area's hydrology and plant communities to a presettlement condition.

Future-with-project Conditions

a. To prevent the upper half of Cuivre Slough from filling with sediment, it will be necessary to increase the discharge capacity of the side channel, and eliminate the existing sediment trap at the slough's upper end. The management measures needed to do this are to construct the two dikes at the slough's upper entrance, and remove the remnant of the upper submerged dike. Without the two dikes, the discharge capacity of the side channel is unlikely to increase beyond what it is now. With the two dikes in place, there will be the potential for increased discharges to carry greater quantities of coarse sediments into the side channel. If the remnant of the upper submerged dike were not removed, these sediments would likely be trapped by the submerged dike and deposited, thereby increasing the height of the existing high spot on the channel bottom, and further closing off the slough.

b. Each hard-point dike will produce an oval-shaped scour hole measuring about 30 feet long, 10 feet wide, and 2.5 to 3 feet below the existing channel bottom.

c. Habitat benefits expected from a management measure will be fully manifested by target year 5 (four years after completion of construction), rather than target year 2. For terrestrial systems, habitat responses were assumed to be relatively quick, and target year 2 was chosen. For aquatic systems, habitat responses should be delayed for those structural features for which the force of the river is to be used to create the desired response. An example is the formation of desired scour holes after the construction of short stone dikes.

Scour holes form only after sufficient flows pass through the side channel. Because the occurrence of sufficient flows is not a predictable event, the team decided to select year five as a target year because it was a compromise between the likelihood that such flows would occur later rather than sooner.

d. The number of acres of aquatic habitat "saved" from sedimentation for each proposed feature was arbitrarily decided to be directly proportional to the magnitude of the feature's effect on habitat quality. For example, if feature "A" produces a change in habitat quality of 0.3 over the future-without-project condition, and feature "B" produces a change of 0.1, then feature "A" would save three times as many acres of aquatic habitat from sedimentation than feature "B."

e. To aid in the evaluation of management measures, target species were chosen by MoDOC to represent the focus of fisheries management efforts at the wildlife area. The catfish, crappie, gizzard shad, and carp were selected as target species.

f. The assumptions d. through g. under future-without-project conditions will hold for future-with-project conditions.

3. RESULTS.

a. Existing conditions.

(1) Quality of aquatic habitat. The team perceived a rather high degree of habitat uniformity within Cuivre Slough after assessing existing habitat quality at each of the 11 sample reaches. Habitat suitability indices (HSIs) are very low for all seven evaluation species, and range from 0.10 to 0.18 (TABLE B-16). (For each species, the values for existing conditions are averages for the 11 sample reaches.) The FHAG method assessed the side channel as having minimal (0.10) habitat quality for the crappie, largemouth bass, and bluegill because of unpredictable water levels during May and June (habitat characteristic #10). The FHAG method treats such conditions as a limiting factor for these three species.

(2) Quantity of aquatic habitat. There are 162 acres of side channel habitat within the project area under existing conditions (TABLE B-17).

b. Future without conditions. Habitat quality and quantity ratings are found in TABLES B-14 and B-15 for all evaluation species under the future condition without any project.

(1) Quality of aquatic habitat. Fifty years in the future without any project, habitat quality is expected to decrease for all evaluation species to a level at or below the minimal (0.10) value (TABLE B-16). Note that some species have an HSI below 0.10. This is possible because each HSI in the table is an average for all 11 sample reaches. The team

decided to assign an HSI value of 0.0 to the sample reaches located above the confluence with Cuivre River, where it was assumed that aquatic habitat would change to terrestrial habitat. Unpredictable water level conditions were assumed to still exist, and exerted their influence as a limiting factor on the crappie, largemouth bass, and bluegill.

(2) Quantity of aquatic habitat. In five years, it is expected there will be 152 acres of side channel habitat without any project. In fifty years, 63 acres are expected to remain. These quantities are based on the assumption that, in a linear fashion over the next fifty years, the upper half of Cuivre Slough will close in with sediment and the lower half will be reduced in width to that of Cuivre River.

c. Habitat variables amenable to manipulation and proposed management measures to improve aquatic habitat conditions. To identify habitat deficiencies or opportunities for improvement, the team used the species characteristic matrix to compare habitat characteristic ratings for existing and future without conditions. This exercise showed that the overriding habitat problem within Cuivre Slough is the loss of water depth due to sedimentation. (The team realized it was not feasible to consider management measures which would reduce pool level fluctuations. In addition, in the early planning stages, MoDOC had stipulated that Cuivre Slough needed to remain open to the Mississippi River for local boat access.)

The Missouri Department of Conservation (MoDOC) decided that the overall goals of the project in Cuivre Slough were to 1) maintain side channel habitat by preventing river-borne sediment from filling the side channel, and 2) to provide overwintering (deep) habitat for fish in the side channel. From an examination of river gage records and recent hydrographic surveys, it was apparent that during normally low water conditions in winter, there is virtually no water with depths greater than eight feet in Cuivre Slough.

Maintain side channel depth. With regard to the first goal, MoDOC desired to provide a uniform, average depth in the side channel of 5-7 feet at normal pool, such that the elevation of the channel bottom would be 415-417 feet NGVD. To eliminate conditions causing localized accumulations of river-borne sediment within the side channel, the submerged remnant of an old dike was proposed to be removed (management measure 9). The dike remnant is found in the upper half of Cuivre Slough (within sample reach #6 in Plate 22). To remove localized accumulations of sediment and maintain a uniform depth, it was proposed that the discharge capacity of the side channel be increased so that such materials would be "washed" down through the side channel and out of the project area. To increase the discharge capacity, a dike was proposed at the upper entrance to the side channel to eliminate a point bar (management measure 8). By eliminating the point bar, the cross-sectional area of the side channel below top of bank would be enlarged. Likewise, a second dike at the upper entrance to the side channel was proposed to capture flow from the main channel and funnel it into the side channel (also management measure 8).

Overwintering habitat. MoDOC specified that overwintering habitat would consist

of areas having water depths greater than 8 feet. To provide such habitat, short hard-point dikes were proposed to create scour holes on the immediate downstream side of the structure. Initially, a series of 65 dikes was proposed to be constructed along the entire west bank of Cuivre Slough. This concept was abandoned after local citizens objected to the idea at a public meeting. The concept was then modified to involve the construction of six pairs of short hard-point dikes at various curves in the side channel (management measure 7) where velocities are naturally higher. Three pairs of dikes were proposed above the confluence with Cuivre River (sets 1-3), and three below (sets 4-6). Each pair consists of a dike on either side of the slough, with centerlines offset by about 200 feet.

d. Future with project conditions. Habitat quality and quantity ratings are found in TABLES B-14 and B-15 for all evaluation species under the future condition with a project. In assessing habitat quality, the effects of the two dikes proposed at the upper end of Cuivre Slough were evaluated as one feature since they perform similar functions and are located in close proximity.

(1) Quality of aquatic habitat. TABLE B-16 presents future HSIs for three management measures: construction of dike sets 1-6; removal of the submerged dike; and construction of the two dikes at the upper end of the slough. The HSIs presented for construction of dike sets 1-6 represent an average for the six structures. As was the case for the existing and future-without conditions, none of the management measures provide any benefits for the crappie, largemouth bass, or bluegill because unpredictable water level conditions in May and June still act as a limiting factor for these species. The following comments therefore only apply to the other four evaluation species.

The management measure which provides the greatest increase in habitat quality over the future-without condition (at target year 50) is construction of the two dikes at the upper end of the slough. With this management measure, the increase in HSI varies from a minimum of 0.36 for the carp, to a maximum of 0.50 for the gizzard shad. The management measure which provides the second greatest increase in HSI is removal of the dike remnant. Here the range of increase is from 0.25 to 0.33. The last management measure, construction of dike sets 1-6, provides very small increases in habitat quality (0.01-0.04), or none at all.

(2) Quantity of aquatic habitat. In TABLE B-17, the amount of side channel habitat present at target years 5 and 50 for each of the four management measures was assumed to be proportional to the increase in habitat quality afforded by each management measure (see section on assumptions for future-with-project condition, paragraph d.). Although this assumption is arbitrary, there did not appear to be any better way of quantifying the effect of each management measure on habitat quantity.

At target year 50, management measure 7 (construction of dike sets 1-6) will "save" only 2 acres of side channel habitat from sedimentation (at target year 50). Construction of the two dikes at the upper end of Cuivre Slough (management measure 8) will save 55 acres

of aquatic habitat. Lastly, management measure 9 (remove remnant of submerged dike) will save 40 acres.

(3) Projected habitat benefits to aquatic evaluation species. TABLE B-18 presents the projected habitat benefits (in annualized habitat units) to all seven evaluation species from each management measure. None of the management measures provide any habitat benefits to the crappie, largemouth bass, or bluegill. This is because one of the habitat characteristics used by the FHAG habitat evaluation method to assess habitat quality - the degree of water level stability during May and June - acted as a limiting factor for all three project conditions (existing, future without, and future with).

Management measure 8 is projected to provide the most habitat benefits, followed by management measures 9 and 7. Construction of the two dikes at the upper end of the slough will produce 256% more habitat benefits than the future-without-project condition. For removal of the dike remnant and construction of dike sets 1-6, the increases above the future without condition are 165% and 7%.

4. DISCUSSION.

The habitat evaluation of Cuivre Slough represents the first application of MoDOC's Fish Habitat Appraisal Guide (FHAG) to a habitat rehabilitation and enhancement project in the St. Louis District. The discussion that follows is a critique of the results of the FHAG habitat evaluation.

a. Habitat suitability indices (HSIs) lower than expected.

(1) Existing conditions. After reviewing the results of the habitat evaluation, the interagency team concluded that the habitat suitability indices generated by the FHAG method for existing conditions were too low for the perceived habitat conditions at the project site. In general, team members thought that existing habitat conditions were fair to good.

(2) Future-without conditions. Likewise, HSIs for the future-without condition were also very low, but team members thought that they should have ranged from very low for the upper half of Cuivre Slough to fair (or so) for the lower half. More importantly, the FHAG method projected only a slight decline (0.02 to 0.08) in HSI values from the present to target year 50 without a project. Had the FHAG method produced HSIs more in line with the team members expectations, the decline would have been significant for the upper half of Cuivre Slough (perhaps on the order of 0.4 or 0.5), and slight to perhaps moderate for the lower half.

b. No increase in future-with HSIs for three of seven evaluation species.

In the present application, the major problem with the FHAG method is that it did not project any increase in habitat quality for three of the seven evaluation species. In the evaluation of the future-with condition, the team assumed that several proposed structural measures would keep the upper half of Cuivre Slough free from sedimentation by target year 50. Despite this assumption, HSIs for the crappie, largemouth bass, and bluegill did not change because the FHAG method designated as a limiting factor the site's unstable water conditions during the spawning months of May and June. It would appear that such unstable water conditions do not act as a limiting factor because crappie, largemouth bass, and bluegill are among the dominant species in Pool 26 (Sheehan et al. 1990, Gutreuter 1992).

In regard to pool fluctuations, the FHAG method does not distinguish between rises or falls in surface elevation. A drop of several feet in pool elevation would do much more harm to spawning habitat than a rise of several feet. In addition, a temporal factor is absent from the FHAG method with respect to this limiting factor. Although there are "unstable" water level fluctuations at the project site for most years, there are years in which fluctuations are less pronounced, during which spawning would be expected to be more successful. Finally, once this limiting factor - unstable water conditions at the project site - is triggered, the FHAG method does not consider the side channel as habitat for crappie, largemouth bass, and bluegill during the non-spawning season (summer, fall, and winter).

If the FHAG method could account for the spawning habitat the side channel provides at least for some years, and the non-spawning habitat it provides to these three species during the summer, fall, and winter, these species' HSIs for the future-with condition would be more similar to those of the four other evaluation species.

c. No habitat benefits generated for three of seven evaluation species.

Because none of the three management measures induced increases in habitat quality for the crappie, largemouth bass, and bluegill, no habitat benefits were generated for these three species. If future-with HSIs for the crappie, largemouth bass, and bluegill were equivalent to the average of the future-with HSIs for the other four species, then the habitat benefits per management measure for all seven species combined would be greater. For management measure 7, AHUs would increase from 101 to 119. For management measure 8, they would change from 335 to 530, and for management measure 9, from 249 to 378.

d. Few habitat benefits provided by creation of scour holes.

In assessing habitat quality under future-with conditions, the FHAG method is not sensitive enough to detect the creation of scour holes by the dikes. The intent of these dikes is to create winter habitat (areas with water depth greater than 8 feet). Under habitat characteristic #12, habitat quality is assessed in terms of the amount of winter habitat within one-quarter mile sample reaches. The amount of winter habitat is broken down into increments that are too broad to detect the proposed scour holes. Each scour hole is estimated to be less than 0.01 acre in size (about 10 feet by 30 feet), and twelve of them are

proposed within the five-mile long side channel. The inability of the FHAG method to show an expected increase in habitat quality in terms of winter habitat is a matter of scale.

Team members believe that the value of winter habitat to be provided by the scour holes has been underestimated by this habitat evaluation exercise. The perceived value has not been quantified, but the team believes that it exceeds the 13 AHUs described above. In the Upper Mississippi River system, the relative importance of side channels as winter habitat for riverine fish is poorly known.

Backwater areas are believed to be critical to the survival of young-of-year of some species, such as largemouth bass, green sunfish, bluegill, channel catfish, and black crappie, as well as adults (Sheehan et al. 1990). In Pools 13, 14, 24, and 25, these authors observed that many fish move into backwater areas in the fall to avoid the near-freezing water temperatures and current of the main channel during winter. They often found extremely overcrowded conditions. One such site in Pool 25 was only 0.15 acre in area, and up to eight feet deep at normal pool.

In general, side channel areas would be expected to offer less optimal winter habitat than backwater areas because of incoming flow from the main channel (lower water temperatures, some current), but better conditions in terms of dissolved oxygen concentrations, at least in years with ice cover.

5. MANAGEMENT MEASURE 17.

Toward the end of the plan evaluation process, the Missouri Department of Conservation proposed a new management measure for aquatic habitat. Management measure 17 consists of the experimental use of propwash to deepen the side channel between Cuivre Island and Turkey Island. This side channel measures about 1.5 miles long and 400 feet wide. Currently, about 40 acres of this 70-acre side channel consist of sand bars that are exposed at normal pool. The remaining 30 acres are shallow water. It is projected that the entire side channel will become filled with sediment within the next 50 years and convert to terrestrial habitat.

MoDOC proposes that the screw (propeller) of a pushboat be used to resuspend and remove sediment from the lower quarter of the side channel. Sediment removed from this area would be flushed into the main channel of the Mississippi River. The area to be affected is about 16 acres (about 2000 feet long by 350 feet wide).

Management measure 17 was evaluated like the other management measures. It was assumed that the area initially dredged would need to be revisited every 5 years by a pushboat for maintenance dredging. Habitat suitability indices and acres of habitat are presented in TABLE B-19. Annualized habitat units are presented in TABLE B-20.

SECTION IV. CONCLUSIONS.

Net habitat benefits (in annualized habitat units) are presented in TABLE B-21 for all management measures - both terrestrial and aquatic. These net benefits represent the difference between the future with and future without conditions. The values in TABLE B-21 were obtained from TABLES B-9, B-10, B-11, B-12, B-13, B-18, and B-20, and can be considered outputs for project planning purposes.

NOTE: Within this appendix, the abbreviation "M.M." in the following tables stands for "management measure."

Wetland Species Characteristic Matrix

Wildlife Area: _____

Date: _____

Habitat Type: _____

	CHARACTERISTIC	Habitat Type	Mallard	Canada Goose	Least Bittern	Lesser Yellowlegs	Muskrat	King Rail	Green-backed Heron	Wood Duck	Beaver	American Coot	Northern Parula	Prothonotary Warbler
1.	Percent Nonforest Wetlands in 2 Mile Wide Circle	N												
	1. >75%				10	10	10	10				10		
	2. 50 - 75%				8	8	8	8				8		
	3. 25 - 50%				6	6	6	6				6		
	4. 10 - 25%				4	4	4	4				4		
	5. <10%				1	1	1	1				1		
2.	Percent Nonforest Wetlands and Lakes or Reservoirs in 2 Mile Wide Circle	N,C,G												
	1. >75%			10										
	2. 50 - 75%			8										
	3. 25 - 50%			6										
	4. 10 - 25%			4										
	5. <10%			LF										
3.	Percent Bottomland Hardwoods and Nonforest Wetlands in 2 Mile Wide Circle	N,B,C												
	1. >75%		10						10	10	10			
	2. 50 - 75%		8						8	8	8			
	3. 25 - 50%		6						6	6	6			
	4. 10 - 25%		4						4	4	4			
	5. <10%		LF						1	1	1			
4.	Fall Winter Water Conditions	N,B,C												
	1. Water present annually (predictable & water levels controlled		10	10										
	2. Water present most years with occasional lapse & water levels controlled		7	7										
	3. Water present 1 out of 3 years (opportunistic) & water levels controlled		4	4										
	4. Water unpredictable; dry during fall and winter; or no control when present		LF	LF										
5.	Fall-Winter Flood Conditions (food plant availability)	N,B	M	M										
	1. Food plants unaffected		10	10										
	2. Reduced 1 - 25% (Multiply index by .75)		8	8										
	3. Reduced 25 - 50% (Multiply index by .50)		6	6										
	4. Reduced 50 - 75% (Multiply index by .25)		4	4										
	5. Reduced >75% (Multiply index by .25)		1	1										
6.	Water Depth 4" - 18" Fall - Winter	N,B,C												
	1. >90%		10	10										
	2. 75 - 90%		8	8										
	3. 50-75%		6	6										
	4. 25 - 50%		4	4										
	5. <25%		1	1										
7.	Water Depth <4" During May	N												
	1. >90%					10							LF	
	2. 75 - 90%					8							2	
	3. 25 - 75%					6							4	
	4. 1 - 25%					4							7	
	5. ZERO or all >4" Deep					1							10	
8.	Water Depth 4 - 18" By August	N												
	1. <75%				1		10	1	10				10	
	2. 50 - 75%				7		7	7	7				7	
	3. 25 - 50%				10		4	10	4				4	
	4. <25%				4		1	4	1				1	
9.	Permanent Water Entire Year	N					M							
	1. >90%						10							
	2. 75 - 90% (Multiply index by .90)						8							
	3. 50 - 75% (Multiply index by .75)						6							
	4. 25 - 50% (Multiply index by .50)						4							
	5. <25% (Multiply index by .25)						1							
10.	Percent Emergent Vegetation Within 2 yds. of Water	N												
	1. >75% of emer. veg. within 2 yd. of water				10							10		
	2. 50-75% of emer. veg. within 2 yd. of water				7							7		
	3. 25-50% of emer. veg. within 2 yd. of water				4							4		
	4. <25% of emer. veg. within 2 yd. of water				1							1		

Wetland Species Characteristic Matrix

	CHARACTERISTIC	Habitat Type	Mallard	Canada Goose	Least Bittern	Lesser Yellowlegs	Muskrat	King Rail	Green-backed Heron	Wood Duck	Beaver	American Coot	Northern Parula	Prothonotary Warbler
11.	Woody Invasion	N												
	1. <10%				10		5	6	1					
	2. 10 - 25%				8		4	8	6					
	3. 25 - 50%				6		3	10	8					
	4. 50 - 75%				4		2	4	10					
	5. >75%				1		1	1	4					
12.	Emergent Vegetation Coverage	N,B												
	1. >90%				6	LF			1					
	2. 75 - 90%				10	2			2					
	3. 50 - 75%				8	4			4					
	4. 25 - 50%				4	6			10					
	5. 10 - 25%				2	8			7					
	6. <10%				LF	10			1					
13.	Cattail and Bulrush Coverage	N												
	1. >75%						10	LF				8		
	2. 50 - 75%						8	2				10		
	3. 25 - 50%						6	4				6		
	4. 10 - 25%						4	7				4		
	5. <10%						1	10				LF		
14.	Wetland Size	N,B												
	1. >200 acres				10	10	10	10	10			10		
	2. 100 - 200 acres				10	8	8	8	10			10		
	3. 50 - 100 acres				8	6	6	6	10			8		
	4. 25 - 50 acres				6	4	4	4	10			6		
	5. 5 - 25 acres				4	1	2	2	5			4		
	6. <5 acres				LF	LF	1	1	LF			LF		
15.	Wetland Edge	N,B												
	1. >75% bottomland H. - ½ adj. to water								10					
	2. 50-75% Nonforest w.-½ woody or adj. to								8					
	3. 25 - 50% bottomland hardwoods								6					
	4. 10 - 25%								4					
	5. <10%								1					
16.	Water Regime	N												
	1. Gradual drying with >75% water remaining by Aug. 1				4	4	8	2	10			8		
	2. Gradual drying with 50 - 75% water remaining by Aug. 1				6	6	6	6	6			6		
	3. Gradual drying with 25 - 50% water remaining by Aug. 1				10	10	4	10	4			4		
	4. Gradual drying with <25% water remaining by Aug. 1				8	8	2	8	2			2		
	5. Stable water				2	4	10	4	10			10		
	6. Rapid drying; or no water after June 1				LF	LF	LF	LF	LF			LF		
17.	Important Food Plant Coverage	N,B	M	M										
	1. >75%		10	10										
	2. 50 - 75% (Multiply index by .75)		8	8										
	3. 25 - 50% (Multiply index by .50)		6	6										
	4. 10 - 25% (Multiply index by .25)		4	4										
	5. <10% (Multiply index by .25)		1	1										
18.	Plant Diversity	N,B												
	1. >7		5	5										
	2. 4 - 7		3	3										
	3. <4		1	1										
19.	Persistent Emergent and Woody Vegetation Coverage	N												
	1. 5 - 15%		5	5										
	2. 15 - 25%		4	4										
	3. 25 - 50%		2	2										
	4. <5% or >50%		1	1										

Wetland Species Characteristic Matrix

CHARACTERISTIC	Habitat Type	Mallard	Canada Goose	Least Bittern	Lesser Yellowlegs	Muskrat	King Rail	Green-backed Heron	Wood Duck	Beaver	American Coot	Northern Parula	Prothonotary Warbler
30. Cropping Practice	C	10	10										
1. 75% unharvested		7	7										
2. 25-50% harvested		4	4										
3. 10 - 25% unharvested		1	1										
4. <10% unharvested													
31. Crop Rotation	C												
1. SG - RC - L			5										
2. SG - RC; or idle some years			3										
3. Continuous SG or RC			1										
32. Field Size (1 min @40' Woodland or Treeline)	C/G								10				
1. <25%									6				
2. 25 - 50%									3				
3. 50 - 75%									1				
4. >75%													
33. Grassland Composition	G								10				
1. Bluegrass, clover, alfalfa									5				
2. Timothy, orchardgrass or mixed CSG									1				
3. Fescue or NSG													
34. Average Height Herbaceous Vegetation (Fall)	G								10				
1. <6"									1				
2. >6"													
35. Woodland Tree Species	B												
1. >50% trees as elm, walnut, cottonwood, sycamore, willow, maple, ash				1						8	10		
2. 25 - 50% trees as elm, walnut, cottonwood, sycamore, willow, maple, ash; or <25% trees as elm, walnut, cottonwood, sycamore, willow, maple, ash; or <25% pin oak (or other small acorns)				4						10	8		
3. 25 - 50% pin oak (or other small acorns)										1	6		
4. >50% pin oak (or other small acorns)				8						4	4		
5. Zero				10						6	1		
36. Permanent Water Within Woodland	B												
1. >25%				1						10	10		10
2. 10 - 25%				3						7	7		7
3. 5 - 10%				5						4	4		4
4. 1 - 5%				3						2	2		2
5. Zero				2						1	1		1
37. Forest Openings (Q ac. in size)	B												
1. 15 - 30% scattered				3						10	10	5	
2. 15 - 30% one or few				5						7	7	4	
3. 5 - 15%				1						4	4	3	
4. <5% or >30%										1	1	1	
38. Woodland Size Class	B									4	10	4	10
1. Sawtimber - open canopy				10						1	8	1	10
2. Sawtimber - close canopy				8						10	6	6	7
Pole with 25-50% sawtimber				6						8	4	8	2
4. Regeneration with 25-50% sawtimber				4						8	LF	10	LF
5. Regeneration				1						6	2	6	4
6. Pole				1									
39. Percent Canopy From Old Growth (>16" dbh)	B									10	1		
1. >25%										8	4		
2. 10 - 25%										6	6		
3. 5 - 10%										4	8		
4. 1 - 5%										1	10		
5. Zero													

Wetland Species Characteristic Matrix

CHARACTERISTIC	Habitat Type	Mallard	Canada Goose	Least Bittern	Lesser Yellowlegs	Muskrat	King Rail	Green-backed Heron	Wood Duck	Beaver	American Coot	Northern Parula	Prothonotary Warbler
Substrate - Surface	N												
Water Interspersion				10									
1. Substrate interspersed with shallow water													
2. Shallow water occurring as one or few pools				1									
Percent Open Water	N	5	5		10				6				
1. >50%		3	3						10				
2. 10 - 25%		1	1		6				8				
3. 25 - 50%		1	1		4				4				
4. 50 - 90%					1				1				
5. >90%													
Winter Water Depth (Oct. - March)	N				10								
1. 15 - 24"					7								
2. 10 - 15" or 24 - 30"					4								
3. 6 - 10" or 30 - 36"					1								
4. <6" or >36"													
Sedge Canopy Coverage	N					8							
1. >90%						10							
2. 50 - 90%						6							
3. 25 - 50%						4							
4. 1 - 25%						2							
5. Zero						LF							
Wetland Substrate	N					5							
1. Mucky						3							
2. Sandy						1							
3. Gravel													
Percent Soil Waterlogged Substrate	N				10								
During May					8								
1. >90% of substrate waterlogged					6								
2. 75 - 90% of substrate waterlogged					4								
3. 50 - 75% of substrate waterlogged					1								
4. 25 - 50% of substrate waterlogged													
5. <25% of substrate waterlogged													
Percent Exposed Wetland Substrate													
and 1-4" Shallow Water													
Covered by Vegetation May-June	M				10								
1. >90%					8								
2. 10 - 25%					6								
3. 25 - 50%					4								
4. 50 - 75%					2								
5. 75 - 90%					LF								
6. >90%													
Percent Channel with Aquatic Vegetation	B								10	10			
1. >50%									7	7			
2. 5 - 10%									4	4			
3. 1 - 5%									1	1			
4. None, or 1/4 mi. from center stand													
Average Water Fluctuation in Channel	B								10				
1. Bank full <3 times per year									7				
2. Bank full 3-5 times per year									4				
3. Bank full 5-7 times per year									1				
4. Bank full >7 times per year; or 1/4 mile from channel													
Cropfield Management	C	10	10										
1. No fall tillage		2	10										
2. Winter wheat		8	8										
3. Chisel plowing		6	6										
4. Chopped, baled, grazed		4	4										
5. Fall disc													
6. Fall moldboard		1	1										

Wetland Species Characteristic Matrix

CHARACTERISTIC	Habitat Type	Mallard	Canada Goose	Least Bittern	Lesser Yellowlegs	Muskrat	King Rail	Green-backed Heron	Wood Duck	Beaver	American Coot	Northern Parula	Prothonotary Warbler
Woodland Overstory Canopy Height (feet)	B												
1. >80'												10	10
2. 65-80'												7	7
3. 40-65'												4	4
4. <40'												1	1
Percent Subcanopy Closure	B												
1. >75%												10	1
2. 50-75%												7	4
3. 25-50%												4	10
4. <25%												1	7
Woodland (Stand) Size	B												
1. >25%												10	10
2. 25-50%												7	7
3. 50-75%												4	4
4. >75%												1	1
Percent Forest Canopy Adjacent to or Over Permanent Water	B												M
1. >25%													10
2. 10-25%													7
3. 5-10%													4
4. <5%													1
Number of Snags Trees per Acre	B												
1. >4									5				10
2. 3-4									5				7
3. 1-2									3				4
4. <1									1				1
Number of Cavity Trees Per Acre	B												
1. >9									10				10
2. 3 - 9									7				7
3. 1 - 3									4				4
4. None									LP				1
Stems per Square Yard of Shrub and Tree Regeneration >3 Feet Tall	B												
1. >3									1	10		10	1
2. 1-3									3	7		7	4
3. .5-1									5	4		4	10
4. <.5									2	1		1	7
Percent Woodland Within 660' of Permanent Water	B							M	M	M			
1. >75%								10	10	10		10	10
2. 50 - 75% (Multiply Index by .75)								7	7	7		7	7
3. 25 - 50% (Multiply Index by .50)								4	4	4		4	4
4. <25% (Multiply Index by .25)								1	1	1		1	1
Distance to Nonforest Wetland, Oxbow or Slough	B,C,G												
1. <250' water predictable		10	10					10	10	10			
2. 250'-1/8 mi. water predictable		10	10					10	10	5			
3. 1/8-1 mi. water predictable		10	10					1	1	1			
4. <250' water predictable 1 of 3 years		5	5					5	5	3			
5. 250'-1/8 mi. water predictable 1 of 3 yrs.		5	5					5	5	2			
6. 1/8-1 mi. water predictable 1 of 3 yrs.		5	5					1	1	1			
7. >1 mi.; or <1 mi. water unpredictable		1	1					1	1	1			
Distance to Bottomland Hardwoods	M,C												
1. <1/4 mi. water predictable		10						5					
2. 1/4-1/2 mi. water predictable		10						3					
3. 1/2-1 mi. water predictable		8						1					
4. <1/4 mi. water predictable 1 of 3 yrs.		6						5					
5. 1/4-1/2 mi. water predictable 1 of 3 yrs.		6						3					
6. 1/2-1 mi. water predictable 1 of 3 yrs.		4						1					
7. >1 mi.; or <1 mi. water unpredictable		1						1					

Wetland Species Characteristic Matrix

CHARACTERISTIC	Habitat Type	Mallard	Canada Goose	Least Bittern	Lesser Yellowlegs	Muskrat	King Rail	Green-backed Heron	Wood Duck	Beaver	American Coot	Northern Parula	Prothonotary Warbler
50. Distance to Cropland	M,B,G												
1. <1/4 mi., unharvested or partially unharvested and water predictable		10	10										
2. 1/4-1/2 mi. unharvested or partially unharvested and water predictable		8	8										
3. 1/2-1 mi. unharvested or partially unharvested and water predictable		6	6										
4. <1/4 mi., unharvested or partially unharvested and water predictable 1 of 3 years; or adjacent, unflooded with residues undisturbed		5	5										
5. 1/4-1/2 mi. unharvested or partially unharvested and water predictable 1 of 3 years; or 1/4-1/2 mi. unflooded with residues and undisturbed		4	4										
6. 1/2-1 mi. unharvested or partially unharvested and water predictable 1 of 3 yrs; or 1/2-1 mi. unflooded with residues undisturbed; or winter wheat		2	2										
7. >1 mi. to any cropfield; or <1 mi. unflooded cropfield with residues disced or plowed		1	1										
51. Distance to Grassland	M,C												
1. <1/2 mi. with winter height <6" and field size >40 acres			10										
2. 1/2-1 mi. with winter height <6" and field size >40 acres			7										
3. <1 mi. with winter height <6" and field size <40 acres			4										
4. >1 mi. to any grassland with winter height <6"; or grassland with winter height>6"			1										
52. Distance to Stream or River (permanent flow or pools)	M,B												
1. <1/4 mi.							10						
2. 1/4 - 1/2 mi.							5						
3. >1/2 mi.							1						
53. Distance to Major River, Lake or Reservoir >100 Acres	M,C,G												
1. <1 miles Missouri, Mississippi,			10										
2. 1 - 5 miles Grand, St. Francis			7										
3. 5 - 10 miles			4										
4. >10 miles			1										
54. Distance to FALL Canada Goose Concentration Area	M,C,G		M										
1. <4 miles			10										
2. 4 - 10 miles (Multiply Index by .75)			7										
3. 10 - 25 miles (Multiply Index by .50)			4										
4. >25 miles (Multiply Index by .25)			1										

Wetland Species Characteristic Matrix

		Mallard	Canada Goose	Least Bittern	Lesser Yellowlegs	Muskrat	King Rail	Green-backed Heron	Wood Duck	Beaver	American Coot	Northern Parula	Prothonotary Warbler
Total													
Maximum Possible													
HTSI													
Multiplier													
Revised HTSI													
	N	85	105	70	85	85	70	85			80		
	B	105						100	110	95		60	100
	C	70	105										
	F G	20	80										

Abbreviations

C = cropfield, G = grassland, N = nonforest wetland, B = bottomland hardwoods,
LF = limiting factor, score Habitat Type Suitability Index (HTSI) as .1 if characteristic scores .1.
M = multiplier. Multiply HTSI by the appropriate value to calculate revised HTSI. Use lowest value if 2 multiplier values apply.

Limiting Factors

	Character Number
Mallard - If Percent in Bottomland Hardwood and Nonforest Wetland or Fall Winter Water Conditions score 1, HTSI = .1.	3,4
Canada goose - If Percent in Nonforest Wetland or Fall Winter Water Conditions score 1, HTSI = .1.	2,4
Lesser yellowlegs - If Wetland Size, Water Regime or Percent Wetland Substrate score 1, HTSI = .1.	14,16,26
Green-backed heron - If Wetland Size Water or Regime HTSI = .1.	14,66
Wood duck - If Woodland Size Class or Number of Tree Cavities score 1, HTSI = .1.	38,45
Least bittern - If Emergent Vegetation Coverage, Wetland Size, or Water Regime Score 1, HTSI = .1.	12,14,16
American Coot - If Cattail and Bulrush Coverage, Wetland Size or Water Regime Score 1, HTSI = .1.	13,14,16
King Rail - If Sedge Canopy Coverage or Water Regime Score 1, HTSI = .1 Score 1, HTSI = .1.	23,16
Northern Parula - If Woodland Size Class	40
Prothonotary Warbler - If Woodland Size Class	40
Muskrat not incl. - should be	

Multiplier

Mallard - Important Food Plant Coverage (Nonforest wetland)	17
Fall-Winter Flood Conditions	5
Canada goose - Distance to Major Canada Goose Winter Area	54
Important Food Plant Coverage (Nonforest wetland)	17
Fall-Winter Flood Conditions	5
Muskrat - Percent Permanent Water Entire Year	9
Wood duck - Percent Woodland Within 660' of Permanent Water	47
Beaver - Percent Woodland Within 660' of Permanent Water	47
Green-backed Heron - Percent Woodland Within 660' of Permanent Water	47
Prothonotary Warbler - Percent Forest Canopy Adjacent to or Over Permanent Water	43

3/89

TABLE B-1. Projected quality of terrestrial habitat (in habitat suitability indices) for wildlife species on mainland for converting cropland into marsh.

Species	Habitat Suitability Index				
	Existing Condition	Future Condition			
		Without any project		M.M. 2A, 2B, 2C: With marsh	
		yr. 2	yr. 50	yr. 2	yr. 50
Cropland					
Mallard	.41	.41	.41	.41	.41
Canada goose	.21	.21	.21	.21	.21
Marsh					
Mallard	.00	.00	.00	.77	.67
Canada goose	.00	.00	.00	.53	.46
Least bittern [1]	.00	.00	.00	.77	.94
Lesser yellowlegs	.00	.00	.00	.62	.58
Muskrat	.00	.00	.00	.60	.62
King rail [1]	.00	.00	.00	.77	.77
Green-backed heron	.00	.00	.00	.71	.61
American coot	.00	.00	.00	.10	.10
Grassland (levee)					
Canada goose	.00	.00	.00	.52	.52

[1] Chosen by MoDOC as target species for management efforts at marsh.

TABLE B-2. Projected quality of terrestrial habitat (in habitat suitability indices) for wildlife species on Cuivre Island for improved water control and higher water surface elevation for green tree reservoir (GTR) management.

Species	Habitat Suitability Index				
	Existing Condition - existing water control and water surface elevation of 426 feet	Future Condition			
		Without any project		M.M. 4A - 4D: With improved water control and higher GTR water surface elevation (427 - 430 feet)	
		yr. 2	yr. 50	yr. 2	yr. 50
Moist-soil (interior sloughs - nonforest species)					
Mallard [1]	.10	.10	.10	.22	.10
Canada goose	.10	.10	.10	.15	.10
Least bittern	.10	.10	.10	.10	.10
Lesser yellowlegs	.10	.10	.10	.10	.10
Muskrat	.25	.25	.10	.48	.10
King rail	.32	.32	.10	.30	.10
Green-backed heron	.49	.48	.10	.64	.10
American coot	.10	.10	.10	.10	.10
Bottomland forest - under GTR management					
Mallard	.10	.10	.10	.61	.63
Green-backed heron	.54	.53	.29	.62	.54
Wood duck [1]	.56	.55	.36	.63	.68
Beaver	.64	.63	.30	.71	.63
Northern parula	.52	.52	.48	.50	.50
Prothonotary warbler	.50	.50	.38	.49	.54
Bottomland forest - not under GTR management					
Mallard	.10	.10	.10	.10	.10
Green-backed heron	.40	.40	.33	.40	.33
Wood duck	.36	.36	.38	.36	.38
Beaver	.38	.38	.32	.38	.32
Northern parula	.45	.45	.42	.45	.42
Prothonotary warbler	.56	.56	.56	.56	.56
Cropland - under GTR management					
Mallard	.43	.43	.43	.87	.87

TABLE B-2. Projected quality of terrestrial habitat (in habitat suitability indices) for wildlife species on Cuivre Island for improved water control and higher water surface elevation for green tree reservoir (GTR) management.

Species	Habitat Suitability Index				
	Existing Condition - existing water control and water surface elevation of 426 feet	Future Condition			
		Without any project		M.M. 4A - 4D: With improved water control and higher GTR water surface elevation (427 - 430 feet)	
		yr. 2	yr. 50	yr. 2	yr. 50
Canada goose	.23	.23	.23	.38	.38
Cropland - not under GTR management					
Mallard	.41	.41	.41	.41	.41
Canada goose	.21	.21	.21	.21	.21
Ditches, disposal areas, access road for ditch cleanout [2]					
Mallard	.10	.10	.10	.61	.63
Green-backed heron	.54	.53	.29	.62	.54
Wood duck	.56	.55	.36	.63	.68
Beaver	.64	.63	.30	.71	.63
Northern parula	.52	.52	.48	.50	.50
Prothonotary warbler	.50	.50	.38	.49	.54
Moist-soil (interior sloughs - forest species) [3]					
Mallard	.10	.10	.10	.28	.29
Green-backed heron	.10	.10	.16	.27	.24
Wood duck	.10	.10	.19	.26	.28
Beaver	.10	.10	.16	.29	.26
Northern parula	.10	.10	.22	.23	.23
Prothonotary warbler	.10	.10	.24	.26	.28

[1] Chosen by MoDOC as target species for GTR management.

[2] Forest species were used to evaluate this habitat type because the disposal area, access road, and ditch would act more as forest habitat than nonforest, cropland, or grassland habitat.

[3] Forest species in addition to nonforest species were used to evaluate the interior sloughs because it was assumed they would undergo a natural conversion to forest through sedimentation.

TABLE B-3. Projected quality of terrestrial habitat (in habitat suitability indices) for wildlife species on Cuivre Island comparing three management measures to implement tree stand improvements (TSI) within bottomland forest.

Species	Habitat Suitability Index								
	Existing Condition	Future Condition							
		Without tree stand improvements		M.M. 15A: With increased density of forest openings		M.M. 15B: With increased snag density		M.M. 15C: With increased cavity tree density	
		yr. 2	yr. 50	yr. 2	yr. 50	yr. 2	yr. 50	yr. 2	yr. 50
Mallard	.10	.10	.10	.10	.10	.10	.10	.10	.10
Green-backed heron	.47	.46	.31	.49	.37	.47	.31	.47	.31
Wood duck	.46	.46	.37	.48	.42	.46	.37	.49	.39
Beaver	.51	.50	.31	.53	.34	.51	.31	.51	.31
Northern parula	.49	.49	.45	.49	.45	.49	.45	.49	.45
Prothonotary warbler	.53	.53	.47	.53	.47	.53	.47	.56	.50

TABLE B-4. Projected quality of terrestrial habitat (in habitat suitability indices) for wildlife species on Cuivre Island comparing three increments to reestablish bottomland forest through tree planting on cropland (planting 10 percent of cropland every 10 years).

Species	Habitat Suitability Index																		
	Existing and Future Without Condition	Future Condition																	
		M.M. 16A: With reforestation of south cropland						M.M. 16B: With reforestation of north cropland						M.M. 16C: With reforestation of south and north cropland					
		Target Years																	
		2	10	20	30	40	50	2	10	20	30	40	50	2	10	20	30	40	50
Reforestation																			
Mallard	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10	.10
Green-backed heron	.10	.10	.47	.45	.45	.53	.53	.10	.37	.39	.39	.42	.42	.10	.42	.42	.42	.48	.48
Wood duck	.10	.10	.10	.10	.46	.52	.57	.10	.10	.10	.30	.35	.38	.10	.10	.10	.38	.44	.48
Beaver	.10	.10	.63	.59	.62	.60	.58	.10	.43	.39	.42	.40	.39	.10	.53	.49	.52	.50	.48
Northern parula	.10	.10	.10	.45	.60	.65	.45	.10	.10	.40	.55	.60	.40	.10	.10	.42	.58	.62	.42
Prothonotary warbler	.10	.10	.10	.22	.25	.26	.28	.10	.10	.20	.23	.25	.25	.10	.10	.21	.24	.26	.26
Remaining cropland																			
Mallard	.41	.41	.41	.41	.41	.41	.41	.41	.41	.41	.41	.41	.41	.41	.41	.41	.41	.41	.41
Canada goose	.21	.21	.21	.21	.21	.21	.21	.21	.21	.21	.21	.21	.21	.21	.21	.21	.21	.21	.21

TABLE B-5. Projected quantity of suitable terrestrial habitat (in acres) for wildlife species on mainland comparing three increments to convert cropland into marsh.

Species	Acres of Habitat								
	Existing Condition	Future Condition							
		Without any project		Alt 2A: With one-half of area 2 as marsh		Alt 2B: With area 2 as marsh		M.M. 2C: With areas 1 and 2 as marsh	
		yr.2	yr.50	yr.2	yr.50	yr.2	yr.50	yr.2	yr.50
Cropland									
Mallard	78	78	78	53	53	23	23	0	0
Canada goose	78	78	78	53	53	23	23	0	0
Marsh									
Mallard	0	0	0	21	21	49	49	68	68
Canada goose	0	0	0	21	21	49	49	68	68
Least bittern [1]	0	0	0	21	21	49	49	68	68
Lesser yellowlegs	0	0	0	21	21	49	49	68	68
Muskrat	0	0	0	21	21	49	49	68	68
King rail [1]	0	0	0	21	21	49	49	68	68
Green-backed heron	0	0	0	21	21	49	49	68	68
American coot	0	0	0	21	21	49	49	68	68
Grassland (levee)									
Canada goose	0	0	0	4	4	6	6	10	10
TOTAL ACRES	78	78	78	78	78	78	78	78	78

[1] Chosen by MoDOC as target species for management efforts at marsh.

TABLE B-6. Projected quantity of suitable terrestrial habitat (in acres) for wildlife species on Cuivre Island comparing four increments to raise water surface elevation of green tree reservoir (GTR) and improve water control.

Species	Acres of Habitat										
	Existing Condition	Future Condition									
		Without any project		M.M. 4A: With improved water control and water surface at 427 feet		M.M. 4B: With improved water control and water surface at 428 feet		Alt 4C: With improved water control and water surface at 429 feet		M.M. 4D: With improved water control and water surface at 430 feet	
		yr. 2	yr. 50	yr. 2	yr. 50	yr. 2	yr. 50	yr. 2	yr. 50	yr. 2	yr. 50
Moist-soil (interior sloughs)											
Nonforest species [1]	30	30	0	30	0	30	0	30	0	30	0
Bottomland forest - under GTR management											
Forest species [2]	55	55	42	128	113	263	246	402	380	580	555
Bottomland forest - not under GTR management											
Forest species	1,207	1,207	1,195	1,114	1,104	979	971	840	837	662	662
Cropland - under GTR management											
Cropland species [3]	16	16	16	16	16	16	16	16	16	26	26
Cropland - not under GTR management											
Cropland species	94	94	94	94	94	94	94	94	94	84	84
Ditches, disposal areas, access road for ditch cleanout [4]											
Forest species	5	5	30	25	50	25	50	25	50	25	50
Moist-soil (interior sloughs) [5]											
Forest species	0	0	30	0	30	0	30	0	30	0	30
TOTAL ACRES	1,407	1,407	1,407	1,407	1,407	1,407	1,407	1,407	1,407	1,407	1,407

[1] Nonforest species = mallard, Canada goose, least bittern, lesser yellowlegs, muskrat, king rail, green-backed heron, American coot.

[2] Forest species = mallard*, green-backed heron, wood duck*, beaver, northern parula, prothonotary warbler (* denotes target species for GTR management).

[3] Cropland species = mallard, Canada goose.

[4] Forest species were used to evaluate this habitat type because the disposal area, access road, and ditch would act more as forest habitat than nonforest, cropland, or grassland habitat.

[5] Forest species in addition to nonforest species were used to evaluate this habitat type because it was assumed the interior sloughs would undergo a natural conversion to forest through sedimentation.

TABLE B-7. Projected quantity of suitable terrestrial habitat (in acres) for wildlife species on Cuivre Island comparing three increments to increase density of openings within bottomland forest.

Species	Acres of Habitat								
	Existing Condition	Future Condition							
		Without any project		M.M. 15A: With increased density of openings over one-third of forest		M.M. 15B: With increased density of openings over two-thirds of forest		M.M. 15C: With increased density of openings over entire forest	
		yr. 2	yr. 50	yr. 2	yr. 50	yr. 2	yr.50	yr. 2	yr. 50
Bottomland forest with TSI									
Forest species [1]	0	0	0	416	416	846	846	1,262	1,262
Bottomland forest without TSI									
Forest species	1,262	1,262	1,262	846	846	416	416	0	0
TOTAL ACRES	1,262	1,262	1,262	1,262	1,262	1,262	1,262	1,262	1,262

[1] Forest species = mallard, green-backed heron, wood duck, beaver, northern parula, prothonotary warbler.

TABLE B-8. Projected quantity of suitable terrestrial habitat (in acres) for wildlife species on Cuivre Island comparing three increments to reestablish bottomland forest through tree planting on cropland (planting 10 percent of cropland every 10 years).

Species	Acres of Habitat																	
	Existing and Future Without Condition	Future Condition																
		M.M. 16A: With reforestation of south cropland						M.M. 16B: With reforestation of north cropland						M.M. 16C: With reforestation of south and north cropland					
		Target Years																
		2	10	20	30	40	50	2	10	20	30	40	50	2	10	20	30	40	50
Reforestation																			
Forest species [1]	0	7	14	20	27	34	34	15	30	46	61	76	76	22	44	66	88	110	110
Remaining cropland																			
Cropland species [2]	110	103	96	90	83	76	76	95	80	64	49	34	34	88	66	44	22	0	0
TOTAL ACRES	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110

[1] Forest species = mallard, green-backed heron, wood duck, beaver, northern parula, prothonotary warbler.
[2] Cropland species = mallard, Canada goose.

TABLE B-9. Projected habitat benefits (in annualized habitat units) to wildlife species on mainland comparing three increments to convert cropland into marsh.

Species	Annualized Habitat Units			
	Future Without Project	Future With Marsh		
		M.M. 2A: one-half of area 2	M.M. 2B: area 2	M.M. 2C: areas 1 and 2
Cropland				
Mallard	32	22	10	1
Canada goose	16	11	5	1
Marsh				
Mallard	0	15	35	48
Canada goose	0	10	24	33
Least bittern [1]	0	18	41	57
Lesser yellowlegs	0	12	29	40
Muskrat	0	13	29	41
King rail [1]	0	16	37	51
Green-backed heron	0	14	32	44
American coot	0	2	5	7
Grassland (levee)				
Canada goose	0	2	3	5
Subtotal - target species	0	34	78	108
Subtotal - nontarget species	48	101	172	220
TOTAL AHU	48	135	250	328

[1] Chosen by MoDOC as target species for management efforts at marsh.

TABLE B-10. Projected habitat benefits (in annualized habitat units) to two target species on Cuivre Island comparing four increments to improve green tree reservoir (GTR) management.

Target Species [1]	Type of Suitable Habitat	Annualized Habitat Units (AHU)				
			Future With Project			
		Future Without Project	M.M. 4A: With improved water control and GTR water surface at 427 feet	M.M. 4B: With improved water control and GTR water surface at 428 feet	M.M. 4C: With improved water control and GTR water surface at 429 feet	M.M. 4D: With improved water control and GTR water surface at 430 feet
Mallard	moist-soil (nonforest)	2	3	3	3	3
	bottomland forest - under GTR mgmt.	5	73	155	238	345
	bottomland forest - not under GTR mgmt.	120	111	98	85	67
	cropland - under GTR mgmt.	7	14	14	14	22
	cropland - not under GTR mgmt.	39	39	39	39	35
	ditches, disposal areas, access road	2	23	23	23	23
	moist-soil (forest)	1	4	4	4	4
	SUBTOTAL AHU	176	267	336	406	499
Wood duck	bottomland forest - under GTR mgmt.	23	78	164	251	365
	bottomland forest - not under GTR mgmt.	444	411	362	313	249
	ditches, disposal areas, access road	7	24	24	24	24
	moist soil as forest	3	4	4	4	4
	SUBTOTAL AHU	477	517	554	592	642
TOTAL AHU		653	784	890	998	1,141

[1] Mallard and wood duck chosen by MoDOC as targets of management efforts at green tree reservoir.

TABLE B-11. Projected habitat benefits (in annualized habitat units) to ten nontarget species on Cuivre Island comparing four increments to improve green tree reservoir (GTR) management.

Nontarget Species [1]	Type of Suitable Habitat	Annualized Habitat Units (AHU)				
		Future Without Project	Future With Project			
			M.M.4A: With improved water control and GTR water surface at 427 feet	M.M. 4B: With improved water control and GTR water surface at 428 feet	M.M. 4C: With improved water control and GTR water surface at 429 feet	M.M. 4D: With improved water control and GTR water surface at 430 feet
Green-backed heron	moist-soil (nonforest)	7	10	10	10	10
	bottomland forest - under GTR mgmt.	21	70	146	224	324
	bottomland forest - not under GTR mgmt.	440	407	359	310	247
	ditches, disposal areas, access road	6	21	21	21	21
	moist-soil (forest)	2	4	4	4	4
	SUBTOTAL AHU	476	512	540	569	606
Beaver	bottomland forest - under GTR mgmt.	24	80	169	258	375
	bottomland forest - not under GTR mgmt.	422	390	344	297	237
	ditches, disposal areas, access road	6	24	24	24	24
	moist soil (forest)	2	4	4	4	4
	SUBTOTAL AHU	454	498	541	583	640
Northern parula	bottomland forest - under GTR mgmt.	25	60	125	192	279

TABLE B-11. Projected habitat benefits (in annualized habitat units) to ten nontarget species on Cuivre Island comparing four increments to improve green tree reservoir (GTR) management.

Nontarget Species [1]	Type of Suitable Habitat	Annualized Habitat Units (AHU)				
		Future Without Project	Future With Project			
			M.M.4A: With improved water control and GTR water surface at 427 feet	M.M. 4B: With improved water control and GTR water surface at 428 feet	M.M. 4C: With improved water control and GTR water surface at 429 feet	M.M. 4D: With improved water control and GTR water surface at 430 feet
	bottomland forest - not under GTR mgmt.	523	484	427	369	293
	ditches, disposal areas, access road	8	18	18	18	18
	moist soil (forest)	3	3	3	3	3
	SUBTOTAL AHU	559	565	573	582	593
Prothonotary warbler	bottomland forest - under GTR mgmt.	22	61	129	198	287
	bottomland forest - not under GTR mgmt.	673	622	549	474	377
	ditches, disposal areas, access road	7	19	19	19	19
	moist soil (forest)	4	4	4	4	4
	SUBTOTAL AHU	706	706	701	695	687
Canada goose	moist-soil (nonforest)	2	2	2	2	2
	cropland - under GTR mgmt.	4	6	6	6	10
	cropland - not under GTR mgmt.	20	20	20	20	18

TABLE B-11. Projected habitat benefits (in annualized habitat units) to ten nontarget species on Cuivre Island comparing four increments to improve green tree reservoir (GTR) management.

Nontarget Species [1]	Type of Suitable Habitat	Annualized Habitat Units (AHU)				
		Future Without Project	Future With Project			
			M.M.4A: With improved water control and GTR water surface at 427 feet	M.M. 4B: With improved water control and GTR water surface at 428 feet	M.M. 4C: With improved water control and GTR water surface at 429 feet	M.M. 4D: With improved water control and GTR water surface at 430 feet
	SUBTOTAL AHU	26	28	28	28	30
Least bittern	moist-soil (nonforest)	2	2	2	2	2
Lesser yellowlegs	moist-soil (nonforest)	2	2	2	2	2
Muskrat	moist-soil (nonforest)	4	7	7	7	7
King rail	moist-soil (nonforest)	5	5	5	5	5
American coot	moist-soil (nonforest)	2	2	2	2	2
TOTAL AHU		2,236	2,327	2,401	2,475	2,574

[1] Mallard and wood duck chosen by MoDOC as targets of management efforts at green tree reservoir.

TABLE B-12. Projected habitat benefits (in annualized habitat units) to wildlife species on Cuivre Island comparing three increments to increase density of openings within bottomland forest.

Species	Annualized Habitat Units			
	Future Without Project	Future With Increased Density of Forest Openings		
		M.M. 15A: Within one-third of forest	M.M. 15B: Within two-thirds of forest	M.M. 15C: Within all of forest
Mallard	125	125	125	125
Green-backed heron	486	504	523	541
Wood duck	522	536	551	565
Beaver	512	524	537	549
Northern parula	588	588	588	588
Prothonotary warbler	627	627	627	627
TOTAL AHU	2,860	2,904	2,951	2,995

TABLE B-13. Projected benefits (in annualized habitat units) to wildlife species on Cuivre Island comparing three increments to reestablish bottomland forest through tree planting on cropland (planting 10 percent of cropland every 10 years).

Species	Annualized Habitat Units			
	Future Without Project (retain cropland)	Future With Tree Planting		
		M.M. 16A: With reforestation of south cropland	M.M. 16B: With reforestation of north cropland	M.M. 16C: With reforestation of south and north cropland
Reforestation				
Mallard	0	2	5	7
Green-backed heron	0	11	20	32
Wood duck	0	9	14	24
Beaver	0	14	20	36
Northern parula	0	11	24	35
Prothonotary warbler	0	5	11	17
Remaining cropland				
Mallard	45	36	24	15
Canada goose	23	18	12	8
TOTAL AHU	68	106	130	174

TABLE B-14. Water surface area of marsh by 1-foot depth intervals as a function of water surface elevation.

Water Surface Elevation (feet NGVD)	Flooded Acres of Marsh					
	<1' Deep	1'-2' Deep	2'-3' Deep	3'-4' Deep	>4' Deep	Total Acres Flooded
433	16	0	0	0	0	16
434	44	17	0	0	0	61
435	0	46	18	0	0	64
436	0	0	49	19	0	68

TABLE B-15. Water surface area of green tree reservoir by 1-foot depth intervals as a function of water surface elevation.

Water Surface Elevation (feet NGVD)	Flooded Acres in Green Tree Reservoir								
	<1' deep	1'-2' deep	2'-3' deep	3'-4' deep	4'-5' deep	5'-6' deep	6'-7' deep	7'-8' deep	Total Acres Flooded
424	17	12	0	0	0	0	0	0	29
425	25	17	12	0	0	0	0	0	54
426	36	25	17	12	0	0	0	0	90
427	80	36	25	17	12	0	0	0	170
428	137	80	36	25	17	12	0	0	307
429	143	137	80	36	25	17	12	0	450
430	180	143	137	80	36	25	17	12	630

SP CHARACTERISTIC MATRIX VALUES MATRIX NAME MOFISH TODAY'S DATE 17-FEB-1993

SPECIES

CHARACTERISTIC NO.		CATF	SAUG	CARP	JODA	LMBA	GISH	CARP	BLUE	BUHD	SMBA
1 PERCENT BACKWATER, OXBOWS & CHANNELS IN 2-MILE WIDE CIRCLE)6FT DEEP HAB TYPE PRSM											
1.)25%		10	5	10		10		10	10	10	10
2. 10-25%		8	4	8		8		8	8	8	8
3. 5-10%		6	3	6		6		6	6	6	6
4. 1-5%		4	2	4		4		4	4	4	4
5. (1% OR NONE		1	1	1		1		1	1	1	1
2 CHANNEL STRUCTURE (% CHANNEL COVERED BY SNAGS, RT WADS, ETC PER 500 FT) HAB TYPE POSM											
1.)25%	1.00	10		10		10*			10*		10* *
2. 10-25%	.90	8		8		8			8		8
3. 5-10%	.75	6		6		6			6		6
4. 1-5%	.50	4		4		4			4		4
5. (1%	.25	1		1		1*			1*		1*
3 BANK STRUCTURE (% COVERED WITH SNAGS, EXPOSED ROOTS, CUTBANKS, ETC) HAB TYPE POSM											
1.)25%		10		5		10	5				10
2. 10-25%		7		3		7	3				7
3. 5-10%		4		2		4	2				4
4. (5% (SMOOTH BANK)		1		1		1	1				1
4 AQUATIC VEGETATION (% CHANNEL COVERED WITH EMER & SUBMER VEGETATION) HAB TYPE POSM											
1.)75%		1	1	1		2	1*	4	4	6	1 *
2. 50-75%		4	2	3		10	1	6	10	10	2
3. 25-50%		7	3	5		8	4	10	8	8	3
4. 1-25%		10	5	4		4	7	8	2	4	5
5. ZERO		1	4	1		1	10	1	1	1	2
5 SUBSTRATE (CHANNEL BOTTOM) HAB TYPE PRSM											
1. MUD/SILT		10	1	5	1	5	3	5	2	10	1
2. SAND		7	7	10	4	10	5	3	5	7	4
3. GRAVEL/COBBLE		5	10	5	10	5	1	2	3	4	10
4. BEDROCK		1	4	1	7	1	1	1	1	1	7
6 PERCENT CHANNEL DEPTH)8 FEET ENTIRE YEAR HAB TYPE POS											
1.)75%	1.00	10*	10*	10*		10*	10*	10*	10*	10*	10* *
2. 50-75%	.70	8	8	8		8	8	8	8	8	8
3. 25-50%	.75	6	6	6		6	6	6	6	8	6
4. 10-25%	.50	4	4	4		6	4	6	6	6	4
5. 1-10%	.25	2	2	2		4	2	4	4	4	2
6. NONE	.25	1*	1*	1*		1*	1*	1*	1*	1*	1*
7 RIP RAP (%SHORELINE COVERED BY RIP RAP) HAB TYPE M											
1. NONE		4	4	2		4	2				
2. 1-5%		7	7	5		7	5				
3. 5-25%		10	10	3		10	3				
4. 25-50%		4	4	2		4	2				
5.)50%		1	1	1		1	1				
8 CHANNEL WATER DEPTH DIVERSITY (% CHANNEL WITH WATER (8 FT DEEP) HAB TYPE M											
1.)50%		10	10	10		10	5	10	10	10	
2. 25-50%		8	8	8		8	4	8	8	8	
3. 10-25%		6	6	6		6	3	6	6	6	
4. 5-10%		4	4	4		4	2	4	4	4	
5. (5%		1	1	1		1	1	1	1	1	
9 AVERAGE VELOCITY FEET PER SECOND MAY THROUGH SEPTMEBER HAB TYPE PRSM											
1. NONE)50% OF TIME		6	1	10	1	10		20	10	20	1 * LF
2. 0 - 0.5 FPS (SLOW)		8	1	5	5	5		10	10	10	1
3. 0.5 - 1.0 FPS		10	7	1	10	1		5	7	5	7
4. 1.0 -4 FPS		4	10	1	5	1		2	4	1	10
5.)4 FPS (VERY FAST)		1	4	1*	1	1		1	1	1	4

CHARACTERISTIC NO.	SPECIES	CATF	SAUG	CARP	JODA	LMBA	GISH	CARP	BLUE	BUHD	SMBA
FILE NAME MOFISH											
10 WATER LEVEL STABILITY (MAY THROUGH JUNE) HAB TYPE POSM ?											
1. STABLE WAT ((1FT CH)		10	10	10	10	10	10	10	10	10	10 * LF(PRSM)
2. RISE OR DECLINE 1-3F		7	7	7	7	7	7	7	7	7	7 ?
3. RISE OR DECLINE 2-4F		4	4	4	4	4	4	4	4	4	4
4. UNPREDICT OR)4 FT CH		1	1	1*	1	1*	1	1	1*	1	1
11 SHORELINE SHADED BY OVERSTORY TREES (PERCENT) HAB TYPE PRSM											
1.)90%		10		10	5	10		5	10	5	10
2. 75-90%		6		8	4	8		4	8	4	8
3. 50-75%		6		6	3	6		3	6	3	6
4. 25-50%		4		4	2	4		2	4	2	4
5. (25%		1		1	1	1		1	1	1	1
12 AVERAGE SIZE) 8 FT DEEP WINTER (AVE FOR YEAR) HAB TYPE OS ?											
1.)25 ACRES		10		10		10	10	10	10	10	10 * LF(O)
2. 10-25 ACRES		8		8		8	5	6	10	10	8 ?
3. 5-10 ACRES		6		6		6	1	6	10	10	6
4. 1-5 ACRES		4		4		4	1	4	5	5	4
5. (1 ACRE		1		1		1	1*	1	1	1	1
13 TURBIDITY (AVE ANNUAL CONDIT EXCLUDING FLOODS - SECCHI DISK IN INCHES) HAB TYPE POSM											
1. HIGH (5 IN SECCHI		1	1	1	1	1	6	8	1	6	1
2. 5-10 IN SECCHI		4	4	4	2	4	8	10	4	8	2
3. 10-20 IN SECCHI		8	6	7	6	7	10	6	6	10	6
4. 20-30 IN SECCHI		10	8	10	8	10	4	4	10	4	8
5. LOW)30 IN SECCHI		4	10	10	10	10	1	1	1	1	10
14 CHANNEL WIDTH (FEET BANK TO BANK) HAB TYPE PRS											
1. (10 FEET		1	1	1	5	1	1	1	1	1	1
2. 10-25 FEET		4	1	4	10	4	1	2	4	5	5
3. 25-50 FEET		7	5	7	5	7	5	5	7	10	10
4.)50 FEET		10	10	10	1	10	10	10	10	10	10
15 CONNECTIVITY WITH MAIN CHANNEL HAB TYPE S											
1. YEAR LONG		10	10	5		2	2	2	2	2	
2. 9-11 MONTHS		8	5	4		3	3	3	3	3	
3. 4-8 MONTHS		6	1	3		5	5	5	5	5	
4. 1-3 MONTHS		4	1	2		2	2	2	2	2	
5. (1 MONTH		1	1	1		1	1	1	1	1	
16 FLOW CONTINUITY HAB TYPE PRS											
1. PERMANENT FLOW		10	10	10	10	10	10	10	10	10	10
2. FLOW 8-11 MONTHS		8	5	8	8	8	8	8	8	8	8
3. FLOW 4-7 MONTHS		6	1	6	6	6	6	6	6	6	6
4. FLOW 1-3 MONTHS		4	1	4	4	4	4	4	4	4	4
5. FLOW (1 MONTH		1	1	1	1	1	1	1	1	1	1
17 STREAM SYSTEM INTERACTION (TIMES PER YR FISH CAN MOVE TO CHANNEL) HAB TYPE O											
1.) TWICE PER YEAR		10		10		10	10	10	10	10	
2. TWICE PER YEAR		7		7		7	7	7	7	7	
3. ACCESS ONCE PER YEAR		4		4		4	4	4	4	4	
4. ACCESS (ONCE PER YR		1		1		1	1	1	1	1	
18 RIFFLE-POOL RATIO (PERCENT RIFFLE LENGHT TO POOL LENGTH) HAB TYPE R											
1.)25% POOL LENGHT		4				1					1
2. 10-25% POOL LENGHT		7				4					4
3. 5-10% POOL LENGHT		10				7					10
4. (5% POOL LENGHT		1				10					7

SPECIES CHARACTERISTIC MATRIX
FILE NAME: MOFISH
TODAY'S DATE 11-21-1991

THIS MATRIX HAS:
NUMBER OF HABITAT TYPES 5 NUMBER OF CHARACTERISTICS 21
NUMBER OF SPECIES 10
NUMBER OF ROWS IN MATRIX 100

HABITAT TYPE ABBREVIATIONS ARE:
P POOL
R RIFFLE
O OVERFLOW WATERS
S SIDE CHANNEL
M MAIN CHANNEL-BIG RIVERS

SPECIES BY HABITAT TYPE

	1	2	3	4	5	6	7	8	9	10
-AB	CATF	SAUG	CRPP	JODA	LMBA	GISH	CARP	BLUE	BUHD	SMBA
2	X		X		X		X	X	X	X
3				X						X
O	X		X		X	X	X	X	X	
S	X		X		X	X	X	X	X	
M	X	X	X		X	X	X	X	X	

A INDICATES APPLICABLE HABITAT TYPES

THESE ARE THE SPECIES ABBREVIATIONS
1 CATF CHANNEL CATFISH
2 SAUG SAUGER
3 CRPP CRAPPIE (WH-BL)
4 JODA JOHNNY DARTER
5 LMBA L. MOUTH BASS
6 GISH GIZARD SHAD
7 CARP CARP
8 BLUE BLUEGILL
9 BUHD BLACK BULLHEAD
10 SMBA S. MOUTH BASS

SPECIES CHARACTERISTIC MATRIX FILE NAME: MOFISH
SPECIES CATF SAUG CRPP JODA LMBA GISH CARP BLUE BUHD SMBA

19 RIFFLE WATER DEPTH (AVG. WATER DEPTH OVER ENTIRE RIFFLE) HAB TYPE R										
1.)24 INCHES				6						10
2. 12-24 INCHES				8						8
3. 6-12 INCHES				10						6
4. 2-6 INCHES				4						4
5. (2 INCHES				1						1
20 DISTANCE TO GRAVEL SUBSTRATE OR GRAVEL SHORELINE HAB TYPE PSM										
1. (.50 MILE				1	1	10				
2. .50 - 1.0 MILE				4	4	7				
3. 1.0 - 2.0 MILE				7	7	4				
4.)2.0 MILE				10	10	1				
21 DISTANCE TO EMERGENT VEGETATION IN WATER 1-4 FT DEEP HAB TYPE PSM										
1. (.25 MILE				10		10	10	10	5	5
2. .25 - .50 MILE				8		8	8	8	4	4
3. .50 - .75 MILE				6		6	6	6	3	3
4. .75 - 1.0 MILE				4		4	4	4	2	2
5.)1.0 MILE				1		1	1	1	1	1
22 D TO SIDE CHANNEL WITH PERMANENT WATER) 8 FT DEEP & YR ROUND CONNECT. HAB TYPE PRM										
1. (.50 MILE				10		10		10	10	10
2. .50 - 1.0 MILE				8		8		8	8	8
3. .75 - 1.0 MILE				6		6		6	6	6
4. 1.0 - 2.0 MILE				4		4		4	4	4
5.)2.0 MILE				1		1		1	1	1
23 DISTANCE TO CHANNEL WITH WATER)8 FT DEEP HAB TYPE R										
1. (.50 MILE				10			10		10	10
2. .50 - 1.0 MILE				8			8		8	8
3. .75 - 1.0 MILE				6			6		6	6
4. 1.0 - 2.0 MILE				4			4		4	4
5.)2.0 MILE				1			1		1	1

LIMITING FACTOR CHARACTERISTICS

LINE NUMBER	SPECIES	SPECIES NUMBER	CHARACTERISTIC NUMBER	HABITAT	FACTOR TYPE
1	GIZARD SHAD	6	4	POSM	LIMITING FACTOR
2	CHANNEL CATFISH	1	6	POSM	MULTIPLIER
3	SAUGER	2	6	POSM	MULTIPLIER
4	CRAPPIE (WH-BL)	3	6	POSM	MULTIPLIER
5	L. MOUTH BASS	5	6	POSM	MULTIPLIER
6	GIZARD SHAD	6	6	POSM	MULTIPLIER
7	CARP	7	6	POSM	MULTIPLIER
8	BLUEGILL	8	6	POSM	MULTIPLIER
9	BLACK BULLHEAD	9	6	POSM	MULTIPLIER
10	S. MOUTH BASS	10	6	POSM	MULTIPLIER
11	CRAPPIE (WH-BL)	3	9	PRSM	LIMITING FACTOR
12	CRAPPIE (WH-BL)	3	10	PROSM	LIMITING FACTOR
13	L. MOUTH BASS	5	10	PROSM	LIMITING FACTOR
14	BLUEGILL	8	10	PROSM	LIMITING FACTOR
15	CRAPPIE (WH-BL)	3	2	POSM	MULTIPLIER
16	L. MOUTH BASS	5	2	POSM	MULTIPLIER
17	BLUEGILL	8	2	POSM	MULTIPLIER
18	S. MOUTH BASS	10	2	P	MULTIPLIER
19	GIZARD SHAD	6	12	O	LIMITING FACTOR

MAXIMUM POSSIBLE POINTS

	CATF	SAUG	CRPP	JODA	LMBA	GISH	CARP	BLUE	BUHD	SMBA
P	130		120		140		120	120	115	120
R				75						90
O	110		100		120	80	90	100	85	
S	140		125		145	105	125	125	120	
M	120	90	105		130	70	100	100	95	

TABLE B-16. Projected quality of aquatic habitat (in habitat suitability indices) for seven fish species in Cuivre side channel comparing four management measures to improve side channel habitat.

