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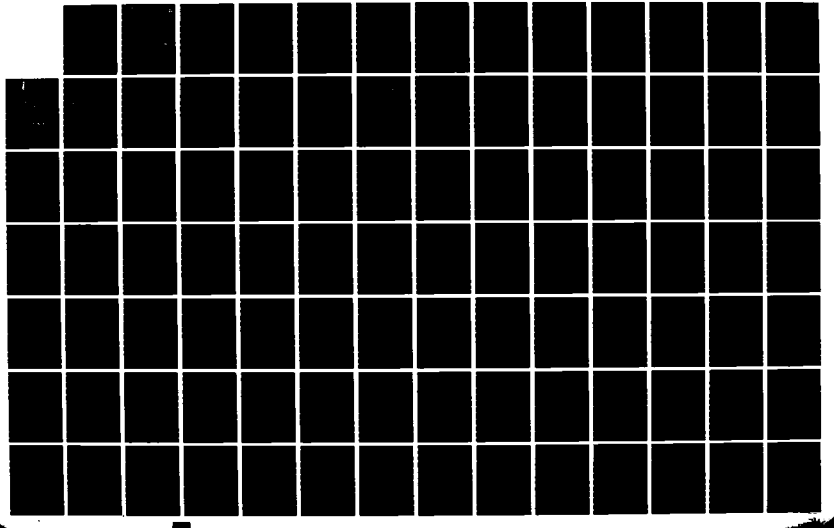

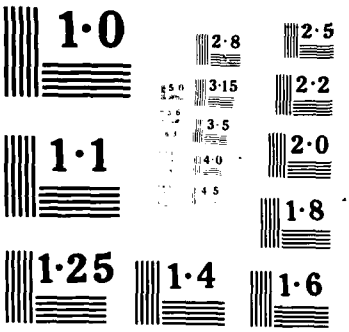
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US Army Corps
of Engineers
St Paul District

DESIGN ANALYSIS REPORT AND FINAL SUPPLEMENT ENVIRONMENTAL IMPACT STATEMENT FOR LOWER POOL 5 CHANNEL MAINTENANCE/WEAVER BOTTOMS REHABILITATION PLAN ON THE UPPER MISSISSIPPI RIVER

MAY 1986

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MISSISSIPPI RIVER
CHANNELS (WATERWAYS)
DREDGING

20 ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

One of the main products of the GREAT I study was a 40-year channel maintenance program for the Mississippi River. The project discussed in this report would implement the general channel maintenance plan for lower pool 5 on the Mississippi River, including rehabilitation of the 4,000 acre backwater lake, Weaver Bottoms. The primary objectives are to develop a 40-year channel maintance plan for lower pool 5, reduce maintenace dredging requirements and restore the habitat quality to the Weaver Bottoms area.

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DESIGN ANALYSIS REPORT
LOWER POOL 5 CHANNEL MAINTENANCE/
WEAVER BOTTOMS REHABILITATION PLAN
ON THE UPPER MISSISSIPPI RIVER

GREAT I IMPLEMENTATION
9-FOOT CHANNEL PROJECT
UPPER MISSISSIPPI RIVER

ST. PAUL DISTRICT, CORPS OF ENGINEERS
1135 U.S. POST OFFICE AND CUSTOM HOUSE
ST. PAUL, MINNESOTA 55101-1479

REGION 3, U.S. FISH AND WILDLIFE SERVICE
FEDERAL BUILDING, FORT SNELLING
TWIN CITIES, MINNESOTA 55111-4056

MAY 1986

FINAL SUPPLEMENT
ENVIRONMENTAL IMPACT STATEMENT
LOWER POOL 5 CHANNEL MAINTENANCE/
WEAVER BOTTOMS REHABILITATION PLAN
ON THE UPPER MISSISSIPPI RIVER

St. Paul District, Corps of Engineers
1135 U.S. Post Office and Custom House
St. Paul, Minnesota 55101-1479

Region 3, U.S. Fish and Wildlife Service
Federal Building, Fort Snelling
Twin Cities, Minnesota 55111-4056

FINAL SUPPLEMENT
ENVIRONMENTAL IMPACT STATEMENT
LOWER POOL 5 CHANNEL MAINTENANCE/
WEAVER BOTTOMS REHABILITATION PLAN
ON THE UPPER MISSISSIPPI RIVER

The responsible lead agency is the U.S. Army Engineer District, St. Paul, Minnesota. The U.S. Fish and Wildlife Service, Region 3, St. Paul, Minnesota, is a cooperating agency for the project.

Abstract: The 9-foot navigation channel on the Upper Mississippi River was authorized by the Rivers and Harbors Act of July 3, 1930, and other legislation. The Great River Environmental Action Team (GREAT) I study was organized in 1973 to identify and assess the problems associated with multipurpose use of the Mississippi River. One of the main products of the GREAT I study was a 40-year channel maintenance plan for the river. The project discussed in this supplement would implement the general channel maintenance plan for lower pool 5 on the Upper Mississippi River, including the rehabilitation of the 4,000-acre backwater lake, Weaver Bottoms. The primary objectives of the project are to develop a 40-year channel maintenance plan for lower pool 5, reduce maintenance dredging requirements in lower pool 5, and restore the habitat quality to the Weaver Bottoms area, by modifying side channels and constructing islands with maintenance-dredged material.

Two final environmental impact statements, the Final Environmental Impact Statement, Operations and Maintenance, 9-foot Navigation Channel, Upper Mississippi River, Head of Navigation to Guttenberg, Iowa (1974), and the Final Environmental Impact Statement, Great River Environmental Action Team I, Study of the Upper Mississippi River, Guttenberg, Iowa, to the Head of Navigation at Minneapolis, Minnesota (1980), cover general operation and maintenance activities on the Upper Mississippi River. However, neither of these documents adequately covers the project proposed in this document. Therefore, this supplement has been prepared to address the significant impacts resulting from the proposed plan and to fulfill requirements of the (1) National Environmental Policy Act of 1969, as amended, (2) Section 404(b)(1) of the Clean Water Act of 1977, and (3) applicable Corps of Engineers regulations and guidance. The supplement consists of two major parts: (1) an evaluation of the significant environmental impacts that would be expected to result from construction and operation of the alternatives considered in detail, and (2) a Section 404(b)(1) evaluation of the fill activities associated with the project.

If you wish further information concerning this supplement, please contact:

Mr. Wayne Knott
U.S. Army Engineer District, St. Paul
1135 U.S. Post Office and Custom House
St. Paul, Minnesota 55101-1479
FTS Telephone 725-7745
Commercial Telephone 612-725-7745

Mr. Richard Berry
U.S. Fish and Wildlife Service
Room 101, 51 East Fourth Street
Winona, Minnesota 55987
Commercial Telephone 507-452-4232

Send your comments on the final supplement to the St. Paul District Engineer within 30 days of the notice of availability published in the Federal Register. That notice should appear 1 or 2 weeks after the initial distribution of this document.

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INTRODUCTION

BACKGROUND

The Great River Environmental Action Team (GREAT) I study was organized in 1973 to identify and assess the problems associated with multipurpose use of the Mississippi River and to develop recommendations for improved management of the river resources. The study team, under the leadership of the Corps of Engineers and the U.S. Fish and Wildlife Service, was composed of State and Federal agencies that have management responsibility on the river. Public involvement in the study was also emphasized. One of the areas investigated by the Fish and Wildlife Work Group of GREAT I was the apparent degradation of several large backwater areas, especially the Weaver Bottoms, a 4,000-acre backwater lake in pool 5 of the Upper Mississippi River. Within the last 20 years, the Weaver Bottoms has changed from a highly productive backwater marsh to a less productive riverine lake with marsh vegetation only on the perimeters. The Weaver Bottoms was studied extensively in 1975 and 1977 to determine what could be done to restore its habitat values. Results of the study indicated that the Weaver Bottoms could be rehabilitated substantially by modifying side channels and by building barrier islands to reduce wind fetch. This study and the recommended actions are in Fremling et al. (1976) and Nielson et al. (1978).

In September 1980, the GREAT I final report was released. The primary product of this study is a channel maintenance plan that provides site-specific recommendations for dredged material disposal over the 40-year period 1986-2025. The recommended plan for lower pool 5 is to use dredged material to make side channel modifications and to create barrier islands for wind fetch reduction in the Weaver Bottoms. In June 1981, the St. Paul District, Corps of Engineers, completed a plan for implementing the GREAT I recommendations; and in July 1981, the District issued a public notice. In March 1982, the plan was approved with comments by the Board of Rivers and Harbors. The plan for implementing the GREAT I recommendations listed the channel maintenance plan (which includes the lower pool 5 channel

maintenance/Weaver Bottoms rehabilitation plan) as a high priority for implementation.

The Weaver Bottoms area is part of the Upper Mississippi River National Wildlife and Fish Refuge, administered by the U.S. Fish and Wildlife Service. The U.S. Fish and Wildlife Service is a cooperating agency for the project.

LOCATION AND DESCRIPTION

The Weaver Bottoms is a 4,000-acre riverine lake in pool 5 of the Upper Mississippi River approximately midway between locks and dams 4 and 5 (figure 1). It is on the Minnesota (right descending) side of the Mississippi River, just across the river from Buffalo City, Wisconsin, and the Belvidere Slough and Lost Island backwater/side channel areas. The Whitewater River discharges into the Weaver Bottoms (figure 2).

The Weaver Bottoms is a former lowland floodplain that was inundated by lock and dam 5 of the 9-foot channel project. Formerly hay meadows and bottomland woods, the Weaver Bottoms became a marshy backwater of significant value to fish and wildlife. In recent years, however, this backwater has been filling with sediment and has evolved into a large riverine lake with marsh vegetation only around its perimeters.

PROJECT PURPOSE

The lower pool 5 channel maintenance/Weaver Bottoms rehabilitation plan has three main purposes:

1. To develop a 40-year plan for material dredged from lower pool 5 during channel maintenance.

2. To reduce dredging requirements in lower pool 5.

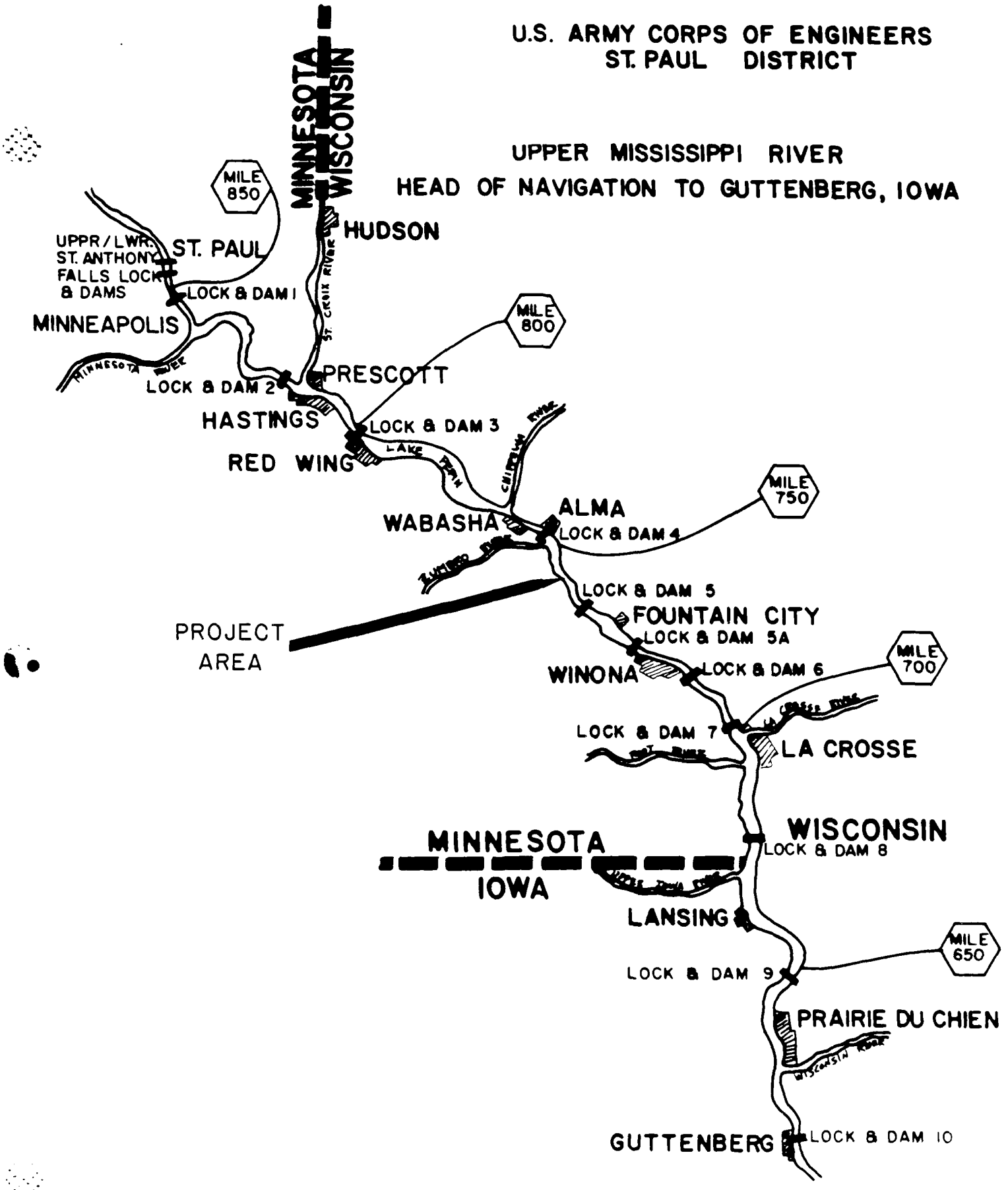
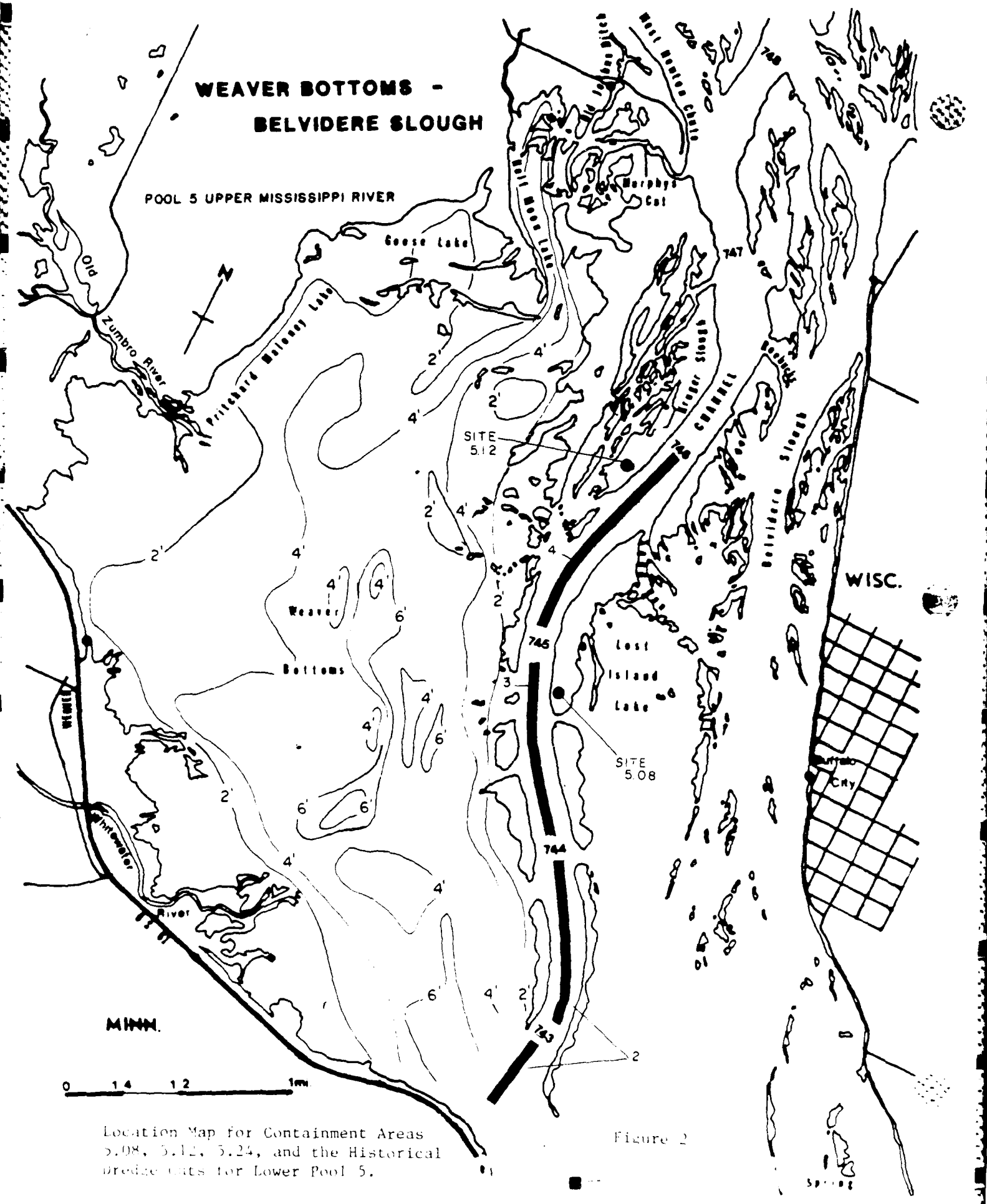

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
UPPER MISSISSIPPI RIVER
HEAD OF NAVIGATION TO GUTTENBERG, IOWA
MINNESOTA
WISCONSIN
MILE 850
HUDSON
ST. CROIX RIVER
UPPR/LWR ST. ANTHONY FALLS LOCK & DAMS
ST. PAUL
LOCK & DAM 1
MINNEAPOLIS
MILE 800
MINNESOTA RIVER
PRESCOTT
LOCK & DAM 2
HASTINGS
LOCK & DAM 3
LAKE PEPIN
CHIPPEWA RIVER
RED WING
MILE 750
ALMA
WABASHA
LOCK & DAM 4
ZUMBRO RIVER
LOCK & DAM 5
FOUNTAIN CITY
LOCK & DAM 5A
PROJECT AREA
WINONA
LOCK & DAM 6
MILE 700
LOCK & DAM 7
LA CROSSE
LA CROSSE RIVER
BLACK RIVER
WISCONSIN
MINNESOTA
LOCK & DAM 8
IOWA
BLACK HAWK PARK
LANSING
MILE 650
LOCK & DAM 9
PRAIRIE DU CHIEN
WISCONSIN RIVER
GUTTENBERG
LOCK & DAM 10

Figure 1



Location Map for Containment Areas 5.08, 5.12, 5.24, and the Historical Dredge Cuts for Lower Pool 5.

Figure 2

3. To create and maintain a more diverse habitat within the Weaver Bottoms, thereby enhancing its use for fish and wildlife species. Specific objectives for this goal were developed by the Fish and Wildlife Work Group of the Channel Maintenance Forum and by the U.S. Fish and Wildlife Service.

MOST PROBABLE FUTURE WITHOUT THE REHABILITATION PROJECT

This section compares the Weaver Bottoms rehabilitation project to what is considered the most probable future without the project (MPFWOP) (also see table 1). The MPFWOP (which is more fully described in supporting document B) was developed based upon past dredging experience and existing regulations.

Basically, the channel maintenance plan for the MPFWOP is similar to that of the Weaver Bottoms project. The plan for both is to excavate existing dredged material placement sites that are filled or near capacity and that cannot be expanded under existing State and Federal environmental laws and regulations.

Once unloaded, these sites would be reused when channel maintenance dredging is necessary (see figure 2).

The differences between the two options lie in where the excavated material would be transferred and what benefits it would provide at the new location. Under the MPFWOP, the material would be relocated to placement site 5.24, which is the designated site for the upper pool 5 dredge cuts. Site 5.24 is located off the main channel at the upstream end of West Newton Chute. The property is privately owned and in agricultural use. If lower pool 5 dredged material is also placed on site 5.24, an additional 55 acres would be required. Implementation of the Weaver Bottoms project would use the material for construction of side channel closures and islands in the backwaters.

The overall advantages and benefits of the Weaver Bottoms project versus the MPFWOP are summarized in table 1. The Weaver Bottoms project is predicted to reduce dredging requirements by 266,500 cubic yards over a 40-year period. This reduction would result from increased main channel discharge and sediment

transport efficiency caused by the side channel closures. The excavated material would have to be transported a shorter distance with the Weaver Bottoms project, and the transport could be done hydraulically instead of mechanically. Even though the Weaver Bottoms project would involve rock protection and other features, it is more cost effective than transporting the material to site 5.24. The reduced dredging requirements combined with the shorter transport distance and the capability to dredge hydraulically instead of mechanically would result in a $1.1 million cost savings with the Weaver Bottoms project.

Table 1. Comparison of MPFWOP to Weaver Bottoms Project

Item	Weaver Bottoms	MPFWOP
1. Reduced dredging	-266,500 cys	0
2. Cost difference	0	+1.1 million
3. Land acquisition	0	55.0 acres
4. Beneficial use of dredged material	1,659,500 cys	0
5. Aquatic habitat restored or maintained	4,000.0 acres	0
6. Weaver Bottoms sedimentation control	+	0

The Weaver Bottoms project would not require land acquisition while the MPFWOP would need 55.0 acres of land now in agricultural use. The MPFWOP would not achieve any beneficial use of dredged material, but the Weaver Bottoms project would use the material productively to restore and preserve a 4,000-acre backwater. The project would drastically reduce sedimentation into the Weaver Bottoms, and it would restore habitat to earlier conditions.

The Weaver Bottoms project is a unique opportunity for integrating the management of commercial navigation with fish and wildlife management to the benefit of both resources. It is a project that would have national importance and that could serve as an example for future endeavors. The St. Paul District and the U.S. Fish and Wildlife Service have determined that using channel maintenance dredged material for rehabilitating the Weaver Bottoms would be economically justified; would provide the best balance of

economic, environmental, and social values; and would be in the best interest of the public.

ORGANIZATION OF THE REPORT

The major intent of this planning report is to identify and evaluate alternative means of rehabilitating the Weaver Bottoms area using dredged material from lower pool 5. Then, based on the results of this evaluation, an alternative can be selected and an implementation plan can be developed.

The report is divided into three basic sections that discuss the GREAT I-recommended plan, the alternative plans, and the recommended plan, including the implementation plan for the recommended plan.

The first section describes and discusses the plan as initially described by GREAT I. The Alternative Plans section describes the various alternatives that were considered, and it summarizes the environmental, cultural, hydraulic, operational, cost, and recreational effects of each alternative. The Recommended Plan section summarizes the recommended plan and provides the rationale for the selection. The Implementation subsection addresses the aspects of the recommended plan that would be implemented by the St. Paul District, and it discusses potential implementation of other aspects of the recommended plan by other Federal and State resource management agencies.

Detailed technical studies were performed as necessary to provide background information and to assist in the formulation and evaluation of alternatives. These studies are either in the volume of supporting documents for this report or they are separate studies available for inspection at the St. Paul District office.

GREAT I-RECOMMENDED PLAN

GREAT I conditionally recommended implementing the Weaver Bottoms rehabilitation project through the use of dredged material from the lower four

historical dredge cuts in pool 5 over the 40-year planning period. The condition for implementing the project is listed as Further Study Item 21: "The Weaver Bottoms rehabilitation proposal (Nielson et al., 1978) should be implemented when it can be documented that the impacts, including those on flood stages, water quality, biological productivity, and sedimentation, are acceptable to the affected States and Federal agencies." The following sections summarize the project recommended by GREAT I.

SIDE CHANNEL MODIFICATIONS

GREAT I recommended partial closing dams at Murphy's Cut (site MN 3), Botsford's Cut (MN 6), and the old mouth of the Zumbro River (MN 10) (figure 3). Complete blocking dams armored with riprap were recommended at MN 4 and MN 5 (figure 3). Dredged material blocking dams with riprapped facings were recommended at MN 7, MN 11, MN 12, and MN 13 (figure 3).

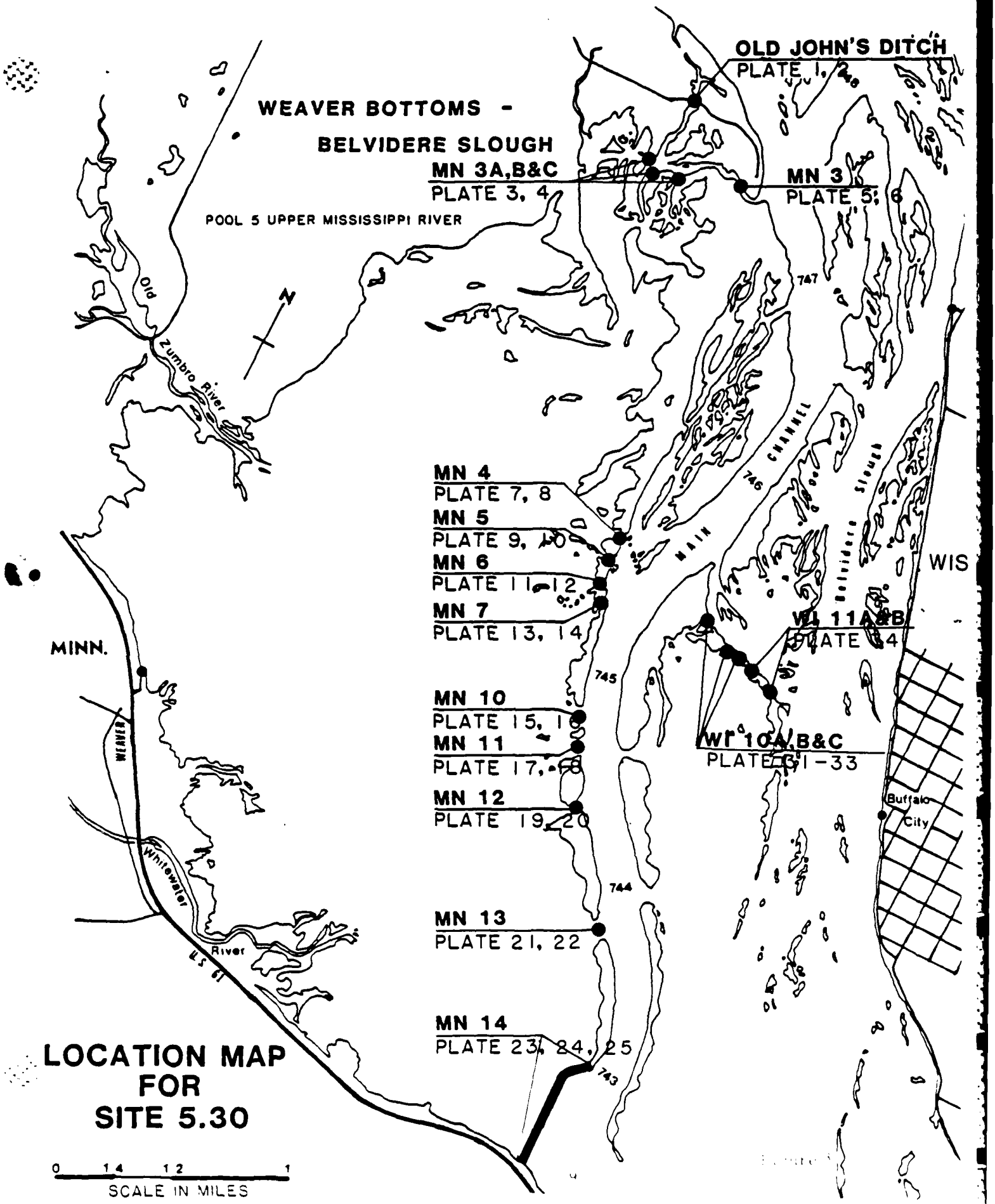
Under the GREAT I-recommended plan, dredged material would be used as it became available to construct the side channel modifications during the first 6 years of the plan.

WIND FETCH REDUCTION

Presently, because of the orientation of the pool, the prevailing summer wind direction, and the open nature of the habitat in lower pool 5, wind-generated waves within Weaver Bottoms cause significant disturbances of bottom sediments, water quality, and the aquatic community. GREAT I did not develop any plans to reduce wind fetch. GREAT I recommended that, during the time the side channel modifications were being made, hydraulic and environmental investigations should be conducted to develop the best plan.

ALTERNATIVE PLANS

Five alternative plans (A, B, C, D, and E) were evaluated for improving the habitat of Weaver Bottoms through construction of side channel closures and


OLD JOHN'S DITCH
PLATE 1, 2
WEAVER BOTTOMS -
BELVIDERE SLOUGH
MN 3A,B&C
PLATE 3, 4
MN 3
PLATE 5, 6
POOL 5 UPPER MISSISSIPPI RIVER
Old Zumbro River
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MN 4
PLATE 7, 8
MN 5
PLATE 9, 10
MN 6
PLATE 11, 12
MN 7
PLATE 13, 14
MAIN CHANNEL
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Slough
WIS
MINN.
WI 11A&B
PLATE 24
745
MN 10
PLATE 15, 16
MN 11
PLATE 17, 18
WI 10A,B&C
PLATE 31-33
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PLATE 19, 20
Buffalo City
Weaver
Whitewater River
744
MN 13
PLATE 21, 22
U.S. 61
MN 14
PLATE 23, 24, 25
743
LOCATION MAP
FOR
SITE 5.30
0 1/4 1/2 1
SCALE IN MILES

barrier islands with dredged material from lower pool 5 (cuts 1, 2, 3, and 4) in accordance with GREAT I. Alternative A is the GREAT-recommended plan. Alternative B is the plan recommended by the original investigators (Fremling et al., 1976). The remaining three alternatives (C, D, and E) were formulated by the St. Paul District, in coordination with the affected resource agencies.

The project is anticipated to be constructed in two phases. In phase I, all the side channel modifications and two of the barrier islands would be created. In phase II, the remaining islands would be constructed unless unacceptable adverse impacts are occurring because of phase I construction. This type of approach is being used for two reasons. One reason is cost, because this approach would allow the cost to be split over a number of years. The other reason is that habitat responses to physical manipulations are difficult to predict and the phased approach would allow monitoring and evaluating of the habitat responses to a number of project features prior to construction of the completed project. Additional or alternative measures to minimize any adverse impacts and/or to maximize environmental enhancement would be identified and considered for implementation in phase II. Further, there may be a need to modify project features constructed in phase I if the monitoring effort indicates that undesirable effects are occurring.

ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION

Side Channel Modifications

One item considered initially, based on comments from other agencies, was the notching or removal of a wing dam at the mouth of Murphy's Cut, to eliminate the funneling of sediment into Murphy's Cut. Records of a wing dam constructed in this area were not found. Surveys of this area also were not able to locate this wing dam structure. Therefore, this item was eliminated from any further consideration.

Another item suggested by other agencies was the construction of a wing dam immediately upstream of the mouth of Murphy's Cut, to direct flow and sediment

away from Murphy's Cut. This action was not considered any further for two reasons: (1) the closing structures would accomplish the intended purposes better; and (2) the wing dam would reduce the amount of coarse sand coming into Murphy's Cut, but, without reducing flows into Murphy's Cut, it would have little impact on fine sand and silt input.

Wind Fetch Reduction

Initially, numerous alternative island designs were considered. These included a greater number of smaller islands of similar design, a series of straight-line islands that would divide the Weaver Bottoms into compartments, and other alternative designs. However, by mutual consent of all the affected resource agencies, the islands were designed to maximize fish and wildlife values and to maximize the reduction in wind fetch from a variety of wind directions. Appendix A contains some of the island designs (plates 26-30) and explains the rationale for these designs.

DESCRIPTION OF ALTERNATIVES

Alternative A - GREAT I CMP

This alternative is the GREAT I Channel Maintenance Plan for the Weaver Bottoms modified to include development of seven islands (see figure 3, tables 2 and 3, and appendix A, plates 26 through 30).

MN 3, 6, and 10 would be partial closing structures consisting of dredged materials completely covered with 30 inches of rockfill. Each structure would extend across the width of the cut and would have a 30-foot-wide by 400-foot-long channel bottom that would be 4 feet below flat pool, with side slopes of 2.5 horizontal (H) to 1 vertical (V). The top of the structure would be 3 feet above flat pool (see appendix A, plates 5, 6, 11, 12, 15, and 16).

Table 2. Features of the Five Alternative Plans

Channel alternative	Old John's Ditch	WI 11A, 11B, 10A	WI 10B, 10C	MN 3	MN 4	MN 5	MN 6	MN 7	MN 10	MN 11	MN 12	MN 13	MN 14	Barrier islands (No.)
A		Open, stabilize with rockfill	Dredged material closure	Partial closing structure	Rock closure	Rock closure	Partial closing structure	Dredged material closure	Partial closing structure	Dredged material closure	Dredged material closure	Dredged material closure		7
B	Reopened culverts installed	Open, stabilize with rockfill	Dredged material closure	Partial closing structure	Rock closure	Rock closure	Partial closing structure	Open, stabilize with rockfill	Partial closing structure	Dredged material closure	Dredged material closure	Dredged material closure		7
C		Open, stabilize with rockfill	Dredged material closure	3 closure structures with culverts	Rock closure	Rock closure	Partial closing structure	Dredged material closure	Partial closing structure	Dredged material closure	Dredged material closure	Dredged material closure		7
D		Open, stabilize with rockfill	Dredged material closure	Partial closing structure	Rock closure	Rock closure	Partial closing structure	Dredged material closure	Partial closing structure	Dredged material closure	Dredged material closure	Dredged material closure	Partial closing structure	6
F		Open, stabilize with rockfill	Partial closing structure	3 closure structures with culverts	Rock closure	Rock closure	Partial closing structure	Dredged material closure	Partial closing structure	Dredged material closure	Dredged material closure	Dredged material closure	Partial closing structure	6

Notes:
1. Partial closing structure: Closure constructed out of dredged material and all surfaces rockfilled. Includes open channel for boat access.
2. Rock closure: Complete closure constructed of rock. No boat access.
3. Dredged material closure: Complete closure constructed from dredged material. No boat access.
4. Open, stabilize with rockfill: 30 inches of rockfill for channel protection.

Table 3. Quantities of Materials Placed per Alternative for Weaver Bottoms.

Alternative	Site	Cut number	Quantities Placements per structure Cut	Dredged	Rock	Fill depth	Acres	Remarks
A	WI 10A				1,750**			
	WI 10B and C			2,000		4	0.6	
	WI 11A and B				5,750**	NA		
	MM 3	1	136,500	19,000	14,750	3	1.9	
	MM 4	2	332,000		2,100*	3	0.1	
	MM 5	3	520,000		2,000*	3	0.2	
	MM 6	4	671,000	23,000	8,000	3	2.1	
	MM 7			34,000		12	2.4	
	MM 10			55,000	26,000	3	8.5	
	MM 11			70,000		12	4.8	
	MM 12			55,000		12	5.0	
	MM 13			42,000		12	3.0	
	7 Islands			1,361,500	13,000	10	68.8	
				56,000				(1)
Totals			1,659,500	1,659,500	73,350		96.8	
	WI 10A				1,750**			
	WI 10B and C			2,000		4	0.6	
	WI 11A and B				5,750**	NA		
	Old John's Ditch					NA		(2)
	MM 3			19,000	14,750	3	1.9	
	MM 4				2,100*	3	0.1	
	MM 5				2,000*	3	0.2	
	MM 6			23,000	8,000	3	2.4	
	MM 7				7,000**	NA	2.4	
	MM 10			55,000	26,000	3	8.5	
	MM 11			70,000		12	4.8	
	MM 12			55,000		12	5.0	
	MM 13			42,000		12	3.0	
	7 Islands			1,395,500	13,000	10	70.5	
				56,000				(1)
Totals				1,659,500	80,350		98.5	
C	WI 10A				1,750			
	WI 10B and C			2,000		4	0.6	
	WI 11A and B				5,750**	NA		
	MM 3				7,250			
	MM 3A			400	375	2	0.1	(3)
	3B			500	500	2	0.1	(3)
	3C			400	375	2	0.1	(3)
	MM 4				2,100*	3	0.1	
	MM 5				2,000*	3	0.2	
	MM 6			23,000	8,000	3	2.1	
	MM 7			34,000		12	2.4	
	MM 10			55,000	26,000	3	8.5	
	MM 11			70,000		12	4.8	
	MM 12			55,000		12	5.0	
	MM 13			42,000		12	3.0	
	7 Islands			1,379,200	13,000	10	69.7	
				56,000				(1)
Totals				1,659,500	67,100		96.1	
D	WI 10A				1,750**			
	WI 10B and C			2,000		4	0.6	
	WI 11A and B				5,750**	NA		
	MM 3			19,000	14,750	3	1.9	
	MM 4				2,100*	3	0.1	
	MM 5				2,000*	3	0.2	
	MM 6			23,000	8,000	3	2.1	
	MM 7			34,000		12	2.4	
	MM 10			55,000	26,000	3	8.5	
	MM 11			70,000		12	4.8	
	MM 12			55,000		12	5.0	
	MM 13			42,000		12	3.0	
	MM 14			340,000	30,000	1	31.8	
	6 Islands			1,021,500		10	51.6	
				48,000				1
Totals				1,659,500	90,350		111.4	
E	WI 10A				1,750**			
	WI 10B and C			2,000		4	0.6	
	WI 11A and B				5,750**	NA		
	MM 3				7,250			
	MM 3A			400	375	2	0.1	(3)
	3B			500	500	2	0.1	(3)
	3C			400	375	2	0.1	(3)
	MM 4				2,100*	3	0.1	
	MM 5				2,000*	3	0.2	
	MM 6			23,000	8,000	3	2.1	
	MM 7			34,000		12	2.4	
	MM 10			55,000	26,000	3	8.5	
	MM 11			70,000		12	4.8	
	MM 12			55,000		12	5.0	
	MM 13			42,000		12	3.0	
	MM 14			340,000	30,000	1	31.8	
	6 Islands			1,039,200		10	52.5	
				48,000				(1)
Totals				1,659,500	84,100		110.7	

Notes
Fill depth is height above flat pool elevation 660.0.
Acres are at flat pool elevation 660.0.
(1) Includes 8,000 cy (6 inches capping) on each island with backwater material quantity not included in totals).
(2) Install 2 36-inch by 50-foot CMP.
(3) Install 4 36-inch by 50-foot CMP with sluice gates in gatewell
*Closure contains rock only.
**Existing opening is stabilized with rock only.

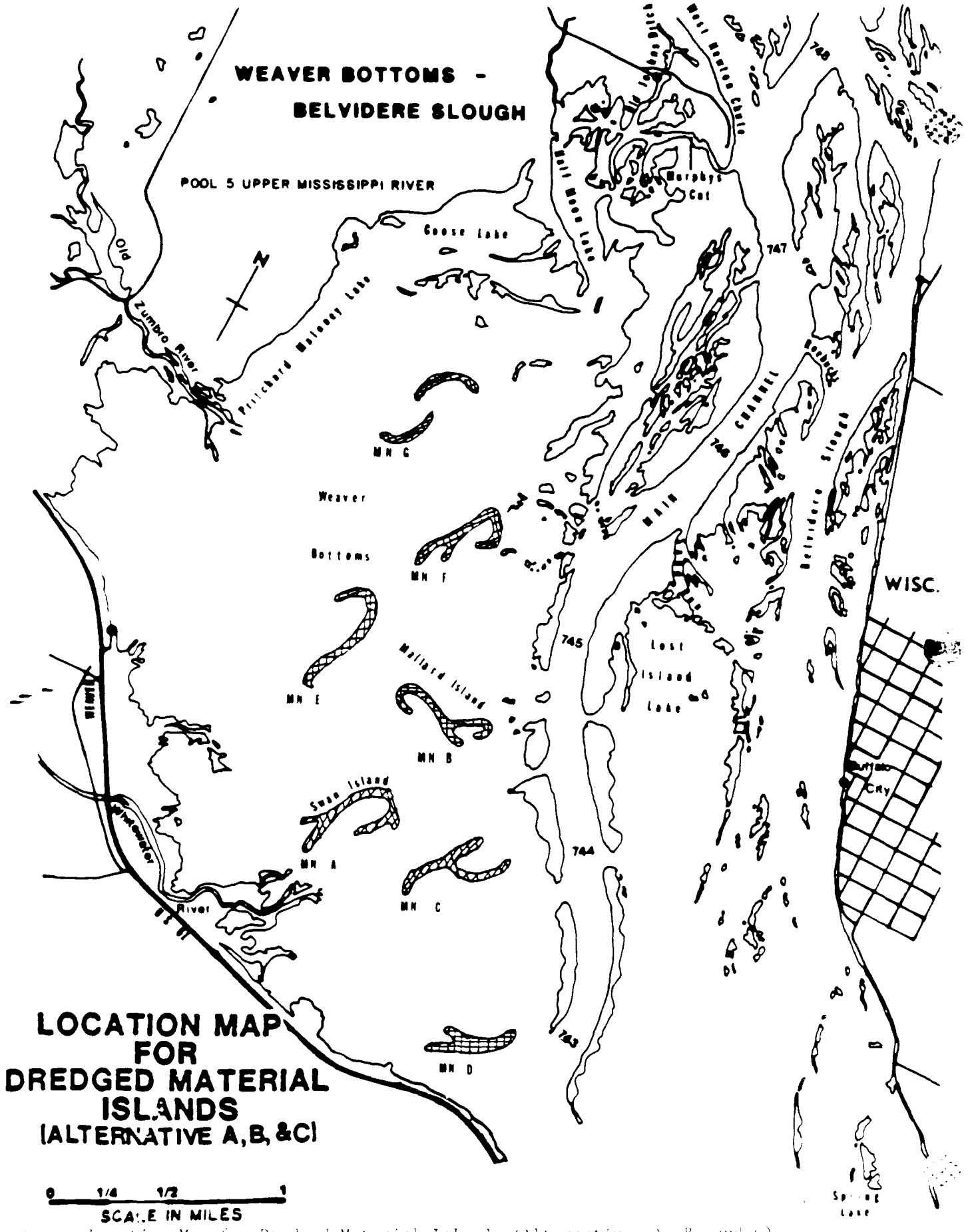


Figure 4. Location Map for Dredged Material Islands (Alternatives A, B, and C)

MN 4 and 5 would be closure structures composed entirely of rock. Typically, each structure would extend across the width of the cut and would be 20 feet wide with 2.5H to 1V slopes (see appendix A, plates 7, 8, 9, and 10).

MN 7, 11, 12, and 13 would be dredged material closures consisting entirely of dredged material. Typical closures would extend across the width of the cut and would have various widths with 4H to 1V slopes and would be 12 feet above flat pool (see appendix A, plates 13, 14, 17, 18, 19, 20, 21, and 22).

WI 10A, 10B, 10C, 11A, and 11B would be a combination of complete dredged material closures and openings stabilized with rockfill on the inlets from Sand Run into Lost Island Lake (see appendix A, plates 31-34).

Alternative B

Alternative B is the same as alternative A except that MN 7 would be left open as it exists and the bottom would be stabilized with 30 inches of rockfill. This action was proposed by the initial investigators (Fremling et al., 1976) because they felt that MN 7 was a unique side channel that should be preserved.

Circulation in Old John's Ditch would be restored by opening the mouth and installing culverts in the causeway to improve water quality in the area (see appendix A, plates 1 and 2).

Alternative C

Alternative C is the same as alternative A except that it would eliminate the partial closing structure at MN 3 and add three other structures at MN 3A, 3B, and 3C.

The three structures would consist of dredged material completely covered with 30 inches of rockfill. The three structures would extend across each of the three channels leading from Murphy's Cut into Half Moon Lake and would be 10

feet wide with slopes of 2.5H to 1V. Four culverts with slide gates would be installed in each of the structures (see appendix A, plates 3 and 4).

Alternative D

Alternative D is the same as alternative A except that it would extend the lower existing island barrier to the Minnesota mainland and would reduce the number of new islands required to six (figure 5).

MN 14 would be constructed as a partial closure similar to the three at MN 3, 6, and 10 in cross-section. The remainder of structure would be rockfill with 30 inches of rockfill or riprap on the downstream side at 2.5H to 1V slope and 20 feet wide on top of the structure. The top of the structure would be 3,675 feet wide and 1 foot above flat pool (see appendix A, plates 23, 24, and 25).

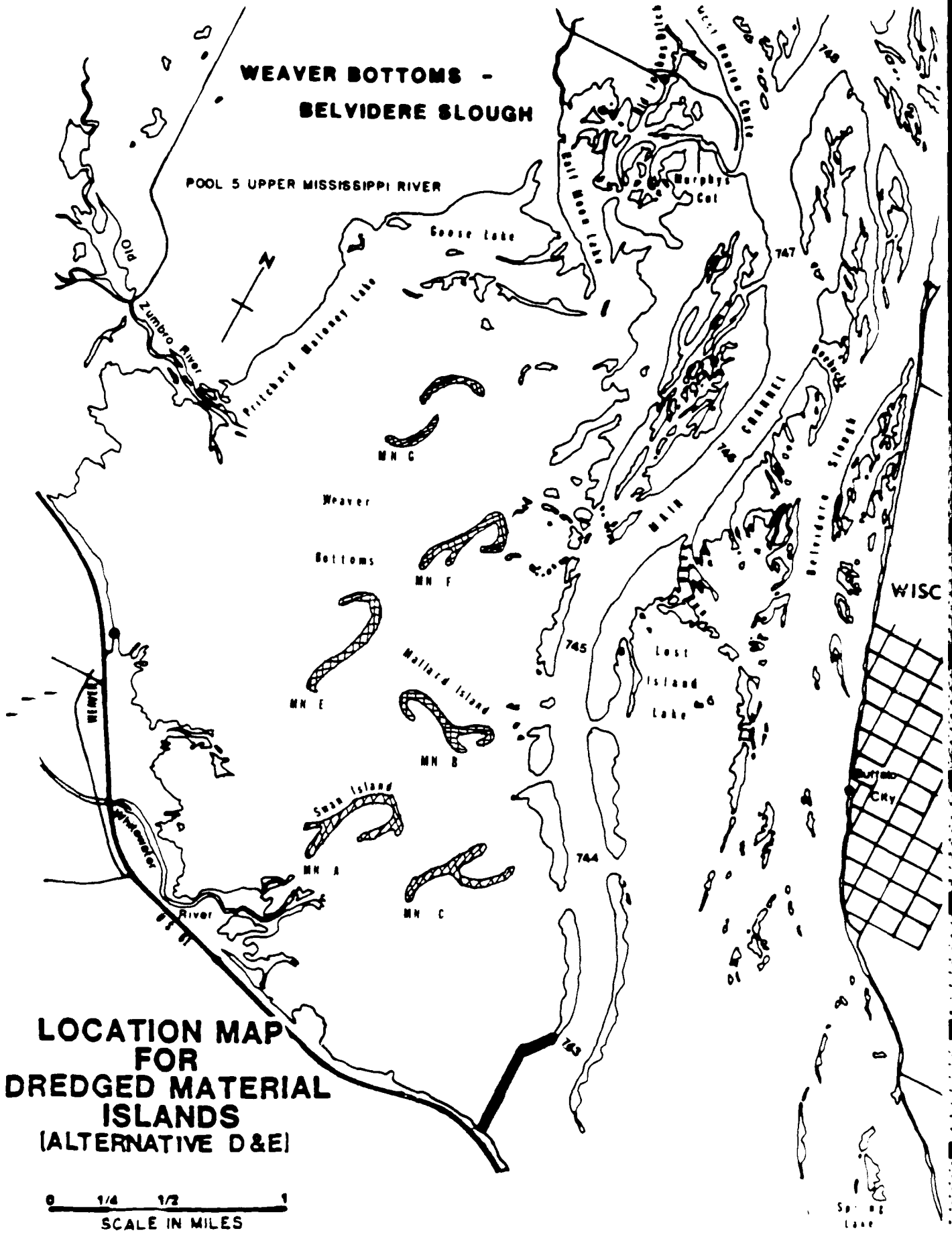
Alternative E

Alternative E is a combination of alternatives C and D, in that three structures would be constructed at MN 3A, 3B, and 3C and a partial closure would be constructed at MN 14.

SUMMARY OF THE EVALUATION OF ALTERNATIVE PLANS

Operational

Methods - Because of operational, economic, and environmental reasons, the only practical method of combining lower pool 5 channel maintenance with rehabilitation of the Weaver Bottoms is to transfer dredged material from existing containment areas 5.12 and 5.08. This method would allow efficient reuse of the historic placement sites while it achieved the benefits of rehabilitation earlier than if the material were placed directly during channel maintenance dredging.



LOCATION MAP FOR DREDGED MATERIAL ISLANDS (ALTERNATIVE D&E)

Figure 5

The rehabilitation project would be constructed in two phases. The first phase would involve modification of side channels MN 3 through MN 13 and construction either of side channel MN 14 with two islands or of just three islands. Five channels would also be modified during phase I construction, three to be stabilized with rockfill and the other two to be filled with dredged material, from Sand Run into Lost Island Lake on the Belvidere Slough side of the river. Phase II would involve construction of the remaining islands and other modifications determined necessary based on project monitoring. Phase II is tentatively scheduled to begin 3 years after construction of phase I.

The quantity of material required for phase I construction would vary by alternative, ranging between 862,000 cubic yards and 979,000 cubic yards. During phase I, at least 600,000 cubic yards would be removed from site 5.12 to restore capacity at that location. The remainder of the material required for phase I and phase II would be excavated from a combination of sites 5.12 and 5.08.

Construction would be done by contract and perhaps by some Government hired labor. The actual equipment and methods used for the project, within environmental and other constraints, would depend upon the contractor. Constraints on equipment, material-handling technology, and time periods for construction might be placed upon the contractor. The environmental and other constraints would be developed jointly by the Corps of Engineers and U.S. Fish and Wildlife Service. Cost estimates used in this report are based on excavating and transferring material with a hydraulic dredge. The exterior boundaries of the containment areas would remain intact, with the center material excavated to a maximum depth of 10 feet below low control pool elevation. Material would be pumped into the desired location and shaped with mechanical equipment. Rock placement for stabilization would be accomplished with mechanical equipment. Backwater dredging and capping of the islands may be accomplished with either mechanical equipment or a small hydraulic dredge. An influencing factor in the choice of equipment would be the environmental and other constraints placed on the backwater dredging.

Table 4
Economic Comparison of Alternatives
(1985 Prices, 8-5/8 Interest)

	ITEM	A	B	C	D	E	MPFWOP*
PHASE I	Quantity Transferred	881,500 cys	862,500 cys	870,000 cys	979,000 cys	965,000 cys	900,000 cys
(Base	Material Relocation	$2,192,700	$2,183,300	$2,138,700	$2,517,500	$2,458,500	$3,483,000
Year)	Rock Placement	1,176,000	1,288,000	1,056,000	1,448,000	1,328,000	
	Gated Culvert Installation	-	-	250,000	-	250,000	
	Backwater Dredging	84,000	84,000	84,000	49,000	49,000	
	Vegetative Stabilization	129,000	129,000	129,000	75,200	75,200	
	Mobilization/Demobilization	185,000	185,000	185,000	185,000	185,000	105,000
	Total Construction Cost	3,766,700	3,869,300	3,842,700	4,274,700	4,345,700	3,588,000
	OH, Contingencies, Profit**	1,318,400	1,354,300	1,345,000	1,496,200	1,521,000	1,255,800
	Phase I Total Cost	$5,085,100	$5,233,600	$5,187,700	$5,770,900	$5,866,700	$4,843,800
PHASE II	Quantity Transferred	778,000 cys	797,000 cys	789,500 cys	680,500 cys	694,500 cys	1,026,000 cys***
(Year 5)	Material Relocation	$1,544,400	$1,579,400	$1,565,700	$1,363,400	$1,389,100	$3,970,600
	Backwater Dredging	112,000	112,000	112,000	98,000	98,000	
	Vegetative Stabilization	172,000	172,000	172,000	150,400	150,400	
	Mobilization/Demobilization	150,000	150,000	150,000	150,000	150,000	105,000
	Total Construction Cost	1,978,400	2,013,400	1,999,700	1,761,800	1,761,800	4,075,600
	OH, Contingencies, Profit**	692,400	704,700	700,000	616,600	625,600	1,426,500
	Phase II Total Cost(Year 5)	$2,670,800	$2,718,100	$2,699,700	$2,378,400	$2,413,100	$5,502,100
	Phase II Total Cost (Discounted to Base Year @ 8-5/8%)	1,765,900	1,797,200	1,785,000	1,572,600	1,595,500	3,638,000
PROJECT	TOTAL COST	$6,851,000	$7,030,800	$6,972,700	$7,343,500	$7,462,200	$8,481,800
	UNIT COST	$4.13/cy	$4.24/cy	$4.20/cy	$4.43/cy	$4.50/cy	$4.40/cy
Ranking by Cost		1	3	2	4	5	6
Difference from Low Cost Alternative		0	$ 179,800	$ 121,700	$ 492,500	$611,200	$1,630,800
Percent Difference		0	2.6%	1.8%	7.2%	8.9%	23.8%

* Most probable future without the Weaver Bottoms rehabilitation project.

** OH - Overhead

*** Includes an additional 266,500 cys because the side channel closure effects of reducing dredging are not realized under this alternative.

Alternative Assessment - There is little difference between alternatives from an operational perspective. Table 4 is a cost comparison of the alternatives, including the most probable future without the Weaver Bottoms project (MPFWOP). The cost difference among the five alternatives is insignificant, considering the preliminary nature of the design and cost estimates (table 4). A reduction in dredging requirements is anticipated for all five alternatives but would not occur under the MPFWOP.

Several minor differences make alternative D more favorable from an operational standpoint. The closure at MN 14 would be more economical to construct an island placed further into the Weaver Bottoms because water depths are more favorable at MN 14 for equipment operation. The MN 14 closure would also use a greater amount of dredged material than an island would. At MN 3 under alternatives A, B, and D, the use of a notched closing structure is preferred over gated culverts that may be difficult to install and that would have greater operation and maintenance requirements.

Hydraulics

Hydraulic analysis of the Weaver Bottoms Rehabilitation Project used a system of two-dimensional finite element models known as TABS-2 to evaluate the changes in hydrodynamics and sedimentation that each alternative would have. The original grid was developed by the Corps of Engineers Waterways Experiment Station (WES) in Vicksburg, Mississippi. WES used the model to determine the flood stage impacts of the proposed changes, since previous estimates of the increase in flood stage ranged from negligible to almost 3 feet. Alternative D was considered to have the most impact on any flood stages because of the closure structure at the lower end of Weaver Bottoms (MN 14), so it was the only alternative modeled by WES (alternative E would have the same impacts). The results indicate that the maximum increases in stage of the 1-percent chance flood, compared to existing conditions, would be less than 0.1 foot. (The WES report is in supporting document C.)

The grid was modified for low-flow to medium-flow conditions (ranging from 13,000 cfs to 80,000 cfs), checked for reasonableness, then further modified for each alternative. The base conditions and all alternatives were run through a 1-year block hydrograph, with the hydrodynamic model and the sedimentation model run at each step.

