# FINDING OF NO SIGNIFICANT IMPACT

## Removal of Bedrock Obstructions to Navigation Traffic in the Mississippi River (River Miles 40 to 82)

1. I have reviewed and evaluated the documents concerning the removal of bedrock obstructions to navigation traffic in several critical locations between Mississippi River Miles 40 to 82. The propoosed project involves excavation of rock obstructions down to specified elevations by drilling and blasting. The project area will be swept with a horizontal beam held at the specified elevations to find the rock for blasting and then swept again after blasting. All disposal debris will be placed below the specified elevation for that excavation zone. Disposal debris that cannot be placed below the required elevation within the excavation area shall be removed to a surveyed disposal area of river bottom scouring or a specified location. An estimated total volume of between 60,000 and 145,000 cubic yards of rock is expected to be removed.

2. I have also evaluated other pertinent data and information on the proposed navigation improvements. As part of this evaluation, I have considered:

a. Various removal techniques,

b. The proposed project, and

c. The "No-Action" Alternative.

3. The possible consequences of these alternatives have been studied for physical, environmental, cultural, social and economic effects, and engineering feasibility. Significant factors evaluated as part of my review include:

a. Bedrock obstacles in the Mississippi Navigation Channel are definite hazards to navigation, by causing grounding of barges, damage to barges, and possible loss of cargo. In extreme cases, this cargo could be of the type to create a major hazardous material spill. The U.S. Coast Guard provided grounding reports from their files for the years 1978 through 1981 by river miles where bedrock obstructions are suspected. Twelve incidents were identified for a 4-year period. Damage estimated from grounding for push boats, barges, and cargo amounted to $769,441.

b. Because of the recent drought conditions and low flows in the Mississippi River, the stretch of river near Grand Tower, Missouri has become the most critical area of rock obstruction because of the rock shelf there that extends across the entire bottom of the navigation channel. Should drought conditions continue, this rock obstruction, if left unremoved, could make Grand Tower, mile 79, the new head of navigation on the Mississippi River.

c. It is not expected that substantial fish mortality will be caused by blasting and other removal and disposal activities. A monitoring program to determine the effects of blasting at a similar project, Beaver Dam Rock, was previously conducted. No direct fish kill from blasting was observed by personnel from the U.S. Fish and Wildlife Service or Illinois and Missouri Departments of Conservation. It is anticipated that the activities of sweeping the bottom to find the pinnacles, drilling and then placing charges will cause fish to move out of the immediate area. The St. Louis District will also require the

contractor to detonate small "repelling" charges prior to a major blast in an attempt to disperse fish from the blast zone. Discussions with blasting contractors indicate that from their experience they have concluded that the detonation of small charges prior to a major blast is effective in dispersing fish, thus reducing mortality.

d. The recommended deterrences will most likely not result in all fish leaving nor prevent some from entering the blasting area. In addition, only organisms which can respond actively by swimming away could move out of the blast zone. The deterrence would be of no value in the case of organisms with little or no self-mobility, such as fish eggs and larvae.

e. No terrestrial environmental impacts are associated with the proposed project.

f. No impacts to archaeological/historic resources are associated with the proposed project.

g. No Federally endangered or threatened species will be adversely impacted by the proposed project.

h. The majority of work will be accomplished without significant interruption to tow traffic. Traffic will be temporarily halted upstream and downstream of blast sites, but this would only be for brief periods during actual blasting events.

4. Based on my analysis and evaluation of the alternative courses of action presented in the Environmental Assessment, I have determined that the implementation of the recommended plan will not have significant effects on the quality of the environment. Therefore, an Environmental Impact Statement will not be prepared prior to proceeding with this action.

28 OCTOBER 1988
Date

James E. Corbin
Colonel, Corps of Engineers
District Engineer

# ENVIRONMENTAL ASSESSMENT
# WITH
# FINDING OF NO SIGNIFICANT IMPACT

## REMOVAL OF BEDROCK OBSTRUCTIONS
## TO NAVIGATION TRAFFIC IN THE MISSISSIPPI RIVER
## (RIVER MILES 40 to 82)

U.S. Army Corps of Engineers
St. Louis District
ATTN: Environmental Analysis Branch (CELMS-PD-A)
210 Tucker Boulevard, North
St. Louis, Missouri 63101-1986
Commercial Telephone Number: (314) 263-5711
FTS Telephone Number: 273-5711

September, 1988

I. PROPOSED PROJECT.

The St. Louis District proposes to remove potential bedrock obstructions to navigation traffic in several critical locations between Mississippi River Miles 40 to 82. (Figures 1-3). Contract specifications call for excavation of rock obstructions down to elevations specified in Section II by drilling and blasting. The area may be swept with a horizontal beam held at the specified elevations to find the rock for blasting and shall be swept again after blasting. All disposal debris will be placed below the specified elevation for that excavation zone. Disposal debris that cannot be placed below the required elevation within the excavation area shall be removed to a surveyed, disposal area of river bottom scouring or a specified location. An estimated total volume of between 60,000 and 145,000 cubic yards of rock is expected to be removed.

The work will be done under contract. The contract will specify that the work be done in accordance with laws and regulations governing work in the river and blasting. Coordination with the U.S. Coast Guard, U.S. Fish and Wildlife Service, and state Departments of Conservation and Department of Transportation will be specified. Contract specifications will insure that the work is conducted in a safe manner with minimum disruption to navigation and the environment. The contract period will be 360 days, beginning in November 1988, to allow the contractor to select the most desirable work period within seasonal flow changes, etc. The contractor shall not close navigation except for short periods when actually blasting.

II. PROJECT LOCATION AND GEOLOGICAL CHARACTERISTICS OF BEDROCK OBSTACLES.

The location and geological characteristics of the potential bedrock obstructions are listed and discussed by river mile.

A. Wittenberg - Grand Tower, RM 82 to 79. Some pinnacle rock is located on the left bank of the navigation channel at mile 81.2 (Wittenberg). Ledge rock is located across the entire navigation channel at Grand Tower - RM 79-80. Rock within the channel will be removed to elevation 314.

Bedrock at the upstream point near Wittenberg may lie within a fault zone and should be composed of hard sandstones and limestones. Soundings indicate that high bedrock is in the form of large mound or pinnacle and is probably limestone. Downstream of Tower Rock at Grand Tower, bedrock is in the form of a shelf extending completely across the river. At this downstream location, bedrock is composed of thinly bedded chert and hard, dense limestone.

B. Gray's Point, RM 46 to 45. Ledge rock is located on the left bank of the navigation channel. This stretch of river is an area where numerous barge groundings have occurred. The Coast Guard did an accident survey study in 1983 and indicated that between 1979 and 1983, eleven barge groundings have occurred, all due to the barges flanking or steering too close to the outside of the solid rock ledge in the bend. Rock within the channel will be removed to elevation 294.