Species	Habitat Suitability Index							
	Existing Condition	Future Condition						
		Without Any Project		M.M. 7: Build 6 sets of dikes		M.M. 8: Build two dikes at upper end of side channel		M.M. 9: Remove remnant of submerged dike	
		yr.5	yr.50	yr.5	yr.50	yr.5	yr.50	yr.5	yr.50
Gizzard shad [1]	.18	.17	.10	.22	.14	.70	.60	.52	.43
Catfish [1]	.16	.15	.10	.17	.12	.59	.54	.45	.41
Black bullhead	.14	.14	.10	.14	.10	.55	.51	.41	.37
Carp [1]	.13	.13	.09	.13	.08	.51	.45	.39	.34
Crappie [1]	.10	.10	.08	.10	.08	.10	.08	.10	.08
Largemouth bass	.10	.10	.08	.10	.08	.10	.08	.10	.08
Bluegill	.10	.10	.08	.10	.08	.10	.08	.10	.08
[1] Chosen by MoDOC as target species for management efforts in side channel.									

TABLE B-17. Projected quantity of suitable aquatic habitat (in acres) for fish species in Cuivre side channel comparing four management measures to improve side channel habitat.

Feature [1]	Acres of Habitat				
	Existing Condition	Future Condition Without Any Project		Future Condition With Project	
		yr. 5	yr. 50	yr. 5	yr. 50
Aquatic habitat					
M.M. 7: Construct 6 sets of dikes	162	152	63	152	65
M.M. 8: Construct two dikes at upper end of side channel	162	152	63	158	118
M.M. 9: Remove remnant of submerged dike	162	152	63	156	103
Terrestrial habitat (aquatic habitat lost to sedimentation)					
M.M. 7: Construct 6 sets of dikes	0	10	99	10	97
M.M. 8: Construct two dikes at upper end of side channel	0	10	99	4	44
M.M. 9: Remove remnant of submerged dike	0	10	99	6	59
TOTAL ACRES (each M.M.)	162	162	162	162	162
[1] Acreage figures for each feature are constant across all evaluation species.					

TABLE B-18. Projected habitat benefits (in annualized habitat units) to seven fish species in Cuivre side channel comparing four management measures to improve side channel habitat.

Species	Annualized Habitat Units (AHU)			
	Future Without Any Project	Future With Project		
		M.M. 7: Build 6 sets of dikes	M.M. 8: Build two dikes at upper end of side channel	M.M. 9: Remove remnant of submerged dike
Gizzard shad [1]	17	22	88	62
Catfish [1]	16	18	77	56
Black bullhead	15	15	72	51
Carp [1]	13	13	65	47
Crappie [1]	11	11	11	11
Largemouth bass	11	11	11	11
Bluegill	11	11	11	11
TOTAL AHU	94	101	335	249
[1] Chosen by MoDOC as target species for management efforts in side channel.				

TABLE B-19. Projected quality (in habitat suitability indices) and quantity (in acres) of aquatic habitat for fish species in side channel between Cuivre and Turkey Islands for propwash dredging to deepen side channel habitat.

Species	Existing Condition	Future Condition Without Any Project		Future Condition With Project	
		yr. 5	yr. 50	yr. 5	yr. 50
Habitat Suitability Indices					
Gizzard shad [1]	.15	.15	.00	.15	.16
Catfish [1]	.16	.16	.00	.15	.16
Black bullhead	.16	.16	.00	.16	.16
Carp [1]	.16	.16	.00	.16	.17
Crappie [1]	.10	.10	.00	.10	.10
Largemouth bass	.10	.10	.00	.10	.10
Bluegill	.10	.10	.00	.10	.10
Acres of Suitable Habitat (at normal pool)					
All species	30	27	0	27	16
Acres of Unsuitable Habitat (at normal pool)					
All species	40	43	70	43	54
[1] Chosen by MoDOC as target species for management efforts in side channel.					

TABLE B-20. Projected habitat benefits (in annualized habitat units) to seven fish species in side channel between Cuivre and Turkey Islands from propwash dredging to deepen side channel habitat.

Species	Annualized Habitat Units (AHU)	
	Future Without Any Project	Future With Project
		M.M. 17: Propwash Dredging
Gizzard shad [1]	2	4
Catfish [1]	2	4
Black bullhead	2	4
Carp [1]	2	4
Crappie [1]	2	2
Largemouth bass	2	2
Bluegill	2	2
TOTAL AHU	14	22
[1] Chosen by MoDOC as target species for management efforts in side channel.		

TABLE B-21. Net habitat benefits (in annualized habitat units) for all evaluation species and all management measures (and associated increments).

Management Measure (and increments)	Net Change in Annualized Habitat Units		
	Target Species	Nontarget Species	All Species
Create marsh from cropland on mainland [1]			
M.M. 2A	34	53	87
M.M. 2B	78	124	202
M.M. 2C	108	172	280
Improve green tree reservoir management on Cuivre Island [2]			
M.M. 4A	131	91	222
M.M. 4B	237	165	402
M.M. 4C	345	239	584
M.M. 4D	488	338	826
Create forest openings and plant with mast tree species on Cuivre Island [3,5]			
M.M. 15A			98
Reestablish bottomland forest on cropland through tree planting on Cuivre Island [3]			
M.M. 16A			38
M.M. 16B			62
M.M. 16C			106
Create wintering habitat for fishes in Cuivre side channel [4]			
M.M. 7	7	0	7
Prevent sedimentation of Cuivre side channel [4]			
M.M. 8	184	57	241
M.M. 9	119	36	155
Propwash dredging of side channel between Cuivre and Turkey Islands [4]			
M.M. 17	6	2	8

[1] Target species = least bittern, king rail
Nontarget species = mallard, Canada goose, lesser yellowlegs, muskrat, green-backed heron, American coot

[2] Target species = mallard, wood duck
Nontarget species = Canada goose, least bittern, lesser yellowlegs, muskrat, king rail, green-backed heron, American coot, beaver, northern parula, prothonotary warbler

[3] No target species designated; evaluation species = mallard, green-backed heron, wood duck, beaver, northern parula, prothonotary warbler

[4] Target species = gizzard shad, catfish, carp, crappie
Nontarget species = black bullhead, largemouth bass, bluegill

[5] Modified management measure 15 - see page B-21.

Appendix C - Section 404(b)(1) Evaluation, Clean Water Act Compliance

APPENDIX C

SECTION 404(b)(1) EVALUATION REPORT
ON THE EFFECTS OF THE DISCHARGE OF DREDGED OR FILL MATERIAL INTO WATERS OF THE UNITED STATES

CUIVRE ISLAND
HABITAT REHABILITATION AND ENHANCEMENT PROJECT
POOL 26, MISSISSIPPI RIVER,
ST. CHARLES AND LINCOLN COUNTIES, MISSOURI

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM

I. PURPOSE OF THIS EVALUATION

The proposed habitat rehabilitation and enhancement project at Cuivre Island, Pool 26, Mississippi River, St. Charles and Lincoln Counties, Missouri, will involve placement of dredged and fill materials into waters of the United States. Discharges of dredged or fill material into such waters are regulated under Section 404 of the Clean Water Act.

Under Section 404(b) of the Act, proposed discharges of dredged or fill material must conform to guidelines developed by the U. S. Environmental Protection Agency. On 5 September 1975, the Environmental Protection Agency published regulations (40 CFR 230) which outline criteria and procedures for evaluating activities subject to Section 404. On 24 December 1980, revised Section 404(b)(1) guidelines were published, and became effective 30 March 1981. It is mandatory that the guidelines be applied to all proposed discharges of dredged or fill material subject to approval under Section 404. This evaluation will address proposed discharges of dredged and fill material required for the habitat rehabilitation and enhancement at Cuivre Island.

On 25 August 1993 the final "Excavation Rule" was published (33 CFR Parts 323 and 328), and became effective on 24 September 1993. This regulation modifies the definition of "discharge of dredged material," which now means any addition of dredged material into, including any redeposit of dredged material within, the waters of the United States. The term includes, but is not limited to, a) the addition of dredged material to a specified discharge site located in waters of the United States; b) the runoff or overflow from a contained land or water disposal area; and c) any addition, including any redeposit, of dredged material, including excavated material, into waters of the United States which is incidental to any activity, including mechanized landclearing, ditching, channelization, or other excavation.

II. PROJECT DESCRIPTION

a. Location - The Cuivre Island project area is located along the right (west) bank of the Mississippi River in Pool 26 (see PLATE 1 for location map). The project area extends from river mile 238.8 at the north to river mile 234.5 at the south. Lock and Dam 25 is about 2.5 miles upriver. The Cuivre River enters the Mississippi River within the project area. The confluence is with Cuivre Slough, a side channel of the Mississippi.

b. General Description

(1) Area Subject to Section 404 Jurisdiction - The entire 1,750-acre project area is considered to be a water of the United States, and therefore subject to Section 404 review requirements. It consists of 113 acres on the mainland, 160 acres of Cuivre side channel, 70 acres of side channel between Cuivre and Turkey Islands, and the 1,407-acre Cuivre Island. The aquatic portion of the project area includes the two side channels (230 acres), five small, interior sloughs or ponds on Cuivre Island (30 acres), and an old oxbow of Cuivre River on the mainland (10 acres). The terrestrial component of the project area consists of all of Cuivre Island but the sloughs (1,377 acres), and an area on the mainland (103 acres), all of which is classified as wetland subject to Section 404. Cropland on the island (110 acres) and mainland (78 acres) has been identified as prior converted farmland by the Soil Conservation Service. The 50 percent duration elevation of the Mississippi River at the project site is 422 feet NGVD.

(2) Proposed Project Features - Recommended Plan - The proposed project consists of measures to improve terrestrial and aquatic habitat in three areas. First, the capability for greentree reservoir management on Cuivre Island will be improved by installing a permanent pump, cleaning out sediment-choked ditches, constructing a segment of new ditch, and replacing five old water control structures and constructing a new one. Seasonally flooded habitats, which include primarily bottomland forest, some cropland, and interior sloughs, will be increased from 106 to 448 acres by increasing the reservoir's pool elevation from 426 to 429 feet NGVD. These measures will benefit wetland-dependent animals, especially fall and spring-migrating waterfowl. Second, bottomland forest habitat on the island will be improved by creating ten 8-acre forest openings and planting them with mast tree species to improve forest tree species composition and habitat conditions for forest-dwelling animals. In addition, 110 acres of existing cropland will be planted with trees to reestablish bottomland forest.

Third, aquatic habitat in two side channels will be improved. In Cuivre slough, the natural deposition of river-borne sediments in the upper portion of the side channel will be changed by removing a portion of a submerged rock dike crossing the slough near the upper end. This will increase the discharge capacity of the side channel and allow river-borne sediments to be flushed down through the side channel. This measure is expected to prolong the closing of the upper half of Cuivre Slough through sedimentation, and it will benefit all aquatic and terrestrial organisms that use the side channel as habitat.

Aquatic habitat in Cuivre slough will also be improved by the construction of six rock dikes within the side channel. Each dike will create a scour hole. Three dikes will be located above the confluence with Cuivre River, and three below the confluence. These scour holes are intended to provide winter habitat (water depth greater than 8 feet) for riverine fish, such as crappie, small-mouth bass, gizzard shad, carp, and channel catfish. These scour holes will also provide summer habitat for these species, because low pool elevations can be common during the summer months.

Aquatic habitat in the side channel between Cuivre and Turkey Islands will be improved by removing accumulated sediment from a 16-acre area using an experimental approach. Propwash dredging with a pushboat is expected to resuspend and remove sediment and flush it into the Mississippi River.

c. Authority and Purpose - Public Law (PL) 95-502 authorized the construction of a new dam and 1,200-foot lock at Alton, Illinois, and directed the Upper Mississippi River Basin Commission to prepare a Comprehensive Master Plan for the Management of the Upper Mississippi River System. The Basin Commission completed the Master Plan report and submitted it to Congress on 1 January 1982. The report recommended an environmental management program that included construction of habitat rehabilitation and enhancement projects.

The 1985 Supplemental Appropriations Bill (PL 99-88), signed into law by President Reagan on 15 August 1985, provided initial authorization and appropriations for an environmental management program for the Upper Mississippi River System. A more comprehensive authorization was later provided by the Water Resources Development Act of 1986 (PL 99-662).

d. General Description of Dredged or Fill Material

(1) General Characteristics of Material (grain size, soil type)

(a) Fill Material - This includes quarry run limestone and concrete. Various sizes of limestone will be used, including graded "C" stone, 6" minus stone, and 3" minus stone. Road stone (aggregate surface course) and 1" crushed stone (drainage material) will be used also. Earthen material will be used for backfilling around various structures.

(b) Dredged Material - Dredged material is defined as material that is either dredged or excavated from waters of the United States. Earthen material consisting of alluvial silts and clays will be excavated from Cuivre Island during mechanized landclearing, ditch cleanout and construction, replacement and construction of water control structures, and construction of the pump station. Rock and sediment will be dredged from Cuivre Slough to remove the submerged remnant of a dike. Sediment will be flushed from the side channel between Cuivre and Turkey Islands using the propwash from a pushboat.

(2) Quantity of Material - The following quantities of materials will be handled:

Cuivre Island - clean out existing ditch system and construct a new ditch, install six 36" CMP gravity drains with sluice gates, remove two existing gravity drains, construct 10,000-gpm pump station.

Disposed earthen material from ditch excavation	26,190	cubic yards
Embankment for road	2,110	cubic yards
Embankment for gravity drains	3,360	cubic yards
Backfill for pump station	3,300	cubic yards
Earthen cofferdams for 2 gravity drains	740	cubic yards
Concrete	103	cubic yards
Revetment, "C" stone	910	tons
6" minus stone	320	tons
3" minus stone	270	tons
Pipe bedding for 4 gravity drains	150	tons

In addition to this work on Cuivre Island, mechanized landclearing will occur over 20 acres for the creation of a disposal area for material obtained during ditch cleanout and construction, and over 80 acres for the creation of ten 8-acre forest clearings to be planted with mast tree species. The quantity of excavated material associated with mechanized landclearing has not been determined.

Cuivre side channel - build seven stone dikes (typically 100' long, 10' high, 6' wide crown, sideslopes 1V on 2H); remove one-half of existing submerged dike.

"A" stone	3,723	tons
Dredged rock and sediment	1,000	cubic yards

Side channel between Cuivre and Turkey Islands - remove sediment from lower quarter of slough (an area about 2000 feet long, 350 feet wide), deepening by an average of 2 feet.

Resuspended sediment	52,000	cubic yards

(3) Source of Material - Stone used for the project will be obtained from commercial stone quarries in the vicinity of St. Charles and Lincoln Counties. Earthen material will come from the island.

e. Description of the Proposed Discharge Sites

(1) Location - The location of the proposed features and work is shown in PLATES 6, 11, 12, 13, and 19 of the main report. The discharge sites are located on Cuivre Island, in Cuivre Slough, and in the Mississippi River just downriver of the lower end of the side channel between Cuivre and Turkey Islands.

(2) Size (acres) and Types of Habitat - Twenty acres of bottomland forest on the island will be cleared in association with ditch cleanout and construction. Fourteen acres will be used along one side of the ditch network for construction of an access road and disposal of ditch cleanout material; widening of existing ditches and construction of a new ditch will take 6 acres. Eighty acres of bottomland forest will be cleared to create clearings for tree plantings. Construction of the pump station and gravity drains will require less than one acre of forest. Within Cuivre side channel, a total of about 1 acre of channel bottom will be filled with stone for the six dikes. Material from removal of one-half of the submerged dike will be disposed of within the slough along the banks, and will affect about 0.15 acres of side channel habitat. The proposed discharge site for resuspension of sediment by propwash will be main channel border and main channel habitat of the Mississippi River. The number of acres to be affected is not known, but it probably is more than the 16 acres from which the material will be taken.

(3) Type of Site (confined, unconfined, open water)

(a) Permanent Deposits of Dredged and Fill Material - All sites for the deposit of dredged and fill material will be unconfined. Open water sites include those in Cuivre Slough designated for construction of stone dikes, disposal of the removed portion of dike, and disposal of resuspended material using propwash. All other sites are located in terrestrial/wetland areas that are subject to flooding.

(b) Temporary Deposits of Fill Materials - Temporary coffer dams will be used to construct two gravity drains on Cuivre Island. The deposits of material resuspended by propwash are temporary in the sense that they are anticipated to be removed and dissipated by Mississippi River currents.

(4) Timing and Duration of Discharge - Work to be performed on Cuivre Island will need to be accomplished during normal (nonflood) pool conditions. Construction of the stone dikes in Cuivre side channel will need to be done during high water when boat and barge access is possible. Depending on local weather and flooding conditions, the estimated duration of the construction period is about 12 months. Actual duration of discharges will only be a fraction of that time. The resuspension of sediment by propwash should only last a few days, but it may need to be done repeatedly (every 5 years or so) to keep the lower quarter of the side channel between Cuivre and Turkey Islands open.

f. Description of Disposal Method (hydraulic, drag line, etc.) - Heavy equipment such

as a backhoe will be used to install gravity drains on Cuivre Island. Sediment will be removed from the ditch system on Cuivre Island by hydraulic excavator. Floating equipment will be used to construct the dikes in Cuivre side channel. A pushboat will be used to remove sediment from the side channel between Cuivre and Turkey Islands.

III. FACTUAL DETERMINATIONS

a. Physical Substrate Determinations

(1) Substrate Elevation and Slope - The project area is located on the Mississippi and Cuivre River floodplain, and is generally flat. Land elevations within the project area range from about 424 to 435 feet NGVD. The bottoms of interior sloughs on Cuivre Island range from about 422 to 424 feet NGVD. Elevations of the bottom of the two side channels range from about 412 to 420 feet NGVD. Much of the project site is sloped no greater than 1-2 percent.

(2) Sediment Type (grain size) - The soil surveys for St. Charles and Lincoln Counties describe the soils within the project area as silt loams and silty clay loams. Sediments within the interior sloughs on Cuivre Island and in the ditch system are fine silts, clays, and organics. The substrate of the side channels varies from fine silts and clays to gravel.

(3) Dredged/Fill Material Movement - Stone used for the construction of dikes, gravity drains, and other structures has been sized to withstand the force of flood waters, and is not expected to move. Earthen material used for backfill will be compacted. Sediments sidecast during cleanout of the ditch system on Cuivre Island will be rough dressed so that the material is typically less than 5 feet high, has 1V on 4H sideslopes, a crown width of 20 feet, and a base of about 55 feet. Because of the relatively flat sideslopes and revegetation measures, these dredged sediments are not expected to be subject to lateral movement. Sediment and smaller rock excavated during removal of the dike and placed back in the side channel along the banks will be subject to movement downstream. Material resuspended by propwash will also be subject to movement downstream.

(4) Physical Effects on Benthos (burial, changes in sediment type, etc.) - Benthos are found only in the aquatic portions of the project area - the side channels and the interior sloughs on Cuivre Island. Construction of the dikes and water control structures will result in the burial and loss of some benthic organisms. Removal of sediment from the ditch system of Cuivre Island and the side channels will also result in loss of benthic organisms. However, these areas are expected to be recolonized within one year, possibly with different assemblages of benthic organisms. The rock material will provide a different but favorable substrate for benthic recolonization.

(5) Other Effects - No other effects are expected.

(6) Actions Taken to Minimize Impacts - The primary actions taken to avoid adverse effects on the substrate are designing stable slopes on structures, the use of immobile stone for constructing some structures (rather than earthen material), and revegetation measures to minimize erosion (lateral movement) of disposal areas and upper half of the ditch channel sideslopes.

b. Water Circulation, Fluctuation and Salinity Determinations

(1) Water

(a) Salinity - Not applicable.

(b) Water Chemistry - It is believed that sediment and rock removal will not release unacceptable levels of un-ionized ammonia to the water column at the point of removal and at the disposal site.

(c) Clarity - Elevated suspended sediment levels are expected to occur in a localized nature within the side channels during removal of the dike remnant, construction of the six dikes, and propwash resuspension. These elevated turbidity levels will be short-term because of the current flowing through the side channel.

(d) Color - No change is expected.

(e) Odor - The project is not expected to have a an impact on water odors.

(f) Taste - The project is not expected to impact water taste.

(g) Dissolved Gas Levels - Construction activities associated with the project will have no significant adverse impact on dissolved gas levels.

(h) Nutrients - Some nutrients will be released to the water column during dike construction and sediment removal; however, this will represent a temporary increase and is not considered significant.

(i) Eutrophication - The project is not expected to have an adverse impact on eutrophication of the water column.

(j) Water Temperature - Temperatures are not expected to change.

(2) Current Patterns and Circulation

(a) Current Patterns and Flow - Overall, the project will slightly alter circulation and flow patterns. The long, linear disposal areas on Cuivre Island probably will act as dikes during small to moderate flood events; flood waters will either flow around the disposal

areas or over them at topographically low points.

(b) Velocity - Localized increases in water velocity are expected within Cuivre side channel at the site of dike. These increases will be slight.

(c) Stratification - Stratification does not occur in the two side channels or any of the interior sloughs on Cuivre Island because of either existing current or shallow depths.

(d) Hydrologic Regime - The project will not change flood profiles of either the Mississippi or Cuivre Rivers.

(3) Normal Water Level Fluctuations (tides, river stage, etc.) - The project will not affect normal fluctuations in the elevation of Pool 26.

(4) Salinity Gradients - Not applicable.

(5) Actions Taken to Minimize Impacts - Resuspension of sediment by propwash in the side channel between Cuivre and Turkey Islands will occur when Pool 26 is high enough for a pushboat to enter and get the work done.

c. Suspended Particulate/Turbidity Determinations

(1) Expected Changes in Suspended Particulates and Turbidity Levels in Vicinity of Disposal Site - Increases in suspended particulates and turbidity due to installation of gravity drains, sediment removal, and dike construction will be confined to the work area, and are anticipated to be minor and short-term.

(2) Effects (degree and duration) on Chemical and Physical Properties of the Water Column - Installation of gravity drains, sediment removal, and dike construction will give rise to impacts that are minimal, localized, and short-term.

(a) Light Penetration - Slight reductions in light penetration are expected in the side channels due to minor and short-term increases in levels of suspended particulates and turbidity levels. These impacts will be short-term. Where there is water in the ditch system on Cuivre Island, these impacts will be more pronounced.

(b) Dissolved Oxygen - A short-term, localized decrease in dissolved oxygen (DO) levels is expected to occur in the side channels during removal of the submerged dike remnant. Current from the main channel of the Mississippi River will reintroduce water with normal DO levels soon after removal is completed. In regard to the ditch system on Cuivre Island, removal of sediments will lead to more prolonged and extensive decreases in DO levels (provided water is present in the ditch).

(c) Toxic Metals and Organics - Results of the analysis of sediment samples for

pesticides and metals indicated no detection of metals and insignificant concentrations of pesticides. The disturbance of sediments during project construction should have no significant impact.

(d) Pathogens - There is no reason to believe any pathogens exist in any of the proposed areas of construction.

(e) Aesthetics - Because impacts to the water column are anticipated to be minor and short-term, these adverse effects are unlikely to be perceived as aesthetically displeasing to the visiting public or adjacent property owners.

(f) Water Temperature - No short-term changes in water temperatures are expected to occur.

(3) Effects on Biota

(a) Primary Production, Photosynthesis - Minor short-term impacts to primary production and photosynthetic processes are expected to occur locally in the side channels. In the ditch system on Cuivre Island, these impacts are anticipated to be more pronounced (where water is present in the ditch system).

(b) Suspension/Filter Feeders - A localized, short-term, and minor reduction in benthos production due to increased suspended sediments is expected for the side channels. For the ditch system on Cuivre Island, the effect is expected to be more notable (where water is present in the ditch system).

(c) Sight Feeders - Impacts to sight-feeders that are associated with placement of fill materials into Cuivre side channel and the Mississippi River are expected to be short-term and minor. Such impacts associated with cleanout activities in the ditch system on Cuivre Island are expected to be more pronounced because turbidity levels will remain higher for the duration of the work (where water is present in the ditch system).

(4) Actions taken to Minimize Impacts - Actions to minimize impacts associated with suspended particulates and turbidity include compaction of earthen materials, and revegetation of disturbed terrestrial areas, including disposal areas.

d. Contaminant Determinations - Results of the analysis of sediment samples for pesticides and metals indicated no detection of metals and insignificant concentrations of pesticides.

e. Aquatic Ecosystem and Organism Determinations

(1) Effects on Plankton - Effects on plankton will be most pronounced within the ditch system on Cuivre Island (where water is present). Increased suspended sediments and

turbidity levels associated with cleanout will adversely impact phytoplankton production. This impact will be short-term and last for the duration of cleanout operations. In the long term, the project is expected to maintain and protect plankton production in the side channels by preventing the conversion of aquatic habitat to terrestrial habitat due to sedimentation.

(2) Effects on Benthos - Benthic organisms in the immediate vicinity of open-water sites designated for the placement of stone materials probably will be lost due to burial. Recolonization of stone structures is expected to occur rapidly. In the long term, new rocky substrates should provide for different benthic assemblages and possibly increase the diversity of the local benthic fauna. Short-term loss of benthos will also occur as a result of sediment removal operations. Also in the long term, the project is expected to maintain and protect benthic production in the side channels by preventing the conversion of aquatic habitat to terrestrial habitat due to sedimentation.

(3) Effects on Nekton - The term "nekton" refers basically to larger, free-swimming aquatic organisms, such as fishes. Ditch cleanout on Cuivre Island will have little or no adverse effect on fishes. The present ditch system serves as poor aquatic habitat because water depths are very shallow in most ditches. In the side channels, adverse impacts on sight-feeding fish due to construction are expected to be short-term and minor. In the long-term, the project is expected to maintain and protect fish habitat in the side channels by preventing the conversion of aquatic habitat to terrestrial habitat due to sedimentation. Because of the creation of scour holes by the rock dikes, the amount of deepwater winter and summer habitat within Cuivre side channel is expected to increase.

(4) Effects on Aquatic Food Web - Construction activities are not expected to disrupt the aquatic food chain of the interior sloughs on Cuivre Island or of the side channels.

(5) Effects on Special Aquatic Sites

(a) Sanctuaries and Refuges - The project area is managed by the Missouri Department of Conservation as a waterfowl rest area. The project is expected to benefit migratory and resident waterfowl, fisheries, and other wetland wildlife.

(b) Wetlands - The project area consists of 1,520 acres of wetlands subject to Section 404 of the Clean Water Act. The wetlands on Cuivre Island include 1,267 acres of bottomland forest, and 30 acres of interior sloughs. On the mainland, there are 33 acres of bottomland forest and old oxbow of the Cuivre River. The project area also includes 110 acres of prior-converted cropland on Cuivre Island, and another 78 acres on the mainland.

On Cuivre Island, nearly 20 acres of bottomland forest will be lost to construction activities. Ditch widening and construction of new ditches will require 5.5 acres, and disposal of sediment from ditch cleanout will require 14 acres. By increasing the pool elevation of the seasonal greentree reservoir from 426 to 429 feet NGVD, the amount of bottomland forest subject to inundation will increase from 106 to 450 acres.

The recommended plan includes the conversion of 110 acres of cropland on Cuivre Island to bottomland forest. In addition, 80 acres of trees killed by the flood of 1993 will be planted with mast tree species.

(c) Mud Flats - Currently, seasonal mud flats occur within the interior sloughs on Cuivre Island only when water naturally evaporates from them in the summer. The project will provide the capability to create mud flats in these sloughs on a reliable basis.

(d) Vegetated Shallows - There are no vegetated shallows in the project area.

(e) Coral Reefs - Not applicable.

(f) Riffle and Pool Complexes - There are no riffle and pool complexes in the project area.

(6) Threatened and Endangered Species - The bald eagle, gray bat, peregrine falcon, Indiana bat, and decurrent false aster are Federally listed endangered or threatened species that may be found in the project area. There currently is no designated critical habitat in the project area. The project will not adversely affect any of these species.

(7) Other Wildlife - Adverse impacts to wildlife habitat caused by construction activities include the loss of about 20 acres of bottomland forest on Cuivre Island, and 110 acres of cropland on the island. Vegetation clearing and other construction activities will destroy some wildlife, whereas other wildlife in the immediate vicinity will be displaced to adjacent areas.

The affected habitats will be replaced by 110 acres of bottomland forest created by tree planting, 14 acres of vegetated disposal areas, and about 6 acres of new or enlarged ditches. Wetland wildlife, especially migrating waterfowl, will benefit from increases in habitat quality and quantity of the greentree reservoir on Cuivre Island.

(8) Actions to Minimize Impacts - Actions that will minimize impacts to the aquatic ecosystem and its organisms include the following. Contractors will be required to submit an environmental protection plan to include protection methods and procedures for avoiding landscape defacement, providing for water and air pollution prevention, for disposal of solid and chemical waste, and for protecting fish and wildlife resources. In addition, the contractor shall be required to conduct a training course emphasizing environmental protection. Government inspectors will oversee construction projects to ensure that personnel, equipment, and construction techniques meet all contract specifications, including environmental requirements.

f. Proposed Disposal Site Determinations

(1) Mixing Zone Determination - The concentration of resuspended material in the

side channel between Turkey and Cuivre Islands will not be high enough to require a mixing zone.

(2) Determination of Compliance with Applicable Water Quality Standards - The project is expected to comply with applicable water quality standards. The District has submitted a request for Section 401 water quality certification to Missouri. The state has already indicated that propwash resuspension is not subject to the Section 401 certification requirements (MDNR 1991).

(3) Potential Effects on Human Use Characteristics

(a) Municipal and Private Water Supply - No municipal water supply will be adversely impacted by project construction.

(b) Recreational and Commercial Fisheries - The opportunity for sport fishing in the side channels is expected to be maintained as a result of the project.

(c) Water Related Recreation - Water-related recreation (hunting, boating, fishing, etc.) is not expected to be adversely impacted by the project in the long-term. Certain opportunities may be unavailable during the construction period, such as boating within the side channels in the immediate vicinity of dikes under construction, or during sediment resuspension. Similarly, waterfowl hunting on or adjacent to Cuivre Island may be adversely affected.

(d) Aesthetics - Construction activities will have minor impacts on the aesthetic quality of the project area during the duration of the work. The most visible activities will occur within Cuivre side channel, especially those above the confluence with Cuivre River where private landowners have homes along the mainland bank. Construction activities on Cuivre Island will not be visible except from the main channel of the Mississippi River.

(e) Parks, National and Historical Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves - The project will not impact any of these resources.

g. Determination of Cumulative Effects on the Aquatic Ecosystem - The Environmental Management Program should have a positive impact on the Upper Mississippi River System. No other work in the aquatic environment is proposed for the project area.

h. Determination of Secondary Effects on the Aquatic Ecosystem - No significant secondary impacts to the aquatic ecosystem have been identified.

IV. FINDINGS OF COMPLIANCE OR NON-COMPLIANCE WITH THE RESTRICTIONS ON DISCHARGE

a. Adaptation of the Section 404(b)(1) Guidelines to this Evaluation - In our evaluation of discharges proposed in connection with the Cuivre Island Habitat Rehabilitation and Enhancement Project, the Environmental Protection Agency's Section 404(b)(1) Guidelines of 24 December 1980 were applied without significant adaptation. Testing procedures outlined in subpart G of the guidelines were required since the proposal will involve removal of sediment from Cuivre side channel, the side channel between Cuivre and Turkey Islands, and from Cuivre Island, and our review of the work disclosed no "reason to believe" that contaminants potentially could be released to the aquatic environment.

b. Evaluation of Availability of Practicable Alternatives to the Proposed Discharge Site Which Would Have Less Adverse Impact on the Aquatic Ecosystem - Because all of the project area is a water of the United States, the selection of nonwetland (upland) disposal sites was not possible. On Cuivre Island, the sizing of disposal areas was primarily determined by height (less than 5 feet, according to the Missouri Department of Conservation). The disposal site for rock and sediment dredged from Cuivre side channel to remove the submerged dike was sited in water and not on land. Adverse impacts were believed to be greater on land rather than in aquatic habitat.

c. Compliance with Applicable State Water Quality Standards - Water quality certification under Section 401 of the Clean Water Act has not been issued yet, but is anticipated.

d. Compliance with Applicable Toxic Effluent Standard or Prohibition Under Section 307 of the Clean Water Act - The placement activities will not violate the toxic effluent standards of Section 307 of the Clean Water Act.

e. Compliance with Endangered Species Act of 1973 - The habitat rehabilitation project will not jeopardize the existence of Federally listed endangered or threatened species or their critical habitat.

f. Compliance with Specified Protection Measures for Marine Sanctuaries Designated by the Marine Protection, Research, and Sanctuaries Act of 1972 - not applicable.

g. Findings of Significant Degradation of the Waters of the United States - The proposed project will not result in significant adverse effects on human health and welfare, including municipal and private water supplies, recreation and commercial fishing, plankton, fish, shellfish, wildlife, and special aquatic sites. The life stages of aquatic life and other wildlife would not be adversely affected in a significant manner. Significant adverse effects on aquatic ecosystem diversity, productivity and stability, and recreational, aesthetic and economic values would not occur.

h. Appropriate and Practicable Steps Taken to Minimize Potential Adverse Impacts of the Discharge on the Aquatic Ecosystem - All appropriate and practicable measures have been taken through application of procedures contained in Subpart H of the Guidelines to

insure minimal adverse effects of the proposed discharges.

i. On the Basis of the Guidelines the Proposed Disposal Sites for the Discharge of Dredged and Fill Material - Based on this evaluation, the proposed work is specified as complying with the requirements of these guidelines with the inclusion of appropriate and practical conditions to minimize pollution or adverse effects to the aquatic ecosystem.

1 Sep 94
Date

Thomas C. Suermann
Colonel, Corps of Engineers
District Engineer

Appendix D - Letters of Intent

MISSOURI DEPARTMENT OF CONSERVATION

MAILING ADDRESS
P.O. Box 180
Jefferson City, Missouri 65102-0180

STREET LOCATION
2901 West Truman Boulevard
Jefferson City, Missouri

Telephone: 314/751-4115
Missouri Relay Center 1-800-735-2966 (TDD)
JERRY J. PRESLEY, Director

January 26, 1994

Mr. Owen D. Dutt
Chief, Planning Division
St. Louis District, Corps of Engineers
1222 Spruce Street
St. Louis, Missouri 63103-2833

Attention: Plan Formulation Branch, Planning Division

Dear Mr. Dutt:

Thank you for providing our Department additional information and opportunity to have further input into formulation of the Cuivre Island Habitat Rehabilitation Project. Resource staff met January 12, 1994 to discuss this proposed project and develop the following comments/recommendations:

Alternative 2. Marshes on the existing Department-owned mainland would provide important moist soil, wetland habitat. However, due to the high projected development cost ($472,132 for a total of 71 acres), we recommend this component be dropped.

Alternative 4. According to our calculations, construction of recommended alternative 4C (pump water to elevation 429 msl) would provide opportunity to restore, create and manage approximately 450 acres of wetland/green tree reservoir habitat on Cuivre Island. This would have a highly significant, positive impact on wetland dependent wildlife species in this reach of river. The large heron rookery on nearby Hat Island would be a noteworthy benefactor.

Given that our Department will be responsible for 25 percent of the construction costs on land we own, would it be possible to get a more detailed cost breakdown on this particular component? In other words, since part of this component will be constructed on Corps owned land at 100 percent federal cost; it cannot simply be assumed that the Department would be responsible for 25 percent of the total projected cost of $880,000 for this component.

Alternative 6. We are aware that this particular component did not make the final cut. We accept this conclusion. Using towboat propwash to remove sediment from Cuivre Island Chute may indeed be too large an undertaking for

an experimental, unproven technique. We are nevertheless not going to let this concept drop. It is simply too important that we find a cost effective means to remove sediment from UMR chutes and backwater areas. Therefore we would like to suggest that consideration be given to using propwash to create deep-water, over wintering fishery habitat in the lower end of the chute between Cuivre Island and Turkey Island (Turkey Island Chute). The close proximity of this area to the main channel makes it particularly important off channel aquatic habitat. The upper end of the chute is already silted in and closed to all but high river stages. Material "blown" from the lower end of this chute with propwash would immediately enter the main channel and be the equivalent of thalweg disposal.

Because of the experimental nature of this component, it is critically important that funding is provided to conduct physical and biological response monitoring.

Alternative 7. We are excited about the prospect of trying to restore some deep holes and aquatic habitat diversity in Cuivre Island Chute through use of the seven pairs of dikes. Has the length of these structures been determined?

Again, given the experimental nature of this particular component, and its applicability elsewhere on the river, we believe it is very important that funding be included for physical and biological response monitoring.

Alternative 8 and 9. We believe implementation of these alternatives is key to the success of alternative 7. The only concern we are aware of relates to the fact that Phelan's Island is privately owned and during the public hearing on this project, the owners expressed fear that erosion problems could result if flow is restored to the chute. We believe it may be wise to contact the owners and discuss the project as presently conceived.

Alternative 15. The proposed timber stand improvement and creation of small clearings in the bottomland forest should generate significant habitat benefits over time. According to the narrative on page 31, the small clearings would be less than two acres in size with a proposed density of one per every ten acres. Our resource biologists suggest this be changed to include one clearing, no less than eight acres in size for every 100 acres of forest.

Alternative 16. The regeneration of bottomland forest on existing cropland areas is acceptable as proposed.

We appreciate the opportunity to work with the St. Louis District in the implementation of the Environmental Management Program. We believe the thoughtful planning

that has gone into this project will pay significant dividends in terms of habitat benefits. We remain committed to serving as the local sponsor for this important project.

Please continue to direct future coordination on this matter to Mr. Norm Stucky at the above address.

Sincerely,

Dan F. Dickneite

DAN F. DICKNEITE
PLANNING DIVISION CHIEF

CELMS-PD-F revised 17 Feb 94

MEMORANDUM FOR RECORD

SUBJECT: Response to 26 Jan 94 Letter from MoDOC

1. This memo explains how the Cuivre Island HREP Draft DPR responds and accommodates the comments and recommendations made by the January 26, 1994 letter received from Dan Dickneite, Planning Division Chief, Missouri Department of Conservation. (Note that the term "Alternate or Alternative" has been changed to Management Measure in the Draft DPR):

a. Alternative 2. This Measure was subsequently eliminated from the recommended project per being unacceptable to the local sponsor.

b. Alternative 4. A more detailed cost breakdown was done and included in the Cost Estimate. This was used for the Table of Cost Sharing in the main report.

c. Alternative 6. Management Measure for Propwash experiment at lower end of chute between Cuivre Island and Turkey Island was added (Management Measure 17). Costs and AAHUs have been estimated.

d. Alternative 7. The dimensions of the dikes were determined early during plan formulation, and a table of the dikes has been included in the Hydrologic & Hydraulic Appendix.

e. Alternatives 8 and 9. We will contact the owners of Phelan's Island and discuss the proposed project and their concerns.

f. Alternative 15. This TSI Measure has been changed in the Draft DPR per MoDOC's suggestion.

/s/

DAVID KIRKPATRICK
Plan Formulation Branch

Appendix E - Hydrologic & Hydraulics

HYDROLOGIC & HYDRAULICS

CUIVRE ISLAND HREP

I. Introduction.

This section discusses the proposed plan to develop increased depths in the Cuivre Slough. The increased depths will provide better access for boats and also enhance the aquatic habitat. The management measures proposed consist of construction of six pairs of dikes in Cuivre Slough, a pair at the mouth of Cuivre Slough at the upper end or point of Phelan's Island, and the notching or partial removal of an old dike across Cuivre Slough near the lower end of Phelan's Island.

II. General Discussion.

The Cuivre Slough has flow passing through it all time. The Mississippi River contributes water to the slough, and depending on local runoff, the Cuivre River can also contribute a significant amount of flow to the slough. To increase depths in a moving body of water, two options exist; one is to excavate material to create additional depth, and the other is to constrict the flow (normally with dikes or partial closure structures), which in turns increases the velocity, which induces scouring of the river bed.

An examination of the hydrographic survey data taken in March and April 1991 (see Hydrographic Survey CADD drawings, prepared by J.T. Blankinship and Assoc., approx. Apr 91, not contained in the DPR), indicates that the Cuivre Slough generally has a bottom elevation of 414.0 to 416.0 National Geodetic Vertical Datum (NGVD). The fifty percent duration river elevation (i.e., half the time the river is higher and half the time its lower) is about elevation 422.5. The minimum pool elevation to be expected is about elevation 419.

If the excavation method is chosen to increase depths, the river would redeposit material into the excavated area and rebuild the river bottom to an elevation between 414 and 416. The survey supports proof that the river "wants" the bottom elevation of the slough at these elevations. Any excavated area would eventually fill up due to natural deposition of the river as it tries to regain its original cross-section. How long it would take would depend on the flow hydrographs experienced, the original depth of the excavation, the original size of the excavation, and the amount of sediment being carried by the river. However, additional excavation could be expected, with the possibility of having to do this on a yearly basis very likely.

Construction of a permanent rock structure will produce a more permanent depth increase. In most cases, the structure will be a rock dike, which extends from the bankline outward into the river. A dike constricts the cross-sectional area available for flow. The

river attempts to regain this loss of area by scouring the river bottom off the end of the dike.

This scouring produces permanently deeper water. The only maintenance required would be repairing the rock dike if it would become damaged by ice flows. Since the majority of this work would be done in the protection of the slough, very little, if any maintenance would be expected after the dikes are constructed.

III. Design Components.

A. Dikes. Earlier in the design process, seven pairs of small dikes were recommended to be constructed to increase water depths at various locations. Because of easement concerns of the local sponsor--following an April 1994 meeting with adjoining landowners--one pair of dikes was eliminated (Pair 1, below), and the 6 remaining pairs were modified by eliminating all dikes emanating from the mainland side of Cuivre Slough.

Plates 11 & 12 show the location of the dikes. Table E-1 summarizes the dike dimensions and quantities of rock required (Note: recommended dikes are grey-shaded). Following is a brief discussion of the purpose of the dikes:

Pair 1. (this is not a recommended feature of the project). This pair will improve water depths at the entrance to the slough. The survey data indicates this area to be a natural area of deposition. The dike extending from the mainland will concentrate flows toward the Illinois side of the slough and allow the elevation 414 contour that is shown in the slough to migrate toward the main river. This will improve access into and out of the slough. The dike extending from the point of Phelan's Island is intended to capture and divert flow from the main river into Cuivre Slough. It is expected that the additional flow will scour and remove sediment from Cuivre Slough. This dike may be lengthened in the future if monitoring shows that the initially constructed length was insufficient to produce adequate flow into Cuivre Slough.

Pairs 2 through 7. These dikes are designed to develop deeper sections in areas of the slough. The dikes will be angled 15 degrees upstream from a line perpendicular to the bank. This angle should be sufficient to direct current away from the bank immediately downstream of the dike, thereby minimizing erosion on the opposite bank. The dikes will be constructed at approximately a 5 to 1 slope from the bank to the dike terminus. Dike tops will be 10 feet wide with a 2 to 1 slope on the upstream side, and a 3 to 1 slope on the downstream side. The roots of the dikes should extend no more than 15 to 25 feet into the bank.

B. Hardpoint Dikes. (This is not a recommended Management Measure of the project). Between the mouth of the Cuivre River (mile 236.75) and the mouth of Cuivre Slough (mile 234.7), fifty-three (53) hard point dikes were initially considered. See Plate 9. Hard point dikes were originally conceived as a means of bank protection. They have been effectively used as such at demonstration sites on the Missouri River. However, in this case their function will be to help establish a deeper permanent depth in this reach of the slough. Results from these demonstration sites documented that turbulent eddies formed at the end of these structures. The eddies are the result of concentrating the flow. The combination of the flow from the Cuivre River and that which naturally flows through the slough will produce scour off the end of the hard point dikes. This scour will provide additional deep water habitat, and also will provide for better boater access from the lower end of the slough.

C. Removal of Closure at Mile 238.2R. This closure structure was built in 1910 as a part of a dike that extended well out into the main river. This general area of the slough has less depths than the reaches upstream and downstream. The age of this structure indicates that it was constructed of wood piling. Records indicate that it was built to an elevation of 422. The upper portions of this structure have rotted away, however, portions covered by silt and water will still remain. The original purpose of constructing this dike across the slough was to encourage siltation of the slough. This would force additional water into the main channel to facilitate navigation.

Cuivre Slough is about 400 feet wide at the location of this submerged dike. Removal of about 100 feet of the dike on each side of the centerline of Cuivre Slough will be about one half of length of the dike across the Slough, and it will allow the slough to regain its natural depth in this area. To accomplish removal, a dragline will have to first remove the deposited material around the dike, and then remove the wooden piles. The other material should be placed immediately on top of or downstream of each remaining 100-foot stub of the dike. The structure should be removed to elevation about 408.0. The removed wooden piles should be loaded on barges and disposed of.

IV. Other Considerations.

Construction access will be limited by river stage (plus 425 for 6 foot draft, plus 428 for 9 foot draft). Sequence of construction: notch submerged dike, then construct 6 dikes off of island. Recommend a yearly survey interval to monitor slough.

Table E-1. Seven Pairs of Dikes in Cuivre Slough. The 6 recommended dikes are grey-shaded.

Dike Location		Ave. Ht. (ft.)	Length (ft.)	Tons of A Stone
pair 1	238.8R	5	150	555
	238.7L	4	300	800
pair 2	238.01R	7	80	512
	237.94L	3.5	125	250
pair 3	237.51L	4	100	270
	237.49R	7	75	480
pair 4	236.91L	3.5	150	300
	236.89R	4.5	125	390
pair 5	236.42L†	7	125	800
	236.30R	7	100	640
pair 6	235.39L	6.5	110	620
	235.36R	7	100	640
pair 7	235.07L	7	100	640
	235.05R	6.5	100	550
			Total	7,446

† Dike to be placed at 236.34 (during draft DPR) was moved 400 ft. upstream to 236.42 to decrease possibility of erosion on opposite side of bank at outside of bend at approx. 236.11 upon concerns of Emerson Electric (adjoining landowner) on July 26, 1994.

Appendix F - Fish and Wildlife Coordination Act Documentation

This appendix includes the final and draft Fish and Wildlife Coordination Act Reports.

This appendix includes draft DPR review comments from US Department of Interior

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Marion Illinois Suboffice (ES)
Rural Route 3, Box 328
Marion, Illinois 62959

IN REPLY REFER TO:

June 30, 1994

Colonel Thomas C. Suermann
U.S. Army Corps of Engineers
St. Louis District
1222 Spruce Street
St. Louis, Missouri 63103-2833

ATTN: Mr. Dan Ragland, CELMS-PD-AE

Dear Colonel Suermann:

This letter will serve as our Final Fish and Wildlife Coordination Act Report (FWCAR) for the Cuivre Island Habitat Rehabilitation and Enhancement Project in Pool 26, Lincoln and St. Charles Counties, Missouri. This report provides compliance with Subsection 2(b) of the Fish and Wildlife Coordination Act and Section 7 Consultation requirements of the Endangered Species Act of 1973, as amended. This FWCAR will update and supplement the information provided in our April 26, 1994, draft FWCAR (copy enclosed).

Since distribution of the draft Definite Project Report, a number of project features have been changed. The six pairs of dikes recommended in Management Measure 7F have been reduced to only six dikes (not pairs). These six dikes will be constructed on Cuivre Island. To assure these structures do not divert flow to the mainland and cause erosion problems, it is suggested these short dikes be angled 15 degrees upstream.

In addition, the two upper dikes recommended in Management Measure 8 have been eliminated. The elimination of these structures will substantially decrease the overall net habitat benefits for riverine fish (in terms of Average Annual Habitat Units). However, the substantial overall benefits of the remaining Management Measures for fish and wildlife continue to justify the project as currently proposed.

With regard to the draft FWCAR, the Fish and Wildlife Service (Service) notes the following changes:

Page 5, Goals and Objectives: An additional objective of this project is to provide summer habitat as well as overwintering habitat for fish in the Cuivre Island side channel.

Page 5, Proposed Project Features (b): Deep water created by scouring at the end of newly installed wingdikes will provide fish summer habitat as well as winter habitat.

With regard to federally listed threatened and endangered species, a Biological Assessment has been prepared for the proposed activity. This document lists the species that may occur in the area and describes efforts to eliminate adverse impacts to these species and their habitats. Based on this information, the Service concurs that the proposed action is not likely to adversely affect any known federally listed threatened or endangered species. This precludes the need for further action on this project as required under Section 7 of the Endangered Species Act of 1973, as amended. Should the project be modified or new information indicate endangered species may be affected, consultation should be initiated.

The Service supports and recommends construction of the project as proposed. We look forward to continually working with your staff on this and other Habitat Rehabilitation and Enhancement Projects.

Sincerely,

for Thomas M. Groutage
Assistant Field Supervisor

cc: MoDOC (Stucky, Farabee, Dalrymple, Brummet)
USFWS (Bornstein, Hansen, Surprenant)
USEPA (Mulder)
IDOC (Atwood)

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Marion Illinois Suboffice (ES)
Rural Route 3, Box 328
Marion, Illinois 62959

IN REPLY REFER TO:

April 26, 1994

Colonel Thomas C. Suermann
U.S. Army Corps of Engineers
St. Louis District
1222 Spruce Street
St. Louis, Missouri 63103-2833

ATTN: Mr. Dan Ragland, CELMS-PD-AE

Dear Colonel Suermann:

This letter constitutes our draft Fish and Wildlife Coordination Act Report (FWCAR) for the Cuivre Island Habitat Rehabilitation and Enhancement Project (HREP) in Pool 26, Lincoln and St. Charles Counties, Missouri. This report is intended to provide compliance with Subsection 2(b) of the Fish and Wildlife Coordination Act and Section 7 consultation requirements of the Endangered Species Act of 1973, as amended.

The Cuivre Island HREP is a component of the Upper Mississippi River System Environmental Management Program (EMP) authorized by Section 1103 of the Water Resources Development Act of 1986. The goal of EMP is to implement "numerous enhancement efforts...to preserve, protect, and restore habitat that is deteriorating due to natural and man-induced activities."

The project area includes land owned by the Federal Government, the State of Missouri and private landowners. The U.S. Army Corps of Engineers (Corps) acquired approximately 862 acres of the island to mitigate for habitat losses associated with the replacement of Lock and Dam 26 and to provide an area for the general public to use. Public Law 95-502 authorized the Chief of Engineers to replace at federal expense land inundated by Lock and Dam 26 on an acre-for-acre basis.

The Missouri Department of Conservation (MoDOC) acquired approximately 377 acres of Cuivre Island and 102 acres on the mainland located approximately 1.5 miles south of the mouth of the Cuivre River. Easements will be required on some privately owned land for the construction of dikes if the project is approved.

DESCRIPTION OF THE PROJECT AREA AND EXISTING CONDITIONS

The project area is primarily Cuivre Island, located at the mouth of the Cuivre River at the Mississippi River, miles 233-239. Cuivre Island is approximately four miles south and downstream of Lock and Dam 25 at Winfield, Missouri. The county line between Lincoln and St. Charles Counties is roughly midway through Cuivre Island. In the vicinity of the project area, the alluvial floodplain of the Mississippi River lies entirely in Missouri and is about 4-5 miles wide.

At present, the project site consists of four major habitat types: mature bottomland forest, slough, cropland and side channel. Bottomland and slough habitats are considered wetlands because of the soils, plant species and hydrology. All cropland within the project area has been classified as prior converted cropland by the Soil Conservation Service.

Bottomland forest covers 1267 acres of the 1407 acre Cuivre Island. This habitat type is also found on a portion of the mainland tract. Silver maple and cottonwood are the dominant tree species. Other tree species include willow, box elder, ash, elm, sugarberry and pin oak. Groundcover species include a variety of herbaceous plants and grasses. Narrow bands of young willow and silver maple surround the interior sloughs on Cuivre Island.

Sloughs occur within the interior of the island and consist of five separate water bodies linked together by a network of natural depressions and man-made ditches. These sloughs are all long and narrow and vary in size from about two to 12 acres. Altogether these sloughs total 30 acres. The normal water surface elevation in each of these waterbodies is about 424 feet National Geodetic Vertical Datum (NGVD). At this elevation, average water depth varies from about one to three feet. As summer progresses, water in these sloughs evaporates, revealing mud flats. These sloughs become directly connected to the Mississippi River only when Pool 26 reaches an elevation of about 426 feet NGVD or higher, at which time water backs up into the interior of the island from the south end. Slough habitat also occurs on the mainland portion of the project area as an old oxbow of the Cuivre River. The dominant vegetation in these areas include duckweed, buttonbush and invading willow and silver maple.

Cropland occurs on 68 acres of the mainland portion of the project area. This cropland is divided into two fields (46 and 22 acres) by an old oxbow of Cuivre River. In addition, two fields (76 and 34 acres) occur on Cuivre Island. Small grain crops are usually planted with a small portion of the crops left unharvested for wildlife. In fallow years, smartweeds and cocklebur are the dominant vegetation types.

Side channel habitat comprises Cuivre Slough which is about 5.25 miles long. With an average width of about 250 feet, this habitat type consists of about 160 acres. At the project site, the normal pool elevation is 422 feet NGVD. The channel bottom of Cuivre Slough ranges in elevation from about 412 to 420 feet NGVD. At normal pool, Cuivre Slough is connected at both ends to the Mississippi River and water depth ranges from two to ten feet. With an average bottom elevation of about 414-416 feet NGVD, the average water depth is about six to eight feet at normal pool.

The side channel between Cuivre Island and Turkey Island is about 1.5 miles long and 400 feet wide. Within this 70 acre side channel, about 40 acres are dry at normal pool because of accumulated sediment. The other 30 acres consist of shallow backwater habitat. This side channel essentially conveys no flow at normal pool because the upper end is shut off from the river by accumulated sediment.

Virtually no aquatic vegetation occurs in either side channel. Small willows and cottonwoods are present on point bars within these areas.

MANAGEMENT

The St. Louis District is in the process of issuing a license to the MoDOC to manage Corps land on Cuivre Island for fish and wildlife purposes. Likewise, MoDOC manages state-owned land within the project area for the same purpose. The aggregate of the Corps and state-owned land is known as the Cuivre Island Wildlife Area.

A formal resource management plan (FRM plan) for the Cuivre Island Wildlife Area has yet to be completed. However, the nature of the wildlife area dictates that management will focus on wetland habitats. The goal of wetland habitat management on MoDOC lands, as expressed in the agency's state wetland management plan, is "to maintain productive and diverse systems that meet the

long-term needs of a broad array of wetland fish and wildlife populations". To meet this goal, managed areas are to provide a diversity or mosaic of wetland habitats, including, moist soil areas, flooded and upland cropland, semi-permanent marsh, bottomland forest (and green tree reservoirs) and permanent sloughs and oxbows.

In the interim, until the FRM plan is completed MoDOC manages the diverse wildlife area to provide predictable wildlife habitat for wetland dependent species. The current management emphasis is on providing food and cover for migratory birds, especially waterfowl. To provide food and cover for waterfowl, water manipulations are conducted annually on a portion of Cuivre Island. These manipulations involve the seasonal flooding and dewatering of moist soil areas, cropland and a stand of living trees within the bottomland forest.

The living trees are shallowly flooded during their period of dormancy (fall, winter, and early spring) to create a green tree reservoir. This reservoir provides feeding and resting habitat for waterfowl during the fall and spring. Resident wood ducks also use the reservoir for feeding and brood rearing habitat. During fall migration, waterfowl eat a variety of plant seeds and tubers, but in flooded timber they often concentrate on mast, especially the acorns produced by oak trees. To a lesser degree, they also feed on invertebrates found in flooded habitats. During the spring migration, waterfowl concentrate on invertebrates found in flooded habitats and eat little plant material. Food in the form of small grains is grown on the island and mainland and some of the cropland on the island is also seasonally flooded to benefit these birds, as well as migrant rails and shorebirds. Moist soil management is conducted on the island's interior sloughs, where moist soil plants are grown as food for migratory waterfowl. Permanent water in slough habitat on the mainland is maintained for a variety of resident wetland wildlife. This area provides habitat for wading birds, fish, furbearers, reptiles, amphibians, invertebrates, wood ducks and other waterfowl.

The size of the green tree reservoir is determined by the island's terrain. There are no low levees to impound water. With the onset of tree dormancy, river water is pumped by a portable pump to flood the island's interior sloughs and adjacent forest to a shallow depth (ideally 6 to 18 inches). The reservoir is attained when water reaches the elevation of about 426 feet NGVD. It then encompasses the 30 acres of sloughs and about 60 acres of adjacent bottomland forest. Any additional pumping only sends water off the island via a ditch-like depression at the south end. Water is also pumped onto the island's southern field of cropland. There a dike-like structure holds water on about 17 acres at an elevation of about 429 feet NGVD. Before tree dormancy is broken in early spring, the reservoir is drained by gravity flow to the river via the south end of the island (when river conditions permit).

To produce moist soil food plants for waterfowl in the island's interior sloughs, water is allowed to gravity drain in the spring or summer to expose mud flats. Within the mud, seeds of naturally occurring herbaceous plants germinate and grow. Japanese millet is artificially seeded onto the mudflats in summer to supplement the production of native species. Migrant shorebirds also benefit from these exposed mudflats.

Because the wildlife area was only recently acquired, there have been only four potential years for habitat management. The green tree reservoir has been established only once due to commitment of pumping equipment at other management areas. Likewise, artificial seeding of moist soil areas has been possible for only two years. Spring and summer flooding occurred in two years, preventing the creation of mudflat conditions necessary for seed germination.

No activities have been implemented to directly benefit fisheries, except for an unsuccessful pilot program to place and maintain sunken cedar trees in the Mississippi River along the east side of Cuivre Island.

RESOURCE PROBLEMS AND OPPORTUNITIES

An interagency team consisting of the Corps, MoDOC and the Fish and Wildlife Service (Service) defined problems occurring at Cuivre Island at the present time and in the future without any project. The following problems have been described in terms of their adverse impacts on local biological resources.

1. High Rates of Sedimentation: Side channel and backwater habitats in upper Pool 26 have declined in areal extent, depth and quality due to excessively high rates of sedimentation. The detrimental effects of high sedimentation rates on backwater and side channel habitats are of major concern. Water depths decrease as bottom elevations are raised by sedimentation. With sufficient time, these aquatic areas may become filled with sediment, undergoing a gradual conversion to forested terrestrial habitat.

Declines in the quality of aquatic habitat occur due to a variety of secondary adverse affects. If areas become too shallow under conditions of no flow, dissolved oxygen levels in summer and winter may drop below the minimum required for fish survival. Sedimentation is accompanied by high turbidity levels, which can often limit the development of aquatic plant communities by blocking the passage of sunlight for photosynthesis and by creating bottoms too soft for such plants to establish successful root systems. Without aquatic plant communities, invertebrate faunas found in aquatic habitats subject to sedimentation are often poor in species diversity and abundance. Deposits of sediment can also smother the eggs of fish which prefer to spawn on silty or muddy substrates, thus inhibiting successful reproduction.

Reductions in areal extent of Cuivre Island side channel habitat and slough habitat on Cuivre Island have been minor. However, the areal extent of the side channel between Cuivre and Turkey Islands has been reduced significantly. In addition, reduction of water depth within both side channels has been significant at some locations.

2. Lack of Deep Water in Cuivre Slough Side Channel: During the normally low pool conditions in winter, there is virtually no overwintering habitat (water depth greater than 8 feet) within the side channel. Low water and elevated water temperatures during the summer can also be stressful to aquatic resources.

3. Limited Water Control Capability on Cuivre Island: The potential for optimum habitat management on Cuivre Island is limited by inefficient water control management due to various factors, including a lack of protection from river flooding, the inability to dewater when the river is high, a lack of dedicated pumping equipment, existing pumping capacity that is too small, a sediment-choked water distribution system, an insufficient number of water control structures and water control structures that are in bad condition.

River flooding reduces the reliability of moist soil food plant production within the interior sloughs. The project area is unprotected from flooding by the Mississippi and Cuivre Rivers. At the present time, this is a problem only on Cuivre Island. For germination and growth of moist soil plants to occur, a gradual withdrawal of water from these sloughs is required during the late spring or summer. Flooding during this drying period interferes with food plant production, by either prohibiting seed germination, or drowning immature plants.