The models clearly indicated (1) that there is essentially no difference between alternatives A and B, (2) that there are local differences within Murphy's Cut between the alternatives which include the partial closure (A, B, and D) and those which include the three closure structures with culverts (C and E), and (3) that there are differences within Weaver Bottoms between the alternatives which include the partial closure structure at MN 14 (D and E) and those which do not (A, B, and C). Leaving MN 7 open as in alternative B or closing it as in the others may have some highly localized environmental effects attributable to habitat changes, but would not make any difference in the hydraulics or sedimentation patterns in the area. The decision on MN 7 should be based on other considerations.

More significant differences would occur within the Weaver Bottoms area. Under existing conditions, the water surface within the Weaver Bottoms area has a slope. For all alternatives, the water surface would be essentially flat with the project. The difference between alternatives is in the water level that would be maintained. For those alternatives that do not include the partial closure structure at MN 14, the water surface level would be essentially equal to that at the lower end under existing conditions. Therefore, at the upper end, the water depth would be less than it is currently (reduction by less than 0.1 foot). The alternatives that include the partial closure would maintain a water surface essentially equal to the current level at the upper end of Weaver Bottoms and would increase the depth in the lower end by less than 0.1 foot. The size of the opening of the closures was designed to maintain the existing water surface in the middle and upper end of Weaver Bottoms.

Within Murphy's Cut (MN 3), alternatives C and E would raise the water surface levels over base conditions, even though they would reduce the discharge. Alternatives A, B, and D would lower the water surface compared to the base conditions, although D would not lower it as much as A or B would because of the increased water surface within Weaver Bottoms that MN 14 would cause. From a hydraulic viewpoint, it cannot be determined which situation is more desirable. Since none of these situations would materially affect conditions within Weaver Bottoms, this decision also should be based on other considerations.

All alternatives meet the objectives of reducing inflow and current velocities within Weaver Bottoms and reducing sedimentation within the Half Moon Lake area and near the side channel inlets. However, none of the alternatives would have any effect upon sedimentation from the Whitewater River. Additionally, with the lowered water level within Weaver Bottoms without the closure structure at MN 14 (alternatives A, B, and C), a large eddy would form from the river into the bottom opening. This eddy would cause sediment intrusion at the lower end that would not occur with the other alternatives (D and E).

In the Belvidere Slough area, all alternatives would have essentially similar impacts. The upper end of Belvidere Slough would be essentially unchanged from the base conditions. In the models, the lower end of the slough showed a slight amount of scour (which did not occur under base conditions), with subsequent deposition of the scoured material in the Spring Lake area. Even though the seriousness of this problem has not been determined, further analysis is attempting to determine if the problem actually exists (or if it is simply a modeling error). If the problem exists, solutions will be sought. An additional problem area, however, is in the Sand Run-Lost Island Lake area. The models indicate that the inlets into Lost Island Lake from Sand Run would experience accelerated erosion with project conditions and that this material would tend to quickly fill in Lost Island Lake. It has been determined that lining these openings with rock, with or without partial fill of some or all openings, would not only solve the problem but would prevent the erosion and

deposition that currently takes place. The difference in the two approaches to the problems outlined above is the result of the relative ease of solution to the second problem and the fact that erosion and deposition occur under baseline conditions as well.

The models indicate that all alternatives would maintain 50 percent more flow in the main channel than existing conditions, as measured in the channel below the last existing outflow point (MN 13). This increased flow would help prevent the deposition of sediment that is the cause for dredging activity in the reach. It should be noted that, under existing conditions, the deposition normally occurs under the high-flow conditions and the channel tries to scour clean again at the lower discharges. This scouring action at the lower discharges does not cause any deposition problems downstream. Therefore, it is not anticipated that any problems would be caused in this area by preventing the deposition in the first place under high-flow conditions.

Environmental/Cultural Resources

Existing Conditions - The rehabilitation project was designed to control two major environmental problems that are occurring within the Weaver Bottoms, rapid accretion of sediments and degradation of the aquatic plant community. The aquatic area of Weaver Bottoms covers approximately 4,000 acres. From shortly after impoundment in the 1930's by the 9-foot navigation project until the late 1960's, approximately three-quarters of the aquatic area of the Weaver Bottoms contained marsh vegetation (2,650 to 2,900 acres). During this time, the Weaver Bottoms contained a great diversity of habitats and species of plants and animals. However, in the late 1960's and mid-1970's, the marsh vegetation dramatically decreased. Since the mid-1970's, the amount of marsh vegetation has showed less change. In 1982, marsh vegetation covered approximately one-third of the Weaver Bottoms (1,380 acres). This dramatic decrease in marsh vegetation has been attributed to a variety of reasons, including two major floods that occurred in the late 1960's, uprooting and removal by ice, and changing flow and sedimentation patterns. The amount of marsh vegetation is likely to remain at the same level in the immediate future

and then increase as the Weaver Bottoms gradually fills in. The Weaver Bottoms is filling in at a rate of 1.3 centimeters annually (loss of depth). At this rate, within 60 years most of the Weaver Bottoms would fill in. The rehabilitation project would restore much of the habitat value of Weaver Bottoms and would preserve it for a longer period of time.

Alternative Assessment - A more detailed evaluation of the effects of the project alternatives can be found in the environmental impact statement supplement and the Section 404(b)(1) evaluation.

All of the alternatives would substantially reduce the existing sedimentation problems in Half Moon Lake and near the side channel openings into Weaver Bottoms. Alternatives D and E would reduce overall sedimentation rates the most and would preserve the area for fish and wildlife the longest. Much of the substrate within Weaver Bottoms, especially near the side channels, in the Half Moon Lake area, and in the middle of Weaver Bottoms, is predominantly sand substrate. The substrate in these areas would tend to become finer over time because of the reduction of the input of coarse sediments from the main channel, the reduction in wave erosion, and the reduction in current velocities. The organic content of the sediments should also increase, with an increase in aquatic plants. Even though flow would be reduced throughout Weaver Bottoms, adequate water circulation should be maintained in most of the area to prevent the sediments from becoming anoxic. Benthos productivity and diversity should increase as a result of these substrate changes.

The predicted minor changes in water level within Weaver Bottoms under low river discharges should not have any significant adverse impacts on the biota. Water levels would be fairly stable for alternatives A, B, and C, fluctuating by less than 0.4 foot at river flows of 80,000 cfs and less. Water levels would fluctuate with river discharge for alternatives D and E similar to what presently occurs, approximately 1 foot at river flows of 80,000 cfs and less. The more stable water surface with river discharge for alternatives A, B, and C could have both positive and negative environmental effects. The more stable water levels would have a very favorable effect on aquatic plant

growth. Some fish, such as the northern pike, depend on flooded emergent wetland vegetation for spawning. Reducing the amount of flooding of this vegetation could have some impact on these fish.

Current velocity within Weaver Bottoms would be substantially reduced, but not totally eliminated. Some water circulation would be maintained for all river discharges. The Pritchard Maloney Lake and Goose Lake areas of Weaver Bottoms (which do not receive much flow now) might be the areas most affected by the project. Dissolved oxygen problems could develop in these areas, especially during the winter. These areas presently receive much of their flow from Murphy's Cut, MN 3, which would have its discharge reduced by approximately 50 percent with the partial closure alternatives (A, B, and D). This reduced discharge is anticipated to provide sufficient flow to prevent dissolved oxygen problems, but would have to be monitored closely. The culvert alternatives (C and E) would allow better management of the flows through Murphy's Cut to ensure that dissolved oxygen problems do not develop in the Pritchard Maloney Lake and Goose Lake areas. The culverts were designed to have the capability to match existing flows through Murphy's Cut under low river discharges.

The various alternatives would initially cause similar, substantial modifications of water levels, current velocity, and sedimentation patterns in the main channel and main channel border. The effects would be reduced as the channel becomes deeper and more stable. Existing flow in the main channel bordering Weaver Bottoms is fairly low because of all the flow into the numerous side channels. With the project, the predicted current velocities for various river discharges would still be generally below what presently occurs in the main channel area immediately upstream. Riverine fauna presently using the main channel and main channel border are not likely to be significantly affected by these increases in current velocity, although some localized changes in the community may occur. Many of the rock training structures that were built for the 6-foot navigation channel project in this area are

partially or completely buried by sand. Increasing the discharge through this area could remove some of this accumulated sand, which could be beneficial to the biota of the main channel and main channel border.

Approximately a 10-percent increase in discharge through Belvidere Slough would occur for any of the alternatives considered. In the lower end of Belvidere Slough area, including the Spring Lake and Lost Island Lake areas, none of the alternatives would have any appreciable effects on water levels. However, the upper end of Belvidere Slough could experience increases in water levels that would range from slight to more substantial, depending on river discharges. For normal discharges (15,000 to 40,000 cfs), the effects on water levels in the upper end would be slight (less than 0.1 foot). The effects on water levels would increase with river discharge until the river discharge reaches the point where the existing land areas and the structures at MN 4 and MN 5 are overtopped (approximately 100,000 cfs). Above this discharge, the effects on water levels would once again become insignificant. The computer model predicted less than a 0.1-foot increase in water levels for river discharges equaling the 1-percent chance flood. The computer model has also predicted that the effects on water levels and discharges into Belvidere Slough would diminish after a few years, because the main channel would become more efficient and more of the water would pass through it. The resource analysis program (RAP) will document the actual effects on water levels and determine the accuracy of the computer model predictions.

The relatively small changes in the hydraulic conditions in the Belvidere area should not produce any significant changes in the aquatic community, although some localized adjustments to the new hydraulic regime may occur. The aquatic community in Lost Island Lake would actually benefit from the reduced deposition of the sediments and the addition of rock substrate.

Approximately 100 to 108 acres of aquatic habitat would be directly modified by any of the alternatives considered. Alternatives D and E would directly affect approximately 6 to 8 more acres than the other alternatives because of the lower closure at MN 14. Of the total acres to be affected, from 30 to 55

acres would be side channel habitat and from 50 to 70 acres would be shallow, open backwater habitat. Approximately 13 to 18 acres of the side channel habitat would be modified to partial rock closing structures that could become valuable areas for fish and other aquatic organisms. The remaining acres would be modified to terrestrial habitat.

Water quality effects from the construction and dredged material disposal would not vary substantially among the alternatives except that less material, with subsequent less disturbance of the fine bottom sediments, would be placed in the backwater area with alternatives D and E. Construction of the islands, especially capping the islands with the fine backwater material, would have the greatest potential for impacts on water quality. No toxic effects are expected from the implementation of any of the alternatives.

Opening up the mouth of Old John's Ditch and placing two culverts in the causeway with alternative B could have both positive and negative impacts on water quality. Alternative B would correct an existing dissolved oxygen problem in Old John's Ditch. However, the Zumbro River, which carries extensive amounts of suspended sediments, enters the Mississippi River immediately upstream of this area. Opening the mouth of Old John's Ditch could funnel some of the water from the Zumbro River into the upper end of Weaver Bottoms, diminishing the water quality in this area.

MN 7, under alternative B, would be left open and armored with rock. The original investigators (Fremling et al., 1976) proposed leaving MN 7 open because they felt that closing it would not significantly contribute to the reduction in discharge and sediment input into Weaver Bottoms and that it is a unique side channel that should be preserved. If left open and armored with rock, MN 7 would be very valuable fish habitat. In order to place the rock, the existing bank area would have to be significantly disrupted, temporarily diminishing its value for wildlife.

Water clarity within Weaver Bottoms is anticipated to improve with the project because of the reduced flows and decreased wave action. The improved clarity

should have a positive impact on aquatic plants, and the areal extent of the vegetated areas should increase fairly dramatically. This increase in the vegetated areas is anticipated to have a very positive effect on waterfowl, aquatic mammals such as the muskrat, and other wildlife species.

In addition to their primary goal of reducing wind fetch, the islands were designed to maximize waterfowl and shorebird use and to increase the shallow littoral area available for fish and wildlife. Dredging and deposition of backwater material at these sites should produce a suitable soil for vegetative plantings on the islands and create deep-water holes for use by fish. The size, location, and configuration of these areas would be determined after more recent bathymetric and substrate information is obtained. The final design would also consider construction methods available and the potential effects on recreational use. The U.S. Fish and Wildlife Service would perform needed management practices involving the islands to maintain and enhance their value for fish and wildlife resources.

Three federally-listed species (the threatened bald eagle, the endangered Higgins' eye pearly mussel, and the endangered peregrine falcon) could occur in the area. None of the alternatives should have a significant impact on these species.

Most of the Weaver Bottoms and surrounding areas are in the Upper Mississippi River National Wildlife and Fish Refuge, administered by the U.S. Fish and Wildlife Service. Therefore, the Fish and Wildlife Service developed a list of management objectives for the rehabilitation and maintenance of the Weaver Bottoms area. The alternatives considered and the design of the project features were developed and evaluated based on their ability to meet and to be compatible with these objectives.

As of November 27, 1984, no properties listed on or determined eligible for the National Register of Historic Places would be affected by any of the proposed alternatives. None of the alternatives would have an effect on known cultural resources.

Recreation and Visual Quality

Existing Conditions - Weaver Bottoms is in the middle third of pool 5. It is one of the most heavily-used waterfowl hunting areas on the Upper Mississippi River. GREAT I identified the greatest deficiencies in pool 5 as river access and boat-launching lanes. That assessment coincided with the recreational needs, desires, and high participation rates identified in Minnesota's Region 10 State Comprehensive Outdoor Recreation Plan (SCORP) report: river access, boat launching, fishing, hunting, natural areas, and trails. Recreational demand on pool 5 will increase since the region's highest growth areas are within 75 miles of Weaver Bottoms.

Alternative Assessment - Alternative A would have the most favorable effects on recreation and visual quality. It would offer the most benefit for recreational opportunities while maintaining the visual experience. Control of the sediment inflow into the Weaver Bottoms and island creation would provide a diversity of habitat and visual quality that that would enhance hunting and fishing opportunities.

Alternative B could have some adverse impacts on recreation and visual quality. Allowing large volumes of silt/chemicals from the agricultural Zumbro River watershed to be transported into the valuable marsh area in the north end of Weaver Bottoms could limit hunting and fishing opportunities there.

Alternatives C and E would have the most negative impacts on recreational opportunities in the backwaters area. These alternatives would eliminate boat access to Weaver Bottoms from the Half Moon Landing and would leave only two available landing sites. The GREAT report recommended upgrading and expanding Half Moon Lake Landing and Weaver Landing because of the lack of boat access sites. Some upgrading has subsequently been done at the Half Moon Lake Landing.

Alternative D would have favorable impacts on recreation and visual quality. With the addition of a large low island at the lower end of Weaver Bottoms, the diversity of habitat and visual quality would improve recreational possibilities.

Social

Existing Conditions - Weaver Bottoms is near the rural communities of Buffalo City, Wisconsin, and Wabasha, Minnesota. Buffalo City, located in Buffalo County, had a 1980 population of 894, which represented a 33-percent increase since 1970. In comparison, Buffalo County's 1980 population (14,309) increased 4.1 percent. Wabasha County's 1980 population (19,335) increased by 17 percent since 1970. The city of Wabasha's population remained unchanged between 1970 and 1980 at 2,372.

Alternative Assessment - Social effects would vary minimally among the alternatives.

Modifying the side channels and constructing barrier islands would result in both positive and negative social impacts. Channel modifications would increase the efficiency of the channel, reduce dredging, and increase the availability of wildlife in the backwaters, thereby enhancing recreation, commercial navigation, and hunting. The local economy could benefit from increased recreational tourism fostered by the increase in available wildlife. In addition, the local economy also would be enhanced by the possible employment of local workers and the use of the local quarries.

Negative impacts could also result from this project. The project would increase discharge levels in the main channel that may result in slight shoreline erosion at a small number of properties downstream of Murphy's Cut. However, under alternatives A, B, and D, the shoreline areas of the property owners most likely to be affected would be stabilized with riprap. The Belvidere Slough area would have to be monitored closely to insure that increases in sediment deposits do not occur, which could impede the city of

Buffalo's access to both the main channel and the backwaters. Along portions of the upper end of Weaver Bottoms, decreases in water levels, especially with alternatives A, B, and C, could affect a small number of cottages. However, because of the small decrease in water levels, this effect is not expected to be significant.

Project construction would have short-term negative effects on land transportation, noise, and area aesthetics.

RECOMMENDED PLAN

ALTERNATIVE SUMMARY

Table 5 summarizes the costs and some of the key advantages of the alternatives considered.

Table 5. Comparison of Alternative Advantages.

Advantages	A	B	C	D	E
1. Reduced sedimentation at lower end of Weaver Bottoms				X	X
2. Greatest control on discharge into upper end of Weaver Bottoms			X		X
3. Least effects on water quality from project construction				X	X
4. Least effects on recreational access into Weaver Bottoms	X	X		X	
5. Reduced shoreline erosion at Murphy's Cut	X	X		X	
6. Lowest operation and maintenance of closing structures	X	X		X	

The estimated cost for the five alternatives varies by less than 7 percent, although alternatives D and E are projected to cost slightly more than the other alternatives. The project is expected to cost about $1.1 million less

than the estimated cost for the most probable future without the project. Operationally, the alternatives are very similar.

The model study indicated that none of the alternatives would have a significant effect on the 1-percent chance of occurrence flood event. The model predicted that the maximum increase in flood stage would be less than 0.1 foot.

All of the alternatives would substantially reduce the existing sedimentation problems in Half Moon Lake and near the side channel openings into Weaver Bottoms. None of the alternatives would increase or correct the sedimentation problem at the mouth of the Whitewater River. With alternatives A, B, and C, an eddy is expected to develop at the lower end of Weaver Bottoms, which would bring in sediment from the main channel. However, alternatives D and E, with the closure across MN 14, would prevent this problem. Alternatives D and E therefore would reduce overall sedimentation rates the most and preserve the area for fish and wildlife the longest.

With alternatives A, B, and C, water levels within Weaver Bottoms would be lowered slightly (less than 0.1 foot) under low river discharges and would be lowered substantially (greater than 1 foot) under normal spring high river discharges. Water levels would be fairly stable, fluctuating by less than 0.4 foot at river flows of 80,000 cfs and less. The openings in the closure at MN 14, in alternatives D and E, were designed to minimize the effects on water levels. Under low river discharges, water levels in Weaver Bottoms would be elevated slightly in the lower end (less than 0.1 foot) and maintained in the upper end. Water levels would fluctuate more with river discharge for alternatives D and E than for alternatives A, B, and C. These fluctuations would be very similar to what presently occurs, approximately 1 foot at river flows of 80,000 cfs and less. The small changes in water level under low river discharges should not have any significant adverse impacts on the biota. If anything, the more stable water surface with river discharge for

alternatives A, B, and C could have a positive effect on aquatic plant growth. The openings in the closure at MN 14, with alternatives D and E, could be designed to achieve the same goal, if desired.

Current velocities within Weaver Bottoms would be substantially reduced. However, some water circulation would occur for all river discharges. The Pritchard Maloney Lake and Goose Lake areas of Weaver Bottoms (which do not receive much flow now) might be the areas most affected by the project. Dissolved oxygen problems could develop in these areas. These areas presently receive much of their flow from Murphy's Cut (MN 3), which would have its discharge reduced with partial closures approximately 50 percent under alternatives A, B, and D. The reduced discharge should still provide sufficient flow to prevent dissolved oxygen problems, but would have to be monitored closely. The culvert alternatives C and E would allow better management of the flows through Murphy's Cut to ensure that dissolved oxygen problems do not develop in the Pritchard Maloney Lake and Goose Lake areas. The culverts were designed to have the capability to match existing flows through Murphy's Cut under low river discharges.

Under alternatives A, B, and D, water levels within Murphy's Cut would be reduced below the partial closure structure. Under alternatives C and E, the culverts would serve to slightly impound the water and would not reduce water levels. However, with the impoundment, some additional sedimentation in Murphy's Cut might occur above the culvert locations.

The alternatives would cause substantial modifications of water levels, current velocity, and sedimentation patterns in the main channel and main channel border. More erosion would occur in the main channel bordering Weaver Bottoms, with a subsequent increase in deposition in the main channel downstream of Weaver Bottoms. The main channel downstream of Weaver Bottoms presently is capable of carrying the extensive bedload through this area; and, after some initial stabilization, it should be able to carry the minor additional bedload. The initial increase in deposition downstream of Weaver Bottoms should not result in any significant changes in the long-term

deposition patterns in the area or in dredging requirements. The effects on water levels, current velocity, and sedimentation patterns in the main channel and main channel border would be reduced after a while when the the channel becomes deeper and more stable. Many of the rock training structures that were built for the 6-foot navigation project in this area (wing dams, closing dams, riprap, and related structures) are partially or completely buried by sand. Increasing the discharge through this area could remove some of this accumulated sand, which could be beneficial to the biota of the main channel and main channel border.

Predicted current velocity increases in the main channel for the various alternatives should not have adverse impacts on navigation. The predicted current velocities with any of the alternatives are well below the normal current velocities encountered immediately upstream of the project area. The project might have a positive impact on navigation because of the improved efficiency of the channel and a slight increase in water levels.

There would be approximately a 50-percent increase in the discharge in the main channel with any of the alternatives. The project is projected to decrease dredging volumes over 40 years by 265,500 cubic yards of material.

The model study predicted a 10-percent increase in discharge through Belvidere Slough for all of the alternatives. The model study indicated there would not be any significant changes in sedimentation patterns in much of the Belvidere Slough area, except in Lost Island Lake. Stabilization of the inlets from Sand Run into Lost Island Lake with rock fill would correct the predicted problem in Lost Island Lake. The model study also indicated a possible slight change in sedimentation patterns in Belvidere Slough and Spring Lake. Modeling is being continued to quantify the results and develop potential solutions. In the lower end of Belvidere Slough area, including the Spring Lake and Lost Island Lake areas, none of the alternatives would have any appreciable effect on water levels. However, the upper end of Belvidere Slough could experience increases in water levels that would range from slight to more substantial, depending on river discharges. For normal discharges

(15,000 to 40,000 cfs), the effects on water levels in the upper end would be slight (less than 0.1 foot). The effects on water levels would increase with river discharge until the river discharge reaches the point where the existing land areas and the structures at MN 4 and MN 5 are overtopped (approximately 100,000 cfs). Above this discharge, the effects on water levels would once again become insignificant. The computer model predicted less than a 0.1-foot increase in water levels for river discharges equaling the 1-percent chance flood. The computer model has also predicted that the effects on water levels and discharges into Belvidere Slough would diminish after a few years, because the main channel would become more efficient and more of the water would pass through it. The resource analysis program (RAP) will document the actual effects on water levels and determine the accuracy of the computer model predictions.

The relatively small changes in the hydraulic conditions in the Belvidere area should not produce any significant changes in the aquatic community, although some localized adjustments to the new hydraulic regime may occur. The aquatic community in Lost Island Lake would actually benefit from the reduced deposition of the sediments and the addition of rock substrate.

Approximately 100 to 108 acres of aquatic habitat would be directly modified by any of the alternatives considered. Alternatives D and E would directly affect approximately 6 to 8 more acres than the other alternatives would, because of the lower closure at MN 14.

Water quality effects from the construction and dredged material disposal would not vary substantially among the alternatives, except that less material, with subsequently less disturbance of the fine bottom sediments, would be placed in the backwater area with alternatives D and E. No toxic effects are expected from the implementation of any of the alternatives.

Opening up the mouth of Old John's Ditch and placing two culverts in the causeway with alternative B could have both positive and negative impacts on water quality. Alternative B would correct an existing dissolved oxygen

problem in Old John's Ditch. However, the Zumbro River, which carries extensive amounts of suspended sediments, enters the Mississippi River immediately upstream of this area. Opening the mouth of Old John's Ditch could funnel some of the water from the Zumbro River into the upper end of Weaver Bottoms.

Water clarity within Weaver Bottoms should improve with the project, because of the reduced flows and decreased wave action. This improved clarity should have a positive impact on aquatic plants and fish.

The islands and the predicted increases in aquatic plants resulting from the project are expected to have a very positive effect on waterfowl and shorebird nesting and use of Weaver Bottoms. The islands would also increase the amount of shallow littoral area and deep water habitat, which would benefit the fisheries of the area.

By increasing the fish and wildlife values of the area, all of the alternatives would have a positive impact on recreational values. Alternatives C and E, with the culverts in Murphy's Cut, would have some adverse impacts on recreational access from the Half Moon boat landing into the upper end of Weaver Bottoms. The opening of Old John's Ditch under alternative B could introduce sediment-laden water from the Zumbro watershed into the upper end of Weaver Bottoms and could reduce the recreational value.

Social impacts do not vary appreciably among the different alternatives. Alternatives A, B, and D may reduce the present shoreline erosion on private property along Murphy's Cut by reducing flows in the area and by riprapping the bank areas. There is already a problem with small boat navigation from Buffalo City to the main channel and adjacent backwaters. The project should not add to this existing problem. If recreational use of the area increases as a result of the project and if local labor and quarries are used during the construction, impacts on the local economy could be positive.

SELECTED PLAN

Alternative D, with the addition of stabilization measures for the inlet from Sand Run into Lost Island Lake, is recommended for implementation. The Weaver Bottoms, although recently experiencing degradation, is still a very important resource. The tundra swan, a species of special concern to the Fish and Wildlife Service, uses the Weaver Bottoms as one of its primary areas for resting and feeding during migration. The area is also used extensively by other waterfowl species, including the canvasback duck, another species of special concern. This 4,000-acre backwater lake is also important to a variety of other fish and wildlife species. The significance of this resource is recognized institutionally, technically, and publicly. This recognition is exemplified by the extensive effort spent by GREAT I in investigating and developing solutions to this area's recent degradation; by the public interest (reflected in press coverage); and by its location within a national refuge.

The side channel modifications proposed for any of the alternatives would significantly alter the hydraulic regime. This altered hydraulic regime, in addition to having positive environmental benefits, could cause some significant adverse impacts on portions of Weaver Bottoms. Alternatives D and E are essentially modifications of the less costly alternatives A, B, and C that are intended to offset the adverse impacts associated with the side channel closures. The adverse impacts that would be offset as a result of these side channel closures are described in the following paragraphs.

Arrowhead, one of the dominant species of emergent aquatic plants within Weaver Bottoms, is a major food source for migrating tundra swans. Arrowhead is extremely sensitive to changes in water level. To ensure that there would be no adverse impacts on existing arrowhead beds within Weaver Bottoms, maintaining water levels at or near existing conditions is considered essential. Alternatives A, B, and C would modify water levels within Weaver Bottoms. The lower closure, with alternatives D and E, would maintain water levels at or near existing conditions.

The computer model studies indicate that, as a result of the side channel modifications, an eddy would develop at the lower end of Weaver Bottoms. This eddy would significantly increase the sedimentation rates in the lower quarter of Weaver Bottoms, an area of approximately 1,000 acres. This area is in the closed part of the national refuge and is used extensively by waterfowl during the fall migrations. Increasing the rate of sedimentation in this area will decrease the longevity of this area as a productive, significant wetland area. The lower closure, with alternatives D and E, would prevent this increased sedimentation in the lower end.

IMPLEMENTATION

The project would be constructed in two phases. In phase I, all the side-channel closures, including MN 14 and islands MN A and MN D (figures 4 and 5, table 6), would be constructed. The remaining four islands (MN C, MN E, MN F, and MN G) (figure 5 and table 6) and/or other features that would be identified as a result of monitoring the effects of phase I would be constructed in phase II at a later date. In phase I, the lower closure (MN 14), would be completed first. MN 7 would be left open initially and monitored. If severe erosion or undesirable effects occur as a result of leaving this open, MN 7 would be closed with dredged material or the Minnesota DNR would stabilize the banks and channel bottom with rock. Prior to the completion of the closure at MN 12, this area may be used as a rehandling area for the material to be used to construct islands MN A and MN D. The majority of dredged material needed for the phase I construction would be obtained from the Fischer Island containment area, located on the right descending bank near river mile 745.8. The remaining dredged material needed for phase I and for phase II would be obtained from the Lost Island containment area, located on the left descending bank near river mile 744.9 and from the Fischer Island containment area. These two containment areas would then become the 40-year placement sites for normal annual maintenance dredging in lower pool 5. The islands would be capped with fine backwater material dredged near the island sites. A variety of stabilization measures would be used on the islands built

Table 6. Summary of Plan (Alternative D) Recommended for Implementation by the St. Paul District and Others

Recommended Action	Recommended Responsible Agency				Schedule
	Corps	FWS	Minnesota	Wisconsin	
PHASE I CONSTRUCTION					1986-1987
Construction and Maintenance of Project Features					
Side Channels					
MN 3 - Partial Rock Closure at Mouth	X				
MN 4 - Complete Rock Closure	X				
MN 5 - Complete Rock Closure	X				
MN 6 - Partial Rock Closure	X				
MN 7 - Left Open and Monitored. If Necessary, Complete Dredged Material Closure or Banks and Channel Bottom Armored with Rock	X				
MN 10 - Partial Rock Closure	X				
MN 11 - Complete Dredged Material Closure	X				
MN 12 - Complete Dredged Material Closure	X				
MN 13 - Complete Dredged Material Closure	X				
MN 14 - Dredged Material Closure with Main Channel Side Rock Filled and Two Partial Rock Closures	X				
WI 10A - Banks and Channel Bottom Armored with Rock	X				
WI 10B - Complete Dredged Material Closure	X				
WI 10C - Complete Dredged Material Closure	X				
WI 11A - Banks and Channel Bottom Armored with Rock	X				
WI 11B - Banks and Channel Bottom Armored with Rock	X				
Old John's Ditch - Two Culverts in Causeway		+	X		
Construction of Islands MN A (Swan Island) and MN D (Mallard Island), Including Capping Islands with Backwater Material, Vegetative Plantings, and Other Experimental Stabilization Measures	X	+	+	+	
PHASE II CONSTRUCTION					1990
Construction of Islands MN C, MN E, MN F, and G	X				
Old John's Ditch - If Necessary, Culverts Connecting Old John's Ditch to Below West Newton		+	X		
NON-CONSTRUCTION ACTIVITIES					
Long-term Fish and Wildlife Management Practices on Islands		X	+		1987+
Planting of Desired Aquatic Plant Species Within Weaver Bottoms		X			1987
Investigation into the Cause of the Sedimentation Problem at the Mouth of the Whitewater River and Development of Potential Solutions	+	X	+		1986-1987
Long-term Resource Analysis Program	+	X	+	+	1986-1995

X = Lead Agency for the Implementation
\+ = Participating Agency for the Implementation

in phase I. The effectiveness of these stabilization measures would be monitored and the results used to assist in the final design of the islands scheduled for phase II.

The St. Paul District would fund the construction and maintenance of the project features using regular operation and maintenance funding because the project represents a cost savings over the most probable future without the project. The project's economic justification is based on construction of the entire project, which includes both phases. Therefore, the District fully intends to construct phase II approximately 3 years after completion of phase I, unless adverse impacts occur as a result of phase I construction. Other features not within the jurisdiction of the Corps of Engineers or that are not justified from an operations and maintenance standpoint would be funded by the U.S. Fish and Wildlife Service and others. Non-Corps funding may be especially appropriate for phase II, if additional modifications are determined to be necessary based on the monitoring of the phase I effort.

The St. Paul District and the U.S. Fish and Wildlife Service recognize that the proposed rehabilitation measures are very experimental and that the effects are hard to predict. This experimental unpredictability is one of the most important reasons for the phased approach to the construction of the project features. Monitoring of the project after construction is essential. A draft monitoring plan is being developed by the U.S. Fish and Wildlife Service and the St. Paul District, in coordination with the Fish and Wildlife Work Group and Recreation Work Group of the Channel Maintenance Forum. The purpose of the monitoring plan is to assess the effectiveness of the project to meet the stated goals and objectives and to identify any unforeseen, unacceptable, impacts on the environment, public use, and/or navigation. The St. Paul District and the U.S. Fish and Wildlife Service are committed to participating in this long-term monitoring effort and to correcting any problems that occur as a result of the project. Solutions will be evaluated and designed within funding and authority limitations.

Results of the computer model have indicated a potential erosion problem in Belvidere Slough, near Buffalo City, with subsequent deposition of the material in Spring Lake. The St. Paul District does not know if this erosion represents a significant change over baseline conditions, but it would monitor this area to identify if significant changes do occur after construction. The St. Paul District believes that solutions are economically feasible and is committed to correcting the problem if it arises. Computer modeling to develop potential solutions and verify the results is being continued. A preliminary evaluation has indicated several ways that the problem could be corrected, including armoring the scour area, dredging a sediment trap, or constructing rock control structures on one or more of the inlets into Belvidere Slough.

RECOMMENDED NON-CORPS OF ENGINEERS ACTIONS

The States of Wisconsin and Minnesota, in addition to the St. Paul District and the U.S. Fish and Wildlife Service, need to be committed to full participation in the monitoring effort of the project. This involvement should include funding, participation in the collection of the information, interpretation of the results, and development of appropriate recommendations for future work. This monitoring effort could best be accomplished by the development of a joint research team, through a memorandum of agreement. The U.S. Fish and Wildlife Service would serve as the lead agency, equipped with a permanent staff responsible for the management of the program.

The U.S. Fish and Wildlife Service would perform necessary management practices to enhance and maintain the rehabilitation projects. The islands that would be created would be managed for wind fetch reduction and wildlife use, and management practices (such as periodic burning, cutting, replanting, and other activities) would be done as necessary to maintain these islands for these purposes. Selected aquatic plants would be planted on the submerged slopes of the islands to ensure their stability. Selected aquatic plant species may also be planted within Weaver Bottoms to accelerate the colonization by aquatic plants, especially of desired species. Studies are presently being done in pool 8 with the planting of wild celery, an important

food source for canvasback ducks, a waterfowl species of special concern. Other management techniques would be employed as necessary to enhance and maintain the Weaver Bottoms area.

The existing sedimentation problem at the mouth of Whitewater River should be studied, and recommendations should be developed to correct this problem. The U.S. Fish and Wildlife Service would lead this investigation and prepare recommendations designed to alleviate the problem. The St. Paul District would participate in this planning and subsequent construction as much as possible under existing Corps of Engineers authority and funding.

Placing culverts in the causeway in Old John's Ditch and dredging open the old mouth of Old John's Ditch into West Newton Chute to allow fresh flow of water was considered. The St. Paul District has no authority under the existing 9-foot channel navigation project to fund and construct these features. However, it is recommended that the State of Minnesota, with support from the U.S. Fish and Wildlife Service, place culverts in the causeway. Dredging the old mouth of Old John's Ditch is not recommended, at least initially. Opening of the mouth could introduce large amounts of the sediment-laden water from the Zumbro River into the Weaver Bottoms. It is anticipated that a head differential between West Newton Chute and Old John's Ditch may cause seepage to occur and provide the needed flow to the area. Seepage water may be low in dissolved oxygen and might not correct the problem. Therefore, this area should be monitored; and, if the dissolved oxygen problem is not corrected by the proposed measure, the Minnesota Department of Natural Resources and U.S. Fish and Wildlife Service should evaluate the installation of a pipe (36-inch diameter) system connecting Old John's Ditch to West Newton Chute to provide a 5 to 10 cfs flow.

MN 7 would not significantly add to the discharge or sediment input into Weaver Bottoms if it were left open. The St. Paul District does not have the authority and would not fund the necessary rock armoring for this feature. Either the State of Minnesota or the U.S. Fish and Wildlife Service would have to fund the rock armoring if MN 7 were left open.

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FINAL SUPPLEMENT

ENVIRONMENTAL IMPACT STATEMENT

1.00 SUMMARY

Major Conclusions and Findings

1.01 The 9-foot navigation channel on the Upper Mississippi River was authorized by the River and Harbor Act of July 3, 1930, and other legislation. The Great River Environmental Action Team (GREAT) I study (authorized in Section 117 of the Water Resources Development Act of 1976) was organized to identify and assess the problems associated with multipurpose use of the Mississippi River and to develop recommendations for improved management of the river resources. In September 1980, the GREAT I final report was released. The primary product of this study was a channel maintenance plan that made site-specific recommendations for dredged material disposal over the 40-year period, 1986-2025. The recommended plan for lower pool 5 was to use dredged material to modify side channels and create barrier islands within the Weaver Bottoms that would rehabilitate this 4,000-acre backwater complex. Five alternatives were developed and evaluated to implement the recommendation. In addition, a no action plan, or the most probable future without the project (MPFWOP), was developed for comparison. The proposed project (alternative D) would result in a cost saving over the MPFWOP and would benefit operation and maintenance activities on the Upper Mississippi River. The proposed project also would have many environmental benefits that would not be realized with the MPFWOP.

1.02 The proposed project consists of partial and complete closures of side channels entering the Weaver Bottoms and Lost Island areas in pool 5 that would reduce sediment intrusion into these valuable backwaters and reduce dredging requirements, plus six islands within the Weaver Bottoms that would maximize habitat diversity and reduce wind fetch. Maintenance-dredged material, borrowed from two existing containment areas to provide capacity for 40 years of normal maintenance dredging, would be used in combination with

rock to construct the project features. Section 3.00 of this EIS provides a more detailed description of the proposed plan and the other alternatives.

1.03 The proposed project would have positive effects on the environmental quality of the area. The proposed project would increase habitat diversity and productivity within the Weaver Bottoms and would preserve the area as a valuable backwater habitat for a longer period of time by reducing sedimentation rates.

1.04 The proposed project should not have any significant adverse social, recreational, or cultural resources impacts.

1.05 The proposed project would require placement of dredged material and rock in approximately 110 acres of aquatic area. Therefore, a Section 404(b)(1) evaluation was prepared to comply with the Clean Water Act (see exhibit 1).

Areas of Controversy

1.06 The project involves several areas of major concern. Buffalo City, Wisconsin, and other adjacent areas were concerned about the potential impacts on flood levels with the project. Previous computer modeling efforts have predicted effects on the 1-percent chance flood ranging from a 0.5- to a 2.0-foot raise in flood levels. Many of the early modeling efforts did not take into account the overtopping of the existing islands and other factors. A state-of-the-art two-dimensional model was used to evaluate the impacts on flood levels. This model predicts less than a 0.1-foot rise in flood levels with the project (see supporting document C for additional details).

1.07 Concerns were also expressed that the project may have adverse impacts on sedimentation patterns in adjacent areas, especially the Belvidere Slough backwater complex, which is immediately across the main channel from the Weaver Bottoms, and in the main channel downstream of the project. Structures were included on the inlets in the Lost Island area of the Belvidere Slough

backwater complex to correct existing and projected changes in sedimentation patterns that would be caused by the project. Other areas would be monitored; and, if unacceptable effects occur, remedial action would be taken.

1.08 The Whitewater River carries extensive amount of sediments into the Weaver Bottoms. There are major concerns that the project would not correct this problem and that it may add to it because of the reduced flows and impounding that would occur with the project. Computer modeling studies have indicated that the project would neither add to this problem nor correct it. An island would be constructed immediately upstream of the mouth of the Whitewater River to try to prevent the Whitewater River sediments from moving into the undisturbed upstream areas.

Unresolved Issues

1.09 An extensive effort was spent during the planning process to develop the best overall predictions of the effects of the project. However, the project still must be viewed as very experimental, especially with respect to the sedimentation predictions.

1.10 The problem with the sediment input from the Whitewater River will not be solved by the proposed project. The U.S. Fish and Wildlife Service (FWS) is committed to investigating this problem and developing solutions to it.

1.11 The Belvidere Slough area of pool 5 is experiencing extensive sedimentation, which is a major concern of the Buffalo City residents. Although the project would not increase this problem, it would not alleviate it either.

1.12 A large portion of the Weaver Bottoms is managed by the FWS as a closed area of the refuge. The primary objective of the closed area is to act as a waterfowl sanctuary during the fall waterfowl hunting season. Increased recreational activity in the closed area as a result of the project could conflict with this primary management objective. The FWS is developing a

public information system that would inform the public about the adverse effects on waterfowl from disturbance in the closed areas by recreational craft. This information system could be intensified and aimed at the Weaver Bottoms area, if this recreational use conflict does develop. Another possible solution, which could be explored for implementation if the conflict does develop, would have the Corps of Engineers place restrictions on public use of the closed area during the waterfowl hunting season. Most of the closed area is owned by the Corps of Engineers.

Relationship to Environmental Protection Statutes and Other Environmental Requirements

1.13 Table EIS-1 shows the relationship of the proposed project to environmental laws, regulations, and other requirements.

2.00 NEED FOR AND OBJECTIVE OF ACTION

Study Authority

2.01 The 9-foot navigation channel on the Upper Mississippi River (UMR) was authorized by the River and Harbor Act of July 3, 1930, and other legislation. For many years, public agencies, private organizations, and individuals expressed concern over the maintenance of the 9-foot navigation channel on the Mississippi River. An environmental impact statement (EIS) prepared by the Corps of Engineers (Corps) in 1974 revealed that current methods of channel maintenance were having adverse impacts upon the backwaters, marshes, and sloughs of the river.

2.02 The Great River Environmental Action Team (GREAT) I study (authorized in Section 117 of the Water Resource Development Act of 1976) was organized to identify and assess the problems associated with multipurpose use of the Mississippi River and to develop recommendations for improved management of the river resources. The study team, under the leadership of the Corps and

Table EIS-1. Relationship of Plans to Environmental Protection Statutes and Other Environmental Requirements.

	Plan D
Federal Statutes	
Archeological and Historic Preservation Act, as amended, 16 USC 469, et seq.	Full
Clean Air Act, as amended, 42 USC 1857h-7, et seq.	Full
Clean Water Act, as amended (Federal Water Pollution Control Act), 33 USC 1251, et seq.	Full
Coastal Zone Management Act, as amended, 16 USC 1451, et seq.	N/A
Endangered Species Act of 1973, as amended, 16 USC 1531, et seq.	Full
Estuary Protection Act, 16 USC 1221, et seq.	N/A
Federal Water Project Recreation Act, as amended, 16 USC 460-1(12), et seq.	Full
Fish and Wildlife Coordination Act, as amended, 16 USC 661, et seq.	Full
Land and Water Conservation Fund Act, as amended, 16 USC 4601-4601-11, et seq.	Full
Marine Protection, Research and Sanctuaries Act, as amended, 16 USC 1401, et seq.	N/A
National Environmental Policy Act of 1969, as amended, 42 USC 4321, et seq.	Full
National Historic Preservation Act of 1966, as amended, 16 USC 470a, et seq.	Full
Rivers and Harbors Act, 33 USC 401, et seq.	
Watershed Protection and Flood Prevention Act, as amended, 16 USC 1001, et seq.	N/A
Wild and Scenic Rivers Act, as amended, 16 USC 1271, et seq.	N/A
Executive Orders, Memorandums, etc.	
Floodplain Management (E.O. 11988)	Full
Protection of Wetlands (E.O. 11990)	Full
Environmental Effects Abroad of Major Federal Actions (E.O. 12114)	N/A
Analysis of Impacts on Prime and Unique Farmlands (CEQ Memorandum, August 11, 1980)	N/A
State and Local Policies	Full
Land Use Plans	Full
Required Federal Entitlements	
U.S. Fish and Wildlife Service Special Use Permit	Pending

NOTES: The compliance categories used in this table were assigned on the basis of the following definitions:

a. Full compliance (Full) - All requirements of the statute, executive order, policy, regulation, etc., have been met for current stage of planning.

b. Partial compliance (Partial) - Some requirements of the statute, executive order, policy, regulation, etc., have not been met for current stage of planning.

c. Noncompliance (Noncomp) - Violation of requirement of the statute, executive order, policy, regulation, etc.

d. Not applicable (N/A) - Statute, executive order, policy, regulation, etc., is not applicable.

e. Pending - Application is pending at present.

the U.S. Fish and Wildlife Service (FWS), was composed of State and Federal agencies that have management responsibility on the river. Public involvement in the study was also emphasized.

2.03 One of the areas investigated by the Fish and Wildlife Work Group (FWWG) of GREAT I was the apparent degradation of several large backwater areas, especially the Weaver Bottoms, a 4,000-acre backwater lake in pool 5 of the UMR. Within the last 20 years, the Weaver Bottoms has changed from a highly productive backwater marsh to a less productive riverine lake with marsh vegetation only on the perimeters. The Weaver Bottoms was studied extensively in 1975 and 1977 to determine what could be done to restore its habitat values. Results of the study indicated that the Weaver Bottoms could be rehabilitated substantially by modifying side channel and by building barrier islands to reduce wind fetch.

2.04 In September 1980, the GREAT I final report (including a programmatic EIS) was released. The primary product of this study was a channel maintenance plan that provided site-specific recommendations for dredged material disposal over the 40-year period 1986-2025. The recommended plan for lower pool 5 was to use dredged material for the side channel modifications and for creation of the barrier islands in the Weaver Bottoms rehabilitation plan. In June 1981, the Corps completed a plan for implementing the GREAT I recommendations. In March 1982, the plan was approved with comments by the Board of Engineers for Rivers and Harbors. In this plan for implementing the GREAT I recommendations, the Channel Maintenance Plan (which includes the lower pool 5 channel maintenance/Weaver Bottoms rehabilitation plan) was listed as a high priority for implementation.

Public/Agency Concerns

2.05 Project-related public concerns can be generally summarized into three categories: (1) the problem of continued use of historical dredged material practices in lower pool 5 and its impact upon river resources; (2) the problem of the degradation of the Weaver Bottoms from a more marsh-like lake to a more

open riverine lake; (3) the impacts associated with the Weaver Bottoms rehabilitation/lower pool 5 channel maintenance plan on the Weaver Bottoms and adjacent aquatic areas, including impacts on flood stages, water quality, biological productivity, sedimentation, and others. Specific concerns under these three general areas of concern were considered in the formulation and evaluation of the alternatives.

Planning Objectives

2.06 The project has three basic objectives: (1) restore the biological productivity and marsh-like nature of the Weaver Bottoms area; (2) develop a balanced long-term (40-year) disposal plan for dredged material in lower pool 5; and (3) reduce dredging requirements in lower pool 5 of the UMR.

Content and Scope of EIS Supplement

2.07 This document supplements two final EIS's: (1) the Final EIS for Operation and Maintenance, 9-Foot Navigation Channel, Upper Mississippi River, Head of Navigation to Guttenberg, Iowa, and (2) the Final EIS for the Great River Environmental Action Team I Study of the Upper Mississippi River, Guttenberg, Iowa, to the Head of Navigation at Minneapolis, Minnesota. Both documents cover various but different aspects of this project. Therefore, "to eliminate repetitive discussions of the same issues and to focus on the actual issues ripe for decision at each level of environmental review" (Council on Environmental Quality regulations, 40 CFR 1502.20), this document supplements both of these final EIS's. This supplement addresses only the specific impacts associated with the project. General background, resource descriptions, and impacts are incorporated by reference to these two final EIS's.

3.00 ALTERNATIVES

Alternatives Considered by GREAT I

3.01 A variety of placement sites/plans were considered by GREAT I, including selective placement, regional placement, centralized placement, beneficial use, habitat enhancement, removal from the floodplain, and most probable future without GREAT (see pages 13 to 15 of the GREAT I final EIS). Based on this evaluation, the habitat enhancement plan (lower pool 5 dredged material disposal/Weaver Bottoms rehabilitation plan) was selected. Five alternative plans to implement the Weaver Bottoms rehabilitation using dredged material were developed and considered in detail. Additional plans were initially considered but eliminated from further study. See the following section for a brief description of these plans and the reasons for their elimination from further study. In addition, the no action plan (the most probable future without the project or MPFWOP) was evaluated.

Alternatives Eliminated from Further Study

3.02 One alternative that was initially considered but eliminated from further study involved a combination of the most probable future without the project (no action) and the Weaver Bottoms rehabilitation. Under this alternative, maintenance-dredged material would be used for the side channel modifications, and fine material dredged from within the Weaver Bottoms would be used to create the barrier islands. The remainder of the projected maintenance-dredged material for the 40-year plan would then be placed at historical disposal sites. However, this alternative was eliminated from further consideration for the following reasons: (1) the lack of Corps authority to conduct backwater dredging strictly for habitat enhancement (this action would have to be conducted by different agencies under different authorities), (2) the difficulty in constructing stable islands using fine material only, (3) economics, and (4) the increased environmental impacts associated with the disposal of the remaining material after the 16 side channel modifications were completed.

3.03 Another item considered initially, because of comments from other agencies, was the notching or removal of a wing dam at the mouth of Murphy's Cut, to eliminate the funneling of sediment into Murphy's Cut. Records of a wing dam constructed in this area were not found. Surveys of this area also were not able to locate this wing dam. Therefore, this item was eliminated from any further consideration.

3.04 Another item suggested by other agencies was the construction of a wing dam immediately upstream of the mouth of Murphy's Cut, to direct flow and sediment away from Murphy's Cut. This action was not considered any further for two reasons: (1) the closing structures could better accomplish the intended purposes; and (2) the wing dam could reduce the amount of coarse sand coming into Murphy's Cut, but, without reducing flows into Murphy's Cut, it would have little impact on fine sand and silt input.

3.05 Initially, different alternative island designs were considered. These included a greater number of smaller islands of similar design, a series of straight-line islands that would divide the Weaver Bottoms into compartments, and other alternative designs. However, by mutual consent of all the affected resource agencies, these were eliminated from further consideration. The islands were designed to maximize fish and wildlife values and to maximize the reduction in wind fetch from a variety of wind directions. Appendix A of the main report shows some of the island designs and explains the rationale for these designs.

Most Probable Future without the Rehabilitation Project (No Action Alternative)

3.06 The no action plan (otherwise known as the without-project conditions or the MPFWOP, which is more fully described in supporting document B) was developed based upon past dredging experience and existing regulations.

3.07 Basically, the channel maintenance plan under the MPFWOP is similar to that of the Weaver Bottoms project. Both would excavate existing dredged

material placement sites that are filled or near capacity and that cannot be expanded under existing laws. Once unloaded, these sites would be reused when channel maintenance dredging is necessary. The Weaver Bottoms project would use the material for construction of side channel closures and islands in the backwaters. Under the MPFWOP, however, the material would be relocated to placement site 5.24, the designated site for the upper pool 5 dredge cuts, near the main channel at the upstream end of West Newton Chute. If lower pool 5 dredged material is also placed on site 5.24, an additional 55 acres would be required.

3.08 Compared to the MPFWOP, the Weaver Bottoms project is predicted to reduce dredging requirements by 266,500 cubic yards over a 40-year period because of increased main channel discharge and sediment transport efficiency caused by the side channel closures. Dredged material would have to be transported over a longer distance with the MPFWOP, and it could not be transported hydraulically. The MPFWOP also would be less cost effective than the Weaver Bottoms project and would require $1.1 million more than the Weaver Bottoms project.

3.09 The MPFWOP would also require purchasing 55.0 acres of agricultural land. The MPFWOP would not achieve any beneficial use of dredged material, but the Weaver Bottoms project would use 1,659,500 cubic yards of material productively to restore and preserve a 4,000-acre backwater. The MPFWOP would not reduce sedimentation into the Weaver Bottoms, and it would not restore habitat to earlier conditions. Under the MPFWOP, the Weaver Bottoms would continue to fill with sediment, and its habitat values would decline.

Alternatives Considered in Detail

3.10 Five alternative plans (A, B, C, D, and E) have been formulated for improving the habitat of Weaver Bottoms through construction of side channel closures and barrier islands with dredged material from lower pool 5 (cuts 1, 2, 3, and 4) in accordance with GREAT I. Alternative A is the GREAT-recommended plan. Alternative B is the plan recommended by the original

investigators (Fremling et al., 1976). The remaining three alternatives (C, D, and E) were formulated by the St. Paul District, in coordination with the affected resource agencies. The recommended plan is alternative D, with modifications.

3.11 The project is anticipated to be constructed in two phases. In phase I, all the side channel modifications and two of the barrier islands would be created. In phase II, the remaining islands would be constructed unless unacceptable adverse impacts occur. Additional or alternative measures to minimize any adverse impacts and/or to maximize environmental enhancement would be identified and considered for implementation in phase II. This type of approach is being used for two reasons. One reason is cost, because this approach would allow the cost to be split over several years. The other reason is that habitat responses to physical manipulations are difficult to predict and that the phased approach would allow monitoring and evaluation of the habitat responses to a number of project features prior to construction of the completed project.

3.12 Dredged material would come from normal maintenance dredging where possible and from two existing containment sites: the Fischer Island containment area (right descending bank at river mile 745.8) and the Lost Island containment area (left descending bank at river mile 744.7) (see figure EIS-1). Normal maintenance dredged material would then be placed at these two containment areas for the remainder of the 40-year disposal plan.

Recommended Plan - Alternative D

3.13 The recommended plan is basically alternative D, modified to include actions by other agencies and to include leaving channel MN 7 open and monitoring it (table EIS-2). MN 7 may be closed with dredged material if unacceptable erosion occurs in this side channel.

