



**US Army Corps
of Engineers**

Rock Island District

OPERATION AND MAINTENANCE MANUAL

BROWN'S LAKE REHABILITATION AND ENHANCEMENT

UPPER MISSISSIPPI RIVER ENVIRONMENTAL MANAGEMENT PROGRAM

POOL 13 RIVER MILE 545.8

JACKSON COUNTY, IOWA

JANUARY 1991

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1. INTRODUCTION.

a. Purpose and Scope.

(1) This manual has been prepared to serve as a guide for the operation and maintenance of Brown's Lake Rehabilitation and Enhancement. Operations and maintenance instructions for the major features of the project are presented. These instructions are consistent with the general procedures presented in the Definite Project Report. This manual has been written for project and management personnel familiar with the project and does not contain detailed information which is common to site personnel or which is presented in other existing manuals or regulations.

(2) The intent of the operating instructions is to provide information which allows orderly and efficient use of the constructed features to meet project goals and objectives. The intent of the maintenance instructions is to present preventative maintenance information consisting of systematic inspections and subsequent corrective actions which should ensure long-term utilization of equipment and features. A timely preventative maintenance program reduces and virtually eliminates breakdown of essential equipment and prevents major damage to constructed features by early corrective action.

(3) This manual provides the general standards of maintenance and establishes an initial frequency of maintenance inspections which should ensure satisfactory project performance.

b. Use of Manual.

(1) This manual is divided into the following sections: Section 2: Historical Summary; Section 3: Description of Project Features; Section 4: Inspections; Section 5: Operation and Maintenance of Project Features; and Section 6: Performance Monitoring and Assessment. Sections 2 and 3 present historical summaries and descriptions of actual features constructed for this project. Section 4 presents project inspection procedures and Section 5 presents operation and maintenance instructions for each project feature.

(2) Section 6 provides a summary of monitoring activities conducted through construction and provides an overview of continued monitoring actions. Performance monitoring is considered necessary to properly evaluate effects of the constructed project features.

(3) The attached drawings have been included to provide general project "as-built" views, typical sections, and plans.

2. HISTORICAL SUMMARY.

a. Authorization and Location.

(1) The authority for this project was provided by the 1985 Supplemental Appropriations Act (Public Law 99-88) and Section 1103 of the Water Resource Development Act of 1986, Public Law 99-662. The project was funded and constructed under this authorization by the U.S. Army Corps of Engineers, Rock Island District, in cooperation with the U.S. Fish and Wildlife Service (USFWS) and the State of Iowa, Department of Natural Resources (IDNR).

(2) Brown's Lake is a 1161 - acre backwater complex approximately 10 miles south of Bellevue, Iowa, on the Iowa side of the Upper Mississippi River and is located in pool 13. The project area is approximately at Upper Mississippi River mile 545.8 in Jackson County, Iowa.

b. Planning and Construction Activities.

(1) Table 2-1 provides a summary of planning and construction activities.

Table 2-1

SUMMARY OF PLANNING AND CONSTRUCTION ACTIVITIES

<u>Project Phase</u>	<u>Responsible Purpose</u>	<u>Agency</u>	<u>Significant Events</u>		<u>Remarks</u>
			<u>Item</u>	<u>Date</u>	
Pre-project	Identify and define problems and establish need of project.	USFWS	Fact Sheet		
			Submitted to Corps		--
			Approved by Corps	Mar 80 Aug 86	--
Design	Quantify project objectives, perform preliminary design satisfy NEPA and permit requirements, develop performance evaluation plan, obtain project approval for construction.	CORPS	Definite Project Report		
			Draft	Jun 87	--
			Final	Nov 87	
			Approved	May 88	
			NEPA Compliance		
			SHPO Concurrence	Jan 87	--
			Public Review	Oct 87	--
			FONSI for EA	Nov 87	1/
			Permits		
			Section 401	Aug 87	--
			Section 404	Nov 87	--
			Refuge Compatibility	Nov 87	--
Construction	Finalize plans and specifications, obtain operation and maintenance agreement, advertise and award construction contract, construct project.	CORPS	Plans and Specifications		
			Final	May 88	--
			Approved	Jun 88	--
			Real Estate		
			Lands Available from USFWS	Nov 87	--
			Lands Available from IDNR	Feb 88	--
			Contributed Funds Received	N/A	--
			O&M Agreement	Nov 87	Reference Appendix A

Table 2-1 (continued)

SUMMARY OF PLANNING AND CONSTRUCTION ACTIVITIES

<u>Project Phase</u>	<u>Responsible Purpose</u>	<u>Significant Events</u>			<u>Remarks</u>
		<u>Agency</u>	<u>Item</u>	<u>Date</u>	
			Levee/Dredging Contract		
			Advertised	Jun 88	--
			Awarded	Jul 88	
			Substantially Complete	Sep 90	--
			Revegetation Construction	TBP	<u>2/</u>
Post- Construction	Operate and maintain project.	USFWS	--	--	Reference Sections 4 and 5.
	Perform evaluation monitoring.	CORPS	--	--	Reference Section 6.

Notes:1/ A FONSI was completed by both the Corps and the USFWS.2/ The revegetation work is scheduled for FY 91 - FY 94.

(2) Goals and objectives were formulated during the design phase. Table 2-2 provides a summary of project objectives.

Table 2-2

PROJECT OBJECTIVES

<u>Goal</u>	<u>Objective</u>	<u>Project Feature</u>
Enhance Aquatic Habitat	Retard the loss of fish and wildlife aquatic habitat by reducing sedimentation in upper and lower Brown's Lake.	Deflection Levee
	Improve water quality for Upper and Lower Brown's Lake by decreasing suspended sediment concentrations and increasing winter dissolved oxygen concentrations.	Water Control Structure and Inlet Channel Improvement
	Increase fish habitat in Upper and Lower Brown's Lakes.	Dredging
	Increase fish diversity by providing varied water depths.	Dredging
	Increase habitat available for wintering fish by providing deeper water areas.	Dredging
Enhance Wetland Habitat	Increase bottomland hardwood diversity by increasing selected terrestrial elevations and reducing frequency of flooding for such hardwoods.	Dredge material placement and mast tree plantings.

(3) The project was designed by the Rock Island District, Corps of Engineers in cooperation with the USFWS and the IDNR. Design considerations and investigations are presented in the Definite Project Report. The construction contract was supervised by the Corps of Engineers, Rock Island District.

(4) The levee/dredging construction work was performed under contract by L.W. Matteson, Inc., of Burlington, Iowa, contract number DACW25-88-C-0077, awarded 21 Jul 88, in the amount of \$1,631,591.95. This bid was

approximately 66 percent of the official Government Estimate principally due to prevailing dry weather and low flow conditions.

(5) The contractor experienced construction problems with bank sloughing during placement of the entrance side channel excavation. These bank failures occurred principally due to inadequate slope resistance for the wet sediments placed upon them. Expertise was gained by the contractor as progress occurred and sloughing decreased as construction proceeded.

c. Actual Project Costs. The actual cost of the project is presented in table 2-3.

Table 2-3

ACTUAL PROJECT COSTS

<u>Item</u>	<u>Description</u>	<u>Actual Quantity</u>	<u>Unit</u>	<u>Unit Price</u>	<u>Total</u>
06.	FISH AND WILDLIFE FACILITIES				
1	Clearing and Grubbing	1	Job	Sum	\$150,000.00
2	Water Control Station	1	Job	Sum	346,602.03
3	Deflection Levee Embankment	43,534.4	CY	3.867	168,347.52
4	Stone Protection				
	a. Bedding Choke Stone	963.2	T	13.00	12,521.60
	b. Riprap	2,395.25	T	14.00	33,533.50
5	Channel Excavation	105,443.06	CY	1.59	167,654.47
6	Hydraulic Dredging				
	a. Mobilization and Demobilization	1	Job	Sum	70,000.00
	b. Removal and Disposal of Stumps				
	(1) First 200 each	200	EA	100.00	20,000.00
	(2) Over 200 each	150	EA	100.00	15,000.00
	c. Dredging				
	(1) To elevation 574	132,866.7	SY	4.536	602,683.35
	(2) To elevation 566	7,500	SY	9.072	68,040.00
7	Re-excavate slide areas, river side, Green Island Levee	1	Job	Sum	27,683.38
8	Excavate for drainage of disposal area	1	Job	Sum	2,782.13
9	Re-excavate slides occurring during channel excavation	1	Job	Sum	8,420.12
10	Re-survey/realign levees	1	Job	Sum	4,123.35
06.	TOTAL, FISH, AND WILDLIFE FACILITIES				\$1,697,391.45
30.	PLANNING, ENGINEERING, AND DESIGN				245,214.07
31.	CONSTRUCTION MANAGEMENT				<u>50,893.44</u>
	TOTAL PROJECT COSTS				\$1,993,498.96

d. Project References. Table 2-4 provides a summary of related project references.

Table 2-4

PROJECT REFERENCES

<u>Title</u>	<u>Date</u>	<u>Purpose</u>
Definite Project Report, Brown's Lake Rehabilitation and Enhancement With Environmental Assessment, U.S. Army Corps of Engineers, Rock Island District	Nov 1987	Provided planning, engineering, and sufficient construction details of the selected plan for project approval purposes.
Construction As-Builts	Dec 1990	Provides as-built construction drawings.
Manufacturer's Data (Shop Drawings)	Dec 1990	Provides detailed operation and maintenance instructions for specific pieces of equipment as recommended by the manufacturer.

3. DESCRIPTION OF PROJECT FEATURES.

a. Project Data. Table 3-1 presents a summary of project data.

Table 3-1

PROJECT DATA SUMMARY

Deflection Levee

Embankment Fill	34,350	cubic yards
Length	3,500	feet
Crown elevation	598.4	feet MSL
Side slopes (except backside in containment cell area)	3:1	H:V
Bedding/Choke Stone/Riprap	2,575	tons

Estimated Sediment Effects

Existing annual river sedimentation

Volume	25.2	acre-feet
Average depth	0.4	inch

Annual river sedimentation with Project implemented

Volume	5.1	acre-feet
Average depth	0.1	inch

Water Control Structure

Gates	4-5'x5'	slide gates
Invert elevation (flow line of concrete culverts)	577.0	feet MSL
Trashracks	4-8.5'x5'	upstream end

Modified Inlet Channel

Length	1,200	feet
Invert elevation	574.0	feet MSL
Section dimension	30	feet bottom width
Side slopes	2:1	H:V

Access Channel Adjacent to Green Island Levee

Length	4,000	feet
Invert elevation	574.0	feet MSL
Section dimension	30	feet bottom width
Side slopes	2:1	H:V

Terrestrial Dredged Material Site

Containment System		
Temporary Containment Levee (3 sides)	6,780	feet
Deflection Levee (1 side)	1,610	feet
Material depth	8	feet (average)
Area		
Cell 1	30.3	acres
Cell 2	<u>10.6</u>	acres
	40.9	acres
Capacity	550,000	cubic yards

Mast Planting at Dredged Material Placement

Pin Oak	6,000	each
Northern Pecan	4,000	each
Shellbark Hickory	4,000	each
Black Walnut	1,000	each
Total planting area		
Cell 1	27.2	acres
Cell 2	<u>9.1</u>	acres
	36.3	acres

Lake Dredging

Volume	370,000	cubic yards
Invert elevation (bottom of excavation)	574.0	feet MSL (9' from flat pool)
Deep hole invert elevation	563.0	feet MSL (20' from flat pool)

b. Deflection Levee.