GOALS AND OBJECTIVES

The goals and objectives of this project are to meet the established management goals and to address the identified problems. The management goal is to restore riverine habitat diversity to benefit fish and wildlife species. Project objectives include: maintain and improve side channel habitat by preventing river-borne sediment from filling side channels, provide overwintering habitat for fish in side channels, increase habitat quality and quantity of artificially flooded habitats for wetland dependent wildlife, increase diversity of wetland types within the project area and maintain and improve habitat quality and quantity of bottomland forest within the project area.

PROPOSED PROJECT FEATURES

Project features designed to meet project goals and objectives include:

a. in the green tree reservoir, install a permanent pump, clean ditches, and install or replace water control structures on Cuivre Island,

b. provide wintering holes for fish by adding pairs of dikes in Cuivre Slough,

c. add two dikes at the upper end of Cuivre Slough by Phelan's Island to direct flow into Cuivre Slough,

d. remove a portion of the submerged dike in Cuivre Slough at Phelan's Island, mile 238.2(R),

e. timber stand improvement by creating small and scattered clearings over the entire forest on Cuivre Island,

f. reforestation of south and north cropland areas on Cuivre Island, and

g. a propwash experiment in the lower 1/3 of the chute between Cuivre Island and Turkey Island to resuspend and move sediment.

Habitat enhancements from these recommended management measures are estimated to provide a net gain of 825 annualized habitat units (AHU's) for wildlife and 411 AHU's for fishes. These AHU's are broken down by species in the enclosed Tables 1 and 2.

THREATENED AND ENDANGERED SPECIES

Federal Species

In our 1991 letter regarding the Cuivre Island HREP, the Service identified two federally-listed endangered species as possibly occurring within the project area. These are the bald eagle (*Haliaeetus leucocephalus*) and the gray bat (*Myotis grisescens*). New information indicates the federally endangered peregrine falcon (*Falco peregrinus*) and Indiana bat (*Myotis sodalis*) and the federally threatened decurrent false aster (*Boltonia decurrens*) either are presently known to occur in Lincoln or St. Charles counties or historically occurred there. There is no designated critical habitat in the project area at this time.

The bald eagle breeds and winters along major rivers and reservoirs. The locks and dams along the Mississippi River typically receive heavy winter usage. The eagles take advantage of the ice-free waters immediately below these structures for feeding on fish that are killed or stunned during passage through the gates. The St. Louis District established a winter eagle sanctuary about two miles north of the project area at Lock and Dam 25. The sanctuary is located on the Missouri shore, and includes Bradely Island adjacent to the lock and dam and Sandy Island and slough about one mile further north. Bald eagles also concentrate at Cap Au Gris Natural Area, about 1.5 miles north of the project area on the Illinois side. At the project area, eagles occasionally use large trees along the riverside of Cuivre Island as perching sites. An eagle night roost has recently been located on the north end of Cuivre Island. No bald eagle nests are located in the area at the present time.

With regard to the gray bat, this species roosts in suitable caves year-round. The nearest cave known to be used by gray bats is found in northern Jefferson County, at least 25 miles south of the project area. During warmer months, these bats forage at night for a variety of insects. Foraging occurs primarily over or near aquatic habitats, such as streams, rivers and reservoirs. Foraging can take place up to 12 miles or more from the roost. It is not known if the gray bat uses the project area as foraging habitat, but it is assumed that suitable foraging habitat exists.

The endangered Indiana bat historically occurred throughout much of Missouri. Optimum habitat for the bat consists of the riparian and floodplain corridors of small streams, perennial and intermittent. The riparian forest is essential to the foraging and reproductive habits of the bat. The bat will utilize rough or exfoliating bark of live trees or the loose bark of dead trees to roost and to form maternity colonies. Upland forests and cropland areas are also utilized for foraging and roosting. Caves and abandoned mines are used for wintering habitat. To avoid impacting this species, it is recommended that clearing of trees that provide suitable roosting habitat be prohibited between May 1 and August 31.

Habitat for the peregrine falcon is described as open country along large rivers, lakes and coastlines. High cliffs are used as nest sites. Eggs are laid in nests on a shelf or in a recess of a high cliff or bluff, usually overlooking water. No nesting sites are known to occur on the project area.

The decurrent false aster can be found in wetland habitats, particularly the disturbed alluvial soils associated with floodplains. No populations are known to occur in the project area.

An in-depth analysis of the project area will be needed to determine potential impacts to federally listed threatened or endangered species and a determination of effect made by the Corps.

State Species

Missouri has listed at the state level several species as either endangered or rare with current or historical distributions that include the project area. Those that currently inhabit the vicinity of the project area include the western fox snake (*Elaphe vulpina*), which prefers natural marshes, and the great egret (*Casmerodius albus*), which inhabits a rookery on an island immediately east of the project area. Species that are known historically from the environs of the project area include two that prefer marshes-the eastern massasauga (*Sisturus catenatus*), a rattlesnake, and the king rail (*Rallus elegans*), a bird in the crane family. The alligator gar (*Lepisosteus spatula*), a riverine fish, is also known historically from this vicinity of

the Mississippi River. The eastern massasauga is being considered for possible addition to the federal list of endangered and threatened species.

METHODOLOGY

Cuivre Island wildlife and fishery habitats were analyzed by using the Wildlife Habitat Appraisal Guide (WHAG) and Fish Habitat Appraisal Guide (FHAG). Existing conditions, future without project conditions and future with project conditions were examined. This analysis employed an interagency team with team members representing the Corps, MoDOC and the Service.

The WHAG and FHAG analyses produce a rating of habitat quality for each respective habitat type. This rating is referred to as a Habitat Suitability Index (HSI). The HSI, a value ranging from 0.1 to 1.0, measures the existing and future habitat conditions compared to optimum habitat. This value, when multiplied by the available habitat within the project area, will provide a measure of available habitat quality and quantity known as habitat units (HU).

Each analysis includes limiting factors in each matrix. Absence of critical life requisites for a particular species makes the habitat unsuitable and results in a HSI value of 0.1 regardless of other habitat characteristic scores. Average annual habitat units (AAHU's) for each species were calculated to reflect expected habitat conditions over a 50-year project life.

FUTURE WITHOUT PROJECT CONDITIONS

A number of assumptions were made about what the project area and vicinity would be like 50 years in the future without any project. The chief assumption was that Pool 26 would continue to be managed as it is now and that there would be no change in normal pool elevation. With regard to the adjacent floodplain, it was assumed that landuse surrounding the project area would remain essentially the same - predominantly cropland, with remnants of terrestrial and aquatic natural communities. Available annualized habitat units for the project area are projected to be low for all evaluated fish species (Table 2). A portion of the projected annualized habitat units for wildlife species (Table 1) are derived from the conversion of aquatic habitat to terrestrial habitat due to sedimentation.

Cuivre Slough side channel

The overall loss of side channel habitat is expected to be about 99 of 162 existing acres, with 63 existing acres remaining. Sediment carried by the Mississippi River would initially close off the upper entrance of the side channel and then the entire 76 acre upper half of the side channel (that portion upstream of the confluence with Cuivre River) would close up. Aquatic habitat remaining in this section of the side channel would be limited to a series of isolated pools, connected only during the times when the Mississippi or Cuivre Rivers are high.

With no flow from the Mississippi River coming down the side channel at low to normal pool conditions, two changes would occur to the lower half of the side channel (that portion downstream of the confluence of Cuivre River). First, about 23 acres of the lower portion of the slough are expected to fill with sediment. Second, average channel depth in the lower side channel would become reduced due to deposition of sediment carried by Cuivre River. This sediment is periodically flushed out the side channel today by Mississippi River flows passing through the entire side channel.

Turkey Island Chute or side channel

Sediment carried by the Mississippi River would close up this area. In 50 years, the existing 30 acres of open water would be converted to terrestrial habitat and the entire side channel would be covered by forest composed of willow, silver maple and cottonwood.

FUTURE WITH PROJECT CONDITIONS

Bottomland Forest

Construction activities will result in the loss of 20 acres of bottomland forest on Cuivre Island. Fourteen acres will be used as disposal areas and access roads during ditch cleanout and six acres for enlargement of existing ditches and the creation of a new ditch. This impact will be offset by converting 110 acres of cropland on Cuivre Island to bottomland forest by tree planting. This conversion will occur over a 50-year period, with 20 percent of the 110 acres planted every 10 years.

The structural improvements for better green tree reservoir management on Cuivre Island will not lead to flooding during the growing season. Flooding will still be targeted for the nongrowing or winter season when trees are dormant. The area covered by water up to two feet deep, which is generally the range of depth preferred by migrating waterfowl, will increase from 61 to 280 acres.

Timber stand improvements in bottomland forest, consisting of selective tree clearings, are expected to slightly modify the composition of the plant community. Selective tree clearings will involve the removal of trees within an 8 acre area (or greater) per every 100 acres of forest to create light gaps in the forest canopy. Within these small clearings, shade intolerant tree species, such as pin oaks, will be able to reproduce. The overall effect of selective tree clearings will be to increase the likelihood of their regeneration. The overall effect of selective tree clearings will be to increase the abundance of hardwood, mast producing species within the forest. Ground cover in these forest openings will develop and will include a variety of herbaceous species not common under the tree canopy.

Sloughs

The interior sloughs on Cuivre Island and the old oxbow of Cuivre River on the mainland will not be physically altered by the project. On Cuivre Island, the ditch cleanout work and gravity drain improvements will allow for the drainage of interior sloughs to create mud flats and implement moist soil management.

Cropland

Of the 188 acres of cropland within the project area, 110 acres on Cuivre Island will be lost to replanting of bottomland hardwoods. Raising the elevation of the green tree reservoir from 426 to 429 feet NGVD will not lead to the seasonal flooding of additional cropland. Cropland not affected by the project will remain planted in small grains.

Side Channel Habitat

Construction of the two dikes at the upper mouth of Cuivre Island side channel and removal of the submerged dike remnant are expected to prevent the upper half of the side channel from closing due to the deposition of river-borne sediment. These structural improvements are expected to cause incoming sediments to pass down through and exit the side channel. Rather than lose

90 acres of side channel habitat within the next 50 years, the project is expected to maintain the current 160 acres of aquatic habitat.

Propwash dredging of the side channel between Cuivre and Turkey Islands will keep 16 acres of this 70 acre area open as backwater habitat. Aquatic vegetation in both side channels is expected to remain sparse.

DISCUSSION AND RECOMMENDATIONS

The project as proposed will result in a net gain of 389 AHU's for target wildlife species (Table 1) and 316 AHU's for target fish species (Table 2). In addition, substantial benefits for nontargeted species will also be derived. The project will provide 436 AHU's for nontarget wildlife species (Table 1) and 95 AHU's for nontarget fish species (Table 2). The Canada goose is expected to lose 13 AHU's with project implementation. However, the project area presently is not an important Canada goose use area and the loss of these AHU's is not anticipated to negatively affect this species.

The MoDOC has expressed some concern regarding the two dikes to be constructed at the upper end of Cuivre Slough by Phelan's Island. The purpose of these features is to restore additional flow to the Cuivre Island side channel. One dike will angle riverward from the upper end of Phelan's Island to capture and divert more flow down the chute. The other is a dike extending from the mainland toward the upper end of Phelan's Island. This is the dike of concern. While there will likely be some scour off the end of the structure, the overall net effect may be to further reduce flow down the chute. This structure may also act as a sediment trap at the mouth of the chute.

Therefore, the Service and MoDOC recommend a phased approach to this component. The first phase would be removal of the closing structure and construction of the angled dike off Phelan's Island to capture and divert more flow down the chute. We could then wait and monitor what happens. Construction of the perpendicular dike across much of the upper end of the chute could occur at a later date.

Thank you for the opportunity to provide this draft report. A final report will be prepared after further coordination with MoDOC and review of planning documents.

Sincerely,

Thomas M. Groutage

Thomas M. Groutage
Assistant Field Supervisor

Enclosures

cc: MoDOC (Stucky, Farabee, Dalrymple, Brummet)
USFWS (Bornstein, Hansen, Surprenant)
USEPA (Mulder)

Enclosure

TABLE 1: Projected habitat effects (in annualized habitat units) on wildlife species derived from all proposed management measures.

Species	Future Without Project	Future With Project	Net Change
Target Species			
Mallard	346	553	+207
Wood Duck	999	1181	+182
Subtotal	1345	1734	+389
Nontarget species			
Green-backed Heron	962	1142	+180
Beaver	966	1168	+202
Northern Parula	1147	1205	+58
Prothonotary Warbler	1333	1339	+6
Canada Goose	49	36	-13
Least Bittern	2	2	00
Lesser Yellowlegs	2	2	00
Muskrat	4	7	+3
King Rail	5	5	00
American Coot	2	2	00
Subtotal	4472	4908	+436
TOTAL AHU	5817	6642	+825

Enclosure

TABLE 2: Projected habitat effects (in annualized habitat units) on fish species derived from all proposed management measures.

Species	Future Without Project	Future With Project	Net Change
Target Species			
Gizzard Shad	53	176	+123
Catfish	50	155	+105
Carp	41	129	+88
Crappie	35	35	00
Subtotal	179	495	+316
Nontarget Species			
Black Bullhead	47	142	+95
Largemouth Bass	35	35	00
Bluegill	35	35	00
Subtotal	117	212	+95
TOTAL AHU	296	707	+411

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
Denver Federal Center, Building 56, Room 1003
P.O. Box 25007 (D-108)
Denver, Colorado 80225-0007

June 10, 1994

ER 94/371

Colonel Thomas C. Suermann
District Engineer
U.S. Army Corps of Engineers
St. Louis District
1222 Spruce Street, Room 4.300
St. Louis, Missouri 63103-2833

Dear Colonel Suermann:

The Department of the Interior (DOI) has reviewed the Draft Definite Project Report (DPR) for the Cuivre Island Habitat Rehabilitation and Enhancement Project with Integrated Environmental Assessment and Draft Finding of No Significant Impact, dated March 1994. The objective of the project is to restore habitat diversity to benefit fish and wildlife species by (1) maintaining and improving side channel habitat by preventing river-borne sediment from filling side channels; (2) providing overwintering habitat for fish in side channels, increasing quality and quantity of artificially flooded habitats for wetland-dependent wildlife; (3) increasing diversity of wetland types; and (4) maintaining and improving habitat quality and quantity of bottomland forest within the project area.

The subject document provides an appropriate description of the site, the proposed work, and assessment of anticipated impacts. The recommended plan consists of seven measures: (1) improvements to the green tree reservoir on Cuivre Island, (2) construction of six pairs of dikes in Cuivre Slough, (3) construction of a pair of dikes at the upper point of Phelan's Island, (4) removal of a portion of a submerged dike in Cuivre Slough, (5) tree stand improvements, (6) reforestation measures on Cuivre Island, and (7) propwash dredging of Turkey Island chute. These habitat enhancement measures are estimated to provide a net gain of 825 Average Annual Habitat Units (AAHU's) for wildlife and 410 AAHU's for fishes. The DOI supports construction of the project as proposed and provides the following comments and recommendations.

Threatened and Endangered Species

In order to avoid any potential impacts upon the Indiana bat (Myotis sodalis), no clearing of trees that may provide suitable roosting habitat should occur between May 1 and August 31. If this restriction is adhered to, we would concur with your determination that the proposed project is not likely to

adversely affect any known Federally listed threatened or endangered species. This precludes the need for further action on this project as required under Section 7 of the Endangered Species Act of 1973, as amended. Should the project be modified, or new information indicate endangered species may be affected, consultation should be initiated with the appropriate field office.

Other Fish and Wildlife Resources

DOI notes that the Missouri Department of Conservation (MODOC) has dropped the marsh construction component from the proposed project due to the high projected development cost. This particular component would have provided substantial habitat benefits for a variety of migratory birds, as well as resident wildlife. Creating marsh type habitat would also help meet the overall project objective of increasing the diversity of wetland types within the project area. Therefore, we would support the construction of this project feature at a later date, should the MODOC decide to do so.

As described in Table 9 on Page 42, operation and maintenance of Management Measure 15 would consist of the periodic cutting of woody vegetation that has regrown in the clearings. However, it is our understanding that the purpose of the small and scattered clearings is to regenerate mast-producing trees and improve forest species abundance and diversity. If this is the case, it needs to be made clear in the table that only non-mast producing trees would be periodically removed from these clearings to reduce competition with the mast producing species.

We appreciate the opportunity to review this Draft DPR and provide these comments.

Sincerely,

Robert F. Stewart

Robert F. Stewart
Regional Environmental Officer

Appendix G - Endangered Species Documentation

This appendix provides the list of Federally threatened and endangered species which may occur in the area of the proposed project, and the St. Louis District's biological assessment for these species.

The USFWS's concurrence with this assessment is included in Appendix F.

FEDERALLY ENDANGERED SPECIES: BIOLOGICAL ASSESSMENT.

a. Introduction. This Biological Assessment evaluates the environmental effects of the habitat rehabilitation and enhancement at Cuivre Island on Federally endangered and threatened species. In compliance with Section 7(c) of the Endangered Species Act of 1973, as amended, the St. Louis District requested that the U. S. Fish and Wildlife Service (USFWS) provide a listing of Federally threatened or endangered species, currently classified or proposed for classification, that may be found in the project area. The USFWS, in a letter dated September 9, 1991, and in the draft Fish and Wildlife Coordination Act Report dated April 26, 1994, provided the following list:

Common Name	Scientific Name	Classification	Habitat
Bald eagle	Haliaeetus leucocephalus	Endangered	Winters along major rivers and reservoirs
Gray bat	Myotis grisescens	Endangered	Caves
Peregrine falcon	Falco peregrinus	Endangered	Open country along large rivers, lakes, coastlines
Indiana bat	Myotis sodalis	Endangered	Caves and riparian
Decurrent false aster	Boltonia decurrens	Threatened	Disturbed alluvial soils of floodplains

There is no designated critical habitat in the project area at this time for any of these five species.

b. Bald Eagle. This large bird is a common winter inhabitant of the major river systems of Illinois and Missouri. As winter arrives on the breeding grounds of northern Alaska and Canada, deep snows and sub-freezing temperatures cause waterways to become icebound. This reduces the availability of fish, the preferred food of the Bald eagle. Eagles respond to this annual paucity of food by migrating south to milder climates and more accessible food sources. Eagles winter as far north as open water and food permit.

The locks and dams along the Mississippi River typically receive heavy winter usage. The eagles take advantage of the ice-free waters immediately below these structures for feeding on fish that are killed or stunned during passage through the gates. The St. Louis District established a winter eagle sanctuary about two miles north of the project area at Lock and Dam 25. The sanctuary is located on the Missouri shore, and includes Bradley Island adjacent to the lock and dam, and Sandy Island and slough about one mile further

north. Bald eagles also concentrate at Cap Au Gris Natural Area, about 1.5 miles north of the project area on the Illinois side.

Havera, Crompton, and Bellrose (1984) summarized the results of 13 years (1972-1984) of aerial censusing of wintering Bald eagles for the Mississippi River from Rock Island to St. Louis. Aerial counts were conducted weekly from early October to mid-December, once in early to mid-January, and weekly from late February to mid-April. Eagles generally arrived during the period October 8 to 28. The average number of eagles observed weekly peaked in mid-December, and stayed elevated through mid-February. By late February, the average weekly counts declined. No eagles were observed after April 20.

According to Dunstan, Ives, and Harper (1982), there are three types of impacts to wintering eagles: destruction or harm to the source of food on the wintering site, destruction of eagle wintering habitat, and disturbance of daily eagle behavior.

Food Source. Eagles feed primarily upon fish, but also eat waterfowl and other birds, as well as carrion. To feed upon fish, eagles concentrate around areas of open water. During cold weather, open water on rivers is often found immediately below dams; portions of channels may stay open naturally, such as at the confluence of tributaries, or by the repeated passage of tows. The project is not expected to impact food sources.

Habitat. Eagles use perch trees at night for roosting, and during the day for foraging (searching for food), feeding (consuming food), and resting (neither foraging or feeding). Dunstan, Ives, and Harper (1982) and Harper (1983) reported that trees used as foraging perch sites are 1) located along the shoreline (ideally adjacent to open water), and usually lean out toward the water or have limbs which jut out over the water, 2) are most often cottonwoods, and 3) are taller than adjacent trees. These authors state that foraging perches may sometimes serve as feeding perches, but preferred feeding perches consist of silver maples with dense branches which are located away from the shoreline; the use of such trees apparently reduces the chances of food being pirated by other eagles. During the day eagles may rest at foraging perches, but they may use other trees located away from the shoreline. Harper (1983) documented the existence of daytime resting trees and a night roost on islands in the vicinity of Lock and Dam 24 at Clarksville, Missouri, about 30 miles to the north of the project site. He also observed eagles resting in trees on top of bluffs near the lock and dam.

At the project area, it is likely that eagles sporadically use some large trees along the riverside of Cuivre Island as perching sites during foraging activities. Eagles also rest in trees at two known sites on the island, which are presumed to be night roosts. It is not known if eagles consistently use these resting sites from year to year.

There is a potential for habitat disturbance in the form of tree clearing. This will be largely confined to the interior of Cuivre Island. Here, earthen material obtained during ditch cleanout or construction will be placed in disposal areas that are now timbered; twenty acres of forest will be cleared for this operation. Likewise, ten 8-acre tree clearings will be

created within the island's forest to promote regeneration of mast tree species. A small number of trees along the Mississippi River will be cleared at the location of the pump station. A few trees will also be cleared on the island side of Cuivre Slough to construct the six dikes. The loss of these trees is unlikely to adversely affect suitable perching sites, as these are not in limited supply in the vicinity of the project site. However, there is the potential for tree clearing to affect the night roosts.

It is important to note that the trees making up the two night roosts may have been killed by the flood of 1993. The flood killed about 60 percent of all trees on the island. If the night roost trees are dead or dying, they may no longer be suitable to eagles. The two roosting sites will be monitored to determine survivorship.

Eagle Disturbance. Although Bald eagles concentrate in large numbers in the winter near human activities, most observations indicate that certain types of human activities within certain distances will cause Bald eagles to leave an area. Stalmaster and Newman (1978) reported that high human activity, such as that occurring frequently in the sight of eagles, caused the birds to use less suitable habitat. They report that feeding behavior was the most sensitive activity observed. Activities directly on the channel of the river, such as boating and fishing, were most disturbing if the activities did not regularly occur there. Harper (1983) reported disruptions of daily activities of eagles at Lock and Dam No. 24 by hunters, fishermen in watercraft, and aircraft. If eagles are disturbed while on a feeding ground, they usually fly to nearby perch sites and do not resume feeding for long periods (Stalmaster, 1976).

The proposed habitat enhancement work at Cuivre Island may occur in part during the winter months when eagles are present. There is the potential that construction activities could disturb eagles using the night roosts, and prevent them from using them. Any disturbance by the proposed work to eagles sporadically feeding or perching in trees along or near the edge of the island is expected to be short term.

c. Gray bat. The habitat requirements, distribution, and natural history of this species are understood in only general terms, and details concerning the gray bat in Missouri are few. Gray bats roost in suitable caves year-round. In Missouri, they hibernate during winter in several caves found in the southern third of the state. In the spring, females leave these hibernacula and migrate to summer caves scattered over half of the state. Some males stay at the winter hibernacula year-round, others also migrate in the spring to the areas where the females go to, but the location of most males during the summer has yet to be discovered. Pregnant females give birth and raise young in maternity caves, and males and nonreproductive females use roosts separate from the maternity caves. A summer colony of gray bats, made up of females with young, males, and nonreproductive females, inhabits several roosting caves dispersed along up to 40 miles of river border or reservoir edge. During the warmer months, these bats forage for a variety of insects. Foraging occurs primarily over the water surface of aquatic habitats such as streams, rivers, and reservoirs,

but it can also occur in forest canopy along these aquatic habitats. Foraging can take place up to 12 miles or more from the roost (USFWS 1982, Clawson 1988).

There are no caves within the project area. Known, active maternity caves in Missouri that are closest to the project area are in eastern Ralls County (about 40 miles to the northwest), and in northern Franklin County (about 60 miles to the southwest) (Clawson, 1988). Winter or summer roosts of the gray bat will not be affected.

It is not known if the gray bat forages in the project area, but it appears that suitable foraging habitat exists. Daytime construction activities would not affect these nocturnal bats. If the gray bat forages within the project area, the project is not expected to adversely affect foraging habitat.

d. Peregrine Falcon. The peregrine falcon used to nest in Illinois and Missouri, primarily on bluffs along major rivers, such as the Mississippi. Eggs are typically laid in nests on a shelf or in a recess on the bluff or high cliff, usually overlooking water. Bohlen (1989) states that DDT poisoning, habitat loss, human disturbance, and indiscriminate shooting were the primary reasons for its disappearance by the mid-1960s as a breeding bird in Illinois and the eastern U.S.

This bird of prey is an uncommon migrant and rare winter resident along major rivers and lakes in Missouri and Illinois (Bohlen 1989, Wilson 1984). The species has been reintroduced in the St. Louis area where it nests on the tops of tall buildings. Recently, the peregrine falcon was reintroduced at the St. Louis District's Riverlands Environmental Demonstration Area adjacent to the Melvin Price Locks and Dam, near Alton, Illinois. The intent of this effort is to establish a locally breeding population. No nesting sites are known to occur within the project area, which lies about 25 miles to the west of the lock and dam.

In cities, peregrine falcons prey primarily on pigeons, whereas in rural areas, they frequent areas used by waterfowl and shorebirds (Bohlen 1989, Wilson 1984). Given that migrating waterfowl and shorebirds pass through the Pool 26 area during fall and spring, it is likely that Cuivre Island and its vicinity serves as migrational habitat for the peregrine falcon. The proposed project will not affect this species in terms of migrational habitat.

e. Indiana Bat. In the central and southern portions of the eastern United States, Indiana bats (Myotis sodalis) hibernate during the winter in caves and mines (hibernacula) with cool and stable temperatures throughout the winter (Brady et al., 1983). Only seven hibernacula support about 85 percent of the entire known population (Brady et al., 1983). Two mines and 11 caves have been designated as critical winter habitat by the U.S. Fish and Wildlife Service. Although seven of these hibernacula occur in Missouri and Illinois, none of these are near Cuivre Island. The most serious known cause of decline of the Indiana bat is human disturbance of hibernating bats (Clawson, 1987). Because there are no hibernacula in the project area, the proposed habitat rehabilitation work will not impact winter hibernating habitat of the Indiana bat.

In general, Indiana bats disperse from hibernacula in the spring and migrate to summer habitat in midwestern and eastern United States. They are entirely insectivorous. Clawson and Titus (1988) reviewed food habitat studies and determined that this bat preys upon insects from eight or more orders. These include (in order of preference): Lepidoptera (moths), Coleoptera (beetles), Diptera (flies and mosquitos), Trichoptera (caddis flies), Plecoptera (stone flies), Homoptera (aphids and scale insects), Neuroptera (lacewings), and Hymenoptera (bees, wasps, and ants). The bat's foraging strategy is apparently dependent upon prey availability - when preferred prey species are abundant, it will feed selectively, whereas the bat becomes opportunistic and feeds on a wider variety of prey items when the preferred ones are less abundant (Clawson and Titus, 1988).

In general, summer habitat requirements are not well known. Foraging habitat usually consists of the tree canopy of riparian and upland forest, but this bat may also feed along forest edges and over old fields and pastures (Clawson and Titus, 1988). During the warm months, female Indiana bats give birth to young. Brady et al. (1983) stated that maternity colonies are established mostly in riparian and flood plain areas of small to medium-sized streams. However, Gardner (1990) recently discovered a maternity roost on an island in the Mississippi River near Quincy, Illinois. Such colonies are usually formed under the loose bark of dead trees, but they can be found under the loose bark of live trees, or in tree cavities. Potential roost trees must also be at least 9 to 10 inches in diameter at breast height (Hofmann, 1994). Tree species known to be used for roosting in Illinois include silver maple, cottonwood, shingle oak, slippery elm, northern red oak, butternut hickory, sassafras, shagbark hickory, sugar maple, post oak, and white oak (Gardner, Hofmann, and Garner, 1988, 1989). Not every tree with loose bark or cavities provides the microclimate of a suitable roost; probably only a small portion of such trees possess the properties required to shelter maternity colonies from weather extremes (hot temperatures, early freezes, extended periods of rain, etc.) (Gardner, 1990). Recent studies of summer habitat use indicate that wooded uplands may be used more extensively for rearing of young than has been previously known (Clark, Bowles, and Clark, 1987; Clawson, 1987; Gardner, Hofmann, and Garner, 1989).

Studies of banded Indiana bats indicate they may return to the same summer locality in successive years. However, an individual tree may serve as a roost for only a relatively short time, perhaps 6 to 8 years. Thus, the bats seem to have the behavioral flexibility to move their homesite every few years, probably to nearby trees that permit them to use the same general foraging area (Humphrey, Richter, and Cope, 1977).

Essentially all of Illinois and Missouri are within the known and suspected range of the Indiana bat (Brady et al., 1983; Clawson and Titus, 1988). The species apparently has not been found in St. Charles and Lincoln Counties, Missouri, but has been encountered in the nearby Illinois Counties of Pike, Madison, and Monroe (Gardner, Hofmann, and Garner, 1989), which range from 30 to 50 miles away.

According to Gardner (1990), Indiana bats probably use the flood plain forests of large rivers such as the Mississippi as summer habitat, including that found at the project site. For this project, it is reasonable to assume that the species does use Cuivre Island and vicinity as foraging and maternity roost habitat. The proposed habitat rehabilitation work will involve the clearing of bottomland forest for the construction of some project features, including forest clearings. Trees to be cleared include potentially suitable roosting trees.

f. Decurrent False Aster. The following information is taken from Keevin et al. (1990). The decurrent false aster (Boltonia decurrens), a perennial plant of the Aster family, is endemic to Illinois and Missouri. Its historical range includes a 400 km segment of the Illinois and Mississippi River floodplain extending from LaSalle, Illinois to the vicinity of St. Louis, Missouri. It is not known to occur at the project site. In 1989, the species was found on the Mississippi River floodplain in St. Clair County, Illinois, and in St. Charles County, Missouri, to the south and east of the project site. Its historical distribution also includes Lincoln County, Missouri, to the immediate north.

This tall, bushy plant usually grows to a height of 1.5 meters, but sometimes exceeds 2 meters. From August to October it produces aster-like flower heads about the size of a quarter-dollar. The flower consists of yellow disks 7-14 mm wide, and white to pale violet rays about 1-1.8 cm long. The leaves, narrow and elongated, are about 5-15 cm long and about 5-20 mm wide. The leaves are decurrent - the base of each leaf extends downward along the stem to which it is attached. B. decurrens reproduces both vegetatively (asexually) by producing basal shoots, and sexually by producing seeds.

The decurrent false aster grows in open wetland habitats, and it appears to require abundant light. Historical collection data indicates that this species once inhabited the shores of lakes and the banks of streams. Although it grows in these habitats today, it is most common in disturbed lowland areas where it appears to be dependant on human activity for survival. The species' decline appears to be caused by habitat destruction and modification: drainage of natural lakes, wet prairies and marshes with conversion to crop land; alteration of natural flood regimes by man-made levee systems; and high rates of silt deposition upon floodplains. Other threats to its existence may include such agricultural practices as discing and the use of herbicides for weed control. However, almost all currently known populations are found in open habitats that are kept free of woody vegetation by occasional cropping. It is also believed that prolonged flooding during the growing season can limit natural reproduction and survival.

The project will not affect the decurrent false aster.

g. Efforts to Eliminate Adverse Impacts on Species and Habitats.

(1) Bald Eagle. To avoid impacts to the bald eagle, the St. Louis District will place special conditions on the contracted work as follows. The contracting officer will ensure appropriate compliance.

(a) The two night roosts on Cuivre Island will be avoided during tree clearing operations. A buffer zone of 500 feet will be established around these sites within which no trees can be felled.

(b) No construction work or activity located within 500 feet of the two night roosts on Cuivre Island will occur during the day or night while eagles are present and using the roosts. Such work will be postponed until spring when they leave the area.

(2) Indiana Bat.

The felling of trees greater than 9 inches diameter at breast height will be scheduled during September through April, which is outside the period May 1 - August 31, when Indiana bats are known to inhabit summer habitat. If for any reason clearing of trees greater than 9 inches diameter at breast height has to be carried out during the period May 1 - August 31, a site visit will be conducted first by a team of biologists to determine if any roost trees are among those proposed to be felled. The team will consist of representatives from the Missouri Department of Conservation, U. S. Fish and Wildlife Service, and St. Louis District. The District will enter into formal consultation with the U. S. Fish and Wildlife Service if removal of a roost tree during the period May 1 - August 31 is proposed.

h. Conclusions. It is the St. Louis District's conclusion that the habitat rehabilitation of Cuivre Island, in conjunction with the described measures to avoid impacts to the Bald eagle and Indiana bat, will have no effect on Federally endangered or threatened species or their critical habitat.

Appendix H - Farmland Protection Policy Act Documentation

According to the Soil Conservation Service, the proposed project does not require compliance with the Farmland Protection Policy Act.

United States
Department of
Agriculture

Soil
Conservation
Service

Parkade Center, Suite 250
601 Business Loop 70 West
Columbia, Missouri 65203

PD-AE

May 12, 1994

RE:
St. Charles & Lincoln Counties, Missouri
Habitat Rehabilitation and Enhancement Project
Cuivre Island
Farmland Conversion Impact Rating

Owen D. Dutt
Chief, Planning Division
Department of the Army
St. Louis District, Corps of Engineers
1222 Spruce Street
St. Louis, MO 63103-2833

Dear Mr. Dutt:

The farmland conversion impact rating for the site referenced above is attached.

Sincerely,

BRUCE W. THOMPSON
State Soil Scientist

Attachment

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*		Date Of Land Evaluation Request: 28 February 1994
Name Of Project: Cuivre Island Habitat Enhancement & Rehabilitation		Federal Agency Involved: U.S. Army Corps of Eng., St. Louis
Proposed Land Use: existing wildlife mgmt. (crops) to proposed wildlife mgmt. (forest)		County And State: St. Charles & Lincoln Cos., Missouri
PART II *(To be completed by SCS)*		Date Request Received By SCS: 3-4-94
Does the site contain prime, unique, statewide or local important farmland? *(If no, the FPPA does not apply — do not complete additional parts of this form).*	Yes ☐ No ☒	Acres Irrigated: — / Average Farm Size: —
Major Crop(s)	Farmable Land In Govt. Jurisdiction: Acres: %	Amount Of Farmland As Defined in FPPA: Acres: %
Name Of Land Evaluation System Used	Name Of Local Site Assessment System	Date Land Evaluation Returned By SCS: 5-12-94

PART III *(To be completed by Federal Agency)*	Alternative Site Rating: Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	76	34		
B. Total Acres To Be Converted Indirectly	0	0		
C. Total Acres In Site	76	34		
PART IV *(To be completed by SCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland				
B. Total Acres Statewide And Local Important Farmland				
C. Percentage Of Farmland In County Or Local Govt. Unit To Be Converted				
D. Percentage Of Farmland In Govt. Jurisdiction With Same Or Higher Relative Value				
PART V *(To be completed by SCS)* Land Evaluation Criterion Relative Value Of Farmland To Be Converted *(Scale of 0 to 100 Points)*				

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(These criteria are explained in 7 CFR 658.5(b)*)	Maximum Points	Site A	Site B	Site C	Site D
1. Area In Nonurban Use					
2. Perimeter In Nonurban Use					
3. Percent Of Site Being Farmed					
4. Protection Provided By State And Local Government					
5. Distance From Urban Builtup Area					
6. Distance To Urban Support Services					
7. Size Of Present Farm Unit Compared To Average					
8. Creation Of Nonfarmable Farmland					
9. Availability Of Farm Support Services					
10. On-Farm Investments					
11. Effects Of Conversion On Farm Support Services					
12. Compatibility With Existing Agricultural Use					
TOTAL SITE ASSESSMENT POINTS	160				
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland *(From Part V)*	100				
Total Site Assessment *(From Part VI above or a local site assessment)*	160				
TOTAL POINTS *(Total of above 2 lines)*	260				

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? Yes ☐ No ☐

Reason For Selection: This item does not require an AD 1006.

(See Instructions on reverse side)

Form AD-1006 (10-83

Appendix I - Final Management License

and

Final Operational Management Plan Regarding the Mitigation Agreement

The Management License grants the State of Missouri, Missouri Department of Conservation (MDOC) the rights to use and occupy the Federally-owned portion of Cuivre Island for fish and wildlife enhancement purposes.

The Operational Management Plan explains stewardship land management goals, objectives and actions necessary to meet statutory and regulatory requirements for the Federal property on Cuivre Island acquired to mitigate for the loss of wildlife habitat at another project.

DEPARTMENT OF THE ARMY LICENSE

FOR FISH AND WILDLIFE ENHANCEMENT PURPOSES

CUIVRE, ISLAND, MISSOURI

THE SECRETARY OF THE ARMY, under the authority of Section 4 of the Act of Congress approved 22 December 1944, as amended, (16 United States Code, Section 460d), the Fish and Wildlife Coordination Act (16 United States Code, Section 661, et seq), and Title 1 of Public Law 95-502, Replacement of Locks and Dam 26; Upper Mississippi River System Comprehensive Master Management Plan, Section 102 (b), hereby grants to the STATE OF MISSOURI, DEPARTMENT OF CONSERVATION, hereinafter referred to as the Licensee, a license to use and occupy for fish and wildlife enhancement purposes approximately 862.3 acres of land, water and improvements thereon under the primary jurisdiction of the Department of the Army, known as Tract No. 300, as shown in red on Exhibit "A", and more particularly described in Exhibit "B" part 1 attached hereto and made a part hereof and hereinafter referred to as the mitigation land, at Cuivre Island, Missouri. This license also includes the right of ingress and egress across Government Tract No. 300-E comprising approximately 4.27 acres of land also shown in red on Exhibit "A" and more particularly described in Exhibit "B" part 2 also attached hereto and made a part hereof.

THIS LICENSE is granted subject to the following conditions:

1. TERM

a. That the term of this license shall be for a period of twenty-five (25) years commencing on 15 April 1994 and ending on 14 April 2019.

b. The parties understand that this license may change under renewals hereof or may be amended from time to time as may be necessary, with such terms and conditions as the parties may agree upon to reflect current policies and conditions.

2. USE AND DEVELOPMENT OF THE MITIGATION LANDS

a. It is the intent of the parties that the Licensee will utilize the mitigation land in accordance with the provisions of Title 1 of Public Law 95-502, Replacement of Locks and Dam 26; Upper Mississippi River System Comprehensive Master Management Plan, Section 102 (b).

b. That the Licensee shall utilize the mitigation land for fish and wildlife enhancement purposes as outlined in this license, in accordance with the Project Master Plan, and in accordance with the Project Operational Management Plan, see EXHIBIT "C" attached hereto and made a part hereof, and in accordance with other plans to be undertaken by the Licensee or jointly by the Corps of Engineers and the Licensee and mutually agreed upon between the parties hereto and approved by the District Engineer, who has the responsibility for the administration of the property licensed herein. As used herein, the term "District Engineer" shall mean the District Engineer, U.S. Army Engineer District, St. Louis and his duly authorized representatives.

c. That the Licensee shall enforce the fish and game laws and such orders and regulation as may be issued by the Missouri Department of Conservation and/or its Director, which laws, orders and regulations are consistent with its state-wide program.

d. That the Licensee may take, trap, remove, stock or otherwise control all forms of fish and wildlife within the mitigation land, and may place therein such additional forms of fish and wildlife from time to time, and may close the area, or any parts thereof from time to time, to fishing, hunting or trapping, provided that the closing of any area to such use for fishing, hunting or trapping shall be consistent with the state laws for the protection of fish and wildlife and in accordance with plans approved by the District Engineer.

e. That the Licensee may construct upon the mitigation lands such buildings, improvements, facilities, accommodations, fences, signs and other structures as may be necessary for the purpose of this license, and may plant seeds, shrubs and trees, provided that all such improvements shall be constructed and the landscaping accomplished in accordance with plans approved by the District Engineer.

f. That any sales of timber from the mitigation land will be conducted by the District Engineer.

g. That the United States shall not be responsible for damages to property or injuries to persons which may arise from, or be incident to, the exercise of the privileges herein granted, or for damages to the property or injuries to the person of the licensee's officers, agents, servants or employees, or others who may be on the premises at their invitation or the invitation of any one of them, arising from or incident to any governmental activities or operation on the mitigations land, and no claim or right to compensation shall accrue from such damages or injuries, and the Licensee shall hold the United States harmless from any and all such claims to the limits of its tort immunity.

3. INGRESS AND EGRESS

a. That ingress to and egress from the mitigation land shall be afforded the Licensee over existing access roads, such interior roads as may be constructed, and at such additional places over the mitigation land as approved by the District Engineer.

b. That the right is hereby expressly reserved to the United States, its officers, agents and employees, to enter upon the land and water areas of the mitigation lands, at any time and for any purpose necessary or convenient in connection with the purposes for which the mitigation land was acquired and with river and harbor and flood control work, and to remove therefrom timber, or other material, required or necessary for such work; to flood the mitigation lands when necessary; and/or to make any other use of the land as may be necessary. The Licensee shall exercise diligence in locating its facilities and improvements so they will not be subject to damage by Project operation and maintenance activities. To the extent practicable, the Licensee will be given advance notice of any activities which could affect the licensee's facilities, improvements and operations.

4. PUBLIC ACCESS

a. That the District Engineer will be responsible for the management and maintenance of any system of public access roads and parking lots.

b. That any land or water areas of the mitigation land shall be open to the public use generally, without charge, for boating, fishing and other recreational purposes, and that ready access to and exit from the water shall be maintained for general public use, when such use is determined by the Secretary of the Army not to be contrary to the public interest. However, no use of any area shall be permitted which is inconsistent with the state laws for the management of fish and wildlife.

5. SUBJECT TO OTHER INTERESTS

a. That this license is subject to all existing and future easements, leases, licenses and permits heretofore granted or to be hereafter granted, by the United States concerning the mitigation land; provided, however, that upon appropriate notification by the Licensee to the District Engineer, the United States, insofar as may be consistent with other uses and purposes of the project, will not enter into any new easements, leases, licenses or permits, or renewals therefore, which will, in the opinion of the District Engineer, adversely affect the current operation of the Licensee under the provisions of the license, or which will conflict with the definitely scheduled program of the Licensee, for the performance of its activities which are authorized under the provisions of this license.

6. PROTECTION OF PROPERTY

a. That the Licensee may make and enforce such rules and regulations as are necessary, and within its legal authority, in exercising the privilege of fish and wildlife enhancement granted in this license, and to protect the mitigation land from fire, vandalism and soil erosion, provided that such rules and regulations are not inconsistent with those prescribed by the Secretary of the Army to govern the public use of the area.

b. That no cuts of fills along the shoreline will be made by the Licensee without the prior approval by the District Engineer.

c. That any property of the United States damaged or destroyed by the Licensee incident to the exercise of the privileges herein granted shall be promptly repaired or replaced by the Licensee to the satisfaction of the District Engineer.

d. That the District Engineer will maintain the boundary line as established by the District Engineer including the replacement of missing or vandalized monuments. The Licensee shall report any trespass activities, encroachments, and missing or vandalized monuments to the District Engineer.

7. ACCOUNTS AND RECORDS

a. The Licensee shall establish and maintain adequate records and accounts and render annual statements of receipts and expenditures in furtherance of its fish and wildlife enhancement program, and as otherwise may be reasonably required by the District Engineer. The District Engineer shall be furnished an annual copy of audits performed by the State of Missouri on the licensee's records and accounts for the mitigation land.

8. ASSURANCE OF NONDISCRIMINATION

a. That the Licensee shall not discriminate against any person or persons in the conduct of his operations hereunder, or exclude any person or persons from participation in any of its operations, programs, or activities conducted on the mitigation land because of race, creed, color, age, sex, handicap or

national origin. By acceptance of this license, the Licensee hereby gives assurance, as part of this licensee, that it will comply with the provisions of Title VI of the Civil Rights Act of 1964, as amended (42 United States Code, Section 2000d), and Department of Defense Directive 5500.11, 1971, issued pursuant thereto, as amended (32 Code of Federal Regulations part 300), and the Rehabilitation Act of 1973, as amended (29 United States Code, Section 794).

9. COMPLIANCE WITH APPLICABLE LAWS AND REGULATIONS

a. That the Licensee, in the exercise of the privileges hereby granted, shall conform to such rules and regulations as may be prescribed by the Secretary of the Army and the Chief of Engineers to govern the public use of the mitigation lands, and with the provisions of Title 1 of Public Law 95-502, Replacement of Locks and Dam 26; Upper Mississippi River System Comprehensive Master Management Plan, Section 102 (b).

b. That it is understood that the mitigation land is wholly within a floodplain and that it is hereby required that all operations and all construction on, or alteration of, the mitigation lands shall comply with applicable Federal, state or local laws, rules and ordinances governing land use in floodplains.

c. That the privileges hereby granted do not preclude the necessity of obtaining any permit which may be required by the provision of Section 10 of the River and Harbor Act approved 3 March 1899 (30 Statute 1151; 33 United States Code 403) and/or Section 404 of the Federal Water Pollution Control Act (Public Law 92-500: 86 Statute 816).

d. That the Licensee shall comply with all other applicable Federal laws and regulations and with all applicable laws, ordinances and regulations of the state, county and municipality wherein the mitigation land is located with regard to construction, health, safety, food service, water supply, sanitation, use of pesticides, and all other matters whether or not specifically cited or mentioned elsewhere herein.

10. ENVIRONMENTAL PROTECTION

a. That within the limits of their respective legal powers, and in furtherance of the purpose and policy of the National Environmental Policy Act of 1969 (Public Law 91-190, 42 United States Code 4321, 4331-4335) and Executive Order 11514, entitled: "Protection and Enhancement of Environmental Quality," March 5, 1970 (35 Federal Register 4247, March 7, 1970), the parties to this license recognize the importance of preservation and enhancement of the quality of the environment and the elimination of environmental pollution, the parties hereto shall protect the mitigation land against pollution of its air, ground, and water. The Licensee shall comply promptly with any regulation, conditions, or instructions affecting the activity hereby authorized if and when issued by the Environmental Protection Agency or any Federal, state, interstate, or local governmental agency having jurisdiction to abate or prevent pollution. The disposal of any toxic or hazardous materials within the licensed area is specifically PROHIBITED. Such regulations, conditions, or instructions in effect or prescribed by the Environmental Protection Agency, or any Federal, state, interstate, or local governmental agency are hereby made a condition of this license.

b. That the Licensee shall comply with all Federal, state and local laws, rules and regulations relating to the use of pesticides. The Licensee shall maintain records and data on the proposed and actual use of pesticides on the mitigation land by the Licensee or its designated representatives and shall make such reports available to the District Engineer upon request for approval and inclusion in the Project Operational Management Plan.

c. That at the commencement of this license, a "Preliminary Assessment Screening" has been accomplished by the District Engineer to identify any instances of hazardous substances being stored, released into the environment or into structures on the mitigation land, or disposed of on the mitigation land. The findings of this screening are documented in EXHIBIT "D" and attached hereto as a part hereof. Said document shall be the basis for determination of any environmental site restoration required of the Licensee pursuant to Condition No. 15. (RESTORATION) hereof at the expiration or any earlier termination hereof.

11. PRESUMPTION OF ENVIRONMENTAL LIABILITY

a. That the Licensee acknowledges that it has reviewed and carefully evaluated the technical environmental reports prepared by, or on behalf of, the Army, the Licensee, and others prior to accepting this license, that it has inspected and accepts the physical condition and current level of environmental hazards on the property and deems the property to be safe for the Licensee's intended use, human health, and the environment in general. The Licensee's acknowledgement of the condition of the property creates a presumption that any substance discovered on the property after the date hereof, is related solely to the activity of, caused, deposited, or created by the Licensee, its successors, or assigns. The consideration for this instrument has been negotiated to eliminate and bar all claims by the Licensee or others against the United States arising out of or in any way predicated upon the activities of the Licensee or substances released by the Licensee. In the event any such claims against the United States are brought, the Licensee agrees to hold harmless, indemnify, and defend the United States from and against all claims, demands, losses, damages, liens, liabilities, injuries, deaths, penalties, fines, lawsuits and other proceedings, judgments, awards and costs and expenses, including legal expenses, in any manner predicated upon, the presence, release, or threatened release of any hazardous substance, pollutant, or contaminant arising out of the activities of the Licensee, its successors or assigns.

12. HISTORIC PRESERVATION

a. That the District Engineer shall be responsible for the identification, evaluation and possible mitigation of historical resources as conducted during the initial development of the mitigation land. Through coordination with the United States, the Licensee agrees to comply with the National Historic Preservation Act of 1966, as amended (Public Law 96-515), The Archaeological Resources and Protection Act of 1979 (Public Law 96-95), and any other applicable laws in reference to historical resources within the land licensed herein. Any historical resources management plans will be coordinated with the Licensee which shall use such plans to guide its responsibilities toward historical resources. The District Engineer will retain final authority for all historical resources and associated work.

b. That the Licensee shall not remove or disturb, or cause or permit to be removed or disturbed, any historical, archaeological, architectural or other cultural artifacts, relics, vestiges or remains. In the event such items are discovered on the premises, the Licensee shall immediately notify the District Engineer, and the site and the material shall be protected by the Licensee from further disturbances until a professional examination of the articles can be made or until clearance to proceed is authorized by the District Engineer.

13. INVENTORY OF GOVERNMENT PROPERTY

a. That at the commencement of this license, an inventory and condition report of any real or personal property and improvement of the United States included in this license shall be made by the District Engineer and the Licensee to reflect the then present condition of said property. A copy of said inventory and condition report shall be attached hereto as EXHIBIT "E" and become a part hereof as fully as if originally incorporated herein. Annually and upon the expiration, revocation, or termination of the license, a similar inventory and condition report shall be prepared and submitted to the District Engineer, said inventory and condition reports to constitute the basis for any licensed property shown to be lost, damaged or destroyed, any such property to be either replaced or restored to a condition to be mutually agreed upon by the Licensee and the District Engineer, or at the election of the parties, reimbursement made therefore to the United States at the then current market value thereof.

14. RIGHTS OF REVOCATION, CLOSURE AND RELINQUISHMENT

a. That the Licensee is charged at all times with the requirement to have full knowledge of all the limitations and requirements of this license, and with the necessity for correction of deficiencies, and with compliance with reasonable request by the District Engineer. That this license may be revoked by the Secretary of the Army in the event the Licensee violates any of the terms and conditions of this license and continues and persists in such noncompliance for a period of ninety (90) days after notice thereof, in writing, by the District Engineer.

b. That the District Engineer, upon discovery of any hazardous condition within the boundaries of the mitigation lands that presents an immediate threat to the health and/or danger to life or property, will so notify the Licensee and will require that the affected part or all of the mitigation lands be closed to the public until such condition is corrected and the danger to the public eliminated. If the condition is not corrected or the area closed by the Licensee within the time needed for adequate protection of the public, the District Engineer shall have the right to close the area and take such emergency action as may be needed for the protection of life or property until corrective action can be taken or completed by the Licensee.

c. That this license may be relinquished by the Licensee at any time by giving to the Secretary of the Army, through the District Engineer, at least ninety (90) days notice in writing.

15. RESTORATION

a. That on or before the date of expiration of this license or its relinquishment by the Licensee, the Licensee shall vacate the mitigation land, remove all property of the Licensee therefrom, and restore the mitigation land to a condition to be agreed upon by the Licensee and the District Engineer. If, however, this license is revoked, the Licensee shall vacate the mitigation land, remove its property therefrom, and restore the mitigation land as

aforesaid within such time as the Secretary of the Army may designate. In either event, if the Licensee shall fail or neglect to remove said property therefrom, and restore the mitigation land, then said property shall become the property of the United States, without compensation therefore, and no claim for damages against the United States, or its officers or agents, shall be created by or made on account thereof.

16. NOTICES

a. That all notices to be given pursuant to this license shall be addressed, if to the Licensee, to DIRECTOR, MISSOURI DEPARTMENT OF CONSERVATION, P.O BOX 180, JEFFERSON CITY, MISSOURI, 65102-0180, if to the UNITED STATES, to the DISTRICT ENGINEER, U.S. ARMY ENGINEER DISTRICT, ST. LOUIS, 1222 SPRUCE ST., ST. LOUIS, MISSOURI, 63103-2833, or as may from time to time otherwise be directed by the parties. Notice shall be deemed to have been duly given if and when enclosed in properly sealed envelope or wrapper, addressed as aforesaid, and deposited, postage prepaid, in a post office or branch post office regularly maintained by the United States Postal Service.

17. DISPUTES

a. That except as otherwise provided in this license, any dispute concerning a question of fact arising under this license which is not disposed of by agreement shall be decided by the District Engineer, who shall reduce the decision to writing and mail or otherwise furnish a copy thereof to the Licensee. The decision of the District Engineer shall be final and conclusive unless, within thirty (30) days from the date of receipt of such copy, the Licensee mails or otherwise furnishes to the District Engineer a written appeal addressed to the Secretary of the Army. The decision of the Secretary or the Secretary's duly authorized representative for the determination of such appeals shall be final and conclusive unless determined by a court of competent jurisdiction to have been fraudulent, or capricious, or arbitrary, or so grossly erroneous as necessarily to imply bad faith, or not supported by substantial evidence. In connection with any appeal proceeding under this condition, the Licensee shall be afforded an opportunity to be heard and to offer evidence in support of its appeal. Pending final decision of a dispute hereunder, the Licensee shall proceed diligently with the performance of the license and in accordance with the District Engineer's decision.

b. This condition does not preclude consideration of law question in connection with decisions provided for in paragraph 17.a. above: Provided, that nothing in this condition shall be construed as making final the decision of any administrative official, representative, or board on a question of law.

IN WITNESS WHEREOF I have hereunto set my hand this 11th day of May, 1994, by authority of the SECRETARY OF THE ARMY.

THOMAS C. SUERMANN
Colonel, U.S. Army
District Engineer

The above instrument, together with the provisions and conditions thereof, is hereby accepted this 25th day of April, 1994.

Signed and sealed in the presence of:

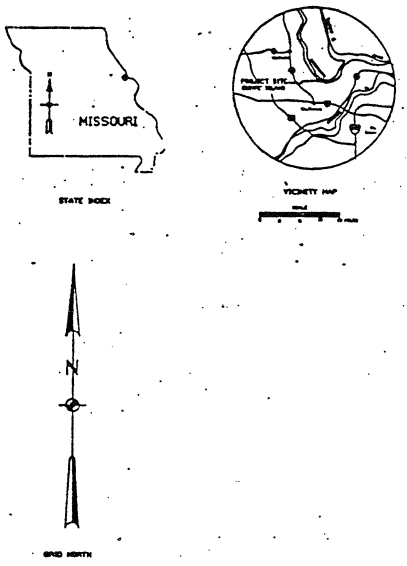
FOR: MISSOURI DEPARTMENT
OF CONSERVATION

BY: _____
JERRY J. PRESLEY, Director
Missouri Department of Conservation

D+R

APPROVED
BY GENERAL
COUNSEL

CORPS OF ENGINEERS



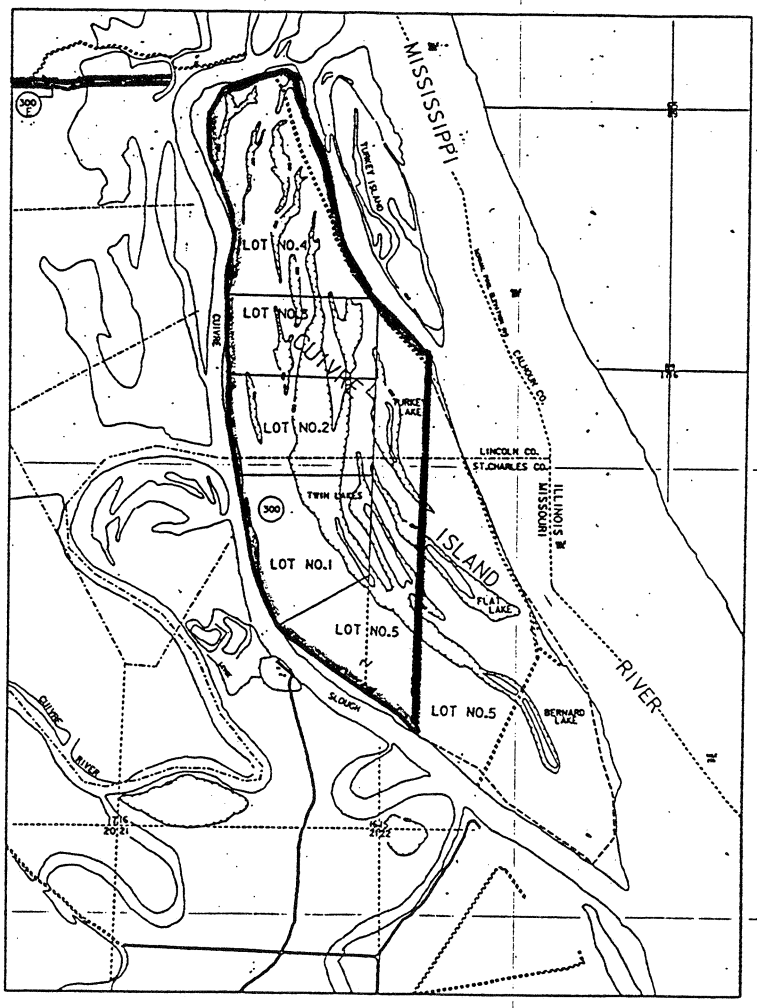


EXHIBIT "A"

LINCOLN AND ST. CHARLES COUNTIES, MO.

T 48 N , R 3 E

Notes:
The boundary of this installation was compiled from Department Of Conservation Data, deed descriptions, and official plats.

LICENSED AREA
866.57 ACRES, MORE OR LESS
GOVERNMENT BOUNDARY

EXHIBIT "B"

MISSISSIPPI RIVER
LOCK AND DAM 26 REPLACEMENT
MITIGATION LANDS
PART 1
TRACT 300

A tract of land situated in the Counties of Lincoln and St. Charles, State of Missouri, and being more particularly described as follows:

All of Lots One (1), Two (2), Three (3), and Four (4) in the Partition of the Estate of Henry Hemmersmeyer, deceased, of the United States Survey No. 3288, Cuiver Island, Township 48 North, Range 3 East, containing in the aggregate Six Hundred Twenty and 33/100 acres (620.33 acres) more or less, as per Commissioners Report recorded in Book 36, Page 585, of Recorder of Deeds Office, Lincoln County, Missouri.

Also the West 241.97 acres, more or less, of Lot No.5 in the Partition of said Island, Lot No. 5 being the eastern and southern part of Cuiver Island and said West 241.97 acres of Lot No. 5 being all that part of Lot No. 5 lying West of a line 1,000 feet East of and parallel to the East line of Lots 2, 3, 1 and the southwardly prolongation of the East line of Lot 1.

Said tract contains in aggregate 862.3 acres, more or less.

The above description is intended to include all of the lands, including accretion lands, that may have formed since the last survey was performed.

PART 2
TRACT 300-E

A strip of land situated in the County of Lincoln, State of Missouri, thirty (30) feet wide off of the entire North end of the tract of land hereinafter described, extending from the County Road on the West to the Cuiver Slough on the East, said tract of land is described as follows:

Part of Survey No. 1650, Township 48 North, Range 3 East being a private road approximately 30 feet in width and extending eastwardly 6,200 feet, more or less, from the County Road to Cuiver Slough, across properties owned or formerly owned by (1) Leora Kelly, (2) AT&F Kelly, (3) Andrew Lauritzen; and intended to be the same land as described in Document filed in Lincoln County, Book 122, Page 250.

Said tract contains in aggregate 4.27 acres, more or less.

"CUIVRE ISLAND AREA"

COMPARTMENT 11

OPERATIONAL MANAGEMENT PLAN

MISSISSIPPI RIVER NINE FOOT NAVIGATION PROJECT

RIVER AND HARBOR PROJECT

MISSISSIPPI RIVER

U.S. ARMY ENGINEER DISTRICT, ST. LOUIS

1222 SPRUCE STREET

ST. LOUIS, MISSOURI

EXHIBIT "C"

"CUIVRE ISLAND AREA"

COMPARTMENT 11
OPERATIONAL MANAGEMENT PLAN
MISSISSIPPI RIVER NINE FOOT NAVIGATION PROJECT

INTRODUCTION

The Cuivre Island Area consists of the federal lands located on Cuivre Island, Missouri, on the right bank of the Mississippi River miles 235 to 238 and comprises a total of 862 acres of the 1240 acre Cuivre Island. The remaining 378 acres of Cuivre Island are owned by the Missouri Department of Conservation. Located in the upper reach of navigation pool 26, the hydrology is essentially unaltered by the slackwater pool regulation of the navigation project. The natural resources have been altered by timber harvesting, agricultural clearing, and minor ditch, trail and levee construction.

This document does not attempt to define measurable objectives or targets, but rather focuses upon broad stewardship land management goals, objectives and actions necessary to meet statutory and regulatory requirements for the federal lands under jurisdiction of the St. Louis District Corps of Engineers. This document prescribes those stewardship land management prescriptions required of the Corps of Engineers, including measures to sustain and restore natural resource biodiversity, and recommends actions to enhance the management, productivity, and restoration of the natural resources. Enhancement opportunities will be addressed through a license for fish and wildlife enhancement to the Missouri Department of Conservation.

The Cuivre Island Area was purchased exclusively for mitigation of lost terrestrial wildlife habitat and is required to be managed for wildlife protection. The mitigation requirements are the sole responsibility of the St. Louis District Corps of Engineers and will be met through the stewardship land management activities prescribed herein to attain sustainable terrestrial wildlife habitats. In addition to meeting mitigation requirements and sustaining the natural resources, the area also provides an excellent opportunity to partner with the Missouri Department of Conservation through a license for fish and wildlife enhancement to realize the full potential for enhancing fish and wildlife habitat conditions, including increased habitat productivity and restoration.

Compatible with the mitigation requirements, the existing natural resources of Cuivre Island Area can be restored and enhanced to meet interim ecosystem and ecoregion goals in compensating losses of productive wetlands and in enhancement of wetland habitat conditions. These ecosystem and ecoregion goals can be further advanced through the Environmental Management Program, the North American Waterfowl Management Plan, or other similar funding mechanisms.

7.1.3. Biological Resources.

7.1.3.1. Artificial Landscapes. The artificial landscapes include the constructed facilities and structures and other human interventions upon the landscape that are not restored. Included are the levees, ditches, roads and old field that preclude the compartment/island from a natural landscape.

Artificial Landscapes		
Structures / Facilities	1.0 AC	0.2 %
Old Field	80.0 AC	9.3 %
Total	81.0 AC	9.5 %

7.1.3.1.1. Structures / Facilities. The structures / facilities consist of the levees and ditches that have historically functioned to enhance migratory waterfowl habitat of the interior open wetlands during non floodcycles by artificial seasonal flooding and drainage, and the service access trails that function to access the levees, ditches and old field from the MDOC portion of the island. These areas will be maintained and consists primarily of the tame grasses smooth brome and ryegrasses. Note: See Para. 9.2. regarding future maintenance.

7.1.3.1.2. Old Fields. A historically cultivated 80 acre old field is located on the northeastern portion of the compartment. The field will be restored to forested and emergent wetland habitats.

7.1.3.2. Natural Landscape / Habitats. The natural landscapes are typical of a Mississippi River floodplain island of the area. The majority of the landscape is forested wetlands habitat consisting of bottomland hardwoods. The remainder landscape is comprised of small and scattered interior open wetlands namely the 20.3 acre Big Twin Lake, 6.3 acre Little Twin Lake, and 6.6 acre Turkey Lake; a 1.7 acre portion of Flat Lake, and two smaller unnamed areas of 1.9 and 0.4 acres. The open wetland habitats consist of both herbaceous annuals and pioneer herbaceous perennials along the shorelines and persistent perennials in the semi-permanent waters, and provide resident and non resident waterbird and to a limited degree fisheries habitats. A complete inventory of the habitat dominance types does not exist at this time. The habitat classification system used here is from DOI, USFWS, 1979, Classification of Wetlands and Deepwater Habitats of the United States.

Mississippi River miles 235 to 238 which is above the slackwater pool of the Melvin Price Locks and Dam Project and below the Lock and Dam 25 Project. The hydrologic patterns at this reach of the Mississippi River approach a typical natural floodpulse; a spring flood, low summer water levels, and a little flood in autumn. Ordinary high water elevation is near 422' NGVD.

7.1.2.4. Geology. The Mississippi river at the compartment location is quite old, probably arising during the Paleozoic when the Ozark dome began to rise and the Lincoln fold and the Cap au Gris faulted flexure were formed. The area has not been glaciated, in contrast to the areas to the east and west. The major impact of glaciers was probably during the Pleistocene Epoch from the Kansan glaciers filling the alluvial valley with outwash. During the Holocene Stage, the alluvial valley fill has been scoured away and subsequent river changes and flooding has created the present day 5 mile wide flood plain morphology of the Lincoln Hills Section of the Ozark Plateaus Province. The alluvial soils that vary in thickness from 90 to 125 feet.