The bedrock present at this site is a hard, dense, medium bedded limestone which typically erodes into a pinnacled, irregular surface.

Soundings indicate that a large bedrock promontory and some large pinnacles are present on the Illinois side.

C. Thebes Bridge area, RM 44.5 to 43.7. Pinnacle rock is near the right bank of the natural channel. Ledge rock is located on the left bank. Rock within the channel will be removed to elevation 291.

The bedrock present at this site is a hard, dense, medium bedded limestone which typically erodes into a pinnacled, irregular surface. Soundings indicate the presence of numerous pinnacles at this site.

D. Counterfeit Rock, RM 43.7-40. Ledge rock is located on the left bank of the natural channel. Some pinnacle rock also lies within the natural channel. Rock within the channel will be removed to elevation 290.

Bedrock at this site may lie within a fault zone which places various limestones against sandstones within a short distance. From the Thebe's railroad bridge downstream to Counterfeit Rock, the bedrock is probably composed of a hard, dense, medium bedded limestone which typically erodes into a pinnacled, irregular surface. Soundings indicate the presence of small, isolated pinnacles in this area. Downstream of Counterfeit Rock, bedrock is probably composed of cherty limestone, which typically erodes into pinnacles, and of hard sandstone which typically forms ledges. Although both pinnacles and ledges may be present at this location, soundings indicate a rock shelf extending beneath the river channel with localized ridges and troughs of up to 15 feet vertical relief.

E. Commerce, RM 39.7 - 37.7. Pinnacle rock is located throughout the natural river channel. Rock within the channel will be removed to elevation 289.

The units at this site consists of sands, clays, poorly consolidated sandstone lenses, a hard dense sandstone, and a limonitic pebble conglomerate. Approximately 30% of the rock in this area was able to be removed by drag line in the 1984 rock removal contract. Soundings indicate large, isolated pinnacles at this site.

III. PROJECT AUTHORIZATION.

The project is authorized under authority of the Rivera and Harbors Act of 1910, as amended. Approval authority for this work has been granted to the District Commander by Memorandum dated 9 March 1987, LMVED-R, Subject: Mississippi River Between Ohio and Missouri Rivers (Regulatory Works).

IV. PROJECT JUSTIFICATION.

A. Bedrock obstacles in the Mississippi Navigational Channel are a definite hazard to navigation by causing grounding of barges, damage to barges, and possible loss of cargo. In extreme cases, this cargo could be of the type to create a major hazardous waste spill incident.

The U.S. Coast Guard provided grounding reports from their files for the years 1978 through 1981 based by river miles where bedrock obstacles are suspected. Twelve incidences were identified for a 4-year period. Damage

estimates from groundings for push boats, barges, and cargo amounted to $769,441. Most accidents occurred at low river stages and most groundings were associated with rocks, rock ledges, or rocky river bottoms. Most tows were downbound at the time of the accident. Most towboats involved in the accidents are in the 4000 to 7000 horsepower range with two at 8400 and 10,500 horsepower.

The Gray's Point reach accounted for most of the accidents (9 of the 12), and the highest damage (over $700,000). Two groundings occurred in the Grand Tower reach, and one grounding was reported downstream of the Thebes Bridge.

## COAST GUARD GROUNDING REPORTS (1978 - 1980)

| River Mile | Date | St. Louis Gage | Incident | Vessel | Horse Power | Damage |
|---|---|---|---|---|---|---|
| 79.0 | 21 Jan 81 | -0.7 | Grounding | ARCO Graphite | Unknown | None |
| 79.5 | 5 Jan 81 | 13.3 | Grounding | National Energy & 6 Barges | 5600 | $ 49,913 |
| 46.0 | 23 Dec 78 | 4.6 | Grounding on | Valley Transporter & 25 Barges | 7000 | $ 97,500 |
| 46.2 | 31 Dec 78 | 3.3 | Landed in Rocks | Cypress & 4 Barges | 4400 | $100,000 |
| 46 | 24 Sep 79 | 6.7 | Struck Rocks on Left Bank | Frank Rader & 25 Barges | 8400 | $ 30,000 |
| 46.0 | 16 Nov 79 | 8.9 | Grounded on Rock Ledge Left Bank | Bilbo Williamson & 2 Barges | 5750 | $107,778 |
| 46 | 29 Dec 80 | 0.6 | Grounded on Rocky Ledge | Conti Bonnie | 6000 | $ 50,000 |
| (This report also stated submerged object in channel; buoys not marking channel.) | | | | | | |
| 46 | 10 Dec 79 | 7.1 | Grounded on Rocky River Bottom | American Pillar & Tow | 10,500 | $147,000 |
| (This report also stated that Red Buoy on Rock Ledge missing.) | | | | | | |
| 45.8 | 13 Oct 79 | 3.5 | Grounded on Rocks Outside Buoy Line | Sandy Southern & Tow | 3200 | $ 1,500 |
| 45.5 | 3 Feb 79 | 1.9 | Grounding on Rocks (outside channel) | Sunflower & 12 Barges | 5600 | $ 65,000 |
| 45 | 26 Nov 79 | 10.4 | Grounding | Mary Weathers | 3800 | $110,000 |
| 43 | 3 Sep 80 | 12.7 | Grounding | Leonidas Polk & 4 Barges | 4300 | $ 750 |
| (This report also stated only towboat aground on large rock, left bank below Thebes Bridge.) | | | | | | |

B. Because of the recent drought conditions and low flows in the Mississippi River, the Grand Tower has become the most critical area because of the rock shelf that extends across the entire bottom of the navigation channel. If the drought continues this rock obstruction, if left unremoved, could make Grand Tower, mile 79, the new head of navigation on the Mississippi River.

V. PAST ROCK REMOVAL PROJECTS.

There have been previous efforts to remove rock obstacles to navigation. The first successful attempt began in 1964 in the Thebes Gap Reach (RM 43.6 to 37) and utilized drilling, blasting, and dragline removal. Some 39,000 tons of rock were removed from the channel and used for dike repair. The effectiveness of this effort was limited by the capabilities of the survey and sounding technology of the day.

Removal of obstructions was performed under contract in the Commerce, Missouri area in 1984 (Beaver Dam Rock). High rock pinnacles were removed from Mississippi River Miles 38.3 to 38.7. An estimated 13,000 cubic yards of rock was removed by drilling and blasting.

VI. ALTERNATIVES CONSIDERED.

A. "No Action" Alternative. With this alternative no rock removal would be conducted. However, navigation on the Mississippi River is a project purpose which has been authorized by the U.S. Congress, and the Corps of Engineers has been given the responsibility to maintain the Mississippi for navigation. Under current drought conditions, if rock removal is not conducted, Grand Tower, RM 79, could become the head of navigation on the Mississippi River.