(1) The deflection levee was built to elevation 598.5 feet MSL, an approximate 50-year flood event, reference drawing C-7. This elevation is approximately equivalent to the elevation of the existing Green Island Levee System. The deflection levee functions as a water deflection feature to prevent continuous flow through and subsequent sedimentation during Mississippi River flood events. It was estimated that a single water column of flood water sedimentation with each river event would occur with the deflection levee as compared to a continuous water column during uncontrolled river events without the deflection levee. It was estimated that this deflection levee would decrease sedimentation into Brown's Lake by approximately 65 percent.

(2) The levee was built parallel to the Mississippi River approximately 200 feet from the main shore line. The levee connects to the existing Green Island Levee and extends to the Lanesville Slough for an approximate length of 3,500 feet. The average height of the levee is approximately 8 to 10 feet. The levee was built when river levels were low using conventional construction equipment and adjacent borrow. Side slopes of the deflection levee are 3 horizontal to 1 vertical, except on the backside in the containment cell area.

(3) A turn around structure was constructed at the end of the levee near Lanesville Slough. Riprap was placed at this location for protection from flood water erosion.

c. Water Control Structure.

Connecting the proposed deflection levee with Green Island Levee is a water control structure which controls the amount of water entering upper Brown's Lake, reference drawing S-1. This structure consists of 4 slide gates, each 5 feet by 5 feet, with individual operating stems. Additional concrete was provided to the structure to allow future installation of heavier slide gates which would operate against a differential head of approximately 15 feet, should expansion complete a ring levee around the entire Upper and Lower Brown's Lake. The water control structure gate dimensions were determined based on providing minimum flows and dissolved oxygen to the Brown's Lake during critical low flow, ice and snow covered conditions.

d. Inlet Channel Improvement.

The inlet channel was improved as shown on drawing C-8. Typical cut and fill sections are shown on drawing C-12. The purpose of this channel modification was to restrict debris and bed load sedimentation from reaching the new water control structure and Brown's Lake by re-orienting the mouth downstream rather than the previous upstream orientation. Excavation was performed by land based dragline. Material was sidecast upstream and downstream of the entrance channel which provides additional debris deflection and service access to the entrance. Finished side slopes of 4:1 (horizontal to vertical) along with seeding was provided to stabilize this area against flood erosion.

e. Side Channel Excavation.

Side channel excavation was performed adjacent to the existing Green Island Levee as shown on drawing C-9. The centerline of the proposed excavation is

approximately 115 feet from the centerline of the Green Island Levee to insure stability to the Green Island Levee. Excavation was performed by land base dragline. The material was placed onto the riverside of the Green Island Levee to provide additional levee section and stability. The dimensions of the side channel were determined based on flows providing water with sufficient dissolved oxygen to the Brown's Lake area during critical winter conditions.

f. Lake Dredging.

Lake dredging was performed as shown on drawing C-1. Dredging to approximately 9 feet below flat pool was performed to insure a maintained water depth of 7 feet below flat pool. Occasional deep holes were provided approximately 20 feet in depth from flat pool to provide habitat diversity.

g. Dredge Material Placement Site.

(1) The dredged material from the lake was placed in this site as shown on drawing C-1. Construction of a complete containment ring levee was necessary to allow settling and consolidation of the dredged material. The containment levee consisted of the deflection levee on the north side and a temporary dike constructed from adjacent borrow on the south, east and west sides. The entire area for the placement site was cleared during construction. The approximate height of the containment levee varied from 8 to 10 feet which allowed dredged material placement depth of approximately 6 to 8 feet.

(2) The dredge material placement site will be replanted with tree species such as swamp white oak, pin oak, northern pecan, and shell bark hickory after sufficient drying/consolidation.

4. INSPECTIONS.

a. General.

(1) An active maintenance program is based on inspections and subsequent servicing, adjustment, or repair. There are 3 main objectives of inspections: (1) to insure project serviceability; (2) to avoid or reduce maintenance costs; and (3) to document the condition of the project as a baseline for consideration of rehabilitation for project damage resulting from a major storm or flood event.

(2) There are 2 types of inspections for the project: (1) Project Inspection by the Site Manager and (2) Joint Inspection by the Site Manager and personnel from the Corps of Engineers, Rock Island District.

b. Project Inspection by Site Manager.

(1) The Project Inspection will be performed by the Site Manager (the USFWS Refuge Manager) or appropriate representative for the purpose of noting routine deficiencies and initiating corrective actions. This inspection will be performed at intervals not exceeding 12 months and will follow inspection guidance presented in subsequent sections of this manual. It is suggested that the inspection be conducted every May, which is representative of after-spring flood conditions. Other Project Inspections should occur as necessary after high water events or as scheduled by the Site Manager.

(2) A Project Inspection checklist has been developed as presented in Appendix B. A copy of the completed checklist will be furnished to the Corps of Engineers, Rock Island District, ATTN: CENCR-OD-S, P.O. Box 2004, Rock Island, Illinois, 61204-2004, immediately following each annual Project Inspection by the Site Manager.

c. Joint Inspection by Site Manager and Corps of Engineers.

(1) Routine. A Joint Inspection by the Site Manager and the Corps of Engineers will be scheduled by the Corps in accordance with ER 1130-2-339. The inspection will follow the Project Inspection checklist presented in Appendix B. The purpose of this inspection is to assure that adequate maintenance is being performed as presented in the DPR and this manual. The District Engineer or authorized representatives will have access to all portions of the constructed project upon coordination with the Site Manager for this purpose. Copies of this inspection will be furnished to the Site Manager stating project maintenance conditions. Corrective actions from these inspections should be accomplished by the Site Manager as provided by USFWS Letter of Intent, reference appendix A.

(2) Catastrophic. A Joint Inspection by the Site Manager and the Corps of Engineers should be formally requested by the Site Manager immediately following a specific storm or flood event which causes damage exceeding the annual operation and maintenance as specified in this manual and the Definite Project Report. A comparison of pre- and post- Project Inspections by the Site Manager and the Joint Inspections will be the basis for determining maintenance responsibility and potential rehabilitation by the Corps of Engineers.

5. OPERATION AND MAINTENANCE OF PROJECT FEATURES.

a. General.

(1) This section presents operation and maintenance instructions for the major project features which were designed and constructed to minimize operation and maintenance requirements.

(2) Steps will be taken by the Site Manager to correct conditions disclosed by Project Inspections or Joint Inspections. Regular maintenance repair measures will be accomplished during the appropriate season as scheduled by the Site Manager to insure structure serviceability. Appropriate advance measures will be taken to insure the availability of adequate labor and materials to meet contingencies.

(3) Project features should be continuously maintained and operated to obtain maximum benefits. No encroachment or trespass which will adversely affect the efficient operation or maintenance of the project should be permitted upon the constructed features. No improvement should be passed over, under, or through the constructed features, nor should any excavation or construction be permitted within these features without prior approval by the Corps of Engineers, Rock Island District. Such improvements or alterations which are desirable and permissible should be constructed in accordance with standard engineering practice. Advice regarding the effect of proposed improvements or alterations on the functioning of the project and information concerning methods of construction acceptable under standard engineering practice should be obtained from the District Engineer or if

otherwise obtained, should be submitted for approval. Drawings or prints showing improvements or alterations as finally constructed should be furnished to the District Engineer after completion of such work.

b. Deflection Levee.

(1) Operation.

(a) During flood periods, the levee will be inspected to locate possible sand boils or unusual wetness of the landward slope and to be certain that:

(i) There are no indications of slides or sloughs developing;

(ii) Wave wash or scouring action is not occurring;

(iii) No low reaches of levee below design grade exist which may be overtopped;

(iv) No other conditions exist which might endanger the structure.

(b) Steps will be taken to control any condition which endangers the levee and to repair the damaged section. If additional riprap is needed to protect eroding banks, the material presented in Table 4-1, or equivalent material will be used.

Table 4-1

IOWA CLASS "D" RIPRAP

<u>Stone Weight, Pounds</u>	<u>Minimum Percent Larger Than</u>
250	0
90	50
5	90

(2) Maintenance.

(a) The Site Manager will provide at all times maintenance as necessary to insure serviceability of the levee in time of flood. Measures will be taken to promote the growth of sod, control burrowing animals, provide routine mowing of the levee extending 5 feet horizontally from the toe of the levee, remove wild growth and drift deposits, and repair damage caused by erosion or other forces. It is suggested that mowing occur during late July or early August to avoid impact to ground nesting birds.

(b) Project inspections will be made by the Site Manager to insure that the above maintenance measures are being effectively carried out and to be certain that:

(i) no unusual settlement, sloughing, or material loss of grade or levee cross-section has taken place;

(ii) no caving has occurred on either the landside or the riverside of the levee which might affect the stability of the levee section;

(iii) no seepage, saturated areas, or sand boils are occurring;

(iv) no revetment work or riprap has been displaced, washed-out, or removed;

(v) no action is being taken, such as burning grass and weeds during inappropriate seasons, which will retard or destroy the growth of sods;

(vi) the crown of the levee is shaped to drain readily;

(vii) there is no unauthorized grazing or vehicular traffic on the levee;

(viii) encroachments are not being made on the levee which might endanger the structure or hinder its proper and efficient functioning during times of flood.

c. Water Control Structure.

(1) Operation.

(a) When water levels of the Mississippi River rise with heavy sediment loads, the gatewell structure will be closed to prevent sediment from entering upper Brown's Lake. The gates will remain closed until:

(i) heavy sediment flood waters recede; and/or

(ii) low dissolved oxygen conditions exist in Brown's Lakes.

(b) This structure was provided with a portable power source and adapter to power lift the 4 gates. The operating stand, electric generator, and drill adapter will be stored off-site to allow ready use when needed.

(2) Maintenance.

(a) The drainage structure will be inspected during floods to determine whether seepage is taking place along the lines of its contact with the embankment.

(b) The 4 gates of the structure will be examined, lubricated, and trial-operated at least twice a year. Follow the manufacturer's instructions for lubrication.

(c) The water control structure was provided with a stop log recess and stop logs. The stop logs will be stored, inspected, and inventoried off-site as appropriate.

