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REDUCTION STUDY THE SNY ISLAND LEVEE DRAINAGE DISTRICT
ADAMS PIKE AND CALHOUN COUNTIES ILLINOIS(U) ARMY
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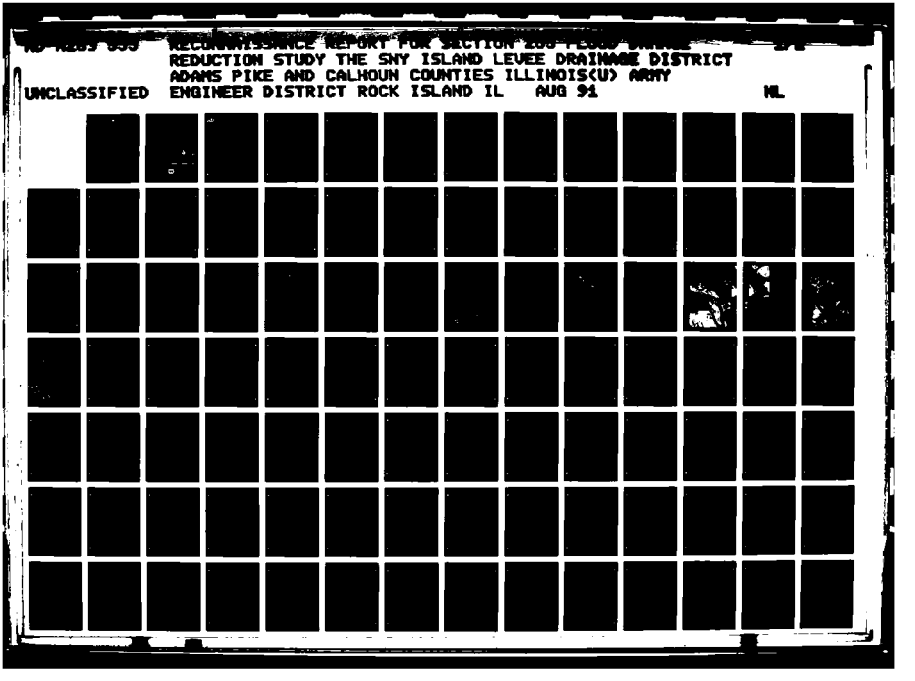

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RECONNAISSANCE REPORT

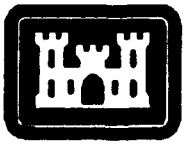
FOR

SECTION 205 FLOOD DAMAGE REDUCTION STUDY

THE SNY ISLAND LEVEE DRAINAGE DISTRICT

ADAMS, PIKE, AND CALHOUN COUNTIES, ILLINOIS

AUGUST 1991



US Army Corps
of Engineers
Rock Island District

REVISED JULY 1992

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING – P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

REPLY TO
ATTENTION OF:

CENCR-PD-F

RECONNAISSANCE REPORT
FOR
SECTION 205 FLOOD DAMAGE REDUCTION STUDY

THE SNY ISLAND LEVEE DRAINAGE DISTRICT
ADAMS, PIKE, AND CALHOUN COUNTIES, ILLINOIS

AUGUST 1991

REVISED JULY 1992

ACKNOWLEDGEMENT

Many members of the Rock Island District assisted in the preparation of this report. Primary study team personnel who are familiar with the technical aspects of the study are listed below:

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ENGINEERING DESIGN	John Kincaid
COST ENGINEERING	Joe Ross

SYLLABUS

In a letter dated January 13, 1989, the Sny Island Levee Drainage District (SILDD) requested that the U.S. Army Corps of Engineers investigate possible solutions to reduce flood damages along the Sny Channel within their drainage district located in Adams, Pike, and Calhoun Counties, Illinois. The study request was made in accordance with the continuing authority of Section 205 of the 1948 Flood Control Act, as amended.

The bottomlands located within the SILDD are protected from Mississippi River flooding by a federally constructed levee built to provide a 50-year level of protection with 2 feet of freeboard. The Sny Channel provides drainage for some 195 square miles of predominantly agricultural bottomland located within the SILDD. Existing interior drainage facilities include two federally constructed retarding and desilting reservoirs, numerous non-Federal retarding and desilting reservoirs, three diversion channels, and three pumping stations.

The study area is that portion of the Sny Channel basin serviced by Pumping Stations Nos. 1 and 3A. The flood-prone areas primarily consist of agricultural lands and structures, homesteads, and transportation facilities.

The Rock Island District completed an Initial Appraisal in June 1988 under the authority of Section 216 of the 1970 Flood Control Act. A direct diversion of the discharge flows from the Horton-Dutch Retarding Reservoir to the Mississippi River was investigated. The diversion was found to be economically feasible, but only remedied 20 percent of the flooding problem. Due to funding constraints within the Section 216 program at that time, the fact that the alternative fell within the funding limits of the Continuing Authorities Program, and the SILDD's desire to continue the evaluation, funding for this study was allocated under the Section 205 authority.

This reconnaissance report presents the results of analyses of possible solutions to reduce flood damages along the Sny Channel within the area serviced by Pumping Stations Nos. 1 and 3A. Both nonstructural and structural alternatives were considered in the preliminary plan formulation; however, screening of alternatives resulted in study focus on evaluating approach channel efficiency and additional pumping capacity needs.

For both Pumping Stations Nos. 1 and 3A, an array of additional pumping capacities was considered. For Pumping Station No. 1, alternate intake channels were considered to evaluate potential increases in flow efficiency, as well as a floating boom at the existing Sny Channel trash rack site to reduce head loss and maintenance at the existing trash rack. For Pumping Station No. 3A, four alternate locations for the additional pumping capacities were considered during the evaluation process. Additional screening of alternatives focused study efforts on: the floating boom,

utilizing the existing intake channel, and additional pumping capacity at the existing site for the Pumping Station No. 1 area; and locating the additional pumping capacity at the existing site for the Pumping Station No. 3A area.

The floating boom and an additional 200 cfs of pumping capacity at Pumping Station No. 1 were the only alternatives found to have economic feasibility. The floating boom has an estimated implementation cost of $162,600, with a benefit-to-cost ratio of 18.6 using an 8-3/4 percent discount rate. The 200 cfs capacity increase has an estimated implementation cost of $1,464,800, with a benefit-to-cost ratio of 3.7. The Horton-Dutch Diversion was briefly reevaluated in consideration of the reconnaissance study economic data, and was found to be economically infeasible.

By letter dated September 3, 1991, the SILDD notified the Rock Island District that they have decided not to participate in additional study at this time. In consideration of the lack of current local support, further Federal participation is presently not warranted.

RECONNAISSANCE REPORT
FOR
SECTION 205 FLOOD DAMAGE REDUCTION STUDY

THE SNY ISLAND LEVEE DRAINAGE DISTRICT
ADAMS, PIKE, AND CALHOUN COUNTIES, ILLINOIS

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RECONNAISSANCE REPORT
FOR
SECTION 205 FLOOD DAMAGE REDUCTION STUDY

THE SNY ISLAND LEVEE DRAINAGE DISTRICT
ADAMS, PIKE, AND CALHOUN COUNTIES, ILLINOIS

SECTION 1 - INTRODUCTION

This report presents the results of an investigation of interior flooding problems within the Sny Basin and affecting the Sny Island Levee Drainage District (SILDD). SILDD officials requested this investigation in a letter dated January 13, 1989. A copy of this letter is included in Appendix D - Pertinent Correspondence.

STUDY AUTHORITY

The Corps of Engineers has authority to construct small flood control projects under certain conditions without the specific authorization of Congress. The authority for this report is Section 205 of the 1948 Flood Control Act, as amended, which is presented below:

> The Secretary of the Army is authorized to allot from any appropriations heretofore or hereafter made for flood control, not to exceed $40,000,000 for any one fiscal year, for the construction of small projects for flood control and related purposes not specifically authorized by Congress, which come within the provisions of Section 1 of the Flood Control Act of June 22, 1936, when in the opinion of the Chief of Engineers such work is advisable. The amount allotted for a project shall be sufficient to complete Federal participation in the project. Not more than $5,000,000 shall be allotted under this section for a project at any single locality. The provisions of local cooperation specified in Section 3 of the Flood Control Act of June 22, 1936, as amended, and in P.L. 99-662 (Water Resources Development Act of 1986) shall apply. The work shall be complete in itself and not commit the United States to any additional improvement to ensure its successful operation, except as may result from the normal procedure applying to projects authorized after submission of preliminary examination and survey reports.

STUDY PURPOSE AND SCOPE

The purpose of the reconnaissance phase is to determine whether or not planning should proceed further based on a preliminary appraisal of Federal

interest in interior drainage flood damage reduction measures for the SILDD, and if potential solutions are in concert with current policies and budgetary priorities.

This reconnaissance study was initiated in response to the SILDD letter request dated January 13, 1989. The Rock Island District, Corps of Engineers, received study funds on January 22, 1990. Through discussion with SILDD staff, the interior areas drained by Pumping Stations Nos. 1 and 3A will be evaluated in this study.

The Sny Basin is located along the east bank of the Mississippi River, between river miles 261.3 and 315.4, in Adams, Pike, and Calhoun Counties, approximately 100 miles west of Springfield, Illinois. The 195 square miles of bottomlands within the Sny Basin are protected from Mississippi River flooding by a federally constructed levee built to provide a 50-year level of protection with 2 feet of freeboard. Plate 1 displays the location map for the study area.

PRIOR STUDIES, REPORTS, AND EXISTING WATER PROJECTS

The Sny Basin: This federally constructed flood control project was completed under the authority of the Flood Control Act of 1946 to reduce interior drainage flood damages within the SILDD. The Sny Channel is the primary drainageway for the 110,000 acres of agricultural bottomland, as well as runoff from adjacent upland areas. Project features include two retarding and desilting reservoirs for Pigeon Creek and Horton-Dutch Creeks; three diversion channels for Hadley-McCraney Creeks, Kiser Creek, and Six Mile-Bay Creeks to pass runoff from the uplands drainage area directly to the Mississippi River; improvement of certain reaches of the Sny Channel; construction of three pumping stations; construction of a downstream closing levee to block backwater from the Mississippi River; and other remedial works necessitated by the improvement. Construction began in August 1959 and was completed in September 1971.

Sny Island Levee and Drainage District, Adams, Pike, and Calhoun Counties, Illinois, Section 216 Initial Appraisal, dated June 1988. This initial appraisal was performed under the authority of Section 216 of the 1970 Flood Control Act which provides for a review of completed projects due to changed condition. The study evaluated the potential for interior drainage damage reduction within the SILDD. Due to limited funds, the study efforts concentrated on the Horton-Dutch Creeks, the largest basin still draining into the Sny Channel. A direct diversion to the Mississippi River of the Horton-Dutch Retarding Reservoir discharge was evaluated and found to have a benefit-to-cost ratio (BCR) of 1.3. The initial appraisal indicates that this alternative reduces interior drainage damages by nearly 20 percent.

SECTION 2 - PLAN FORMULATION

GENERAL

The plan formulation procedure is a process designed to identify and evaluate possible solutions to existing and projected problems and needs. Its goal is to select the most economically feasible solution. For a reconnaissance study, the procedure is to determine if there is a solution that is economically justified and engineeringly and environmentally sound which warrants further consideration. The Water Resources Development Act of 1986 (Public Law 99-662) requires that the Corps of Engineers identify a local cost-sharing and study partner for feasibility phase work. The feasibility study must be cost-shared 50 percent Federal and 50 percent local sponsor as established in a Feasibility Study Cost-Sharing Agreement.

ASSESSMENT OF WATER AND LAND RESOURCE PROBLEMS AND OPPORTUNITIES

EXISTING CONDITIONS

General Description

The Sny Channel provides drainage for some 195 square miles of predominantly agricultural bottomland located within the SILDD. The interior drainage system is divided into three primary areas, each of which contains a pumping station. The pumping stations are identified as No. 1, No. 3A, and No. 4. The drainage area handled by Pumping Station No. 4 is not evaluated in this study. The pumping station locations are shown on plate 1. Plan and profile views for Pumping Stations Nos. 1 and 3A are displayed on plates 2 and 3, respectively. The drainage area accommodated by Pumping Station No. 1 is connected to the drainage area handled by the Pumping Station No. 3A outlet works via an aqueduct beneath the Hadley-McCraney Diversion Channel. This aqueduct is rated at 200 cubic feet per second (cfs) with 1 foot of head. Table 1 displays the pumping station information.

TABLE 1

Pumping Stations - General Data

Station No.	No. 1	No. 3A
Location (Mississippi River mile)	297.5	273.0
Design capacity	900 cfs	1,200 cfs
Maximum Mississippi River design elevation	468.7	457.2
Average Mississippi River elevation 1/	454.2	440.2
Flat pool Mississippi River elevation	449.0	434.0
Top of levee elevation	470.7	459.2
Discharge pipe invert at crown of levee elev.	468.7	457.2
Discharge pipe invert at river headwall	436.0	424.0
Top of headwall at river	454.0	442.5
Apron of headwall at river	435.0	423.0
Maximum suction bay flood elevation	455.0	443.5
Normal suction bay high elevation	447.0	437.0
Normal suction bay low elevation	445.0	435.0
PUMPS		
Pumps - number and diameter	2 - 96"	3 - 96"
Operating floor elevation	451.0	441.0
Centerline pump elevation	456.0	446.0
Minimum submergence, feet	3.0	3.0
Minimum floor clearance, feet	5.5	5.5
Floor suction bay elevation	436.5	428.0
Suction lift maximum, feet	11.0	11.0
Number and size of discharge pipes	2 - 96"	3 - 96"
Engine ratings, horsepower	2 @ 900	3 @ 900
Discharge flare diameter, inches	120	120

1/ Sea Level Datum of 1912 - all other elevations referred to sea level datum of 1929 (NGVD).