7.1.2.5. Soils.

Carlow Silty Clay Loam (85)	862.3 AC	100.0 %
Total	862.3 AC	100.0 %

7.1.2.5.1. Carlow Silty Clay Loam. (85) Floodplain, nearly level, poorly drained, along major streams, subject to occasional flooding. Permeability and surface runoff slow, water capacity high, shrink swell capacity high, seasonal high water table within one foot of the surface, strong acid reaction, medium natural fertility, organic matter content moderate, and surface layer friable and easily tilled after dry out.

7.1.2.6. Boundaries. The fee title boundary (approximately 6.0 miles) includes 1.5 miles of interior boundary dissecting the island north to south and 4.5 miles of shoreline boundary described as the ordinary high water line. The interior acquisition boundary survey was completed on July 29, 1992 and approved on June 28, 1993 by the Bureau of Land Management (BLM). The Missouri Department of Conservation is the adjacent landowner of the island interior acquisition boundary. Delineation of the fee title interior boundary with signs will be accomplished during inspection and maintenance in 1994. The shoreline boundary will be delineated as necessary for identification. No encroachments.

Fee Title Boundary Line (Interior)	8,000 FT
Fee Title Boundary Line (Shoreline)	23,760 FT

No Fleeting	24,000 FT	100.0 %
Total Shoreline	24,000 FT	100.0 %

6. ADMINISTRATION. Administration management of compartment lands is the responsibility of the U.S. Army Corps of Engineers, Riverlands Area Office, P.O. Box 337, West Alton, MO 63386-0337, 314-355-6585, FAX 314-355-4601, Attn. Area Manager.

6.1. ADMINISTRATIVE PRESCRIPTIONS. Compartment wide administrative management activities necessary to meet objectives include the following administrative (Indirect Cost (IC) - 00 series) prescriptions;

* ADM0100 * Natural Resource Management (IC)
* ADM0200 * Recreation Management (IC)
* ADM0300 * Visitor Management (IC)

7. NATURAL RESOURCES. Natural resource management of compartment lands is the responsibility of the U.S. Army Corps of Engineers, Riverlands Area Office, P.O. Box 337, West Alton, MO 63386-0337, 314-355-6585, FAX 314-355-4601, Attn. Natural Resource Ranger.

7.1. NATURAL RESOURCE INVENTORY. Natural resources include;

7.1.1. Historical Resources. No known significant historical resources exists. A preliminary historical properties survey was performed in conjunction with acquisition.

7.1.2. Physical Resources.

7.1.2.1. Climate.

General	Relatively Moderate
Winters	Short & Moderate
Average annual temperature	55 DF
Average monthly temperature maximum	Jul 78 DF
Average monthly temperature minimum	Jan 30 DF
Average annual precipitation	30.0 IN

7.1.2.2. Topography. The compartment is within a portion of the alluvia floodplain of the Mississippi River approximately 3.5 miles east of Old Monroe, Missouri, St. Charles and Lincoln counties, on the left bank of the Mississippi River between miles 235 and 238. The natural relief ranges from above 435' NGVD on the higher ridges to below 424' NGVD in the swales and sloughs. No major changes since pre-settlement are known to have been constructed with the exception of minor ditching and small levees used for flooding of the swales for migratory waterfowl habitats.

7.1.2.3. Hydrology. The compartment location is between

"CUIVRE ISLAND AREA"

COMPARTMENT 11
OPERATIONAL MANAGEMENT PLAN
MISSISSIPPI RIVER NINE FOOT NAVIGATION PROJECT

1. DESCRIPTION. Compartment 11, Cuivre Island Area, consist of approximately 862 acres of Corps of Engineers fee title lands of which make up approximately two-thirds of Cuivre Island, Missouri. The remaining 378 acres of Cuivre Island are Missouri Department of Conservation fee title lands. These lands were purchased exclusively for mitigation of lost terrestrial wildlife habitat in the State of Missouri, as a result of the construction of the Melvin Price Locks and Dam Project, and are required to be managed for wildlife protection.

1.1. ACCESS. Compartment access is via marine transportation only. An existing operational easement purchased for future access does not connect to the island. A public boat ramp on the mainland near the mouth of Cuivre Slough is owned and operated by the Missouri Department of Conservation (MDOC). No landing exists on the compartment. A landing and joining service access roads to the island interior are located on the adjacent MDOC lands.

2. OBJECTIVES. To mitigate for lost terrestrial wildlife habitats and to sustain the existing natural resources and facilities and to provide for public health, safety and recreation opportunities for compartment lands, and to the extent possible and practicable, and in cooperation with MDOC, provide for sustaining, restoring, and enhancing the island's natural resources and habitats.

3. LAND ALLOCATIONS.

Mitigation	862.3 AC	100.0 %

4. LAND CLASSIFICATIONS.

Mitigation	862.3 AC	100.0 %
Total Fee Title Land	862.3 AC	100.0 %
Easement Operations / Flowage	4.3 AC	100.0 %
Total Easement Land	4.3 AC	100.0 %

5. SHORELINE CLASSIFICATIONS. Of the total 4.5 miles of shoreline, 3.2 miles or 71 percent is located along Cuivre Slough, and 1.3 or 29 percent is located along Turkey Slough. No Shoreline is located adjacent to the main channel of the Mississippi River.

"CUIVRE ISLAND AREA"

COMPARTMENT 11
OPERATIONAL MANAGEMENT PLAN
MISSISSIPPI RIVER NINE FOOT NAVIGATION PROJECT

CONTENTS

"CUIVRE ISLAND AREA"

COMPARTMENT 11
OPERATIONAL MANAGEMENT PLAN
MISSISSIPPI RIVER NINE FOOT NAVIGATION PROJECT

FOREWORD
(THE USER FRIENDLY GUIDE TO THE OMP)

The operational management plan (OMP) is comprised of three basic components,

* INVENTORIES --- the resources,
* OBJECTIVES ---- the results aspired, and
* PRESCRIPTIONS - the recommended actions to attain the objectives.

With known resources and objectives, the OMP recommends prescriptions for the compartment.

Each prescription is assigned a seven item alphanumeric code, typically three letters followed by four numbers, i.e. ABC9999.

The first three letters break out four basic program objectives used for functional management responsibilities,

ADM0000 * **ADM**INISTRATION **M**ANAGEMENT,
NRM0000 * **N**ATURAL **R**ESOURCE **M**ANAGEMENT,
FCM0000 * **F**ACILITY **M**ANAGEMENT, and
VSM0000 * **V**ISITOR **M**ANAGEMENT.

The first two numbers represent program objectives/prescriptions; and represent administrative indirect (off site) costs (IC) if followed by 00 (00 series); i.e.

* NRM0000 * NATURAL RESOURCE MANAGEMENT -
  * NRM**01**00 * Endangered Species Management (IC)

A complete listing of program prescriptions is found on page (2).

The second two numbers represent management prescriptions; and are assigned direct (on site) costs (DC), and are explained in detailed text following the prescription; i.e.

* NRM0000 * NATURAL RESOURCE MANAGEMENT -
  * NRM0100 * Endangered Species Management -
    * NRM01**01** * Post/Sign Eagle Sanctuary (DC) - Twice each year seasonally post and sign the Mel Price eagle staging sanctuary Dec 1± thru Mar 1±.

Estimated five year fiscal indirect and direct costs, schedules, and summaries for prescriptions and are contained in the report tables following the text.

Natural Landscape / Habitats		
System: Palustrine		
Water Regime: Intermittently Flooded		
Water Chemistry: Fresh, Circumnuetral		
Soil: Organic		
Class: Forested Wetlands		
Subclass: Broadleaf Deciduous ------	744.1 AC	86.3 %
Class: Unconsolidated Shore Wetlands		
Subclass: Vegetated ----------	29.8 AC	3.4 %
Class: Emergent Wetlands		
Subclass: Persistent ----------	7.4 AC	0.8 %
Total ----------	781.3 AC	90.5 %

7.1.3.2.1. Forested Wetland - Broadleaf Deciduous. A forest inventory was completed in February 1994. The forested landscape consists of a large mostly unbroken stand of a floodplain bottomland hardwood forest, actually a combination of forest dominant types, due to the interspersion of species. The two major dominance types known are cottonwood - willow, which is fairly specific with regard to the species, and cottonwood - maple (silver maple, box elder), which also includes green ash, sycamore, hackberry, oak (pin), elm, and some hickories. The forest is subject to occasional flooding and contains a herbaceous understory of variety of grasses and sedges in association with the isolated oaks and hickories found only on the higher elevations.

Based on preliminary evaluation of the forest inventory data and stand mapping, the condition of the forested resource can be generalized as poor. The island appears to have been heavily logged in the past apparently for the revenue produced, the harvesting patterns reflecting little consideration for sustainable forest management practices, leaving an abundance of boxelder, elm, and hackberry. Future forest management practices will likely improve the overall condition of the residual stand. Remnant stands of hickory, oak, and pecan indicate that the potential to develop diverse and healthy forest stands is quite high.

The flood of 1993 caused significant mortality of hackberry (Celtis occidentalis) and sugarberry (Celtis laevigata). Most of the trees of these species were found to have recently died, regardless of age or size. Sycamore (Platanus occidentalis) and boxelder (Acer negundo) appear to be in very poor health as a result of the flood, the extent of damage has not been fully ascertained. Without active management, possible future conditions would be for boxelder and/or elm to become the dominant forest vegetation. The die-off of hackberry and sugarberry, and possibly sycamore and boxelder, will create canopy openings large enough to provide adequate sunlight to stimulate shade intolerant plants. These natural openings would

provide opportunities to begin to restore healthy bottomland hardwood forest stands through active management.

7.1.3.2.2. Unconsolidated Shore Wetlands - Vegetated (Open). These habitats landscape the shorelines of the open wetlands and are subject to seasonal cyclic drying and flooding. The typical dominant types generally consists of herbaceous annuals and pioneer herbaceous perennials such as barnyard grass, wild millet, rice cutgrass and smartweeds. Willow, maple and cottonwood invasions are a continual encroachment threat to the sustainability of these habitats.

7.1.3.2.2. Emergent Wetlands - Persistent (Open). These habitats landscape the lower elevations of the open wetlands, retain open water in most years during seasonal floodpulse cycles. The typical dominate types may vary depending on water cyclic water regimes but are generally consist of persistent perennials such as cattails, sedges, rushes and smartweeds.

7.1.3.2.3. Endangered Floral Species. None known.

7.1.3.2.4. Unique Endemic Floral Species. None known.

7.1.3.3. Fish and Wildlife. The mixture of habitats provide for sustained populations of white tail deer, turkey, squirrel, predatory and non-game species and an assemblage of typical resident riverine game and non-game wildlife. The forested wetland provides excellent migratory neo-tropical bird habitats. During fall and spring migrations, most species of waterbirds common to the Mississippi Flyway will use the open and forested wetlands when flooded for both foraging and resting habitat. Complete fish/wildlife inventories do not exist at this time.

7.1.3.3.1. Endangered Fish and Wildlife Species. Two federally endangered species will use the island habitats. The bald eagle (Haliaeetus leucocephalus) will use the large shoreline cottonwood trees as essential feeding site wintering habitat and nest site breeding habitat. No historical bald eagle nest sites are known. During the February 1994 forest inventory, active night roosts were discovered on the compartment within interior mature cottonwood stands. Surveys will be conducted to determine specific site significance, importance, bird tenacity, and possible site specific management plans. The gray bat (Myotis grisescens) will use the open wetlands of the area as foraging habitat. No critical habitats exist on the compartment for either species.

7.2. NATURAL RESOURCE PRESCRIPTIONS. Compartment wide natural resource management activities necessary to meet objectives include the following administrative (Indirect Costs (IC) - 00 series) program prescriptions and selected management (Direct Costs (DC)) prescriptions;

* NRM0100 * Endangered / Threatened Species Mgmt (IC)

* NRM0100 * Bald Eagle Wintering Habitat Surveys (DC) - Twice each month during January and February (1995 - 1996) identify compartment feeding areas and night roosts.

* NRM0200 * Migratory Waterfowl Habitat Mgmt (IC)

* NRM0201 * Wetland Succession Control (DC) - Once each year manipulate the vegetation of approximately 30 acres of the open wetlands by mowing, discing, herbicide, or water to maintain existing habitats.

* NRM0300 * Natural Resource Protection Mgmt (IC)

* NRM0301 * Boundary Inspection and Maintenance (DC) - Once each three years perform on-site inspection, maintenance, and delineation and record encroachments, trespass, delineation, and monumentation of the fee title boundary.

* NRM0302 * Boundary Maintenance Materials / Supplies (DC) - Provide boundary and area signs, posts, hardware, and other miscellaneous materials, supplies, and hand tools.

* NRM0400 * Natural Resource Sustainability Mgmt (IC) - To include compilation of forest inventory data and stand mapping the forest resources (1994) to define and delineate dominant type stands and prescribe silviculture, restocking, and other treatments for operational management plan prescriptions.

* NRM0401 * Natural Resource Inventory (DC) - Seasonally four times each year inventory the natural resources by physical census to further define and delineate habitat dominance types and record resident, migratory, endangered and threatened species populations.

* NRM0403 * Herbaceous Communities Inventory (DC) - Inventory and map the herbaceous flora (1994) to define and delineate dominant types and prescribe treatments for operational management plan prescriptions.

* NRM0404 * Timber Stand Improvement / Silviculture (DC) - Twice each year manipulate the forested wetlands via forest inventory prescriptions to include selective silviculture for regeneration and restocking.

* NRM0405 * Timber Stand Improvement / Silviculture Materials and Supplies (DC) - Provide TSI/Silviculture plant materials, hand tools, and other materials and supplies.

* NRM0500 * Resident Fish and Wildlife Habitat Mgmt (IC)

* NRM0600 * Natural Resource Restoration / Reclamation Mgmt (IC)

* NRM0601 * Native Habitats Restoration - Old Field (DC) - Restore over a long term the 80 acre old field to native forested and emergent wetlands habitats in accordance with forest inventory prescriptions to include initial restoration planting 20 acres (1994) to forested and emergent wetlands to create an immediate ecotone of these two habitat types. Species will be based upon forest inventory and native habitat datum and ecosystem management goals.

* NRM0602 * Native Habitats Succession Control - Old Field (DC) - Maintain annual successional control of the unrestored old field 60 acres (1994 - 1997) until long term restoration plans are finalized.

* NRM0800 * Fish and Wildlife Recreation Mgmt (IC)

* NRM0900 * Operational Management Plan Update (IC)

7.3. NATURAL RESOURCES MANAGEMENT LIMITING FACTORS. The major limiting factors for natural resources management of the wetland habitats are flooding, siltation, woody encroachment, and limited water control capability.

7.4. NATURAL RESOURCES POTENTIAL FOR ENHANCEMENT. Enhancement measures will be addressed through a license to the Missouri Department of Conservation for fish and wildlife enhancement and with funding mechanisms such as the Environmental Management Program, the North American Waterfowl Management Plan, or other similar programs, and may include the following;

* Fish and wildlife game species management through supplemental state hunting and fishing regulations and programs to avoid delineation of island ownerships, integrate island fish and wildlife management and protect carrying capacities.

* Wetland species habitats enhancement through control of vegetation composition and water regimes of the open and forested wetlands.

7.5. NATURAL RESOURCES POTENTIAL FOR RESTORATION. Restoration measures will be addressed by prescription by the Corps of Engineers or jointly by the Corps of Engineers and the Missouri Department of Conservation, and may include the following;

* Restoration of the old field to forested wetlands.

* Restoration of the unconsolidated shore wetlands to emergent wetlands.

8. FACILITIES. Facilities management of compartment lands is the responsibility of the U.S. Army Corps of Engineers, Riverlands Area Office, P.O. Box 337, West Alton, MO 63386-0337, 314-355-6585, FAX 314-355-4601, Attn. Facilities Ranger.

8.1. FACILITY INVENTORY. Compartment facilities include;

* Levees, Culverts and Ditches. The levees are designed to hold natural floodwaters or artificially pumped waters within the open wetlands. The culverts and ditches are designed to transport artificially pumped waters to the open wetlands and to regulate and drain artificial or natural waters from the open wetlands. Facility inventory consists of approximately;

* 300' levees
* 4 @ 17" X 20' CMP culverts
* 1,200' ditches

* Service Access Trails. The dirt surface service access trails function to access the open wetlands, ditches, old field and general access to the interior. Inventory consists of approximately;

* 7,500' service access trails

8.2. FACILITY PRESCRIPTIONS. Compartment wide facility management activities necessary to meet objectives include the following administrative (Indirect Costs (IC) - 00 series) program prescriptions and selected management (Direct Costs (DC)) prescriptions;

* FCM0100 * Safe and Healthful Environment Mgmt (IC)

* FCM0200 * Project Operation Mgmt (IC)

* FCM0201 * Facility Inspections (DC) - Once each year inspect all facilities to prescribe annual preventive, corrective and functional maintenance, rehabilitation and restoration.

* FCM0202 * Culvert and Ditch Maintenance (DC) - Once each year cleanout culverts and ditches of silt as necessary for proper drainage, and stabilize ditch erosion.

* FCM0203 * Levee Maintenance (DC) - Once each year mow levees, perform minor grading, and stabilize levee erosion.

* NOTE: The culverts, ditches and levees will be maintained and repaired until such time that;

* (1) their repair and/or rehabilitation costs are substantially in excess of estimated maintenance costs,
* (2) they are utilized to enhance fish and wildlife habitats under typical cost sharing agreements, or
* (3) they are removed for restoration of natural hydrologic regimes.

* FCM0204 * Trail Maintenance (DC) - Once each year mow trails, perform minor grading, and stabilize erosion.

* FCM0205 * Mobilization and Demobilization (DC) - Twice each year provide marine transport to/from the compartment of equipment necessary for execution of prescriptions.

* FCM0206 * Service Access Easement (DC) - Obtain a perpetual operational easement at no cost for overland service access from the existing island landing to the compartment through the MDOC owned portion of the island over existing service access routes.

* FCM0300 * Public Access Mgmt (IC)

8.3. FACILITY MANAGEMENT LIMITING FACTORS. The major limiting factors for sustained management of the facilities is flood damage, silt deposition and access.

8.4. FACILITY RESTORATION AND REHABILITATION POTENTIAL. The existing facilities have potential to be rehabilitated to enhance their function as fish and wildlife management facilities. (See also FCM0203).

9. OUTGRANTS. Outgrants management of compartment lands is the responsibility of the U.S. Army Corps of Engineers, Riverlands Area Office, P.O. Box 337, West Alton, MO 63386-0337, 314-355-6585, FAX 314-355-4601, Attn. Natural Resource Ranger.

9.1. OUTGRANT INVENTORY. None.

9.2. OUTGRANT PRESCRIPTIONS. N/A

9.3. OUTGRANT MANAGEMENT LIMITING FACTORS. (See Para. 7.3)

9.4. OUTGRANT POTENTIAL. (See Para. 7.4.)

10. VISITORS. Visitor management of compartment lands is the responsibility of the U.S. Army Corps of Engineers, Riverlands Area Office, P.O. Box 337, West Alton, MO 63386-0337, 314-355-6585, FAX 314-355-4601, Attn. Visitor Ranger.

10.1. VISITOR INVENTORY. Visitors of the compartment include primarily fishermen, hunters, and hikers. No visitor inventory exist at this time.

10.2. VISITOR PRESCRIPTIONS. Visitor management activities necessary to effectively manage the visitors of the compartment at this time will be accomplished via the Natural Resource and Facility Rangers and supporting staffs, which will include resource protection management, Title 36 regulation enforcement, and volunteer program management during routine inspections and inventories.

10.3. VISITOR USE LIMITING FACTORS. All visitor use should be compatible with the mitigation objective. The major limiting factor for visitor use is access.

10.4. VISITOR USE POTENTIAL. The anticipated primary visitor use will be hunting and secondary will be fishing (See Para. 7.4.). Other anticipated uses would include nut and fruit gathering, birdwatching, and primitive camping. Potential for developed visitor use, subject to review of environmental impacts, regulation provisions, enforcement capabilities and compatibility with objectives, may include;

* Primitive camping
* Interpretive self guided nature trails

11. SUMMARY. The compartment has potential to sustain, restore and enhance its natural resources and habitats for fish and wildlife and to develop compatible recreation opportunities. There is a need for a operational easement for interior overland service access through the MDOC owned portion of the island. The existing mainland operational access easement will be evaluated for methods to facilitate a functional access to the island. A fish and wildlife enhancement license to the State of Missouri will begin the process necessary to enhance the natural resources of the compartment and integrate and not fragment management for Cuivre Island as part of the Mississippi River ecosystem.

FISCAL FIVE YEAR PRESCRIPTION SUMMARY

COMPARTMENT 11

FISCAL PRESCRIPTION SUMMARY

	FY94	FY95	FY96	FY97	FY98	TOTAL
DIRECT COSTS	$ 17,286	$ 13,185	$ 13,491	$ 12,360	$ 11,666	$ 67,988
INDIRECT COSTS	$ 4,000	$ 4,200	$ 4,400	$ 4,600	$ 4,800	$ 22,000
TOTAL COSTS	$ 21,286	$ 17,385	$ 17,891	$ 16,960	$ 16,466	$ 89,988

FISCAL FIVE YEAR PRESCRIPTION SUMMARY - TOTAL COSTS

COMPARTMENT /AREA NO.	OBJCTVE PRSCPTN	DESCRIPTION	TOTAL FY94	TOTAL FY95	TOTAL FY96	TOTAL FY97	TOTAL FY98
11	FCM0100	SAFE/HLTHFL ENV MGMT	200 $	210 $	220 $	230 $	240 $
11	FCM0200	PRJCT OPERATION MGMT	400 $	420 $	440 $	460 $	480 $
11	FCM0201	FACILITY INSPECTIONS	200 $	210 $	220 $	230 $	240 $
11	FCM0202	CULVERT/DITCH MAINT	525 $	550 $	575 $	600 $	625 $
11	FCM0203	LEVEE MAINT	424 $	440 $	464 $	480 $	504 $
11	FCM0204	TRAIL MAINT	424 $	440 $	464 $	480 $	504 $
11	FCM0205	MOB & DEMOB	2,100 $	2,200 $	2,300 $	2,400 $	2,500 $
11	FCM0206	SERV ACCESS EASEMENT	0 $	0 $	0 $	0 $	0 $
11	FCM0300	PUBLIC ACCESS MGMT	200 $	210 $	220 $	230 $	240 $
11	NRM0100	ENDANGERED SP MGMT	200 $	210 $	220 $	230 $	240 $
11	NRM0101	BALD EAGLE SURVEYS	0 $	840 $	880 $	0 $	0 $
11	NRM0200	MIG WTRFWL MGMT	800 $	840 $	880 $	920 $	960 $
11	NRM0201	WETLAND SCCSSN CNTRL	2,520 $	2,640 $	2,760 $	2,880 $	3,000 $
11	NRM0300	NAT RES PROTECT MGMT	400 $	420 $	440 $	460 $	480 $
11	NRM0301	BOUNDARY INSPT/MAINT	200 $	210 $	220 $	230 $	240 $
11	NRM0302	BNDRY MAINT MAT/SPLY	53 $	55 $	58 $	60 $	63 $
11	NRM0400	NAT RES SUSTAIN MGMT	800 $	840 $	880 $	920 $	960 $
11	NRM0401	NAT RES INVENTORY	1,600 $	1,680 $	1,760 $	1,840 $	960 $
11	NRM0403	HERBACEOUS COM INVNT	3,000 $	0 $	0 $	0 $	0 $
11	NRM0404	TSI / SILVICULTURE	1,000 $	1,500 $	1,000 $	500 $	500 $
11	NRM0405	TSI/SLVCLTR MAT/SPLY	300 $	500 $	750 $	500 $	250 $
11	NRM0500	RSDNT F&W HABTT MGMT	400 $	420 $	440 $	460 $	480 $
11	NRM0600	NAT RES RSTRTN MGMT	200 $	210 $	220 $	230 $	240 $
11	NRM0601	NAT HAB RESTORATION	3,140 $	0 $	0 $	0 $	0 $

FISCAL FIVE YEAR PRESCRIPTION SUMMARY - TOTAL COSTS

COMPARTMENT /AREA NO.	OBJCTVE PRSCPTN	DESCRIPTION	TOTAL FY94	TOTAL FY95	TOTAL FY96	TOTAL FY97	TOTAL FY98
11	NRM0602	NAT HAB SUCCESS CNTR	1,800 $	1,920 $	2,040 $	2,160 $	2,280 $
11	NRM0800	F&W REC MGMT	200 $	210 $	220 $	230 $	240 $
11	NRM0900	OMP UPDATE	200 $	210 $	220 $	230 $	240 $
Total:			21,286 $	17,385 $	17,891 $	16,960 $	16,466 $

15 Mar 1994

OPERATIONAL MANAGEMENT PLAN
FISCAL FIVE YEAR PRESCRIPTION SUMMARY - DIRECT COSTS

5YPRSM 1

COMPARTMENT /AREA NO.	OBJCTVE PRSCPTN	DESCRIPTION	TOTAL FY94	TOTAL FY95	TOTAL FY96	TOTAL FY97	TOTAL FY98
11	FCM0201	FACILITY INSPECTIONS	200 $	210 $	220 $	230 $	240 $
11	FCM0202	CULVERT/DITCH MAINT	525 $	550 $	575 $	600 $	625 $
11	FCM0203	LEVEE MAINT	424 $	440 $	464 $	480 $	504 $
11	FCM0204	TRAIL MAINT	424 $	440 $	464 $	480 $	504 $
11	FCM0205	MOB & DEMOB	2,100 $	2,200 $	2,300 $	2,400 $	2,500 $
11	FCM0206	SERV ACCESS EASEMENT	0 $	0 $	0 $	0 $	0 $
11	NRM0101	BALD EAGLE SURVEYS	0 $	840 $	880 $	0 $	0 $
11	NRM0201	WETLAND SCCSSN CNTRL	2,520 $	2,640 $	2,760 $	2,880 $	3,000 $
11	NRM0301	BOUNDARY INSPT/MAINT	200 $	210 $	220 $	230 $	240 $
11	NRM0302	BNDRY MAINT MAT/SPLY	53 $	55 $	58 $	60 $	63 $
11	NRM0401	NAT RES INVENTORY	1,600 $	1,680 $	1,760 $	1,840 $	960 $
11	NRM0403	HERBACEOUS COM INVNT	3,000 $	0 $	0 $	0 $	0 $
11	NRM0404	TSI / SILVICULTURE	1,000 $	1,500 $	1,000 $	500 $	500 $
11	NRM0405	TSI/SLVCLTR MAT/SPLY	300 $	500 $	750 $	500 $	250 $
11	NRM0601	NAT HAB RESTORATION	3,140 $	0 $	0 $	0 $	0 $
11	NRM0602	NAT HAB SUCCESS CNTR	1,800 $	1,920 $	2,040 $	2,160 $	2,280 $
Total:			17,286 $	13,185 $	13,491 $	12,360 $	11,666 $

FISCAL FIVE YEAR PRESCRIPTION SUMMARY - INDIRECT COSTS

COMPARTMENT /AREA NO.	OBJCTVE PRSCPTN	DESCRIPTION	TOTAL FY94	TOTAL FY95	TOTAL FY96	TOTAL FY97	TOTAL FY98
11	FCM0100	SAFE/HLTHFL ENV MGMT	200 $	210 $	220 $	230 $	240 $
11	FCM0200	PRJCT OPERATION MGMT	400 $	420 $	440 $	460 $	480 $
11	FCM0300	PUBLIC ACCESS MGMT	200 $	210 $	220 $	230 $	240 $
11	NRM0100	ENDANGERED SP MGMT	200 $	210 $	220 $	230 $	240 $
11	NRM0200	MIG WTRFWL MGMT	800 $	840 $	880 $	920 $	960 $
11	NRM0300	NAT RES PROTECT MGMT	400 $	420 $	440 $	460 $	480 $
11	NRM0400	NAT RES SUSTAIN MGMT	800 $	840 $	880 $	920 $	960 $
11	NRM0500	RSDNT F&W HABTT MGMT	400 $	420 $	440 $	460 $	480 $
11	NRM0600	NAT RES RSTRTN MGMT	200 $	210 $	220 $	230 $	240 $
11	NRM0800	F&W REC MGMT	200 $	210 $	220 $	230 $	240 $
11	NRM0900	OMP UPDATE	200 $	210 $	220 $	230 $	240 $
Total:			4,000 $	4,200 $	4,400 $	4,600 $	4,800 $

FISCAL YEAR 94 PRESCRIPTION SUMMARY - DIRECT COSTS

COMPARTMENT /AREA NO.	OBJCTVE PRSCPTN	DESCRIPTION	QUANTITY	UNIT	UNIT FY94 PRICE	TOTAL FY94 PRICE
11	FCM0201	FACILITY INSPECTIONS	1	MD	200 $	200 $
11	FCM0202	CULVERT AND DITCH MAINTENANCE	1	JB	525 $	525 $
11	FCM0203	LEVEE MAINTENANCE	8	HR	53 $	424 $
11	FCM0204	TRAIL MAINTENANCE	8	HR	53 $	424 $
11	FCM0205	MOBILIZATION & DEMOBILIZATION	2	JB	1,050 $	2,100 $
11	FCM0206	SERVICE ACCESS EASEMENT	1	JB	N/C	0 $
11	NRM0201	WETLAND SUCCESSION CONTROL	30	AC	84 $	2,520 $
11	NRM0301	BOUNDARY INSPECTION AND MAINTENANCE	1	MD	200 $	200 $
11	NRM0302	BOUNDARY MAINTENANCE MATERIALS / SUPPLIES	1	EA	53 $	53 $
11	NRM0401	NATURAL RESOURCE INVENTORY	8	MD	200 $	1,600 $
11	NRM0403	HERBACEOUS COMMUNITIES INVENTORY	1	JB	3,000 $	3,000 $
11	NRM0404	TIMBER STAND IMPROVEMENT / SILVICULTURE	1	JB	1,000 $	1,000 $
11	NRM0405	TSI / SILVICULTURE MATERIALS / SUPPLIES	1	EA	300 $	300 $
11	NRM0601	NATIVE HABITATS RESTORATION	20	AC	157 $	3,140 $
11	NRM0602	NATIVE HABITATS SUCCESSION CONTROL	60	AC	30 $	1,800 $
Total:						17,286 $

OPERATIONAL MANAGEMENT PLAN
FISCAL YEAR 94 PRESCRIPTION SUMMARY - INDIRECT COSTS

COMPARTMENT /AREA NO.	OBJCTVE PRSCPTN	DESCRIPTION	QUANTITY	UNIT	UNIT FY94 PRICE	TOTAL FY94 PRICE
11	FCM0100	SAFE AND HEALTHFUL ENVIRONMENT MGMT	1	MD	200 $	200 $
11	FCM0200	PROJECT OPERATION MANAGEMENT	2	MD	200 $	400 $
11	FCM0300	PUBLIC ACCESS MANAGEMENT	1	MD	200 $	200 $
11	NRM0100	ENDANGERED SPECIES MANAGEMENT	1	MD	200 $	200 $
11	NRM0200	MIGRATORY WATERFOWL HABITAT MANAGEMENT	4	MD	200 $	800 $
11	NRM0300	NATURAL RESOURCE PROTECTION MANAGMENT	2	MD	200 $	400
11	NRM0400	NATURAL RESOURCE SUSTAINABLITY MANAGEMENT	4	MD	200 $	800 $
11	NRM0500	RESIDENT FISH & WILDLIFE HABITAT MGMT	2	MD	200 $	400 $
11	NRM0600	NATURAL RESOURCE RESTORATION MANAGEMENT	1	MD	200 $	200 $
11	NRM0800	FISH AND WILDLIFE RECREATION MANAGEMENT	1	MD	200 $	200 $
11	NRM0900	OPERATIONAL MANAGMENT PLAN UPDATE	1	MD	200 $	200 $
Total:						4,000 $

FISCAL YEAR 95 PRESCRIPTION SUMMARY - DIRECT COSTS

COMPARTMENT /AREA NO.	OBJCTVE PRSCPTN	DESCRIPTION	QUANTITY	UNIT	UNIT FY95 PRICE	TOTAL FY95 PRICE
11	FCM0201	FACILITY INSPECTIONS	1	MD	210 $	210 $
11	FCM0202	CULVERT AND DITCH MAINTENANCE	1	JB	550 $	550 $
11	FCM0203	LEVEE MAINTENANCE	8	HR	55 $	440 $
11	FCM0204	TRAIL MAINTENANCE	8	HR	55 $	440 $
11	FCM0205	MOBILIZATION & DEMOBILIZATION	2	JB	1,100 $	2,200 $
11	NRM0101	BALD EAGLE WINTERING HABITAT SURVEYS	4	MD	210 $	840 $
11	NRM0201	WETLAND SUCCESSION CONTROL	30	AC	88 $	2,640 $
11	NRM0301	BOUNDARY INSPECTION AND MAINTENANCE	1	MD	210 $	210 $
11	NRM0302	BOUNDARY MAINTENANCE MATERIALS / SUPPLIES	1	EA	55 $	55 $
11	NRM0401	NATURAL RESOURCE INVENTORY	8	MD	210 $	1,680 $
11	NRM0404	TIMBER STAND IMPROVEMENT / SILVICULTURE	1	JB	1,500 $	1,500 $
11	NRM0405	TSI / SILVICULTURE MATERIALS / SUPPLIES	1	EA	500 $	500 $
11	NRM0602	NATIVE HABITATS SUCCESSION CONTROL	60	AC	32 $	1,920 $
Total:						13,185 $

FISCAL YEAR 95 PRESCRIPTION SUMMARY - INDIRECT COSTS

COMPARTMENT /AREA NO.	OBJCTVE PRSCPTN	DESCRIPTION	QUANTITY	UNIT	UNIT FY95 PRICE	TOTAL FY95 PRICE
11	FCM0100	SAFE AND HEALTHFUL ENVIRONMENT MGMT	1	MD	210 $	210 $
11	FCM0200	PROJECT OPERATION MANAGEMENT	2	MD	210 $	420 $
11	FCM0300	PUBLIC ACCESS MANAGEMENT	1	MD	210 $	210 $
11	NRM0100	ENDANGERED SPECIES MANAGEMENT	1	MD	210 $	210 $
11	NRM0200	MIGRATORY WATERFOWL HABITAT MANAGEMENT	4	MD	210 $	840 $
11	NRM0300	NATURAL RESOURCE PROTECTION MANAGMENT	2	MD	210 $	420
11	NRM0400	NATURAL RESOURCE SUSTAINABLITY MANAGEMENT	4	MD	210 $	840 $
11	NRM0500	RESIDENT FISH & WILDLIFE HABITAT MGMT	2	MD	210 $	420 $
11	NRM0600	NATURAL RESOURCE RESTORATION MANAGEMENT	1	MD	210 $	210 $
11	NRM0800	FISH AND WILDLIFE RECREATION MANAGEMENT	1	MD	210 $	210 $
11	NRM0900	OPERATIONAL MANAGMENT PLAN UPDATE	1	MD	210 $	210 $
Total:						4,200 $

OPERATIONAL MANAGEMENT PLAN
FISCAL YEAR 96 PRESCRIPTION SUMMARY - DIRECT COSTS

COMPARTMENT /AREA NO.	OBJCTVE PRSCPTN	DESCRIPTION	QUANTITY	UNIT	UNIT FY96 PRICE	TOTAL FY96 PRICE
11	FCM0201	FACILITY INSPECTIONS	1	MD	220 $	220 $
11	FCM0202	CULVERT AND DITCH MAINTENANCE	1	JB	575 $	575 $
11	FCM0203	LEVEE MAINTENANCE	8	HR	58 $	464 $
11	FCM0204	TRAIL MAINTENANCE	8	HR	58 $	464 $
11	FCM0205	MOBILIZATION & DEMOBILIZATION	2	JB	1,150 $	2,300 $
11	NRM0101	BALD EAGLE WINTERING HABITAT SURVEYS	4	MD	220 $	880 $
11	NRM0201	WETLAND SUCCESSION CONTROL	30	AC	92 $	2,760 $
11	NRM0301	BOUNDARY INSPECTION AND MAINTENANCE	1	MD	220 $	220 $
11	NRM0302	BOUNDARY MAINTENANCE MATERIALS / SUPPLIES	1	EA	58 $	58 $
11	NRM0401	NATURAL RESOURCE INVENTORY	8	MD	220 $	1,760 $
11	NRM0404	TIMBER STAND IMPROVEMENT / SILVICULTURE	1	JB	1,000 $	1,000 $
11	NRM0405	TSI / SILVICULTURE MATERIALS / SUPPLIES	1	EA	750 $	750 $
11	NRM0602	NATIVE HABITATS SUCCESSION CONTROL	60	AC	34 $	2,040 $
Total:						13,491 $

OPERATIONAL MANAGEMENT PLAN
FISCAL YEAR 96 PRESCRIPTION SUMMARY - INDIRECT COSTS

COMPARTMENT /AREA NO.	OBJCTVE PRSCPTN	DESCRIPTION	QUANTITY	UNIT	UNIT FY96 PRICE	TOTAL FY96 PRICE
11	FCM0100	SAFE AND HEALTHFUL ENVIRONMENT MGMT	1	MD	220 $	220 $
11	FCM0200	PROJECT OPERATION MANAGEMENT	2	MD	220 $	440 $
11	FCM0300	PUBLIC ACCESS MANAGEMENT	1	MD	220 $	220 $
11	NRM0100	ENDANGERED SPECIES MANAGEMENT	1	MD	220 $	220 $
11	NRM0200	MIGRATORY WATERFOWL HABITAT MANAGEMENT	4	MD	220 $	880 $
11	NRM0300	NATURAL RESOURCE PROTECTION MANAGMENT	2	MD	220 $	440 $
11	NRM0400	NATURAL RESOURCE SUSTAINABLITY MANAGEMENT	4	MD	220 $	880 $
11	NRM0500	RESIDENT FISH & WILDLIFE HABITAT MGMT	2	MD	220 $	440 $
11	NRM0600	NATURAL RESOURCE RESTORATION MANAGEMENT	1	MD	220 $	220 $
11	NRM0800	FISH AND WILDLIFE RECREATION MANAGEMENT	1	MD	220 $	220 $
11	NRM0900	OPERATIONAL MANAGMENT PLAN UPDATE	1	MD	220 $	220 $
Total:						4,400 $

OPERATIONAL MANAGEMENT PLAN
FISCAL YEAR 97 PRESCRIPTION SUMMARY - DIRECT COSTS

COMPARTMENT /AREA NO.	OBJCTVE PRSCPTN	DESCRIPTION	QUANTITY	UNIT	UNIT FY97 PRICE	TOTAL FY97 PRICE
11	FCM0201	FACILITY INSPECTIONS	1	MD	230 $	230 $
11	FCM0202	CULVERT AND DITCH MAINTENANCE	1	JB	600 $	600 $
11	FCM0203	LEVEE MAINTENANCE	8	HR	60 $	480 $
11	FCM0204	TRAIL MAINTENANCE	8	HR	60 $	480 $
11	FCM0205	MOBILIZATION & DEMOBILIZATION	2	JB	1,200 $	2,400 $
11	NRM0201	WETLAND SUCCESSION CONTROL	30	AC	96 $	2,880 $
11	NRM0301	BOUNDARY INSPECTION AND MAINTENANCE	1	MD	230 $	230 $
11	NRM0302	BOUNDARY MAINTENANCE MATERIALS / SUPPLIES	1	EA	60 $	60 $
11	NRM0401	NATURAL RESOURCE INVENTORY	8	MD	230 $	1,840 $
11	NRM0404	TIMBER STAND IMPROVEMENT / SILVICULTURE	1	JB	500 $	500 $
11	NRM0405	TSI / SILVICULTURE MATERIALS / SUPPLIES	1	EA	500 $	500 $
11	NRM0602	NATIVE HABITATS SUCCESSION CONTROL	60	AC	36 $	2,160 $
Total:						12,360 $

OPERATIONAL MANAGEMENT PLAN
FISCAL YEAR 97 PRESCRIPTION SUMMARY - INDIRECT COSTS

COMPARTMENT /AREA NO.	OBJCTVE PRSCPTN	DESCRIPTION	QUANTITY	UNIT	UNIT FY97 PRICE	TOTAL FY97 PRICE
11	FCM0100	SAFE AND HEALTHFUL ENVIRONMENT MGMT	1	MD	230 $	230 $
11	FCM0200	PROJECT OPERATION MANAGEMENT	2	MD	230 $	460 $
11	FCM0300	PUBLIC ACCESS MANAGEMENT	1	MD	230 $	230 $
11	NRM0100	ENDANGERED SPECIES MANAGEMENT	1	MD	230 $	230 $
11	NRM0200	MIGRATORY WATERFOWL HABITAT MANAGEMENT	4	MD	230 $	920 $
11	NRM0300	NATURAL RESOURCE PROTECTION MANAGMENT	2	MD	230 $	460
11	NRM0400	NATURAL RESOURCE SUSTAINABLITY MANAGEMENT	4	MD	230 $	920 $
11	NRM0500	RESIDENT FISH & WILDLIFE HABITAT MGMT	2	MD	230 $	460 $
11	NRM0600	NATURAL RESOURCE RESTORATION MANAGEMENT	1	MD	230 $	230 $
11	NRM0800	FISH AND WILDLIFE RECREATION MANAGEMENT	1	MD	230 $	230 $
11	NRM0900	OPERATIONAL MANAGMENT PLAN UPDATE	1	MD	230 $	230 $
Total:						4,600 $

OPERATIONAL MANAGEMENT PLAN
FISCAL YEAR 98 PRESCRIPTION SUMMARY - DIRECT COSTS

COMPARTMENT /AREA NO.	OBJCTVE PRSCPTN	DESCRIPTION	QUANTITY	UNIT	UNIT FY98 PRICE	TOTAL FY98 PRICE
11	FCM0201	FACILITY INSPECTIONS	1	MD	240 $	240 $
11	FCM0202	CULVERT AND DITCH MAINTENANCE	1	JB	625 $	625 $
11	FCM0203	LEVEE MAINTENANCE	8	HR	63 $	504 $
11	FCM0204	TRAIL MAINTENANCE	8	HR	63 $	504 $
11	FCM0205	MOBILIZATION & DEMOBILIZATION	2	JB	1,250 $	2,500 $
11	NRM0201	WETLAND SUCCESSION CONTROL	30	AC	100 $	3,000 $
11	NRM0301	BOUNDARY INSPECTION AND MAINTENANCE	1	MD	240 $	240 $
11	NRM0302	BOUNDARY MAINTENANCE MATERIALS / SUPPLIES	1	EA	63 $	63 $
11	NRM0401	NATURAL RESOURCE INVENTORY	4	MD	240 $	960 $
11	NRM0404	TIMBER STAND IMPROVEMENT / SILVICULTURE	1	JB	500 $	500 $
11	NRM0405	TSI / SILVICULTURE MATERIALS / SUPPLIES	1	EA	250 $	250 $
11	NRM0602	NATIVE HABITATS SUCCESSION CONTROL	60	AC	38 $	2,280 $
Total:						11,666 $

OPERATIONAL MANAGEMENT PLAN
FISCAL YEAR 98 PRESCRIPTION SUMMARY - INDIRECT COSTS

COMPARTMENT /AREA NO.	OBJCTVE PRSCPTN	DESCRIPTION	QUANTITY	UNIT	UNIT FY98 PRICE	TOTAL FY98 PRICE
11	FCM0100	SAFE AND HEALTHFUL ENVIRONMENT MGMT	1	MD	240 $	240 $
11	FCM0200	PROJECT OPERATION MANAGEMENT	2	MD	240 $	480 $
11	FCM0300	PUBLIC ACCESS MANAGEMENT	1	MD	240 $	240 $
11	NRM0100	ENDANGERED SPECIES MANAGEMENT	1	MD	240 $	240 $
11	NRM0200	MIGRATORY WATERFOWL HABITAT MANAGEMENT	4	MD	240 $	960 $
11	NRM0300	NATURAL RESOURCE PROTECTION MANAGMENT	2	MD	240 $	480
11	NRM0400	NATURAL RESOURCE SUSTAINABLITY MANAGEMENT	4	MD	240 $	960 $
11	NRM0500	RESIDENT FISH & WILDLIFE HABITAT MGMT	2	MD	240 $	480 $
11	NRM0600	NATURAL RESOURCE RESTORATION MANAGEMENT	1	MD	240 $	240 $
11	NRM0800	FISH AND WILDLIFE RECREATION MANAGEMENT	1	MD	240 $	240 $
11	NRM0900	OPERATIONAL MANAGMENT PLAN UPDATE	1	MD	240 $	240 $
Total:						4,800 $

FISCAL FIVE YEAR MANDAY PRESCRIPTION SUMMARY - DIRECT COSTS

COMPARTMENT /AREA NO.	OBJCTVE PRSCPTN	DESCRIPTION	FY94	FY95	FY96	FY97	FY98
11	FCM0201	FACILITY INSPECTIONS	1	1	1	1	1
11	NRM0101	BALD EAGLE WINTERING HABITAT SURVEYS		4	4		
11	NRM0301	BOUNDARY INSPECTION AND MAINTENANCE	1	1	1	1	1
11	NRM0401	NATURAL RESOURCE INVENTORY	8	8	8	8	4
Total:			10	14	14	10	

FISCAL FIVE YEAR MANDAY PRESCRIPTION SUMMARY - INDIRECT COSTS

COMPARTMENT /AREA NO.	OBJCTVE PRSCPTN	DESCRIPTION	FY94	FY85	FY96	FY97	FY98
11	FCM0100	SAFE AND HEALTHFUL ENVIRONMENT MGMT	1	1	1	1	1
11	FCM0200	PROJECT OPERATION MANAGEMENT	2	2	2	2	2
11	FCM0300	PUBLIC ACCESS MANAGEMENT	1	1	1	1	1
11	NRM0100	ENDANGERED SPECIES MANAGEMENT	1	1	1	1	1
11	NRM0200	MIGRATORY WATERFOWL HABITAT MANAGEMENT	4	4	4	4	4
11	NRM0300	NATURAL RESOURCE PROTECTION MANAGMENT	2	2	2	2	
11	NRM0400	NATURAL RESOURCE SUSTAINABLITY MANAGEMENT	4	4	4	4	4
11	NRM0500	RESIDENT FISH & WILDLIFE HABITAT MGMT	2	2	2	2	2
11	NRM0600	NATURAL RESOURCE RESTORATION MANAGEMENT	1	1	1	1	1
11	NRM0800	FISH AND WILDLIFE RECREATION MANAGEMENT	1	1	1	1	1
11	NRM0900	OPERATIONAL MANAGMENT PLAN UPDATE	1	1	1	1	1
Total:			20	20	20	20	20

15 Mar 1994

OPERATIONAL MANAGEMENT PLAN
FISCAL FIVE YEAR PRESCRIPTION SCHEDULE - DIRECT COSTS

5YPRSC 1

COMPARTMENT /AREA NO.	OBJCTVE PRSCPTN	DESCRIPTION	FY 94 Q1	FY 94 Q2	FY 94 Q3	FY 94 Q4	FY 95 Q1	FY 95 Q2	FY 95 Q3	FY 95 Q4	FY 96 Q1	FY 96 Q2	FY 96 Q3	FY 96 Q4	FY 97 Q1	FY 97 Q2	FY 97 Q3	FY 97 Q4	FY 98 Q1	FY 98 Q3	FY 98 Q4
11	FCM0201	FACILITY INSPECTIONS		XX				XX				XX				XX			XX		
11	FCM0202	CULVERT/DITCH MAINT				XX				XX				XX				XX		XX	XX
11	FCM0203	LEVEE MAINT			XX	XX			XX	XX			XX	XX			XX	XX		XX	XX
11	FCM0204	TRAIL MAINT			XX	XX			XX	XX			XX	XX			XX	XX		XX	XX
11	FCM0205	MOB & DEMOB			XX	XX			XX	XX			XX	XX			XX	XX		XX	X
11	FCM0206	SERV ACCESS EASEMENT			XX																
11	NRM0101	BALD EAGLE SURVEYS					XX	XX			XX	XX									
11	NRM0201	WETLAND SCCSSN CNTRL			XX	XX			XX	XX			XX	XX			XX	XX		XX	XX
11	NRM0301	BOUNDARY INSPT/MAINT		XX				XX				XX				XX			XX		
11	NRM0302	BNDRY MAINT MAT/SPLY	XX				XX				XX				XX				XX		
11	NRM0401	NAT RES INVENTORY				XX				XX				XX				XX			XX
11	NRM0403	HERBACEOUS COM INVNT	XX	XX	XX	XX															
11	NRM0404	TSI / SILVICULTURE	XX	XX			XX	XX			XX	XX			XX	XX			XX	XX	
11	NRM0405	TSI/SLVCLTR MAT/SPLY		XX				XX		XX		XX		XX		XX		XX		XX	
11	NRM0601	NAT HAB RESTORATION		XX	XX																
11	NRM0602	NAT HAB SUCCESS CNTR			XX				XX				XX				XX			XX	

FISCAL FIVE YEAR PRESCRIPTION SCHEDULE - INDIRECT COSTS

COMPARTMENT /AREA NO.	OBJCTVE PRSCPTN	DESCRIPTION	FY 94 Q1	FY 94 Q2	FY 94 Q3	FY 94 Q4	FY 95 Q1	FY 95 Q2	FY 95 Q3	FY 95 Q4	FY 96 Q1	FY 96 Q2	FY 96 Q3	FY 96 Q4	FY 97 Q1	FY 97 Q2	FY 97 Q3	FY 97 Q4	FY 98 Q1	FY 98 Q1	FY 98 Q3	FY 98 Q4
11	FCM0100	SAFE/HLTHFL ENV MGMT				XX				XX				XX				XX				XX
11	FCM0200	PRJCT OPERATION MGMT	XX			XX	XX			XX	XX			XX	XX			XX	XX			XX
11	FCM0300	PUBLIC ACCESS MGMT	XX			XX	XX			XX	XX			XX	XX			XX	XX			XX
11	NRM0100	ENDANGERED SP MGMT			XX				XX				XX				XX				XX	
11	NRM0200	MIG WTRFWL MGMT	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	
11	NRM0300	NAT RES PROTECT MGMT	XX		XX		XX		XX		XX		XX		XX		XX		XX		XX	
11	NRM0400	NAT RES SUSTAIN MGMT				XX				XX				XX				XX				XX
11	NRM0500	RSDNT F&W HABTT MGMT		XX		XX		XX		XX		XX		XX		XX		XX		XX		XX
11	NRM0600	NAT RES RSTRTN MGMT				XX				XX				XX				XX				XX
11	NRM0800	F&W REC MGMT				XX				XX				XX				XX				XX
11	NRM0900	OMP UPDATE				XX				XX				XX				XX				XX

CELMS-ED-HQ 2 June 1992

MEMORANDUM THRU ED-H
ED

FOR RE-M

SUBJECT : Review of Cuiver Island , Missouri, Mitigation Land

1. A Preliminary Assessment Screening (PAS) was performed in accordance with CERCLA requirements for the subject site. Based on our review, there is no reason to believe that there was any hazardous substance stored, released into the environment or structures, or disposed on the subject property. The property assessment was based on a review of the following:

a. Past Property Uses

b. Area maps

c. Interviews

d. site visit

2. The point of contact for any questions is Genie Wachter (8334).

Signed: for Dan R Gysbers Date: 6/2/92
Theodore S. Postol, P.E.
Chief, Environmental Quality Section
Hydrologic & Hydraulics Branch

Signed: Stanley F Ebersohl Date: 4/12/94
Stanley F. Ebersohl, P.E.
Environmental Compliance Coordinator
Natural Resource Management Branch

EXHIBIT "D"

CUIVER ISLAND , MISSOURI - MITIGATION LAND

OFFICIAL CERTIFICATION OF NEPA AND CERCLA AND OF 15 OTHER ENVIRONMENTAL ACTS BY CELMS-ED-HQ; CELMS-PD-AE; CELMS-CO-N; And CO-N

LOCATION AND DESCRIPTION OF THE LAND

Cuiver Island, Missouri at Mississippi River mile 236 to mile 238. The licensed area is approximately 866.57 acres.

CELMS-ED-HQ CERTIFICATION:

I hereby certify clearance for CERCLA and for items 6, 11, 12, and 13 of the attached 15 item check list of environmental acts:

Gary R Dyhouse 6/2/92

CELMS-ED-HQ Certifying Official Date

****

CELMS-PD-AE CERTIFICATION:

I hereby certify clearance for NEPA and for items 1, 2, 3, 5, 7, 8, 9, 10, and 15 of the attached 15 item check list of environmental acts.

Daniel V. Rayland 4-7-94

CELMS-PD-AE Certifying Official Date

****

CELMS-CO-F CERTIFICATION:

I hereby certify clearance for items 4 and 14 of the attached 15 item check list of environmental acts.

Michael A. Brajer 7 APR 94

CELMS-CO-F Certifying Official Date

****

Stanley F. Ebersohl 4/12/94

Stanley F. Ebersohl, CELMS-CO-N Date
Environmental Compliance Coordinator

CHECK LIST OF 15 ENVIRONMENTAL ACTS

1. National Historic Preservation Act, 16 USC 470 et seq.;

2. Coastal Zone Management Act, 16 USC 1451 et seq.;

3. Endangered Species Act, 16 USC 1536 et seq.;

4. Clean Water Act, 33 USC 1251 et seq.; including the Section 404 wetlands permitting process and Section 311;

5. Wild and Scenic Rivers Act, 16 USC 1271 et seq.;

6. Clean Air Act, 42 USC 7401 et seq.;

7. Antiquities Act, 16 USC 431 et seq.;

8. Archaeological and Historic Preservation Act, 16 USC 469;

9. American Indian Religious Freedom Act, 16 USC 1996;

10. Archaeological Resources Protection Act, 16 USC 470aa-11;

11. Toxic Substances Control Act, 15 USC 2601;

12. Solid waste Disposal Act, 42 USC 6901, (Also known as the Resource Conservation and Recovery Act);

13. Federal Insecticide, Fungicide, and Rodenticide Act, 7 USC 135;

14. Executive Order 11990; Protection of Wetlands;

15. Executive Order 11988 as amended by Executive Order 12148, Floodplain Management.

INVENTORY OF TRACT 300
CUIVER ISLAND MITIGATION LAND

THERE ARE NO U.S. GOVERNMENT OWNED IMPROVEMENTS ON THIS PROPERTY.

EXHIBIT "E"

Appendix J - Project Cooperation Agreement (PCA)

DRAFT

07\21\94

**PROJECT COOPERATION AGREEMENT
BETWEEN
THE DEPARTMENT OF THE ARMY
AND
THE MISSOURI DEPARTMENT OF CONSERVATION
FOR CONSTRUCTION OF THE
CUIVRE ISLAND HABITAT REHABILITATION AND ENHANCEMENT PROJECT
AT
POOL 26, MISSISSIPPI RIVER,
LINCOLN AND ST. CHARLES COUNTIES, MISSOURI**

THIS AGREEMENT is entered into this _____ day of _____, 1994, by and between the **DEPARTMENT OF THE ARMY** (hereinafter the "Government"), represented by the District Engineer, U.S. Army Engineer District, St. Louis (hereinafter the "District Engineer"), and the **MISSOURI DEPARTMENT OF CONSERVATION** (hereinafter the "Local Sponsor"), represented by the Director.

WITNESSETH, THAT:

WHEREAS, construction of the Cuivre Island Habitat Rehabilitation and Enhancement Project at Pool 26, Mississippi River, Lincoln and St. Charles Counties, Missouri was authorized by the 1985 Supplemental Appropriations Act (Public Law 99-88) and Section 1103 of the Water Resources Development Act of 1986 (Public Law 99-662);

WHEREAS, the Government and the Local Sponsor desire to enter into a Project Cooperation Agreement for construction of the Cuivre Island Habitat Rehabilitation and Enhancement Project at Pool 26, Mississippi River, Lincoln and St. Charles Counties, Missouri (hereinafter the "Project", as defined in Article I.A. of this Agreement);

WHEREAS, Section 103 of the Water Resources Development Act of 1986, Public Law 99-662, as amended, specifies the cost-sharing requirements applicable to the Project;

WHEREAS, Section 221 of the Flood Control Act of 1970, Public Law 91-611, as amended, and Section 103 of the Water Resources Development Act of 1986, Public Law 99-662, as amended, provide that the Secretary of the Army shall not commence construction of any water resources project, or separable element thereof, until each non-Federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element;

WHEREAS, the Local Sponsor does not qualify for a reduction of the maximum non-Federal cost share pursuant to the guidelines that implement Section 103(m) of the Water Resources Development Act of 1986, Public Law 99-662, as amended;

WHEREAS, the Government and Local Sponsor have the full authority and capability to perform as hereinafter set forth and intend to cooperate in cost-sharing and financing of the construction of the Project in accordance with the terms of this Agreement.

NOW, THEREFORE, the Government and the Local Sponsor agree as follows:

ARTICLE I - DEFINITIONS AND GENERAL PROVISIONS

For purposes of this Agreement:

A. The term "Project" shall mean the rehabilitation and enhancement of the Project by: installing a permanent pump, cleaning ditches, and installing or replacing water control structures on Cuivre Island at the Green Tree Reservoir so as to raise the water elevation to 429.0 N.G.V.D.; providing wintering holes for fish by adding 6 pairs of dikes in Cuivre Slough; adding 2 dikes at the upper end of Cuivre Slough by Phelan's Island to direct flow into Cuivre Slough; removing a portion of the submerged dike in Cuivre Slough at Phelan's Island at mile 238.2R; creating ten, 8 acre forest clearings on Cuivre Island and planting them with mast tree species; reforesting cropland; and, using towboat propwash as a means of deepening the lower third of the chute between Cuivre Island and Turkey Island as generally described in the Definite Project Report (DPR) with Integrated Environmental Assessment, dated July 1994, and approved by Commander, Lower Mississippi Valley Division on _____, 1994.

B. The term "total project costs" shall mean all costs incurred by the Local Sponsor and the Government in accordance with the terms of this Agreement directly related to construction of the Project. Subject to the provisions of this Agreement, the term shall include, but is not necessarily limited to: continuing planning and engineering costs incurred after October 1, 1985; advanced engineering and design costs; preconstruction engineering and design costs; engineering and design costs during construction; the costs of investigations to identify the existence and extent of hazardous substances in accordance with Article XV.A. of this Agreement; costs of historic preservation activities in accordance with Article XVIII.A. of this Agreement; actual construction costs, including the costs of alteration, lowering, raising, or replacement and attendant removal of existing railroad bridges and approaches thereto; supervision and administration costs; costs of participation in the Project

Coordination Team in accordance with Article V of this Agreement; costs of contract dispute settlements or awards; the value of lands, easements, rights-of-way, relocations, and suitable borrow and dredged or excavated material disposal areas for which the Government affords credit in accordance with Article IV of this Agreement; and costs of audit in accordance with Article X of this Agreement. The term does not include any costs for operation, maintenance, repair, replacement, or rehabilitation; any costs due to betterments; or any costs of dispute resolution under Article VII of this Agreement.

C. The term "financial obligation for construction" shall mean a financial obligation of the Government, other than an obligation pertaining to the provision of lands, easements, rights-of-way, relocations, and borrow and dredged or excavated material disposal areas, that results or would result in a cost that is or would be included in total project costs.

D. The term "non-Federal proportionate share" shall mean the ratio of the Local Sponsor's total cash contribution required in accordance with Articles II.D.1. and II.D.3. of this Agreement to total financial obligations for construction, as projected by the Government.

E. The term "period of construction" shall mean the time from the date the Government first notifies the Local Sponsor in writing, in accordance with Article VI.B. of this Agreement, of the scheduled date for issuance of the solicitation for the first construction contract to the date that the District Engineer notifies the Local Sponsor in writing of the Government's determination that construction of the Project is complete.

F. The term "highway" shall mean any public highway, roadway, street, or way, including any bridge thereof.

G. The term "relocation" shall mean providing a functionally equivalent facility to the owner of an existing utility, cemetery, highway or other public facility, or railroad (excluding existing railroad bridges and approaches thereto) when such action is authorized in accordance with applicable legal principles of just compensation or as otherwise provided in the authorizing legislation for the Project or any report referenced therein. Providing a functionally equivalent facility may take the form of alteration, lowering, raising, or replacement and attendant removal of the affected facility or part thereof.

H. The term "fiscal year" shall mean one fiscal year of the Government. The Government fiscal year begins on October 1 and ends on September 30.

I. The term "functional portion of the Project" shall mean a portion of the Project that is suitable for tender to the Local Sponsor to operate and maintain in advance of completion of the entire Project. For a portion of the Project to be suitable for tender, the District Engineer must notify the Local Sponsor in writing of the Government's determination that the portion of the Project is complete and can function independently and for a useful purpose, although the balance of the Project is not complete.

J. The term "betterment" shall mean a change in the design and construction of an element of the Project resulting from the application of standards that the Government determines exceed those that the Government would otherwise apply for accomplishing the design and construction of that element.

ARTICLE II - OBLIGATIONS OF THE GOVERNMENT AND THE LOCAL SPONSOR

A. The Government, subject to receiving funds appropriated by the Congress of the United States (hereinafter, the "Congress") and using those funds and funds provided by the Local Sponsor, shall expeditiously construct the Project (including alteration, lowering, raising, or replacement and attendant removal of existing railroad bridges and approaches thereto), applying those procedures usually applied to Federal projects, pursuant to Federal laws, regulations, and policies.

1. The Government shall afford the Local Sponsor the opportunity to review and comment on the solicitations for all contracts, including relevant plans and specifications, prior to the Government's issuance of such solicitations. The Government shall not issue the solicitation for the first construction contract until the Local Sponsor has confirmed in writing its willingness to proceed with the Project. To the extent possible, the Government shall afford the Local Sponsor the opportunity to review and comment on all contract modifications, including change orders, prior to the issuance to the contractor of a Notice to Proceed. In any instance where providing the Local Sponsor with notification of a contract modification or change order is not possible prior to issuance of the Notice to Proceed, the Government shall provide such notification in writing at the earliest date possible. To the extent possible, the Government also shall afford the Local Sponsor the opportunity to review and comment on all contract claims prior to resolution thereof. The Government shall consider in good faith the comments of the Local Sponsor, but the contents of solicitations, award of contracts, execution of contract modifications, issuance of change orders, resolution of contract claims, and performance of all work on the Project (whether the work is performed under contract or by Government personnel), shall be exclusively within the control of the Government.

2. Throughout the period of construction, the District Engineer shall furnish the Local Sponsor with a copy of the Government's Written Notice of Acceptance of Completed Work for each contract for the Project.

3. Notwithstanding paragraph A.1. of this Article, if, upon the award of any contract for construction of the Project, cumulative financial obligations for construction would exceed $_____, the Government and the Local Sponsor agree to defer award of that contract and all subsequent contracts for construction of the Project until such time as the Government and the Local Sponsor agree to proceed with further contract awards for the Project, but in no event shall the award of contracts be deferred for more than three years. Notwithstanding this general provision for deferral of contract awards, the Government, after consultation with the Local Sponsor, may award a contract or contracts after the Assistant Secretary of the Army (Civil Works) makes a written determination that the award of such contract or contracts must proceed in order to comply with law or to protect life or property from imminent and substantial harm.

B. The Local Sponsor may request the Government to accomplish betterments. Such requests shall be in writing and shall describe the betterments requested to be accomplished. If the Government in its sole discretion elects to accomplish the requested betterments or any portion thereof, it shall so notify the Local Sponsor in a writing that sets forth any applicable terms and conditions, which must be consistent with this Agreement. In the event of conflict between such a writing and this Agreement, this Agreement shall control. The Local Sponsor shall be solely responsible for all costs due to the requested betterments and shall pay all such costs in accordance with Article VI.C. of this Agreement.

C. When the District Engineer determines that the entire Project is complete or that a portion of the Project has become a functional portion of the Project, the District Engineer shall so notify the Local Sponsor in writing and furnish the Local Sponsor with an Operation, Maintenance, Repair, Replacement, and Rehabilitation Manual (hereinafter the "OMRR&R Manual") and with copies of all of the Government's Written Notices of Acceptance of Completed Work for all contracts for the Project or the functional portion of the Project that have not been provided previously. Upon such notification, the Local Sponsor shall operate, maintain, repair, replace, and rehabilitate the entire Project or the functional portion of the Project in accordance with Article VIII of this Agreement.

D. The Local Sponsor shall contribute a minimum of 25 percent, but not to exceed 50 percent, of total project costs in accordance with the provisions of this paragraph.

1. The Local Sponsor shall provide a cash contribution equal to 5 percent of total project costs in accordance with Article VI.B. of this Agreement.

2. In accordance with Article III of this Agreement, the Local Sponsor shall provide all lands, easements, rights-of-way, and suitable borrow and dredged or excavated material disposal areas that the Government determines the Local Sponsor must provide for the construction, operation, and maintenance of the Project, and shall perform or ensure performance of all relocations that the Government determines to be necessary for the construction, operation, and maintenance of the Project.

