



US Army Corps
of Engineers
St. Paul District

UPPER MISSISSIPPI RIVER SYSTEM

ENVIRONMENTAL MANAGEMENT PROGRAM

OPERATION AND MAINTENANCE MANUAL

SPRING LAKE PENINSULA

**HABITAT REHABILITATION
AND ENHANCEMENT PROJECT**

**POOL 5
UPPER MISSISSIPPI RIVER
BUFFALO COUNTY, WISCONSIN**

JUNE 1996

PREFACE

The Spring Lake Peninsula Habitat Rehabilitation and Enhancement Project was constructed by the Corps of Engineers. In accordance with Section 107(b) of the Water Resources Development Act of 1992, the U.S. Fish and Wildlife Service has the responsibility for operation and maintenance. The Corps of Engineers has prepared this manual to assist in fulfilling the operation and maintenance tasks.

The manual and appendices contain the latest approved agreements, maps, drawings, tables, and references pertinent to operation and maintenance of this project. The project as designed and constructed will improve fish habitat in Spring Lake, located in lower pool 5 on the Wisconsin side of the Upper Mississippi River. However, continued successful functioning of the project will depend upon the manner in which the project is maintained. Careful inspection and proper maintenance can help accomplish that goal.

The planning, design, and construction of the project was the result of an extensive cooperative effort on the part of the involved Federal and State agencies and the public. The continuation of this cooperation and coordination as part of the operation and maintenance of the project will be important to the success of the project and is strongly recommended.

DEPARTMENT OF THE ARMY
St. Paul District, Corps of Engineers
190 Fifth Street East
St. Paul, Minnesota 55101-1638

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM

SPRING LAKE PENINSULA
POOL 5, UPPER MISSISSIPPI RIVER
BUFFALO COUNTY, WISCONSIN

OPERATION AND MAINTENANCE MANUAL

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INTRODUCTION

This manual has been prepared to serve as a guide for the operation and maintenance of the Spring Lake Peninsula Habitat Rehabilitation and Enhancement Project in Buffalo County, Wisconsin. Operation and maintenance instructions for the major features of the project are presented. These instructions are consistent with the general procedures found in the Spring Lake Peninsula Definite Project Report dated August 1991.

There are no structures that need to be operated for the project. The intent of the maintenance instructions is to present preventive maintenance information consisting of systematic inspections and subsequent corrective actions to ensure long-term use of project features. A timely maintenance program prevents major damage to constructed features by early corrective action.

For ease in use, this manual is divided into two sections.

Part I. This section describes the project features and provides background information on the project.

Part II. This section gives details on the operation and maintenance of the project.

PART I - PROJECT FEATURES AND HISTORY

LOCATION

The Spring Lake project area is located in pool 5 of the Upper Mississippi River at Buffalo City, Wisconsin, approximately 4 miles above Lock and Dam 5. It is a 302-acre backwater area that is partially separated from the main river by remnant islands and a peninsula. The project lies within the Upper Mississippi River National Wildlife and Fish Refuge. Project drawings (appendix A) show the location of Spring Lake and project features.

AUTHORIZATION

The Spring Lake Peninsula project was authorized under the provisions of the 1985 Supplemental Appropriations Act (Public Law 99-88) and Section 1103 of the Water Resources Development Act of 1986 (Public Law 99-662).

Because the Spring Lake Peninsula project is located on Federal lands managed as a National Wildlife Refuge, operation and maintenance are to be carried out in compliance with Section 107(b) of the 1992 Water Resources Development Act.

DESCRIPTION OF PROJECT

Spring Lake is a triangular shaped lake created by the construction of the L/D 5 dike in the 1930's. The river valley in this area is about 3 miles wide from bluff to bluff with a mile-wide low terrace on the Wisconsin side. A natural peninsula extends from the Wisconsin shore at the upper end of Spring Lake, and a series of barrier islands forms the west side of the upper half of the lake. The lower half of the lake is open to Belvidere Slough and pool 5. The Wisconsin shoreline forms the east boundary and the L/D 5 dike forms the lower boundary.

Spring Lake was previously a quiet, protected area with much diversity, making it a valuable area for fish and wildlife. However, the natural peninsula had been breached by past floods, allowing flow and sediment into the upper end of the lake, resulting in declining habitat quality for backwater fish species, especially during the winter.

To reduce water flows and sedimentation entering the lake through the breach in the peninsula, a closure of the 700-foot-long breach was constructed. The top elevation of 665.0 is 5 feet above the average water surface. The top width is 20 feet with a 1 vertical on 10 horizontal slope to a 60-foot-wide berm on the Spring Lake side. An 18-inch layer of rock riprap placed over geotextile fabric stabilizes the 1 vertical on 3 horizontal slope on the upstream side, and 7 rockfill groins were placed on the Spring Lake side. The groins have a 3-foot top width, 2 feet above the average water surface, and are 30 feet long. Material to construct the closure was obtained from a backwater slough about 1/4-mile upstream of the closure and from Spring Lake just downstream of the closure. Dredging of the area downstream of the closure was done to the maximum allowable limits shown on the drawings in appendix A. The upstream borrow site was selectively dredged, depending on composition of the material. A 300-foot-long road to access the closure was constructed using rockfill. A rockfill wedge was constructed along 470 feet of existing island shoreline. The Definite Project Report/Environmental Assessment (SP-12), Spring Lake Peninsula Habitat Rehabilitation and Enhancement Project, August 1991, provides details on the formulation and evaluation processes and the overall project.

CONSTRUCTION HISTORY

A contract (DACW37-94-C-0014) was awarded to J.F. Brennan Co., Inc., La Crosse, Wisconsin, on 13 April 1994 at the bid price of \$189,379. Notice to proceed was issued on 7 June 1994. Actual construction began on 20 July 1994. Placement of fill proceeded slowly because of problems encountered with equipment working on the material after placement. All material was dredged and placed mechanically, but it was necessary to give the material dredged from the upstream borrow site time to dry in the barge and also after placement. The breach was closed with fill at the end of September. Riprap and groins were placed in October and November. An overrun on the rockfill was experienced because of unexpectedly high displacement/settlement for the access road between stations 0+50 and 2+50. Fine material dredged from Spring Lake was used for topsoil on the closure. The material was placed on the closure in November and a pre-final inspection was held on 28 November to declare the project substantially complete. The contractor was unable to adequately grade and seed the topsoil until May and June of 1995, respectively. Final inspection and acceptance was done on 31 July 1995, with a final contract cost of \$259,235.

PART II - PROJECT OPERATION AND MAINTENANCE

GENERAL RESPONSIBILITIES AND PROCEDURES

Approved Responsibilities

Operation and maintenance responsibilities for the Spring Lake Peninsula habitat project were originally outlined in the Definite Project Report. These responsibilities were formally accepted by an agreement between the U.S. Fish and Wildlife Service (USFWS) and the St. Paul District, Corps of Engineers, fully executed on 4 March 1994 (see appendix B). The capability of the USFWS to carry out the maintenance responsibilities described below will be contingent upon the passage of sufficient appropriations by Congress. Average annual operation and maintenance costs estimated in the Definite Project Report for the project were \$1,000.

District Manager

Typically, the USFWS operation and maintenance responsibility for habitat projects is given to the district manager in charge of that portion of the appropriate National Wildlife Refuge. For the Spring Lake Peninsula project, the current address is: District Manager, U.S. Fish and Wildlife Service, 51 East 4th Street, Room 101, Winona, Minnesota 55987, telephone #(507) 454-7351. Hereafter, for the purposes of this manual, when describing responsibilities, etc., the term "District Manager" will be used.

Improvements or Alterations

It is understood that improvements or alterations to any portion of the habitat project that would affect the ability of that element to function as intended to meet the project's habitat goals and objectives would be coordinated with other involved agencies. Along with the St. Paul District, these agencies are the Wisconsin and Minnesota Departments of Natural Resources. Improvements or alterations should not be undertaken without the mutual consent of the involved agencies.

Procedure for Reviewing Operation and Maintenance Responsibilities

The District Engineer or his representative will be kept informed on operation and maintenance activities for the Spring Lake Peninsula habitat project through a periodic inspection of the project by the Corps and through analysis of an annual inspection checklist submitted by the USFWS. The Corps will inspect the project with a USFWS representative at least once every 3 years, and at other times as may be required. The Corps should contact the District Manager so that a mutually convenient date can be set up for the joint inspection. The findings of these inspections will be transmitted to the USFWS and could include recommendations for any remedial work considered necessary to maintain the habitat project in a satisfactory operating condition. Any agreed upon remedial work should be completed as soon as possible by the USFWS as provided for in the Memorandum of Agreement between the USFWS and the Corps. Since the project is located in the state of Wisconsin, it is recommended that the USFWS also coordinate any remedial work with the Wisconsin Department of Natural Resources to ascertain whether permits are needed prior to performing the work.

Annual Report

The checklist report and project drawing showing damaged areas encountered during the annual inspection, operation, and maintenance of the habitat project shall be submitted each year to the District Engineer. The USFWS may send the Spring Lake Peninsula report in conjunction with reports on other habitat projects for which it has responsibility. If so desired, these reports can be sent to the Corps with the annual Cooperative Agreement Report which is done every April by the USFWS. A sample copy of the checklist can be found in appendix C. Besides completion of the inspection checklist, each individual report should briefly summarize the condition of the entire system, including any maintenance work done during the past 1-year period.