Two federally constructed retarding reservoirs were constructed as part of the interior drainage system--the Pigeon Creek Retarding Reservoir and the Horton-Dutch Retarding Reservoir. Their locations are shown on plate 1. The reservoirs were designed to contain runoff from a 24-hour, 25-year frequency rainfall, and 25 years of projected silt aggradation. Table 2 displays the reservoir details.

TABLE 2

Retarding Reservoirs - General Data

Reservoir	Pigeon Creek	Horton-Dutch
Drainage Area into Reservoir, sq. mi.	28.8	34.6
Design Capacity, acre-ft.	6,900	7,800
Storage Elevation at Design Capacity, NGVD	472.3	462.3
Freeboard, ft.	3.0	3.0
Estimated 25-yr Silt Accumulation, acre-ft.	2,100	2,400
Fuse-Plug Length, ft.	400	400
Fuse Plug Crown El., NGVD	472.3	462.3
Uncontrolled Outlet Structure	two 54" diameter CMP	one 60" diameter CMP
Maximum Outlet Discharge, cfs	450	350
Outlet Invert El., NGVD	457.6	439.0

The SILDD has constructed smaller scale desilting reservoirs within the Sny Basin. These reservoirs are built on Austin, Walnut, Grubb, Shewhart, Brewster-Brown, Atlas-Two Mile, and Howell Creeks.

The flows from five major hill streams have been diverted directly to the Mississippi River through three diversion channels. Hadley-McCraney, Kiser, and Six Mile-Bay diversion channels drain a combined total of 394 square miles to the Mississippi River. This drainage area accounts for 72 percent of the upland area which drained into the Sny Channel. The design storm for the creeks is the 3-hour, 50-year rainfall, except for Bay Creek which was designed for a 6-hour, 50-year rainfall. The design storms resulted in flows of 27,800 cfs, 19,400 cfs, and 22,300 cfs for Hadley-McCraney, Kiser, and Six Mile-Bay Creeks, respectively.

Hydrologic and Hydraulic Conditions

The Sny Channel drains approximately 110,000 acres of Mississippi River bottomlands within the SILDD, as well as adjacent upland areas. The average annual precipitation is 36.87 inches, with most occurring during the months of April through July. The average monthly precipitation for the April through July period is 4.28 inches. The water surface profiles

of the Sny Channel are impacted by seepage from the Mississippi River as well as interior runoff. The original 10-year design elevation for interior drainage has been exceeded 15 times at Pumping Station No. 1 and 21 times at Pumping Station No. 3A for the period of record from 1966 to 1989. Further discussion on hydrology and hydraulics is addressed in Appendix A - Hydrology and Hydraulics.

Economic Conditions

The Sny Basin encompasses a lengthy reach of rich agricultural land along the Illinois side of the Mississippi River bottomlands. Rural-based communities within the basin include New Canton, Hull, Shepherd, Fall Creek, East Hannibal, and Pittsfield.

The majority of the SILDD is located within Pike County. The county's 1980 population was 18,896. The largest concentration of inhabitants is in Pittsfield (1985 pop. 3,862). Employment is concentrated in agriculture, wholesale and retail trade, and manufacturing, with a 30.6, 19.1, and 15.5 percent distribution, respectively.

Interior flooding primarily impacts agricultural land and facilities, farmsteads, roads, and drainage ditches within the area served by Pumping Stations Nos. 1 and 3A. It is estimated that the total average annual damages are $646,000 within the Pumping Station No. 1 area, and $817,000 within the Pumping Station No. 3A area.

Environmental Conditions

Much of the land protected by levees along the Sny, Big Cutoff, Swain Slough, Iowa Cutoff, and the Mississippi River is intensively farmed in row crops. However, the area is also interspersed with tracts of bottomland forest, open water areas, and remnant emergent wetlands. These areas provide habitat values for species adapted to agricultural environments and those which utilize more than one habitat type.

Ten currently documented historic properties lie within or immediately adjacent to potential impact areas of the proposals under study. These presently known sites exist as surficial deposits. Nevertheless, the potential for buried cultural deposits is unusually high due to past geomorphological processes. Of the 10 properties, 1 Euro-American and 6 Native American properties were recorded during an initial preliminary reconnaissance on October 16-18, 1990.

A more detailed description of existing natural and man-made resources is contained in Appendix C - Environmental Analysis.

Environmental and Other Criteria

The health, safety, well-being, and quality of life of the local residents are prime considerations in project development. Any protective works would be designed to disturb natural and cultural features as little as possible. Opportunities for development of recreational facilities would be provided if applicable and desired by local residents.

EXPECTED FUTURE CONDITIONS

If no action is taken, interior drainage flooding within the SILDD will occur as a result of flood events exceeding the protection capabilities of the existing interior drainage facilities.

If a flood damage reduction plan is developed and implemented within the SILDD, the social and financial hardships associated with the existing interior drainage facilities will be alleviated to the degree of flood protection provided by the project.

SPECIFIC PROBLEMS AND OPPORTUNITIES

The SILDD has expressed concern over interior drainage flooding of their agricultural land and structures, primarily within the Pumping Station Nos. 1 and 3A areas. In response to their request, the Rock Island District will determine if there are feasible solutions which warrant further study of the SILDD flooding situation within the drainage areas of Pumping Stations Nos. 1 and 3A.

PLANNING OBJECTIVES AND CONSTRAINTS

NATIONAL OBJECTIVE

The national objective of water and related land resources planning is to contribute to economic development consistent with protecting the Nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements. Contributions to the National Economic Development (NED) are increases in the net value of the national output of goods and services, expressed in monetary units. Contributions to NED are the direct net benefits and costs that accrue in the planning area and the rest of the nation, and include increases in the value of those goods and services that are marketed, and also of those that may not be marketed.

The plan formulation process to accomplish flood damage reduction is formulated and directed by the national planning objective:

> National Economic Development (NED). To enhance the national economic development by increasing the value of the Nation's output of goods and services and by improving the national economic efficiency.

SPECIFIC OBJECTIVE WITHIN THE STUDY AREA

The specific planning objective for this study is as follows:

> To reduce economic losses and social hardships associated with interior flooding of the lands and structures within the SILDD.

PLANNING CONSTRAINTS

The planning process provides the basis for selecting one of the developed plans and, if appropriate, recommending Federal participation to implement the plan. The selected plan is the one that is in the best public interest regardless of whether or not it is within the existing authority of the Corps of Engineers to implement.

The planning constraints which have been developed for this study are as follows:

> This study is constrained by applicable laws of the United States and by the State of Illinois, all Executive Orders of the President, the Water Resources Council's Principles and Guidelines, and all engineering regulations of the Corps of Engineers.

DEVELOPMENT OF ALTERNATIVE MEASURES

AVAILABLE MEASURES

Improvements eligible for Federal participation are of two kinds: those intended to modify flood behavior (structural measures) and those intended to modify the ways in which people would otherwise occupy and use floodplain lands and waters (nonstructural measures).

Structural measures include dams and reservoirs, levees and floodwalls, and channel alterations and diversions. Nonstructural measures include

floodproofing, evacuation and/or relocation of structures, and flood forecasting and warning systems.

FORMULATION PROCEDURE

The objective of the formulation portion of this study is to fulfill the interior flood damage reduction needs of the SILDD through the logical selection of a plan of action.

In developing a plan to reduce flood damage, standards and procedures have been followed which have been set forth in various flood control acts, policies, and related regulations established by the Corps of Engineers through experience in the flood protection field. The key regulation which guides the Corps of Engineers' planning processs is ER 1105-2-100, Policy and Planning, Guidance for Conducting Civil Works Planning Studies, dated December 28, 1990.

DESCRIPTION OF PLANS

Using the available measures, study team members conceptualized alternative plans. A preliminary screening methodology using the formulation criteria was applied to the plans to reduce the number of plans carried forward for more detailed analysis. All plans which were considered are explained below.

NONSTRUCTURAL ALTERNATIVE PLANS

Floodproofing, Evacuation, and Relocation

Floodproofing is a combination of structural changes and adjustments to properties subject to flooding which is used primarily to reduce or eliminate flood damage. This measure involves raising existing structures, properly elevating future structures, or providing panels that can be placed over building doors and windows to effectively keep out floodwaters.

Evacuation of homes and businesses is usually considered where floodwaters exceed a depth of 3 feet. This measure involves acquiring the homes or businesses and relocating the occupants and their possessions to homes or buildings located outside of the floodplain that are of similar worth and in decent, safe, and sanitary condition.

Relocation of homes and businesses involves physically lifting the structure off its present foundation, moving it, and then lowering it onto a

suitable foundation outside of the floodplain. Relocation is considered where it is structurally feasible and economically justified.

The majority of the damages from interior flooding are to the agricultural land, with only minimal structural inundation. Since the driving factor for a potentially viable alternative is from agricultural benefits, a non-structural plan involving floodproofing, evacuation, and/or relocation of structures was not considered further.

Flood Forecasting and Flood-Warning Systems

Flood forecasting is provided on a regional basis by the National Oceanic and Atmospheric Administration (NOAA). The NOAA issues frequent warnings of potential flood-producing storms. Often, the flood warnings are preceded by notification of "severe weather or a flood watch." The flood warnings and statements on flood conditions are transmitted to city officials, as well as to area newspapers and radio and television stations. The available services include flash flood warnings and major flood forecasts based on radar coverage of the area, numerous rainfall reporting stations, river gages, anticipated weather conditions, and hydrologic factors.

A flood-warning system is a water level sensing device or devices which are connected to an alarm. As water levels rise and reach a potentially threatening level, the alarm is activated. This would alert local officials of the imminent flood and prompt them to warn floodplain residents via the civil defense siren or some other public address system. These systems increase area residents' safety by providing evacuation time.

Stream gages are located at both pumping stations and are utilized in pump operation. This system is adequate in consideration of the agricultural area and the lack of rapid and imminent danger to human life normally associated with a flashy stream.

STRUCTURAL ALTERNATIVE PLANS

Structural measures to accommodate interior drainage typically involve ponding areas, retarding reservoirs, pumping stations, or leveed diversions/channels carrying flows directly to the primary stream. The Sny Basin project is a very extensive system which incorporates all of these measures. Structural alternatives for this study focused on enhancement or modification to existing facilities.

Pumping Station No. 1 Area

Preliminary consideration identified the following potential alternatives: modification of the Pigeon Creek Retarding Reservoir or direct diversion to the Mississippi River; improvements or modification to the intake channel to Pumping Station No. 1; modification at the Sny Channel trash rack; and additional pumping capacity at the present pumping station site.

The Pigeon Creek Retarding Reservoir alternatives were eliminated from further consideration early in the study process. During initial coordination, the SILDD staff indicated that there was local concern and lower interest in enlarging the capacity of the Pigeon Creek Reservoir. A direct diversion of the creek flow or reservoir discharge directly to the Mississippi River would involve approximately 3.5 miles of channel excavation, 7 miles of new levee, a new Sny Channel aqueduct, and associated public works and utility modifications. The direct diversion was eliminated from further consideration due to certain economic infeasibility resulting from the existing level of protection and alternative features costs.

The efficiency of the inlet channel to Pumping Station No. 1 was evaluated due to local reports of pump cycling. The following three intake channel alternatives were investigated: extending the western portion of the Swain Slough meander an additional 2,500 feet to the Sny Channel, excavating 1.6 miles of an unnamed ditch running through Big Cutoff to the Sny Channel; and excavating 3.2 miles of Big Cutoff to the Sny Channel near Burr Oak Pond. The general channel alignments are displayed on plate 4. Hydraulic analysis showed that the alternative channel alignments are no more efficient than the existing intake channel, and the construction costs and environmental and cultural concerns could be great. Therefore, the three alternate intake channel alignments were eliminated from further consideration.

The SILDD officials indicate that the Sny Channel trash rack near Pumping Station No. 1 is an ongoing maintenance problem. Plate 5 displays a cross section of the existing trash rack. As a result, up to an estimated 3 feet of head loss through the trash rack has been observed by SILDD staff. During the August 23, 1990, Corps of Engineers field visit, approximately 2 feet of head loss was observed which creates a backwater effect for 4 miles.

The concept of a floating boom was evaluated. The boom is a floating barrier with approximately 2 feet of draft, and is linked to tracked abutments in order to allow the boom to fluctuate with the varying water surface elevations. The floating boom is skewed to the Sny Channel to force debris to the bankline and, therefore, to allow a shorter reach for simple debris removal. Plate 5 displays the floating boom concept. The floating boom is expected to relieve the debris buildup on the existing trash rack and, in turn, increase the efficiency of flow through the existing trash rack and to Pumping Station No. 1. Elevation reduction

resulting from the floating boom is identified as trash rack on plates A-8 through A-15 of appendix A. The cost of the floating boom is estimated to be $162,600, as shown in table 3.

