

US Army Corps  
Of Engineers  
St. Paul District

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# **UPPER MISSISSIPPI RIVER SYTEM**

## **ENVIRONMENTAL MANAGEMENT PROGRAM**

### **OPERATION AND MAINTENANCE MANUAL**

# **POLANDER LAKE STAGE 2 HABITAT REHABILITATION AND ENHANCEMENT PROJECT**

**Pool 5A  
Upper Mississippi River  
Winona County, Minnesota**

**October 2005**

## **PREFACE**

The Polander Lake Stage 2 Habitat Rehabilitation and Enhancement Project, constructed by the Corps of Engineers, was completed in June 2002. In accordance with Section 906(e) of the Water Resources Development Act of 1986, and policies set forth in the Fourth and Fifth Annual Addenda, the U.S. Fish and Wildlife Service has responsibility for the operation and maintenance of project features located on the Upper Mississippi River National Wildlife and Fish Refuge. The Corps of Engineers has prepared this manual to assist the U.S. Fish and Wildlife Service in fulfilling this responsibility.

The manual and appendices contain the latest information pertinent to operation and maintenance of this project. The project as designed and constructed will improve the quality of habitat for a variety of fish and wildlife species in Polander Lake. The planning, design, and construction of the project were the result of a 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  
Army Corps of Engineers Centre, 190 Fifth Street East  
St. Paul, Minnesota 55101-1638

UPPER MISSISSIPPI RIVER SYSTEM  
ENVIRONMENTAL MANAGEMENT PROGRAM

POLANDER LAKE STAGE 2, POOL 5A, UPPER MISSISSIPPI RIVER  
WINONA COUNTY, MINNESOTA

OPERATION AND MAINTENANCE MANUAL

TABLE OF CONTENTS

<u>ITEM</u>	<u>PAGE</u>
PREFACE	
INTRODUCTION	1
PART I - PROJECT FEATURES AND CONSTRUCTION HISTORY	1
AUTHORIZATION AND LOCATION	1
DESCRIPTION OF PROJECT	1
General/Background	1
Design Considerations	2
CONSTRUCTION HISTORY	5
PART II - OPERATION AND MAINTENANCE	6
GENERAL RESPONSIBILITIES AND PROCEDURES	6
Approved Responsibilities	6
Refuge Manager	6
Inspections	6
Annual Report	7

<u>ITEM CONT'D</u>	<u>PAGE</u>
OPERATION	7
MAINTENANCE	7
INSPECTIONS, TESTS, AND OPERATIONS FOLLOWING MAJOR STORMS OR FLOODS	8
PROJECT MONITORING AND EVALUATION	8

#### APPENDICES

- A PROJECT DRAWINGS
- B MEMORANDUM OF AGREEMENT
- C REPLACEMENT SPECIFICATIONS



## **INTRODUCTION**

This manual has been prepared to serve as a guide for the operation and maintenance of the Polander Lake Stage 2 Habitat Rehabilitation and Enhancement Project in Winona County, Minnesota. Operation and maintenance instructions presented are consistent with the general procedures found in the Polander Lake Definite Project Report dated March 1992. (The Polander Lake Stage 1 project was completed in October 1994 and turned over to the U.S. Fish and Wildlife Service for operation and maintenance in September 1995.) This manual has been written for project and management personnel familiar with the project. It does not contain detailed information which is common knowledge to personnel or which is presented in other existing manuals or regulations.

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

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

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

## **PART I - PROJECT FEATURES AND CONSTRUCTION HISTORY**

### **AUTHORIZATION AND LOCATION**

The Polander Lake Stage 2 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). The project is located in the lower portion of pool 5A near Winona, Minnesota. The project lies within the Upper Mississippi River National Wildlife Refuge (Refuge). Project drawings (appendix A) show the location of the project.

The Polander Lake Stage 2 project is located on Federal lands managed as a National Wildlife Refuge. As such, operation and maintenance of those features are to be carried out in compliance with Section 906(e) of the 1986 Water Resources Development Act and policies set forth in the Fourth and Fifth Annual Addenda.

## **DESCRIPTION OF THE PROJECT**

### **General/Background**

The Polander Lake Stage 2 project is designed to restore islands and increase habitat diversity and quality in the lower portion of pool 5A. The primary feature of the project was restoration of about 9,000 linear feet of islands/peninsulas forming a complex covering about 70 acres. Two main islands form the perimeter of the complex, with three smaller peninsulas located within the interior of the complex. The Definite Project Report/Environmental Assessment (SP-14), Polander Lake Habitat Rehabilitation and Enhancement Project, March 1992, provides details on the habitat goals and objectives of the project.

### **Design Considerations**

Islands - The islands were designed to serve a number of functions. The most important of these are to restore habitat diversity within Polander Lake and to reduce the effects of wind and wave action within the lake. All of the islands contribute to improving habitat diversity. Exterior islands 3 and 4 form the basic outline of the complex. The interior "islands" (1, 2, and 3) primarily serve the function of increasing habitat diversity within the interior of the complex. (It should be noted that under the original design, these interior features were separate islands and were labeled as such. In the final design they were connected to the main islands and have become peninsulas. However, the "island" nomenclature was retained in the construction documents and is used in this manual for consistency purposes.)

A number of considerations went into the basic island cross section. Island width is necessary to provide the mass to withstand river forces and insure the islands do not breach or erode away during the 50-year project life. However, excessive width was undesirable from the perspective of cost control. Total island width for the two exterior islands ranges from 150 to 175 feet, depending upon island height. These were considered to be the minimum widths necessary to insure stable islands. The interior islands range in total width from 75 to 100 feet. Because they were constructed to lower elevations and protected by the exterior islands, they could be constructed with smaller widths.

The bases of the islands (to about 6 inches above the normal summer water surface elevation) were constructed of granular fill (sand) with the requirement that not more than 5 percent of the material would pass a No. 200 sieve. The majority of the sand was obtained from the Wild's Bend dredged material containment site in conjunction with a St. Paul District project involving unloading of that site. Some of the sand fill came from the alternate borrow site in the eastern corner of Polander Lake. The purpose of using the alternate borrow site was to provide additional deepwater habitat for fish.

The random fill placed above the sand had no special grain size requirement. This material was either sand obtained from the Wild's Bend site or random material from the alternative borrow site.

Topsoil (fine fill) for the islands was placed in a 1-foot layer. The fine fill had the requirement that no less than 40 percent of the material had to pass a No. 200 sieve. The purpose of this requirement was to insure sufficient fine material content for good vegetation growth. This material was obtained from the paddlefish channel (see later discussion).

Island heights varied for a number of reasons. The exterior islands (3 and 4) were constructed to a minimum elevation of 656.0, the elevation of the 5-year flood event. Sections of the islands were constructed to elevation 658.0 to provide drier conditions suitable for the growth of different types of vegetation to increase habitat diversity. The interior islands were constructed to elevations 654.0 or 654.5.

The interior and exterior edges of the islands consist of sand berms 20 to 30 feet wide and constructed about 2 feet above normal summer water elevations. These sand berms are designed to be sacrificial in the sense that some erosion is expected, as wave action will erode this material and create a stable beach zone. Erosion of the islands is controlled by rock groins. The end result should be a relatively stable scalloped shoreline.

Rock bank protection was used to protect the ends of the islands. A round end design was used. Low rock breakwaters were placed in two locations off the northwest side of Island 4 to protect areas exposed to long wind fetches from the northwest.

Islands 3 and 4 contain short sections that are all granular fill material on their interior slopes to provide sand substrate for turtle nesting.

Interior Islands – Interior Islands 1, 2, and 3 were designed as loops attached to the main islands. The purpose was to create low areas within the loops that would be protected shallow aquatic habitat, providing additional habitat diversity within the complex. The loop of Interior Island 1 was filled with fine material to within approximately 6 inches of summer pool elevation, while the loops of the other two interior islands were not filled. The purpose was to provide a variety of habitat conditions.

Paddlefish Channel – When identifying potential borrow sites, it was identified that construction access dredging would be needed to access the lower ends of Islands 3 and 4 with marine equipment, and that this access dredging would provide some of the fill needed for island construction. It was known that paddlefish (a species of special concern) used the deeper water habitats on the easterly and westerly sides of Polander Lake. It was decided to extend the access channel entirely across the shallow area downstream of the island complex to provide a deepwater connection across the lake for fish passage. In addition, this provided additional material needed for the construction of the islands.

Island 5 – At the beginning of construction, the contractor began constructing Island 4 in the wrong location. The mistake was discovered a short time after construction began, but already a small sand island had been formed. Rather than have the contractor remove this sand, it was decided to shape and protect it to form a small island at or near normal summer pool elevation to create a semi-protected sand flat for use by wading and shorebirds. It is hoped that

eventually wetland vegetation will colonize this site

Vegetation – The Polander Lake islands were designed to provide a variety of habitat conditions. About two-thirds of Island 4 and one-third of Island 3 were planted to trees and shrubs. The majority of the tree plantings consisted of green ash (*Fraxinus pennsylvanica*), silver maple (*Acer saccharinum*), and cottonwood (*Populus deltoides*). In some limited reaches where the island elevations were higher, a tree mix of bur oak (*Quercus macrocarpa*), swamp white oak (*Q. bicolor*), and hackberry (*Celtis occidentalis*) was planted. Shrub species consisting of red osier dogwood (*Cornus stolonifera*), indigobush (*Amorpha fruticosa*), buttonbush (*Cephalanthus occidentalis*), nannyberry (*Viburnum lentago*), winterberry (*Ilex verticillata*), and chokecherry (*Prunus virginiana*) were planted in various portions of the islands.

About one-third of island 4, two-thirds of island 3, nearly all of interior island 1, about one-half of interior island 2, and all of interior island 3 were planted to grasses and forbs to create open habitat. The predominant seed mix consisted of Canada wildrye (*Elymus canadensis*), switchgrass (*Panicum virgatum*), Indiangrass (*Sorghastrum nutans*), big bluestem (*Andropogon gerardi*), prairie cordgrass (*Spartina pectinata*), bluejoint reedgrass (*Calamagrostis canadensis*), black-eyed susan (*Rudbeckia hirta*), Maximilian sunflower (*Helianthus maximiliani*), prairie clovers (*Petalostemum* sp.). In a few locations of higher elevation, side-oats grama (*Bouteloua curtipendula*), little bluestem (*Andropogon scoparius*), sand dropseed (*Sporobolus cryptandrus*), horsemint (*Monarda punctata*), and partridgepea (*Chamaecrista fasciculata*) were added to the mix in place of switchgrass, big bluestem, prairie cordgrass, and bluejoint reedgrass.

About a 450 foot section of interior island 3 (stations 1+50 to 6+00) was left unseeded as a test of what natural revegetation would take place in the absence of seeding.

## CONSTRUCTION HISTORY

The contract for the Polander Lake Stage 2 project was awarded in July 1999 to J.F. Brennan Co., Inc., P.O. Box 2557, 820 Bainbridge St., La Crosse, Wisconsin 54602-2557.

Construction began in May 2000 and was substantially completed in November 2000. The spring of 2001 saw the second largest flood of record in this reach of the Upper Mississippi River. There was some minor erosion damage to the islands. In addition, the prolonged duration of the high water (until late June) prevented the designated seeding and planting. A cover crop was seeded for temporary erosion protection.

The repair of the 2001 flood damage was completed in the spring of 2002 along with the seeding and plantings. Due to a mistake by the contractor pertaining to the source of some of the tree plantings, final tree plantings will be conducted by the U.S. Fish and Wildlife Service in 2003.

The approximate construction cost of the Polander Lake Phase II project was \$1,795,846. Approximate material quantities were as follows:

Island sand fill	191,090 yd <sup>3</sup>
Island random fill	29,000 yd <sup>3</sup>
Island fine fill	30,560 yd <sup>3</sup>
Island groins/slope protection rock	11,690 tons

## **PART II - OPERATION AND MAINTENANCE**

### **GENERAL RESPONSIBILITIES AND PROCEDURES**

#### **Approved Responsibilities**

Operation and maintenance responsibilities for the Polander Lake Stage 2 project were originally outlined in the Definite Project Report for the project. The acceptance of these responsibilities was formally recognized by an agreement signed by the U.S. Fish and Wildlife Service (USFWS) and the St. Paul District, Corps of Engineers. This agreement, dated November 4, 1993 is contained in appendix B. The capability of the USFWS to carry out the responsibilities described below will be contingent upon the passage of sufficient appropriations by Congress.

#### **District Manager**

Typically, the USFWS operation and maintenance responsibility for habitat projects located within the Refuge is given to the District Manager in charge of the Refuge District where the project is located. For the Polander Lake Stage 2 project, the current address for the District Manager is 51 East 4<sup>th</sup> Street, Winona, Minnesota 55987. Hereafter, for the purposes of this manual, when describing responsibilities, etc., the term "District Manager" will be used.

#### **Inspections**

The District Engineer or his representative will be kept informed on operation and maintenance activities for the Polander Lake project through periodic inspection of the project by the Corps and through review of an annual report submitted by the USFWS. A representative of the Corps will coordinate the periodic inspection in advance with the USFWS. The first inspection will occur within 5 years after project completion. Subsequent inspections will occur at 5-year intervals. After the first 10 years of project operation, the Corps and the USFWS will jointly review the inspection plans and make any appropriate revisions.

The findings of the periodic 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 condition. Any agreed upon remedial work should be completed as soon as possible by the USFWS as provided in the Memorandum of Agreement between the USFWS and the Corps.

An inspection of the project should be made by the District Manager (or a designated representative) once a year as a minimum. The frequency for inspection will be subject to review by the USFWS and 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. No special inspections are required after high water events as they occur on an almost annual basis. The annual inspections should be sufficient to reveal any problems or damage caused by high water events.

## **Annual Report**

An annual report covering inspection of the habitat project shall be submitted to the St. Paul District, attn: Project Management Branch, at the end of the calendar year. The report should briefly summarize the condition of the project and any maintenance or repairs required during the reporting period.

## **OPERATION**

There are no operational requirements associated with the Polander Lake Stage 2 project.

## **MAINTENANCE**

The U.S. Fish and Wildlife Service will maintain the project as necessary for the project to function properly and provide the benefits for which it was designed. Because of the relatively straightforward nature of the project, no maintenance instructions are considered necessary.

Pertinent sections of the construction specification are contained in appendix C to be used as applicable in procuring replacement rock or other materials.

## **INSPECTIONS, TESTS, AND OPERATIONS FOLLOWING MAJOR STORMS OR FLOODS**

As stated in the Memorandum of Agreement between the USFWS and the Corps, the Corps will be responsible for any mutually agreed upon repair and rehabilitation of the Polander Lake Stage 2 project that may be needed as a result of a specific storm or flood.

Should inspection of the project area following a major flood or natural disaster disclose substantial damage to the project, the Corps and USFWS will meet and discuss the appropriate course of action in light of original project design. 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.

## **PROJECT MONITORING AND EVALUATION**

Performance monitoring of the Polander Lake Stage 2 project will be conducted by the Corps of Engineers to help determine the extent to which the design meets the habitat improvement objectives. 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.



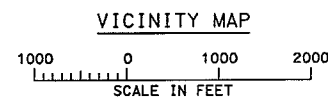
## **APPENDIX A**

### **PROJECT DRAWINGS**

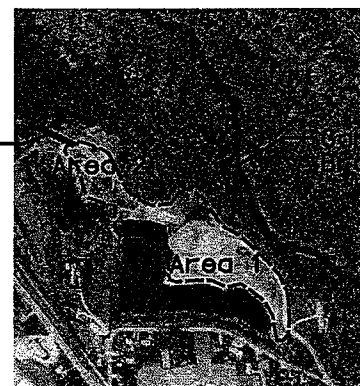


PHOTO TAKEN 5 MAY 1992

PHOTO TAKEN 7 MAY 1992



Effluent Discharge



Mathy Pit #2 Placement Site

**PRIMARY VERTICAL CONTROL BENCHMARK**

VERTICAL CONTROL MON. D-4: ELEV 663.838  
DESCRIBED FIELD BOOK MSA-SPS1, FEB. 1953:  
BUFFALO COUNTY, WIS., ON DAM #5A BASE LINE,  
BETWEEN C.B. & Q. RR TRACKS AND DAM #5A STORAGE YARD.  
A STANDARD CORP OF ENGINEERS BRASS CAP.

THE NAMES BELOW INDICATE THE OFFICIALS THAT ORIGINALLY SIGNED THE SET OF DRAWING.  
THIS DRAWING HAS SINCE BEEN REVISED AND REPLOTED, AND NEW SIGNATURES WERE NOT OBTAINED.

THE PROJECT WAS DESIGNED BY THE ST. PAUL DISTRICT OF THE U.S. ARMY CORPS OF ENGINEERS. THE INITIALS OR SIGNATURES AND REGISTRATION DESIGNATIONS OF INDIVIDUALS APPEAR ON THESE PROJECT DOCUMENTS WITHIN THE SCOPE OF THEIR EMPLOYMENT AS REQUIRED BY 16A 110-1-8.52. SIGNATURES INDICATE OFFICIAL RECOMMENDATION OF ALL DRAWINGS IN THIS SET.

**APPROVAL RECOMMENDED BY:**

**ALLEN L. GEISEN**  
CHIEF ED-D BRANCH

**ROBERT G. ENGELSTAD**  
CHIEF ED-H BRANCH

**JOHN J. BAILEN**  
CHIEF ENGINEERING DIVISION

APPROVED BY:  
**JOHN W. WEIDNER, CPT. EN, DDE**  
DISTRICT COMMANDER

**JEFFREY L. HANSEN**

PROJECT ENGINEER

**MICHAEL S. DAHLQUIST**

CHIEF COST ENGINEERING & SPECIFICATIONS SECTION

**JAMES B. MOSNER**

CHIEF GENERAL ENGINEERING SECTION

**N/A**

CHIEF STRUCTURAL ENGINEERING SECTION

**GREG M. FRANKOSKY**

CHIEF ARCHITECTURAL SECTION

**DAVID W. RYDEEN**

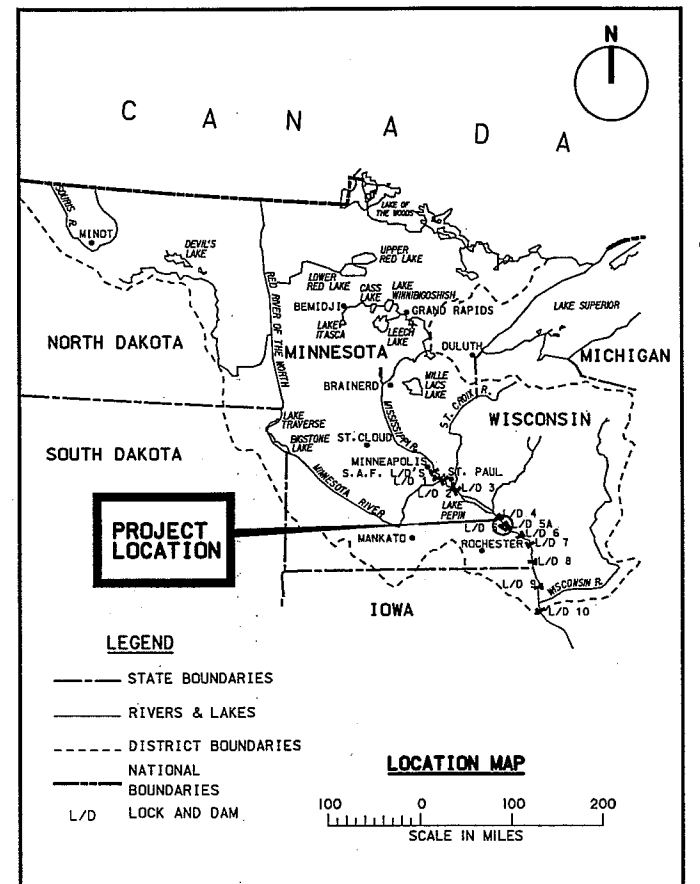
CHIEF GEOTECHNICAL AND GEOLOGY SECTION

**PATRICK M. FOLEY**

CHIEF HYDRAULICS SECTION

**KENT J. PETERSON**

CHIEF HYDROLOGY SECTION



**LEGEND**

- DISPOSAL SITES
- ALTERNATIVE FINE FILL BORROW SITE
- OLD McNALLY LANDING
- MINNESOTA CITY BOAT CLUB
- VERCHOTA LANDING

**NOTES:**

- PROPOSED HYDRAULIC DREDGING PIPELINE LOCATION TO BE COORDINATED WITH C.D.R..
- RIPRAP AND ROCK CAN BE LOADED AT FOUNTAIN CITY PLACEMENT SITE #5A-731.9-LWP.
- SURVEY CONTROL:
  - A. HORIZONTAL CONTROL IS BASED ON MINNESOTA STATE PLANE GRID SYSTEM, SOUTH ZONE 2203, NAD 27.
  - B. VERTICAL CONTROL IS N.G.V.D. (1912 ADJ.)
- RIGHT-OF-WAY

PROJECT ENGINEER		AS-BUILT AS OF DECEMBER 2002	
SYMBOL	DESCRIPTION	DATE	APPROVAL
AS-BUILT			
AE APPROVING OFFICIAL:		US Army Corps of Engineers St. Paul District	
DESIGNED: DMT/JJF		AS-BUILT	
CHECKED: GVF/DWR		POLANDER LAKE STAGE 2 - WILDS BEND EXCAVATION	
DRAWN: DMT		ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE	
DESIGNED: SMG		MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA	
CHECKED: JSH		ISLAND CONSTRUCTION	
DATE: 20 MAY 1999		LOCATION AND VICINITY MAP	
CAD FILE NAME: CM410000.DGN		DRAWING NUMBER	
SOL NO. DACW37-99-B-0006		M-PSA-00/001	
		SHT 1 OF 39	

AS-BUILT

CIVIL/SITE DRAWINGSLANDSCAPE

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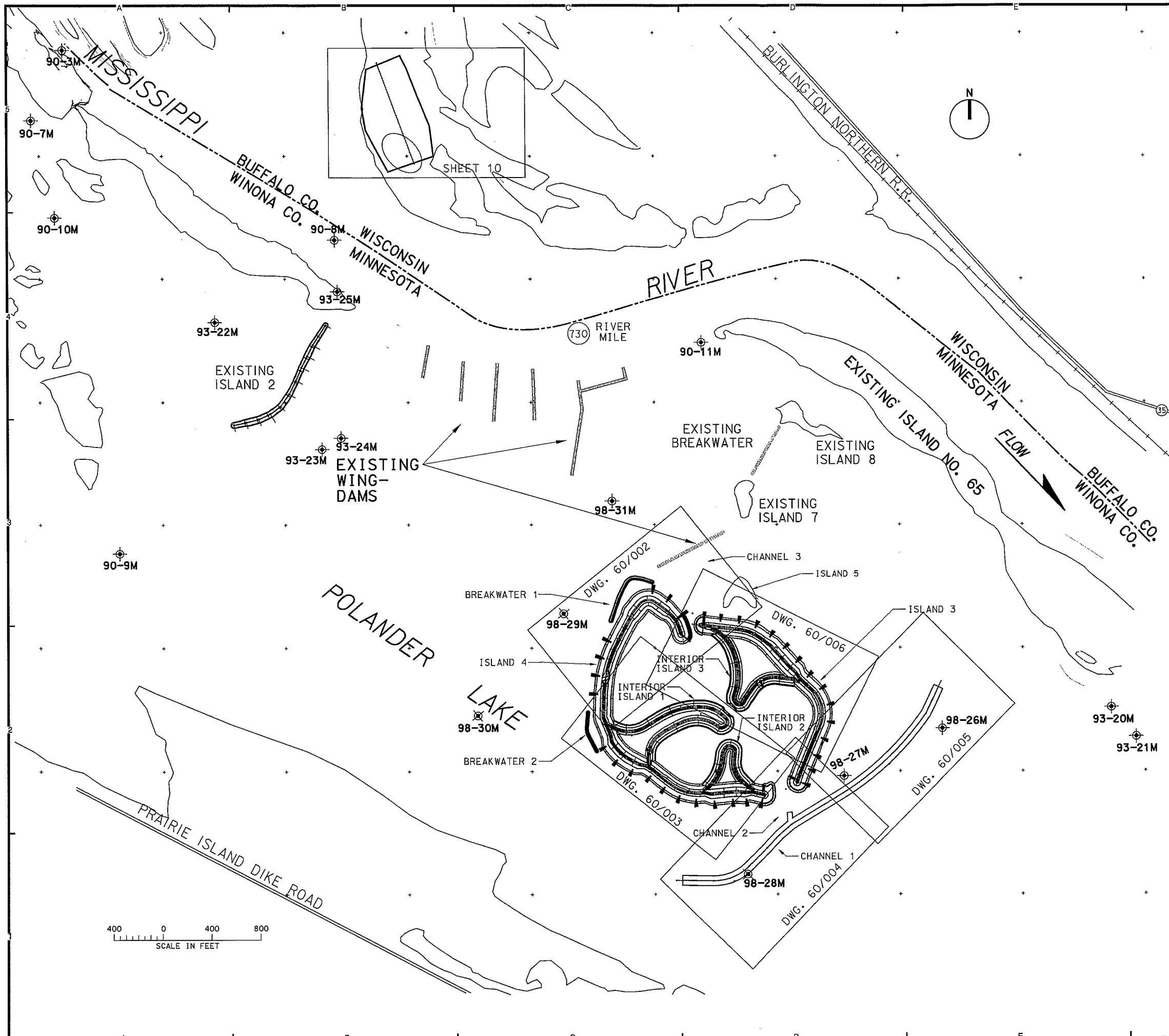
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## ABBREVIATIONS

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AC DUL H

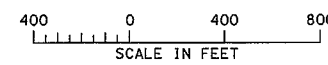


GROIN LOCATION	
1V ON 4H END SLOPE 1V ON 1.5H SIDE SLOPES	
GROIN NUMBER	ISLAND 4 STATION
1	1+25.00
2	2+72.00
3	3+80.00
4	8+58.00
5	9+98.00
6	11+34.00
7	12+73.00

GROIN LOCATION	
1V ON 1.5H END SLOPE 1V ON 1.5H SIDE SLOPES	
GROIN NUMBER	ISLAND 4 STATION
8	16+78.00
9	18+04.00
10	19+38.00
11	21+05.00
12	22+51.00
13	23+76.00
14	24+98.00
15	26+41.00
16	27+92.00
17	29+03.00
18	30+31.00

GROIN LOCATION	
1V ON 1.5H END SLOPE 1V ON 1.5H SIDE SLOPES	
GROIN NUMBER	ISLAND 3 STATION
19	34+50.00
20	35+75.00
21	36+97.00
22	38+48.00
23	39+78.00
24	40+92.00
25	42+19.00
26	43+48.00

GROIN LOCATION	
1V ON 1.5H END SLOPE 1V ON 1.5H SIDE SLOPES	
GROIN NUMBER	ISLAND 3 STATION
27	44+97.00
28	46+55.00
29	47+97.00
30	49+22.00
31	50+44.00
32	51+94.00
33	53+27.00



AS-BUILT AS OF DECEMBER 2002		DATE	APPROVAL
SYMBOL	DESCRIPTION	DATE	APPROVAL
AE APPROVING OFFICIAL:		AS-BUILT	
DESIGNED: DMT/JJF		POLANDER LAKE STAGE 2 - WILDS BEND EXCAVATION	
CHECKED: GVF/DWR		ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE	
DRAWN: DMT		MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA	
DESIGNED: SMG		ISLAND CONSTRUCTION	
CHECKED: JSH		SITE MAP	
DATE: 20 MAY 1999		CAD FILE NAME: CM110001.DGN	DRAWING NUMBER: M-P5A-10/010
		SOL NO: DACW37-99-B-0006	OF 39

HORIZONTAL CONTROL POINTS - ISLAND 3 & 4 BASELINE											
P.I. POINT	NORTH AZIMUTH	DISTANCE (FT)	COORDINATES		STATIONING			CURVE DATA			
			NORTH	EAST	P.C.	P.I.	P.T.	Δ	R	L	T
1	N 18°33'25" W	64.90	406111.720	2607215.540		0+00.00					
3	N 44°08'18" W	46.42	406109.590	2607005.290	0+64.90	1+10.3	1+54.19	25°34'53"	-200.00	89.30	45.40
5	N 53°39'41" W	139.47	406282.187	2607116.490		2+00.61					
7	S 39°10'27" W	91.98	406289.92	2606949.030	3+40.09	4+28.59	4+81.57	87°09'52"	-93.00	141.48	88.51
10	S 28°45'47" W	190.80	406277.356	2606818.833		5+73.55					
11	S 25°56'32" W	149.61	406110.100	2606727.024		7+64.35					
12	S 20°37'05" W	98.09	405975.568	2606661.576		9+13.96					
13	S 15°09'15" W	90.41	405883.759	2606627.034		10+12.05					
14	S 9°07'49" W	51.56	405796.495	2606603.400		11+02.46					
15	S 6°37'15" W	102.49	405745.590	2606595.220		11+54.01					
16	S 1°30'51" W	206.42	405643.783	2606583.402		12+56.50					
17	S 21°51'10" E	157.08	405437.440	2606577.948		14+62.92					
274	S 9°40'41" E	53.61	405291.647	2606636.417		16+20.00					
9	S 33°02'28" E	13.94	405238.803	2606645.429		16+73.61					
19	S 62°14'28" E	75.18	405445.210	2606988.34	16+87.55	17+91.74	18+91.40	29°12'00"	-400.00	203.85	104.19
42	S 79°14'55" E	52.20	405056.234	2606888.567		19+66.58					
21	S 62°50'46" E	24.55	405046.496	2606919.852		20+18.78					
284	S 57°39'26" E	41.79	405035.294	2606941.692		20+43.33					
22	S 51°11'01" E	110.12	405012.937	2606976.999		20+85.12					
23	S 53°27'02" E	78.61	404943.911	2607062.800		21+95.24					
43	N 85°34'21" E	21.75	405198.350	2607349.270	22+73.84	24+13.96	25+42.04	40°58'37"	-375.00	268.19	140.12
275	S 77°43'39" E	52.20	404826.151	2607399.903		25+63.79					
25	N 84°10'52" E	171.88	404815.055	2607450.911		26+15.99					
27	S 80°31'36" E	2.67	404414.640	2607664.480	27+87.87	28+44.25	28+99.96	15°17'32"	420.00	112.10	56.38
278	N 84°49'40" E	48.79	404828.478	2607736.242		29+02.63					
277	S 78°06'18" E	28.16	404832.876	2607784.830		29+51.42					
276	S 76°09'36" E	297.76	404827.072	2607812.384		29+79.58					
45	N 19°42'16" E	258.60	404755.844	2608101.504		32+77.34					
30	N 22°47'59" E	391.82	404999.302	2608188.696		35+35.94					
33	N 47°24'33" W	126.76	405465.140	2608091.630	39+27.76	41+17.55	42+58.61	70°12'32"	-270.00	330.85	189.79
279	N 31°45'28" W	55.60	405749.697	2608181.031		43+85.37					
32	N 47°22'30" W	76.65	405796.976	2608151.765		44+40.98					
35	N 42°19'19" W	227.13	405848.880	2608095.369		45+17.62					
36	N 53°22'40" W	90.74	406016.816	2607942.441		47+44.76					
37	N 54°36'21" W	25.85	406070.943	2607869.618		48+35.49					
281	N 83°33'40" W	163.34	405800.600	2607645.830	48+61.34	49+51.71	50+38.22	28°57'19"	-350.00	176.88	90.37
283	N 83°42'09" W	216.87	406166.709	2607522.772		52+01.55					
41			406190.498	2607307.207		54+18.43					

HORIZONTAL CONTROL POINTS - INTERIOR ISLAND 1 BASELINE											
P.I. POINT	NORTH AZIMUTH	DISTANCE (FT)	COORDINATES		STATIONING			CURVE DATA			
			NORTH	EAST	P.C.	P.I.	P.T.	Δ	R	L	T
38	S 66°33'12" E	96.32	405380.181	2608600.911		0+00.00	11				
40	N 58°35'30" E	129.83	405571.210	2606788.750	0+96.32	11	2+26.06	11	3+35.67	11	54°51'18"
56	N 60°34'09" E	37.21	405425.505	2607029.843		4+65.50	11				
57	S 88°19'48" E	11.60	404921.220	2607357.080	5+02.72	11	6+69.68	11	8+28.40	11	31°08'02"
50	S 49°19'08" E	43.58	405270.730	2607378.870	8+40.00	11	2+26.06	11	10+10.22	11	39°00'40"
61	S 71°06'20" W	17.55	405397.790	2607545.550	10+53.80	11	11+32.41	11	11+48.38	11	120°25'28"
68	N 54°08'42" W	30.63	405368.450	2607537.030	11+65.93	11	11+65.93	11	11+85.04	11	54°44'58"
63	S 66°12'33" W	48.60	405147.290	2607339.420	12+15.67	11	13+73.31	11	15+01.95	11	59°38'45"
52	S 62°23'46" W	116.78	405379.319	2607184.011		15+50.55	11				
65	S 54°52'23" W	65.68	405325.207	2607080.521		16+67.34	11				
54	S 0°07'25" E	99.31	405132.020	2607136.130	17+33.01	11	18+31.91	11	19+15.39	11	54°59'48"
55			405032.302	2606946.344		20+14.70	11				

HORIZONTAL CONTROL POINTS - INTERIOR ISLAND 2 BASELINE											
P.I. POINT	NORTH AZIMUTH	DISTANCE (FT)	COORDINATES		STATIONING			CURVE DATA			
			NORTH	EAST	P.C.	P.I.	P.T.	Δ	R	L	T
70			404825.260	2607388.390		0+00.00 12					
72	N 43°48'23" E	73.75	405138.070	2607168.810	0+73.75 12	1+97.67 12	3+13.13 12	36°34'28"	-375.00	239.38	123.93
79	N 7°13'55" E	58.81	405149.202	2607548.229		3+71.94 12					
75	N 28°21'18" E	35.61	405159.170	2607604.740	4+07.55 12	4+46.56 12	4+71.83 12	81°50'44"	45.00	64.28	39.01
81	S 69°47'58" E	14.11	405168.370	2607623.160	4+85.94 12	5+09.01 12	5+25.27 12	75°07'44"	30.00	39.34	23.07
83	S 5°19'46" W	75.10	405072.230	2607845.19	6+00.37 12	6+96.10 12	7+78.94 12	51°09'18"	-200.00	78.56	95.73
78	S 45°49'32" E	145.32	404827.519	2607810.054		9+24.26 12					

HORIZONTAL CONTROL POINTS - CHANNEL 3A					
P.I. POINT	NORTH AZIMUTH	DISTANCE (FT)	COORDINATES		STATIONING
			NORTH	EAST	P.C. P.I.
285	S 24°54'15" E	358.79	406578.358	2607328.980	0+00.00 C3A
286			406252.932	2607480.067	3+58.79 C3A

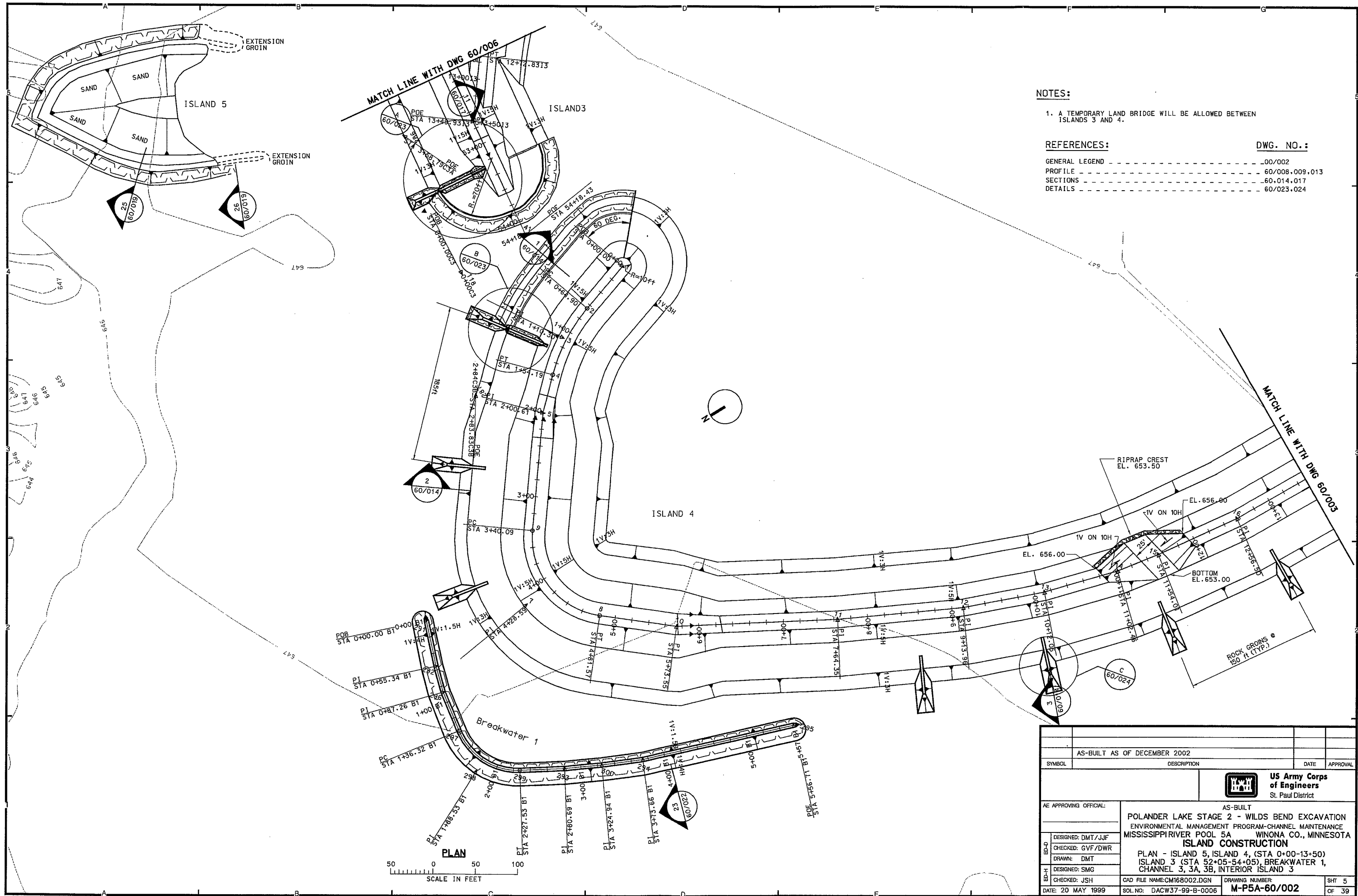
HORIZONTAL CONTROL POINTS - CHANNEL 3B					
P.I. POINT	NORTH AZIMUTH	DISTANCE (FT)	COORDINATES		STATIONING
			NORTH	EAST	P.C. P.I.
285	S 32°47'47" W	283.83	406578.358	2607328.980	0+00.00 C3B
287			406339.770	2607175.242	2+83.83 C3B

HORIZONTAL CONTROL POINTS - INTERIOR ISLAND 3 BASELINE											
P.I. POINT	NORTH AZIMUTH	DISTANCE (FT)	COORDINATES		STATIONING			CURVE DATA			
			NORTH	EAST	P.C.	P.I.	P.T.	Δ	R	L	T
29			405734.959	2608196.045		0+00.00	13				
47	N 83°06'30" W	214.35	405760.680	2607983.240		2+14.35	13				
87	S 86°51'50" W	20.67	405539.880	2607974.640	2+35.02	13	3+42.56	13	4+35.07	13	52°06'00"
85	S 34°45'50" W	98.11	405584.722	2607737.966		5+33.18	13				
96	S 29°30'03" W	30.66	405577.730	2607688.050	5+63.85	13	6+18.04	13	6+38.64	13	107°08'09"
99	N 43°21'48" W	6.92	405596.500	2607697.840	6+45.56	13	6+80.69	13	7+09.12	13	60°41'29"
98	N 17°19'40" E	61.37	405672.951	2607658.840		7+70.49	13				
93	N 10°23'04" E	15.25	405778.080	2607169.780	7+85.74	13	9+12.96	13	10+34.89	13	28°33'02"
102	N 18°09'58" W	24.38	405848.010	2607304.700	10+59.27	13	11+69.49	13	12+72.83	13	34°57'40"
95	N 53°07'38" W	77.10	406174.259	2607453.038		13+49.93	13				