OPERATION

There are no operational requirements associated with the Spring Lake Peninsula project.

MAINTENANCE

General Inspection and Maintenance

The established points and times at which the required inspections should be made were developed through coordination between the Corps of Engineers and the USFWS during the preparation of plans and specifications for this project. After the habitat project has been in operation for 5 years, the Corps and the USFWS will review these inspection activities for adequacy. The frequency and nature of the inspections may be modified by mutual written agreement. If the design goals discussed under "DESCRIPTION OF PROJECT" have not been achieved in spite of proper maintenance, continued operation and maintenance of this project could be discontinued by mutual written agreement of the two Government agencies.

Inspection

The closure, access road, and rockfill wedge should be visually inspected by the District Manager at a minimum frequency of once a year to insure that they are functionally intact. Inspections should also be made after any flood whose elevation exceeds 664.0 feet above mean sea level (msl) at the lock 5 headwater gage. The general condition of the closure should be noted. If photographs of the site are taken, these should accompany the submitted report.

The frequency for inspection will be subject to review by the USFWS and the Corps and could change upon mutual agreement of both parties. The timing of the inspection can be made at the discretion of the District Manager.

Maintenance

Maintenance of the project features will be accomplished on an as needed basis by the District Manager, such that their structural integrity is maintained and they continue to function in the manner for which they were designed. If the District Manager encounters project conditions that are judged to exceed normally expected maintenance, the Corps' technical staff should be contacted so that a determination can be made as to whether the problem is considered a maintenance responsibility or project rehabilitation. Specific maintenance requirements are as follows:

a) Any significant loss of riprap or rockfill should be replaced to prevent erosion problems.

b) Should any of the underlying geotextile fabric become exposed to light, riprap should be replaced immediately if the fabric is still intact. Otherwise, the fabric should also be replaced as described below.

c) Some erosion of the berm and movement of material between the rockfill groins on the Spring Lake side of the closure is expected. However, vegetative cover on the main closure embankment needs to be maintained to control erosion. If there is significant erosion on the upper portion of the closure (above the berm) such that the condition of the unprotected (nonriprapped) side slopes of the closure is in question, the Corps' technical staff should be consulted prior to proceeding with any repairs to determine whether the repairs are considered a routine maintenance activity or if rehabilitation is needed.

d) Some minor settlement of the access road and closure is possible. However, if significant settlement is observed that impacts on the design function of the project, the Corps' geotechnical staff should be consulted prior to proceeding with any repairs as stated above.

Repair Materials

Appendix D contains excerpts from the construction specifications that provide a description of the materials and procedures required for repair of the structures. Repair activities include the following:

a) Sand and fines replacement for the closure structure. Any fill material placed should be compacted to the same degree as the surrounding fill.

b) Riprap, rockfill groin, and rockfill wedge replacement. As-built drawings should be consulted for placement of rockfill and dimensions.

c) Geotextile fabric replacement. If geotextile fabric becomes torn or deteriorated and thereby loses its protective function, the surrounding riprap should be removed to expose the unharmed fabric such that the new section of fabric overlaps the old by 36 inches. Proper procurement and installation of geotextile fabric is included in appendix D.

d) Timber guard post replacement. If timber guard posts are removed, broken, or damaged so that motor vehicles are able to access the peninsula, the posts should be replaced.

INSPECTIONS, TESTS, AND OPERATIONS FOLLOWING MAJOR STORMS OR FLOODS

General

As stated in the Memorandum of Agreement between the USFWS and the Corps, the Corps will be responsible for any mutually agreed upon rehabilitation of the Spring Lake Peninsula project that exceeds the annual maintenance requirements and that may be needed as a result of a specific storm or flood. The project will be inspected as previously described, following flood events producing a water surface elevation greater than 664.0 feet (msl) at the lock 5 headwater gage.

Project Rehabilitation or Abandonment

Should inspection of the project area following a major flood or natural disaster disclose substantial damage to any of the major components of the project that appears to exceed the annual operation and maintenance as specified in this manual and the Definite Project Report, the Corps and the USFWS should meet and discuss the appropriate course of action in light of the original project design. The inspections by the District Manager (as summarized in the submitted checklist) and the joint inspections with the Corps will be the basis for determining maintenance responsibility by the USFWS versus potential rehabilitation by the Corps. Repair of damage attributable to lack of maintenance would be considered a USFWS responsibility.

The options of rehabilitation or abandonment of the project may be considered at this time. Any decision would be carried forth only upon written mutual agreement of the USFWS and the Corps. Included within such agreement would be a description of the agreed upon course of action and funding responsibilities, if any. The Wisconsin Department of Natural Resources will be consulted prior to reaching any final determination on a course of action.

Project Monitoring and Evaluation

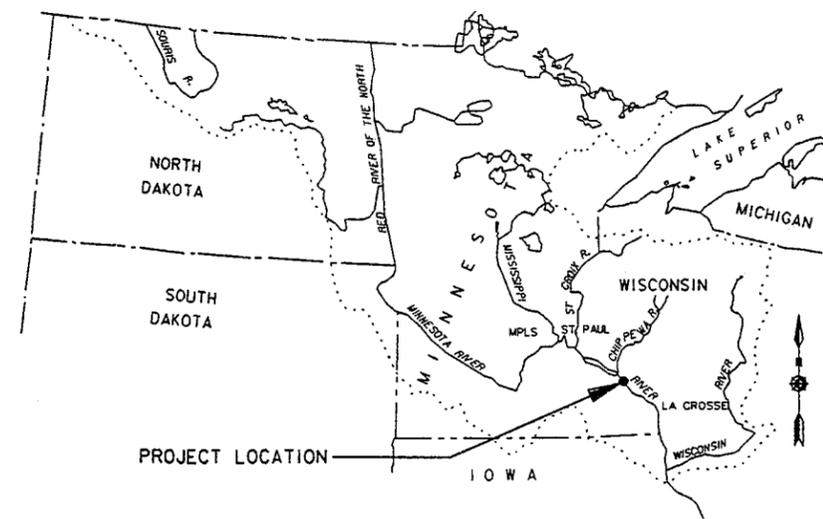
Performance monitoring of the Spring Lake Peninsula project will be conducted by the Corps of Engineers as described in appendix E to help determine the extent to which the design meets the habitat project objectives. The post-construction evaluation basically includes flow and dissolved oxygen measurements and vegetation investigations in the upper end of Spring Lake. Information from this monitoring will also be used, if required, when ascertaining whether rehabilitation or abandonment of portions of this project would be the wisest choice. If any additional information of this nature is obtained by the USFWS, it should be submitted to the Corps of Engineers in conjunction with the annual report.

APPENDIX A

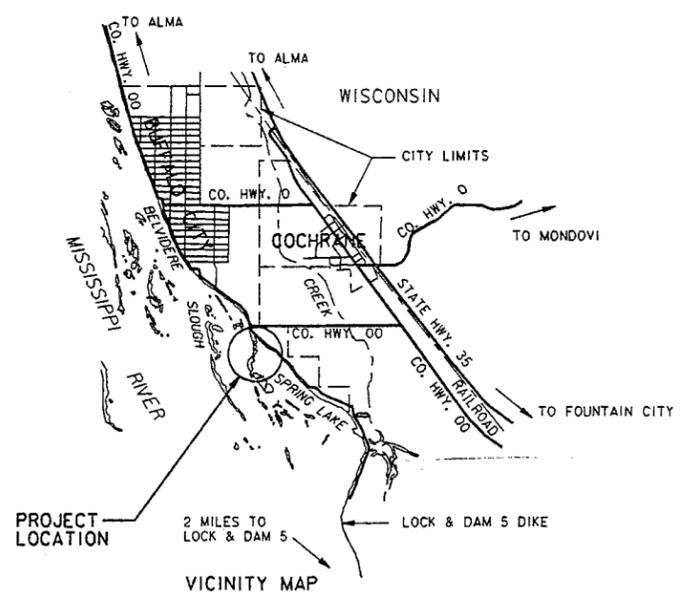
PROJECT DRAWINGS

CONTRACT DRAWING INDEX			
DRAWING NO.	SHT.	DESCRIPTION	CAD FILE
M-P5-10/7	1	DRAWING INDEX, LOCATION MAP, AND VICINITY MAP	M504P001.DGN
M-P5-10/8	2	GENERAL PLAN - HORIZONTAL & VERTICAL CONTROL AND SOIL BORING LOCATION	MP5108.DGN
M-P5-64/1	3	PLAN VIEW	MP5641.DGN
M-P5-64/2	4	PROFILE AND CROSS SECTION	MP5642.DGN

REFERENCE DRAWINGS		
DRAWING NO.	DESCRIPTION	CAD FILE
M-P5-10/9	BORING LOGS	SPRING01.DGN
M-P5-10/10	BORING LOGS	SPRING02.DGN
M-P5-14/5	ELEVATION DURATION CURVES	D1_DAM5D.DGN
M-P5-14/6	ELEVATION DURATION CURVES	D2_DAM5D.DGN
M-P5-14/7	HYDROGRAPHIC DATA	H1_DAM5P.DGN
M-P5-14/8	HYDROGRAPHIC DATA	H2_DAM5P.DGN