Bedrock obstacles in the Mississippi Navigational Channel are a definite hazard to navigation by causing grounding of barges, damage to barges, and possible loss of cargo. Twelve groundings occurred in the years 1978 through 1981 in the project area which amounted to $769,441 in losses to the navigation industry. Perhaps the most serious environmental consequence associated with grounding of a tow is the possibility of a destructive spill. It is not difficult to imagine a major spill of an environmentally damaging substance. If the project is carried out successfully, the chances for this particular type of disaster approach zero. Without the rock removal project the potential for future groundings, resulting in monetary loss and possible environmental damage, remains high.

B. Various Engineering Alternatives.

1. The use of a dragline rather than drilling and blasting has been previously evaluated. However, past experience with rock removal from the Mississippi River indicates that barge mounted dragline equipped with rock grapples was not successful. Rock removal has been successful by drilling and blasting bedrock and removing the rock from the river with dipper dredge, dragline or clamshell.

2. The depth to which the bedrock obstructions would be removed was a major consideration, and various elevations to which the obstructions would

be removed were evaluated. Rock quantity approximately doubles for an increase in depth of 2 feet. Costs of rock removal would also double. Critical rock areas were located by applying drought design parameters to the Mississippi River. The parameters are a 9-foot navigation channel depth below a slope profile of 35,000 cfs at St. Louis.

A design stage slope profile was developed by the District to simulate probable future conditions that could occur through the critical rock reaches of the Mississippi River above Cairo. This design profile was based upon a recurrence of the low water condition experienced during the period of 9-12 July 1988. During this period, the stage fell to -1.1 foot at St. Louis. By 15 Nov 88, a base flow situation on the Missouri River could be experienced, assuming that drought conditions continued to occur. Total base flow conditions at St. Louis would then be in the order of approximately 35,000 cfs, equating to a design stage of -4.5 feet.

Under the above base flow conditions, the design stage slope profile through the critical rock reaches would be 3 to 4 feet below the low water reference plane (LWRP). This would require the removal of rock at several key locations discussed in this Environmental Assessment.

The depth of channel under the design slope profile was studied at -9 feet, and this Environmental Assessment addresses rock removal to that level.

VII. SECTION 404 OF THE CLEAN WATER ACT.

The public is being notified of the proposed action by Public Notice under Section 404 of the Clean Water Act.

VIII. IMPACT ON BIOLOGICAL RESOURCES.

A. Aquatic. The potential of fish mortality during demolition exists. A review of the fishery literature found few data on the amplitude and frequency of underwater explosions required to kill fish. The Ontario Ministry of National Resources investigated the effects of underwater blasting on fishes in Lake Erie using a high explosive (Hydromex) (Teleki and Chamberlain 1978). The design of that project is similar to the one proposed in this Environmental Assessment, in that limestone bedrock was removed by the insertion of explosive charges into drilled holes. Based on blast effects on both caged and free swimming fish, several conclusions were reached:

1. The type of explosive used is indirectly related to fish mortality. Explosives with a low detonation velocity (DV) (e.g., black powder) caused little injury compared to explosives with a high DV (e.g., trinitrotoluene or TNT).

2. The nature of the substrate determines the distance at which fish mortality occurs. In one experiment, "A 38-Kg rock blast monitored from 24 m away produced 26 kPa while a 30-Kg charge detonated in clay-till material developed 93 kPa at 25 m". (Note: kPa are units of pressure.)

3. Certain species of fish are more susceptible to injury than others. Laterally compressed, physoclistous (air bladder not connected to mouth) species such as pumpkinseed, white bass and crappie are more sensitive

to blasting than fusiform, physostomous (mouth and air bladder connected by an air duct) fishes such as rainbow trout, white suckers, and yellow bullhead.

4. Explosive charges that were not buried generated a larger lethal radius than did buried charges.

5. Fishes seemed to repopulate the blast zone soon after detonation.

It is not expected that substantial fish mortality will be caused by blasting and other removal and disposal activities. A monitoring program to determine the effects of blasting at a similar project, Beaver Dam Rock, was conducted in 1984. No direct fish kill from blasting was observed by personnel from the U.S. Fish and Wildlife Service or Missouri and Illinois Departments of Conservation. It is anticipated that the activities of sweeping the bottom to find the pinnacles, drilling and then placing charges will cause fish to move out of the immediate area. The St. Louis District will also require the contrsctor to detonate small "repelling" charges prior to a major blast in an attempt to disperse fish from the blast zone. Discussions with blasting contractors indicate that from their experience they have concluded that the detonation of small charges prior to a major blast is effective in dispersing fish, thua reducing mortality.

Major fish migrations and spawning activities which might be disrupted by the project occur mostly in the spring. This is also when the major downstream passage of fish larvae and pelagic eggs occurs (U.S. Army Corps of Engineers 1982). Accordingly, the contract would specify no blasting during the period 1 April through 15 June.

The recommended deterrences will most likely not result in all fish leaving nor prevent some from entering the blasting area (see ASCE 1980: 64-75). In addition, only organisms which can respond actively by swimming away could move out of blast zone. The deterrences would be of no value in the case of organisms with little or no self-mobility such as fish eggs and larvae.

The proposed project area, because it is narrow, has some of the highest current velocities normally encountered in the navigation channel. The bottom (other than the bedrock outcrops) is composed of sand to boulder size particles which constantly shift and accumulate or abrade in response to hydrologic factors. This sort of shifting, abrasive environment is difficult for most bottom dwelling organisms and the channel here is thought to be a relatively sterile habitat. The rock pinnacles may offer organisms some respite from swift, abrasive currents. They also offer solid substrate for attachment and perhaps cracks and crevices for cover as well. With present available technology, sampling benthic organisms in this type of habitat is both difficult and dangerous; thus, we have no observational data on what benthic organisms, if any, currently inhabit this rock area.

Drilling, blasting and rock recovery operations would kill some benthic organisms and displace others. The St. Louis District has previously conducted field tests with underwater explosives to determine the pressure levels involved with mortality of invertebrates. Caged invertebrates (mussels and crayfish) at 4, 8, 12, and 15 meters from a 4 pound charge of Tovex were relatively unaffected at all distances, with the exception of thin shelled

mussels which experienced some shell damage and mortality at all distances tested. It should be noted that there are no mussel beds within the blast zone.