TABLE 3

Cost Estimate - Floating Boom
(June 1991 Price Levels)

Description	Quantity	Unit	Unit Cost ($)	Total Cost ($)
End Anchorage (pile caps)	2	EA	7,600.00	15,200
Riser Tracks	2	EA	3,100.00	6,200
Floating Boom	100	LF	61.00	6,100
Retaining Wall:				
Excavation	500	CY	5.00	2,500
Sheetpile	3,120	SF	20.00	62,400
Seeding	2	AC	2,000.00	4,000
Mob/Demob	1	EA	5,000.00	5,000
			Sum	102,800
			Contingency (25%)	25,700
			Sum	128,500
			E&D (16%)	20,600
			S&A (10.5%)	13,500
			Total	$162,600

Pumping capacity increases of 50, 100, 200, and 400 cfs were considered. Benefits from these capacity increases were considered additive to benefits estimated for the floating boom. The stage-frequency curves for the peak stage and agricultural drawdowns for these capacity ranges are displayed on plates A-8 through A-15 of appendix A. The 50- and 100-cfs capacity increases had marginal benefits and therefore were eliminated from further consideration. The 400-cfs capacity was eliminated since this increase would make the total pumping capacity exceed the intake channel capacity at the shutoff elevation of 446.0 NGVD. A pumping station housing a 200-cfs diesel pump and associated appurtenances at the existing pumping station site is estimated to cost $1,464,800, as displayed in a detailed cost estimate in table 4.

TABLE 4

Cost Estimate - Pumping Station No. 1: 200 cfs Addition
(June 1991 Price Levels)

Description	Quantity	Unit	Unit Cost ($)	Total Cost ($)
Pumping Station: 200 cfs	1	EA	885,000.00	885,000
Excavation:				
Forebay/Outlet Bay	11,200	CY	5.00	56,000
Seeding	2	AC	2,000.00	4,000
			Sum	945,000
			Contingency (25%)	236,300
			Sum	1,181,300
			E&D (15%)	177,200
			S&A (9%)	106,300
			Total	1,464,800

Pumping Station No. 3A Area

Preliminary consideration identified the following potential alternatives: a new pumping station near Mississippi River mile 275.5; a new pumping station near Mississippi River mile 278.0; a new pumping station near Mississippi River mile 288.0; or additional pumping capacity at Pumping Station No. 3A. Plate 6 displays the general locations for these alternatives.

A general evaluation was made for the pumping station alternatives located near Mississippi River miles 275.5, 278.0, and 288.0. Preliminary estimates of impacts to water surface profiles of the Sny Channel, feature costs, and environmental concerns eliminated these alternatives from further consideration.

Pumping capacity increases ranging from 100 through 1,200 cfs were considered at Pumping Station No. 3A. The existing pumping station has a capacity of 1,200 cfs. Stage frequency curves for peak stage and agricultural drawdowns are displayed on plates A-18 through A-27 of appendix A. Appreciable benefits appear to result from increases of 600 cfs or more. Capacity increases of 600 and 900 cfs were chosen for further evaluation in determining a Federal interest. The pumping station additions would be constructed at the existing pumping station site. No intake channel widening would be necessary due to its existing capacity. The estimated construction costs for the 600 and 900 cfs pumping stations are $2,808,000 and $3,797,400, respectively. Table 5 displays the detailed cost estimates for these pumping stations.

TABLE 5

Cost Estimates - Pumping Station No. 3A
(June 1991 Price Level)

Description	Quantity 600 cfs & 900 cfs	Unit	Unit Cost ($) 600 cfs	Unit Cost ($) 900 cfs	Total Cost ($) 600 cfs	Total Cost ($) 900 cfs
Pumping Station	1	EA	1,770,000	2,425,000	1,770,000	2,425,000
Excavation:						
Forebay/Outlet Bay	11,200	CY	5.00		56,000	
Seeding	2	AC	2,000.00		4,000	
				Sum	1,830,000	2,485,000
				Contingency (25%)	457,500	612,250
				Sum	2,287,500	3,106,250
				E&D (%)	326,000 (14.25)	434,900 (14.0)
				S&A (%)	194,500 (8.5)	256,250 (8.25)
				Total	2,808,000	3,797,400

Hydraulic Effects

A capacity increase of 200 cfs at Pumping Station No. 1 will not affect noticeably the profiles for the Mississippi River which have a flow rate of 245,000 to 444,000 cfs for the 5- to 500-year flood frequency, respectively. An increase of 600 to 900 cfs at Pumping Station No. 3A will not affect noticeably the Mississippi River profiles which have flow rates of 252,000 to 590,000 cfs for the 5- through 500-year flood frequency, respectively. The changes in the Sny Channel water surface profiles are reflected in the stage-frequency curves on plates A-8 through A-11 for Pumping Station No. 1, and plates A-18 through A-22 for Pumping Station No. 3A. The purpose of the capacity increases is to handle excessive flow rates, not to lower the normal water surface elevations within the Sny Channel and adjacent areas. Further hydrologic and hydraulic details associated with the alternatives are discussed in Appendix A - Hydrology and Hydraulics.

Economic Effects

Cost, damage, and benefit data are displayed in table 6. Additional economic information is presented in Appendix B - Economic Analysis.

TABLE 6

Economic Summary ($1,000)

Alternative	Average Annual Cost	Average Annual Benefit	Benefit-to-Cost Ratio
Pumping Station No. 1:			
Floating Boom	24.1	448.0	18.6
200 cfs Increase	155.8	581.0	3.7
Pumping Station No. 3A:			
600 cfs Increase	324.0	276.0	0.85
900 cfs Increase	420.0	351.0	0.84

In consideration of the information gathered during this reconnaissance study, the Section 216 Horton-Dutch Diversion alternative was briefly evaluated. Based on this evaluation, it is apparent that this alternative is not economically justified. Additional explanation can be found on page B-9 of appendix B.

Social and Environmental Effects

The potential for impacts to natural and cultural resources is expected to be lowest for alternatives involving minimal alteration of existing physical features and structures. The trash rack modification and addition of pumping capacity at the existing pumping station sites will have minimal alterations to existing conditions. Therefore, these alternatives are expected to have only minor impacts on fish and wildlife resources.

Coordination responses from the IDOC, dated November 28, 1990, and the USFWS, dated December 11, 1990, stated concern over the alternatives involving excavation within Big Cutoff and the two alternate pumping station locations upstream of Pumping Station 3A. Copies of their response letters are enclosed in Appendix D - Pertinent Correspondence.

Presently known historic properties exist in the area of study. A detailed cultural resource survey will be required for any alternatives which are pursued for potential implementation. Coordination with the State Historic Preservation Officer (SHPO) was initiated in a letter dated July 18, 1990. The SHPO provided a records search for the project area and vicinity. This, combined with maps provided by the Illinois State Museum, revealed information on previous cultural resource surveys and studies in the vicinity of the project areas. The records search verified that at least

three known sites have been previously recorded within impact areas of the alternative proposals under study. The SHPO noted that "numerous historic and prehistoric archaeological sites are potentially located within this study area. Any project proposals should include plans for identifying these resources and ensure that impacts on cultural resources will be adequately addressed" (letter dated April 25, 1990).

A preliminary cultural resource reconnaissance revealed seven additional archeological sites in the project areas. These sites were included in a report to the SHPO forwarded under a cover letter dated November 14, 1990. The SHPO responded on December 12, 1990, concurring in the opinion of the Corps as stated in that letter. A copy of the April 25, 1990, SHPO letter and the Corps of Engineers November 14, 1990, letter with SHPO concurrence are enclosed in Appendix D - Pertinent Correspondence. Continued coordination will be maintained with the SHPO as project plans are developed in detail.

Social, natural resource, and cultural resource evaluations are presented in more detail in Appendix C - Environmental Analysis.

REAL ESTATE NEEDS

The SILDD owns in fee and easement the necessary lands to proceed with the improvements to Pumping Station No. 1, which includes channel improvements, modification of the trash rack, and a spoil disposal site.

Prior to construction, the SILDD will be required to enter into a written agreement (Local Cooperation Agreement) with the Government and to contribute at least 25 percent of the total project costs.

In no event shall a local sponsor receive credit for interests in land previously provided as an item of local cooperation for a Federal project.

EVALUATION OF ALTERNATIVE PLANS

Table 7 summarizes the preliminary screening process utilizing the formulation criteria defined below:

Completeness is the extent to which a given alternative plan provides and accounts for all necessary investments or other actions to ensure the realization of the planned effects.

Effectiveness is the extent to which an alternative plan alleviates the specified problems and achieves the specified opportunities.

TABLE 7

Preliminary Screening Process

Plan	Completeness	Effectiveness	Efficiency	Acceptability
No Federal Action	Not Met	Not Met	Met	Not Met
Nonstructural Measures	Not Met	Met	Unknown	Not Met
Pumping Station No. 1 Area:				
Pigeon Creek Retarding Reservoir:				
Expansion	Unknown	Met	Unknown	Not Met
Direct Diversion	Unknown	Met	Not Met	Unknown
Floating Boom	Met	Met	Met	Met
Increased Pumping Capacity:				
With Big Cut-Off (Long)	Unknown	Met	Unknown	Not Met
With Big Cut-Off (Short)	Unknown	Met	Unknown	Not Met
With Swain Slough	Unknown	Met	Unknown	Not Met
Existing Site (200 cfs)	Met	Met	Met	Met
Pumping Station No. 3A Area:				
Increased Pumping Capacity:				
At River Mile 275.5	Not Met	Met	Not Met	Not Met
At River Mile 278.0	Not Met	Met	Not Met	Not Met
At River Mile 288.0	Unknown	Met	Not Met	Unknown
Existing Site: 600 cfs	Met	Met	Not Met	Met
900 cfs	Met	Met	Not Met	Met
Norton-Dutch Diversion	Met	Met	Not Met	Unknown

Efficiency is the extent to which an alternative plan is the most cost effective means of alleviating the specified problems and opportunities, consistent with protecting the Nation's environment.

Acceptability is the workability and viability of the alternative plan with respect to acceptance by State and local entities and the public, and compatibility with existing laws, regulations, and public policies.

Only those alternatives which meet or exceed all criteria are considered further during a feasibility phase study.

NON-FEDERAL SPONSOR'S VIEWS AND PREFERENCES

The SILDD staff had expressed strongest interest in the Horton-Dutch Diversion alternative, which is economically infeasible based on the reconnaissance study review. The SILDD expressed no interest in a Pigeon Creek Reservoir expansion reservoir due to local landowner concerns. Although the SILDD remains open to other alternatives which reduce interior flood damage, they are concerned about increased operation and maintenance costs associated with additional pumping capacity. The Sny Channel trash rack near Pumping Station No. 1 has been difficult to keep clean, and the SILDD has expressed interest in possible solutions to ease trash collection or reduce annual cleaning efforts.

PRELIMINARY FINANCIAL ANALYSIS

By letter dated September 3, 1991, the SILDD has stated its understanding of the cost-sharing requirements for the feasibility and implementation phases, and their financial capabilities to meet these requirements. A copy of that letter is contained in Appendix D - Pertinent Correspondence.

SECTION 3 - SUMMARY OF STUDY MANAGEMENT, COORDINATION, PUBLIC VIEWS, AND COMMENTS

COORDINATION

Property owners within the Sny Basin have expressed their concern about interior flooding along the Sny Channel, resulting in the SILDD study request dated January 13, 1989.

A Notice of Study Initiation was distributed on March 29, 1990, to Federal, State, and local governmental agencies and the general public. No significant comments were received.

SITE VISIT - AUGUST 22-23, 1990

Rock Island District staff met with Mr. John Reiter, SILDD Superintendent. The Continuing Authorities Program and related procedures were reviewed. Field investigations were performed within the interior drainage area of Pumping Stations Nos. 1 and 3A to view site conditions and identify any existing features which would require special attention during the reconnaissance study.

ECONOMIC FIELD INVENTORY - MARCH 12-16, 1990

A staff member from our Economic and Social Analysis Branch, Planning Division, performed a field inventory of the study area. The information gathered includes land use, structure types and values, ground and first-floor elevations, and flood damage estimates.

ENVIRONMENTAL SITE VISIT - OCTOBER 16-18, 1990

Staff from the Environmental Analysis Branch, Planning Division, performed field work to identify potential cultural resource areas which could be impacted by the study alternatives.

ON-SITE MEETING - AUGUST 27, 1991

A meeting was held with the SILDD at their New Canton office to review the preliminary findings of the study, to solicit their feedback on the findings, and to determine their desire to initiate the feasibility phase.