3.14 Six islands would be constructed in the Weaver Bottoms to reduce wind fetch (figure EIS-2). Two islands (Mallard and Swan Islands) would be

Table EIS-2. Summary of Plan (Alternative D) Recommended for Implementation by the St. Paul District and Others

Recommended Action	Recommended Responsible Agency				Schedule
	Corps	FWS	Minnesota	Wisconsin	
PHASE I CONSTRUCTION					1986-1987
Construction and Maintenance of Project Features					
Side Channels					
MN 3 - Partial Rock Closure at Mouth	X				
MN 4 - Complete Rock Closure	X				
MN 5 - Complete Rock Closure	X				
MN 6 - Partial Rock Closure	X				
MN 7 - Left Open and Monitored. If Necessary, Complete Dredged Material Closure or Banks and Channel Bottom Armored with Rock	X				
MN 10 - Partial Rock Closure	X				
MN 11 - Complete Dredged Material Closure	X				
MN 12 - Complete Dredged Material Closure	X				
MN 13 - Complete Dredged Material Closure	X				
MN 14 - Dredged Material Closure with Main Channel Side Rock Filled and Two Partial Rock Closures	X				
WI 10A - Banks and Channel Bottom Armored with Rock	X				
WI 10B - Complete Dredged Material Closure	X				
WI 10C - Complete Dredged Material Closure	X				
WI 11A - Banks and Channel Bottom Armored with Rock	X				
WI 11B - Banks and Channel Bottom Armored with Rock	X				
Old John's Ditch - Two Culverts in Causeway		+	X		
Construction of Islands MN A (Swan Island) and MN D (Mallard Island), Including Capping Islands with Backwater Material, Vegetative Plantings, and Other Experimental Stabilization Measures	X	+	+		
PHASE II CONSTRUCTION					1990
Construction of Islands MN C, MN E, MN F, and G	X				
Old John's Ditch - If Necessary, Culverts Connecting Old John's Ditch to Below West Newton		+	X		

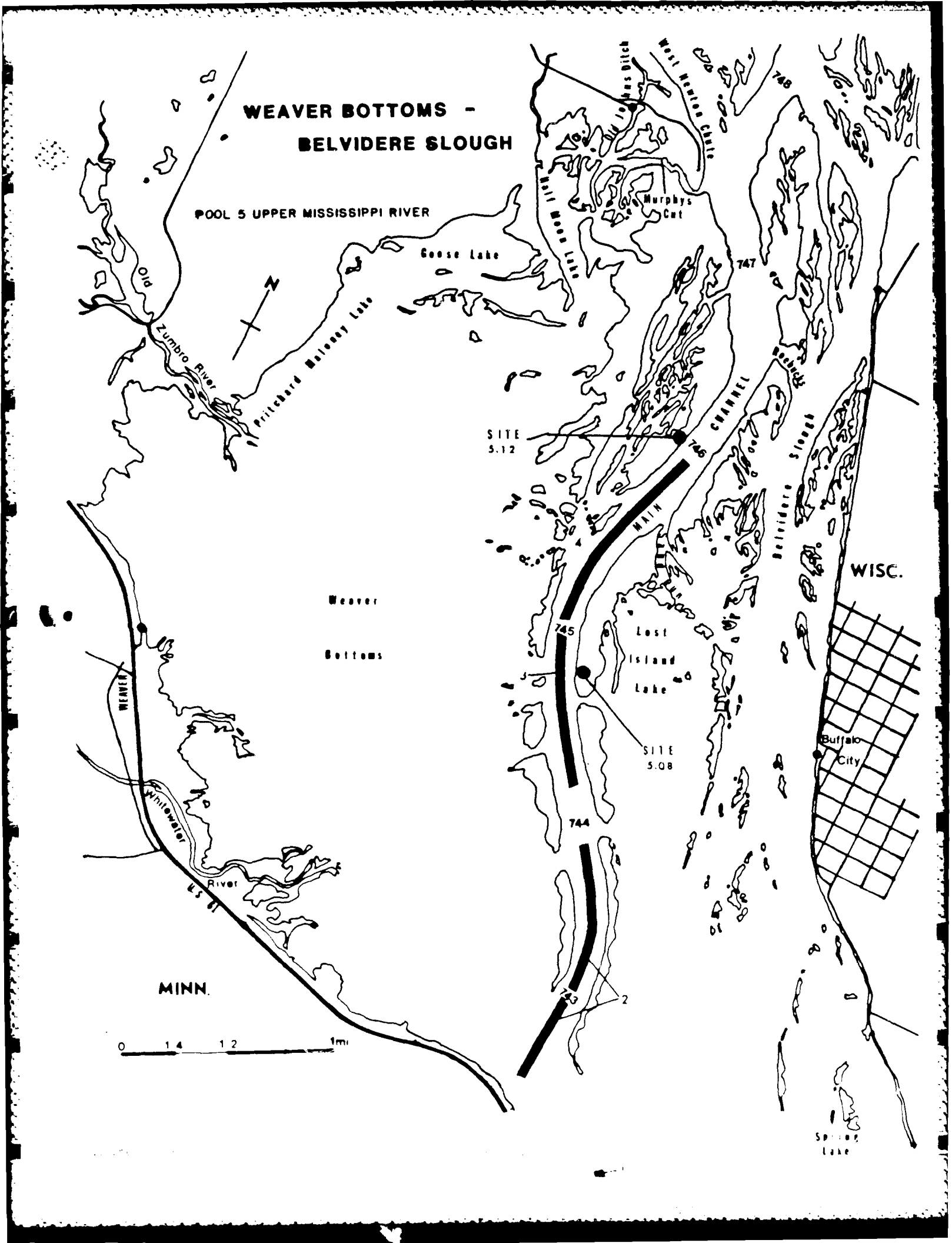
NON-CONSTRUCTION ACTIVITIES					
Long-term Fish and Wildlife Management Practices on Islands		X	+		1987 +
Planting of Desired Aquatic Plant Species Within Weaver Bottoms		X			1987
Investigation into the Cause of the Sedimentation Problem at the Mouth of the Whitewater River and Development of Potential Solutions	+	X	+		1986-1987
Long-term Resource Analysis Program	+	X	+	+	1986-1995

X = Lead Agency for the Implementation
+ = Participating Agency for the Implementation

Table EIS-2. Summary of Plan (Alternative D) Recommended for Implementation by the St. Paul District and Others

Recommended Action	Recommended Responsible Agency				Schedule
	Corps	FWS	Minnesota	Wisconsin	
PHASE I CONSTRUCTION					1986-1987
Construction and Maintenance of Project Features					
Side Channels					
MN 3 - Partial Rock Closure at Mouth	X				
MN 4 - Complete Rock Closure	X				
MN 5 - Complete Rock Closure	X				
MN 6 - Partial Rock Closure	X				
MN 7 - Left Open and Monitored. If Necessary, Complete Dredged Material Closure or Banks and Channel Bottom Armored with Rock	X				
MN 10 - Partial Rock Closure	X				
MN 11 - Complete Dredged Material Closure	X				
MN 12 - Complete Dredged Material Closure	X				
MN 13 - Complete Dredged Material Closure	X				
MN 14 - Dredged Material Closure with Main Channel Side Rock Filled and Two Partial Rock Closures	X				
WI 10A - Banks and Channel Bottom Armored with Rock	X				
WI 10B - Complete Dredged Material Closure	X				
WI 10C - Complete Dredged Material Closure	X				
WI 11A - Banks and Channel Bottom Armored with Rock	X				
WI 11B - Banks and Channel Bottom Armored with Rock	X				
Old John's Ditch - Two Culverts in Causeway		+	X		
Construction of Islands MN A (Swan Island) and MN D (Mallard Island), Including Capping Islands with Backwater Material, Vegetative Plantings, and Other Experimental Stabilization Measures	X	+	+		
PHASE II CONSTRUCTION					1990
Construction of Islands MN C, MN E, MN F, and G	X				
Old John's Ditch - If Necessary, Culverts Connecting Old John's Ditch to Below West Newton		+	X		
NON-CONSTRUCTION ACTIVITIES					
Long-term Fish and Wildlife Management Practices on Islands		X	+		1987 +
Planting of Desired Aquatic Plant Species Within Weaver Bottoms		X			1987
Investigation into the Cause of the Sedimentation Problem at the Mouth of the Whitewater River and Development of Potential Solutions	+	X	+		1986-1987
Long-term Resource Analysis Program	+	X	+	+	1986-1995

X = Lead Agency for the Implementation
\+ = Participating Agency for the Implementation


WEAVER BOTTOMS -
BELVIDERE SLOUGH
POOL 5 UPPER MISSISSIPPI RIVER
Goose Lake
Old Zumbro River
Pritchard Midway Lake
Hall Moon Lake
Murphys Cut
West Newton Chute
748
747
746
745
744
743
SITE 5.12
SITE 5.08
MAIN CHANNEL
Belvidere Slough
Lost Island Lake
Weaver Bottoms
WEAVER
Whitewater River
U.S. 61
MINN.
WISC.
Buffalo City
Spring Lake
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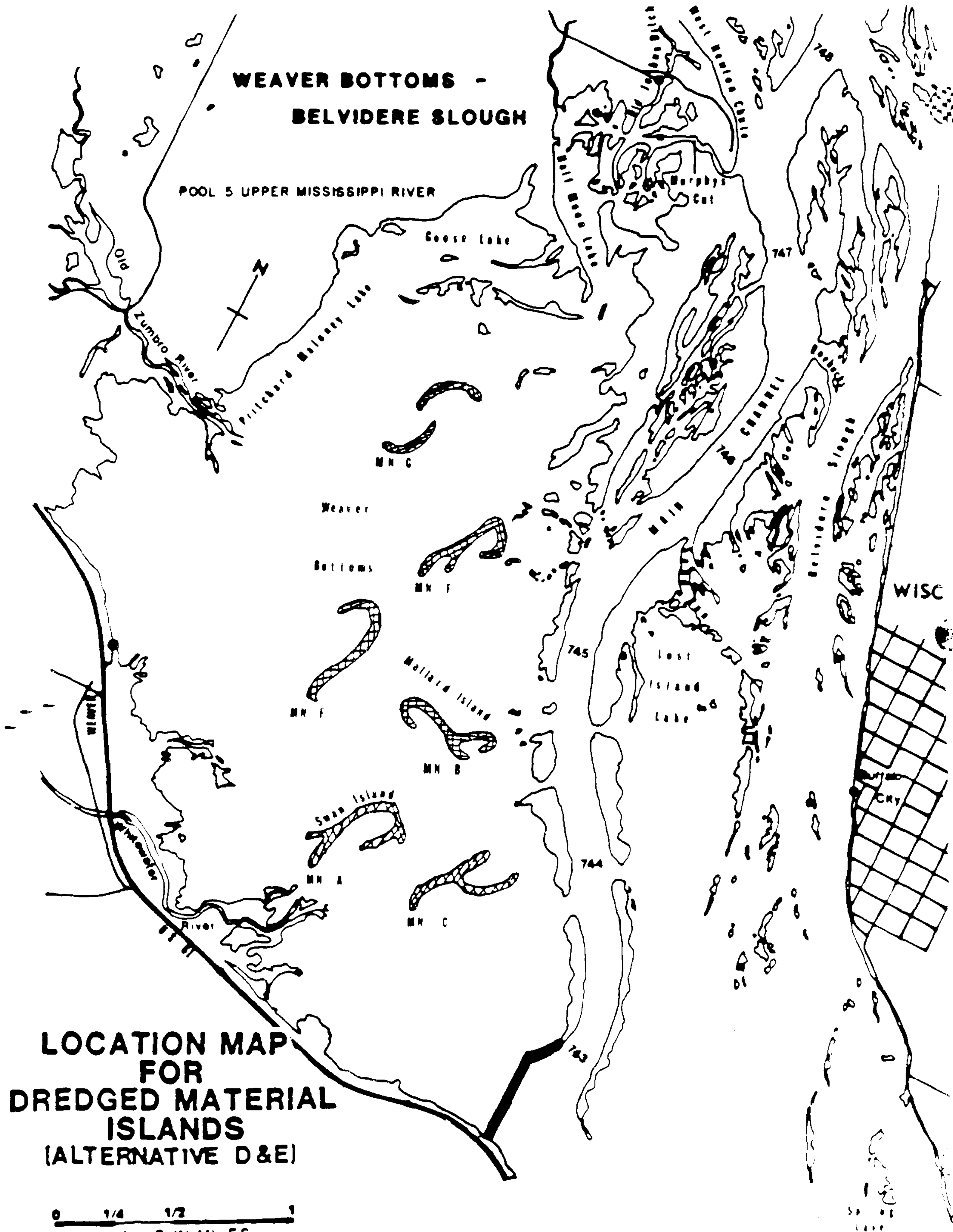
WEAVER BOTTOMS -
BELVIDERE SLOUGH
POOL 5 UPPER MISSISSIPPI RIVER
Zumbro River
Goose Lake
Weaver
Bottoms
Mallard Island
Swan Island
MN C
MN F
MN E
MN B
MN A
MN C
MAIN CHANNEL
Belvidere Slough
Lost
Island
Lake
747
746
745
744
743
748
WISC
LOCATION MAP
FOR
DREDGED MATERIAL
ISLANDS
(ALTERNATIVE D&E)
0 1/4 1/2 1
SCALE IN MILES

Figure EIS-2

constructed in phase II. The islands would be 8 to 10 feet above normal water levels, would be 150 to 170 feet wide at the base, and would have side slopes between 4 to 1 and 6 to 1. The islands would be capped with a minimum of 6 inches of fine backwater material, to facilitate vegetative plantings. A variety of experimental vegetative stabilization measures would be tried on the two initial islands and the apparently most effective measures would be incorporated into the final designs for the remaining islands (see appendix A, plates 26, 27, 28, 29, and 30).

3.15 MN 3, 6, and 10 would be partial closing structures consisting of dredged materials completely covered with 30 inches of rockfill (see figure EIS-2). Each structure would extend across the width of the cut, would have a 30-foot-wide by 400-foot-long channel bottom that would be 4 feet below flat pool, and would have side slopes of 2.5 to 1. The top of the structure or channel would be 3 feet above flat pool (see appendix A, plates 5, 6, 11, 12, 15, and 16).

3.16 MN 4 and 5 would be closure structures consisting totally of rock. Each structure would extend typically across the width of the cut and would be 20 feet wide with 2.5 to 1 slopes (see appendix A, plates 7, 8, 9, and 10).

3.17 MN 7, 11, 12, and 13 and WI 10B and 10C would be closure structures consisting totally of dredged material. The structures would extend typically across the width of the cut and would have various widths with 4 to 1 slopes and would be 12 feet above flat pool except 10B and 10C, which would be 4 feet above it (see appendix A, plates 13, 14, 17, 18, 19, 20, 21, 22, 31, and 34).

3.18 WI 10A, 11A, and 11B would be left open, and the banks and channel bottom would be stabilized with rock (see appendix A, plates 31, 32, and 34).

3.19 MN 14 would be a partial closure similar to the three in MN 3, 6, and 10 in cross section. The structure would be stabilized with 30 inches of rockfill on the downstream side at a 2.5 horizontal (H) to 1 vertical (V) slope.

The top of the structure would be 400 feet wide and 0.5 foot above flat pool (see appendix A, plates 23, 24, and 25).

3.20 Circulation in Old John's Ditch would be restored by installing culverts in the causeway to improve water quality in the area (see supporting document A, plates 1 and 2). Additional culverts may be added to connect Old John's Ditch to the West Newton Chute, if the initial culverts in the causeway are not sufficient to improve water quality.

Other Plans Considered in Detail

3.21 Alternative A - GREAT I CMP - This alternative is the GREAT I channel maintenance plan for the Weaver Bottoms modified to include development of seven islands. It is basically the same as the recommended plan except for the following: instead of the partial closure at MN 14, one additional island would be placed within Weaver Bottoms near the lower end; culverts would not be added to the causeway in Old John's Ditch; and MN 7 would be a closure consisting totally of dredged material.

3.22 Alternative B - Alternative B is the same as alternative A except that MN 7 would be left open as it exists and that the bottom would be stabilized with 30 inches of rockfill. Culverts would also be placed in the causeway in Old John's Ditch. Both of these features have been incorporated into the recommended plan except that MN 7 would not be stabilized with rock.

3.23 Alternative C - Alternative C is the same as alternative A except that it would eliminate the partial closing structure at MN 3 and would add three other structures.

3.24 MN 3A, 3B, and 3C would consist of dredged material completely covered with 30 inches of rockfill. The three structures would extend across each of the three channels leading from Murphy's Cut into Half Moon Lake and would be 10 feet wide with slopes of 2.5 H to 1 V. Two culverts with flap gates would

be installed in each of the structures (see supporting document A, plates 3 and 4).

3.25 Alternative E - Alternative E is basically the same as alternative C except that this alternative would include a structure at MN 14 and only six islands within Weaver Bottoms.

Comparative Impacts of the Alternatives

3.26 Table EIS-3 shows the comparative impacts of the alternatives.

4.00 AFFECTED ENVIRONMENT

4.01 Pool 5 is approximately 14.6 river miles long, running from river miles 738.1 to 752.7 (figure EIS-2). The pool surface area covers approximately 11,836 acres. The Corps owns 7,565 acres. The FWS manages 7,192 acres, most of it Corps-owned land.

Natural Resources

4.02 Pool 5 - Pool 5 provides excellent fish and wildlife habitat. Waterfowl hunting and trapping are considered good. Much of the pool is within the Winona District of the Upper Mississippi National Wildlife and Fish Refuge.

4.03 The Finger Lakes area immediately below lock and dam 4 provides some unique habitat qualities in this reach of the river. The main channel border area below the dam is used by bald eagles as a winter roosting area. The backwaters of the Weaver Bottoms and Belvidere Slough provide excellent spawning, nesting, and rearing areas, although sedimentation plus wind and current action are causing a decline in the fish and wildlife habitat value of these areas. The Weaver Bottoms "closed area" receives significant use from migrating canvasback ducks. Both the Weaver Bottoms and Belvidere Slough areas are important for migrating tundra swans. Areas such as Island 42 provide habitat for significant wood duck production. Mozeman's Slough is one

	Baseline	NFS/WCF (no action)	Plan D (selected)	Plan A	Plan B	Plan C	Plan E
		$ 8,481,800	$7,193,500	$6,851,000	$7,010,800	$6,972,700	$7,462,700
Natural Resources							
	55 acres cropland	55 acres cropland	52 acres of backwater habitat modified to island habitat 18 acres of side channel habitat modified to terrestrial habitat 18 acres of side channel habitat modified from sand to rock substrate	59 acres of backwater habitat modified to island habitat 18 acres of side channel habitat modified to terrestrial habitat 15 acres of side channel habitat modified from sand to rock substrate	71 acres of backwater habitat modified to island habitat 14 acres of side channel habitat modified to terrestrial habitat. 18 acres of side channel habitat modified from sand to rock substrate	70 acres of backwater habitat modified to island habitat 16 acres of side channel habitat modified to terrestrial habitat. 14 acres of side channel habitat modified from sand to rock substrate	53 acres of backwater habitat modified to island habitat 18 acres of side channel habitat modified to terrestrial habitat. 17 acres of side channel habitat modified from sand to rock substrate.
		No effect	Minor localized changes resulting from hydraulic conditions	Same as plan D	Same as plan D	Same as plan D.	Same as plan D.
		No effect	Enhancement of 4,000-acre backwater, Weaver Bottoms Increase in aquatic plants, structural diversity, shallow littoral areas, deep water habitat, and fish and wildlife productivity and diversity	Same as plan D			
	Bald eagle and peregrine falcon may occur in the area, but only in a migrating or transient status No endangered mussels occur in the area	No effect	No effect	No effect.	No effect.	No effect.	No effect.
Air quality			Temporary minor increase in air pollution during construction	Same as plan D.	Same as plan D.	Same as plan D.	Same as plan D.
Noise			Temporary minor increase in noise pollution during construction	Same as plan D	Same as plan D.	Same as plan D.	Same as plan D.
Water quality construction		localized, minor effects during construction and dredged material disposal	Localized, minor effects during construction and maintenance-dredged material disposal Disturbance of the fine backwater material at the island sites would cause localized degradations in water quality	Same as plan D.	Same as plan D.	Same as plan D.	Same as plan D.
		No effect	Potential localized dissolved oxygen problem areas within Weaver Bottoms because of reduced flows and increased aquatic plants	Same as plan D	Same as plan D.	Reduced potential for dissolved oxygen problems because of greater control on flow.	Same as plan C.

Table [illegible] Comparative Impacts of Alternatives (Selected Alternative D with Modifications)

Item	Baseline	NPS/WOR (No action)	Plan D (selected)	Plan A	Plan B	Plan C	Plan E
	Mights Euclid and the Weaver Bottoms because of high flows and long wind fetch	No effect	Improved water clarity within Weaver Bottoms because of reduced flows and wind fetch	Same as plan D			
[illegible] Old John's Ditch	Dissolved oxygen problem in Old John's Ditch	No effect	Correct dissolved oxygen problem in Old John's Ditch	No effect	Same as plan D.	Same as plan D.	Same as plan D.
Hydraulics Hydraulic dis- charge							
Weaver Bottoms	15 to 35 percent of the river discharge passes through Weaver Bottoms	No effect	75 to 80 percent reduction in discharge through Weaver Bottoms	Same as plan D	Same as plan D.	No effect.	No effect.
Main channel	50 to 75 percent of the river discharge passes through the main channel	No effect	50 to 60 percent increase in discharge in main channel	Same as plan D	Same as plan D.	Same as plan D.	Same as plan D.
Belvidere [illegible]	20 to 45 percent of the river discharge passes through the Belvidere Slough backwater area		2 to 9 percent increase *in discharge through* Belvidere Slough area This effect would decrease after a few years because of the increase in hydraulic efficiency of the main channel	Same as plan D	Same as plan D.	*Same as plan D*	Same as plan D.
[illegible] of the Weaver Bottoms	Weaver Bottoms is filling with sediment at an average annual rate of 1.1 [illegible] per year	No change	Greatest reduction in sedimentation within Weaver Bottoms No effect on sedimentation from Whitewater River	Reduction in sedimentation rates within Weaver Bottoms No effect on sedimentation from Whitewater River	Same as plan A.	Same as plan A.	Same as plan D.
[illegible]	Lost Island and Sand Run are filling rapidly with sediment	No change	Reduction in Lost Island *sedimentation Sand* Run dredged in order to construct project features	Same as plan D.	Same as plan D.	Same as plan D.	Same as plan D.
[illegible]		No effect	Potential increase in sedimentation in the main channel and bordering areas downstream of the project	Same as plan D.	Same as plan D	Same as plan D.	Same as plan D.
[illegible]	Belvidere Slough is filling rapidly with sediment	No effect	The project could cause some changes in the sedi*mentation patterns* in the Belvidere Slough area The effects are anticipated to be insignificant and short term, until the main channel becomes hydraulically more *efficient However, the* RAF will document short-term and long-term project related modifications in the sedimentation patterns in Belvidere	Same as plan D	Same as plan D.	Same as plan D.	Same as plan D.

Table ES-1 Comparative Impacts of Alternatives (Selected Alternative D with Modifications)

Item	Baseline	NPRMP (no action)	Plan D (selected)	Plan A	Plan B	Plan C	Plan E
			Slough and Spring Lake. Corrective actions will be taken as determined necessary				
Hydraulic water level							
Weaver Bottoms		No effect	Maintained at or near existing conditions throughout most of Weaver Bottoms, except for lower portions of Weaver Bottoms, which would be elevated by 0.1 foot for lower river discharges and by as much as 0.5 foot for higher river discharges.	Lowered slightly (0.1 foot) for lower river discharges and lowered substantially (greater than 0.5 foot) for higher river discharges throughout much of the Weaver Bottoms area.	Same as plan A.	Same as plan A.	Same as plan D
Belvidere Slough and Main Channel		No effect	Slight elevation (0.1 foot) in main channel and upper end of Belvidere Slough for low river discharges. The effects on water levels would increase as the river discharge increases, up to the point at which the structures at MR 4 and MR 5 and much of the land area are overtopped. It is anticipated that, as the main channel increases in efficiency, the effects on water levels in the upper end of Belvidere Slough would be reduced. The Resource Analysis Program will document the short-term and long-term effects on water levels in Belvidere Slough.				
Cultural Resources		No effect	No known sites listed on NRHP that will be affected	Same as plan D	Same as plan D.	Same as plan D.	Same as plan D.
Recreation Resources							
Aesthetics		Minor decreases during construction and disposal events	Minor decreases during construction and disposal. Increasing habitat diversity would increase aesthetic value	Same as plan D	Same as plan D.	Same as plan D.	Same as plan D.
Access to Weaver Bottoms		No effect	No effect	No effect	No effect.	Restrict access from Half Moon Landing into Weaver Bottoms.	Same as plan C.
Recreational use	Weaver Bottoms is used extensively for waterfowl hunting and fishing	No effect	Positive increase in recreational use, especially for canoeing, birdwatching, and other related activities	Same as plan D	Same as plan D.	Same as plan D.	Same as plan D.
Social Resources							
Local economy		Slight positive effects if local people are hired for contract work	Slight positive effects if local people are hired and local quarries used. Improving habitat quality could have positive effect on local recreation-based economy	Same as plan D	Same as plan D.	Same as plan D.	Same as plan D.
Riparian rights		Condemnation of 55 acres of privately owned cropland	No effect. Shoreline areas most likely to erode would be stabilized with rock	Same as plan D	Same as plan D.	Minor effects on shoreline erosion.	Same as plan C.

of the most heavily fished areas in pool 5, especially for ice fishing. The sand prairie and marsh areas north of the Weaver Bottoms provide habitat for rare species of turtles and many waterfowl.

4.04 Detailed descriptions of the habitat conditions and the historical changes within the Weaver Bottoms and Belvidere Slough areas are in Fremling et al., 1976, and Nielsen et al., 1978. A description of the Kruger Slough area is in Fremling et al., 1980. The following discussion is derived from these sources. Figure EIS-1 shows the locations of these areas.

4.05 Weaver Bottoms - The aquatic area of Weaver Bottoms covers approximately 4,000 acres. From shortly after impoundment in the 1930's by the 9-foot navigation channel project until the mid to late 1960's, approximately three-quarters of the Weaver Bottoms contained marsh vegetation (2,650 to 2,900 acres). During this time, the Weaver Bottoms contained a great diversity of habitats and of plant and animal species. However, in the late 1960's and early 1970's, the marsh vegetation dramatically decreased. In 1983, emergent and floating leaf aquatic macrophytes covered approximately a third of the aquatic area (1,380 acres). This decrease in vegetation has been attributed to a variety of reasons, including several major floods in the late 1960's, uprooting and removal by ice, and changed hydraulic and sedimentation patterns. Since the mid-1970's, the amount of aquatic vegetation has generally stabilized, although there has been some slight increase (12 percent from 1975 to 1982) in submersed vegetation. The area's inability to recover from the changes in the vegetative community is most likely a result of the changed flow and sedimentation patterns and of the negative impacts on water clarity caused by wind-induced waves. Arrowheads (Sagittaria spp.), lotus (Nelumbo lutea), and water lilies (Nymphaea tuberosa and Nuphar variegatum) dominate the existing emergent and floating leaf vegetation in the Weaver Bottoms. The four dominant submersed species are coontail (Ceratophyllum demersum), wild celery (Vallisneria americana), river pondweed (Potamogeton americanus), and curly-leaf pondweed (Potamageton crispus).

4.06 The benthos community in much of the open water area of the Weaver Bottoms is characterized by low diversity and standing crop. The reasons for this rather poor benthos community are the lack of structural diversity in the open water area, the diminished water quality caused by wind-induced waves, the abundance of sand substrate, and the existing hydraulic regime, which washes out many of the nutrients and detrital material.

4.07 Waterfowl and shorebird use of the Weaver Bottoms for resting and feeding during the spring and fall migrations is extensive, especially use by tundra swans, a species of special interest to the FWS. The area is a very popular waterfowl hunting area. Muskrats and other aquatic mammals are abundant along the edges of Weaver Bottoms that contain suitable aquatic vegetation. The fishery generally is good, mainly consisting of a centrachid-type fishery.

4.08 Belvidere Slough - The Belvidere Slough area is along the Wisconsin shoreline, across from the Weaver Bottoms area (figure EIS-2). Belvidere Slough receives approximately 40 percent of the river flow. The area consists of a large wooded slough and adjacent shallow backwater areas.

4.09 Because of the extensive flow to the area, much of the substrate, especially in the slough itself, is generally coarse. Some of the areas are experiencing extensive sedimentation rates. However, finer sediments are present in the backwater areas, such as Lost Island Lake and Spring Lake.

4.10 Generally, the benthos community in the slough can be characterized as having low diversity and low standing crop because of the coarse nature of the sediments. Lost Island Lake, Spring Lake, and other backwater areas that are part of the Belvidere Slough complex have benthos communities with greater diversity and productivity because of the abundance of aquatic plants and finer-grained sediments.

4.11 The aquatic plant community of the Belivdere area is diverse and is widely distributed, indicating favorable marsh conditions throughout much of

the area, except the slough itself where water depths and current velocity prevent colonization. Thirteen species of emergent plants occur in the area, with arrowheads (Sagittaria spp.) and white water lily (Nymphaea tuberosa) being the most widely distributed. Fifteen species of submersed plants occur in the area, with coontail (Ceratophyllum demersum) and wild celery (Vallisneria americana) being the most widely distributed.

4.12 Fisheries information on the area is limited. However, the well-vegetated backwater areas probably have valuable centrarchid-type fisheries. The slough area and side channels provide excellent flowing habitat for more riverine-type fish. Use of the area by waterfowl, shorebirds, furbearers, and other wildlife species is extensive because of the diversity of habitats and the abundance of shallow, vegetated backwater areas in the Belvidere Slough area.

4.13 Kruger Slough - The Krueger Slough area is a small backwater area near Weaver Bottoms (figure EIS-2). The substrate in most of the Krueger Slough area consists primarily of fine-grained sediments. The main side channel has coarser sediments, indicating that most of the flow in this area goes through this side channel.

4.14 Aquatic plants cover much of the area except the main side channel, where water depths and flow characteristics prevent colonization. Eighteen species of emergent and submersed aquatic plants are found in the area, with white water lily (Nymphaea tuberosa) and bur reed (Sparganium eurycarpum) being the most common emergent species. The most common submersed species are coontail (Ceratophyllum demersum), waterweed (Elodea canadensis), and river pondweed (Potamogeton americanus).

4.15 Krueger Slough contains an abundant and diverse benthic fauna. Its productivity is caused largely by the presence of the lush aquatic plant beds and the fine-grained sediments.

4.16 In the past, summer and winter dissolved oxygen problems have somewhat limited the fisheries value of portions of the Krueger Slough area. An opening into one of the stagnant backwater areas was made in 1978. Although this opening may have somewhat alleviated the dissolved oxygen problem, it has also introduced sand into the area. Remedial action by the Minnesota Department of Natural Resources (DNR) is scheduled for 1985.

4.17 The Krueger Slough area has a diversity of habitat types, both terrestrial and aquatic. The wildlife community reflects this diversity of habitat types with abundant wading birds, waterfowl, blackbirds, swallows, and furbearers.

Water Quality

4.18 The existing water quality conditions within the Weaver Bottoms project area (Fremling et al., 1976, and Nielsen et al., 1978) and adjacent backwater areas (Nielsen et al., 1978, and Nielsen et al., 1980) were studied during the late 1970's. Dissolved oxygen was adequate to maintain a good fishery throughout the year in most of the Weaver Bottoms area. The only exceptions were portions of Old John's Ditch, which is subject to stratification and dissolved oxygen problems during the late summer and winter months. Portions of Kruger Slough, an adjacent backwater, were also found to have some problems with dissolved oxygen levels. The Belvidere Slough/Spring Lake area exhibited dissolved oxygen problems only at some of the deeper areas in the Spring Lake area that became thermally stratified.

4.19 Nutrient levels found in the Weaver Bottoms and adjacent backwater areas are typical of other backwater areas on the Upper Mississippi and other eutrophic systems. Water clarity was found to be a problem in the open portions of the Weaver Bottoms.

Cultural Resources

4.20 No prehistoric archeological resources are known to be in the vicinity of the Weaver Bottoms on the Mississippi River floodplain. Archeological sites are known to be on the terraces, uplands, and tributary valleys surrounding the study area (Overstreet et al., 1982: Vol. 6). Prior to inundation associated with construction of the locks and dams, the Weaver Bottoms was a broad floodplain surface that had been settled and that was being used for agriculture (Mississippi River Commission, 1895). It is very likely that this area was also inhabited prehistorically. No intensive archeological surveys were done prior to inundation to confirm or deny this hypothesis. It is possible that the eastern edge of Weaver Bottoms (now islands) contains extant cultural resources, but these islands have also been heavily used for dredged material disposal.

4.21 A single historic site exists within the project area at West Newton. This site is a log rafting site that dates to the late 19th century. No other historic properties are in the floodplain near the Weaver Bottoms.

4.22 During 1984, a shoreline inspection of the proposed locations for the closure structures was made by a St. Paul District archeologist. The only well-exposed shoreline was located at MN 3, where no evidence of cultural remains was found eroding from the riverbank. This closure structure would be the closest to the West Newton log rafting site, probably located to the north. Little exposed shoreline was visible at the other proposed closure structure locations, and the majority of these were covered with dredged material and rock.

Recreational Resources

4.23 The Weaver Bottoms is an inundated lowland floodplain on the Upper Mississippi River in the middle of pool 5. It is now a 4,000-acre riverine lake with marsh vegetation on its perimeters. The west shoreline of the Weaver Bottoms borders Minnesota, and the main channel of the river borders

the Wisconsin or east shore edge. The Great River Road travels along the Minnesota shoreline. In Wisconsin, Buffalo City is on the east shoreline of the river, and the Great River Road is further from the river.

4.24 Pool 5 of the Mississippi River is part of region 10 of the Minnesota State Comprehensive Outdoor Recreation Plan (SCORP), and region 12 of the Wisconsin SCORP. Pool 5 is surrounded by a dynamic scenic area of forested rock bluffs that rise 500 feet above the broad Misssissippi floodplains. The pool area offers scenic views of limestone and sandstone cliffs, floodplains, trout streams, and the northern reach of the Upper Mississippi National Wildlife and Fish Refuge. Approximately 76,500 acres of forest, park, and wildlife lands are along the Minnesota side of the Mississippi River Valley in region 10. Because Wisconsin's region 12 contains only a few scattered lakes, the Mississippi River supplies 95 percent of the region's boating, fishing, camping, picnicking, and swimming opportunities. In a regional setting, pool 5 seems to hold little recreational allure for Wisconsin participants. Wisconsin residents use this pool of the Mississippi River most heavily for developed camping activity. Minnesotans participate heavily in water-oriented activities, are avid campers, and are frequent visitors at historic sites in the area. A significant portion of their participation in recreational activities is associated with a traditional Minnesota summer vacation that occurs more than 75 miles from home. Fishing ranks highest in participation, followed by boating, camping, nature study/bird watching, canoeing, visiting historic sites, and ice fishing. Other summer and winter recreation occurs closer to home.

4.25 Pool 5 provides 9 boat accesses with a total of 13 launching lanes (7 in Wisconsin, 6 in Minnesota), 22 parking spaces, 12 marina slips, 16 rental boats, 115 camping units, and 43 picnic units. Weaver Bottoms has 3 boat accesses providing launch facilities on the north end and west shore. Most recreational boating activity is in the upper third of the pool. Pool 5 has 8 dredged material disposal islands used for boat beaching. Most of the beaching areas are along the main channel in the middle third of the pool (RM 743 to RM 748), with a couple of island boat-beaching sites located in the

upper third of pool 5. The Weaver Bottoms area is in the middle third of pool 5 and historically is one of the most heavily used waterfowl hunting areas on the UMR.

Social Resources

4.26 The Weaver Bottoms is in southern Wabasha County, Minnesota, between the communities of Kellogg and Minneiska. In 1980, Kellogg's population was 440 and Minnieska's was 65. The 1980 estimated population of Wabasha County was 19,335. Major industries of employed persons are services, manufacturing, agricultural, and retail trade. The 1980 estimated median household income was $15,101. Nine percent of the families in Wabasha County had incomes below the poverty level in 1980. The estimated unemployment rate was 4.7 percent in 1980.

4.27 The project area is also adjacent to Buffalo County on the Wisconsin side of the river. The community closest to the project is Buffalo City, which had a population of 14,309 in 1980. Major industries employing people are agriculture, services, manufacturing, and retail trade. The 1980 estimated median household income was $13,422. Approximately 11 percent of the families in Buffalo County had incomes below the 1980 poverty level. The civilian unemployment rate was 7.4 percent in 1980.

4.28 The St. Paul District's primary authority and interest in the Weaver Bottoms project is maintenance of the 9-foot channel project. The nearly 20,000,000 tons of commercial cargo that move through the District annually depend upon a reliable navigation channel. The District has limited funding and equipment resources for channel maintenance and a large geographic area of responsibility. The St. Paul District equipment is used for maintenance of 1,050.0 miles of river, which includes the Rock Island District and a portion of the St. Louis District.

Land Use on the National Wildlife and Fish Refuge

4.29 Most of the Weaver Bottoms and surrounding area are in the Upper Mississippi National Wildlife and Fish Refuge. The FWS therefore has been actively assisting in the planning of this project and is a cooperating agency for the project. The FWS is developing a master plan for the Upper Mississippi refuge system. The Weaver Bottoms project will be included in the final master plan. The FWS has developed a list of management objectives for the rehabilitation project and the Weaver Bottoms area in general. The alternatives considered for this project and the design of the project features were developed to meet the objectives developed by the FWS and should be compatible with these objectives.

5.00 ENVIRONMENTAL EFFECTS

Effects on Natural Resources

5.01 Biological Effects - All of the alternatives considered (except the no action plan) would substantially reduce the existing sedimentation problems in Half Moon Lake and near the side channel openings into Weaver Bottoms. Of the alternatives considered, the selected plan would reduce overall sedimentation rates the most and would preserve the area for fish and wildlife the longest. Much of the substrate within the Weaver Bottoms, especially near the side channels, the Half Moon Lake area, and the middle of the Weaver Bottoms, is predominantly sand substrate. This condition is also true for Lost Island Lake area, especially near the inlets from Sand Run. The substrate in these areas would tend to become finer over time because of reductions in the amount of coarse sediments introduced from the main channel, in wave erosion, and in current velocities. The organic content of the sediments should also increase, with an increase in aquatic plants. Benthos productivity and diversity, especially for fingernail clams and Hexagenia mayflies, which are important fish and waterfowl food, should increase as a result of these substrate changes. In addition, these substrate changes should increase the ability of aquatic plants to colonize these areas.

5.02 Extensive amounts of sediments are deposited in the Weaver Bottoms by the Whitewater River. Computer modeling studies have indicated that the proposed project would neither correct nor add to this problem.

5.03 The predominant substrate in the main channel and main channel border is sand. Therefore, substrate composition in the main channel and main channel border is not likely to significantly change because of the increased current velocity with the project. This is also true for much of the Belvidere Slough and Roebucks Run areas.

5.04 At the side channels proposed for partial rock closures, the existing sand and silt substrate would be modified to rock substrate. Rock substrate on the river is valuable to certain fish species (such as smallmouth bass and walleye) for cover and food, and an increase in rock substrate should have a positive effect on these species.

5.05 The reduced number and modification of the remaining access points may somewhat impede fish movement into and out of the Weaver Bottoms area. The partial closing structures were designed to maintain the maximum current velocities under 3 feet per second. At these maximum current velocities and the design lengths of 400 feet, the partial closing structures should not significantly impede the movement of most riverine fish species. The culverts at Murphy's Cut in alternatives C and E would be more of an impediment to fish movement than would the partial closing structure in the selected plan.

5.06 The predicted minor changes in water level within Weaver Bottoms under low river discharges should not have any significant adverse impacts on the biota. Water levels would fluctuate with river discharge for the selected plan similar to what presently occurs, approximately 1 foot at river flows of 80,000 cfs and less.

5.07 The proposed project would cause substantial initial modifications of water levels, current velocity, and sedimentation patterns in the main channel

and main channel border. The effects would be reduced after a while when the channel becomes deeper and more stable. Existing flow in the main channel bordering Weaver Bottoms is fairly low because of all the flow into the numerous side channels. With the project, the predicted current velocities for various river discharges generally still would be below what presently occurs in the main channel area immediately upstream. Riverine fauna presently using the main channel and main channel border are not likely to be significantly affected by these increases in current velocity, although some localized changes in the community may occur. Many of the rock training structures that were built for the 6-foot navigation project in this area are partially or completely buried by sand. Increasing the discharge through this area could remove some of this accumulated sand, which could be beneficial to the biota of the main channel and border.

5.08 The project is predicted to reduce dredging volumes by 260,000 cubic yards of sediments over 40 years (6,500 cubic yards annually), but this figure is an estimate, and the actual amount of the reduction in dredging requirements may be either greater or less. If the project is implemented, this material would remain within the system, although the ultimate fate of this material is unknown. The computer model studies did show that the main channel downstream of Weaver Bottoms may experience an increase in sedimentation. The main channel downstream of Weaver Bottoms presently is capable of carrying the extensive bedload of the Mississippi River through this reach. This area should be capable of carrying the minor additional bedload material resulting from the modified hydraulic conditions in the main channel upstream. Compared to the total amount of sediment transport from pool 5, the volume of additional material is insignificant. During the GREAT study, the Sediment and Erosion Work Group determined that the bedload material outflow from pool 5 ranged from 162,000 cubic yards/year for a 2-year annual hydrograph to 400,000 cubic yards/year for the 10-year annual hydrograph. If the reduced dredging constitutes increased bedload material, the estimated average increase would amount to 4.0 percent and 1.6 percent of the outflow from pool 5 for these two hydrographs, respectively. If the river could not pass this increase, this material would amount to an average deposition of

less than 0.04 foot/year over the channel downstream of the project and a total of less than 1-1/2 foot for the 40-year period. If the main channel downstream of Weaver Bottoms does not show increased sedimentation, the increased bedload outflow may result in less scour below the dam. Whatever the short-term fate of this material, which cannot even be readily identified as a separate quantity, it will not have any environmental impacts that would be any greater than those that would normally occur under the most probable future without a project. The quantity of material is just too small, unless the river deposited it all in one small area, and rivers do not do that. Additionally, this aspect of the project impacts would be monitored closely.

5.09 The upper end of Belvidere Slough could experience increases in water levels that would range from slight to more substantial, depending on river discharges. For normal discharges (15,000 to 40,000 cfs), the effects on water levels in the upper end would be slight (less than 0.1 foot). The effects on water levels would increase with river discharge until the river discharge reaches the point where the existing land areas and the structures at MN 4 and MN 5 are overtopped (approximately 100,000 cfs). Above this discharge, the effects on water levels would once again become insignificant. The computer model predicted less than a 0.1-foot increase in water levels for river discharges equaling the 1-percent chance flood. The computer model has also predicted that the effects on water levels and discharges into Belvidere Slough would diminish after a few years, because the main channel would become more efficient and more of the water would pass through it.

5.10 One of the major concerns expressed by the general public and other Federal and State agencies was the potential effects of the project on sedimentation patterns in adjacent backwaters. The Belvidere Slough backwater complex, which is across the main channel from Weaver Bottoms, already experiences high sedimentation rates. Comparisons of 1973 and 1981 aerial photographs show that land is accreting at a fairly high rate in the Belvidere Slough backwater complex area. Recreational access has been a problem and is becoming more of a problem because of this high sedimentation rate. Computer modeling studies have indicated that the project would not add to the existing

sedimentation problems in most of the area. Structures on the inlet from Sand Run into the Lost Island area were included in the project to prevent an increase in sedimentation in the Lost Island area as a result of the project. The structures would also correct the existing sedimentation problem in this area. Another potential problem area defined by the model is the area within Belvidere Slough near the downstream end of Buffalo City. The computer model indicates that the project would cause scouring to occur in this area, with subsequent deposition of the material in the Spring Lake area. The extent of the changes in the sedimentation patterns in this area are unknown. However, this area would be monitored, and corrective measures would be taken if unacceptable changes in sedimentation patterns did occur.

5.11 It is anticipated that Krueger Slough would also receive approximately a 10-percent increase in discharge. The effects on fish and wildlife would probably be similar to those projected for Belvidere Slough.

5.12 Approximately 100 to 118 acres of aquatic habitat would be directly modified by any of the alternatives considered (table EIS-4). Because of the lower closure at MN 14, the selected plan would directly affect approximately 8 more acres than some of the other alternatives. Of the total acres to be affected, 30 to 60 acres would be side channel habitat and from 50 to 70 acres would be shallow, open backwater habitat. Approximately 13 to 18 acres of the side channel habitat would be modified to partial rock closing structures that could become valuable areas for fish and other aquatic organisms. The remaining side channel areas would be modified to terrestrial habitat.

Table EIS-4. Acres Directly Affected by the Weaver Bottoms Alternatives

Alternatives	Acres of side channel modified to partial rock closures	Acres of side channel modified to terrestrial	Acres of back-water modified to island habitat	Total acres directly affected
A	15.4	16.1	68.8	100.3
B	17.8	13.7	70.5	102.0
C	13.5	16.4	69.7	99.6
D (Selected plan)	18.4	38.1	51.6	108.1
E	16.5	38.1	52.5	107.1

5.13 The existing substrate at the side channels is predominantly sand, with some areas of finer material. These areas with finer sediments would be dredged, temporarily stored near the site, and then used to cap the backwater side of the maintenance-dredged material closures. This material should provide a suitable soil for vegetative plantings. Burial of existing rock channel structures would be minimized as much as practical; and, in most cases, these structures simply would be tied into the proposed closures. The benthos in the side channels is generally typical of other sand substrate on the Upper Mississipppi River, being characterized by low diversity and standing crop. This rather impoverished fauna would be buried by the proposed closures. A few aquatic macrophytes are present in some of the larger side channel openings, such as MN 13 and MN 14. These macrophytes would also be buried by the closures.

5.14 Approximately 50 acres of shallow, unvegetated backwater habitat would be changed to island habitat. The island locations were chosen to avoid existing important habitat features (such as the stump fields, existing emergent aquatic plants, and the deeper water areas) as much as practical, within the constraints of maximizing the primary goal of reducing wind fetch.

5.15 In addition to their primary goal of reducing wind fetch, the islands were designed to maximize waterfowl and shorebird use and to increase the shallow littoral area available for fish and wildlife. Dredging of backwater material should produce a suitable soil for vegetative plantings on the islands and create deep-water habitat for use by fish. The FWS would perform needed management practices on the islands to maintain and enhance the value of the islands for fish and wildlife.

5.16 Endangered Species - Two mussel species are federally listed as endangered on the Upper Mississippi River: the Higgins' eye pearly mussel (Lampsilis higginsi) and the fat pocketbook mussel (Proptera capax). These endangered species have not been recorded in pool 5 during any of the recent surveys (Fuller, 1978; Fuller, 1979; and Wisconsin DNR, 1981). A survey was conducted in 1972 at the side channel sites that would be directly affected by the proposed project (Nielson et al., 1978). Only six mussel taxa were found in the side channel areas. No specimens of the two listed species were found. Therefore, the proposed project is unlikely to have any significant impact on the two listed mussel species.

5.17 Two other federally-protected species, the threatened bald eagle (Haliaeetus leucocephalus) and the endangered peregrine falcon (Falco peregrinus), could occur in the project area. Very little upland area would be disturbed, and the disturbance from construction activities is likely to be relatively minor. Therefore, it is unlikely that any significant impact would occur on the two species or on their required habitat.

5.18 No other federally-listed endangered or threatened species nor any species proposed to be listed are in the project area and/or are likely to be affected by the project. The U.S. Fish and Wildlife Service, as a cooperating agency, has prepared a biological assessment for endangered species (see supporting document A) and has determined that the proposed project would not have any significant impact on any federally-listed endangered or threatened species or its habitat.

5.19 Overall Impacts on Habitat - Overall, the project is expected to have very positive environmental benefits on the 4,000-acre Weaver Bottoms backwater. The project was designed to restore the habitat quality within the Weaver Bottoms and preserve it as a valuable backwater for a longer period of time. The Fish and Wildlife Service and the Fish and Wildlife Technical Work Group of the Channel Maintenance Forum developed a set of environmental enhancement objectives and anticipated benefits (tables EIS-5 and EIS-6).

5.20 Many of the physical benefits, such as reduced sedimentation and current velocity within Weaver Bottoms, are anticipated to occur immediately after construction of the project features. Water clarity within Weaver Bottoms may improve slightly after the construction of the phase I features because of the reduced flows and wind fetch. However, more substantial changes in water clarity would not be realized until after the construction of the remaining islands in phase II. The biological community would respond rather slowly to the changes in the physical environment. It would probably take 3 to 5 years before observable changes in the biological community occur, and probably 10 years before the biological community comes to a new equilibrium in respect to the physical habitat changes.

Water Quality Effects

5.21 Short-term Construction/Dredged Material Disposal Water Quality Effects - Potential short-term impacts on water quality would derive mainly from three sources: (1) effluent from the containment areas for the long-term (40 years) disposal of maintenance-dredged material; (2) open-water disposal (hydraulically and/or mechanically) of maintenance-dredged material from the two containment areas to construct the side channel modifications and the barrier islands; and (3) runoff from the disposal of hydraulically dredged backwater material to create a cap of fine material on the barrier islands and to create deep-water areas next to the islands. The effects of these sources are more fully described in the Section 404(b)(1) evaluation (exhibit 1). The first two sources of impacts should produce only localized, minor impacts on water quality because of the clean, coarse nature of the dredged material.

Table EIS-5. Objectives of Weaver Bottoms Project Developed by the U.S. Fish and Wildlife Service

The fish and wildlife habitat of Weaver Bottoms has deteriorated in recent years. The Weaver Bottoms area has changed from a biologically-productive marsh to a less productive, windswept riverine lake. Losses of submergent and emergent vegetation resulting from changes in substrate type, deposition, and water turbidity have been identified as contributing factors to the decline in habitat quality. The overall goal of the FWS is to rehabilitate Weaver Bottoms and enhance its use for fish and wildlife species. The following objectives are directed toward achieving this goal. They are not listed in priority order.

1. Reduce sediment deposition within Weaver Bottoms. Means:
   a. Closure of side channels along the border between Weaver Bottoms and the main channel.
   b. Island(s) construction to direct flow from the Whitewater River out of the Weaver Bottoms area.

2. Reduce suspended sediments (turbidity) within the water column. Means:
   a. Reduce water flow rates entering the Weaver Bottoms area.
   b. Reduce wind fetch by creation of upland islands.
   c. Direct discharge from the Whitewater River out of the Weaver Bottoms area.

3. Promote increased growth of both emergent and submergent hydrophytes. Means:
   a. Increase lake-like conditions by reducing current flow.
   b. Increase littoral area by islands.
   c. Plantings of aquatic plant species as appropriate.
   d. Reduce wave action.

4. Maintain and enhance the use of Weaver Bottoms by swans and other waterfowl; retain the integrity of the designated waterfowl sanctuary area. Means:
   a. Promote the growth of aquatic vegetation.
   b. Maintain the integrity of Whitewater River delta area.
   c. Ensure that rehabilitation efforts do not adversely affect swan use.
   d. Maintain existing aquatic plant beds.
   e. Regulate vessel access during critical waterfowl use periods.

5. Encourage waterfowl nesting/feeding/loafing habitats. Means:
   a. Design islands and manage them for waterfowl purposes.
   b. Planting of high wildlife-value vegetation.

6. Maintain predator populations at acceptable levels. Means:
   a. Monitor nest success of waterfowl.
   b. Design islands/closures to inhibit predator movement and prevent establishing travel corridors.

7. Enhance fishery habitat. Means:
   a. Diversify bottom contours/substrates.
   b. Maintain adequate flows and dissolved oxygen levels.

8. Increase the amount of habitat available for use by shorebirds. Means:
   a. Island creation.
   b. Substrate modifications.

9. Provide necessary shoreline stabilization to existing islands bordering the main channel. Means: Riprap placement where necessary.

10. Maintain access to Weaver Bottoms for appropriate recreational uses.

A program of monitoring and analyzing the work done in Weaver Bottoms is also essential whether all or only some of the above objectives are undertaken:

11. Monitoring the physical and biological changes. Means: Develop a monitoring program for Weaver Bottoms and surrounding areas.

12. Determine the biological and physical changes in areas surrounding Weaver Bottoms (i.e., Belvidere Slough). Means: Monitoring and analysis

Table EIS-6. Preliminary Goal and Objectives for the Weaver Bottoms Rehabilitation Project Developed by the Fish and Wildlife Work Group

Goal

The biological/physical goal of the Weaver Bottoms rehabilitation project is to create and maintain a more diverse riverine habitat for fish and wildlife.

Objectives

1. Reduce sediment transport and/or deposition into Weaver Bottoms.
   a. Modify selected side channels.
   b. Construct islands to direct flow from the Whitewater River out of Weaver Bottoms.

2. Promote diversity of the aquatic environment.
   a. Enhance water regime (quality, depth, velocity) by partial and complete side channel closures.
   b. Reduce wind fetch and increase littoral area by construction of islands.
   c. Create deepwater habitat adjacent to islands.
   d. Stabilize selected areas with riprap and vegetation.

3. Evaluate large-river rehabilitation techniques.
   a. Implement a resource analysis program.

Expected Benefits

1. Improve abundance and diversity of aquatic vegetation.

2. Improve waterfowl feeding, resting, and nesting habitats.

3. Improve fisheries spawning, nursery, and dwelling habitats.

4. Improve furbearer habitat.

5. Increase longevity of Weaver Bottoms as a productive backwater.

6. Establish a basis for future rehabilitation projects elsewhere on the Upper Mississippi River and similar river systems.

7. Promote beneficial use of dredged material.

8. Increase recreational opportunities.

5.22 The last source of construction/dredged material disposal impacts on water quality would be from capping the barrier islands with dredged material from the backwaters. This action would have the potential for more significant effects on water quality. The material would be placed on the islands by a small hydraulic dredge with a sprayer system or would be placed mechanically on the site. With the hydraulic system, the discharge would be a wide, fine-mist spray used to blanket the islands. This system should minimize runoff of the material as much as practical. However, there would be some runoff, and some of the material would be resuspended in the water column near the islands. Mixing and dilution would occur rather slowly because of low current velocities that would be present in the Weaver Bottoms. Turbidity and suspended solids may remain elevated for a period after disposal. Because the contaminants found in the sediment samples have a high affinity for fine material, they are not likely to be released. Sediment bioassays conducted on a similar backwater material from pool 5A did not show any significant toxicity or accumulation of PCB's or selected heavy metals. Therefore, no toxic effects are anticipated on endemic biota.

5.23 The proposed action involves the disposal of dredged material and rock in waters of two States, Minnesota and Wisconsin. Most of the project would be constructed in Minnesota. The Minnesota Pollution Control Agency (6 MCAR 4.8024) has classified the Mississippi River as 2B, 3B. This classification indicates that the water quality should be suitable for fisheries and recreation and for industrial consumption, but that the "quality of the resource has been significantly altered by human activity and the effect is essentially irreversible." Wisconsin (NR 103) indicates that "water quality shall meet the standards and requirements for recreational use and fish and aquatic life." Table 404-3 summarizes the State standards that have been established to protect these designated uses. Construction of the project features with maintenance-dredged material and quarry rock that have a coarse, clean nature should not violate the standard for unspecified toxic substrates and most of the other water chemistry standards in the table. The backwater material that would cap the islands contains some low levels of contaminants. However, with restrictions on the placement of this material to minimize

runoff and the high affinity of fine sediments of the contaminants present, Minnesota standard for unspecified toxic substances should not be violated.

5.24 The Minnesota standard for turbidity (25 NTU's) and suspended solids (30 mg/1) and the Wisconsin standard for suspended solids (80 mg/1) would be exceeded as a result of the construction of the project features. A variance from the Minnesota standards for these two parameters, similar to the procedure for normal channel maintenance activities, would be required.

5.25 However, it should be noted that turbidity, under present conditions within Weaver Bottoms, frequently exceeds the Minnesota standard (Fremling et al., 1976). Implementation of the project, with the resultant reduced flows and wind fetch, should reduce normal turbidity levels and allow this standard to be met more frequently. The Wisconsin DNR has a special exception process that allows the State to waive certain permit or regulatory requirements, including the prohibition of the disposal of fill material below the ordinary high water mark, for the implementation of GREAT I Channel Maintenance Plan and/or environmental enhancement projects. Preliminary discussions with the Wisconsin DNR have indicated that the agency will use this process to approve all or part of the project. Water quality certification may also be required to approve the non-dredged material side channel modifications. The project is anticipated to maintain adequate water circulation within Weaver Bottoms to prevent dissolved oxygen problems from developing. However, it is possible that isolated areas within Weaver Bottoms could have seasonal dissolved oxygen levels below the Minnesota standard of 5 mg/1.

5.26 If monitoring shows that this problem does develop and become an unacceptable long-term effect of the project, remedial actions may be required to correct the problem.

5.27 Long-term Water Quality Effects - Long-term impacts on water quality may come from two sources: (1) secondary movement of the dredged material, and (2) the modified hydraulic and sediment transport regime of the area caused by the project. Dredged material used at partial rock closures would be overlain

with rock, and the banks in the area would be riprapped. This protection should prevent any secondary movement of the dredged material or erosion of the existing banks. Side channels MN 12 and MN 13 are proposed to be only dredged material closures. These closures would be built up to approximately 2 feet above the surrounding land and would not be overtopped under normal high water conditions. Therefore, under normal high water conditions, water would be forced across the vegetated portions of the existing island, which should minimize any erosion. The backwater side of these islands would be stabilized with vegetation. The main channel side of these structures and the adjacent bank would be monitored. If erosion becomes evident, rock would be added to stabilize the bank. The lower closure would be tied into existing wing dams and a closing structure. The main channel bank would be further stabilized in this reach, thereby minimizing any erosion. The barrier islands that would be built initially would have a variety of stabilization measures so that the effectiveness of the stabilization measures can be monitored and evaluated. Based on the result of the evaluation, problems with any of the initial stabilization measures would be corrected, and the necessary stabilization measures would be incorporated into the design of the remaining barrier islands.