Rock outcroppings are "structure" which may be attractive to fish of many species. Fishes can use the rock areas to escape the full force of the current while migrating upstream. These rock areas may also provide spawning sites for species which utilize firm substrate for egg deposition. Anecdotal information supplied by commercial fishermen suggests that fish did use the Thebes Gap area rock structures. They report taking significant numbers of channel catfish, flathead catfish, blue catfish, carp, buffalo fishes and paddlefish from around rock outcroppings (U.S. Army Corps of Engineers, 1983). All rock rubble debris will be placed below the specified elevation for that excavation zone. Disposal debris that cannot be placed below the required elevation the excavation area shall be removed to a surveyed, disposal area of river bottom scouring or a specified location.

River disposal of rubble removed from blast sites may kill or temporarily disturb fish populations and other organisms, especially benthic species. Most fish would probably be active enough to escape burial. However, some fish might be buried; for example, it has been noted that flathead catfish are sluggish at cooler temperatures, 9 or 10°C (Lubinski 1984). Leaving the rubble in place or moving it to a disposal will be quickly colonized by benthic organisms from nearby dikes and bedrock structures. It is expected that the new rock structures will act as fish attractors.

To compensate for any loss of aquatic habitat in the Middle Mississippi River due to rock removal, the St. Louis District will modify previous V-notched dikes, in the rock removal reach (RM 44.5R, 44.2R, and 44.0R), to trapezoidal notches in order to reclaim habitat. Also the dike field, RM 110L to 115L will be modified.

F. Water Quality. The nature of the sediments in the area is such that no significant water quality changes (either immediate or long term) is expected to be caused by the project.

G. Terrestrial. No known terrestrial impacts associated with the proposed project are anticipated.

H. Federally Endangered Species Biological Assessment. 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 provide a listing of Federally threatened or endangered species, currently classified or proposed for classification, that could be present in the project area. By telephone communication on 9 September 1988, Mr. Bruce Stebbings provided the following list:

| Common Name | Scientific Name | Classification |
|---|---|---|
| Bald eagle | Haliaeetus leucocephalus | Endangered |
| Interior least tern | Sterna antillarum athalassos | Endangered |

Bald Eagle (Haliaeetus leucocephalus)

The bald eagle formerly bred throughout most of North America but is now restricted to Alaska, parts of northern and eastern Canada, northern United States, the Gulf Coast, and Florida. Winter habitat includes large bodies of water, especially the larger rivers in the interior of the continent. The three major wintering areas of bald eagles in North America are the Pacific coastal regions of Alaska and British Columbia; the Midwestern United States; and northwestern Washington, Oregon, Idaho, and Montana (Griffin, 1978).

The decline of the bald eagle over its entire range in the contiguous 48 states has been well documented by studies done by Federal, state and private organizations. Contamination by DDT was the primary cause of the decline; the mechanism was accumulation of this pesticide in fish, the major food of the bald eagle. Since the banning of DDT in 1972, bald eagle populations have increased nationwide. A recovery plan for the bald eagle, which discusses habitat requirements and winter range, has been prepared (Northern States Bald Eagle Recovery Team 1983).

The northern bald eagle is a common winter inhabitant of the Mississippi River. As winter arrives on the breeding grounds of northern Alaska and Canada, deep snows and below freezing temperatures cause waterways in the area to become icelocked. 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 are available.

The construction of numerous dams and reservoirs in this century has altered the distribution of wintering eagles in the United States. Humankind's alteration of habitat has unintentionally increased potential wintering areas, attracting wintering populations to areas where eagles were previously only casual visitors. Concentrations of wintering bald eagles below locks and dams on the Mississippi River are a recent phenomenon (Musselman 1949). These man-made structures create areas of relatively warm, open water which provides feeding areas throughout the winter. The bald eagle is now seen in the proposed project area from November to March.

Bald eagles commonly utilize large trees adjacent to the river as foraging perches and day resting sites (Harper 1983). Night roosts, which also occur in large trees, generally offer seclusion from human disturbance and protection from cold winds (Havera and Kruse 1988). Bald eagles generally select trees that are taller than the surrounding ones and which have large, horizontal branches like cottonwoods (Sabine and Klimstra 1985).

Stalmaster and Newman (1978) reported that high activity, such as that occurring frequently in the sight of eagles, cause 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 to eagles 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 project does not involve clearing of any trees. Since no trees will be cleared, no foraging perches, resting sites, or night roosts areas will be destroyed. Human activity associated with rock removal may disturb foraging perches and day resting sites of bald eagles and cause them to move from the immediate work area. However, the work area, at any given time, will be small and the eagles will have to move only a short distance to avoid human disturbance. As such, impacts, if they occur, are not considered to be significant. Bald eagles are known to breed in Alexander Co., Illinois on the Union County Refuge. However, this area is not within the immediate project area and no impacts to breeding birds associated with the proposed project are anticipated.

Interior least tern (Sterna antillarum athalassos)

The interior least tern occurs in Illinois as an uncommon local migrant and summer resident in the Southern counties, a rare summer resident in the central counties, and a rare migrant and postbreeding wanderer in the rest of the state (Bowles and Tom 1981). Breeding has been observed on Gabberet Island, Madison County (Widmann 1898). It also attempted to breed in 1969, 1971, and 1972 on Mosenthien Island, Madison County (Kleen and Bush 1971; Thompson and Land 1978). Aerial surveys flown during the nesting season in 1977 (Thompson and Land 1978) and 1985 (Smith 1985) did not locate nesting activity on either Gabberet or Mosenthien Islands. During a 1983 survey conducted by the Illinois Department of Conservation, two tern colonies were found, one located on a sandbar adjacent to Bumgard Island (RM 30L) and the other on a towhead of Brown's Bar (RM 23L). Nine terns and 2 nests with eggs were found at Bumgard Island, and 8 terns and 4 nests with eggs at Brown's Bar. A 1984 census revealed no nests on Bumgard Island, probably because of high water, and 16 nests on Brown's Bar (Sweet 1984). A survey conducted by the Missouri Department of Conservation located 10 terns and 2 nests on Bumgard Island during the 1985 breeding season (Smith 1985).

The interior least tern has been eliminated from most stretches of the UMR and its tributaries. The reasons for the population's decline are numerous. Many nesting islands in rivers have been permanently inundated or destroyed by reservoirs and channelization projects. Alteration of natural river dynamics has caused unfavorable vegetational succession on many remaining islands, curtailing their use as nesting sites by terns.

Recreational use of sandbars is a major threat to the reproductive success of the tern. The annual spring floods of the watershed are often delayed past the onset of normal breeding, and many islands are exposed as suitable sites in time of nesting.

The U.S. Fish and Wildlife Service (1985) provides a review of the species' life history requirements. The tern exhibits a localized pattern of distribution, and its breeding biology generally centers around three ecological factors. These include: (1) the presence of bare or nearly bare aluvial islands or sandbars; (2) the existence of favorable water levels during the nesting seasons, and (3) the availability of food.