HORIZONTAL CONTROL POINTS - CHANNEL 1														
P.I. POINT	NORTH AZIMUTH	DISTANCE (FT)	COORDINATES		STATIONING			CURVE DATA						
			NORTH	EAST	P.C.	P.I.	P.T.	Δ	R	L	T			
89	S 89°22'26" E	304.60	404114.228	2607171.101		0+00.00	CI							
112			404510.880	2607480.080	3+04.60	CI	4+71.57	CI	6+20.95	CI	45°18'50"	-400.00	316.35	166.97
105	N 45°18'43" E	213.46	404376.610	2607913.110				8+34.41	CI					
106	N 43°10'07" E	143.52	404481.288	2608011.301				9+77.93	CI					
107	N 49°00'31" E	130.51	404566.896	2608109.812				11+08.44	CI					
114	N 58°57'03" E	429.87	404788.611	2608478.091				15+38.31	CI					
	N 58°19'18" E	58.13												
110	N 36°02'19" E	59.38	406759.440	2607330.220	15+96.44	CI	20+45.48	CI	24+83.16	CI	22°16'59"	-2280.00	886.72	449.03
109	N 25°27'32" E	289.23	405466.059	2609208.807			25+42.54	CI						
111			405727.206	2609333.138			28+31.77	CI						

HORIZONTAL CONTROL POINTS - CHANNEL 2					
P.I. POINT	NORTH AZIMUTH	DISTANCE (FT)	COORDINATES		STATIONING
			NORTH	EAST	P.C. P.I.
116	N 3°30'23" W	311.70	404543.437	2608082.589	0+00.00 C2
117			404854.551	2608063.526	3+11.70 C2

HORIZONTAL CONTROL POINTS - CHANNEL 3					
P.I. POINT	NORTH AZIMUTH	DISTANCE (FT)	COORDINATES		STATIONING
			NORTH	EAST	P.C. P.I.
118	N 4°04'51" E	515.76	406279.119	2607307.630	0+00.00 C3
119			406793.574	2607344.334	5+



NOTES:

1. A TEMPORARY LAND BRIDGE WILL BE ALLOWED BETWEEN ISLANDS 3 AND 4.

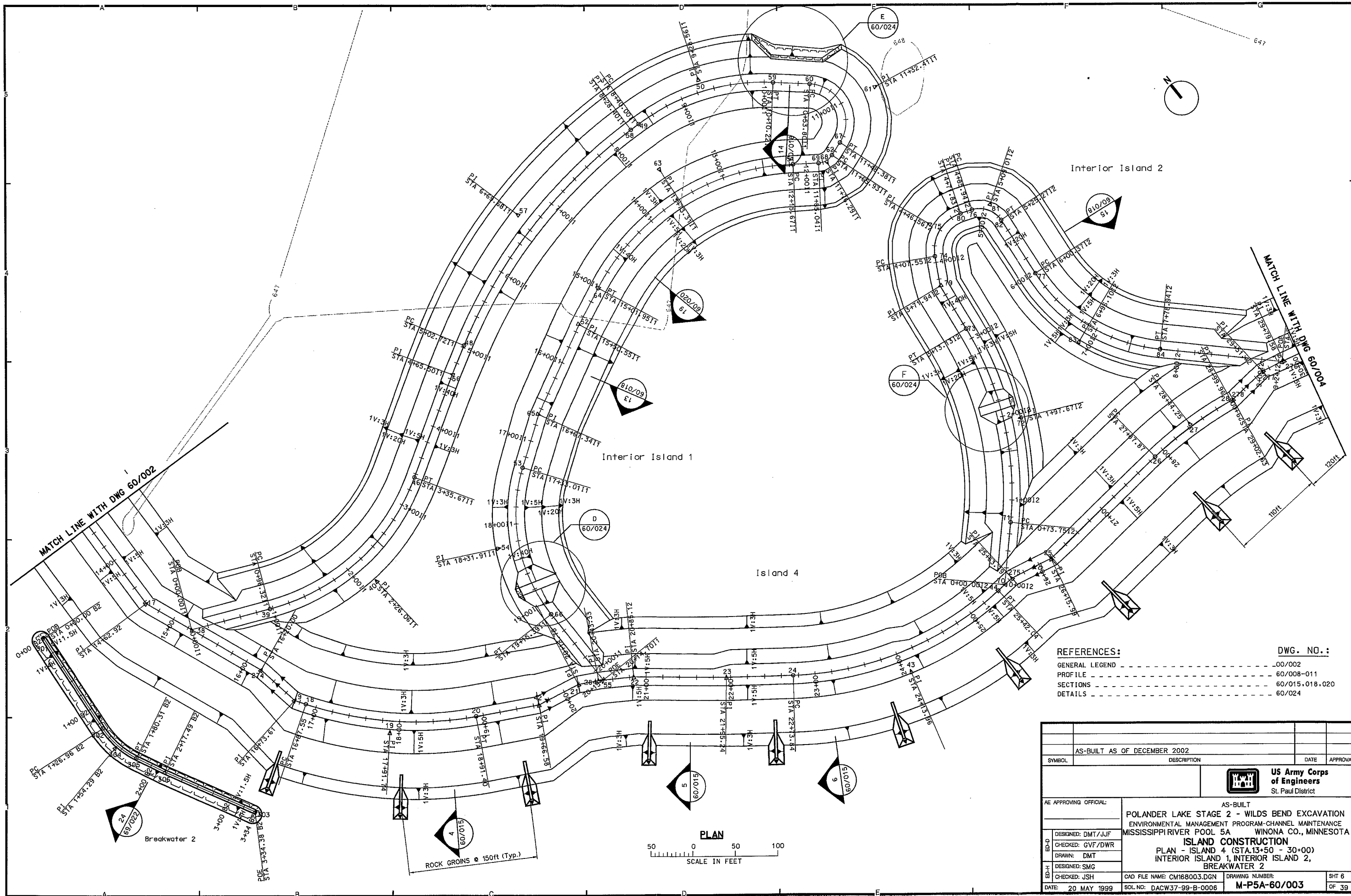
REFERENCES:

GENERAL LEGEND	DWG. NO.:
PROFILE	60/008,009,013
SECTIONS	60,014,017
DETAILS	60/023,024

AS-BUILT AS OF DECEMBER 2002		DATE	APPROVAL
SYMBOL	DESCRIPTION	DATE	APPROVAL
AE APPROVING OFFICIAL:		US Army Corps of Engineers St. Paul District	
AS-BUILT		POLANDER LAKE STAGE 2 - WILDS BEND EXCAVATION ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA ISLAND CONSTRUCTION PLAN - ISLAND 5, ISLAND 4, (STA 0+00-13+50) ISLAND 3 (STA 52+05-54+05), BREAKWATER 1, CHANNEL 3, 3A, 3B, INTERIOR ISLAND 3	
DESIGNED: DMT/JJF	CHECKED: GVF/DWR	DRAWN: DMT	DESIGNED: SMG
CHECKED: JSH	CAD FILE NAME: CM168002.DGN	DRAWING NUMBER:	SHT 5
DATE: 20 MAY 1999	SOL NO: DACW37-99-B-0006	M-P5A-60/002	OF 39

AS-BUILT

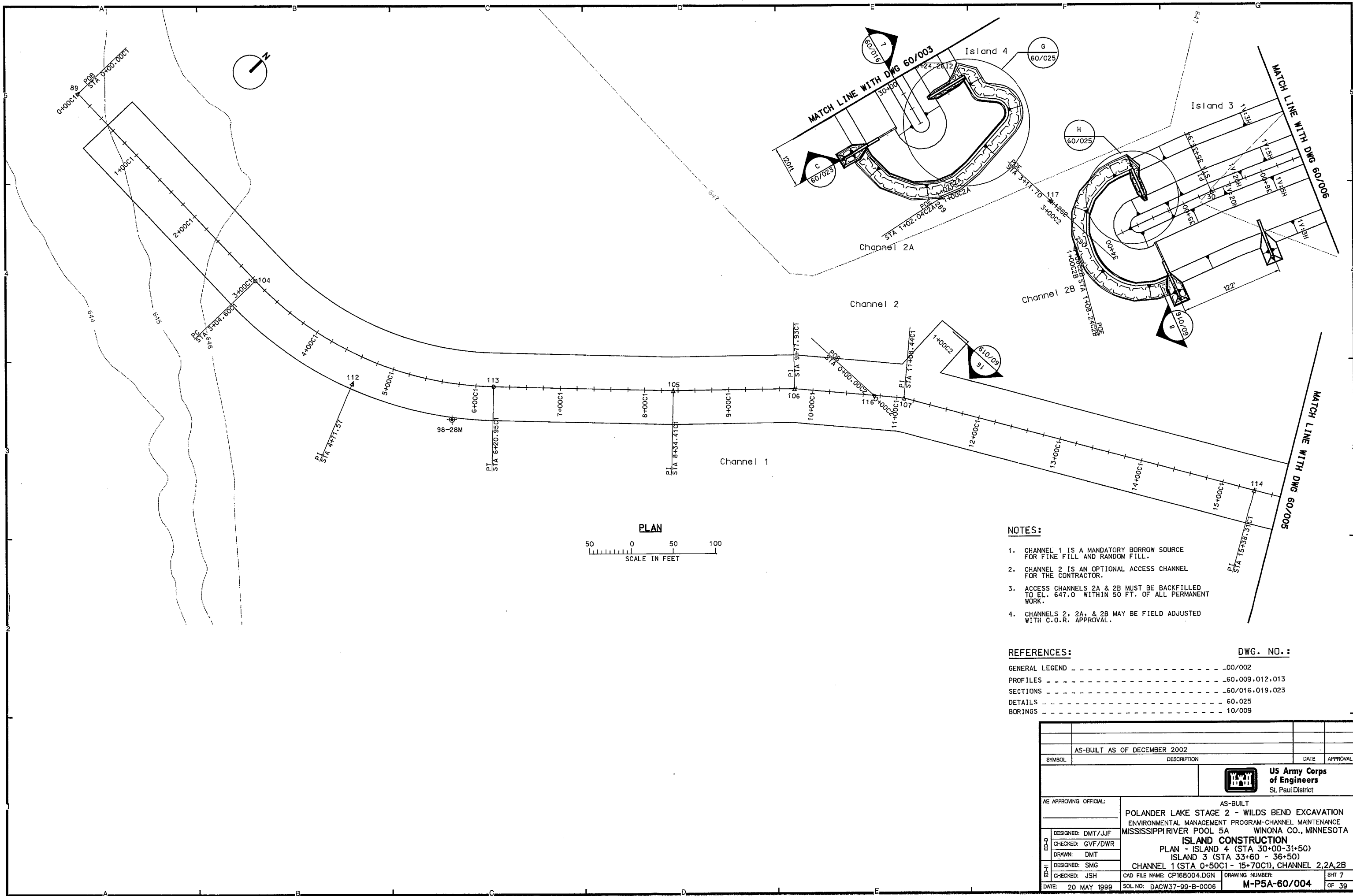




REFERENCES:		DWG. NO.:
GENERAL LEGEND	-----	00/002
PROFILE	-----	60/008-011
SECTIONS	-----	60/015, 018, 020
DETAILS	-----	60/024

AS-BUILT AS OF DECEMBER 2002		DATE	APPROVAL
SYMBOL		DESCRIPTION	
AE APPROVING OFFICIAL:		<b>US Army Corps of Engineers</b> St. Paul District	
DESIGNED: DMT/JJF		AS-BUILT	
CHECKED: GVF/DWR		POLANDER LAKE STAGE 2 - WILDS BEND EXCAVATION	
DRAWN: DMT		ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE	
DESIGNED: SMG		MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA	
CHECKED: JSH		ISLAND CONSTRUCTION	
DATE: 20 MAY 1999		PLAN - ISLAND 4 (STA.13+50 - 30+00)	
CAD FILE NAME: CM168003.DGN		INTERIOR ISLAND 1, INTERIOR ISLAND 2,	
SOL NO: DACW37-99-B-0006		BREAKWATER 2	
DRAWING NUMBER:		SHT 6	
M-P5A-60/003		OF 39	

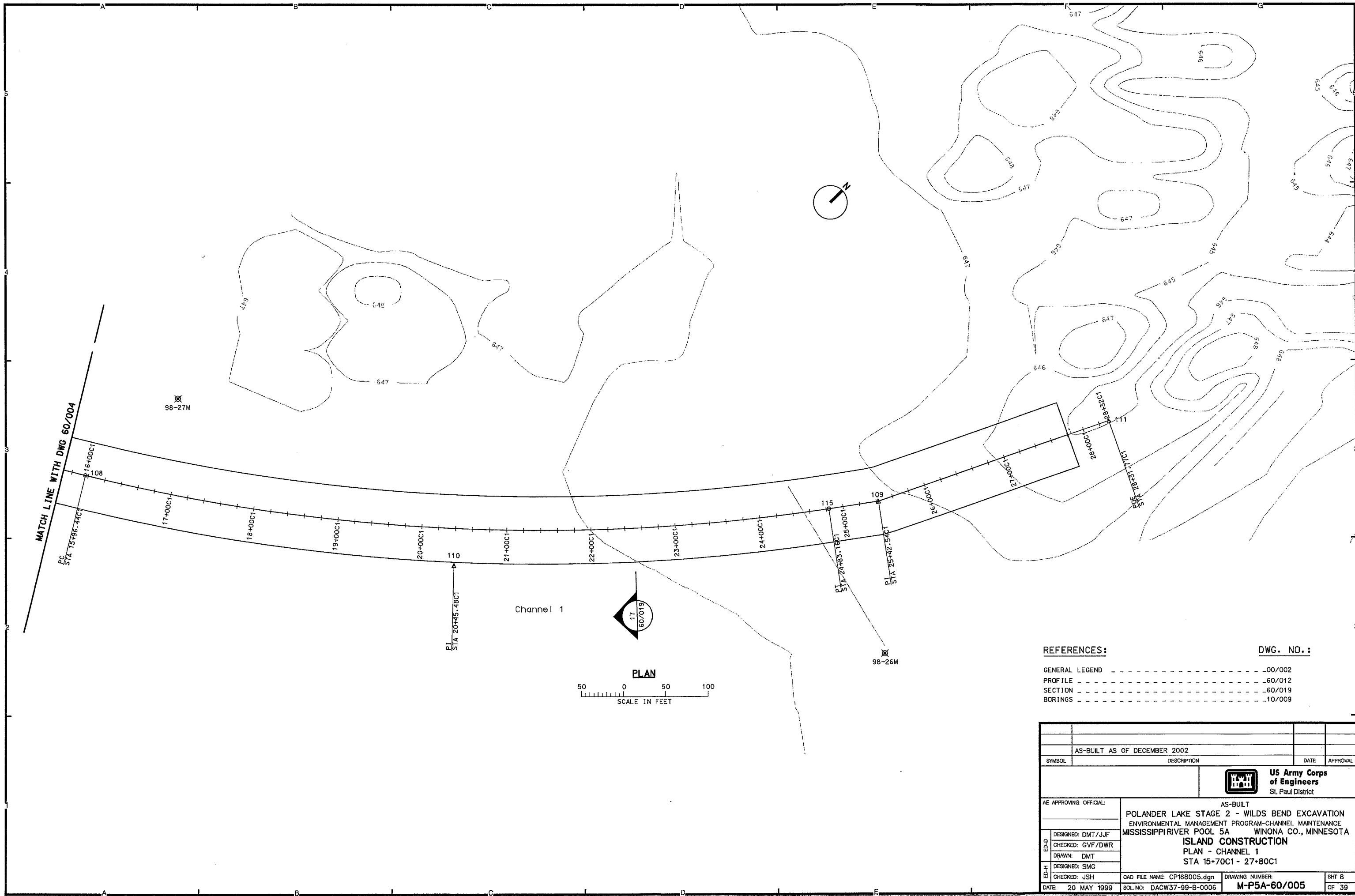
AS-BUILT



- NOTES:**
- 1. CHANNEL 1 IS A MANDATORY BORROW SOURCE FOR FINE FILL AND RANDOM FILL.
  - 2. CHANNEL 2 IS AN OPTIONAL ACCESS CHANNEL FOR THE CONTRACTOR.
  - 3. ACCESS CHANNELS 2A & 2B MUST BE BACKFILLED TO EL. 647.0 WITHIN 50 FT. OF ALL PERMANENT WORK.
  - 4. CHANNELS 2, 2A, & 2B MAY BE FIELD ADJUSTED WITH C.O.R. APPROVAL.
- REFERENCES:**
- |                |       |                  |
|----------------|-------|------------------|
| GENERAL LEGEND | ----- | ..00/002         |
| PROFILES       | ----- | ..60,009,012,013 |
| SECTIONS       | ----- | ..60/016,019,023 |
| DETAILS        | ----- | 60,025           |
| BORINGS        | ----- | 10/009           |
- DWG. NO.:**

AS-BUILT AS OF DECEMBER 2002		DATE	APPROVAL
SYMBOL	DESCRIPTION	DATE	APPROVAL
AE APPROVING OFFICIAL:		AS-BUILT	
DESIGNED: DMT/JJF		POLANDER LAKE STAGE 2 - WILDS BEND EXCAVATION	
CHECKED: GVF/DWR		ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE	
DRAWN: DMT		MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA	
DESIGNED: SMG		ISLAND CONSTRUCTION	
CHECKED: JSH		PLAN - ISLAND 4 (STA 30+00-31+50)	
CAD FILE NAME: CP168004.DGN		ISLAND 3 (STA 33+60 - 36+50)	
DRAWING NUMBER:		CHANNEL 1 (STA 0+50C1 - 15+70C1), CHANNEL 2, 2A, 2B	
DATE: 20 MAY 1999	SOL NO: DACW37-99-B-0006	M-P5A-60/004	SHT 7 OF 39



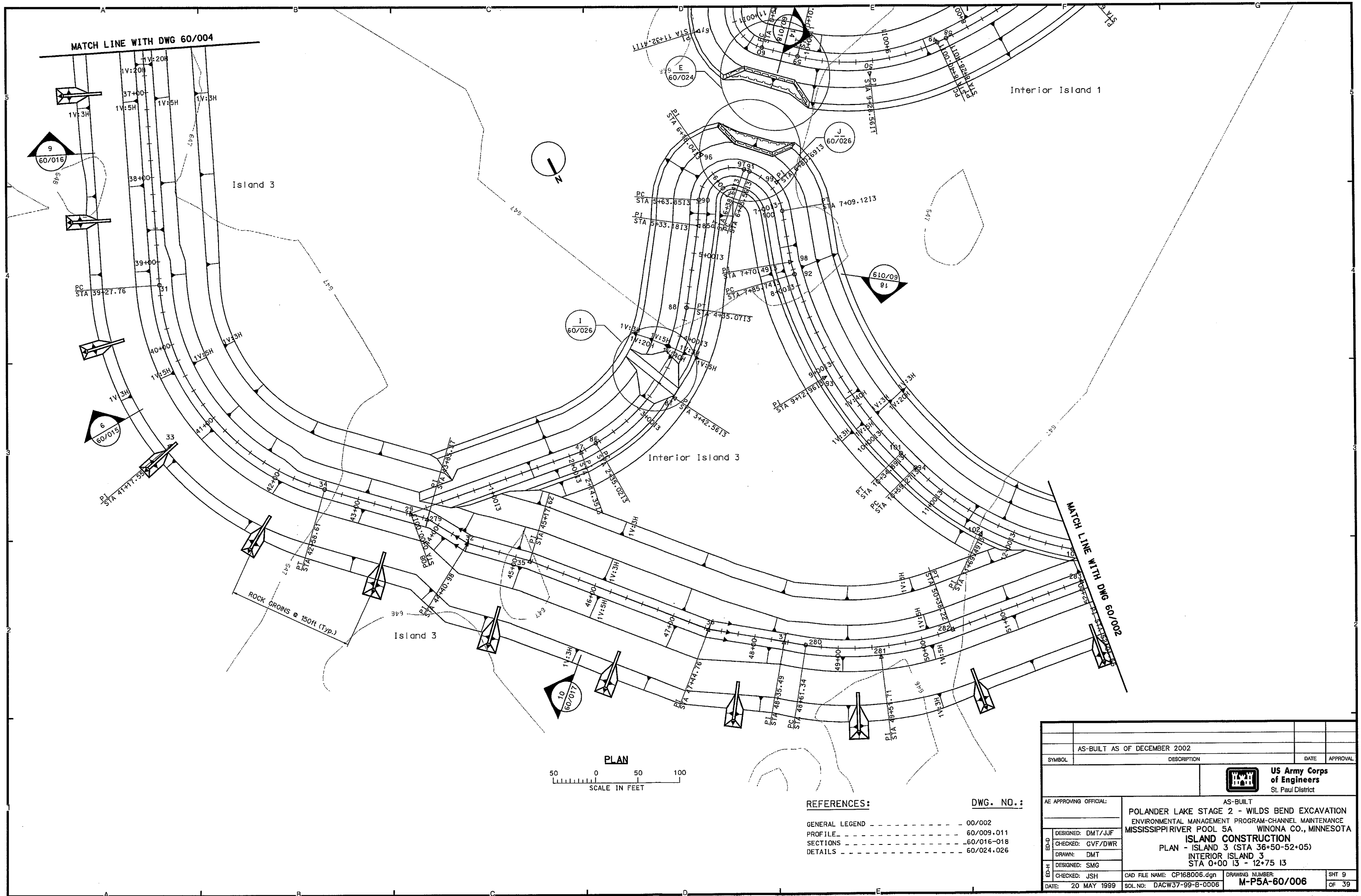


REFERENCES:

DWG. NO.:

GENERAL LEGEND	-----	00/002
PROFILE	-----	60/012
SECTION	-----	60/019
BORINGS	-----	10/009

AS-BUILT AS OF DECEMBER 2002		DATE	APPROVAL
SYMBOL		DESCRIPTION	
AE APPROVING OFFICIAL:		US Army Corps of Engineers St. Paul District	
DESIGNED: DMT/JJF		AS-BUILT	
CHECKED: GVF/DWR		POLANDER LAKE STAGE 2 - WILDS BEND EXCAVATION	
DRAWN: DMT		ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE	
DESIGNED: SMG		MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA	
CHECKED: JSH		ISLAND CONSTRUCTION	
DATE: 20 MAY 1999		PLAN - CHANNEL 1	
CAD FILE NAME: CP168005.dgn		STA 15+70C1 - 27+80C1	
SOL NO: DACW37-99-B-0006		DRAWING NUMBER: M-P5A-60/005	
		SHT 8 OF 39	



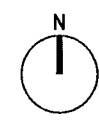
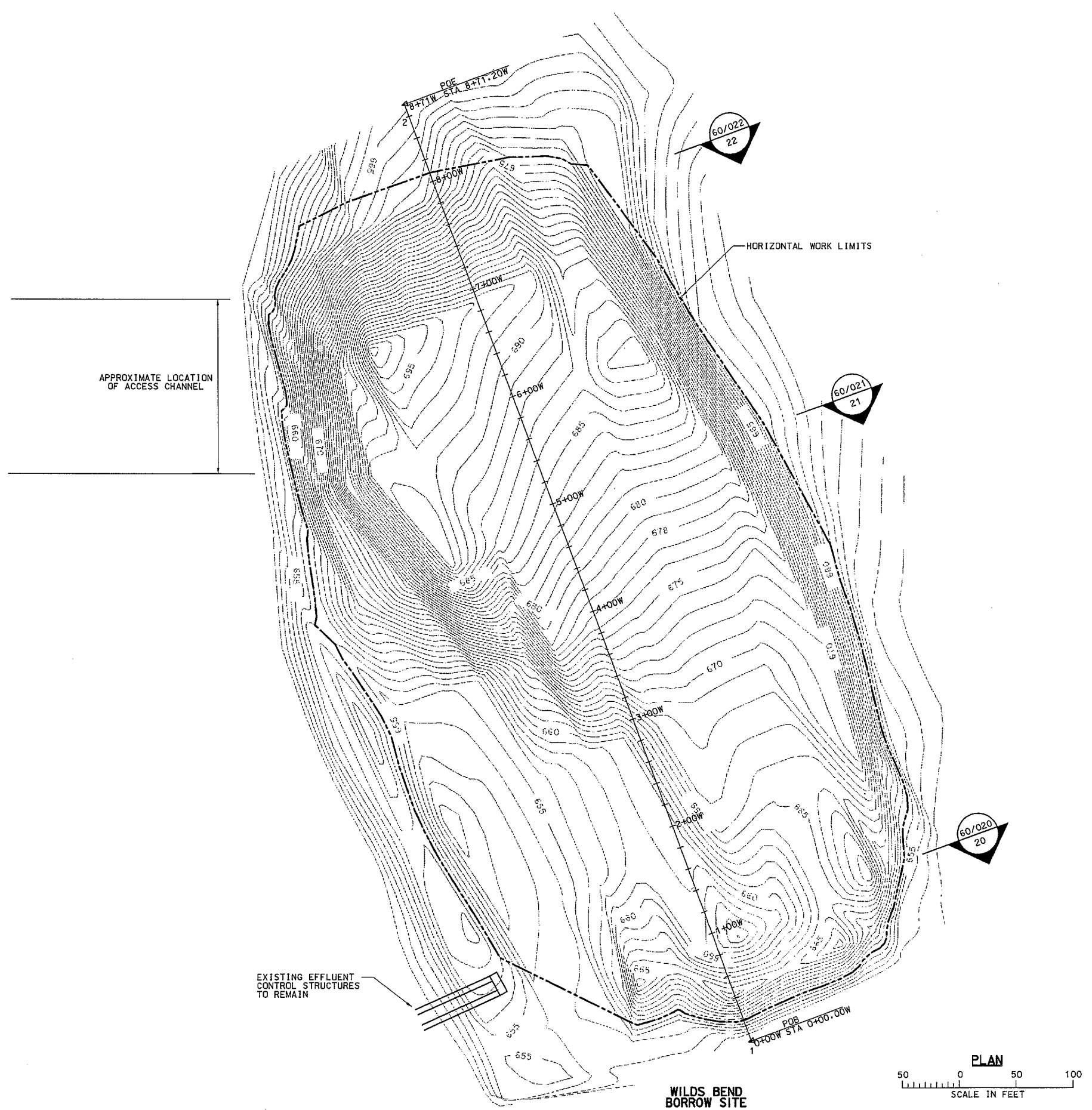
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SCALE IN FEET

REFERENCES: DWG. NO.:

GENERAL LEGEND	00/002
PROFILE	60/009.011
SECTIONS	60/016-018
DETAILS	60/024,026

AS-BUILT AS OF DECEMBER 2002		DATE	APPROVAL
SYMBOL	DESCRIPTION	DATE	APPROVAL
AE APPROVING OFFICIAL:		AS-BUILT	
DESIGNED: DMT/JJF		POLANDER LAKE STAGE 2 - WILDS BEND EXCAVATION	
CHECKED: GVF/DWR		ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE	
DRAWN: DMT		MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA	
DESIGNED: SMG		ISLAND CONSTRUCTION	
CHECKED: JSH		PLAN - ISLAND 3 (STA 36+50-52+05)	
DATE: 20 MAY 1999		INTERIOR ISLAND 3	
SOL NO: DACW37-99-B-0006		STA 0+00 I3 - 12+75 I3	
DRAWING NUMBER: M-P5A-60/006		SHT 9 OF 39	

AS-BUILT



**NOTES:**

- 1. TOPOGRAPHY SURVEYED JANUARY 1997.

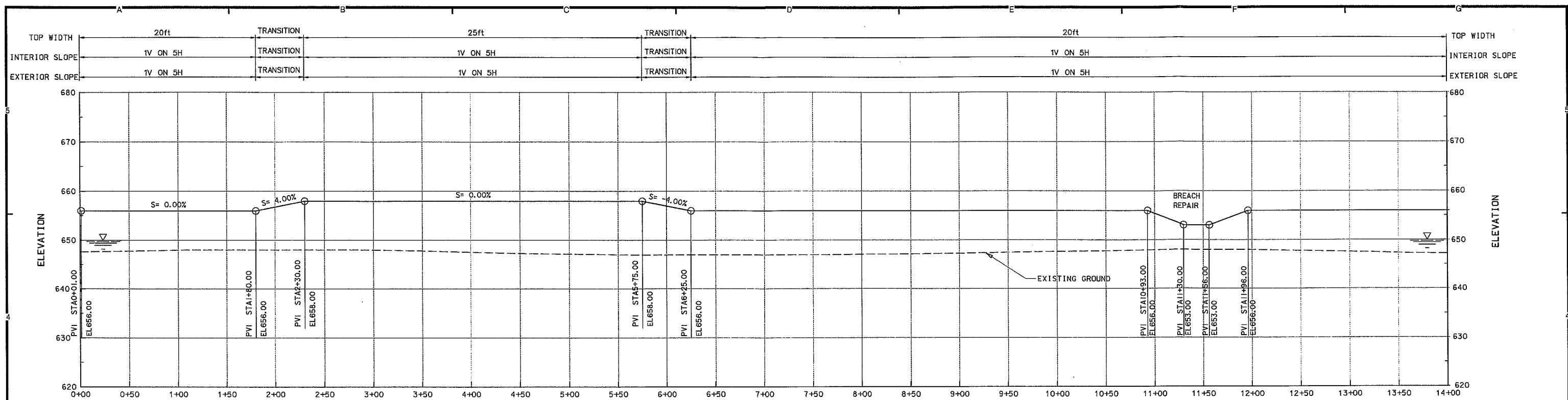
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PROFILE	-----	60/020-022
SECTIONS	-----	60/013

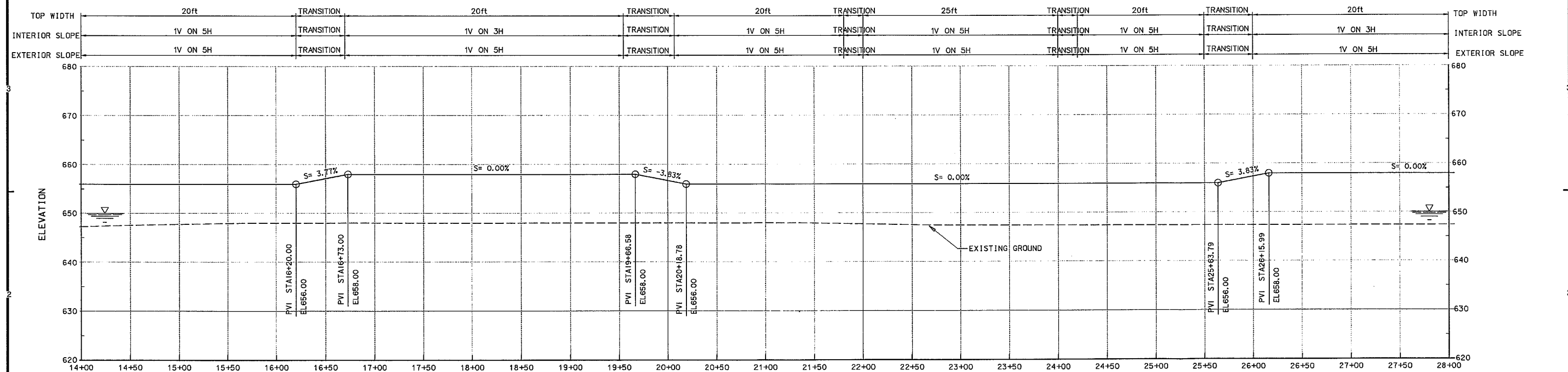
**DWG. NO.:**

AS-BUILT AS OF DECEMBER 2002		DATE	APPROVAL
SYMBOL		DESCRIPTION	
AE APPROVING OFFICIAL:		AS-BUILT	
DESIGNED: DMT/JJF		POLANDER LAKE STAGE 2 - WILDS BEND EXCAVATION	
CHECKED: GVF/DWR		ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE	
DRAWN: DMT		MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA	
DESIGNED: SMG		ISLAND CONSTRUCTION	
CHECKED: JSH		PLAN - WILDS BEND	
DATE: 20 MAY 1999		CAD FILE NAME: CP168007.dgn	DRAWING NUMBER: M-P5A-60/007
		SOL NO: DACW37-99-B-0006	SHT 10 OF 39

AS-BUILT

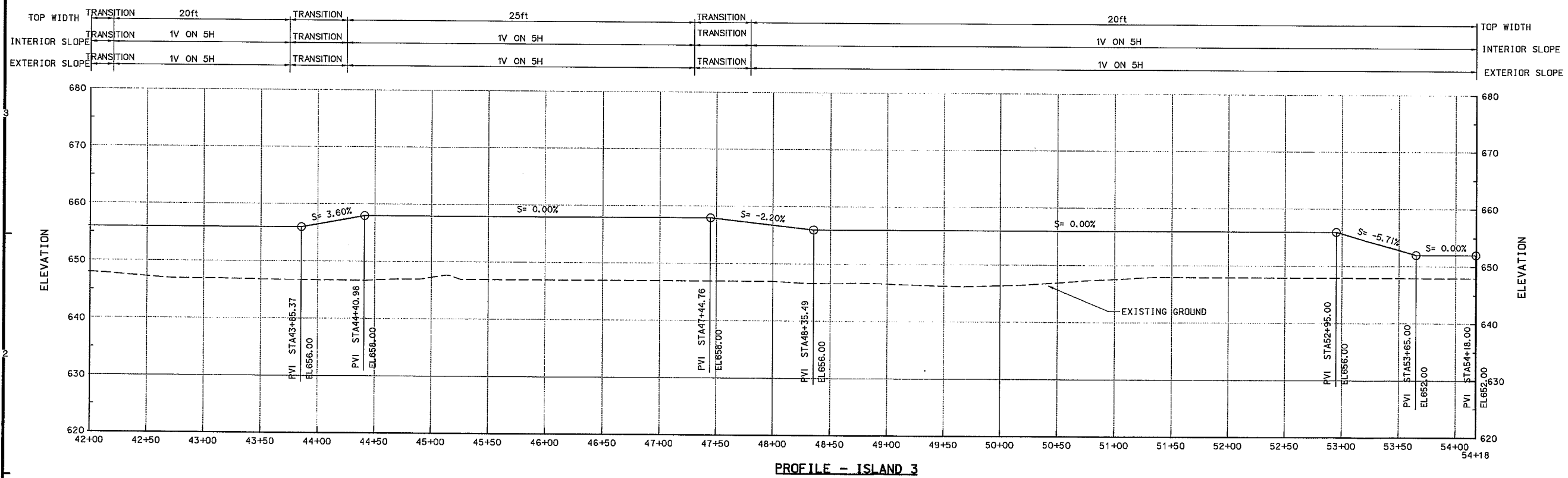
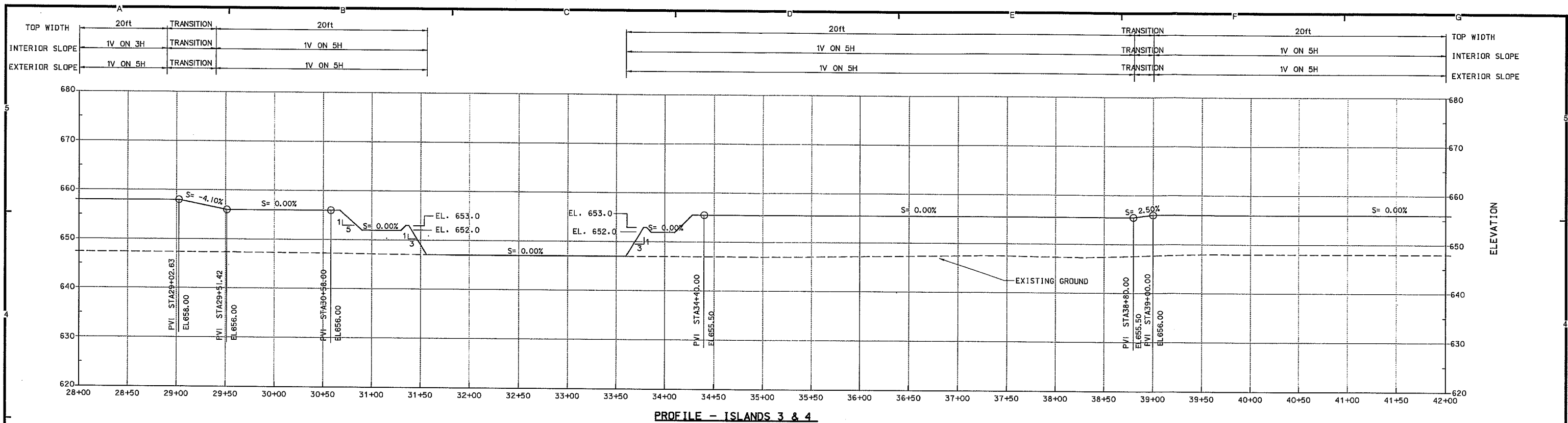



PROFILE - ISLAND 4

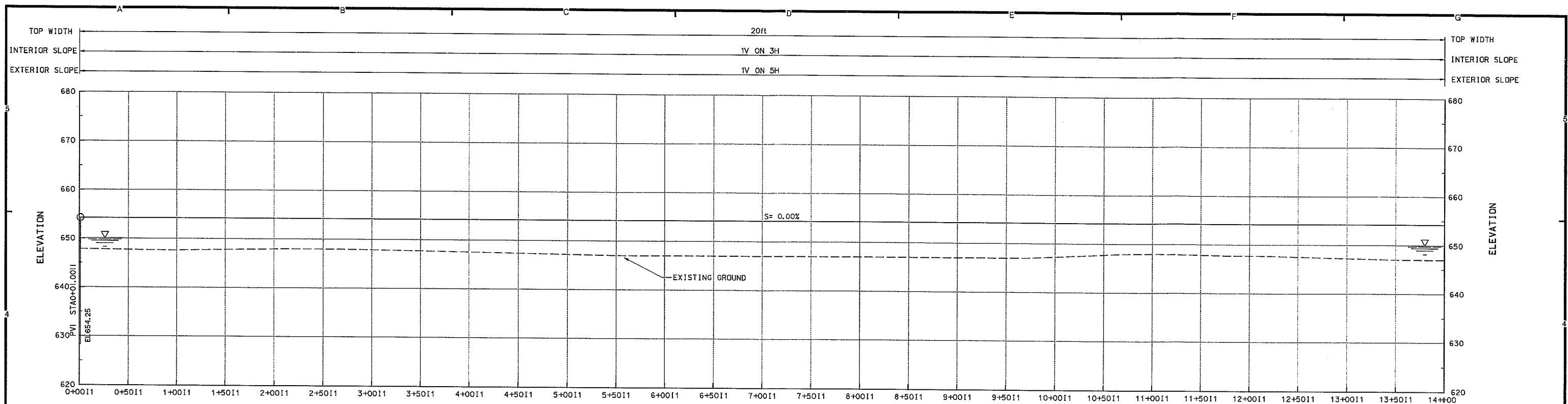


PROFILE - ISLAND 4

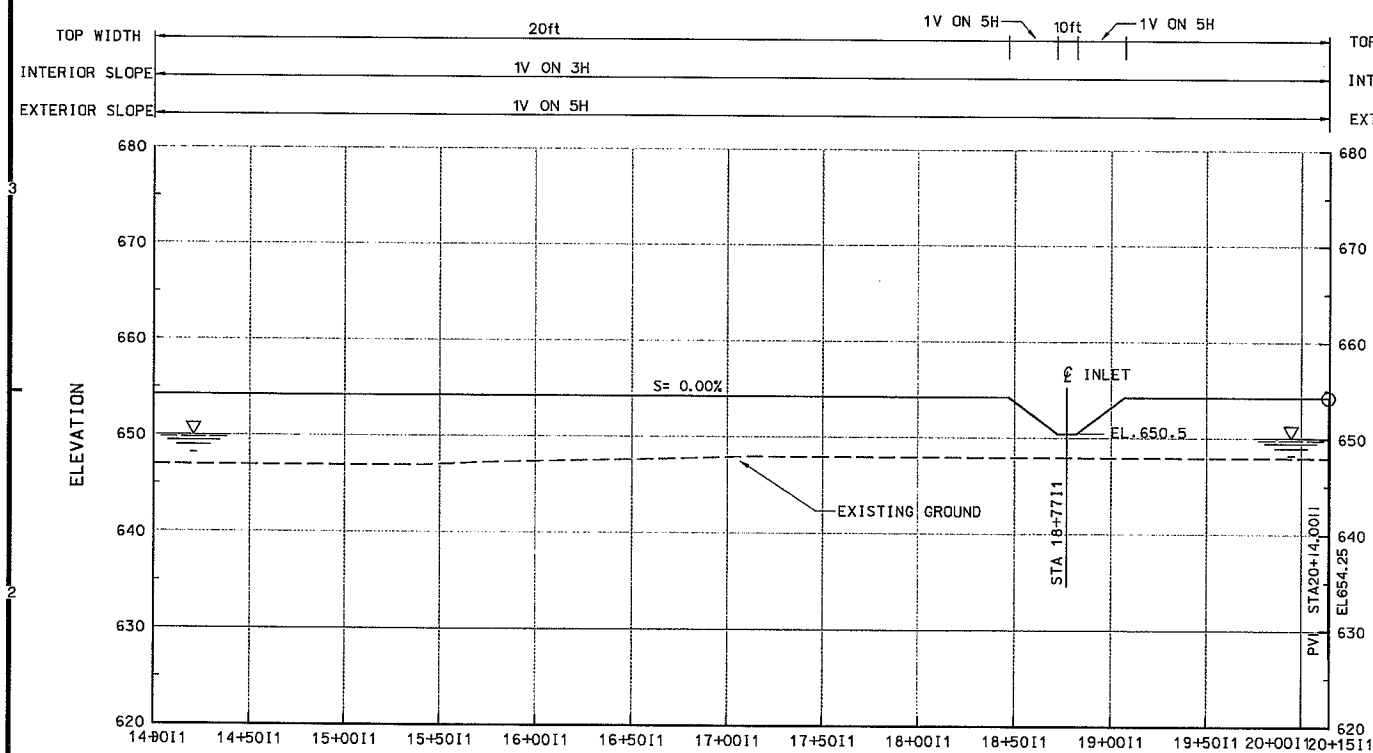
AS-BUILT AS OF DECEMBER 2002		DATE	APPROVAL
SYMBOL	DESCRIPTION	DATE	APPROVAL
<b>US Army Corps of Engineers</b> St. Paul District		AS-BUILT POLANDER LAKE STAGE 2 - WILDS BEND EXCAVATION ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA <b>ISLAND CONSTRUCTION</b> PROFILE ISLAND 4 STA 0+00 TO STA 28+00	
AE APPROVING OFFICIAL: DESIGNED: DMT/JJF CHECKED: GVF/DWR DRAWN: DMT DESIGNED: SMG CHECKED: JSH		CAD FILE NAME: CP268010.DGN DATE: 20 MAY 1999	DRAWING NUMBER: <b>M-P5A-60/008</b> SHT 11 OF 39