5.28 Current velocity within Weaver Bottoms would be substantially reduced but not totally eliminated, and some water circulation would occur for all river discharges. The Pritchard Maloney Lake and Goose Lake areas of Weaver Bottoms (which do not receive much flow now) might be the areas most affected by the project. Dissolved oxygen problems presently do not occur in these areas but could develop there with the project. These areas presently receive much of their flow from Murphy's Cut (MN 3), which would have its discharge reduced by approximately 50 percent with the partial closure alternatives A, B, and D. This reduced discharge in combination with wave mixing and water circulation from changing water levels is anticipated to provide sufficient flow to prevent dissolved oxygen problems but would have to be monitored closely, especially during the winter.

5.29 The slight additional flows into Spring Lake might prevent stratification, with subsequent depressed dissolved oxygen levels, from occurring in the deeper areas within Spring Lake. The reduction in the flow into Lost Island Lake would not be as substantial as it would be for Weaver Bottoms, and adverse impacts on water quality are not expected.

5.30 Opening up the mouth of Old John's Ditch and placing a culvert in the causeway with alternative B could have both positive and negative impacts on water quality. Alternative B would correct an existing dissolved oxygen problem in Old John's Ditch. Old John's Ditch presently receives extensive bank fishing, which might be improved if the dissolved oxygen problem is eliminated. However, the Zumbro River, which carries extensive amounts of suspended sediments, enters the Mississippi River immediately upstream of this area. Opening the mouth of Old John's Ditch could funnel some of the water from the Zumbro River into the upper end of Weaver Bottoms, diminishing the water quality in this area.

5.31 Spacing of the islands at 4,000 feet should prevent waves from being generated that would erode and resuspend the finer sediments. The basic crescent shape of the islands should provide the greatest reduction in wind fetch from a variety of directions. Reducing wave-induced disturbance of the bottom sediments and reducing current velocities should reduce turbidity and suspended solids levels within Weaver Bottoms. With these changes, plankton may increase, which could offset the gain in water clarity from reducing turbidity and suspended solids levels. However, it is anticipated that there would still be an overall net gain in water clarity. This improved clarity should have a positive impact on aquatic plants, and the areal extent of the vegetated areas should increase fairly dramatically. This increased vegetation is anticipated to have a very positive effect on waterfowl, aquatic mammals such as the muskrat, and other wildlife species. The canvasback duck and tundra swan use the Weaver Bottoms rather extensively during migration. Use by these species is not likely to be adversely affected by the proposed project.

AD-A170 084 DESIGN ANALYSIS REPORT FOR LOWER POOL 5 CHANNEL MAINTENANCE/WEAVER BOTTOM..(U) CORPS OF ENGINEERS ST PAUL MN ST PAUL DISTRICT MAY 86 2/3

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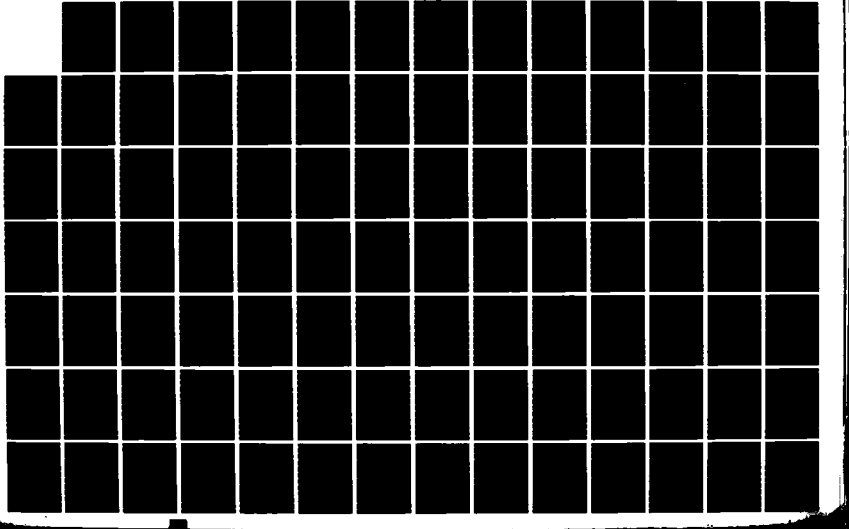

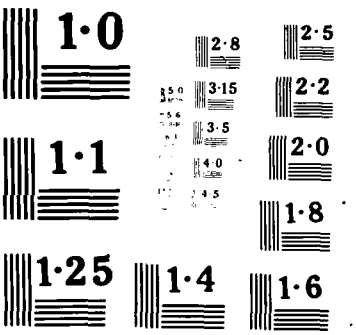
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Air Quality Effects

5.32 Short-term, minor impacts on air quality, including noise, would occur with the construction of the project features. However, no long-term significant effects should occur.

Cultural Resources Effects

5.33 In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, the National Register of Historic Places has been consulted. As of November 27, 1984, no properties listed on or determined eligible for the National Register would be affected by the proposed actions at Weaver Bottoms.

5.34 It is unlikely that any cultural resources would be adversely affected by construction of the closure structures. These structures would involve the placement of fill on areas that have been previously filled. Deeply buried prehistoric sites may be intact on the islands, but the placement of fill would not affect these resources. If continual overtopping of the island occurs during floods, deeply buried sites could be affected by erosion. However, this scouring probably could not be repaired after significant flood events without negating the project's purpose.

5.35 Construction of the wind fetch reduction islands would not have any effect upon known cultural resources. It is possible that the Weaver Bottoms area had prehistoric resources prior to inundation. However, a comparison of the 1930 and 1975 topography of the areas shows significant changes have taken place in this land surface. Some areas of original land surface have been scoured to a depth of greater than 4 feet, with comparable deposition in other areas.

5.36 None of the project features would have an impact upon the historic West Newton log rafting site. The St. Paul District, Corps of Engineers, has coordinated the side channel closures and wind fetch reduction islands with

the Minnesota State Historic Preservation Officer (MSHPO), the National Park Service, and the Minnesota State Archeologist. The only response that the St. Paul District received was from the MSHPO, who concluded that the side channel closures and wind fetch reduction islands had low potential for containing archeological and historic resources.

Recreational Resources

5.37 Channel closures MN 3 through MN 11 would be next to wildlife management land (as identified in the Corps-FWS Land Use Allocation Plan for the Upper Mississippi River). These closures would be consistent with the wildlife allocation and would be revegetated, where appropriate. The two channel closures, MN 12 and MN 13, would be next to low-density recreation boat-beaching sites along the main channel, but would offer little potential for boat beaching. The importance of the existing recreational beaching sites would be enhanced by revegetating as many channel closures as possible.

5.38 The proposed plan would provide increased recreational opportunities and maintain the visual aesthetics. The anticipated benefits are as follows:

1. Reduction in excessive water and sediment inflow into the Weaver Bottoms area.

2. Improved visual quality and more diverse habitat for sport hunting and fishing recreational opportunities.

3. Vegetation plantings to provide erosion control, habitat enhancement, water clarity, and visual amenities.

4. Continued use of Half Moon Landing for boat launching.

5. An opportunity to create islands that can offer more diverse habitats that would increase production of fish and wildlife. Production increases would provide better opportunities for hunters and fishermer.

6. Birdwatching/nature study opportunities for Great River Road users, island beach users, and fishing and hunting recreationalists.

5.39 Alternatives C and E would close off boat access to Weaver Bottoms by eliminating the Half Moon Landing site. Since this alternative would leave only two landing sites available, it would severely decrease hunting and fishing opportunities.

Social Resources

5.40 Modifying the side channels and constructing barrier islands would have both positive and negative social impacts. Channel modifications would increase the efficiency of the channel, reduce dredging, and increase the availability of wildlife in the backwaters, thereby enhancing recreation, commercial navigation, and hunting. The local economy could benefit from increased recreational tourism fostered by the increase in available wildlife. In addition, the local economy also would be enhanced by the possible employment of local workers and the use of the local quarries.

5.41 Negative social impacts could also result from this project. The project would increase discharge levels in the main channel that may result in slight shoreline erosion at a small number of properties downstream of Murphy's Cut. However, with the project, the shoreline areas of the property owners most likely to be affected would be stabilized with riprap. The Belvidere Slough area would have to be monitored closely to insure that increases in sediment deposits do not occur. Such increases could impede Buffalo City's access to both the main channel and the backwaters.

5.42 The rock used to construct the project features would be transported to the sites on barges and placed mechanically with a crane or similar mechanical equipment. River access for barge loading is very limited in pool 5. The most likely access point that would be used is the Alma, Wisconsin, public boating landing in upper pool 5. This landing was used in 1985 to load barges

for the scour repair at locks and dam 4. This use of the landing did not have any significant effects on recreational use of the site. Therefore, other than increases in truck traffic from and to the boat landing, no significant social effects from this operation are anticipated.

5.43 Project construction would have short-term negative effects on land transportation, noise, and area aesthetics.

Land Use on the National Fish and Wildlife Refuge

5.44 Most of the Weaver Bottoms and surrounding area are in the Upper Mississippi National Fish and Wildlife Refuge system. The FWS therefore has actively assisted in the planning of this project and is a cooperating agency for the project. The FWS is developing a master plan for this refuge system. The Weaver Bottoms project will be included in the final master plan. The FWS has developed a list of management objectives for the rehabilitation project and the Weaver Bottoms area in general (table EIS-5). The alternatives considered for this project and the design of the project features were developed to meet the objectives developed by the FWS and should be compatible with these objectives. There is, however, one potential conflict area. Many of the proposed islands would be built in a portion of the refuge that is closed to waterfowl hunting. Increasing the littoral area and deep-water habitat in the closed portion of the refuge by building the barrier islands would increase fish use of this area and possibly increase fishing activities. Increases in fishing activities in the closed refuge area during the fall waterfowl migration may increase the disturbance to resting waterfowl and may conflict with the FWS-designated primary purpose for the closed areas.

Navigation Effects

5.45 Implementation of the Weaver Bottoms project is a less expensive method of channel maintenance than the most probable future without the project (MPFWOP). The proposed project would have much of its cost up front in the first phase of construction because of the rock stabilization requirements.

The project benefits would not be realized until the second phase of construction.

5.46 Although a reduction in dredging requirements is predicted, future channel maintenance will have to be analyzed to determine actual effects. Increased maintenance downstream of the project is not anticipated, but channel conditions will have to be monitored.

5.47 Channel velocities are expected to increase but not sufficiently that commercial vessels would have difficulty navigating. Predicted current velocities with the project are less than those that presently occur upstream of the project area.

6.00 PUBLIC INVOLVEMENT

Public Involvement Program: GREAT I

6.01 GREAT I was formed in 1974 as an interagency, interdisciplinary approach to problem solving on the UMR. GREAT I defined a number of subobjectives, including "to assure an appropriate level of public participation." It also formed a Public Participation and Information Work Group (PPIWG) to provide a mechanism for informing people about the river and GREAT, and for obtaining and directing public involvement in the GREAT I study decision-making process. The PPIWG coordinated the initial studies of the Weaver Bottoms, the definition of the problem, and the GREAT I decision process, including the selection of the Weaver Bottoms rehabilitation project as the channel maintenance plan for lower pool 5; and it received solid support. Two recommendations of the PPIWG are most important to this project: (1) "Measures must be taken to restore lost habitat and preserve and enhance existing habitat important to the ecosystem," and (2) "The Channel Maintenance Plan, as designed by GREAT, should be implemented through Congressional funding and authority." The EIS for the GREAT I study also provided a means of specific involvement.

6.02 The Channel Maintenance Forum (CMF) was established in 1981 basically as a replacement for the GREAT I team. The CMF is an informal organization consisting of various Federal and State agencies. The primary objectives of the CMF are (1) "to provide a mechanism for all Federal and State agencies with management or regulatory responsibilities along the Mississippi River and tributaries in the GREAT I area to facilitate the coordination of their programs and activities for implementation of the GREAT I channel maintenance program and related issues, and (2) provide an opportunity for other interested parties to express their concerns and views to the agencies." A Fish and Wildlife Technical Work Group (FWTWG) of the CMF was established in October 1983. The tasks that the FWTWG were given included providing non-agency fish and wildlife input into the planning process for the proposed project and assisting the Fish and Wildlife Service in the development of a long-term resource monitoring program for the proposed project. The project was extensively coordinated through these two groups.

6.03 The FWTWG reported to the CMF on September 30, 1985, that they were in general agreement with the recommended plan, with comments. The CMF endorsed the recommended plan, with comments, on September 30, 1985.

6.04 A notice of intent to prepare a draft supplement to the final EIS's for the Mississippi River 9-foot navigation project and GREAT I study appeared in the Federal Register on May 8, 1984. This notice invited all interested parties to participate in the scoping process for this supplement. A series of agency and public scoping meeting were held to inform the interested public and to solicit input into the planning process.

Required Coordination

6.05 This final supplement to the EIS, together with the design analysis report, will be coordinated with all public agencies, conservation groups, and interested individuals for review and comment. The draft supplement and design analysis report were distributed for public review on February 24, 1986. A notice of availability appeared in the March 7, 1986, Federal

Register. The official 45-day comment period ended April 21, 1986. Appendix B contains the letters of comment on the draft plus the Corps responses. The final design analysis report and the final supplement to the EIS reflect changes made in response to these comments. After the final supplement and design analysis report go through an official 30-day review, a record of decision will be distributed to everyone on the project mailing list. Routine coordination with appropriate agencies will continue throughout the study process.

6.06 Because the proposed plan involves placement of fill material in waters of the U.S., a Section 404(b)(1) evaluation of the effects of fill placement is in this supplement. Water quality certification is being requested from the Minnesota Pollution Control Agency, including a request for a variance from their turbidity and suspended solids standards, which the proposed action would exceed. Negotiations with the Wisconsin DNR indicate that the actions involving maintenance-dredged material will be included in the present Memorandum of Understanding (MOU) between the St. Paul District and the State of Wisconsin. This MOU waives certain Wisconsin permit and regulatory requirements, including prohibition of disposal of dredged material below the ordinary high water mark, for the use of the GREAT I channel maintenance sites or other sites approved by the CMF. The structural modifications that only involve rock may be approved through either a water quality certification process or through the exemption process.

6.07 The project impacts on cultural resources have been coordinated with the State Archeologists, the State Historic Preservation Officers, and the National Park Service.

6.08 The project has been fully coordinated with the Wisconsin DNR, the Minnesota DNR, and the Minnesota Pollution Control Agency. The plan was initially approved, in concept, by the State resource agencies through the GREAT I process. Further coordination has been conducted through the normal EIS scoping process and through the CMF. The CMF is approved by the States of Minnesota and Wisconsin as the mechanism for coordination of channel

maintenance activities on the Upper Mississippi River. The CMF endorsed the report and plan, with suggested changes, on September 30, 1985.

List of Recipients

6.09 The following agencies, organizations, and individuals will receive copies of this supplement or a notice of its availability.

United States Senators

Honorable David Durenberger
Honorable Rudy Boschwitz
Honorable William Proxmire
Honorable Robert W. Kasten, Jr.

United States House of Representatives

Honorable Timothy J. Penny
Honorable Steve Gunderson

Governor of Minnesota

Honorable Rudy Perpich

Governor of Wisconsin

Honorable Anthony S. Earl

Federal Agencies

United States Department of the Interior
Assistance Secretary for Program Policy
United States Fish and Wildlife Service, Field Office
United States Fish and Wildlife Service, Regional Office

United States Fish and Wildlife Service, Upper Mississippi National Fish and Wildlife Refuge

Acting Assistant Director, United States Geological Survey

Bureau of Indian Affairs

Bureau of Land Management

National Park Service

United States Department of Agriculture

United States Forest Service

Soil Conservation Service, River Basin Planning Branch

Soil Conservation Service, Minnesota State Conservationist

Soil Conservation Service, Wisconsin State Conservationist

Agriculture Stabilization and Conservation Service

United States Department of Commerce

Deputy Assistant Secretary for Environmental Affairs

Deputy Assistant Secretary for Regulatory Policy

National Oceanic and Atmospheric Administration

- National Marine Fisheries Service
- National Weather Service

United States Department of Health and Human Services

Director of Environmental Affairs

Region V Environmental Office

Public Health Service

United States Department of Housing and Urban Development

Region V Environmental Clearance Officer

Regional Administrator, Federal Housing Authority

United States Department of Energy

Federal Energy Regulatory Commission

Division of NEPA Affairs

United States Department of Transportation

Federal Highway Administration

U.S. Coast Guard

United States Environmental Protection Agency

Region V Administrator

Office of Federal Activities

Federal Emergency Management Administration

Advisory Council on Historic Preservation

Minnesota State Offices and Agencies

Minnesota Senate

Minnesota State House of Representatives

Minnesota Department of Agriculture

Minnesota State Historic Preservation Officer

Minnesota State Archeologist

Minnesota Environmental Quality Board

Minnesota Pollution Control Agency

Minnesota Department of Transportation

Minnesota Department of Energy and Economic Development

Minnesota Department of Health, Division of Environmental Health

Minnesota Department of Natural Resources

Minnesota State Board of Health

Minnesota State Planning Agency

Natural Resources and Agriculture Senate Committee

Wisconsin State Agencies and Offices

Wisconsin Department of Administration

Wisconsin Department of Agriculture

Wisconsin Department of Natural Resources

Wisconsin Department of Transportation
Wisconsin Division of Health
Wisconsin State Historic Preservation Officer
Wisconsin State Archeologist
Wisconsin State Board of Soil and Water

Iowa State Offices

Department of Transportation
Department of Water, Air, and Waste Management
Iowa Conservation Commission

Interagency and Regional Agencies

Channel Maintenance Forum
Mississippi River Regional Planning Commission
Southeast Regional Development Commission
Minnesota-Wisconsin Boundary Area Commission
Upper Mississippi River Conservation Commission
Upper Mississippi River Basin Association

County and Local Agencies

Buffalo City, Wisconsin
City of Cochrane, Wisconsin
Buffalo County, Wisconsin
City of Kellogg, Minnesota
City of Minneiska, Minnesota
City of Wabasha, Minnesota
City of Weaver, Minnesota
City of Winona, Minnesota
Wabasha County, Minnesota

Libraries

Wabasha Public Library
Winona Public Library
Winona State University Library

St. Mary's College Library
Minneapolis Public Library
St. Paul Public Library
Metro Council Library
Hill Reference Library
University of Minnesota Library
Madison Public Library
University of Wisconsin Memorial Library
Colorado State University Library

Newspapers and Media

Buffalo County Journal
Eau Claire Leader-Telegram
La Crosse Tribune
Lake City Graphic
Red Wing Republican Eagle
Wabasha County Herald
Winona News
Minneapolis Star and Tribune
St. Paul Pioneer Press-Dispatch
Wisconsin State Journal
United Press International
KAGE AM FM, Winona
KNXR FM, Rochester
KOLM AM/FWWK FM, Rochester
KROC AM/FM, Rochester
KRPR FM, Rochester
KSTP TV, St. Paul
KTTC TV, Rochester
KWEB AM/KRCH FM, Rochester
KWMB AM, Rochester
KWNO AM, Winona
WCCO TV, Minneapolis
WEAU TV, Eau Claire

WIZM AM, La Crosse

WKGT TV, La Crosse

WKTY/WSPL, La Crosse

WQOW TV, Eau Claire

WXOW TV, La Crosse

Interest Groups and Individuals

Friends of the Earth, Minnesota Branch

Izaak Walton League of America

Izaak Walton League, Minneapolis Chapter

Ducks Unlimited

Minnesota Environmental Education

Minnesota Environmental Control Citizens Association

Minnesota Waterfowl Association

Minnesota Public Interest Research Group

Sierra Club, John Muir Chapter

Sierra Club, North Star Chapter

Minnesota League of Women Voters

Soil Conservation Society of America

Environmental Defense Fund, Inc.

National Audubon Society, North Midwest Region

National Audubon Society, North Midwest Representative

National Wildlife Federation

Midwestern Gas Transmission

Minnesota League of Women Voters

Upper Mississippi Waterway Users Association

Private Individuals (approximately 100)

INDEX AND REFERENCES

Table 7 summarizes some of the areas that have been covered in other documents that are incorporated by reference into this supplement. In addition, several reports were prepared on the detailed background environmental studies conducted in the mid-1970's for the project. The full citations for these reports are listed below. These reports have been previously widely distributed and should be available at many local libraries, colleges, and Federal and State agencies. Two other references (Mississippi River Commission, 1895, and Overstreet, 1982) are not so widely available. All of the reports are available for inspection at the St. Paul District office, however. Additional copies of these reports are not available for distribution.

Fremling, C.R., D.R. McConville, D.N. Nielson, and R.N. Vose. 1976. The Weaver Bottoms: A Field Model for the Rehabilitation of Backwater Areas of the Upper Mississippi River by Modification of Standard Channel Maintenance Practices. Winona State University and St. Mary's College, Winona, Minnesota.

Fremling, C.R., D.N. Nielson, D.R. McConville, R.N. Vose, and R.A. Faber. 1980. The Feasibility and Environmental Effects of Opening Side Channels in Five Areas of the Mississippi River (West Newton Chute, Fountain City Bay, Sam Gordy's Slough, Kruger Slough, and Island 42). Winona State University and St. Mary's College, Winona, Minnesota.

Great River Environmental Action Team. A Study of the Upper Mississippi River: GREAT I. 9 Vols. St. Paul, Minnesota.

Mississippi River Commission. 1895. Detail Map of the Upper Mississippi River from the Mouth of the Ohio River to Minneapolis, Minnesota, in 89 Sheets. Chart No. 178.

Nielson, D.N., R.N. Vose, C.R. Fremling, and D.R. McConville. 1978. Phase I Study of the Weaver-Belvidere Area, Upper Mississippi River. Winona State University and St. Mary's College, Winona, Minnesota.

Overstreet, David F., Robert P. Fay, Carol I. Mason, and Robert F. Boszhardt. 1982. Literature Search and Records Review of the Upper Mississippi Basin: St. Anthony Falls to Lock and Dam 10. A Report Prepared for the St. Paul District, U.S. Army Corps of Engineers, under Contract No. DACW37-82-C-0011. Report of Investigations No. 116. Great Lakes Archaeological Research Center. Wauwatosa, Wisconsin.

U.S. Army Corps of Engineers. 1974. Final Environmental Impact Statement, Operation and Maintenance, 9-Foot Navigation Channel Upper Mississippi River, Head of Navigation to Guttenberg, Iowa. 2 Vols. St. Paul District, St. Paul, Minnesota.

U.S. Army Corps of Engineers. 1981. Implementation for GREAT I Study. St. Paul District, St. Paul, Minnesota.

Vose, R.N. 1983. 1982 Aquatic Macrophytes of Weaver Bottoms, Compared to 1975-77.

In addition to the reports listed above, a volume of Supporting Documents for the Lower Pool 5 Channel Maintenance/Weaver Bottoms Rehabilitation Plan was prepared. The Supporting Documents report contains the results of the detailed technical studies that were conducted as part of the overall planning process. The Supporting Documents report also contains the Resources Analysis Program that was developed to monitor the long-term effects of the project. This report is available upon request. The various sections of the Supporting Documents report are listed below.

A. Biological Assessment for Endangered Species
B. Operational Evaluation
C. Hydraulic Evaluation

D. Long-term Resource Analysis Program

E. Recreational Evaluation

F. Public Involvement

Table EIS-7. Index and References

Subject area	EIS supplement (section)	Final EIS, 9-foot navigation channel (references incorporated) (pages)	Final EIS, GREAT I study (references incorporated) (pages)	GREAT I main report and appendixes (references incorporated)
Affected Environment - General UMR				
Geology and Soils	4.00	36-39, 43-46		MR; PP II, 1-18
Climate	4.00	42-43		
Surface and Ground Water	4.00	39-42, 46-71	49-50	
Fish and Wildlife Resources	4.00	71-107	43-49	
Recreation	4.00	130-134	52-54	
Cultural Resources	4.00	115-118	54-55	
Socio-economic Resources	4.00	107-114, 118-179	55-59	
Channel Maintenance - General Objectives	4.00		59-60	
Fish and Wildlife Refuge	4.00	195		
National Recreation Area	4.00	198		
Affected Environment - Pool 5	4.00			MR; PP III, 32
Alternatives Eliminated from Further Study (Backwater Dredging - Further Study Item 20)	3.00		182	
Alternatives - Historical	3.00	xii and xiii		
Authority	2.00	6-7		
Background - 9-foot Channel GREAT I CMP	2.00	1-6	2-4	MR; PP II, 1-9
Environmental Effects - General, for a Variety of Plans and Measures	5.00	330-334		
Environmental Effects - General Operation and Maintenance	5.00	202-230		
Environmental Effects - Pool 5 - General for Historical Versus Incorporating Weaver Bottoms Rehabilitation	5.00		122-124	
Public Agency/Concern (Further Study Item 21)	2.00			MR; PP VII, 40-41
Public and Agency Coordination	6.00	375-386	206-207	PP 1-87
Without-Project Condition (No Action)	3.00	223-234		

*GREAT I Reports: MR = Main Report, PP - Public Participation (volume 7).

LIST OF PREPARERS

The following people were primarily responsible for preparing this draft supplement to the EIS.

Name	Discipline/Expertise	Experience	Role in preparing supplement
Dennis Anderson	Aquatic/Fisheries Biologist	8 years EIS studies, St. Paul District, Corps of Engineers; Master's in Aquatic Biology.	Effects on fish and wildlife resources, water quality, and wetlands.
Gary D. Nelson	Sociologist	2 years social impact analyses, St. Paul District, Corps of Engineers; 6 years socio-economic research.	Social analysis, public involvement.
Karen Nagengast	Landscape Architect	2 years, recreation studies, St. Paul District, Corps of Engineers; 3 years water resource design and research.	Effects on recreation resources, aesthetics.
David Berwick	Archeologist	8 years cultural resources management, St. Paul District, Corps of Engineers.	Cultural resources impacts.
Cliff Schlueter	Hydraulic Engineer	8 years hydraulic studies, St. Paul District, Corps of Engineers, Hydraulic Section; BSCE Colorado State University.	Hydraulic analysis.
Bruce Heide	Landscape Architect	3 years project management, St. Paul District; 7 years public use planning, St. Paul District.	Study Manager.
Deborah Foley	Civil Engineer (P.E.)	2 months project management, 3 years hydrologic studies, 2 years computer application, St. Paul District; 2 years hydraulic and hydrologic studies, TRDA, St. Paul, Minnesota; 2 years hydraulic studies, Wilmington District.	Study Manager.

EXHIBIT 1
SECTION 404(b)(1) EVALUATION

SECTION 404(b)(1) EVALUATION
FOR DREDGED MATERIAL DISPOSAL AND FILL ACTIVITIES ASSOCIATED WITH THE LONG-TERM CHANNEL MAINTENANCE/WEAVER BOTTOMS REHABILITATION PLAN IN POOL 5, UPPER MISSISSIPPI RIVER

I. PROJECT DESCRIPTION

A. Location - The proposed project would be in pool 5 of the Upper Mississippi River. Figure 404-1 shows the locations of the side channel closures and the tentative locations of the barrier islands for the selected plan, alternative D.

B. General Description - The proposed project consists of a series of partial and complete closures at side channel openings into Weaver Bottoms and Lost Island backwaters that would reduce flow and sediment input. In addition, six islands of approximately 10 acres each would be built in Weaver Bottoms to reduce wind fetch. Table 404-1 summarizes the project features for the selected plan and the other alternatives considered in detail. A more detailed description of the alternatives is in the EIS supplement.

C. Authority and Purpose - The 9-foot navigation channel on the Upper Mississippi River was authorized by the Rivers and Harbors Act of July 3, 1930, and other legislation. The Great River Environmental Action Team (GREAT) I study (authorized by Section 117 of the Water Resources Development Act of 1976) was organized to identify and assess the problems associated with multipurpose use of the Mississippi River and to develop recommendations for improved management of the river resources. In September 1980, the GREAT I final report was released. The primary product of this study was a channel maintenance plan that provided site-specific recomendations for dredged material disposal over the 40-year period 1986-2025. The recommended plan for lower pool 5 was to use dredged material to modify side channels and create barrier islands within Weaver Bottoms, to rehabilitate this large backwater complex. The proposed project has three main purposes:

1. To develop a 40-year plan for material dredged from lower pool 5 during channel maintenance.

2. To reduce dredging requirements in lower pool 5.

3. To restore and maintain a more diverse habitat within Weaver Bottoms, thereby enhancing its use for fish and wildlife species.

D. General Description of Dredged and Fill Material

1. Physical Characteristics - The particle size analyses indicate that the sediments normally deposited at the maintenance dredge cuts are medium to fine sands with only traces of silts and clays (mean of 1.8 percent of the sample (table 404-1). The rock would be local quarry-run rock, ranging in size from 2 to 30 inches in diameter. Most of the backwater sediments are expected to have a large percentage of silts and clays. Samples collected in the general area within Weaver Bottoms contained 67 to 87 percent silts and clays.

2. Chemical Characteristics - Since 1974, 16 sediment samples from the four dredge cuts have been analyzed for bulk chemistry and particle size distribution (Corps of Engineers, unpublished data). In addition, in 1980 acute particulate phase and solid phase sediment bioassays were performed on sediments from one of the dredge cuts (Sommerfield Island dredge cut 2) (Marking et al., 1980). The results of the bulk chemical analyses indicate that the sediments are generally uncontaminated and that they are typical of the sediments from dredge cuts below Lake Pepin (table 404-1). No acute toxicity to indigenous organisms was observed in either the suspended particulate or solid phase bioassays.

Table [illegible] Bottom Sediment Quality

PHYSICAL DATA 1974-1984
NO DATA AVAILABLE

MILE	DREDGE CUT/LOCATION	YEAR	GRAB TYPE	SETTLEABILITY TESTS: SUSPENDED SOLIDS (mg/l) 0 HRS	SUSPENDED SOLIDS (mg/l) 4 HRS	TURBIDITY (FTU) 0 HRS	TURBIDITY (FTU) 4 HRS	HYDROMETER (% FINER) .005 mm	HYDROMETER (% FINER) .020 mm	U. S. STANDARD MESH SIZES (% FINER) 270	200	140	100	80	70	50	40	30	20	16	12	10	8	4	3/8 in	3/4 in	1 1/2 in	3 in
749.00	MILE BEND	1979	MC	780	264	82	27	0	0.0	--	1	--	--	2	--	--	53	--	91	--	--	99	--	100	100	100	100	100
749.00	MILE BEND	1979	MC	428	156	42	15	0	1.0	--	2	--	--	3	--	--	21	--	72	--	--	94	--	99	100	100	100	100
748.00	WEST NEWTON	1980	MC	488	120	75	30	0	0.0	--	0	--	0	--	--	--	35	--	--	96	--	--	100	100	100	100	100	100
747.00	WEST NEWTON	1980	MC	--	--	--	--	0	0.0	--	0	--	0	--	--	--	32	--	--	86	--	--	91	95	100	100	100	100
747.92	WEST NEWTON	1974	MC	--	--	--	--	0	0.0	--	0	--	1	--	--	--	34	--	--	94	--	--	98	100	100	100	100	100
747.70	WEST NEWTON	1975	MC	--	--	--	--	--	--	--	3	--	4	--	--	--	39	--	--	90	--	--	94	97	100	100	100	100
747.50	WEST NEWTON	1980	MC	272	148	54	25	0	0.0	--	0	--	0	--	--	--	22	--	--	70	--	--	79	88	95	100	100	100
746.80	BELOW WEST NEWTON	1980	MC	144	0	55	33	0	0.0	--	0	--	0	--	--	--	22	--	--	79	--	--	90	97	100	100	100	100
746.01	BELOW WEST NEWTON	1979	MC	428	252	40	11	0	0.0	--	1	--	--	1	--	--	37	--	91	--	--	100	--	100	100	100	100	100
746.00	BELOW WEST NEWTON	1979	MC	752	180	34	12	0	0.0	--	1	--	--	2	--	--	13	--	55	--	--	79	--	96	100	100	100	100
745.63	FISCHER ISLAND	1975	MC	--	--	--	--	--	--	--	3	--	4	--	--	--	37	--	--	98	--	--	99	100	100	100	100	100
745.62	FISCHER ISLAND	1975	MC	--	--	--	--	0	0.0	--	0	--	1	--	--	--	40	--	--	95	--	--	98	99	100	100	100	100
745.61	FISCHER ISLAND	1975	MC	--	--	--	--	0	0.0	--	0	--	0	--	--	--	28	--	--	99	--	--	100	100	100	100	100	100
745.60	FISCHER ISLAND	1975	MC	--	--	--	--	0	0.0	--	0	--	0	--	--	--	28	--	--	99	--	--	100	100	100	100	100	100
745.01	FISCHER ISLAND	1974	MC	--	--	--	--	0	0.0	--	0	--	0	--	--	--	71	--	--	97	--	--	99	100	100	100	100	100
745.00	FISCHER ISLAND	1974	MC	--	--	--	--	0	0.0	--	0	--	0	--	--	--	71	--	--	97	--	--	99	100	100	100	100	100
744.30	FISCHER ISLAND	1980	MC	156	0	49	29	0	0.0	--	0	--	0	--	--	--	44	--	--	98	--	--	99	100	100	100	100	100
744.21	LOWER ZUMBRO	1979	MC	964	260	62	22	0	2.0	--	2	--	--	11	--	--	96	--	100	--	--	100	--	100	100	100	100	100
744.20	LOWER ZUMBRO	1979	MC	1824	232	60	25	0	2.0	--	3	--	--	18	--	--	93	--	100	--	--	100	--	100	100	100	100	100
743.22	SUMERFIELD ISLAND	1974	MC	--	--	--	--	0	0.0	--	0	--	2	--	--	--	88	--	--	100	--	--	100	100	100	100	100	100
743.00	SUMERFIELD ISLAND	1980	MC	--	--	--	--	0	0.0	--	4	--	7	--	--	--	62	--	--	94	--	--	99	100	100	100	100	100
741.82	MOUNT VERNON LIGHT	1978	MC	1768	0	280	60	0	0.0	--	1	--	--	5	--	--	72	--	94	--	--	97	--	97	98	100	100	100
741.81	MOUNT VERNON LIGHT	1978	MC	1284	96	192	82	0	0.0	--	1	--	--	4	--	--	64	--	95	--	--	100	--	100	100	100	100	100
741.80	MOUNT VERNON LIGHT	1978	MC	18916	484	4000	320	0	2.0	--	8	--	--	10	--	--	41	--	80	--	--	93	--	97	100	100	100	100
741.51	MOUNT VERNON LIGHT	1979	MC	13388	968	2000	170	0	1.0	--	5	--	--	10	--	--	69	--	89	--	--	97	--	100	100	100	100	100
741.50	MOUNT VERNON LIGHT	1979	MC	3884	772	660	84	1	2.0	--	2	--	--	3	--	--	33	--	78	--	--	96	--	100	100	100	100	100

BACKWATER DATA

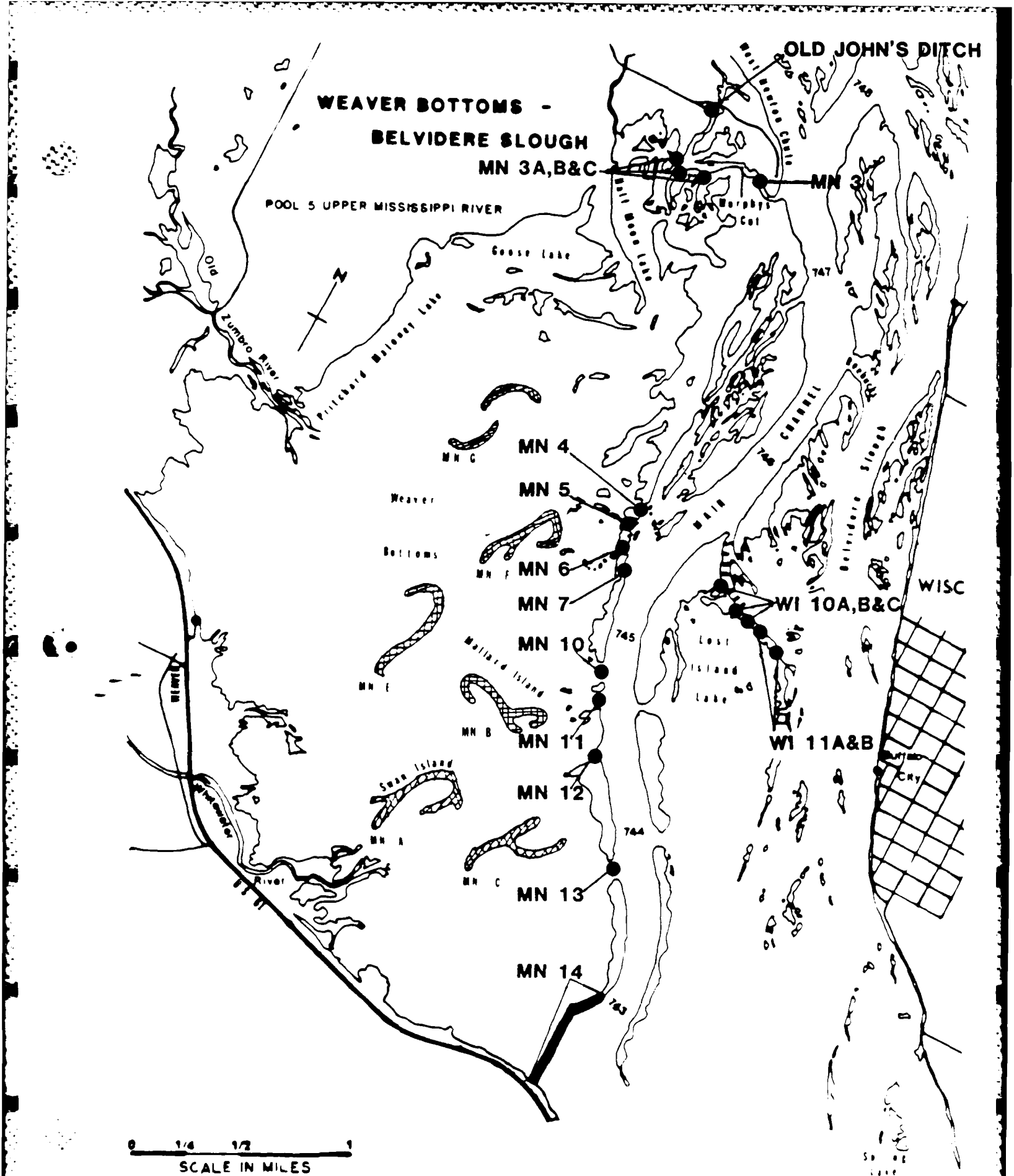
MILE	DREDGE CUT/LOCATION	YEAR	GRAB TYPE	SETTLEABILITY TESTS: SUSPENDED SOLIDS (mg/l) 0 HRS	SUSPENDED SOLIDS (mg/l) 4 HRS	TURBIDITY (FTU) 0 HRS	TURBIDITY (FTU) 4 HRS	HYDROMETER (% FINER) .005 mm	HYDROMETER (% FINER) .020 mm	U. S. STANDARD MESH SIZES (% FINER) 270	200	140	100	80	70	50	40	30	20	16	12	10	8	4	3/8 in	3/4 in	1 1/2 in	3 in
745.05	WEAVER BOTTOMS	1984	BW	--	--	--	--	5	17.0	46	67	78	84	86	87	90	93	95	96	97	98	98	99	99	100	100	100	100
744.80	WEAVER BOTTOMS	1984	BW	--	--	--	--	14	27.0	53	72	76	82	84	85	88	91	93	95	96	97	98	99	99	99	100	100	100
743.30	WEAVER BOTTOMS	1984	BW	--	--	--	--	27	40.0	69	87	94	96	97	97	97	98	98	98	98	99	99	99	99	99	100	100	100

[illegible] DATA [illegible]
NO DATA AVAILABLE

MILE	YEAR	AS (ug/g)	BA (ug/g)	CD (ug/g)	CR (ug/g)	CU (ug/g)	FE (ug/g)	MN (ug/g)	HG (ug/g)	NI (ug/g)	PB (ug/g)	ZN (ug/g)	CN (ug/g)	CHLOR (ug/kg)	DDD (ug/kg)	DDE (ug/kg)	DDT (ug/kg)	DIELD (ug/kg)	ENDR (ug/kg)	PCB (ug/kg)	OIL (ug/kg)	LOI (mg/kg)	COD (mg/kg)	NH4N (ug/g)	KJDN (mg/kg)	TPHOS (ug/g)
[illegible].01	1973	0	50	(10.00	(10	(10	26000	150	0.00	(10	(10	10	0	0.00	0.0	0.0	0.0	0.00	0.0	0	0	3700	3700	4.3	300	140
[illegible].00	1973	0	50	(10.00	(10	(10	9000	260	0.00	10	(10	10	0	0.00	0.0	0.0	0.0	0.00	0.0	0	0	4870	1800	6.2	300	230
[illegible].00	1980	0	50	(10.00	(10	(10	1800	180	0.00	(10	(10	6	0	0.00	0.0	0.0	0.0	0.00	0.0	1	0	2350	710	4.3	75	--
[illegible].00	1980			0.81	28	7	8950	--	(0.01	24	4	37	--	(0.40	(0.2	(0.2	(0.4	(0.20	(0.2	1	2130	5000	1110	(0.5	--	583
[illegible].00	1974	(0.6		1.00	7	7	--	--	0.90	5	(10	30	--	(0.01	(0.01	0.01	(0.01	(0.01	(0.01	--	699	4800	2096	--	52	177
[illegible].00	1975	1		(0.10	8	20		--	0.06	--	(0.1	21	--	-	--	--	--	--	--	--	1471	18000	4340	0.4	6	450
[illegible].00	1980	0	50	(10.00	10	(10	1300	220	0.00	(10	(10	8	0	0.00	0.0	0.0	0.0	0.00	0.0	0	0	33100	930	3.4	4500	--
[illegible].00	1980	0	40	(10.00	(10	(10	2300	300	0.00	10	(10	10	0	0.00	0.0	0.0	0.0	0.00	0.0	2	0	2650	710	3.0	450	--
[illegible].00	1979	0	20	(10.00	(10	(10	2800	240	0.00	(10	(10	10	0	0.00	0.0	0.0	0.0	0.00	0.0	0	0	3650	1040	3.9	400	170
[illegible].00	1979	0	50	(10.00	(10	(10	2900	190	0.00	(10	(10	10	0	0.00	0.0	0.0	0.0	0.00	0.0	0	0	4740	550	3.1	300	230
[illegible].00	1975	0		(0.10	6	6		--	0.03	--	(0.1	19	--	--	--	--	--	--	--	--	973	16000	2810	0.1	10	310
[illegible].00	1975	0	-	(0.10	6	5	-	--	0.03	--	(0.1	16	--	--	--	--	--	--	--	--	29	15000	1274	0.1	3	240
[illegible].00	1975	0	-	(0.10	5	6	--	--	0.04	--	(0.1	16	--	--	--	--	--	--	--	--	15	15000	1103	0.1	2	210
[illegible].00	1975	0	--	(0.10	6	7	--	--	0.04	--	(0.1	25	--	--	--	--	--	--	--	--	62	14000	1226	0.0	3	260
[illegible].01	1979	11		(1.00	5	10	--	--	0.30	5	(10	13	--	(0.01	(0.01	(0.01	(0.01	(0.01	(0.01	--	(6	3000	1278	--	52	104
[illegible].00	1979	1	-	(1.00	5	8		--	0.20	5	(10	13	--	(0.01	(0.01	(0.01	(0.01	(0.01	(0.01	--	(6	4000	964	--	134	119
[illegible].00	1980	0	30	(10.00	(10	(10	1500	190	0.00	(10	(10	8	0	0.00	0.0	0.0	0.0	0.00	0.0	6	0	2900	800	5.4	30	--
[illegible].01	1979	0	30	(10.00	(10	(10	2400	180	0.00	(10	(10	10	0	0.00	0.0	0.0	0.0	0.00	0.0	0	0	2230	1400	4.4	500	180
[illegible].00	1979	0	20	(10.00	(10	(10	2100	180	0.00	(10	(10	(10	0	0.00	0.0	0.0	0.0	0.00	0.0	0	0	2280	1900	5.2	380	160
[illegible].00	1979	(0.6		(0.70	33	5		--	0.40	26	(7	13	--	(0.01	(0.01	0.01	(0.01	(0.01	(0.01	--	530	4000	1397	--	109	142
[illegible].00	1980			1.43	28	4	14100	--	(0.01	23	0	75	--	(0.40	(0.2	(0.2	(0.4	(0.20	(0.2	(1	180	3500	1170	(0.5	--	684
[illegible].80	1978	0	10	(10.00	(10	(10	1800	170	0.00	20	(10	4	0	0.00	0.0	0.0	0.0	0.00	0.0	0	0	3070	2000	1.5	490	150
[illegible].81	1976				--	--	--	--	--	--	--	--	--	0.00	0.0	0.0	0.0	0.00	0.0	0	0	--	--	--	--	--
[illegible].00	1978	0	30	(10.00	(10	(10	3200	270	0.75	(10	(10	(10	0	0.00	0.0	0.0	0.0	0.00	0.0	6	0	2970	8100	3.4	1000	100
741.51	1979	0	30	(10.00	(10	(10	3900	290	0.00	(10	(10	10	0	0.00	0.0	0.0	0.0	0.00	0.0	0	0	13500	7300	6.6	2100	200
741.50	1979	0	40	(10.00	(10	(10	2800	200	0.00	(10	(10	10	0	0.00	0.0	0.0	0.0	0.00	0.0	3	0	7310	2100	6.9	300	220

BACKWATER DATA

MILE	YEAR	AS (ug/g)	BA (ug/g)	CD (ug/g)	CR (ug/g)	CU (ug/g)	FE (ug/g)	MN (ug/g)	HG (ug/g)	NI (ug/g)	PB (ug/g)	ZN (ug/g)	CN (ug/g)	CHLOR (ug/kg)	DDD (ug/kg)	DDE (ug/kg)	DDT (ug/kg)	DIELD (ug/kg)	ENDR (ug/kg)	PCB (ug/kg)	OIL (ug/kg)	LOI (mg/kg)	COD (mg/kg)	NH4N (ug/g)	KJDN (mg/kg)	TPHOS (ug/g)
[illegible].05	1984	13	--	1.10	26	13	21000	--	2.40	23	17	55	(1.0	(0.50	(0.5	(0.5	(0.5	(0.50	(0.5	16	18000	74400	82000	(20.0	1300	14000
[illegible].80	1984	13	--	1.30	34	14	38000	--	1.70	25	19	79	(0.94	(0.50	(0.5	(0.5	(0.5	(0.50	(0.5	8	26000	74800	56400	(19.0	1600	14000
[illegible].90	1984	11	-	2.00	24	12	18000	--	1.60	20	20	48	(0.89	(0.50	(0.5	(0.5	(0.5	(0.50	(0.5	14	36000	54300	41600	(18.0	2300	14000


OLD JOHN'S DITCH
WEAVER BOTTOMS -
BELVIDERE SLOUGH
MN 3A,B&C
MN 3
POOL 5 UPPER MISSISSIPPI RIVER
Goose Lake
Old
Zumbro River
Pritchard Belvedere Lake
MN 4
MN 5
MN 6
MN 7
MN 10
MN 11
MN 12
MN 13
MN 14
Weaver
Bottoms
MN C
MN F
MN E
MN B
MN A
MN C
Wallard Island
Swan Island
Main
Channel
Lost
Island
Lake
WISC
WI 10A,B&C
WI 11A&B
CRY
748
747
746
745
744
743
0 1/4 1/2 1
SCALE IN MILES

In addition to the main channel sediments to be dredged, fine material from the Weaver Bottoms would be dredged to cap the islands and to diversify the bottom topography. Three sediment samples collected from within the Weaver Bottoms in 1984 were analysed for bulk chemistry and particle size distribution. The sediment samples consisted of predominantly silts and clays (mean of 75 percent of total sample by weight) (see table 404-1). Many of the metals and nutrients tested were detected well below the values recorded from fine sediments in pool 2 and in other areas near major sources of pollution. These metals and nutrients likely are tightly bound to the fine material. Of the chlorinated hydrocarbons tested, only polychlorinated hydrocarbons (PCB's) were detected in the three samples, and only at low levels (8 to 16 parts per billion). Sediment bioassays (both acute toxicity and bioaccumulation studies) were conducted on similiar backwater material from Lake Polander, in pool 5A (Peddicord et al., 1980). No significant acute toxicity or bioaccumulation of PCB's and selected metals were found for a variety of test species.

3. Quantity of Fill Material - Approximately 1.6 million cubic yards of maintenance-dredged material would be used in the construction of the closures and the barrier islands. Approximately 50,000 cubic yards of fine backwater material would be dredged and used to cap the islands. Approximately 30,000 cubic yards of rock would be used to construct and stabilize the side channel closures and islands.

E. Description of Proposed Dredged Material Disposal Sites - Eleven side channels would be modified along the Weaver Bottoms, and five small side channels would be modified off of Sand Run into the Lost Island backwater area (figure 404-1). These channels and the proposed work for each are fully described in the EIS supplement. In addition, approximately 52 acres of shallow, open aquatic area within Weaver Bottoms would be modified to island habitat.

F. Timing and Duration of Dredged Material Disposal and Fill Activities - The project is anticipated to be constructed in two phases. In phase I, all

the side channel modifications and two of the barrier islands would be created. In phase II, the remaining islands would be constructed unless unacceptable adverse impacts occur. Additional or alternative measures to minimize any adverse impacts and/or to maximize environmental enhancement would be identified and considered for implementation in phase II.

Construction of the first phase of the project is scheduled to begin in 1986 and be completed during the 1987 construction season, if funding and approval are obtained. Where there would be a high probability of erosion during construction, project features would not be built during times of very high river discharge. Work on the barrier islands would not be done during the spring and fall waterfowl migrations.

G. Description of Fill and Dredged Material Disposal Methods - Over the 40-year planning period, an estimated 1.6 million cubic yards would be dredged to maintain the navigation channel. This dredging would mean an average of one hydraulic dredging action every year, lasting approximately 3 to 4 days per action, with subsequent disposal in either of the two containment areas.

Some of the side channel modifications during phase I would be constructed using historical maintenance-dredged material taken from the Fischer Island containment area. The material would be removed and placed at the proposed sites (MN 7, MN 11, MN 12, MN 13, and MN 14) either mechanically or hydraulically, with direct placement and/or rehandling in the Lost Island containment area.

The islands that would be built in the first phase would be constructed by hydraulic placement of the dredged material at the island sites. So that the material for the islands could be placed mechanically, a small channel would have to be dredged through a portion of the lower end of Weaver Bottoms. The amount of dredging necessary for this channel would be fairly substantial because water depths within Weaver Bottoms are generally not sufficient to allow barges to pass. Therefore, mechanical placement of the dredged material is not practical. So that the material could be placed hydraulically at the

island sites, a rehandling area would be needed. A temporary rehandling site would be constructed at the MN 12 side channel closure. Material from the Fischer Island containment area would be placed here either hydraulically or mechanically for temporary stockpiling. Material taken from the Lost Island containment area could be pumped directly to the island sites. The material needed to construct the islands during phase II would be obtained from the Lost Island containment area and could be pumped directly to the island site, thereby eliminating the need for a rehandling area for phase II.

The backwater material would be placed on the islands by a small hydraulic dredge with a sprayer system or would be placed mechanically on the site. With the hydraulic system, the discharge would be a wide, fine-mist spray used to blanket the islands.

The rock used to construct the project features would be transported to the sites on barges and placed mechanically with a crane or similar mechanical equipment. River access for barge loading is very limited in pool 5. The most likely access point that would be used is the Alma, Wisconsin, public boat landing in upper pool 5. This loading was used in 1985 to load barges for the scour repair at locks and dam 4. This use of the landing did not have any significant effects on recreational use of the site. Therefore, other than increases in truck traffic from and to the boat landing, no significant social effects from this operation are anticipated.

II. FACTUAL DETERMINATIONS

A. Physical Substrate Determinations

1. Substrate Elevation and Slope - The proposed closures would modify the side channels to fast land for the complete closures and reduce water depths at the partial closures. The islands and closure at MN 14 would modify existing aquatic areas, with water depths from 2 to 6 feet, to fast land and shallow littoral areas.

2. Substrate Changes - Much of the substrate within Weaver Bottoms, especially near the side channels, the Half Moon Lake area, and the middle of Weaver Bottoms, is predominantly sand substrate. This condition is also true for the Lost Island Lake area, especially near the inlets from Sand Run. The substrate in these areas would tend to become finer over time because of reductions in the amount of coarse sediments introduced from the main channel, in wave erosion, and in current velocities. The organic content of the sediments should also increase, with an increase in aquatic plants. Even though flow would be reduced throughout Weaver Bottoms and Lost Island Lake, adequate water circulation should be maintained in most of the areas to prevent the sediments from becoming anoxic. The sediments in Weaver Bottoms are relatively uncontaminated; and, with some water circulation occurring, no significant increases in the release of contaminants from the sediments are expected.

The predominant substrate in the main channel and main channel border is sand. Therefore, substrate composition in the main channel and main channel border is not likely to change significantly because of the increased current velocity with the project. This is also true for much of the Belvidere Slough and Roebucks Run areas.

The existing substrate at the side channels is predominantly sand, with some areas of finer material. These areas with finer sediments would be dredged, temporarily stored near the site, and then used to cap the backwater side of the maintenance-dredged material closures. This material should provide a suitable soil for vegetative plantings. Burial of existing rock channel structures would be minimized as much as practical; and, in most cases, these structures would be simply tied into the proposed closures.

At the side channels proposed for partial rock closures, the existing sand and silt substrate would be modified to rock substrate. Rock substrate on the river is valuable to certain fish species (such as smallmouth bass and walleye) for cover and food, and an increase in rock substrate should have a positive effect on these species.

3. Dredged/Fill Material Movement - Dredged material used at partial rock closures would be overlain with rock, and the banks in the area would be riprapped. This protection should prevent any secondary movement of the dredged material or erosion of the existing banks. Side channels MN 7, MN 12, and MN 13 are proposed to be only dredged material closures. These closures would be built up to approximately 2 feet above the surrounding land and would not be overtopped under normal high water conditions. Therefore, under normal high water conditions, water would be forced across the vegetated portions of the existing island, which should minimize any erosion. The backwater side of these islands would be stabilized with vegetation. The main channel side of these structures and the adjacent bank would be monitored. If erosion becomes evident, rock would be added to stabilize the bank. The lower closure would be tied into existing wing dams and a closing structure. The main channel bank would be further stabilized in this reach, thereby minimizing any erosion. The barrier islands that would be built initially would have a variety of stabilization measures so that the effectiveness of the stabilization measures can be monitored and evaluated. Based on the results of the evaluation, problems with any of the initial stabilization measures would be corrected, and the necessary stabilization measures would be incorporated into the design of the remaining barrier islands. The lower island closure structure (MN 14), which is to be stabilized with rock riprap, would serve as the first windbreak.