The nest is a simple unlined scrape usually containing three brown spotted buffy eggs. Breeding colonies or terneris are usually small (up to 20 nests) with nests spaced far apart. However, colonies of 75 nests have been reported

on the Mississippi River. Egg laying and incubation occur from late May to early August, depending on the geographical location and availability of habitat. After a 20-day incubation period, the chicks hatch and will fledge in another 20 days. Little is known about the interior least tern's specific food preferences, but small fish such as minnows constitute its prey.

The interior least tern is currently not known to breed within the proposed project area (Mississippi River Miles 82-40). In addition, construction activities would not impact any breeding habitat (alluvial islands or sandbars). The project will not impact potential feeding habitat.

In summary, it is the St. Louis District's opinion that the proposed project will not impact either of the Federally endangered species which may occur within the project area.

IX. IMPACTS TO HISTORIC PROPERTIES.

The rock removal work will occur within the navigation channel where there are no known historic properties or archeological resources. As such, no impacts to historic resources will occur.

X. IMPACTS TO NAVIGATION AND COMMERCIAL TRANSPORTATION.

The majority of work will be accomplished without significant interruption to tow traffic. Traffic will be temporarily halted upstream and downstream of blast sites, but this would only be for brief periods during actual blasting events. All work adjacent to or on the Burlington Northern Railroad's property will be performed so as not to interrupt or delay the operation of trains over the tracks in use, or to interfere with communications and signal lines adjacent the tracks upon the railroad's premises, except under arrangements effected between the Contractor and the Railroad.

XI. COORDINATION.

The Contractor is required to notify in writing the Contracting Officer and Government agencies at least 7 government-business days in advance of the commencement of initial blasting operations. The agencies to be notified are the U.S. Fish and Wildlife Service, the U.S. Coast Guard, the Illinois Department of Conservation, the Illinois Department of Transportation, the Missouri Department of Conservation, and the Missouri Department of Transportation.

XII. RELATIONSHIP OF PLAN TO ENVIRONMENTAL REQUIREMENTS.

| Guidance | Degree of Compliance[1] |
|---|---|
| Archaeological and Historic Preservation Act, as Amended, 16 U.S.C. 469, et seq. | PC[2] |
| Clean Air Act, as Amended, 42 U.S.C. 7609. | PC[3] |

| Guidance | Degree of Compliance[1] |
|---|---|
| Clean Water Act, as Amended, 33 U.S.C. 466 et seq. | FC |
| Coastal Zone Management Act, as Amended, 16 U.S.C. 1451, et seq. | NA |
| Endangered Species Act, as Amended, 16 U.S.C. 1531, et seq. | PC[4] |
| Estuary Protection Act, 16 U.S.C. 1221, et seq. | NA |
| Farmland Protection Policy Act, 7 U.S.C. 4201, et seq. | FC |
| Federal Water Project Recreation Act, as Amended, 16 U.S.C. 460-1(12), et seq. | PC[5] |
| Fish and Wildlife Coordination Act, as Amended, 16 U.S.C. 4601, et seq. | PC[6] |
| Land and Water Conservation Fund Act, as Amended, 16 U.S.C. 4601, et seq. | FC |
| Marine Protection, Research and Sanctuaries Act, 33 U.S.C. 1401, et seq. | NA |
| National Environmental Policy Act, as Amended, 42 U.S.C. 4321, et seq. | PC[7] |
| National Historic Preservation Act, as Amended, 16 U.S.C. 470a, et seq. | PC[2] |
| River and Harbors Act, 22 U.S.C. 401, et seq. | FC |
| Watershed Protection and Flood Prevention Act, 16 U.S.C. 1001, et seq. | NA |
| Wild and Scenic Rivers Act, as Amended, 16 U.S.C. 1271, et seq. | NA |
| Flood Plain Management, E.O. 11988. | FC |
| Protection of Wetlands, E.O. 11990. | FC |
| Environmental Effects Abroad of Major Federal Actions, E.O. 12114. | NA |

| Guidance | Degree of Compliance[1] |
|---|---|
| Protection and Enhancement of the Cultural Environment, E.O. 11593. | PC[2] |
| Analysis of Impacts on Primer or Unique Agricultural Lands in Implementing NEPA, CEQ Memorandum, August 11, 1980. | FC |
| Interagency Consultation to Avoid or Mitigate Adverse Effects on Rivers in the Nationwide Inventory, CEQ Memorandum, August 10, 1980. | NA |

Definitions: FC - Full Compliance
PC - Partial Compliance
NA - Not Applicable

2 Full compliance will be attained after review and comment on the Environmental Assessment by the State Historic Preservation Officers in Illinois and Missouri.

3 Full compliance will be attained after U.S. Environmental Protection Agency reviews and comments on the Environmental Assessment.

4 Full compliance will be attained after review of the Biological Assessment and concurrence with its finding by the U.S. Fish and Wildlife Service.

5 Full compliance will be attained after the Department of the Interior has reviewed the Environmental Assessment and has had an opportunity to comment on the recreation and fish and wildlife aspects of the report.

6 Full compliance will be attained after the U.S. Fish and Wildlife Service and Missouri Department of Conservation review and comment on the Environmental Assessment.

7 Full compliance will be achieved after the Finding of No Significant Impact (FONSI) is signed.

XIII. LIST OF PREPARERS.

| Name | Discipline/ Expertise | Education | Experience | Role |
|---|---|---|---|---|
| Mr. Gregory E. Bertoglio | River Engineer/ Potomologist | BS Civil Engineering University of MO-Rolla | 8 years-Design Branch River Engineering | Design Input, Preparation of Contract Drawings |
| Mr. Gregory L. Hempen | Geophysicist/ Blast Vibration | Ph.D. Candidate University of MO-Rolla | 14 years, Geophysical & Geological Engineering | Vibration and Blasting Concerns |
| Mr. Thomas M. Keevin | Environmental Analysis/Aquatic Ecology/Fisheries | M.S. Biology Southern Illinois University-Edwardsville | 8 years, Fisheries Biologist, SLD | Environmental Impact Analysis, Environmental Assessment Preparation |
| Mr. Michael J. Klosterman | Geologist Geotechnical Exploration | M.S. Geochemistry Arizona State Univ. | 18 years, Geology & Geological Engineering | Geotechnical Exploration |
| Mr. Gerald Phelan | Civil Engineer | B.S. Geology B.S. Civil Engineering St. Louis University St. Louis, MO | 15 years, Dam Design & Safety, 10 years, Project Management | Project Management |

XIV. REFERENCES.

American Society of Civil Engineers (ASCE). 1982. Design of water intake structures for fish protection. Prepared by the Task Committee on Fish-Handling Capability of Intake Structures. Committee on Hydraulic Structures, Hydraulics Division. ASCE.