(d) Project inspections of the control structure will be made by the Site Manager to be certain that:

(i) Pipes, gates, operating mechanism, riprap, and headwalls are in good condition;

(ii) Inlet and outlet channels are open;

(iii) Care is being exercised to prevent the accumulation of trash and debris near the structures;

(iv) Erosion is not occurring adjacent to the structure which might endanger its function.

d. Inlet Channel Improvement.

(1) Operation. The improved channel will be inspected immediately following major high water periods. As soon as practicable after high water events, all snags and other debris will be removed from the channel.

(2) Maintenance. Project inspections of the improved channel will be made by the Site Manager to be certain that:

(a) The channel is cleared of debris, weeds, and wild growth;

(b) The channel is not being restricted by the depositing of waste materials, building of unauthorized structures, or other encroachments;

(c) Banks are not being damaged by rain or wave wash and that no sloughing of banks has occurred;

e. Side Channel Excavation.

Section 5d will be followed for operation and maintenance of this feature. A maintenance access drive will be mowed annually for maintenance of the side channel connecting the channel adjacent to the Green Island Levee to upper Brown's Lake.

f. Lake Dredging.

(1) Operation. Specific operational requirements will be performed as determined by the Site Manager.

(2) Maintenance. Project Inspections of the dredged lake channels will be made by the Site Manager to record the presence of undesirable debris, waste materials, or unauthorized structures.

g. Dredged Material Placement Site.

(1) Operation. The dredged material placement site is scheduled for revegetation with select mast tree species during FY 91-FY 94. Standard accepted forest management practices which emphasize wildlife production will be practiced the area by the Site Manager.

(2) Maintenance. Maintenance of the dredge material placement site principally consists of sufficient mowings/herbicide treatment to insure that the planted tree seedlings survive. Once trees become dominant to competing undesired vegetation species, mowings and herbicide treatments may be reduced accordingly.

6. PERFORMANCE MONITORING AND ASSESSMENT

a. The purpose of this section is to summarize monitoring and data collection aspects of the project. Table 6-1 presents the principal types, purposes, and responsibility of monitoring and data collection. Table 6-2 provides a summary of actual monitoring and data parameters grouped by project phase, responsible agency, and data collection intervals. Changes to the monitoring plan should be coordinated with the USFWS, IDNR, and COE.

b. Table 6-3 presents the post-construction evaluation plan. The monitoring parameters were developed to measure the effectiveness of the stated goals. The Site Manager should follow Table 6-3, as shown, to make annual field observations. These observations are summarized in checklist form in Appendix B. The annual field observations and the quantitative monitoring parameters will form the basis of project evaluation.

Table 6-1

MONITORING AND PERFORMANCE EVALUATION MATRIX

Project Phase	Type of Activity	Purpose	Responsible Agency	Implementing Agency	Funding Source	Implementation Instructions
Pre Project	Sedimentation Problem Analysis	System-wide problem definition. Evaluates planning assumptions.	USFWS	USFWS (EMTC)	LTRM <u>1/</u>	--
	Pre-project Monitoring	Identifies and defines problems at HREP site. Establish need of proposed project features.	USFWS	USFWS	USFWS	--
	Baseline Monitoring	Establishes baselines for performance evaluation.	Corps	Field station or sponsor thru Cooperative Agreements or Corps.	LTRM	See Table 6-2.
Design	Data Collection for Design	Includes quantification of project objectives, design of project, and development of performance evaluation plan.	Corps	Corps	HREP <u>2/</u>	See Table 6-2
Construction	Construction Monitoring	Assess construction impacts; assures permit conditions are met.	Corps	Corps	HREP	See State Section 401 Stipulations.
Post Construction	Performance Evaluation Monitoring	Determine success of project as related to objectives.	Corps (quantitative) sponsor (Field Observations).	Field station or sponsor thru Cooperative Agreement, sponsor thru O&M, or Corps.	LTRM	See Table 6-3.
	Analysis of Biological Responses to Projects	Evaluate predictions and assumptions of habitat unit analysis. Studies beyond scope of performance evaluation, or if projects do not have desired biological results. *	USFWS	USFWS (EMTC)	LTRM	--

1/ Long Term Resource Monitoring of the Environmental Management Program (P.L. 99-662).2/ Habitat Rehabilitation and Enhancement Project of the Environmental Management Program (P.L. 99-662).

TABLE 6-2

Resource Monitoring and Data Collection Summary 1/

	WATER QUALITY DATA						ENGINEERING DATA			NATURAL RESOURCE DATA			
	Pre- Project Phase	OCT- Design Phase	APR- Design Phase	OCT- Design Phase	Post- Const. Phase	APR- Design Phase	OCT- Design Phase	Post- Const. Phase	Pre- Project Phase	OCT- Design Phase	Post- Const. Phase		
Type Measurement	APR- SEP	OCT- MAR	APR- SEP	OCT- MAR	APR- SEP	OCT- MAR							Sampling Agency Remarks
POINT MEASUREMENTS	-	-	-	-	2W								FWS/LTRM
<u>Water Quality Stations</u> <u>2/</u>	-	-	-	-	2W								
Turbidity	-	-	-	-	2W								
Secchi Disk Transparency	-	-	-	-	2W								
Dissolved Oxygen	-	-	-	-	2W	2W							
Specific Conductance	-	-	-	-	2W	2W							
Water Temperature	-	-	-	-	2W	2W							
Velocity	-	-	-	-	2W	2W							
Water Depth	-	-	-	-	2W	2W							
Water Elevation	-	-	-	-	2W	2W							
Percent Ice Cover	-	-	-	-	2W								
Ice Depth	-	-	-	-	2W								
Percent Snow Cover	-	-	-	-	2W								
Snow Depth	-	-	-	-	2W								
Substrate Hardness	-	-	-	-	2W	2W							
pH	-	-	-	-	2W	2W							
Chlorophyll	-	-	-	-	2W	2W							
Suspended Solids	-	-	-	-	2W	M							
Wind Direction	-	-	-	-	2W	M							
Wind Velocity	-	-	-	-	2W	M							
Wave Height	-	-	-	-	2W	M							

TABLE 6-2 (Cont'd)

Resource Monitoring and Data Collection Summary 1/

	WATER QUALITY DATA						ENGINEERING DATA			NATURAL RESOURCE DATA			Sampling Agency	Remarks
	Pre-Project Phase	OCT-Design Phase	SEP-MAR	Post-Const. Phase	SEP-MAR	OCT-MAR	Pre-Project Phase	Design Phase	Post-Const. Phase	Pre-Project Phase	OCT-Design Phase	Post-Const. Phase		
Type Measurement	APR-SEP	OCT-MAR	APR-SEP	OCT-MAR	APR-SEP	OCT-MAR								
<u>Water Quality Stations 1,2,3,4</u> Dissolved Oxygen	-		1		-								COE	
<u>Water Quality Stations B-2, B-4, B-5</u> Sediment Oxygen Demand	-		1		-								COE	
<u>Fish Stations 4/</u> Creel Survey Electrofishing/netting Radio Telemetry										1	1	6M	IDNR	
										1	1	4M		
										-	1	Y		
<u>Water Quality Station</u> Column Settling Analyses at Boring B-87-15							-	-	1				COE	
<u>Geotechnical Boring Stations</u> Soil Borings. See Construction Drawings.							-	1	-				COE	
<u>TRANSECT MEASUREMENTS</u> <u>Sedimentation Transects 5/</u> Hydrographic Soundings							-	-	Y				FWS/LTRM	
<u>Sedimentation Transects 6/</u> Hydrographic Soundings								1	Y				IDNR	
<u>Sedimentation Transects 7/</u> Hydrographic Soundings							-	1	5Y	-	1	-	COE	
<u>Sedimentation Transects B, E, G, I</u> Hydrographic Soundings							-	1	-				COE	

TABLE 6-2 (Cont'd)

Resource Monitoring and Data Collection Summary 1/

	WATER QUALITY DATA						ENGINEERING DATA			NATURAL RESOURCE DATA			Sampling Agency	Remarks
	Pre- Project Phase	OCT- Design Phase	APR- Design Phase	OCT- Design Phase	Post- Const. Phase	APR- Design Phase	Pre- Project Phase	Design Phase	Post- Const. Phase	Pre- Project Phase	Design Phase	Post- Const. Phase		
Type Measurement	APR- SEP	OCT- MAR	APR- SEP	OCT- MAR	APR- SEP	OCT- MAR								
<u>Transects at Select Intervals</u> Topographic Mapping										-	1	-	COE	
<u>Vegetation Transects</u> <u>8/</u> Vegetation Survey										-	1	Y	FWS/LTRM	
<u>Vegetation Transects</u> <u>9/</u> Vegetation (timber) survey										-	1	Y	COE COE	
<u>AREAL MEASUREMENTS</u> <u>Vertical Stereo Areal</u> <u>Photographs (1=15,000)</u>										-	1	5Y	COE	

Legend

W = Weekly
 M = Monthly
 Y = Yearly
 nW = n-Week interval
 nY = n-Year interval
 1, 2, 3 --- = number of times data is collected within designated project phase

1/ See drawing LMP - 1 of this manual for locations of post-construction phase sampling points, transects, and area measurements. See DPR for locations of design phase sampling locations.

2/ FWS/LTRM Water Quality Stations

Remarks

W-M545.8 F	COE measures pH, chlorophyll, suspended solids
W-M545.5 B	COE measures pH, chlorophyll, suspended solids
W-M545.5 C	COE measures pH, chlorophyll, suspended solids
W-M545.1 H	All parameters measured weekly during Apr-Sep. Site of Vallisneria study.
W-M544.5 F	-
W-M544.7 F	-
W-M544.6 F	-
W-M544.1 D	-
W-M544.2 C	COE measures pH, chlorophyll, suspended solids
W-M544.2 D	-

3/ COE Water Quality Station

W-M546.0A	Smith's Creek
-----------	---------------

4/ IDNR Fish Stations

F-M545.5 C
F-M545.4 B
F-M545.1 J
F-M544.3 C

5/ FWS/LTRM Sedimentation Transects

S-M544.2 C	DPR Transect E
S-M545.5 A	DPR Transect B
S-M545.4 C	

6/ IDNR Sedimentation Transects

S-M545.2 I	IDNR Number 11
S-M544.9 E	IDNR Number 9
S-M545.0 C	IDNR Number 1
S-M545.6 B	IDNR Number 10
S-M545.8 E	IDNR Number 6

7/ COE Sedimentation Transects

S-M545.8 H	DPR Transect A
S-M545.7 H	DPR Transect B
S-M545.3 H	DPR Transect C
S-M544.3 H	DPR Transect D
S-M544.1 E	DPR Transect E
S-M545.9 H	DPR Transect H
S-M546.3 H	DPR Transect I
S-M544.6 H	DPR Transect N
S-M545.6 B	DRP Transect F (Smith's Creek Thalweg)