4. Sedimentation Patterns - All of the alternatives would substantially reduce the existing sedimentation problems in Half Moon Lake and near the side channel openings into Weaver Bottoms. Alternative D, the selected plan, would reduce overall sedimentation rates the most and would preserve the area for fish and wildlife the longest. Extensive amounts of sediments enter the Weaver Bottoms by the Whitewater River, and the delta area has substantially increased over the years. Concerns have been expressed recently that the Whitewater River may breach its existing natural levee and enter Weaver Bottoms at a new location, upstream of the existing delta area. If this breach occurs, it would affect a presently undisturbed area. The proposed project would neither correct this existing problem nor add to the

problem. The U.S. Fish and Wildlife Service will undertake studies to identify and implement potential solutions to this problem.

The project is predicted to reduce dredging volumes by 260,000 cubic yards of sediments over 40 years (6,500 cubic yards annually), but this figure is an estimate, and the actual amount of the reduction in dredging requirements may be either greater or less. If the project is implemented, this material would remain within the system, although the ultimate fate of this material is unknown. The computer model studies did show that the main channel downstream of Weaver Bottoms may experience an increase in sedimentation. The main channel downstream of Weaver Bottoms presently is capable of carrying the extensive bedload of the Mississippi River through this reach. This area should be capable of carrying this minor additional bedload material resulting from the modified hydraulic conditions in the main channel upstream. Compared to the total amount of sediment transport from pool 5, the volume of additional material is insignificant. During the GREAT study, the Sediment and Erosion Work Group determined that the bedload material outflow from pool 5 ranged from 162,000 cubic yards/year for a 2-year annual hydrograph to 400,000 cubic yards/year for the 10-year annual hydrograph. If the reduced dredging constitutes increased bedload material, the estimated average increase would amount to 4.0 percent and 1.6 percent of the outflow from pool 5 for these two hydrographs, respectively. If the river could not pass this increase, this material would amount to an average deposition of less than 0.04 foot/year over the channel downstream of the project and a total of less than 1-1/2 feet for the 40-year period. If the main channel downstream of Weaver Bottoms does not show increased sedimentation, the increased bedload material outflow may result in less scour below the dam. Whatever the short-term fate of this material, which cannot even be readily identified as a separate quantity, it will not have any environmental impacts that would be any greater than those that would normally occur under the most probable future without a project. The quantity of material is just too small, unless the river deposited all of it in one small area, and rivers do not do that. Additionally, this aspect of the project impacts would be monitored closely.

Many of the rock training structures that were built for the 6-foot navigation project in the main channel border area are partially or completely buried by sand. Increasing the discharge through this area could remove some of this accumulated sand, which could be beneficial to the biota of the main channel and border.

One of the major concerns expressed by the general public and by other Federal and State agencies was the potential effects of the project on sedimentation patterns in adjacent backwaters. The Belvidere Slough backwater complex, which is across the main channel from Weaver Bottoms, already experiences high sedimentation rates. Comparisons of 1973 and 1981 aerial photographs show that the accretion of land is occurring at a fairly high rate in the Belvidere Slough backwater complex area. Recreational access has been a problem and is becoming more of a problem because of this high sedimentation rate. Computer modeling studies have indicated that the project would not add to the existing sedimentation problems in most of the area. Structures on the inlets from Sand Run into the Lost Island area were included in the project to prevent an increase in sedimentation in the Lost Island area as a result of the project. The structures would also correct the existing sedimentation problem in this area. Another potential problem area defined by the model is the area within Belvidere Slough near the downstream end of Buffalo City. The computer model indicates that the project would cause a slight scouring to occur in this area, with subsequent deposition of the material in the Spring Lake area. This area would be monitored and corrective measures would be taken if unacceptable changes in sedimentation patterns did occur.

B. Water Circulation and Flucuations

1. General Water Chemistry - The general water chemistry within Kruger Slough and Belvidere Slough is not likely to change as a result of the slight increase in discharge in these areas. Projected current velocities in the main channel and main channel border are lower than what presently occurs

immediately upstream of the project area. Therefore, the project should not significantly modify general water chemistry within the main channel and main channel border.

Water temperature and other general water chemistry parameters, such as pH, alkalinity, and nutrients, within Weaver Bottoms may change, at least under summer low river flows, because of the reduced water circulation and the predicted increases in aquatic plants caused by the project. However, the extent of these impacts is difficult to predict because of many confounding factors. Discharge into Weaver Bottoms would be significantly reduced for a given river discharge. However, with the selected plan, water-level fluctuations with river discharge would not vary substantially from existing conditions. Water circulation within Weaver Bottoms is very dependent on these water level changes with river discharge. During a normal year, water level changes fairly frequently throughout much of the open water season and will provide adequate water circulation even with the project.

2. Current Patterns and Circulation - The predicted minor changes in water level within Weaver Bottoms under low river discharges should not have any significant adverse impacts on the biota. Water levels would fluctuate with river discharge for the selected plan similarly to what presently occurs, approximately 1 foot at river flows of 80,000 cfs and less. Water levels under normal summer river discharge (20,000 cfs) would be maintained near existing conditions in most of Weaver Bottoms, except in the lower end, which would be raised by less than 0.1 foot. With higher river discharges, the effects of the lower structure in impounding water within Weaver Bottoms would become more evident. Water levels within most of Weaver Bottoms would be elevated by less than 0.1 foot to 0.2 foot at river discharges of 80,000 cfs, except at the lower end, which would be elevated by 0.4 to 0.6 foot. At river discharges of approximately 100,000 cfs, the lower closure would be overtopped and the impounding effects of the structure would be reduced.

The other alternatives considered that did not have the lower structure (alternatives A, B, and C) showed substantial differences in the effects on water levels. At the river discharge of 20,000 cfs, water levels would be reduced by approximately 0.1 foot throughout Weaver Bottoms. At the river discharge of 80,000 cfs, water levels would be reduced by over 0.6 foot. With these alternatives, water levels would be fairly stable, fluctuating by less than 0.4 foot, at river flows of 80,000 cfs and less. The more stable water surface with river discharge could have both positive and negative environmental effects. The more stable water levels would have a very favorable effect on aquatic plant growth. Some fish, such as the northern pike, depend on flooded emergent wetland vegetation for spawning. Reducing the amount of flooding of this vegetation could have some impact on these fish.

The project would cause substantial initial modifications of water levels, current velocity, and sedimentation patterns in the main channel and main channel border. The effects would be reduced after a while when the channel becomes deeper and more stable. Existing flow in the main channel bordering Weaver Bottoms is fairly low because of all the flow that occurs into the numerous side channels. With the project, the predicted current velocities for various river discharges are generally still below what presently occurs in the main channel area immediately upstream. Riverine fauna presently using the main channel and main channel border are not likely to be significantly affected by these increases in current velocity, although some localized changes in the community may occur.

Approximately a 10-percent increase in discharge through Belvidere Slough would occur for any of the alternatives considered. In the lower end of the Belvidere Slough area, including the Spring Lake and Lost Island Lake areas, there would not be any appreciable changes in water levels for any river discharge. However, the upper end of Belvidere Slough could experience increases in water levels that would range from slight to more substantial, depending on river discharges. For normal discharges (15,000 to 40,000 cfs), the effects on water levels in the upper end would be slight (less than 0.1 foot). The effects on water levels would increase with river discharge until

the river discharge reaches the point where the existing land areas and the structures at MN 4 and MN 5 are overtopped (approximately 100,000 cfs). Above this discharge, the effects on water levels would once again become insignificant. The computer model predicted less than a 0.1-foot increase in water levels for river discharges equaling the 1-percent chance flood. The computer model has also predicted that the effects on water levels and discharges into Belvidere Slough would diminish after a few years, because the main channel would become more efficient and more of the water would pass through it. The relatively small changes in the hydraulic conditions in the Belvidere area should not produce any significant changes in the aquatic community, although some localized adjustments in the new hydraulic regime may occur. The aquatic community in Lost Island Lake would actually benefit from the reduced deposition of the sediments and the addition of rock substrate.

It is anticipated that Krueger Slough would also receive approximately a 10-percent increase in discharge. The effects on fish and wildlife would probably be similar to those projected for Belvidere Slough.

C. Suspended Particulate/Turbidity Determinations

1. Suspended Particulates and Turbidity - Potential short-term impacts on water quality would derive mainly from three sources: (1) effluent from the containment areas for the long-term (40 years) disposal of maintenance-dredged material; (2) open-water disposal (hydraulically and/or mechanically) of maintenance-dredged material from the two containment areas to construct the side channel modifications and the barrier islands; and (3) runoff from the disposal of hydraulically dredged backwater material to create a cap of fine material on the barrier islands and to create deep-water areas next to the islands.

No effluent from the Fischer Island containment area is likely to occur for the first several years of the 40-year plan because of the large initial capacity of the site. As the containment areas fill, an effluent would begin

to be generated. Effluent quality would continue to decline as the containment areas fill over the 40 years and as effluent retention time decreases. From 1979 to 1983, effluent quality from the Fischer Island and Lost Island containment areas was monitored. From the Fischer Island containment area, which is filled near capacity, turbidity and suspended solids in the effluent have ranged from 30 to 35 NTU's and from 57 to 89 mg/l, respectively. Turbidity and suspended solids in the effluent from the Lost Island containment area have ranged from 12 to 37 NTU's and 16 to 35 mg/l, respectively. Because of the clean nature of the dredged material and because of the levels of turbidity and suspended solids in the effluent, no significant degradation of water quality from the effluent from the containment areas is expected. Monitoring of sediment quality and effluent quality would be required to ensure that no significant changes in effluent quality occur over the 40-year planning period.

Placement, either mechanically or hydraulically, of dredged material at the proposed side channel closures would cause some minor elevations in turbidity and suspended solids. The impacts on water quality would vary slightly, depending on which method of construction would be used. Mechanical placement would result in less impact on water quality than either of the two hydraulic options because mechanical placement avoids the problem of carriage return water. Rehandling in the Lost Island containment area prior to hydraulic placement at the sites would have the greatest effect because, in addition to the effects on water quality from the placement at the side channel closures, an effluent would be generated from the containment area. However, the effects on water quality are not anticipated to be very significant for any of the construction options because of the coarse, clean nature of the dredged material.

Hydraulic placement of the maintenance-dredged material at the island sites would have some negative effects on water quality. One of the reasons for the designed width of the islands is that at 150 feet, by strategic placement of the pipe, the directly affected area should be confined to the base of the island. Even though the maintenance-dredged material that would be used is

very coarse, a localized degradation of the water quality, which may persist a while after dredging, would occur. However, the results of sediment bioassays indicate that toxic effects on endemic biota are not likely to occur from the operation.

The last source of construction/dredged material disposal impacts on water quality would be from capping the barrier islands with dredged material from the backwaters. The material would be placed on the islands by a small hydraulic dredge with a sprayer system or would be placed mechanically on the site. With the hydraulic system, the discharge would be a wide, fine-mist spray used to blanket the islands. This system should minimize runoff of the material as much as practical. However, there would be some runoff, and some of the material would be resuspended in the water column near the islands. Mixing and dilution would occur rather slowly because of low current velocities that would be present in the Weaver Bottoms. Turbidity and suspended solids may remain elevated for a period after disposal.

The short-term construction/dredged material disposal effects are likely to be very similar for the different alternatives that were considered. The method of placement would make a greater difference in impact, with direct mechanical placement having the least impact.

The Zumbro River carries extensive amounts of suspended sediments and enters the Mississippi River immediately upstream of the project area. Opening the mouth of Old John's Ditch, considered under alternative B, could funnel some of the water from the Zumbro River into the upper end of Weaver Bottoms, diminishing the water quality in this area.

2. Effects on Physical and Chemical Properties of the Water Column

a. Light Penetration - Spacing of the islands at 4,000 feet should prevent waves from being generated that would erode and resuspend the finer sediments. The basic crescent shape of the islands should provide the greatest reduction in wind fetch from a variety of directions. Reducing wave-

induced disturbance of the bottom sediments and reducing current velocities should reduce turbidity and suspended solids levels within Weaver Bottoms. With these changes, plankton may increase, which could offset the gain in water clarity from reducing turbidity and suspended solids levels. However, it is anticipated that there would still be an overall net gain in water clarity. Light penetration could be reduced near the island sites as a result of the dredged material disposal activities, which could persist for a while after dredging because of the low current velocities.

b. Dissolved Oxygen - Current velocity within Weaver Bottoms would be substantially reduced but not totally eliminated, and some water circulation would occur for all river discharges. The Pritchard Maloney Lake and Goose Lake areas of Weaver Bottoms (which do not receive much flow now) might be the areas most affected by the project. Dissolved oxygen problems presently do not occur in these areas but could develop there with the project. These areas presently receive much of their flow from Murphy's Cut (MN 3), which would have its discharge reduced by approximately 50 percent with the partial closure. The increase in aquatic plants would further add to the potential for problems by increasing the amount of oxygen-demanding material. Because of the discharge from Murphy's Cut, because of the flow caused by changing water levels, and because of wind, circulation is anticipated to be adequate to prevent dissolved oxygen from becoming a problem during the open water season. However, it is possible that low levels of dissolved oxygen could become a problem during ice cover for these and other remote areas within Weaver Bottoms. Dissolved oxygen would have to be monitored closely in these areas. The culvert alternatives C and E would allow better management of the flows through Murphy's Cut to minimize the potential for dissolved oxygen problems to develop in the Pritchard Maloney Lake and Goose Lake areas. The culverts were designed to allow the capability to match existing flows through Murphy's Cut, under low river discharges. However, culverts on the Mississippi River would require extensive operation and maintenance because of all the debris. If operation and maintenance is not conducted routinely, the culverts could become plugged and could significantly reduce the flow to the upper end of Weaver Bottoms.

The slight additional flows into Spring Lake might prevent stratification, with subsequent depressed dissolved oxygen levels, from occurring in the deeper areas within Spring Lake. The reduction in the flow into Lost Island Lake would not be as substantial as it would be for Weaver Bottoms, and adverse impacts on water quality are not expected.

Opening up the mouth of Old John's Ditch and placing a culvert in the causeway could correct an existing dissolved oxygen problem in Old John's Ditch. Old John's Ditch presently receives extensive bank fishing that might improve if the dissolved oxygen problem is eliminated.

c. Toxic Metals and Organics - The channel maintenance-dredged material in this area is relatively uncontaminated. Therefore, there should not be any significant releases of contaminants during the operation.

Runoff from capping the islands with fine backwater material, which contains low levels of contaminants (mainly metals), would occur. However, because the contaminants found in the sediment samples have a high affinity for fine material, they are not likely to be released. Sediment bioassays on similar backwater material from pool 5A did not show any significant toxicity or accumulation of PCB's or selected heavy metals. Therefore, no toxic effects are anticipated on endemic biota.

The project would reduce the amount of resuspension of the fine bottom sediments within Weaver Bottoms by reducing currents and wind-generated waves. This change could reduce the amount of normal resuspension and releases of contaminants within Weaver Bottoms.

It is anticipated that there would be sufficient circulation within most of Weaver Bottoms with the project, to prevent substantial modifications of dissolved oxygen, pH, and other general water quality characteristics that could effect the releases of contaminants from the sediments. However, it is possible that localized areas, because of the projected increased aquatic plants, increased organic sediment load, and reduced water circulation, could

have substrates that become seasonally anoxic. It is not known whether this problem would occur. It would have to be monitored, and remedial actions would have to be taken if the problem occurs at unacceptable levels. Generally, the anticipated increase in water quality resulting from the project should offset these potential localized degradations.

d. Pathogens - No municipal treatment outfalls occur in the immediate area; therefore, there is no reason to expect that pathogenic bacteria would be present in the sediments that could be released to the water column during the operation.

e. Aesthetics - During construction, some aesthetic impacts would occur. Once completed, the overall project should have favorable effects on visual quality. Control of sediment inflow into Weaver Bottoms and island creation would provide a diversity of habitats and increase the visual quality.

D. Contaminant Distribution Determinations - The backwater and channel maintenance material would be taken from the general project area. Therefore, the project would locally relocate some contaminants, but should not introduce or increase contaminant levels in the general area, although there is one potential concern related to contaminant distribution. Some of the material to be borrowed from the Fisher Island containment is old dredged material that is underlying the more recent deposits. In addition, to get the required volume for phase I, the containment area would be excavated to below the original riverbed. The quality of the old dredged material and riverbed sediments are unknown. A similar dredging operation was performed recently at the Reads Landing containment area in pool 4, and the quality of this material was not a problem. However, monitoring of the effluent quality and sediment quality will be necessary, as the operation progresses, to ensure that a problem with contaminants does not arise.

E. Aquatic Ecosystem and Organisms Determinations

1. Effects on Plankton - Increases in turbidity and suspended solids near the construction and disposal sites would have a localized suppressing effect on phytoplankton and zooplankton productivity. However, the plankton population should recover quickly once the activities stop. The slight increase in discharge in Kruger Slough and Belvidere Slough should not have any long-term impacts on the plankton community. However, the reduced flow and improved water clarity within the Weaver Bottoms area should have a very positive effect on plankton.

2. Effects on Benthos - The benthos community in much of the open water area of the Weaver Bottoms is characterized by low diversity and standing crop. The reasons for this rather poor benthos community are the lack of structural diversity in the open water area, the diminished water quality caused by wind-induced waves, the abundance of sand substrate, and the existing hydraulic regime, which washes out many of the nutrients and detrital material. The benthos at the island sites would be buried. However, with the project, benthos productivity and diversity, especially for fingernail clams and Hexagenia mayflies, which are important fish and waterfowl food, should increase as a result of the substrate changes, the modified hydraulic conditions, and reduced wind fetch.

The benthos in the side channels is generally typical of other sand substrate on the Upper Mississipppi River, being characterized by low diversity and standing crop. This rather impoverished fauna would be buried by the proposed closures. The addition of rock substrate could somewhat offset the loss of this impoverished fauna. A few aquatic macrophytes are present in some of the larger side channel openings, such as MN 13 and MN 14. These macrophytes would also be buried by the closures.

The existing benthos community in the main channel and mair channel border is adapted to a flowing condition. The increased discharge as a result of the project might cause some localized changes, but no significant change in the

benthos community is expected. The same is also true for the predicted minor increases in discharge in the Belvidere Slough and Kruger Slough areas.

3. Effects on Fish - Fish use of the general project area during the construction and dredged material disposal would be reduced slightly as a result of all the activity and the increased turbidity and suspended solids. If winter dissolved oxygen problems do occur in some of the remote areas within Weaver Bottoms as a result of the reduced flow and increased aquatic plants, fish use of these areas could be seasonally curtailed. However, the increase in aquatic plants, the creation of deep-water habitat, and the increase in shallow littoral area are anticipated to have an overall net positive impact on the Weaver Bottoms fisheries.

The reduced number and modification of the remaining access points may somewhat impede fish movement into and out of the Weaver Bottoms area. The partial closing structures were designed to maintain the maximum current velocities under 3.5 feet per second. At these maximum current velocities and the design lengths of 400 feet, the partial closing structures should not significantly impede the movement of most riverine fish species. The culverts at Murphy's Cut in alternatives C and E would be more of an impediment to fish movement than would the recommended partial closing structure.

The minor changes in hydraulic conditions in the Belvidere Slough and Kruger Slough, as a result of the project, should not produce any significant changes in the fisheries communities. The wetland areas adjacent to Kruger Slough and Belvidere Slough, such as Lost Island and Spring Lake, should receive only minor changes in hydraulic conditions, and therefore no significant changes in the fish community are anticipated.

4. Effects on Wildlife - The improved water clarity within Weaver Bottoms, as a result of the modified hydraulic conditions and reduced wind-fetch, should have a positive impact on aquatic plants, and the areal extent of the vegetated areas should increase fairly dramatically. This increased

vegetation is anticipated to have a very positive effect on waterfowl, aquatic mammals such as the muskrat, and other wildlife species.

In addition to their primary goal of reducing wind fetch, the islands were designed to maximize waterfowl and shorebird use and to increase the shallow littoral area available for fish and wildlife. Dredging of backwater material should produce a suitable soil for vegetative plantings on the islands and create deep-water habitat for use by fish. The U.S. Fish and Wildlife Service (FWS) would perform needed management practices on the islands to maintain and enhance the value of the islands for fish and wildlife.

Two species of special concern to the FWS, the tundra swan and the canvasback duck, use the Weaver Bottoms rather extensively during their migrations. The two important plant species for these birds, arrowhead and wild celery, respectively, are not likely to be adversely affected by the project. Therefore, it is unlikely that the use of Weaver Bottoms by these species would change.

5. Effects on Aquatic Food Web - The food web will change as a result of the modified hydraulic conditions. However, the overall productivity of Weaver Bottoms is anticipated to improve with the project.

6. Effects on Special Aquatic Sites

a. Sanctuaries and Refuges - Most of the Weaver Bottoms and surrounding area are in the Upper Mississippi Fish and Wildlife Refuge system. The FWS therefore has been actively assisting in the planning of this project and is a cooperating agency for the project. The FWS is developing a master plan for the refuge. The Weaver Bottoms project will be included in the final refuge master plan. The FWS has developed a list of management objectives for the rehabilitation project and the Weaver Bottoms area in general. The alternatives considered for this project and the design of the project features were developed to meet the objectives developed by the FWS and should

be compatible with these objectives. There is, however, one potential conflict area. Many of the proposed islands would be built in a portion of the refuge that is closed to waterfowl hunting. Increasing the littoral area and deep-water habitat in the closed portion of the refuge by building the barrier islands would increase fish use of this area and possibly increase fishing activities. Increases in fishing activities in the closed refuge area during the fall waterfowl migration may increase the disturbance to resting waterfowl and may be in conflict with the FWS-designated primary purpose for the closed areas.

b. Wetlands, Mud Flats, and Vegetated Shallows - Approximately 100 to 115 acres of aquatic habitat would be directly modified by any of the alternatives considered (table 404-2). Because of the lower closure at MN 14, alternatives D and E would directly affect approximately 15 more acres than the other alternatives. Of the total acres to be affected, 25 to 60 acres would be side channel habitat and from 50 to 70 acres would be shallow, open backwater habitat. Approximately 12 to 17 acres of the side channel habitat would be modified to partial rock closing structures that could become valuable areas to fish and other aquatic organisms. The remaining side channel areas would be modified to terrestrial habitat.

Table 404-2. Acres Directly Affected by the Weaver Bottoms Alternatives

Alternatives	Acres of side channel modified to partial rock closures	Acres of side channel modified to terrestrial	Acres of back-water modified to island habitat	Total acres directly affected
A	15.4	16.1	68.8	100.3
B	17.8	13.7	70.5	102.0
C	13.5	16.4	69.7	99.6
D (selected)	18.4	38.1	51.6	108.1
E	16.5	38.1	52.5	107.1

Depending on the alternative, from 50 to 70 acres of shallow, unvegetated backwater habitat would be changed to island habitat. The island locations were chosen to avoid existing important habitat features such as the stump fields, existing emergent aquatic plants, and the deeper water areas, as much as practical, within the constraints of maximizing the primary goal of reducing wind fetch.

7. Threatened and Endangered Species - Two mussel species are federally listed as endangered on the Upper Mississippi River: the Higgins' eye pearly mussel (Lampsilis higginsi) and the fat pocketbook mussel (Proptera capax). These endangered species have not been recorded in pool 5 during any of the recent surveys (Fuller, 1978; Fuller, 1979; and Wisconsin DNR, 1981). A survey was conducted in 1977 at the side channel sites that would be directly affected by the proposed project (Nielson et al., 1978). Only six mussel taxa were found in the side channel areas. No specimens of the two listed species were found. Therefore, the proposed project is unlikely to have any significant impact on the two listed mussel species.

Two other federally-protected species, the threatened bald eagle (Haliaeetus leucocephalus) and the endangered peregrine falcon (Falco peregrinus), could occur in the project area. Very little upland area would be disturbed, and the disturbance from construction activities is likely to be relatively minor. Therefore, it is unlikely that any significant impact would occur on the two species or on their required habitat.

No other federally-listed endangered or threatened species nor any species proposed to be listed are in the project area or are likely to be affected by the project. The FWS, as a cooperating agency, has prepared a biological assessment for endangered species (see Supporting Documents report) and has determined that the proposed project would not have any significant impact on any federally-listed endangered or threatened species or its habitat.

8. Actions Taken to Minimize Impacts - The project features were designed to maximize environmental enhancement and to minimize undesirable environmental effects. Constraints on equipment, timing, and other factors are being placed on the construction to minimize the environmental effects.

F. Proposed Disposal Site Determinations

1. Mixing Zone - The effects on water quality of the disposal of maintenance-dredged material and rock at the side channel closures and the two containment areas are expected to be relatively minor, and the mixing zone is expected to be relatively small. Creation of the islands with maintenance-dredged material and capping of the islands with backwater material would cause more appreciable impacts on water quality, with a larger mixing zone. However, sediment bioassays on similar material indicate that no toxic effects on endemic organisms are likely to occur anywhere within the mixing zone.

2. Compliance with Applicable Water Quality Standards - The Minnesota Pollution Control Agency's water quality standards for turbidity (25 NTU's) and suspended solids (30 mg/l) would be exceeded by much of the construction and disposal activities. A variance would be required if the project is to comply with these standards. Contaminants are not likely to be released in sufficient quantities (of any single contaminant or any combination) to be toxic to endemic organisms.

Water quality certification is being requested from the Minnesota Pollution Control Agency, including a request for a variance from their turbidity and suspended solids standards, which the proposed action would exceed. Negotiations with the Wisconsin Department of Natural Resources (DNR) indicate that the actions involving maintenance-dredged material will be included in the present Memorandum of Understanding (MOU) between the St. Paul District and the State of Wisconsin. This MOU waives certain Wisconsin permit and regulatory requirements, including the prohibitation on disposal of dredged material below the ordinary high water mark, for the use of the GREAT I channel maintenance sites or other sites approved by the Channel Maintenance

Forum. The structural modifications that involve only rock may be approved through either the water quality certification process or the exemption process.

The proposed action involves the disposal of dredged material and rock in waters of two States, Minnesota and Wisconsin. Most of the project would be constructed in Minnesota. The Minnesota Pollution Control Agency has (6 MCAR 4.8024) classified the Mississippi River as 2B, 3B. This classification indicates that the water quality should be suitable for fishes and recreation and for industrial consumption, but that the "quality of the resource has been significantly altered by human activity and the effect is essentially irreversible." Wisconsin (NR 103) indicates that "water quality shall meet the standards and requirements for recreational use and fish and aquatic life." Table 404-3 summarizes the State standards that have been established to protect these designated uses. Construction of the project features with maintenance-dredged material and quarry rock that have a coarse, clean nature should not violate the standard unspecified toxic substances or most of the other water chemistry standards in the table.

The backwater material that would cap the islands contains some low levels of contaminants. However, with restrictions on the placement of this material to minimize runoff and the high affinity to fine sediments of the contaminants present, Minnesota's standard of unspecified toxic substances should not be violated.

The Minnesota standard for turbidity (25 NTU's) and suspended solids (30 mg/l) and the Wisconsin standard for suspended solids (80 mg/l) would be exceeded as a result of the construction of the project features. A variance from the Minnesota standards for these two parameters, similar to the procedure for normal channel maintenance activities, would be required. However, it should be noted that turbidity, under present conditions within Weaver Bottoms, frequently exceeds the Minnesota standard (Fremling et al., 1976).

Table 404-3. Applicable Wisconsin and Minnesota State Water Quality Standards for Mississippi River

Parameter	Minnesota Standards (6 MCAR 48015)	Wisconsin Standards (NR 102)
Dissolved oxygen	5 mg/l	5 mg/l
Temperature	5 degrees F above natural not to exceed 86 degrees F	5 degrees F above natural not to exceed 89 degrees F
pH	6.5-9.0	6.0-9.0 (no change) .5 units)
Fecal coliforms	200/100 ml (logarithmic mean of 5 samples) 2,000/100 ml (10% of samples in a month)	200/100 ml (logarithmic mean of 5 samples) 2,000/100 ml (10% of samples in a month)
Suspended solids	30 mg/l	80 mg/l
Ammonia	0.04 mg/l unionized	
Chromium	0.05 mg/l	
Copper	0.01 mg/l or not to exceed 1/10 of 96-hour TLm	
Cyanides	0.02 mg/l	
Oil	0.5 mg/l	
Phenols	0.01 mg/l	
Turbidity	25 NTU	
Total residue chlorine	0.005 mg/l	
Hardness	250 mg/l	
Chlorides	100 mg/l	
5-day BOD	25 mg/l	
Phosphorus	1 mg/l	
Unspecified toxic substances	1/10 of 96-hour median tolerance limit or other application factors when justified based on available scientific evidence	Unauthorized concentrations of substances are not permitted that alone or in combination with other materials present are toxic to fish and other aquatic life
Mixing zones	Guidelines: a. Provide passageway for fish b. No larger than 25% of the cross-sectional area or volume of flow and not extending more than 50% of width c. The 96-hour TLm to indigenous fish and fish food organisms shall not be exceeded at any point within the mixing zone d. Minimize the overlapping of mixing areas e. Should not intersect spawning or nursery areas, migratory routes, water intakes, or municipal rivers	Guidelines: a. Provide passageway for fish b. No larger than 25% of the cross-sectional area or volume of flow and not extending more than 50% of width c. The 96-hour TLm to indigenous fish and fish food organisms shall not be exceeded at any point within the mixing zone d. Minimize the overlapping of mixing zones e. Should not intersect spawning or nursery areas, migratory routes, water intakes, or municipal rivers

Implementation of the project, with the resultant reduced flows and wind fetch, should reduce normal turbidity levels and allow this standard to be met more frequently.

The project is anticipated to maintain adequate water circulation within Weaver Bottoms to prevent dissolved oxygen problems from developing. However, it is possible that isolated areas within Weaver Bottoms could have seasonal dissolved oxygen levels below the Minnesota standard of 5 mg/l.

If monitoring shows that this problem does develop and become an unacceptable long-term effect of the project, remedial actions may be required to correct the problem.

3. Potential Effects on Human Use Characteristics

a. Municipal and Private Water Supply - No private or municipal wells are in the project area that would be affected by the proposed project.

b. Recreational and Commercial Fisheries - Approximately 150,000 pounds of fish are commercially harvested annually from pool 5. The predominant commercial species are carp, buffalo fish, and catfish. The proposed project would not have any significant effect on the commercial fisheries value of pool 5. The side channels that are scheduled to be modified receive recreational fishing, which would be eliminated or sustantially reduced at the side channels scheduled for complete closure. The side channels scheduled for partial closure may increase in fishing value because of the rock substrate. This will also be true for the bank areas proposed to be riprapped. Presently, the Goose Lake area of Weaver Bottoms is used rather extensively for ice fishing. If winter dissolved oxygen problems develop in this area as a result of the project, this use could be adversely affected.

c. Water-Related Recreation and Aesthetics - Increasing habitat diversity and water clarity would have a positive impact on the aesthetic value of the area. Creation of the islands and the predicted increase in aquatic vegetation would break up the open-water area and would make the area more desirable for such activities as canoeing and birdwatching. The area presently receives extensive waterfowl hunting pressure, which is not likely to be affected by the project.

d. Cultural Resources - In accordance with Section 106 of the National Historic Preservation Act of 1966, as amended, the National Register of Historic Places has been consulted. As of November 27, 1984, no properties listed on or determined eligible for the National Register would be affected by the proposed actions at Weaver Bottoms.

It is unlikely that any cultural resources would be adversely affected by construction of the closure structures. These structures would involve the placement of fill on areas that have been previously filled. Deeply buried prehistoric sites may be intact on the islands, but the placement of fill would not affect these resources. If continual overtopping of the island occurs during floods, deeply buried sites could be affected by erosion. However, this scouring probably could not be repaired after significant flood events without negating the project's purpose.

Construction of the wind-fetch reduction islands would not have any effect upon known cultural resources. It is possible that the Weaver Bottoms area, had prehistoric resources prior to inundation in the 1930's. However, a comparison of the 1930 and 1975 topography of the areas shows significant changes in this land surface. Some areas of original land surface have been scoured to a depth greater than 4 feet, with comparable deposition in other areas.

None of the project features would have an impact upon the historic West Newton log rafting site. The St. Paul District, Corps of Engineers, has coordinated the side channel closures and wind-fetch reduction islands with

the Minnesota State Historic Preservation Officer (MSHPO), the National Park Service, and the Minnesota State Archeologist. The only response that the St. Paul District received was from the MSHPO, who concluded that the side channel closures and wind-fetch reduction islands had low potential for containing archeological and historic resources.

e. Parks, Wilderness Areas, Wild and Scenic Rivers, and Other Special Areas - Most of the area that would be directly affected is part of the National Fish and Wildlife Refuge and was discussed previously. The John Latsch Minnesota State Park is located along the bluffs bordering lower pool 5. The State-managed McCarthy Lake Wildlife Area is immediately upstream of the Weaver Bottoms area, in Minnesota. Neither of these State areas would be affected by the proposed project.

G. Cumulative Effects on the Aquatic Ecosystem - The project is very experimental, and the net cumulative effects of the project are difficult to predict. This is one of the most important reasons for the phased approach to the construction. Long-term monitoring will be done to assess the effectiveness of the project to meet the stated objectives and to identify and quantify any predicted or unforseen adverse impacts of the project. The project is expected to provide two major benefits: restore the habitat quality within Weaver Bottoms and preserve it as a productive backwater for a longer period of time.

H. Secondary Effects on the Aquatic Ecosystems - The project features were designed to be stable, and no secondary effects are anticipated as a result of secondary movement. Monitoring of the project would be done to identify any adverse impacts associated with the project, in a timely manner to allow for corrective measures to be taken.

III. FINDINGS OF COMPLIANCE OR NONCOMPLIANCE WITH RESTRICTIONS ON DISCHARGE

This evaluation was prepared according to the Section 404(b)(1) guidelines of December 24, 1980 (Federal Register, Vol. 45, No. 249). Several alternatives,

including the most probable future without the project, were considered. The most probable future without the project (MPFWOP) was eliminated from detailed consideration because it was projected to cost $1.1 million more than any of the other alternatives considered. In addition, none of the restoration measures would be implemented for Weaver Bottoms under the MPFWOP. Alternative D was selected because it represents the best means to achieve the habitat restoration objectives, with the least amount of adverse impacts.

A variance from Minnesota Pollution Control Agency water quality standards would be necessary for the project to comply with applicable State water pollution standards. The proposed fill activity and dredged material disposal would comply with applicable toxic effluent standards under Section 307 of the Clean Water Act and the Endangered Species Act of 1973. The proposed project should not result in any significant degradation of the waters of the United States.

The proposed project should result in a net benefit to fish and wildlife and would comply with the Section 404(b)(1) guidelines.

_____

Date

Joseph Briggs
Colonel, Corps of Enginneers
District Engineer

REFERENCES

Marking, Leif L.; Verdel K. Dawson, John L. Allen; Terry D. Bills; and Jeff F. Rach. A Summary Report: Biological Activity and Chemical Characteristics of Dredge Material from Ten Sites on the Upper Mississippi River (Cooperative Agreement No. 14-16-0009-79-1020, Supported by the U.S. Army Corps of Engineers, St. Paul District). U.S. Fish and Wildlife Service, National Fishery Research Laboratory. La Crosse, Wisconsin. April 1980.

Peddicord, Richard; Henry Tatem; Alfreda Gibson; and Susan Pedron. Biological Assessment of Upper Mississippi River Sediments. Miscellaneous Paper EL-80-5. Environmental Laboratory, U.S. Army Engineer Waterways Experiment Station. December 1980.

EXHIBIT 2
U.S. FISH AND WILDLIFE SERVICE
LETTER: ROLE AS COOPERATING AGENCY

United States Department of the Interior

FISH AND WILDLIFE SERVICE

IN REPLY REFER TO:

Upper Mississippi River National Wildlife and Fish Refuge
51 East 4th Street
Winona, Minnesota 55987

January 15, 1985

Colonel Edward Rapp, District Engineer
St. Paul District, Corps of Engineers
1135 U.S. Post Office & Custom House
St. Paul, MN 55101

Dear Colonel Rapp:

This responds to Deputy District Engineer Doering's letter to Regional Director Nelson regarding the Weaver Bottoms project. I would like to reaffirm the Fish and Wildlife Service's commitment to play an active role in the Weaver Bottoms Rehabilitation/Lower Pool 5 Channel Maintenance Project. As a cooperating agency with the Corps of Engineers, we anticipate that the Service will be responsible for the following items as they relate to the Weaver Bottoms Rehabilitation:

1. Development of management objectives for the project. The Fish and Wildlife Service has developed a list of objectives which we believe are attainable through successful rehabilitation of the Weaver area (copy attached). These objectives reflect the overall habitat enhancement goals of this project as well as the importance of retaining the integrity of the area as a portion of the National Wildlife Refuge System.

2. The Service will be developing a long-term biological monitoring and analysis program designed to assess the effects of the rehabilitation project. Initial steps in the program will be set forth in a handbook to be completed by April 1, 1985. We anticipate that the Service will ultimately be responsible for overseeing the monitoring work and, in association with State and Corps personnel, will actively participate in accomplishing various portions of the plan.

3. The Service, operating through the Winona District of the Upper Mississippi River National Wildlife and Fish Refuge, will assume responsibility for the maintenance of certain project features. These might include, but not necessarily be limited to, such things as operational maintenance of culverts and boat access ramps or prescribed burns. Specific maintenance activities will be determined after project features are established.

4. The Fish and Wildlife Service will develop plans to address any adverse impacts which the project implementation may impart to the National Wildlife and Fish Refuge. This will be done in cooperation with the States and will likely include personnel from the refuge, the Ecological Services Field Office, St. Paul, and our Research program. Specific plans to minimize potential impacts will be submitted to the Corps by April 1, 1985.

5. Recommendations will be provided directly to the Corps of Engineers on specific design features to maximize fish and wildlife habitat value or populations in the Weaver area.

6. A comprehensive assessment of the project's impacts on endangered species will be prepared by the Service and submitted to the Corps.

7. The Fish and Wildlife Service will consider funding selected portions of the rehabilitation effort which may be necessary to environmentally enhance Weaver Bottoms but which cannot be justified under the Corps' authority to operate and maintain the navigation project. However, specific needs for funding are not yet clear from the alternative selection and planning process. The Service will review such project features which might require funding when the construction alternative(s) has been determined.

These are areas where the Fish and Wildlife Service can provide expertise and, hopefully, benefit the overall project. The Service is committed to assisting in this effort, and we are excited about the prospects for the rehabilitation of Weaver Bottoms as well as the long-range implications of habitat restoration projects elsewhere on the Mississippi River.

Should you have any questions about the extent of our involvement, please contact me at 507/452-4232. Thank you.

Sincerely,

Richard F. Berry

Richard F. Berry
Complex Manager

Attachment

cc: Welford
St. Paul ESFO

OBJECTIVES OF WEAVER BOTTOMS PROJECT - FWS

The fish and wildlife habitat of Weaver Bottoms has deteriorated in recent years. The Weaver area has changed from a biologically-productive marsh to a less productive, windswept riverine lake. Losses of submergent and emergent vegetation resulting from changes in substrate type, deposition, and water turbidity have been identified as contributing factors to the decline in habitat quality. The overal goal of the Fish and Wildlife Service is to rehabilitate Weaver Bottoms and enhance its use for fish and wildlife species. The following objectives are directed toward achieving this goal. They are not listed in priority order.

- Reduce sediment deposition within Weaver Bottoms

  Means: a) Closure of side channels along the border between Weaver Bottoms and the main channel
  b) Island(s) construction to direct flow from the Whitewater River out of the Weaver area

  Reduce suspended sediments (turbidity) within the water column

  Means: a) Reduce water flow rates entering the Weaver area
  b) Reduce wind fetch by creation of upland islands
  c) Direct discharge from the Whitewater River out of the Weaver area

- Promote increased growth of both emergent and submergent hydrophytes

  Means: a) Increase lake-like conditions by reducing current flow
  b) Increase littoral area by islands
  c) Plantings of aquatic plant species as appropriate
  d) Reduce wave action

- Maintain and enhance the use of Weaver Bottoms by swans and other waterfowl; retain the integrity of the designated waterfowl sanctuary area

  Means: a) Promote the growth of aquatic vegetation
  b) Maintain the integrity of Whitewater River delta area
  c) Ensure that rehabilitation efforts do not adversely impact on swan use.

d) Maintain existing aquatic plant beds
e) Regulate vessel access during critical waterfowl use periods

- Encourage waterfowl nesting/feeding/loafing habitats

  Means: a) Design islands and manage them for waterfowl purposes
  b) Planting of high wildlife-value vegetation

- Maintain predator populations at acceptable levels

  Means: a) Monitor nest success of waterfowl
  b) Design islands/closures to inhibit predator movement and prevent establishing travel corridors

- Enhance fishery habitat

  Means: a) Diversify bottom contours/substrates
  b) Maintain adequate flows and dissolved oxygen levels

- Increase the amount of habitat available for use by shorebirds

  Means: a) Island creation
  b) Substrate modifications

- Provide necessary shoreline stabilization to existing islands bordering the main channel

  Means: a) Riprap placement where necessary

- Maintain access to Weaver Bottoms for appropriate recreational uses

A program of monitoring and analyzing the work done in Weaver Bottoms is also essential whether all or only some of the above objectives are undertaken.

- Monitor the physical and biological changes

  Means: a) Develop a monitoring program for Weaver Bottoms and surrounding areas

- Determine the biological and physical changes in areas surrounding Weaver Bottoms (i.e., Belvidere Slough)

  Means: a) Monitoring and analysis

APPENDIX A

PROJECT FEATURES

APPENDIX A

PROJECT FEATURES

LIST OF PLATES

No.	Title
1	Old John's Ditch, Site Plan for Alternative B
2	Causeway Culverts Sections for Alternative B
3	MN 3A, B, and C: Murphy's Cut Site Plan for Alternatives C and E
4	MN 3A, B, and C: Closures with Gatewell Structures and Culverts Sections for Alternatives C and E
5	MN 3: Site Plan for Alternatives A, B, and D
6	MN 3: Partial Closure Sections for Alternatives A, B, and D
7	MN 4: Site Plan for Alternatives A, B, C, D, and E
8	MN 4: Rock Closure Sections for Alternatives A, B, C, D, and E
9	MN 5: Site Plan for Alternatives A, B, C, D, and E
10	MN 5: Rock Closure Sections for Alternatives, A, B, C, D, and E
11	MN 6: Site Plan for Alternatives A, B, C, D, and E
12	MN 6: Partial Closure Sections for Alternatives A, B, C, D, and E
13	MN 7: Site Plan for Alternatives A, C, D, and E
14	MN 7: Material Closure Sections for Alternatives A, C, D, and E
15	MN 10: Site Plan for Alternatives A, B, C, D, and E
16	MN 10: Partial Closure Sections for Alternatives A, B, C, D, and E
17	MN 11: Site Plan for Alternatives A, B, C, D, and E
18	MN 11: Material Closure Sections for Alternatives A, B, C, D, and E
19	MN 12: Site Plan for Alternatives A, B, C, D, and E
20	MN 12: Material Closure Sections for Alternatives A, B, C, D, and E
21	MN 13: Site Plan for Alternatives A, B, C, D, and E
22	MN 13: Material Closure Sections for Alternatives A, B, C, D, and E
23	MN 14: Water Level Control Structure Site Plan for Alternatives D and E
24	MN 14: Water Level Control Structure Partial Closure Sections A-A, B-B, and C-C for Alternatives D and E

25 MN 14: Water Level Control Structure Partial Closure Section D-D for Alternatives D and E

26 MN A: Site Plan for Alternatives A, B, C, D, and E

27 MN A: Island Section for Alternatives A through E

28 MN B: Site Plan for Alternatives A, B, and C

29 MN B: Island Section for Alternatives A through E

30 Island Stabilization with Vegetation

31 WI 10A, B, and C; WI 11A and B: Site Plan for Alternatives A, B, C, D, and E

32 WI 10A: Stabilization Sections for Alternatives A, B, C, D, and E

33 WI 10B and C: Material Closure Sections for Alternatives A, B, C, D, and E

34 WI 11A and B: Stabilization Sections for Alternatives A, B, C, D, and E

RATIONALE FOR APPENDIX A PROJECT FEATURES

The following discussion summarizes some of the rationale for the design of the project features. More detailed discussions of the advantages and rationale can be found in the supporting documents report.

SIDE CHANNEL CLOSURE DESIGNS FOR THE WEAVER BOTTOMS REHABILITATION

MN 4 and MN 5 were designed to be all rock structures approximately 3 feet above low control pool. The main purpose of these structures would be to eliminate flow under normal river discharges, but to allow these structures to be overtopped readily during floods. These structures would serve basically as safety valves, minimizing the efffects on adjacent areas of the more frequently occurring floods. To ensure the stability of these closures, they would be constructed only with rock.

MN 11, MN 12, MN 13, and MN 7 (for all alternatives except B) would be completely dredged material closures. These closures would be built to 12 feet above the adjacent land areas, so that in flood events the adjacent vegetated land areas would be overtopped first. The backwater sides of these closing structures would be vegetatively stabilized. No stabilzation measures on the main channel side of these would be initially constructed. However, these shoreline areas would be monitored; and, if unacceptable erosion would occur, they would be stabilized.

Under alternative B, MN 7 would be left open. The original investigators felt that MN 7 was rather a unique side channel and should be left open. If MN 7 is left open, complete armoring of the bank and channel bottom with rock may be required to prevent erosion.

The lower closure at MN 14 would be constructed to a height varying from 0.5 to 5 feet above low control pool. Most of this closure would be easily overtopped during normal peak spring flows (80,000 cfs). Therefore, no impounding of water within Weaver Bottoms should occur under higher river

discharges. The main channel side of this closure would be tied into an existing channel training structure, and the shoreline area would be stabilized with riprap.

The partial closing structures built at MN 3 (for alternatives A, B, and D), MN 6, and MN 10 would consist of both dredged material and rock. A bottom width of 30 feet for the opening was selected because it would allow the safe passage of small boats yet maximize the reduction of flow into the Weaver Bottoms. A length of 400 feet for the opening was selected to maintain maximum current velocities below 3 feet per second on the structure. Maintaining current velocities at 3 feet per second or less has several advantages: (1) the stability of the structure would be greater, (2) it would minimize impediments to fish movement, (3) it would make small boat navigation easier and safer. The partial closing structure at MN 3 was placed downstream of the mouth to avoid building the structure on a curve or significantly disturbing the existing bank. The bank area upstream of the structure would be stabilized with riprap. The partial closing structures at MN 14(for alternatives D and E) were designed using many of the same criteria, except for the bottom width of the openings. The bottom width of the closures was designed, with the assistance of the computer model, to maintain the desired water levels within the Weaver Bottoms. The measures at WI 10A, 10B, 10C, 11A, and 11B were designed to prevent the scouring and subsquent deposition in Lost Island Lake. Reducing the cross-sectional area of these openings and stabilizing the bottom should be adequate to meet this ojective.

The number and size of the culverts at the closure at MN 3A, B, and C for alternatives C and E were selected to enable flows through Murphy's Cut to be maintained at or near existing flow conditions at normal low river discharges.

ISLAND DESIGN FOR THE WEAVER BOTTOMS REHABILITATION

The anticipated benefits from construction of islands within Weaver Bottoms are as follows:

1. Increased physical habitat diversity (increased shallow littoral area and deep water areas) within Weaver Bottoms for fish and wildlife.

2. Reduced effects of wind-induced waves by creation of shadow zones behind islands and reduction of overall wind fetch.

3. Creation of desirable nesting, resting, and feeding areas for waterfowl and shorebirds.

4. Partial redirection of the Whitewater River to maximize transport of sediment from the Whitewater River out of the Weaver Bottoms.

5. Beneficial use of maintenance dredged material.

6. Improved visual quality.

Preliminary island designs have been developed that attempt to maximize these expected benefits. In addition to using the expected benefits to develop the designs for the islands, the following items were also used: avoidance, in as much as practicable, of existing valuable habitat; creation of natural-looking islands; and creation of stable islands. Designs for the islands may be modified by the Corps and the Fish and Wildlife Service when more recent information on the habitat conditions in Weaver Bottoms are obtained.

Spacing and Location

The primary factor determining the locations of the islands was the need to reduce wind fetch. A literature review indicated that limiting maximum near-bed velocities produced by waves to those levels which would not cause the resuspension of fine sediments in shallow water would also protect against the uprooting or breakage of aquatic plants, would minimize the potential for shoreline erosion, and would reduce other environmental adverse effects associated with waves. Using the guidance contained in the Shoreline

Protection Manual, reducing fetch length to 4,000 feet was calculated to be necessary to achieve the desired goals.

Aquatic plants serve as forms of natural windbreaks. The existing emergent plant beds within Weaver Bottoms were used to position the islands.

Island MN A (see figure 4 in the main report) was positioned immediately upstream of the mouth of the Whitewater River to minimize the movement upstream into Weaver Bottoms of the sediment coming in from the Whitewater River.

In placing the islands, the existing deeper water areas and the stump fields within Weaver Bottoms were avoided as much as practicable.

Slope and Height

The 1 on 4 to 1 on 6 slope was selected to minimize the affected aquatic area, but also provide a stable slope against waves. The slope, especially near the shoreline, would be made rather irregular to maximize habitat diversity and the shoreline stability. The below-water slope could be initially 1 on 2, but would eventually assume a 1 on 6 slope. Once a 1 on 6 slope has been established, the submerged riprap would be planted with aquatic plants.

The height of 10 feet above the water level was selected considering the following factors:

1. The quantity of dredged material available and the size needed to reduce wind fetch.

2. Many of the existing islands along the eastern shore of Weaver Bottoms are 10 to 12 feet above water level.

3. Kennedy et al. (1979) indicates that 90 percent of the land mass should remain above water level during normal high water to maximize waterfowl nesting.

4. Simons and Chen (1977) indicated that a "shadow zone" downwind of the islands is created that is approximately 10 to 11 times the height of the island.

5. The island should not be built to an elevation where it would be subject to heavy wind erosion or extreme xeric soil conditions.

Configuration

The basic shape for all the islands would be a crescent shape. This shape provides the greatest reduction in wind fetch from different wind directions and the greatest amount of shoreline and shallow littoral area for the least amount of aquatic area directly affected. Using the basic crescent shape, the islands were shaped to maximize the edge effect, habitat diversity, and visual quality and minimize shoreline erosion.

Size

The 8- to 10-acre size of the island was determined by the size needed to reduce wind fetch to the desired length, the quantity of dredged material available, and studies showing that islands of 10 acres and less are the most desirable for waterfowl and shorebird use.

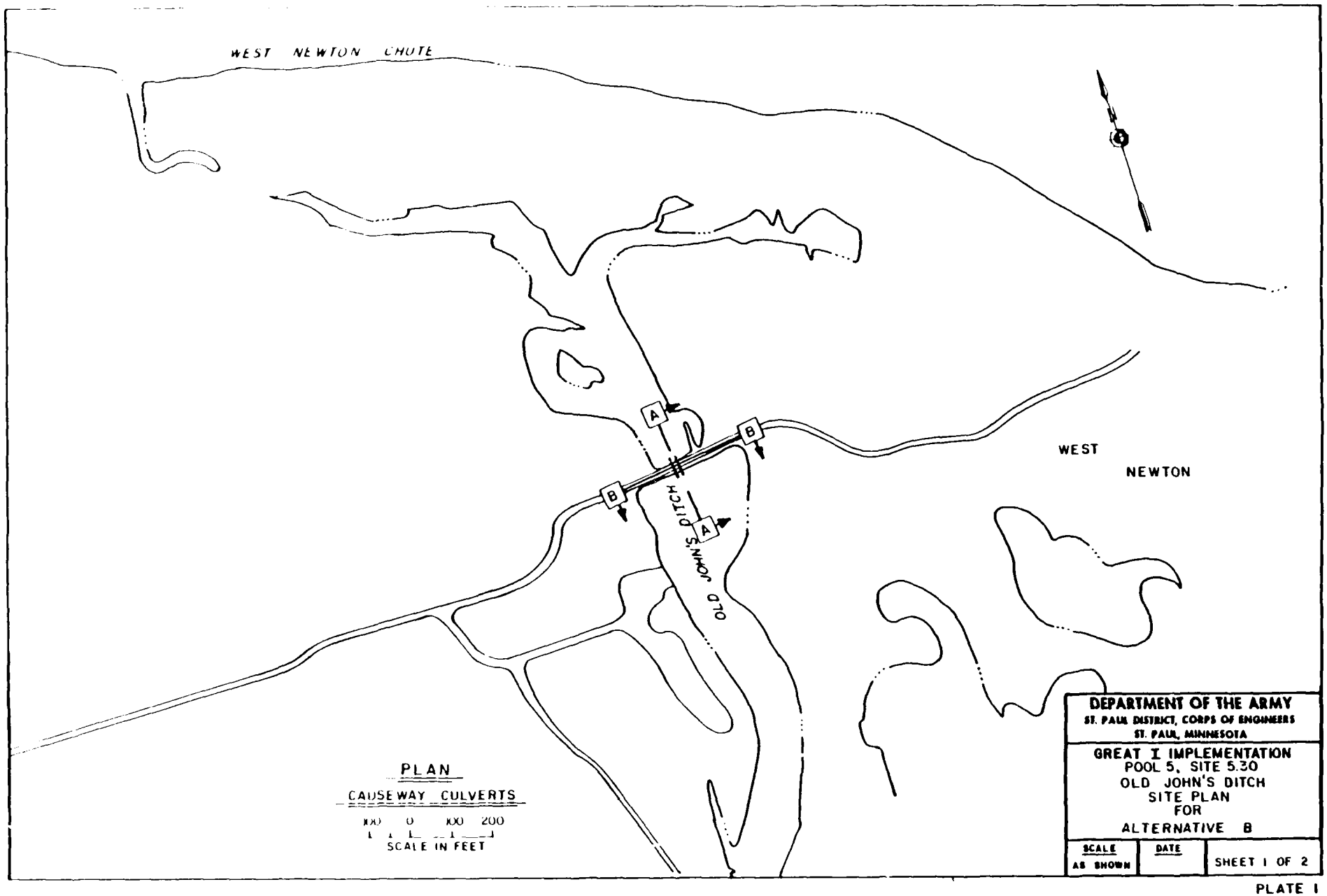
Stabilization Measures

A variety of vegetative stabilization measures would be used for the island built in phase I. Vegetative plantings were designed not only to provide substrate stabilzation, but also to attract wildlife. The dredged sand material would be capped with dredged fine material obtained near the island and the dredged material closure sites to provide a suitable soil for the

vegetative plantings. The islands would be planted in vegetation zones. Plants for each of the vegetation zone were selected based on the erosion potential of the area, the soil water characteristics of the area, the needs of the target fish and wildlife species, and the need to produce a diverse habitat.