Bowles, M. and R. H. Thom. 1981 Endangered and threatened birds. pp. 34-58. In: Bowles, M. L., V. E. Diersing, J. E. Ebinger, and H. C. Schultz, (eds.). Endangered and threatened species of Illinois, Illinois Dept. of Cons., Springfield, Illinois. 214 pp.

Griffin, C. 1978. The ecology of wintering bald eagles at Swan Lake National Wildlife Refuge. M.S. Thesis, Univ. Missouri, Columbia. 185 pp.

Harper, R. G. 1983. An ecological investigation of wintering bald eagles at Lock and Dam 24, Mississippi River. Unpublished M.S. Thesis. Western Illinois University, Macomb. 117 pp.

Havera, S. P. and G. W. Kruse. 1988. Distribution and abundance of winter populations of bald eagles in Illinois. Illinois Natural History Survey Biological Notes 129. 29 pp.

Kleen, V. M. and L. Bush. 1971. Middlewestern prairie region. American Birds 25: 862-865.

Kleen, V. M., and L. Bush. 1972. Middlewestern prairie region. American Birds 26: 864-867.

Musselman, T. E. 1949. Concentrations of bald eagles on the Mississippi River at Hamilton, Illinois. Auk 66: 83.

Northern States Bald Eagle Recovery Team. 1983. Northern states bald eagle recovery plan. U. S. Fish and Wildlife Service. 76 pp. + Appendices.

Sabine, N. and W. D. Klimstra. 1985. Ecology of bald eagles wintering in southern Illinois. Trans. Ill. Acad. of Sci. 78: 13-24.

Smith, J. W. 1985. Improving the status of endangered species in Missouri (interior least term habitat and nest survey). Performance Report Endangered Species Project No. SE-01-12. 142 pp.

Stalmaster, M. V. 1976. Winter ecology and effects of human activity on bald eagles in the Nooksack River Valley, Washington, M.S. Thesis. Western Washington State College, Belingham. 100 pp.

Stalmaster, M. V., and J. R. Newman, 1978. Behavioral responses of wintering bald eagles to human activity. J. Widl. Management 43: 506-513.

Sweet, M. 1984. Letter to the St. Louis District, Least Tern Survey. Illinois Department of Conservation.

Teleki, G. C., and A. J. Chamberlain, 1978. Acute effects of underwater construction blasting on fishes in Long Point Bay, Lake Erie. J. Fish Res. Board Can. 35: 1191-1198.

Thompson, D. H., and M. C. Landin. 1978. An aerial survey of waterbird colonies along the Upper Mississippi River and their relationship to dredged material deposits. U. S. Army Engineer Experimental Station. TR D-78-13.

U.S. Army Corps of Engineers. 1982. Fishery Impact Assessment, Lock and Dam No. 26 (Replacement) Hydroelectric Power Study.

U.S. Army Corps of Engineers. 1983. Draft Environmental Assessment: Beaver Dam Rock Removal, Mississippi River Mile 38.5.

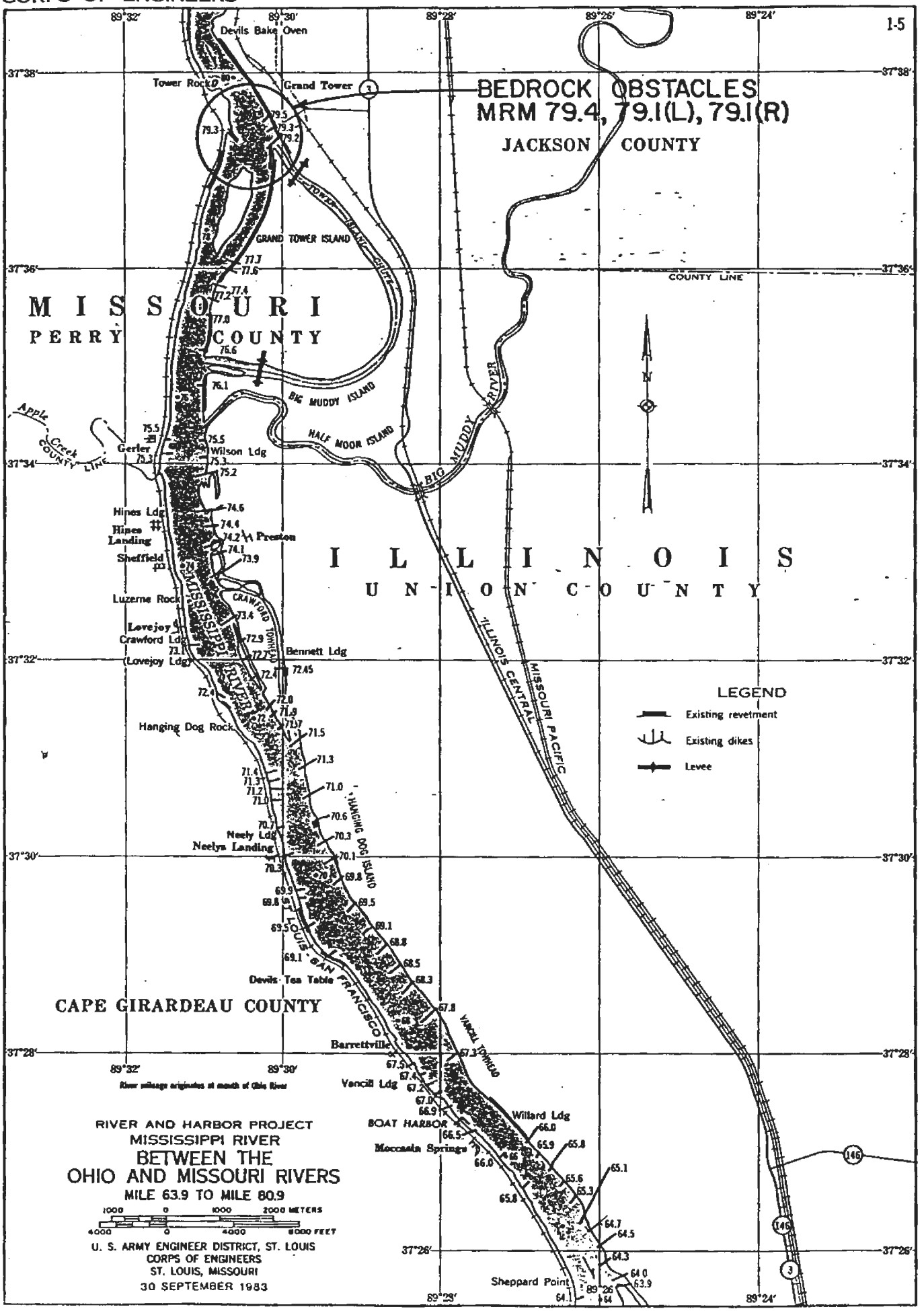
U.S. Army Corps of Engineers. 1987. Letter Report; Mississippi River Between the Ohio and Missouri Rivers (Regulating Works).