3. If the Government projects that the value of the Local Sponsor's contributions under paragraphs D.1. and D.2. of this Article and Articles V, X, and XV.A. of this Agreement will be less than 25 percent of total project costs, the Local Sponsor shall provide an additional cash contribution, in accordance with Article VI.B. of this Agreement, in the amount necessary to make the Local Sponsor's total contribution equal to 25 percent of total project costs.

4. If the Government determines that the value of the Local Sponsor's contributions provided under paragraphs D.2. and D.3. of this Article and Articles V, X, and XV.A. of this Agreement has exceeded 45 percent of total project costs, the Government, subject to the availability of funds, shall reimburse the Local Sponsor for any such value in excess of 45 percent of total project costs. After such a determination, the Government, in its sole discretion, may provide any remaining Project lands, easements, rights-of-way, and suitable borrow and dredged or excavated material disposal areas and perform any remaining Project relocations on behalf of the Local Sponsor.

E. The Local Sponsor may request the Government to provide lands, easements, rights-of-way, and suitable borrow and dredged or excavated material disposal areas or perform relocations on behalf of the Local Sponsor. Such requests shall be in writing and shall describe the services requested to be performed. If in its sole discretion the Government elects to perform the requested services or any portion thereof, it shall so notify the Local Sponsor in a writing that sets forth any applicable terms and conditions, which must be consistent with this Agreement. In the event of conflict between such a writing and this Agreement, this Agreement shall control. The Local Sponsor shall be solely responsible for all costs of the requested services and shall pay all such costs in accordance with Article VI.C. of this Agreement. Notwithstanding the provision of lands, easements, rights-of-way, and suitable borrow and dredged or excavated material disposal areas or performance of relocations by the Government, the Local Sponsor shall be responsible, as between

the Government and the Local Sponsor, for the costs of cleanup and response in accordance with Article XV.C. of this Agreement.

F. The Government shall perform a final accounting in accordance with Article VI.D. of this Agreement to determine the contributions provided by the Local Sponsor in accordance with paragraphs B., D., and E. of this Article and Articles V, X, and XV.A. of this Agreement and to determine whether the Local Sponsor has met its obligations under paragraphs B., D., and E. of this Article.

G. The Local Sponsor shall not use Federal funds to meet the Local Sponsor's share of total project costs under this Agreement unless the Federal granting agency verifies in writing that the expenditure of such funds is expressly authorized by statute.

H. The Local Sponsor agrees to participate in and comply with applicable Federal floodplain management and flood insurance programs.

ARTICLE III - LANDS, RELOCATIONS, DISPOSAL AREAS, AND PUBLIC LAW 91-646 COMPLIANCE

A. The Government, after consultation with the Local Sponsor, shall determine the lands, easements, and rights-of-way required for the construction, operation, and maintenance of the Project, including those required for relocations, borrow materials, and dredged or excavated material disposal. The Government in a timely manner shall provide the Local Sponsor with general written descriptions, including maps as appropriate, of the lands, easements, and rights-of-way that the Government determines the Local Sponsor must provide, in detail sufficient to enable the Local Sponsor to fulfill its obligations under this paragraph, and shall provide the Local Sponsor with a written notice to proceed with acquisition of such lands, easements, and rights-of-way. Prior to the end of the period of construction, the Local Sponsor shall acquire all lands, easements, and rights-of-way set forth in such descriptions. Furthermore, prior to issuance of the solicitation for each construction contract, the Local Sponsor shall provide the Government with authorization for entry to all lands, easements, and rights-of-way the Government determines the Local Sponsor must provide for that contract. For so long as the Project remains authorized, the Local Sponsor shall ensure that lands, easements, and rights-of-way that the Government determines to be required for the operation and maintenance of the Project and that were provided by the Local Sponsor are retained in public ownership for uses compatible with the authorized purposes of the Project.

B. The Government, after consultation with the Local Sponsor, shall determine the improvements required on lands, easements, and rights-of-way to enable the proper disposal of dredged or excavated material associated with the construction, operation, and maintenance of the Project. Such improvements may include, but are not necessarily limited to, retaining dikes, wasteweirs, bulkheads, embankments, monitoring features, stilling basins, and de-watering pumps and pipes. The Government in a timely manner shall provide the Local Sponsor with general written descriptions of such improvements in detail sufficient to enable the Local Sponsor to fulfill its obligations under this paragraph, and shall provide the Local Sponsor with a written notice to proceed with construction of such improvements. Prior to the end of the period of construction, the Local Sponsor shall provide all improvements set forth in such descriptions. Furthermore, prior to issuance of the solicitation for each Government construction contract, the Local Sponsor shall prepare plans and specifications for all improvements the Government determines to be required for the proper disposal of dredged or excavated material under that contract, submit such plans and specifications to the Government for approval, and provide such improvements in accordance with the approved plans and specifications.

C. The Government, after consultation with the Local Sponsor, shall determine the relocations necessary for the construction, operation, and maintenance of the Project, including those necessary to enable the removal of borrow materials and the proper disposal of dredged or excavated material. The Government in a timely manner shall provide the Local Sponsor with general written descriptions, including maps as appropriate, of such relocations in detail sufficient to enable the Local Sponsor to fulfill its obligations under this paragraph, and shall provide the Local Sponsor with a written notice to proceed with such relocations. Prior to the end of the period of construction, the Local Sponsor shall perform or ensure the performance of all relocations as set forth in such descriptions. Furthermore, prior to issuance of the solicitation for each Government construction contract, the Local Sponsor shall prepare or ensure the preparation of plans and specifications for, and perform or ensure the performance of, all relocations the Government determines to be necessary for that contract.

D. The Local Sponsor in a timely manner shall provide the Government with such documents as are sufficient to enable the Government to determine the value of any contribution provided pursuant to paragraphs A., B., or C. of this Article. Upon receipt of such documents the Government, in accordance with Article IV of this Agreement and in a timely manner, shall determine the value of such contribution, include such value in

total project costs, and afford credit for such value toward the Local Sponsor's share of total project costs.

E. The Local Sponsor shall comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100-17), and the Uniform Regulations contained in 49 C.F.R. Part 24, in acquiring lands, easements, and rights-of-way required for the construction, operation, and maintenance of the Project, including those necessary for relocations, borrow materials, and dredged or excavated material disposal, and shall inform all affected persons of applicable benefits, policies, and procedures in connection with said Act.

ARTICLE IV - CREDIT FOR VALUE OF LANDS, RELOCATIONS, AND DISPOSAL AREAS

A. The Local Sponsor shall receive credit toward its share of total project costs for the value of the lands, easements, rights-of-way, and suitable borrow and dredged or excavated material disposal areas that the Local Sponsor must provide pursuant to Article III of this Agreement, and for the value of the relocations that the Local Sponsor must perform or for which it must ensure performance pursuant to Article III of this Agreement. However, the Local Sponsor shall not receive credit for the value of any lands, easements, rights-of-way, relocations, or borrow and dredged or excavated material disposal areas that have been provided previously as an item of cooperation for another Federal project. The Local Sponsor also shall not receive credit for the value of lands, easements, rights-of-way, relocations, or borrow and dredged or excavated material disposal areas to the extent that such items are provided using Federal funds unless the Federal granting agency verifies in writing that such credit is expressly authorized by statute.

B. For the sole purpose of affording credit in accordance with this Agreement, the value of lands, easements, and rights-of-way, including those necessary for relocations, borrow materials, and dredged or excavated material disposal, shall be the fair market value of the real property interests, plus certain incidental costs of acquiring those interests, as determined in accordance with the provisions of this paragraph.

1. Date of Valuation. The fair market value of lands, easements, or rights-of-way owned by the Local Sponsor on the effective date of this Agreement shall be the fair market value of such real property interests as of the date the Local Sponsor provides the Government with authorization for entry thereto.

The fair market value of lands, easements, or rights-of-way acquired by the Local Sponsor after the effective date of this Agreement shall be the fair market value of such real property interests at the time the interests are acquired.

2. General Valuation Procedure. Except as provided in paragraph B.3. of this Article, the fair market value of lands, easements, or rights-of-way shall be determined in accordance with paragraph B.2.a. of this Article, unless thereafter a different amount is determined to represent fair market value in accordance with paragraph B.2.b. of this Article.

a. The Local Sponsor shall obtain, for each real property interest, an appraisal that is prepared by a qualified appraiser who is acceptable to the Local Sponsor and the Government. The appraisal must be prepared in accordance with the applicable rules of just compensation, as specified by the Government. The fair market value shall be the amount set forth in the Local Sponsor's appraisal, if such appraisal is approved by the Government. In the event the Government does not approve the Local Sponsor's appraisal, the Local Sponsor may obtain a second appraisal, and the fair market value shall be the amount set forth in the Local Sponsor's second appraisal, if such appraisal is approved by the Government. In the event the Government does not approve the Local Sponsor's second appraisal, or the Local Sponsor chooses not to obtain a second appraisal, the Government shall obtain an appraisal, and the fair market value shall be the amount set forth in the Government's appraisal, if such appraisal is approved by the Local Sponsor. In the event the Local Sponsor does not approve the Government's appraisal, the Government, after consultation with the Local Sponsor, shall consider the Government's and the Local Sponsor's appraisals and determine an amount based thereon, which shall be deemed to be the fair market value.

b. Where the amount paid or proposed to be paid by the Local Sponsor for the real property interest exceeds the amount determined pursuant to paragraph B.2.a. of this Article, the Government, at the request of the Local Sponsor, shall consider all factors relevant to determining fair market value and, in its sole discretion, after consultation with the Local Sponsor, may approve in writing an amount greater than the amount determined pursuant to paragraph B.2.a. of this Article, but not to exceed the amount actually paid or proposed to be paid. If the Government approves such an amount, the fair market value shall be the lesser of the approved amount or the amount paid by the Local Sponsor, but no less than the amount determined pursuant to paragraph B.2.a. of this Article.

3. Eminent Domain Valuation Procedure. For lands, easements, or rights-of-way acquired by eminent domain

proceedings instituted after the effective date of this Agreement, the Local Sponsor shall, prior to instituting such proceedings, submit to the Government notification in writing of its intent to institute such proceedings and an appraisal of the specific real property interests to be acquired in such proceedings. The Government shall have 60 days after receipt of such a notice and appraisal within which to review the appraisal, if not previously approved by the Government in writing.

a. If the Government previously has approved the appraisal in writing, or if the Government provides written approval of, or takes no action on, the appraisal within such 60-day period, the Local Sponsor shall use the amount set forth in such appraisal as the estimate of just compensation for the purpose of instituting the eminent domain proceeding.

b. If the Government provides written disapproval of the appraisal, including the reasons for disapproval, within such 60-day period, the Government and the Local Sponsor shall consult in good faith to promptly resolve the issues or areas of disagreement that are identified in the Government's written disapproval. If, after such good faith consultation, the Government and the Local Sponsor agree as to an appropriate amount, then the Local Sponsor shall use that amount as the estimate of just compensation for the purpose of instituting the eminent domain proceeding. If, after such good faith consultation, the Government and the Local Sponsor cannot agree as to an appropriate amount, then the Local Sponsor may use the amount set forth in its appraisal as the estimate of just compensation for the purpose of instituting the eminent domain proceeding.

c. For lands, easements, or rights-of-way acquired by eminent domain proceedings instituted in accordance with sub-paragraph B.3. of this Article, fair market value shall be either the amount of the court award for the real property interests taken, to the extent the Government determined such interests are required for the construction, operation, and maintenance of the Project, or the amount of any stipulated settlement or portion thereof that the Government approves in writing.

4. Incidental Costs. For lands, easements, or rights-of-way acquired by the Local Sponsor within a five-year period preceding the effective date of this Agreement, or at any time after the effective date of this Agreement, the value of the interest shall include the documented incidental costs of acquiring the interest, as determined by the Government, subject to an audit in accordance with Article X.C. of this Agreement to determine reasonableness, allocability, and allowability of costs. Such incidental costs shall include, but not necessarily

be limited to, closing and title costs, appraisal costs, survey costs, attorney's fees, plat maps, and mapping costs, as well as the actual amounts expended for payment of any Public Law 91-646 relocation assistance benefits provided in accordance with Article III.E. of this Agreement.

C. After consultation with the Local Sponsor, the Government shall determine the value of relocations in accordance with the provisions of this paragraph.

1. For a relocation other than a highway, the value shall be only that portion of relocation costs that the Government determines is necessary to provide a functionally equivalent facility, reduced by depreciation, as applicable, and by the salvage value of any removed items.

2. For a relocation of a highway, the value shall be only that portion of relocation costs that would be necessary to accomplish the relocation in accordance with the design standard that the State of Missouri would apply under similar conditions of geography and traffic load, reduced by the salvage value of any removed items.

3. Relocation costs shall include, but not necessarily be limited to, actual costs of performing the relocation; planning, engineering and design costs; supervision and administration costs; and documented incidental costs associated with performance of the relocation, but shall not include any costs due to betterments, as determined by the Government, nor any additional cost of using new material when suitable used material is available. Relocation costs shall be subject to an audit in accordance with Article X.C. of this Agreement to determine reasonableness, allocability, and allowability of costs.

D. The value of the improvements made to lands, easements, and rights-of-way for the proper disposal of dredged or excavated material shall be the costs of the improvements, as determined by the Government, subject to an audit in accordance with Article X.C. of this Agreement to determine reasonableness, allocability, and allowability of costs. Such costs shall include, but not necessarily be limited to, actual costs of providing the improvements; planning, engineering and design costs; supervision and administration costs; and documented incidental costs associated with providing the improvements, but shall not include any costs due to betterments, as determined by the Government.

ARTICLE V - PROJECT COORDINATION TEAM

A. To provide for consistent and effective communication, the Local Sponsor and the Government, not later than 30 days

after the effective date of this Agreement, shall appoint named senior representatives to a Project Coordination Team. Thereafter, the Project Coordination Team shall meet regularly until the end of the period of construction. The Government's Project Manager and a counterpart named by the Local Sponsor shall co-chair the Project Coordination Team.

B. The Government's Project Manager and the Local Sponsor's counterpart shall keep the Project Coordination Team informed of the progress of construction and of significant pending issues and actions, and shall seek the views of the Project Coordination Team on matters that the Project Coordination Team generally oversees.

C. Until the end of the period of construction, the Project Coordination Team shall generally oversee the Project, including issues related to design; plans and specifications; scheduling; real property and relocation requirements; real property acquisition; contract awards and modifications; contract costs; the Government's cost projections; final inspection of the entire Project or functional portions of the Project; preparation of the proposed OMRR&R Manual; anticipated requirements and needed capabilities for performance of operation, maintenance, repair, replacement, and rehabilitation of the Project; and other related matters. This oversight shall be consistent with a project management plan developed by the Government after consultation with the Local Sponsor.

D. The Project Coordination Team may make recommendations that it deems warranted to the District Engineer on matters that the Project Coordination Team generally oversees, including suggestions to avoid potential sources of dispute. The Government in good faith shall consider the recommendations of the Project Coordination Team. The Government, having the legal authority and responsibility for construction of the Project, has the discretion to accept, reject, or modify the Project Coordination Team's recommendations.

E. The costs of participation in the Project Coordination Team shall be included in total project costs and cost shared in accordance with the provisions of this Agreement.

ARTICLE VI - METHOD OF PAYMENT

A. The Government shall maintain current records of contributions provided by the parties and current projections of total project costs and costs due to betterments. At least quarterly, the Government shall provide the Local Sponsor with a report setting forth all contributions provided to date and the current projections of total project costs, of total costs due to betterments, of the components of total project costs, of each

party's share of total project costs, of the Local Sponsor's total cash contributions required in accordance with Articles II.B., II.D., and II.E. of this Agreement, and of the non-Federal proportionate share. On the effective date of this Agreement, total project costs are projected to be $_____, and the Local Sponsor's cash contribution required under Article II.D. of this Agreement is projected to be $_____. Such amounts are estimates subject to adjustment by the Government and are not to be construed as the total financial responsibilities of the Government and the Local Sponsor.

B. The Local Sponsor shall provide the cash contribution required under Articles II.D.1. and II.D.3. of this Agreement in accordance with the following provisions: Not less than 30 calendar days prior to the scheduled date for issuance of the solicitation for the first construction contract, the Government shall notify the Local Sponsor in writing of such scheduled date and the funds the Government determines to be required from the Local Sponsor to meet its projected cash contribution under Articles II.D.1. and II.D.3. of this Agreement. Not later than such scheduled date, the Local Sponsor shall provide the Government with the full amount of the required funds by delivering a check payable to "FAO, USAED, Memphis" to the District Engineer. The Government shall draw from the funds provided by the Local Sponsor such sums as the Government, deems necessary to cover: (a) the non-Federal proportionate share of financial obligations for construction incurred prior to the commencement of the period of construction; and (b) the non-Federal proportionate share of financial obligations for construction as they are incurred during the period of construction. In the event the Government determines that the Local Sponsor must provide additional funds to meet the Local Sponsor's cash contribution, the Government shall notify the Local Sponsor in writing of the additional funds required. Within 60 calendar days thereafter, the Local Sponsor shall provide the Government with a check for the full amount of the additional required funds.

C. In advance of the Government incurring any financial obligation associated with additional work under Article II.B. or II.E. of this Agreement, the Local Sponsor shall provide the Government with the full amount of the funds required to pay for such additional work by delivering a check payable to "FAO, USAED, Memphis" to the District Engineer. The Government shall draw from the funds provided by the Local Sponsor such sums as the Government deems necessary to cover the Government's financial obligations for such additional work as they are incurred. In the event the Government determines that the Local Sponsor must provide additional funds to meet its cash contribution, the Government shall notify the Local Sponsor in writing of the additional funds required. Within 30 calendar

days thereafter, the Local Sponsor shall provide the Government with a check for the full amount of the additional required funds.

D. Upon completion of the Project or termination of this Agreement, and upon resolution of all relevant claims and appeals, the Government shall conduct a final accounting and furnish the Local Sponsor with the results of the final accounting. The final accounting shall determine total project costs, each party's contribution provided thereto, and each party's required share thereof. The final accounting also shall determine costs due to betterments and the Local Sponsor's cash contribution provided pursuant to Article II.B. of this Agreement.

1. In the event the final accounting shows that the total contribution provided by the Local Sponsor is less than its required share of total project costs plus costs due to any betterments provided in accordance with Article II.B. of this Agreement, the Local Sponsor shall, no later than 90 calendar days after receipt of written notice, make a cash payment to the Government of whatever sum is required to meet the Local Sponsor's required share of total project costs plus costs due to any betterments provided in accordance with Article II.B. of this Agreement.

2. In the event the final accounting shows that the total contribution provided by the Local Sponsor exceeds its required share of total project costs plus costs due to any betterments provided in accordance with Article II.B. of this Agreement, the Government shall, subject to the availability of funds, refund the excess to the Local Sponsor no later than 90 calendar days after the final accounting is complete; however, the Local Sponsor shall not be entitled to any refund of the 5 percent cash contribution required pursuant to Article II.D.1. of this Agreement. In the event existing funds are not available to refund the excess to the Local Sponsor, the Government shall seek such appropriations as are necessary to make the refund.

ARTICLE VII - DISPUTE RESOLUTION

As a condition precedent to a party bringing any suit for breach of this Agreement, that party must first notify the other party in writing of the nature of the purported breach and seek in good faith to resolve the dispute through negotiation. If the parties cannot resolve the dispute through negotiation, they may agree to a mutually acceptable method of non-binding alternative dispute resolution with a qualified third party acceptable to both parties. The parties shall each pay 50 percent of any costs for the services provided by such a third party as such costs are

incurred. The existence of a dispute shall not excuse the parties from performance pursuant to this Agreement.

ARTICLE VIII - OPERATION, MAINTENANCE, REPAIR, REPLACEMENT, AND REHABILITATION (OMRR&R)

A. Upon notification in accordance with Article II.C. of this Agreement and for so long as the Project remains authorized, the Local Sponsor shall operate, maintain, repair, replace, and rehabilitate the entire Project or the functional portion of the Project, at no cost to the Government, in a manner compatible with the Project's authorized purposes and in accordance with applicable Federal and State laws as provided in Article XI of this Agreement and specific directions prescribed by the Government in the OMRR&R Manual and any subsequent amendments thereto.

B. The Local Sponsor hereby gives the Government a right to enter, at reasonable times and in a reasonable manner, upon property that the Local Sponsor owns or controls for access to the Project for the purpose of inspection and, if necessary, for the purpose of completing, operating, maintaining, repairing, replacing, or rehabilitating the Project. If an inspection shows that the Local Sponsor for any reason is failing to perform its obligations under this Agreement, the Government shall send a written notice describing the non-performance to the Local Sponsor. If, after 30 calendar days from receipt of notice, the Local Sponsor continues to fail to perform, then the Government shall have the right to enter, at reasonable times and in a reasonable manner, upon property that the Local Sponsor owns or controls for access to the Project for the purpose of completing, operating, maintaining, repairing, replacing, or rehabilitating the Project. No completion, operation, maintenance, repair, replacement, or rehabilitation by the Government shall operate to relieve the Local Sponsor of responsibility to meet the Local Sponsor's obligations as set forth in this Agreement, or to preclude the Government from pursuing any other remedy at law or equity to ensure faithful performance pursuant to this Agreement.

ARTICLE IX - INDEMNIFICATION

The Local Sponsor shall hold and save the Government free from all damages arising from the construction, operation, maintenance, repair, replacement, and rehabilitation of the Project and any Project-related betterments, except for damages due to the fault or negligence of the Government or its contractors.

ARTICLE X - MAINTENANCE OF RECORDS AND AUDIT

A. Not later than 60 calendar days after the effective date of this Agreement, the Government and the Local Sponsor shall develop procedures for keeping books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to this Agreement. These procedures shall incorporate, and apply as appropriate, the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments at 32 C.F.R. Section 33.20. The Government and the Local Sponsor shall maintain such books, records, documents, and other evidence in accordance with these procedures and for a minimum of three years after the period of construction and resolution of all relevant claims arising therefrom. To the extent permitted under applicable Federal laws and regulations, the Government and the Local Sponsor shall each allow the other to inspect such books, documents, records, and other evidence.

B. Pursuant to 32 C.F.R. Section 33.26, the Local Sponsor is responsible for complying with the Single Audit Act of 1984, 31 U.S.C. Sections 7501-7507, as implemented by Office of Management and Budget (OMB) Circular No. A-128 and Department of Defense Directive 7600.10. Upon request of the Local Sponsor and to the extent permitted under applicable Federal laws and regulations, the Government shall provide to the Local Sponsor and independent auditors any information necessary to enable an audit of the Local Sponsor's activities under this Agreement. The costs of any non-Federal audits performed in accordance with this paragraph shall be allocated in accordance with the provisions of OMB Circulars A-87 and A-128, and such costs as are allocated to the Project shall be included in total project costs and cost shared in accordance with the provisions of this Agreement.

C. In accordance with 31 U.S.C. Section 7503, the Government may conduct audits in addition to any audit that the Local Sponsor is required to conduct under the Single Audit Act. Any such Government audits shall be conducted in accordance with Government Auditing Standards and the cost principles in OMB Circular No. A-87 and other applicable cost principles and regulations. The costs of Government audits performed in accordance with this paragraph shall be included in total project costs and cost shared in accordance with the provisions of this Agreement.

ARTICLE XI - FEDERAL AND STATE LAWS

In the exercise of their respective rights and obligations under this Agreement, the Local Sponsor and the Government agree to comply with all applicable Federal and State laws and

regulations, including, but not limited to, Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulations 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army".

ARTICLE XII - RELATIONSHIP OF PARTIES

A. In the exercise of their respective rights and obligations under this Agreement, the Government and the Local Sponsor each act in an independent capacity, and neither is to be considered the officer, agent, or employee of the other.

B. In the exercise of its rights and obligations under this Agreement, neither party shall provide, without the consent of the other party, any contractor with a release that waives or purports to waive any rights such other party may have to seek relief or redress against such contractor either pursuant to any cause of action that such other party may have or for violation of any law.

ARTICLE XIII - OFFICIALS NOT TO BENEFIT

No member of or delegate to the Congress, nor any resident commissioner, shall be admitted to any share or part of this Agreement, or to any benefit that may arise therefrom.

ARTICLE XIV - TERMINATION OR SUSPENSION

A. If at any time the Local Sponsor fails to fulfill its obligations under Article II.B., II.D., II.E., VI, or XVIII.C. of this Agreement, the Assistant Secretary of the Army (Civil Works) shall terminate this Agreement or suspend future performance under this Agreement unless he determines that continuation of work on the Project is in the interest of the United States or is necessary in order to satisfy agreements with any other non-Federal interests in connection with the Project.

B. If the Government fails to receive annual appropriations in amounts sufficient to meet Project expenditures for the then-current or upcoming fiscal year, the Government shall so notify the Local Sponsor in writing, and 60 calendar days thereafter either party may elect without penalty to terminate this Agreement or to suspend future performance under this Agreement. In the event that either party elects to suspend future performance under this Agreement pursuant to this paragraph, such suspension shall remain in effect until such time as the Government receives sufficient appropriations or until either the Government or the Local Sponsor elects to terminate this Agreement.

C. In the event that either party elects to terminate this Agreement pursuant to this Article or Article XV of this Agreement, both parties shall conclude their activities relating to the Project and proceed to a final accounting in accordance with Article VI.D. of this Agreement.

D. Any termination of this Agreement or suspension of future performance under this Agreement in accordance with this Article or Article XV of this Agreement shall not relieve the parties of liability for any obligation previously incurred. Any delinquent payment shall be charged interest at a rate, to be determined by the Secretary of the Treasury, equal to 150 per centum of the average bond equivalent rate of the 13-week Treasury bills auctioned immediately prior to the date on which such payment became delinquent, or auctioned immediately prior to the beginning of each additional 3-month period if the period of delinquency exceeds 3 months.

ARTICLE XV - HAZARDOUS SUBSTANCES

A. After execution of this Agreement and upon direction by the District Engineer, the Local Sponsor shall perform, or cause to be performed, any investigations for hazardous substances that the Government or the Local Sponsor determines to be necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (hereinafter "CERCLA"), 42 U.S.C. Sections 9601-9675, that may exist in, on, or under lands, easements, and rights-of-way that the Government determines, pursuant to Article III of this Agreement, to be required for the construction, operation, and maintenance of the Project. However, for lands that the Government determines to be subject to the navigation servitude, only the Government shall perform such investigations unless the District Engineer provides the Local Sponsor with prior specific written direction, in which case the Local Sponsor shall perform such investigations in accordance with such written direction. All actual costs incurred by the Local Sponsor for such investigations for hazardous substances shall be included in total project costs and cost shared in accordance with the provisions of this Agreement, subject to an audit in accordance with Article X.C. of this Agreement to determine reasonableness, allocability, and allowability of costs.

B. In the event it is discovered through any investigation for hazardous substances or other means that hazardous substances regulated under CERCLA exist in, on, or under any lands, easements, or rights-of-way that the Government determines, pursuant to Article III of this Agreement, to be required for the construction, operation, and maintenance of the Project, the Local Sponsor and the Government shall provide prompt written

notice to each other, and the Local Sponsor shall not proceed with the acquisition of the real property interests until both parties agree that the Local Sponsor should proceed.

C. The Government and the Local Sponsor shall determine whether to initiate construction of the Project, or, if already in construction, whether to continue with work on the Project, suspend future performance under this Agreement, or terminate this Agreement for the convenience of the Government, in any case where hazardous substances regulated under CERCLA are found to exist in, on, or under any lands, easements, or rights-of-way that the Government determines, pursuant to Article III of this Agreement, to be required for the construction, operation, and maintenance of the Project. Should the Government and the Local Sponsor determine to initiate or continue with construction after considering any liability that may arise under CERCLA, the Local Sponsor shall be responsible, as between the Government and the Local Sponsor, for the costs of clean-up and response, to include the costs of any studies and investigations necessary to determine an appropriate response to the contamination. Such costs shall not be considered a part of total project costs. In the event the Local Sponsor fails to provide any funds necessary to pay for clean up and response costs or to otherwise discharge the Local Sponsor's responsibilities under this paragraph upon direction by the Government, the Government may, in its sole discretion, either terminate this Agreement for the convenience of the Government, suspend future performance under this Agreement, or continue work on the Project.

D. The Local Sponsor and the Government shall consult with each other in accordance with Article V of this Agreement in an effort to ensure that responsible parties bear any necessary clean up and response costs as defined in CERCLA. Any decision made pursuant to paragraph C. of this Article shall not relieve any third party from any liability that may arise under CERCLA.

E. As between the Government and the Local Sponsor, the Local Sponsor shall be considered the operator of the Project for purposes of CERCLA liability. To the maximum extent practicable, the Local Sponsor shall operate, maintain, repair, replace, and rehabilitate the Project in a manner that will not cause liability to arise under CERCLA.

ARTICLE XVI - NOTICES

A. Any notice, request, demand, or other communication required or permitted to be given under this Agreement shall be deemed to have been duly given if in writing and either delivered personally or by telegram or mailed by first-class, registered, or certified mail, as follows:

If to the Local Sponsor:

Director
Missouri Department of Conservation
P.O. Box 180
Jefferson City, Missouri 65102

If to the Government:

District Engineer
U.S. Army Engineer District, St. Louis
1222 Spruce Street
St. Louis, Missouri 63103

B. A party may change the address to which such communications are to be directed by giving written notice to the other party in the manner provided in this Article.

C. Any notice, request, demand, or other communication made pursuant to this Article shall be deemed to have been received by the addressee at the earlier of such time as it is actually received or seven calendar days after it is mailed.

ARTICLE XVII - CONFIDENTIALITY

To the extent permitted by the laws governing each party, the parties agree to maintain the confidentiality of exchanged information when requested to do so by the providing party.

ARTICLE XVIII - HISTORIC PRESERVATION

A. The costs of identification, survey and evaluation of historic properties shall be included in total project costs and cost shared in accordance with the provisions of this Agreement.

B. As specified in Section 7(a) of Public Law 93-291 (16 U.S.C. Section 469c(a)), the costs of mitigation and data recovery activities associated with historic preservation shall be borne entirely by the Government and shall not be included in total project costs, up to the statutory limit of one percent of the total amount authorized to be appropriated for the Project.

C. The Government shall not incur costs for mitigation and data recovery that exceed the statutory one percent limit specified in paragraph B. of this Article unless and until the Assistant Secretary of the Army (Civil Works) has waived that limit in accordance with Section 208(3) of Public Law 96-515 (16 U.S.C. Section 469c-2(3)). Any costs of mitigation and data recovery that exceed the one percent limit shall not be included in total project costs but shall be cost shared between the Local

Sponsor and the Government consistent with the minimum non-Federal cost sharing requirements for the underlying flood control purpose, as follows: 25 percent borne by the Local Sponsor, and 75 percent borne by the Government.

ARTICLE XIX - OBLIGATIONS OF FUTURE APPROPRIATIONS

Nothing herein shall constitute, nor be deemed to constitute, an obligation of future appropriations by the Legislature of the State of Missouri.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement, which shall become effective upon the date it is signed by the District Engineer.

THE DEPARTMENT OF THE ARMY	**THE MISSOURI DEPARTMENT OF CONSERVATION**
BY: _____	**BY:** _____
Thomas C. Suermann **District Engineer,** **U.S. Army Engineer District,** **St. Louis**	**Jerry J. Presley** **Director, Missouri Department of Conservation**
DATE: _____	**DATE:** _____

CERTIFICATE OF AUTHORITY

I, _____, do hereby certify that I am the principal legal officer of the Missouri Department of Conservation, that the Missouri Department of Conservation is a legally constituted public body with full authority and legal capability to perform the terms of the Agreement between the Department of the Army and the Missouri Department of Conservation in connection with the Cuivre Island Habitat Rehabilitation and Enhancement Project at Pool 26, Mississippi River, Lincoln and St. Charles Counties, Missouri, and to pay damages in accordance with the terms of this Agreement, if necessary, in the event of the failure to perform, as required by Section 221 of Public Law 91-611 (42 U.S.C. Section 1962d-5b), and that the persons who have executed this Agreement on behalf of the Missouri Department of Conservation have acted within their statutory authority.

IN WITNESS WHEREOF, I have made and executed this certification this _____ day of _____ 1994.

_____
[SIGNATURE]
[TYPED NAME]
[TITLE IN FULL]

CERTIFICATION REGARDING LOBBYING

The undersigned certifies, to the best of his or her knowledge and belief that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

_____

Jerry J. Presley, Director
Missouri Department
of Conservation

DATE: _____

Appendix K - Project Fact Sheets

Upper Mississippi River System Environmental Management Program
Fact Sheet
CUIVRE ISLAND HABITAT REHABILITATION
Pool 26, Missouri

LOCATION: Cuivre Island is located between Mississippi River miles 233-239. The project area consists of Cuivre Island, the western bank of the Mississippi River adjacent to the island, Cuivre Slough, Turkey Island-Phelan's Island Chute, Turkey Island Chute (all Cooperative Agreement lands) and approximately 200 mainland acres of Cuivre River wetland owned by the Missouri Department of Conservation.

RESOURCE PROBLEM: The primary problem in this upper reach of Pool 26 is that the chutes, sloughs, backwater areas and wetlands have declined in areal extent, depth, and quality due to sedimentation.

PROPOSED PROJECT: The proposed project would include removal of existing closing structures, construction of new closures, installation of gated drains, construction of short lengths of "hard point" dikes to promote scour, displacement of sediment by increased flows and prop-wash, emplacement of fish habitat structures and rehabilitating wetlands/moist soil units by constructing low levees, enlarging drainage ditches and providing portable pumping units.

PROJECT OUTPUTS: Accumulated sediments will be flushed from Cuivre Slough. Approximately 400 acres of moist soil/managed wetland area would be created on the upper end of Cuivre Island and some 200 acres of wetland/slough habitat would be rehabilitated on the mainland adjacent to the Cuivre River.

FINANCIAL DATA: Costs for general design are estimated at $180,000, and construction costs are estimated at $926,000. Annual OMRR costs are estimated at $14,000. Portions of the project (1,580 acres) were included in certain lands acquired for the navigation project that were identified in a General Plan and made available to the States, through Cooperative Agreements between the Corps of Engineers and the Department of Interior (DOI), and between the DOI and each State. These lands were made available "for use in the conservation and management of wildlife resources thereof, and its habitat thereon, in connection with the national migratory bird program." The Cooperative Agreements stipulate that the areas shall be maintained "in accordance with an annual management program ... submitted to the Service." Under Section 906(e) of the 1986 Water Resources Development Act, this portion of the project area is "managed as a national wildlife refuge" and qualifies for 100 percent Federal funding of general design and construction. Other portions (200 acres) are land owned in fee title by the Missouri Department of Conservation (MO DOC). In accordance with Section 906(e), general design and construction costs on the MO DOC land, and all OMRR costs, would be shared 75 percent Federal/25 percent non-Federal. The non-Federal sponsor would be the Missouri Department of Conservation.

Cuivre Island Wildlife Area

Missouri Department of Conservation
Box 428
Hannibal, MO 63401

Location: The area is located in Lincoln and St. Charles counties near Old Monroe, Missouri. It can be reached by Highway 79, 3.5 miles south of Old Monroe, then 4 miles east on Dalbow Road. The area is within the confines of the Upper Mississippi River between river miles 235 and 238.

General Information: The Cuivre Island Wildlife Area was purchased through a cooperative effort among the Department of Conservation, the U.S. Army Corps of Engineers and special assistance from the Nature Conservancy. The 1,400-acre wildlife area was acquired, in part, to provide wildlife habitat as a result of mitigation for the Melvin Price Lock and Dam, and to provide an area for the general public to use.

The area is predominantly bottomland hardwoods. However, agricultural fields and several small sloughs add diversity.

Public use of the Cuivre Island area is permitted in accordance with the Wildlife Code of Missouri and subject to the following special regulations.

Regulatons

Area rules and regulations are governed by the Wildlife Code of Missouri, Chapter 4, 3CSR10-4.115, Special Management Areas. Always consult the Wildlife Code and check area regulations posted at parking lots.

Questions concerning the area can be answered by the county conservation agent or by writing Missouri Department of Conservation, Box 428, Hannibal, MO 63401, (314/221-4805). The area is open all year.

General Restrictions

Motor vehicles shall be operated only upon roads, thoroughfares or areas specifically designated for such travel. The maximum speed permitted on area roads is 45 m.p.h. unless otherwise posted. Vehicles shall be operated in a careful and prudent manner and with the highest degree of care so as not to endanger the property of another or the life and limb of any person.

Hunting of waterfowl is permitted and is controlled by statewide regulations. Blinds and decoys must be removed from the area daily. Willows only may be cut to construct blinds and improve blind sites. **Hunting of other wildlife** is permitted except in areas designated closed by posting; provided deer may be taken by archery methods only during the statewide season on the mainland portions of the area. The use of dogs to pursue furbearers on the mainland is prohibited.

Frogging: Bullfrogs and green frogs may be taken by pole and line, gig, longbow, hand and handnet during the statewide bullfrog season.

Trapping: Furbearers may be trapped only under special permit areas.

Camping is permitted only at specifically posted or otherwise designated sites, and is not to exceed 15 consectuive days in any 30-day period.

Missouri Department of Conservation
P.O. Box 180
Jefferson City, MO 65102-0180

11/89

Appendix L - Initial Cost Estimates

Includes initial and OM&R costs. These initial estimates were used for the evaluation and selection of Management Measures.

Note: Initial and OM&R costs are summarized in Table 8 of the main report.

Note: cost estimates include a percentage increase for contingencies, and a further increase for E&D (engineering and design, meaning the preparation of plans and specifications).

Note: MCACES cost estimate (final cost estimate) is in Appendix M

Mgmt. Measure 2A

GOVERNMENT ESTIMATE WORK SHEET

PROJECT__CUIVRE ISLAND, DPR DATE: 7/27/1993

SUBJECT__MAINLAND, HALF of AREA 2 ED-CE \ DYN

File: CUIVRE1.CAL

ITEM	QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
Clearing	28	ACR	2,000.0	$56,000
Embankment, Levee	11,200	CY	3.5	$39,200
36" Gravity Drainage Struct(1ea)				
Excavation	42	CY	3.0	$126
Drainage Material	50	TON	12.0	$600
Concrete Pad	2	CY	150.0	$300
36" Dia CMP's	74	LF	50.0	$3,700
36" Dia CMP End Sections	2	EA	350.0	$700
72" Dia CMP Riser Pipe,	1	EA	60,000.0	$60,000
Sluice Gates & Appurtenances				
Staff Gages	2	EA	1,100.0	$2,200
Hydraulic Operator	1	EA	7,000.0	$7,000
Seeding	5	ACR	1,100.0	$5,500
Submersible Pump (500 GPM)	1	Ea	8,000.0	$8,000
Well	Sum	Job		$5,000
Electrical Supply	Sum	Job		$6,500
10" PVC Pipe	202	LF	15.0	$3,030
10" Dia Butterfly Valve	1	EA	1,500.0	$1,500
3' Dia Precast Conc. Manhole	1	EA	1,200.0	$1,200
		SUBTOTAL:		$200,556
	CONTINGENCIES: (in %)		25.0	49,444
		SUBTOTAL:		$250,000
	E&D (in %)_____		15.0	$38,000
	S&A (in %)_____		10.0	$25,000
		TOTAL COST		$313,000

Mgmt. Measure 2B

GOVERNMENT ESTIMATE WORK SHEET

PROJECT__CUIVRE ISLAND, DPR DATE: 7/27/1993

SUBJECT__MAINLAND, ALL of AREA 2 ED-CE \ DYN

File: CUIVRE1

ITEM	QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
Clearing	55	ACR	2,000.0	$110,000
Embankment, Levee	22,400	CY	3.5	$78,400
36" Gravity Drainage Struct(1ea)				
Excavation	42	CY	3.0	$126
Drainage Material	50	TON	12.0	$600
Concrete Pad	2	CY	150.0	$300
36" Dia CMP's	74	LF	50.0	$3,700
36" Dia CMP End Sections	2	EA	350.0	$700
72" Dia CMP Riser Pipe,	1	EA	60,000.0	$60,000
Sluice Gates & Appurtenances				
Staff Gages	2	EA	1,100.0	$2,200
Hydraulic Operator	1	EA	7,000.0	$7,000
Seeding	10	ACR	1,100.0	$11,000
Submersible Pump (500 GPM)	1	Ea	8,000.0	$8,000
Well	Sum	Job		$5,000
Electrical Supply	Sum	Job		$6,500
10" PVC Pipe	202	LF	15.0	$3,030
10" Dia Butterfly Valve	1	EA	1,500.0	$1,500
3' Dia Precast Conc. Manhole	1	EA	1,200.0	$1,200
		SUBTOTAL:		$299,256
		CONTINGENCIES: (in %)	25.0	70,744
		SUBTOTAL:		$370,000
		E&D (in %)_____	15.0	$56,000
		S&A (in %)_____	10.0	$37,000
		TOTAL COST		$463,000

Mgmt. Measure 2C

GOVERNMENT ESTIMATE WORK SHEET

PROJECT__CUIVRE ISLAND, DPR DATE: 7/27/1993

SUBJECT__MAINLAND - AREAS 1 & 2 ED-CE \ DYN

File: CUIVRE1.CAL

ITEM	QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
Clearing	78	ACR	2,000.0	$156,000
Embankment, Levee	36,800	CY	3.5	$128,800
36" Gravity Drainage Struct(2ea)				
Excavation	84	CY	3.0	$252
Drainage Material	100	TON	12.0	$1,200
Concrete Pad	4	CY	150.0	$600
36" Dia CMP's	148	LF	50.0	$7,400
36" Dia CMP End Sections	4	EA	350.0	$1,400
72" Dia CMP Riser Pipe,	2	EA	60,000.0	$120,000
Sluice Gates & Appurtenances				
Staff Gages	4	EA	1,100.0	$4,400
Hydraulic Operator	1	EA	7,000.0	$7,000
24" Dia CMP's (2ea)	64	LF	35.0	$2,240
24" Dia CMP End Sections	4	EA	250.0	$1,000
Aggregate Surface Course	300	TON	12.0	$3,600
Seeding	16	ACR	1,100.0	$17,600
Embankment, Road	1,040	CY	3.5	$3,640
Submersible Pump (1,000 GPM)	1	EA	12,000.0	$12,000
Well	Sum	Job		$5,000
		SUBTOTAL:		$472,132

MM 2C (cont.)

GOVERNMENT ESTIMATE WORK SHEET

PROJECT__CUIVRE ISLAND, DPR — DATE: 7/27/1993

SUBJECT__MAINLAND - AREAS 1 & 2 — ED-CE \ DYN

File: CUIVRE1.CAL

ITEM	QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
Electrical Supply	Sum	Job		6,500
10" PVC Pipe	405	LF	15.0	$6,075
10" Dia Butterfly Valves	2	EA	1,500.0	$3,000
3' Dia Precast Conc. Manholes	2	EA	1,200.0	$2,400

SUBTOTAL:		$490,107
CONTINGENCIES: (in %)	25.0	119,893
SUBTOTAL:		$610,000
E&D (in %)____________	15.0	$92,000
S&A (in %)____________	10.0	$61,000
TOTAL COST		$763,000

Mgmt. Measure 4A

GOVERNMENT ESTIMATE WORK SHEET

PROJECT__CUIVRE ISLAND, DPR DATE: 7/27/1993

SUBJECT__ISLAND - 4,000 GPM PUMP STA., Ponding at El. 424 ED-CE \ DYN

File: CUIVRE2

ITEM	QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
Clearing	19	ACR	2,000.0	$38,000
Excavation, Ditching	31,500	CY	2.5	$78,750
Embankment Road	2,110	CY	3.5	$7,385
36" Gravity Drainage Struct(2ea)				
Embankment	230	CY	3.5	$805
Cofferdam	370	CY	3.5	$1,295
Excavation	130	CY	3.0	$390
Staff Gages	2	EA	1,100.0	$2,200
Concrete Pad	1	CY	150.0	$150
36" Dia CMP's	68	LF	50.0	$3,400
36" Dia Cmp End Sections	2	EA	350.0	$700
72" Dia Riser Pipe,	1	EA	60,000.0	$60,000
Sluice Gate & Appurtenances				
6" Stone (minus)	160	TON	12.0	$1,920
3" Stone (minus)	60	TON	12.0	$720
Geogrid	175	SY	5.0	$875
Geotextile	155	SY	1.5	$233
Revetment, "C" Stone	150	TON	16.0	$2,400
Seeding	18	ACR	1,100.0	$19,800
		SUBTOTAL:		$219,023

MM 4 A (cont.)

GOVERNMENT ESTIMATE WORK SHEET

PROJECT__CUIVRE ISLAND, DPR DATE: 7/27/1993

SUBJECT__ISLAND - 4,000 GPM PUMP STA., Ponding at El. 424 ED-CE \ DYN

File: CUIVRE2

ITEM	QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
Pump Station - 4,000 GPM				
Excavation	3,840	CY	3.0	$11,520
Backfill	3,300	CY	2.5	$8,250
48" Dia Steel Pipe (3/8")	62	LF	190.0	$11,780
30" Dia Steel Pipe (3/8")	36	LF	90.0	$3,240
Geogrid	80	SY	5.0	$400
Geotextile	80	SY	1.5	$120
Revetment, "C" Stone	610	TON	16.0	$9,760
3" Stone (minus)	150	TON	12.0	$1,800
Sluice Gate - 4'x 4'	2	EA	9,700.0	$19,400
Sluice Gate - 30" Dia	2	EA	6,500.0	$13,000
Concrete	85	CY	200.0	$17,000
Grating, Fiberglass	148	SF	20.0	$2,960
Handrail, Fiberglass (3'high)	20	LF	35.0	$700
Reinforcing Steel	11,500	LB	.7	$8,050
Staff Gages	2	EA	1,100.0	$2,200
Pump, 4,000 GPM	1	EA	25,000.0	$25,000
Electrical Supply	Sum	Job		$10,000
		SUBTOTAL:		$145,180

MM 4A (cont.)

GOVERNMENT ESTIMATE WORK SHEET

PROJECT__CUIVRE ISLAND, DPR DATE: 7/27/1993

SUBJECT__ISLAND - 4,000 GPM PUMP STA., Ponding at El. 424 ED-CE \ DYN

File: CUIVRE2

ITEM	QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
36" Dia CMP's (5ea)				
Embankment	2,900	CY	3.5	$10,150
Excavation	100	CY	3.0	$300
36" Dia CMP's	360	LF	50.0	$18,000
36" CMP End Sections	10	EA	350.0	$3,500
Pipe Bedding Material	150	TON	12.0	$1,800
Culvert Removal (2ea)				
36" & 18" Dia CMP	70	LF	10.0	$700
		SUBTOTAL:		$398,653
		CONTINGENCIES: (in %)	25.0	101,347
		SUBTOTAL:		$500,000
		E&D (in %)_____	15.0	$75,000
		S&A (in %)_____	10.0	$50,000
		TOTAL COST		$625,000

Mgmt. Measure 4C

GOVERNMENT ESTIMATE WORK SHEET

PROJECT__CUIVRE ISLAND, DPR DATE: 7/27/1993

SUBJECT__ISLAND - 10,000 GPM PUMP STA., Ponding at El. 429 ED-CE \ DYN

File: CUIVRE2

ITEM	QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
Clearing	19	ACR	2,000.0	$38,000
Excavation, Ditching	31,500	CY	2.5	$78,750
Embankment Road	2,110	CY	3.5	$7,385
36" Gravity Drainage Struct(2ea)				
Embankment	460	CY	3.5	$1,610
Cofferdam	740	CY	3.5	$2,590
Excavation	260	CY	3.0	$780
Staff Gages	4	EA	1,100.0	$4,400
Concrete Pad	3	CY	150.0	$450
36" Dia CMP's	136	LF	50.0	$6,800
36" Dia Cmp End Sections	4	EA	350.0	$1,400
72" Dia Riser Pipe,	2	EA	60,000.0	$120,000
Sluice Gate & Appurtenances				
6" Stone (minus)	320	TON	12.0	$3,840
3" Stone (minus)	120	TON	12.0	$1,440
Geogrid	350	SY	5.0	$1,750
Geotextile	310	SY	1.5	$465
Revetment, "C" Stone	300	TON	16.0	$4,800
Seeding	18	ACR	1,100.0	$19,800
		SUBTOTAL:		$294,260

MM 4C (cont.)

GOVERNMENT ESTIMATE WORK SHEET

PROJECT__CUIVRE ISLAND, DPR DATE: 7/27/1993

SUBJECT__ISLAND - 10,000 GPM PUMP STA., Ponding at El. 429 ED-CE \ DYN

File: CUIVRE2

ITEM	QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
Pump Station - 10,000 GPM				
Excavation	3,840	CY	3.0	$11,520
Backfill	3,300	CY	2.5	$8,250
48" Dia Steel Pipe (3/8")	34	LF	190.0	$6,460
60" Dia Steel Pipe (3/8")	28	LF	250.0	$7,000
30" Dia Steel Pipe (3/8")	36	LF	90.0	$3,240
Geogrid	80	SY	5.0	$400
Geotextile	80	SY	1.5	$120
Revetment, "C" Stone	610	TON	16.0	$9,760
3" Stone (minus)	150	TON	12.0	$1,800
Sluice Gate - 5'x 5'	2	EA	19,000.0	$38,000
Sluice Gate - 30" Dia	2	EA	6,500.0	$13,000
Concrete	100	CY	200.0	$20,000
Grating, Fiberglass	168	SF	20.0	$3,360
Handrail, Fiberglass (3'high)	20	LF	35.0	$700
Reinforcing Steel	13,500	LB	.7	$9,450
Staff Gages	2	EA	1,100.0	$2,200
Pump, 10,000 GPM	1	EA	85,000.0	$85,000
Electrical Supply	Sum	Job		$15,000
		SUBTOTAL:		$235,260

MM 4C (cont.)

GOVERNMENT ESTIMATE WORK SHEET

PROJECT__CUIVRE ISLAND, DPR DATE: 7/27/1993

SUBJECT__ISLAND - 10,000 GPM PUMP STA., ED-CE \ DYN
Ponding at El. 429

File: CUIVRE2

ITEM	QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
36" Dia CMP's (5ea)				
Embankment	2,900	CY	3.5	$10,150
Excavation	100	CY	3.0	$300
36" Dia CMP's	360	LF	50.0	$18,000
36" CMP End Sections	10	EA	350.0	$3,500
Pipe Bedding Material	150	TON	12.0	$1,800
Culvert Removal (2ea)				
36" & 18" Dia CMP	70	LF	10.0	$700
		SUBTOTAL:		$563,970
		CONTINGENCIES: (in %)	25.0	136,030
		SUBTOTAL:		$700,000
		E&D (in %)_____	15.0	$110,000
		S&A (in %)_____	10.0	$70,000
		TOTAL COST		$880,000

Mgmt. Measure 4C (cont.)

aid to determine cost sharing of 4C, cuivre island 2/17/94 DGK

this info to be put into Table of Cost Sharing

	est amount from ED-C	% Fed (decimal)	cost of Mgmt Measure on property: Fed portion	state portion
clearing	38000	.5	19000	19000
excavation	78750	.5	39375	39375
embank	7385	.5	3693	3693
36 in. grav drain (2)	170125	0	0	170125
pump sta	235260	0	0	235260
36 in. cmp (5)	33750	.8	27000	6750
culvert removal	700	1	700	0
			89768	474203
563970				
	contin		21652	114378
136030				
	e&d		17509	92491
110000				
	s&a		11142	58858
70000				
			140070	739930
880000				

for Table of Cost Sharing

Mgmt. Measure 7A

GOVERNMENT ESTIMATE WORK SHEET

PROJECT__CUIVRE ISLAND, DPR | DATE: 7/28/1993

SUBJECT__STONE DIKES | ED-CE \ DYN

File: CUIVRE3.CAL

ITEM	QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
Mobilization and Demobilization	Sum	Job		$15,000
Stone Dikes, "A" Stone (1-pair)	800	TON	16.00	$12,800

SUBTOTAL:		$27,800
CONTINGENCIES: (in %)	25.00	7,200
SUBTOTAL:		$35,000
E&D (in %)____________	15.00	$5,300
S&A (in %)____________	10.00	$3,500
TOTAL COST		$43,800

Mgmt. Measure 7B

GOVERNMENT ESTIMATE WORK SHEET

PROJECT__CUIVRE ISLAND, DPR DATE: 7/28/1993

SUBJECT__STONE DIKES ED-CE \ DYN

File: CUIVRE3.CAL

ITEM	QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
Mobilization and Demobilization	Sum	Job		$15,000
Stone Dikes, "A" Stone (2-pair)	1,600	TON	15.00	$24,000

SUBTOTAL:		$39,000
CONTINGENCIES: (in %)	25.00	10,000
SUBTOTAL:		$49,000
E&D (in %)	15.00	$7,400
S&A (in %)	10.00	$4,900
TOTAL COST		$61,300

Mgmt. Measure 7C

GOVERNMENT ESTIMATE WORK SHEET

PROJECT__CUIVRE ISLAND, DPR

DATE: 7/28/1993

SUBJECT__STONE DIKES

ED-CE \ DYN

File: CUIVRE3.CAL

ITEM	QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
Mobilization and Demobilization	Sum	Job		$15,000
Stone Dikes, "A" Stone (3-pair)	2,400	TON	14.00	$33,600

SUBTOTAL:		$48,600
CONTINGENCIES: (in %)	25.00	12,400
SUBTOTAL:		$61,000
E&D (in %)____________	15.00	$9,200
S&A (in %)____________	10.00	$6,100
TOTAL COST		$76,300

Mgmt. Measure 7D

GOVERNMENT ESTIMATE WORK SHEET

PROJECT__CUIVRE ISLAND, DPR | DATE: 7/28/1993

SUBJECT__STONE DIKES | ED-CE \ DYN

File: CUIVRE3.CAL

ITEM	QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
Mobilization and Demobilization	Sum	Job		$15,000
Stone Dikes, "A" Stone (4-pair)	3,200	TON	13.00	$41,600

SUBTOTAL:		$56,600
CONTINGENCIES: (in %)	25.00	14,400
SUBTOTAL:		$71,000
E&D (in %)	15.00	$11,000
S&A (in %)	10.00	$7,100
TOTAL COST		$89,100

Mgmt. Measure 7E

GOVERNMENT ESTIMATE WORK SHEET

PROJECT__CUIVRE ISLAND, DPR — DATE: 7/28/1993

SUBJECT__STONE DIKES — ED-CE \ DYN

File: CUIVRE3.CAL

ITEM	QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
Mobilization and Demobilization	Sum	Job		$15,000
Stone Dikes, "A" Stone (5-pair)	4,000	TON	12.00	$48,000

SUBTOTAL:		$63,000
CONTINGENCIES: (in %)	25.00	16,000
SUBTOTAL:		$79,000
E&D (in %)____________	15.00	$12,000
S&A (in %)____________	10.00	$7,900
TOTAL COST		$98,900

Mgmt. Measure 7F

GOVERNMENT ESTIMATE WORK SHEET

PROJECT__CUIVRE ISLAND, DPR DATE: 7/28/1993

SUBJECT__STONE DIKES ED-CE \ DYN

File: CUIVRE3.CAL

ITEM	QUANTITY	UNIT	UNIT PRICE	ESTIMATED AMOUNT
Mobilization and Demobilization	Sum	Job		$15,000
Stone Dikes, "A" Stone (6-pair)	4,800	TON	11.00	$52,800

SUBTOTAL:		$67,800
CONTINGENCIES: (in %)	25.00	17,200
SUBTOTAL:		$85,000
E&D (in %)	15.00	$13,000
S&A (in %)	10.00	$8,500
TOTAL COST		$106,500

cost estimates for O&M&R
est 12/9/93

ED-CE (12/93)
fn=CUIVREOM

CUIVRE ISLAND HREP
ANNUAL OPERATION, MAINTENANCE AND REPLACEMENT COSTS-MAINLAND(2A)

ITEM	FREQUENCY	COST
OPERATION		
Drainage Structure	Annual	300
Pumping	4yr Interval (5th year @ no cost)	1,400
MAINTENANCE		
Drainage Structure & Hydraulic Operator	Annual	200
Pumping	Annual	1,200
Mowing	Annual	300
Road Stone	5yr Interval	1,500
Pump & Well	5yr Interval	2,000
	Annual	200
Drain Marshland	4yr Interval	500
Disk Marshland	4yr Interval	1,000
REPLACEMENT		
Drainage Structure-	25yr Interval	
Gate		7,500
Structure		15,000
Staff Gages		2,200
Submersible Pump-	25yr Interval	
Well		8,000
Valves		5,000
Pump		1,500

ALT 2A i= .08

	YR	CASH FLOW	PRESENT VALUE	ANNUAL VALUE
OPERATION				
DRAINAGE STRUC.				300
PUMPING				
	4	1400	1029	
	8	1400	756	
	12	1400	556	
	16	1400	409	
	20	1400	300	
	24	1400	221	
	28	1400	162	
	32	1400	119	
	36	1400	88	
	40	1400	64	
	44	1400	47	
	48	1400	35	

		NPV	3787	310
MAINTENANCE				
DRAINAGE STRUC.				200
PUMPING				1200
MOWING				300
ROAD STONE				
	5	1500	1021	
	10	1500	695	
	15	1500	473	
	20	1500	322	
	25	1500	219	
	30	1500	149	
	35	1500	101	
	40	1500	69	
	45	1500	47	

		NPV	3096	253
PUMP & WELL				
	5	2000	1361	
	10	2000	926	
	15	2000	630	
	20	2000	429	
	25	2000	292	
	30	2000	199	
	35	2000	135	

40	2000	92	
45	2000	63	

	NPV	4128	337

PUMP & WELL ANNUAL COST 200

DRAIN MARSH

4	500	368	
8	500	270	
12	500	199	
16	500	146	
20	500	107	
24	500	79	
28	500	58	
32	500	43	
36	500	31	
40	500	23	
44	500	17	
48	500	12	

	NPV	1353	111

DISK MARSH

4	1000	735	
8	1000	540	
12	1000	397	
16	1000	292	
20	1000	215	
24	1000	158	
28	1000	116	
32	1000	85	
36	1000	63	
40	1000	46	
44	1000	34	
48	1000	25	

	NPV	2705	221

REPLACEMENT

DRAINAGE STRUCT

25	24700	3607	

	NPV	3607	295

SUBMERSIBLE PUMP

25	14500	2117	

	NPV	2117	173

TOTAL ANNUAL= 3900

ED-CE (12/93)
fn=CUIVREOM

CUIVRE ISLAND HREP
ANNUAL OPERATION, MAINTENANCE AND REPLACEMENT COSTS-MAINLAND(2B)

ITEM	FREQUENCY	COST
OPERATION		
Drainage Structure	Annual	300
Pumping	4yr Interval	3,100
MAINTENANCE		
Drainage Structure & Hydraulic Operator	Annual	200
Pumping	Annual	2,700
Mowing	Annual	300
Road Stone	5yr Interval	1,500
Pump & Well	5yr Interval	2,000
	Annual	200
Drain Marshland	4yr Interval	500
Disk Marshland	4yr Interval	2,500
REPLACEMENT		
Drainage Structure-	25yr Interval	
Gate		7,500
Structure		15,000
Staff Gages		2,200
Submersible Pump-	25yr Interval	
Well		8,000
Valves		5,000
Pump		1,500

ALT 2B i= .08

	YR	CASH FLOW	PRESENT VALUE	ANNUAL VALUE
OPERATION				
DRAINAGE STRUC.				300
PUMPING				
	4	3100	2279	
	8	3100	1675	
	12	3100	1231	
	16	3100	905	
	20	3100	665	
	24	3100	489	
	28	3100	359	
	32	3100	264	
	36	3100	194	
	40	3100	143	
	44	3100	105	
	48	3100	77	
		NPV	8386	685
MAINTENANCE				
DRAINAGE STRUC.				200
PUMPING				2700
MOWING				300
ROAD STONE				
	5	1500	1021	
	10	1500	695	
	15	1500	473	
	20	1500	322	
	25	1500	219	
	30	1500	149	
	35	1500	101	
	40	1500	69	
	45	1500	47	
		NPV	3096	253
PUMP & WELL				
	5	2000	1361	
	10	2000	926	
	15	2000	630	
	20	2000	429	
	25	2000	292	
	30	2000	199	
	35	2000	135	

40	2000	92	
45	2000	63	

	NPV	4128	337

PUMP & WELL ANNUAL COST 200

DRAIN MARSH

4	500	368	
8	500	270	
12	500	199	
16	500	146	
20	500	107	
24	500	79	
28	500	58	
32	500	43	
36	500	31	
40	500	23	
44	500	17	
48	500	12	

	NPV	1353	111

DISK MARSH

4	2500	1838	
8	2500	1351	
12	2500	993	
16	2500	730	
20	2500	536	
24	2500	394	
28	2500	290	
32	2500	213	
36	2500	157	
40	2500	115	
44	2500	85	
48	2500	62	

	NPV	6763	553

REPLACEMENT

DRAINAGE STRUCT

25	24700	3607	

	NPV	3607	295

SUBMERSIBLE PUMP

25	14500	2117	

	NPV	2117	173

TOTAL ANNUAL= 6107

ED-CE (12/93)
fn=CUIVREOM

CUIVRE ISLAND HREP
ANNUAL OPERATION, MAINTENANCE AND REPLACEMENT COSTS-MAINLAND(2C)

ITEM	FREQUENCY	COST
OPERATION		
Drainage Structures	Annual	600
Pumping	4yr Interval	4,500
MAINTENANCE		
Drainage Structures & Hydraulic Operator	Annual	400
Pumping	Annual	3,900
Mowing	Annual	300
Culvert Cleanout	10yr Interval	1,000
Road Stone	5yr Interval	1,500
Pump & Well	5yr Interval	2,000
	Annual	200
Drain Marshland	4yr Interval	1,000
Disk Marshland	4yr Interval	3,500
REPLACEMENT		
Drainage Structures-	25yr Interval	
Gates		15,000
Structures		30,000
Staff Gages		4,400
Submersible Pump-	25yr Interval	
Well		12,000
Valves		5,000
Pump		3,000
Culverts	25yr Interval	1,000

ALT 2C i= .08

	YR	CASH FLOW	PRESENT VALUE	ANNUAL VALUE
OPERATION				
DRAINAGE STRUC.				600
PUMPING				
	4	4500	3308	
	8	4500	2431	
	12	4500	1787	
	16	4500	1314	
	20	4500	965	
	24	4500	710	
	28	4500	522	
	32	4500	383	
	36	4500	282	
	40	4500	207	
	44	4500	152	
	48	4500	112	
		NPV	12173	995
MAINTENANCE				
DRAINAGE STRUC.				400
PUMPING				3900
MOWING				300
CULVERT CLEANOUT				
	10	1000	463	
	20	1000	215	
	30	1000	99	
	40	1000	46	
		NPV	823	67
ROAD STONE				
	5	1500	1021	
	10	1500	695	
	15	1500	473	
	20	1500	322	
	25	1500	219	
	30	1500	149	
	35	1500	101	
	40	1500	69	
	45	1500	47	
		NPV	3096	253
PUMP & WELL				

5	2000	1361	
10	2000	926	
15	2000	630	
20	2000	429	
25	2000	292	
30	2000	199	
35	2000	135	
40	2000	92	
45	2000	63	

	NPV	4128	337

PUMP & WELL ANNUAL COST 200

DRAIN MARSH

4	1000	735	
8	1000	540	
12	1000	397	
16	1000	292	
20	1000	215	
24	1000	158	
28	1000	116	
32	1000	85	
36	1000	63	
40	1000	46	
44	1000	34	
48	1000	25	

	NPV	2705	221

DISK MARSH

4	3500	2573	
8	3500	1891	
12	3500	1390	
16	3500	1022	
20	3500	751	
24	3500	552	
28	3500	406	
32	3500	298	
36	3500	219	
40	3500	161	
44	3500	118	
48	3500	87	

	NPV	9468	774

REPLACEMENT

DRAINAGE STRUCT

25	49400	7213	

	NPV	7213	590

SUBMERSIBLE PUMP				
	25	20000	2920	

		NPV	2920	239
CULVERTS				
	25	1000	146	

		NPV	146	12
			TOTAL ANNUAL=	8888

ED-CE (12/93)
fn=CUIVREOM

CUIVRE ISLAND HREP
ANNUAL OPERATION, MAINTENANCE AND REPLACEMENT COSTS - ISLAND(4A)

ITEM	FREQUENCY	COST
OPERATION		
Drainage Structure	Annual	400
Pumping	Annual	2,000
MAINTENANCE		
Drainage Structure & Hydraulic Operator	Annual	400
Pumping - pump in	Annual	800
pump out	5yr Interval	2,000
Mowing	Annual	1,000
Clearing	25yr Interval	25,000
Seeding	25yr Interval	15,000
Ditch Cleanout	25yr Interval	10,000
Culvert Cleanout	25yr Interval	5,000
Revetment	5yr Interval	1,200
Pump Station	5yr Interval	3,500
	Annual	500
REPLACEMENT		
Drainage Structure-	25yr Interval	
Gate		7,500
Structure		15,000
Staff Gages		2,200
Pump Station-	25yr Interval	
Gates		32,400
Structure		15,000
Pipes		3,800
Pump		19,000
Culverts	25yr Interval	8,500

p. 1/2

ALT 4A i= .08

	YR	CASH FLOW	PRESENT VALUE	ANNUAL VALUE
OPERATION				
DRAINAGE STRUC.				400
UMPING				2000
MAINTENANCE				
DRAINAGE STRUC.				400
PUMPING IN				800
PUMPING OUT				
	5	2000	1361	
	10	2000	926	
	15	2000	630	
	20	2000	429	
	25	2000	292	
	30	2000	199	
	35	2000	135	
	40	2000	92	
	45	2000	63	