8/ FWS/LTRM Vegetation Transect

V-M545.0 B

9/ COE Vegetation Transects

1545.8 H	DPR Transect K
M545.5 H	DPR Transect L

TABLE 6-3

POST-CONSTRUCTION EVALUATION PLAN

<u>Goal</u>	<u>Objective</u>	<u>Alternative</u>	<u>Enhancement Feature</u>	<u>Enhancement Potential</u>				<u>Feature Measurement Reference Table 6-2</u>	<u>Annual Field Observations by Site Manager</u>
				<u>Unit</u>	<u>Year 0 Without Alternative</u>	<u>Year X With Alternative¹</u>	<u>Year 50 Target With Alternative</u>		
Enhance Aquatic Habitat	Retard loss of fish and wildlife by reducing sedimen- tation	Basic Development	Deflection Levee	Acre feet of annual sedi- ment reduc- tion	0	--	20	Evaluate data per Notes 5 and 6. Perform transects per Note 7.	Observe by pole soundings or depth gauges sedimentation in excavated channel
	Improve water qual- ity by decreasing suspended solid concen- trations and increas- ing winter dissolved oxygen concentrations	Basic Development	Water Control Structure and Inlet Channel Improvement	mg/l Suspended Solids	300	--	50	Evaluate water quality per Note 2.	Observe water clarity differences between blocked river flows and lake water
				mg/l dissolved oxygen	<5.0	--	>5.0	Evaluate water quality per Note 2.	Observe effects of low dissolved oxygen (fish kills)
				cubic feet per second of desired water inflow	0	--	350	Perform water quality tests per Note 3.	Observe effects of opening and closing gates
	Increase fish habitat	Basic development	Dredging	Acre-feet of additional lake volume	0	--	8	Evaluate data per Notes 5 and 6.	Observe/Record fish changes

TABLE 6-3 (Cont'd)

<u>Goal</u>	<u>Objective</u>	<u>Alternative</u>	<u>Enhancement Feature</u>	<u>Unit</u>	<u>Enhancement Potential</u>			<u>Feature Measurement Reference Table 6-2</u>	<u>Annual Field Observations by Site Manager</u>
					<u>Year 0 Without Alternative</u>	<u>Year X With Alternative¹</u>	<u>Year 50 Target With Alternative</u>		
Enhance Wetland habitat	Increase bottomland hardwood diversity	Basic development	Mast tree plantings on dredged material placement site	Acres of Mast trees	0	--	35	Evaluate data per Note 8. Perform vegetation transect per Note 9.	Observe/record planted mast survivability

^{1/} This column is completed for the year the enhancement feature is monitored.

APPENDIX A

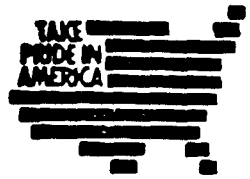
LETTERS OF INTENT

1. Letter from USFWS to Corps of Engineers, Rock Island District, dated 5 November 1987.
2. Letter from Iowa Department of Natural Resources to Corps of Engineers, Rock Island District, dated 17 February 1988.
3. Letter from Iowa Department of Natural Resources to Corps of Engineers, Rock Island District, dated 29 February 1988.



United States Department of the Interior

FISH AND WILDLIFE SERVICE
FEDERAL BUILDING, FORT SNELLING
TWIN CITIES, MINNESOTA 55111



IN REPLY REFER TO:

FWS/ARW-WSS

NOV 5 1987

Colonel Neil A. Smart
District Commander
U. S. Army Engineer District
Rock Island
Clock Tower Building
Rock Island, Illinois 61201

Dear Colonel Smart:

The Fish and Wildlife Service has reviewed the Definite Project Report for the Browns' Lake, Iowa rehabilitation and enhancement project. This project is proposed under the Water Resources Act of 1986 as part of the Upper Mississippi River System Environmental Management Program.

The Browns' Lake project has been coordinated with the Fish and Wildlife Service and we approve and support the project as planned and described in the Definite Project Report. Concerning the Long-Term Resource Monitoring aspects, we recommend that responsibility for specific monitoring items be assigned during the coordinated preparation of the operation and maintenance plan, because the most cost-effective method for implementation of monitoring efforts may require interagency coordination.

The Service agrees with the preferred alternative action contained in the Environmental Assessment and has effected a Finding of No Significant Action (copy enclosed). The project is located within the Upper Mississippi River National Wildlife and Fish Refuge, and the project has been determined to be compatible with the purpose for which the refuge was established. Compatibility is based upon the current project description, and we request the opportunity to review final plans and specifications prior to construction. The Browns' Lake project involves Fish and Wildlife Service fee title lands, and the Corps of Engineers is authorized to construct the proposed project on these lands. When the project is complete, the Fish and Wildlife Service will assume operation and maintenance responsibilities as described in Table 12-1 of the Definite Project Report.

Colonel Neil A. Smart

2

We look forward to our continued cooperative efforts in developing habitat rehabilitation and enhancement projects under the Environmental Management Program. If we can be of further assistance, please let us know.

Sincerely,


Acting Regional Director

Enclosure

FINDING OF NO SIGNIFICANT IMPACT

For the reasons presented below and based on an evaluation of the information contained in the supporting references, I have determined that the Environmental Management Program project of rehabilitating and enhancing Brown's Lake through backwater dredging for deepwater habitat and a deflection levee to keep out sediment-laden water in the Upper Mississippi River National Wildlife and Fish Refuge, is not a major Federal action which would significantly affect the quality of the human environment within the meaning of Section 102(2)(c) of the National Environmental Policy Act of 1969. An Environmental Impact Statement will, accordingly, not be prepared.

Reasons:

The U. S. Fish and Wildlife Service has adopted the environmental assessment prepared by the U. S. Army Corps of Engineers which considered ten alternatives. Several of the alternatives have the potential to meet the objective of the project, which is to restore and protect the shallow backwater complex important for several species of fish as well as waterfowl and furbearers, and some of the alternatives will be considered further for separate projects. The preferred alternative, however, appears to meet the objective with no or no measurable economic and social impacts and no adverse impacts on natural resources except the loss of up to fifty acres of bottomland forest which will be mitigated through replanting to species that provide better wildlife food.

Supporting References:

1. Environmental Assessment


Acting Regional Director

11/4/87
Date

Distribution: AE (Master File)
ES/BEC--Washington, DC
RF--Washington, DC
WSS/FM--Twin Cities, MN
UMR through RF1



ERRY E. BRANSTAD, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
LARRY J. WILSON, DIRECTOR

2-17-88

Mr. John E. George- Real Estate Division
U.S. Army Corps of Engineers- Rock Island District
Clock Tower Building
Rock Island, Illinois

Dear Mr. George,

I have discussed the access you requested at Green Island. I reviewed the proposal with Mr. Jon Andreson- Chairman of the Green Island Drainage District. We both feel that the proposed Browns Lake deflection levee and inlet channel will benefit our flood protection levee at Green Island. As a result, we offer our consent and cooperation for access to your proposed work locations.

The Iowa Dept of Natural Resources grants approval for contractor equipment associated with this project to cross our agricultural field located in the NE qtr of Section 29 T85N R 6-7E in Jackson county. And the drainage district grants permission for travel upon the required sections of the Green Island flood levee for the same purposes. I would request that no equipment be stored in this field or upon the levee without prior coordination with the resident state wildlife technician. His name is Darrell Jennings. He lives in state quarters near the RR crossing close to the field in question. His phone # is 319-682-7392.

The drainage district and our agency have both wondered if the Green Island levee is high enough along the Blakes Lake segment. We would like to ask if it is possible to determine if it may need additional material placed on the crown. And if it does, we would ask if the draglining project could place material on top as well as on the side of the levee.

Hoping this response helps see the project to completion.

Sincerely,

BOB SHEETS WILDLIFE BIOLOGIST
Iowa Department of Natural Resources
Courthouse - MAQUOKETA, IA 52060
Ph: (319) 652-3132