U.S. Army Corps of Engineers. 1988. Environmental Assessment: Removal of Existing Locks and Dam No. 26 and Burlington Northern (Alton) Railroad Bridge.

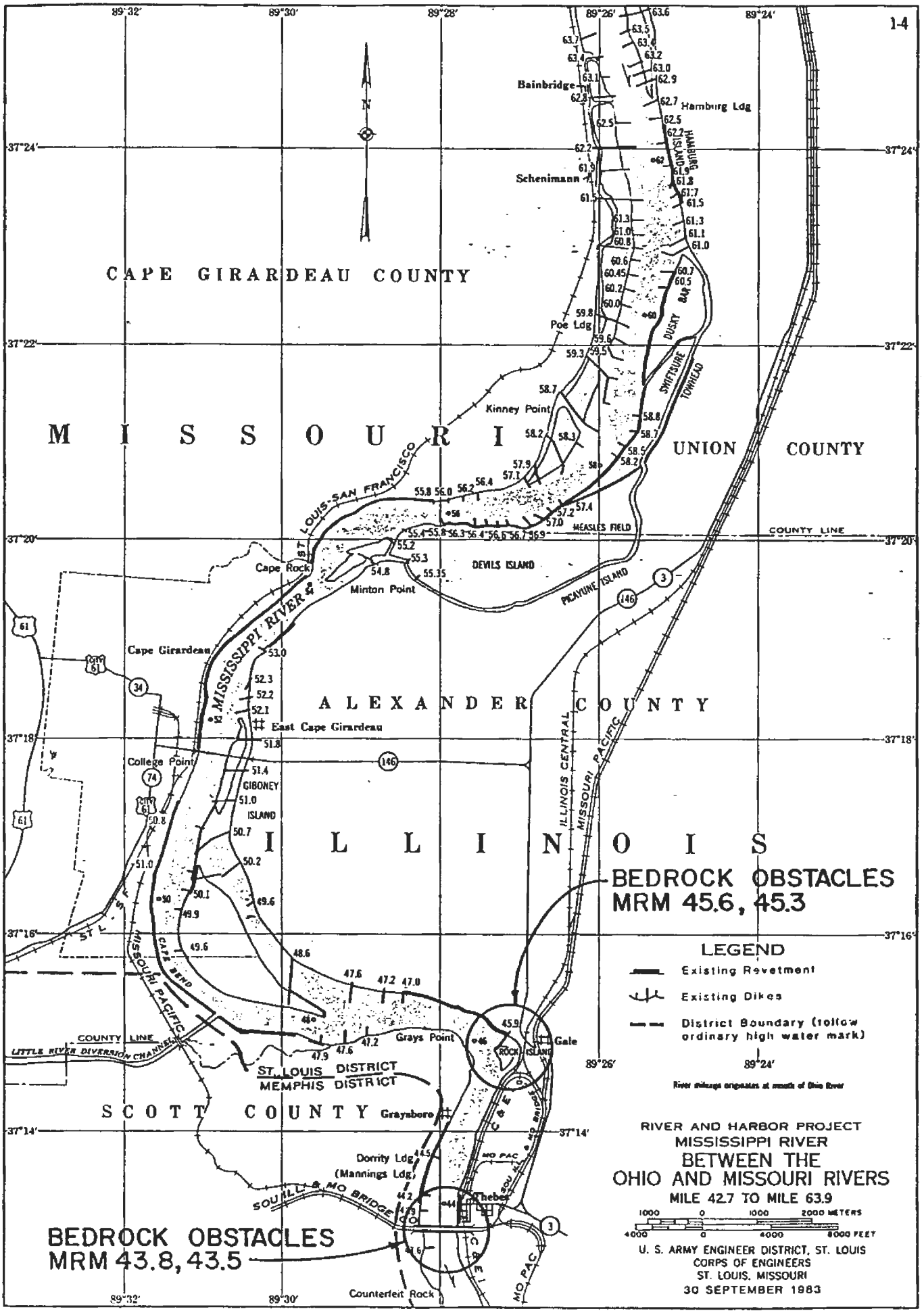
U.S. Army Corps of Engineers. 1988. Memorandum; Mississippi River Between the Ohio and Missouri Rivers (Regulating Works), Rock Removal.

U.S. Fish and Wildlife Service. 1985. Endangered and Threatened Wildlife and Plants; interior population of the least tern determined to be endangered; final rule. Federal Register 50(102): 21784-21792.

Widmann, O. 1898. The great roosts of Gabberet Island, opposite North St. Louis, Mo. Auk 15: 22-27.


1-5
BEDROCK OBSTACLES
MRM 79.4, 79.1(L), 79.1(R)
JACKSON COUNTY
COUNTY LINE
MISSOURI
PERRY COUNTY
ILLINOIS
UNION COUNTY
CAPE GIRARDEAU COUNTY
Devils Bake Oven
Tower Rock
Grand Tower
GRAND TOWER ISLAND
TOWER ISLAND CUT
BIG MUDDY ISLAND
HALF MOON ISLAND
BIG MUDDY RIVER
Apple Creek
Gerler
Wilson Ldg
Hines Ldg
Hines Landing
Preston
Sheffield
Luzerne Rock
Lovejoy
Crawford Ldg
(Lovejoy Ldg)
Bennett Ldg
CRAWFORD TOWHEAD
MISSISSIPPI RIVER
Hanging Dog Rock
HANGING DOG ISLAND
Neely Ldg
Neelys Landing
Devils Tea Table
SOUTH SAN FRANCISCO
Barrettville
VANCIL TOWHEAD
Vancill Ldg
BOAT HARBOR
Willard Ldg
Moccasin Springs
Sheppard Point
ILLINOIS CENTRAL MISSOURI PACIFIC
LEGEND
Existing revetment
Existing dikes
Levee
River mileage originates at mouth of Ohio River
RIVER AND HARBOR PROJECT
MISSISSIPPI RIVER
BETWEEN THE
OHIO AND MISSOURI RIVERS
MILE 63.9 TO MILE 80.9
1000 0 1000 2000 METERS
4000 0 4000 8000 FEET
U. S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI
30 SEPTEMBER 1983