LOCATION MAP
SCALE IN MILES



VICINITY MAP
SCALE IN MILES

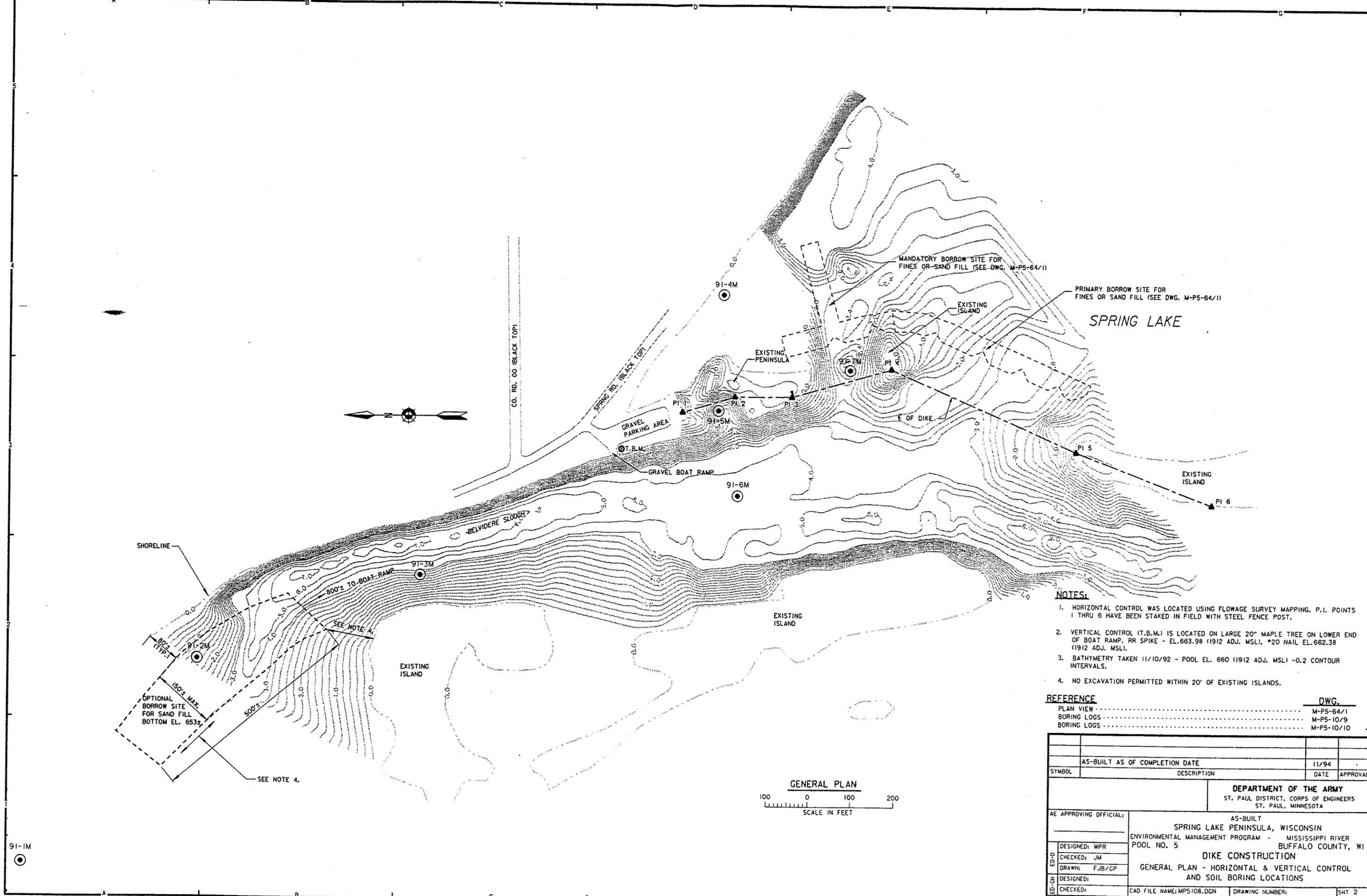
- LEGEND**
- FINISH GRADE
 - - - CONTROL LINE
 - SHORELINE
 - LIMITS OF WORK
 - ▲ P.I. POINTS
 - FILL
 - SOIL BORING LOCATION

- GEN ENG
- HYD
- HYDR
- GEOTECH
- STR ENG
- MLA



SIGNATURES AFFIXED BELOW INDICATE OFFICIAL RECOMMENDATION AND APPROVAL OF ALL DRAWINGS IN THIS SET. *AS REQUIRED BY ENGINEER CIRCULAR NO. 1110-1-10)		ENGINEER MANAGER		AS-BUILT AS OF COMPLETION DATE		11/94	
APPROVAL RECOMMENDED BY:		CHIEF SPECS. & TECH. SUPPORT SECTION		SYMBOL		DESCRIPTION	
CHIEF ED-D BRANCH		CHIEF GENERAL ENGINEERING SECTION		APPROVED BY		DEPARTMENT OF THE ARMY	
CHIEF ED-GH BRANCH		CHIEF STRUCTURAL SECTION		CHIEF, DESIGN BRANCH		ST. PAUL DISTRICT, CORPS OF ENGINEERS	
CHIEF ENGINEERING DIVISION		CHIEF MECH/ELEC/ARCH SECTION		DESIGNED: WPR		ST. PAUL, MINNESOTA	
APPROVED BY:		CHIEF HYDRAULICS SECTION		CHECKED: JM		CONTRACT DRAWING	
COL., CORPS OF ENGINEERS		CHIEF HYDROLOGY SECTION		DRAWN: FJB/DPF		SPRING LAKE PENINSULA, WISCONSIN	
		CHIEF GEOTECHNICAL DESIGN SECTION		DESIGNED:		ENVIRONMENTAL MANAGEMENT PROGRAM - MISSISSIPPI RIVER	
				CHECKED:		BUFFALO COUNTY, WISCONSIN	
				DATE: 12-7-93		DIKE CONSTRUCTION	
				CAD FILE NAME: M504P001.DGN		DRAWING INDEX, LOCATION MAP,	
				DRAWING NUMBER:		AND VICINITY MAP	
				SHT 1			
				DATE: 12-7-93		OF 4	
				SPEC NO: DACW37-93-B-0044		M-P5-10/7	

● GEN ENG
 ○ HYD
 ○ HYDR
 ○ GEOTECH
 ○ STR ENG
 MEA



- NOTES:**
- HORIZONTAL CONTROL WAS LOCATED USING FLOWAGE SURVEY MAPPING. P.I. POINTS 1 THRU 6 HAVE BEEN STAKED IN FIELD WITH STEEL FENCE POST.
 - VERTICAL CONTROL (T.B.M.) IS LOCATED ON LARGE 20" MAPLE TREE ON LOWER END OF BOAT RAMP. RR SPIKE - EL. 663.98 (1912 ADJ. MSL), *20 NAIL EL. 662.38 (1912 ADJ. MSL).
 - BATHYMETRY TAKEN 11/10/92 - POOL EL. 660 (1912 ADJ. MSL) -0.2 CONTOUR INTERVALS.
 - NO EXCAVATION PERMITTED WITHIN 20' OF EXISTING ISLANDS.