In addition to plantings on the islands, planting emergent aquatic plants adjacent to the island would also increase both the stability of the shoreline and the attractiveness of the islands for fish and wildlife.

The islands built in phase I would not have any riprap. With the reduced discharge through Weaver Bottoms and the reduced wind fetch, stabilization with vegetation should be adequate to prevent shoreline erosion. During major floods these islands may be subject to some erosion. However, it would be no worse than what would be expected on existing islands. The islands would be monitored; and, if unacceptable shoreline erosion does occur, stabilization of selected areas with rock riprap may be necessary.

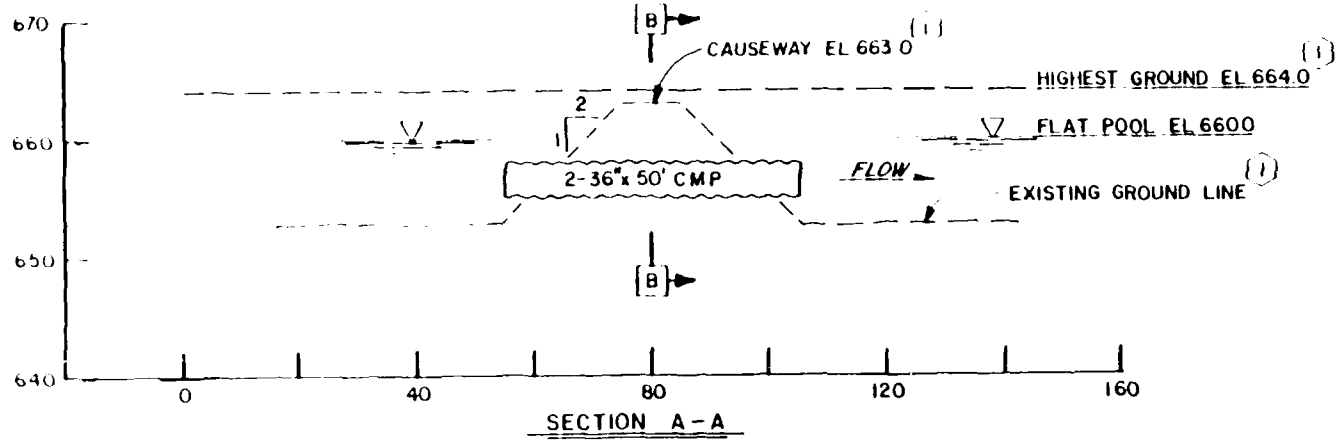


DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

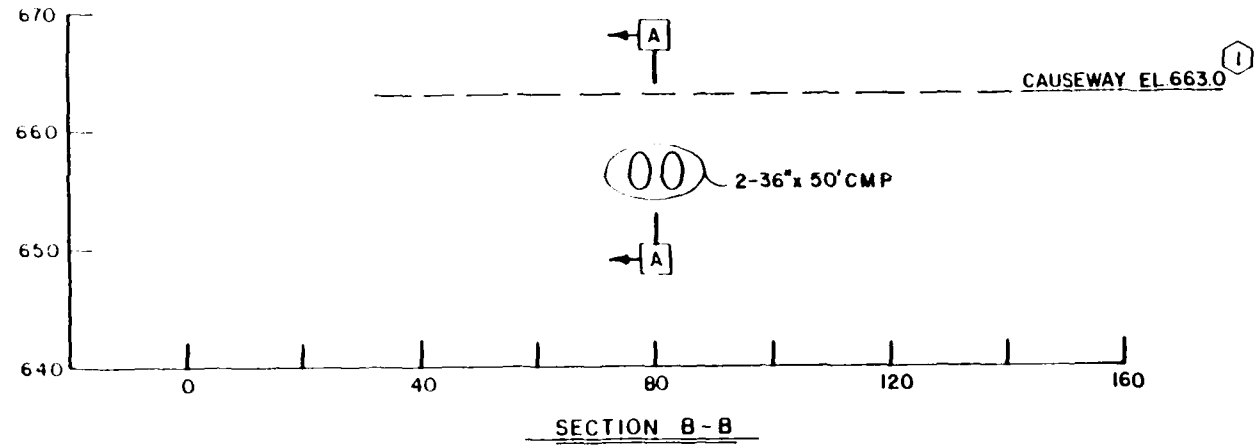
GREAT I IMPLEMENTATION
POOL 5, SITE 5.30
OLD JOHN'S DITCH
SITE PLAN
FOR
ALTERNATIVE B

SCALE	DATE	
AS SHOWN		SHEET 1 OF 2

PLATE 1



SECTION A-A



SECTION B-B

NOTE:
(1) ASSUMED GROUND ELEVATION

DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA	
GREAT I IMPLEMENTATION POOL 5, SITE 5.30 CAUSEWAY CULVERTS SECTIONS FOR ALTERNATIVE B	
SCALE AS SHOWN	DATE
SHEET 1 OF 2	

PLATE 2

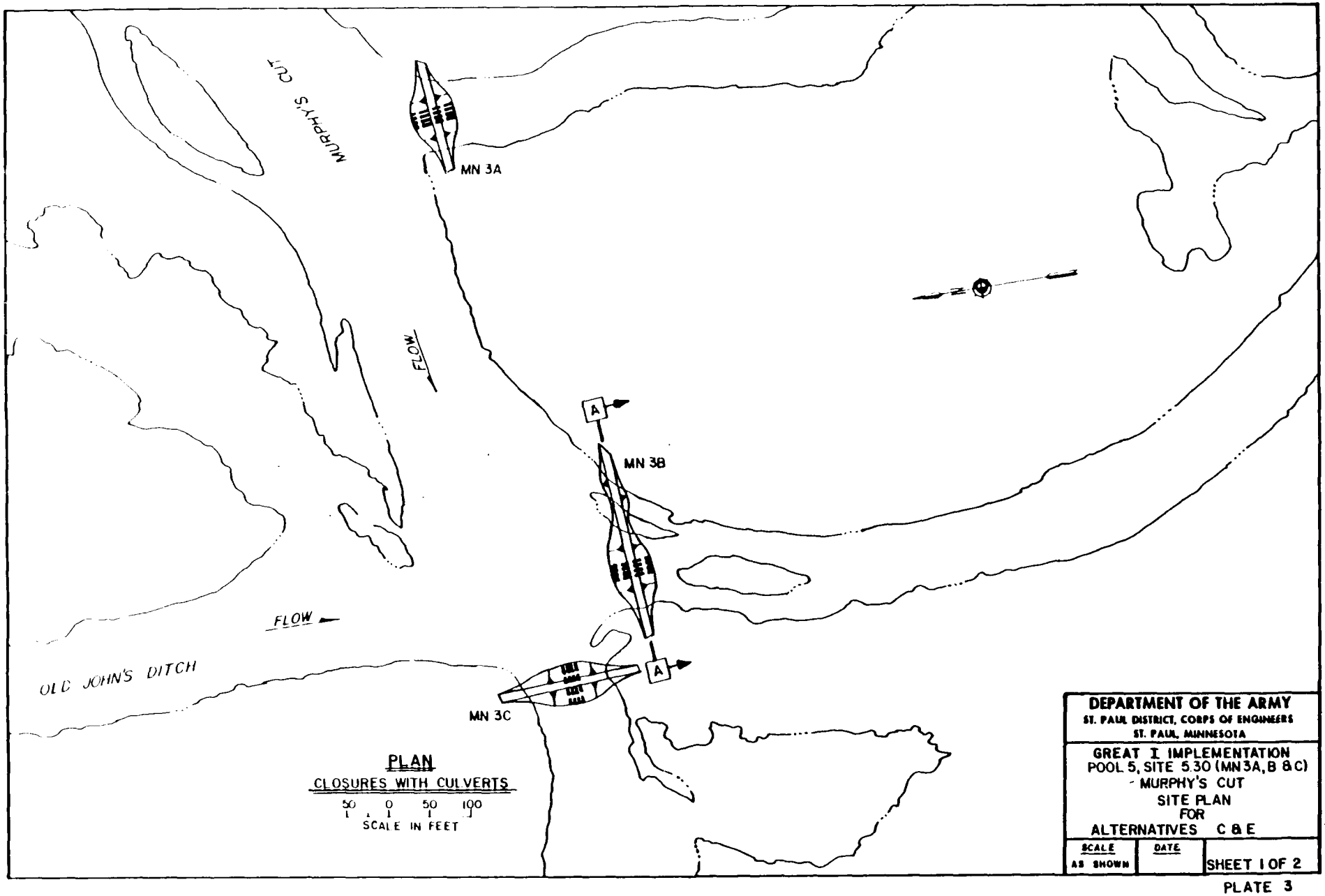
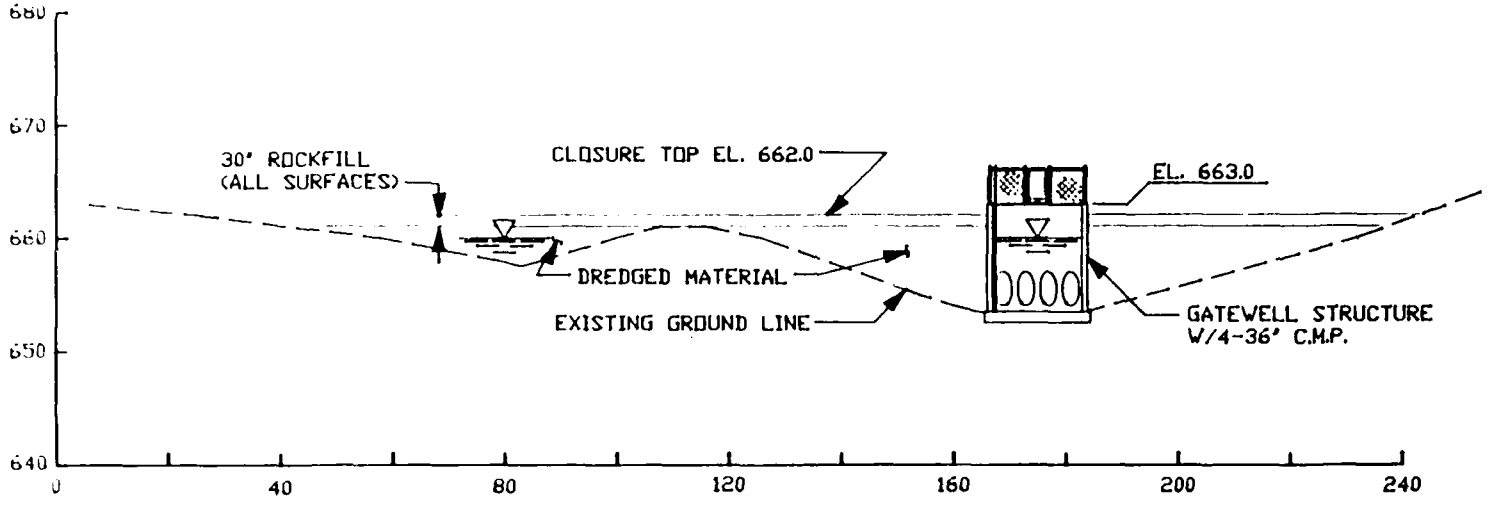
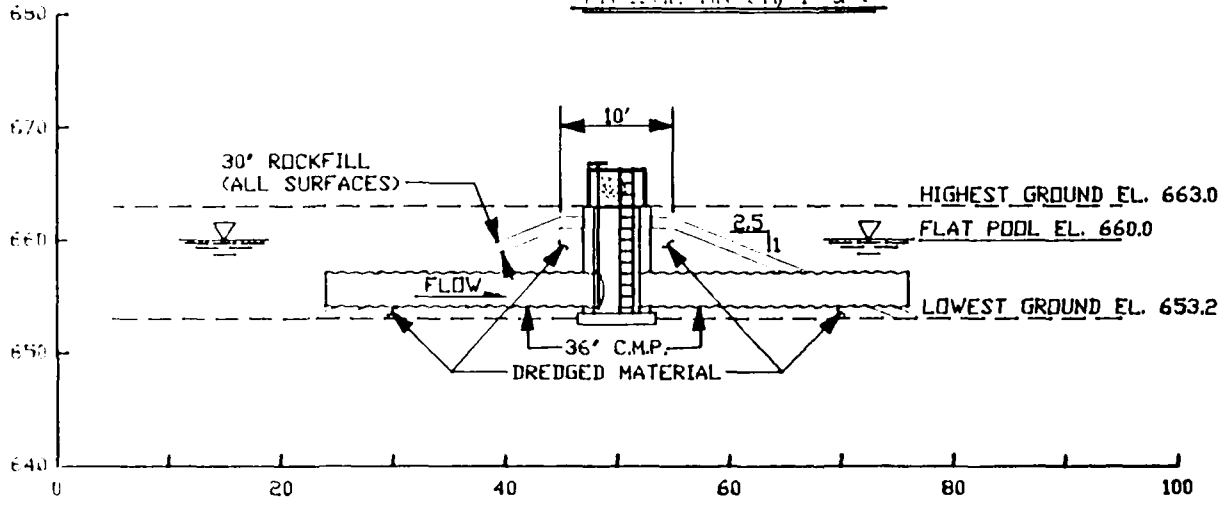

MURPHY'S CUT
MN 3A
FLOW
A
MN 3B
FLOW
OLD JOHN'S DITCH
A
MN 3C
PLAN
CLOSURES WITH CULVERTS
50 0 50 100
SCALE IN FEET
DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA
GREAT I IMPLEMENTATION
POOL 5, SITE 5.30 (MN 3A, B & C)
MURPHY'S CUT
SITE PLAN
FOR
ALTERNATIVES C & E
SCALE
AS SHOWN
DATE
SHEET 1 OF 2

PLATE 3



SECTION A-A

TYPICAL FOR SITES 3A, B & C



TYPICAL GATEWELL SECTION

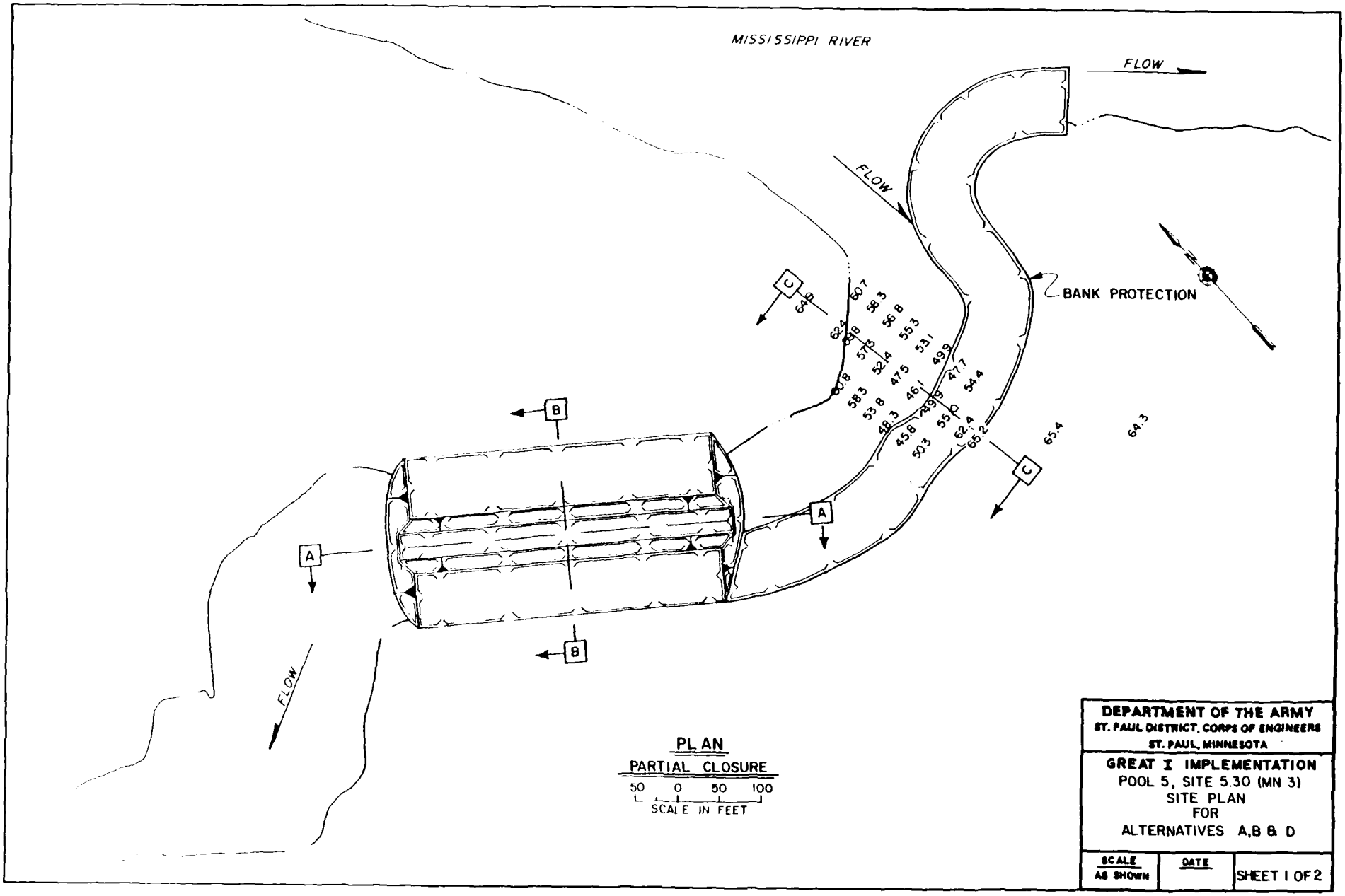
NOTE:
1. ALL GROUND LINES ASSUMED.

DEPARTMENT OF THE ARMY
ST.PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

GREAT I IMPLEMENTATION
POOL 9, SITE 5.30 (MN 3A, B & C)
CLOSURES WITH GATEWELL
STRUCTURES AND CULVERTS
SECTIONS
FOR
ALTERNATIVES C & E

SCALE	DATE	SHEET 2 OF 2
AS SHOWN	6/83	

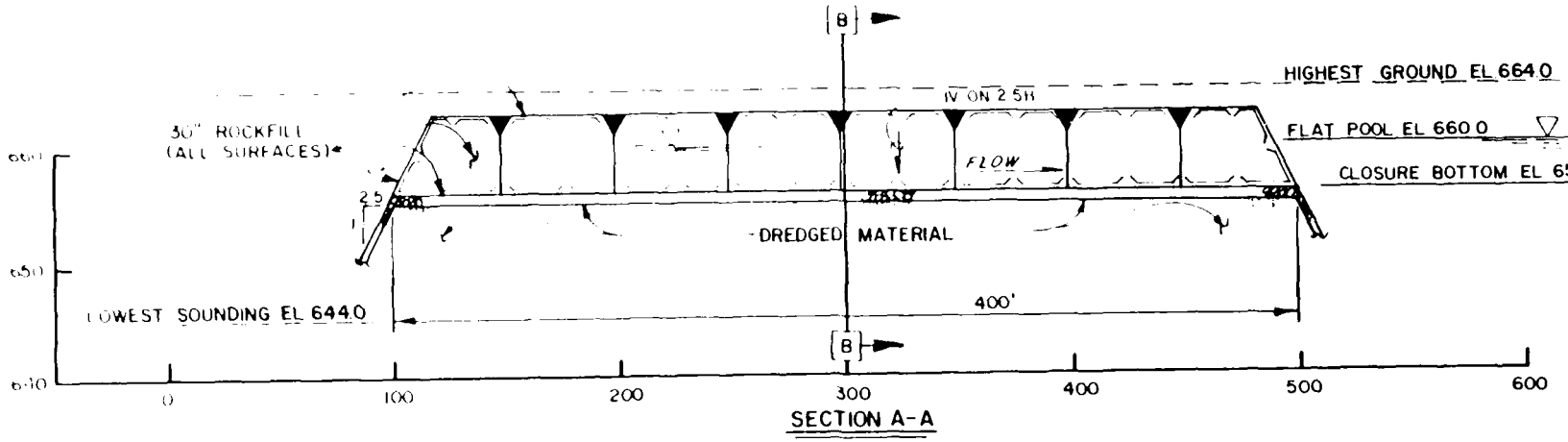
PLATE 4



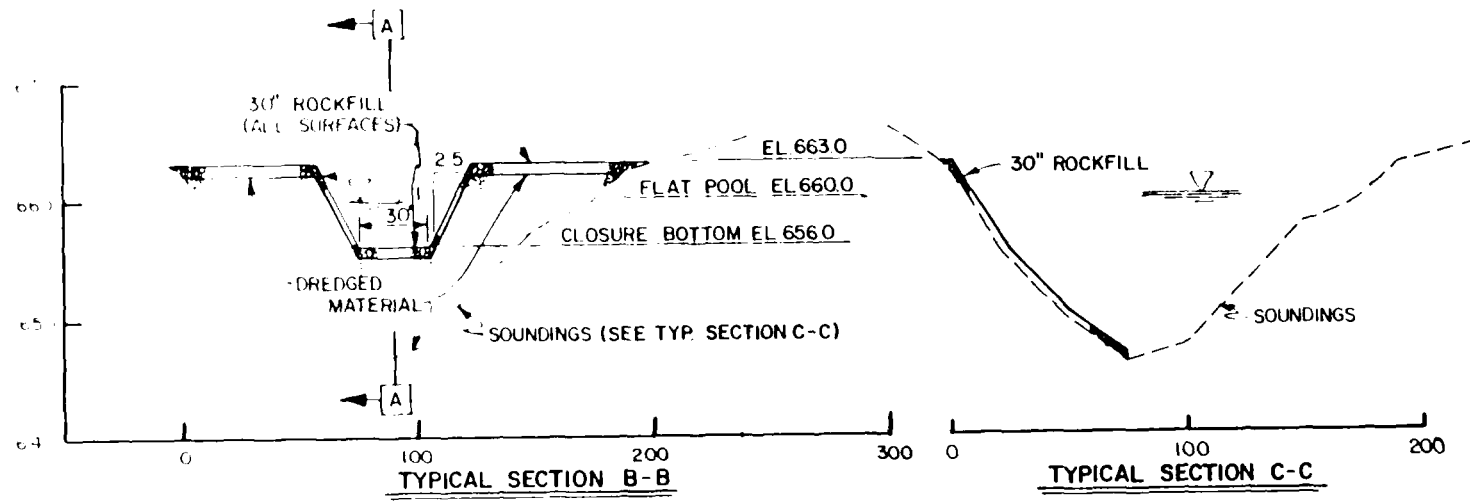
PLAN
PARTIAL CLOSURE
50 0 50 100
SCALE IN FEET

DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA		
GREAT I IMPLEMENTATION POOL 5, SITE 5.30 (MN 3) SITE PLAN FOR ALTERNATIVES A,B & D		
SCALE AS SHOWN	DATE	SHEET 1 OF 2

PLATE 5



SECTION A-A



TYPICAL SECTION B-B

TYPICAL SECTION C-C

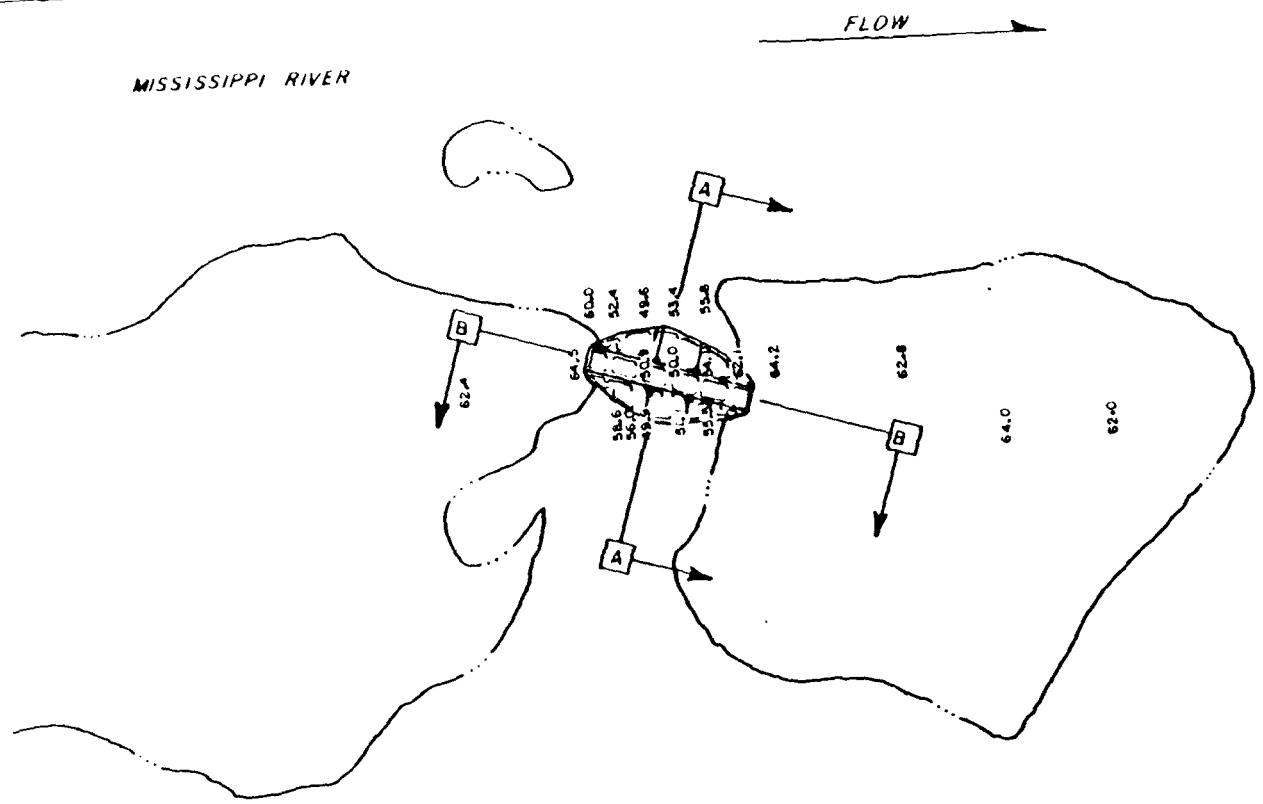
NOTES:
1. SOUNDINGS TAKEN 2,3 & 4/83

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

GREAT I IMPLEMENTATION
POOL 5, SITE 5.30 (MN 3)
PARTIAL CLOSURE SECTIONS
FOR
ALTERNATIVES A, B & D

SCALE	DATE	SHEET 2 OF 2
AS SHOWN		

PLATE 6



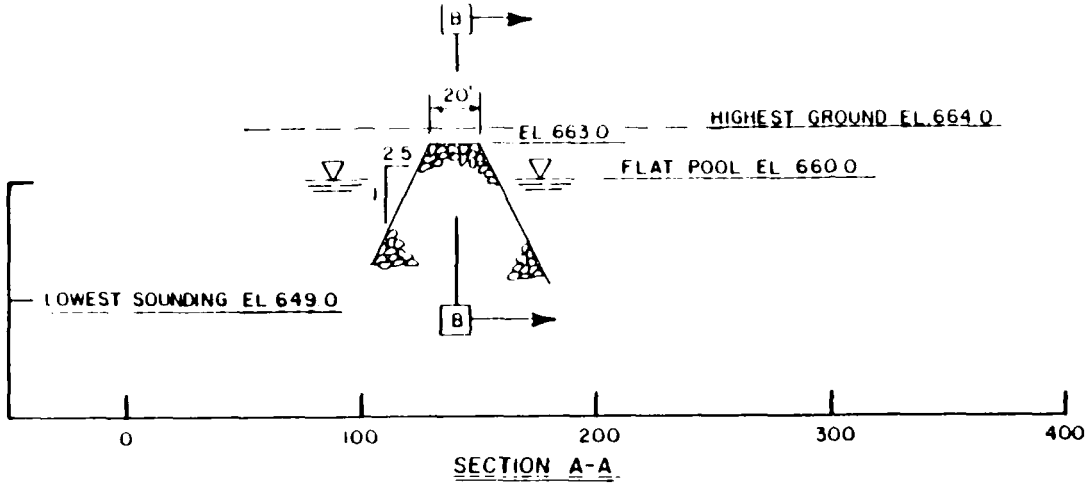
PLAN
ROCK CLOSURE
50 0 50 100
SCALE IN FEET

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

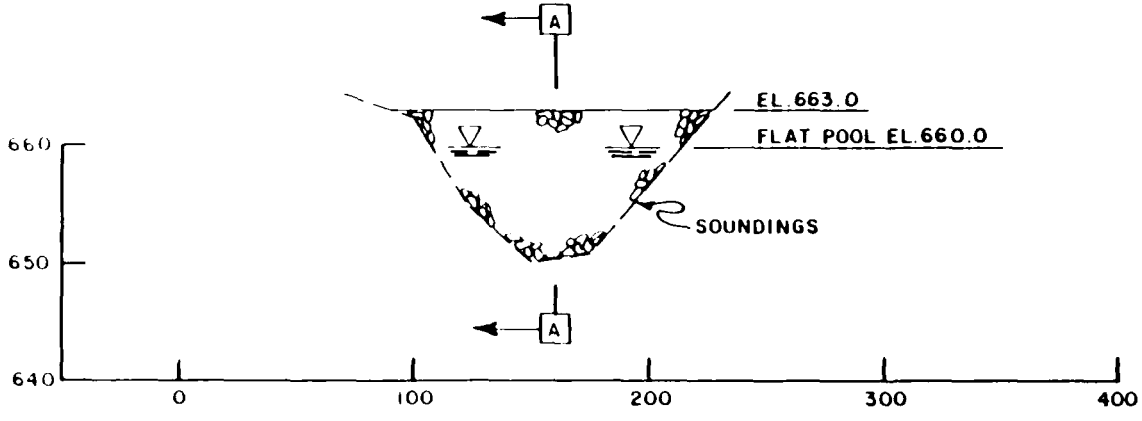
GREAT I IMPLEMENTATION
POOL 5, SITE 5.30 (MN 4)
SITE PLAN
FOR
ALTERNATIVES A,B,C,D & E

SCALE	DATE	
AS SHOWN		SHEET 1 OF 2

PLATE 7



SECTION A-A



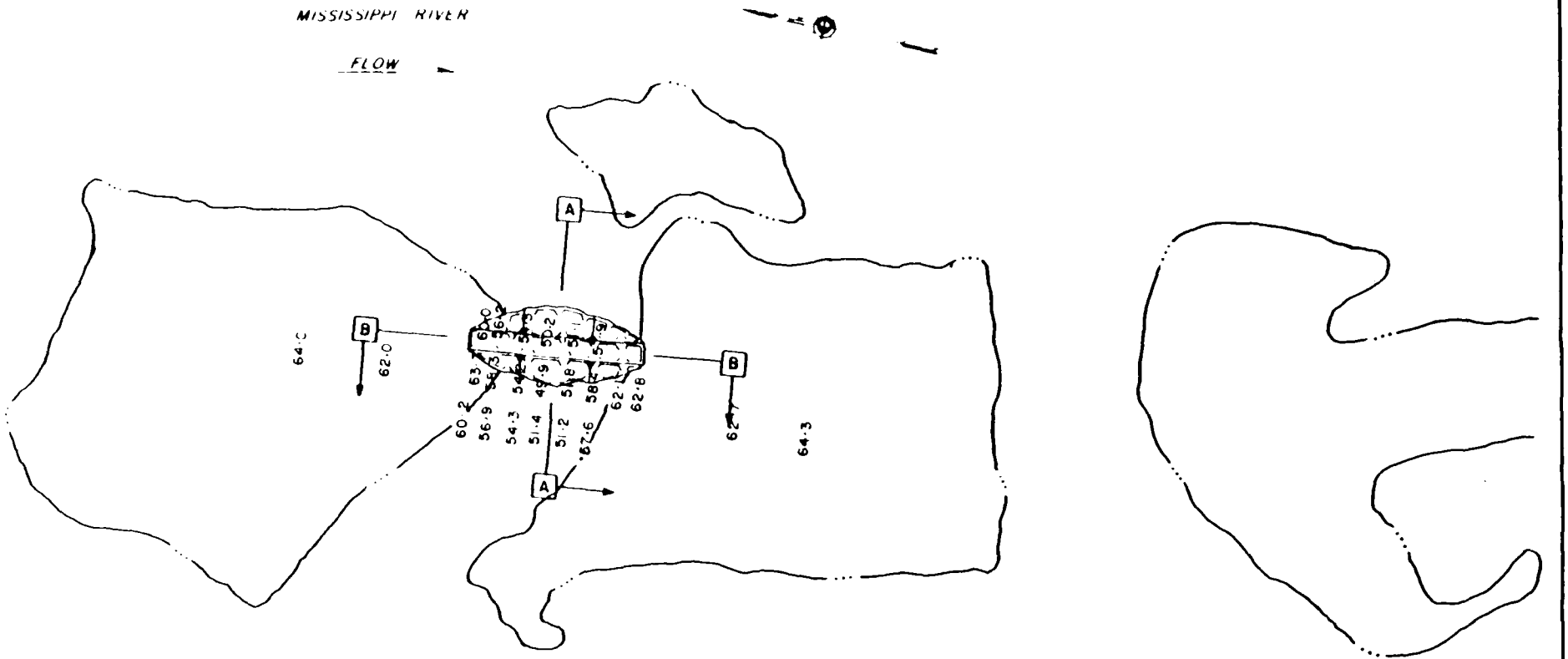
TYPICAL SECTION B-B

NOTE:

1. SOUNDINGS TAKEN 2,3 & 4/83

DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA		
GREAT I IMPLEMENTATION POOL 5, SITE 5.30 (MN 4) ROCK CLOSURE SECTIONS FOR ALTERNATIVES A, B, C, D & E		
SCALE AS SHOWN	DATE	SHEET 2 OF 2

PLATE 8



PLAN

ROCK CLOSURE

50 0 50 100

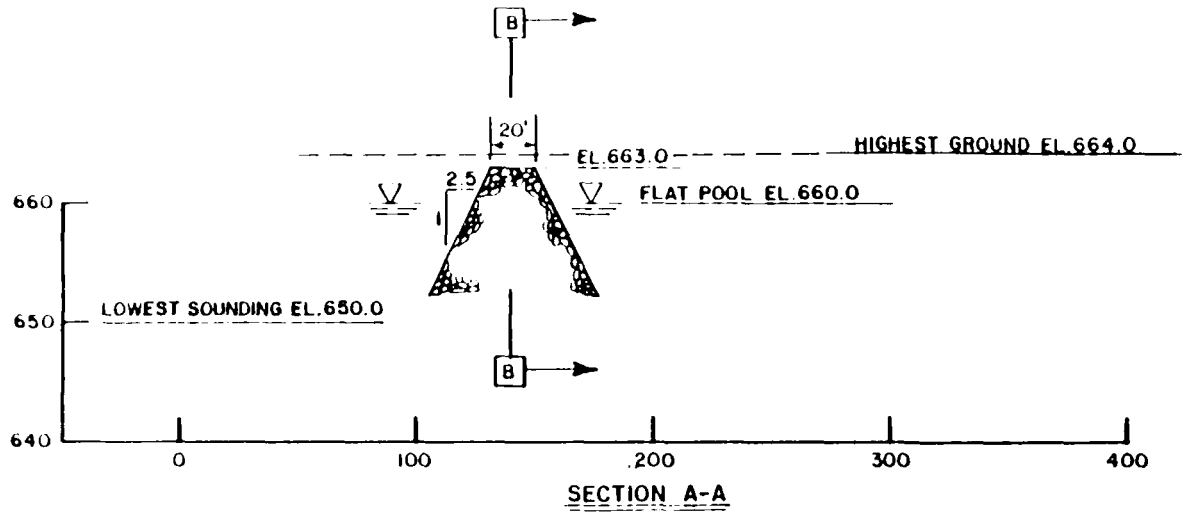
SCALE IN FEET

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

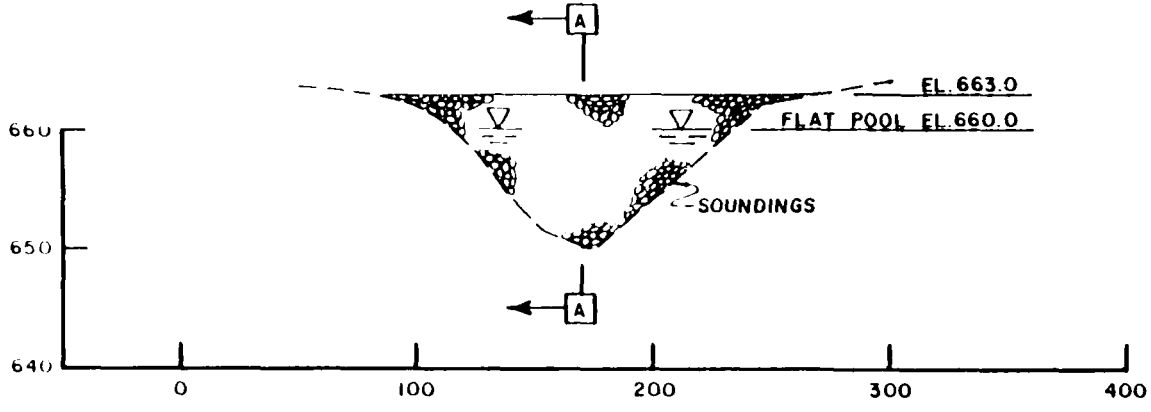
GREAT I IMPLEMENTATION
POOL 5, SITE 5.30 (MN 5)
SITE PLAN
FOR
ALTERNATIVES A,B,C,D & E

SCALE	DATE	
AS SHOWN		SHEET 1 OF 2

PLATE 9



SECTION A-A

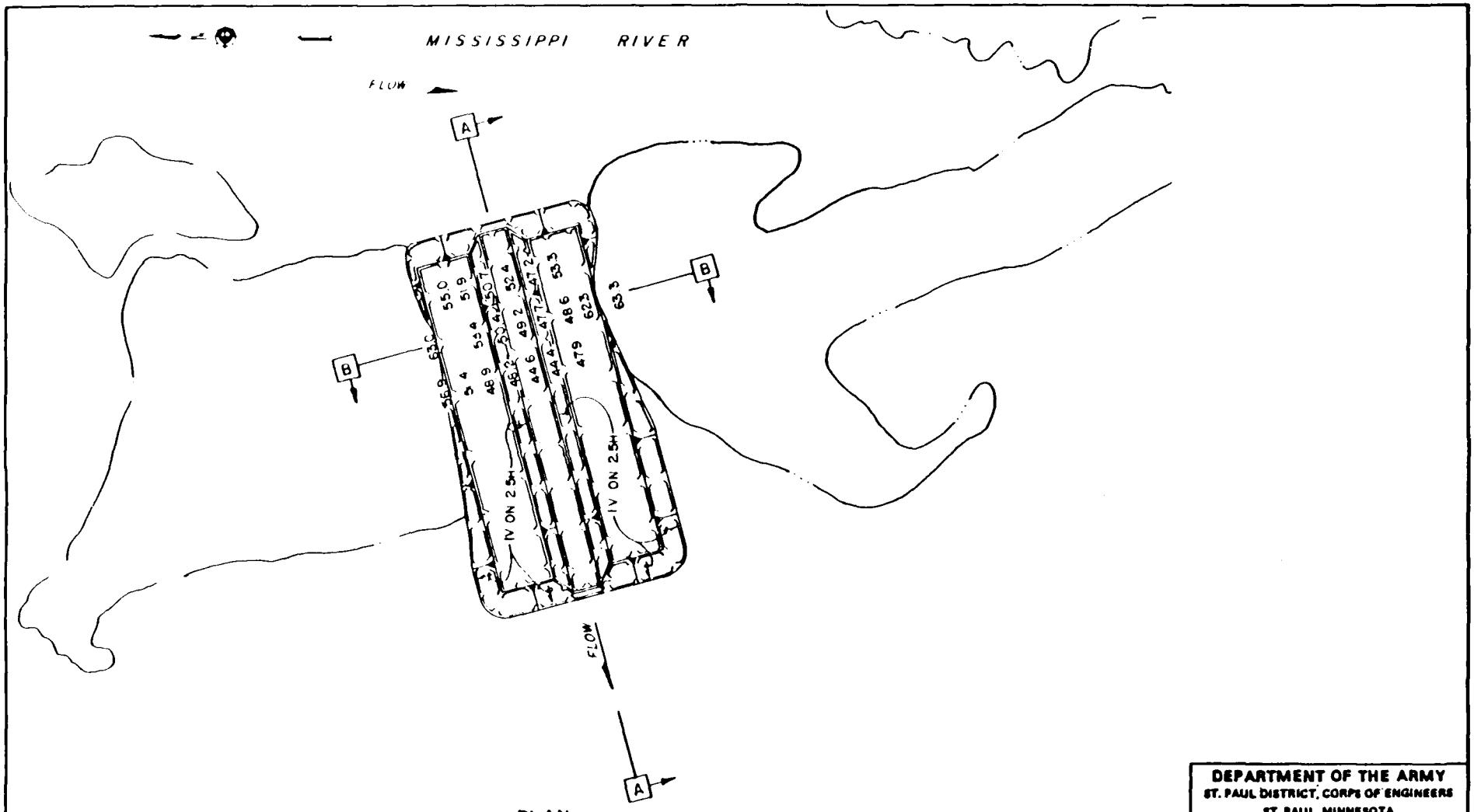


TYPICAL SECTION B-B

NOTE:
1. SOUNDINGS TAKEN 2,3&4/83

DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA		
GREAT I IMPLEMENTATION POOL 5, SITE 5.30 (MN5) ROCK CLOSURE SECTIONS FOR ALTERNATIVES A,B,C,D & E		
SCALE AS SHOWN	DATE	SHEET 2 OF 2

PLATE 10



PLAN

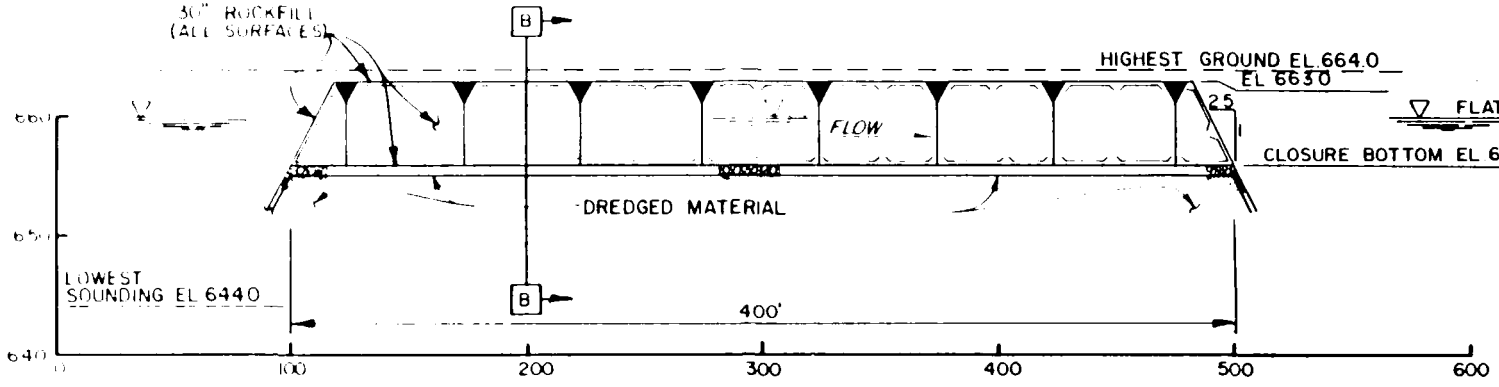
PARTIAL CLOSURE

50 0 50 100

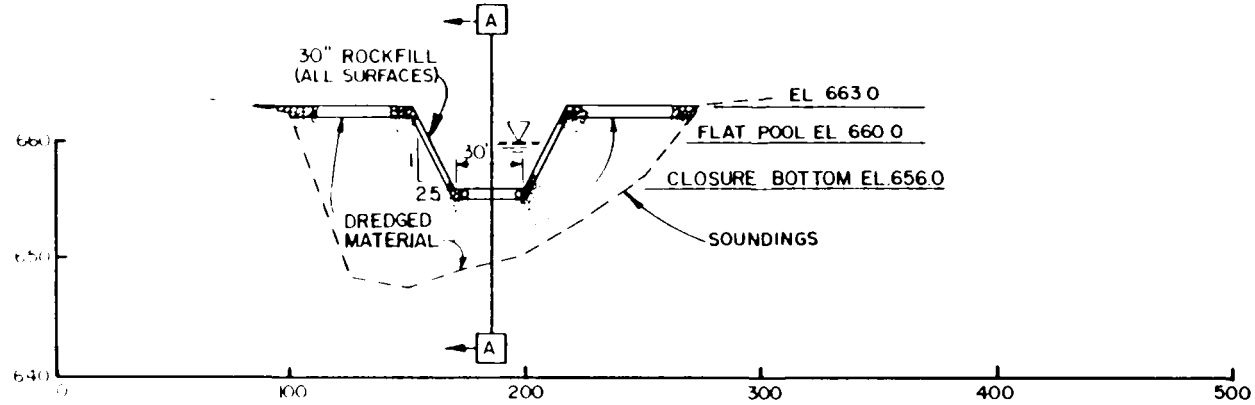
SCALE IN FEET

DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA		
GREAT I IMPLEMENTATION POOL 5, SITE 5.30 (MN 6) SITE PLAN FOR ALTERNATIVES A,B,C,D&E		
SCALE AS SHOWN	DATE	SHEET 1 OF 2

PLATE 11



SECTION A-A



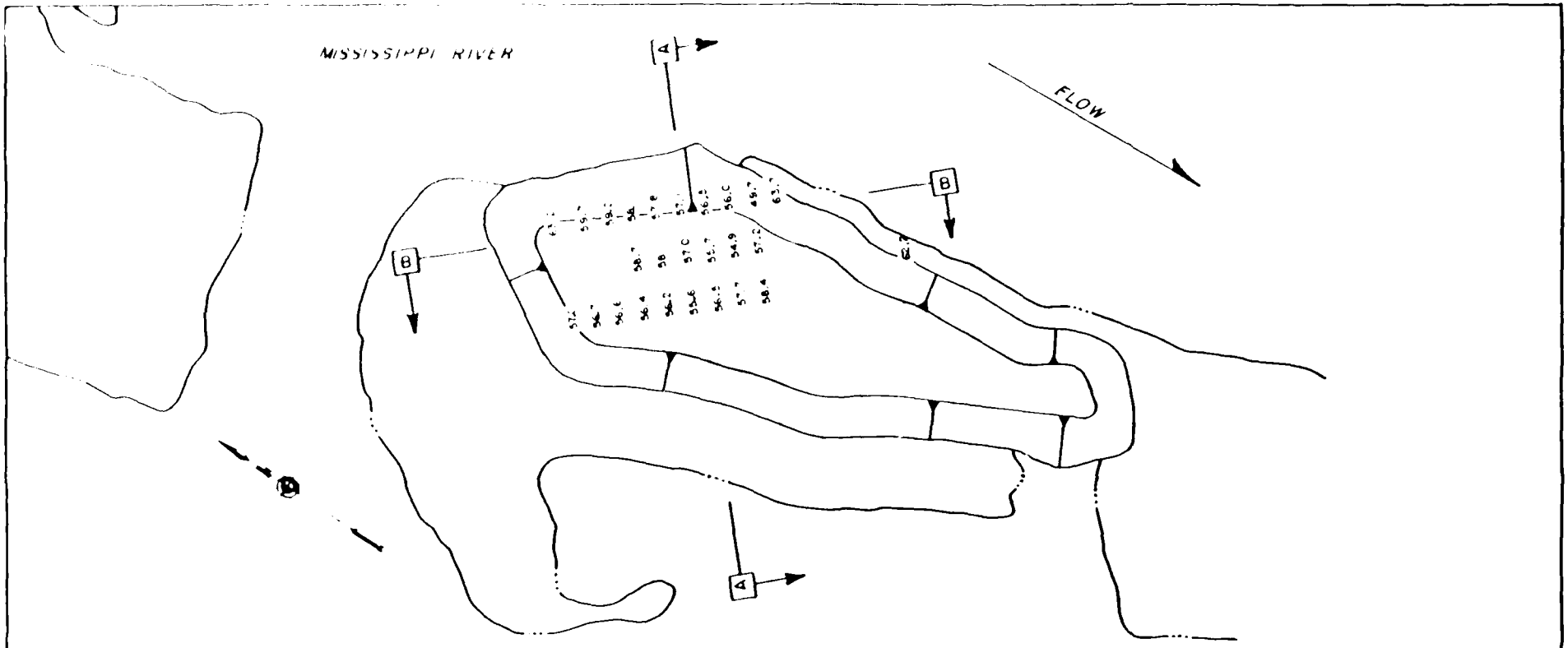
TYPICAL SECTION B-B

NOTES

1 SOUNDINGS TAKEN 2,3 & 4/83

DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA		
GREAT I IMPLEMENTATION POOL 5, SITE 5.30(MN6) PARTIAL CLOSURE SECTIONS FOR ALTERNATIVES A,B,C,D & E		
SCALE AS SHOWN	DATE	SHEET 2 OF 2

PLATE 12



PLAN

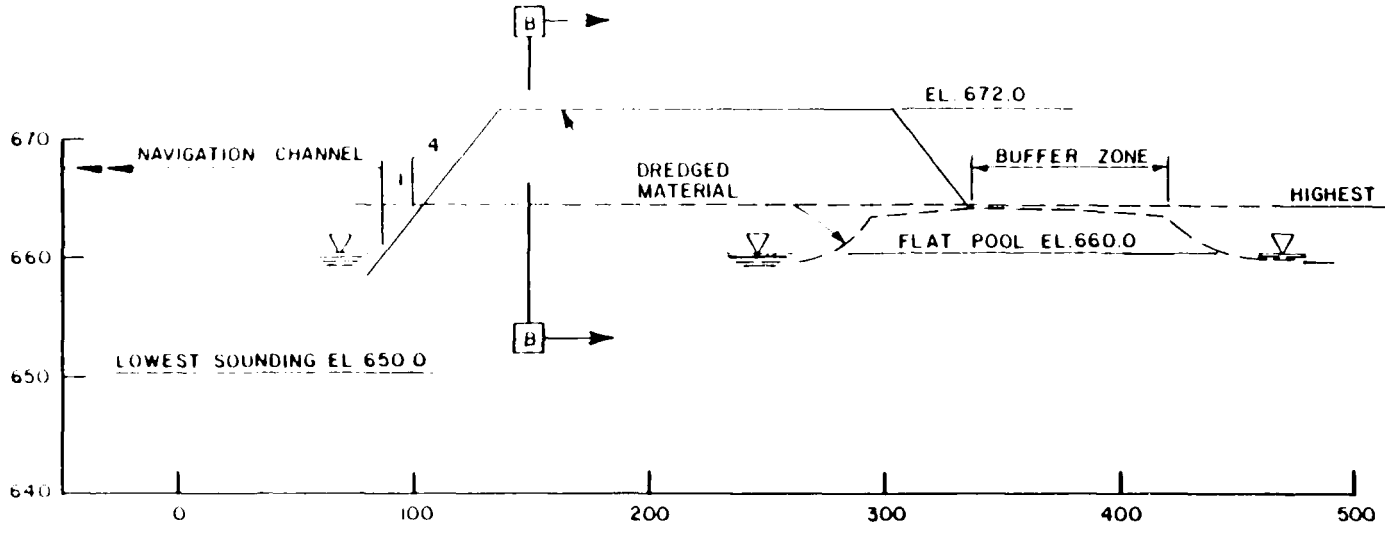
MATERIAL CLOSURE

50 0 50 100

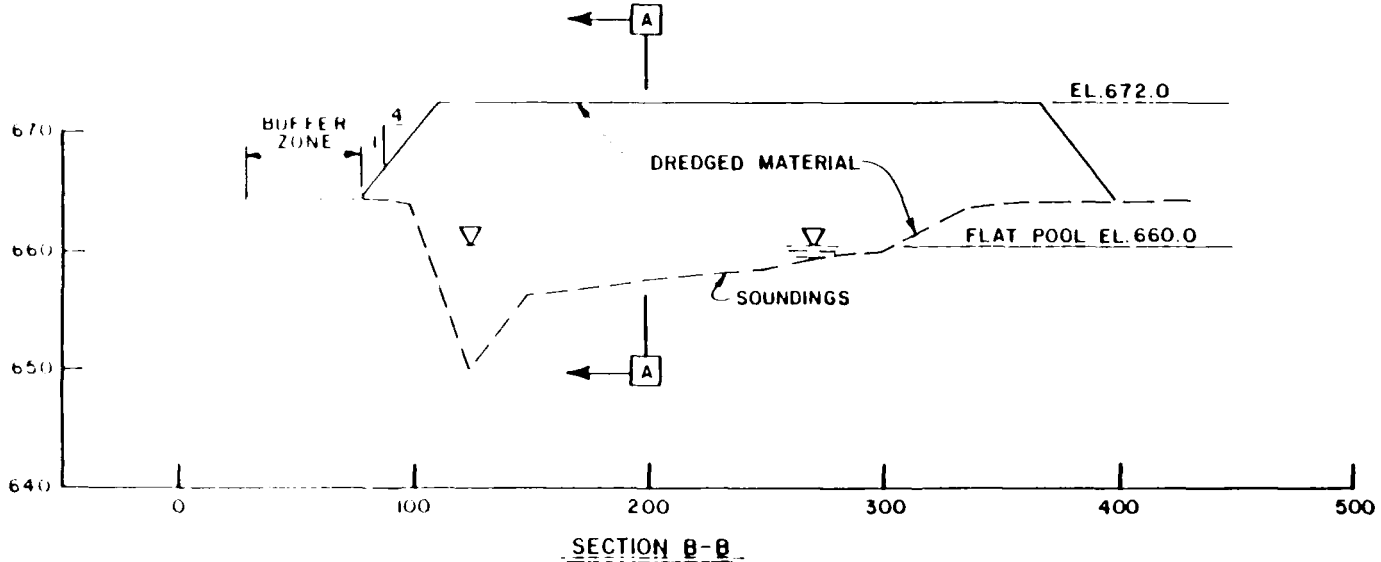
SCALE IN FEET

DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA		
GREAT I IMPLEMENTATION POOL 5, SITE 5.30 (MN 7) SITE PLAN FOR ALTERNATIVES A,C,D & E		
SCALE AS SHOWN	DATE	SHEET 1 OF 2