ENCL 1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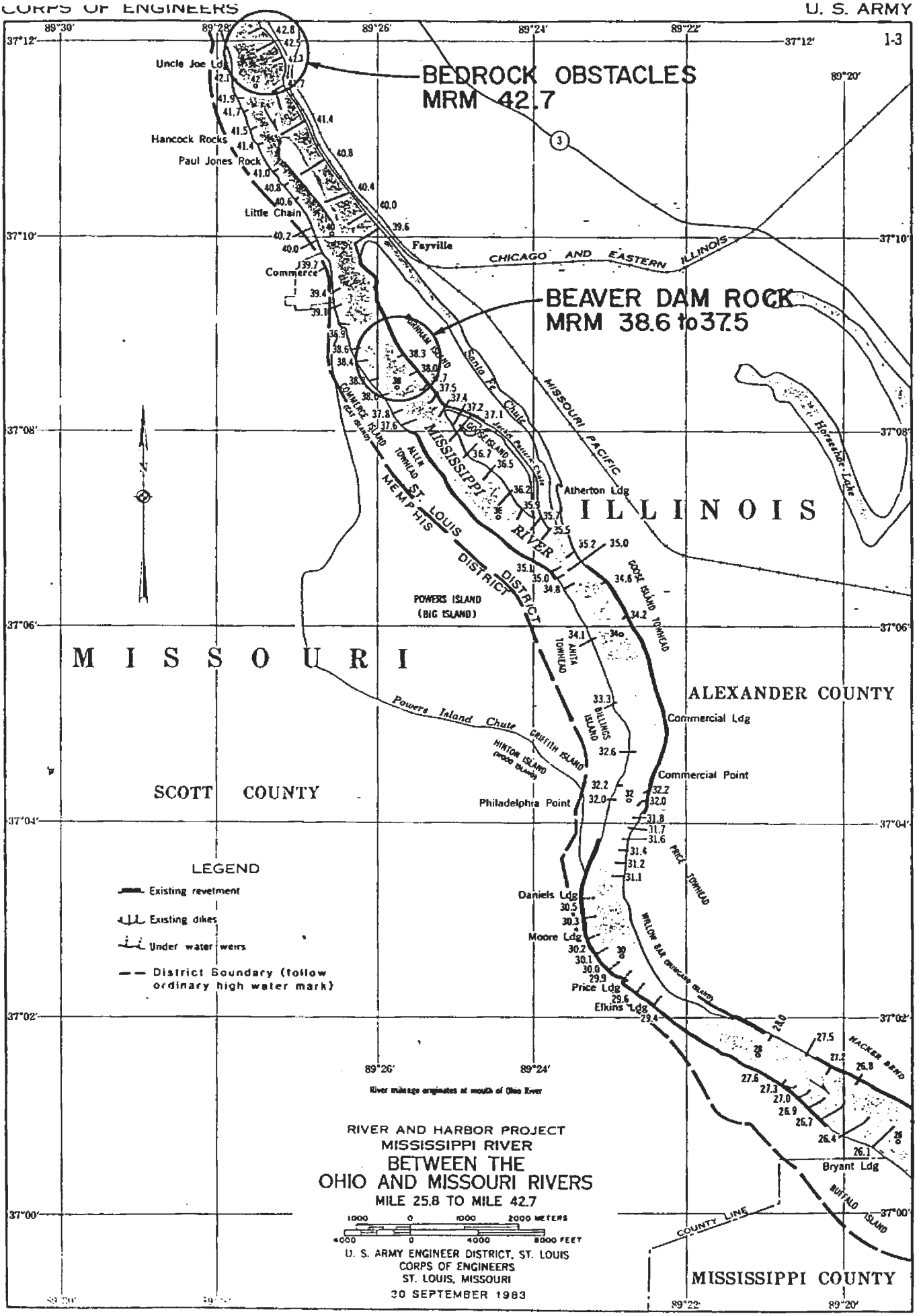
89°30'
89°28'
89°26'
89°24'
37°24'
37°22'
37°20'
37°18'
37°16'
37°14'
N
CAPE GIRARDEAU COUNTY
MISSOURI
UNION COUNTY
ALEXANDER COUNTY
ILLINOIS
SCOTT COUNTY
Bainbridge
Hamburg Ldg
Schenimann
Poe Ldg
Kinney Point
Cape Rock
Minton Point
DEVILS ISLAND
PICAYUNE ISLAND
Cape Girardeau
East Cape Girardeau
College Point
GIBONEY ISLAND
MEASLES FIELD
COUNTY LINE
DUSTY BAR
SWIFTSURE TOWHEAD
HAMBURG ISLAND
ST. LOUIS-SAN FRANCISCO
MISSISSIPPI RIVER
ILLINOIS CENTRAL
MISSOURI PACIFIC
CAPE BEND
LITTLE RIVER DIVERSION CHANNEL
Grays Point
Gale
ROCK ISLAND
Graysboro
Dorrity Ldg
(Mannings Ldg)
Thebes
SOUILL S MO BRIDGE
MO PAC
Counterfeit Rock
ST. LOUIS DISTRICT
MEMPHIS DISTRICT
BEDROCK OBSTACLES
MRM 45.6, 45.3
BEDROCK OBSTACLES
MRM 43.8, 43.5
LEGEND
Existing Revetment
Existing Dikes
District Boundary (follow ordinary high water mark)
River mileage originates at mouth of Ohio River
RIVER AND HARBOR PROJECT
MISSISSIPPI RIVER
BETWEEN THE
OHIO AND MISSOURI RIVERS
MILE 42.7 TO MILE 63.9
1000 0 1000 2000 METERS
4000 0 4000 8000 FEET
U. S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI
30 SEPTEMBER 1983

ENCL 2


1-3
BEDROCK OBSTACLES
MRM 42.7
BEAVER DAM ROCK
MRM 38.6 to 37.5
Uncle Joe Ldg
Hancock Rocks
Paul Jones Rock
Little Chain
Fayville
Commerce
CHICAGO AND EASTERN ILLINOIS
Santa Fe Chute
MISSOURI PACIFIC
Horseshoe Lake
Atherton Ldg
ILLINOIS
MISSISSIPPI RIVER
MEMPHIS ST. LOUIS DISTRICT
POWERS ISLAND (BIG ISLAND)
MISSOURI
ALEXANDER COUNTY
Powers Island Chute
Commercial Ldg
Commercial Point
Philadelphia Point
SCOTT COUNTY
Daniels Ldg
Moore Ldg
Price Ldg
Elkins Ldg
Bryant Ldg
COUNTY LINE
MISSISSIPPI COUNTY
LEGEND
Existing revetment
Existing dikes
Under water weirs
District Boundary (follow ordinary high water mark)
River mileage originates at mouth of Ohio River
RIVER AND HARBOR PROJECT
MISSISSIPPI RIVER
BETWEEN THE
OHIO AND MISSOURI RIVERS
MILE 25.8 TO MILE 42.7
1000 0 1000 2000 METERS
4000 0 4000 8000 FEET
U. S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS
ST. LOUIS, MISSOURI
30 SEPTEMBER 1983

ENCL 3