Bob Sheets- Area Manager- Iowa DNR

2-17-88
Date


Jon Andreson- GI Drainage Dist. Chmn

2-17-88
Date

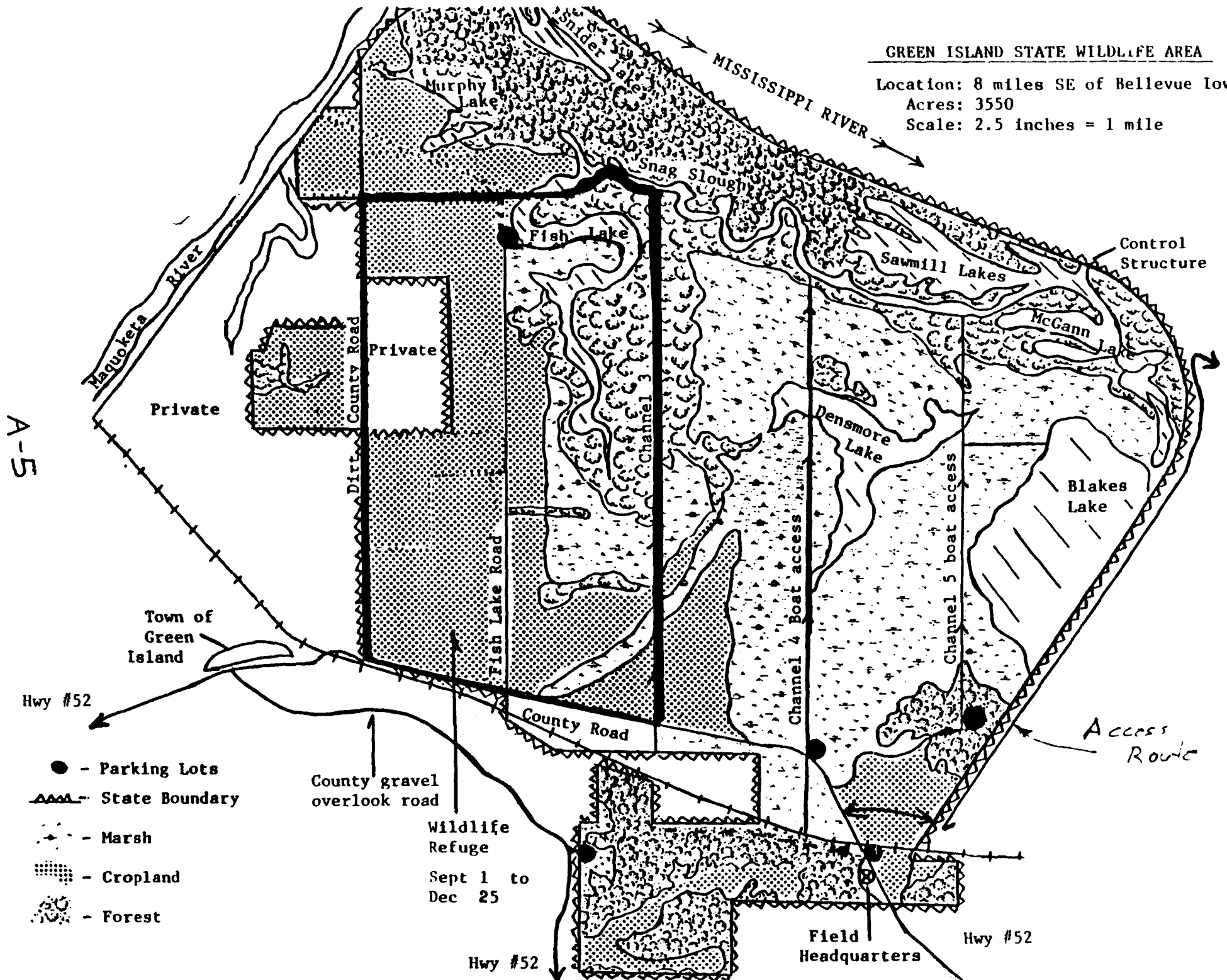
A-4

GREEN ISLAND STATE WILDLIFE AREA

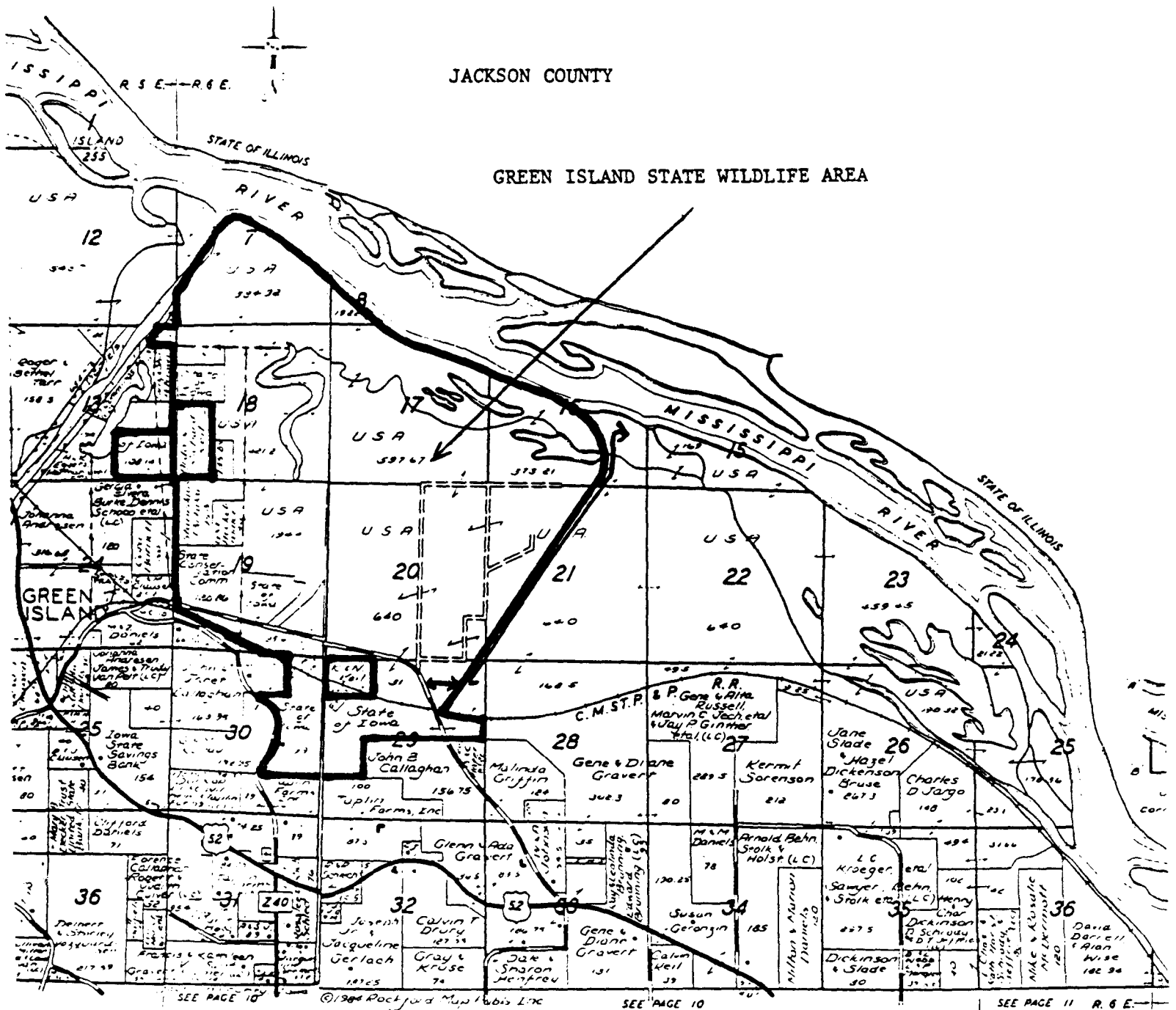
Location: 8 miles SE of Bellevue Iowa

Acres: 3550

Scale: 2.5 inches = 1 mile



35 N.-R. 5-6 E. NORTH PART IOWA T85N - R6-7E





TERRY E. BRANSTAD, GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
LARRY J. WILSON, DIRECTOR

February 29, 1988

Department of the Army
Rock Island District Corps of Engineers
Clock Tower Building
P.O. Box 2004
Rock Island, IL 61204-2004

Dear Sirs:

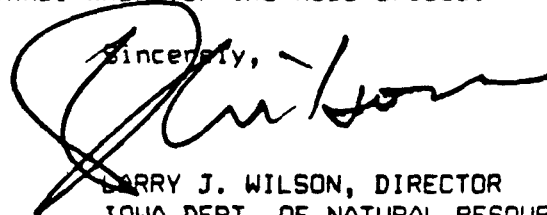
We are in receipt of your recent letter requesting comments from the Iowa DNR relative to ingress and egress for the contractors and work crews associated with the Browns Lake EMP construction project. We believe the most direct and appropriate route for getting vehicles and construction equipment to the work site would be via the Blakes Lake levee. Access to the levee from the county roadway would be through a former cropfield.

Borrow material obtained from the dredge cut that will parallel approximately 3,000 feet of the Green Island (Blakes Lake) levee can be incorporated into the downstream side of the levee. The additional fill material will serve to strengthen the levee and provide additional flood protection at that point. We would also request that the spoil material be graded, sloped and seeded in a manner that would allow maintenance mowing with a wheeled tractor (4 to 1 backslope).

We would ask that close coordination be maintained with our Maquoketa Wildlife unit field personnel relative to the EMP work project. Contact persons would be Bob Sheets (Wildlife Biologist), telephone number (319) 652-3132, and/or Darrell Jennings (Wildlife Technician at the Green Island Field Headquarters), telephone number (319) 682-7392. Dean Dalziel (District Wildlife Supervisor), (319) 927-3276, could also be contacted if these gentlemen can't be reached.

We look forward to cooperating with the U.S. Army Corps of Engineers and the U.S. Fish & Wildlife Service representatives on this important EMP project. Feel free to contact the Iowa DNR personnel whenever the need arises.

Sincerely,



LARRY J. WILSON, DIRECTOR
IOWA DEPT. OF NATURAL RESOURCES

/sao

PD alg
PD-C _____
PD-E _____
PD-F _____
PD-P _____
PD-R 2/3

APPENDIX B

SITE MANAGER'S

PROJECT INSPECTIONS AND MONITORING RESULTS

OPERATION AND MAINTENANCE MANUAL
BROWN'S LAKE REHABILITATION AND ENHANCEMENT
UPPER MISSISSIPPI RIVER ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 13, RIVER MILE 545.8
JACKSON COUNTY, IOWA
SITE MANAGER'S PROJECT INSPECTION AND MONITORING RESULTS

Inspected by _____ Date _____

Type of Inspection (Annual) (Emergency) (other)

1. PROJECT INSPECTION (DEFICIENCIES REQUIRE CORRECTION).

- | <u>Item</u> | <u>Comment</u> |
|---|----------------|
| a. <u>Deflection Levee.</u> | |
| <input type="checkbox"/> Settlement, sloughs, or loss of section. | |
| <input type="checkbox"/> Seepage, saturated areas, sand boils. | |
| <input type="checkbox"/> Wavewash, scouring. | |
| <input type="checkbox"/> Overtopping erosion. | |
| <input type="checkbox"/> Vegetative cover. | |
| <input type="checkbox"/> Displaced/missing riprap. | |
| <input type="checkbox"/> Burrowing animals. | |
| <input type="checkbox"/> Unauthorized grazing or traffic. | |
| <input type="checkbox"/> Encroachments. | |
| b. <u>Water Control Structure.</u> | |
| <input type="checkbox"/> Pipes, gates, and operating mechanisms. | |
| <input type="checkbox"/> Concrete. | |
| <input type="checkbox"/> Displaced/missing riprap. | |
| <input type="checkbox"/> Blockage of inlet and outlet channels. | |
| <input type="checkbox"/> Erosion adjacent to structure. | |
| c. <u>Inlet Channel Improvement.</u> | |
| <input type="checkbox"/> Debris. | |
| <input type="checkbox"/> Waste materials/unauthorized structures. | |
| <input type="checkbox"/> Bank Erosion. | |

- d. Side Channel Excavation.
 - () Debris.
 - () Waste materials/unauthorized structures.
 - () Bank erosion.
 - e. Lake Dredging.
 - () Debris/waste materials.
 - f. Dredged Material Placement Site.
 - () Mowings, herbicide.
2. PROJECT MONITORING (OBSERVATIONS AID PROJECT EVALUATION).
- a. Deflection Levee.
 - () Sedimentation in excavated channels.
 - b. Water Control Structure.
 - () Water clarity.
 - () Dissolved oxygen.
 - () Fish effects from gate operation.
 - c. Dredging.
 - () Fish population/species changes.
 - () Sedimentation in lake excavated areas.
 - () Sedimentation/scouring changes in Lainsville Slough.
 - d. Dredged Material Placement Site.
 - () Mast tree survivability.