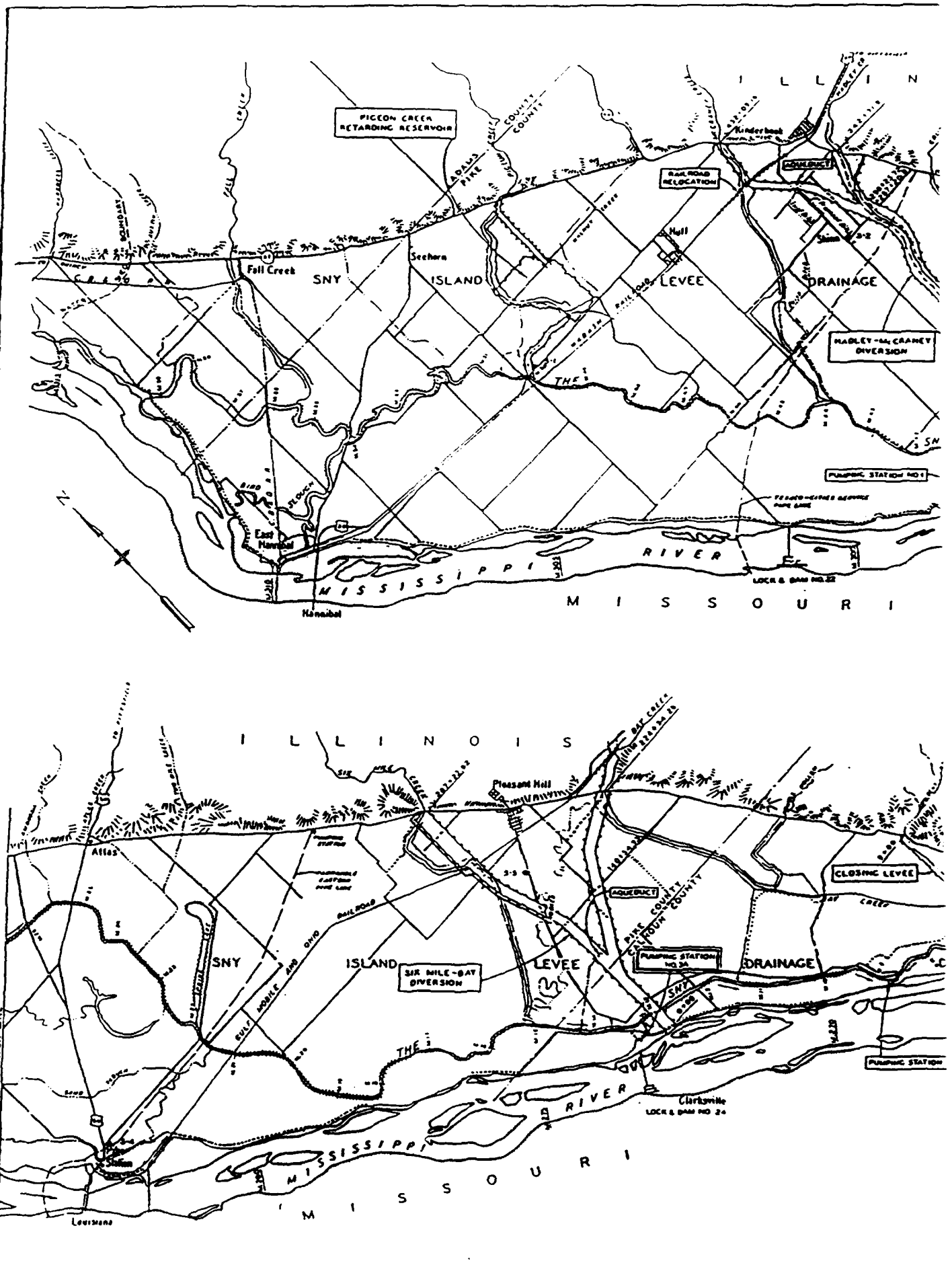
The SILDD officials present for the meeting indicated that their interest was in both pumping station areas. Corps of Engineers representatives indicated that other alternatives could be evaluated in the feasibility phase.

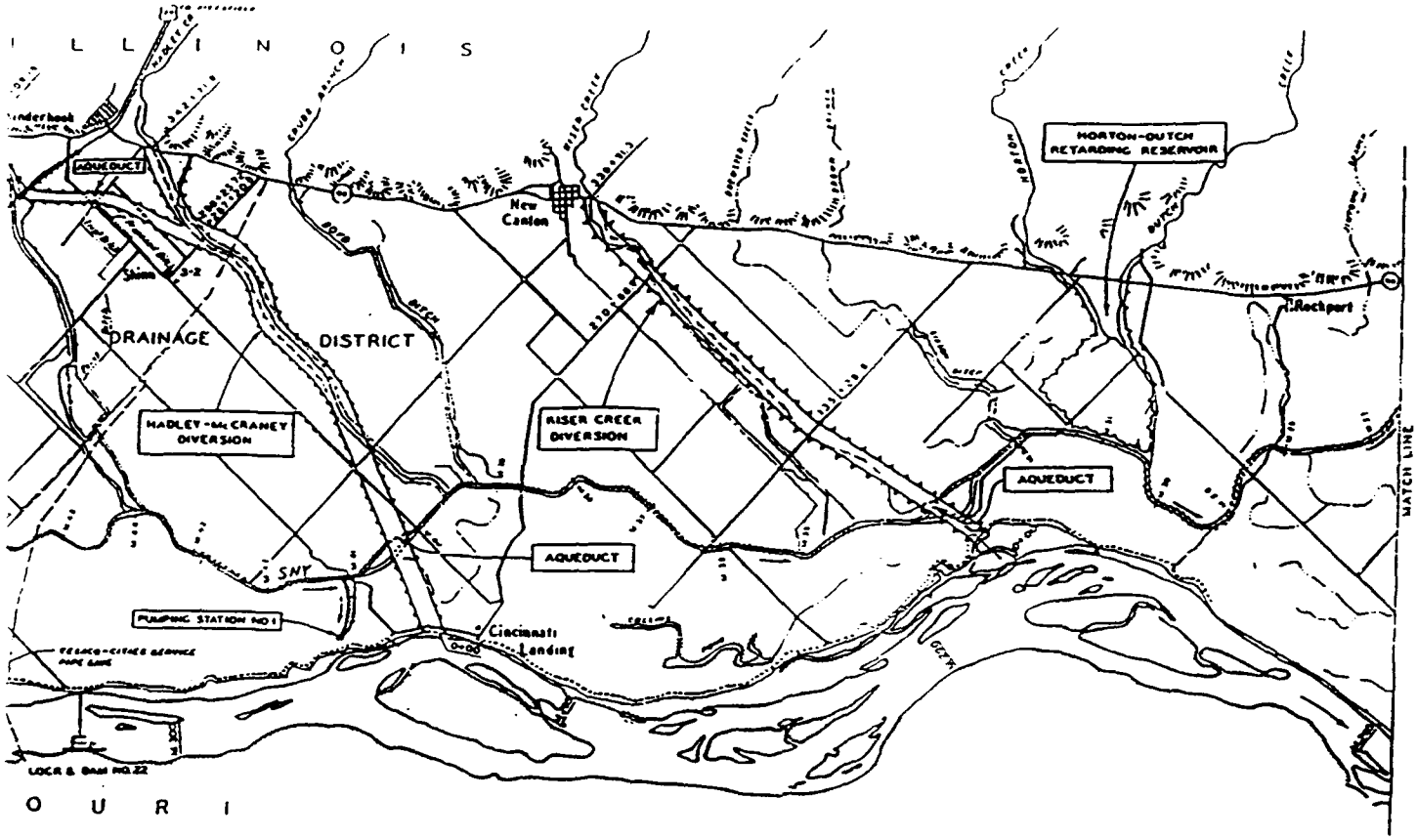
By letter dated September 3, 1991, the SILDD stated that they have decided not to participate in further study at this time. A copy of this letter is included in Appendix D - Pertinent Correspondence.

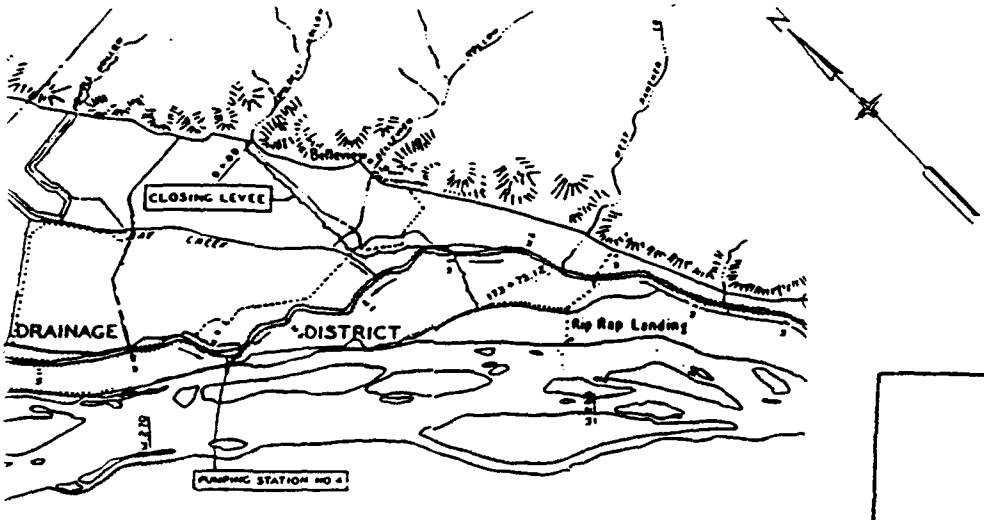
SECTION 4 - RECOMMENDATION

Based on the current lack of local interest in additional study, I recommend that further Federal action under Section 205 of the 1948 Flood Control Act, as amended, be terminated at this time regarding interior flood damage reduction measures within the Sny Basin.

Dudley M. Hanson, P.E.
Chief, Planning Division


PIGEON CREEK RETARDING RESERVOIR
RAILROAD RELOCATION
AQUEDUCT
Kinderhook
Hull
Fall Creek
SNY
Seehorn
ISLAND
LEVEE
DRAINAGE
HADLEY-McCRANEY DIVERSION
PUMPING STATION NO 1
East Hannibal
Hannibal
MISSISSIPPI RIVER
MISSOURI
LOCK & DAM NO 22
ILLINOIS
Pleasant Hill
Atlas
CLOSING LEVEE
PUMPING STATION NO 2A
SIX MILE-BAY DIVERSION
PUMPING STATION
Clarksville
LOCK & DAM NO 24
Louisiana
MATCH LINE



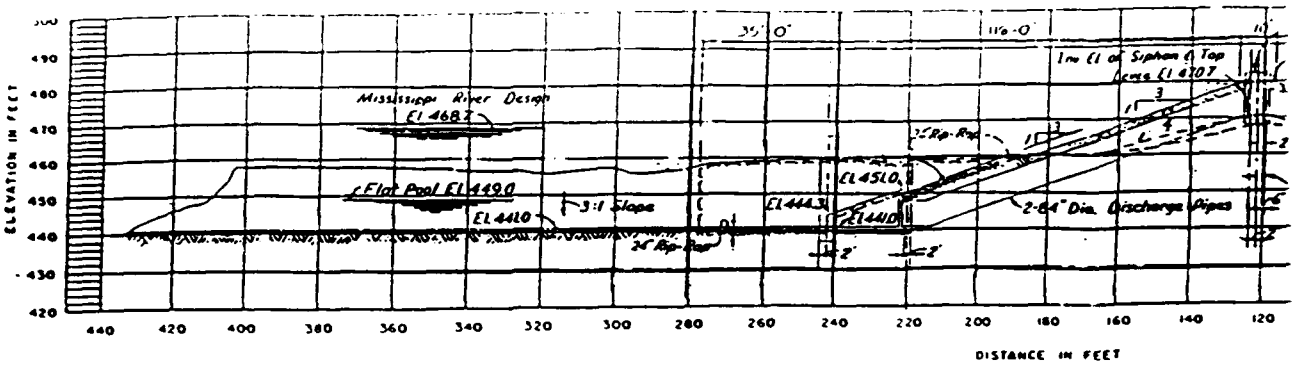


LEGEND

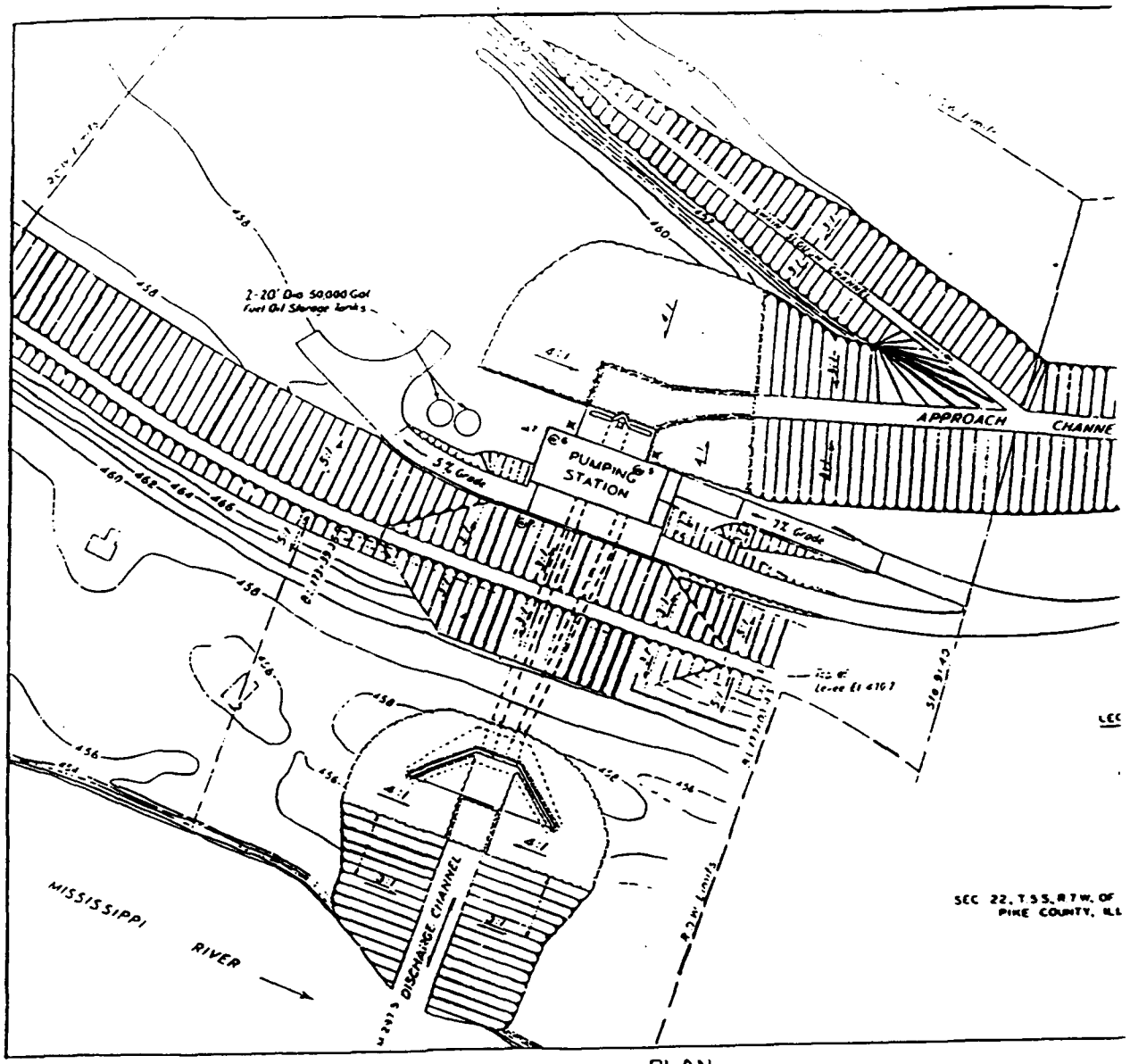
- Railroad Track
- Leveed Channel
- Levee
- Access Road
- Unleveed Clearcut
- Aqueduct
- Pumping Station
- Drainage Ditch
- Location of Deep Borings
- U.S. Highway
- State Highway
- Improved Road
- Unimproved Road
- Levee
- Mileage Above Mouth of Sny
- Mississippi Mileage Above Mouth of Ohio River
- Bluff