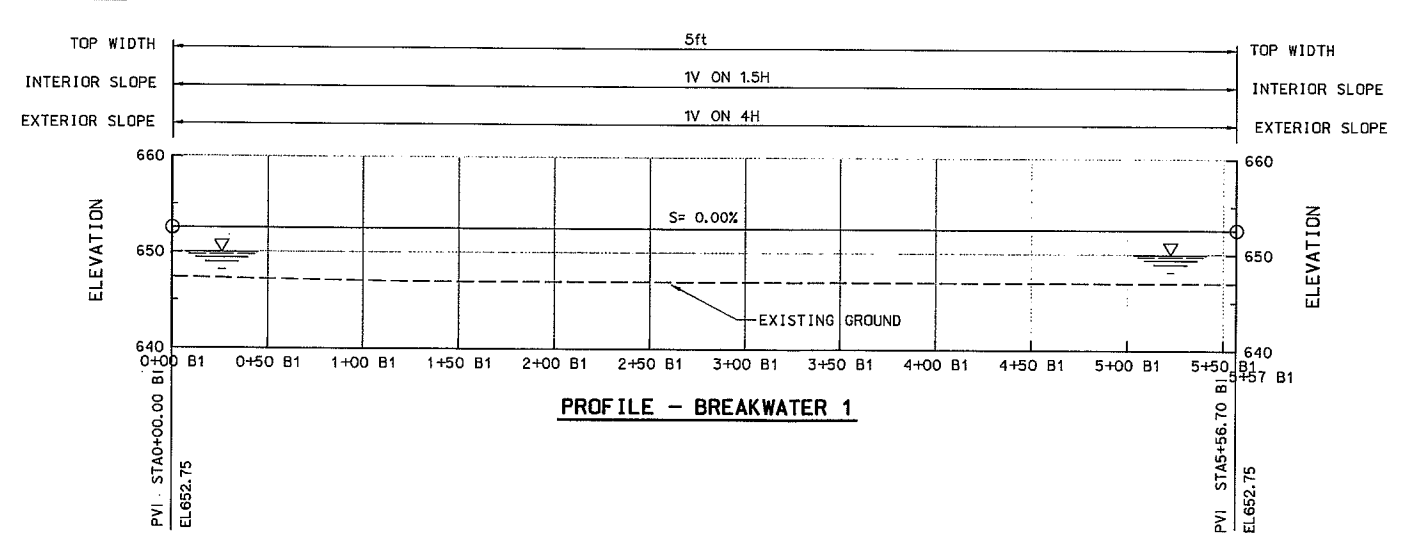
AS-BUILT AS OF DECEMBER 2002		DATE	APPROVAL
SYMBOL	DESCRIPTION	DATE	APPROVAL
 <b>US Army Corps of Engineers</b> St. Paul District		AE APPROVING OFFICIAL: _____ AS-BUILT POLANDER LAKE STAGE 2 - WILDS BEND EXCAVATION ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA <b>ISLAND CONSTRUCTION</b> PROFILE ISLANDS 3 & 4 STA 28+00 TO STA 54+18	
DESIGNED: DMT/JJF	CHECKED: GVF/DWR	CAD FILE NAME: CP268011.DGN	DRAWING NUMBER: M-P5A-60/009
DRAWN: DMT	DESIGNED: SMG	DATE: 20 MAY 1999	SOL NO: DACW37-99-B-0006
CHECKED: JSH	DATE: 20 MAY 1999	SOL NO: DACW37-99-B-0006	OF 39



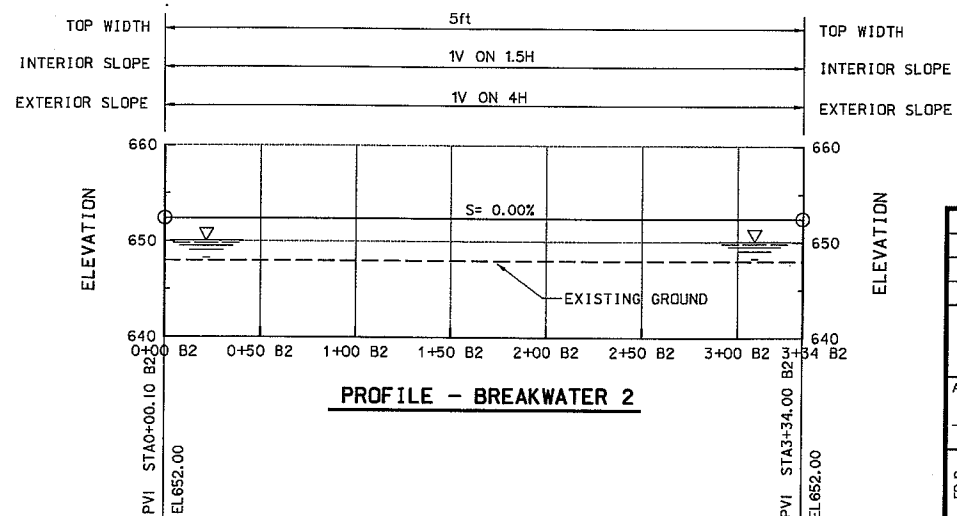
PROFILE - INTERIOR ISLAND 1



PROFILE - INTERIOR ISLAND 1

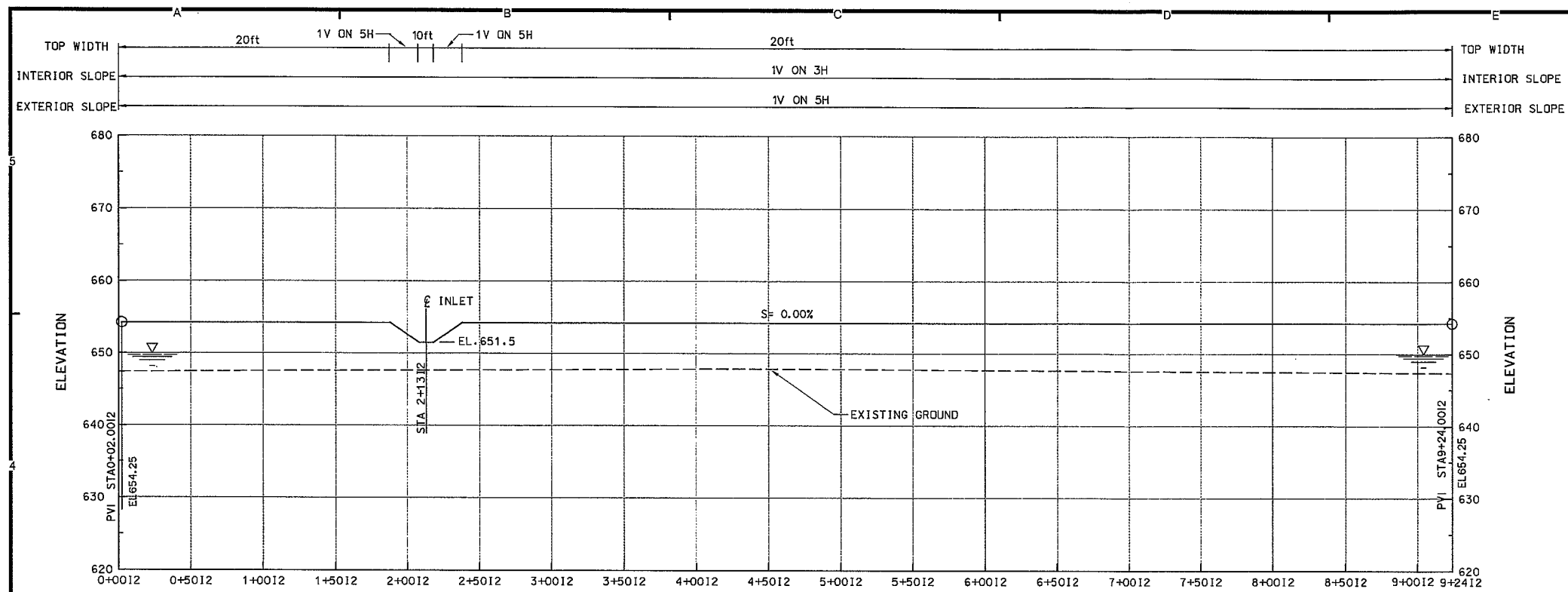


PROFILE - BREAKWATER 1

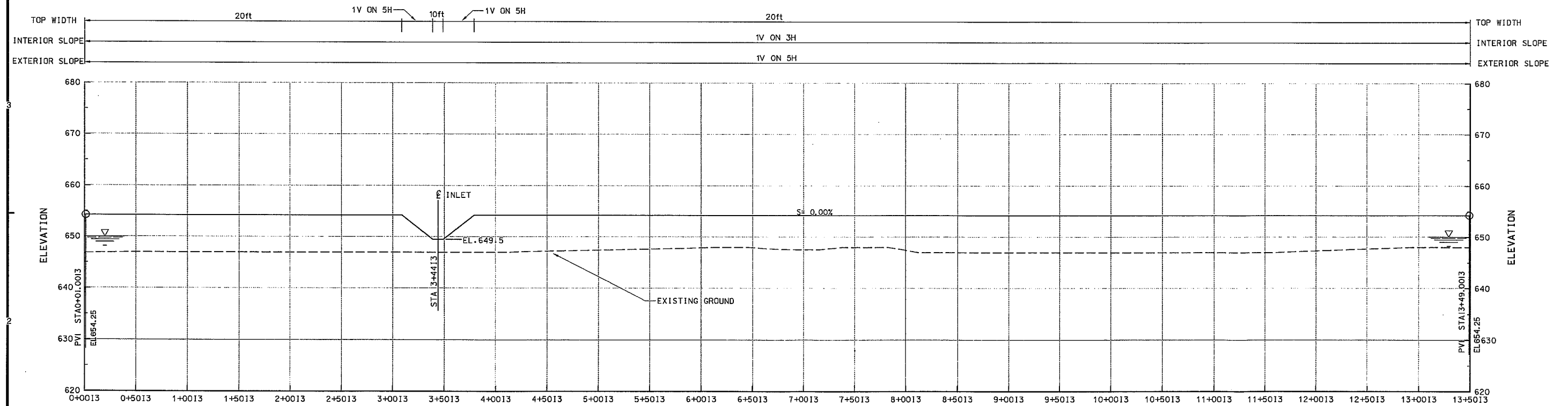


PROFILE - BREAKWATER 2


AS-BUILT AS OF DECEMBER 2002		DATE	APPROVAL
SYMBOL	DESCRIPTION	DATE	APPROVAL
<b>US Army Corps of Engineers</b> St. Paul District		AE APPROVING OFFICIAL: AS-BUILT POLANDER LAKE STAGE 2 - WILDS BEND EXCAVATION ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA <b>ISLAND CONSTRUCTION</b> PROFILE INTERIOR ISLAND 1 (STA. 0+0011 - 20+1511), BREAKWATER 1 AND 2	
DESIGNED: DMT/JJF	CHECKED: GVF/DWR	DATE: 20 MAY 1999	SHT 13
DRAWN: DMT	CHECKED: JSH	SOL NO: DACW37-99-B-0006	OF 39
CAD FILE NAME: CM268012.DGN		DRAWING NUMBER: M-P5A-60/010	

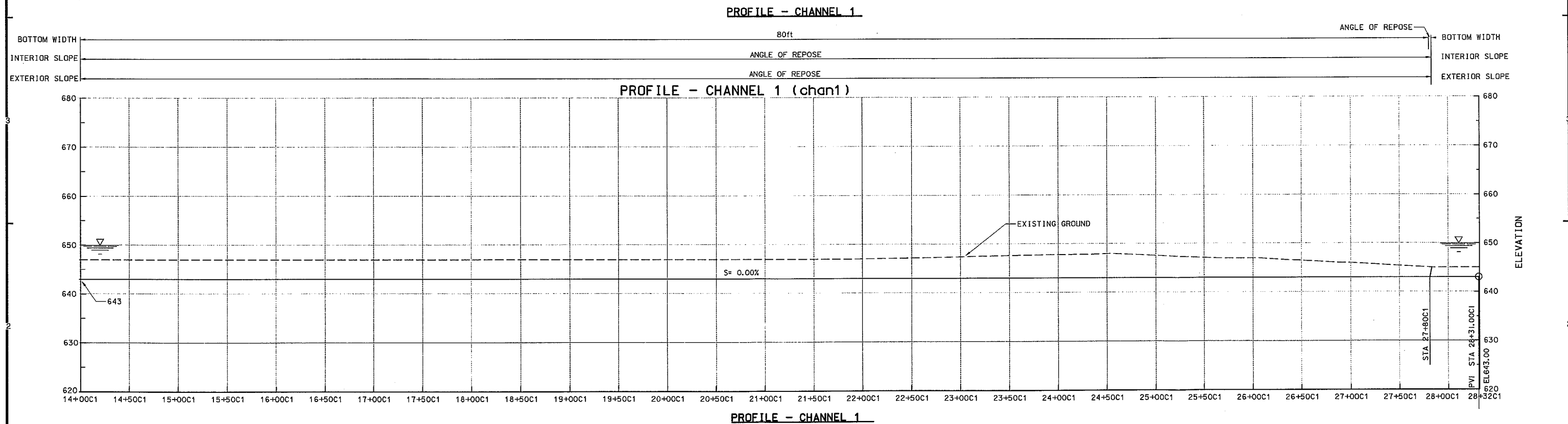
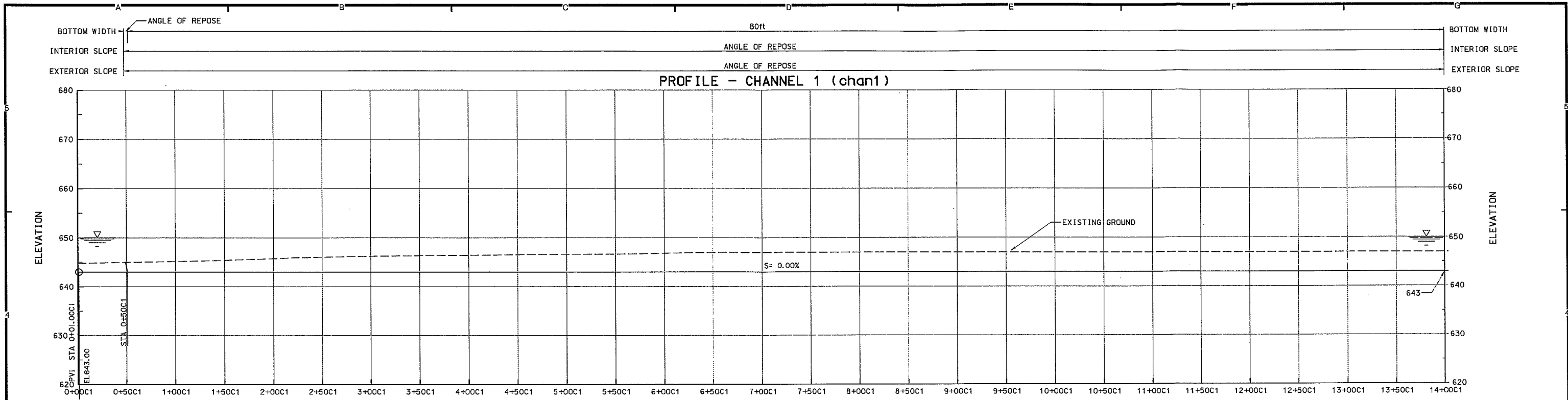


PROFILE - INTERIOR ISLAND 2



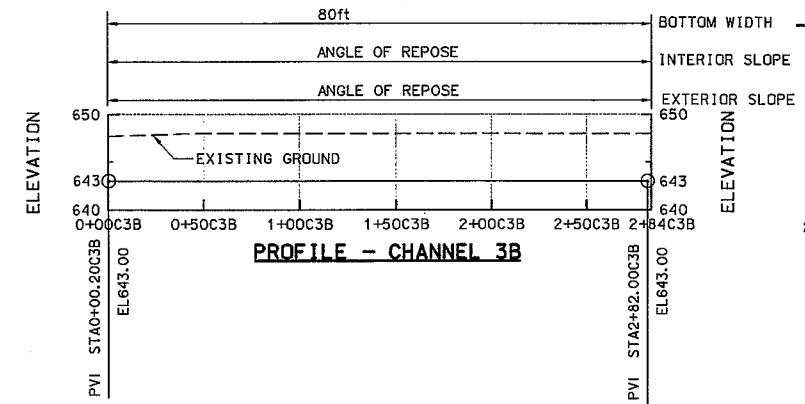
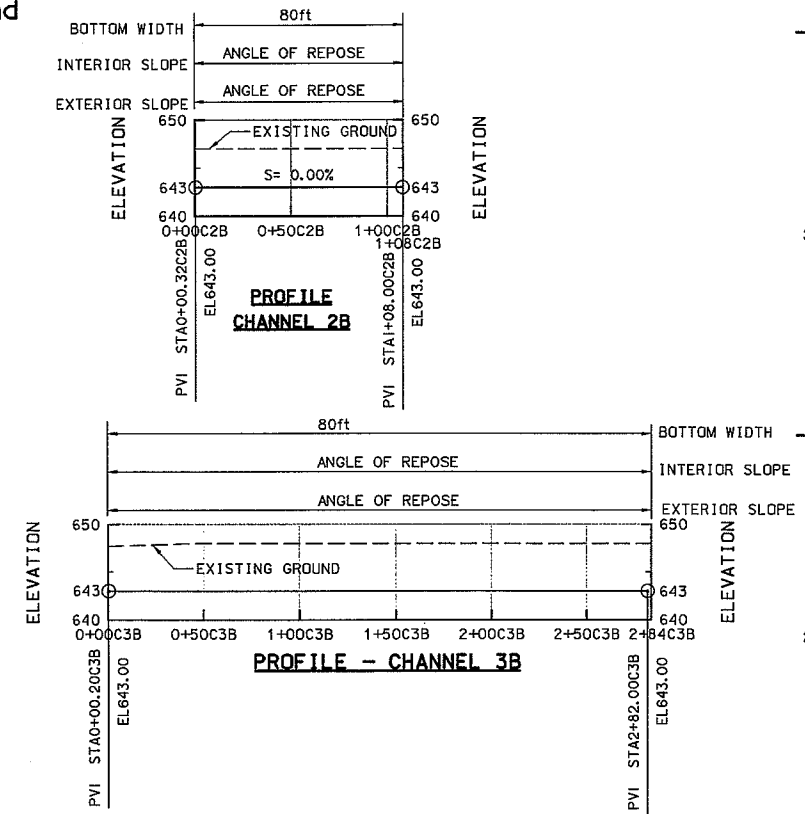
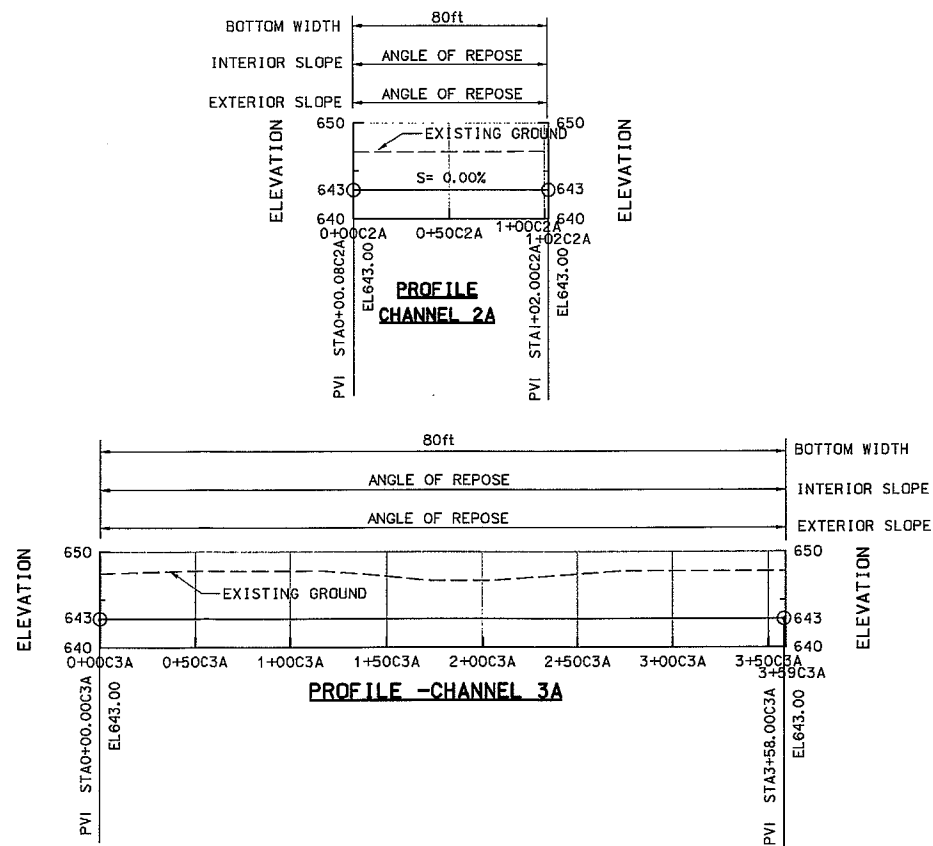
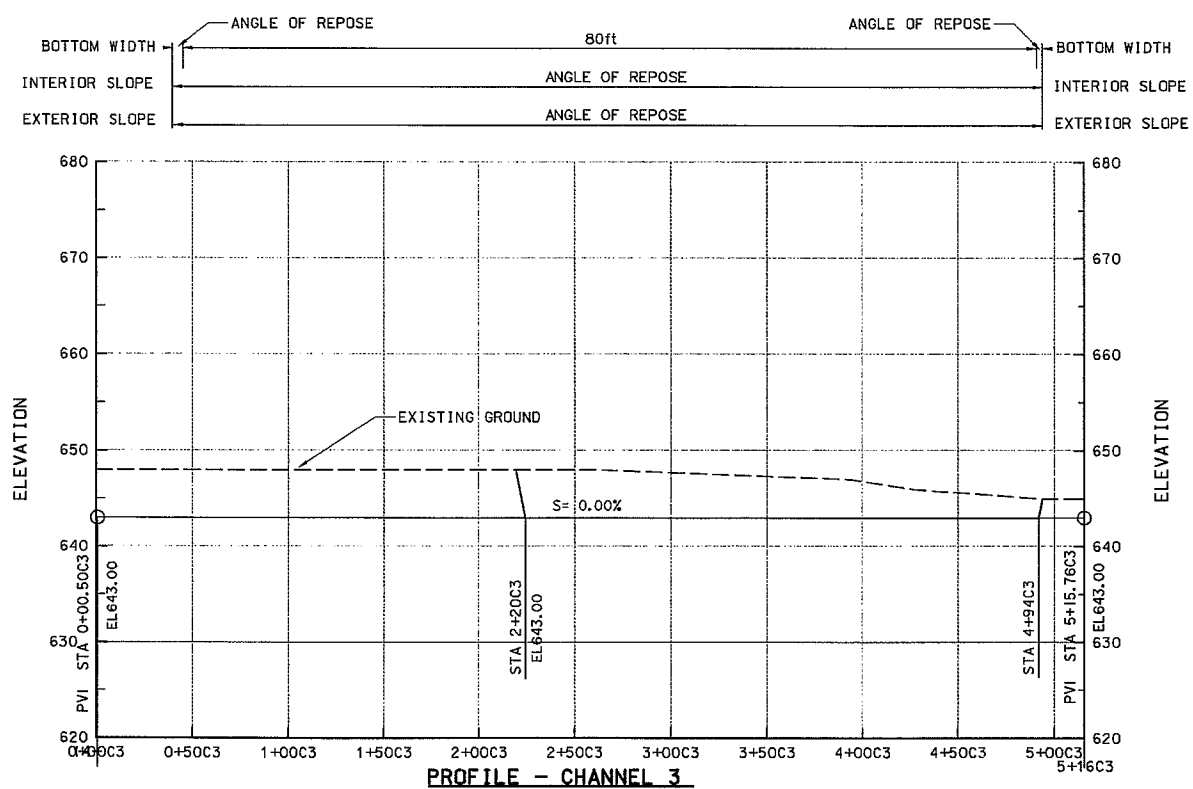
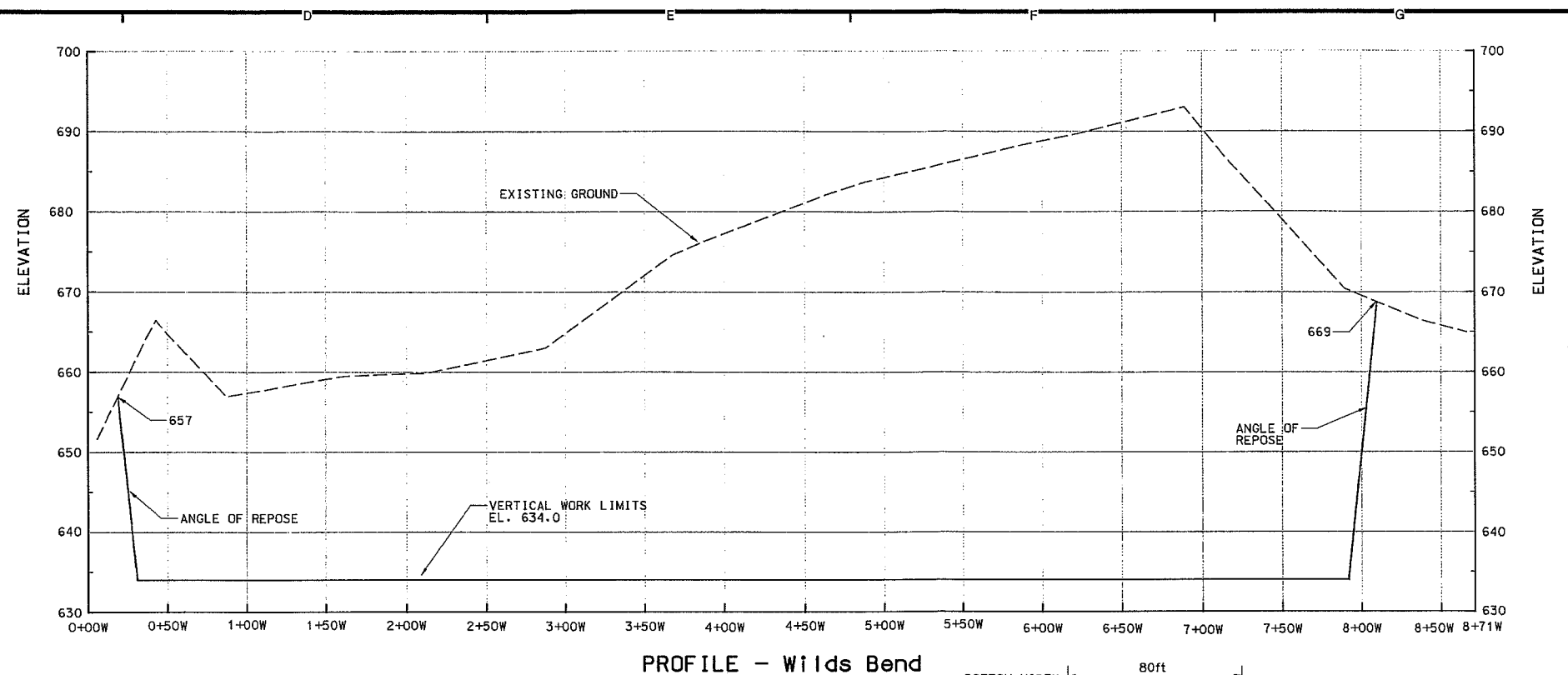
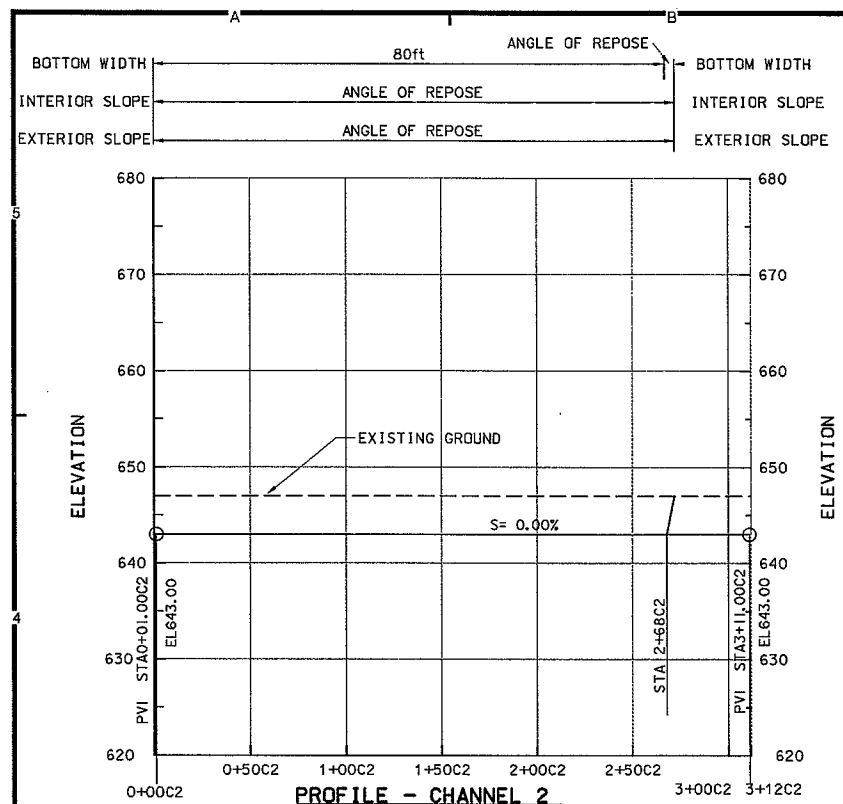
PROFILE - INTERIOR ISLAND 3

AS-BUILT AS OF DECEMBER 2002		DATE	APPROVAL
SYMBOL		DESCRIPTION	
AE APPROVING OFFICIAL:		 <b>US Army Corps of Engineers</b> St. Paul District	
DESIGNED: DMT/JJF		AS-BUILT	
CHECKED: GVF/DWR		POLANDER LAKE STAGE 2 - WILDS BEND EXCAVATION	
DRAWN: DMT		ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE	
DESIGNED: SMG		MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA	
CHECKED: JSH		ISLAND CONSTRUCTION	
DATE: 20 MAY 1999		PROFILES	
SOL NO: DACW37-99-B-0006		INTERIOR ISLAND 2 (STA 0+00 12 TO 9+24 12)	
		INTERIOR ISLAND 3 (0+00 13 TO 13+50 13)	
		DRAWING NUMBER: M-P5A-60/011	
		SHT 14 OF 39	

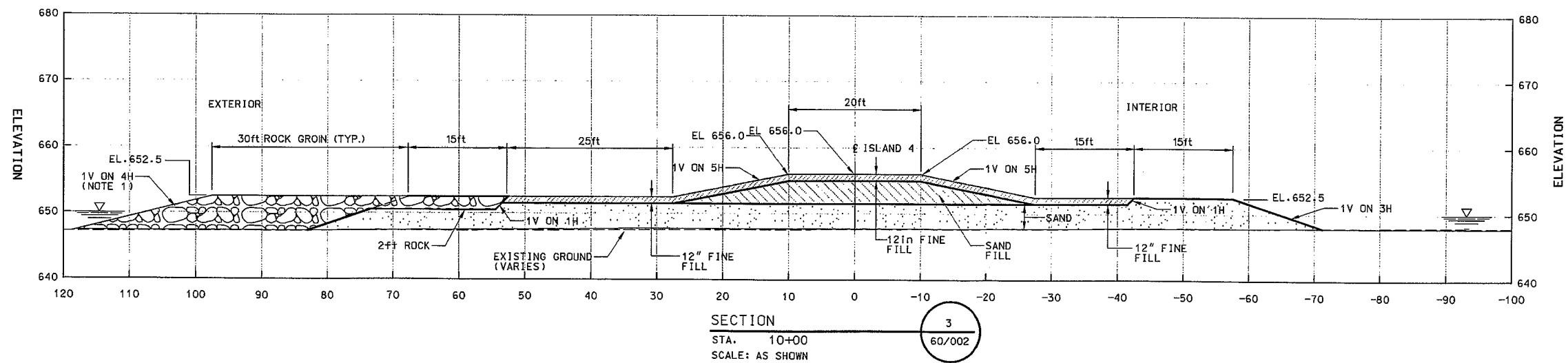
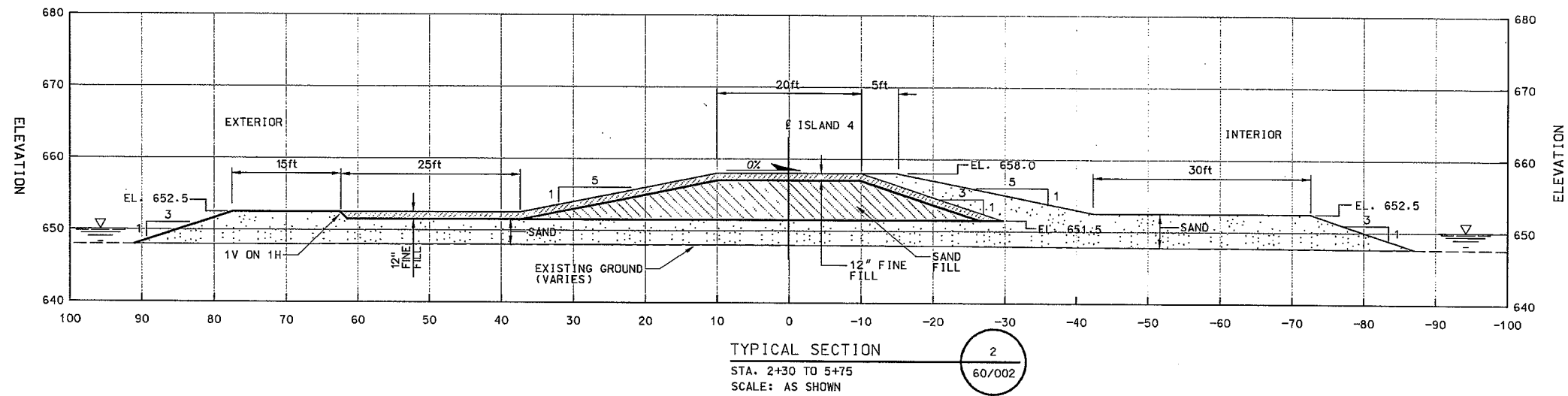
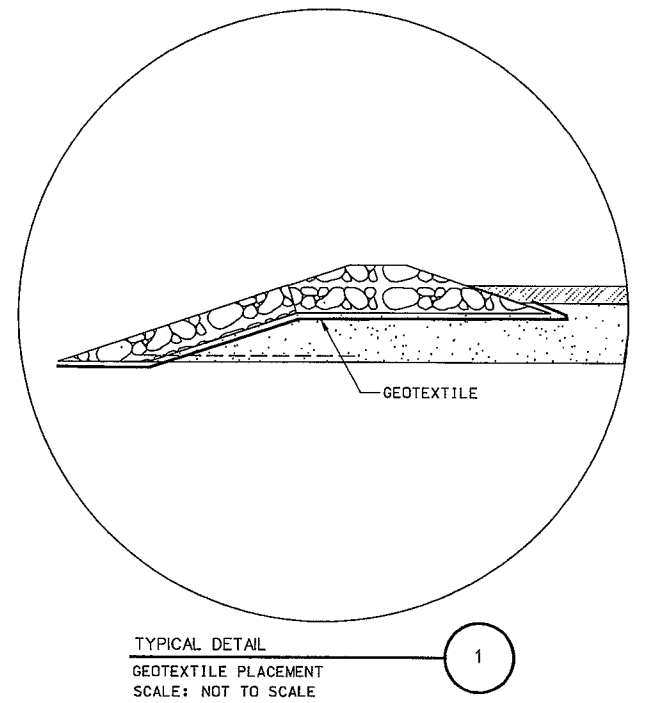
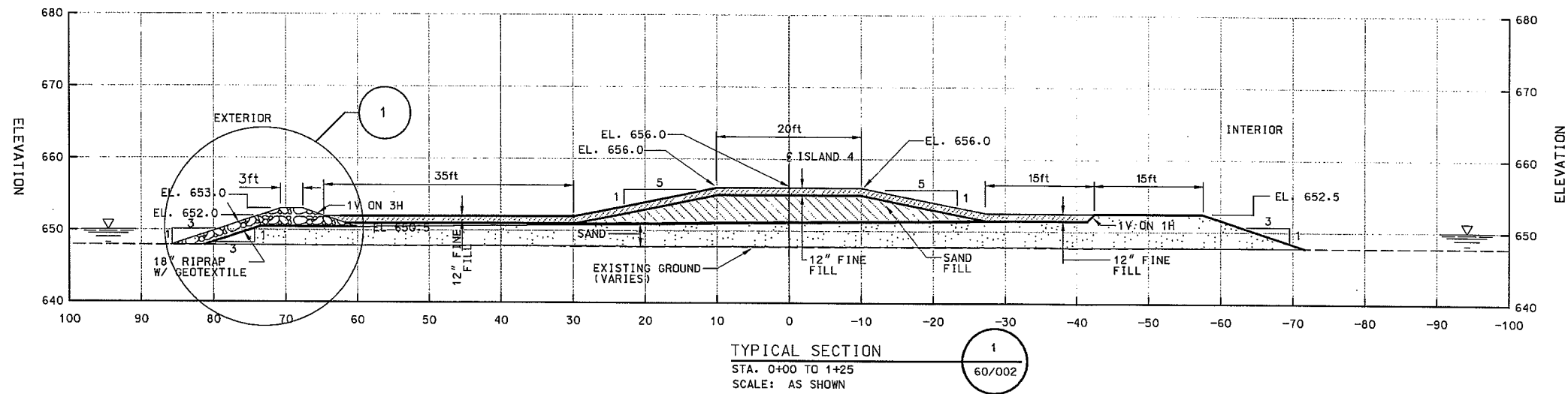


AS-BUILT AS OF DECEMBER 2002		DATE	APPROVAL
SYMBOL	DESCRIPTION	DATE	APPROVAL
<b>US Army Corps of Engineers</b> St. Paul District			
AE APPROVING OFFICIAL: DESIGNED: DMT/JJF CHECKED: GVF/DWR DRAWN: DMT		AS-BUILT POLANDER LAKE STAGE 2 - WILDS BEND EXCAVATION ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA <b>ISLAND CONSTRUCTION</b> PROFILE CHANNEL 1 STA 0+50C1 TO STA 27+80C1	
DESIGNED: SMG CHECKED: JSH		CAD FILE NAME: CP268014.DGN DATE: 20 MAY 1999	DRAWING NUMBER: <b>M-P5A-60/012</b> SHT 15 OF 39