REFERENCE

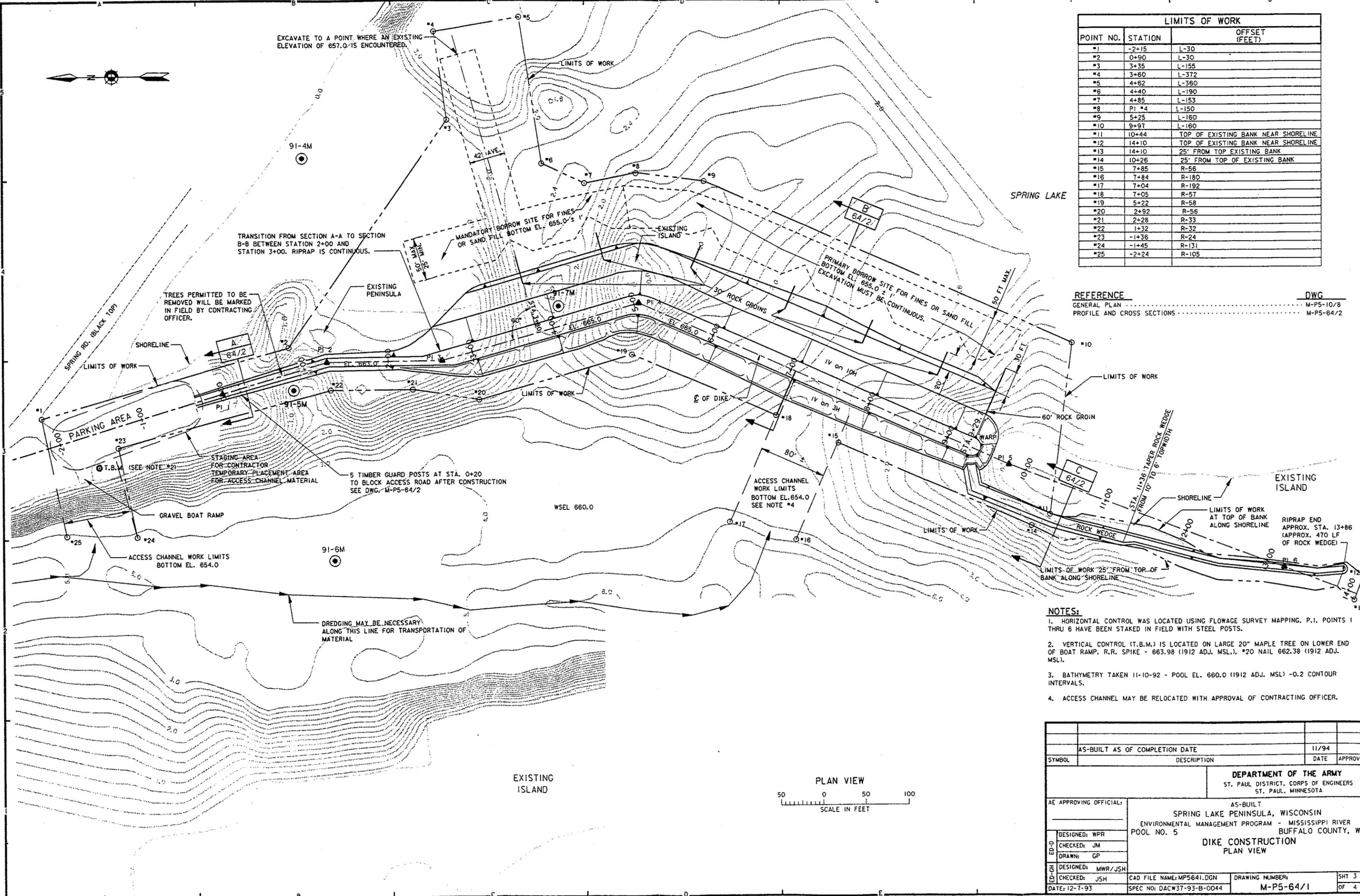
	DWG.
PLAN VIEW	M-P5-64/1
BORING LOGS	M-P5-10/9
BORING LOGS	M-P5-10/10

AS-BUILT AS OF COMPLETION DATE		11/94	
SYMBOL	DESCRIPTION	DATE	APPROVAL
DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA			
AE APPROVING OFFICIAL:		AS-BUILT	
DESIGNED: WPR		ENVIRONMENTAL MANAGEMENT PROGRAM - MISSISSIPPI RIVER	
CHECKED: JM		POOL NO. 5 BUFFALO COUNTY, WI	
DRAWN: FJB/GP		DIKE CONSTRUCTION	
DESIGNED:		GENERAL PLAN - HORIZONTAL & VERTICAL CONTROL	
CHECKED:		AND SOIL BORING LOCATIONS	
DATE: 12-7-93	CAD FILE NAME: MP5108.DGN	DRAWING NUMBER:	SHT 2
	SPEC NO: DACW37-93-B-0044	M-P5-10/8	OF 4

91-1M

LIMITS OF WORK		
POINT NO.	STATION	OFFSET (FEET)
#1	-2+15	L-30
#2	0+90	L-30
#3	3+35	L-155
#4	3+60	L-372
#5	4+62	L-360
#6	4+40	L-190
#7	4+85	L-153
#8	PI #4	L-150
#9	5+25	L-160
#10	9+97	L-160
#11	10+44	TOP OF EXISTING BANK NEAR SHORELINE
#12	14+10	TOP OF EXISTING BANK NEAR SHORELINE
#13	14+10	25' FROM TOP EXISTING BANK
#14	10+26	25' FROM TOP OF EXISTING BANK
#15	7+85	R-56
#16	7+84	R-180
#17	7+04	R-192
#18	7+05	R-57
#19	5+22	R-58
#20	2+92	R-56
#21	2+28	R-33
#22	1+32	R-32
#23	-1+36	R-24
#24	-1+45	R-131
#25	-2+24	R-105

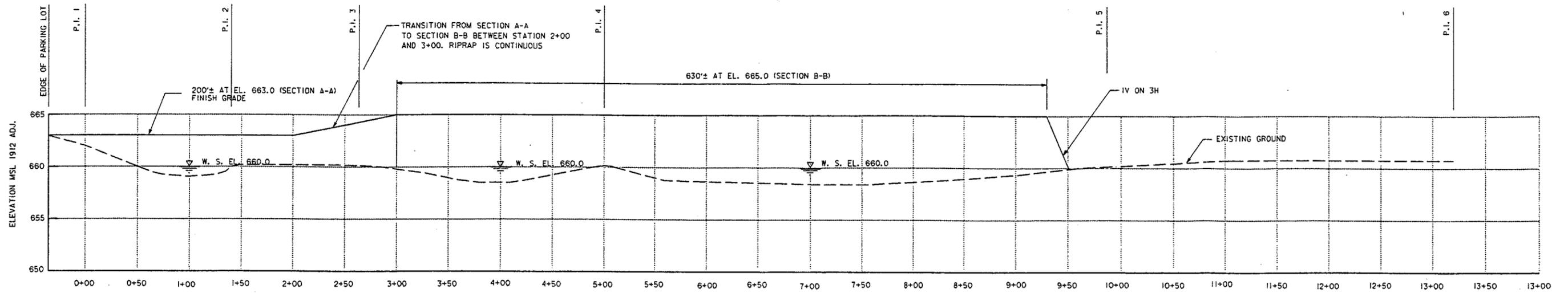
REFERENCE	DWG
GENERAL PLAN	M-P5-10/8
PROFILE AND CROSS SECTIONS	M-P5-64/2



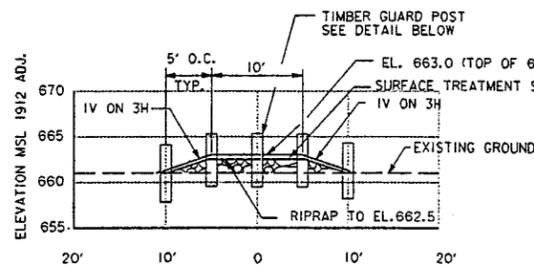
- NOTES:**
- HORIZONTAL CONTROL WAS LOCATED USING FLOWAGE SURVEY MAPPING. P.I. POINTS 1 THRU 6 HAVE BEEN STAKED IN FIELD WITH STEEL POSTS.
 - VERTICAL CONTROL (T.B.M.) IS LOCATED ON LARGE 20" MAPLE TREE ON LOWER END OF BOAT RAMP. R.R. SPIKE - 663.98 (1912 ADJ. MSL.), #20 NAIL 662.38 (1912 ADJ. MSL).
 - BATHYMETRY TAKEN 11-10-92 - POOL EL. 660.0 (1912 ADJ. MSL) -0.2 CONTOUR INTERVALS.
 - ACCESS CHANNEL MAY BE RELOCATED WITH APPROVAL OF CONTRACTING OFFICER.

- GEN ENG
- HYD
- HYDR
- GEOTECH
- MEA

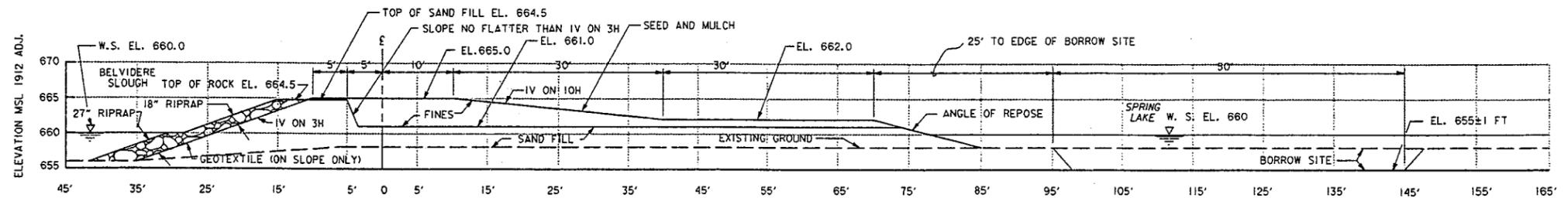
AS-BUILT AS OF COMPLETION DATE		11/94
SYMBOL	DESCRIPTION	DATE APPROVAL
DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA		
AE APPROVING OFFICIAL:		AS-BUILT
DESIGNED: WPR		SPRING LAKE PENINSULA, WISCONSIN
CHECKED: JM		ENVIRONMENTAL MANAGEMENT PROGRAM - MISSISSIPPI RIVER
DRAWN: GP		POOL NO. 5 BUFFALO COUNTY, WI
DIKE CONSTRUCTION		
PLAN VIEW		
DESIGNED: MWR/JSH	CAD FILE NAME: MP5641.DGN	DRAWING NUMBER:
CHECKED: JSH	SPEC NO: DAC#37-93-B-0044	M-P5-64/1
DATE: 12-7-93		SHT 3 OF 4