PLATE 13



SECTION A-A



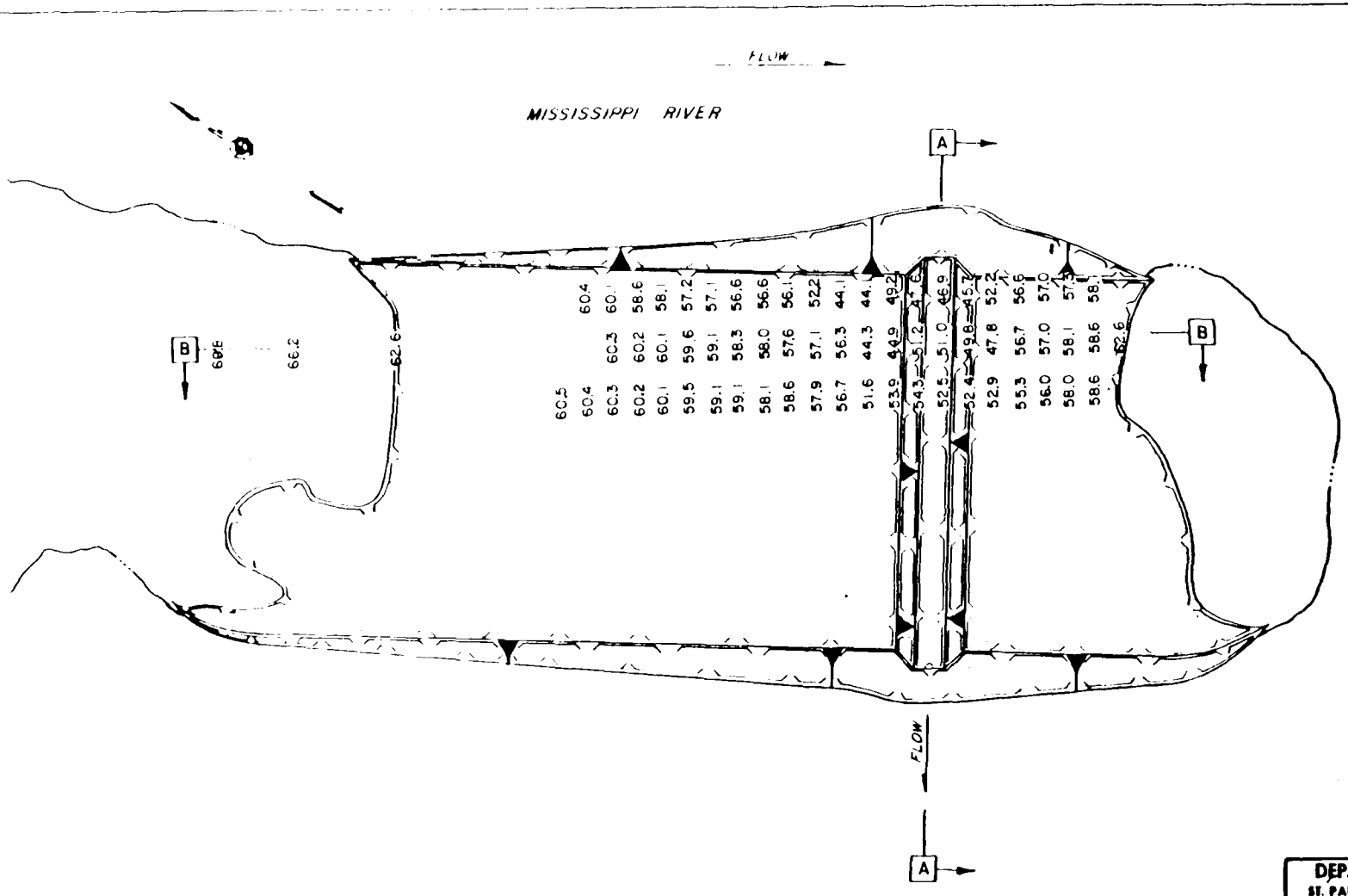
SECTION B-B

NOTE:

1. SOUNDINGS TAKEN 2,3&4/83

DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA		
GREAT I IMPLEMENTATION POOL 5, SITE 5.30 (MN 7) MATERIAL CLOSURE SECTIONS FOR ALTERNATIVES A,C,D & E		
SCALE AS SHOWN	DATE	SHEET 2 OF 2

PLATE 14



PLAN

PARTIAL CLOSURE

50 0 50 100

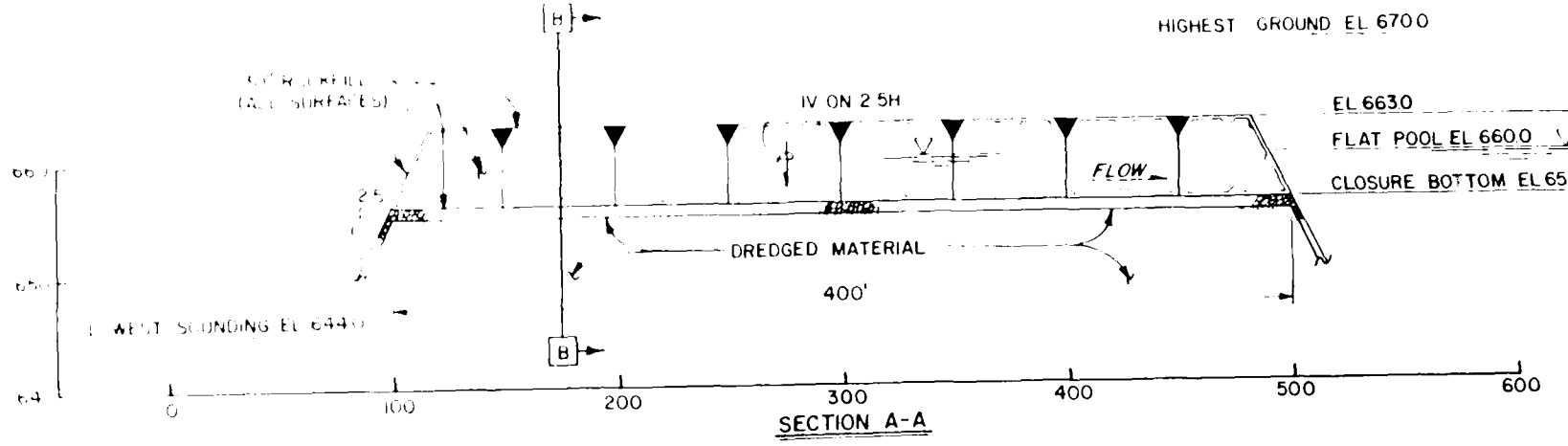
SCALE IN FEET

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

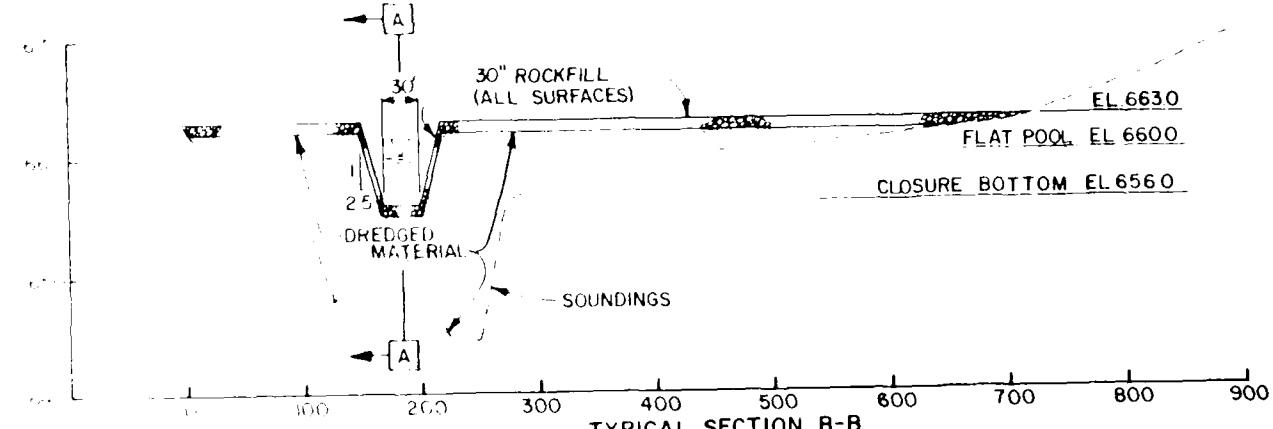
GREAT I IMPLEMENTATION
POOL 5, SITE 5.30 (MN 10)
SITE PLAN
FOR
ALTERNATIVES A,B,C,D & E

SCALE	DATE	
AS SHOWN		SHEET 1 OF 2

PLATE 15



SECTION A-A



TYPICAL SECTION B-B

DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA	
GREAT I IMPLEMENTATION POOL 5, SITE 5.30 (MN10) PARTIAL CLOSURE SECTIONS FOR ALTERNATIVES A,B,C,D & E	
SCALE AS SHOWN	DATE
SHEET 2 OF 2	

PLATE 16

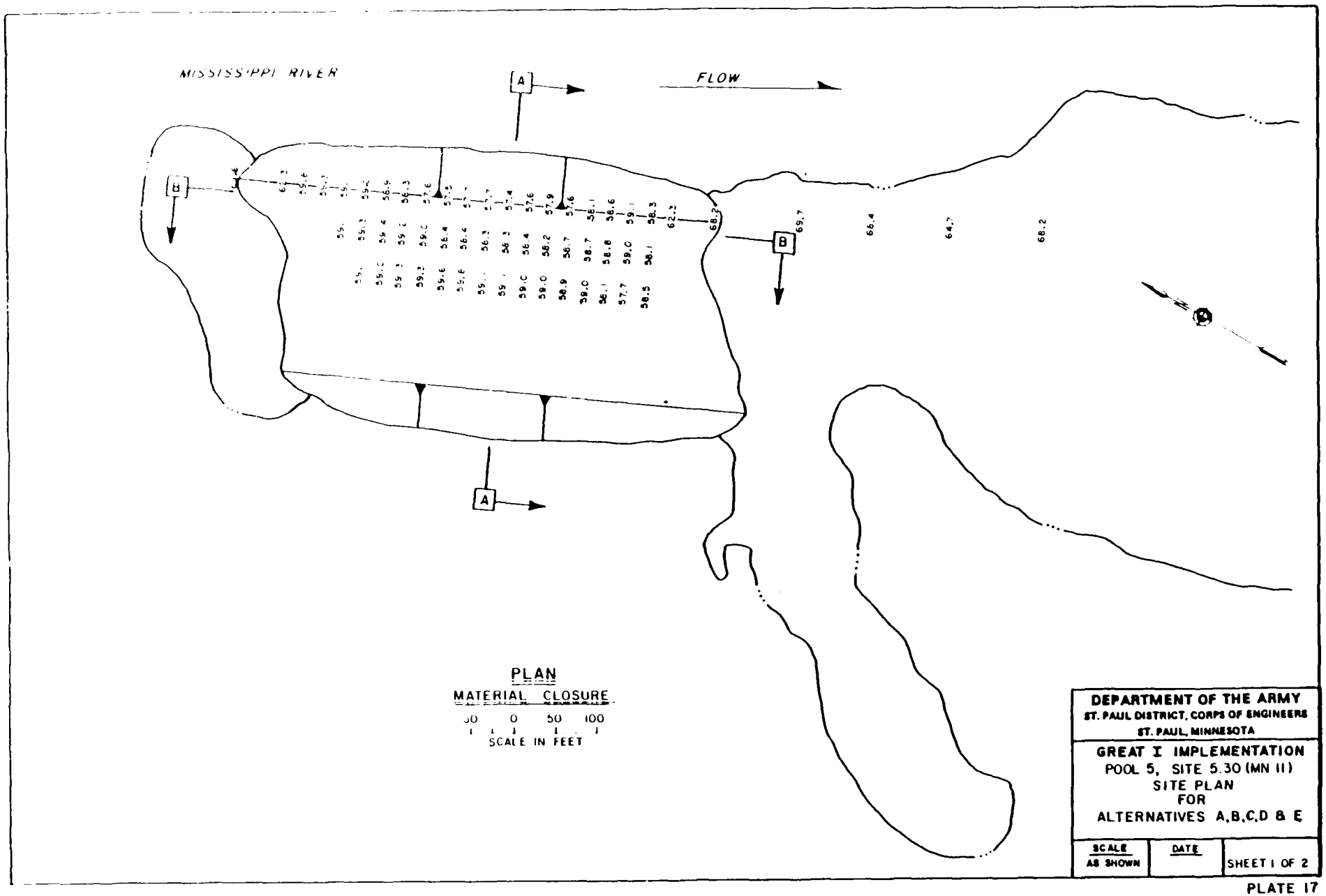
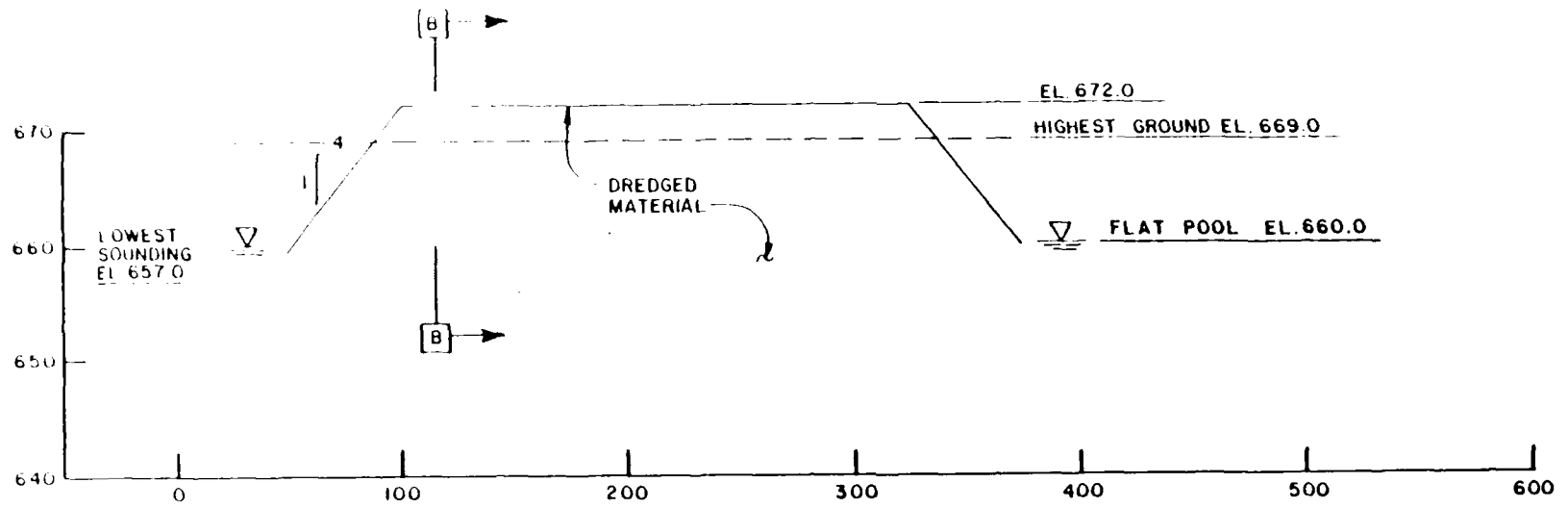
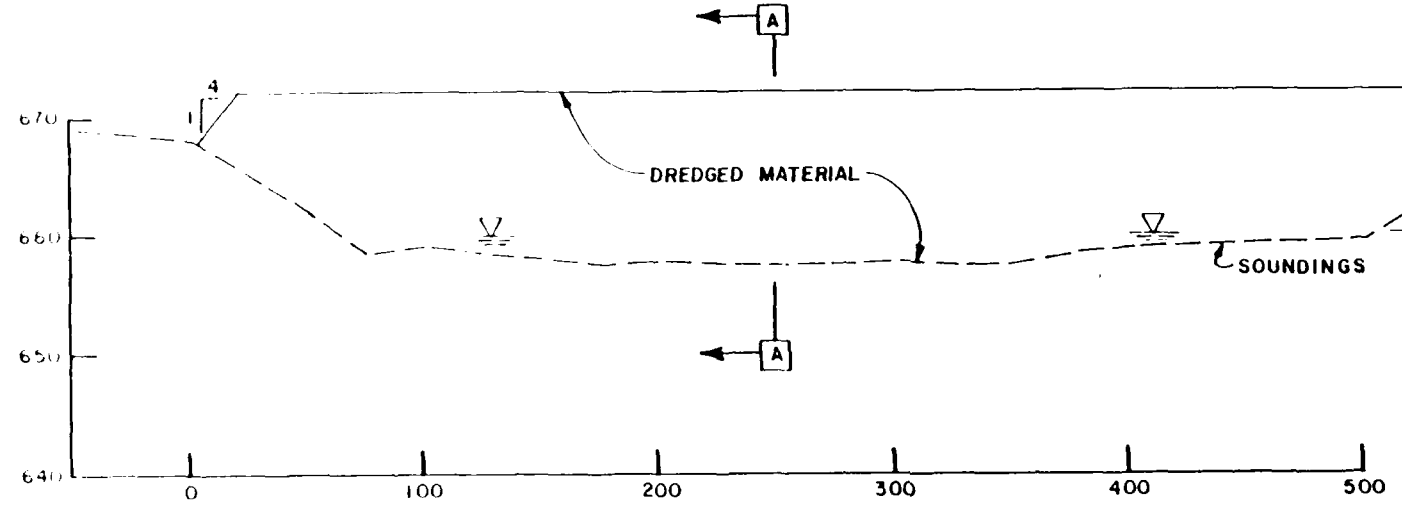

MISSISSIPPI RIVER
FLOW
A
B
PLAN
MATERIAL CLOSURE
50 0 50 100
SCALE IN FEET
DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA
GREAT I IMPLEMENTATION
POOL 5, SITE 5.30 (MN 11)
SITE PLAN
FOR
ALTERNATIVES A,B,C,D & E
SCALE
AS SHOWN
DATE
SHEET 1 OF 2

PLATE 17



TYPICAL SECTION A-A



TYPICAL SECTION B-B

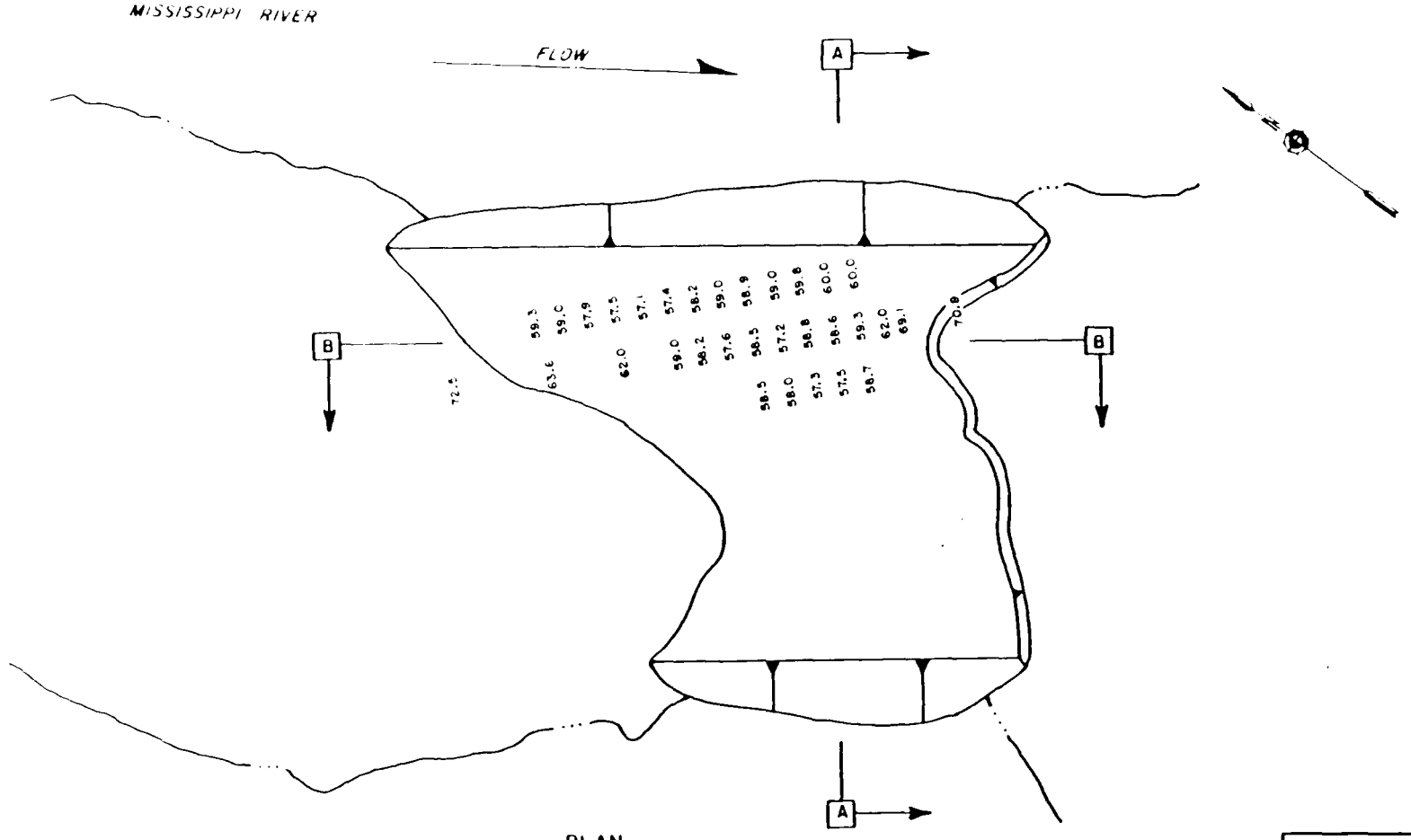
NOTE:
1. SOUNDINGS TAKEN 2,3 & 4/83

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

GREAT I IMPLEMENTATION
POOL 5, SITE 5.30 (MN11)
MATERIAL CLOSURE SECTIONS
FOR
ALTERNATIVES A,B,C,D & E

SCALE	DATE	
AS SHOWN		SHEET 2 OF 2

PLATE 18



PLAN

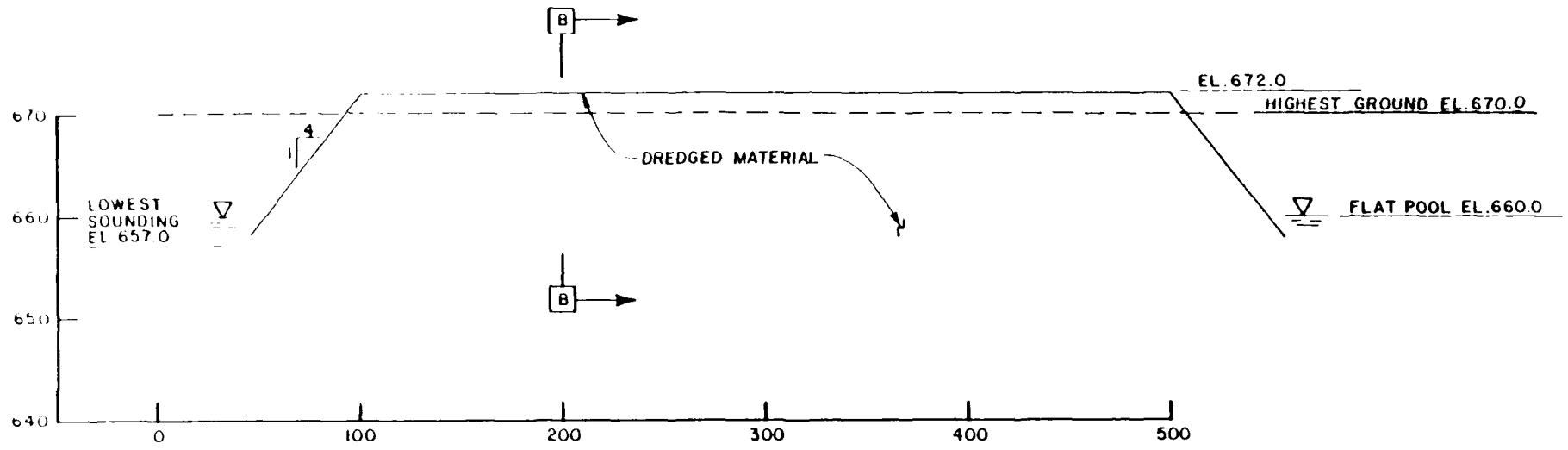
MATERIAL CLOSURE

50 0 50 100

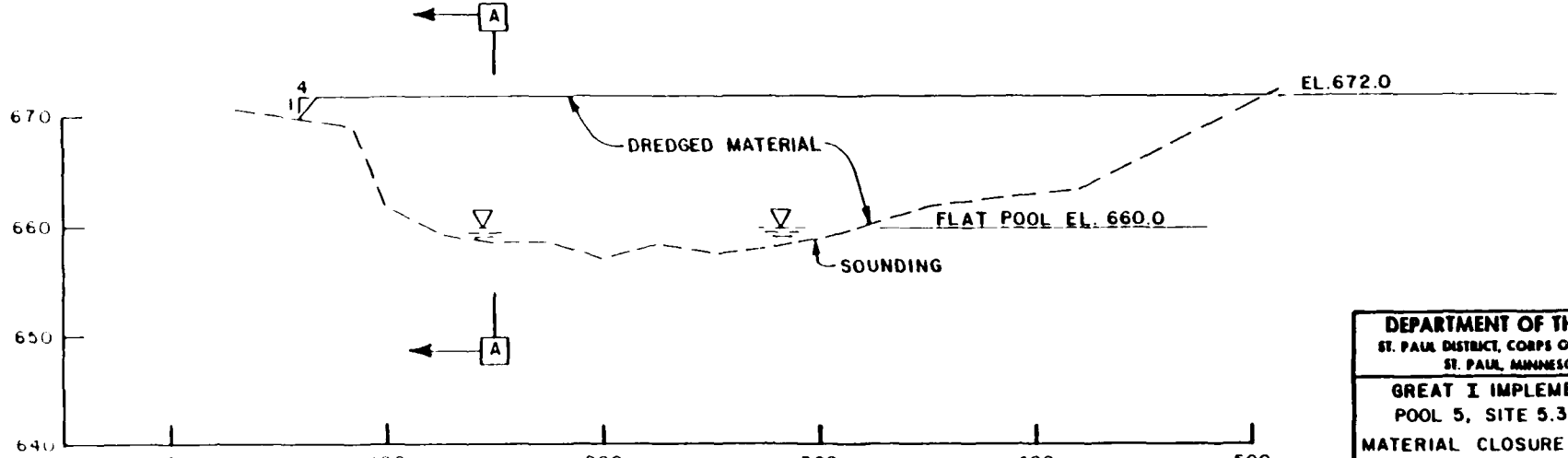
SCALE IN FEET

DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA		
GREAT I IMPLEMENTATION POOL 5, SITE 5.30 (MN 12) SITE PLAN FOR ALTERNATIVES A,B,C,D & E		
SCALE AS SHOWN	DATE	SHEET 1 OF 2

PLATE 19



TYPICAL SECTION A-A



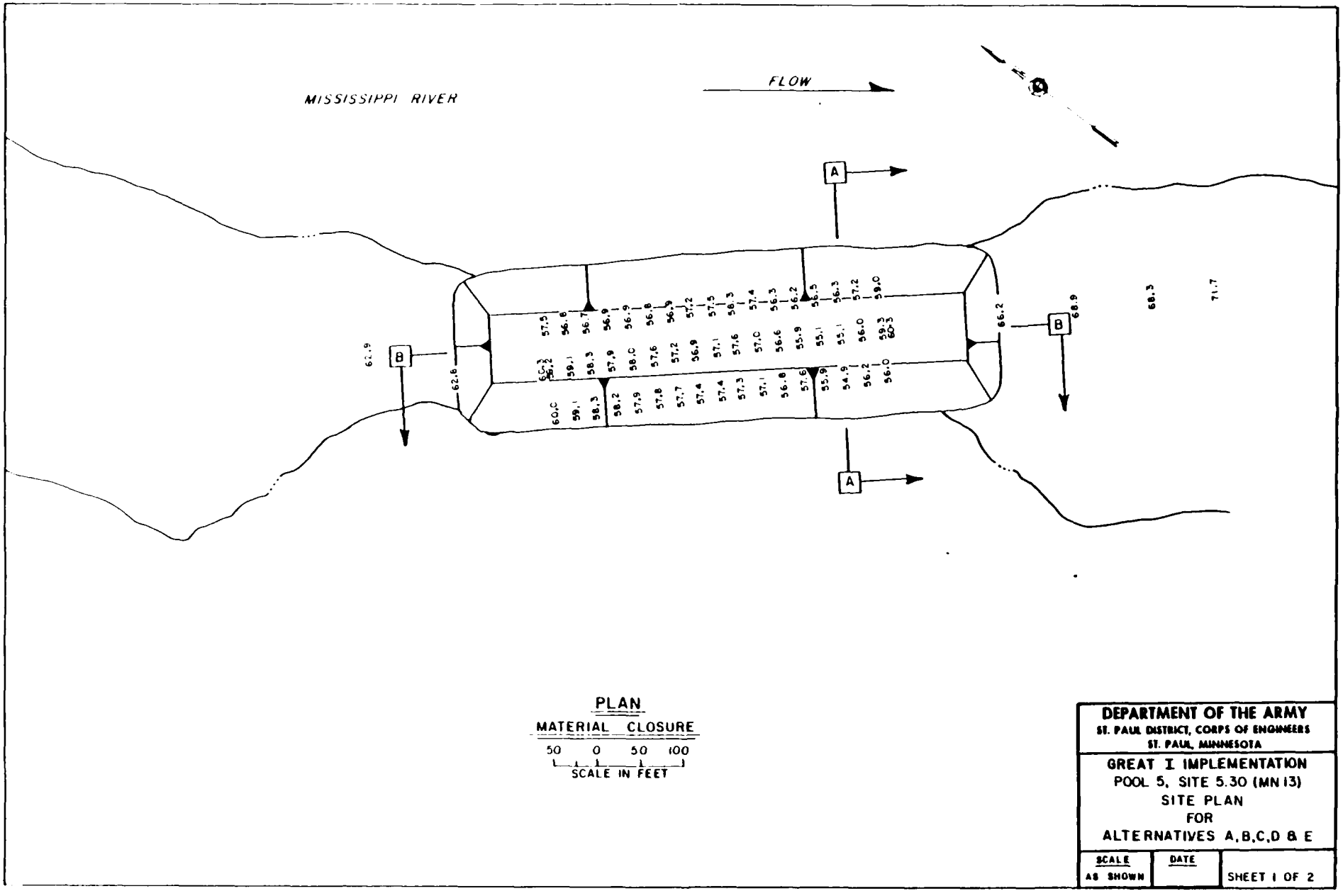
TYPICAL SECTION B-B

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

GREAT I IMPLEMENTATION
POOL 5, SITE 5.30 (MN12)
MATERIAL CLOSURE SECTIONS
FOR
ALTERNATIVES A,B,C,D & E

SCALE	DATE	SHEET 2 OF 2
AS SHOWN		

PLATE 20



PLAN

MATERIAL CLOSURE

50 0 50 100

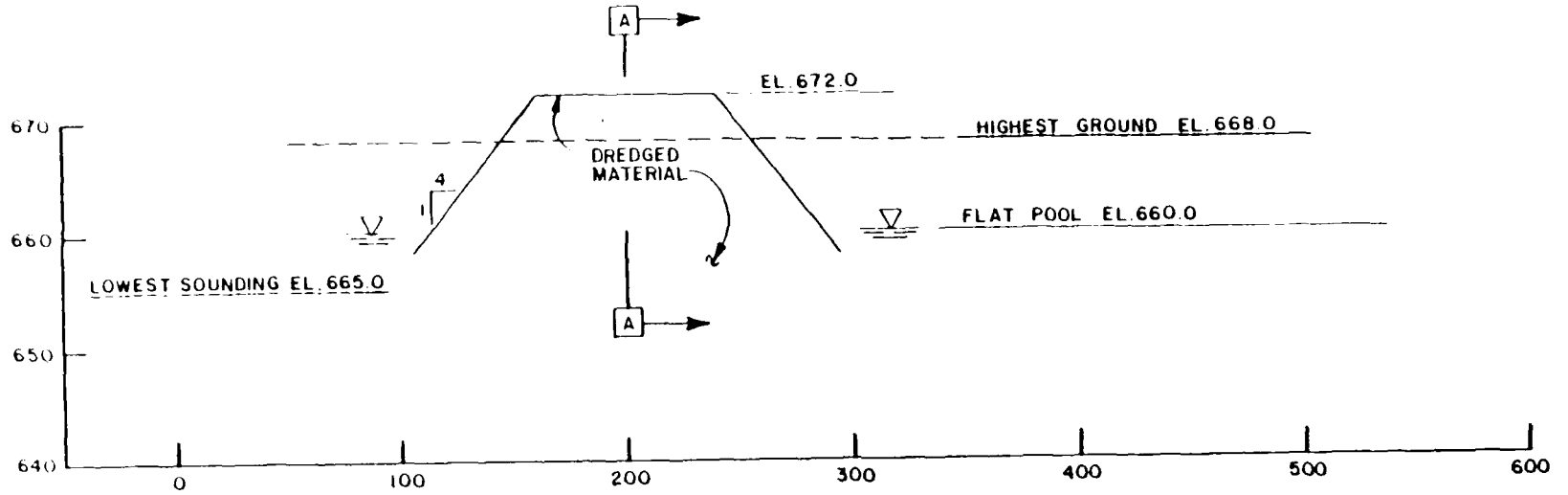
SCALE IN FEET

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

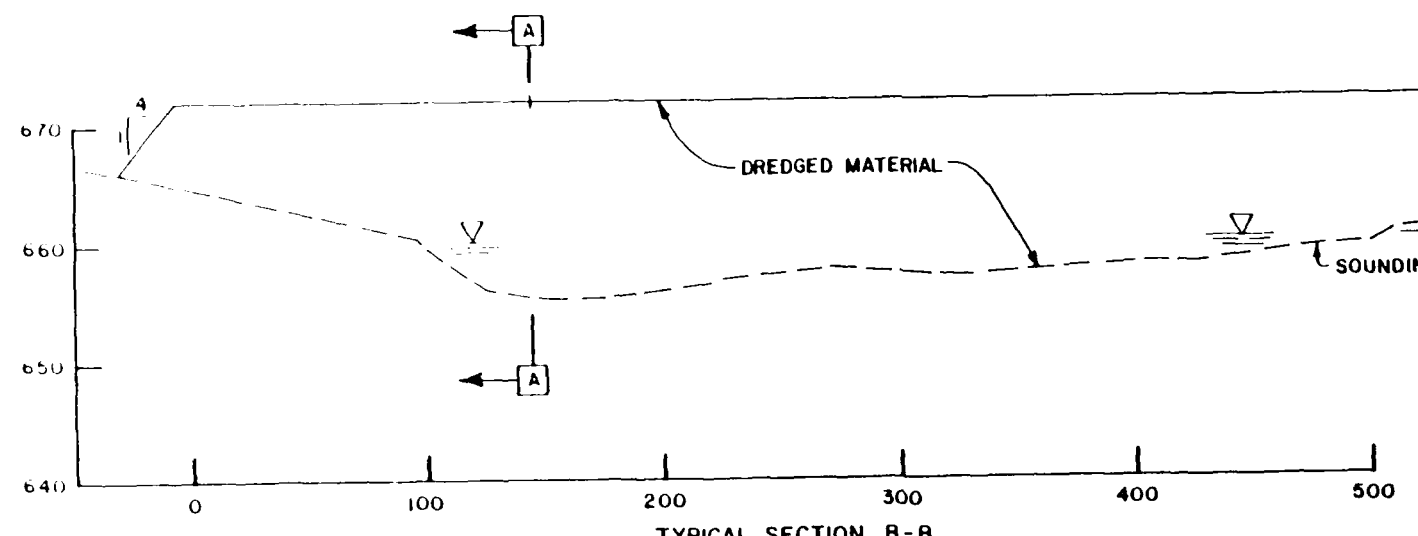
GREAT I IMPLEMENTATION
POOL 5, SITE 5.30 (MN 13)
SITE PLAN
FOR
ALTERNATIVES A,B,C,D & E

SCALE	DATE	
AS SHOWN		SHEET 1 OF 2

PLATE 21



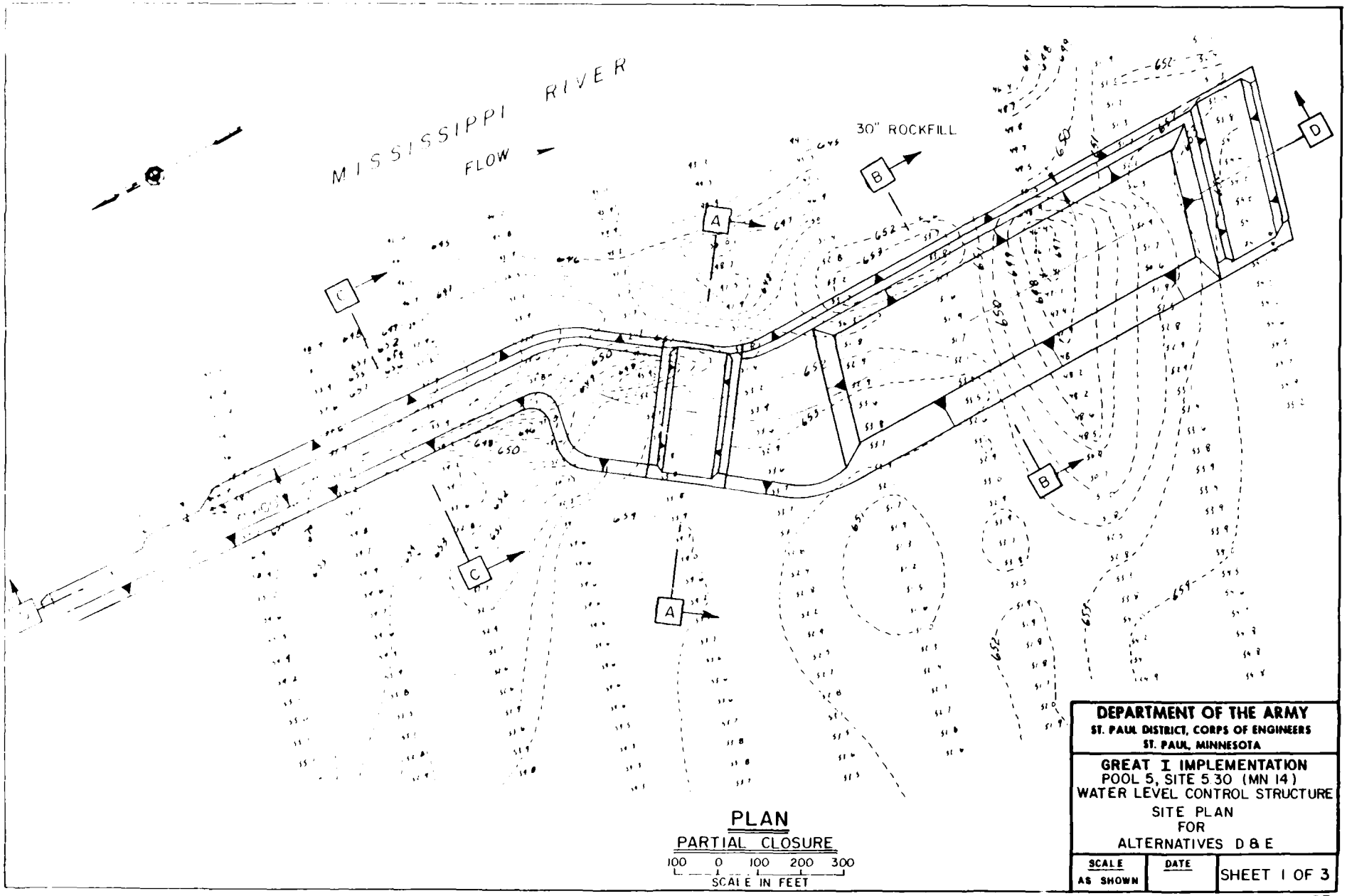
TYPICAL SECTION A-A



TYPICAL SECTION B-B

DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA		
GREAT I IMPLEMENTATION POOL 5, SITE 5.30 (MN13) MATERIAL CLOSURE SECTIONS FOR ALTERNATIVES A,B,C,D & E		
SCALE AS SHOWN	DATE	SHEET 2 OF 2

PLATE 22



PLAN

PARTIAL CLOSURE

100 0 100 200 300

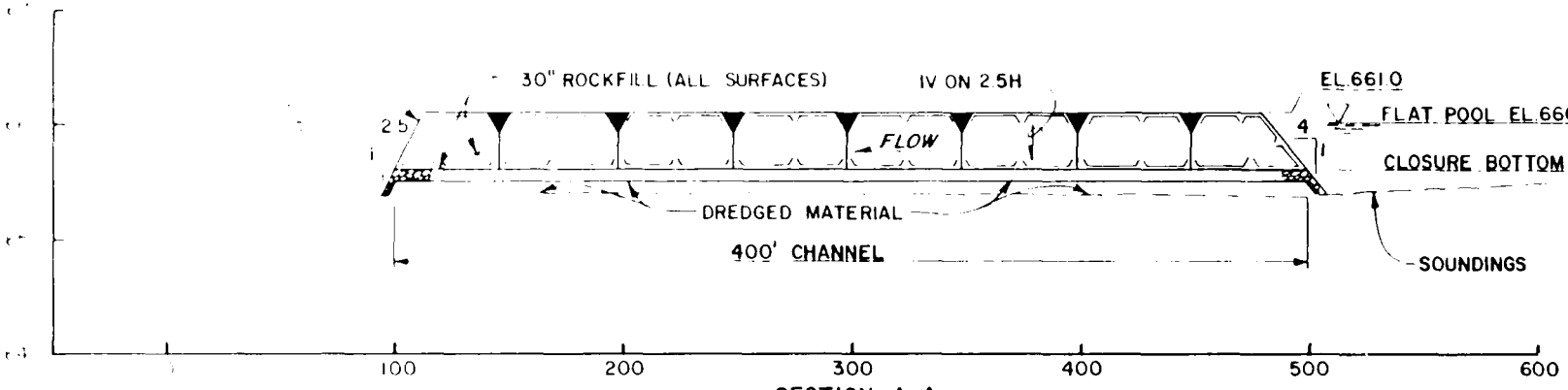
SCALE IN FEET

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

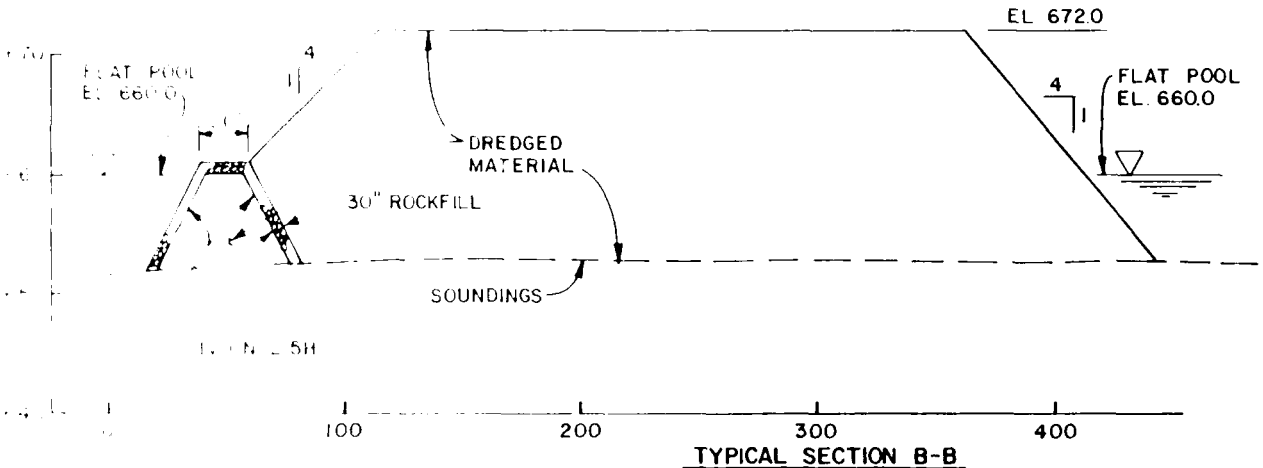
GREAT I IMPLEMENTATION
POOL 5, SITE 5.30 (MN 14)
WATER LEVEL CONTROL STRUCTURE
SITE PLAN
FOR
ALTERNATIVES D & E

SCALE	DATE	SHEET
AS SHOWN		SHEET 1 OF 3

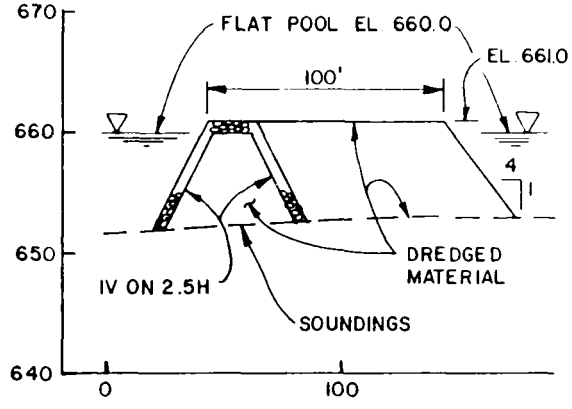
PLATE 23



SECTION A-A
TYPICAL CLOSURE OPENING



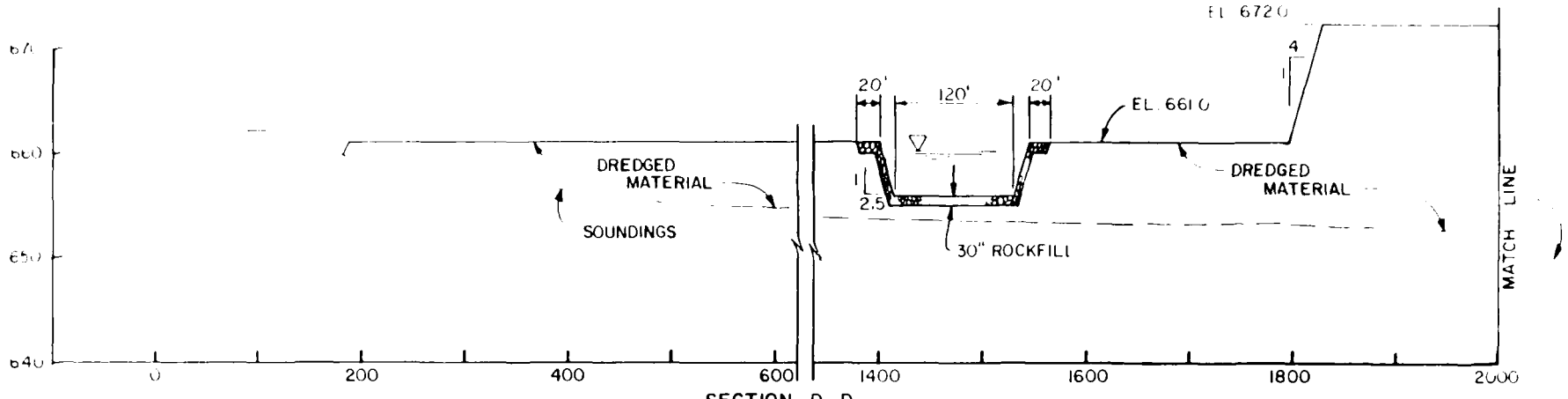
TYPICAL SECTION B-B



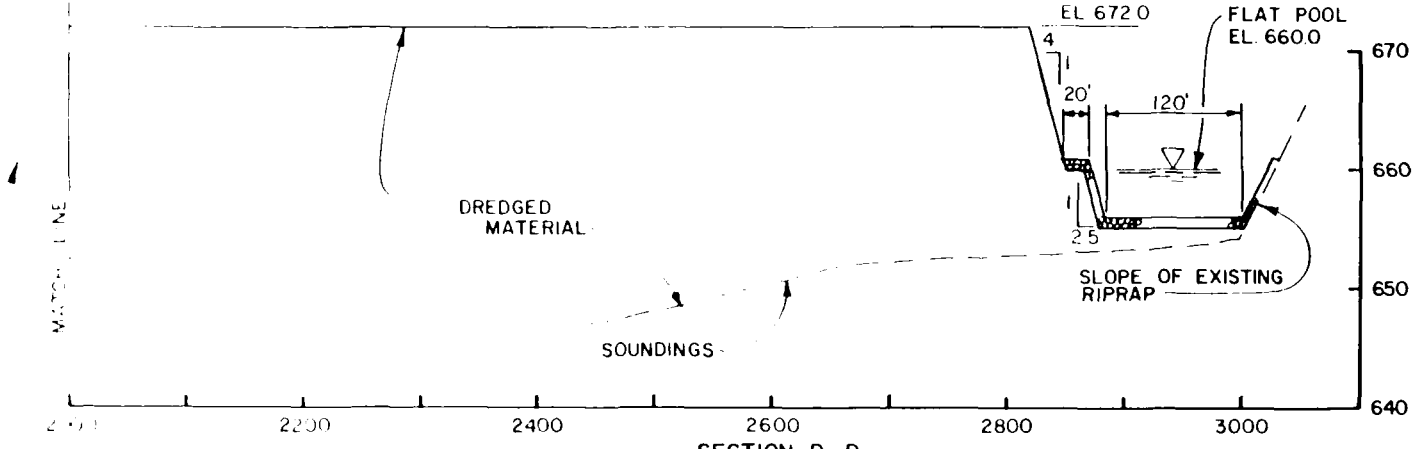
TYPICAL SECTION C-C

DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA		
GREAT I IMPLEMENTATION POOL 5, SITE 5.30 (MN (4) WATER LEVEL CONTROL STRUCTURE PARTIAL CLOSURE SECTIONS FOR ALTERNATIVES D & E		
SCALE AS SHOWN	DATE	SHEET 2 OF 3

PLATE 24



SECTION D-D



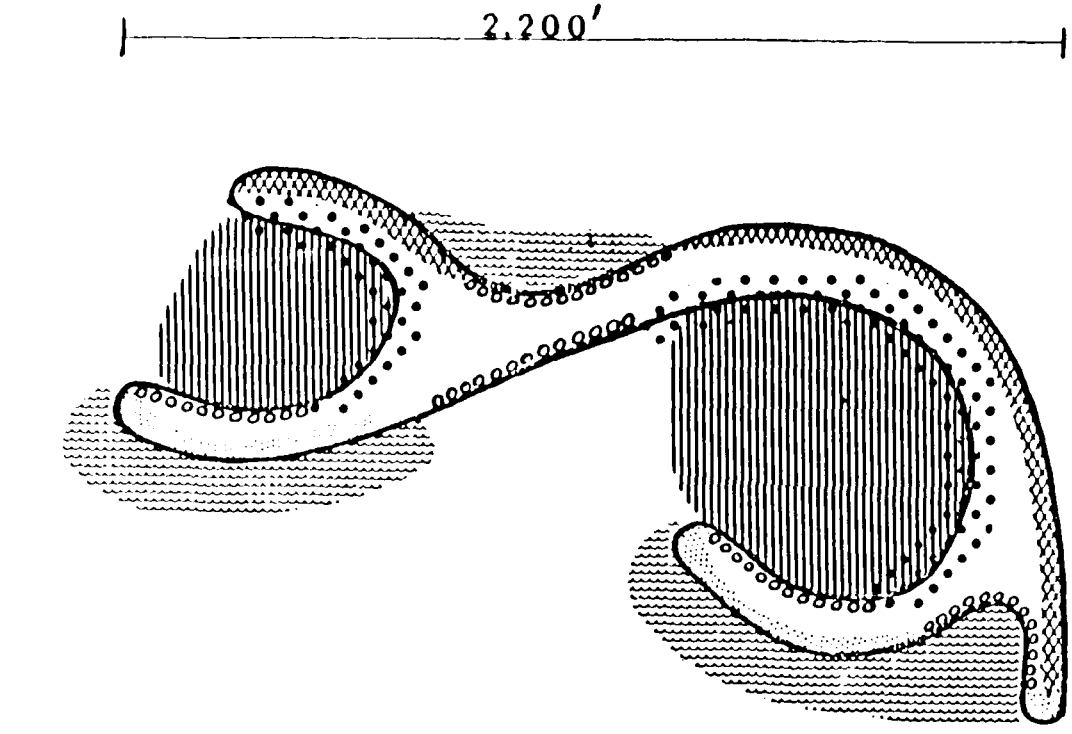
SECTION D-D

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

GREAT I IMPLEMENTATION
POOL 5, SITE 5.30 (MN 14)
WATER LEVEL CONTROL STRUCTURE
PARTIAL CLOSURE SECTION C-C
FOR
ALTERNATIVES D & E