SNY ISLAND
LEVEE DRAINAGE DISTRICT
ILLINOIS

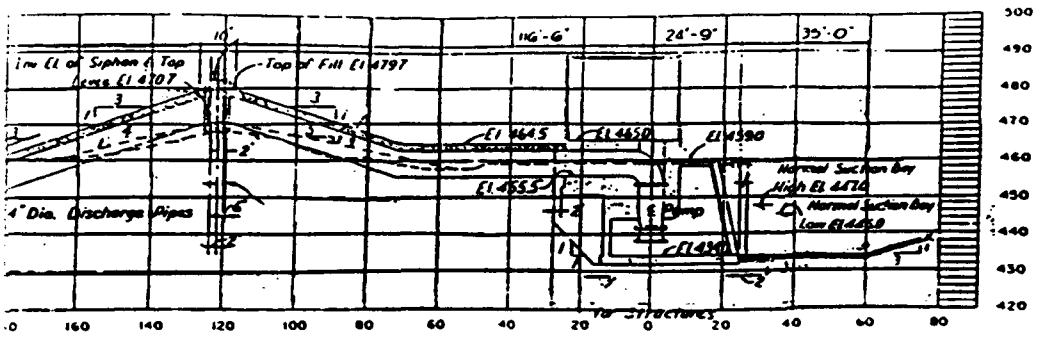
LOCATION MAP



SECTION 1/15/1



PLAN



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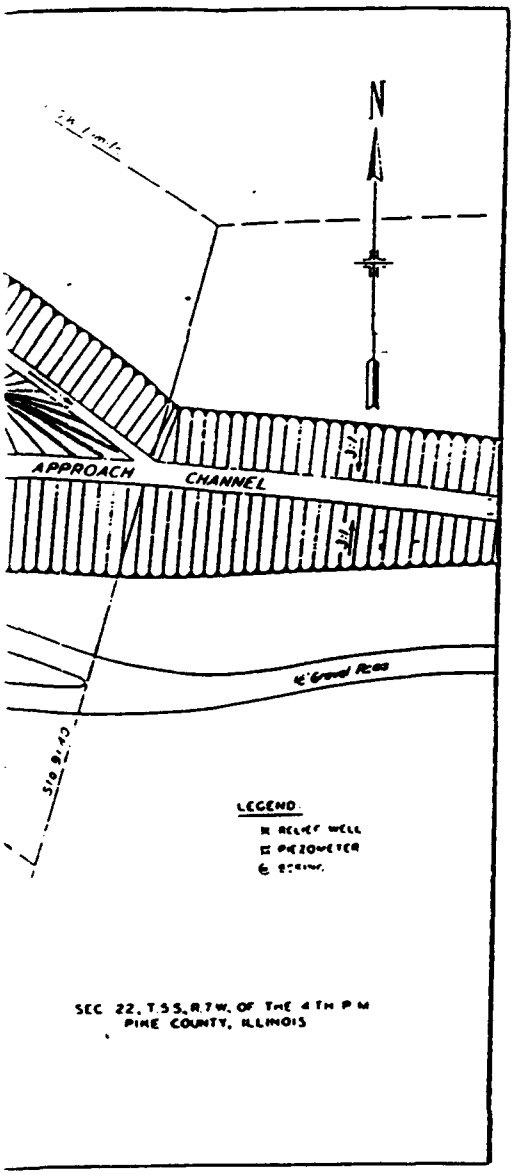


SNY ISLAND

LEVEE DRAINAGE DISTRICT

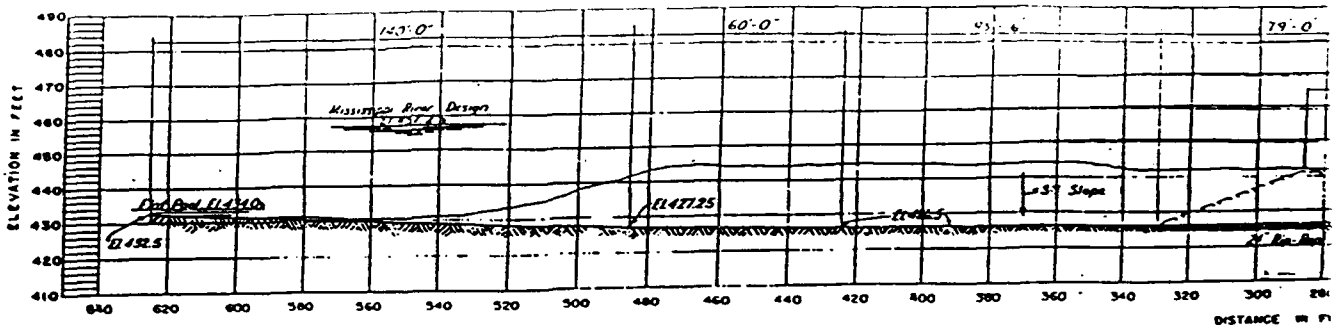
ILLINOIS

PUMPING STATION NO. 1

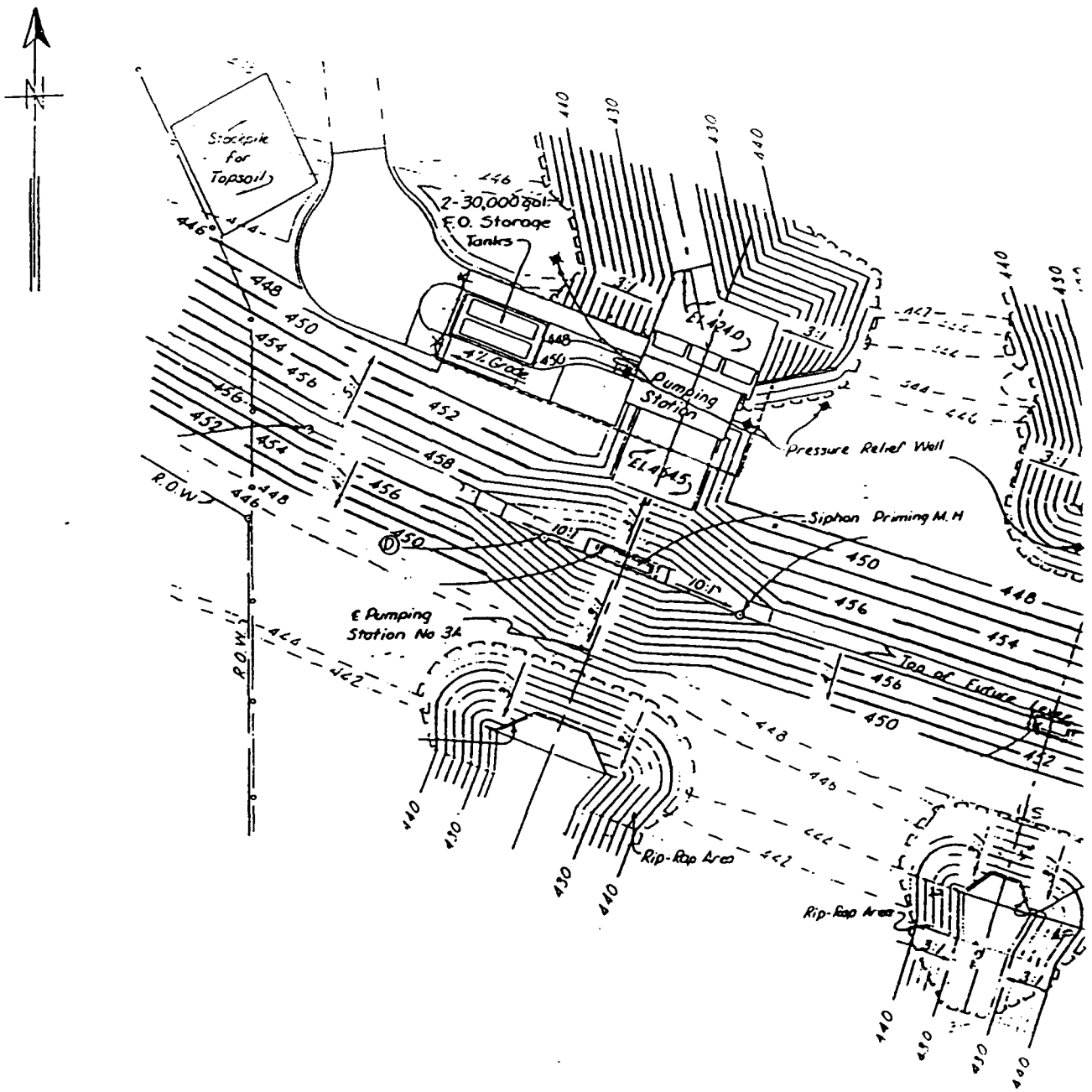
EXISTING STATION

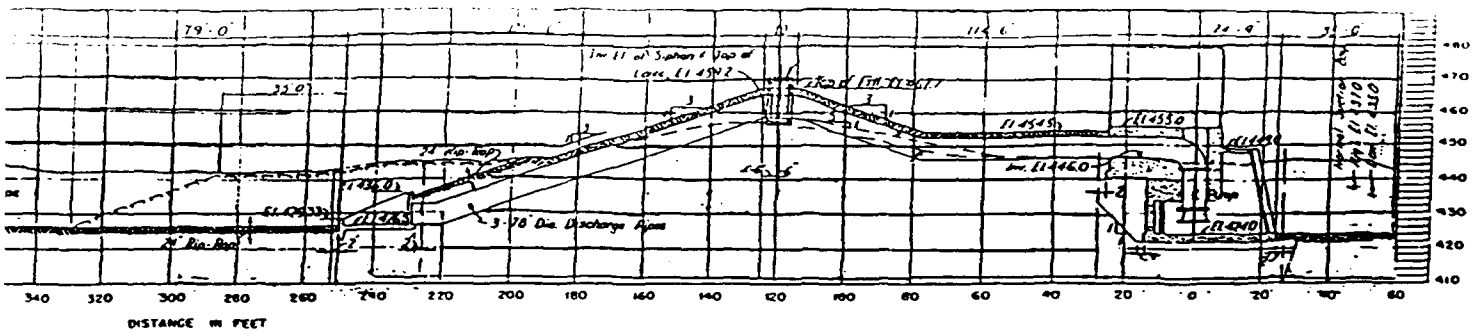
PLAN AND PROFILE

PLATE 2


ELEVATION IN FEET
DISTANCE IN FT
Mississippi River Design
Dredged EL 432.5
EL 427.25
3:1 Slope
Rip-Rap

SECTION


Stockpile for Topsoil
2-30,000 gal. F.O. Storage Tanks
Pumping Station
EL 445
Pressure Relief Wall
Siphon Priming M.H.
R.O.W.
℄ Pumping Station No 3A
Top of Existing Levee
Rip-Rap Area
Rip-Rap Area



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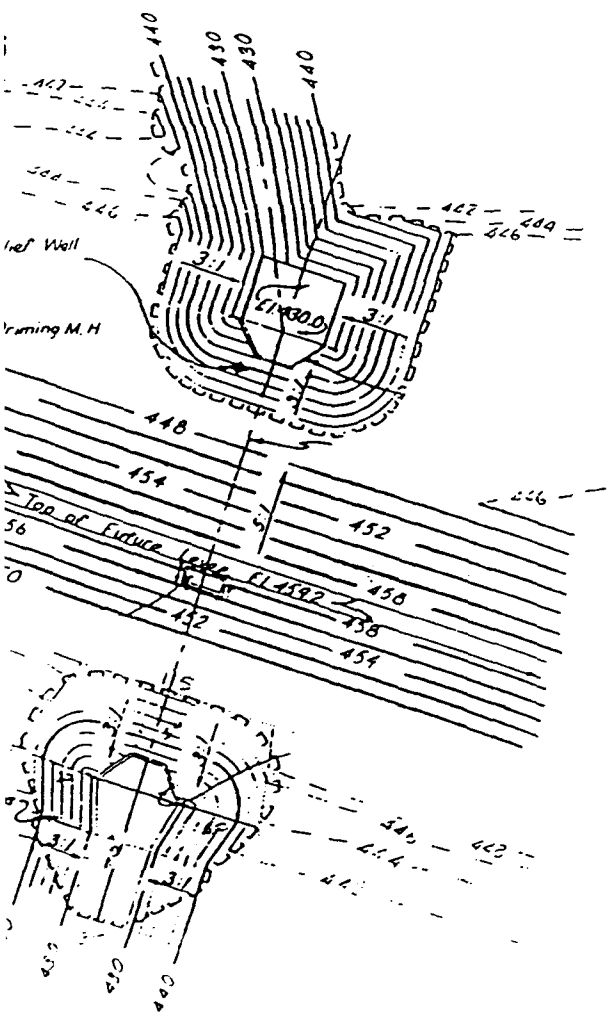