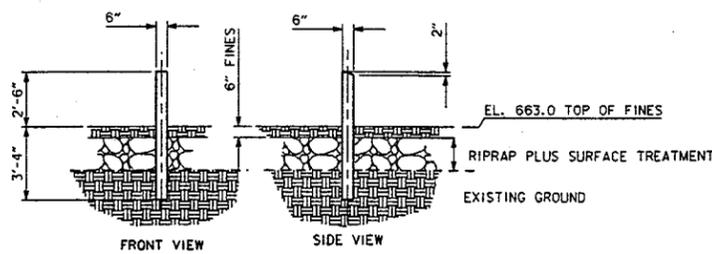
PROFILE OF DIKE



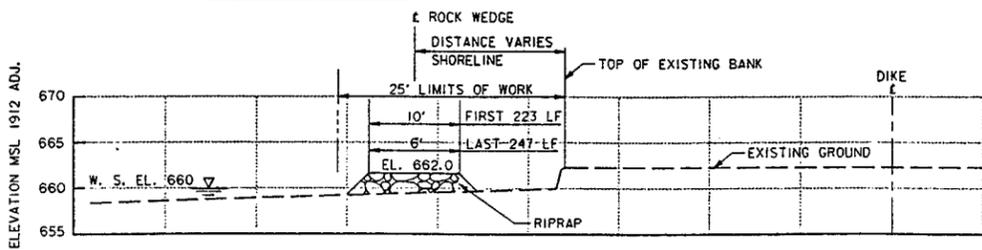
ACCESS ROAD FOR CONSTRUCTION SECTION A-A



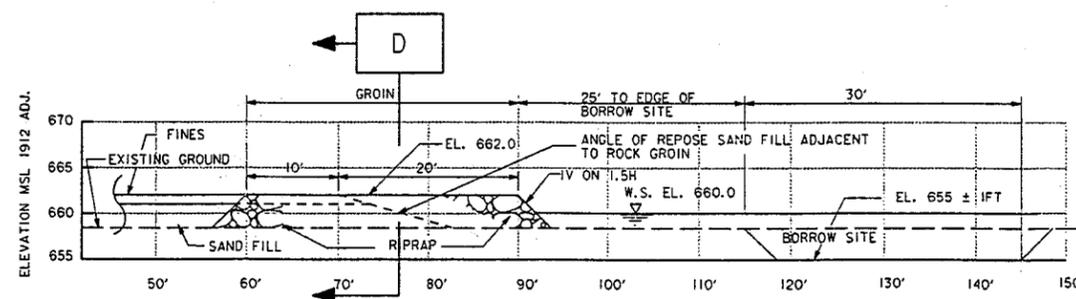
TYPICAL DIKE SECTION B-B



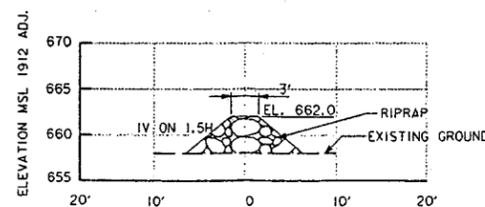
TIMBER GUARD POST



ROCK WEDGE ALONG SHORELINE SECTION C-C



PROFILE OF 30' ROCK GROIN
60' ROCK GROIN HAS SAME PROFILE



ROCK GROIN SECTION I-1

NOTE

1. SEE SPECIFICATIONS FOR ACCESS ROAD RIPRAP SURFACE TREATMENT FROM PARKING LOT TO STA. 2+50. AFTER COMPLETION OF CONSTRUCTION WORK, 6" OF FINES SHALL BE PLACED, FOLLOWED BY SEEDING AND MULCHING.

REFERENCE

PLAN VIEW DWG. M-P5-64/1

AS-BUILT AS OF COMPLETION DATE		11/94	
SYMBOL	DESCRIPTION	DATE	APPROVAL
DEPARTMENT OF THE ARMY ST. PAUL DISTRICT, CORPS OF ENGINEERS ST. PAUL, MINNESOTA			
AE APPROVING OFFICIAL:		AS-BUILT SPRING LAKE PENINSULA, WISCONSIN ENVIRONMENTAL MANAGEMENT PROGRAM - MISSISSIPPI RIVER POOL NO.5 BUFFALO COUNTY, WISCONSIN	
DIKE CONSTRUCTION PROFILE AND CROSS SECTIONS			
DESIGNED: WPR	CHECKED: JM	DRAWN: GP/NK	
DESIGNED: MWR/JSH	CHECKED: JSH	CAD FILE NAME: MP5642.DGN	
DATE: 12-7-93	SPEC NO: DACW37-93-B-0044	DRAWING NUMBER:	SHT 4 OF 4
		M-P5-64/2	

GEN ENG

HYD

HYDR

GEOTECH

STP ENG

MEA

APPENDIX B

MEMORANDUM OF AGREEMENT

MEMORANDUM OF AGREEMENT
BETWEEN
THE UNITED STATES FISH AND WILDLIFE SERVICE
AND
THE DEPARTMENT OF THE ARMY
FOR
ENHANCING FISH AND WILDLIFE RESOURCES
OF THE
UPPER MISSISSIPPI RIVER SYSTEM
AT THE
SPRING LAKE PENINSULA
BUFFALO COUNTY, WISCONSIN

I. PURPOSE

The purpose of this Memorandum of Agreement (MOA) is to establish the relationships, arrangements, and general procedures under which the U.S. Fish and Wildlife Service (USFWS) and the Department of the Army (DOA) will operate in constructing, operating, maintaining, repairing, and rehabilitating the Spring Lake Peninsula separable element of the Upper Mississippi River System - Environmental Management Program (UMRS-EMP).

II. BACKGROUND

Section 1103 of the Water Resources Development Act of 1986, Public Law 99-662, authorizes construction of measures for the purpose of enhancing fish and wildlife resources in the Upper Mississippi River System. The project area is managed by the USFWS and is on land managed as a national wildlife refuge. Under conditions of Section 906(e) of the Water Resources Development Act of 1986, Public Law 99-662, all construction costs of those fish and wildlife features for the Spring Lake Peninsula project are 100 percent Federal, and pursuant to Section 107(b) of the Water Resources Development Act of 1992, Public Law 102-580, all costs of operation and maintenance for the Spring Lake Peninsula project are 100 percent Federal.

III. GENERAL SCOPE

The project to be accomplished pursuant to this MOA shall provide for the construction of a closure to prevent flow into the upper end of Spring Lake through a breached portion of the peninsula. This would restore and maintain centrarchid fisheries and enhance aquatic plant bed development in Spring Lake for fish and wildlife.

IV. RESPONSIBILITIES

A. DOA is responsible for:

1. Construction: Construction of the project which consists of closing a breach in the Spring Lake peninsula with an earth structure. Material to build the structure would be excavated from the backwater. Rock riprap would be used to protect the structure and adjacent shoreline from erosion.

2. Major Rehabilitation: The Federal share of any mutually agreed upon rehabilitation of the project that exceeds the annual operation and maintenance requirements identified in the Definite Project Report and that is needed as a result of specific storm or flood events.

3. Construction Management: Subject to and using funds appropriated by the Congress of the United States, and in accordance with Section 906(e) of the Water Resources Development Act of 1986, Public Law 99-662, DOA will construct the Spring Lake Peninsula project as described in the Definite Project Report/Environmental Assessment, Spring Lake Peninsula, Habitat Rehabilitation and Enhancement Project, dated August 1991, applying those procedures usually followed or applied in Federal projects, pursuant to Federal laws, regulations, and policies. The USFWS will be afforded the opportunity to review and comment on all modifications and change orders prior to the issuance to the contractor of a Notice to Proceed. If DOA encounters potential delays related to construction of the Project, DOA will promptly notify USFWS of such delays.

4. Maintenance of Records: The DOA will keep books, records, documents, and other evidence pertaining to costs and expenses incurred in connection with construction of the project to the extent and in such detail as will properly reflect total costs. The DOA shall maintain such books, records, documents, and other evidence for a minimum of three years after completion of construction of the project and resolution of all relevant claims arising therefrom, and shall make available at its offices, at reasonable times, such books, records, documents, and other evidence for inspection and audit by authorized representatives of the USFWS.

B. USFWS is responsible for operation, maintenance, and repair: Upon completion of construction as determined by the District Engineer, St. Paul, the USFWS shall accept the project and shall operate, maintain, and repair the project as defined in the Definite Project Report/Environmental Assessment entitled "Spring Lake Peninsula, Habitat Rehabilitation and Enhancement Project," dated August 1991, in accordance with Section 107(b) of the Water Resources Development Act of 1992, Public Law 102-580.

V. MODIFICATION AND TERMINATION

This MOA may be modified or terminated at any time by mutual agreement of the parties. Any such modification or termination must be in writing. Unless otherwise modified or terminated, this MOA shall remain in effect for a period of no more than 50 years after initiation of construction of the project.