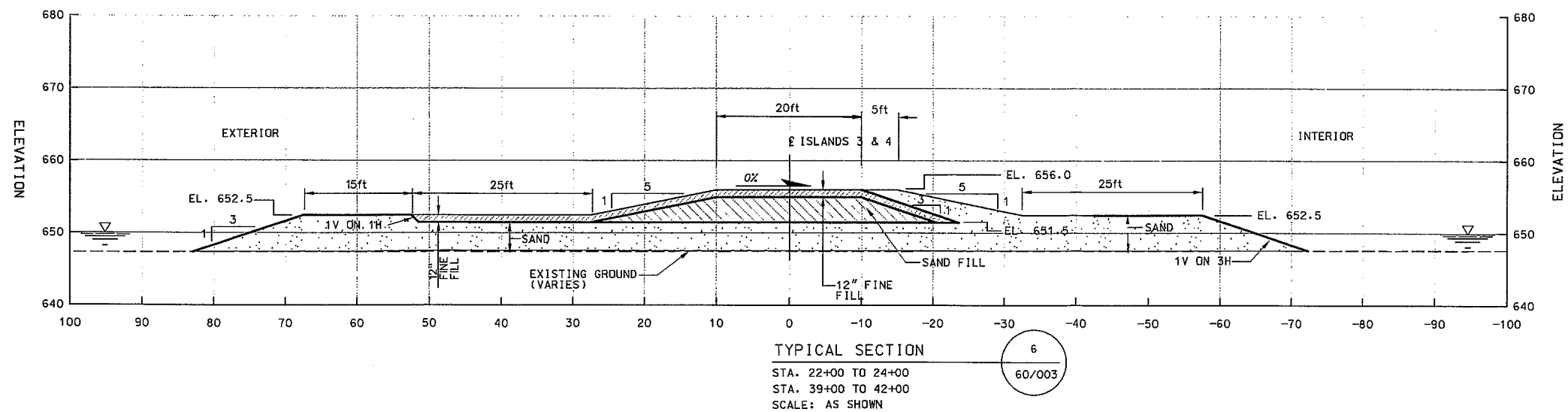
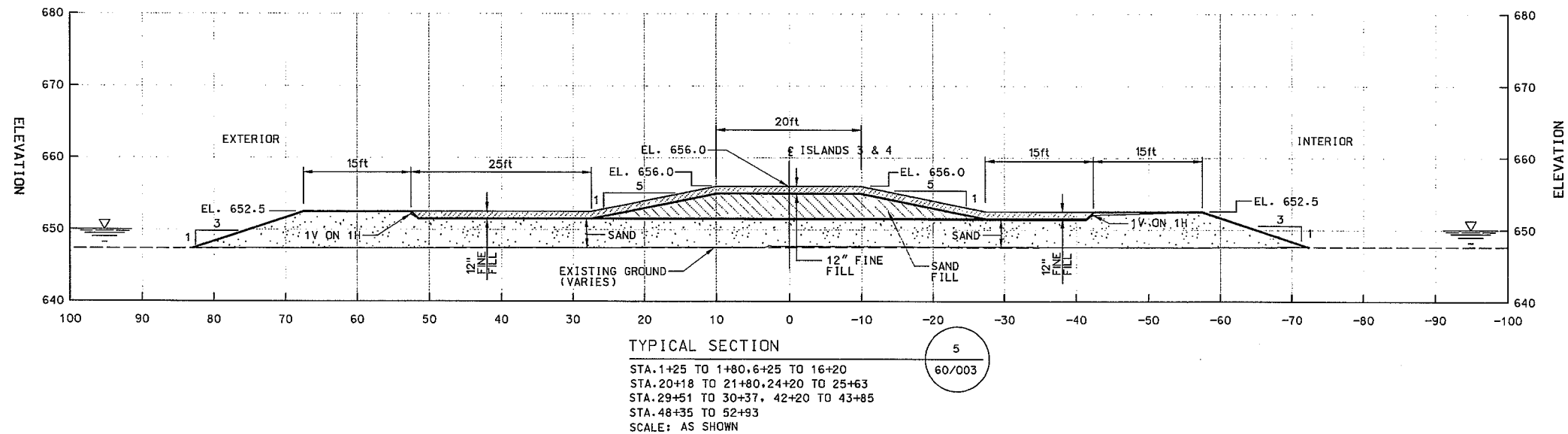
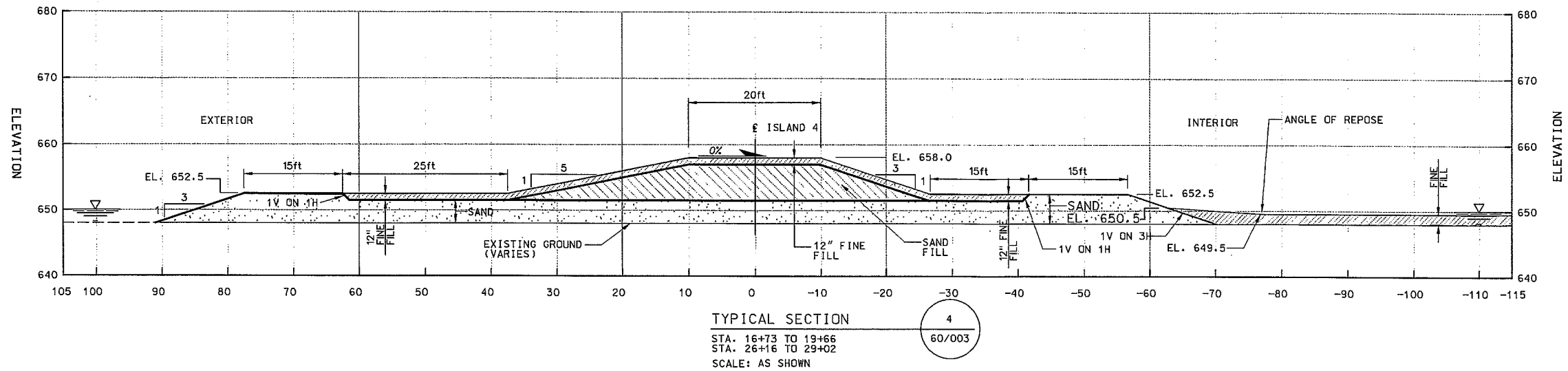
AS-BUILT AS OF DECEMBER 2002		DATE	APPROVAL
SYMBOL	DESCRIPTION	DATE	APPROVAL
AE APPROVING OFFICIAL: DESIGNED: DMT/JJF CHECKED: GVF/DWR DRAWN: DMT DESIGNED: SMG CHECKED: JSH		AS-BUILT POLANDER LAKE STAGE 2 - WILDS BEND EXCAVATION ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA ISLAND CONSTRUCTION PROFILES - CHANNEL 2, 2A, 2B CHANNEL 3, 3A, 3B WILDS BEND (STA 0+00W TO 8+71W)	
CAD FILE NAME: CP268015.DGN DATE: 20 MAY 1999		DRAWING NUMBER: M-P5A-60/013	SHEET 16 OF 39



#### NOTES:

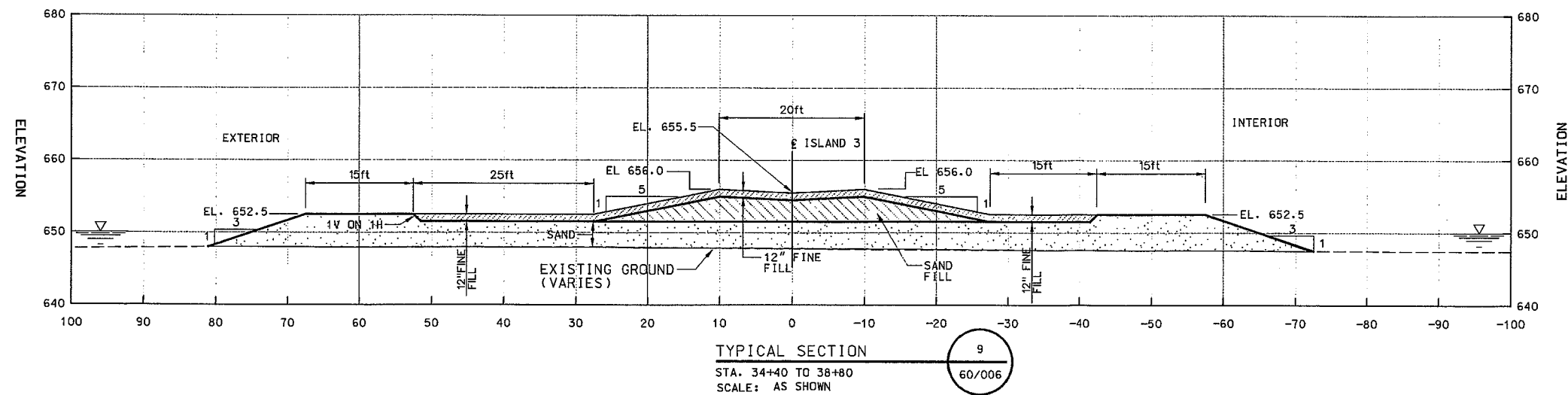
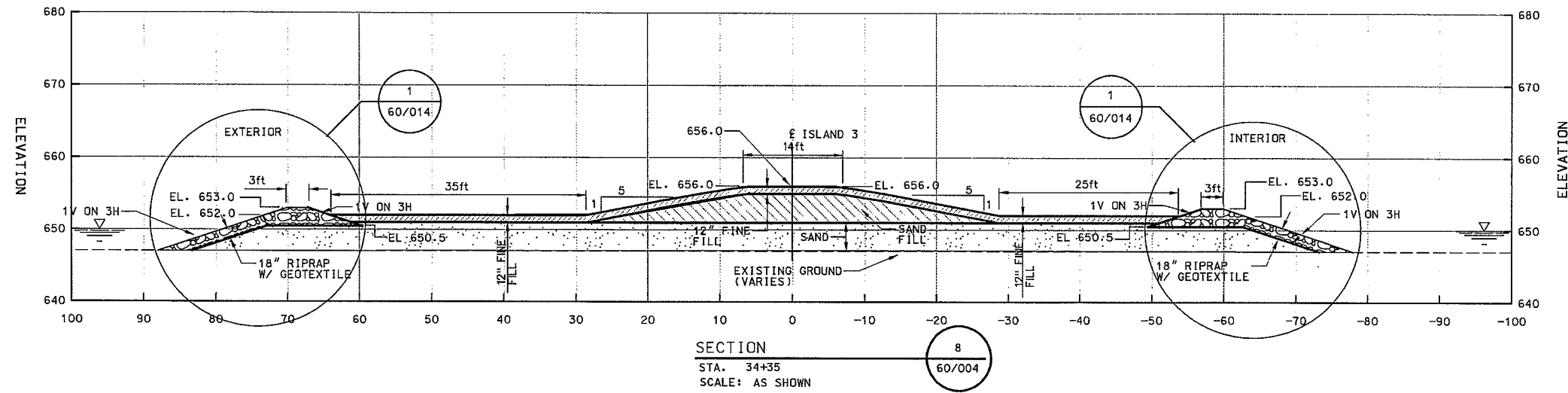
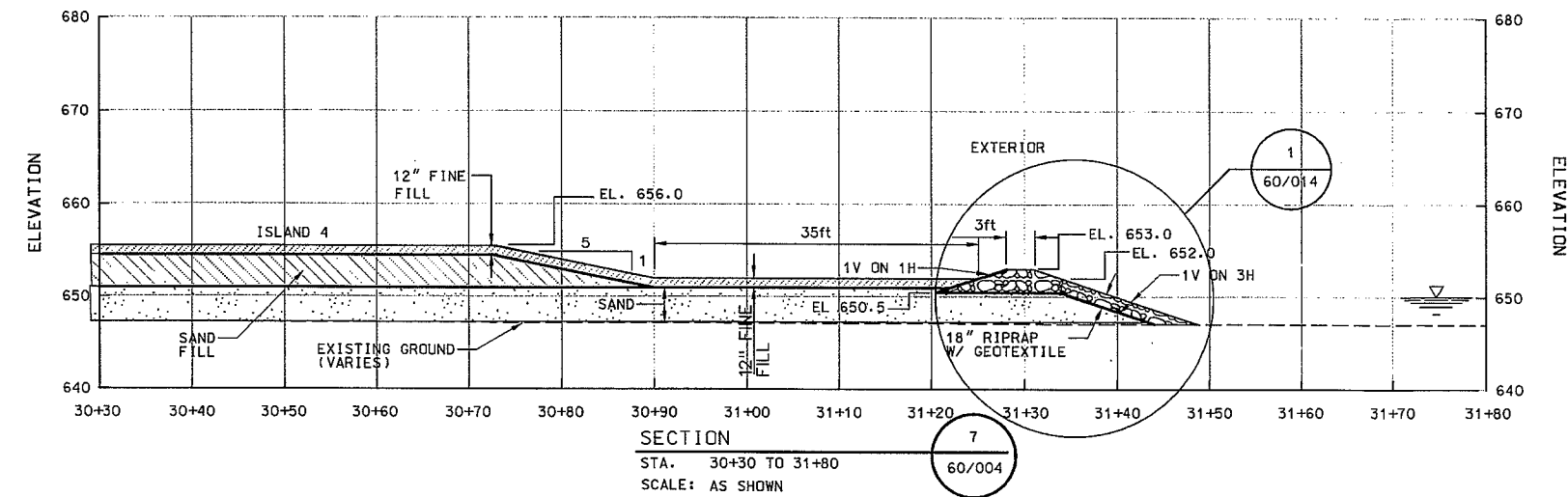
- 1V ON 4H END SLOPES FOR ROCK GROINS STA. 1+25.0 TO 15+41.0.  
1V ON 1.5H END SLOPES FOR ROCK GROINS STA. 16+74 TO 53+10.
2. SAND FILL AND RANDOM FILL MATERIAL FROM WILDS BEND EXCAVATION PLACED AS ONE OPERATION STA 0+00 TO 31+00 AND 40+00 TO 54+00.
3. SAND FILL AND RANDOM FILL MATERIAL FROM ALTERNATE BORROW SITE EXCAVATION PLACED AS ONE OPERATION STA 33+50 TO 40+00.

AS-BUILT AS OF DECEMBER 2002		DATE	APPROVAL
SYMBOL	DESCRIPTION	DATE	APPROVAL
<b>US Army Corps of Engineers</b> St. Paul District			
AE APPROVING OFFICIAL: DESIGNED: DMT/JJF CHECKED: GVF/DWR DRAWN: DMT DESIGNED: SMG CHECKED: JSH		AS-BUILT POLANDER LAKE STAGE 2 - WILDS BEND EXCAVATION ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA <b>ISLAND CONSTRUCTION</b> TYPICAL SECTIONS 1, 2, SECTION 3	
DATE: 20 MAY 1999 CAD FILE NAME: CM368015.DGN SOL NO: DACW37-99-B-0006		DRAWING NUMBER: <b>M-P5A-60/014</b>	SHT 17 OF 39




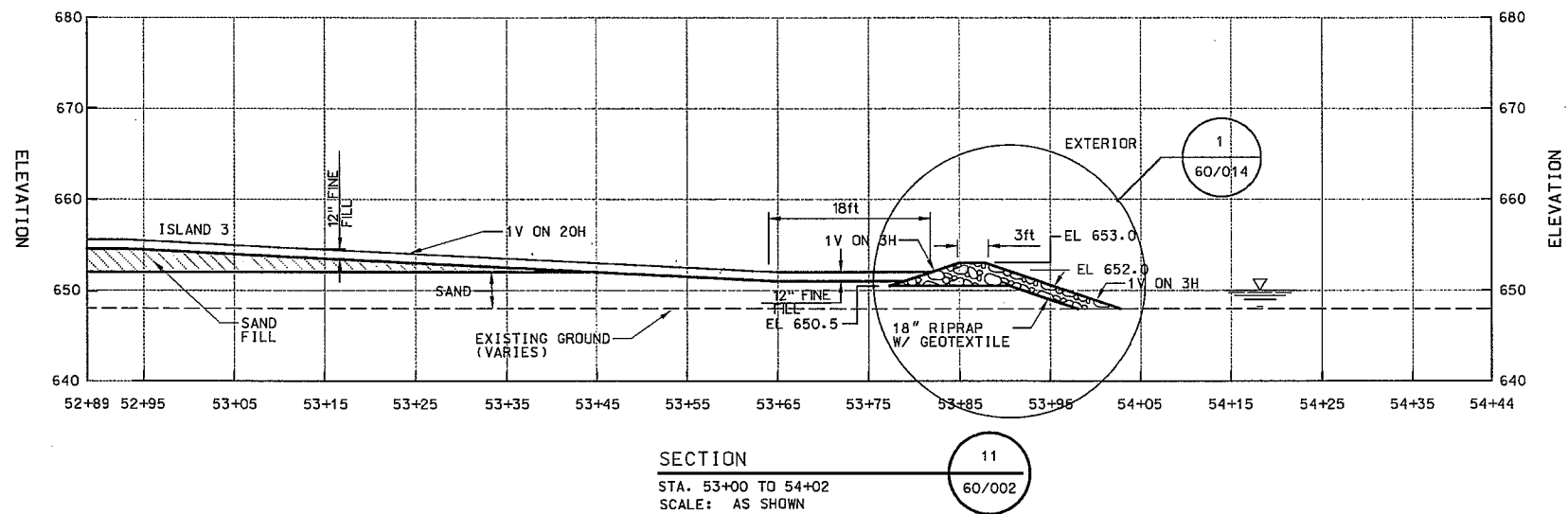
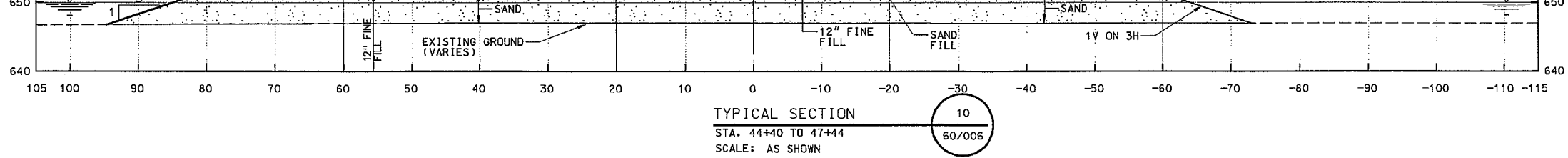
**NOTE:**  
 SAND FILL AND RANDOM FILL MATERIAL FROM WILDS BEND EXCAVATION PLACED AS ONE OPERATION STA 0+00 TO 31+00 AND 40+00 TO 54+00.  
 SAND FILL AND RANDOM FILL MATERIAL FROM ALTERNATE BORROW SITE EXCAVATION PLACED AS ONE OPERATION STA 33+50 TO 40+00.

AS-BUILT AS OF DECEMBER 2002		DATE	APPROVAL
SYMBOL	DESCRIPTION	DATE	APPROVAL
<b>US Army Corps of Engineers</b> St. Paul District			
AE APPROVING OFFICIAL: DESIGNED: DMT/JJF CHECKED: GVF/DWR DRAWN: DMT DESIGNED: SMG CHECKED: JSH		AS-BUILT POLANDER LAKE STAGE 2 - WILDS BEND EXCAVATION ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA <b>ISLAND CONSTRUCTION</b> TYPICAL SECTIONS 4, 5, 6	
DATE: 20 MAY 1999 CAD FILE NAME: CP368016.DGN SOL NO: DACW37-99-B-0006		DRAWING NUMBER: <b>M-P5A-60/015</b> SHT 18 OF 39	



NOTE:  
SAND FILL AND RANDOM FILL MATERIAL FROM WILDS BEND EXCAVATION  
PLACED AS ONE OPERATION STA 0+00 TO 31+00 AND 40+00 TO 54+00.  
SAND FILL AND RANDOM FILL MATERIAL FROM ALTERNATE BORROW SITE  
EXCAVATION PLACED AS ONE OPERATION STA 33+ 50 TO 40+00.

AS-BUILT AS OF DECEMBER 2002		DATE	APPROVAL
SYMBOL		DESCRIPTION	
AE APPROVING OFFICIAL:		 <b>US Army Corps of Engineers</b> St. Paul District	
DESIGNED: DMT/JJF		AS-BUILT	
CHECKED: GVF/DWR		POLANDER LAKE STAGE 2 - WILDS BEND EXCAVATION	
DRAWN: DMT		ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE	
DESIGNED: SMG		MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA	
CHECKED: JSH		ISLAND CONSTRUCTION	
DATE: 20 MAY 1999		SECTIONS 7, 8	
CAD FILE NAME: CP368017.DGN		TYPICAL SECTION 9	
SOL NO: DACW37-99-B-0006		DRAWING NUMBER:	SHT 19
		M-P5A-60/016	OF 39

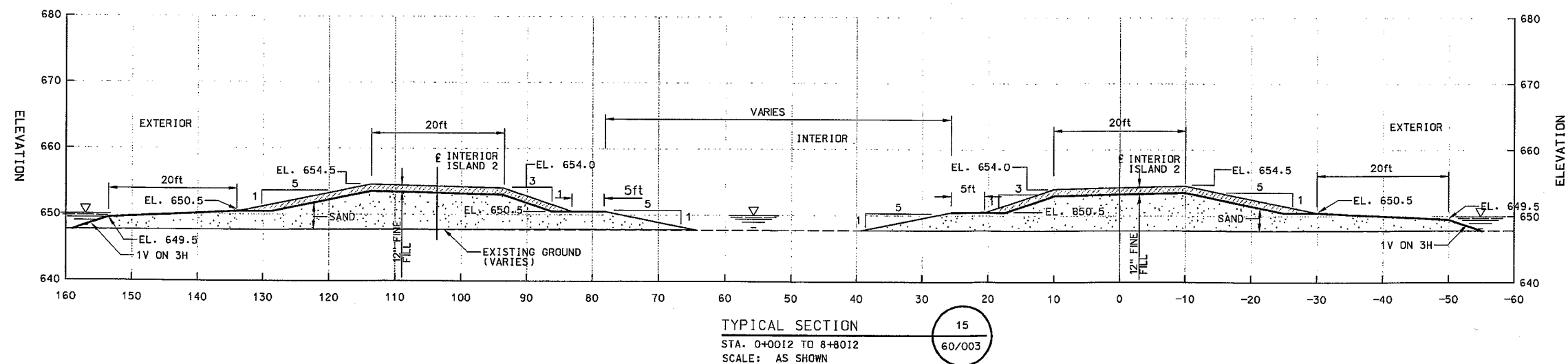
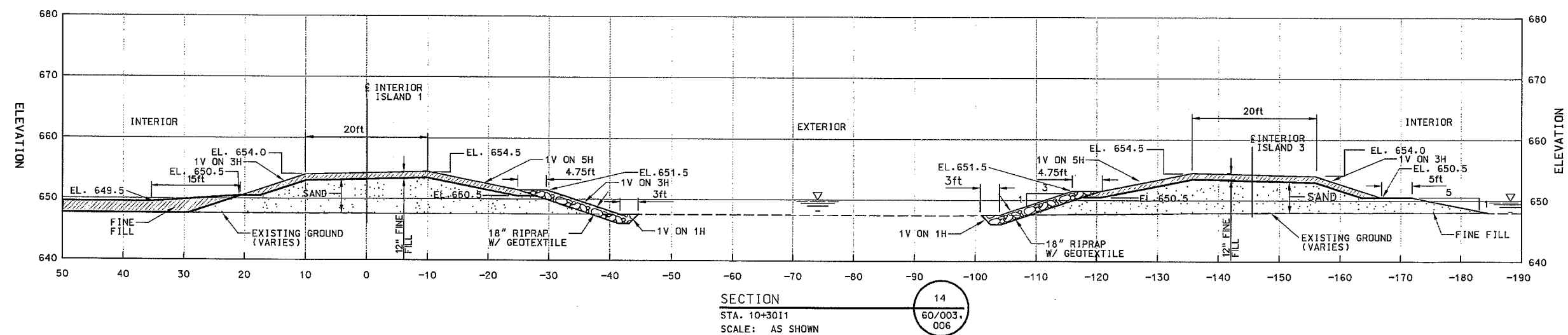
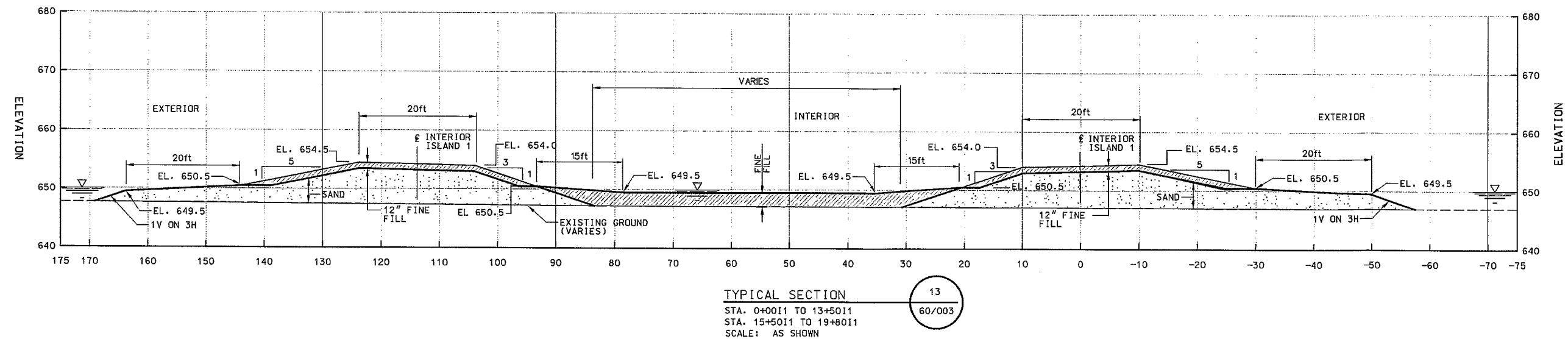


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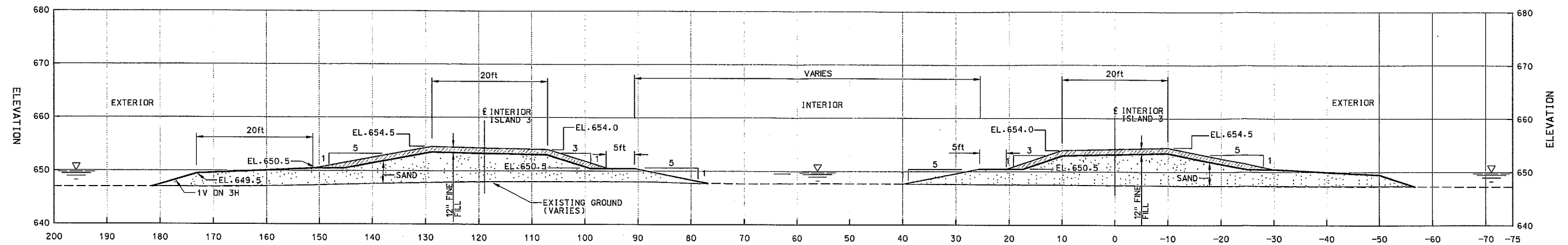
SAND FILL AND RANDOM FILL  
PLACED AS ONE OPERATION

SAND FILL AND RANDOM FILL  
EXCAVATION PLACED AS ONE OPERATION

AS-BUILT AS OF	
SYMBOL	
AE APPROVING OFFICIAL:	
DESIGNED: DMT/JJF	
CHECKED: GVF/DWR	
DRAWN: DMT	
DESIGNED: SMG	
CHECKED: JSH	
DATE: 20 MAY 1999	



AS-BUILT AS OF DECEMBER 2002		DATE	APPROVAL
SYMBOL		DESCRIPTION	
AE APPROVING OFFICIAL:		<b>US Army Corps of Engineers</b> St. Paul District	
DESIGNED: DMT/JJF		AS-BUILT	
CHECKED: GVF/DWR		POLANDER LAKE STAGE 2 - WILDS BEND EXCAVATION	
DRAWN: DMT		ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE	
DESIGNED: SMG		MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA	
CHECKED: JSH		ISLAND CONSTRUCTION	
DATE: 20 MAY 1999		TYPICAL SECTIONS 13, 15, SECTION 14	
CAD FILE NAME: CP368019.DGN		DRAWING NUMBER:	SHT 21
SOL NO: DACW37-99-B-0006		<b>M-P5A-60/018</b>	OF 39

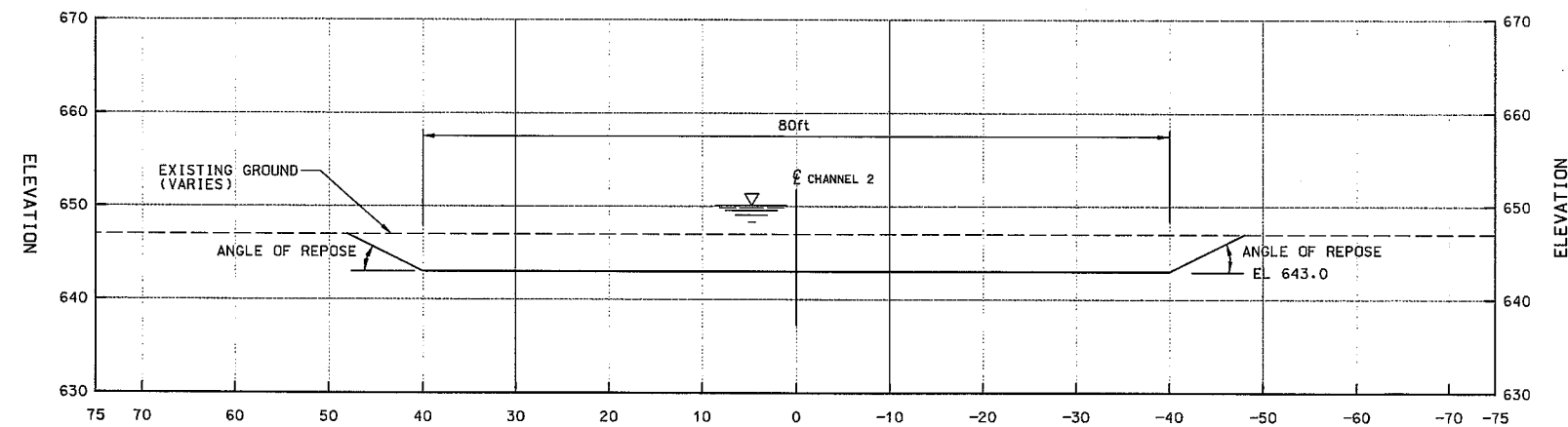


**TYPICAL SECTION**

STA. 0+0013 TO 13+5013  
SCALE: AS SHOWN

18

60/006

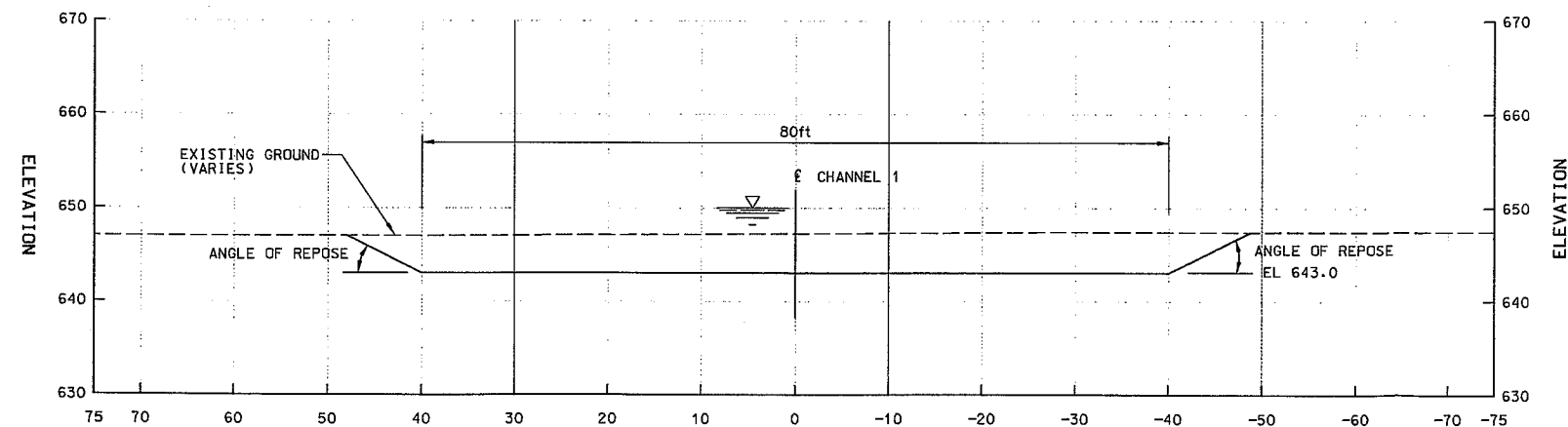


**TYPICAL SECTION**

STA. 0+00C2 TO 1+70C2  
STA. 0+00C2A TO 1+02C2A  
STA. 0+00C2B TO 1+08C2B  
SCALE: AS SHOWN

16

60/004

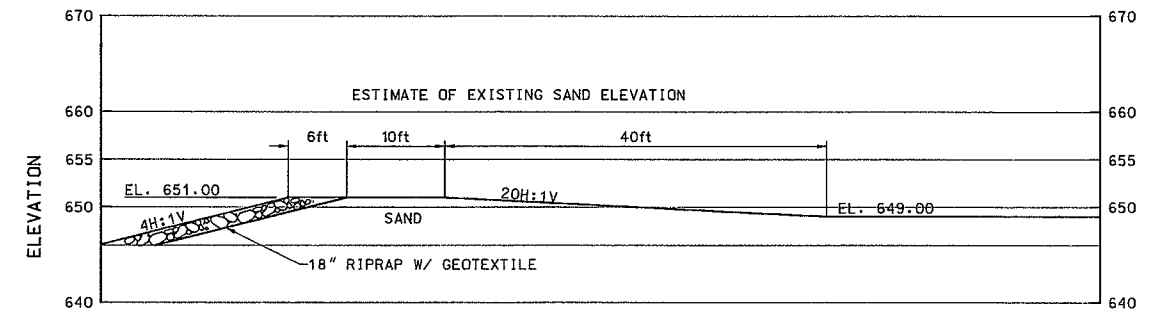


**TYPICAL SECTION**

STA. 0+00C1 TO 27+31C1  
SCALE: AS SHOWN

17

60/005

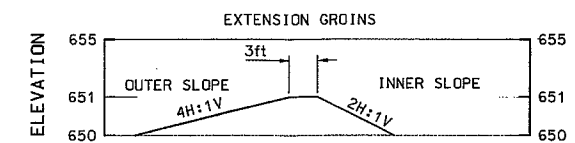


**TYPICAL CROSS SECTION**

ISLAND #5

25

60/002




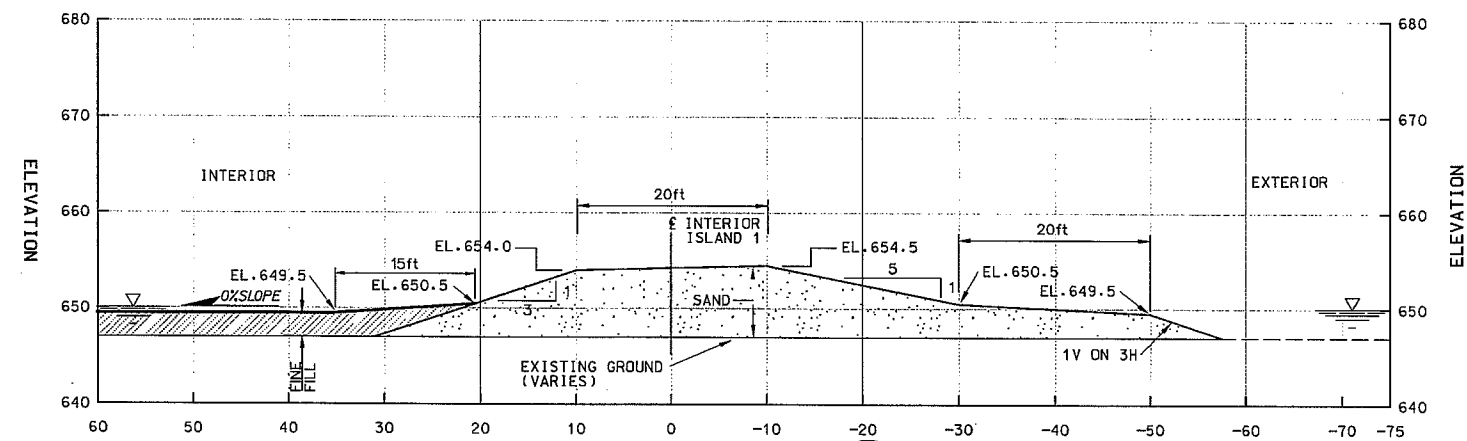
**TYPICAL CROSS SECTION**

ISLAND #5

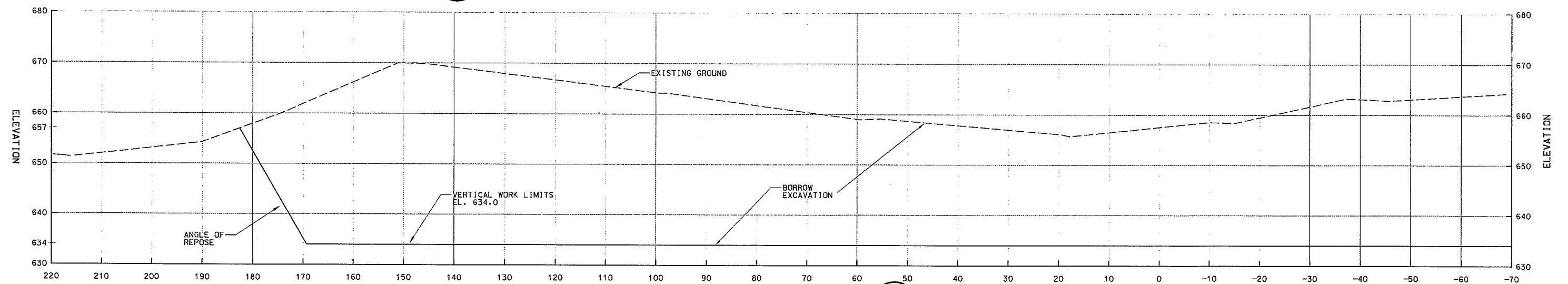
26

60/002

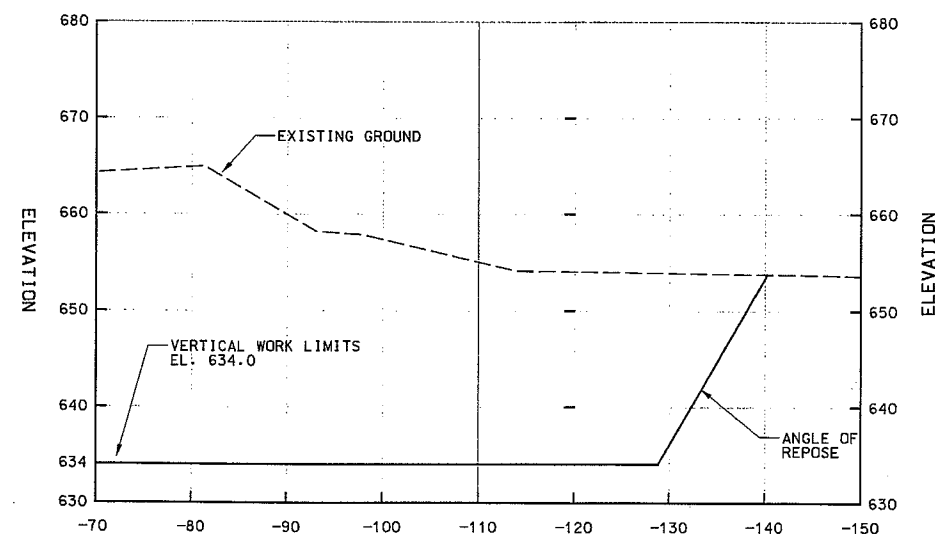
AS-BUILT AS OF DECEMBER 2002		DATE	APPROVAL
SYMBOL		DESCRIPTION	
AE APPROVING OFFICIAL:		 <b>US Army Corps of Engineers</b> St. Paul District	
DESIGNED: DMT/JJF		AS-BUILT	
CHECKED: GVF/DWR		POLANDER LAKE STAGE 2 - WILDS BEND EXCAVATION	
DRAWN: DMT		ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE	
DESIGNED: SMG		MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA	
CHECKED: JSH		ISLAND CONSTRUCTION	
DATE: 20 MAY 1999		TYPICAL SECTIONS 16, 17, 18	
CAD FILE NAME: CP368020.DGN		DRAWING NUMBER:	SHY 22
SOL NO: DACW37-99-B-0006		M-P5A-60/019	OF 39