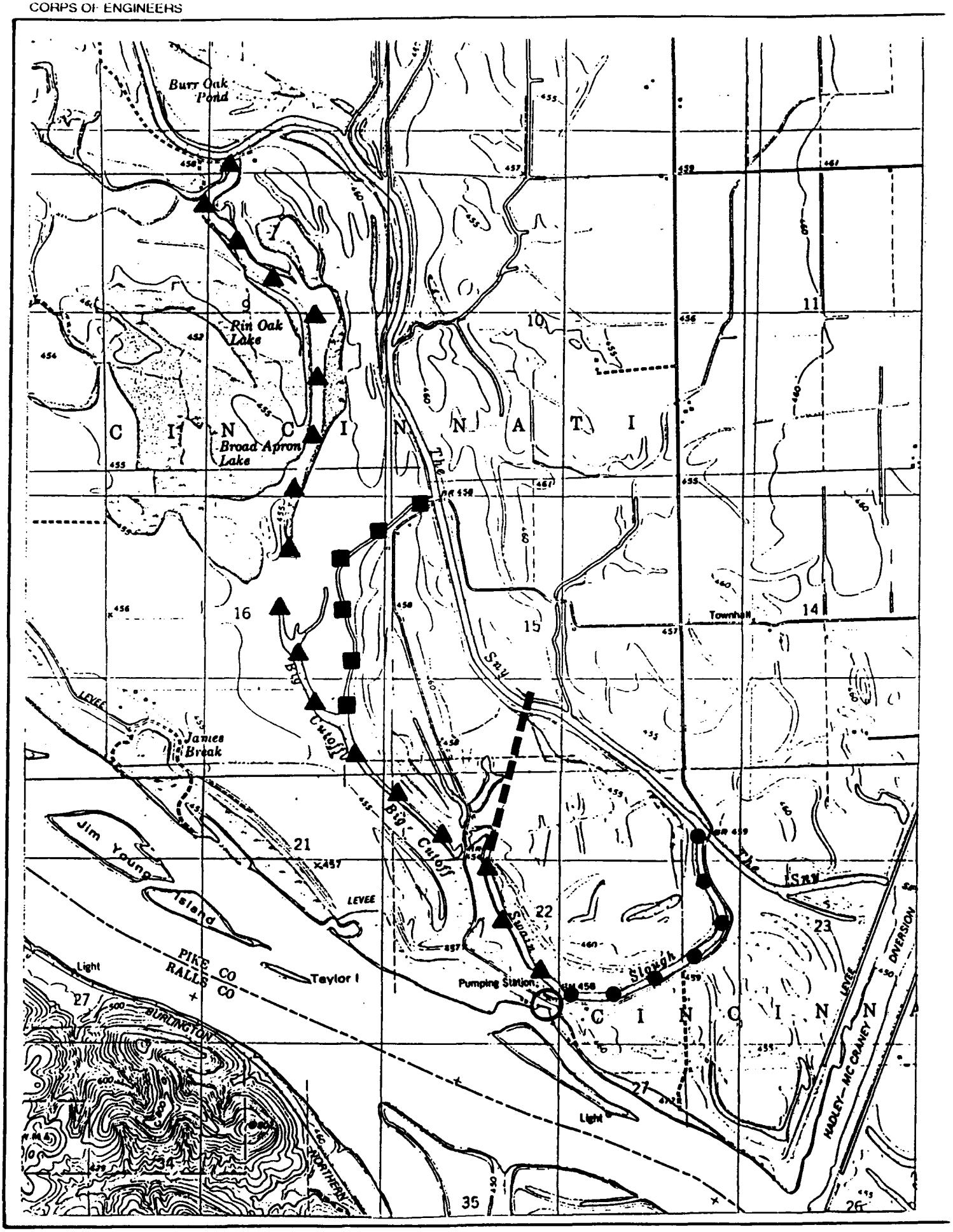
SNY ISLAND

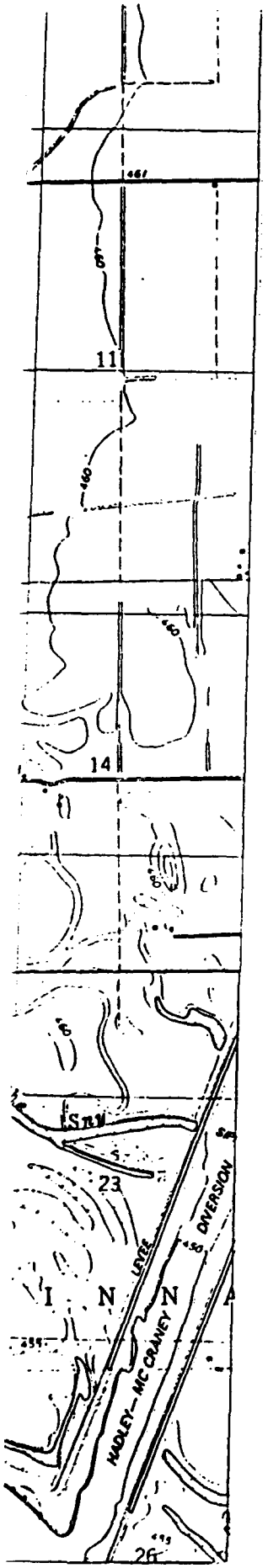
LEVEE DRAINAGE DISTRICT

ILLINOIS

PUMPING STATION NO. 3A
EXISTING STATION
PLAN AND PROFILE

PLATE 3


Burr Oak Pond
Rin Oak Lake
Broad Apron Lake
C I N C I N N A T I
Big Cutoff
Stay
James Break
LEVEE
Jim Young Island
Taylor I
PIKE CO
RALLS CO
Light
BURLINGTON
NORTHERN
Pumping Station
Slough
The Stay
HADLEY-MC CRANEY LEVEE DIVERSION
Townhall
10
11
14
15
16
21
22
23
27
34
35
26



LEGEND: Proposals Under Study

- ▲ ▲ Big Cutoff Channel Construction (Long Route)
- ■ ■ Big Cutoff Channel Construction (Short Route)
- ▬ ▬ ▬ Sny-Swain Slough Channel Cut
- ○ Pumping Station No. 1 Capacity Increase
- ● ● Widen Existing Channel