VI. REPRESENTATIVES

The following individuals or their designated representatives shall have authority to act under this MOA for their respective parties:

USFWS: Regional Director
U.S. Fish and Wildlife Service
Bishop Henry Whipple Federal Building
1 Federal Drive
Fort Snelling, Minnesota 55111-4056

DOA: District Engineer
Department of the Army
Corps of Engineers, St. Paul District
190 Fifth Street East
St. Paul, Minnesota 55101-1638

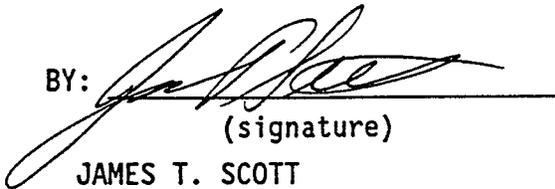
VII. EFFECTIVE DATE OF MOA

This MOA shall become effective when signed by the appropriate representatives of both parties.

THE DEPARTMENT OF THE ARMY

THE U.S. FISH AND WILDLIFE SERVICE

BY:


(signature)

JAMES T. SCOTT
Colonel, Corps of Engineers
St. Paul District

Date 4 March 94

BY:


(signature)

SAM MARLER
Regional Director
U.S. Fish and Wildlife Service

Date 10 Feb 1994

APPENDIX C

INSPECTION CHECKLIST FORM

Inspection Checklist

SPRING LAKE PENINSULA
Habitat Rehabilitation and Enhancement Project
Environmental Management Program
Pool 5 - Upper Mississippi River

TO: U.S. Army Corps of Engineers
ATTN: CENCS-CO-TS
Army Corps of Engineers Centre
190 Fifth Street East
St. Paul, Minnesota 55101-1638

Inspected by: _____ Date: _____

Type of Inspection: () Annual () Flood () Major Storm
() Other _____

Note: Show any problems areas on the appropriate project drawing.

I. ACCESS ROAD

- () No Major Problems
- () Erosion - location(s) _____
- () Fill Needed - estimate of quantity _____ CY
- () Displaced Rockfill
- () Rockfill Needed - estimate of quantity _____ CY
- () Timber Post(s) Needed - how many? _____

II. CLOSURE

- () No Major Problems
- () Erosion - location(s) _____
- () Fill Needed - estimate of quantity _____ CY
- () Vegetation Management Needed
Describe: _____
- () Displaced Riprap
- () Riprap Needed - estimate of quantity _____ CY
- () Displaced Rock Groin
- () Rebuild Rock Groin - est. of quantity _____ CY
- () Geotextile Fabric Needed - est. of quantity _____ SY

III. ROCKFILL WEDGE

- () No Major Problems
- () Displaced Rockfill
- () Rockfill Needed - estimate of quantity _____ CY

IV. OTHER ITEMS (List)

A. Areas needing special attention (describe and show on the appropriate project drawing)

B. Maintenance performed during the past year (include cost)

C. Maintenance needed (include itemized estimate of cost to repair)

D. Other Comments

APPENDIX D

REPLACEMENT SPECIFICATIONS

2H - ESTABLISHMENT OF TURF

1. SCOPE. This section covers seeding and mulching of the dikefill area.

2. MATERIALS.

2.1 Seed shall be certified to be the latest season's crop and shall be delivered in original sealed packages bearing the producer's guaranteed analysis for percentages of mixtures and pure live seed. Seed that has become wet, moldy, or otherwise damaged will not be acceptable. The seed mix shall be as follows:

2.1.1 Grass Seed Mix:

<u>Species</u>	<u>Variety</u>	<u>PLS(a)</u> <u>(lbs/acre)</u>
Canada Wild Rye (Elymus canadensis)	WI or MN Common	5
Cordgrass (Spartina pectinatus)	WI or MN Common	3
Side Oats Grama (Bouteloua curtipendula)	WI or MN Common	5
Switchgrass (Sorghastrum nutans)	WI or MN Common	2
Prairie clovers (Petalostemum sp.)	WI or MN Common	3 oz. bulk
Perennial Ryegrass (Lolium perenne)	WI or MN Common	10 (b)

(a) PLS - pure live seed.

(b) Perennial ryegrass rate in bulk pounds.

NOTE: Weed seed shall not exceed one percent by weight of the total mixture.

2.2 Water shall not contain elements toxic to plant life.

2.3 Mulch shall be clean straw derived from oats, wheat, barley, rice or rye crops that are free from noxious weeds, mold, or other objectionable material. Materials that contain objectionable weed seeds or other species that might be detrimental to the planting being established or to adjacent land will not be accepted. Straw shall be in an air-dry condition and suitable for placing with blower equipment.

2.4 Soil for Repairs. For fill of areas to be repaired, soil shall be of at least equal quality to that which exists in areas adjacent to the areas to be repaired. Soil shall be used that is free from roots, stones, and other materials that hinder grading, planting, maintenance operations and establishment of turf.

3. SITE PREPARATION.

3.1 General. Equipment shall be provided for the proper preparation of the ground and for handling and placing all materials.

3.2 Grading. Previously established grades shall be maintained on the areas to be seeded in a true and uniform condition; necessary repairs shall be made to previously graded areas. Where grades have not been established, the areas shall be graded as shown or directed, and all surfaces shall be left in a uniformly and properly compacted condition to prevent formation of depressions. Finished grade shall be such that after subsequent treatment, (tillage and planting) the planted grade shall join even with adjoining turf areas.

3.3 Tillage. After the areas required to be seeded have been brought up to the grades shown, the fines shall be tilled to a depth of at least 4 inches by plowing, disking, harrowing or other approved operations only during periods when beneficial results are likely to be obtained. Undulations or irregularities in the surface shall be leveled before the next specified operation. Soil compacted by construction equipment or soil on compacted cut slopes or grades shall be pulverized to a minimum depth of 4 inches by disking or tilling before applying seed.

3.4 Leveling. Surface irregularities resulting from tillage or other operations shall be leveled before seeding.

4. APPLICATION.

4.1 General. Seed shall be applied to all areas required to be covered with fines above elevation 661.5. Climatic conditions should be favorable for growth.

4.2 Broadcast seeding shall be permitted. Seed shall be broadcast using hand spreaders or by simple hand broadcasting. Seed shall be distributed uniformly over designated areas. One half of seed shall be sown in one direction, and the remainder shall be sown at right angles to first sowing. The seed shall be covered to an average depth of 1/4 inch. Seed shall not be broadcast during windy weather (wind exceeding 10 miles per hour).

4.3 Planting Dates. The designated seed mix shall be applied within the following planting dates:

- (a) Spring planting, seed from April 20 to June 15.
- (b) Dormant planting, seed after October 21.

4.4 Firming Soil. Immediately after seeding operations have been completed, the surface shall be compacted by a cultipacker, roller or other approved equipment weighing 90 to 100 pounds per linear foot of roller. If the soil is of such type that a smooth or corrugated roller cannot be operated satisfactorily, a pneumatic-tired roller shall be used. A roller having tires of sufficient size shall be used, or sufficient passes of the roller shall be made, to cover soil surface completely.

4.5 Applying and Anchoring Mulch. Immediately after the seeding has been completed, mulch shall be spread uniformly in a continuous blanket at a rate of 1 1/2 tons per acre. Mulch shall be spread by hand, manure spreader, modified grain combine with straw-spreader attachment or blower-type mulch spreader. Mulching shall be started at the windward side of relatively flat areas, or at the upper part of a steep slope, and continued uniformly until the area is covered. Mulch shall not be bunched. Immediately following the spreading, the mulch shall be anchored to the soil by a V-type wheel land packer, a scalloped disk land packer designed to force mulch into the soil surface, or other suitable equipment. The number of passes need not exceed three. All areas seeded on any given day must be mulched on that given day.

20 - DIKE CONSTRUCTION

1. SCOPE. This section covers construction of the dike using fines and sand fill materials.

2. SOURCES OF SAND FILL AND FINES. Material can be obtained from any upland or marine source that meets the specifications hereinafter.

3. MATERIALS.

3.1 Satisfactory materials for fill include all soils except those classified in ASTM D 2487 as Pt. Satisfactory material shall be free from ice, snow, frozen earth, trash, debris, woody material and stones larger than 6 inches in any dimension.

3.2 Cohesionless and Cohesive Materials. Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW, SP, and SP-SM. Cohesive materials include materials classified as GC, SC, ML, and CL. Materials classified as GM and SM will be identified as cohesionless when the fines have a plasticity index of zero and cohesive when the fines have a plasticity index of one or greater.

3.3 Dike Fill.

3.3.1 Sand fill shall be cohesionless satisfactory materials with not more than 12 percent by weight, in place, passing the No. 200 sieve.

3.3.2 Fines shall be satisfactory materials with not less than 50 percent by weight, in place, passing the No. 200 sieve.

4. FOUNDATION PREPARATION.

4.1 Drainage. The foundation receiving fill and all partially completed fill shall be kept thoroughly drained, except where filling below water is allowed.

4.2 Clearing. The foundation area that is to have fill material placed upon it shall be cleared of woody vegetation materials that could prevent proper placement of dike fill. Plant root systems may be left in place and intact. Plant trunks and stems that construction work can be built around and remain standing vertically through the completed dike fill may be left in place in order to assist in the natural revegetation of the completed dike fill.