TYPICAL SECTION  
STA. 13+5011 TO 15+5011  
SCALE: AS SHOWN



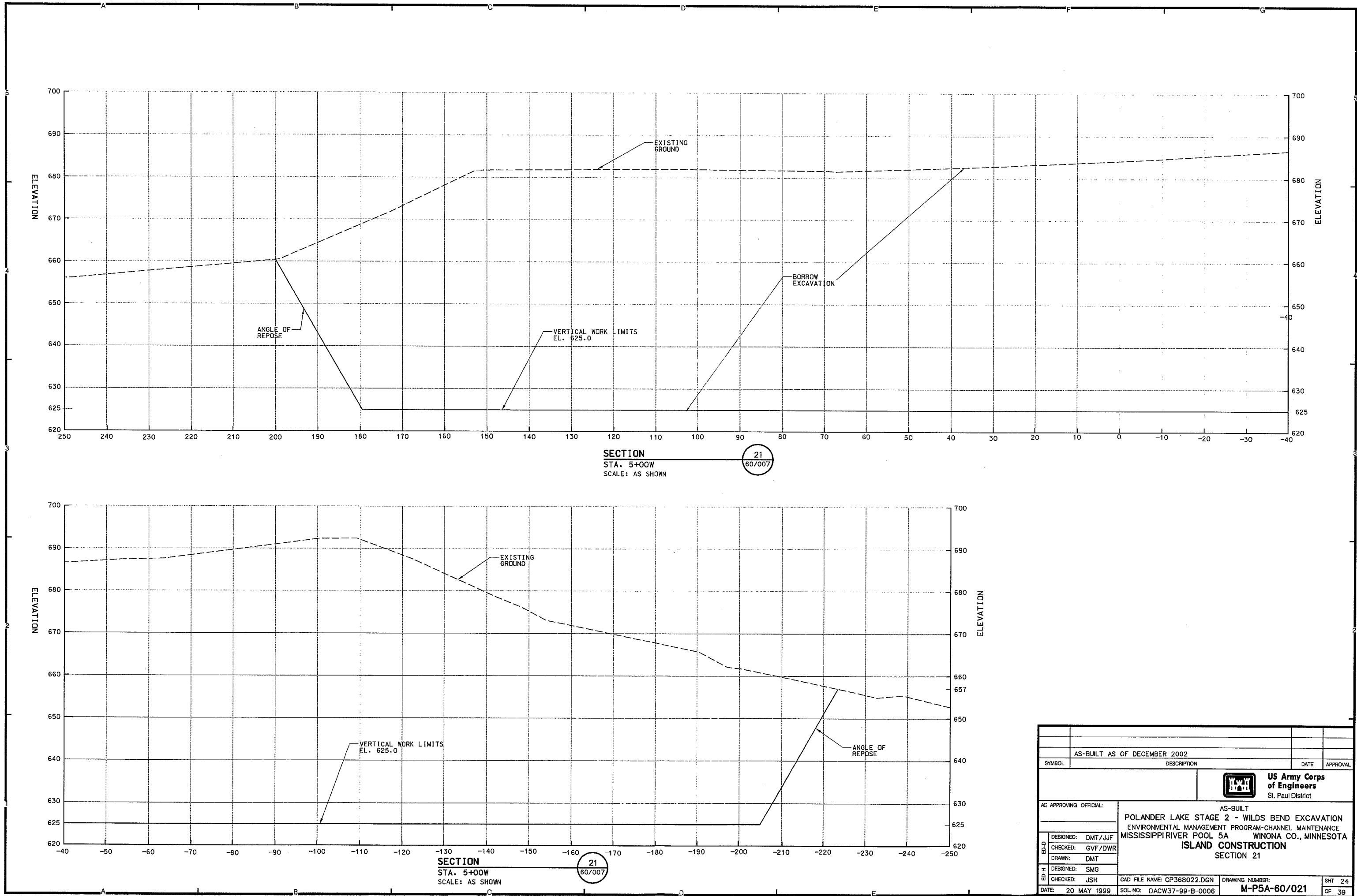
SECTION  
STA. 1+00W  
SCALE: AS SHOWN



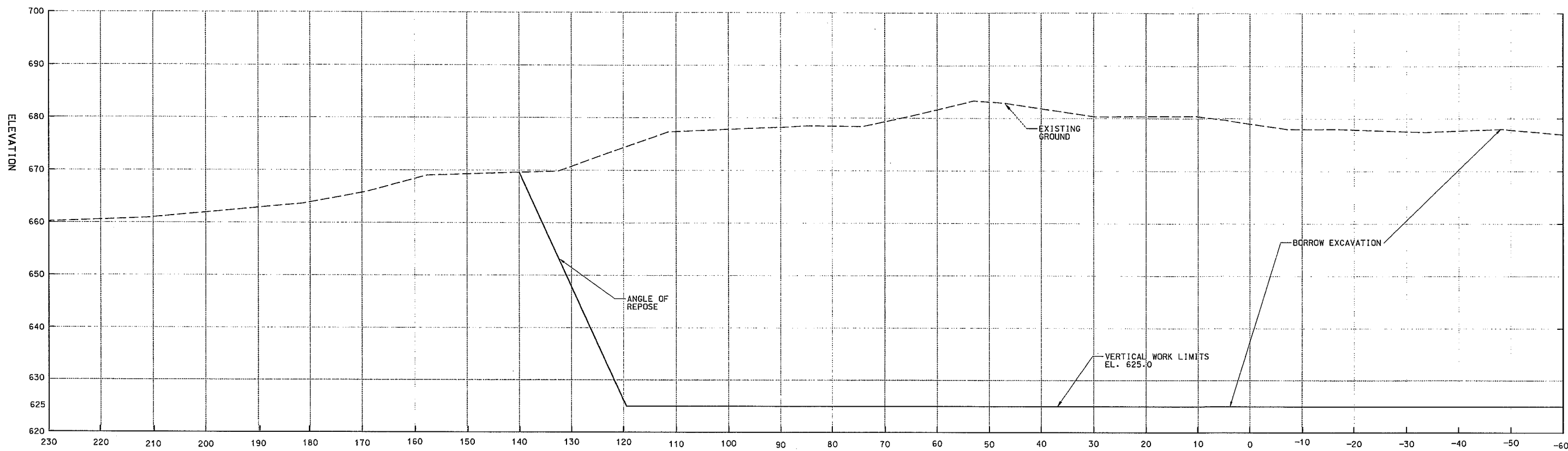
SECTION  
STA. 1+00W  
SCALE: AS SHOWN

AS-BUILT AS OF DECEMBER 2002		DATE	APPROVAL
SYMBOL	DESCRIPTION	DATE	APPROVAL
<b>US Army Corps of Engineers</b> St. Paul District			
AE APPROVING OFFICIAL: AS-BUILT POLANDER LAKE STAGE 2 - WILDS BEND EXCAVATION ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA <b>ISLAND CONSTRUCTION</b> SECTIONS 19, 20			
DESIGNED: DMT/JJF	CAD FILE NAME: CP368021.DGN	DRAWING NUMBER:	SHT 23
CHECKED: GVF/DWR	CHECKED: JSH	SOL NO: DACW37-99-B-0006	OF 39
DRAWN: DMT	DATE: 20 MAY 1999	<b>M-P5A-60/020</b>	



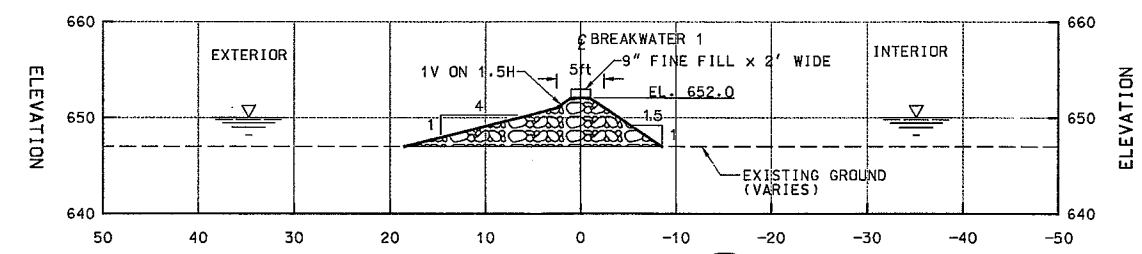
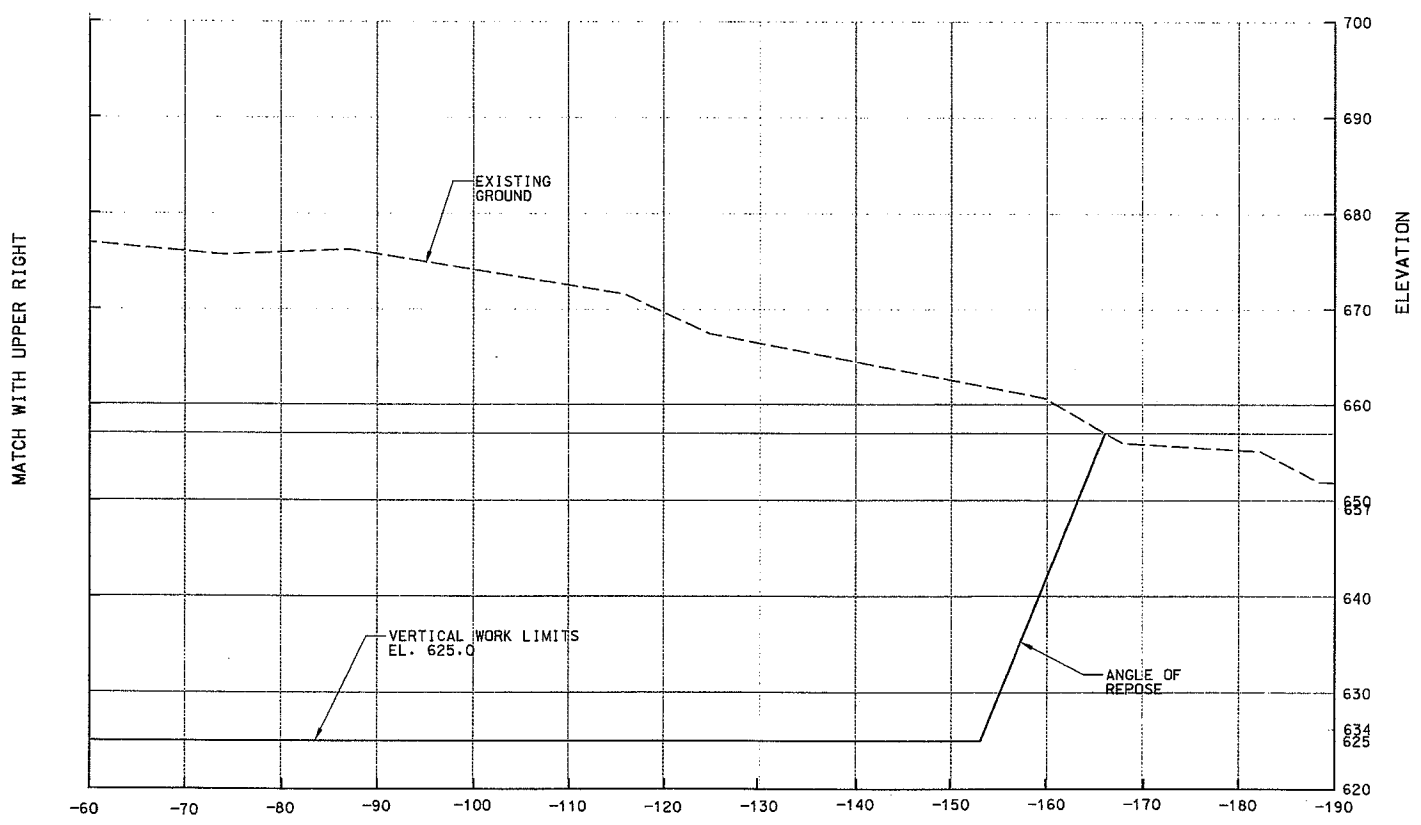


AS-BUILT AS OF DECEMBER 2002		DATE	APPROVAL
SYMBOL		DESCRIPTION	
AE APPROVING OFFICIAL:		AS-BUILT	
DESIGNED: DMT/JJF		POLANDER LAKE STAGE 2 - WILDS BEND EXCAVATION	
CHECKED: GVF/DWR		ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE	
DRAWN: DMT		MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA	
DESIGNED: SMG		ISLAND CONSTRUCTION	
CHECKED: JSH		SECTION 21	
DATE: 20 MAY 1999		CAD FILE NAME: CP368022.DGN	DRAWING NUMBER: M-P5A-60/021
SOL NO: DACW37-99-B-0006		SHR 24	OF 39



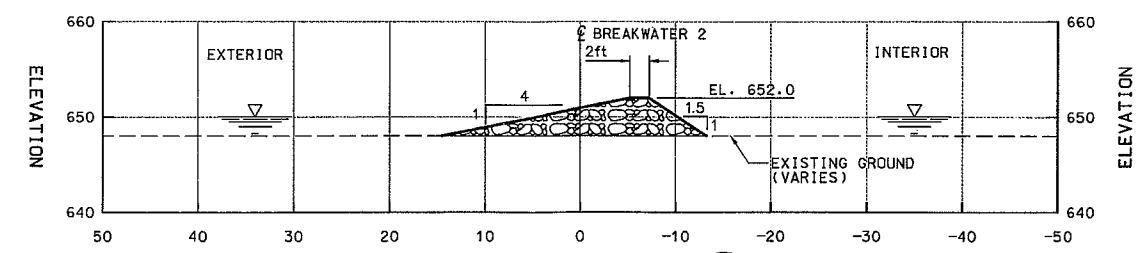
SECTION  
STA. 7+50W  
SCALE: AS SHOWN

22  
60/007



TYPICAL SECTION  
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SCALE: AS SHOWN

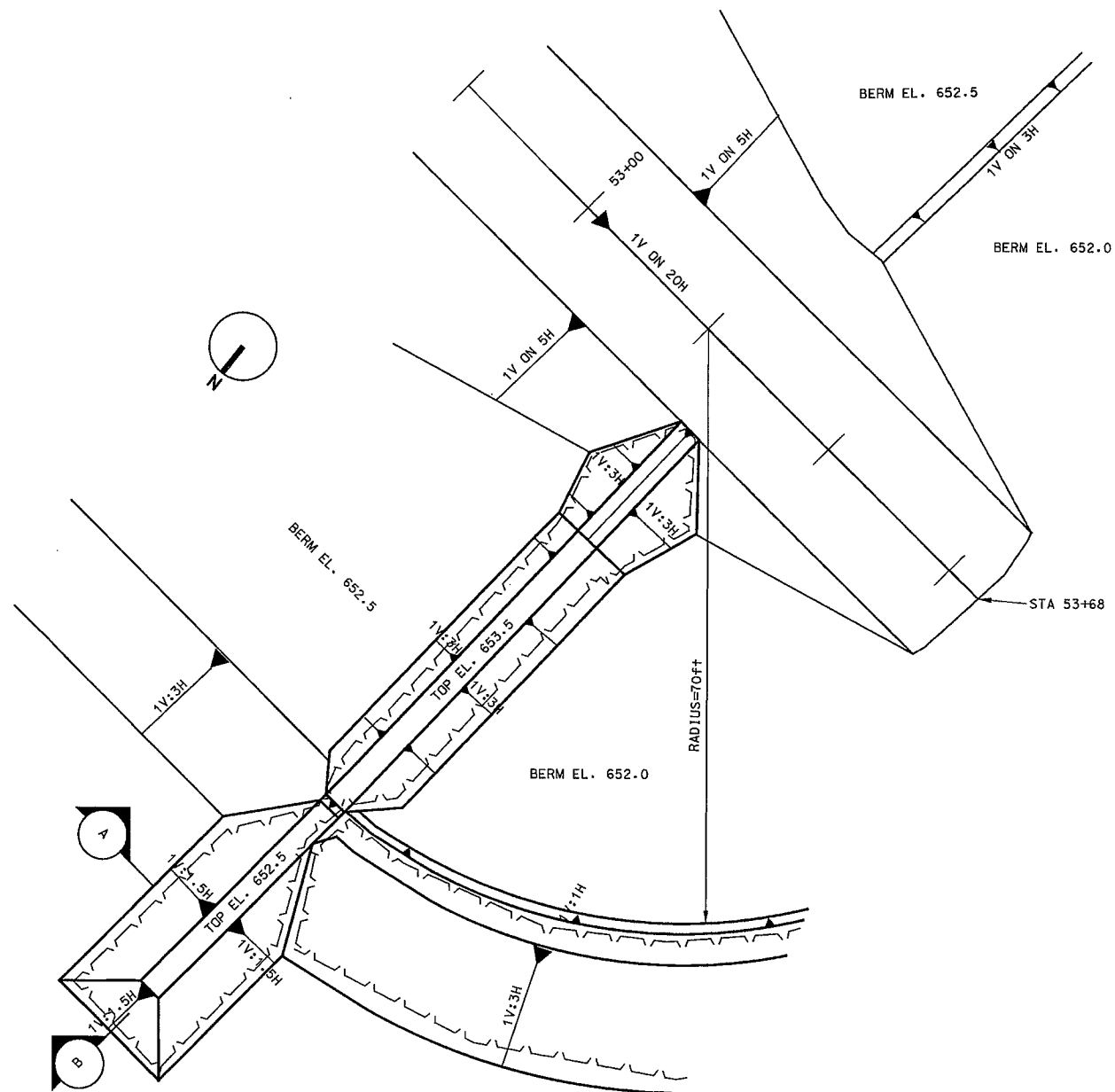
23  
60/002



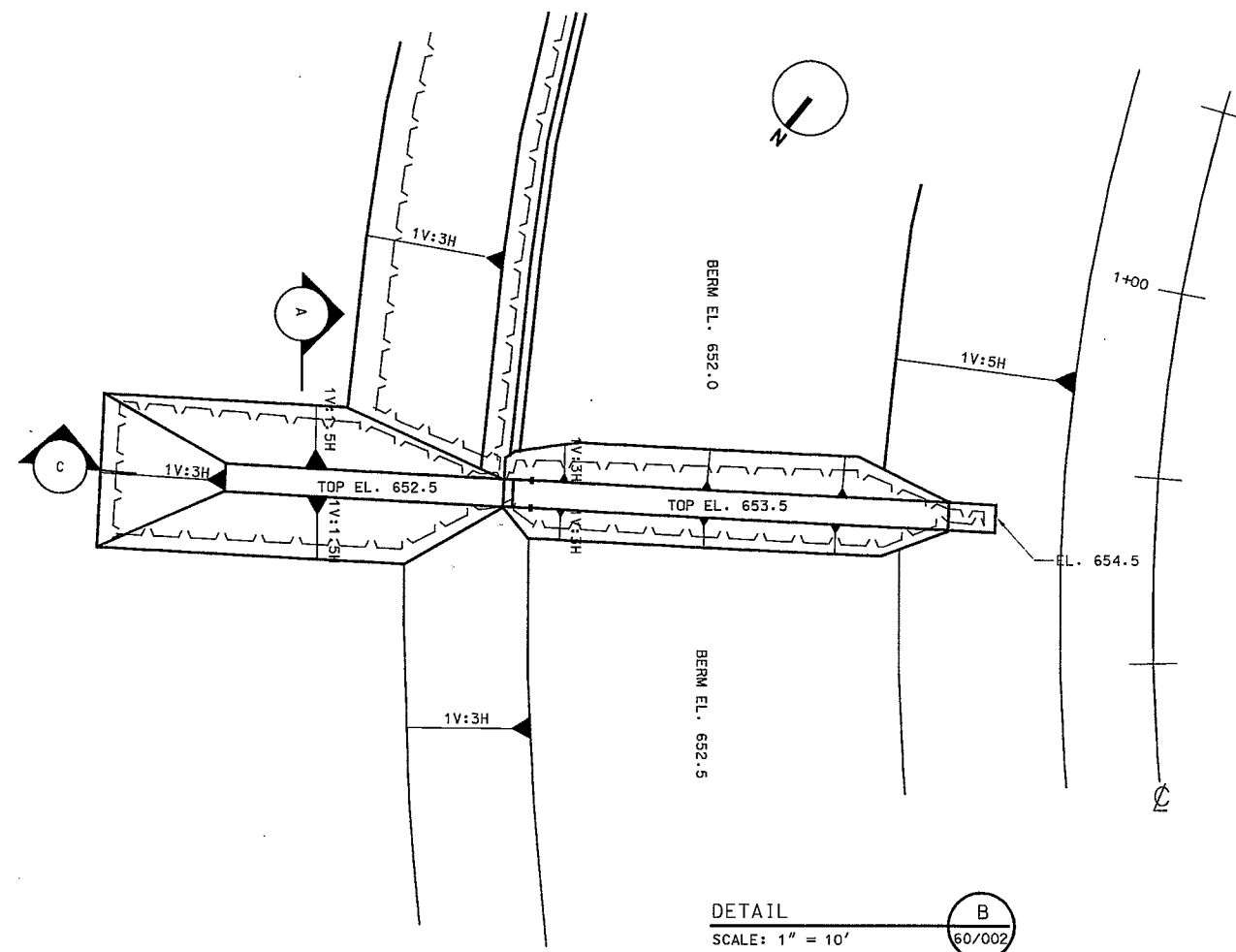
TYPICAL SECTION  
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SCALE: AS SHOWN

24  
60/003

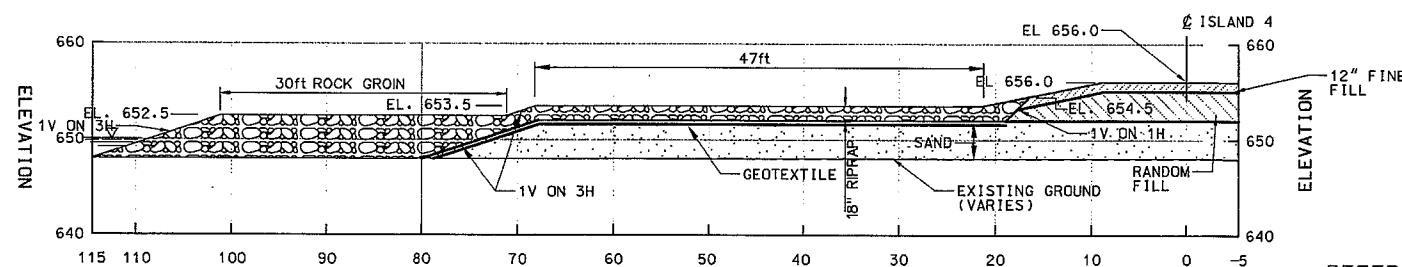
AS-BUILT AS OF DECEMBER 2002		DATE	APPROVAL
SYMBOL	DESCRIPTION	DATE	APPROVAL
<b>US Army Corps of Engineers</b> St. Paul District			
AE APPROVING OFFICIAL: DESIGNED: DMT/JJF CHECKED: GVF/DWR DRAWN: DMT DESIGNED: SMG CHECKED: JSH		AS-BUILT <b>POLANDER LAKE STAGE 2 - WILDS BEND EXCAVATION</b> ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA <b>ISLAND CONSTRUCTION</b> SECTION 22 TYPICAL SECTIONS 23, 24	
DATE: 20 MAY 1999 SOL NO: DACW37-99-B-0006		CAD FILE NAME: CM368023.DGN DRAWING NUMBER: <b>M-P5A-60/022</b>	SHT 25 OF 39



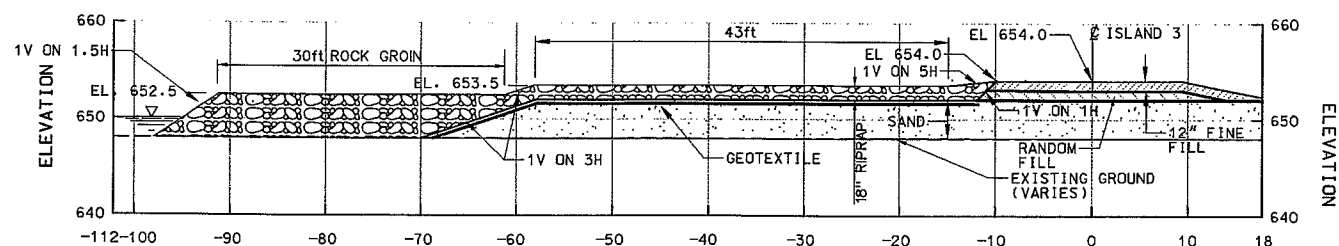
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SCALE: 1" = 10'



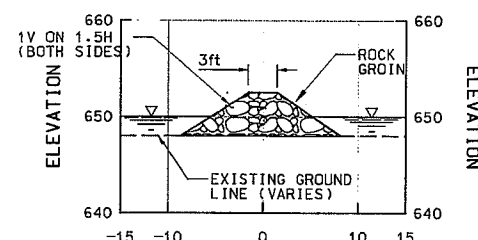
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SECTION  
SCALE: 1" = 10'



SECTION  
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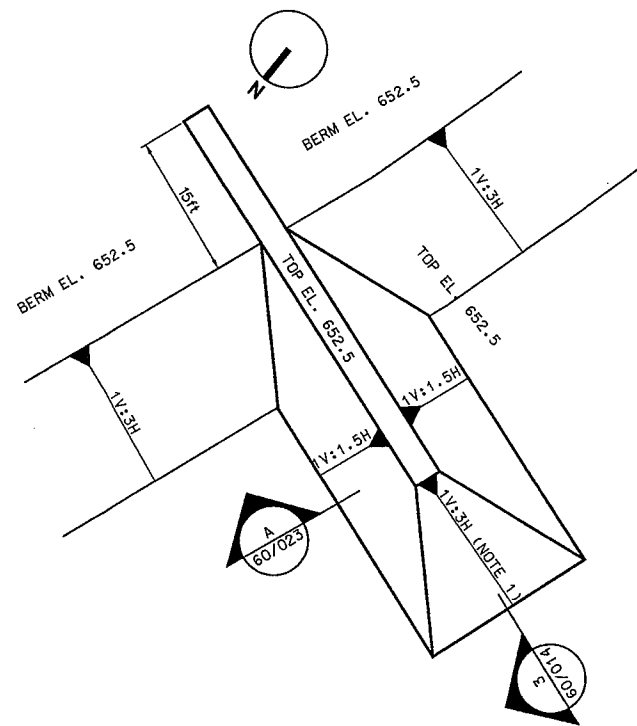


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SCALE: 1" = 10'

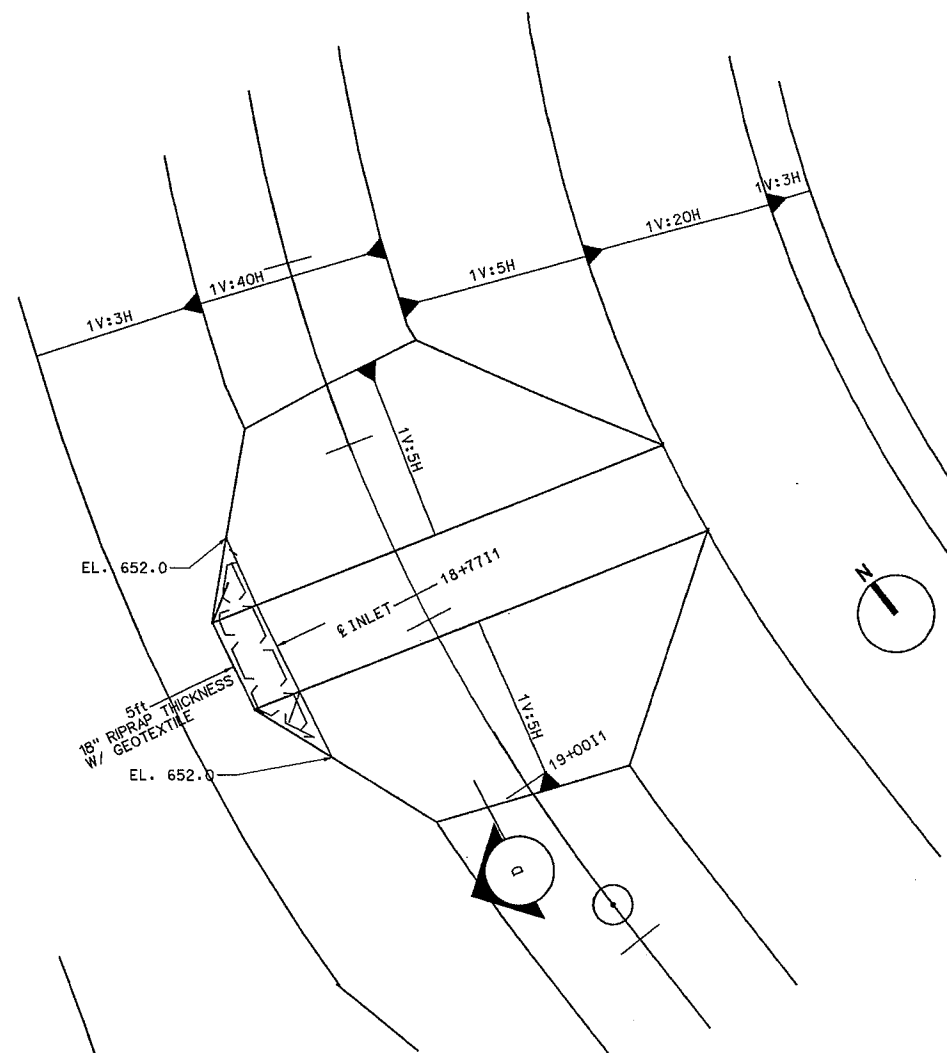
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AS-BUILT AS OF DECEMBER 2002		DATE	APPROVAL
SYMBOL		DESCRIPTION	
AE APPROVING OFFICIAL:		<b>US Army Corps of Engineers</b> St. Paul District	
DESIGNED: DMT/JJF		AS-BUILT	
CHECKED: GVF/DWR		POLANDER LAKE STAGE 2 - WILDS BEND EXCAVATION	
DRAWN: DMT		ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE	
DESIGNED: SMG		MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA	
CHECKED: JSH		ISLAND CONSTRUCTION	
DATE: 20 MAY 1999		DETAILS A, B & C	
SOL. NO: DACW37-99-B-0006		DRAWING NUMBER:	SHT 26
		M-P5A-60/023	OF 39

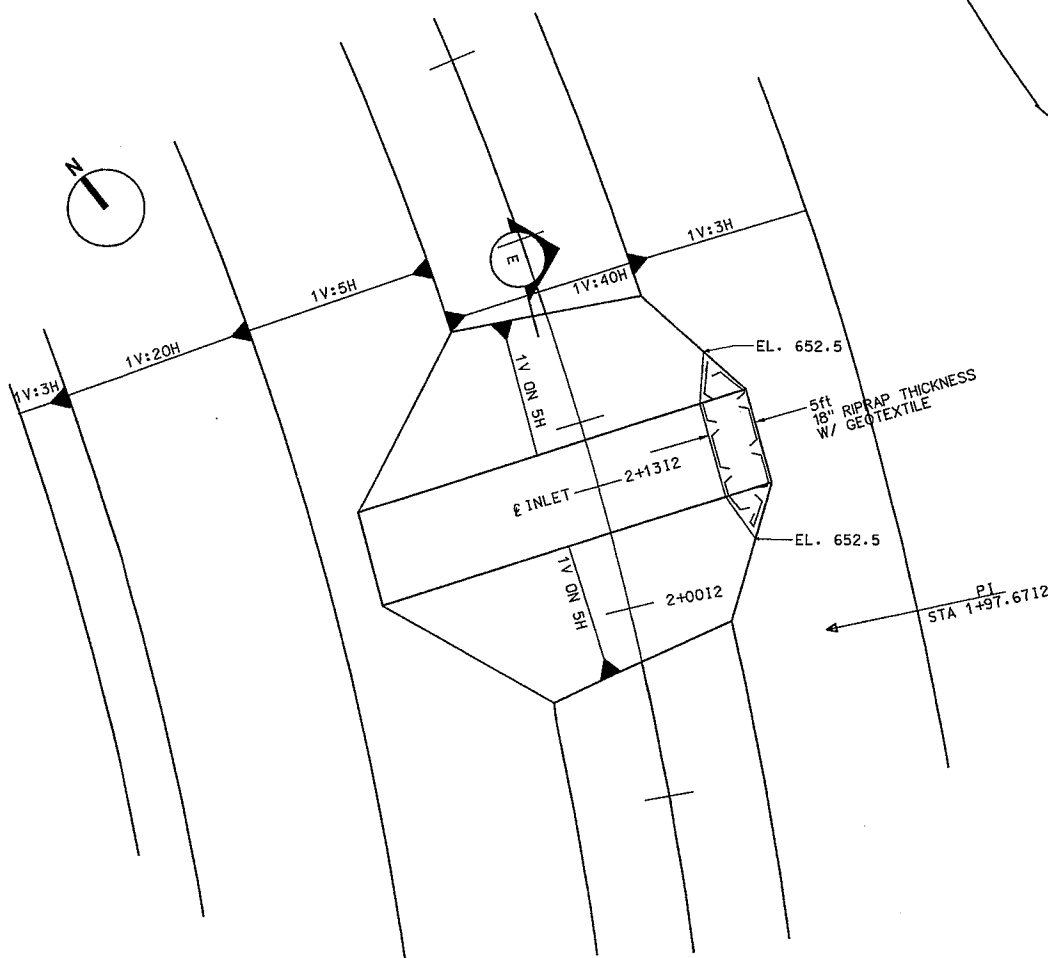
AS-BUILT



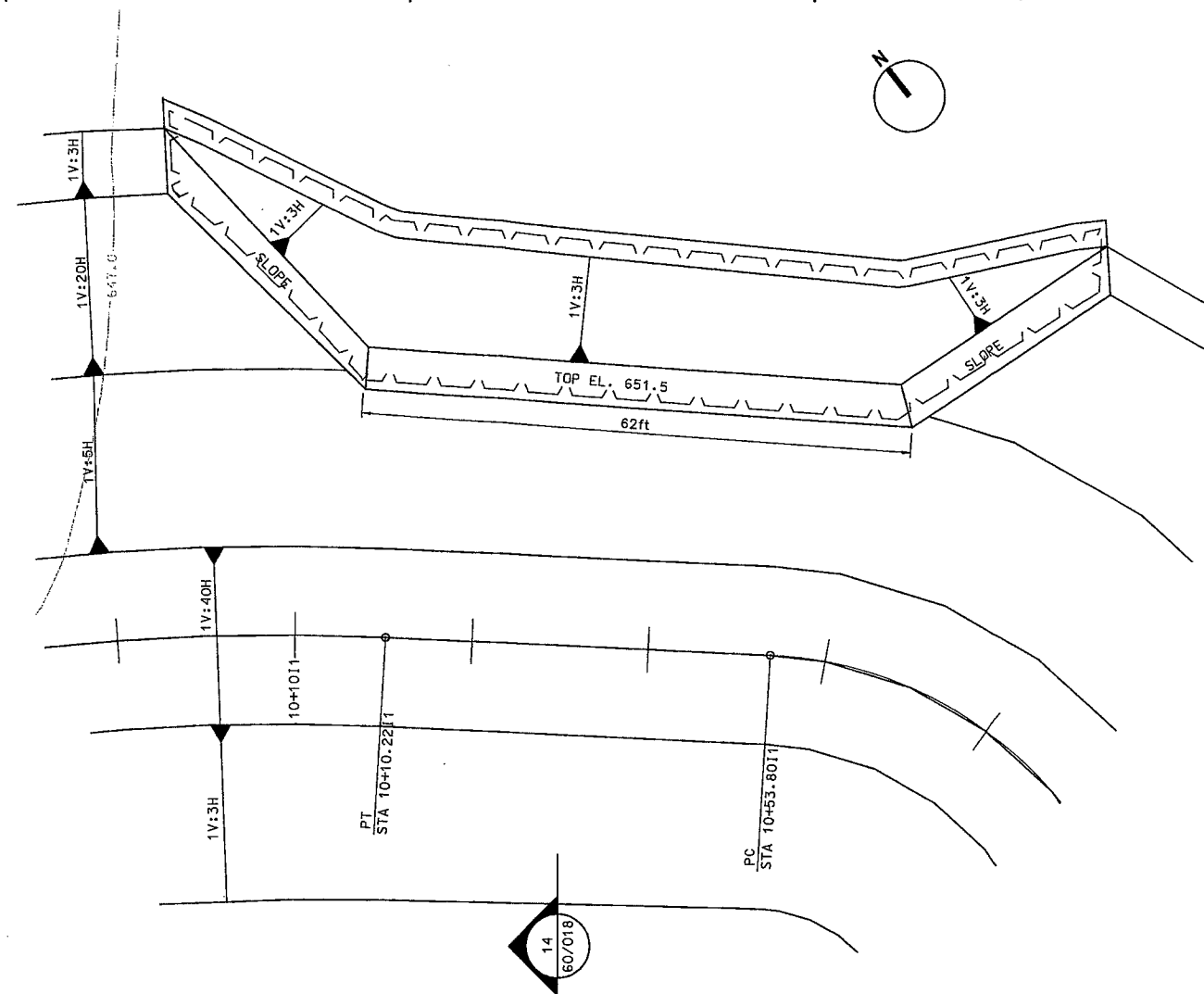
DETAIL  
TYPICAL GROIN  
SCALE: 1" = 10'



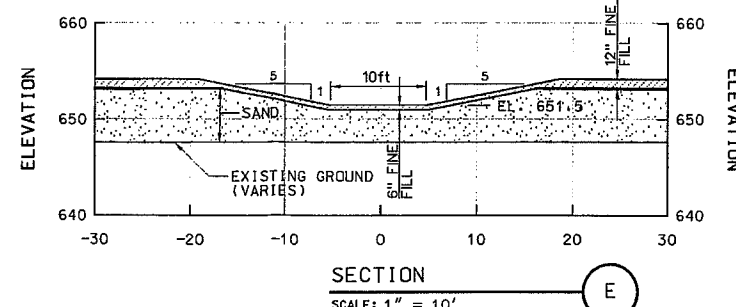
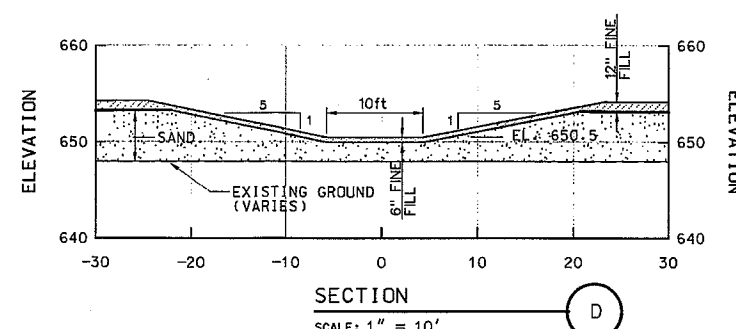
DETAIL  
INTERIOR ISLAND 1 INLET  
SCALE: 1" = 10'



DETAIL  
INTERIOR ISLAND 2 INLET  
SCALE: 1" = 10'



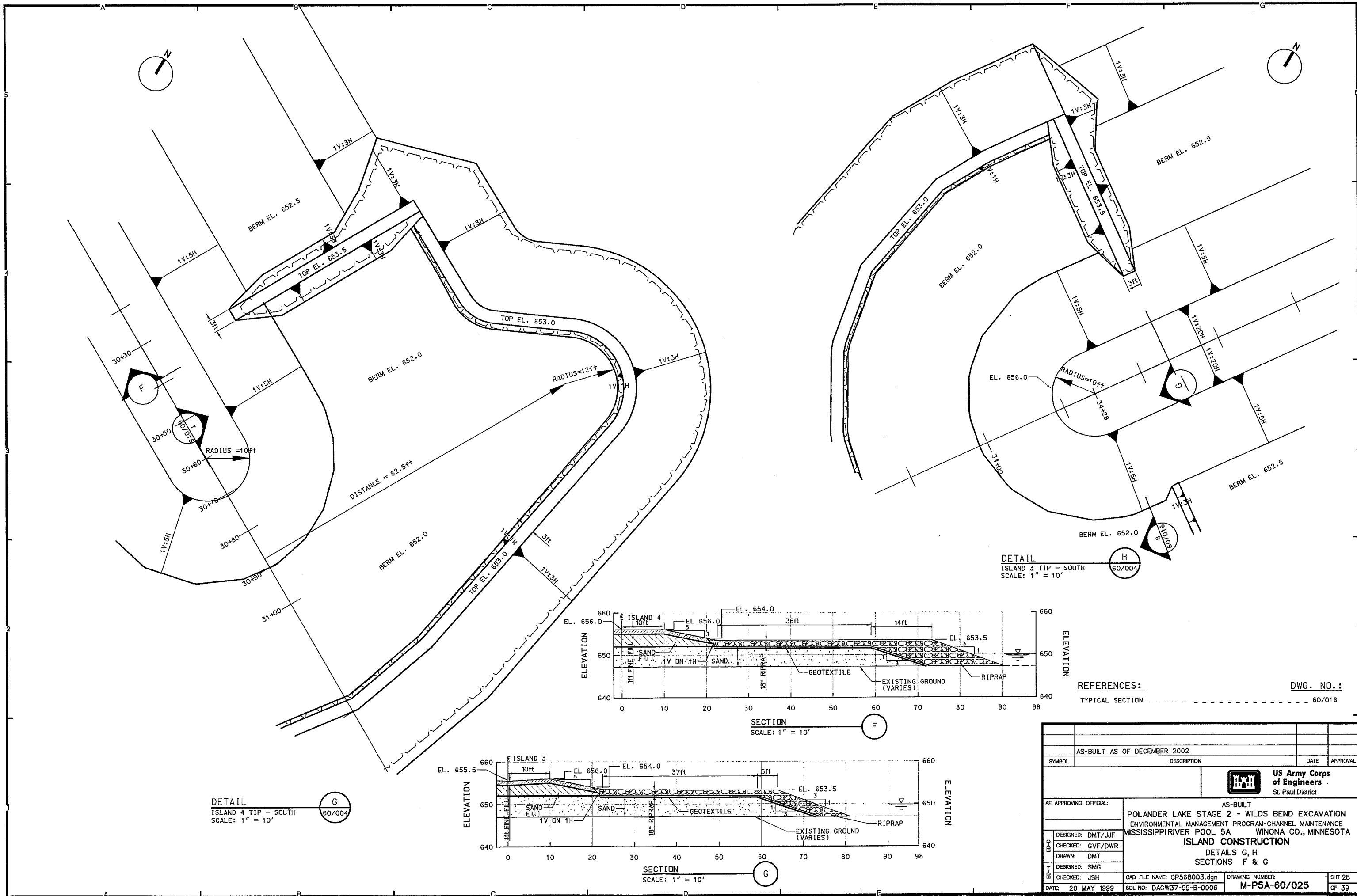
DETAIL  
INTERIOR ISLAND 1  
SCALE: 1" = 10'



- NOTES:
- 1V ON 3H END SLOPES FOR ROCK GROINS STA. 1+25.0 TO 15+41.0.  
1V ON 1.5H END SLOPES FOR ROCK GROINS STA. 16+74 TO 53+10.