		NPV	4128	337
MOWING				1000
CLEARING				
	25	25000	3650	

		NPV	3650	298
SEEDING				
	25	15000	2190	

		NPV	2190	179
DITCH CLEANOUT				
	25	10000	1460	

		NPV	1460	119
CULVERT CLEANOUT				
	25	5000	730	

		NPV	730	60
REVETMENT				
	5	1200	817	
	10	1200	556	

15	1200	378	
20	1200	257	
25	1200	175	
30	1200	119	
35	1200	81	
40	1200	55	
45	1200	38	

	NPV	2477	202

PUMP STATION

5	3500	2382	
10	3500	1621	
15	3500	1103	
20	3500	751	
25	3500	511	
30	3500	348	
35	3500	237	
40	3500	161	
45	3500	110	

	NPV	7224	590

PUMP STATION ANNUAL COST 500

REPLACEMENT

DRAINAGE STRUCT

25	24700	3607	

	NPV	3607	295

PUMP STATION

25	70200	10250	

	NPV	10250	838

CULVERTS

25	8500	1241	

	NPV	1241	101

TOTAL ANNUAL= 8121

ED-CE (12/93)
fn=CUIVREOM

CUIVRE ISLAND HREP
ANNUAL OPERATION, MAINTENANCE AND REPLACEMENT COSTS - ISLAND(4C)

ITEM	FREQUENCY	COST
OPERATION		
Drainage Structures	Annual	600
Pumping	Annual	3,000
MAINTENANCE		
Drainage Structures & Hydraulic Operator	Annual	400
Pumping - pump in	Annual	1,200
pump out	5yr Interval	3,000
Mowing	Annual	1,000
Clearing	25yr Interval	25,000
Seeding	25yr Interval	15,000
Ditch Cleanout	25yr Interval	10,000
Culvert Cleanout	25yr Interval	5,000
Revetment	5yr Interval	1,200
Pump Station	5yr Interval	5,000
	Annual	500
REPLACEMENT		
Drainage Structures-	25yr Interval	
Gates		15,000
Structures		30,000
Staff Gages		4,400
Pump Station-	25yr Interval	
Gates		51,000
Structure		20,000
Pipes		4,200
Pump		64,000
Culverts	25yr Interval	12,500

p. 1/2

ALT 4C i= .08

	YR	CASH FLOW	PRESENT VALUE	ANNUAL VALUE
OPERATION				
DRAINAGE STRUC.				600
PUMPING				3000
MAINTENANCE				
DRAINAGE STRUC.				400
PUMPING IN				1200
PUMPING OUT				
	5	3000	2042	
	10	3000	1390	
	15	3000	946	
	20	3000	644	
	25	3000	438	
	30	3000	298	
	35	3000	203	
	40	3000	138	
	45	3000	94	
		NPV	6192	506
MOWING				1000
CLEARING				
	25	25000	3650	
		NPV	3650	298
SEEDING				
	25	15000	2190	
		NPV	2190	179
DITCH CLEANOUT				
	25	10000	1460	
		NPV	1460	119
CULVERT CLEANOUT				
	25	5000	730	
		NPV	730	60
REVETMENT				
	5	1200	817	
	10	1200	556	

15	1200	378	
20	1200	257	
25	1200	175	
30	1200	119	
35	1200	81	
40	1200	55	
45	1200	38	

	NPV	2477	202

PUMP STATION

5	5000	3403	
10	5000	2316	
15	5000	1576	
20	5000	1073	
25	5000	730	
30	5000	497	
35	5000	338	
40	5000	230	
45	5000	157	

	NPV	10320	844

PUMP STATION ANNUAL COST 500

REPLACEMENT

DRAINAGE STRUCT

25	49400	7213	

	NPV	7213	590

PUMP STATION

25	139200	20326	

	NPV	20326	1661

CULVERTS

25	12500	1825	

	NPV	1825	149

TOTAL ANNUAL= 11309

ED-CE (12/93)
fn=CUIVREOM

CUIVRE ISLAND HREP
ANNUAL OPERATION, MAINTENANCE AND REPLACEMENT COSTS-DIKES(7A-7G)

ITEM	FREQUENCY	COST
OPERATION		
None		
MAINTENANCE		
Stone - 7A	10yr Interval	8,800
7B	10yr Interval	12,300
7C	10yr Interval	15,300
7D	10yr Interval	17,800
7E	10yr Interval	19,800
7F	10yr Interval	21,300
7G	10yr Interval	22,200
REPLACEMENT		
None		

ALT 7A-G i= .08

	YR	CASH FLOW	PRESENT VALUE	ANNUAL VALUE
OPERATION				
NONE				
MAINTENANCE				
7A	10	8800	4076	
	20	8800	1888	
	30	8800	875	
	40	8800	405	
		NPV	7244	592
7B	10	12300	5697	
	20	12300	2639	
	30	12300	1222	
	40	12300	566	
		NPV	10125	828
7C	10	15300	7087	
	20	15300	3283	
	30	15300	1520	
	40	15300	704	
		NPV	12594	1029
7D	10	17800	8245	
	20	17800	3819	
	30	17800	1769	
	40	17800	819	
		NPV	14652	1198
7E	10	19800	9171	
	20	19800	4248	
	30	19800	1968	
	40	19800	911	
		NPV	16298	1332
7F	10	21300	9866	
	20	21300	4570	
	30	21300	2117	
	40	21300	980	
		NPV	17533	1433

7G	10	22200	10283	
	20	22200	4763	
	30	22200	2206	
	40	22200	1022	

		NPV	18274	1494

REPLACEMENT
NONE

TOTAL ANNUAL= 7906

Mgmt. Measure 15
(modified after draft DPR)

Creation of Forest Clearings with Planting of Hard Mast Tree Species

Ten sites of 8 acres/site:

Initial costs:

1. Mechanized clearing - $500/acre = $40,000

2. Herbicide application - $30/acre = $ 2,400

3. Establish ground cover (disc and plant) - $80/acre = $ 6,400

4. Plant seedlings - 2 gallon containers
   $648/acre - purchase seedlings = $51,840
   $200/acre - planting with planter = $16,000
   $116,640

OM&R costs: (see next sheet for annualization)

1. Mow twice per year for first 3 years - $50/acre/mowing

2. Release oak seedings, once after 11 years - $100/acre

ALT 15 i= .08
(modified for final DPR)

	YR	CASH FLOW	PRESENT VALUE	ANNUAL VALUE
O&M				
MOWING				
	.5	4000	3849	
	1	4000	3704	
	1.5	4000	3564	
	2	4000	3429	
	2.5	4000	3300	
	3	4000	3175	

		NPV	21021	1718
RELEASE OAK SEEDLINGS				
	11	8000	3431	

		NPV	3431	280

REFORESTATION Mgmt. Measure 16

(PLANT CROPLAND WITH TREES)

initial construction costs (20% of cropland):

tree planting:	$130/ac
establish ground cover:	$80/ac

O&M costs:

years 10, 20, 30, 40 (20% of cropland each period):

tree planting:	$130/ac
establish ground cover:	$80/ac

first 6 yrs following years 10, 20, 30, 40:

mow:	$30/ac/year
spray herbicide:	$100/ac/year

Mgmt. Meas. 16A (south cropland):

initial: ($130/ac + $80/ac) x 34 ac x 20% per year = $1,428

O&M, planting in year 10, 20, 30, 40 = $1,428 at each period

O&M, mowing and herbicide:
($30/ac + $100/ac) x 34 ac x 20% per year = $884/yr

Mgmt. Meas. 16B (north cropland):

initial: ($130/ac + $80/ac) x 76 ac x 20% per year = $3,192

O&M, planting in year 10, 20, 30, 40 = $3,192 at each period

O&M, mowing and herbicide:
($30/ac + $100/ac) x 76 ac x 20% per year = $1,976/yr

Mgmt. Meas. 16C (south & north cropland):

initial: ($130/ac + $80/ac) x 110 ac x 20% per year = $4,620

O&M, planting in year 10, 20, 30, 40 = $4,620 at each period

O&M, mowing and herbicide:
($30/ac + $100/ac) x 110 ac x 20% per year = 2,860/yr

MGMT. MEAS. 16

i= .08

	YR	CASH FLOW	PRESENT VALUE	ANNUAL VALUE	
O&M					
16A PLANTING					TOTAL ANNUAL VALUE FOR 16A 70
	10	1428	661		
	20	1428	306		
	30	1428	142		
	40	1428	66		
		NPV	1175	96	
MOWING & HERBICIDE					
	1	884	819		
	2	884	758		
	3	884	702		
	4	884	650		
	5	884	602		
	6	884	557		
		NPV	4087	334	
	11	884	379		
	12	884	351		
	13	884	325		
	14	884	301		
	15	884	279		
	16	884	258		
		NPV	1893	155	
	21	884	176		
	22	884	163		
	23	884	151		
	24	884	139		
	25	884	129		
	26	884	120		
		NPV	877	72	
	31	884	81		
	32	884	75		
	33	884	70		
	34	884	65		
	35	884	60		
	36	884	55		

	NPV	406	33
41	884	38	
42	884	35	
43	884	32	
44	884	30	
45	884	28	
46	884	26	
	NPV	188	15

16B

TOTAL ANNUAL VALUE FOR 16B 1576

PLANTING

10	3192	1479	
20	3192	685	
30	3192	317	
40	3192	147	
	NPV	2627	215

MOWING & HERBICIDE

1	1976	1830	
2	1976	1694	
3	1976	1569	
4	1976	1452	
5	1976	1345	
6	1976	1245	
	NPV	9135	747
11	1976	847	
12	1976	785	
13	1976	727	
14	1976	673	
15	1976	623	
16	1976	577	
	NPV	4231	346
21	1976	393	
22	1976	363	
23	1976	337	
24	1976	312	
25	1976	289	
26	1976	267	
	NPV	1960	160
31	1976	182	
32	1976	168	
33	1976	156	

	34	1976	144	
	35	1976	134	
	36	1976	124	

		NPV	908	74
	41	1976	84	
	42	1976	78	
	43	1976	72	
	44	1976	67	
	45	1976	62	
	46	1976	57	

		NPV	420	34

16C

TOTAL ANNUAL VALUE FOR 16C 2281

PLANTING

10	4620	2140	
20	4620	991	
30	4620	459	
40	4620	213	

	NPV	3803	311

MOWING & HERBICIDE

1	2860	2648	
2	2860	2452	
3	2860	2270	
4	2860	2102	
5	2860	1946	
6	2860	1802	

	NPV	13221	1081
11	2860	1227	
12	2860	1136	
13	2860	1052	
14	2860	974	
15	2860	902	
16	2860	835	

	NPV	6124	501
21	2860	568	
22	2860	526	
23	2860	487	
24	2860	451	
25	2860	418	
26	2860	387	

	NPV	2837	232

31	2860	263	
32	2860	244	
33	2860	226	
34	2860	209	
35	2860	193	
36	2860	179	

	NPV	1314	107
41	2860	122	
42	2860	113	
43	2860	105	
44	2860	97	
45	2860	90	
46	2860	83	

	NPV	609	50

Appendix M - Microcomputer-Aided Cost Engineering System (MCACES) Cost Estimate

CUIVRE ISLAND HREP
APPENDIX M - MCACES COST ESTIMATE

DEPARTMENT OF THE ARMY
ST.LOUIS DISTRICT, CORPS OF ENGINEERS
ST. LOUIS, MISSOURI

COST ESTIMATE
FOR
CUIVRE ISLAND
HABITAT REHABILITATION AND
ENHANCEMENT PROJECT (HREP)
POOL 26
MISSISSIPPI RIVER
LINCOLN & ST. CHARLES COUNTIES, MISSOURI

DATE of ESTIMATE: 01 AUG 1994

ESTIMATE APPROVED BY:

JOSEPH KELLETT, P.E.
Project Manager

JOHN W. DIERKER, P.E.
Chief, Cost Engineering Branch

WILLIAM R. SUTTON, P.E.
Acting Deputy District Engineer
For Project Management

APPENDIX M - MCACES COST ESTIMATE

M-01. GENERAL.

The MCACES cost estimate was developed using the preliminary cost estimate, included in the draft DPR, as a basis. Current designs and recent bid abstracts for similar projects in the area have been used as a reference. An appropriate contingency was applied to each line item of cost at the 4th level of the MCACES cost estimate.

M-02. DISCUSSION OF RELIABILITY OF DESIGNS, QUANTITIES, AND UNIT PRICES.

a. Fish and Wildlife Facilities. The Flood of 93 caused extensive damage to the forest in the project area. Many of the trees have died as a result of the flood. It has therefore been determined that it will be necessary to plant a large number of trees in order to sustain the environmental integrity of the area.

b. Channels and Canals. The majority of this work can be accomplished with traditional land based equipment but a few items will require the use of a floating plant and are considered to involve more risk on the part of the contractor. The construction of stone dikes is assumed to be typical and involve little risk. Removal of the submerged dike and the propwash experiment are assumed to involve more risk and has been assigned higher contingencies due to the uncertainty of these items.

c. Levees and Floodwalls. The design of the gravity drainage structures has been used on previously constructed projects similar in nature and have proven effective. The main problem in constructing these structures remains to be the high water table in the areas they are used. It is essential that dewatering be considered for constructability of such structures.

d. Pumping Plant. The pump station design has changed from the draft DPR. These changes are minor and have little bearing on the overall cost of the project. Dewatering will also be a major concern for the constructability of this structure. Due to the design elevations a deep well type dewatering system has been assumed.

M-03. DISCUSSION OF SENSITIVE ITEMS.

Cuivre island is accessible by boat only. It is therefore assumed that all construction equipment, material, and supplies will be barged to the island. This is considered to be a burden to the contractor and could possibly limit the number of contractors who would typically bid on this type of work. This item is considered to be part of the Prime Contractors overhead and is reflected in the MCACES cost estimate.

M-04. DISCUSSION OF VARIABLE CONTINGENCIES.

The cost estimate for this project involves contingencies ranging in value from 10% to 30%. Assigned contingencies are based on the inherent difficulties in visualizing and quantifying certain types of work. Generally a contingency of 15% was utilized for this project which was felt to be reasonable at this stage of the design.

John W. Dierker
Chief, Cost Engineering Branch

CUIVRE ISLAND - DPR
HABITAT REHABILITATION AND
ENHANCEMENT PROJECT (HREP)
POOL 26, MISSISSIPPI RIVER
LINCOLN & ST. CHARLES COUNTIES

Designed By: ST. LOUIS DISTRICT, COE
Estimated By: ST. LOUIS DISTRICT, COE

Prepared By: GREG DYN
Reviewed by: JOHN DIERKER, P.E.

Date: 08/01/94

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DETAILED ESTIMATE DETAIL PAGE

DETAILED ESTIMATE DETAIL PAGE

DETAILED ESTIMATE — DETAIL PAGE

BACKUP REPORTS — BACKUP PAGE

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** PROJECT OWNER SUMMARY - LEVEL 1 **

		QUANTY UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
06	Fish and Wildlife Facilities		121,420	18,074	139,494	
09	Channels and Canals		233,210	29,382	262,592	
11	Levees and Floodwalls		153,329	24,478	177,807	
13	Pumping Plant		418,410	64,042	482,452	
30	Planning, Engineering and Design		259,000	0	259,000	
31	Construction Management (S&I)		151,750	0	151,750	
	CUIVRE ISLAND - DPR	1.00 EA	1,337,119	135,976	1,473,095	1473095

		QUANTY	UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
06	Fish and Wildlife Facilities						
0603	Wildlife Facilities & Sanctuary						
060373	Habitat and Feeding Facilities						
060373_01	Forest Clearings/Tree Planting			116,800	17,520	134,320	
060373_02	Reforestation			4,620	554	5,174	
	Habitat and Feeding Facilities			121,420	18,074	139,494	
	Wildlife Facilities & Sanctuary			121,420	18,074	139,494	
	Fish and Wildlife Facilities			121,420	18,074	139,494	
09	Channels and Canals						
0901	Channels						
090120	Disposal Areas						
090120_01	Grading of Disposal Areas	26030	CY	16,609	1,661	18,270	0.70
	Disposal Areas			16,609	1,661	18,270	
090130	Bank Stabilize, Dikes & Jetties						
090130_01	Construction of Stone Dikes	2400.00	TON	27,372	2,737	30,109	12.55
090130_02	Remove Submerged Dike	500.00	TON	13,659	4,098	17,757	35.51
	Bank Stabilize, Dikes & Jetties			41,031	6,835	47,866	
090199	Associated General Items						
090199_01	Clearing	19.00	ACR	49,526	7,429	56,954	2997.60
090199_02	Excavation, Ditching	31500	CY	82,112	8,211	90,324	2.87
090199_03	Embankment	2110.00	CY	10,035	1,004	11,039	5.23
090199_04	Seeding	18.00	ACR	29,632	2,963	32,595	1810.82
090199_05	Propwash Experiment			4,264	1,279	5,544	
	Associated General Items			175,569	20,886	196,455	
	Channels			233,210	29,382	262,592	
	Channels and Canals			233,210	29,382	262,592	
11	Levees and Floodwalls						

		QUANTY UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
1101	Levees					
110102	Drainage					
110102_01	36" Gravity Drainage Structures	2.00 EA	74,373	11,156	85,529	42764
110102_02	36" CMP's	5.00 EA	51,618	7,743	59,361	11872
	Drainage		125,991	18,899	144,890	
110103	Care & Diversion of Water					
110103_01	Dewatering - Gravity Drain. Str.		21,515	4,303	25,818	
110103_02	Dewatering - 36" CMP's		3,586	717	4,303	
	Care & Diversion of Water		25,101	5,020	30,121	
110199	Associated General Items					
110199_01	Culvert Removal (2ea)	70.00 LF	2,237	559	2,796	39.95
	Associated General Items		2,237	559	2,796	
	Levees		153,329	24,478	177,807	
	Levees and Floodwalls		153,329	24,478	177,807	
13	Pumping Plant					
1300	Pumping Plant					
130003	Care and Diversion of Water					
130003_01	Wells	4.00 EA	31,371	4,706	36,077	9019.26
130003_02	Pumps	4.00 EA	81,991	12,299	94,290	23572
	Care and Diversion of Water		113,362	17,004	130,367	
130010	Earthwork for Structures					
130010_01	Excavation	3840.00 CY	11,080	1,108	12,187	3.17
130010_02	Backfill	3300.00 CY	8,062	806	8,868	2.69
	Earthwork for Structures		19,141	1,914	21,056	

		QUANTY	UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
130011	Foundation Work						
130011_01	Geogrid	80.00	SY	472	47	519	6.49
130011_02	Geotextile	80.00	SY	195	20	215	2.68
130011_03	Stone, 3" minus	150.00	TON	2,868	287	3,155	21.03
	Foundation Work			3,535	353	3,888	
130018	Utilities						
130075	Pumping Plant Superstructure						
130075_01	Concrete	180.00	CY	66,356	6,636	72,992	405.51
130075_02	Reinforcing Steel	24300	LB	14,087	1,409	15,496	0.64
	Pumping Plant Superstructure			80,443	8,044	88,488	
130076	Pumping Machinery & Appurtenance						
130076_01	10,000 GPM Pump	1.00	EA	80,252	16,050	96,303	96303
130076_02	Moter Control and Misc. Connect.			19,389	3,878	23,267	
	Pumping Machinery & Appurtenance			99,641	19,928	119,569	
130077	Gates and Valves						
130077_01	Sluice Gate - 5' x 5'	1.00	EA	24,399	3,660	28,059	28059
	Gates and Valves			24,399	3,660	28,059	
130099	Associated General Items						
130099_01	Concrete Pipe, 60"	60.00	LF	9,067	1,360	10,427	173.79
130099_02	Grating, Fiberglass	168.00	SF	4,250	637	4,887	29.09
130099_03	Handrail, Fiberglass	20.00	LF	1,144	172	1,316	65.79
130099_04	Staff Gages	2.00	EA	2,918	438	3,356	1678.00
130099_05	Revetment, "C" Stone	610.00	TON	15,713	1,571	17,285	28.34
130099_06	Aluminum Stop Logs			44,795	8,959	53,754	
	Associated General Items			77,888	13,137	91,025	
	Pumping Plant			418,410	64,042	482,452	
	Pumping Plant			418,410	64,042	482,452	
30	Planning, Engineering and Design						

	QUANTY	UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
3004 Environment-Regulatory Activity						
Environment-Regulatory Activity			3,000	0	3,000	
3008 Plans and Specifications						
Plans and Specifications			216,000	0	216,000	
3010 Engineering During Construction						
Engineering During Construction			15,000	0	15,000	
3013 Cost Engineering						
Cost Engineering			12,000	0	12,000	
3014 Const-Supply Contract Award Acty						
Const-Supply Contract Award Acty			8,000	0	8,000	
3026 Miscellaneous Activities						
Miscellaneous Activities			5,000	0	5,000	
Planning, Engineering and Design			259,000	0	259,000	
31 Construction Management (S&I)						
3101 Area Office Operation						
Area Office Operation			81,200	0	81,200	
3102 District Office Operation						
District Office Operation			40,200	0	40,200	
3103 Contingencies						
Contingencies			30,350	0	30,350	
Construction Management (S&I)			151,750	0	151,750	

	QUANTY	UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
CUIVRE ISLAND - DPR	1.00	EA	1,337,119	135,976	1,473,095	1473095

	QUANTY UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
06 Fish and Wildlife Facilities					
0603 Wildlife Facilities & Sanctuary					
060373 Habitat and Feeding Facilities					
060373_01 Forest Clearings/Tree Planting					
Forest Clearings/Tree Planting		116,800	17,520	134,320	
060373_02 Reforestation					
Reforestation		4,620	554	5,174	
Habitat and Feeding Facilities		121,420	18,074	139,494	
Wildlife Facilities & Sanctuary		121,420	18,074	139,494	
Fish and Wildlife Facilities		121,420	18,074	139,494	
09 Channels and Canals					
0901 Channels					
090120 Disposal Areas					
090120_01 Grading of Disposal Areas					
Grading of Disposal Areas	26030 CY	16,609	1,661	18,270	0.70
Disposal Areas		16,609	1,661	18,270	
090130 Bank Stabilize, Dikes & Jetties					
090130_01 Construction of Stone Dikes					
090130_01 A Stone Shuttle Crew	2400.00 TON	13,903	1,390	15,294	6.37
090130_01 B Stone Placement Crew	2400.00 TON	13,469	1,347	14,816	6.17
Construction of Stone Dikes	2400.00 TON	27,372	2,737	30,109	12.55
090130_02 Remove Submerged Dike					

		QUANTY UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
090130_02 A	Dike Removal Crew	500.00 TON	13,659	4,098	17,757	35.51
	Remove Submerged Dike	500.00 TON	13,659	4,098	17,757	35.51
	Bank Stabilize, Dikes & Jetties		41,031	6,835	47,866	
090199	Associated General Items					
090199_01	Clearing					
	Clearing	19.00 ACR	49,526	7,429	56,954	2997.60
090199_02	Excavation, Ditching					
	Excavation, Ditching	31500 CY	82,112	8,211	90,324	2.87
090199_03	Embankment					
	Embankment	2110.00 CY	10,035	1,004	11,039	5.23
090199_04	Seeding					
	Seeding	18.00 ACR	29,632	2,963	32,595	1810.82
090199_05	Propwash Experiment					
	Propwash Experiment		4,264	1,279	5,544	
	Associated General Items		175,569	20,886	196,455	
	Channels		233,210	29,382	262,592	
	Channels and Canals		233,210	29,382	262,592	
11	Levees and Floodwalls					
1101	Levees					
110102	Drainage					

** PROJECT OWNER SUMMARY - LEVEL 5 **

		QUANTY	UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
110102_01	36" Gravity Drainage Structures						
110102_01 A	Embankment	460.00	CY	2,188	328	2,516	5.47
110102_01 B	Cofferdam	740.00	CY	3,519	528	4,047	5.47
110102_01 C	Excavation	260.00	CY	750	113	863	3.32
110102_01 D	Staff Gages	4.00	EA	5,837	875	6,712	1678.00
110102_01 E	Concrete Pad	3.00	CY	444	67	511	170.24
110102_01 F	36" CMP	136.00	LF	10,259	1,539	11,798	86.75
110102_01 G	36" CMP End Sections	4.00	EA	3,009	451	3,461	865.22
110102_01 H	72" Riser Pipe (2ea)	20.00	LF	8,382	1,257	9,639	481.97
110102_01 I	Sluice Gates & Appurtenances	2.00	EA	18,347	2,752	21,099	10550
110102_01 J	Stone, 6" minus	460.00	TON	8,794	1,319	10,114	21.99
110102_01 K	Stone, 3" minus	120.00	TON	2,294	344	2,638	21.99
110102_01 L	Geogrid	350.00	SY	2,064	310	2,374	6.78
110102_01 M	Geotextile	310.00	SY	756	113	869	2.80
110102_01 N	Revetment, "C" Stone	300.00	TON	7,728	1,159	8,887	29.62
	36" Gravity Drainage Structures	2.00	EA	74,373	11,156	85,529	42764
110102_02	36" CMP's						
110102_02 A	Embankment	2900.00	CY	13,793	2,069	15,861	5.47
110102_02 B	Excavation	100.00	CY	289	43	332	3.32
110102_02 C	36" CMP	360.00	LF	27,146	4,072	31,218	86.72
110102_02 D	36" CMP End Sections	10.00	EA	7,524	1,129	8,652	865.22
110102_02 E	Pipe Bedding Material	150.00	TON	2,868	430	3,298	21.99
	36" CMP's	5.00	EA	51,618	7,743	59,361	11872
	Drainage			125,991	18,899	144,890	
110103	Care & Diversion of Water						
110103_01	Dewatering - Gravity Drain. Str.						
	Dewatering - Gravity Drain. Str.			21,515	4,303	25,818	
110103_02	Dewatering - 36" CMP's						
	Dewatering - 36" CMP's			3,586	717	4,303	
	Care & Diversion of Water			25,101	5,020	30,121	
110199	Associated General Items						

	QUANTY UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
110199_01 Culvert Removal (2ea)					
Culvert Removal (2ea)	70.00 LF	2,237	559	2,796	39.95
Associated General Items		2,237	559	2,796	
Levees		153,329	24,478	177,807	
Levees and Floodwalls		153,329	24,478	177,807	
13 Pumping Plant					
1300 Pumping Plant					
130003 Care and Diversion of Water					
130003_01 Wells					
Wells	4.00 EA	31,371	4,706	36,077	9019.26
130003_02 Pumps					
Pumps	4.00 EA	81,991	12,299	94,290	23572
Care and Diversion of Water		113,362	17,004	130,367	
130010 Earthwork for Structures					
130010_01 Excavation					
Excavation	3840.00 CY	11,080	1,108	12,187	3.17
130010_02 Backfill					
Backfill	3300.00 CY	8,062	806	8,868	2.69
Earthwork for Structures		19,141	1,914	21,056	
130011 Foundation Work					
130011_01 Geogrid					

		QUANTY UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
	Geogrid	80.00 SY	472	47	519	6.49
130011_02	Geotextile					
	Geotextile	80.00 SY	195	20	215	2.68
130011_03	Stone, 3" minus					
	Stone, 3" minus	150.00 TON	2,868	287	3,155	21.03
	Foundation Work		3,535	353	3,888	
130018	Utilities					
130018_01	Electrical Supply					
130075	Pumping Plant Superstructure					
130075_01	Concrete					
	Concrete	180.00 CY	66,356	6,636	72,992	405.51
130075_02	Reinforcing Steel					
	Reinforcing Steel	24300 LB	14,087	1,409	15,496	0.64
	Pumping Plant Superstructure		80,443	8,044	88,488	
130076	Pumping Machinery & Appurtenance					
130076_01	10,000 GPM Pump					
	10,000 GPM Pump	1.00 EA	80,252	16,050	96,303	96303
130076_02	Moter Control and Misc. Connect.					

		QUANTY UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
	Moter Control and Misc. Connect.		19,389	3,878	23,267	
	Pumping Machinery & Appurtenance		99,641	19,928	119,569	
130077	Gates and Valves					
130077_01	Sluice Gate - 5' x 5'					
	Sluice Gate - 5' x 5'	1.00 EA	24,399	3,660	28,059	28059
	Gates and Valves		24,399	3,660	28,059	
130099	Associated General Items					
130099_01	Concrete Pipe, 60"					
	Concrete Pipe, 60"	60.00 LF	9,067	1,360	10,427	173.79
130099_02	Grating, Fiberglass					
	Grating, Fiberglass	168.00 SF	4,250	637	4,887	29.09
130099_03	Handrail, Fiberglass					
	Handrail, Fiberglass	20.00 LF	1,144	172	1,316	65.79
130099_04	Staff Gages					
	Staff Gages	2.00 EA	2,918	438	3,356	1678.00
130099_05	Revetment, "C" Stone					
	Revetment, "C" Stone	610.00 TON	15,713	1,571	17,285	28.34
130099_06	Aluminum Stop Logs					

	QUANTY UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
Aluminum Stop Logs		44,795	8,959	53,754	
Associated General Items		77,888	13,137	91,025	
Pumping Plant		418,410	64,042	482,452	
Pumping Plant		418,410	64,042	482,452	
30 Planning, Engineering and Design					
3004 Environment-Regulatory Activity					
Environment-Regulatory Activity		3,000	0	3,000	
3008 Plans and Specifications					
Plans and Specifications		216,000	0	216,000	
3010 Engineering During Construction					
Engineering During Construction		15,000	0	15,000	
3013 Cost Engineering					
Cost Engineering		12,000	0	12,000	
3014 Const-Supply Contract Award Acty					
Const-Supply Contract Award Acty		8,000	0	8,000	
3026 Miscellaneous Activities					
Miscellaneous Activities		5,000	0	5,000	
Planning, Engineering and Design		259,000	0	259,000	
31 Construction Management (S&I)					
3101 Area Office Operation					
Area Office Operation		81,200	0	81,200	
3102 District Office Operation					

		QUANTY	UOM	CONTRACT	CONTINGN	TOTAL COST	UNIT
	District Office Operation			40,200	0	40,200	
3103	Contingencies						
	Contingencies			30,350	0	30,350	
	Construction Management (S&I)			151,750	0	151,750	
	CUIVRE ISLAND - DPR	1.00	EA	1,337,119	135,976	1,473,095	1473095

		QUANTY	UOM	DIRECT	FOOH&MOB	HOME OFC	PROFIT	BOND	TOTAL COST	UNIT
06	Fish and Wildlife Facilities			121,420	0	0	0	0	121,420	
09	Channels and Canals			156,100	46,952	10,153	18,157	1,849	233,210	
11	Levees and Floodwalls			105,082	28,428	6,676	11,902	1,241	153,329	
13	Pumping Plant			286,753	77,576	18,216	32,478	3,387	418,410	
30	Planning, Engineering and Design			259,000	0	0	0	0	259,000	
31	Construction Management (S&I)			151,750	0	0	0	0	151,750	
	CUIVRE ISLAND - DPR	1.00	EA	1,080,104	152,956	35,045	62,537	6,477	1,337,119	1337119
	Contingency								135,976	
	TOTAL INCL OWNER COSTS								1,473,095	

		QUANTY UOM	DIRECT	FOOH&MOB	HOME OFC	PROFIT	BOND	TOTAL COST	UNIT
06	Fish and Wildlife Facilities								
0603	Wildlife Facilities & Sanctuary								
060373	Habitat and Feeding Facilities								
060373_01	Forest Clearings/Tree Planting		116,800	0	0	0	0	116,800	
060373_02	Reforestation		4,620	0	0	0	0	4,620	
	Habitat and Feeding Facilities		121,420	0	0	0	0	121,420	
	Wildlife Facilities & Sanctuary		121,420	0	0	0	0	121,420	
	Fish and Wildlife Facilities		121,420	0	0	0	0	121,420	
09	Channels and Canals								
0901	Channels								
090120	Disposal Areas								
090120_01	Grading of Disposal Areas	26030 CY	11,383	3,079	723	1,289	134	16,609	0.64
	Disposal Areas		11,383	3,079	723	1,289	134	16,609	
090130	Bank Stabilize, Dikes & Jetties								
090130_01	Construction of Stone Dikes	2400.00 TON	16,506	7,319	1,191	2,158	198	27,372	11.41
090130_02	Remove Submerged Dike	500.00 TON	8,237	3,652	594	1,077	99	13,659	27.32
	Bank Stabilize, Dikes & Jetties		24,743	10,971	1,786	3,234	297	41,031	
090199	Associated General Items								
090199_01	Clearing	19.00 ACR	33,942	9,182	2,156	3,844	401	49,526	2606.61
090199_02	Excavation, Ditching	31500 CY	56,275	15,224	3,575	6,374	665	82,112	2.61
090199_03	Embankment	2110.00 CY	6,878	1,861	437	779	81	10,035	4.76
090199_04	Seeding	18.00 ACR	20,308	5,494	1,290	2,300	240	29,632	1646.20
090199_05	Propwash Experiment		2,572	1,140	186	336	31	4,264	
	Associated General Items		119,973	32,901	7,644	13,633	1,418	175,569	
	Channels		156,100	46,952	10,153	18,157	1,849	233,210	
	Channels and Canals		156,100	46,952	10,153	18,157	1,849	233,210	
11	Levees and Floodwalls								

		QUANTY UOM	DIRECT	FOOH&MOB	HOME OFC	PROFIT	BOND	TOTAL COST	UNIT
1101	Levees								
110102	Drainage								
110102_01	36" Gravity Drainage Structures	2.00 EA	50,970	13,789	3,238	5,773	602	74,373	37186
110102_02	36" CMP's	5.00 EA	35,376	9,570	2,247	4,007	418	51,618	10324
	Drainage		86,347	23,360	5,485	9,780	1,020	125,991	
110103	Care & Diversion of Water								
110103_01	Dewatering - Gravity Drain. Str.		14,745	3,989	937	1,670	174	21,515	
110103_02	Dewatering - 36" CMP's		2,457	665	156	278	29	3,586	
	Care & Diversion of Water		17,202	4,654	1,093	1,948	203	25,101	
110199	Associated General Items								
110199_01	Culvert Removal (2ea)	70.00 LF	1,533	415	97	174	18	2,237	31.96
	Associated General Items		1,533	415	97	174	18	2,237	
	Levees		105,082	28,428	6,676	11,902	1,241	153,329	
	Levees and Floodwalls		105,082	28,428	6,676	11,902	1,241	153,329	
13	Pumping Plant								
1300	Pumping Plant								
130003	Care and Diversion of Water								
130003_01	Wells	4.00 EA	21,500	5,816	1,366	2,435	254	31,371	7842.84
130003_02	Pumps	4.00 EA	56,192	15,202	3,570	6,364	664	81,991	20498
	Care and Diversion of Water		77,692	21,018	4,935	8,799	918	113,362	
130010	Earthwork for Structures								
130010_01	Excavation	3840.00 CY	7,593	2,054	482	860	90	11,080	2.89
130010_02	Backfill	3300.00 CY	5,525	1,495	351	626	65	8,062	2.44
	Earthwork for Structures		13,118	3,549	833	1,486	155	19,141	

		QUANTY UOM	DIRECT	FOOH&MOB	HOME OFC	PROFIT	BOND	TOTAL COST	UNIT
130011	Foundation Work								
130011_01	Geogrid	80.00 SY	323	87	21	37	4	472	5.90
130011_02	Geotextile	80.00 SY	134	36	8	15	2	195	2.44
130011_03	Stone, 3" minus	150.00 TON	1,965	532	125	223	23	2,868	19.12
	Foundation Work		2,422	655	154	274	29	3,535	
130018	Utilities								
130075	Pumping Plant Superstructure								
130075_01	Concrete	180.00 CY	45,477	12,303	2,889	5,151	537	66,356	368.65
130075_02	Reinforcing Steel	24300 LB	9,654	2,612	613	1,093	114	14,087	0.58
	Pumping Plant Superstructure		55,131	14,915	3,502	6,244	651	80,443	
130076	Pumping Machinery & Appurtenance								
130076_01	10,000 GPM Pump	1.00 EA	55,000	14,879	3,494	6,229	650	80,252	80252
130076_02	Moter Control and Misc. Connect.		13,288	3,595	844	1,505	157	19,389	
	Pumping Machinery & Appurtenance		68,288	18,474	4,338	7,734	807	99,641	
130077	Gates and Valves								
130077_01	Sluice Gate - 5' x 5'	1.00 EA	16,722	4,524	1,062	1,894	198	24,399	24399
	Gates and Valves		16,722	4,524	1,062	1,894	198	24,399	
130099	Associated General Items								
130099_01	Concrete Pipe, 60"	60.00 LF	6,214	1,681	395	704	73	9,067	151.12
130099_02	Grating, Fiberglass	168.00 SF	2,913	788	185	330	34	4,250	25.30
130099_03	Handrail, Fiberglass	20.00 LF	784	212	50	89	9	1,144	57.21
130099_04	Staff Gages	2.00 EA	2,000	541	127	227	24	2,918	1459.13
130099_05	Revetment, "C" Stone	610.00 TON	10,769	2,913	684	1,220	127	15,713	25.76
130099_06	Aluminum Stop Logs		30,700	8,305	1,950	3,477	363	44,795	
	Associated General Items		53,380	14,441	3,391	6,046	631	77,888	
	Pumping Plant		286,753	77,576	18,216	32,478	3,387	418,410	
	Pumping Plant		286,753	77,576	18,216	32,478	3,387	418,410	
30	Planning, Engineering and Design								

	QUANTY UOM	DIRECT	FOOH&MOB	HOME OFC	PROFIT	BOND	TOTAL COST	UNIT
3004 Environment-Regulatory Activity								
Environment-Regulatory Activity		3,000	0	0	0	0	3,000	
3008 Plans and Specifications								
Plans and Specifications		216,000	0	0	0	0	216,000	
3010 Engineering During Construction								
Engineering During Construction		15,000	0	0	0	0	15,000	
3013 Cost Engineering								
Cost Engineering		12,000	0	0	0	0	12,000	
3014 Const-Supply Contract Award Acty								
Const-Supply Contract Award Acty		8,000	0	0	0	0	8,000	
3026 Miscellaneous Activities								
Miscellaneous Activities		5,000	0	0	0	0	5,000	
Planning, Engineering and Design		259,000	0	0	0	0	259,000	
31 Construction Management (S&I)								
3101 Area Office Operation								
Area Office Operation		81,200	0	0	0	0	81,200	
3102 District Office Operation								
District Office Operation		40,200	0	0	0	0	40,200	
3103 Contingencies								
Contingencies		30,350	0	0	0	0	30,350	
Construction Management (S&I)		151,750	0	0	0	0	151,750	

** PROJECT INDIRECT SUMMARY - LEVEL 4 **

	QUANTY UOM	DIRECT	FOOH&MOB	HOME OFC	PROFIT	BOND	TOTAL COST	UNIT
CUIVRE ISLAND - DPR	1.00 EA	1,080,104	152,956	35,045	62,537	6,477	1,337,119	1337119
Contingency							135,976	
TOTAL INCL OWNER COSTS							1,473,095	

	QUANTY UOM	DIRECT	FOOH&MOB	HOME OFC	PROFIT	BOND	TOTAL COST	UNIT
06 Fish and Wildlife Facilities								
0603 Wildlife Facilities & Sanctuary								
060373 Habitat and Feeding Facilities								
060373_01 Forest Clearings/Tree Planting								
Forest Clearings/Tree Planting		116,800	0	0	0	0	116,800	
060373_02 Reforestation								
Reforestation		4,620	0	0	0	0	4,620	
Habitat and Feeding Facilities		121,420	0	0	0	0	121,420	
Wildlife Facilities & Sanctuary		121,420	0	0	0	0	121,420	
Fish and Wildlife Facilities		121,420	0	0	0	0	121,420	
09 Channels and Canals								
0901 Channels								
090120 Disposal Areas								
090120_01 Grading of Disposal Areas								
Grading of Disposal Areas	26030 CY	11,383	3,079	723	1,289	134	16,609	0.64
Disposal Areas		11,383	3,079	723	1,289	134	16,609	
090130 Bank Stabilize, Dikes & Jetties								
090130_01 Construction of Stone Dikes								
090130_01 A Stone Shuttle Crew	2400.00 TON	8,384	3,717	605	1,096	101	13,903	5.79
090130_01 B Stone Placement Crew	2400.00 TON	8,122	3,601	586	1,062	97	13,469	5.61
Construction of Stone Dikes	2400.00 TON	16,506	7,319	1,191	2,158	198	27,372	11.41
090130_02 Remove Submerged Dike								

		QUANTY UOM	DIRECT	FOOH&MOB	HOME OFC	PROFIT	BOND	TOTAL COST	UNIT
090130_02 A	Dike Removal Crew	500.00 TON	8,237	3,652	594	1,077	99	13,659	27.32
	Remove Submerged Dike	500.00 TON	8,237	3,652	594	1,077	99	13,659	27.32
	Bank Stabilize, Dikes & Jetties		24,743	10,971	1,786	3,234	297	41,031	
090199	Associated General Items								
090199_01	Clearing								
	Clearing	19.00 ACR	33,942	9,182	2,156	3,844	401	49,526	2606.61
090199_02	Excavation, Ditching								
	Excavation, Ditching	31500 CY	56,275	15,224	3,575	6,374	665	82,112	2.61
090199_03	Embankment								
	Embankment	2110.00 CY	6,878	1,861	437	779	81	10,035	4.76
090199_04	Seeding								
	Seeding	18.00 ACR	20,308	5,494	1,290	2,300	240	29,632	1646.20
090199_05	Propwash Experiment								
	Propwash Experiment		2,572	1,140	186	336	31	4,264	
	Associated General Items		119,973	32,901	7,644	13,633	1,418	175,569	
	Channels		156,100	46,952	10,153	18,157	1,849	233,210	
	Channels and Canals		156,100	46,952	10,153	18,157	1,849	233,210	
11	Levees and Floodwalls								
1101	Levees								
110102	Drainage								

		QUANTY	UOM	DIRECT	FOOH&MOB	HOME OFC	PROFIT	BOND	TOTAL COST	UNIT
110102_01	36" Gravity Drainage Structures									
110102_01 A	Embankment	460.00	CY	1,499	406	95	170	18	2,188	4.76
110102_01 B	Cofferdam	740.00	CY	2,412	653	153	273	28	3,519	4.76
110102_01 C	Excavation	260.00	CY	514	139	33	58	6	750	2.89
110102_01 D	Staff Gages	4.00	EA	4,000	1,082	254	453	47	5,837	1459.13
110102_01 E	Concrete Pad	3.00	CY	304	82	19	34	4	444	148.03
110102_01 F	36" CMP	136.00	LF	7,031	1,902	447	796	83	10,259	75.44
110102_01 G	36" CMP End Sections	4.00	EA	2,062	558	131	234	24	3,009	752.36
110102_01 H	72" Riser Pipe (2ea)	20.00	LF	5,745	1,554	365	651	68	8,382	419.10
110102_01 I	Sluice Gates & Appurtenances	2.00	EA	12,574	3,402	799	1,424	149	18,347	9173.49
110102_01 J	Stone, 6" minus	460.00	TON	6,027	1,631	383	683	71	8,794	19.12
110102_01 K	Stone, 3" minus	120.00	TON	1,572	425	100	178	19	2,294	19.12
110102_01 L	Geogrid	350.00	SY	1,415	383	90	160	17	2,064	5.90
110102_01 M	Geotextile	310.00	SY	518	140	33	59	6	756	2.44
110102_01 N	Revetment, "C" Stone	300.00	TON	5,296	1,433	336	600	63	7,728	25.76
	36" Gravity Drainage Structures	2.00	EA	50,970	13,789	3,238	5,773	602	74,373	37186
110102_02	36" CMP's									
110102_02 A	Embankment	2900.00	CY	9,453	2,557	600	1,071	112	13,793	4.76
110102_02 B	Excavation	100.00	CY	198	53	13	22	2	289	2.89
110102_02 C	36" CMP	360.00	LF	18,604	5,033	1,182	2,107	220	27,146	75.41
110102_02 D	36" CMP End Sections	10.00	EA	5,156	1,395	328	584	61	7,524	752.36
110102_02 E	Pipe Bedding Material	150.00	TON	1,965	532	125	223	23	2,868	19.12
	36" CMP's	5.00	EA	35,376	9,570	2,247	4,007	418	51,618	10324
	Drainage			86,347	23,360	5,485	9,780	1,020	125,991	
110103	Care & Diversion of Water									
110103_01	Dewatering - Gravity Drain. Str.									
	Dewatering - Gravity Drain. Str.			14,745	3,989	937	1,670	174	21,515	
110103_02	Dewatering - 36" CMP's									
	Dewatering - 36" CMP's			2,457	665	156	278	29	3,586	
	Care & Diversion of Water			17,202	4,654	1,093	1,948	203	25,101	
110199	Associated General Items									

	QUANTY UOM	DIRECT	FOOH&MOB	HOME OFC	PROFIT	BOND	TOTAL COST	UNIT
110199_01 Culvert Removal (2ea)								
Culvert Removal (2ea)	70.00 LF	1,533	415	97	174	18	2,237	31.96
Associated General Items		1,533	415	97	174	18	2,237	
Levees		105,082	28,428	6,676	11,902	1,241	153,329	
Levees and Floodwalls		105,082	28,428	6,676	11,902	1,241	153,329	
13 Pumping Plant								
1300 Pumping Plant								
130003 Care and Diversion of Water								
130003_01 Wells								
Wells	4.00 EA	21,500	5,816	1,366	2,435	254	31,371	7842.84
130003_02 Pumps								
Pumps	4.00 EA	56,192	15,202	3,570	6,364	664	81,991	20498
Care and Diversion of Water		77,692	21,018	4,935	8,799	918	113,362	
130010 Earthwork for Structures								
130010_01 Excavation								
Excavation	3840.00 CY	7,593	2,054	482	860	90	11,080	2.89
130010_02 Backfill								
Backfill	3300.00 CY	5,525	1,495	351	626	65	8,062	2.44
Earthwork for Structures		13,118	3,549	833	1,486	155	19,141	
130011 Foundation Work								
130011_01 Geogrid								

	QUANTY UOM	DIRECT	FOOH&MOB	HOME OFC	PROFIT	BOND	TOTAL COST	UNIT
Geogrid	80.00 SY	323	87	21	37	4	472	5.90
130011_02 Geotextile								
Geotextile	80.00 SY	134	36	8	15	2	195	2.44
130011_03 Stone, 3" minus								
Stone, 3" minus	150.00 TON	1,965	532	125	223	23	2,868	19.12
Foundation Work		2,422	655	154	274	29	3,535	
130018 Utilities								
130018_01 Electrical Supply								
130075 Pumping Plant Superstructure								
130075_01 Concrete								
Concrete	180.00 CY	45,477	12,303	2,889	5,151	537	66,356	368.65
130075_02 Reinforcing Steel								
Reinforcing Steel	24300 LB	9,654	2,612	613	1,093	114	14,087	0.58
Pumping Plant Superstructure		55,131	14,915	3,502	6,244	651	80,443	
130076 Pumping Machinery & Appurtenance								
130076_01 10,000 GPM Pump								
10,000 GPM Pump	1.00 EA	55,000	14,879	3,494	6,229	650	80,252	80252
130076_02 Moter Control and Misc. Connect.								

		QUANTY UOM	DIRECT	FOOH&MOB	HOME OFC	PROFIT	BOND	TOTAL COST	UNIT
	Moter Control and Misc. Connect.		13,288	3,595	844	1,505	157	19,389	
	Pumping Machinery & Appurtenance		68,288	18,474	4,338	7,734	807	99,641	
130077	Gates and Valves								
130077_01	Sluice Gate - 5' x 5'								
	Sluice Gate - 5' x 5'	1.00 EA	16,722	4,524	1,062	1,894	198	24,399	24399
	Gates and Valves		16,722	4,524	1,062	1,894	198	24,399	
130099	Associated General Items								
130099_01	Concrete Pipe, 60"								
	Concrete Pipe, 60"	60.00 LF	6,214	1,681	395	704	73	9,067	151.12
130099_02	Grating, Fiberglass								
	Grating, Fiberglass	168.00 SF	2,913	788	185	330	34	4,250	25.30
130099_03	Handrail, Fiberglass								
	Handrail, Fiberglass	20.00 LF	784	212	50	89	9	1,144	57.21
130099_04	Staff Gages								
	Staff Gages	2.00 EA	2,000	541	127	227	24	2,918	1459.13
130099_05	Revetment, "C" Stone								
	Revetment, "C" Stone	610.00 TON	10,769	2,913	684	1,220	127	15,713	25.76
130099_06	Aluminum Stop Logs								

	QUANTY UOM	DIRECT	FOOH&MOB	HOME OFC	PROFIT	BOND	TOTAL COST	UNIT
Aluminum Stop Logs		30,700	8,305	1,950	3,477	363	44,795	
Associated General Items		53,380	14,441	3,391	6,046	631	77,888	
Pumping Plant		286,753	77,576	18,216	32,478	3,387	418,410	
Pumping Plant		286,753	77,576	18,216	32,478	3,387	418,410	
30 Planning, Engineering and Design								
3004 Environment-Regulatory Activity								
Environment-Regulatory Activity		3,000	0	0	0	0	3,000	
3008 Plans and Specifications								
Plans and Specifications		216,000	0	0	0	0	216,000	
3010 Engineering During Construction								
Engineering During Construction		15,000	0	0	0	0	15,000	
3013 Cost Engineering								
Cost Engineering		12,000	0	0	0	0	12,000	
3014 Const-Supply Contract Award Acty								
Const-Supply Contract Award Acty		8,000	0	0	0	0	8,000	
3026 Miscellaneous Activities								
Miscellaneous Activities		5,000	0	0	0	0	5,000	
Planning, Engineering and Design		259,000	0	0	0	0	259,000	
31 Construction Management (S&I)								
3101 Area Office Operation								
Area Office Operation		81,200	0	0	0	0	81,200	
3102 District Office Operation								

		QUANTY	UOM	DIRECT	FOOH&MOB	HOME OFC	PROFIT	BOND	TOTAL COST	UNIT
	District Office Operation			40,200	0	0	0	0	40,200	
3103	Contingencies									
	Contingencies			30,350	0	0	0	0	30,350	
	Construction Management (S&I)			151,750	0	0	0	0	151,750	
	CUIVRE ISLAND - DPR Contingency	1.00	EA	1,080,104	152,956	35,045	62,537	6,477	1,337,119 135,976	1337119
	TOTAL INCL OWNER COSTS								1,473,095	

** PROJECT DIRECT SUMMARY - LEVEL 1 **

		QUANTY UOM	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
06	Fish and Wildlife Facilities		0	0	0	121,420	121,420	
09	Channels and Canals		60,037	78,063	18,000	0	156,100	
11	Levees and Floodwalls		34,602	17,981	45,499	7,000	105,082	
13	Pumping Plant		95,741	24,902	56,610	109,500	286,753	
30	Planning, Engineering and Design		0	0	0	259,000	259,000	
31	Construction Management (S&I)		0	0	0	151,750	151,750	
	CUIVRE ISLAND - DPR	1.00 EA	190,380	120,946	120,109	648,670	1,080,104	1080104
	Field Office Overhead & Mobilization						152,956	
	SUBTOTAL						1,233,060	
	Home Office Overhead						35,045	
	SUBTOTAL						1,268,105	
	Profit						62,537	
	SUBTOTAL						1,330,641	
	Bond						6,477	
	TOTAL INCL INDIRECTS						1,337,119	
	Contingency						135,976	
	TOTAL INCL OWNER COSTS						1,473,095	

** PROJECT DIRECT SUMMARY - LEVEL 4 **

		QUANTY	UOM	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
06	Fish and Wildlife Facilities								
0603	Wildlife Facilities & Sanctuary								
060373	Habitat and Feeding Facilities								
060373_01	Forest Clearings/Tree Planting			0	0	0	116,800	116,800	
060373_02	Reforestation			0	0	0	4,620	4,620	
	Habitat and Feeding Facilities			0	0	0	121,420	121,420	
	Wildlife Facilities & Sanctuary			0	0	0	121,420	121,420	
	Fish and Wildlife Facilities			0	0	0	121,420	121,420	
09	Channels and Canals								
0901	Channels								
090120	Disposal Areas								
090120_01	Grading of Disposal Areas	26030	CY	3,230	8,153	0	0	11,383	0.44
	Disposal Areas			3,230	8,153	0	0	11,383	
090130	Bank Stabilize, Dikes & Jetties								
090130_01	Construction of Stone Dikes	2400.00	TON	6,720	9,786	0	0	16,506	6.88
090130_02	Remove Submerged Dike	500.00	TON	4,464	3,773	0	0	8,237	16.47
	Bank Stabilize, Dikes & Jetties			11,184	13,559	0	0	24,743	
090199	Associated General Items								
090199_01	Clearing	19.00	ACR	20,488	13,454	0	0	33,942	1786.41
090199_02	Excavation, Ditching	31500	CY	17,325	38,950	0	0	56,275	1.79
090199_03	Embankment	2110.00	CY	3,924	2,953	0	0	6,878	3.26
090199_04	Seeding	18.00	ACR	2,205	103	18,000	0	20,308	1128.21
090199_05	Propwash Experiment			1,680	892	0	0	2,572	
	Associated General Items			45,622	56,351	18,000	0	119,973	
	Channels			60,037	78,063	18,000	0	156,100	
	Channels and Canals			60,037	78,063	18,000	0	156,100	
11	Levees and Floodwalls								

** PROJECT DIRECT SUMMARY - LEVEL 4 **

		QUANTY UOM	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
1101	Levees							
110102	Drainage							
110102_01	36" Gravity Drainage Structures	2.00 EA	11,776	6,445	25,750	7,000	50,970	25485
110102_02	36" CMP's	5.00 EA	10,078	5,549	19,749	0	35,376	7075.21
	Drainage		21,855	11,993	45,499	7,000	86,347	
110103	Care & Diversion of Water							
110103_01	Dewatering - Gravity Drain. Str.		10,165	4,579	0	0	14,745	
110103_02	Dewatering - 36" CMP's		1,694	763	0	0	2,457	
	Care & Diversion of Water		11,860	5,343	0	0	17,202	
110199	Associated General Items							
110199_01	Culvert Removal (2ea)	70.00 LF	888	645	0	0	1,533	21.90
	Associated General Items		888	645	0	0	1,533	
	Levees		34,602	17,981	45,499	7,000	105,082	
	Levees and Floodwalls		34,602	17,981	45,499	7,000	105,082	
13	Pumping Plant							
1300	Pumping Plant							
130003	Care and Diversion of Water							
130003_01	Wells	4.00 EA	0	0	0	21,500	21,500	5375.00
130003_02	Pumps	4.00 EA	43,610	12,581	0	0	56,192	14048
	Care and Diversion of Water		43,610	12,581	0	21,500	77,692	
130010	Earthwork for Structures							
130010_01	Excavation	3840.00 CY	3,036	4,558	0	0	7,593	1.98
130010_02	Backfill	3300.00 CY	4,009	1,516	0	0	5,525	1.67
	Earthwork for Structures		7,045	6,074	0	0	13,118	

		QUANTY UOM	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
130011	Foundation Work							
130011_01	Geogrid	80.00 SY	79	5	240	0	323	4.04
130011_02	Geotextile	80.00 SY	39	2	92	0	134	1.67
130011_03	Stone, 3" minus	150.00 TON	650	491	825	0	1,965	13.10
	Foundation Work		768	497	1,157	0	2,422	
130018	Utilities							
130075	Pumping Plant Superstructure							
130075_01	Concrete	180.00 CY	27,940	1,108	16,429	0	45,477	252.65
130075_02	Reinforcing Steel	24300 LB	4,788	38	4,828	0	9,654	0.40
	Pumping Plant Superstructure		32,728	1,147	21,256	0	55,131	
130076	Pumping Machinery & Appurtenance							
130076_01	10,000 GPM Pump	1.00 EA	0	0	0	55,000	55,000	55000
130076_02	Moter Control and Misc. Connect.		873	0	12,115	300	13,288	
	Pumping Machinery & Appurtenance		873	0	12,115	55,300	68,288	
130077	Gates and Valves							
130077_01	Sluice Gate - 5' x 5'	1.00 EA	4,434	1,162	11,126	0	16,722	16722
	Gates and Valves		4,434	1,162	11,126	0	16,722	
130099	Associated General Items							
130099_01	Concrete Pipe, 60"	60.00 LF	1,771	438	4,005	0	6,214	103.57
130099_02	Grating, Fiberglass	168.00 SF	221	4	2,688	0	2,913	17.34
130099_03	Handrail, Fiberglass	20.00 LF	328	6	450	0	784	39.21
130099_04	Staff Gages	2.00 EA	0	0	0	2,000	2,000	1000.00
130099_05	Revetment, "C" Stone	610.00 TON	3,963	2,993	3,813	0	10,769	17.65
130099_06	Aluminum Stop Logs		0	0	0	30,700	30,700	
	Associated General Items		6,283	3,441	10,956	32,700	53,380	
	Pumping Plant		95,741	24,902	56,610	109,500	286,753	
	Pumping Plant		95,741	24,902	56,610	109,500	286,753	
30	Planning, Engineering and Design							

	QUANTY	UOM	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
3004 Environment-Regulatory Activity								
Environment-Regulatory Activity			0	0	0	3,000	3,000	
3008 Plans and Specifications								
Plans and Specifications			0	0	0	216,000	216,000	
3010 Engineering During Construction								
Engineering During Construction			0	0	0	15,000	15,000	
3013 Cost Engineering								
Cost Engineering			0	0	0	12,000	12,000	
3014 Const-Supply Contract Award Acty								
Const-Supply Contract Award Acty			0	0	0	8,000	8,000	
3026 Miscellaneous Activities								
Miscellaneous Activities			0	0	0	5,000	5,000	
Planning, Engineering and Design			0	0	0	259,000	259,000	
31 Construction Management (S&I)								
3101 Area Office Operation								
Area Office Operation			0	0	0	81,200	81,200	
3102 District Office Operation								
District Office Operation			0	0	0	40,200	40,200	
3103 Contingencies								
Contingencies			0	0	0	30,350	30,350	
Construction Management (S&I)			0	0	0	151,750	151,750	

** PROJECT DIRECT SUMMARY - LEVEL 4 **

	QUANTY UOM	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
CUIVRE ISLAND - DPR	1.00 EA	190,380	120,946	120,109	648,670	1,080,104	1080104
Field Office Overhead & Mobilization						152,956	
SUBTOTAL						1,233,060	
Home Office Overhead						35,045	
SUBTOTAL						1,268,105	
Profit						62,537	
SUBTOTAL						1,330,641	
Bond						6,477	
TOTAL INCL INDIRECTS						1,337,119	
Contingency						135,976	
TOTAL INCL OWNER COSTS						1,473,095	

	QUANTY UOM	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
06 Fish and Wildlife Facilities							
0603 Wildlife Facilities & Sanctuary							
060373 Habitat and Feeding Facilities							
060373_01 Forest Clearings/Tree Planting							
Forest Clearings/Tree Planting		0	0	0	116,800	116,800	
060373_02 Reforestation							
Reforestation		0	0	0	4,620	4,620	
Habitat and Feeding Facilities		0	0	0	121,420	121,420	
Wildlife Facilities & Sanctuary		0	0	0	121,420	121,420	
Fish and Wildlife Facilities		0	0	0	121,420	121,420	
09 Channels and Canals							
0901 Channels							
090120 Disposal Areas							
090120_01 Grading of Disposal Areas							
Grading of Disposal Areas	26030 CY	3,230	8,153	0	0	11,383	0.44
Disposal Areas		3,230	8,153	0	0	11,383	
090130 Bank Stabilize, Dikes & Jetties							
090130_01 Construction of Stone Dikes							
090130_01 A Stone Shuttle Crew	2400.00 TON	3,360	5,024	0	0	8,384	3.49
090130_01 B Stone Placement Crew	2400.00 TON	3,360	4,762	0	0	8,122	3.38
Construction of Stone Dikes	2400.00 TON	6,720	9,786	0	0	16,506	6.88
090130_02 Remove Submerged Dike							

		QUANTY UOM	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
090130_02 A	Dike Removal Crew	500.00 TON	4,464	3,773	0	0	8,237	16.47
	Remove Submerged Dike	500.00 TON	4,464	3,773	0	0	8,237	16.47
	Bank Stabilize, Dikes & Jetties		11,184	13,559	0	0	24,743	
090199	Associated General Items							
090199_01	Clearing							
	Clearing	19.00 ACR	20,488	13,454	0	0	33,942	1786.41
090199_02	Excavation, Ditching							
	Excavation, Ditching	31500 CY	17,325	38,950	0	0	56,275	1.79
090199_03	Embankment							
	Embankment	2110.00 CY	3,924	2,953	0	0	6,878	3.26
090199_04	Seeding							
	Seeding	18.00 ACR	2,205	103	18,000	0	20,308	1128.21
090199_05	Propwash Experiment							
	Propwash Experiment		1,680	892	0	0	2,572	
	Associated General Items		45,622	56,351	18,000	0	119,973	
	Channels		60,037	78,063	18,000	0	156,100	
	Channels and Canals		60,037	78,063	18,000	0	156,100	
11	Levees and Floodwalls							
1101	Levees							
110102	Drainage							

** PROJECT DIRECT SUMMARY - LEVEL 5 **

		QUANTY	UOM	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
110102_01	36" Gravity Drainage Structures								
110102_01 A	Embankment	460.00	CY	856	644	0	0	1,499	3.26
110102_01 B	Cofferdam	740.00	CY	1,376	1,036	0	0	2,412	3.26
110102_01 C	Excavation	260.00	CY	206	309	0	0	514	1.98
110102_01 D	Staff Gages	4.00	EA	0	0	0	4,000	4,000	1000.00
110102_01 E	Concrete Pad	3.00	CY	105	8	192	0	304	101.45
110102_01 F	36" CMP	136.00	LF	1,266	313	5,452	0	7,031	51.70
110102_01 G	36" CMP End Sections	4.00	EA	242	20	1,800	0	2,062	515.62
110102_01 H	72" Riser Pipe (2ea)	20.00	LF	550	136	2,058	3,000	5,745	287.23
110102_01 I	Sluice Gates & Appurtenances	2.00	EA	2,217	581	9,776	0	12,574	6286.95
110102_01 J	Stone, 6" minus	460.00	TON	1,992	1,505	2,530	0	6,027	13.10
110102_01 K	Stone, 3" minus	120.00	TON	520	393	660	0	1,572	13.10
110102_01 L	Geogrid	350.00	SY	345	20	1,050	0	1,415	4.04
110102_01 M	Geotextile	310.00	SY	153	9	357	0	518	1.67
110102_01 N	Revetment, "C" Stone	300.00	TON	1,949	1,472	1,875	0	5,296	17.65
	36" Gravity Drainage Structures	2.00	EA	11,776	6,445	25,750	7,000	50,970	25485
110102_02	36" CMP's								
110102_02 A	Embankment	2900.00	CY	5,394	4,059	0	0	9,453	3.26
110102_02 B	Excavation	100.00	CY	79	119	0	0	198	1.98
110102_02 C	36" CMP	360.00	LF	3,351	829	14,424	0	18,604	51.68
110102_02 D	36" CMP End Sections	10.00	EA	605	51	4,500	0	5,156	515.62
110102_02 E	Pipe Bedding Material	150.00	TON	650	491	825	0	1,965	13.10
	36" CMP's	5.00	EA	10,078	5,549	19,749	0	35,376	7075.21
	Drainage			21,855	11,993	45,499	7,000	86,347	
110103	Care & Diversion of Water								
110103_01	Dewatering - Gravity Drain. Str.								
	Dewatering - Gravity Drain. Str.			10,165	4,579	0	0	14,745	
110103_02	Dewatering - 36" CMP's								
	Dewatering - 36" CMP's			1,694	763	0	0	2,457	
	Care & Diversion of Water			11,860	5,343	0	0	17,202	
110199	Associated General Items								

	QUANTY UOM	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
110199_01 Culvert Removal (2ea)							
Culvert Removal (2ea)	70.00 LF	888	645	0	0	1,533	21.90
Associated General Items		888	645	0	0	1,533	
Levees		34,602	17,981	45,499	7,000	105,082	
Levees and Floodwalls		34,602	17,981	45,499	7,000	105,082	
13 Pumping Plant							
1300 Pumping Plant							
130003 Care and Diversion of Water							
130003_01 Wells							
Wells	4.00 EA	0	0	0	21,500	21,500	5375.00
130003_02 Pumps							
Pumps	4.00 EA	43,610	12,581	0	0	56,192	14048
Care and Diversion of Water		43,610	12,581	0	21,500	77,692	
130010 Earthwork for Structures							
130010_01 Excavation							
Excavation	3840.00 CY	3,036	4,558	0	0	7,593	1.98
130010_02 Backfill							
Backfill	3300.00 CY	4,009	1,516	0	0	5,525	1.67
Earthwork for Structures		7,045	6,074	0	0	13,118	
130011 Foundation Work							
130011_01 Geogrid							

		QUANTY	UOM	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
	Geogrid	80.00	SY	79	5	240	0	323	4.04
130011_02	Geotextile								
	Geotextile	80.00	SY	39	2	92	0	134	1.67
130011_03	Stone, 3" minus								
	Stone, 3" minus	150.00	TON	650	491	825	0	1,965	13.10
	Foundation Work			768	497	1,157	0	2,422	
130018	Utilities								
130018_01	Electrical Supply								
130075	Pumping Plant Superstructure								
130075_01	Concrete								
	Concrete	180.00	CY	27,940	1,108	16,429	0	45,477	252.65
130075_02	Reinforcing Steel								
	Reinforcing Steel	24300	LB	4,788	38	4,828	0	9,654	0.40
	Pumping Plant Superstructure			32,728	1,147	21,256	0	55,131	
130076	Pumping Machinery & Appurtenance								
130076_01	10,000 GPM Pump								
	10,000 GPM Pump	1.00	EA	0	0	0	55,000	55,000	55000
130076_02	Moter Control and Misc. Connect.								