5. PLACEMENT.

5.1 Except for underwater placement, all layers shall be started full out to the slope stakes and shall be carried substantially horizontal with sufficient crown or slope to provide satisfactory drainage during construction. Material deposited under water shall be placed in such a manner as to insure that soft material in the foundation will be forced progressively outward from the section and not be trapped within the base of the dike. At no time shall frozen fill or placing of fill on frozen ground be permitted.

5.1.1 The maximum drop of fill materials placed under water by mechanical dredging shall be 6 inches from the water surface.

2S - STONE PROTECTION

1. MATERIALS. Riprap shall be a durable, field or quarried stone of a quality suitable to ensure permanence of the structure in the climate in which it is used. The stone shall be well graded within the limits shown in the gradation curves attached at the end of this section, and shall be free from cracks, seams, and other defects that would unduly increase its deterioration from natural causes. No more than 3% of the total materials by weight shall pass the No. 4 sieve. Neither the breadth nor thickness of any piece of stone shall be less than one-third of its length. Occasional pieces of stone slightly larger than the maximum weight will be permitted, provided the gradation and voids are not unduly affected and that surface tolerances are met. In order to meet the structural design requirements for weight, gradation, and layer thickness, stone for riprap shall have a specific gravity between 2.60 and 2.70.

2. SOURCES. The sources of suitable stone protection materials include the following:

<u>Owner</u>	<u>Name</u>	<u>Source</u>
Ed Kramer & Sons Plain, WI (608) 546-2311	Wender	SE 1/4, Sec 3, T20N, R12W Buffalo County, WI
Wilber Lime Products Rt. 2, Box 204 Arcadia, WI 54612 (608) 323-3308	Dunn	SE 1/4, Sec 14, T20N, R12W Buffalo County, WI
Mathy Construction Co. 915 Commercial Ct. Onalaska, WI 54650 (608) 783-6411	Weaver	SE 1/4, SE 1/4, NE 1/4, Sec 25, T109N, R10W Wabasha County, MN

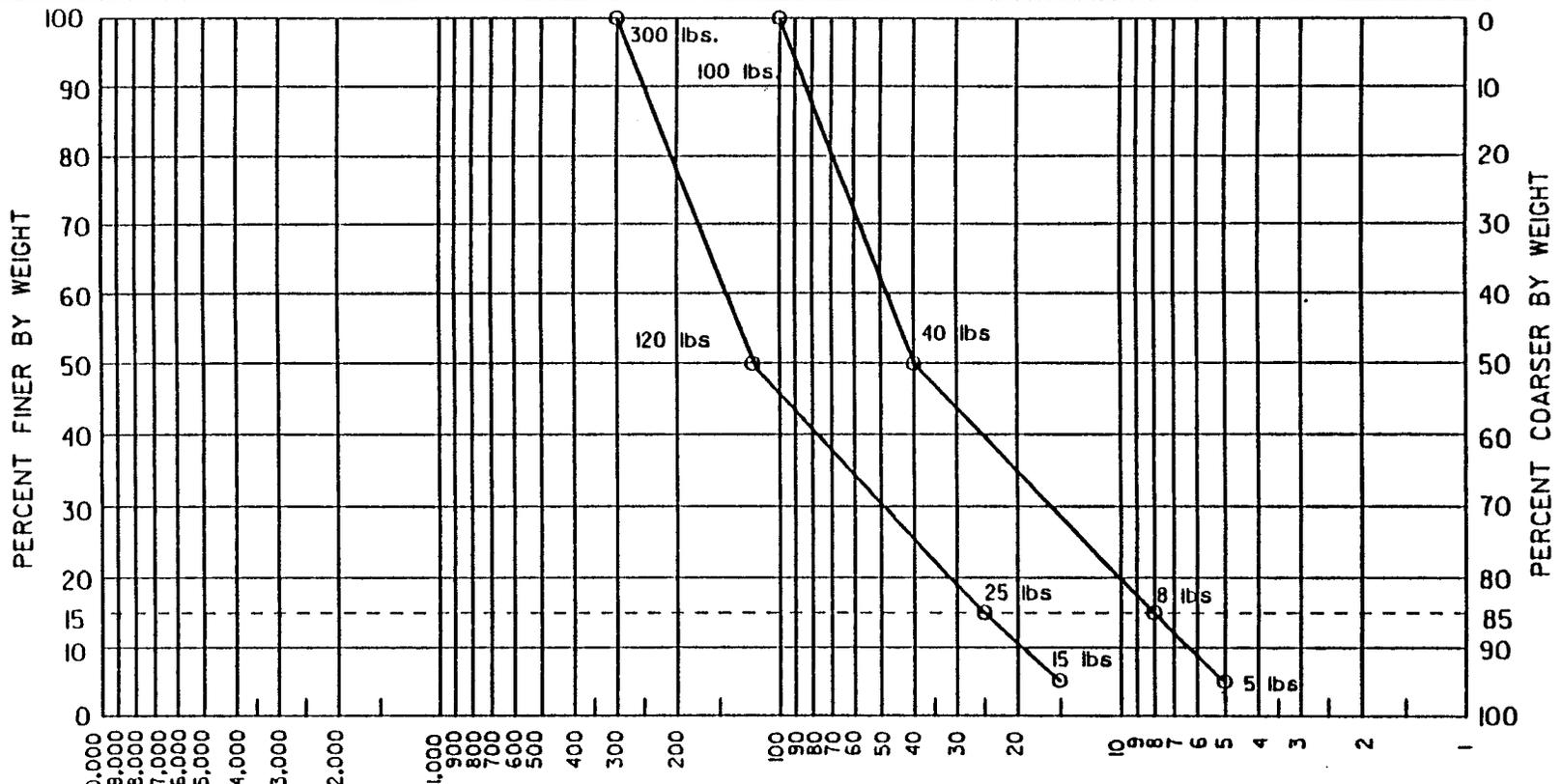
3. FOUNDATION PREPARATION. Foundation areas shall be excavated or filled to the lines and grades shown, or otherwise established, within a tolerance of plus or minus 2 inches for areas above and 3 inches plus or minus for areas below the water line. Filling shall be with earth similar to the adjacent material or with sand fill material, as specified in 20: DIKE CONSTRUCTION, and well compacted.

4. PLACEMENT

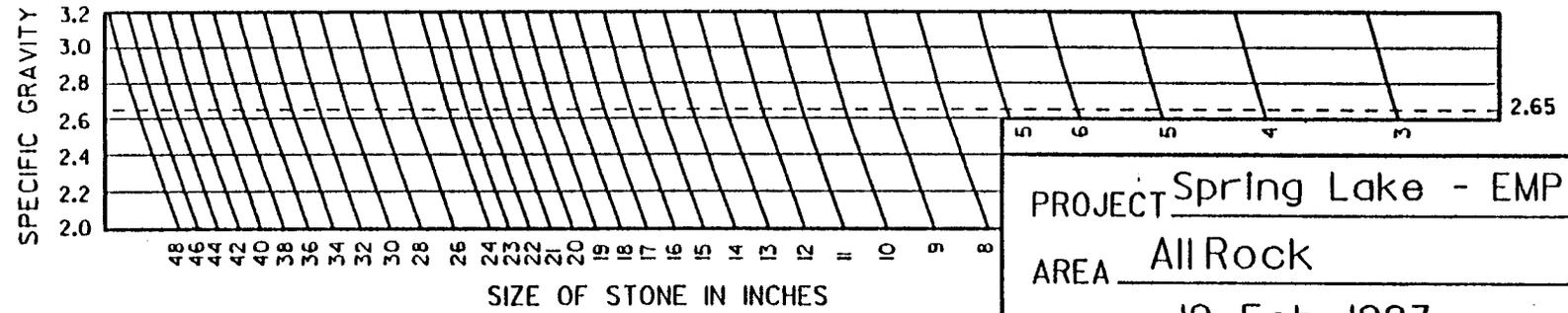
4.1.1 Riprap shall be constructed to the lines and grades shown or established within a tolerance of 6 inches above and 3 inches below the prescribed grade, except either extreme shall not be continuous over an area greater than 200 square feet. Riprap shall be placed to the full surface course thickness in one operation and in such a manner as to avoid displacing the underlying material. Placing riprap in layers shall not be permitted. All riprap shall be placed in such a manner as to produce a mass of unsegregated stone with maximum interlocking and stone to stone contact and a minimum of voids. The finished mass shall be free from pockets of small stones, clusters or larger stones and excessive voids. Placing riprap by dumping into chutes or by similar methods likely to cause segregation shall not be permitted.

4.1.2 Riprap to be placed under water shall meet gradation requirements in the bucket or container used for placing, and shall be placed in a systematic manner directly on the geotextile so as to ensure a continuous uniform layer of well-graded stone of the required thickness. Stone to be placed under water shall not be cast across the surface of the water.

4.2 Placement of Riprap on Geotextile. The geotextile shall be in place prior to placement of the riprap thereon. Placement of the geotextile is specified in 2SS: GEOTEXTILE. The riprap shall be placed on the geotextile with care so as not to rupture the geotextile and shall not be dropped from a height greater than one (1) foot. Riprap placement shall generally be initiated at the toe of the dike slope and progress up the slope towards the dike crest. Stone for riprap shall not be allowed to roll down the geotextile. Riprap in direct contact with the geotextile shall not be pushed, or moved by mechanical equipment.