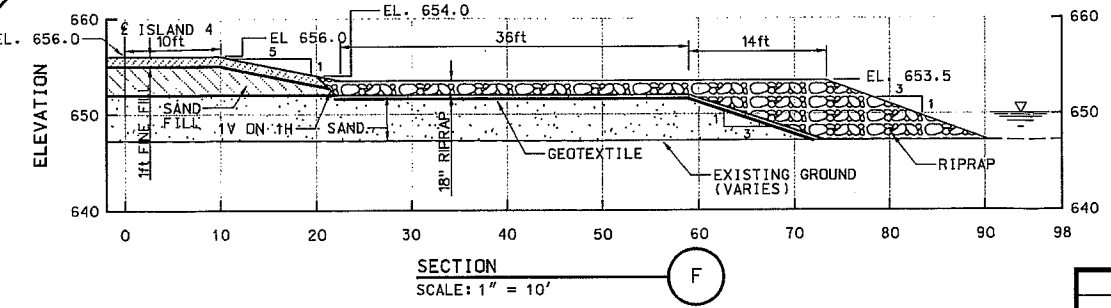
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TYPICAL SECTION	60/014.023
TYPICAL GROIN	60/002
INTERIOR ISLAND 1 INLET	60/003.006
INTERIOR ISLAND	60/003

AS-BUILT AS OF DECEMBER 2002		DATE	APPROVAL
SYMBOL		DESCRIPTION	
AE APPROVING OFFICIAL:		<b>US Army Corps of Engineers</b> St. Paul District	
DESIGNED: DMT/JJF		AS-BUILT	
CHECKED: GVF/DWR		POLANDER LAKE STAGE 2 - WILDS BEND EXCAVATION	
DRAWN: DMT		ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE	
DESIGNED: SMG		MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA	
CHECKED: JSH		ISLAND CONSTRUCTION	
DATE: 20 MAY 1999		DETAILS C, D, E & F	
CAD FILE NAME: CP568002.dgn		SECTIONS D & E	
SOL NO: DACW37-99-B-0006		DRAWING NUMBER:	SHT 27
		M-P5A-60/024	OF 39

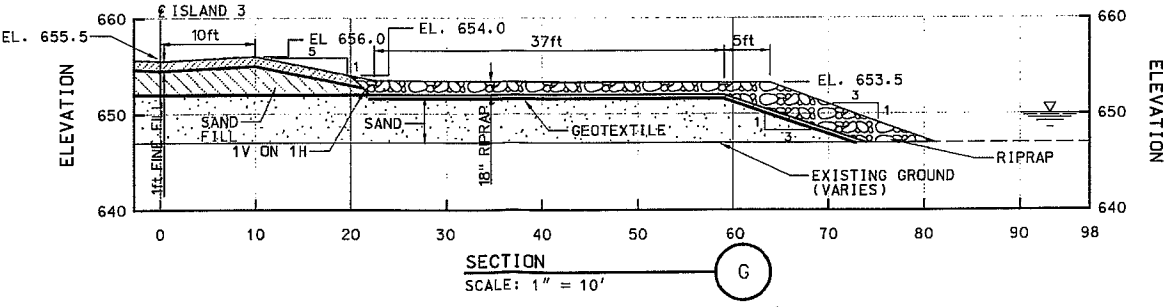


DETAIL  
ISLAND 4 TIP - SOUTH  
SCALE: 1" = 10'

DETAIL  
ISLAND 3 TIP - SOUTH  
SCALE: 1" = 10'



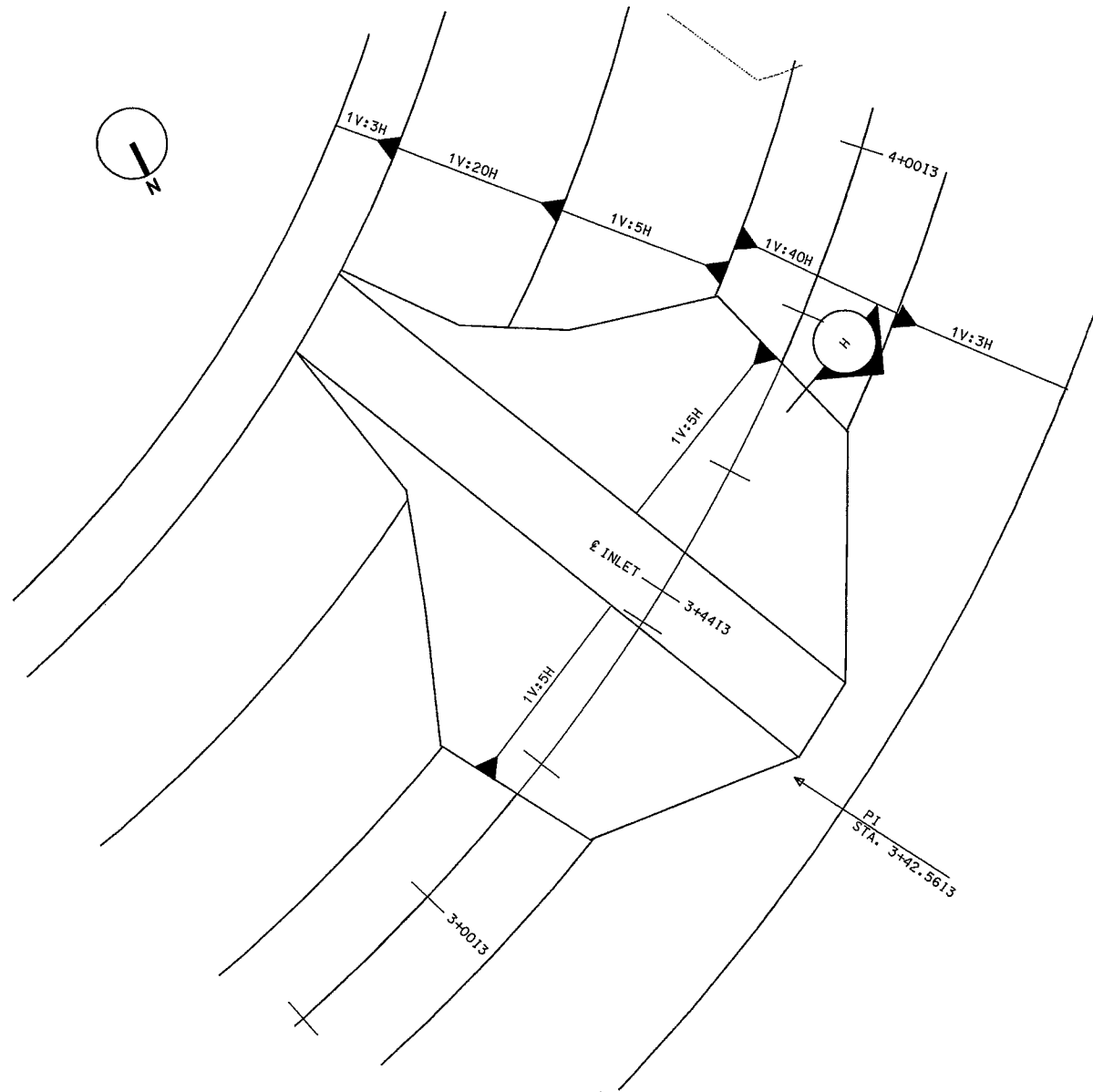
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SECTION  
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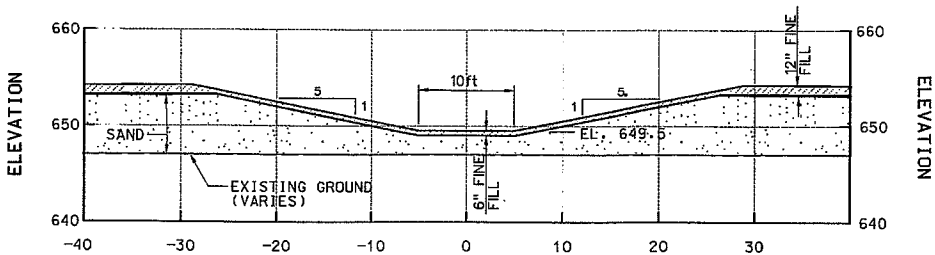
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AS-BUILT AS OF DECEMBER 2002		DATE	APPROVAL
SYMBOL		DESCRIPTION	
AE APPROVING OFFICIAL:		<b>US Army Corps of Engineers</b> St. Paul District	
DESIGNED: DMT/JJF		AS-BUILT	
CHECKED: GVF/DWR		POLANDER LAKE STAGE 2 - WILDS BEND EXCAVATION	
DRAWN: DMT		ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE	
DESIGNED: SMG		MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA	
CHECKED: JSH		ISLAND CONSTRUCTION	
DATE: 20 MAY 1999		DETAILS G, H	
SOL. NO: DACW37-99-B-0006		SECTIONS F & G	
DRAWING NUMBER: M-P5A-60/025		SHT 28	OF 39



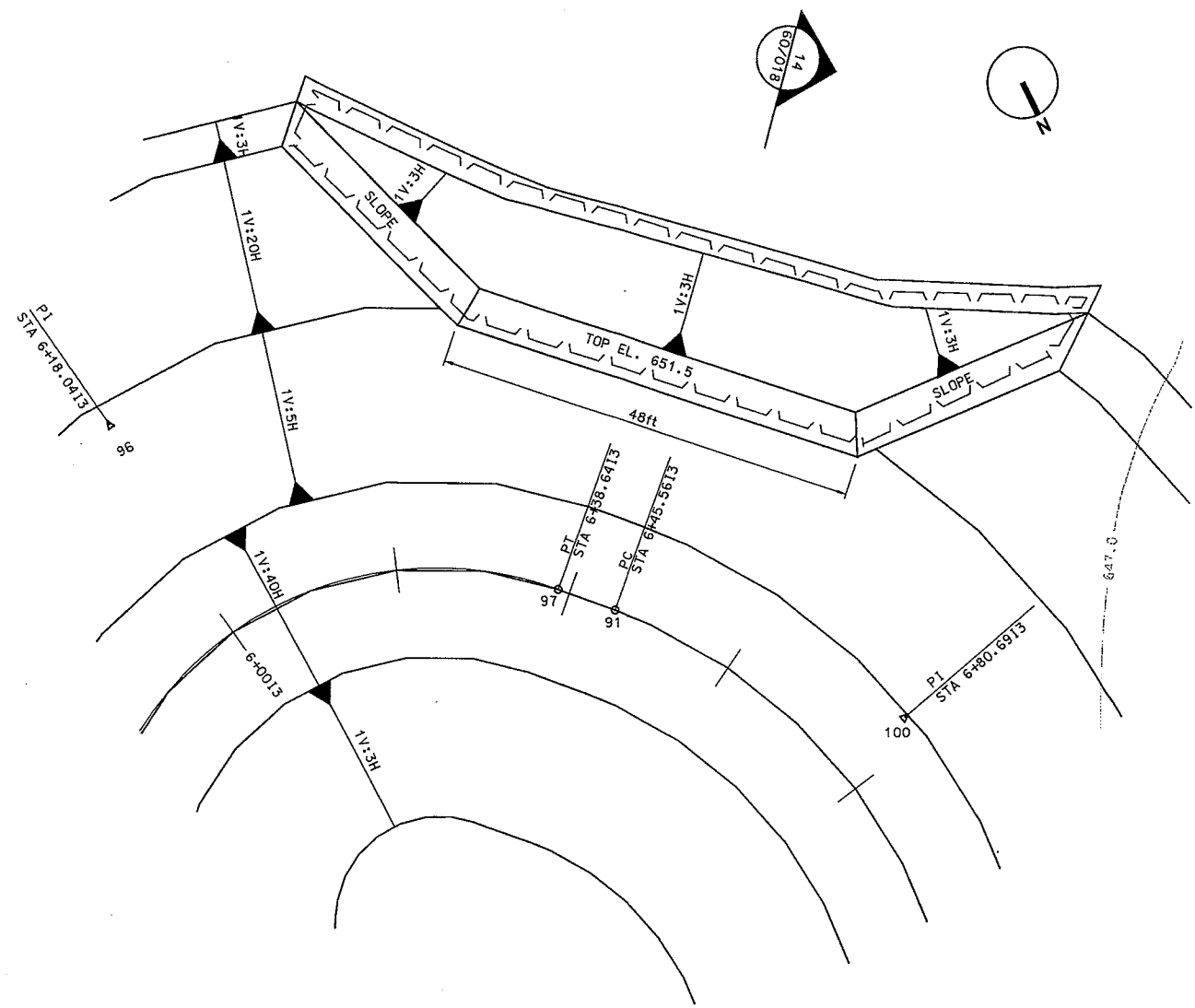
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SCALE: 1" = 10'

I  
60/006



SECTION  
SCALE: 1" = 10'

H



DETAIL  
INTERIOR ISLAND 3  
SCALE: 1" = 10'

J  
60/006

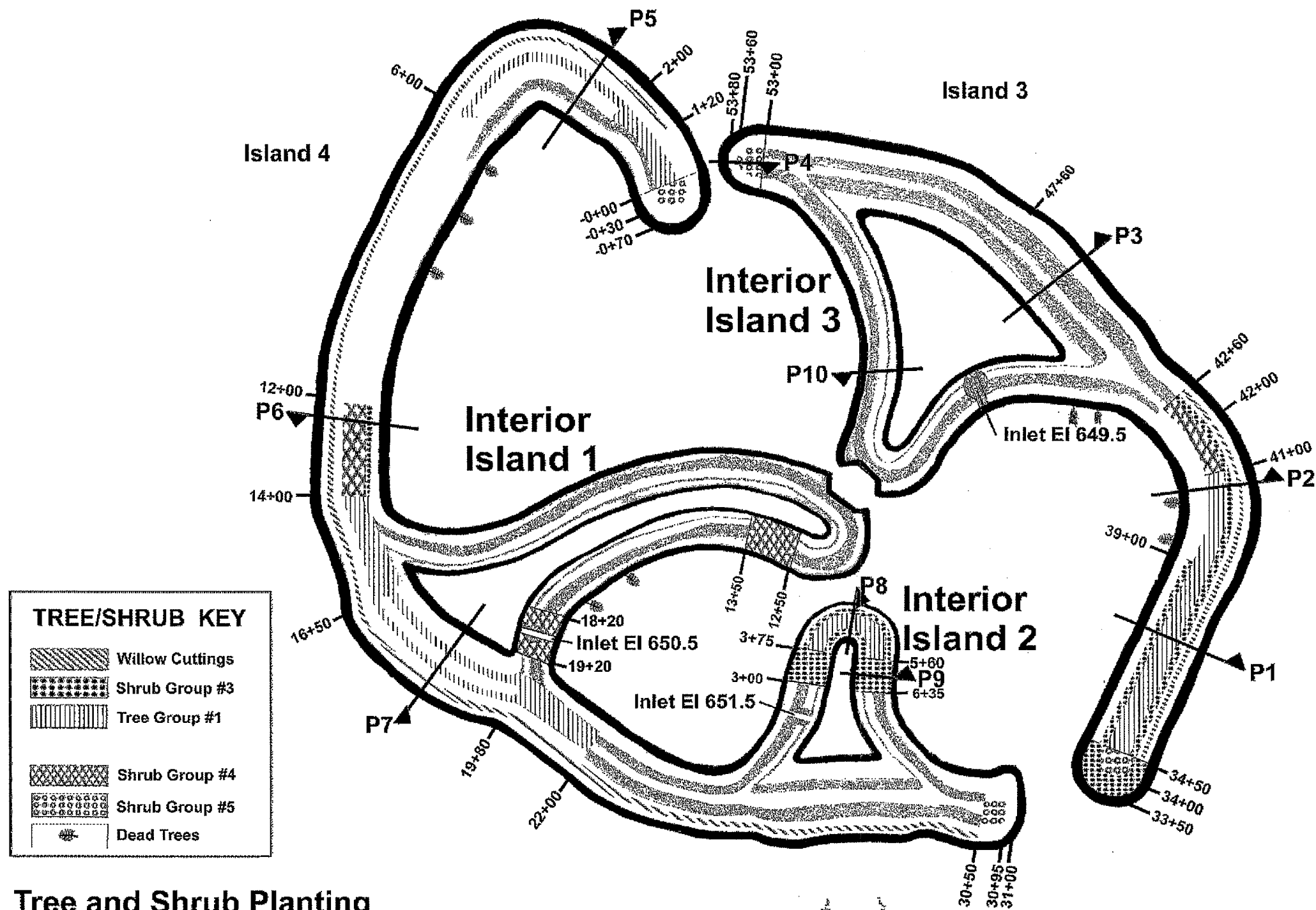
REFERENCES:

DWG. NO.:

SECTION ----- 60/018

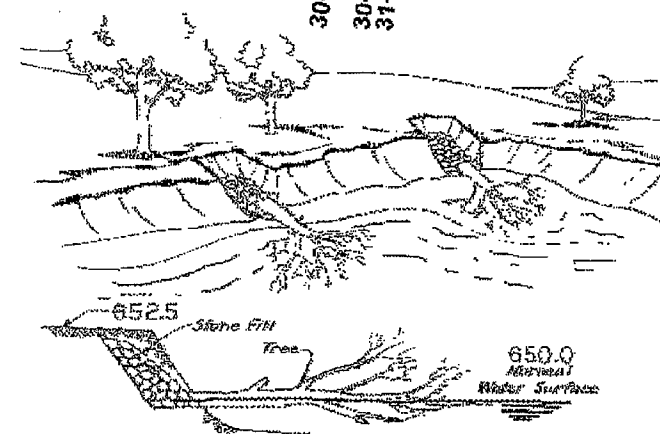
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SYMBOL		DESCRIPTION	
AE APPROVING OFFICIAL:		<b>US Army Corps of Engineers</b> St. Paul District	
DESIGNED: DMT/JJF		AS-BUILT	
CHECKED: GVF/DWR		POLANDER LAKE STAGE 2 - WILDS BEND EXCAVATION	
DRAWN: DMT		ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE	
DESIGNED: SMG		MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA	
CHECKED: JSH		ISLAND CONSTRUCTION	
DATE: 20 MAY 1999		DETAILS I, J	
CAD FILE NAME: CP568004.dgn		SECTION H	
SOL NO: DACW37-99-B-0006		DRAWING NUMBER:	SHT 29
		M-P5A-60/026	OF 39

AS-BUILT



## Tree and Shrub Planting

Woody Plantings	Island 4	Island 3	Interior Island 1	Interior Island 2	Interior Island 3
Willow Cuttings	Sta. 1+20 to 30+45	Sta. 34+50 to 42+60	n.a.	n.a.	n.a.
Tree Group #1	Sta. 2+00 to 6+00 Sta. 14+00 to 22+00	Sta. 34+50 to 41+00	n.a.	Sta. 3+75 to 5+60	n.a.
Tree Group #2	n.a.	n.a.	n.a.	n.a.	n.a.
Shrub Group #3	n.a.	Sta. 33+50 to 36+50	n.a.	Sta. 3+00 to 6+35	n.a.
Shrub Group #4	Sta. 12+00 to 14+00	Sta. 41+00 to 42+60	Sta. 12+50 to 13+50 Sta. 18+20 to 19+20	n.a.	n.a.
Shrub Group #5	Sta. -0+30 to 0+00 Sta. 30+50 to 30+95	Sta. 34+00 to 34+50 Sta. 53+00 to 53+60	n.a.	n.a.	n.a.



Typical Section - Dead Trees





NOTE:  
THE CONTRACTOR WILL PLACE 10 TREE TRUNKS ON THE INTERIOR OF THE ISLAND COMPLEX TO SERVE AS TURTLE AND WATERFOWL LOAFING SITES. THE LOCATIONS WILL BE DESIGNATED BY THE CONTRACTING OFFICER. THE TREE TRUNKS SHALL BE A MINIMUM LENGTH OF 25 FEET AND SHALL HAVE A MINIMUM DIAMETER OF 14 INCHES AT THE BUTT END. FIVE FEET OF THE BUTT END OF THE TREE SHALL BE EMBEDDED INTO THE ISLANDS BY EXCAVATING A HOLE INTO THE ISLAND, DOWN TO ELEVATION 651.0 AND PLACING THE BUTT END OF THE TREE TRUNK INTO THE HOLE (WITH THE TREE IN AN APPROXIMATE HORIZONTAL POSITION). THE HOLE SHALL BE BACKFILLED WITH ROCK SIMILAR IN NATURE TO THE ROCK USED FOR THE ROCK GROINS.

REFERENCES: DWG. NO.:  
SITE PLANS ----- 60/002-006

AS-BUILT AS OF DECEMBER 2002		DATE	APPROVAL
SYMBOL	DESCRIPTION	DATE	APPROVAL
<b>US Army Corps of Engineers</b> St. Paul District			
AE APPROVING OFFICIAL: DESIGNED: KYN CHECKED: DMS DRAWN: KYN/DMT		AS-BUILT <b>POLANDER LAKE STAGE 2 - WILDS BEND EXCAVATION</b> ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA <b>ISLAND CONSTRUCTION</b> PLAN VIEW <b>TREE AND SHRUB PLANTING PLAN</b>	
DESIGNED: KYN CHECKED: DMS DATE: 20 MAY 1999		CAD FILE NAME: LP112001.DGN SOL NO: DACW37-99-B-0006	DRAWING NUMBER: <b>M-P5A-12/001</b> SHEET 30 OF 39

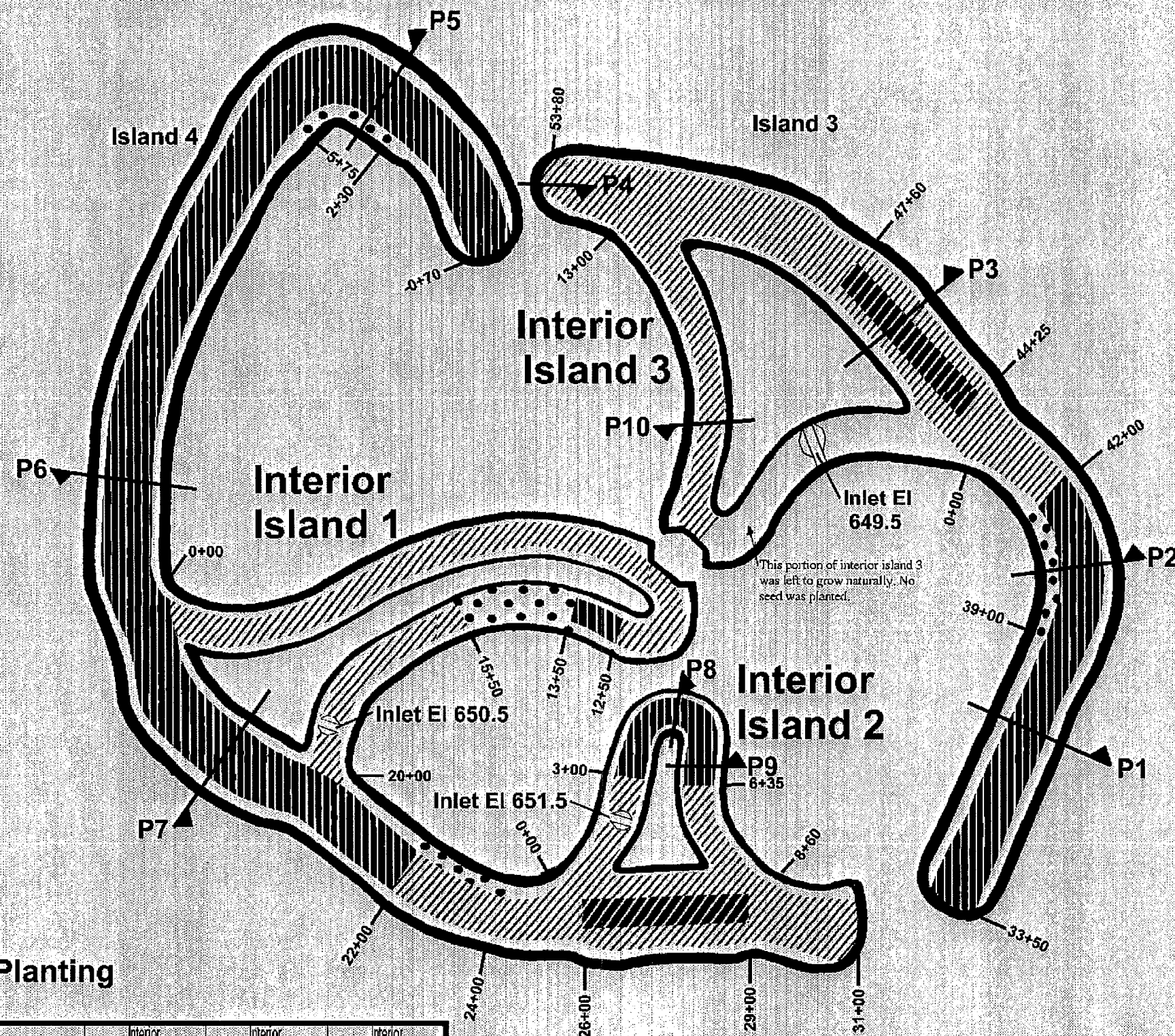


**KEY**

-  Seed Mix #1
-  Seed Mix #2
-  Seed Mix #3
-  Seed Mix #4


## Grass and Forbs Planting

Grass/Forb Plantings	Island 4	Island 3	Interior Island 1	Interior Island 2	Interior Island 3
Seed Mix #1	Sta. 0+70 to 22+00	Sta. 33+50 to 42+00	Sta. 12+50 to 13+50	Sta. 3+00 to 6+35	n.a.
Seed Mix #2	Sta. 26+00 to 29+00	Sta. 44+25 to 47+60	n.a.	n.a.	n.a.
Seed Mix #3	Sta. 22+00 to 31+00	Sta. 42+00 to 53+80	Sta. 0+00 to 12+50 Sta. 15+50 to 20+00*	Sta. 0+00 to 3+00* Sta. 6+35 to 8+60	Sta. 6+00 to 13+00*
Seed Mix #4	Sta. 2+30 to 5+75 Sta. 22+00 to 24+00	Sta. 39+00 to 42+00	Sta. 13+50 to 15+50	n.a.	n.a.

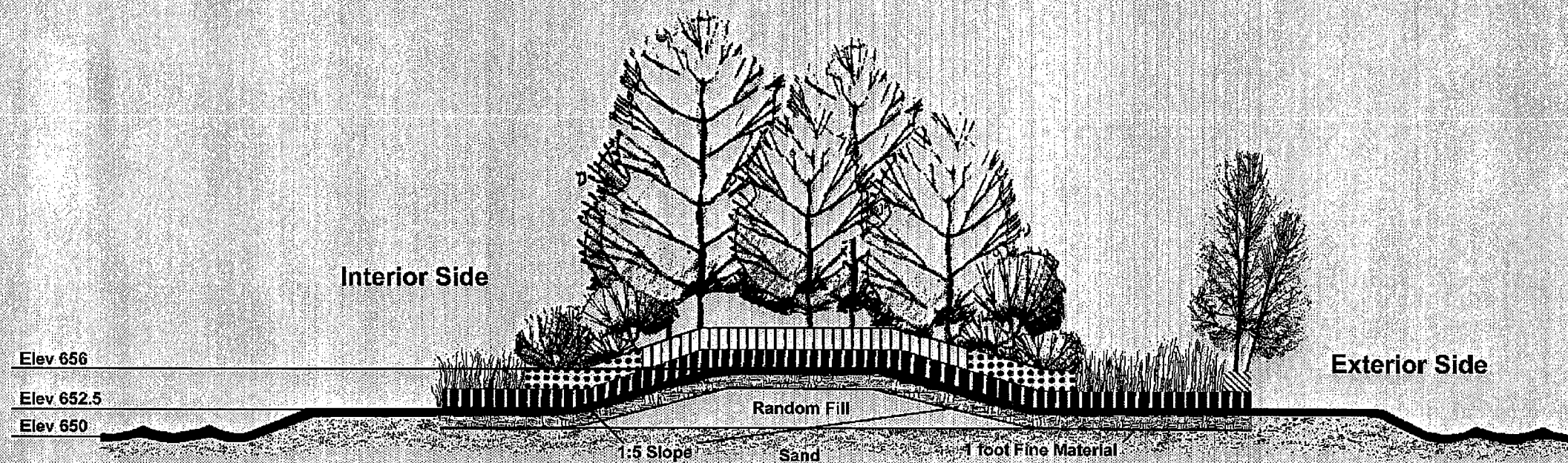


REFERENCES: \_\_\_\_\_ DWG. NO.: \_\_\_\_\_

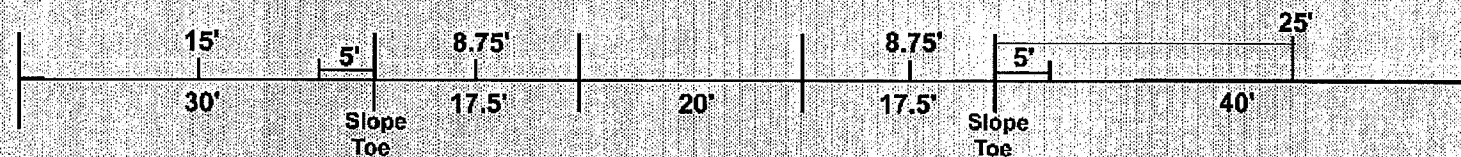
SITE PLANS \_\_\_\_\_ \_60/002-006

AS-BUILT AS OF DECEMBER 2002		DATE	APPROVAL
SYMBOL	DESCRIPTION	DATE	APPROVAL
 <b>US Army Corps of Engineers</b> St. Paul District			
AE APPROVING OFFICIAL: DESIGNED: KYN CHECKED: DMS DRAWN: KYN/DMT		AS-BUILT POLANDER LAKE STAGE 2 - WILDS BEND EXCAVATION ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA <b>ISLAND CONSTRUCTION</b> PLAN VIEW GRASS AND FORBS PLANTING PLAN	
DATE: 20 MAY 1999	CAD FILE NAME: LP112002.DGN SOL NO: DACW37-99-B-0006	DRAWING NUMBER: <b>M-P5A-12/002</b>	SHT 31 OF 39





**Cross Section P1 - Island 3**



**TREE/SHRUB KEY**

- Willow Cuttings
- Shrub Group #3
- Tree Group #1
- Shrub Group #4
- Shrub Group #5

**GRASS KEY**

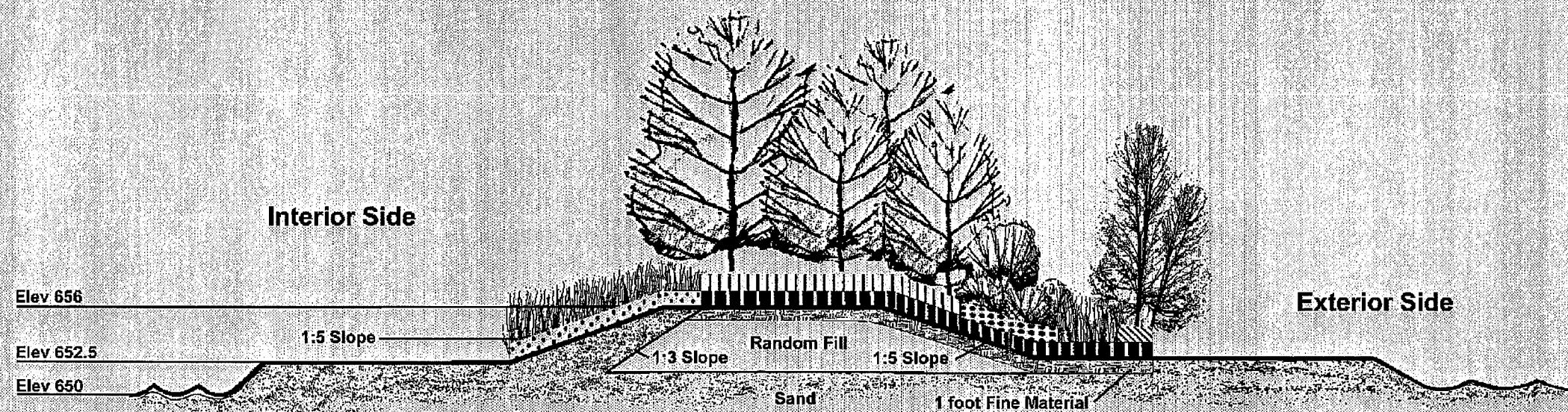
- Seed Mix #1
- Seed Mix #2
- Seed Mix #3
- Seed Mix #4

**REFERENCES:**

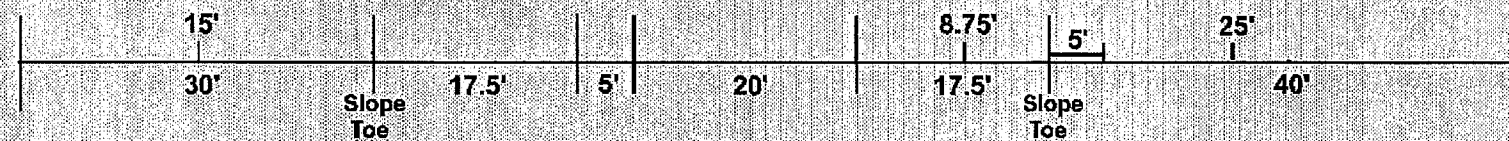
PLANTING PLANS ----- 12/001-002  
TYPICAL SECTION 9 ----- 60/016

**DWG. NO.:**

AS-BUILT AS OF DECEMBER 2002		DATE	APPROVAL
SYMBOL		DESCRIPTION	
AE APPROVING OFFICIAL:		<b>US Army Corps of Engineers</b> St. Paul District	
DESIGNED: KYN		AS-BUILT	
CHECKED: DMS		POLANDER LAKE STAGE 2 - WILDS BEND EXCAVATION	
DRAWN: KYN/DMT		ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE	
DESIGNED:		MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA	
CHECKED:		<b>ISLAND CONSTRUCTION</b>	
DATE: 20 MAY 1999		CROSS SECTION P1	
SOL NO: DACW37-99-B-0006		ISLAND 3	
DRAWING NUMBER:		SHT 32	OF 39
M-P5A-12/003			



**Cross Section P2 - Island 3**



**TREE/SHRUB KEY**

- Willow Cuttings
- Shrub Group #3
- Tree Group #1
- Shrub Group #4
- Shrub Group #5

**GRASS KEY**

- Seed Mix #1
- Seed Mix #2
- Seed Mix #3
- Seed Mix #4

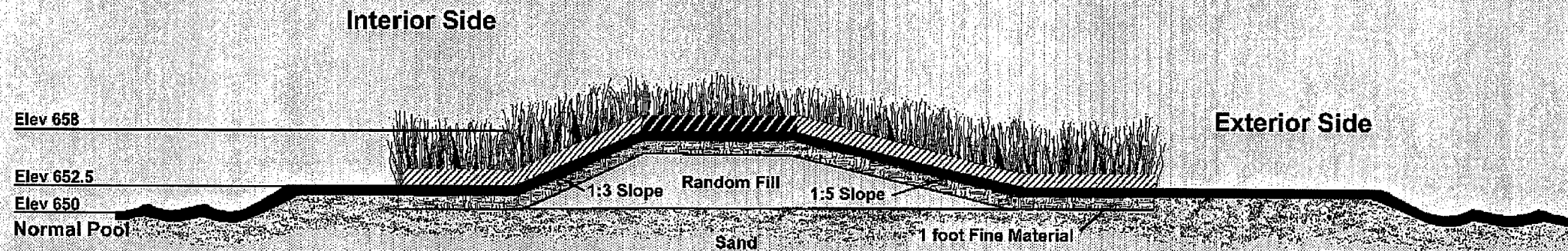
**REFERENCES:**

PLANTING PLANS - - - - - 12/001-002  
TYPICAL SECTION 6 - - - - - 60/015

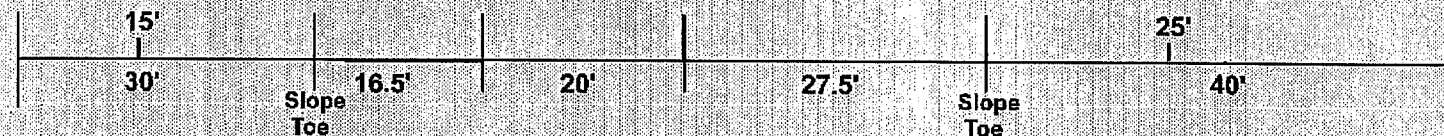
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DESIGNED: KYN		AS-BUILT	
CHECKED: DMS		POLANDER LAKE STAGE 2 - WILDS BEND EXCAVATION	
DRAWN: KYN/DMT		ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE	
DESIGNED:		MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA	
CHECKED:		ISLAND CONSTRUCTION	
DATE: 20 MAY 1999		CROSS SECTION P2	
SOL NO: DACW37-99-B-0006		ISLAND 3	
DRAWING NUMBER: M-P5A-12/004		SHT 33 OF 39	





**Cross Section P3 - Island 3**



**TREE/SHRUB KEY**

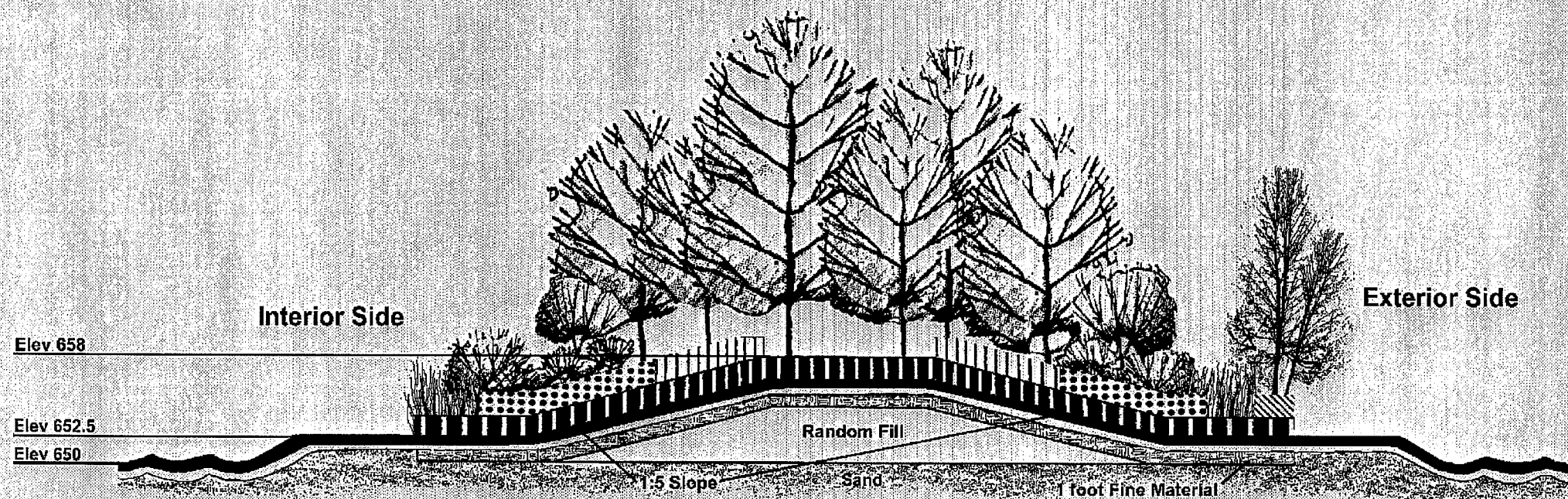
- Willow Cuttings
- Shrub Group #3
- Tree Group #1
- Shrub Group #4
- Shrub Group #5