		QUANTY	UOM	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
	Moter Control and Misc. Connect.			873	0	12,115	300	13,288	
	Pumping Machinery & Appurtenance			873	0	12,115	55,300	68,288	
130077	Gates and Valves								
130077_01	Sluice Gate - 5' x 5'								
	Sluice Gate - 5' x 5'	1.00	EA	4,434	1,162	11,126	0	16,722	16722
	Gates and Valves			4,434	1,162	11,126	0	16,722	
130099	Associated General Items								
130099_01	Concrete Pipe, 60"								
	Concrete Pipe, 60"	60.00	LF	1,771	438	4,005	0	6,214	103.57
130099_02	Grating, Fiberglass								
	Grating, Fiberglass	168.00	SF	221	4	2,688	0	2,913	17.34
130099_03	Handrail, Fiberglass								
	Handrail, Fiberglass	20.00	LF	328	6	450	0	784	39.21
130099_04	Staff Gages								
	Staff Gages	2.00	EA	0	0	0	2,000	2,000	1000.00
130099_05	Revetment, "C" Stone								
	Revetment, "C" Stone	610.00	TON	3,963	2,993	3,813	0	10,769	17.65
130099_06	Aluminum Stop Logs								

	QUANTY UOM	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
Aluminum Stop Logs		0	0	0	30,700	30,700	
Associated General Items		6,283	3,441	10,956	32,700	53,380	
Pumping Plant		95,741	24,902	56,610	109,500	286,753	
Pumping Plant		95,741	24,902	56,610	109,500	286,753	
30 Planning, Engineering and Design							
3004 Environment-Regulatory Activity							
Environment-Regulatory Activity		0	0	0	3,000	3,000	
3008 Plans and Specifications							
Plans and Specifications		0	0	0	216,000	216,000	
3010 Engineering During Construction							
Engineering During Construction		0	0	0	15,000	15,000	
3013 Cost Engineering							
Cost Engineering		0	0	0	12,000	12,000	
3014 Const-Supply Contract Award Acty							
Const-Supply Contract Award Acty		0	0	0	8,000	8,000	
3026 Miscellaneous Activities							
Miscellaneous Activities		0	0	0	5,000	5,000	
Planning, Engineering and Design		0	0	0	259,000	259,000	
31 Construction Management (S&I)							
3101 Area Office Operation							
Area Office Operation		0	0	0	81,200	81,200	
3102 District Office Operation							

		QUANTY	UOM	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
	District Office Operation			0	0	0	40,200	40,200	
3103	Contingencies								
	Contingencies			0	0	0	30,350	30,350	
	Construction Management (S&I)			0	0	0	151,750	151,750	
	CUIVRE ISLAND - DPR	1.00	EA	190,380	120,946	120,109	648,670	1,080,104	1080104
	Field Office Overhead & Mobilization							152,956	
	SUBTOTAL							1,233,060	
	Home Office Overhead							35,045	
	SUBTOTAL							1,268,105	
	Profit							62,537	
	SUBTOTAL							1,330,641	
	Bond							6,477	
	TOTAL INCL INDIRECTS							1,337,119	
	Contingency							135,976	
	TOTAL INCL OWNER COSTS							1,473,095	

** CONTRACTOR DIRECT SUMMARY **

		QUANTY	UOM	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST
	<<< Non-Contracted Work >>>	1.00	EA	0	0	0	532,170	532,170
PM	Prime Contractor - Contract #1			177,516	106,495	120,109	116,500	520,620
P2	Prime Contractor - Contract #2			12,864	14,451	0	0	27,315

	QUANTY	UOM	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST
06. Fish and Wildlife Facilities							
<<< Non-Contracted Work >>>			0	0	0	121,420	121,420
09. Channels and Canals							
PM Prime Contractor - Contract #1			47,173	63,612	18,000	0	128,785
P2 Prime Contractor - Contract #2			12,864	14,451	0	0	27,315
11. Levees and Floodwalls							
PM Prime Contractor - Contract #1			34,602	17,981	45,499	7,000	105,082
13. Pumping Plant							
PM Prime Contractor - Contract #1			95,741	24,902	56,610	109,500	286,753
30. Planning, Engineering and Design							
<<< Non-Contracted Work >>>			0	0	0	259,000	259,000
31. Construction Management (S&I)							
<<< Non-Contracted Work >>>			0	0	0	151,750	151,750

** CONTRACTOR INDIRECT SUMMARY **

		DIRECT	FOOH&MOB	HOME OFC	PROFIT	BOND	TOTAL COST	UNIT
	<<< Non-Contracted Work >>>	532,170	0	0	0	0	532,170	532170
PM	Prime Contractor - Contract #1	520,620	140,844	33,073	58,966	6,149	759,653	
P2	Prime Contractor - Contract #2	27,315	12,111	1,971	3,571	328	45,296	

** CONTRACTOR INDIRECT SUMMARY - LEVEL 1 **

	DIRECT	FOOH&MOB	HOME OFC	PROFIT	BOND	TOTAL COST	UNIT
06. Fish and Wildlife Facilities							
<<< Non-Contracted Work >>>	121,420	0	0	0	0	121,420	
09. Channels and Canals							
PM Prime Contractor - Contract #1	128,785	34,840	8,181	14,586	1,521	187,914	
P2 Prime Contractor - Contract #2	27,315	12,111	1,971	3,571	328	45,296	
11. Levees and Floodwalls							
PM Prime Contractor - Contract #1	105,082	28,428	6,676	11,902	1,241	153,329	
13. Pumping Plant							
PM Prime Contractor - Contract #1	286,753	77,576	18,216	32,478	3,387	418,410	
30. Planning, Engineering and Design							
<<< Non-Contracted Work >>>	259,000	0	0	0	0	259,000	
31. Construction Management (S&I)							
<<< Non-Contracted Work >>>	151,750	0	0	0	0	151,750	

001. Prime Contractor - Contract #	QUANTY	UOM	CREW ID	OUTPUT	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
001. Prime Contractor - Contract #1										
001 0. Overhead Items - PM It is assumed that this project will be accomplished with two contracts. The first contract will include all construction with the exception of the river work under the 09 account and the work under the 06 account. The second contract will consist of all river work requiring a floating plant.										
	CONTRACT NO.1	CONTRACT NO.2								
Contract Duration	270 Days	30 Days								
Construction Duration	210 Days	15 Days								
001 0_01. Field Office Overhead-Contract 1 Skiff and operator are to be used to shuttle personnel to and from the island.										
USR < > Project Engineer	7.00	MO		0.00	0.00 0	0.00 0	0.00 0	4500.00 31,500	4500.00 31,500	4500.00
USR < > Survey Crew - assume 1wk/mo	7.00	WK		0.00	0.00 0	0.00 0	0.00 0	4000.00 28,000	4000.00 28,000	4000.00
USR < > Field Office Trailer	7.00	MO		0.00	0.00 0	0.00 0	0.00 0	400.00 2,800	400.00 2,800	400.00
USR < > Temporary Hookup	1.00	LS		0.00	0.00 0	0.00 0	0.00 0	500.00 500	500.00 500	500.00
USR < > Utilities	7.00	MO		0.00	0.00 0	0.00 0	0.00 0	150.00 1,050	150.00 1,050	150.00
USR < > Sanitary Facilities	7.00	MO		0.00	0.00 0	0.00 0	0.00 0	150.00 1,050	150.00 1,050	150.00
USR < > Pickup Truck	7.00	MO		0.00	0.00 0	0.00 0	0.00 0	500.00 3,500	500.00 3,500	500.00
USR < > Safety Equipment	1.00	LS		0.00	0.00 0	0.00 0	0.00 0	500.00 500	500.00 500	500.00
USR < > Project/Safety Sign	1.00	LS		0.00	0.00 0	0.00 0	0.00 0	400.00 400	400.00 400	400.00
USR < > Environmental Protection	1.00	LS		0.00	0.00 0	0.00 0	0.00 0	2000.00 2,000	2000.00 2,000	2000.00
MIL < > Skiff And Outboard (4hrs/day)	560.00	HR	XXOXX009	0.00	0.00 0	8.24 4,614	0.00 0	0.00 0	8.24 4,614	8.24

001. Prime Contractor - Contract #1			QUANTY	UOM	CREW ID	OUTPUT	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
MIL	<	> Skiff Operator (4hrs/day)	560.00	HR	X-EQOPRLT	1.00	28.24 15,813	0.00 0	0.00 0	0.00 0	28.24 15,813	28.24
		Field Office Overhead-Contract 1					15,813	4,614	0	71,300	91,727	

001 0_02. Mob and Demob - Contract 1
Assume the following for mobilization and demobilization:

- Allow 2hrs operating time for each piece of equipment, each way.
- Allow 2hrs drive time each way for trucks.

Cycle Time per Trip -		
	Load Equip.	1hr
	Mob. to Jobsite	2hr
	Unload Equip.	1hr
	Return	2hr
		6hrs/trip

Mob = 7trips x 6hrs/ea = 42hrs
Demob = Use the same as mob
Total = 84hrs

MIL	<	> GRADER,MOTOR,CAT12-G, ARTIC ARTICULATED FRAME, POWERSHIFT	4.00	HR	G15CA003	1.00	0.00 0	29.49 118	0.00 0	0.00 0	29.49 118	29.49
MIL	<	> HYD EXCAV,CRWLR,3 CY BKT 3.00 CY BUCKET	4.00	HR	H25KO007	1.00	0.00 0	130.71 523	0.00 0	0.00 0	130.71 523	130.71
MIL	<	> ROLLER,STATIC,SELF,15T, 11 TIRE 15 TON, 11 TIRES, HYDROSTATIC	4.00	HR	R30IG003	0.00	0.00 0	12.68 51	0.00 0	0.00 0	12.68 51	12.68
MIL	<	> ROLL,VIB,TOWED,STL,PAD,58"D,60"W 58" DIAMETER X 60" WIDE	4.00	HR	R40HY004	0.00	0.00 0	10.02 40	0.00 0	0.00 0	10.02 40	10.02
MIL	<	> BLADE, ANGLE, HYDR, FOR D6 BLADE, ANGLE, HYDRAULIC, FOR D6	4.00	HR	T10CA010	1.00	0.00 0	4.04 16	0.00 0	0.00 0	4.04 16	4.04
MIL	<	> BLADE, UNIVERSAL,HYDR,FOR D8 BLADE, UNIVERSAL,HYDRAULIC,FOR D	4.00	HR	T10CA017	1.00	0.00 0	7.36 29	0.00 0	0.00 0	7.36 29	7.36
MIL	<	> DOZER,CWLR,D-6H,PS,(ADD BLADE) POWERSHIFT, (ADD BLADE)	4.00	HR	T15CA010	1.00	0.00 0	39.58 158	0.00 0	0.00 0	39.58 158	39.58
MIL	<	> DOZER,CWLR,CAT D-8L, (ADD BLADE) POWERSHIFT, (ADD BLADE)	4.00	HR	T15CA015	1.00	0.00 0	78.77 315	0.00 0	0.00 0	78.77 315	78.77
MIL	<	> CRANE,HYD,SELF 14T ROUGH TERRAIN 13.6 TON ROUGH TERRAIN, 4WD	4.00	HR	C75BD003	1.00	0.00 0	27.60 110	0.00 0	0.00 0	27.60 110	27.60

001. Prime Contractor - Contract #				QUANTY	UOM	CREW ID	OUTPUT	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
MIL	<	>	LDR,FE,CRWLR, 3.75 CY, 973 3.75 CY	4.00	HR	L35CA007	1.00	0.00 0	75.41 302	0.00 0	0.00 0	75.41 302	75.41
MIL	<	>	TRUCK OPT,REAR DUMP BODY, 12 CY 12 CY, 36000 AND UP GVW, AIR GAT	16.00	HR	T40XX010	1.00	0.00 0	2.69 43	0.00 0	0.00 0	2.69 43	2.69
MIL	<	>	WATER TANK, 3000 GAL (ADD TRUCK) 3000 GAL (ADD 29000-40000 GVW TR	4.00	HR	T40XX033	1.00	0.00 0	3.23 13	0.00 0	0.00 0	3.23 13	3.23
MIL	<	>	TRK TRLR,LOWBOY, 60 TON, 3 AXLE 60 TON, 3 AXLE	84.00	HR	T45XX017	1.00	0.00 0	7.47 627	0.00 0	0.00 0	7.47 627	7.47
MIL	<	>	TRK,HWY,48,000/64,000 GVW,3 AXLE 64,000 GVW, 3 AXLE	84.00	HR	T50FO020	1.00	0.00 0	40.91 3,436	0.00 0	0.00 0	40.91 3,436	40.91
MIL	<	>	TRK, HWY, 3 AXLE, 41000 GVW, 6X4 6X4, 3 AXLE, 41000 GVW	20.00	HR	T50GM015	1.00	0.00 0	27.17 543	0.00 0	0.00 0	27.17 543	27.17
MIL	<	>	Misc. Power Tools	84.00	HR	XMIXX010	1.00	0.00 0	5.90 496	0.00 0	0.00 0	5.90 496	5.90
MIL	<	>	Small Tools	84.00	HR	XMIXX020	1.00	0.00 0	1.45 122	0.00 0	0.00 0	1.45 122	1.45
MIL	<	>	Outside Equip. Op. Heavy	84.00	HR	X-EQOPRHVY	1.00	30.28 2,544	0.00 0	0.00 0	0.00 0	30.28 2,544	30.28
MIL	<	>	Outside Laborer (Semi-Skilled)	84.00	HR	X-LABORER	1.00	25.00 2,100	0.00 0	0.00 0	0.00 0	25.00 2,100	25.00
MIL	<	>	Outside Truck Dr. Heavy	84.00	HR	X-TRKDVRHV	1.00	27.28 2,292	0.00 0	0.00 0	0.00 0	27.28 2,292	27.28
MIL	<	>	Outside Truck Dr. Heavy	20.00	HR	X-TRKDVRHV	1.00	27.28 546	0.00 0	0.00 0	0.00 0	27.28 546	27.28
			Mob and Demob - Contract 1					7,482	6,943	0	0	14,424	

001 0_03. Equip. & Supply Shuttle
Cuivre Island is accessible by boat only. Therefore it is assumed that all construction equipment and supplies will be barged to the island. Assume 20 trips at 1hr/trip to mob and demob equipment, plus 1-8hr day per week for 4 months to ferry supplies to the island. TOTAL = 148 hrs

MIL	<	>	Push Boat 350 hp.	148.00	HR	XXOXX004	1.00	0.00 0	22.45 3,322	0.00 0	0.00 0	22.45 3,322	22.45

001. Prime Contractor - Contract #1				QUANTY	UOM	CREW ID	OUTPUT	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
MIL	<	>	Work Barge	148.00	HR	XXOXX013	0.00	0.00 0	8.50 1,258	0.00 0	0.00 0	8.50 1,258	8.50
MIL	<	>	Boat Operator	148.00	HR	X-EQOPRHVY	1.00	30.28 4,482	0.00 0	0.00 0	0.00 0	30.28 4,482	30.28
MIL	<	>	Outside Oiler	148.00	HR	X-EQOPROIL	1.00	24.72 3,658	0.00 0	0.00 0	0.00 0	24.72 3,658	24.72
MIL	<	>	Deckhand (2ea)	296.00	HR	X-LABORER	1.00	25.00 7,400	0.00 0	0.00 0	0.00 0	25.00 7,400	25.00
MIL	<	>	CRANE,HYD,SELF 14T ROUGH TERRAIN 13.6 TON ROUGH TERRAIN, 4WD	128.00	HR	C75BD003	1.00	0.00 0	27.60 3,532	0.00 0	0.00 0	27.60 3,532	27.60
MIL	<	>	HYDR CRANE FOR FLATBED, 5.3 TON MAX CAP. 5.3 TON, MAX. BOOM 48	128.00	HR	T40XX001	1.00	0.00 0	7.46 954	0.00 0	0.00 0	7.46 954	7.46
MIL	<	>	TRUCK OPT,FLATBED, 8' x 20.0' 8' x 20.0'	128.00	HR	T40XX018	1.00	0.00 0	0.78 100	0.00 0	0.00 0	0.78 100	0.78
MIL	<	>	TRK, HWY,F600,21,000 GVW, 2 AXLE 21,000 GVW, 2 AXLE	128.00	HR	T50FO006	1.00	0.00 0	15.72 2,012	0.00 0	0.00 0	15.72 2,012	15.72
MIL	<	>	Outside Equip. Op. Heavy	148.00	HR	X-EQOPRHVY	1.00	30.28 4,482	0.00 0	0.00 0	0.00 0	30.28 4,482	30.28
MIL	<	>	Outside Truck Dr. Heavy	128.00	HR	X-TRKDVRHV	1.00	27.28 3,492	0.00 0	0.00 0	0.00 0	27.28 3,492	27.28
			Equip. & Supply Shuttle					23,515	11,178	0	0	34,693	
			Overhead Items - PM					46,809	22,735	0	71,300	140,845	
002. Prime Contractor - Contract #2													
002 0. Overhead Items - P2													
002 0_01. Field Office Overhead-Contract 2													
USR	<	>	Project Engineer	1.00	MO		0.00	0.00 0	0.00 0	0.00 0	4500.00 4,500	4500.00 4,500	4500.00
USR	<	>	Work Barge W/Office	1.00	MO		0.00	0.00 0	0.00 0	0.00 0	1000.00 1,000	1000.00 1,000	1000.00
USR	<	>	Sanitary Facilities	1.00	MO		0.00	0.00 0	0.00 0	0.00 0	150.00 150	150.00 150	150.00

002. Prime Contractor - Contract #				QUANTY	UOM	CREW ID	OUTPUT	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
USR	<	> Pickup Truck		1.00	MO		0.00	0.00 0	0.00 0	0.00 0	500.00 500	500.00 500	500.00
USR	<	> Safety Equipment		1.00	LS		0.00	0.00 0	0.00 0	0.00 0	500.00 500	500.00 500	500.00
USR	<	> Project/Safety Sign		1.00	LS		0.00	0.00 0	0.00 0	0.00 0	400.00 400	400.00 400	400.00
USR	<	> Environmental Protection		1.00	LS		0.00	0.00 0	0.00 0	0.00 0	1000.00 1,000	1000.00 1,000	1000.00
		Field Office Overhead-Contract 2						0	0	0	8,050	8,050	
002 0_02. Mob and Demob - Contract 2 Assume 8hrs to mob and 8hrs to demob.													
MIL	<	> Push Boat 350 hp.		16.00	HR	XX0XX004	1.00	0.00 0	22.45 359	0.00 0	0.00 0	22.45 359	22.45
MIL	<	> Work Barge		16.00	HR	XX0XX013	0.00	0.00 0	8.50 136	0.00 0	0.00 0	8.50 136	8.50
MIL	<	> Spud Barge		16.00	HR	XX0XX011	0.00	0.00 0	20.00 320	0.00 0	0.00 0	20.00 320	20.00
MIL	<	> CR,DRAG/CLAM,3.5CY,100'B,ADD BKT 3.5 CY,DRAGLINE/CLAM (ADD BUCKET		16.00	HR	C85MA001	1.00	0.00 0	90.73 1,452	0.00 0	0.00 0	90.73 1,452	90.73
MIL	<	> BKT,CLAM,4CY, GEN PURP/SQ NOSE 4.000 CY, GEN. PURPOSE/SQUARE NO		16.00	HR	B25ES011	1.00	0.00 0	7.14 114	0.00 0	0.00 0	7.14 114	7.14
MIL	<	> Outside Equip. Op. Heavy		16.00	HR	X-EQOPRHVY	1.00	30.28 485	0.00 0	0.00 0	0.00 0	30.28 485	30.28
MIL	<	> Outside Oiler		16.00	HR	X-EQOPROIL	1.00	24.72 395	0.00 0	0.00 0	0.00 0	24.72 395	24.72
MIL	<	> Deckhand (2ea)		32.00	HR	X-LABORER	1.00	25.00 800	0.00 0	0.00 0	0.00 0	25.00 800	25.00
		Mob and Demob - Contract 2						1,680	2,381	0	0	4,061	
		Overhead Items - P2						1,680	2,381	0	8,050	12,11	

0603. Wildlife Facilities & Sanctuary	QUANTY	UOM	CREW ID	OUTPUT	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
06. Fish and Wildlife Facilities										
0603. Wildlife Facilities & Sanctuary										
060373. Habitat and Feeding Facilities Costs for both the Forest Clearings and Reforestation were provided to the Corps by the Missouri Department of Conservation (MDOC). It is assumed that this work will be accomplished with there own personnel or local labor hired by MDOC. Assume all indirect costs to be included. Based on the information provided, all costs associated with this measure appear to be reasonable.										
060373_01. Forest Clearings/Tree Planting Creation of Forest Clearings with Planting of Hard Mast Tree Species. (10 sites @ 8 acres/site) This item was modified after the draft DPR due to changes incurred from the Flood of 93.										
USR < > Mechanized Clearing	80.00	ACR		0.00	0.00 0	0.00 0	0.00 0	500.00 40,000	500.00 40,000	500.00
USR < > Herbicide Application	80.00	ACR		0.00	0.00 0	0.00 0	0.00 0	30.00 2,400	30.00 2,400	30.00
USR < > Establish Ground Cover	80.00	ACR		0.00	0.00 0	0.00 0	0.00 0	80.00 6,400	80.00 6,400	80.00
USR < > Plant Seedlings	80.00	ACR		0.00	0.00 0	0.00 0	0.00 0	850.00 68,000	850.00 68,000	850.00
Forest Clearings/Tree Planting					0	0	0	116,800	116,800	
060373_02. Reforestation This work consists of planting trees and establishing ground cover and will be accomplished in 5-10 year increments. The initial construction cost is considered to be 1/5th of the total acreage or 22 acres. The remaining work is considered to be O&M costs.										
USR < > Initial Const. Cost for Alt. 16C	22.00	ACR		0.00	0.00 0	0.00 0	0.00 0	210.00 4,620	210.00 4,620	210.00
Reforestation					0	0	0	4,620	4,620	
Habitat and Feeding Facilities					0	0	0	121,420	121,420	
Wildlife Facilities & Sanctuary					0	0	0	121,420	121,420	

0603. Wildlife Facilities & Sanctuary	QUANTY	UOM	CREW ID	OUTPUT	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
Fish and Wildlife Facilities					0	0	0	121,420	121,420	

0901. Channels

		QUANTY	UOM	CREW ID	OUTPUT	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
09. Channels and Canals											
0901. Channels											
090120. Disposal Areas											
090120_01. Grading of Disposal Areas Quantity for this item is assumed to be equal to the quantity of material excavated for the ditching, minus the material used for embankment construction. Approximate size of disposal areas, 4,800lf x 50lf. Ditching +31,500 cy Embankment, Channel - 2,110 cy Gravity Drains - 460 cy CMP's, 36" - 2,900 cy 26,030 cy											
02210 1000 Site Grading											
L MIL PM <02210 1004 >	Rough Grade Large Area w/Dozer 300 HP	26030	CY	CODTK	307.00	0.12 3,230	0.31 8,153	0.00 0	0.00 0	0.44 11,383	0.44
	Grading of Disposal Areas	26030	CY			3,230	8,153	0	0	11,383	0.44
	Disposal Areas					3,230	8,153	0	0	11,383	
090130. Bank Stabilize, Dikes & Jetties											
090130_01. Construction of Stone Dikes "A" Stone (6-dikes, island side) PRODUCTION - Based on production studies of previous stone jobs assume an average production rate of 300 ton/hr plus 4 hrs/ea location to move and setup. 2400 ton / 300 ton/hr = 8 + 5 moves at 4 hr/ea = 28 USE 32 hrs											
090130_01 A. Stone Shuttle Crew											
MIL P2 <	> Tow Boat 750 hp.	32.00	HR	XX0XX002	1.00	0.00 0	55.72 1,783	0.00 0	0.00 0	55.72 1,783	55.72
MIL P2 <	> Stone Barge (6ea)	192.00	HR	XX0XX012	0.00	0.00 0	16.88 3,241	0.00 0	0.00 0	16.88 3,241	16.88
MIL P2 <	> Outside Equip. Op. Heavy	32.00	HR	X-EQOPRHVY	1.00	30.28 969	0.00 0	0.00 0	0.00 0	30.28 969	30.28

0901. Channels		QUANTY	UOM	CREW ID	OUTPUT	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
MIL P2 <	> Outside Oiler	32.00	HR	X-EQOPROIL	1.00	24.72 791	0.00 0	0.00 0	0.00 0	24.72 791	24.72
MIL P2 <	> Deckhand (2ea)	64.00	HR	X-LABORER	1.00	25.00 1,600	0.00 0	0.00 0	0.00 0	25.00 1,600	25.00
	Stone Shuttle Crew	2400.00	TON			3,360	5,024	0	0	8,384	3.49
090130_01	B. Stone Placement Crew										
MIL P2 <	> Push Boat 350 hp.	32.00	HR	XX0XX004	1.00	0.00 0	22.45 718	0.00 0	0.00 0	22.45 718	22.45
MIL P2 <	> Work Barge	32.00	HR	XX0XX013	0.00	0.00 0	8.50 272	0.00 0	0.00 0	8.50 272	8.50
MIL P2 <	> Spud Barge	32.00	HR	XX0XX011	0.00	0.00 0	20.00 640	0.00 0	0.00 0	20.00 640	20.00
MIL P2 <	> CR,DRAG/CLAM,3.5CY,100'B,ADD BKT 3.5 CY,DRAGLINE/CLAM (ADD BUCKET	32.00	HR	C85MA001	1.00	0.00 0	90.73 2,903	0.00 0	0.00 0	90.73 2,903	90.73
MIL P2 <	> BKT,CLAM,4CY, GEN PURP/SQ NOSE 4.000 CY, GEN. PURPOSE/SQUARE NO	32.00	HR	B25ES011	1.00	0.00 0	7.14 228	0.00 0	0.00 0	7.14 228	7.14
MIL P2 <	> Outside Equip. Op. Heavy	32.00	HR	X-EQOPRHVY	1.00	30.28 969	0.00 0	0.00 0	0.00 0	30.28 969	30.28
MIL P2 <	> Outside Oiler	32.00	HR	X-EQOPROIL	1.00	24.72 791	0.00 0	0.00 0	0.00 0	24.72 791	24.72
MIL P2 <	> Deckhand (2ea)	64.00	HR	X-LABORER	1.00	25.00 1,600	0.00 0	0.00 0	0.00 0	25.00 1,600	25.00
	Stone Placement Crew	2400.00	TON			3,360	4,762	0	0	8,122	3.38
	Construction of Stone Dikes	2400.00	TON			6,720	9,786	0	0	16,506	6.88

090130_02. Remove Submerged Dike
Based on previous contracts of similar work assume an average of 50 ton/hr for stone removal. Considering setup and down time use 16hrs to remove the stone from the river and 8hrs to move and dispose of material.

0901. Channels			QUANTY	UOM	CREW ID	OUTPUT	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
090130_02 A. Dike Removal Crew												
	MIL P2 <	> Push Boat 350 hp.	24.00	HR	XX0XX004	1.00	0.00 0	22.45 539	0.00 0	0.00 0	22.45 539	22.45
	MIL P2 <	> Work Barge	24.00	HR	XX0XX012	0.00	0.00 0	16.88 405	0.00 0	0.00 0	16.88 405	16.88
	MIL P2 <	> Spud Barge	24.00	HR	XX0XX011	0.00	0.00 0	20.00 480	0.00 0	0.00 0	20.00 480	20.00
	MIL P2 <	> BKT,CLAM,4CY, GEN PURP/SQ NOSE 4.000 CY, GEN. PURPOSE/SQUARE NO	24.00	HR	B25ES011	1.00	0.00 0	7.14 171	0.00 0	0.00 0	7.14 171	7.14
	MIL P2 <	> Outside Equip. Op. Heavy	48.00	HR	X-EQOPRHVY	1.00	30.28 1,454	0.00 0	0.00 0	0.00 0	30.28 1,454	30.28
	MIL P2 <	> Outside Oiler	48.00	HR	X-EQOPROIL	1.00	24.72 1,186	0.00 0	0.00 0	0.00 0	24.72 1,186	24.72
	MIL P2 <	> Deckhand	48.00	HR	X-LABORER	1.00	25.00 1,200	0.00 0	0.00 0	0.00 0	25.00 1,200	25.00
	MIL P2 <	> Foreman	24.00	HR	X-LABORER	1.00	26.00 624	0.00 0	0.00 0	0.00 0	26.00 624	26.00
	MIL P2 <	> CR,DRAG/CLAM,3.5CY,100'B,ADD BKT 3.5 CY,DRAGLINE/CLAM (ADD BUCKET	24.00	HR	C85MA001	1.00	0.00 0	90.73 2,178	0.00 0	0.00 0	90.73 2,178	90.73
		Dike Removal Crew	500.00	TON			4,464	3,773	0	0	8,237	16.47
		Remove Submerged Dike	500.00	TON			4,464	3,773	0	0	8,237	16.47
		Bank Stabilize, Dikes & Jetties					11,184	13,559	0	0	24,743	
090199. Associated General Items												
090199_01. Clearing Assume that this material will be pushed into a excavated trench and burned onsite.												
02102 1100 Cut Trees - Grub Roots And Stump												
	L MIL PM <02102 1101 >	Clear and Grub Lt Trees to 6" D (15cm) Dia, Cut and Chip	5.00	ACR	COMCA	0.50	302.51 1,513	166.30 831	0.00 0	0.00 0	468.81 2,344	468.81
	L MIL PM <02102 1103 >	Clear and Grub Med Trees to 10"D (25cm) Dia, Cut and Chip	5.00	ACR	COMCA	0.25	605.03 3,025	332.60 1,663	0.00 0	0.00 0	937.62 4,688	937.62

0901. Channels

			QUANTY	UOM	CREW ID	OUTPUT	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
L MIL PM <02102 1105 >	Clear and Grub Hvy Trees to 16"D (41cm) Dia, Cut and Chip	9.00	ACR	COMCA	0.13	1210.05 10,890	665.20 5,987	0.00 0	0.00 0	1875.25 16,877	1875.25
L MIL PM <02102 1106 >	Clear & Grub Hvy Stumps to 16" D (41cm) Dia, Include Removal	9.00	ACR	COETV	0.15	562.22 5,060	552.49 4,972	0.00 0	0.00 0	1114.70 10,032	1114.70
	Clearing	19.00	ACR			20,488	13,454	0	0	33,942	1786.41

090199_02. Excavation, Ditching

02225 1460 5 Cy Bucket

CIV PM <02225 1464 >	Bulk Site Excavation, Unclass 5 CY Bucket Drag Line	31500	CY	UOEDO	100.00	0.55 17,325	1.24 38,950	0.00 0	0.00 0	1.79 56,275	1.79
	Excavation, Ditching	31500	CY			17,325	38,950	0	0	56,275	1.79

090199_03. Embankment

02212 1010 By Towed Roller Assume Following Cond. 6Ft

L MIL PM <02212 1012 >	Spread/Compact w/Sheepsft Roller 8"(20cm) Lift, 654 CY/HR	2110.00	CY	COFCO	100.00	0.76 1,596	0.98 2,058	0.00 0	0.00 0	1.73 3,654	1.73

02212 2100 By Machine

L MIL PM <02212 2101 >	Shape Embankment/Slope w/Machine Up to 1 on 4 Slope	2110.00	CY	COFCF	100.00	1.10 2,328	0.42 895	0.00 0	0.00 0	1.53 3,223	1.53
	Embankment	2110.00	CY			3,924	2,953	0	0	6,878	3.26

090199_04. Seeding

02810 1000 Mechanical Seeding

B MIL PM <02810 1002 >	Mechanical Seeding	18.00	ACR	ULABE	0.25	122.49 2,205	5.71 103	1000.00 18,000	0.00 0	1128.21 20,308	1128.21
	Seeding	18.00	ACR			2,205	103	18,000	0	20,308	1128.21

0901. Channels	QUANTY	UOM	CREW ID	OUTPUT	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
090199_05. Propwash Experiment This item of work consists of using a pushboat in the slough area for moving material by means of prop agitation.										
MIL P2 < > 500 To 800hp Tug Boat	16.00	HR	XX0XX002	1.00	0.00 0	55.72 892	0.00 0	0.00 0	55.72 892	55.72
MIL P2 < > Boat Operator	16.00	HR	X-EQOPRHVY	1.00	30.28 485	0.00 0	0.00 0	0.00 0	30.28 485	30.28
MIL P2 < > Oiler	16.00	HR	X-EQOPROIL	1.00	24.72 395	0.00 0	0.00 0	0.00 0	24.72 395	24.72
MIL P2 < > Deckhand	16.00	HR	X-LABORER	1.00	25.00 400	0.00 0	0.00 0	0.00 0	25.00 400	25.00
MIL P2 < > Deckhand	16.00	HR	X-LABORER	1.00	25.00 400	0.00 0	0.00 0	0.00 0	25.00 400	25.00
Propwash Experiment					1,680	892	0	0	2,572	
Associated General Items					45,622	56,351	18,000	0	119,973	
Channels					60,037	78,063	18,000	0	156,100	
Channels and Canals					60,037	78,063	18,000	0	156,100	

1101. Levees			QUANTY UOM	CREW ID	OUTPUT	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
11. Levees and Floodwalls											
1101. Levees											
110102. Drainage											
110102_01. 36" Gravity Drainage Structures											
110102_01 A. Embankment											
02212 1010	By Towed Roller Assume Following Cond. 6Ft										
	L MIL PM <02212 1012 >	Spread/Compact w/Sheepsft Roller 8"(20cm) Lift, 654 CY/HR	460.00 CY	COFCO	100.00	0.76 348	0.98 449	0.00 0	0.00 0	1.73 797	1.73
02212 2100	By Machine										
	L MIL PM <02212 2101 >	Shape Embankment/Slope w/Machine Up to 1 on 4 Slope	460.00 CY	COFCF	100.00	1.10 508	0.42 195	0.00 0	0.00 0	1.53 703	1.53
		Embankment	460.00 CY			856	644	0	0	1,499	3.26
110102_01 B. Cofferdam											
02212 1010	By Towed Roller Assume Following Cond. 6Ft										
	L MIL PM <02212 1012 >	Spread/Compact w/Sheepsft Roller 8"(20cm) Lift, 654 CY/HR	740.00 CY	COFCO	100.00	0.76 560	0.98 722	0.00 0	0.00 0	1.73 1,282	1.73
02212 2100	By Machine										
	L MIL PM <02212 2101 >	Shape Embankment/Slope w/Machine Up to 1 on 4 Slope	740.00 CY	COFCF	100.00	1.10 817	0.42 314	0.00 0	0.00 0	1.53 1,130	1.53
		Cofferdam	740.00 CY			1,376	1,036	0	0	2,412	3.26
110102_01 C. Excavation											
02225 2140	3 Cy Capacity										
	CIV PM <02225 2142 >	Exc & Load,3 CY Hyd Exc,Med Matl 147 CY/Hr (112M3)	260.00 CY	XXQHK	147.00	0.54 141	0.89 231	0.00 0	0.00 0	1.43 373	1.43
02226 1000	Excavation By Dozer Moved 150 Ft (45M) And										
	L MIL PM <02226 1002 >	Exc & Fill, D-6D Dozer w/S-Blade	260.00 CY	CODTE	147.00	0.25 64	0.30 77	0.00 0	0.00 0	0.54 141	0.54

1101. Levees			QUANTY	UOM	CREW ID	OUTPUT	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
		Excavation	260.00	CY			206	309	0	0	514	1.98
110102_01	D. Staff Gages											
	USR PM < >	Staff Gages	4.00	EA		0.00	0.00 0	0.00 0	0.00 0	1000.00 4,000	1000.00 4,000	1000.00
		Staff Gages	4.00	EA			0	0	0	4,000	4,000	1000.00
110102_01	E. Concrete Pad											
03110 1610	Slab On Grade Edge Forms (4 Uses)											
	MIL PM <03110 1612 >	Slab on Gr Edge Forms,7" to 12"H (18cm to 31cm)H, Based on 4 Uses	28.00	LF	ACARJ	54.38	2.06 58	0.04 1	0.68 19	0.00 0	2.79 78	2.79
03210 1000	Footings And Slabs											
	MIL PM <03210 1003 >	Gr 60 Resteel,Ftgs & Slabs,#3-#6	150.00	LB	SIWRC	626.00	0.20 30	0.00 0	0.20 30	0.00 0	0.40 60	0.40
03305 0000	Concrete Curing											
	MIL PM <03305 1004 >	Conc Curing, Sprayed Membrane Curing Compound	0.50	CSF	ULABB	11.88	5.16 3	0.03 0	2.95 1	0.00 0	8.14 4	8.14
03311 1160	Slab On Grade											
	MIL PM <03311 1166 >	Pour Slab on Gr,>= 6", Conc Pump >= (15 cm) Place 3000 PSI Conc	3.00	CY	ALABI	41.25	4.96 15	2.04 6	47.15 141	0.00 0	54.15 162	54.15
		Concrete Pad	3.00	CY			105	8	192	0	304	101.45
110102_01	F. 36" CMP											
02458 2000	Basic Cost Items											
M	MIL PM <02458 2008 >	36"(91cm) 16 Ga Corr Metal Pipe Galv Or Alum, Plain	136.00	LF	UOEHC	16.25	9.31 1,266	2.30 313	39.33 5,349	0.00 0	50.94 6,928	50.94
02458 2800	Galvanized Couplings For Corrugated Metal Pipe											
	CIV PM <02458 2806 >	36" Dia Galv Corr Metal Coupling (91cm) Diameter	7.00	EA	N/A	0.00	0.00 0	0.00 0	14.73 103	0.00 0	14.73 103	14.73
		36" CMP	136.00	LF			1,266	313	5,452	0	7,031	51.70

1101. Levees		QUANTY	UOM	CREW ID	OUTPUT	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
110102_01 G. 36" CMP End Sections											
02458 2600 Corrugated Metal Pipe End Sections											
M CIV PM <02458 2607 >	36"(91cm) Corr Metal Pipe Ends	4.00	EA	CODEK	2.50	60.50 242	5.12 20	450.00 1,800	0.00 0	515.62 2,062	515.62
	36" CMP End Sections	4.00	EA			242	20	1,800	0	2,062	515.62
110102_01 H. 72" Riser Pipe (2ea)											
USR PM < >	Fabrication of Riser Sections Galv Or Alum, Plain	2.00	EA		0.00	0.00 0	0.00 0	0.00 0	1500.00 3,000	1500.00 3,000	1500.00
02458 2000 Basic Cost Items											
M CIV PM <02458 2016 >	72"(183cm) 10Ga Corr Metal Pipe Galv Or Alum, Plain	20.00	LF	UOEHC	5.50	27.50 550	6.81 136	102.92 2,058	0.00 0	137.23 2,745	137.23
	72" Riser Pipe (2ea)	20.00	LF			550	136	2,058	3,000	5,745	287.23
110102_01 I. Sluice Gates & Appurtenances											
05651 1100 Heavy Duty Sluice Gates Self Contained											
CIV PM <05651 1104 >	36" Heavy Duty Sluice Gates Self Contained w/Crank Oper Gate	2.00	EA	SIWSE	0.10	1108.49 2,217	290.45 581	4888.00 9,776	0.00 0	6286.95 12,574	6286.95
	Sluice Gates & Appurtenances	2.00	EA			2,217	581	9,776	0	12,574	6286.95
110102_01 J. Stone, 6" minus											
02261 1000 Random - Filter Stone Dumped From Trucks -											
B USR PM <02261 1004 >	Stone, 6" minus Random, Dumped from Truck	460.00	TON	COETE	30.00	4.33 1,992	3.27 1,505	5.50 2,530	0.00 0	13.10 6,027	13.10
	Stone, 6" minus	460.00	TON			1,992	1,505	2,530	0	6,027	13.10
110102_01 K. Stone, 3" minus											
02261 1000 Random - Filter Stone Dumped From Trucks -											
B USR PM <02261 1004 >	Stone, 3" minus Random, Dumped from Truck	120.00	TON	COETE	30.00	4.33 520	3.27 393	5.50 660	0.00 0	13.10 1,572	13.10

1101. Levees		QUANTY	UOM	CREW ID	OUTPUT	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
	Stone, 3" minus	120.00	TON			520	393	660	0	1,572	13.10
110102_01 L. Geogrid											
02535 1010 Non-Woven Polypropylene Geotextiles For											
B CIV PM <02535 1017 >	Geogrid					0.99	0.06	3.00	0.00	4.04	
	Non-Woven Polypropylene	350.00	SY	ULABJ	75.00	345	20	1,050	0	1,415	4.04
	Geogrid	350.00	SY			345	20	1,050	0	1,415	4.04
110102_01 M. Geotextile											
02535 1010 Non-Woven Polypropylene Geotextiles For											
CIV PM <02535 1017 >	Geotextile Fabric, 120 Mil Thick					0.49	0.03	1.15	0.00	1.67	
	Non-Woven Polypropylene	310.00	SY	ULABJ	150.00	153	9	357	0	518	1.67
	Geotextile	310.00	SY			153	9	357	0	518	1.67
110102_01 N. Revetment, "C" Stone											
02261 1000 Random - Filter Stone Dumped From Trucks -											
B USR PM <02261 1004 >	Rip Rap, 25# to 400# Pieces					6.50	4.91	6.25	0.00	17.65	
	Random, Dumped from Truck	300.00	TON	COETE	20.00	1,949	1,472	1,875	0	5,296	17.65
	Revetment, "C" Stone	300.00	TON			1,949	1,472	1,875	0	5,296	17.65
	36" Gravity Drainage Structures	2.00	EA			11,776	6,445	25,750	7,000	50,970	25485
110102_02. 36" CMP's											
110102_02 A. Embankment											
02212 1010 By Towed Roller Assume Following Cond. 6Ft											
L MIL PM <02212 1012 >	Spread/Compact w/Sheepsft Roller 8"(20cm) Lift, 654 CY/HR	2900.00	CY	COFCO	100.00	0.76 2,194	0.98 2,829	0.00 0	0.00 0	1.73 5,023	1.73
02212 2100 By Machine											
L MIL PM <02212 2101 >	Shape Embankment/Slope w/Machine Up to 1 on 4 Slope	2900.00	CY	COFCF	100.00	1.10 3,200	0.42 1,230	0.00 0	0.00 0	1.53 4,430	1.53

1101. Levees		QUANTY UOM CREW ID	OUTPUT	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
	Embankment	2900.00 CY		5,394	4,059	0	0	9,453	3.26
110102_02 B. Excavation									
02225 2140 3 Cy Capacity									
CIV PM <02225 2142 >	Exc & Load,3 CY Hyd Exc,Med Matl 147 CY/Hr (112M3)	100.00 CY XXQHK	147.00	0.54 54	0.89 89	0.00 0	0.00 0	1.43 143	1.43
02226 1000 Excavation By Dozer Moved 150 Ft (45M) And									
L MIL PM <02226 1002 >	Exc & Fill, D-6D Dozer w/S-Blade	100.00 CY CODTE	147.00	0.25 25	0.30 30	0.00 0	0.00 0	0.54 54	0.54
	Excavation	100.00 CY		79	119	0	0	198	1.98
110102_02 C. 36" CMP									
02458 2000 Basic Cost Items									
M MIL PM <02458 2008 >	36"(91cm) 16 Ga Corr Metal Pipe Galv Or Alum, Plain	360.00 LF UOEHC	16.25	9.31 3,351	2.30 829	39.33 14,159	0.00 0	50.94 18,339	50.94
02458 2800 Galvanized Couplings For Corrugated Metal Pipe									
CIV PM <02458 2806 >	36" Dia Galv Corr Metal Coupling (91cm) Diameter	18.00 EA N/A	0.00	0.00 0	0.00 0	14.73 265	0.00 0	14.73 265	14.73
	36" CMP	360.00 LF		3,351	829	14,424	0	18,604	51.68
110102_02 D. 36" CMP End Sections									
02458 2600 Corrugated Metal Pipe End Sections									
M CIV PM <02458 2607 >	36"(91cm) Corr Metal Pipe Ends	10.00 EA CODEK	2.50	60.50 605	5.12 51	450.00 4,500	0.00 0	515.62 5,156	515.62
	36" CMP End Sections	10.00 EA		605	51	4,500	0	5,156	515.62
110102_02 E. Pipe Bedding Material									
02261 1000 Random - Filter Stone Dumped From Trucks -									
B USR PM <02261 1004 >	Stone, Pipe Bedding Material Random, Dumped from Truck	150.00 TON COETE	30.00	4.33 650	3.27 491	5.50 825	0.00 0	13.10 1,965	13.10

1101. Levees		QUANTY	UOM	CREW ID	OUTPUT	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
	Pipe Bedding Material	150.00	TON			650	491	825	0	1,965	13.10
	36" CMP's	5.00	EA			10,078	5,549	19,749	0	35,376	7075.21
	Drainage					21,855	11,993	45,499	7,000	86,347	
110103. Care & Diversion of Water											
110103_01. Dewatering - Gravity Drain. Str.											
It is assumed that these areas can be sumped. Use a portable pump with a operater for 12hrs/day for 5 days/wk during the construction duration. Duration = 1wk/structure + 1wk/gate = 4wk or 360hrs											
MIL PM <	> Outside Equip. Oper Light	360.00	HR	X-EQOPRLT	1.00	28.24 10,165	0.00 0	0.00 0	0.00 0	28.24 10,165	28.24
MIL PM <	> PUMP,TRASH,6"DIA,1300GPM/100'HD 6" DIA TRASH PUMP,1300GPM AT 100	360.00	HR	P50WC004	1.00	0.00 0	5.24 1,887	0.00 0	0.00 0	5.24 1,887	5.24
MIL PM <	> TRK,HWY,4X2,F350,1T,10000 GVW 4X2 1-TON PICK-UP,10000 GVW	360.00	HR	T50FO005	1.00	0.00 0	7.48 2,693	0.00 0	0.00 0	7.48 2,693	7.48
	Dewatering - Gravity Drain. Str.					10,165	4,579	0	0	14,745	
110103_02. Dewatering - 36" CMP's											
These areas may require a minimal amount of pumping. Consider a portable pump and operator to be on site during the duration of this operation. Approximate duration = 60 hrs											
MIL PM <	> Outside Equip. Oper Light	60.00	HR	X-EQOPRLT	1.00	28.24 1,694	0.00 0	0.00 0	0.00 0	28.24 1,694	28.24
MIL PM <	> PUMP,TRASH,6"DIA,1300GPM/100'HD 6" DIA TRASH PUMP,1300GPM AT 100	60.00	HR	P50WC004	1.00	0.00 0	5.24 314	0.00 0	0.00 0	5.24 314	5.24
MIL PM <	> TRK,HWY,4X2,F350,1T,10000 GVW 4X2 1-TON PICK-UP,10000 GVW	60.00	HR	T50FO005	1.00	0.00 0	7.48 449	0.00 0	0.00 0	7.48 449	7.48
	Dewatering - 36" CMP's					1,694	763	0	0	2,457	
	Care & Diversion of Water					11,860	5,343	0	0	17,202	

1101. Levees		QUANTY	UOM	CREW ID	OUTPUT	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
110199. Associated General Items											
110199_01. Culvert Removal (2ea)											
02112 8000	Sewer & Water Pipe Removal No Excavation, W/										
CIV PM <02112 8004 >	Demo Pipe to 36" Dia Sewer/Water Pipe, No Excavation	70.00	LF	XXPLA	18.75	8.11 568	1.74 122	0.00 0	0.00 0	9.85 690	9.85
02221 1700	By Hydr. Excav 2-1/2 ,3,4 & 5 Cy										
L CIV PM <02221 1707 >	Trench, 3 CY Hyd Excav, Med Soil 14'-20' Deep, 194 CY/Hr	200.00	CY	XXQHK	50.00	1.60 320	2.62 523	0.00 0	0.00 0	4.22 843	4.22
	Culvert Removal (2ea)	70.00	LF			888	645	0	0	1,533	21.90
	Associated General Items					888	645	0	0	1,533	
	Levees					34,602	17,981	45,499	7,000	105,082	
	Levees and Floodwalls					34,602	17,981	45,499	7,000	105,082	

1300. Pumping Plant			QUANTY	UOM	CREW ID	OUTPUT	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
13. Pumping Plant												
1300. Pumping Plant												
* The design of the pump station has changed since the draft DPR. Reference "PUMP STATION, PLAN AND SECTION"												
130003. Care and Diversion of Water												
130003_01. Wells												
	USR PM <	> Deep Well Installation	80.00	LF		0.00	0.00 0	0.00 0	0.00 0	200.00 16,000	200.00 16,000	200.00
	USR PM <	> Deep Well Removal	80.00	LF		0.00	0.00 0	0.00 0	0.00 0	50.00 4,000	50.00 4,000	50.00
	USR PM <	> Monitering Well Installation	20.00	LF		0.00	0.00 0	0.00 0	0.00 0	75.00 1,500	75.00 1,500	75.00
		Wells	4.00	EA			0	0	0	21,500	21,500	5375.00
130003_02. Pumps It is assumed that the pumps will be operated for 30 days for 12 hours/day to maintain an appropriate water elevation.												
	MIL PM <	> PUMP,WAT,CEN,DWAT,100GPM,40'HD 1100 GPM AT 40' HEAD	1440.00	HR	P60ML004	1.00	0.00 0	8.74 12,581	0.00 0	0.00 0	8.74 12,581	8.74
	MIL PM <	> Outside Equip. Op. Heavy	1440.00	HR	X-EQOPRHVY	1.00	30.28 43,610	0.00 0	0.00 0	0.00 0	30.28 43,610	30.28
		Pumps	4.00	EA			43,610	12,581	0	0	56,192	14048
		Care and Diversion of Water					43,610	12,581	0	21,500	77,692	
130010. Earthwork for Structures												
130010_01. Excavation												
02225 2140 3 Cy Capacity												
	CIV PM <02225 2142 >	Exc & Load,3 CY Hyd Exc,Med Matl 147 CY/Hr (112M3)	3840.00	CY	XXQHK	147.00	0.54 2,090	0.89 3,418	0.00 0	0.00 0	1.43 5,508	1.43
02226 1000 Excavation By Dozer Moved 150 Ft (45M) And												
	L MIL PM <02226 1002 >	Exc & Fill, D-6D Dozer W/S-Blade	3840.00	CY	CODTE	147.00	0.25 946	0.30 1,139	0.00 0	0.00 0	0.54 2,085	0.54

1300. Pumping Plant			QUANTY	UOM	CREW ID	OUTPUT	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
		Excavation	3840.00	CY			3,036	4,558	0	0	7,593	1.98
130010_02. Backfill												
02212 3100	Compaction Of Backfill For Structures And											
	MIL PM <02212 3103 >	Compact Bfill by Hand w/1 T Rol 6"(15cm) Lift	1100.00	CY	CLACD	49.13	0.84 927	0.14 155	0.00 0	0.00 0	0.98 1,081	0.98
	MIL PM <02212 3104 >	Compact Bfill, by Mach SP Roller 6"(15cm) Lift	2200.00	CY	COFCD	117.13	0.36 787	0.12 271	0.00 0	0.00 0	0.48 1,058	0.48
02221 5000	Backfill Trenches - W/O Compaction											
	MIL PM <02221 5003 >	Backfill Trench w/Sm FEnd Loader Without Compaction	3300.00	CY	CODLB	70.00	0.60 1,976	0.33 1,089	0.00 0	0.00 0	0.93 3,065	0.93
02231 2100	In Place Tests											
	MIL PM <02231 2101 >	Soil Density Test,Nuclear Method ASTM D2922-71	10.00	EA	USKCB	2.00	31.94 319	0.17 2	0.00 0	0.00 0	32.11 321	32.11
		Backfill	3300.00	CY			4,009	1,516	0	0	5,525	1.67
		Earthwork for Structures					7,045	6,074	0	0	13,118	
130011. Foundation Work												
130011_01. Geogrid												
02535 1010	Non-Woven Polypropylene Geotextiles For											
	B CIV PM <02535 1017 >	Geogrid Non-Woven Polypropylene	80.00	SY	ULABJ	75.00	0.99 79	0.06 5	3.00 240	0.00 0	4.04 323	4.04
		Geogrid	80.00	SY			79	5	240	0	323	4.04
130011_02. Geotextile												
02535 1010	Non-Woven Polypropylene Geotextiles For											
	CIV PM <02535 1017 >	Geotextile Fabric, 120 Mil Thick Non-Woven Polypropylene	80.00	SY	ULABJ	150.00	0.49 39	0.03 2	1.15 92	0.00 0	1.67 134	1.67
		Geotextile	80.00	SY			39	2	92	0	134	1.67

1300. Pumping Plant		QUANTY	UOM	CREW	ID	OUTPUT	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
130011_03. Stone, 3" minus												
02261 1000	Random - Filter Stone Dumped From Trucks -											
	B USR PM <02261 1004 > Stone, 3" minus						4.33	3.27	5.50	0.00	13.10	
	Random, Dumped from Truck	150.00	TON	COETE		30.00	650	491	825	0	1,965	13.10
	Stone, 3" minus	150.00	TON				650	491	825	0	1,965	13.10
	Foundation Work						768	497	1,157	0	2,422	
130018. Utilities												
130018_01. Electrical Supply												
	The local electrical utility company (UE) has been contacted in regard to the existing electrical supply at the job site. The utility company will supply the transformer and any power line extension at no charge to the contractor.											
	Electrical Supply						0	0	0	0	0	
	Utilities						0	0	0	0	0	
130075. Pumping Plant Superstructure												
130075_01. Concrete												
03110 1420	Over 8 Ft (2.4M) High Wall											
	MIL PM <03110 1422 > Wall Forms, Over 8'H Wall,2 Uses						3.14	0.07	1.05	0.00	4.26	
	(Below Gr) Plywd Forms,F&S w/Acc	6900.00	SF	ACARL		43.13	21,654	485	7,245	0	29,384	4.26
03110 1610	Slab On Grade Edge Forms (4 Uses)											
	MIL PM <03110 1612 > Slab on Gr Edge Forms,7" to 12"H						2.06	0.04	0.68	0.00	2.79	
	(18cm to 31cm)H, Based on 4 Uses	170.00	LF	ACARJ		54.38	351	7	116	0	474	2.79
03305 0000	Concrete Curing											
	MIL PM <03305 1004 > Conc Curing, Sprayed Membrane						5.16	0.03	2.95	0.00	8.14	
	Curing Compound	80.00	CSF	ULABB		11.88	413	3	236	0	651	8.14
03311 1160	Slab On Grade											
	MIL PM <03311 1166 > Pour Slab on Gr,>= 6", Conc Pump						4.96	2.04	47.15	0.00	54.15	
	>= (15 cm) Place 3000 PSI Conc	40.00	CY	ALABI		41.25	199	82	1,886	0	2,166	54.15
03311 1240	Walls											

1300. Pumping Plant			QUANTY	UOM	CREW ID	OUTPUT	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
	MIL PM <03311 1248 >	Pour Conc Walls,12"Tk, Conc Pump (31cm) 3000 PSI Conc	140.00	CY	ALABI	23.75	8.62 1,207	3.55 496	47.15 6,601	0.00 0	59.32 8,304	59.32
03311 4100 Floor Finishes												
	MIL PM <03311 4104 >	Concrete Floor Finishes, Broom	960.00	SF	ACMAC	84.38	0.38 366	0.02 17	0.00 0	0.00 0	0.40 383	0.40
03311 4200 Wall Finishes												
	MIL PM <03311 4208 >	Wall Finishes,Break Ties & Patch	6900.00	SF	ACMAA	67.50	0.54 3,751	0.00 18	0.05 345	0.00 0	0.60 4,114	0.60
		Concrete	180.00	CY			27,940	1,108	16,429	0	45,477	252.65
130075_02. Reinforcing Steel												
03210 1000 Footings And Slabs												
	MIL PM <03210 1003 >	Gr 60 Resteel,Ftgs & Slabs,#3-#6	4.00	TON	SIWRC	0.31	394.10 1,576	3.15 13	394.00 1,576	0.00 0	791.25 3,165	791.25
03210 2000 Basic Cost Items												
	MIL PM <03210 2003 >	Gr 60 Resteel,Bm,Clmn,Wall,#3-#6	8.15	TON	SIWRC	0.31	394.10 3,212	3.15 26	399.00 3,252	0.00 0	796.25 6,489	796.25
		Reinforcing Steel	24300	LB			4,788	38	4,828	0	9,654	0.40
		Pumping Plant Superstructure					32,728	1,147	21,256	0	55,131	
130076. Pumping Machinery & Appurtenance												
130076_01. 10,000 GPM Pump												
	USR PM < >	Pump and Moter	1.00	EA		0.00	0.00 0	0.00 0	0.00 0	55000.00 55,000	55000.00 55,000	55000
		10,000 GPM Pump	1.00	EA			0	0	0	55,000	55,000	55000
130076_02. Moter Control and Misc. Connect.												
	USR PM < >	Labor	32.00	MHR		0.00	27.28 873	0.00 0	0.00 0	0.00 0	27.28 873	27.28
	USR PM < >	Material	1.00	LS		0.00	0.00 0	0.00 0	12115.00 12,115	0.00 0	12115.00 12,115	12115

1300. Pumping Plant		QUANTY UOM CREW ID	OUTPUT	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
USR PM <	> Trenching	100.00 LF	0.00	0.00 0	0.00 0	0.00 0	3.00 300	3.00 300	3.00
	Moter Control and Misc. Connect.			873	0	12,115	300	13,288	
	Pumping Machinery & Appurtenance			873	0	12,115	55,300	68,288	
130077. Gates and Valves									
130077_01. Sluice Gate - 5' x 5'									
05651 1100 Heavy Duty Sluice Gates Self Contained									
CIV PM <05651 1108 >	60"x 60"Heavy Duty Sluice Gates Self Contained w/Crank Oper Gate	1.00 EA SIWSE	0.03	4433.98 4,434	1161.81 1,162	11126.00 11,126	0.00 0	16721.79 16,722	16722
	Sluice Gate - 5' x 5'	1.00 EA		4,434	1,162	11,126	0	16,722	16722
	Gates and Valves			4,434	1,162	11,126	0	16,722	
130099. Associated General Items									
130099_01. Concrete Pipe, 60"									
02452 1000 Reinforced Conc. Pipe Class 3 Without Gaskets									
M MIL PM <02452 1009 >	60"(152cm) Dia Cl III Conc Pipe Reinforced without Gaskets	60.00 LF UOEHC	5.13	29.51 1,771	7.30 438	66.75 4,005	0.00 0	103.57 6,214	103.57
	Concrete Pipe, 60"	60.00 LF		1,771	438	4,005	0	6,214	103.57
130099_02. Grating, Fiberglass									
06510 1100 Isophthalic Resin System For Moderately									
L CIV PM <06510 1103 >	1-1/2"Fib Grate,1-1/2"Mesh,Green For Mod Corrosive Environment	168.00 SF SIWSB	62.50	1.31 221	0.02 4	16.00 2,688	0.00 0	17.34 2,913	17.34
	Grating, Fiberglass	168.00 SF		221	4	2,688	0	2,913	17.34
130099_03. Handrail, Fiberglass									
06510 5100 Fiberglass Handrail									
L CIV PM <06510 5102 >	Fbgs Handrail,42"Hi,2" Dia Rails Pickets @ 5'OC,Misc Fib Castings	20.00 LF SIWSB	5.00	16.42 328	0.29 6	22.50 450	0.00 0	39.21 784	39.21

1300. Pumping Plant			QUANTY UOM CREW ID	OUTPUT	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
	Handrail, Fiberglass		20.00 LF		328	6	450	0	784	39.21
130099_04. Staff Gages										
USR PM <	> Staff Gages		2.00 EA	0.00	0.00 0	0.00 0	0.00 0	1000.00 2,000	1000.00 2,000	1000.00
	Staff Gages		2.00 EA		0	0	0	2,000	2,000	1000.00
130099_05. Revetment, "C" Stone										
02261 1000 Random - Filter Stone Dumped From Trucks -										
B USR PM <02261 1004 >	Rip Rap, 25# to 400# Pieces Random, Dumped from Truck		610.00 TON COETE	20.00	6.50 3,963	4.91 2,993	6.25 3,813	0.00 0	17.65 10,769	17.65
	Revetment, "C" Stone		610.00 TON		3,963	2,993	3,813	0	10,769	17.65
130099_06. Aluminum Stop Logs										
USR PM <	> Stop Logs W/Frame, 5'x 22' (Series 509)		1.00 EA	0.00	0.00 0	0.00 0	0.00 0	11300.00 11,300	11300.00 11,300	11300
USR PM <	> Stop Logs W/Frame, 9'x 16' (Series 510)		1.00 EA	0.00	0.00 0	0.00 0	0.00 0	12600.00 12,600	12600.00 12,600	12600
USR PM <	> Stop Logs W/Frame, 4'x 4' (Series 509)		2.00 EA	0.00	0.00 0	0.00 0	0.00 0	1900.00 3,800	1900.00 3,800	1900.00
USR PM <	> Adjustible Stop Log Lifter (Series 509)		1.00 EA	0.00	0.00 0	0.00 0	0.00 0	1400.00 1,400	1400.00 1,400	1400.00
USR PM <	> Stop Log Lifter (Series 510)		1.00 EA	0.00	0.00 0	0.00 0	0.00 0	1600.00 1,600	1600.00 1,600	1600.00
	Aluminum Stop Logs				0	0	0	30,700	30,700	
	Associated General Items				6,283	3,441	10,956	32,700	53,380	
	Pumping Plant				95,741	24,902	56,610	109,500	286,753	
	Pumping Plant				95,741	24,902	56,610	109,500	286,753	

3004. Environment-Regulatory Activity	QUANTY	UOM	CREW ID	OUTPUT	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
30. Planning, Engineering and Design										
Environment-Regulatory Activity					0	0	0	3,000	3,000	

3008. Plans and Specifications

SUMMARY

ED-G, Geotech	$ 40,000
ED-DC, Civil	25,000
ED-DS, Specs	8,000
ED-DA, Structures	23,000
ED-DM, Mechanical	16,000
ED-DM, Electrical	4,000
ED-HE, Hydraulics	5,000
ED-HG, Surveys	70,000
PD-AE, Environmental	5,000
PM-M, Project Management	20,000
TOTAL P & S	$ 216,000

Plans and Specifications					0	0	0	216,000	216,000	
Engineering During Construction					0	0	0	15,000	15,000	
Cost Engineering					0	0	0	12,000	12,000	
Const-Supply Contract Award Acty					0	0	0	8,000	8,000	
Miscellaneous Activities					0	0	0	5,000	5,000	
Planning, Engineering and Design					0	0	0	259,000	259,000	

3101. Area Office Operation	QUANTY	UOM	CREW ID	OUTPUT	LABOR	EQUIPMNT	MATERIAL	UNIT PRC	TOTAL COST	UNIT
31. Construction Management (S&I)										
Area Office Operation					0	0	0	81,200	81,200	
District Office Operation					0	0	0	40,200	40,200	
Contingencies					0	0	0	30,350	30,350	
Construction Management (S&I)					0	0	0	151,750	151,750	
CUIVRE ISLAND - DPR	1.00	EA			190,380	120,946	120,109	648,670	1,080,104	1080104