WEIGHT OF STONES IN POUNDS
(ASSUMING STONE SHAPE MIDWAY BETWEEN A SPHERE AND CUBE)



SPECIFIC GRAVITY OF STONE = 2.65

PROJECT Spring Lake - EMP
 AREA All Rock
 DATE 19 Feb. 1993

RIPRAP GRADATION CURVES

2SS - GEOTEXTILE

1. SCOPE. The work consists of placing geotextile fabric on the dike as a filter under the stone protection.

2. MATERIALS.

2.1 Geotextile. The geotextile shall be a woven or a non-woven pervious sheet of plastic yarn as defined by ASTM D 123. The geotextile shall meet the physical requirements listed in Table No. 1. The geotextile fiber shall consist of a long-chain synthetic polymer composed of at least 85 percent by weight of propylene, ethylene, ester, amide or vinylidene-chloride, and shall contain stabilizers and/or inhibitors added to the base plastic to make the filament resistant to deterioration due to ultra-violet and heat exposure. The edge of the geotextile shall be finished to prevent the outer fiber from pulling away from the geotextile.

2.2 Seams. The seams of the geotextile sections shall be sewn with thread of a material meeting the chemical requirements given above for geotextile yarn or shall be bonded by cementing or by heat. The sheets of geotextile shall be attached at the factory or another approved location, if necessary, to form sections not less than 20 feet wide. Seams shall be tested in accordance with method ASTM D 1683, using 1-inch square jaws and 12 inches per minute constant rate of traverse. The strengths shall be not less than 90 percent of the required tensile strength (Table 1) of the unaged geotextile in any principal direction.

Table No. 1 - Physical Requirements

<u>Physical Property</u>	<u>Test Procedure</u>	<u>Acceptable Values ++</u>
Tensile Strength +(unaged geotextile)	ASTM D 4632 Grab Test Method using 1 inch square jaws and a 12 inches per minute constant rate of traverse.	200 pound minimum in all principal directions.
Breaking Elongation +(unaged geotextile)	ASTM D 4632 Determine Apparent Breaking Elongation	15% minimum in all principal directions.
Puncture Strength +(unaged geotextile)	ASTM D 3787 except polished steel ball replaced with a 5/16-inch diameter solid steel cylinder with a hemispherical tip centered within the ring clamp.	80 pound minimum.
Abrasion Resistance	ASTM D 3884 Rubber-base abrasive wheels equal to CS-17 "Calibrase" by Taber Instrument Co; 1 kilogram load per wheel; 1000 revolutions, determine residual breaking load.	55 pound minimum. Residual Breaking Load in all principal directions.
Apparent Opening Size (AOS)	ASTM D 4751	No finer than the U.S. Standard Sieve No.120 and no coarser than the U.S. Standard Sieve No. 30.
Tear Strength	ASTM D 4533 Trapezoidal Tear strength	30 lb. minimum in all principal directions.

+ Unaged geotextile is defined as geotextile in the condition received from the manufacturer or distributor.

++ All numerical values represent minimum average roll values (i.e., any roll in a lot should meet or exceed the minimum in the table).

3. SHIPMENT AND STORAGE. During all periods of shipment and storage, the geotextile shall be protected from direct sunlight, ultra-violet rays, temperatures greater than 140 degrees fahrenheit, mud, dirt, dust and debris. To the extent possible, the geotextile shall be maintained wrapped in a heavy duty protective covering.

4. INSTALLATION OF THE GEOTEXTILE.

4.1 The geotextile shall be placed in the manner and at the locations shown on the drawings. At the time of installation, the geotextile shall be rejected if it has defects, rips, holes, flaws, deterioration or damage incurred during manufacture, transportation or storage. The surface to receive the geotextile shall be prepared to a relatively smooth condition free of obstructions, depressions, debris and soft or low density pockets of material. Erosion features such as rills, gullies, etc. must be graded out of the surface before geotextile placement. The geotextile shall be placed to provide a minimum width of 36 inches of overlap for each joint and shall be laid smooth and free of tension, stress, folds, wrinkles, or creases. If large areas of geotextile need to be replaced, the geotextile shall be placed so that the upper strip of geotextile will overlap the next lower strip.

4.2 Temporary pinning of the geotextile to help hold it in place until the riprap is placed will not be allowed. The geotextile shall be securely anchored with sand bags or stones to prevent it from moving during placement of riprap.

4.3 The geotextile shall be protected at all times during the installation and should be replaced if any damage occurs during its installation. The work shall be scheduled so that the covering of the geotextile with a layer of the specified material is accomplished within 3 calendar days after placement of the geotextile. The geotextile shall be protected from damage prior to and during the placement of riprap. In no case shall any type of equipment be allowed on the unprotected geotextile.

2Z - TIMBER GUARD POSTS

1. SCOPE. This section covers timber guard posts that are located at the edge of the parking area for the Spring Lake landing where the access road to the peninsula begins.

2. MATERIALS.

2.1 Treated Timber Posts.

2.1.1 Timber guard posts shall meet the requirements of WI/DOT 615.2.2 and shall conform to WI/DOT S.S.D.14C1-2 for timber guard post, except the height of the timber guard post above the finished ground line shall be 2'-6".

2.1.2 Preservative treatment. Timber guard posts shall be full length water-borne pressure treated to refusal with chromated copper arsenate (CCA) type A, B, or C, in accordance with AASHTO M 133 (AWPA Standard P5). Minimum preservative retention for timber guard posts shall be 0.50 pounds per cubic foot of timber. Exposed surfaces of timber that are cut after preservative treatment shall be liberally swabbed with a minimum 3% concentrated solution of preservative in accordance with AASHTO M 133 (AWPA Standard M4).

3. INSTALLATION.

3.1 Five timber guard posts shall be installed perpendicular to the dike control line at the location indicated on the drawings. Posts shall be in a straight line and spaced five feet on center with the center post located on the center of the dike. Timber guard posts shall be installed with a minimum embedment depth of 3'-4" as indicated on WI/DOT S.S.D.14C1-2. Posts shall be set plumb in proper alignment. Backfill material shall meet the requirements of sand fill as specified in SECTION 20: DIKE CONSTRUCTION, and shall be placed in layers not exceeding 9 inches, properly moistened to approximate optimum conditions and each layer compacted by hand tamping, machine tampers, or other suitable equipment to a density equivalent to that of adjacent ground.

APPENDIX E

PROJECT OBJECTIVES AND MONITORING PLAN

Project Objectives and Monitoring Plan

Spring Lake Peninsula Habitat Project Buffalo County, Wisconsin

DESCRIPTION OF PROJECT AREA

Spring Lake is a 300-acre backwater area located on the Wisconsin side of the Mississippi River in pool 5, on the south end of Buffalo City, Wisconsin, within the Upper Mississippi River National Wildlife and Fish Refuge.

DESCRIPTION OF PROJECT

The project included building a 300-foot-long access road and closing a 700-foot-long breach in a peninsula at the upper end of Spring Lake. About 9,000 cubic yards of pervious fill to build the closure was dredged from an upstream slough and from the Spring Lake area adjacent to the closure. Fine sediment dredged from Spring Lake was used for topsoil. Riprap was placed on the upstream side of the closure and rock groins used on the Spring Lake side. A rockfill wedge was also placed along 470 feet of the existing island shoreline.

PROJECT GOALS

The goals are to improve the productivity and habitat conditions for centrarchid fish species and wildlife in Spring Lake. The closure prevents normal flow and associated sediments through the breach in the peninsula to stop the continued degradation of 40 acres of a valuable fishery area.

PROJECT OBJECTIVES AND MONITORING TASKS

The following objectives and monitoring tasks are taken from the final Definite Project Report for the project. The monitoring tasks listed will be the responsibility of the Corps of Engineers. Any additional monitoring conducted by the U.S. Fish and Wildlife Service should be reported to the Corps on an annual basis. The monitoring shown below could be extended to be done tentatively in 2003, 2008, 2023, and 2048 (the authorized program ends in 2002) if funds are made available or if another agency assumes the effort.

Objective 1

Decrease winter flow velocities in about 40 acres of upper Spring Lake to improve centrarchid habitat.

Monitoring Task - Flow velocity measurements 3 times in the upper end of Spring Lake during the winters of 1996-97 and 1998-99.

Objective 2

Maintain summer dissolved oxygen levels in upper Spring Lake at greater than 5 mg/l.

Monitoring Task - Dissolved oxygen monitoring for 6 consecutive days during July or August in 1996 and 1998.

Objective 3

Maintain winter dissolved oxygen levels in upper Spring Lake at greater than 5 mg/l and water temperature greater than 4 degrees C.

Monitoring Task - Dissolved oxygen and temperature monitoring every 2 weeks during safe ice cover conditions in the winters of 1996-97 and 1998-99.

Objective 4

Create additional area 3 to 10 feet deep.

Monitoring Task - Final construction surveys of dredged area. A cursory check of depths in the dredged area in 1999.

Objective 5

Increase area of aquatic plants.

Monitoring Task - None required. However, a cursory investigation of vegetation and extent will be made in 1996 and 1998 and will be documented.