**GRASS KEY**

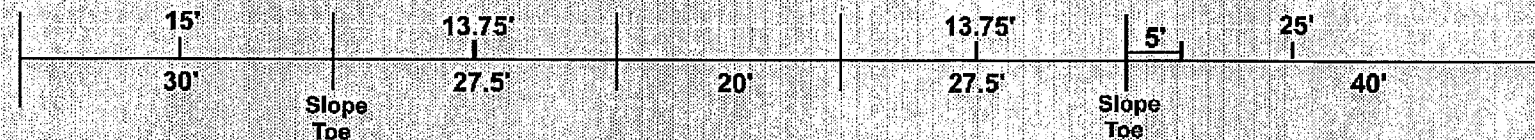
- Seed Mix #1
- Seed Mix #2
- Seed Mix #3
- Seed Mix #4

REFERENCES: DWG. NO. :  
 PLANTING PLANS - - - - - 12/001-002  
 TYPICAL SECTION 10 - - - - - 60/017

AS-BUILT AS OF DECEMBER 2002		DATE	APPROVAL
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CAD FILE NAME: LP312005.DGN SOL NO: DACW37-99-B-0006 DATE: 20 MAY 1999		DRAWING NUMBER: <b>M-P5A-12/005</b>	SHT 34 OF 39



**Cross Section P7 - Island 4**



**TREE/SHRUB KEY**

- Willow Cuttings
- Shrub Group #3
- Tree Group #1
- Shrub Group #4
- Shrub Group #5

**GRASS KEY**

- Seed Mix #1
- Seed Mix #2
- Seed Mix #3
- Seed Mix #4

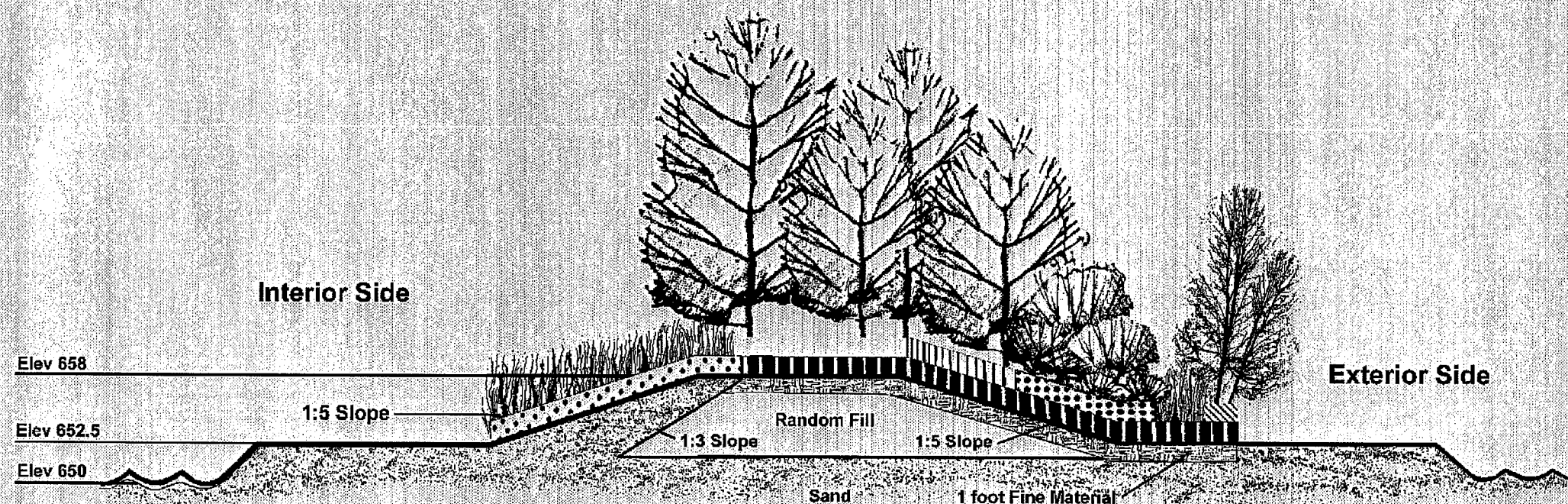
**REFERENCES:**

PLANTING PLANS ----- 12/001-002  
SECTION 11 ----- 60/017

**DWG. NO.:**




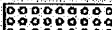
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DESIGNED: KYN		AS-BUILT	
CHECKED: DMS		POLANDER LAKE STAGE 2 - WILDS BEND EXCAVATION	
DRAWN: KYN/DMT		ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE	
DESIGNED:		MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA	
CHECKED:		ISLAND CONSTRUCTION	
DATE: 20 MAY 1999		CROSS SECTION P4	
SOL NO: DACW37-99-B-0006		ISLAND 4	
DRAWING NUMBER: M-P5A-12/006		SHT 35	OF 39









**Cross Section P5 - Island 4**


**TREE/SHRUB KEY**

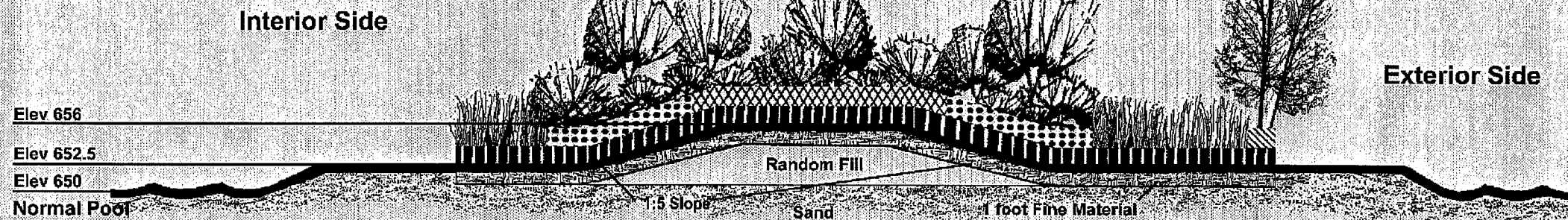
-  Willow Cuttings
-  Shrub Group #3
-  Tree Group #1
-  Shrub Group #4
-  Shrub Group #5

**GRASS KEY**

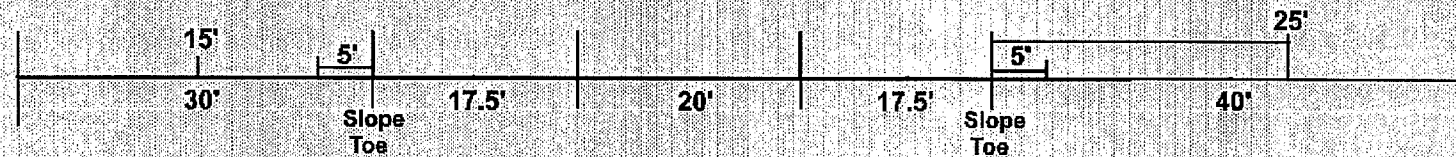
-  Seed Mix #1
-  Seed Mix #2
-  Seed Mix #3
-  Seed Mix #4

REFERENCES: DWG. NO.:  
 PLANTING PLANS 12/001-002  
 TYPICAL SECTION 2 60/014

AS-BUILT AS OF DECEMBER 2002		DATE	APPROVAL
SYMBOL		DESCRIPTION	
AE APPROVING OFFICIAL:		 <b>US Army Corps of Engineers</b> St. Paul District	
DESIGNED: KYN		AS-BUILT	
CHECKED: DMS		POLANDER LAKE STAGE 2 - WILDS BEND EXCAVATION	
DRAWN: KYN/DMT		ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE	
DESIGNED:		MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA	
CHECKED:		ISLAND CONSTRUCTION	
DATE: 20 MAY 1999		CROSS SECTION P5	
SOL NO: DACW37-99-B-0006		ISLAND 4	
DRAWING NUMBER: M-P5A-12/007		SHT 36	
		OF 39	



**Cross Section P6 - Island 4**



**TREE/SHRUB KEY**

- Willow Cuttings
- Shrub Group #3
- Tree Group #1
- Shrub Group #4
- Shrub Group #5

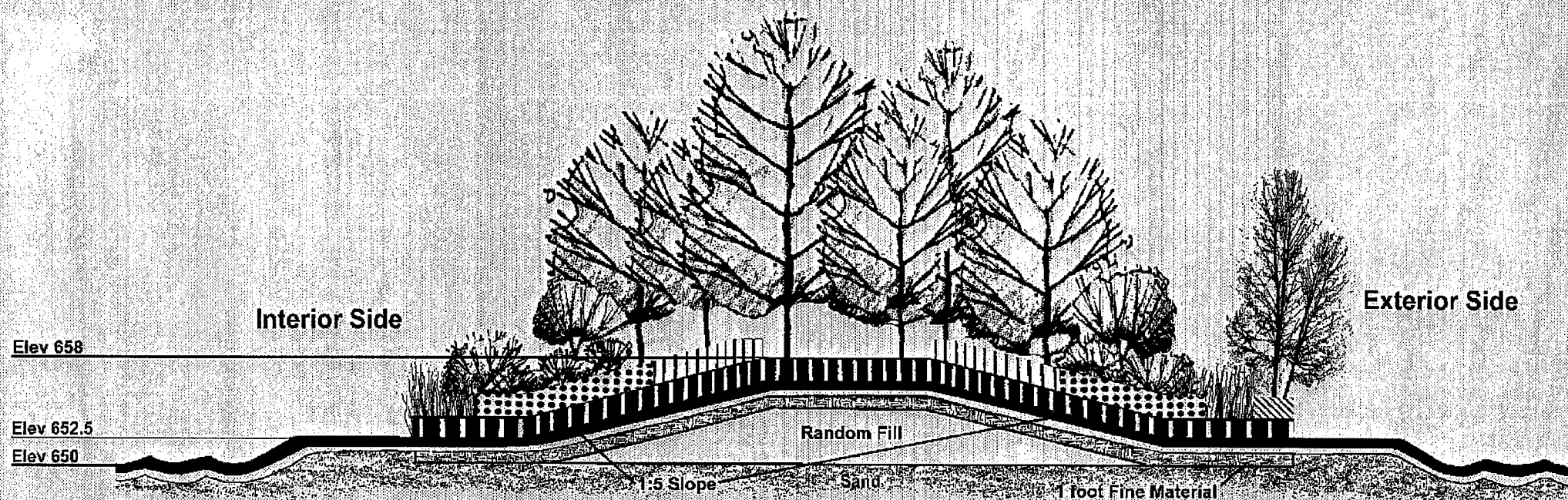
**GRASS KEY**

- Seed Mix #1
- Seed Mix #2
- Seed Mix #3
- Seed Mix #4

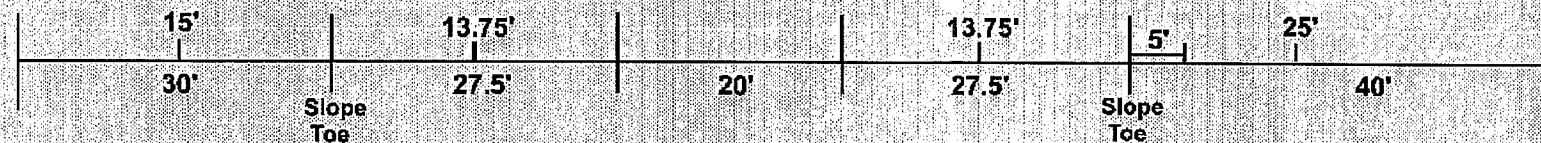
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 PLANTING PLAN - - - - - 12/001-002

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DRAWN: KYN/DMT		ENVIRONMENTAL MANAGEMENT PROGRAM-CHANNEL MAINTENANCE	
		MISSISSIPPI RIVER POOL 5A WINONA CO., MINNESOTA	
		<b>ISLAND CONSTRUCTION</b>	
		CROSS SECTION P6	
		ISLAND 4	
DESIGNED:	CAD FILE NAME: LP312008.DGN	DRAWING NUMBER:	SHT 37
CHECKED:	SOL NO: DACW37-99-B-0006	<b>M-P5A-12/008</b>	OF 39
DATE: 20 MAY 1999			





**Cross Section P7 - Island 4**



**TREE/SHRUB KEY**

- Willow Cuttings
- Shrub Group #3
- Tree Group #1
- Shrub Group #4
- Shrub Group #5

**GRASS KEY**

- Seed Mix #1
- Seed Mix #2
- Seed Mix #3
- Seed Mix #4

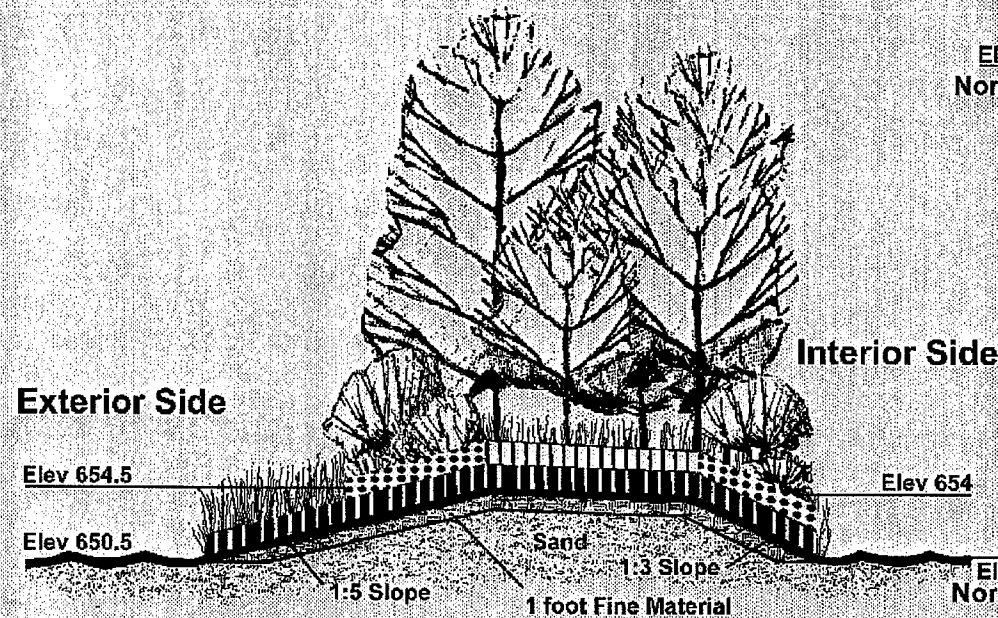
**REFERENCES:**

PLANTING PLANS - 12/001-002  
TYPICAL SECTION 4 - 60/015

**DWG. NO.:**

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SYMBOL		DESCRIPTION	
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# Interior Islands



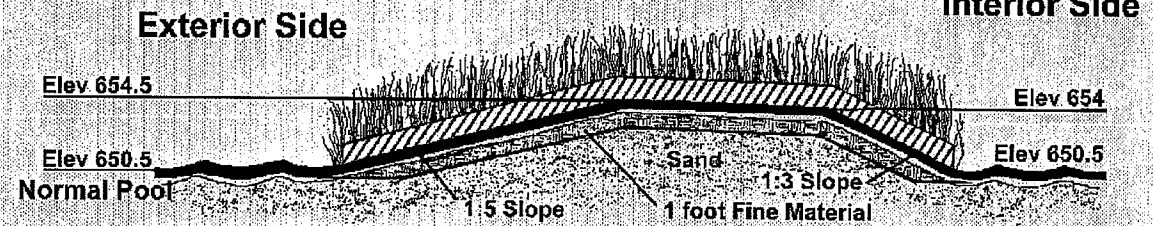
Section P8

## TREE/SHRUB KEY

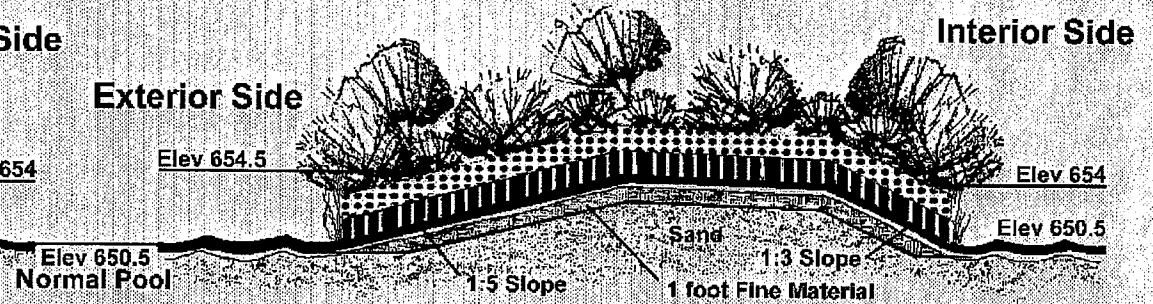
- Willow Cuttings
- Shrub Group #3
- Tree Group #1
- Shrub Group #4
- Shrub Group #5

## GRASS KEY

- Seed Mix #1
- Seed Mix #2
- Seed Mix #3
- Seed Mix #4



Section P10



Section P9

## REFERENCES:

- SITE PLANS - - -
- PLANTING PLANS -
- TYPICAL SECTION 15
- TYPICAL SECTION 18

AE APPROVING OFFICIAL:	
DESIGNED: KYN	MI
CHECKED: DMS	
DRAWN: KYN/DMT	
DATE: 20 MAY 1999	SO



## **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  
POLANDER LAKE  
WINONA COUNTY, MINNESOTA**

**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 (FWS) and the Department of the Army (DOA) will operate in constructing, operating, maintaining, repairing, and rehabilitating the Polander Lake 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 located on lands managed as a national wildlife refuge by the FWS. Therefore, under conditions of Section 906(3) of the Water Resources Development Act of 1986, Public Law 99-662, all construction costs of those fish and wildlife features for the Polander Lake 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 are 100 percent Federal.

### III. GENERAL SCOPE

The Polander Lake project rehabilitates and improves the fish and wildlife habitat in the lake primarily through features to improve habitat diversity in the lake. This would be accomplished through the construction of a side channel closure, six new islands, and the protection of two existing islands. These features would reduce flow through the lake, reduce wind and wave induced turbidity, and increase structure diversity in the lake.

### IV. RESPONSIBILITIES

#### A. DOA is responsible for:

1. Construction: Construction of the Project which consists of constructing a side channel closure, constructing three large and three smaller islands, and applying riprap to two existing islands. Material to construct the islands would be taken from Polander Lake and adjacent side channels.

2. Major Rehabilitation: 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, DOA will construct the Polander Lake project as described in the Definite Project Report/Environmental Assessment, Polander Lake, Habitat Rehabilitation and Enhancement, dated March 1992, applying those procedures usually followed or applied in Federal projects, pursuant to Federal laws, regulations, and policies. The FWS 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 FWS of such delays.

4. Maintenance of Records: 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. 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 FWS.

B. USFWS is responsible for:

1. Operation, Maintenance, and Repair: Upon completion of construction as determined by the District Engineer, St. Paul, the FWS shall accept the Project and shall operate, maintain, and repair the Project as defined in the Definite Project Report entitled "Polander Lake Habitat Rehabilitation and Enhancement," dated March 1992, 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:

FWS: Regional Director  
U.S. Fish and Wildlife Service  
Federal Building, Fort Snelling  
Twin Cities, Minnesota 55111

DOA: District Engineer  
U.S. Army Corps of Engineers, St. Paul  
180 Kellogg Boulevard East, Room 1421  
St. Paul, Minnesota 55101-1479

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

BY: 

(signature)

for

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

Thomas J. Herze  
Acting Regional Director

Date: 4 Nov 93

Date: OCT 6 - 1993

## **APPENDIX C**

### **REPLACEMENT SPECIFICATIONS**

## SECTION 02270

## STONE PROTECTION

<u>Par. No.</u>	<u>Description</u>	<u>Page No.</u>
PART 1	GENERAL	02270-2
1.1	SCOPE	
1.2	RELATED WORK OF OTHER SECTIONS	
1.3	REFERENCES (NOT USED)	
1.4	SUBMITTALS	
1.5	MEASUREMENT AND PAYMENT	
1.6	BIDDING SCHEDULE ITEMS	02270-3
1.7	DELIVERY, STORAGE, AND HANDLING	
PART 2	PRODUCTS	02270-4
2.1	MATERIALS	
2.2	SOURCES AND EVALUATION	02270-5
2.3	TESTS FOR ACCEPTABILITY	
2.4	TESTS FOR GRADATION AND SHAPE	
PART 3	EXECUTION	02270-7
3.1	FOUNDATION PREPARATION	
3.2	PLACEMENT	
3.3	TOLERANCES	02270-8

## ATTACHMENTS

(BLANK) WORKSHEET FOR GRADATION ANALYSIS  
OF RIPRAP METHOD A

(BLANK) WORKSHEET FOR GRADATION ANALYSIS  
OF RIPRAP METHOD B

RIPRAP/ROCKFILL GRADATION CURVE (ENG FORM 4055)

## SECTION 02270 - STONE PROTECTION

### PART 1 GENERAL

#### 1.1 SCOPE

This section covers: island riprap rock groins; and island riprap stone slope protection.

#### 1.2 RELATED WORK OF OTHER SECTIONS

The following items of related work are covered under other sections:

- a. Disposal of debris: SECTION - GENERAL
- b. Island sand fill construction: SECTION - EMBANKMENT.
- c. Geotextile placement: SECTION - GEOTEXTILE.

#### 1.3 REFERENCES (NOT USED)

#### 1.4 SUBMITTALS

Government approval is required for all submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with SECTION - SUBMITTAL PROCEDURES:

##### 1.4.1 SD-01 Data Sources; GA.

Stone material sources in accordance with PARAGRAPH: SOURCES AND EVALUATION.

Methods; GA.

Riprap processing methods in accordance with PARAGRAPH: MATERIALS.

##### 1.4.2 SD-09 Reports Testing results; FIO.

Scale test reports in accordance with PARAGRAPH: DELIVERY, STORAGE, AND HANDLING.

Testing procedures results in accordance with PARAGRAPH: TESTS FOR GRADATION AND SHAPE.

##### 1.4.3 SD-14 Samples Samples; GA.

Samples of materials in accordance with PARAGRAPH: TESTS FOR ACCEPTABILITY.

#### 1.5 MEASUREMENT AND PAYMENT

##### 1.5.1 General



All placed riprap stone permitted by the Contracting Officer to remain outside of the required tolerances will not be measured for payment nor paid for by the Government.

#### 1.5.2 Scales

Riprap stone used for construction of rock groins and for slope protection for the new islands shall be weighed on accurate and approved scales furnished by, or made available by, the Contractor in accordance with PARAGRAPH: DELIVERY, STORAGE, AND HANDLING. Payment shall be by the ton (2,000 pounds) of material acceptably placed within the required tolerances, and shall constitute full compensation for all required contract work including: surveys, foundation preparation, and riprap stone delivery and placement.

#### 1.6 BIDDING SCHEDULE ITEMS

Bidding schedule items applicable to the work of this section are as follows:

<u>Item</u>	<u>Unit</u>
Island Riprap Rock Groins and Riprap Slope Protection	TN

#### 1.7 DELIVERY, STORAGE, AND HANDLING

##### 1.7.1 Scales

Material provided in this section shall be weighed on accurate and approved scales furnished by, or made available by, the Contractor. Prior to using, the scales shall be tested by the Department of Weights and Measures or by a reliable scale servicing company so as to operate within a degree of error not greater than one percent and be sensitive to a change in load of 1/5 of one percent, both percentages being used on the total required weight of material normally weighed as a unit on the scale. The Contractor shall submit the scale test report to the Contracting Officer for review and approval. Scales shall be spot checked for accuracy and sensitivity at least once each week of use during the contract period as the contract project work progresses. When materials are weighed in hauling vehicles, gross weights shall be checked and the vehicle tare weight checked daily as a minimum. The Contractor shall furnish such weights, accessories, and assistance as the Contracting Officer may require for conducting weighing equipment tests.

##### 1.7.2 Weighing Operations

Weighing operations shall be performed offsite, as approved, in the presence of the Contracting Officer unless directed otherwise. Each load shall be accompanied by duplicate copies of delivery tickets certified by the weighmaster. As a minimum, each delivery ticket shall contain the following information:

- a. Date and time.
- b. Vehicle number.
- c. Gross weight.

- d. Vehicle tare weight.
- e. Net weight.
- f. Material weight.
- g. Signature of weighmaster.

Delivery tickets shall be collected by the Contractor and one copy thereof furnished to the Contracting Officer at the close of each work day's operation.

#### 1.7.3 Loading Sites

The Contractor may use the existing U.S. Army Corps of Engineers Fountain City Placement Site as a riprap loading site. This placement site is in Fountain City, Wisconsin at approximate river mile 731.9. If the Contractor uses this placement site as a loading site, the following conditions shall be met:

- a. Use of this placement site shall not interfere with Corps of Engineers activities, either scheduled or unscheduled.
- b. Only direct loading of barges will be permitted. No stockpiling of riprap stone material at the this placement site will be permitted.

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### 2.1.1 General

Riprap stone for riprap slope protection and for rock groins shall be a durable quarried stone of suitable quality to ensure permanence in the contract project work site environment. Riprap stone shall be free from cracks, seams, and other defects that could unduly increase its deterioration from natural causes.

#### 2.1.2 Specific Gravity

Riprap stone shall have a specific gravity of not less than 2.55 and not more than 2.75.

#### 2.1.3 Shape

Neither the breadth nor thickness of any individual riprap stone shall be less than one-third its length.

#### 2.1.4 Gradation

##### 2.1.4.1 Riprap

Riprap shall be reasonably well graded within the required limits in accordance with the riprap gradation curve(s) included at the end of this section. The riprap shall be reasonably well graded within these required limits in order to permit construction of relatively dense stone blankets. Inclusion of dirt, sand, clay, rock fines or other deleterious materials will not be allowed.

### 2.1.5 Processing

The Contractor shall submit its proposed method(s) of processing riprap at the material source (quarry) that shall preclude the inclusion of objectionable amounts of fine material and/or organic matter. All riprap shall be processed in accordance with the approved method.

## 2.2 SOURCES AND EVALUATION

Stone materials shall be produced from the sources listed in SECTION - ATTACHMENTS. If the Contractor proposes to furnish materials from a source not listed in SECTION - ATTACHMENTS, the Contracting Officer will make such investigations and evaluations as necessary to determine whether or not stone materials meeting the contract requirements can be produced from the proposed source. The Contractor shall be responsible for making its own investigations for sources of suitable materials and for making its own arrangements with the owner(s) of the quarries and/or land for procuring the required quantities of suitable stone materials. Sources from which the Contractor proposes to obtain the materials shall be selected and submitted for approval at least 60 calendar days in advance of the date when the stone material shall be needed at the contract project work site.

## 2.3 TESTS FOR ACCEPTABILITY

### 2.3.1. Quality Tests and Service Records

Quality tests and service records will be used by the Government in order to determine the acceptability of the proposed stone materials. In the event suitable test reports and satisfactory service records are not available, as in the case of newly operated sources, the stone materials will be tested to determine acceptability. Tests to which the materials may be subjected include petrographic analysis, specific gravity, soundness, abrasion, absorption, freezing and thawing, and other tests considered necessary to demonstrate acceptability. Tests will be made by, or under the supervision of, the Government and at the Government's expense.

### 2.3.2 Samples

When and if directed, suitable samples of materials shall be submitted for approval prior to delivery of stone materials to the contract project work site. Unless directed otherwise, samples shall be obtained by the Contractor and in the presence of the Contracting Officer; and then delivered at the Contractor's expense to a point designated by the Contracting Officer at least 30 calendar days in advance of the date that the riprap stone work is proposed to commence. The stone materials must be approved by the Contracting Officer prior to delivering such materials to the contract project work site.

## 2.4 TESTS FOR GRADATION AND SHAPE

### 2.4.1 General

Sampling and testing shall be performed by and at the expense of the Contractor at no additional cost to the Government. Unless required or approved otherwise, suitable samples of stone shall be obtained prior to

delivery of stone material to the contract project work site. Unless otherwise approved, samples shall be obtained by the Contractor in the presence of the Contracting Officer.

#### 2.4.2 Riprap

One sample for each type of material shall be taken from stockpiles and the remaining samples shall be taken from loads prior to dumping or from in-place material, when and where directed. The minimum sample size for tests shall be as follows:

<u>Material</u>	<u>Minimum Sample Size</u>
Riprap	6 tons

#### 2.4.3 Testing Riprap For Gradation.

##### 2.4.3.1 General

Gradation testing shall be performed by and at the expense of the Contractor. Gradation testing shall also be performed by the methods and at the frequency listed below. Gradation testing results shall be submitted to the Contracting Officer utilizing ENG FORM 4055, and either the WORKSHEET FOR GRADATION ANALYSIS OF RIPRAP METHOD A or the WORKSHEET FOR GRADATION ANALYSIS OF RIPRAP METHOD B. A copy of ENG FORM 4055 and a blank copy of each of the worksheet forms are included at the end of this section. The Contracting Officer will direct the time(s) and location(s) of sampling, unless waived. The Contractor shall notify the Contracting Officer in writing at least 24 hours prior to performing each gradation testing. All testing results, including failing testing results, shall be submitted to the Contracting Officer. The Contracting Officer shall be informed of testing results immediately (within one calendar day) after completion of each test and draft copies of the test results shall be submitted to the Contracting Officer when requested. Tests performed on materials which do not meet gradation and shape requirements will not be counted as part of the tests required.

##### 2.4.3.2 Test Method "A"

Test Method "A" shall consist of weighing all stones larger than 5 pounds in a sample. Five to seven weight classes shall be selected within the range of stone sizes. Each stone shall be weighed and recorded on the WORKSHEET FOR GRADATION ANALYSIS OF RIPRAP METHOD A. The weight of stones shall be summed for each weight class; after which calculations and a plot of the gradation shall be completed in accordance with accepted practice for soil and aggregate gradations.

##### 2.4.3.3 Test Method "B"

Test Method "B" shall consist of separating the stones into 5 to 7 piles and ordered by stone size. The sample shall be separated on a clean, hard surface that is free of smaller stones that could become mixed with the sample. The stones shall be visually screened to place them into appropriate piles. All stones shall be separated and placed into a pile before weighing. After separating, the smallest and largest rock in each pile shall be weighed and recorded. The stones shall be adjusted as necessary so that the weight classes do not overlap. After

adjustment is adequate and weight classes have been established, each pile of stone shall be weighed and recorded on the WORKSHEET FOR GRADATION ANALYSIS OF RIPRAP METHOD B. Calculations and a plot of the gradation shall then be completed in accordance with accepted practice for soil and aggregate gradations.

#### 2.4.3.4 Testing results

Testing results shall be submitted to the Contracting Officer immediately after completion of such testing.

#### 2.4.3.5 Frequency

The minimum gradation tests shall be performed as follows. The Contractor shall take as many additional tests under the Contractor's quality control program as is needed in order to ensure that the required gradation is being met. Tests performed on stone materials that do not meet the contract requirements will not be counted as part of the minimum testing required.

<u>Material</u>	<u>Minimum Number of Tests</u>
Riprap	1 test prior to placement; and 1 test per 2,000 tons or fraction thereof.

#### 2.4.3.6 Corrective Actions

If stone materials fail to meet gradation and/or shape requirements, the Contractor shall adjust its operations and verify with necessary tests that acceptable stone materials are being produced; or the Contractor shall propose another source and verify, with necessary tests, that acceptable stone material can be produced from that source. Payment will not be made for material which fails to meet contract requirements. Stone material already placed in the contract project work that fails to meet contract requirements shall be removed by the Contractor at the Contractor's own expense and at no additional cost to the Government.

### PART 3 EXECUTION

#### 3.1 FOUNDATION PREPARATION

Foundation areas shall be cleared of woody vegetation materials that could prevent proper placement of riprap. Removal of driftwood, snags, wood debris and brush within the limits of riprap protection construction work shall be considered part of the riprap protection construction process and shall be disposed of in accordance with SECTION - GENERAL. Plant root systems may be left in-place and intact. Plant trunks and stems that required contract project work can be built around and remain standing vertically through the completed rock groins may be left in place in order to assist in the natural revegetation of the project work site.

#### 3.2 PLACEMENT

##### 3.2.1 General

Riprap shall be constructed to the lines and grades shown. All riprap shall be placed in such a manner as to produce a mass of unsegregated stone with maximum stone interlocking, maximum stone to stone contact, and a minimum of voids. The finished mass of stone 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 will not be approved. The Contractor shall maintain the riprap stone protection until such work has been accepted. All displaced riprap must be repaired/replaced prior to acceptance and such work shall be performed by the Contractor at no additional cost to the Government.

### 3.2.2 Constructing Rock Groins and Stone Slope Protection

Upon completion of placing sand fill material at island locations in accordance with SECTION - EMBANKMENT, the Contractor shall immediately construct the rock groin(s) for that reach of the island section and /or the stone slope protection for the islands.

### 3.2.3 Stone Slope Protection

Riprap used for stone slope protection at each island end 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 used for stone slope protection in layers shall not be permitted.

### 3.2.4 Placing Riprap Underwater

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

### 3.2.5 Placement of Riprap On Geotextile

#### 3.2.5.1 Geotextile

Geotextile shall be in place prior to placement of the riprap thereon. Placement of the geotextile shall be in accordance with SECTION - GEOTEXTILE. The riprap shall be placed on the installed geotextile with care so as not to rupture the geotextile and shall not be dropped from a height greater than one foot.

#### 3.2.5.2 Riprap

Riprap placement shall generally be initiated at the toe of the embankment (island) slope and progress up such slope towards the crest as indicated. The riprap shall not be allowed to roll down the installed geotextile. Riprap in direct contact with the installed geotextile shall not be pushed or moved by mechanical equipment. Any damage to the installed geotextile that occurs during placement of the riprap shall be repaired and/or replaced by the Contractor at no additional cost to the Government.

### 3.3 TOLERANCES

### 3.3.1 Rock Groins

Unless required otherwise, rock groin work shall conform to the following tolerances except either limit shall not be continuous over an area greater than 200 square feet:

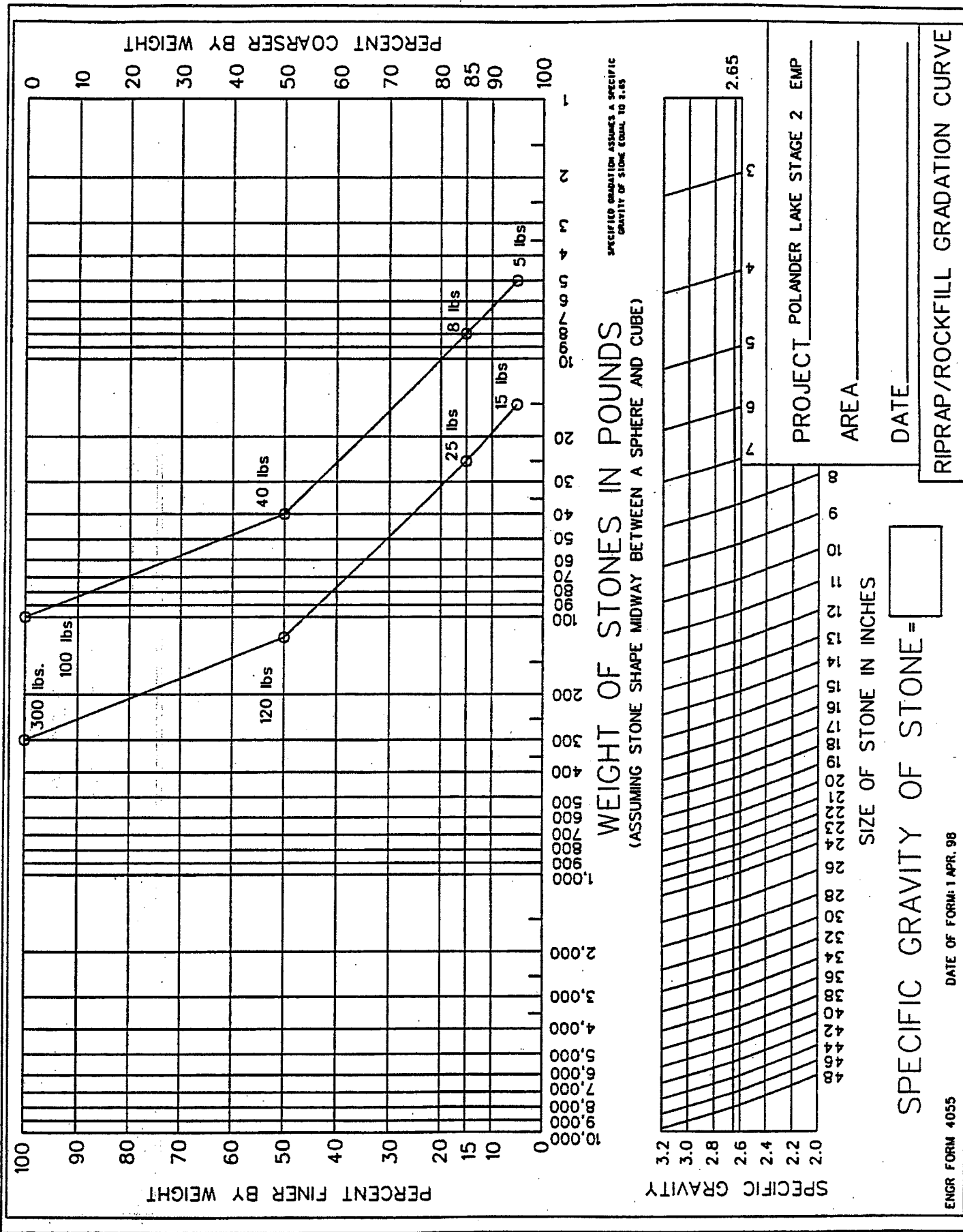
- a. 8 inches above the prescribed grade.
- b. 4 inches below the prescribed grade.

### 3.3.2 Stone Slope Protection

Unless required otherwise, stone slope protection shall conform to the following tolerances except either limit shall not be continuous over an area greater than 200 square feet:

- a. 8 inches above the prescribed grade.
- b. 4 inches below the prescribed grade.

\* \* \* \*





## SECTION 02272

## GEOTEXTILE

<u>Par. No.</u>	<u>Description</u>	<u>Page No.</u>
PART 1	GENERAL	02272-2
1.1	SCOPE	
1.2	RELATED WORK OF OTHER SECTIONS	
1.3	REFERENCES	
1.4	SUBMITTALS	
1.5	MEASUREMENT AND PAYMENT	02272-3
1.6	BIDDING SCHEDULE ITEMS	
1.7	QUALITY CONTROL	
1.8	DELIVERY, STORAGE, AND HANDLING	02272-4
PART 2	PRODUCTS	
2.1	MATERIALS	
PART 3	EXECUTION	02272-6
3.1	SURFACE PREPARATION	
3.2	INSTALLATION	
3.3	PROTECTION	02272-7

## SECTION 02272 - GEOTEXTILE

### PART 1 GENERAL

#### 1.1 SCOPE

This section covers geotextile (filter fabric) to be used with the required island riprap work where and as shown.

#### 1.2 RELATED WORK OF OTHER SECTIONS

The following items of related work are covered under other sections:

- a. Placement of riprap on geotextile: SECTION - STONE PROTECTION.

#### 1.2 REFERENCES

The publications listed below form a part of this section to the extent referenced. The publications are referred to in the text by basic designation only.

##### 1.2.1 American Society for Testing and Materials (ASTM)

ASTM D 123 (1996A)	Terminology Relating to Textiles
ASTM D 3786 (1987)	Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics - Diaphragm Bursting Strength Tester Method
ASTM D 4355 (1992)	Deterioration of Geotextile from Exposure to Ultraviolet light and Water (Xenon-Arc Type Apparatus)
ASTM D 4491 (1996)	Water Permeability of Geotextile By Permittivity
ASTM D 4533 (1991)	Trapezoid Tearing Strength of Geotextiles
ASTM D 4632 (1991)	Grab Breaking Load and Elongation of Geotextiles
ASTM D 4751 (1995)	Determining Apparent Opening Size of a Geotextile
ASTM D 4833 (1988)	Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
ASTM D 4873 (1995)	Identification, Storage, and Handling of Geosynthetic Rolls

#### 1.4 SUBMITTALS

Government approval is required for all submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with SECTION - SUBMITTAL PROCEDURES:

1.4.1 SD-13 Certificates and Certificates of Compliance  
Certificates of Compliance; FIO.

Certificate of compliance in accordance with PARAGRAPH:  
QUALITY CONTROL.

1.4.2 SD-14 Samples  
Samples; GA.

Samples of materials in accordance with PARAGRAPH: QUALITY  
CONTROL.

1.5 MEASUREMENT AND PAYMENT

1.5.1 Geotextile

Geotextile used for riprap slope protection at each island will be measured for payment in place to the nearest square yard of protected area within the limits of contract work as shown. Payment shall be made at the contract unit price and shall constitute full compensation to the Contractor for providing all plant, labor, material, and equipment and performing all operations necessary for the complete and satisfactory installation of the geotextile work. The following items are included the contract unit price for "Geotextile" and shall not be counted a second time in the process of determining the extent of geotextile installed: material and associated equipment and operation used in laps, seams, or extra length; securing pins and associated material, equipment, and operations; and operations used to provide cushioning layer of sand or gravel or both to permit increase in allowable drop height of riprap stone. No separate payment will be made for geotextile replaced because of waste, contamination, damage, repair, or due to Contractor fault or negligence.