** CREW BACKUP **

SRC	ITEM ID	DESCRIPTION	NO.	UOM	RATE	**** LABOR **** HOURS	**** LABOR **** COST	**** EQUIP **** HOURS	**** EQUIP **** COST	TOTAL COST
	ACARJ	3 B-carpnter + Misc Power Tools			PROD = 100%				CREW HOURS =	4
MIL	B-CARPNTERF	Carpenters	1.00	HR	29.96	1.00	29.96			29.96
MIL	B-CARPNTERL	Carpenters	2.00	HR	28.96	2.00	57.92			57.92
MIL	B-LABORER L	Laborer (Semi-Skilled)	1.00	HR	24.30	1.00	24.30			24.30
MIL	XMIXX010 E	Misc. Power Tools	0.25	HR	5.90			0.25	1.48	1.48
MIL	XMIXX020 E	Small Tools	0.63	HR	1.45			0.63	0.91	0.91
	TOTAL					4.00	112.17	0.88	2.39	114.56
	ACARL	4 B-carpnter + Misc Power Tools			PROD = 100%				CREW HOURS =	160
MIL	B-CARPNTERL	Carpenters	2.00	HR	28.96	2.00	57.92			57.92
MIL	B-CARPNTERF	Carpenters	1.00	HR	29.96	1.00	29.96			29.96
MIL	B-CARPNTERA	Carpenters	1.00	HR	23.17	1.00	23.17			23.17
MIL	B-LABORER L	Laborer (Semi-Skilled)	1.00	HR	24.30	1.00	24.30			24.30
MIL	XMIXX010 E	Misc. Power Tools	0.32	HR	5.90			0.32	1.89	1.89
MIL	XMIXX020 E	Small Tools	0.79	HR	1.45			0.79	1.15	1.15
	TOTAL					5.00	135.34	1.11	3.03	138.37
	ACMAA	1 B-cemtfinr + Small Tools			PROD = 100%				CREW HOURS =	102
MIL	B-CEMTFINRF	Cement Finishers	0.25	HR	30.15	0.25	7.54			7.54
MIL	B-CEMTFINRL	Cement Finishers	1.00	HR	29.15	1.00	29.15			29.15
MIL	XMIXX020 E	Small Tools	0.12	HR	1.45			0.12	0.17	0.17
	TOTAL					1.25	36.69	0.12	0.17	36.87
	ACMAC	1 B-cemtfinr + Misc Power Tools			PROD = 100%				CREW HOURS =	11
MIL	B-CEMTFINRF	Cement Finishers	0.10	HR	30.15	0.10	3.02			3.02
MIL	B-CEMTFINRL	Cement Finishers	1.00	HR	29.15	1.00	29.15			29.15
MIL	XMIXX010 E	Misc. Power Tools	0.21	HR	5.90			0.21	1.24	1.24
MIL	XMIXX020 E	Small Tools	0.18	HR	1.45			0.18	0.26	0.26
	TOTAL					1.10	32.17	0.39	1.50	33.67
	ALABI	6 B-laborer + 2 Electric Concrete Vibrators			PROD = 100%				CREW HOURS =	7
MIL	B-CEMTFINRL	Cement Finishers	1.00	HR	29.15	1.00	29.15			29.15
MIL	B-LABORER F	Laborer (Semi-Skilled)	1.00	HR	25.30	1.00	25.30			25.30
MIL	B-LABORER L	Laborer (Semi-Skilled)	5.00	HR	24.30	5.00	121.49			121.49
MIL	B-EQOPRMEDL	Eq Oper, Medium	1.00	HR	28.76	1.00	28.76			28.76
MIL	C55SC005 E	CONC PUMP,117CY/HR,75'BOOM,TRK	1.00	HR	71.89			1.00	71.89	71.89
MIL	C65MS001 E	CONCRETE VIBRATOR, 2.5"	2.00	HR	0.86			2.00	1.72	1.72
MIL	XMIXX020 E	Small Tools	0.68	HR	1.45			0.68	0.99	0.99
MIL	A15XX009 E	AIR COMPR, 250 CFM, 100 PSI	1.00	HR	9.21			1.00	9.21	9.21
MIL	A20XX002 E	AIR HOSE, 1", 50', HARDROCK	1.00	HR	0.40			1.00	0.40	0.40
	TOTAL					8.00	204.71	5.68	84.21	288.92

** CREW BACKUP **

SRC	ITEM ID	DESCRIPTION	NO.	UOM	RATE	**** LABOR **** HOURS	**** LABOR **** COST	**** EQUIP **** HOURS	**** EQUIP **** COST	TOTAL COST
	CLACD	1 B-eqoprmed + 1 Handtamping Roller, 2000 Lbs			PROD = 100%				CREW HOURS =	22
MIL	B-LABORER L	Laborer (Semi-Skilled)	0.50	HR	24.30	0.50	12.15			12.15
MIL	B-EQOPRLT F	Eq Oper, Light	1.00	HR	29.24	1.00	29.24			29.24
MIL	XMIXX020 E	Small Tools	0.08	HR	1.45			0.08	0.12	0.12
MIL	C10WC011 E	ROLL,WK-BH,VIB,DBL,29.5"W X17.3	1.00	HR	6.79			1.00	6.79	6.79
	TOTAL					1.50	41.39	1.08	6.90	48.29
	CODEK	5 B-laborer + 1 Backhoe Loader, 55 Hp			PROD = 100%				CREW HOURS =	6
MIL	B-LABORER L	Laborer (Semi-Skilled)	4.00	HR	24.30	4.00	97.19			97.19
MIL	B-LABORER F	Laborer (Semi-Skilled)	1.00	HR	25.30	1.00	25.30			25.30
MIL	B-EQOPRMEDL	Eq Oper, Medium	1.00	HR	28.76	1.00	28.76			28.76
MIL	L50CS002 E	LDR,W/BH,WH,1.0CY FE BKT/24"DIP	1.00	HR	12.11			1.00	12.11	12.11
MIL	XMIXX020 E	Small Tools	0.48	HR	1.45			0.48	0.70	0.70
	TOTAL					6.00	151.26	1.48	12.80	164.06
	CODLB	1 B-eqoprmed + 1 Front End Ldr, 1-1/2 Cy, Cwlr			PROD = 100%				CREW HOURS =	47
MIL	B-LABORER L	Laborer (Semi-Skilled)	0.50	HR	24.30	0.50	12.15			12.15
MIL	B-EQOPRMEDF	Eq Oper, Medium	1.00	HR	29.76	1.00	29.76			29.76
MIL	L35CS002 E	LDR,FE,CRWLR, MODEL 855D, 1.5 C	1.00	HR	23.10			1.00	23.10	23.10
	TOTAL					1.50	41.91	1.00	23.10	65.01
	CODTE	1 B-eqoprmed + 1 Dozer, Cat D-6h, 165 Hp			PROD = 100%				CREW HOURS =	29
MIL	B-EQOPRMEDF	Eq Oper, Medium	0.25	HR	29.76	0.25	7.44			7.44
MIL	B-EQOPRMEDL	Eq Oper, Medium	1.00	HR	28.76	1.00	28.76			28.76
MIL	T10CA010 E	BLADE, ANGLE, HYDR, FOR D6	1.00	HR	4.04			1.00	4.04	4.04
MIL	T15CA010 E	DOZER,CWLR,D-6H,PS,(ADD BLADE)	1.00	HR	39.58			1.00	39.58	39.58
	TOTAL					1.25	36.20	2.00	43.62	79.82
	CODTK	1 B-eqoprmed + 1 Dozer, Cat D-8l, 335 Hp			PROD = 100%				CREW HOURS =	85
MIL	B-EQOPRCRNF	Eq Oper, Crane/Shovl	0.25	HR	31.28	0.25	7.82			7.82
MIL	B-EQOPRCRNL	Eq Oper, Crane/Shovl	1.00	HR	30.28	1.00	30.28			30.28
MIL	R40HY004 E	ROLL,VIB,TOWED,STL,PAD,58"D,60"	1.00	HR	10.02			1.00	10.02	10.02
MIL	T10CA017 E	BLADE, UNIVERSAL,HYDR,FOR D8	1.00	HR	7.36			1.00	7.36	7.36
MIL	T15CA015 E	DOZER,CWLR,CAT D-8L, (ADD BLADE	1.00	HR	78.77			1.00	78.77	78.77
	TOTAL					1.25	38.11	3.00	96.15	134.26
*	COETE	3 B-laborer + 1 Dump Truck, 12 Cy			PROD = 100%				CREW HOURS =	75
MIL	B-LABORER F	Laborer (Semi-Skilled)	1.00	HR	25.30	1.00	25.30			25.30
MIL	B-LABORER L	Laborer (Semi-Skilled)	2.00	HR	24.30	2.00	48.60			48.60
MIL	B-TRKDVRHVL	Truck Drivers, Heavy	1.00	HR	27.28	1.00	27.28			27.28
MIL	XMIXX020 E	Small Tools	0.52	HR	1.45			0.52	0.75	0.75
MIL	T40XX010 E	TRUCK OPT,REAR DUMP BODY, 12 CY	1.00	HR	2.69			1.00	2.69	2.69
MIL	T50GM016 E	TRK, HWY, 3 AXLE, 41000 GVW, 6X	1.00	HR	19.28			1.00	19.28	19.28
MIL	L35CA007 E	LDR,FE,CRWLR, 3.75 CY, 973	1.00	HR	75.41			1.00	75.41	75.41
MIL	B-EQOPRMEDL	Equip. Oper. Medium	1.00	HR	28.76	1.00	28.76			28.76
	TOTAL					5.00	129.94	3.52	98.13	228.08

** CREW BACKUP **

SRC	ITEM ID	DESCRIPTION	NO. UOM	RATE	**** LABOR **** HOURS	**** LABOR **** COST	**** EQUIP **** HOURS	**** EQUIP **** COST	TOTAL COST
	COETV	2 B-trkdvrhv + 2 Dump Truck, 12 Cy		PROD = 100%				CREW HOURS =	60
MIL	B-EQOPRMEDF	Eq Oper, Medium	1.00 HR	29.76	1.00	29.76			29.76
MIL	B-TRKDVRHVL	Truck Drivers, Heavy	2.00 HR	27.28	2.00	54.57			54.57
MIL	H25JD009 E	HYD EXCAV,CRWLR,1.5 CY BKT	1.00 HR	39.06			1.00	39.06	39.06
MIL	T40XX008 E	TRUCK OPT,REAR DUMP BODY, 8 CY	2.00 HR	2.63			2.00	5.25	5.25
MIL	T50GM016 E	TRK, HWY, 3 AXLE, 41000 GVW, 6X	2.00 HR	19.28			2.00	38.56	38.56
	TOTAL				3.00	84.33	5.00	82.87	167.21
	COFCD	1 B-eqoprmed + 1- 12 Ton 3 Wheel Steel Roller		PROD = 100%				CREW HOURS =	19
MIL	B-LABORER L	Laborer (Semi-Skilled)	0.50 HR	24.30	0.50	12.15			12.15
MIL	B-EQOPRMEDF	Eq Oper, Medium	1.00 HR	29.76	1.00	29.76			29.76
MIL	R30IG008 E	ROLLER,SM-DR,SELF,12T,3WHL,3"OV	1.00 HR	14.40			1.00	14.40	14.40
	TOTAL				1.50	41.91	1.00	14.40	56.31
	COFCF	2 B-eqoprmed + 1-Grader, Cat 12g, 135 Hp		PROD = 100%				CREW HOURS =	62
MIL	B-LABORER L	Laborer (Semi-Skilled)	1.00 HR	24.30	1.00	24.30			24.30
MIL	B-EQOPRMEDF	Eq Oper, Medium	0.50 HR	29.76	0.50	14.88			14.88
MIL	B-EQOPRMEDL	Eq Oper, Medium	2.00 HR	28.76	2.00	57.53			57.53
MIL	B-TRKDVRHVL	Truck Drivers, Heavy	0.50 HR	27.28	0.50	13.64			13.64
MIL	G15CA003 E	GRADER,MOTOR,CAT12-G, ARTIC	1.00 HR	29.49			1.00	29.49	29.49
MIL	XMIXX020 E	Small Tools	0.16 HR	1.45			0.16	0.23	0.23
MIL	R30IG003 E	ROLLER,STATIC,SELF,15T, 11 TIRE	1.00 HR	12.68			1.00	12.68	12.68
	TOTAL				4.00	110.35	2.16	42.41	152.76
	COFCO	1 B-eqoprmed + 1 Dozer, Cat D-7h, 215 Hp		PROD = 100%				CREW HOURS =	62
MIL	B-LABORER L	Laborer (Semi-Skilled)	0.50 HR	24.30	0.50	12.15			12.15
MIL	B-EQOPRMEDL	Eq Oper, Medium	1.00 HR	28.76	1.00	28.76			28.76
MIL	B-EQOPRMEDF	Eq Oper, Medium	0.25 HR	29.76	0.25	7.44			7.44
MIL	B-TRKDVRHVL	Truck Drivers, Heavy	1.00 HR	27.28	1.00	27.28			27.28
MIL	R40HY004 E	ROLL,VIB,TOWED,STL,PAD,58"D,60"	1.00 HR	10.02			1.00	10.02	10.02
MIL	T10CA013 E	BLADE, UNIVERSAL,HYDR,FOR D7	1.00 HR	5.70			1.00	5.70	5.70
MIL	T15CA013 E	DOZER,CWLR,D-7H,PS,(ADD BLADE)	1.00 HR	59.31			1.00	59.31	59.31
MIL	T40XX033 E	WATER TANK, 3000 GAL (ADD TRUCK	1.00 HR	3.23			1.00	3.23	3.23
MIL	T50GM016 E	TRK, HWY, 3 AXLE, 41000 GVW, 6X	1.00 HR	19.28			1.00	19.28	19.28
	TOTAL				2.75	75.64	5.00	97.55	173.18
	COMCA	5 B-laborer + 1 Front End Ldr, 3-3/4 Cy, Cwlr		PROD = 100%				CREW HOURS =	102
MIL	B-LABORER L	Laborer (Semi-Skilled)	4.00 HR	24.30	4.00	97.19			97.19
MIL	B-LABORER F	Laborer (Semi-Skilled)	1.00 HR	25.30	1.00	25.30			25.30
MIL	B-EQOPRMEDL	Eq Oper, Medium	1.00 HR	28.76	1.00	28.76			28.76
MIL	B20CI006 E	CHIPPER, 16" CAPACITY, TRLR-MTD	1.00 HR	6.67			1.00	6.67	6.67
MIL	L35CA007 E	LDR,FE,CRWLR, 3.75 CY, 973	1.00 HR	75.41			1.00	75.41	75.41
MIL	XMIXX020 E	Small Tools	0.74 HR	1.45			0.74	1.07	1.07
	TOTAL				6.00	151.26	2.74	83.15	234.41

** CREW BACKUP **

SRC	ITEM ID	DESCRIPTION	NO. UOM	RATE	**** LABOR **** HOURS	COST	**** EQUIP **** HOURS	COST	TOTAL COST
	SIWRC	3 B-rodman + Small Tools		PROD = 100%				CREW HOURS =	39
MIL	B-RODMAN F	Rodmen (reinforcing)	1.00 HR	31.59	1.00	31.59			31.59
MIL	B-RODMAN L	Rodmen (reinforcing)	3.00 HR	30.59	3.00	91.76			91.76
MIL	XMIXX020 E	Small Tools	0.68 HR	1.45			0.68	0.99	0.99
	TOTAL				4.00	123.35	0.68	0.99	124.34
*	SIWSB	2 B-strsteel + Small Tools		PROD = 100%				CREW HOURS =	7
MIL	B-STRSTEELL	Struct Stl Workers	2.00 HR	32.63	2.00	65.27			65.27
MIL	B-STRSTEELF	Struct Stl Workers	0.50 HR	33.63	0.50	16.82			16.82
MIL *	XMIXX020 E	Small Tools	1.00 HR	1.45			1.00	1.45	1.45
	TOTAL				2.50	82.09	1.00	1.45	83.54
	SIWSE	2 B-strsteel + 1- 12.5 Ton Crane, Hydraulic		PROD = 100%				CREW HOURS =	60
MIL	C75BD003 E	CRANE,HYD,SELF 14T ROUGH TERRAI	1.00 HR	27.60			1.00	27.60	27.60
MIL	XMIXX020 E	Small Tools	1.00 HR	1.45			1.00	1.45	1.45
MIL	B-STRSTEELF	Struct Stl Workers	0.50 HR	33.63	0.50	16.82			16.82
MIL	B-STRSTEELL	Struct Stl Workers	2.00 HR	32.63	2.00	65.27			65.27
MIL	B-EQOPRMEDL	Eq Oper, Medium	1.00 HR	28.76	1.00	28.76			28.76
	TOTAL				3.50	110.85	2.00	29.05	139.89
	ULABB	2 B-laborer + Small Tools		PROD = 100%				CREW HOURS =	7
MIL	B-LABORER L	Laborer (Semi-Skilled)	2.00 HR	24.30	2.00	48.60			48.60
MIL	B-LABORER F	Laborer (Semi-Skilled)	0.50 HR	25.30	0.50	12.65			12.65
MIL	XMIXX020 E	Small Tools	0.27 HR	1.45			0.27	0.39	0.39
	TOTAL				2.50	61.25	0.27	0.39	61.64
*	ULABE	1 B-laborer + Misc. Power Tools		PROD = 100%				CREW HOURS =	72
MIL *	B-LABORER L	Laborer (Semi-Skilled)	1.00 HR	24.30	1.00	24.30			24.30
MIL	B-LABORER F	Laborer (Semi-Skilled)	0.25 HR	25.30	0.25	6.32			6.32
MIL	XMIXX010 E	Misc. Power Tools	0.22 HR	5.90			0.22	1.30	1.30
MIL	XMIXX020 E	Small Tools	0.09 HR	1.45			0.09	0.13	0.13
	TOTAL				1.25	30.62	0.31	1.43	32.05
	ULABJ	3 B-laborer + 1-3/4 Ton Pickup Truck		PROD = 100%				CREW HOURS =	8
MIL	B-LABORER L	Laborer (Semi-Skilled)	2.00 HR	24.30	2.00	48.60			48.60
MIL	B-LABORER F	Laborer (Semi-Skilled)	1.00 HR	25.30	1.00	25.30			25.30
MIL	XMIXX020 E	Small Tools	0.25 HR	1.45			0.25	0.36	0.36
MIL	T50GM008 E	TRK,HWY,4X2 3500 PICKUP, 8600GV	0.40 HR	9.77			0.40	3.91	3.91
	TOTAL				3.00	73.90	0.65	4.27	78.17
	UOEDO	1 B-eqoprcrn + 1-165 Ton Crane, Dragline		PROD = 100%				CREW HOURS =	315
MIL	B-EQOPRCRNL	Eq Oper, Crane/Shovl	1.00 HR	30.28	1.00	30.28			30.28
MIL	B-EQOPROILL	Eq Oper, Oilers	1.00 HR	24.72	1.00	24.72			24.72
MIL	B35HE040 E	BUCKET, DRAGLINE, HVWT, 5.0 CY	1.00 HR	6.40			1.00	6.40	6.40
MIL	C85PH005 E	CRA,DRAG/CLAM,5CY,135'B,ADD BKT	1.00 HR	117.04			1.00	117.04	117.04

** CREW BACKUP **

SRC	ITEM ID	DESCRIPTION	NO.	UOM	RATE	**** LABOR **** HOURS	**** LABOR **** COST	**** EQUIP **** HOURS	**** EQUIP **** COST	TOTAL COST
MIL	XMIXX020 E	Small Tools	0.15	HR	1.45			0.15	0.22	0.22
	TOTAL					2.00	55.00	2.15	123.65	178.65
	UOEHC	5 B-laborer + 1- 22 Ton Crane, Hydraulic			PROD = 100%				CREW HOURS =	46
MIL	B-LABORER F	Laborer (Semi-Skilled)	1.00	HR	25.30	1.00	25.30			25.30
MIL	B-LABORER L	Laborer (Semi-Skilled)	4.00	HR	24.30	4.00	97.19			97.19
MIL	B-EQOPRMEDL	Eq Oper, Medium	1.00	HR	28.76	1.00	28.76			28.76
MIL	C75PH004 E	CRANE,HYD,SELF, 22 TON	1.00	HR	36.56			1.00	36.56	36.56
MIL	XMIXX020 E	Small Tools	0.60	HR	1.45			0.60	0.87	0.87
	TOTAL					6.00	151.26	1.60	37.43	188.69
	USKCB	2 B-skillwkr + Small Tools			PROD = 100%				CREW HOURS =	5
MIL	B-SKILLWKRL	Skilled Worker	2.00	HR	25.35	2.00	50.71			50.71
MIL	B-SKILLWKRF	Skilled Worker	0.50	HR	26.35	0.50	13.18			13.18
MIL	XMIXX020 E	Small Tools	0.23	HR	1.45			0.23	0.33	0.33
	TOTAL					2.50	63.88	0.23	0.33	64.22
	XXPLA	3 X-laborer + 1-14 Ton Crane, Hydraulic			PROD = 100%				CREW HOURS =	4
MIL	C75GV001 E	CRANE,HYD,SELF,ROUGH TER,4WD,18	1.00	HR	31.23			1.00	31.23	31.23
MIL	XMIXX020 E	Small Tools	1.00	HR	1.45			1.00	1.45	1.45
MIL	X-LABORER L	Outside Laborer	3.00	HR	25.00	3.00	75.00			75.00
MIL	X-EQOPRMEDL	Outside Equip. Op. Medium	1.00	HR	28.76	1.00	28.76			28.76
MIL	X-PLUMBER F	Outside Plumber	0.50	HR	32.87	0.50	16.44			16.44
MIL	X-PLUMBER L	Outside Plumber	1.00	HR	31.87	1.00	31.87			31.87
	TOTAL					5.50	152.07	2.00	32.68	184.75
	XXQHK	1 X-eqoprhvy + 1 Hydr. Excavator, 3 Cy, Cwlr			PROD = 100%				CREW HOURS =	33
MIL	H25KO007 E	HYD EXCAV,CRWLR,3 CY BKT	1.00	HR	130.71			1.00	130.71	130.71
MIL	XMIXX020 E	Small Tools	0.11	HR	1.45			0.11	0.16	0.16
MIL	X-LABORER L	Outside Laborer	1.00	HR	25.00	1.00	25.00			25.00
MIL	X-EQOPRHVYL	Outside Equip. Op. Heavy	1.00	HR	30.28	1.00	30.28			30.28
MIL	X-EQOPROILL	Outside Oiler	1.00	HR	24.72	1.00	24.72			24.72
	TOTAL					3.00	80.00	1.11	130.86	210.87

ITEM ID	DESCRIPTION			
06. Fish and Wildlife Facilities				
09. Channels and Canals				
CODTK	1 B-eqoprmed + 1 Dozer, Cat D-8l, 335 Hp	PROD = 100%	CREW HOURS =	85
COETV	2 B-trkdvrhv + 2 Dump Truck, 12 Cy	PROD = 100%	CREW HOURS =	60
COFCF	2 B-eqoprmed + 1 Grader, Cat 12g, 135 Hp	PROD = 100%	CREW HOURS =	21
COFCO	1 B-eqoprmed + 1 Dozer, Cat D-7h, 215 Hp	PROD = 100%	CREW HOURS =	21
COMCA	5 B-laborer + 1 Front End Ldr, 3-3/4 Cy, Cwlr	PROD = 100%	CREW HOURS =	102
* ULABE	1 B-laborer + Misc. Power Tools	PROD = 100%	CREW HOURS =	72
UOEDO	1 B-eqoprcrn + 1-165 Ton Crane, Dragline	PROD = 100%	CREW HOURS =	315
11. Levees and Floodwalls				
ACARJ	3 B-carpnter + Misc Power Tools	PROD = 100%	CREW HOURS =	1
ALABI	6 B-laborer + 2 Electric Concrete Vibrators	PROD = 100%	CREW HOURS =	0
CODEK	5 B-laborer + 1 Backhoe Loader, 55 Hp	PROD = 100%	CREW HOURS =	6
CODTE	1 B-eqoprmed + 1 Dozer, Cat D-6h, 165 Hp	PROD = 100%	CREW HOURS =	2
* COETE	3 B-laborer + 1 Dump Truck, 12 Cy	PROD = 100%	CREW HOURS =	39
COFCF	2 B-eqoprmed + 1 Grader, Cat 12g, 135 Hp	PROD = 100%	CREW HOURS =	41
COFCO	1 B-eqoprmed + 1 Dozer, Cat D-7h, 215 Hp	PROD = 100%	CREW HOURS =	41
SIWRC	3 B-rodman + Small Tools	PROD = 100%	CREW HOURS =	0
SIWSE	2 B-strsteel + 1- 12.5 Ton Crane, Hydraulic	PROD = 100%	CREW HOURS =	20
ULABB	2 B-laborer + Small Tools	PROD = 100%	CREW HOURS =	0
ULABJ	3 B-laborer + 1-3/4 Ton Pickup Truck	PROD = 100%	CREW HOURS =	7
UOEHC	5 B-laborer + 1- 22 Ton Crane, Hydraulic	PROD = 100%	CREW HOURS =	34
XXPLA	3 X-laborer + 1-14 Ton Crane, Hydraulic	PROD = 100%	CREW HOURS =	4
XXQHK	1 X-eqoprhvy + 1 Hydr. Excavator, 3 Cy, Cwlr	PROD = 100%	CREW HOURS =	6
13. Pumping Plant				
ACARJ	3 B-carpnter + Misc Power Tools	PROD = 100%	CREW HOURS =	3
ACARL	4 B-carpnter + Misc Power Tools	PROD = 100%	CREW HOURS =	160
ACMAA	1 B-cemtfinr + Small Tools	PROD = 100%	CREW HOURS =	102
ACMAC	1 B-cemtfinr + Misc Power Tools	PROD = 100%	CREW HOURS =	11
ALABI	6 B-laborer + 2 Electric Concrete Vibrators	PROD = 100%	CREW HOURS =	7
CLACD	1 B-eqoprmed + 1 Handtamping Roller, 2000 Lbs	PROD = 100%	CREW HOURS =	22
CODLB	1 B-eqoprmed + 1 Front End Ldr, 1-1/2 Cy, Cwlr	PROD = 100%	CREW HOURS =	47
CODTE	1 B-eqoprmed + 1 Dozer, Cat D-6h, 165 Hp	PROD = 100%	CREW HOURS =	26
* COETE	3 B-laborer + 1 Dump Truck, 12 Cy	PROD = 100%	CREW HOURS =	36
COFCD	1 B-eqoprmed + 1- 12 Ton 3 Wheel Steel Roller	PROD = 100%	CREW HOURS =	19
SIWRC	3 B-rodman + Small Tools	PROD = 100%	CREW HOURS =	39
* SIWSB	2 B-strsteel + Small Tools	PROD = 100%	CREW HOURS =	7
SIWSE	2 B-strsteel + 1- 12.5 Ton Crane, Hydraulic	PROD = 100%	CREW HOURS =	40
ULABB	2 B-laborer + Small Tools	PROD = 100%	CREW HOURS =	7
ULABJ	3 B-laborer + 1-3/4 Ton Pickup Truck	PROD = 100%	CREW HOURS =	2
UOEHC	5 B-laborer + 1- 22 Ton Crane, Hydraulic	PROD = 100%	CREW HOURS =	12
USKCB	2 B-skillwkr + Small Tools	PROD = 100%	CREW HOURS =	5
XXQHK	1 X-eqoprhvy + 1 Hydr. Excavator, 3 Cy, Cwlr	PROD = 100%	CREW HOURS =	26
30. Planning, Engineering and Design				
31. Construction Management (S&I)				

SRC LABOR ID	DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	RATE	UOM	UPDATE	**** TOTAL **** DEFAULT	HOURS
MIL B-CARPNTER	Carpenters	21.21	0.0%	18.0%	3.93	0.00	28.96	HR	04/29/94	0.00	651
MIL B-CEMTFINR	Cement Finishers	19.20	0.0%	17.0%	6.69	0.00	29.15	HR	04/29/94	0.00	147
MIL B-EQOPRCRN	Equip. Oper. Heavy	19.97	0.0%	17.0%	6.92	0.00	30.28	HR	04/29/94	0.00	421
MIL B-EQOPRLT	Equip. Oper. Light	18.22	0.0%	17.0%	6.92	0.00	28.24	HR	04/29/94	0.00	22
MIL B-EQOPRMED	Equip. Oper. Medium	18.67	0.0%	17.0%	6.92	0.00	28.76	HR	04/29/94	0.00	690
MIL B-EQOPROIL	Oiler	15.21	0.0%	17.0%	6.92	0.00	24.72	HR	04/29/94	0.00	315
MIL B-LABORER	Laborer (Semi Skilled)	17.05	0.0%	17.0%	4.35	0.00	24.30	HR	04/29/94	0.00	1466
MIL B-ROOMAN	Rodman (Reinf.)	20.46	0.0%	17.0%	6.65	0.00	30.59	HR	04/29/94	0.00	156
MIL B-SKILLWKR	Skilled Worker	17.65	0.0%	19.0%	4.35	0.00	25.35	HR	04/29/94	24.94	13
MIL B-STRSTEEL	Structural Steel Workers	20.46	0.0%	27.0%	6.65	0.00	32.63	HR	04/29/94	0.00	167
MIL B-TRKDVRHV	Truck Driver Heavy	23.32	0.0%	17.0%	0.00	0.00	27.28	HR	04/29/94	0.00	288
MIL X-EQOPRHVY	Outside Equip. Op. Heavy	19.97	0.0%	17.0%	6.92	0.00	30.28	HR	04/29/94	24.33	1997
MIL X-EQOPRLT	Outside Equip. Oper Light	18.22	0.0%	17.0%	6.92	0.00	28.24	HR	04/29/94	23.21	980
MIL X-EQOPRMED	Outside Equip. Op. Medium	18.67	0.0%	17.0%	6.92	0.00	28.76	HR	04/29/94	24.03	4
MIL X-EQOPROIL	Outside Oiler	15.21	0.0%	17.0%	6.92	0.00	24.72	HR	04/29/94	18.51	325
MIL X-LABORER	Outside Laborer (Semi-Skilled)	17.65	0.0%	17.0%	4.35	0.00	25.00	HR	04/29/94	21.01	688
MIL X-PLUMBER	Outside Plumber/Pipefitter	21.36	0.0%	14.0%	7.52	0.00	31.87	HR	04/29/94	27.57	6
MIL X-TRKDVRHV	Outside Truck Dr. Heavy	23.32	0.0%	17.0%	0.00	0.00	27.28	HR	04/29/94	22.09	232

SRC	LABOR ID	DESCRIPTION	BASE	OVERTM	TXS/INS	FRNG	TRVL	RATE	UOM	UPDATE	**** TOTAL **** DEFAULT	HOURS
06. Fish and Wildlife Facilities												
MIL	X-EQOPRHVY	Outside Equip. Op. Heavy	19.97	0.0%	17.0%	6.92	0.00	30.28	HR	04/29/94	24.33	396
MIL	X-EQOPRLT	Outside Equip. Oper Light	18.22	0.0%	17.0%	6.92	0.00	28.24	HR	04/29/94	23.21	560
MIL	X-EQOPROIL	Outside Oiler	15.21	0.0%	17.0%	6.92	0.00	24.72	HR	04/29/94	18.51	164
MIL	X-LABORER	Outside Laborer (Semi-Skilled)	17.65	0.0%	17.0%	4.35	0.00	25.00	HR	04/29/94	21.01	412
MIL	X-TRKDVRHV	Outside Truck Dr. Heavy	23.32	0.0%	17.0%	0.00	0.00	27.28	HR	04/29/94	22.09	232
09. Channels and Canals												
MIL	B-EQOPRCRN	Equip. Oper. Heavy	19.97	0.0%	17.0%	6.92	0.00	30.28	HR	04/29/94	0.00	421
MIL	B-EQOPRMED	Equip. Oper. Medium	18.67	0.0%	17.0%	6.92	0.00	28.76	HR	04/29/94	0.00	241
MIL	B-EQOPROIL	Oiler	15.21	0.0%	17.0%	6.92	0.00	24.72	HR	04/29/94	0.00	315
MIL	B-LABORER	Laborer (Semi Skilled)	17.05	0.0%	17.0%	4.35	0.00	24.30	HR	04/29/94	0.00	632
MIL	B-TRKDVRHV	Truck Driver Heavy	23.32	0.0%	17.0%	0.00	0.00	27.28	HR	04/29/94	0.00	152
MIL	X-EQOPRHVY	Outside Equip. Op. Heavy	19.97	0.0%	17.0%	6.92	0.00	30.28	HR	04/29/94	24.33	128
MIL	X-EQOPROIL	Outside Oiler	15.21	0.0%	17.0%	6.92	0.00	24.72	HR	04/29/94	18.51	128
MIL	X-LABORER	Outside Laborer (Semi-Skilled)	17.65	0.0%	17.0%	4.35	0.00	25.00	HR	04/29/94	21.01	232
11. Levees and Floodwalls												
MIL	B-CARPNTER	Carpenters	21.21	0.0%	18.0%	3.93	0.00	28.96	HR	04/29/94	0.00	2
MIL	B-CEMTFINR	Cement Finishers	19.20	0.0%	17.0%	6.69	0.00	29.15	HR	04/29/94	0.00	0
MIL	B-EQOPRMED	Equip. Oper. Medium	18.67	0.0%	17.0%	6.92	0.00	28.76	HR	04/29/94	0.00	256
MIL	B-LABORER	Laborer (Semi Skilled)	17.05	0.0%	17.0%	4.35	0.00	24.30	HR	04/29/94	0.00	400
MIL	B-RODMAN	Rodman (Reinf.)	20.46	0.0%	17.0%	6.65	0.00	30.59	HR	04/29/94	0.00	1
MIL	B-STRSTEEL	Structural Steel Workers	20.46	0.0%	27.0%	6.65	0.00	32.63	HR	04/29/94	0.00	50
MIL	B-TRKDVRHV	Truck Driver Heavy	23.32	0.0%	17.0%	0.00	0.00	27.28	HR	04/29/94	0.00	101
MIL	X-EQOPRHVY	Outside Equip. Op. Heavy	19.97	0.0%	17.0%	6.92	0.00	30.28	HR	04/29/94	24.33	6
MIL	X-EQOPRLT	Outside Equip. Oper Light	18.22	0.0%	17.0%	6.92	0.00	28.24	HR	04/29/94	23.21	420
MIL	X-EQOPRMED	Outside Equip. Op. Medium	18.67	0.0%	17.0%	6.92	0.00	28.76	HR	04/29/94	24.03	4
MIL	X-EQOPROIL	Outside Oiler	15.21	0.0%	17.0%	6.92	0.00	24.72	HR	04/29/94	18.51	6
MIL	X-LABORER	Outside Laborer (Semi-Skilled)	17.65	0.0%	17.0%	4.35	0.00	25.00	HR	04/29/94	21.01	18
MIL	X-PLUMBER	Outside Plumber/Pipefitter	21.36	0.0%	14.0%	7.52	0.00	31.87	HR	04/29/94	27.57	6
13. Pumping Plant												
MIL	B-CARPNTER	Carpenters	21.21	0.0%	18.0%	3.93	0.00	28.96	HR	04/29/94	0.00	649
MIL	B-CEMTFINR	Cement Finishers	19.20	0.0%	17.0%	6.69	0.00	29.15	HR	04/29/94	0.00	147
MIL	B-EQOPRLT	Equip. Oper. Light	18.22	0.0%	17.0%	6.92	0.00	28.24	HR	04/29/94	0.00	22
MIL	B-EQOPRMED	Equip. Oper. Medium	18.67	0.0%	17.0%	6.92	0.00	28.76	HR	04/29/94	0.00	193
MIL	B-LABORER	Laborer (Semi Skilled)	17.05	0.0%	17.0%	4.35	0.00	24.30	HR	04/29/94	0.00	435
MIL	B-RODMAN	Rodman (Reinf.)	20.46	0.0%	17.0%	6.65	0.00	30.59	HR	04/29/94	0.00	155
MIL	B-SKILLWKR	Skilled Worker	17.65	0.0%	19.0%	4.35	0.00	25.35	HR	04/29/94	24.94	13
MIL	B-STRSTEEL	Structural Steel Workers	20.46	0.0%	27.0%	6.65	0.00	32.63	HR	04/29/94	0.00	117
MIL	B-TRKDVRHV	Truck Driver Heavy	23.32	0.0%	17.0%	0.00	0.00	27.28	HR	04/29/94	0.00	36
MIL	X-EQOPRHVY	Outside Equip. Op. Heavy	19.97	0.0%	17.0%	6.92	0.00	30.28	HR	04/29/94	24.33	1466
MIL	X-EQOPROIL	Outside Oiler	15.21	0.0%	17.0%	6.92	0.00	24.72	HR	04/29/94	18.51	26
MIL	X-LABORER	Outside Laborer (Semi-Skilled)	17.65	0.0%	17.0%	4.35	0.00	25.00	HR	04/29/94	21.01	26
30. Planning, Engineering and Design												
31. Construction Management (S&I)												

** EQUIPMENT BACKUP **

SRC	EQUIP ID	DESCRIPTION	DEPR	CAPT	FUEL	FOG	EQ REP	TR WR	TR REP	TOTAL UOM	** TOTAL ** HOURS
UPB	A15XX009	AIR COMPR, 250 CFM, 100 PSI	2.20	0.66	3.18	0.8	2.24	0.04	0.01	9.21 HR	7
UPB	A20XX002	AIR HOSE, 1.00", 100',HARDROCK	0.14	0.01			0.24			0.40 HR	7
UPB	B20CI006	B-CHIPPER, 16" DIA LOG, TRLR-MTD	1.40	0.31	2.54	0.7	1.66	0.03	0.01	6.67 HR	102
MIL	B25ES011	BKT,CLAM, 4.00CY,GEN PURP/SQNOSE	3.34	0.82			2.97			7.14 HR	72
UPB	B35HE040	BUCKET,DRAGLINE, 5.0CY, HVWT	2.99	0.74			2.66			6.40 HR	315
UPB	C10WC011	ROLLER,WK-BH,VIB,DBL,0.8T,29.5"W	2.32	0.34	0.37	0.0	3.66			6.79 HR	22
UPB	C55SC005	CONC PUMP,117CY/HR,75'BM,W/TRUCK	22.14	4.54	13.24	3.6	27.43	0.75	0.11	71.89 HR	7
MIL	C65MS001	CONC VIBRATOR, 2.5"D, AIR	0.19	0.02		0.0	0.59			0.86 HR	14
MIL	C75BD003	CRANE,HYD,S/P,RT,4WD,14T/49'BOOM	5.91	2.03	9.76	3.0	6.12	0.60	0.09	27.60 HR	192
MIL	C75GV001	CRANE,HYD,S/P,RT,4WD,18T/70'BOOM	10.22	3.54	4.10	1.2	10.61	1.34	0.20	31.23 HR	4
UPB	C75PH004	CRANE,HYD,S/P,RT,4WD,22T/72'BOOM	11.94	4.12	5.08	1.5	12.38	1.34	0.20	36.56 HR	46
MIL	C85MA001	CRANE,DRAG/CLAM, 3.5CY /100'BOOM	31.36	11.85	7.47	1.6	38.43			90.73 HR	72
UPB	C85PH005	CRANE,DRAG/CLAM, 5.0CY /135'BOOM	41.79	15.79	6.77	1.4	51.22			117.04 HR	315
UPB	G15CA003	GRADER,MOTOR, ARTIC, CAT 12-G	9.87	3.55	4.14	1.3	9.79	0.65	0.10	29.49 HR	66
MIL	H25KO007	HYD EXCAV, CRWLR, 3.00 CY BKT	43.28	12.54	12.89	2.8	59.18			130.71 HR	37
UPB	L35CA007	LDR,FE, CRWLR, 3.75 CY	21.31	5.75	7.62	2.8	37.87			75.41 HR	181
MIL	L35CS002	LDR,FE, CRWLR, 1.50 CY	6.24	1.68	2.97	1.1	11.09			23.10 HR	47
UPB	L50CS002	LDR,BH,WH, 1.00CY FE BKT, 24"DIP	3.61	1.12	2.11	0.6	4.03	0.50	0.07	12.11 HR	6
MIL	P50WC004	PUMP,TRASH, 6"D,1300GPM/100'HD	1.20	0.29	1.63	0.6	1.51			5.24 HR	420
MIL	P60ML004	PUMP,CENTRF,DW,6"D, 100GPM/40'HD	1.96	0.47	2.79	1.0	2.47			8.74 HR	1440
UPB	R30IG008	ROLLER,STATIC,3WHL,S/P, 12T,84"W	4.90	1.32	2.54	0.6	5.03			14.40 HR	19
UPB	T10CA010	BLADE, ANGLE, HYDR (FOR D6	1.71	0.46		0.0	1.80			4.04 HR	33
UPB	T10CA013	BLADE, UNIVERSAL, HYDR (FOR D7	2.42	0.65		0.0	2.55			5.70 HR	62
UPB	T10CA017	BLADE, UNIVERSAL, HYDR (FOR D8	3.11	0.84		0.1	3.28			7.36 HR	89
UPB	T15CA010	DOZER,CWLR, D-6H,PS (ADD BLADE)	10.55	3.13	5.98	2.1	17.78			39.58 HR	33
UPB	T15CA013	DOZER,CWLR, D-7H,PS (ADD BLADE)	16.34	4.85	7.80	2.7	27.54			59.31 HR	62
UPB	T15CA015	DOZER,CWLR, D-8L,PS (ADD BLADE)	24.46	6.60	12.15	3.3	32.19			78.77 HR	89
MIL	T40XX001	HYDR CRANE 5.3T,W/ 48'BOOM	3.19	0.71		0.2	3.36			7.46 HR	128
UPB	T40XX008	REAR DUMP BODY, 8 CY,(30,000 GVW	1.18	0.26		0.0	1.09			2.63 HR	120
UPB	T40XX010	REAR DUMP BODY,12 CY,(36,000 GVW	1.22	0.27		0.0	1.12			2.69 HR	91
UPB	T40XX018	FLATBED, 8'x 20.0' (ADD TRK)	0.39	0.09			0.31			0.78 HR	128
UPB	T40XX033	WATER TANK, 3000 GAL (ADD TRK	1.61	0.36			1.27			3.23 HR	66
MIL	T45XX017	TRLR,LOWBOY, 60T, 3 AXLE(ADD TRK	2.68	1.04		0.1	2.12	1.30	0.19	7.47 HR	84
MIL	T50FO005	TRK,HWY,10,000GVW,4X2, 1T-PICKUP	1.53	0.35	2.83	0.7	1.53	0.40	0.06	7.48 HR	420
MIL	T50FO006	TRK,HWY, 21,000 GVW, 4X2, 2 AXLE	2.40	0.62	7.62	2.2	2.23	0.51	0.08	15.72 HR	128
UPB	T50FO020	TRK,HWY, 64,000 GVW, 6X4, 3 AXLE	10.53	2.43	13.33	3.6	9.11	1.58	0.23	40.91 HR	84
MIL	T50GM008	TRK,HWY, 8,600GVW,4X2, 1T-PICKUP	1.37	0.31	5.06	1.4	1.37	0.23	0.03	9.77 HR	3
MIL	T50GM015	TRK,HWY, 41,000 GVW, 6X4, 3 AXLE	3.78	0.92	13.42	4.2	3.31	1.29	0.19	27.17 HR	20
UPB	T50GM016	TRK,HWY, 41,000 GVW, 6X4, 3 AXLE	4.29	1.03	6.83	1.8	3.75	1.29	0.19	19.28 HR	257
UPB	XMIXX010	MISC. POWER TOOLS	2.00	0.70	0.55	0.2	2.40			5.90 HR	154
UPB	XMIXX020	SMALL TOOLS	0.46	0.20	0.15	0.0	0.58			1.45 HR	547
UPB	XX0XX002	TUG BOAT, 500 TO 800 HP	18.61	6.64	5.25	2.2	22.94			55.72 HR	48
UPB	XX0XX004	TUG BOAT, 150 TO 400 HP	7.50	2.68	2.11	0.9	9.24			22.45 HR	220

SRC	EQUIP ID	DESCRIPTION	DEPR	CAPT	FUEL	FOG	EQ REP	TR WR	TR REP	TOTAL UOM	** TOTAL ** HOURS
06. Fish and Wildlife Facilities											
MIL	B25ES011	BKT,CLAM, 4.00CY,GEN PURP/SQNOSE	3.34	0.82			2.97			7.14 HR	16
MIL	C75BD003	CRANE,HYD,S/P,RT,4WD,14T/49'BOOM	5.91	2.03	9.76	3.0	6.12	0.60	0.09	27.60 HR	132
MIL	C85MA001	CRANE,DRAG/CLAM, 3.5CY /100'BOOM	31.36	11.85	7.47	1.6	38.43			90.73 HR	16
UPB	G15CA003	GRADER,MOTOR, ARTIC, CAT 12-G	9.87	3.55	4.14	1.3	9.79	0.65	0.10	29.49 HR	4
MIL	H25KO007	HYD EXCAV, CRWLR, 3.00 CY BKT	43.28	12.54	12.89	2.8	59.18			130.71 HR	4
UPB	L35CA007	LDR,FE, CRWLR, 3.75 CY	21.31	5.75	7.62	2.8	37.87			75.41 HR	4
UPB	T10CA010	BLADE, ANGLE, HYDR (FOR D6	1.71	0.46		0.0	1.80			4.04 HR	4
UPB	T10CA017	BLADE, UNIVERSAL, HYDR (FOR D8	3.11	0.84		0.1	3.28			7.36 HR	4
UPB	T15CA010	DOZER,CWLR, D-6H,PS (ADD BLADE)	10.55	3.13	5.98	2.1	17.78			39.58 HR	4
UPB	T15CA015	DOZER,CWLR, D-8L,PS (ADD BLADE)	24.46	6.60	12.15	3.3	32.19			78.77 HR	4
MIL	T40XX001	HYDR CRANE 5.3T,W/ 48'BOOM	3.19	0.71		0.2	3.36			7.46 HR	128
UPB	T40XX010	REAR DUMP BODY,12 CY,(36,000 GVW	1.22	0.27		0.0	1.12			2.69 HR	16
UPB	T40XX018	FLATBED, 8'x 20.0' (ADD TRK)	0.39	0.09			0.31			0.78 HR	128
UPB	T40XX033	WATER TANK, 3000 GAL (ADD TRK	1.61	0.36			1.27			3.23 HR	4
MIL	T45XX017	TRLR,LOWBOY, 60T, 3 AXLE(ADD TRK	2.68	1.04		0.1	2.12	1.30	0.19	7.47 HR	84
MIL	T50FO006	TRK,HWY, 21,000 GVW, 4X2, 2 AXLE	2.40	0.62	7.62	2.2	2.23	0.51	0.08	15.72 HR	128
UPB	T50FO020	TRK,HWY, 64,000 GVW, 6X4, 3 AXLE	10.53	2.43	13.33	3.6	9.11	1.58	0.23	40.91 HR	84
MIL	T50GM015	TRK,HWY, 41,000 GVW, 6X4, 3 AXLE	3.78	0.92	13.42	4.2	3.31	1.29	0.19	27.17 HR	20
UPB	XMIXX010	MISC. POWER TOOLS	2.00	0.70	0.55	0.2	2.40			5.90 HR	84
UPB	XMIXX020	SMALL TOOLS	0.46	0.20	0.15	0.0	0.58			1.45 HR	84
UPB	XX0XX004	TUG BOAT, 150 TO 400 HP	7.50	2.68	2.11	0.9	9.24			22.45 HR	164
09. Channels and Canals											
UPB	B20CI006	B-CHIPPER, 16" DIA LOG, TRLR-MTD	1.40	0.31	2.54	0.7	1.66	0.03	0.01	6.67 HR	102
MIL	B25ES011	BKT,CLAM, 4.00CY,GEN PURP/SQNOSE	3.34	0.82			2.97			7.14 HR	56
UPB	B35HE040	BUCKET,DRAGLINE, 5.0CY, HVWT	2.99	0.74			2.66			6.40 HR	315
MIL	C85MA001	CRANE,DRAG/CLAM, 3.5CY /100'BOOM	31.36	11.85	7.47	1.6	38.43			90.73 HR	56
UPB	C85PH005	CRANE,DRAG/CLAM, 5.0CY /135'BOOM	41.79	15.79	6.77	1.4	51.22			117.04 HR	315
UPB	G15CA003	GRADER,MOTOR, ARTIC, CAT 12-G	9.87	3.55	4.14	1.3	9.79	0.65	0.10	29.49 HR	21
UPB	L35CA007	LDR,FE, CRWLR, 3.75 CY	21.31	5.75	7.62	2.8	37.87			75.41 HR	102
UPB	T10CA013	BLADE, UNIVERSAL, HYDR (FOR D7	2.42	0.65		0.0	2.55			5.70 HR	21
UPB	T10CA017	BLADE, UNIVERSAL, HYDR (FOR D8	3.11	0.84		0.1	3.28			7.36 HR	85
UPB	T15CA013	DOZER,CWLR, D-7H,PS (ADD BLADE)	16.34	4.85	7.80	2.7	27.54			59.31 HR	21
UPB	T15CA015	DOZER,CWLR, D-8L,PS (ADD BLADE)	24.46	6.60	12.15	3.3	32.19			78.77 HR	85
UPB	T40XX008	REAR DUMP BODY, 8 CY,(30,000 GVW	1.18	0.26		0.0	1.09			2.63 HR	120
UPB	T40XX033	WATER TANK, 3000 GAL (ADD TRK	1.61	0.36			1.27			3.23 HR	21
UPB	T50GM016	TRK,HWY, 41,000 GVW, 6X4, 3 AXLE	4.29	1.03	6.83	1.8	3.75	1.29	0.19	19.28 HR	141
UPB	XMIXX010	MISC. POWER TOOLS	2.00	0.70	0.55	0.2	2.40			5.90 HR	16
UPB	XMIXX020	SMALL TOOLS	0.46	0.20	0.15	0.0	0.58			1.45 HR	133
UPB	XX0XX002	TUG BOAT, 500 TO 800 HP	18.61	6.64	5.25	2.2	22.94			55.72 HR	48
UPB	XX0XX004	TUG BOAT, 150 TO 400 HP	7.50	2.68	2.11	0.9	9.24			22.45 HR	56
11. Levees and Floodwalls											
UPB	A15XX009	AIR COMPR, 250 CFM, 100 PSI	2.20	0.66	3.18	0.8	2.24	0.04	0.01	9.21 HR	0
UPB	A20XX002	AIR HOSE, 1.00", 100',HARDROCK	0.14	0.01			0.24			0.40 HR	0
UPB	C55SC005	CONC PUMP,117CY/HR,75'BM,W/TRUCK	22.14	4.54	13.24	3.6	27.43	0.75	0.11	71.89 HR	0
MIL	C65MS001	CONC VIBRATOR, 2.5"D, AIR	0.19	0.02		0.0	0.59			0.86 HR	0
MIL	C75BD003	CRANE,HYD,S/P,RT,4WD,14T/49'BOOM	5.91	2.03	9.76	3.0	6.12	0.60	0.09	27.60 HR	20
MIL	C75GV001	CRANE,HYD,S/P,RT,4WD,18T/70'BOOM	10.22	3.54	4.10	1.2	10.61	1.34	0.20	31.23 HR	4
UPB	C75PH004	CRANE,HYD,S/P,RT,4WD,22T/72'BOOM	11.94	4.12	5.08	1.5	12.38	1.34	0.20	36.56 HR	34

** EQUIPMENT BACKUP - LEVEL 1 **

SRC	EQUIP ID	DESCRIPTION	DEPR	CAPT	FUEL	FOG	EQ REP	TR WR	TR REP	TOTAL	UOM	** TOTAL HOURS
UPB	G15CA003	GRADER,MOTOR, ARTIC, CAT 12-G	9.87	3.55	4.14	1.3	9.79	0.65	0.10	29.49	HR	41
MIL	H25KO007	HYD EXCAV, CRWLR, 3.00 CY BKT	43.28	12.54	12.89	2.8	59.18			130.71	HR	6
UPB	L35CA007	LDR,FE, CRWLR, 3.75 CY	21.31	5.75	7.62	2.8	37.87			75.41	HR	39
UPB	L50CS002	LDR,BH,WH, 1.00CY FE BKT, 24"DIP	3.61	1.12	2.11	0.6	4.03	0.50	0.07	12.11	HR	6
MIL	P50WC004	PUMP,TRASH, 6"D,1300GPM/100'HD	1.20	0.29	1.63	0.6	1.51			5.24	HR	420
UPB	T10CA010	BLADE, ANGLE, HYDR (FOR D6	1.71	0.46		0.0	1.80			4.04	HR	2
UPB	T10CA013	BLADE, UNIVERSAL, HYDR (FOR D7	2.42	0.65		0.0	2.55			5.70	HR	41
UPB	T15CA010	DOZER,CWLR, D-6H,PS (ADD BLADE)	10.55	3.13	5.98	2.1	17.78			39.58	HR	2
UPB	T15CA013	DOZER,CWLR, D-7H,PS (ADD BLADE)	16.34	4.85	7.80	2.7	27.54			59.31	HR	41
UPB	T40XX010	REAR DUMP BODY,12 CY,(36,000 GVW	1.22	0.27		0.0	1.12			2.69	HR	39
UPB	T40XX033	WATER TANK, 3000 GAL (ADD TRK	1.61	0.36			1.27			3.23	HR	41
MIL	T50FO005	TRK,HWY,10,000GVW,4X2, 1T-PICKUP	1.53	0.35	2.83	0.7	1.53	0.40	0.06	7.48	HR	420
MIL	T50GM008	TRK,HWY, 8,600GVW,4X2, 1T-PICKUP	1.37	0.31	5.06	1.4	1.37	0.23	0.03	9.77	HR	3
UPB	T50GM016	TRK,HWY, 41,000 GVW, 6X4, 3 AXLE	4.29	1.03	6.83	1.8	3.75	1.29	0.19	19.28	HR	80
UPB	XMIXX010	MISC. POWER TOOLS	2.00	0.70	0.55	0.2	2.40			5.90	HR	0
UPB	XMIXX020	SMALL TOOLS	0.46	0.20	0.15	0.0	0.58			1.45	HR	77
13. Pumping Plant												
UPB	A15XX009	AIR COMPR, 250 CFM, 100 PSI	2.20	0.66	3.18	0.8	2.24	0.04	0.01	9.21	HR	7
UPB	A20XX002	AIR HOSE, 1.00", 100',HARDROCK	0.14	0.01			0.24			0.40	HR	7
UPB	C10WC011	ROLLER,WK-BH,VIB,DBL,0.8T,29.5"W	2.32	0.34	0.37	0.0	3.66			6.79	HR	22
UPB	C55SC005	CONC PUMP,117CY/HR,75'BM,W/TRUCK	22.14	4.54	13.24	3.6	27.43	0.75	0.11	71.89	HR	7
MIL	C65MS001	CONC VIBRATOR, 2.5"D, AIR	0.19	0.02		0.0	0.59			0.86	HR	14
MIL	C75BD003	CRANE,HYD,S/P,RT,4WD,14T/49'BOOM	5.91	2.03	9.76	3.0	6.12	0.60	0.09	27.60	HR	40
UPB	C75PH004	CRANE,HYD,S/P,RT,4WD,22T/72'BOOM	11.94	4.12	5.08	1.5	12.38	1.34	0.20	36.56	HR	12
MIL	H25KO007	HYD EXCAV, CRWLR, 3.00 CY BKT	43.28	12.54	12.89	2.8	59.18			130.71	HR	26
UPB	L35CA007	LDR,FE, CRWLR, 3.75 CY	21.31	5.75	7.62	2.8	37.87			75.41	HR	36
MIL	L35CS002	LDR,FE, CRWLR, 1.50 CY	6.24	1.68	2.97	1.1	11.09			23.10	HR	47
MIL	P60ML004	PUMP,CENTRF,DW,6"D, 100GPM/40'HD	1.96	0.47	2.79	1.0	2.47			8.74	HR	1440
UPB	R30IG008	ROLLER,STATIC,3WHL,S/P, 12T,84"W	4.90	1.32	2.54	0.6	5.03			14.40	HR	19
UPB	T10CA010	BLADE, ANGLE, HYDR (FOR D6	1.71	0.46		0.0	1.80			4.04	HR	26
UPB	T15CA010	DOZER,CWLR, D-6H,PS (ADD BLADE)	10.55	3.13	5.98	2.1	17.78			39.58	HR	26
UPB	T40XX010	REAR DUMP BODY,12 CY,(36,000 GVW	1.22	0.27		0.0	1.12			2.69	HR	36
MIL	T50GM008	TRK,HWY, 8,600GVW,4X2, 1T-PICKUP	1.37	0.31	5.06	1.4	1.37	0.23	0.03	9.77	HR	1
UPB	T50GM016	TRK,HWY, 41,000 GVW, 6X4, 3 AXLE	4.29	1.03	6.83	1.8	3.75	1.29	0.19	19.28	HR	36
UPB	XMIXX010	MISC. POWER TOOLS	2.00	0.70	0.55	0.2	2.40			5.90	HR	54
UPB	XMIXX020	SMALL TOOLS	0.46	0.20	0.15	0.0	0.58			1.45	HR	254

30. Planning, Engineering and Design
31. Construction Management (S&I)

R2024: 001 001	Skiff And Ou	Equip XX0XX009	not recognized -- Not repriced
R2024: 001 002	ROLLER,STATI	Equip R30IG003	not recognized -- Not repriced
R2024: 001 002	ROLL,VIB,TOW	Equip R40HY004	not recognized -- Not repriced
R2024: 001 003	Work Barge	Equip XX0XX013	not recognized -- Not repriced
R2024: 002 002	Work Barge	Equip XX0XX013	not recognized -- Not repriced
R2024: 002 002	Spud Barge	Equip XX0XX011	not recognized -- Not repriced
R2024: 09013001 A	Stone Barge	Equip XX0XX012	not recognized -- Not repriced
R2024: 09013001 B	Work Barge	Equip XX0XX013	not recognized -- Not repriced
R2024: 09013001 B	Spud Barge	Equip XX0XX011	not recognized -- Not repriced
R2024: 09013002 A	Work Barge	Equip XX0XX012	not recognized -- Not repriced
R2024: 09013002 A	Spud Barge	Equip XX0XX011	not recognized -- Not repriced
R2024: 09013001 A	Stone Barge	Equip XX0XX012	not recognized -- Not repriced
R2024: 09013001 B	Work Barge	Equip XX0XX013	not recognized -- Not repriced
R2024: 09013001 B	Spud Barge	Equip XX0XX011	not recognized -- Not repriced
R2024: 09013002 A	Work Barge	Equip XX0XX012	not recognized -- Not repriced
R2024: 09013002 A	Spud Barge	Equip XX0XX011	not recognized -- Not repriced

* * * END OF ERROR REPORT * * *

Appendix N - SHPO Concurrence

DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
1222 SPRUCE STREET
ST. LOUIS, MISSOURI 63103-2833

REPLY TO
ATTENTION OF

April 27, 1993

Planning Division
Environmental and Recreational
Resources Branch

Mr. Michael S. Weichman
Chief, Review and Compliance Section
Missouri Department of Natural Resources
Division of Parks, Recreation, and
Historic Preservation
P.O. Box 176
Jefferson City, Missouri 65102

Dear Mr. Weichman:

The St. Louis District Corps of Engineers, the U.S. Fish and Wildlife Service, and the Missouri Department of Conservation (MDOC) have cooperated in the development of a Habitat Rehabilitation and Enhancement Project (HREP) involving Cuivre Island and portions of the adjoining mainland. The project area is shown in Figure 1. It lies within Pool 26 of the Mississippi River in Lincoln and St. Charles Counties, Missouri. The project area includes about 1400 acres comprising Cuivre Island, about 160 acres comprising Cuivre Slough, and about 120 acres of cropland and wetland on the adjacent mainland to the west of Cuivre Island (Figure 2).

A draft Definite Project Report (DPR) is being prepared. Basic problems that have been outlined for the project area include sedimentation in the side channel and on the island, fluctuations in water levels, and loss of habitat for both fish and waterfowl. A total of 16 solutions have been defined to resolve these problems. These can be reduced to 12 alternatives. These are not mutually exclusive and include:

1. No action;
2. Development of 90 acres of marshes in two cropland fields on the adjoining mainland;
3. Replace pump and clear ditches on Cuivre Island;
4. Deepen Cuivre Slough (side channel) with a series of hard point dikes and the removal of two dikes that have caused increased sedimentation;
5. During an episode(s) of high water, use of a towboat to churn up sediments which would be carried downstream;
6. Construction of three sets of dikes south of the mouth of Cuivre River to provide wintering holes for fish;

7. Increase the size of the pumping station on the eastern side of Cuivre Island to create larger interior wetlands;
8. Placement of redccdar trees in the Mississippi River along Cuivre Island to provide additional fish habitat;
9. Placement of redcedar trees in Cuivre Slough for the same reason;
10. Dredge Cuivre Slough;
11. Construct 2.25 km of low levee on the north part of Cuivre Island to create 400 acres of wetland;
12. Construct new closure structures between: (a) Phelans Island and Turkey Island; (b) Phelans Island and Cuivre Island; and (c) Turkey Island and Cuivre Island.

Among these 12 alternatives, only Nos. 2, 3, 4, 6, and 7 are now viewed as viable. Alternatives Nos. 2 and 3 will involve some earthmoving and construction activities, whereas Alternative No. 7 will result in greater flooding of interior portions of Cuivre Island. Combined, Alternatives Nos. 3 and 7 call for the emplacement of a larger pump than has been used in the past, as well as the cleaning of existing ditches. These ditches interconnect the five major lakes on Cuivre Island (Bernard Slough, Flat Lake, Big Twin Lake, Little Twin Lake, and Turkey Lake) and were constructed by the hunting club that originally owned the island. The pumping station will occupy a previously established pad consisting of a platform of disturbed spoil near the eastern shoreline of the island. Plans also call for the replacement of the existing system of culverts and gates. The locations of these facilities are shown in Figure 3.

No previously undisturbed part of the island owned by the Corps of Engineers will be affected by earthmoving and/or construction activities associated with the implementation of Alternatives Nos. 3 and 7. However, a much larger area of Cuivre Island will be subject to inundation (Figure 4). General Land Office (GLO) survey records indicate that the island dates to presettlement times. The existence today of some relatively large trees and large stumps of culled oaks attest to the historic antiquity of the island. Although relatively old, its use during historic and prehistoric times is not known. No sites have been previously filed with the Archaeological Survey of Missouri (ASM) for the island, nor for the associated mainland portion. This is due to the fact that no surveys evidently have been conducted on the island and on the adjacent mainland segment.

The island itself consists of ridge-and-swale topography and is largely forested. There are, nonetheless, two agricultural fields, one at the northern end of Cuivre Island and another near the southern end (Figure 2). The field at the southern end and forested portions of the island between the Mississippi and Big Twin Lake were examined in early March by Dr. Neal H. Lopinot and Mr. Timothy George, both staff members in my Environmental Planning Section. The field and wooded sections are in fact covered with relatively thick deposits of recent alluvium, indicative of the aforementioned sedimentary buildup that has led to losses of aquatic and wetland habitats on the island. Because of the thick deposits of recent sediments, it would seem

therefore that any survey of the increased amount of low area to be inundated would be unfruitful. The chances are that few, if any cultural resources would occur in such low situations. And if they do, the thick blanket of recent sediments should serve to protect these resources. It is therefore argued that a Phase I survey for historic properties of these inundated properties should not be conducted.

In conjunction with the wetlands enhancement program, Alternative No. 2 involves the construction of wetlands on the two agricultural fields on the contiguous mainland (Figure 5). These fields are bisected by an old channel of Cuivre River. They comprise 46 acres and 22 acres (Figure 3). Dr. Lopinot and Mr. F. Terry Norris walked larger 46-acre field during the summer of 1992. Despite the relatively poor surface visibility conditions, several chipped stone prehistoric artifacts were observed scattered about in this field. During the brief reconnaissance survey of the Cuivre Island area in early March, 1993, Dr. Lopinot noted that some prehistoric artifacts also were scattered about in places within the northwesternmost 22-acre field. Current Alternative No. 2 plans specify the scraping of about 30 cm of soil from the interior of the fields and the construction of low levees around their perimeters. This will effectively remove the plowzone and could expose in situ archaeological deposits, if such occurs in these fields. The fields are owned by MDOC. Dr. Lopinot has contacted Mr. Dave Urich (314-751-4115, ext. 262) of MDOC to notify him of their findings and point out the need for a Phase I survey, should the two agricultural tracts be modified by earthmoving activities.

It is our recommendation that clearance be given to proceed with existing plans for Alternatives Nos. 3, 4, 6, and 7, but that a Phase I survey should be initiated for the mainland fields, if Alternative No. 2 is to be implemented. It is further noted that, should the plans for these alternatives be changed or new alternatives be developed, the impacts of these on potential cultural resources will be assessed and coordinated with your office. I request your concurrence on our recommendations (see below).

Sincerely,

Owen D. Dutt
Chief, Planning Division

Attachments (5)

CONCURRENCE:

X Approved ___Not Approved _____ 3 Mar 1994
Signature Date

Appendix O - Distribution List

APPENDIX O

DPR DISTRIBUTION LIST
CUIVRE ISLAND
HABITAT REHABILITATION AND ENHANCEMENT PROJECT
POOL 26, MISSISSIPPI RIVER
LINCOLN & ST. CHARLES COUNTIES, MISSOURI

Distribution List	No. of Copies

Elected Officials (U.S.)

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