Site Manager

APPENDIX C

DISTRIBUTION

DISTRIBUTION:

Mr. James C. Gritman
Regional Director, Region 3
U.S. Fish and Wildlife Service
Federal Building, Ft. Snelling
Twin Cities, MN 55111

U.S. Fish and Wildlife Service
ATTN: Mr. Chuck Gibbons
Federal Building, Ft. Snelling
Twin Cities, MN 55111

Upper Mississippi River
National Wildlife and Fish Refuge
ATTN: Mr. Keith Beseke
51 E. 4th Street
Winona, MN 55987

Upper Mississippi River Fish and Wildlife Refuge
ATTN: Mr. Larry Wargowsky
Post Office Building
Savanna, IL 61074

Rock Island Field Office
U.S. Fish and Wildlife Service
1830 Second Avenue
Rock Island, IL 61201

Environmental Management Technical Center
ATTN: Mr. Jerry Rasmussen
575 Lester Drive
Onalaska, WS 54650

Mr. Bob Sheets
Iowa Department of Natural Resources
Court House
Maquoketa, IA 52060

Mr. Tom Boland
Bellevue Fish Station
P.O. Box 160
Bellevue, IA 52031

Ms. Holly Stoerker
Upper Mississippi River Basin Association
415 Hamm Building
408 St. Peter Street
St. Paul, MN 55111

Mr. Erwin E. Klass
Iowa State University
Iowa Cooperative Fish and Wildlife Research Unit
11 Science II
Iowa State University
Ames, IA 50011

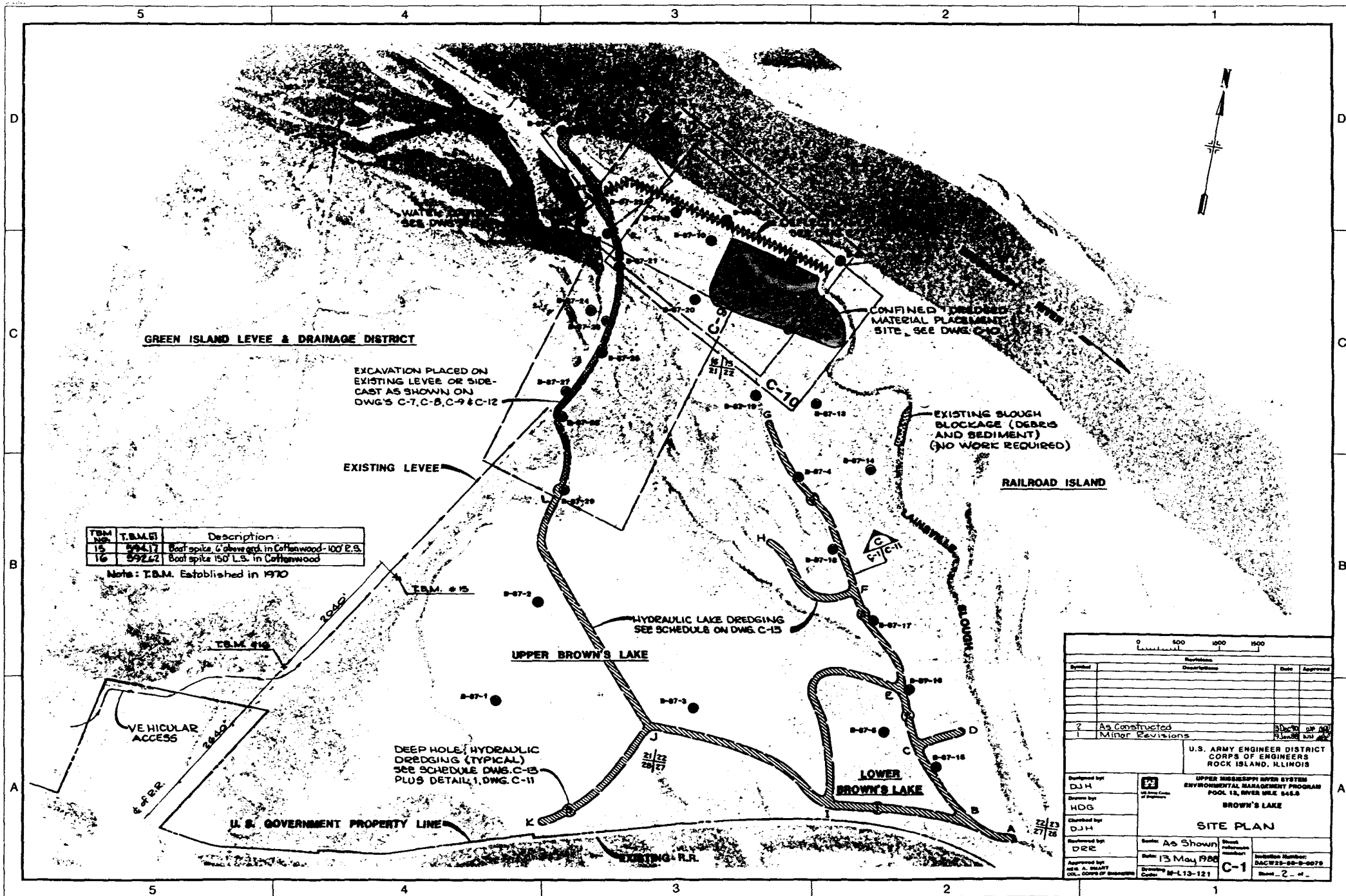
Division Engineer
U.S. Army Engineer Division, North Central
ATTN: CENCD-PD/CENCD-CO (4)
539 South Clark Street
Chicago, Illinois 60605-1592

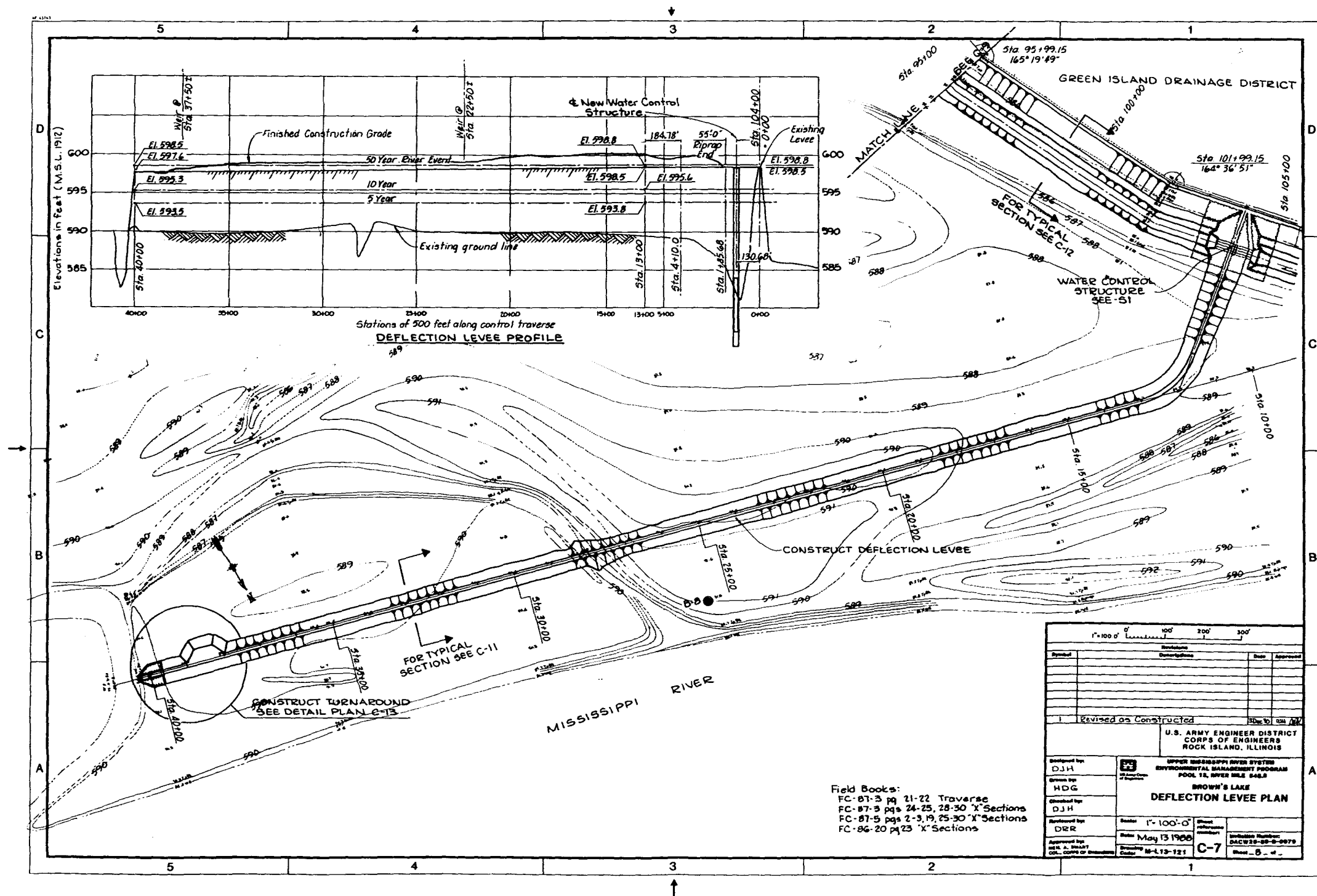
District Engineer
U.S. Army Engineer District, St. Paul
ATTN: Planning Division
1421 USPO and Custom House
180 East Kellogg Boulevard
St. Paul, Minnesota 55101-1479

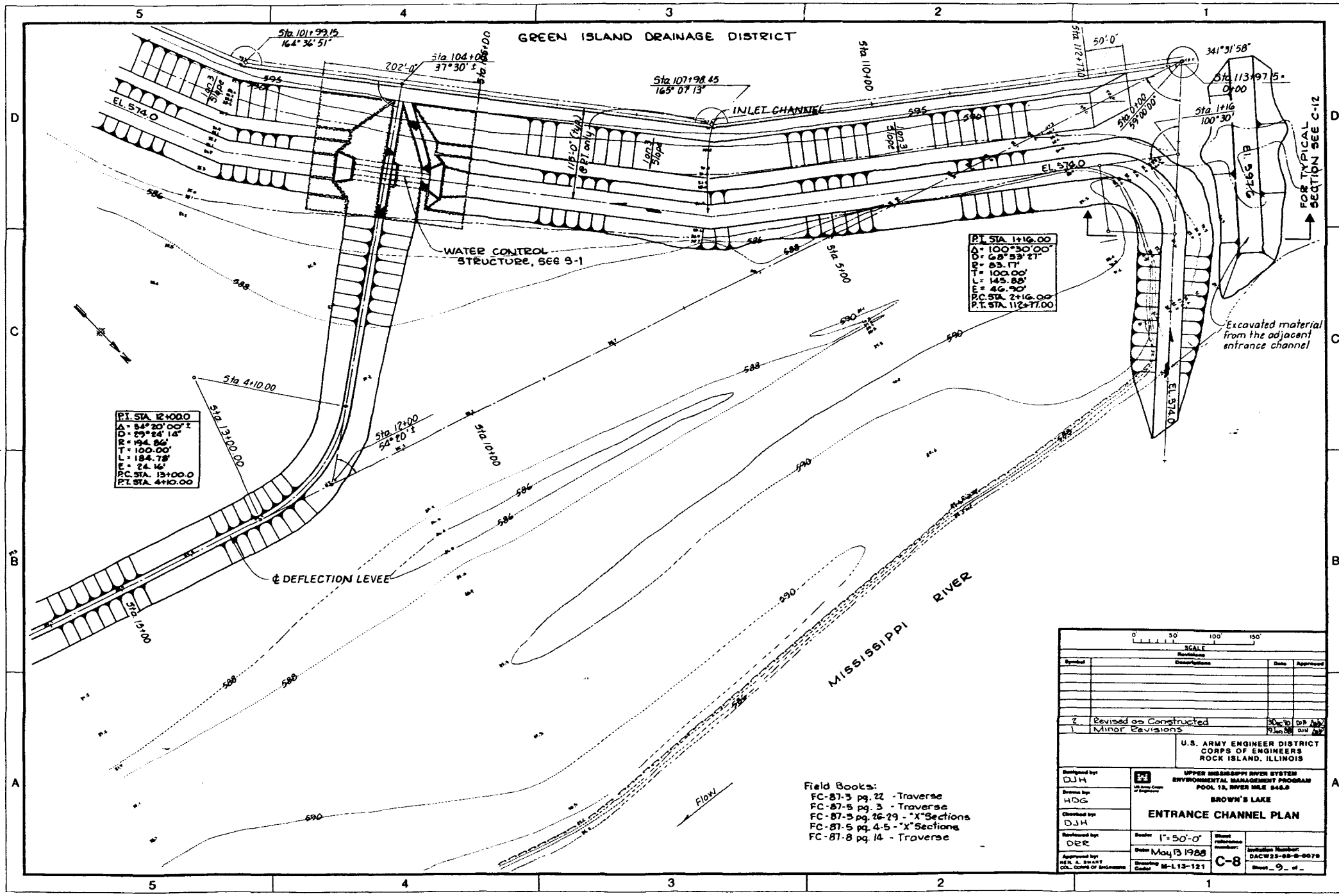
District Engineer
U.S. Army Engineer District, St. Louis
ATTN: Planning Division
210 Tucker Boulevard North
St. Louis, Missouri 63101-1986