SNY ISLAND

LEVEE DRAINAGE DISTRICT

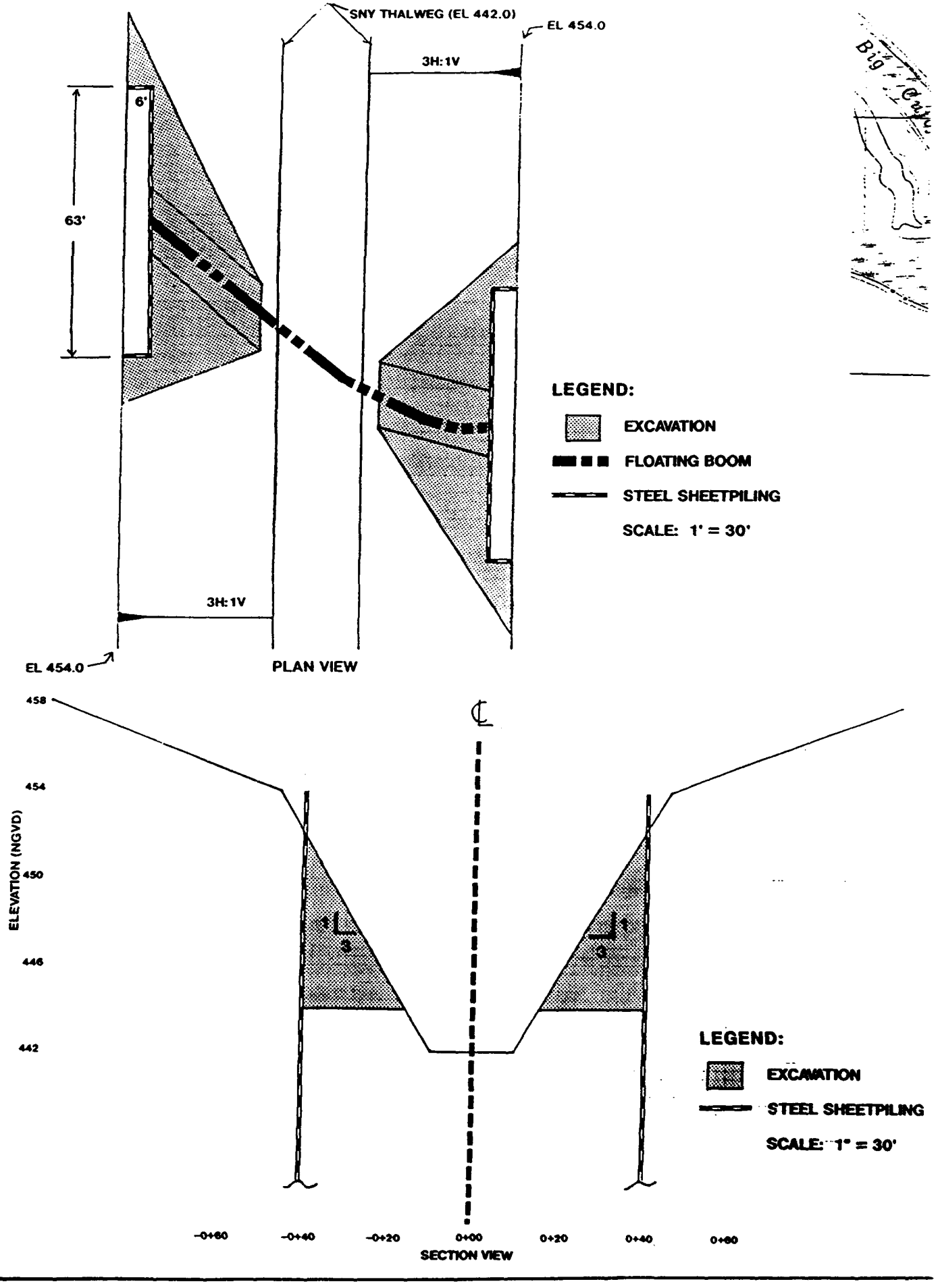
ILLINOIS

PUMPING STATION NO. 1

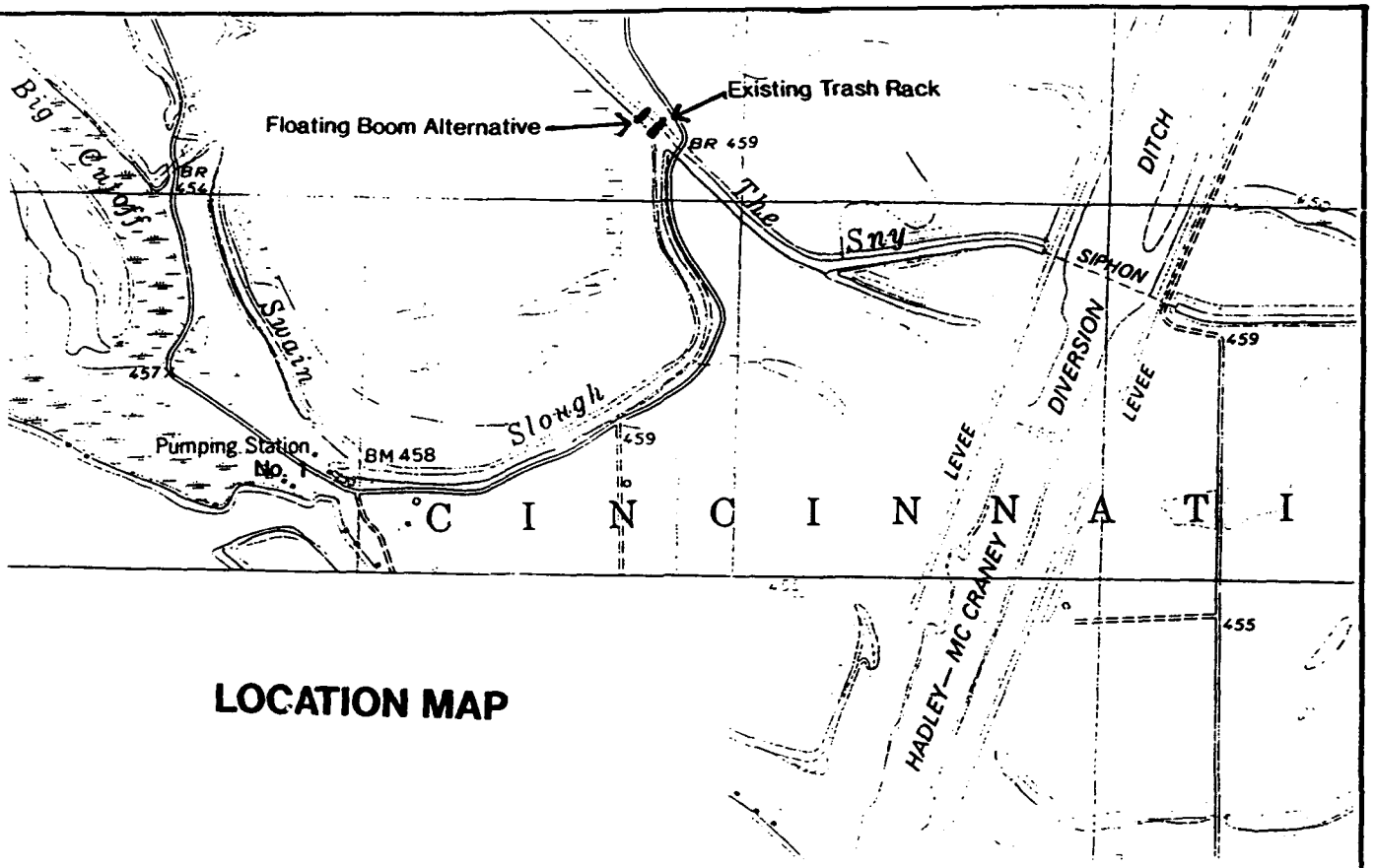
INTAKE CHANNEL ALTERNATIVES

PLATE 4

CORPS OF ENGINEERS

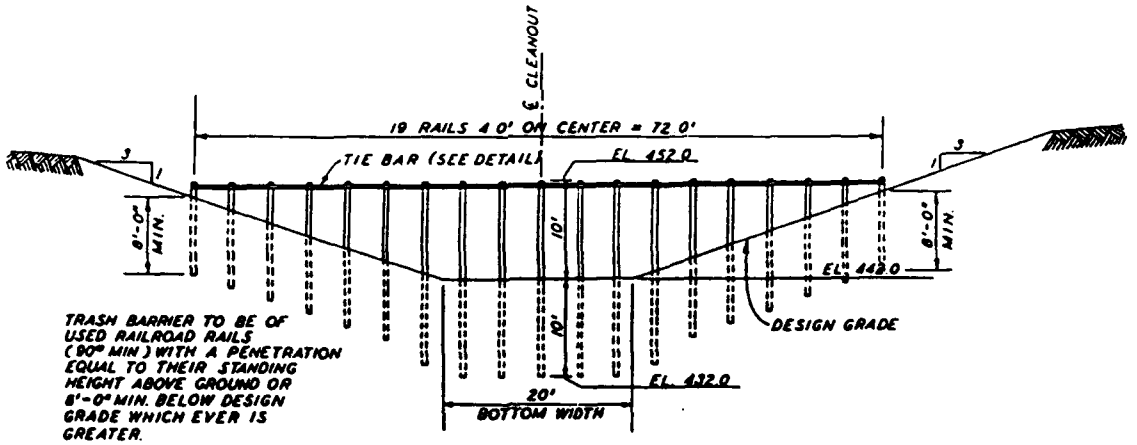


U.S. ARMY



LOCATION MAP

NG



EXISTING TRASH RACK

STA. 486 + 00

10 0 10 20 30

SCALE IN FEET

ID:

EXCAVATION

STEEL SHEETPILING

SCALE: 1" = 30'

SNY ISLAND

LEVEE DRAINAGE DISTRICT

ILLINOIS

EXISTING TRASH RACK AND FLOATING BOOM ALTERNATIVE

PLATE 5

CORPS OF ENGINEERS

1

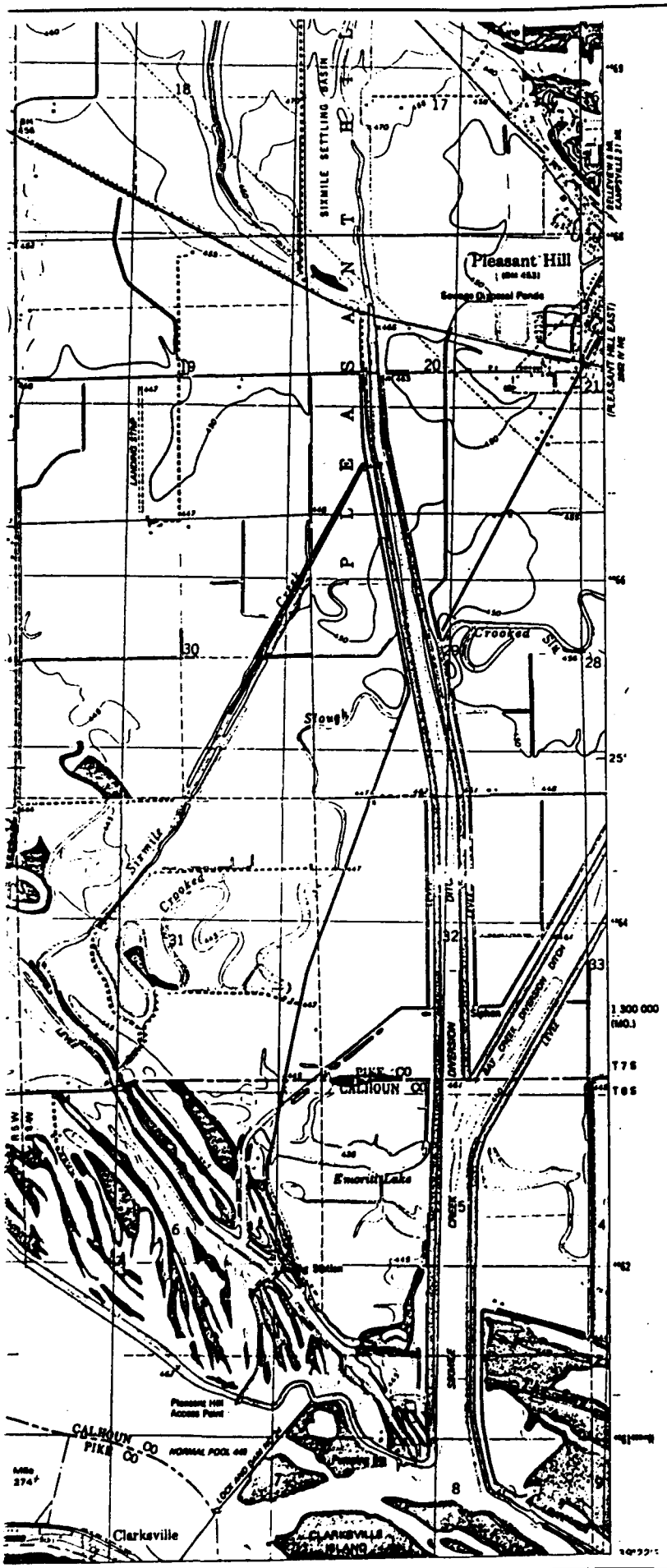
LEGEND

ALTERNATIVE SITE LOCATIONS

SNY ISLAND
LEVEE DRAINAGE DISTRICT
ILLINOIS
PUMPING STATION NO. 3A
ALTERNATIVE SITE LOCATIONS
FOR
ADDITIONAL PUMPING CAPACITY

PLATE 6


Slough
Towhead Lake
Lick Pond
Snyder Pond
Halfmoon Lake
Log Slough
Hog Slough
Mud Slough
Short Slough
Horseshoe Lake
Sixmile
Crooked
Island
ILLINOIS
MISSOURI
MISSISSIPPI
RIVER
UPPER MISSISSIPPI RIVER STATE WILDLIFE MANAGEMENT AREA
REFUGE
BOUNDARY
PIKE CO
CALHOUN CO
Sewage Disposal
Pleasant Hill Access Point
Clarksville



LEGEND

ALTERNATIVE SITE LOCATIONS

SNY ISLAND

LEVEE DRAINAGE DISTRICT

ILLINOIS

PUMPING STATION NO. 3A ALTERNATIVE SITE LOCATIONS FOR ADDITIONAL PUMPING CAPACITY

PLATE 7

APPENDIX A

HYDROLOGY AND HYDRAULICS

RECONNAISSANCE REPORT
FOR
SECTION 205 FLOOD DAMAGE REDUCTION STUDY

THE SNY ISLAND LEVEE DRAINAGE DISTRICT
ADAMS, PIKE, AND CALHOUN COUNTIES, ILLINOIS

APPENDIX A
HYDROLOGY AND HYDRAULICS

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RECONNAISSANCE REPORT
FOR
SECTION 205 FLOOD DAMAGE REDUCTION STUDY

THE SNY ISLAND LEVEE DRAINAGE DISTRICT
ADAMS, PIKE, AND CALHOUN COUNTIES, ILLINOIS

APPENDIX A
HYDROLOGY AND HYDRAULICS

SECTION 1 - GENERAL

PURPOSE AND SCOPE

The Sny Island Levee Drainage District (SILDD) is experiencing substantial damage due to frequent and prolonged interior flooding. Several alternatives are available to alleviate these problems. The purpose of this appendix is to summarize hydrologic, hydraulic, and climatological investigations for the local flood protection project at the SILDD. The scope of this report includes summarizing investigations of improvements at two locations:

a. At Pumping Station No. 1, investigate increasing pumping capacity, increasing approach ditch capacity, and improving an upstream trash rack which impedes pumping and increases ponding stages.

b. At Pumping Station No. 3A, investigate adding pumping capacity. Improvements to the Horton-Dutch diversion were reported in a previous Rock Island District, Corps of Engineers, report entitled, *Section 216 Initial Appraisal, Sny Island Levee and Drainage District; Adams, Pike, and Calhoun Counties, Illinois,* June 1988. The Horton-Dutch diversion improvements will not be rediscussed in this appendix.

CLIMATOLOGICAL DATA

The climate of the SILDD, Illinois, is generally mid-continental, with hot summers and cold winters. Data for the SILDD are based upon records observed at a long-term National Weather Service station at nearby Quincy, Illinois. Climatological data are summarized in the following paragraphs.

TEMPERATURE

The average temperature is 54.2 degrees Fahrenheit. Record extremes are a maximum of 114 degrees and a minimum of -19 degrees Fahrenheit. Table A-1 shows average monthly temperatures.

TABLE A-1

Average Monthly Temperatures (Degrees Fahrenheit)

Month	Average Temperature	Month	Average Temperature
January	27.4	July	78.3
February	31.9	August	76.6
March	41.1	September	68.5
April	54.8	October	57.9
May	65.1	November	43.3
June	74.2	December	31.7

PRECIPITATION

The average annual precipitation is 36.87 inches, with most occurring during the months of April through July. Table A-2 shows monthly averages for precipitation.

TABLE A-2

Average Monthly Precipitation (Inches)

Month	Average Precipitation	Month	Average Precipitation
January	1.61	July	4.42
February	1.41	August	3.48
March	2.74	September	3.99
April	3.88	October	3.17
May	4.07	November	1.77
June	4.74	December	1.56

SECTION 2 - MISSISSIPPI RIVER CHARACTERISTICS

HYDROLOGY AND HYDRAULICS OF THE MISSISSIPPI RIVER

GENERAL

The Mississippi River affects the SILDD interior drainage indirectly. The SILDD is protected from the Mississippi River by a Corps of Engineers local flood protection levee most recently raised in 1969. The SILDD would experience Mississippi River flooding only in the event of failure of the Sny Levee. The SILDD levee is considered to provide protection only up to the 50-year level. However, with intensive flood-fighting efforts, the levee withstood the 1973 Flood of Record which ranged from a 200- to 500-year frequency.

BASIN HYDROLOGY

The drainage area of the Mississippi River at the SILDD is 135,000 square miles. The Flood of Record, as mentioned above, is the 1973 Flood. The 10 highest flows on the Mississippi River at Quincy, Illinois, are shown on table A-3. Peak flow frequency for the Mississippi River at Quincy is shown on plate A-1. Elevation-duration curves for nearby Lock and Dam 22 are shown on plate A-2. Plate A-2 is from the Rock Island District, Corps of Engineers, report entitled, *Upper Mississippi River Basin, Mississippi River-Nine Foot Channel, Appendix 22, Master Reservoir Regulation Manual, Lock and Dam No. 21*, November 1980.

FLOODING

In the vicinity of the SILDD, Mississippi River floods typically endure 1 to 2 months. During this time, the interior of the SILDD is subject to seepage, which is a major component of interior ponding. In fact, stage-duration data indicate that seepage begins to occur at a stage equalled or exceeded 48 percent of the time.

FLOOD PROFILES

The Mississippi River flood profiles adopted in 1979 by the Flood Plain Task Force of the Upper Mississippi River Basin Commission were used in this study. Profiles for the project site are shown in plates A-3 and A-4.

TABLE A-3

Summary of the 10 Highest Flood Stages
Mississippi River at Quincy, Illinois

Date	Crest Elevation (feet)	Flow (cfs)
1973	28.9	386,600
1965	24.8	330,600
1960	24.3	324,500
1947	23.8	325,700
1947	23.0	302,000
1951	22.8	299,200
1979	22.5	294,200
1976	22.2	289,300
1952	21.9	284,200
1969	21.9	282,500

Gage zero = 458.9 NGVD (5th Adj.)

At approximately the midpoint of the 54.2-mile-long SILDD, at RM 303.0, the 50-, 100-, 200- and 500-year flood elevations are 471.4, 472.8, 474.1, and 476.2, respectively.