SCALE	DATE	SHEET 3 OF 3
AS SHOWN		

PLATE 25



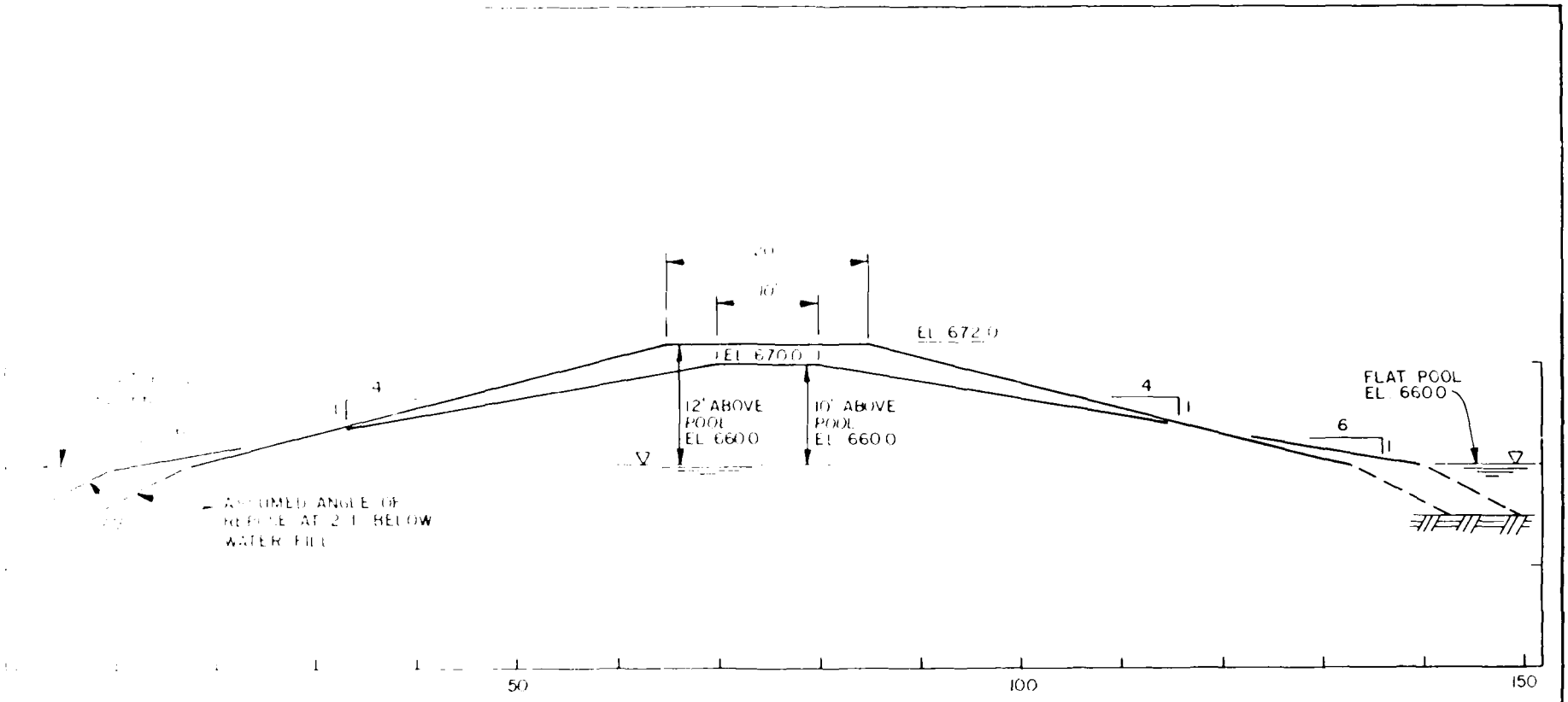
ISLAND MN A

- SAND EDGE
- SHRUB EDGE
- MARSH EDGE
- PROTECTED HABITAT
- OPEN HABITAT
- PROTECTION NEEDED

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

GREAT I IMPLEMENTATION
POOL 5, SITE 5.30 (MN A)
SITE PLAN
FOR
ALTERNATIVES A,B,C,D & E

SCALE	DATE	
AS SHOWN		SHEET 1 OF 2



NOTE ISLAND DIMENSIONS

1 WIDTH AT TOE NOT TO EXCEED 150'

2 HEIGHT TO BE AT LEAST 10' ABOVE POOL AND NOT EXCEED 12'

3 SLOPE TO BE AT LEAST 6 1 AND NOT TO EXCEED 4 1

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

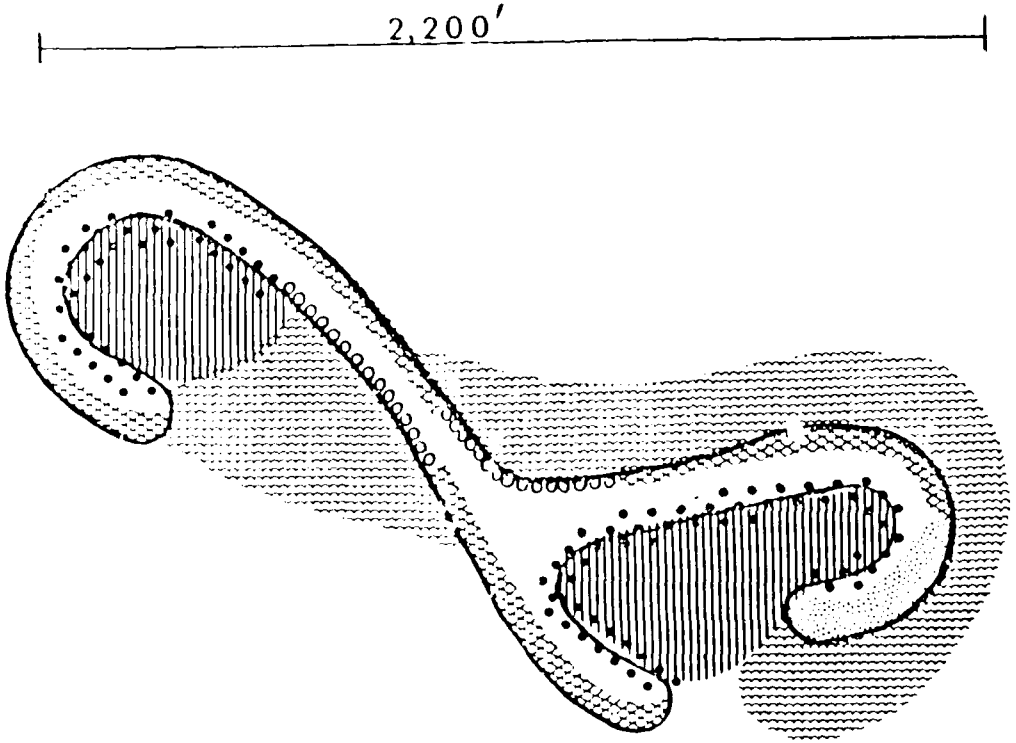
GREAT I IMPLEMENTATION

POOL 5, SITE 5.30 (MN A)

ISLAND SECTION
FOR
ALTERNATIVES A THRU E

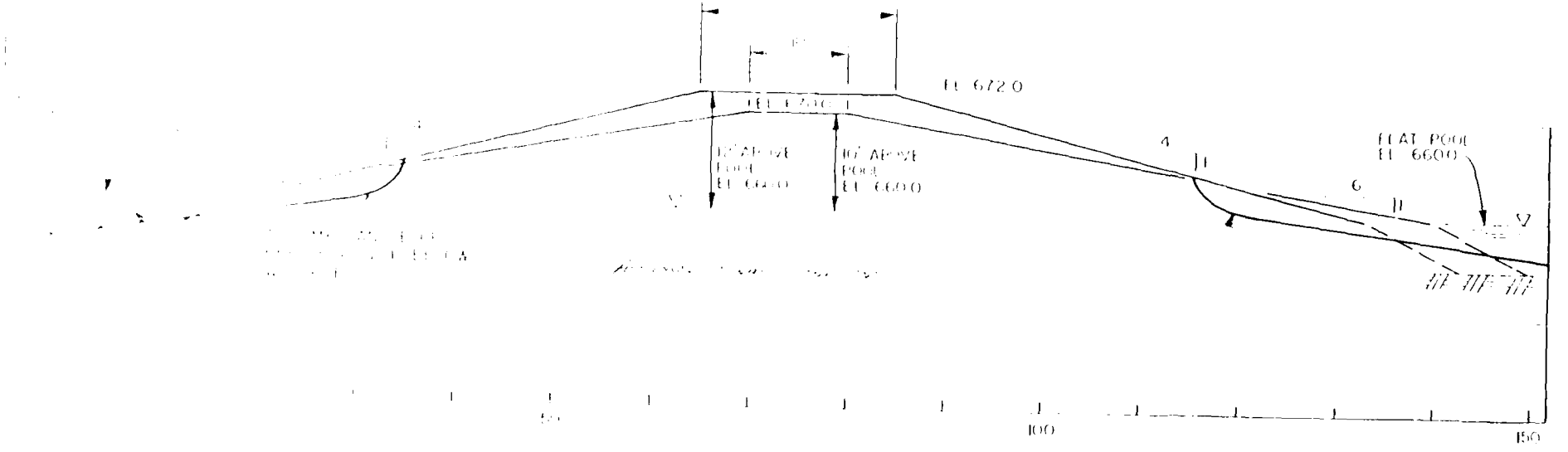
SCALE	DATE	SHEET 2 OF 2
AS SHOWN		

PLATE 27



ALTERNATIVE 4 ISLAND DESIGN

DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA		
GREAT I IMPLEMENTATION POOL 5, SITE 5.30 (MN B) SITE PLAN FOR ALTERNATIVES A, B & C		
SCALE AS SHOWN	DATE	SHEET 1 OF 2

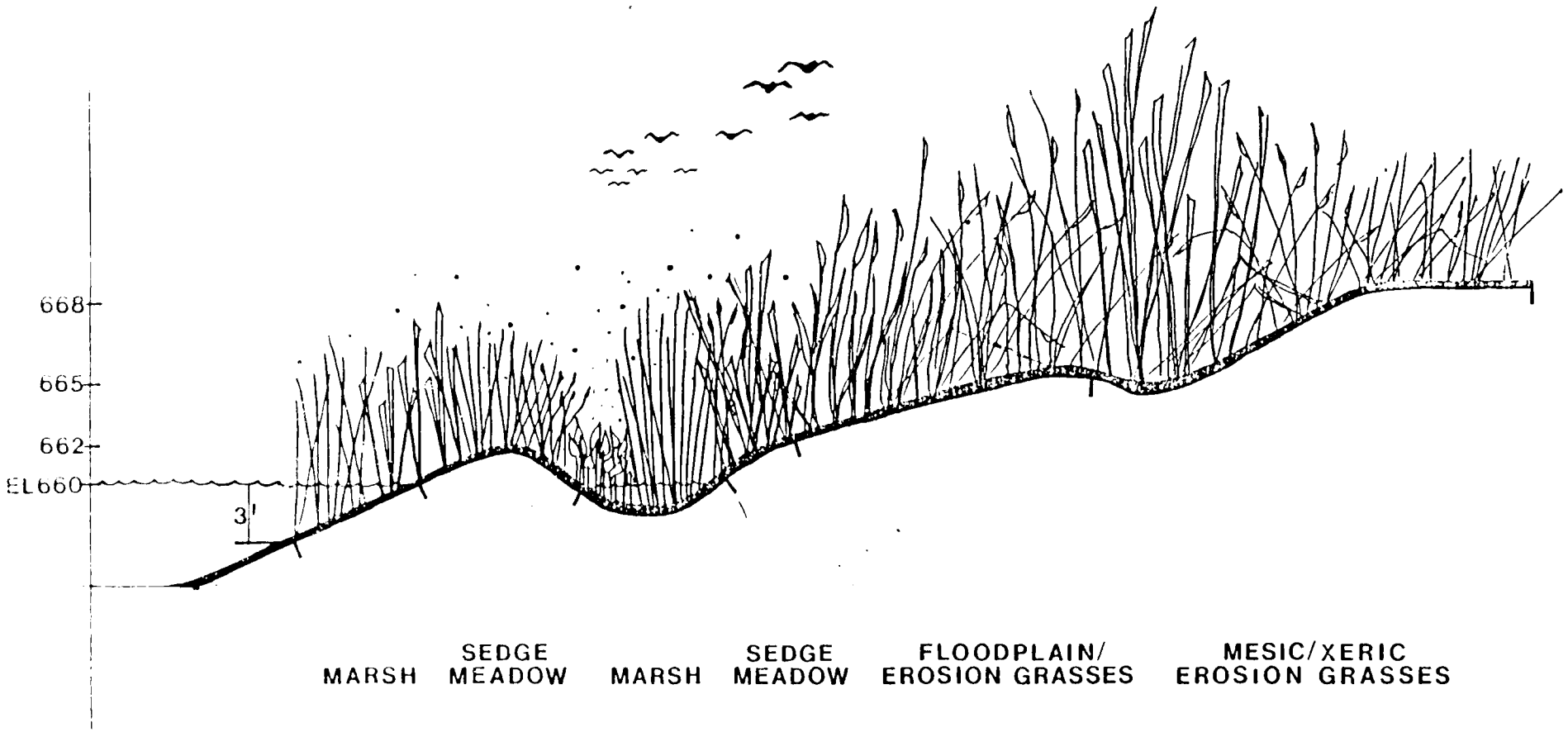


NOTE - ISLAND DIMENSIONS

1. WIDTH AT TOE NOT TO EXCEED 150'
2. HEIGHT TO BE AT LEAST 10' ABOVE POOL AND NOT EXCEED 12'
3. SLOPE TO BE AT LEAST 6:1 AND NOT TO EXCEED 4:1

DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA		
GREAT I IMPLEMENTATION POOL 5, SITE 530 (MN B) ISLAND SECTION FOR ALTERNATIVES A THRU E		
SCALE AS SHOWN	DATE	SHEET 2 OF 2

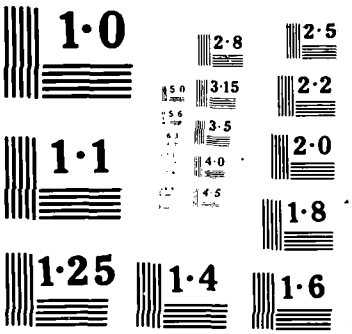
PLATE



ISLAND STABILIZATION WITH VEGETATION

AD-A170 084 DESIGN ANALYSIS REPORT FOR LOWER POOL 5 CHANNEL MAINTENANCE/WEAVER BOTTOM..(U) CORPS OF ENGINEERS ST PAUL MN ST PAUL DISTRICT MAY 86 3/3

UNCLASSIFIED F/G 13/2 NL


1·0
2·8
2·5
3·15
2·2
3·5
1·1
2·0
4·0
1·8
1·25
1·4
1·6

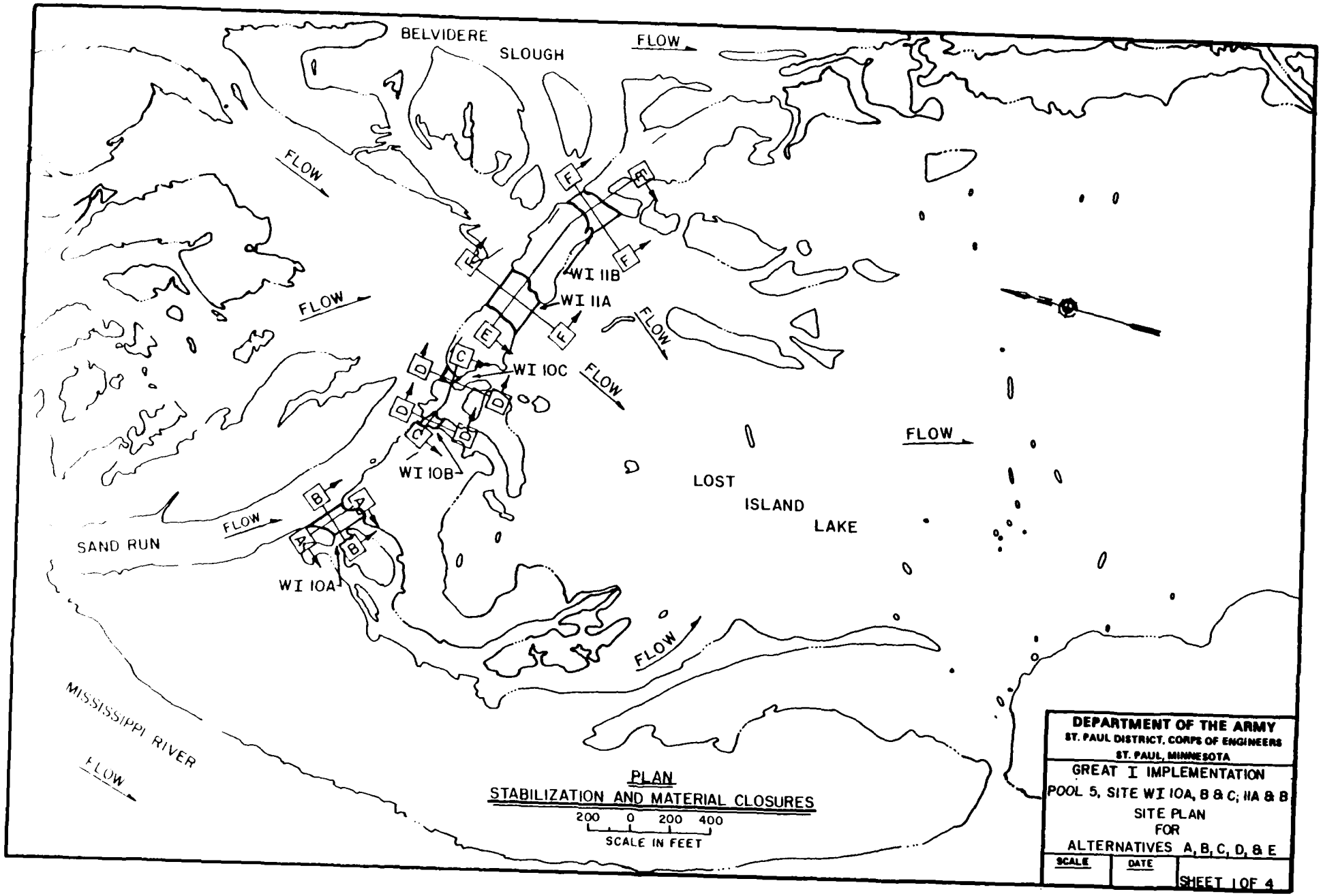
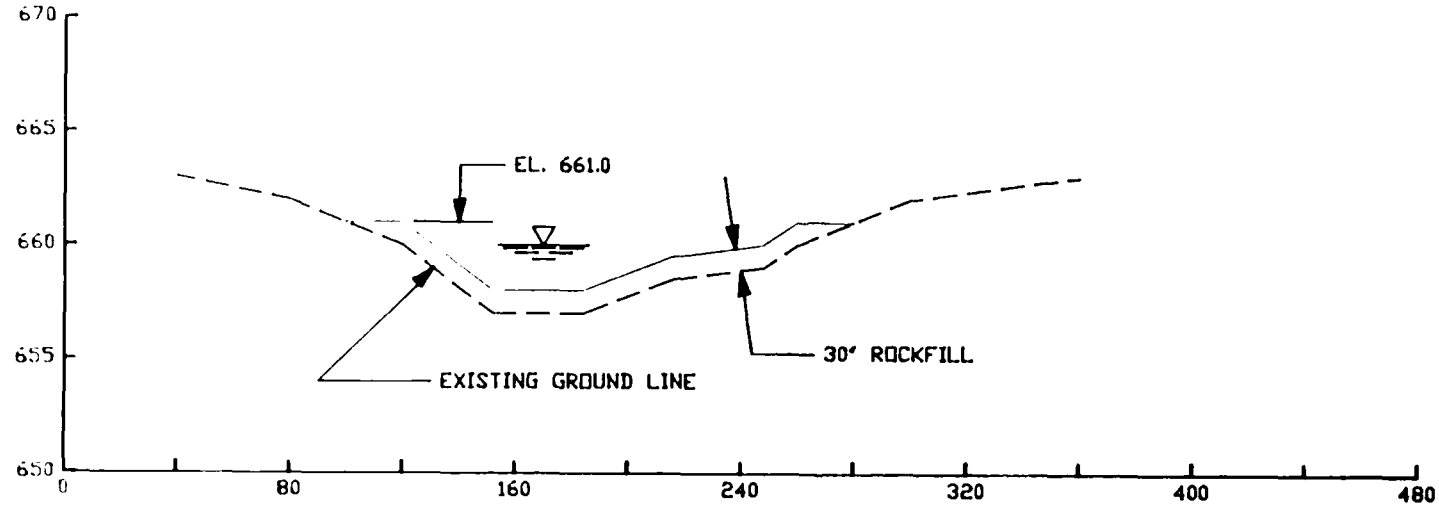
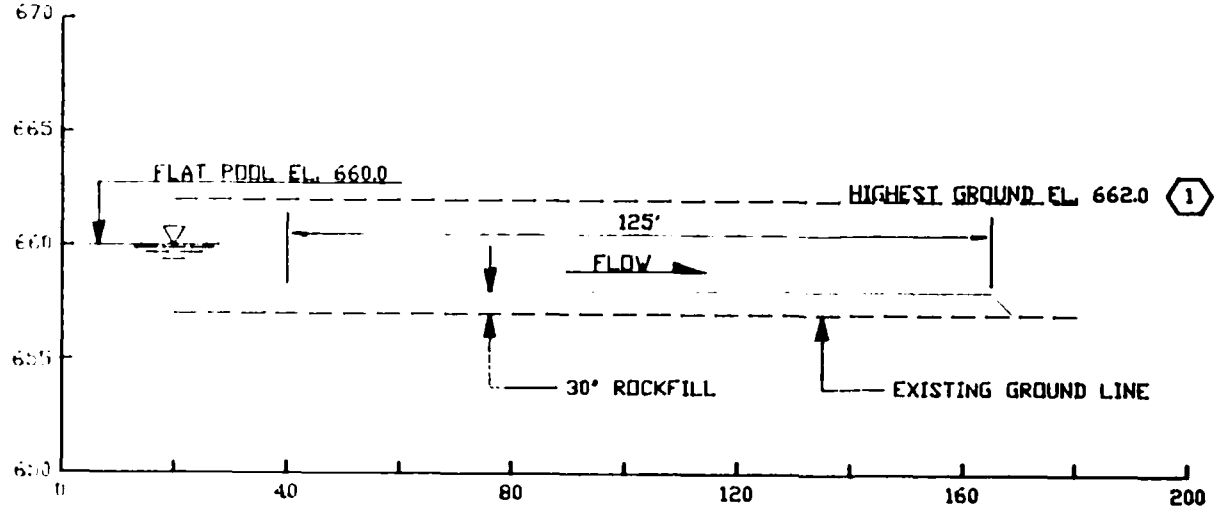

BELVIDERE
SLOUGH
FLOW
FLOW
FLOW
FLOW
FLOW
FLOW
FLOW
FLOW
WI 11B
WI 11A
WI 10C
WI 10B
WI 10A
LOST
ISLAND
LAKE
SAND RUN
MISSISSIPPI RIVER
A
B
C
D
E
F
PLAN
STABILIZATION AND MATERIAL CLOSURES
200 0 200 400
SCALE IN FEET
DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA
GREAT I IMPLEMENTATION
POOL 5, SITE WI 10A, B & C; 11A & B
SITE PLAN
FOR
ALTERNATIVES A, B, C, D, & E
SCALE
DATE
SHEET 1 OF 4

PLATE 31



SECTION A-A



TYPICAL SECTION B-B

NOTE:
1. SOUNDINGS OF WI 10A TAKEN 6/24/77.

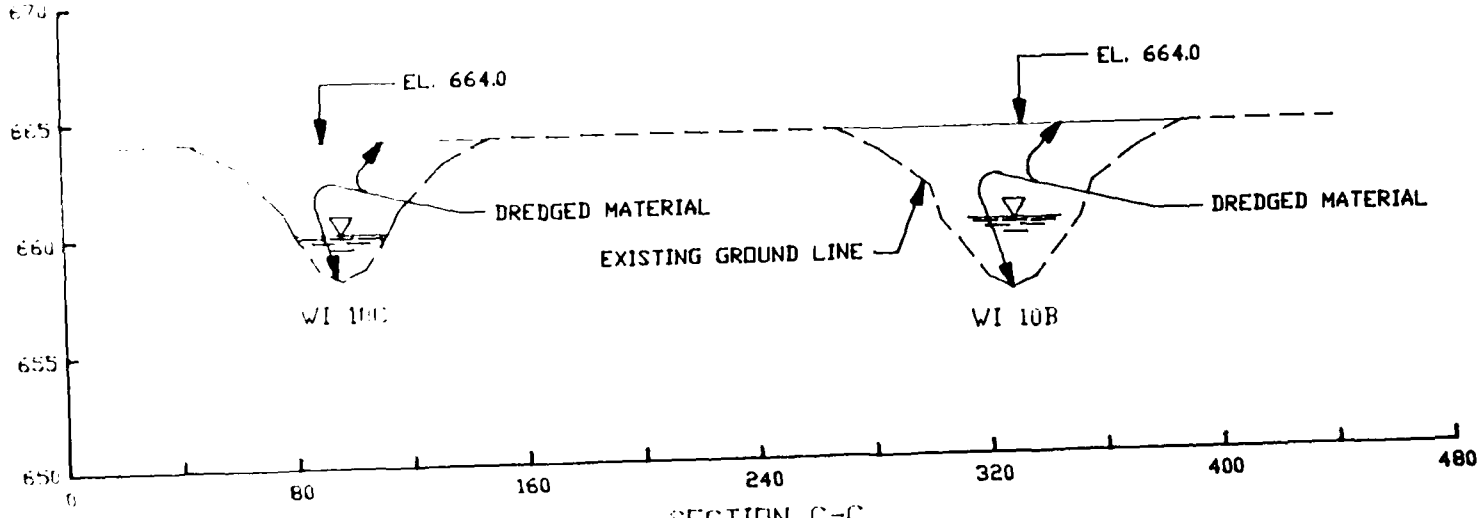
(1) ASSUMED GROUND ELEVATION

DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

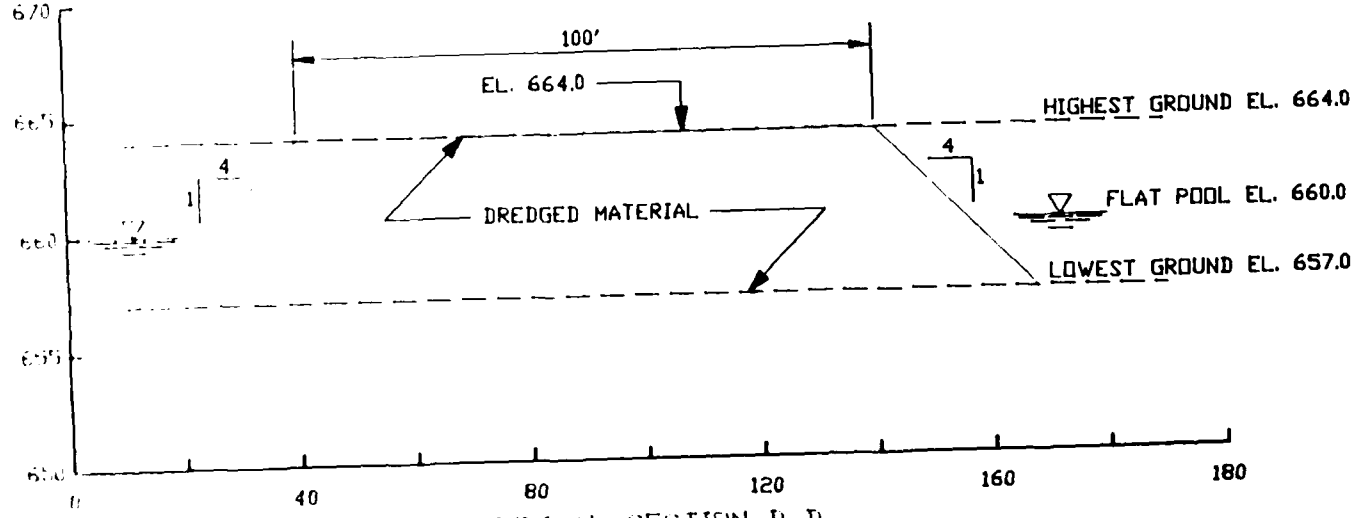
GREAT I IMPLEMENTATION
POOL 5, SITE WI 10A
STABILIZATION SECTIONS
FOR
ALTERNATIVES A,B,C,D & E

SCALE	DATE	SHEET
AS SHOWN	8/78	2 OF 4

PLATE 32



SECTION C-C



TYPICAL SECTION D-D

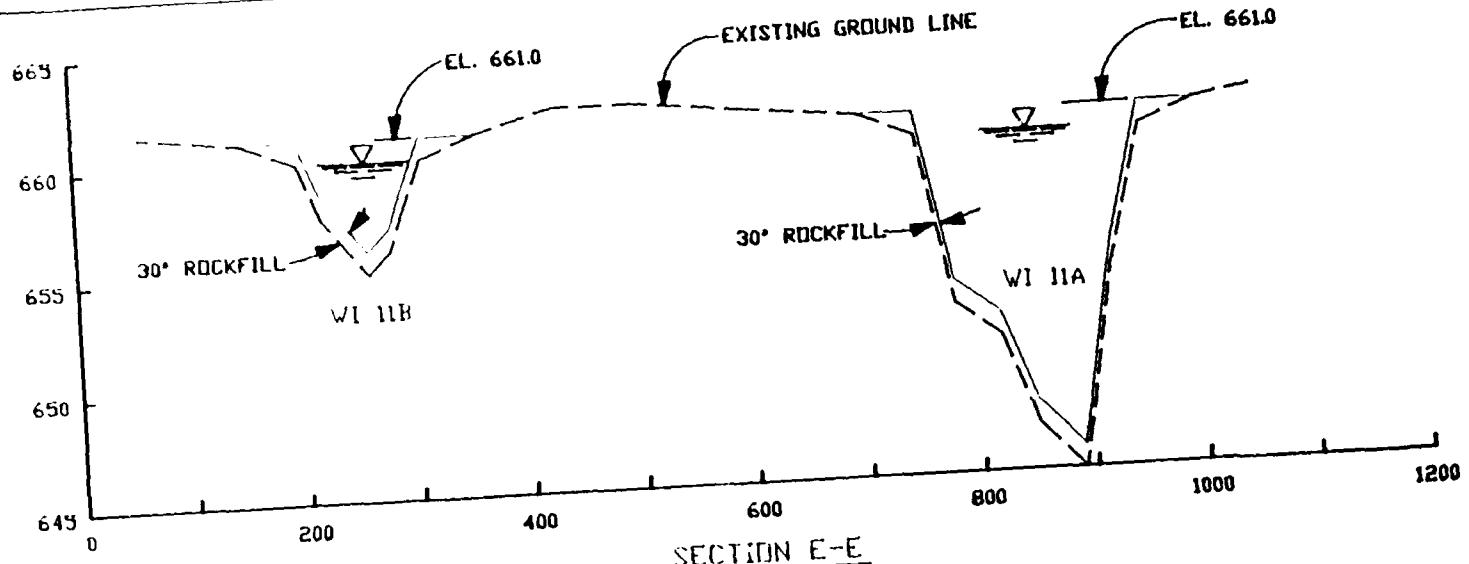
NOTE:
1. ALL GROUND LINES ASSUMED.

DEPARTMENT OF THE ARMY
ST.PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

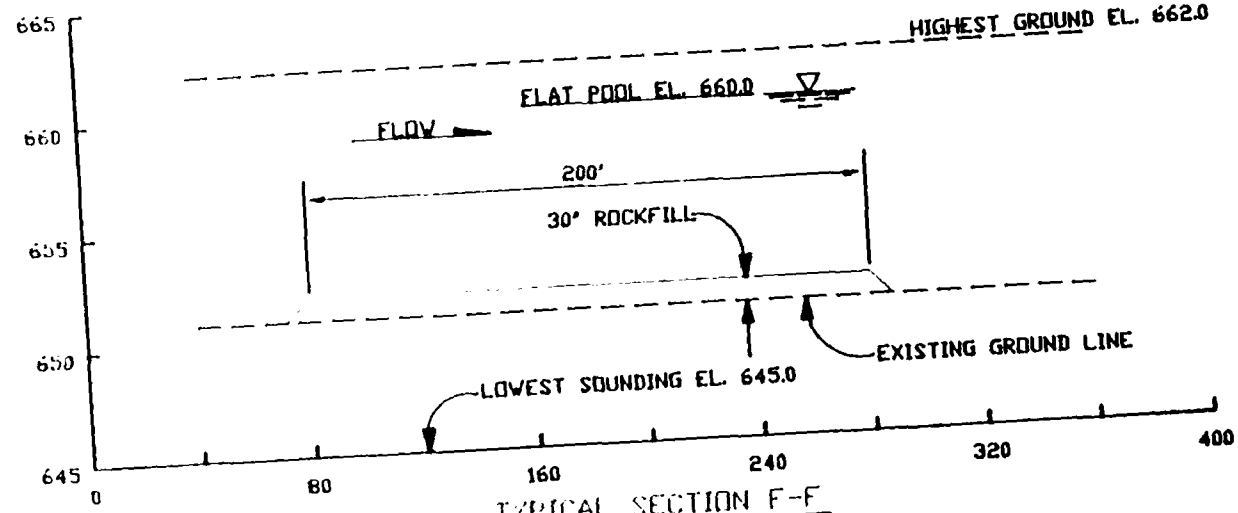
GREAT I IMPLEMENTATION
POOL 5, SITE WI 10B + 10C
MATERIAL CLOSURE SECTIONS
FOR
ALTERATIVES A,B,C,D & E

SCALE	DATE	SHEET
AS SHOWN	8/85	3 OF 4

PLATE 33



SECTION E-E



TYPICAL SECTION F-F

NOTES:
1. SOUNDINGS OF WI 11A TAKEN 6/24/77.
2. ALL OTHER GROUND LINES ASSUMED.

DEPARTMENT OF THE ARMY
ST.PAUL DISTRICT, CORPS OF ENGINEERS
ST. PAUL, MINNESOTA

GREAT I IMPLEMENTATION
POOL 5, SITE WI 11A + 11B
STABILIZATION SECTIONS
FOR
ALTERNATIVES A,B,C,D & E

SCALE	DATE	SHEET 4 OF 4
AS SHOWN	6/77	

PLATE 34

APPENDIX B

LETTERS OF COMMENT

AND CORPS OF ENGINEERS RESPONSES

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
230 SOUTH DEARBORN ST
CHICAGO, ILLINOIS 60604

5MS

APR 10 1986

Colonel Joseph Briggs
District Engineer
Department of the Army
St. Paul District, Corps of Engineers
1135 U.S. Post Office and Custom House
St. Paul, Minnesota 55101-1479

ATTN: Environmental Resources Branch - Planning Division

Dear Colonel Briggs

In accordance with our responsibilities under the National Environmental Policy Act and Section 309 of the Clean Air Act, we have reviewed the Design Analysis Report and Draft Supplement Environmental Impact Statement (EIS) for the Lower Pool 5 Channel Maintenance/Weaver Bottoms Rehabilitation Plan. The proposed project is the development of a maintenance dredging plan for Pool 5 of the Upper Mississippi River. A major component of the plan is the rehabilitation of a degraded wetland area (Weaver Bottoms) to restore its habitat value through the placement of dredged material from these maintenance activities, which would occur during the period 1985-2025. The dredged material would be used to make side channel modifications and to create barrier islands for wind fetch reduction in Weaver Bottoms.

Based on our review of this document, we have no objection to the proposed project. We do not believe that this action would adversely affect human health or significantly degrade the environment. We have given this project a "LO" rating, which indicates our lack of objection to the proposed activity. This rating will be published in the Federal Register.

We commend the U.S. Army Corps of Engineers and the U.S. Fish and Wildlife Service, who had lead agency operating agency, for the extensive time and effort they have put into this project, and we appreciate the opportunities extended for our participation.

If you have any questions concerning our comments, please contact Ms. Kathleen Shanahan of my staff, at 312/886-6923 (Commercial), or 886-6923 (FTS).

Sincerely yours,

William D. Adams

William D. Adams, Chief
Environmental Review Branch
Planning and Management Division

United States Department of the Interior

FISH AND WILDLIFE SERVICE
[illegible]
[illegible]

IN REPLY REFER TO:

AE/ES

APR 22 1986

Colonel Gerald E. Briggs
District Engineer, St. Paul District
U.S. Army Corps of Engineers
180 E. U.S. Post Office and Custom House
St. Paul, Minnesota 55101-1479

Dear Colonel Briggs:

This replies to your February 24, 1986 letter requesting our comments on the Design Analysis Report and Draft Supplemental Environmental Impact Statement and Supporting Documents for the Lower Pool 5 Channel Maintenance Weaver Bottoms Rehabilitation Project on the Upper Mississippi River (UMR).

We have no substantive comments to offer on these reports. We feel both documents are well written and accurately describe project features. As a formal cooperating agency in this project, the Service supports the rehabilitation of Weaver Bottoms through beneficial use of dredged material from operation and maintenance of the nine-foot navigation project. We believe this project is an outstanding example of federal and state interagency cooperation and one which will hopefully represent the first of several large-scale river rehabilitation projects on this nationally significant resource. We are hopeful the knowledge and experience gained through implementation of the Weaver Bottoms project will be useful in developing other backwater rehabilitation projects on the UMR and other large river systems.

We appreciate the opportunity to offer our comments on these documents. We look forward to working with District personnel throughout the final implementation of this important project.

Sincerely yours,

Harry K. Nelson

Harry K. Nelson
[illegible]

cc: MN Department of Natural Resources, St. Paul
WI Department of Natural Resources, Madison/Eau Claire
US EPA, Chicago

United States Department of the Interior

OFFICE OF ENVIRONMENTAL PROJECT REVIEW
[illegible] WEST JACKSON BOULEVARD
CHICAGO, ILLINOIS 60604

April 17, 1986

[illegible]

[illegible] Briggs
District Engineer
St. Paul District, Corps of Engineers
[illegible] Post Office and Custom House
St. Paul, Minnesota 55101

Dear Colonel Briggs:

This is in regard to your letter of February 24, 1986 requesting the comments of the Interior's review and comments on the Design Analysis Report and Draft Environmental Statement Supplement, Lower Pool 5 Channel Maintenance Weaver Bottoms Rehabilitation Plan, Minnesota, Wisconsin, and Iowa.

It is to inform you that the Department will have comments on the subject report, but will be unable to reply by the date you requested. Our comments should be available by May 5, 1986.

Sincerely,

Sheila Minor Huff
Regional Environmental Officer

United States Department of the Interior

OFFICE OF ENVIRONMENTAL PROJECT REVIEW
[illegible] WEST JACKSON BOULEVARD
CHICAGO, ILLINOIS 60604

April 3, 1986

IN REPLY REFER TO:

Colonel Joseph Briggs
District Engineer, St. Paul District
U.S. Army Corps of Engineers
1135 U.S. Post Office and Custom House
St. Paul, Minnesota 55101-1479

Dear Colonel Briggs:

This replies to your February 24, 1986 letter requesting comments on the Design Analysis Report and Draft Supplemental Environmental Impact Statement and Supporting Documents for the Lower Pool 5 Channel Maintenance Weaver Bottoms Rehabilitation Project on the Upper Mississippi River (UMR).

The Department of the Interior has reviewed the subject documents and hereby provides consolidated review comments for your consideration during future project planning phases.

Bureau of Mines personnel have reviewed the subject document for its treatment of mineral resources and their related activities. The project, as described, involves the development of a pool dredging and channel maintenance plan for an existing Corps of Engineers project area, along with the restoration and maintenance of a more diverse wildlife habitat. Although the document does not discuss minerals, significant conflicts between mineral resources and the proposed project are not anticipated. The Bureau of Mines has no objection to the proposed project or to the document as written.

The Fish and Wildlife Service (Service) has no substantive comments to offer on these reports. Both documents are well written and accurately describe project features. As a formal cooperating agency in this project, the Service supports the rehabilitation of Weaver Bottoms through beneficial use of dredged material obtained from operation and maintenance of the nine-foot navigation project. This project is an outstanding example of federal and state interagency cooperation and one which hopefully will represent the first of several large-scale river rehabilitation projects on this nationally significant resource. Hopefully, the knowledge and experience gained through implementation of the Weaver Bottoms project will be useful in developing other backwater rehabilitation projects on the UMR and other large river systems.

We appreciate the opportunity to offer our comments on these documents. We look forward to working with District personnel throughout the final design and implementation of this important project.

Sincerely yours,

Sheila Minor Huff
Regional Environmental Officer

STATE OF

DEPARTMENT OF NATURAL RESOURCES

[illegible]

[illegible]

April [illegible], 1987

[illegible] Joseph Briggs, District Engineer
St. Paul District
U.S. Army Corps of Engineers
[illegible] U.S. Post Office and Custom House
St. Paul, Minnesota [illegible]

RE: [illegible] REPORT AND ENVIRONMENTAL IMPACT STATEMENT SUPPLEMENT FOR LOWER POOL 5 CHANNEL MAINTENANCE WEAVER BOTTOMS REHABILITATION PLAN

Dear Colonel Briggs:

The Department of Natural Resources (DNR) has reviewed the above-referenced report and offers the following comments for your consideration.

As you know, DNR staff has been involved with the Weaver Bottoms project since its inception in the early 1970's as part of the GREAT Fish and Wildlife Work Group, and more recently, in an advisory capacity to the Channel Maintenance Group. We have worked closely with the Corps and the U.S. Fish and Wildlife Service in developing the various alternatives that are discussed in the EIS Supplement.

We believe that the selected plan, Alternative D (modified) will alleviate the problems in the Weaver Bottoms area which have resulted in the degradation of this important backwater marsh over the last 20 to 25 years. We are confident that most of the expected benefits will occur, and that we have a good resource analysis program with which to measure the changes. If any adverse impacts are identified after completion, the Corps has made a commitment to correct them. In addition, we recognize the Weaver Bottoms proposal as a pilot project, and what is learned there can be applied to other rehabilitation projects as well.

We note that the Report and EIS Supplement generally indicate that the stage increase resulting from the project for the 100-year flood will be less than 0.1 foot. We generally accept a 0.1 foot increase as being negligible. We recommend that the Corps identify those areas where the stage increase will be greater than 0.1 foot (these will apparently be in the main channel and the Belvidere Slough area). For these areas a damage assessment should be conducted to insure that no increased damages occur during the 100-year flood. A map showing this information should be submitted to all local units

Corps of Engineers Responses
to Minnesota Department of Natural Resources Comments

1. Details concerning the predicted impacts on the 1-percent chance flood are in supporting document C. The model predicted less than a 0.1-foot increase in flood levels along either bank of the river. The model did predict a maximum water-level increase of 0.15 foot in certain areas of the main channel with the 1-percent chance flood. We do not feel that this predicted small increase warrants a flood damage assessment. The EIS and main report indicate that the project would increase water levels by more than 0.1 foot in the main channel and Belvidere Slough. However, this increase would only occur for lower discharges than the 1-percent chance flood. The following response provides additional details on this issue.

[illegible] responsibility for enforcing the floodplain regulations in the [illegible]

[illegible] helpful if more information could be provided on the impacts of [illegible] more frequent floods, and the potential for increased damages [illegible]. Although state floodplain rules do not address this issue, [illegible] information which could be provided in the Final EIS [illegible]

[illegible], I want to reiterate that the Department of Natural Resources [illegible] pleased to see it nearing the point of [illegible]. If you or your staff have any questions regarding these [illegible] please feel free to call my staff at 296-4796.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Corps of Engineers Responses
to Minnesota Department of Natural Resources Comments (cont.)

2. Most of the Belvidere Slough area and the main channel in pool 5 would not experience any appreciable project-related changes in water levels for any river discharge. However, the upper ends of Belvidere Slough and of the main channel bordering Weaver Bottoms could experience increases in water levels that would range from slight to more substantial, depending on river discharges. For normal discharges (15,000 to 40,000 cfs), the effects on water levels in these areas would be slight (less than 0.1 foot). The effects on water levels would increase with river discharge until the discharge reaches the point (above 100,000 cfs) that overtops much of the existing land areas and the structures at MN 4 and MN 5. At discharges above 100,000 cfs, the effects on water levels would decrease. The computer model predicted that the maximum increase in water levels for the 5-year and 10-year floods would be approximately 0.3 foot and 0.1 foot, respectively. The effects on the less frequently occurring floods, including the 1-percent chance flood, would be less than a 0.1-foot increase. The computer model has also predicted that the effects on water levels in Belvidere Slough and the main channel would diminish after a few years because the main channel would become more efficient. The Resource Analysis Program will help document the actual effects on water levels and determine the accuracy of the computer model predictions.

Minnesota Pollution Control Agency

April 21, 1986

Colonel Joseph Briggs
District Engineer
St. Paul District, Corps of Engineers
ATTN: NCSCO-M
1135 U.S. Post Office & Custom House
St. Paul, Minnesota 55101-1479

Dear Colonel Briggs:

Subject: Lower Pool 5 Channel Maintenance/Weaver Bottoms Rehabilitation Plan

The Minnesota Pollution Control Agency staff has reviewed the Design Analysis Report, the Environmental Impact Statement, and other supporting documents which provide a detailed description of the above-referenced subject. Based on this review, the MPCA offers the following comments:

1. The MPCA is primarily concerned with the potential water quality impacts associated with the project. We do not believe air quality or noise issues are significant.

2. The MPCA agrees with the statement on page 26 of the main report which reads as follows: "Construction of the islands, especially capping the islands with the fine backwater material, would have the greatest potential for impacts on water quality." For this reason, the MPCA would like to emphasize the importance of implementing measures to minimize runoff during the placement of the backwater material on the islands. Based on discussions with Army Corps of Engineers, U.S. Fish and Wildlife Service, and Wisconsin and Minnesota Department of Natural Resources staff which were held during an April 3, 1986 meeting in Lake City, Minnesota, such measures include the use of silt screens at critical areas of erosion and the use of mulch in conjunction with a revegetation program. It is our understanding that a revegetation plan will be developed in the near future by an interagency committee. We request a copy of the draft plan be submitted to the MPCA when it becomes available for review. In addition, it appears that the method of placement which would create the least water quality impacts involves the use of a containment area (or several containment areas) on the islands. The MPCA recommends that this method and the above measures be utilized.

Corps of Engineers Responses
to Minnesota Pollution Control Agency Comments

1. We concur.

2. Mechanical dredging and direct placement of the material on the islands would also minimize water quality impacts. Because most of the work for the project would be done under contract, we want to allow proper flexibility in the contract specifications. Mechanical dredging with direct placement, hydraulic dredging with containment areas, and other methods with reduced or equal potential for minimized impacts on water quality will be considered acceptable. The measures needed to minimize runoff will depend on the final method selected. Silt screens and mulching will be considered if determined necessary for the method selected. The vegetation plan and the operational plan for the placement of the backwater material, including measures to minimize runoff, will be coordinated with the Minnesota Pollution Control Agency and other State and Federal resource agencies. The final vegetation plan will be developed by the interagency committee formed to address this issue.

3. Although the placement of backwater material on the islands is our main concern, we also believe measures to minimize runoff from the backsides of the closures are important and need to be implemented.

4. During the April 3, 1986 meeting, MPCA staff were given a copy of a monitoring plan for the project. The primary purpose of this plan, which was developed by the U.S. Fish & Wildlife Service, is to document the impacts caused by long-term activities (monitoring of the project after construction). The MPCA believes a short-term monitoring program should also be implemented to determine the impacts during construction. Short-term monitoring was not addressed in the EIS, however, it was briefly discussed during the April 3, 1986 meeting, and appears to be agreeable to all agencies. We would appreciate the opportunity to be involved in developing and reviewing this monitoring plan.

   Based on a preliminary review of the long-term monitoring plan, we request that additional sediment monitoring for toxic organics and metals be considered. Water quality monitoring of toxics, ammonia, and Carbonaceous Biological Oxygen Demand, should be considered for both the short-term and long-term studies. We intend to discuss these issues more fully after our review of the long-term monitoring plan has been completed.

Thank you for the opportunity to review the project description and environmental review documents for the Weaver Bottoms project. It is our intention to also review and provide comments on the state environmental assessment worksheet which has been prepared by the Minnesota Department of Natural Reosurces. Final approval of this proposal under authority of MPCA permit No. MN0050580 will be provided as soon as possible after the final review of the monitoring plans, the completion of the mandatory environmental review process, and the resolution of any outstanding MPCA related issues discussed in this letter. If you have any questions, please contact Kenneth Haberman at (612) 296-7275 or Louis Flynn at (612) 296-7355.

Sincerely,

Thomas J. Kalitowski
Executive Director

TJK:jw

Corps of Engineers Responses
to Minnesota Pollution Control Agency Comments (cont.)

3. All practical measures to limit the affected area to the geographical limits of the closure will be done. The flow through the side channels will be cut off as quickly as possible, with the initial placement of dredged material on the main channel side. This measure should minimize erosion and runoff during the placement of the remaining material. The backwater sides of the closures would be vegetatively stabilized, including practical measures to accelerate the revegetation and minimize erosion during revegetation.

4. We will conduct a short-term monitoring program to assess the impacts of the construction activities on water quality. The scope of work for this monitoring effort will be coordinated with the Minnesota Pollution Control Agency.

The final resource monitoring plan developed by the U.S. Fish and Wildlife Service was extensively coordinated with the Channel Maintenance Forum and the Fish and Wildlife Work Group of the CMF. However, we would still welcome comments on the plan from the Minnesota Pollution Control Agency. In addition, because the project has a significant potential to improve water quality within the Weaver Bottoms, we would also welcome Minnesota Pollution Control Agency participation in implementing the monitoring effort.

State of Wisconsin DEPARTMENT OF NATURAL RESOURCES

Carroll D. Besadny
Secretary

[illegible]

[illegible]

Dear [illegible]:

Re: [illegible] Maintenance Weaver B[illegible]ttoms [illegible] - Design Analysis Report and Draft Supplement Environmental Impact Statement

[illegible] the Department, I would like to take this opportunity to [illegible] the efforts [illegible] and your staff in pursuit of this [illegible] (GREAT) I began studying the Weaver B[illegible]ttoms [illegible] nearly ten years ago, your agency has used [illegible] determination to assess backwater [illegible] dredged material disposal options, predict [illegible] using state-of-the-art techniques, prepare [illegible] these efforts with all interested [illegible]. As a result, we are on the verge of seeing these plans become [illegible]. I view the planning and anxiously [illegible] implementation of the Weaver Project as a highly successful [illegible] GREAT's cooperative management approach. The real [illegible] is the great river itself, a truly awesome resource.

[illegible] that I offer comments on the subject reports:

1. [illegible] - There is inconsistency in the [illegible] water level increases in Belvidere [illegible] different [illegible] discharges (pages [illegible]) and especially [illegible]. Reported [illegible] for [illegible] cfs discharge.

2. [illegible] Spring Lake and Belvidere [illegible] - The [illegible] patterns in Spring Lake is [illegible] insignificant (page [illegible]) need for further analysis (page [illegible], EIS-[illegible], EIS-14, EIS-31, [illegible] is identified as a current problem in Spring Lake, [illegible] quantified. The report indicates that [illegible] will be taken by the Corps if the project will [illegible] significant change over existing conditions. The Department [illegible] the high environmental and recreational value of this area. [illegible]

Corps of Engineers Responses
to Wisconsin Department of Natural Resources Comments

1. We feel that these statements are points that need clarification, not inconsistencies in the report. Most of Belvidere Slough would not experience appreciable project-related changes in water levels for any river discharge. However, the upper end of Belvidere Slough could experience increases in water levels that would range from slight to more substantial, depending on river discharges. For normal discharges (15,000 to 40,000 cfs), the effects on water levels in the upper end would be slight (less than 0.1 foot). The effects on water levels would increase with river discharge, until the river discharge reaches the point (above 100,000 cfs) that would overtop much of the existing land areas and the structures at MN 4 and MN 5. Recent computer modeling, which better simulates the overtopping of the structures and land areas, indicates that the maximum potential project-induced elevation in water levels in Belvidere Slough is between 0.2 and 0.3-foot. At discharges above 100,000 cfs, the effects on water levels would decrease and once again become insignificant. The computer model predicted less than a 0.1-foot increase in water levels for river discharges equaling the 1-percent chance flood. The computer model has also predicted that the effects on water levels and discharges into Belvidere Slough would diminish after a few years because the main channel would become more efficient and because more of the water would pass through it. The resource analysis program (RAP) will help document the actual effects on water levels and determine the accuracy of the computer model predictions. Changes have been made on pages 26, 34, and 35 of the design analysis report; pages EIS-20 and EIS-31 of the final supplement; and pages 404-14 and 404-15 of the Section 404(b)(1) evaluation to provide the clarifications discussed above.

2. The project could cause some changes in the sedimentation patterns in the Belvidere Slough area. At this point, we lack confidence in the computer model's ability to predict the extent of changes. We feel that the computer model can identify areas of change and their relative degree of change. We have incorporated features in the project that would prevent changes in sedimentation patterns at the areas where the computer model shows the greatest potential change. Our professional judgement is that the effects on other areas will be insignificant and short term until the main channel becomes hydraulically more efficient. However, the RAP will document short-term and long-term project-induced modifications in the sedimentation patterns in Belvidere Slough and Spring Lake. In addition, computer modeling will continue, and the results obtained from the RAP will help refine the model's long-term predictions. Corrective actions will be taken as determined necessary.

As part of the RAP, a preproject bathymetric survey of the entire Belvidere Slough area is being conducted. In addition, selected areas within Belvidere Slough have been surveyed annually since 1984. Surveys from the 1930's (prior to impoundment) and some survey information from the studies done in the late 1970's are available. This information will help identify the existing sedimentation patterns in the Belvidere area and serve as the data base to assess the effects of the project. We recognize that it will be difficult to discern the project's influence on sedimentation patterns. However, we believe that the survey information, in combination with continuing and refining the computer model, will allow us to determine the significant project-related changes in the sedimentation patterns as a result of the project.

Corps of Engineers Responses
to Wisconsin Department of Natural Resources Comments (cont.)

We concur.

4. The revised final RAP is incorporated in supporting document D. This version of the RAP clearly defines what would be monitored and when and where it would be monitored. Tables and figures summarizing the proposed monitoring effort (including a parameter list, annual and seasonal schedules, and sampling locations) have been incorporated in the RAP. The information that you wish summarized in the main report would require several tables and figures if we were to address it adequately. We do not feel these additions are necessary because we consider supporting document D an integral part of the report that both summarizes and provides detail on these issues. The only issue that the revised RAP does not adequately cover is the designation of responsible agencies for the various tasks. We feel that this designation would be best accomplished by a memorandum of understanding (MOU) among the various State and Federal agencies. The U.S. Fish and Wildlife Service is preparing this MOU. The MOU will be completed before the North Central Division Engineer signs the record of decision.

5. A time schedule for the various aspects of the recommended plan has been added to table 6 (recommended implementation plan).

6.a. The specific reference to "minor" applies only to the use of maintenance-dredged material to construct the project features. This coarse material does not contain any appreciable amount of contaminants. Therefore, use of this material, in combination with rock, to construct the project features should produce only minor effects on water quality: mainly localized, temporary increases in turbidity and suspended solids during the construction. However, hydraulic placement of the maintenance-dredged material at the island sites would resuspend the fine backwater material present. This disturbance and the capping the islands with the fine backwater material could cause a localized degradation of water quality, which may persist a while after dredging. However, the results of sediment bioassays indicate that toxic effects on endemic biota are not likely. Table EIS-3 has been amended to include the effects on water quality from the disturbance of the fine backwater sediments near the island site.

6.b. The following sentences replace the orginal wording in table EIS-3: "The project could cause some changes in the sedimentation patterns in the Belvidere Slough area. The effects are anticipated to be insignificant and short term, until the main channel becomes hydraulically more efficient. However, the RAP will document short-term and long-term project-related modifications in the sedimentation patterns in Belvidere Slough and Spring Lake. Corrective actions will be taken as determined necessary."

6.c. The following sentences have been added to table EIS-3: "The effects on water levels would increase as the river discharge increases, up to the point at which the structures at RM 4 and RM 5 and much of the land area are overtopped. It is anticipated that, as the main channel increases in efficiency, the effects on water levels in the upper end of Belvidere Slough would be reduced. The Resource Analysis Program will document the short-term and long-term effects on water levels in Belvidere Slough."

[illegible]

[illegible] Main Channel - [illegible]

[illegible] - The Department is currently [illegible] with the [illegible] in revising [illegible] Memorandum of [illegible] maintenance dredged material [illegible]. It is expected that necessary updates can be made [illegible] dredged material disposal at Wisconsin Cuts 10b [illegible]. Where riprap lining is [illegible] Cuts [illegible]A, 11A, and 11B), the Department will require that a permit and water quality certification be issued [illegible] with Wisconsin Statutes, Chapter 30, and Wisconsin Administrative [illegible]. Please contact Mr. Ed Bourget at [illegible] to initiate this process.

In summary, the Department feels that, to the degree possible, [illegible] risks have been factored out of the proposal through [illegible] state-of-the-art analysis techniques and the Resource Analysis Program. On this basis, we support initiation of Phase I [illegible] beginning this summer. All phases of project implementation and monitoring should be coordinated through the Channel Maintenance Forum by means of timely progress reports.

I [illegible] appreciate the opportunity to comment on these draft reports and [illegible] to enhance the multipurpose values of the Upper Mississippi River.

Sincerely,

[illegible]

[illegible]

cc: [illegible] Anthony S. Earl
Honorable William Proxmire
Honorable Robert W. Kasten Jr.
[illegible]
MB Members
MWA

[illegible]

Corps of Engineers Responses
to Wisconsin Department of Natural Resources Comments (cont.)

7. Coordination has been initiated with the Wisconsin DNR concerning their regulatory process. The parts of the EIS and Section 404(b)(1) evaluation concerning compliance with State water quality regulations have been modified to reflect that a permit and water quality certification from the Wisconsin DNR may be required for some of the project features that would be constructed in Wisconsin waters.

END

DTIC

8-86