District Engineer
U.S. Army Engineer District, Rock Island
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004
ATTN: CENCR-ED CENCR-IM-C
CENCR-ED-DG CENCR-PD-E
CENCR-ED-G CENCR-PD-W
CENCR-ED-H CENCR-OD-S
CENCR-ED-D

1/ All addresses receive one copy of the document except where noted in parentheses.





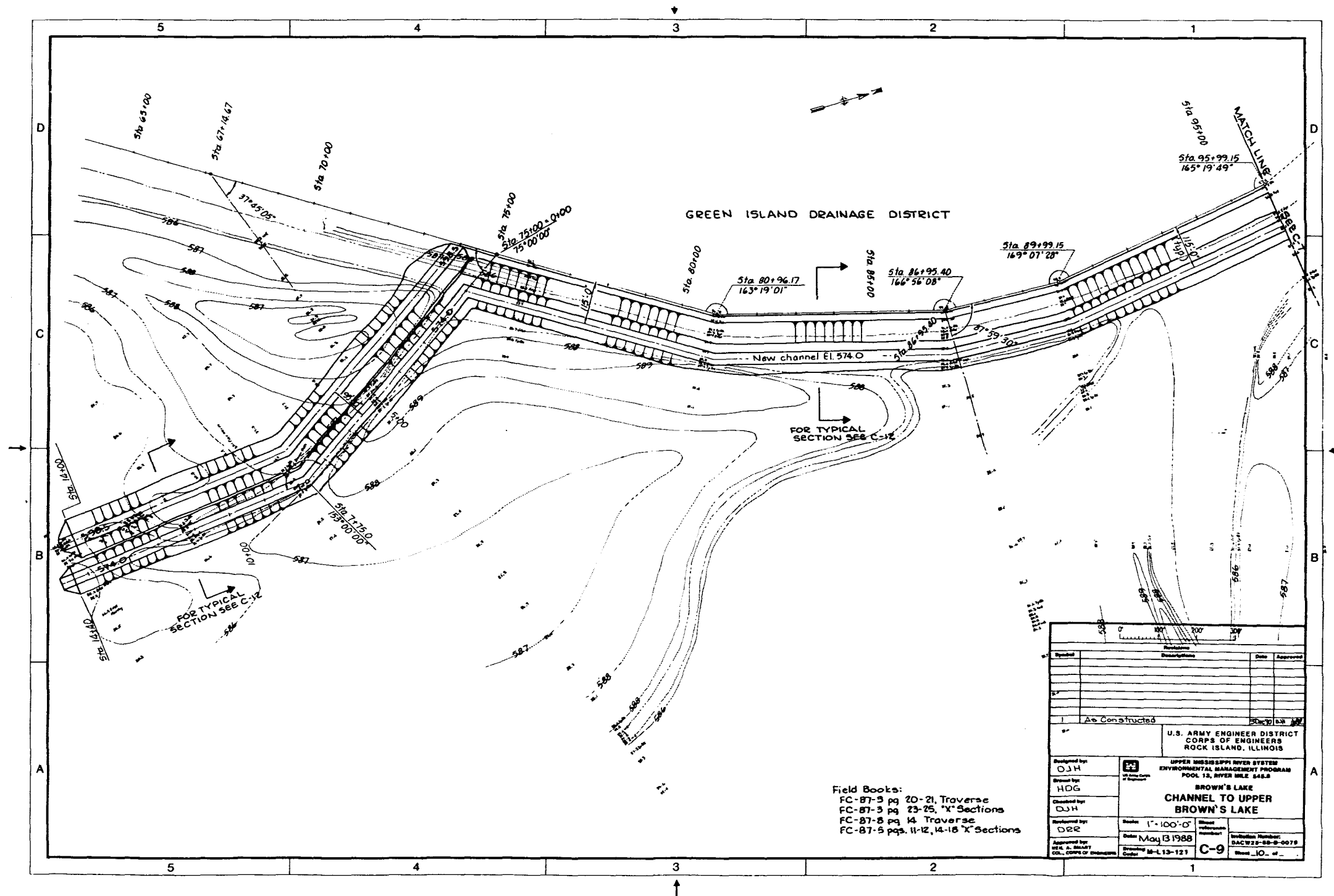


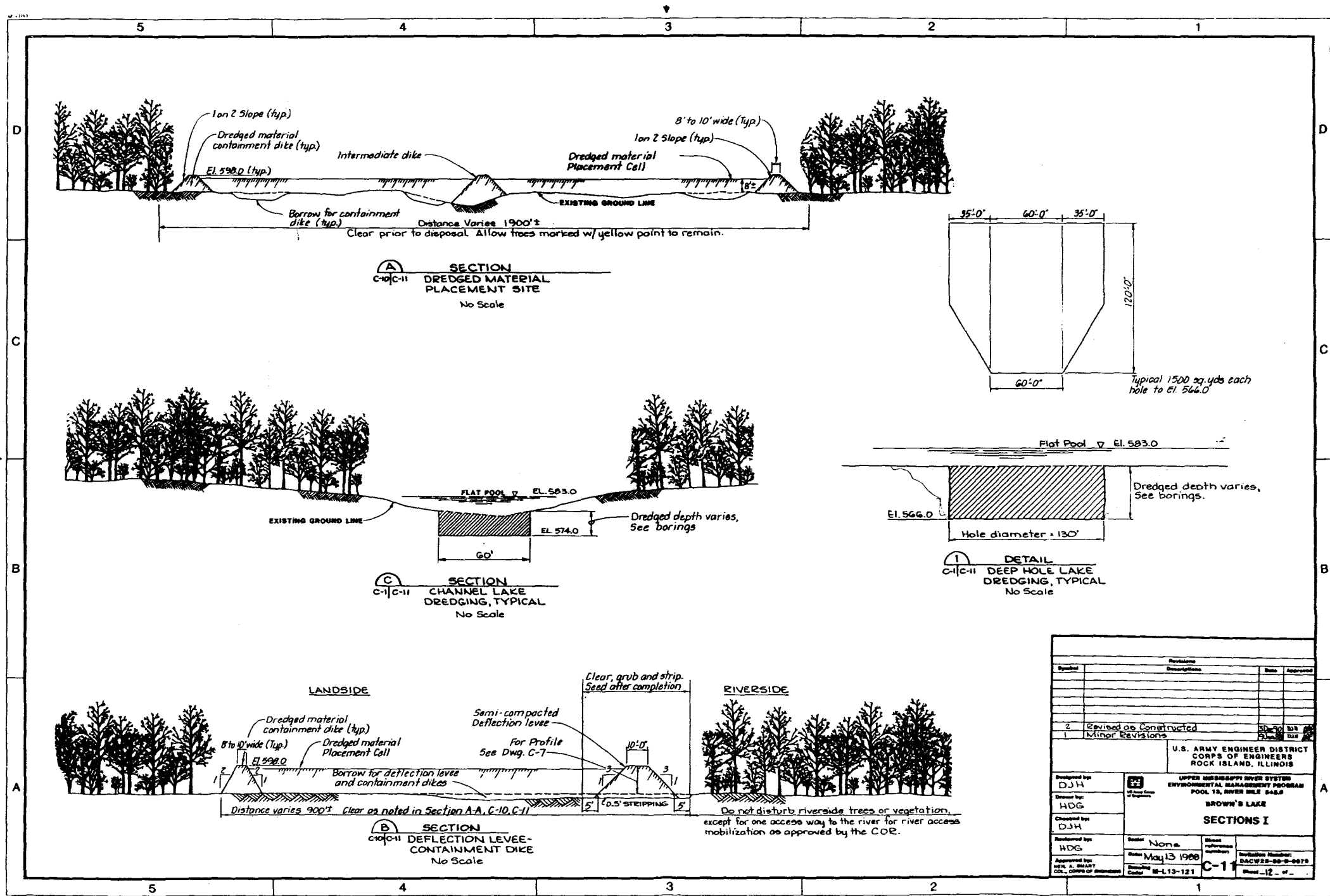
P.I. STA. 12+00.0
 A = 84° 20' 00" E
 D = 25' 24' 14"
 R = 194.86'
 L = 100.00'
 T = 184.78'
 E = 24.16'
 P.C. STA. 13+00.0
 P.T. STA. 4+10.00

P.I. STA. 1+16.00
 A = 100° 30' 00" E
 D = 68' 53' 21"
 R = 83.17'
 L = 100.00'
 T = 145.80'
 E = 46.90'
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 P.T. STA. 112+71.00