1.6 BIDDING SCHEDULE ITEMS

Bidding schedule items applicable to the work of this section are as follows:

<u>Item</u>	<u>Unit</u>
Island Geotextile	SY

1.7 QUALITY CONTROL

1.7.1 Certificates

The Contractor shall furnish the Contracting Officer, in duplicate, a mill certificate, or affidavit, signed by a legally authorized official from the geotextile manufacturer. The certificate shall state that the geotextile shipped to the contract project work site meets or exceeds the contract requirements. The certificate shall contain: the signer's name and title; the Contractor's name and address; and the contract project number, name, and location.

1.7.2 Samples

If and when requested by the Contracting Officer, the Contractor shall submit to the Government geotextile samples for testing in order to determine compliance with contract requirements. When samples are to be submitted, they shall be submitted a minimum of 60 calendar days prior to commencing contract project geotextile installation work. All samples provided shall be from the same production lot as shall be supplied for the contract project work, and shall be the full manufactured width of the geotextile by at least 10 feet long, except that samples for seam strength may be a full width sample folded over and the edges stitched for a length of at least 5 feet. Samples submitted for testing shall be identified by the manufacturer's lot designation. For needle punched geotextile, the manufacturer shall certify that the geotextile has been inspected using permanent on-line metal detectors and does not contain any needles.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

Only approved geotextile rolls shall be delivered to the contract project work site. All geotextile shall be labeled, shipped, stored, and handled in accordance with ASTM D 4873. No hooks, tongs, or other sharp instruments shall be used for handling geotextile.

### PART 2 PRODUCTS

#### 2.1 MATERIALS

##### 2.1.1 Geotextile

Geotextile shall be a woven or a non-woven pervious sheet of plastic yarn as defined by ASTM D 123. The geotextile shall equal or exceed the minimum average roll values listed below in TABLE 1, MINIMUM PHYSICAL REQUIREMENTS FOR GEOTEXTILE. Strength values indicated in the table are for the weaker principal direction.

TABLE 1:

## MINIMUM PHYSICAL REQUIREMENTS FOR GEOTEXTILE

<u>Property</u>	<u>Minimum Average Values</u>	<u>Test Method</u>
Grab Strength	200 pounds (minimum)	ASTM D 4632
Puncture	80 pounds (minimum)	ASTM D 4833
Burst Strength	325 pounds per square inch (minimum)	ASTM D 3786
Trapezoid Tear	40 pounds (minimum)	ASTM D 4533
Apparent Opening Size	No finer than 0.006 inch and no courser than 0.025 inch	ASTM D 4751
Permittivity	0.2 per second (minimum)	ASTM D 4491
Ultraviolet Degradation	50 percent at 500 hours (minimum)	ASTM D 4355

## 2.1.2 Geotextile Fibers

Fibers used in the manufacturing of the geotextile shall consist of a long-chain synthetic polymer composed of at least 85 percent by weight of polyolefins, polyesters, or polamides. Stabilizers and/or inhibitors shall be added to the base polymer if necessary to make the filaments resistant to deterioration caused by ultraviolet light and heat exposure. Reclaimed or recycled fibers or polymer shall not be added to the formulation. Geotextile shall be formed into a network such that the filaments or yarns retain dimensional stability relative to each other, including the edges. The edges of the geotextile shall be finished to prevent the outer fiber from pulling away from the geotextile.

## 2.1.3 Securing Pins

Geotextile shall be secured to the embankment/foundation soil materials by pins in order to prevent movement prior to placement of riprap stone materials. Other appropriate means to prevent movement such as staples, sand bags, and stone could also be used subject to prior approval by the Contracting Officer. Securing pins shall be inserted through both strips of overlapped geotextile along the line passing through midpoints of the overlap. Maximum spacing between securing pins depends on the steepness of the embankment slope. The maximum pins spacing shall be equal to or less than the values listed below in TABLE 2: MAXIMUM SPACING FOR SECURING PINS. When windy conditions prevail at the contract project work site, the number of pins shall be increased when directed by the Contracting Officer.

TABLE 2:

## MAXIMUM SPACING FOR SECURING PINS

<u>Embankment/Foundation Slope</u>	<u>Spacing (feet)</u>
Steeper than 1 vertical on 3 horizontal	2.0
1 vertical on 3 horizontal to 1 vertical on 4 horizontal	3.0
Flatter than 1 vertical on 4 horizontal	5.0

## PART 3 EXECUTION

## 3.1 SURFACE PREPARATION

The embankment/foundation soil materials surfaces upon which geotextile is to be placed shall be prepared to a relatively smooth surface condition in accordance with the contract requirements; and shall be free from obstruction, debris, depressions, erosion feature, or vegetation. Irregularities shall be removed so as to insure continuous, intimate contact of the geotextile with all the underlying soil material surfaces. Loose material and soft or low density pockets of embankment/foundation soil materials shall be removed; erosion features such as rills, gullies, etc., must be graded out of the embankment/foundation soil materials surfaces prior to installation of geotextile.

## 3.2, INSTALLATION

## 3.2.1 General

The geotextile shall be installed in the manner and at the locations shown. At the time of installation, the geotextile shall be rejected if it has defects, rips, holes, flaws, deterioration or damage incurred during manufacture, transportation, and/or storage.

## 3.2.2 Placement

## 3.2.2.1 General

The geotextile shall be placed with the long dimension parallel to the centerline of the island embankment and laid smooth and free of tension, stress, folds, wrinkles, and creases. The strips shall be placed to provide a minimum width of 20 inches of overlap for each joint.

## 3.2.2.2 Temporary pinning

Temporary pinning of the geotextile, in order to help hold it in place until the required riprap has been installed, will be permitted. The temporary pins shall be removed as the riprap is installed in order to relieve high tensile stress which may occur during installation of riprap on the installed geotextile.

## 3.2.2.3 Trimming

Trimming shall be performed in such a manner that the geotextile shall not be damaged in any way.

### 3.3 PROTECTION

#### 3.3.1 General

The geotextile shall be protected at all times during construction from contamination by surface runoff and any geotextile so contaminated shall be removed and replaced with uncontaminated geotextile.

#### 3.3.2 Replacement of Damaged Geotextile

All damage to the geotextile during its installation and/or during installation of riprap will require the Contractor to replace such damaged geotextile with new satisfactory undamaged geotextile by the Contractor and at no cost to the Government.

#### 3.3.3 Installation

The work shall be scheduled so that the covering of installed geotextile with a layer of the required riprap materials is accomplished within three calendar days after installation of the geotextile. Failure to comply with this requirement shall require replacement of geotextile with new geotextile. Geotextile shall be protected from damage prior to and during the installation of riprap or other materials. Before placement of riprap or other materials, the Contractor shall demonstrate that the riprap installation techniques will not cause damage to the installed geotextile. In no case shall any type of construction equipment be allowed on unprotected geotextile.

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## SECTION 02935

## TURF

<u>Par. No.</u>	<u>Description</u>	<u>Page No.</u>
PART 1	GENERAL	02935-2
1.1	SCOPE	
1.2	REFERENCES	
1.3	SUBMITTALS	
1.4	MEASUREMENT AND PAYMENT	
1.5	BIDDING SCHEDULE ITEMS	02935-3
1.6	QUALITY CONTROL	
1.7	DELIVERY, STORAGE, AND HANDLING	
PART 2	PRODUCTS	
2.1	SEED	
2.2	MULCH	02935-5
2.3	SOIL FOR REPAIRS	
PART 3	EXECUTION	
3.1	SEEDING PERIODS AND CONDITIONS	
3.2	SITE PREPARATION	
3.3	SEEDING	02935-6
3.4	MULCHING	02935-7
3.5	TURF ESTABLISHMENT PERIOD	02935-8
3.6	FINAL ACCEPTANCE	



SECTION 02935 - TURF

PART 1 GENERAL

1.1 SCOPE

This section covers for the new turf areas for the new islands: site preparation, seeding, mulching, establishment, and maintenance.

1.2 REFERENCES

The publications listed below form a part of this section to the extent referenced. The publications are referred to in the text by basic designation only.

1.2.1 Agricultural Marketing Service (AMS)

AMS 1 (Aug 1988) Federal Seed Act Regulations (Part 201-202)

1.3 SUBMITTALS

Government approval is required for all submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with SECTION - SUBMITTAL PROCEDURES:

1.3.1 SD-01 Data  
Data; FIO.

List of proposed seeding and mulching equipment to be used in performance of turfing operations including descriptive data and calibration tests.

1.3.2 SD-13 Certificates and Certificates of Compliance  
Certificates of Compliance; FIO.

Certificate of compliance in accordance with PARAGRAPH:  
QUALITY CONTROL.

1.4 MEASUREMENT AND PAYMENT

Required new turf areas will be measured for payment by the acre seeded for each required seed mixture, within the indicated limits on the new islands, to the nearest one-hundredth acre. Payment will be made at the contract price and will include payment for site preparation, seeding, mulching, maintenance, and work incidental to the turfing. Work performed for repairs to disturbed areas outside of the designated turf establishment areas on the new islands will not be measured for payment.

## 1.5 BIDDING SCHEDULE ITEMS

Bidding schedule items applicable to the work of this section are as follows:

<u>Item</u>	<u>Unit</u>
Island Turf, Seed Mixture 1	AC
Island Turf, Seed Mixture 2	AC
Island Turf, Seed Mixture 3	AC

## 1.6 QUALITY CONTROL

Prior to the delivery of materials to the contract project work site, the Contractor shall submit certificates of compliance certifying that materials meet the contract requirements. Certified copies of the reports for the following materials shall be included:

### a. Seed.

The report shall include: mixture, percent pure live seed, minimum percent germination and hard seed, maximum percent weed seed content, date tested, and state certification.

## 1.7 DELIVERY, STORAGE, AND HANDLING

### 1.7.1 Delivery

The seed materials shall be inspected upon delivery to the contract project work site by the Contractor, in the presence of Contracting Officer, for conformity to type and quality in accordance with PARAGRAPH: PRODUCTS. Other turf materials shall be inspected upon delivery to the contract project work site for meeting specified requirements; unacceptable materials shall be removed from the contract project work site.

### 1.7.2 Storage

Materials shall be stored in areas designated by the Contracting Officer. Seed shall be stored in cool and dry locations away from contaminants.

## PART 2 PRODUCTS

### 2.1 SEED

#### 2.1.1 Seed Classification

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, purity, germination, hard seed, weed seed content, and inert material. Labels shall be in conformance with AMS 1 and applicable state seed laws.

#### 2.1.1.1 Seed Mixtures

Seed mixtures shall be proportioned by weight as follows:

##### a. Seed Mixture 1:

<u>Species</u>	<u>(Pounds/Acre)</u>
Alfalfa ( <i>Medicago sativa</i> )	6.0
Smooth Bromegrass ( <i>Bromus inermis</i> )	6.0
Timothy ( <i>Phleum pratense</i> )	4.0
Oats ( <i>Avena sativa</i> )	19.6

##### b. Seed Mixture 2:

<u>Grass Species</u>	<u>(Pounds/Acre)</u>
Indiangrass ( <i>Sorghastrum nutans</i> )	2.0
Canada Wildrye ( <i>Elymus canadensis</i> )	2.3
Side-Oats Grama ( <i>Bouteloua curtipendula</i> )	2.0
Little Bluestem ( <i>Andropogon scoparius</i> )	3.0
Sand Dropseed ( <i>Sporobolus cryptandrus</i> )	1.0
Oats ( <i>Avena sativa</i> )	19.6

<u>Forb Species</u>	<u>(Pounds/Acre)</u>
Prairie Clovers ( <i>Petalostemum</i> sp.)	0.1
Partridgepea ( <i>Chamaecrista fasciculata</i> )	0.1
Maximilian Sunflower ( <i>Helianthus maximiliani</i> )	0.1
Black-Eyed Susan ( <i>Rudbeckia hirta</i> )	0.1

##### c. Seed Mixture 3:

<u>Grass Species</u>	<u>(Pounds/Acre)</u>
Canada Wildrye ( <i>Elymus canadensis</i> )	2.3
Switchgrass ( <i>Panicum virgatum</i> )	2.0
Indiangrass ( <i>Sorghastrum nutans</i> )	2.0
Big Bluestem ( <i>Andropogon gerardi</i> )	3.0
Prairie Cordgrass ( <i>Spartina pectinata</i> )	0.4
Bluejoint Reedgrass ( <i>Calamagrostis canadensis</i> )	0.1
Oats ( <i>Avena sativa</i> )	19.6

<u>Forb Species</u>	<u>(Pounds/Acre)</u>
Black-Eyed Susan ( <i>Rudbeckia hirta</i> )	0.1
Prairie Clovers ( <i>Petalostemum</i> sp.)	0.1
Maximilian Sunflower ( <i>Helianthus maximiliani</i> )	0.1

#### 2.1.3 Quality

Weed seed shall not exceed one percent by weight of the total seed mixture. Wet, moldy, or otherwise damaged seed shall be rejected. For applicable species, seed quantities shall be pure live seed quantities.

#### 2.1.4 Seed Mixing

The field mixing of seed shall be performed at the contract project work site by the Contractor and in the presence of the Contracting Officer.

## 2.2 MULCH

Mulch shall be clean straw derived from oats that is free from noxious weeds, mold, or other objectionable material. Materials that contain objectionable weed seeds or other seed species that might be detrimental to the turfing 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.

## 2.3 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.

## PART 3 EXECUTION

### 3.1 SEEDING PERIODS AND CONDITIONS

#### 3.1.1 Seeding Periods

The seed mixtures shall be applied during the spring period between April 20 and June 15.

#### 3.1.2 Turfing Conditions

Turf operations shall be performed only during periods when beneficial results can be obtained. When drought, excessive moisture or other unsatisfactory conditions prevail, the contract project turfing work shall be stopped when directed. Turfing shall resume only when conditions are favorable or when alternate or corrective measures and procedures have been approved by the Contracting Officer. When turfing operations have resumed, the Contractor shall regrade all areas to receive seed that have not been maintained to the established grades and condition in accordance with PARAGRAPH: SITE PREPARATION. When conditions warrant a variance to the turfing operations, proposed times shall be submitted to and approved by the Contracting Officer.

### 3.2 SITE PREPARATION

#### 3.2.1 Grading

The Contracting Officer shall verify that finished grades are as indicated on drawings.

#### 3.2.2 Finished Grading

Required turf areas shall be filled as shown, or have excess fill material removed, in order to attain the required finished grade. Drainage patterns shall be maintained as indicated on drawings. Turf areas compacted by construction operations shall be completely pulverized by tillage. Soil used for repair of erosion or grade deficiencies shall be in accordance with PARAGRAPH: PRODUCTS. Finished

grade shall be one inch below the adjoining grade of any surfaced area. New surfaces shall be blended into existing areas.

### 3.2.3 Tillage

After each area required to be seeded has been brought up to the required grade, the area shall be tilled to a depth of at least four inches by plowing, disking, harrowing, or other approved operations only during periods when, in the opinion of the Contracting Officer, beneficial results are likely to be obtained. Undulations or irregularities in the turfing area surfaces shall be leveled before the next turfing operation. Soil compacted by construction equipment or soil on compacted cut slopes or grades shall be pulverized to a minimum depth of four inches by disking or tilling before applying seed.

### 3.2.4 Protection

Finished graded areas shall be protected from damage caused by construction equipment traffic and by erosion.

## 3.3 SEEDING

### 3.3.1 General

Prior to seeding, any previously prepared seed bed areas compacted or damaged by interim rain, traffic, or other cause shall be reworked to restore the ground condition previously required above. Seeding operations shall not take place when the wind velocity could prevent uniform seed distribution.

### 3.3.2 Equipment Calibration

The equipment to be used for turfing and the methods of turfing shall be subject to approval of the Contracting Officer prior to commencement of turfing operations. Immediately prior to the commencement of turfing operations, the Contractor shall conduct turfing equipment calibration tests in the presence of the Contracting Officer.

### 3.3.3 Seeding Locations

#### 3.3.3.1 Areas Shown

Seed shall be planted within the limits shown to all surface areas requiring seeding.

#### 3.3.3.2 Other Areas

Turf establishment shall be performed by the Contractor in any areas disturbed by the Contractor's operations either inside or outside the limits of work, at no additional cost to the Government. The damaged turf areas shall be re-established with seed in accordance with the contract requirements.

### 3.3.4 Applying Seed

#### 3.3.4.1 Drill Seeding

- a. Unless approved otherwise, each required new island shall have the required seed mixture planted by drill seeding.
- b. Drill seeding shall be accomplished using approved equipment such as cultipacker seeders and grass seed drills. The seed shall be drilled uniformly to an average depth of 0.5 inch. Drill seeding shall be done at right angles to surface drainage with a maximum row spacing of 8 inches. When slopes are steeper than 1 vertical on 5 horizontal, baffle plates spaced not more than 8 inches apart shall be installed in the seed box. Seed shall be drilled using equipment capable of drilling a native seed mixture.

#### 3.3.4.2 Broadcast Seeding

- a. Broadcast seeding will only be permitted in areas on the new islands that are inaccessible to drills or other approved equipment and then only when specifically approved in writing by the Contracting Officer.
- b. When approved, seed shall be broadcast using hand spreaders or by simple hand broadcasting using seeding rates approved by the Contracting Officer. 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 the direction of the first sowing. The seed shall be covered to an average depth of 0.25 inch by means of spike-tooth harrow, cultipacker, or other approved device. Seed shall not be broadcast during windy weather (wind exceeding 10 miles per hour).

#### 3.3.5 Firming Soil

Immediately after seeding operations have been completed, the newly seeded surfaces shall be compacted by a cultipacker, roller, or other approved equipment weighing 90 to 100 pounds per foot of roller. Under certain conditions, the Contracting Officer will direct that rolling be delayed from 15 to 30 minutes following planting in order to avoid balling the soil in the roller or squeezing water out of furrows. 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 the soil surface completely.

#### 3.4 MULCHING

##### 3.4.1 Mulching Locations

Mulch shall be applied to all surface areas requiring seeding.

##### 3.4.2 Applying Mulch

Immediately after the seeding has been completed, mulch shall be spread uniformly in a continuous blanket at a rate of 8 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.

### 3.4.3 Anchoring Mulch

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 needed, not to exceed three, will be determined by the Contracting Officer. All areas seeded on any given day must be mulched on that same day.

## 3.5 TURF ESTABLISHMENT PERIOD

### 3.5.1 Seeded Areas

The Contractor shall be responsible for the proper care of seeded areas during the turf establishment period. The turf establishment period shall extend for 16 months after completion of the seeding operations on the entire project, unless the desired growth is established in a shorter period of time and shortening the period of Contractor's responsibility for acceptably established turf areas is authorized by the Contracting Officer.

### 3.5.2 Maintenance During Turf Establishment Period

#### 3.5.2.1 General

Maintenance of the turfed areas shall include: protecting island embankments from erosion; maintaining mulch; protecting turfed areas from traffic; and mowing.

#### 3.5.2.2 Mowing

3.5.2.2.1 The Contractor shall only mow seed Mixture 2 and seed Mixture 3 turf areas. The Contractor shall mow the grass/forb seedings during the period of that the turf seeding and/or weed growth average height is 12 inches; mow such growth to a height ranging between 4 to 5 inches. Shrub/vine planting areas and tree planting areas shall not be mowed. The Contractor shall take precautions to avoid trampling and/or mowing sand areas and beachgrass plantings areas.

### 3.5.3 Repairs

When any portion of a required turf area becomes damaged, the affected portion shall be repaired to re-establish the turfing in accordance with the contract turfing requirements and as directed by the Contracting Officer. All repair work shall be performed by the Contractor at no additional cost to the Government.

## 3.6 FINAL ACCEPTANCE

### 3.6.1 Preliminary Inspection

Prior to the completion of the turf establishment period, a preliminary site inspection will be held by the Contracting Officer. The date for

the inspection(s) will be established in writing. In mid-August following the establishment of turf in each area seeded with seed Mixture 1, there shall be at least 3 plants of the required planted variety per square foot of required turfed area. In mid-August of the year following the establishment of turf in each area seeded with seed Mixture 2 and/or seed Mixture 3, there shall be at least 3 plants of the required planted variety per square foot of each required turfed area. The acceptability of the established turf shall be determined in accordance with PARAGRAPH: TURF ESTABLISHMENT PERIOD. All unacceptable stands of turf shall be repaired as soon as turfing conditions permit.

### 3.6.2 Final Inspection

A final inspection will be held by the Contracting Officer in order to determine that deficiencies noted in the above preliminary inspection(s) have been acceptably corrected. The time for the inspection will be established in writing.

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## SECTION 02950

## PLANTINGS

<u>Par. No.</u>	<u>Description</u>	<u>Page No.</u>
PART 1	GENERAL	02950-2
1.1	SCOPE	
1.2	RELATED WORK OF OTHER SECTIONS	
1.3	REFERENCES	
1.4	SUBMITTALS	
1.5	MEASUREMENT AND PAYMENT	
1.6	BIDDING SCHEDULE ITEMS	02950-3
1.7	QUALITY CONTROL	
1.8	DELIVERY, STORAGE, AND HANDLING	
PART 2	PRODUCTS	02950-5
2.1	PLANTS	
2.2	TREE SHELTERS	02950-7
2.3	TREE MATS	02950-8
2.4	SOIL FOR REPAIRS	
2.5	ANTIDESICCANT	
PART 3	EXECUTION	
3.1	LAYOUT	
3.2	EXCAVATION	02950-9
3.3	INSTALLING (PLANTING) TIMES AND CONDITIONS	
3.4	INSTALLATION	
3.5	PLANTING DESIGN	02950-10
3.6	TREE SHELTERS	02950-11
3.7	TREE MATS	
3.8	PLANT ESTABLISHMENT PERIOD	
3.9	FINAL ACCEPTANCE	02950-12

SECTION 02950 - PLANTINGS

PART 1 GENERAL

1.1 SCOPE

This section covers the following plantings for the new islands: trees, shrubs, willows, and stolons (plugs).

1.2 RELATED WORK OF OTHER SECTIONS

The following items of related work are covered under other sections:

- a. Fine fill material: SECTION 02221 - EMBANKMENT.

1.3 REFERENCES

The publications listed below form a part of this section to the extent referenced. The publications are referred to in the text by basic designation only.

1.3.1 American Association of Nurserymen (AAN)

AAN 1 (1990) American Standard for Nursery Stock

1.4 SUBMITTALS

Government approval is required for all submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with SECTION - SUBMITTAL PROCEDURES:

1.4.1 SD-01 Data  
Manufacturer's data; FIO.

Manufacturer's installation and application procedures, specification data sheet(s), and manufacturer's catalog sheet(s) for tree shelters and tree mats.

Maintenance instructions; FIO.

Written instructions for year-round care.

1.4.2 SD-09 Reports  
Maintenance; FIO.

The Contractor's written record of maintenance work performed and quantity of plant losses and replacements.

1.4.3 SD-13 Certificates and Certificates of Compliance  
Certificates of Compliance; FIO.

Certificate of compliance in accordance with PARAGRAPH:  
QUALITY CONTROL.

1.5 MEASUREMENT AND PAYMENT

The work of this section will not be measured for payment and shall be performed on a lump sum basis, complete. Payment will be made at the contract price and will constitute full compensation for furnishing, transporting, installing, establishment, maintenance, replacement/repair of unacceptable planting work, and other related work incidental work.

#### 1.6 BIDDING SCHEDULE ITEMS

Bidding schedule items applicable to the work of this section are as follows:

<u>Item</u>	<u>Unit</u>
Island Plantings, Trees	LS
Island Plantings, Shrubs	LS
Island Plantings, Willows	LS
Island Plantings, Stolons	LS

#### 1.7 QUALITY CONTROL

##### 1.7.1 General

Prior to the delivery of materials, the Contractor shall submit certificates of compliance certifying that materials meet the contract requirements. Certified copies of the reports for the following materials shall also be included with this certificate of compliance submittal:

- a. For each plant material furnish: botanical and common name; size; and quantity by species, grade, and name of nursery where plant was grown.

##### 1.7.2 Plant Material Inspection

Prior to commencing planting installation work at each required planting site, the Contractor shall inspect, in the presence of the Contracting Officer, the delivered plant materials at each respective required planting site for compliance with the contract requirements; all unacceptable plant material shall be removed immediately from the contract project work site.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

##### 1.8.1 Delivery

##### 1.8.1.1 Preparation

Digging and preparation for shipment shall be performed in a manner that will not cause shock or damage to branches, trunk, or root systems.

##### 1.8.1.1.1 Bare-root plants

Minimum root spread shall be in accordance with AAN 1. Each plant shall have a well branched root system characteristic of the required plant

variety. No roots shall be pulled from the ground. The root system shall be protected from drying out.

#### 1.8.1.1.2 Container-grown plants

Container size shall be provided in accordance with AAN 1. Plants shall be grown in a container sufficiently long for new fibrous roots to have developed and for root mass to retain its shape and hold together when removed from container. Container shall be sufficiently rigid to hold ball shape and protect root mass during shipping.

#### 1.8.1.1.3 Plant cuttings

##### 1.8.1.1.3.1 Willow plant cuttings

Plant cuttings shall be obtained prior to leaf-out. No more plant material shall be cut than that which can be installed within 48 hours after completion of cutting. Plant saplings shall be cut to size in a manner which does not result in frayed ends or bark. During preparation, the orientation of plant cuttings shall be maintained, i.e., willow plant cuttings shall be arranged basipetally (tops up and bases down). Additional requirements for plant cuttings include:

- a. For safety concerns, plant stock shall be cut flat (horizontal) and as close to the existing groundline as possible.
- b. The Contractor shall not make brush piles out of discarded or unsuitable plant stock material (i.e. tops and branches) but shall scatter such material uniformly over the cut area at the plant source location.

#### 1.8.1.1.4 Stolons

##### 1.8.1.1.4.1 Beachgrass

Stolons shall be handled and stored as recommended from the nursery where the stolons have been obtained.

#### 1.8.1.2 Antidesiccant Application

Plants shall be root dipped with an antidesiccant.

#### 1.8.1.3 Protection during delivery

Plants shall be protected during delivery in order to prevent desiccation of the plant and/or damage to the roots or balls. Branches of plants shall be protected by tying-in the branches and covering all exposed branches.

#### 1.8.2 Storage

Plants not installed on the day of arrival at the contract project work site shall be stored and protected in areas selected by the Contractor and approved by the Contracting Officer. Plants shall be maintained in moist conditions at all times. Plants must be: stored outside; protected from the wind; and continually shaded with at least their

bases submerged in water, either in natural streams, ponds, or containers. When stored in containers, the water shall be changed at least once daily. Plants may be stored, wrapped in wet burlap, under refrigeration between 32 °F to 45 °F. During plant installation operations, the plants shall be kept moist until installed; this may be accomplished by carrying the plants in planting bags or buckets that are covered with moist vermiculite, sawdust, or similar material, or in water. Bare-root plants shall be heeled-in.

#### 1.8.3 Handling

Care shall be taken to avoid drying and/or damaging plants being moved from the source site(s) or storage area(s) to the required planting site. Damaged plants will not be accepted and the Contractor shall be remove all unacceptable plants from the contract project work site. Plant materials shall not be dropped during handling operations. Container-grown plants shall be handled by the container. Plants shall not be handled by the trunk or stems.

### PART 2 PRODUCTS

#### 2.1 PLANTS

##### 2.1.1 Varieties

Plants shall: be nursery grown stock or plantation grown stock; be in accordance with AAN 1; and be of the required variety in the appropriate required plant list and bearing botanical names listed in one or more of the publications listed under "Nomenclature" in AAN 1.

##### 2.1.2 Growing Conditions

Plants shall be grown under climatic conditions similar to those in the locality of the contract project work site and within 200 miles of the contract project work site.

##### 2.1.3 Quality

Each plant shall be well shaped, well grown, vigorous, healthy, and have a healthy and well branched root system. Each plant shall be free from disease, harmful insects and insect eggs, sun-scald injury, disfigurement, and abrasion. Plants to be provided shall be: typical of the respective species or variety; in accordance with AAN 1; and meet the contract requirements.

##### 2.1.4 Trees

For each plant: height shall average 24 inches or more; be at least 0.25 inch in diameter measured at the root collar; be dormant when installed; and not be "poled" or have the leader removed. The height of branching should bear a relationship to the size and variety of required plant and with the crown in good balance with the trunk. All plants shall be two to three years old at the time of installation (i.e., each plant having gone through at least two growing seasons prior to the required planting work herein). Each plant shall be well branched, have a fibrous root system, and be free of damage and disease.

- a. Single stem. Trunk shall be reasonably straight and symmetrical with crown and have a persistent main leader.
- b. Multi-stem. All countable stems, in aggregate, shall average the required size. In order to be considered a stem, there should be no division of the trunk which branches more than 6 inches from ground level.
- c. Specimen. Each plant shall be well branched and pruned naturally according to the respective plant species. The required plant species to be provided shall include the following:

Tree Species

Silver Maple	(Acer saccharinum)
Green Ash	(Fraxinus pennsylvanica)
Cottonwood	(Populus deltoides)
Bur Oak	(Quercus macrocarpa)
Swamp White Oak	(Quercus bicolor)
Hackberry	(Celtis occidentalis)

2.1.5 Shrubs

For each plant: height shall have a minimum height of 12 inches. All plants shall be two to three years old at the time of installation (i.e., each plant having gone through at least two growing seasons prior to the required planting work herein). Each plant shall be well shaped with sufficient well-spaced side branches recognized by the trade as typical for the variety grown in the region of the contract project work site. The required species to be provided shall include the following:

Shrub Species

Red Osier Dogwood	(Cornus stolonifera)
Indigobush	(Amorpha fruticosa)
Buttonbush	(Cephalanthus occidentalis)
Nannyberry	(Viburnum lentago)
Winterberry	(Ilex verticillata)
Chokecherry	(Prunus virginiana)

2.1.6 Not Used

2.1.7 Plant Cuttings

2.1.7.1 Willow plant cuttings

#### 2.1.7.1.1 General

Plant cuttings (live stakes) shall be prepared from live Willow (*Salix* spp.) saplings obtained from a source to be designated by the Contracting Officer during the fall season of calendar year 1999; this designated source will be located within 10 miles of the contract project work site. Indigobush (*Amorpha fruticosa*) saplings will also be accepted as willow saplings. Plant cuttings shall be made from dormant spring season stock, prior to bud burst, and free from obvious signs of canker diseases. Plant cuttings shall not be removed from one source site.

#### 2.1.7.1.2 Plant size

The diameter of each plant cutting shall not be less than 3/8 inch nor more than 3/4 inch. The length of a plant cutting shall be a minimum length of 21 inches. Each plant cutting shall have at least four healthy buds.

#### 2.1.8 Stolons/Plugs

Each plant shall have heavy, well developed and balanced top with a vigorous and well developed root system. The required plant species to be provided shall include the following:

##### Stolons/Plugs

Beachgrass {or Dunegrass} (*Ammophila brevigulata*)

#### 2.2 TREE SHELTERS

##### 2.2.1 General

Tree shelters shall be the standard product of a reputable manufacturer who's normal business is the production of tree shelters to be used for the purpose of: protecting trees from damage due to animals, mowing, and application of herbicide; providing support; and providing improved growing conditions for seedlings through the recycling of moisture.

##### 2.2.2 Construction

Tree shelters shall: be constructed of a translucent plastic polymer that is ultraviolet stabilized for five years; be seamless twin-walled around entire circumference; and have a continuous scrape free rim. Tree shelters shall also include netting to screen the tops for excluding songbirds.

##### 2.2.3 Dimensions

Tree shelters shall be 4 feet long and approximately 4 inches in diameter with a minimum diameter of 3-1/2 inches.

##### 2.2.4 Stakes

Stakes for supporting tree shelters shall be solid white oak lumber, 1 inch square, and either pencil pointed or double-cut pointed. The

length of the stake shall be as recommended by the tree shelter manufacturer and as approved.

#### 2.2.5 Ties

Tree shelter ties shall be nylon ratchet-locking ties at least 1/4 inch wide and as long as necessary to secure the tree and the tree shelter.

#### 2.3 TREE MATS

##### 2.3.1 General

Tree mats shall be the standard product of a reputable manufacturer who's normal business is the production mats to be used for the purpose of protecting trees from the growth of adjacent weeds.

##### 2.3.2 Construction

Tree mats shall be constructed of black polyethylene that is ultraviolet stabilized for three years and porous yet block 90 percent of the sunlight.

##### 2.3.3 Dimensions

Tree mats shall be 3 feet square (minimum) and 0.0025 inch thick (minimum).

##### 2.3.4 Anchors

Tree mat anchors shall be 10 gauge thick wire (minimum) and formed into staples measuring the following minimum dimensions: 6 inches by 1 inch by 6 inches.

#### 2.4 SOIL FOR REPAIRS

For filling and topsoiling of areas to be repaired, soil material shall be of at least equal quality to that which exists in areas adjacent to the repair area(s) and in accordance with SECTION - EMBANKMENT. Soil shall be used that is free from roots, stones, and other materials that hinder grading, installation, maintenance operations, objectionable weed seed, and toxic substances.

#### 2.5 ANTIDESICCANT

Antidesiccant shall be an emulsion that provides a film over plant surfaces permeable enough to permit transpiration and shall not damage the plant.

### PART 3 EXECUTION

#### 3.1 LAYOUT

Plant material installation locations and planting bed outlines shall be staked on the respective work site before any related excavation work has been performed. Plant material installation locations and/or



planting bed outlines may be field adjusted by the Contracting Officer  
as determined necessary.

### 3.2 EXCAVATION

Plant pits shall be excavated to produce vertical sides and flat, uncompacted bottoms. Pits shall be excavated with 6 inch diameter tree augers or larger and if the sides of the pits become glazed, the glazed surface(s) shall be scarified to removed such glazing. The minimum allowable dimensions of plant pits: pit depth shall be 6 inches deeper than the depth of ball or the depth of base roots; and the minimum pit diameter shall be twice the root spread.

### 3.3 INSTALLING (PLANTING) PERIODS AND CONDITIONS

#### 3.3.1 Installing (Planting) Periods

- a. Install deciduous plants (trees, shrubs) in the spring season from April 15 through June 15.
- b. Install deciduous plants (trees, shrubs) in the fall season from October 15 until ground freeze.
- c. Install plant cuttings (willow) by May 1 and prior to bud burst.
- d. Install stolons/plugs (beachgrass) by May 1.

#### 3.3.2 Installation Conditions

Plant installation operations shall be performed only during periods when beneficial results can be obtained. When drought, excessive moisture, and/or other unsatisfactory conditions prevail, the required contract project plant installation work shall be stopped when directed. When special conditions warrant a variance to the required plant installation operations, the Contractor shall submit its proposed revised plant installation periods to the Contracting officer for approval.

### 3.4 INSTALLATION

#### 3.4.1 Setting Plants

Each plant shall be set plumb and held in position until sufficient soil has been firmly placed around its roots or ball. Plants shall be set in relation to surrounding grade so that they are even with the depth at which they were grown in the nursery or container.

#### 3.4.2 Bare-Root Plants

Bare-root plants shall be installed by arranging the roots in a natural position. Damaged roots shall be removed with a clean cut. Bare-root plants shall be backfilled with soil carefully worked in among the roots.

#### 3.4.3 Container-Grown Plants

Non-biodegradable containers or platforms shall be removed without damage to the plant and the root system. Biodegradable containers shall be split open. The backfill work shall then be completed.

### 3.4.4 Plant Cuttings

#### 3.4.4.1 Willow plants

- a. Plant cuttings shall be installed in a manner so as to avoid damaging the bark and buds of the cuttings. Plant cuttings shall not be driven with hammers into the ground. Plant cuttings shall be installed after the planting bed has completely thawed and before the buds burst.
- b. Each plant cutting shall be installed with base down such that about 3 inches shall remain above the groundline and the planting soil tamped firmly around it in order to produce a firm hold. No air pockets and/or voids shall remain around the installed plant cuttings. The Contractor shall take care to ensure that the plant cuttings are not installed at an angle and are as plumb (vertical) as possible.

### 3.4.5 Stolons/Plugs

#### 3.4.5.1 Beachgrass

Stolons/plugs shall be installed by arranging the roots in a natural position. Damaged roots shall be removed with a clean cut. Each stolon/plug shall be backfilled with topsoil carefully worked in among the roots and up to the root collar.

### 3.4.6 Backfill

Topsoil shall be used as backfill in the planting pit and shall be blended to the surrounding grade.

3.4.7 Excess and waste material shall be removed from on a daily basis from the contract project work site. Completed planting areas that become damaged during the contract project plant installation operations shall be restored to an undamaged condition by the Contractor and at no additional cost to the Government.

## 3.5 PLANTING DESIGN

### 3.5.1 Trees

Unless required otherwise, tree plants shall be installed as shown and at a minimum rate of 600 tree plants per acre, randomly mixed and spaced. The spacing between tree plants shall be between 7 feet to 9 feet. An equal number of tree plants (in cumulative totaling the above plantings rate) shall be installed of each plant species within the following tree plants groups as shown::

- a. Tree Group 1: Green Ash, Silver Maple, and Cottonwood.
- b. Tree Group 2: Bur Oak, Swamp White Oak, Hackberry

### 3.5.2 Shrubs

Unless required otherwise, shrub plants shall be installed as shown and at a minimum rate of 900 shrub plants per acre, randomly mixed and

spaced. The spacing between shrub plants shall be between 6 feet to 8 feet. An equal number of shrub plants (in cumulative totaling the above plantings rate) shall be installed of each plant species within the following shrub plants groups as shown:

- a. Shrub Group 3: Red Osier Dogwood, Indigobush, and Buttonbush.
- b. Shrub Group 4: Nannyberry, Winterberry, and Chokecherry.
- c. Shrub Group 5: Red Osier Dogwood and Nannyberry.

### 3.5.3 Willow Plantings

Unless required otherwise, two rows of willow plant cuttings shall be installed as shown with a 24 inch spacing between staggered rows and between willow plant cuttings.

### 3.5.4 Stolons/Plugs

Unless required otherwise, plants shall be installed as shown; Plants shall be common Beachgrass or Dunegrass. Plants shall be installed in random locations with spacing between plants of 12 to 20 inches.

## 3.6 TREE SHELTERS

Tree shelters shall be installed at a rate of 200 tree shelters per acre of required installed tree planting area. Tree shelters shall be dispersed randomly across the islands and not clumped in any one area. Tree shelters shall be placed on each species in proportion to the percentage of that species mix. Tree stakes shall be installed and tied to the tree shelters as required. Tree stakes shall be oriented on the upstream side of the tree shelters in order to maximize stability during periods of high water.

## 3.7 TREE MATS

Tree mats shall be installed at a rate of 200 tree mats per acre of installed planting area but only for plants not receiving required tree shelters protection (i.e., tree mats shall not be installed on the same trees which receive tree shelters). Unless approved otherwise, tree mats shall cover the ground in a radius of 18 inches around each tree plant and be staked with a minimum of four staples per mat and install one each per doubled-over mat corner.

## 3.8 PLANT ESTABLISHMENT PERIOD

On completion of the last day of the plant installation operations, the plant establishment period for maintaining installed plants in a healthy growing condition shall commence and shall be in effect until September 15 of that year (or the following year if the last plant installation is a fall season plant installation). When the plant installation operations extends over more than one plant installation season or there is a variance to the plant installation times, plant establishment periods shall be established for the contract project plant work completed, as directed. A written calendar time period shall be submitted to the Contracting Officer for the beginning of the plant establishment period; where there is more than one plant establishment

period, the Contractor shall describe the boundaries of the installed planting areas covered for each period.

### 3.9 FINAL ACCEPTANCE

#### 3.9.1 Preliminary Inspection

A preliminary inspection will be conducted in mid-July following the date of the beginning of the plant establishment period in order to determine plant acceptability and the number, if any, of plant replacements. The preliminary inspection will be considered complete when the Contractor has complied with the following requirements:

- a. The maximum spacing of surviving groups of plantings shall not be more than 30 feet.
- b. The survival rate for tree plantings shall be a minimum of 75 percent.
- c. The survival rate for shrub plantings shall be a minimum of 75 percent.
- d. The survival rate for willow plantings shall be a minimum of 60 percent.
- e. The survival rate for stolon plantings shall be a minimum of 60 percent.

#### 3.9.2 Final Inspection

A final inspection of all installed plantings will be held after replacement plantings installation work has been completed. The final inspection will be considered final acceptance when the Contractor has complied with the following requirements:

- a. Dead, missing, and defective plant materials that do not meet the minimum survival requirements shall be replaced in accordance with Paragraph - "Preliminary Inspection" above. Final acceptance could be delayed until such replacement work has been satisfactorily accomplished.
- b. Plants shall be provided for replacement in accordance with PARAGRAPH: PLANTS. Replacement plants shall be installed in accordance with PARAGRAPH: INSTALLATION. No extended plant establishment period will be required for replacement plants.

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