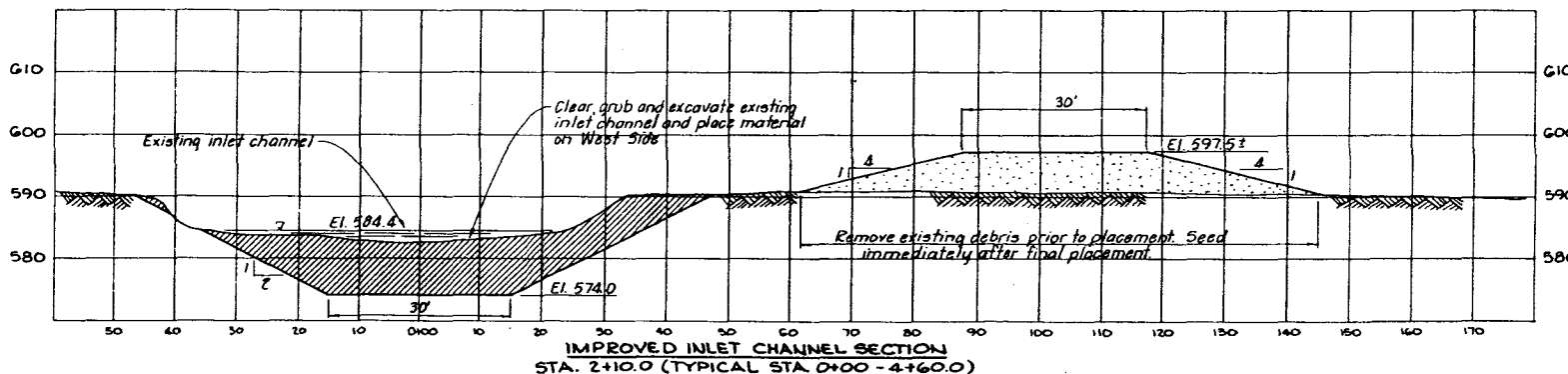
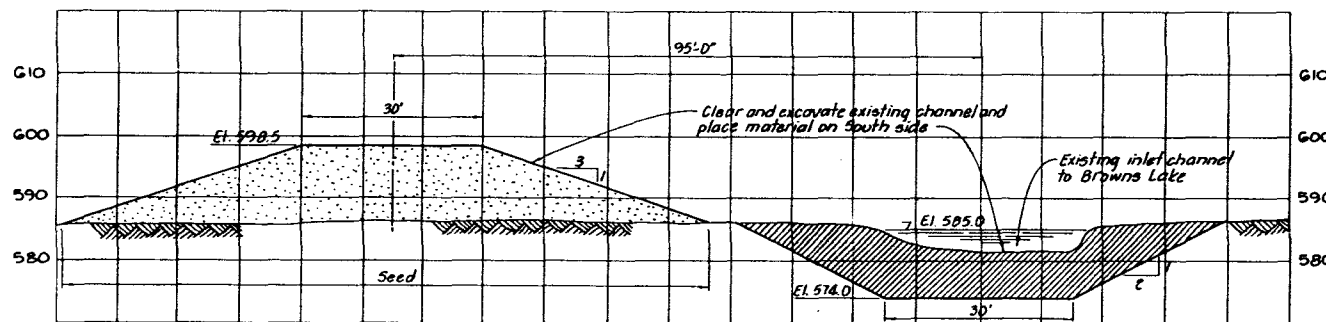
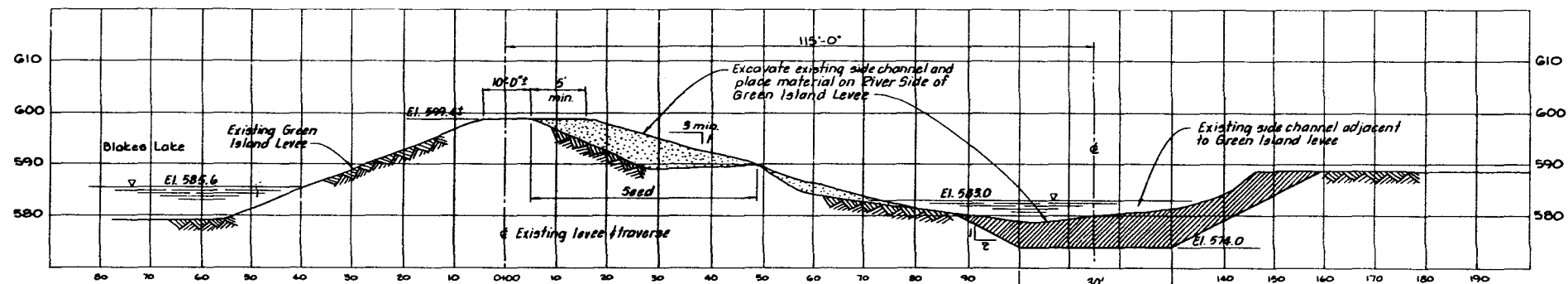
Field Books:
 FC-87-3 pg. 22 - Traverse
 FC-87-5 pg. 3 - Traverse
 FC-87-5 pg. 26-29 - "X" Sections
 FC-87-5 pg. 4-5 - "X" Sections
 FC-87-8 pg. 14 - Traverse

SCALE 0 50 100 150 Feet	
Symbol Revisions Date Approved	Revisions Date Approved
2 Revised as Constructed 1 Minor Revisions	
U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS	
Designed by DJH	
Drawn by HDG	
Checked by DJH	
Reviewed by DER	
Approved by M.E. A. HART COL., Corps of Engineers	
UPPER MISSISSIPPI RIVER SYSTEM ENVIRONMENTAL MANAGEMENT PROGRAM POOL 13, RIVER MILE 548.8 BROWN'S LAKE ENTRANCE CHANNEL PLAN	
Scale 1" = 50'-0" Date May 13 1988	Sheet C-8 of 9





Revisions			
Symbol	Description	Date	Approved
1	Revised as Constructed	10/30/88	DJH
2	Minor Revisions	11/15/88	DJH
U.S. ARMY ENGINEER DISTRICT CORPS OF ENGINEERS ROCK ISLAND, ILLINOIS			
UPPER MISSISSIPPI RIVER SYSTEM ENVIRONMENTAL MANAGEMENT PROGRAM POOL 13, RIVER MILE 545.5 BROWN'S LAKE SECTIONS I			
Designed by DJH	Drawn by HDG	Checked by DJH	Reviewed by HDG
Approved by M. A. SHAW COL, Corps of Engineers	Date May 13 1988	Sheet 12 of 12	Project DACW33-88-S-9079



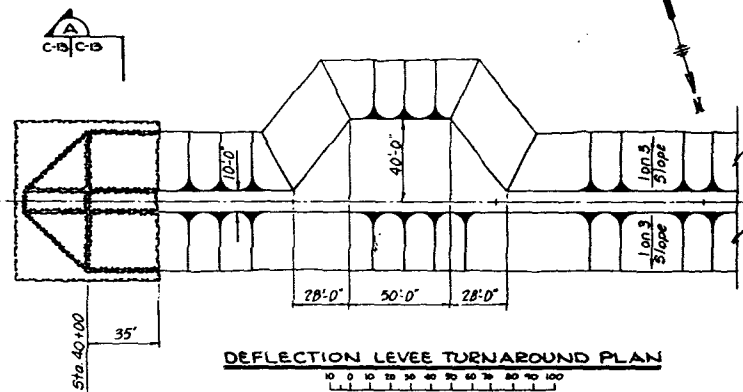
Revisions			
Symbol	Description	Date	Approved
2	As Constructed	5/13/88	DER
1	Minor Revisions	5/13/88	DER

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

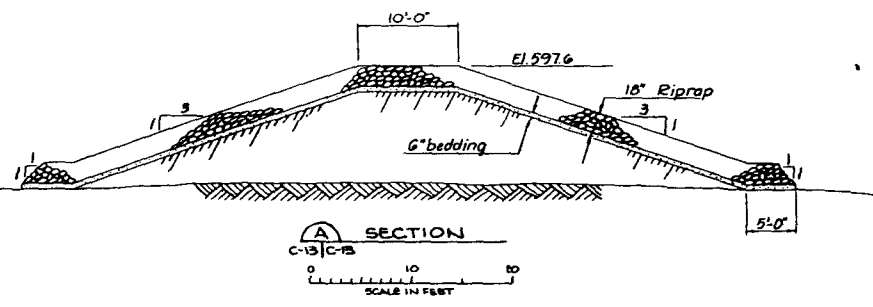
UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 13, RIVER MILE 848.8

BROWN'S LAKE
SECTIONS II

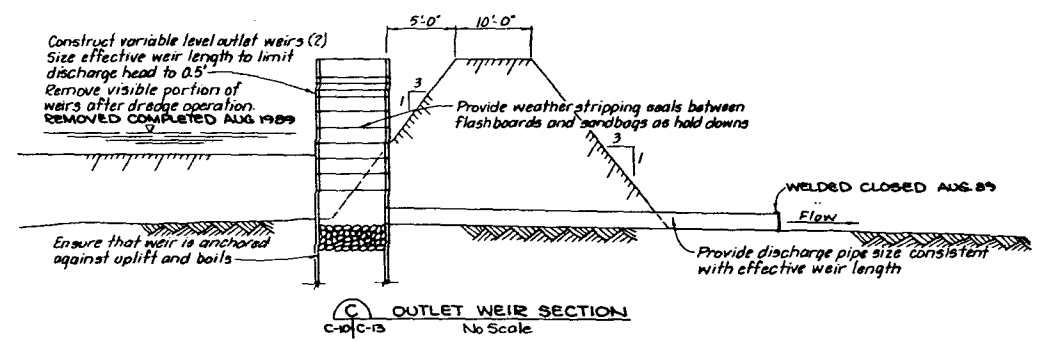
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Drawn by: HDG	Date: May 13 1988	Revision Number: BACW25-SB-S-0078
Checked by: DJH	Drawing Code: M-L-13-121	Sheet 13 of 13
Reviewed by: DER	Approved by: REN. A. SMART CH. CHIEF OF DISTRICT	



DEFLECTION LEVEE TURNAROUND PLAN
SCALE IN FEET



SECTION A
SCALE IN FEET



OUTLET WEIR SECTION
No Scale

HYDRAULIC DREDGING SCHEDULE				
Channel Dredging	Length	Width	Bottom of dredge Cut, Elevation	Square Yards
A-B	750'	60'	574	5,000
B-C	1100'	60'	574	7,400
C-D	550'	60'	574	3,700
D-E	650'	60'	574	4,400
E-F	1210'	60'	574	8,100
F-G	2250'	60'	574	15,000
G-H	1400'	60'	574	9,400
H-I	2700'	60'	574	18,000
I-J	1500'	60'	574	10,000
J-K	1450'	60'	574	16,400
K-L	1710'	60'	574	11,400
J-L	3250'	60'	574	21,700
	19,520			130,500

Deep Holes	Diameter		Square Yards
①	130'	566	1500
②	130'	566	1500
③	130'	566	1500
④	130'	566	1500
⑤	130'	566	1500
			7,500

Revisions			
Symbol	Description	Date	Approved
2	Revised as Constructed	10-30-89	DAW
1	Minor Revisions	9-18-89	DAW

U.S. ARMY ENGINEER DISTRICT
CORPS OF ENGINEERS
ROCK ISLAND, ILLINOIS

Developed by: DJH
Drawn by: HDG
Checked by: DJH
Reviewed by: DRE

Project: As shown
Date: May 13 1988
Drawing Number: C-13
Sheet: 14 of 14

UPPER MISSISSIPPI RIVER SYSTEM
ENVIRONMENTAL MANAGEMENT PROGRAM
POOL 15, RIVER MILE 846.9
BROWN'S LAKE
DETAILS AND DREDGING
SCHEDULE