PUMPING STATION ANALYSES

GENERAL

Construction of the levees and diversions during the 1950's unquestionably improved the interior drainage situation in the SILDD. However, unanticipated flooding of low areas occurred in sufficient magnitude and duration to generate a request for this study. This interior flooding, summarized in the next paragraph, is documented in *Engineer's Report on Interior Flooding, Sny Island Levee Drainage District, Adams, Pike, and Calhoun Counties, Illinois*, January 1975, and a supplement to that report published in April 1982, both reports by Klingner and Associates of Quincy, Illinois. The reports include daily pumping, rainfall, and stage data for the years 1966 through 1981. The SILDD furnished data to extend the record through 1989.

Flooding has exceeded the original design. At Pumping Station No. 1, between 1966 and 1989, the original 10-year design elevation (elevation 453.0) for interior flooding was exceeded 15 times. At Pumping Station No. 1, this elevation exceeded corresponds to 1,600 acres or 18 percent of the lowlands served by the pumping station. Average flooding duration above elevation 453.0 was 4.3 days, with flooding durations ranging from 1 day to 12 days. At Pumping Station No. 3A, between 1966 and 1989, the original 10-year design elevation (elevation 442.0) for interior flooding was exceeded 21 times. At Pumping Station No. 3A, this elevation corresponds to 2,700 acres, or 24 percent of the lowlands served by the pumping station. Average flooding duration above elevation 442.0 was 5.9 days, with flooding durations ranging from 1 day to 12 days. Deleting several 1-day inundations raised the average flooding duration above elevation 442.0 to 7.0 days.

INTERIOR DRAINAGE

This report will consider only Area 1 and Area 3A. (There is no Area 2, and Area 4 is hydrologically separate from Areas 1 and 3A.) Presently, interior drainage from Area 1 and Area 3A is handled in the following way. The incoming Sny channel at Pumping Station No. 1 (serving Area 1) is designed to carry 1,100 cfs. Of this flow, 900 cfs is directed to Pumping Station via the Swain Slough approach channel (see plate 1 of the main text). The remaining 200 cfs bypasses Pumping Station No. 1. This flow passes under the Hadley-McCraney Diversion via an aqueduct which is designed to pass the 200 cfs with 1.0 foot of head. The Sny continues, carrying this flow and other flows to Pumping Station No. 3A. Pumping Station No. 3A has a capacity of 1,200 cfs. During low Mississippi River stages, gravity drainage at Pumping Station No. 3A is opened.

The volume of ponding within the SILDD at any one day may be changed by precipitation, seepage, evaporation, pumping withdrawals, infiltration, diversions, and bluff drainage. The volume of ponding in Area 1 is also affected by the bypass flows mentioned above.

This multiplicity of inflow components render reconstruction of past events impractical. Any such modelling would be burdened with so many assumptions that it would be useless.

A saving feature is that the Sny has such a huge volume of storage that stages near the peak events change very slowly from day to day. Daily stages have been recorded since 1966. From the area-capacity curves, plates A-16 and A-28, the volume of storage each day is then also known. While the inflows cannot be reconstructed, their daily summation is observed as the daily stage, that is, the daily volume.

Analysis of added pumping can be accomplished by computing the pumping station withdrawals and, hence, the revised the volume of storage.

Accordingly, a frequency curve for the period of record was constructed from the observed annual peaks. The development of frequency curves is discussed below. In addition to peak stages, the number of days during which added pumping would have been useful in reducing the peak was computed. The criteria for selecting the number of days useful to lowering the peak stage are described below. Therefore, in computing the effect of added pumping, the removed volume of storage is simply the rate of pumping times the above number of days of pumping. This volume is subtracted from the original volume (at peak). From the area-capacity curve, a new (and lower) peak elevation is directly obtained. This procedure is repeated for each selected peak event, and a revised frequency curve is developed.

In this development, a partial duration frequency analysis was accomplished because some years had no events and other years had several. Events were conservatively selected on the basis of several criteria. This frequency curve was constructed from the daily stage record furnished by Klingner and Associates and the SILDD. Daily stages, pumping hours, and rainfalls are available for the years 1966 through 1990. To assure consistency in the selection of interior events, the following criteria were applied:

a. Only events above the damaging elevation were included.

b. Only crop-year events were included.

c. Crop-year events which peak less than 1 month apart were excluded.

d. Crop-year events which are separated by a substantial drawdown of interior stages are partially excluded. Only the highest of such events will be included.

e. Crop-year events that are not accompanied by pumping are excluded. That is, if the SILDD did not consider those stages to be a problem, nor will they be considered so in this report.

Pumping during an event may endure 60 to 90 days. However, added pumping would be useful in lowering the peak for only 4 to 7 days. To assure consistency in selecting this useful period, only the time from the beginning of the rapid rise to the day before the peak was included. The day of the peak itself was not included because the elevations are logged in between 6 a.m. and 7 a.m.; hence, most of the day is not available for added pumping to reduce the stage. Also, in order for a day to be included in this period, all the pumps had to be on that day. These criteria are necessary to prevent the over-estimation of the benefits of added pumping.

Discussion of the stage versus benefited area curves, found on plates A-16 and A-28, is useful. These curves were based upon data provided by Klingner and Associates and the SILDD. The elevation flooding relationship in the SILDD is unusually complex, but because the district is so large (nearly 55 miles long) the usually insignificant hydraulic slope of interior water surface becomes important. That is, the interior water surfaces are sloped. Hence, equal elevation contours cannot be traced

and accurately predict the area of interior flooding. This sloping water surface is built into the stage-area curves and is not further mentioned.

The above paragraphs apply to peak stage damages. To better estimate agricultural damages, the above procedure was modified. Lands can be briefly flooded and drained without major agricultural loss. To account for this, the stages occurring 7 days after the start of the rapid rise (not from the peak) were selected for each event. This procedure will include lands flooded during the usually brief ascending limb of the hydrograph. This selection permits the computation of the effect of added pumping. During the 7 days, the added pumping would have removed an easily computed volume of storage. The revised (lowered) stage is derived from the area-capacity curves as above. This procedure is executed for each event. These revised stages are ranked and assigned plotting positions for development of agricultural frequency curves.

The remainder of this appendix is divided into two parts: one discussing Pumping Station No. 1 and the other discussing Pumping Station No. 3A. The location of these facilities is shown on plate 1 of the main text.

PUMPING STATION NO. 1

Pumping Station No. 1 consists of two diesel driven pumps of 450 cfs each for a station capacity of 900 cfs at a head of 8.3 feet. The pump-on elevation is elevation 449.0, and the pump-off elevation is elevation 446.0. In no case shall the pumps operate below elevation 445.0. The rated engine speed is 757 rpm. The general purpose of Pumping Station No. 1 is to prevent interior flooding of the Sny bottomlands contained within Pumping District No. 1. The design flow arriving via the Sny at the head of the approach channel is 1,100 cfs. The pumping station was designed to remove 900 cfs of this flow and an additional 200 cfs passes under the Hadley-McCraney Diversion via gravity drainage through a viaduct into Pumping District 3A.

The SILDD operation records indicate that Pumping Station No. 1 cycles excessively. To partially avoid excessive recycling, pumps are slowed down; however, this does not solve the problem that Pumping Station No. 1 is under-utilized. Solving this problem would be economical since it would result in utilizing existing pumping capacity.

Several studies were accomplished to both analyze the problem and to derive the solutions. Pumping operation records show that Pumping Station No. 1 regularly operates at 690 rpm instead of the more common 720 rpm. This constitutes a reduction of the capacity of each pump from 430 cfs to 380 cfs, a reduction of 50 cfs per pump, or 100 cfs for the pumping station. The water that is not pumped flows on, passing through the viaduct, and is eventually pumped by Pumping Station No. 3A. Also, since more than 200 cfs is available for bypassing the station, this results in elevated stages in Area 1.

Existing approaches appear to be unable to supply the pumps sufficient water for efficient operation. Several alternatives for delivering greater quantities of water to Pumping Station No. 1 were investigated. These included opening new channels upstream and connecting these the existing approach channel, as shown on plate 4 of the main text. Thus, the slope of the Sny itself could be utilized to deliver water to the pumping station. These studies are summarized on plates A-5 and A-6, ratings for various width channels for the "Big Cutoff" and the "Middle Cutoff." In addition, a rating was developed for simply widening the existing approach channel, as shown on plate A-7.

The costs of constructing the "Big Cutoff" or the "Middle Cutoff" were substantially excessive. Only the existing Swain Slough approach channel would be a candidate for improvement.

The principal cause of the under-utilization of the pumping station was found to be a debris-clogged trash rack. A supplementary trash rack just upstream of the mouth of the existing approach channel was holding back 1 to 3 feet of water. As discussed below, this starves the pumps of water.

The trash rack consists of minimum weight 90 lbs/ft railroad rails at 4-foot centers. The rails are vertical to enable trash removal by a clam-shell dragline. This trash rack is intended to catch the larger debris such as logs, oil drums, and telephone poles.

One of the problems with this type of trash rack is that the vertical orientation allows the trash rack to plug up from top to bottom. Also, removing the debris with a dragline is a cumbersome operation. Several fetches are required to grip each large piece of debris. Despite diligent maintenance, the trash rack is often partially blocked.

This blocking causes the pumping station to cycle. Plate A-7 results show that these losses are critical. The existing channel is 18 feet wide. About 900 cfs is required for Pumping Station No. 1 to fully operate both pumps. This flow (900 cfs) requires a depth of 7 feet in the channel, corresponding to elevation 445.0 in the Sny, which is a low flow. A loss of only 1 foot reduces the capacity of the approach channel from 900 cfs to 625 cfs; 2 feet of loss reduces the capacity to about 450 cfs.

This problem may be simply remedied by a variety of measures. The least expensive of many considered is a floating boom upstream of the trash rack serviced by a bridge spanning the Sny. Trash could be collected by a mounted knuckle boom.

Beginning with observed peak stage events, stage reductions for various added pumping capacities were computed as described above to derive benefits. These investigations are summarized on plates A-8 through A-11 which show the stage-frequency curves for various sizes of added pumping capacity ranging from 50 to 400 cfs. Since a partial duration series was used, a log scale was required rather than the usual probability scale.

The assumption of an improved trash rack is incorporated in plates A-8 through A-11. In developing these curves, it was assumed that the improved trash rack (e.g., a floating boom) would eliminate 75 percent of the trash rack losses. The presence of debris floating on top of the Sny would interfere less with the flow than would the presence of debris clogging a trash rack from top to bottom. Conservatively, the maximum loss was assumed to be 0.5 foot. Using post-peak stages described above, agricultural damages were computed in a similar fashion. These investigations are summarized on plates A-12 through A-15, with stage frequency curves for various sizes of added pumping capacity ranging from 50 to 400 cfs. In addition to adding pumping capacity at Pumping Station No. 1, each added pump capacity corresponds to an increase in approach channel capacity. Plate A-7 can be used to directly derive the needed ditch width.

It is noted that increases in pump capacity above 50 cfs are unlikely to be feasible since the design width of the Sny itself is only 20 feet. Increases above 50 cfs would require the Sny to be widened for its entire length.

Plate A-16, Ponding Elevation vs. Benefit Areas, contains data developed by the SILDD. This data appears reasonable when compared with the original area capacity curves published in the Rock Island District report entitled, *Definite Project Report, The Sny Basin, Illinois, Flood Control, Binder 2 of 4, Rock Island, Illinois*, dated January 13, 1950. The report contains curves for both stage-versus-overall ponding area and stage-benefit acres. The above data indicate a reduction in non-tilled acres above elevation 448.0 since the 1950 report and consequent construction of levees and pumping station.

PUMPING STATION NO. 3A

Pumping Station No. 3A consists of three pumps of 400 cfs each for a station capacity of 1,200 cfs at a design head of 4.2 feet. The pump-on elevation is elevation 439.0, and the pump-off elevation is elevation 436.0. In no case shall the pumps operate below elevation 435.0. The rated engine speed is 724 rpm.

The development of alternatives for Pumping Station No. 3A proceeded in much the same way as in Pumping Station No. 1. Use of similar procedures will not be reiterated.

An important difference is that the approach ditch leading to Pumping Station No. 3A is adequate. A normal depth analysis on the steeper sloped approach channel indicated adequate capacity. This was verified using an HEC-2 backwater analysis which modeled the profile 13.1 miles up the Sny, shown on plate A-17. Based on several site visits, Manning's roughness coefficient(n) was 0.035 and the same for overbanks. Expansion and contraction coefficients were 0.5 and 0.3, respectively. Starting elevations

for the same flow were varied. Upstream, where the slope returned to that typical for the Sny, the profiles quickly converged. It was expected that frictional effects would dominate the flow regime in the shallow sloped Sny, and this proved to be the case. In developing frequency curves for Pumping Station No. 3A, the improvements at Pumping Station No. 1 (which will show up at Area 3A) were modelled. However, this effect was so slight that it was neglected in the final analysis. Peak stage frequency curves are shown on plates A-18 through A-22. Agricultural effects are shown on plates A-23 through A-27 which portray the modified frequency curves for adding pumping of 150, 300, 600, 900, and 1,200 cfs. Because of the large area subject to inundation, only the larger pumps achieve significant drawdowns.

Additional pumping sites were identified at upstream locations where the Sny channel closely approaches the Mississippi River levee. These upstream locations were considered because it was suspected that local drawdown effects could drain flooded lands more effectively than the same pumping capacity added to the existing Pumping Station No. 3A. This was not the case; local drawdown effects were negligible.

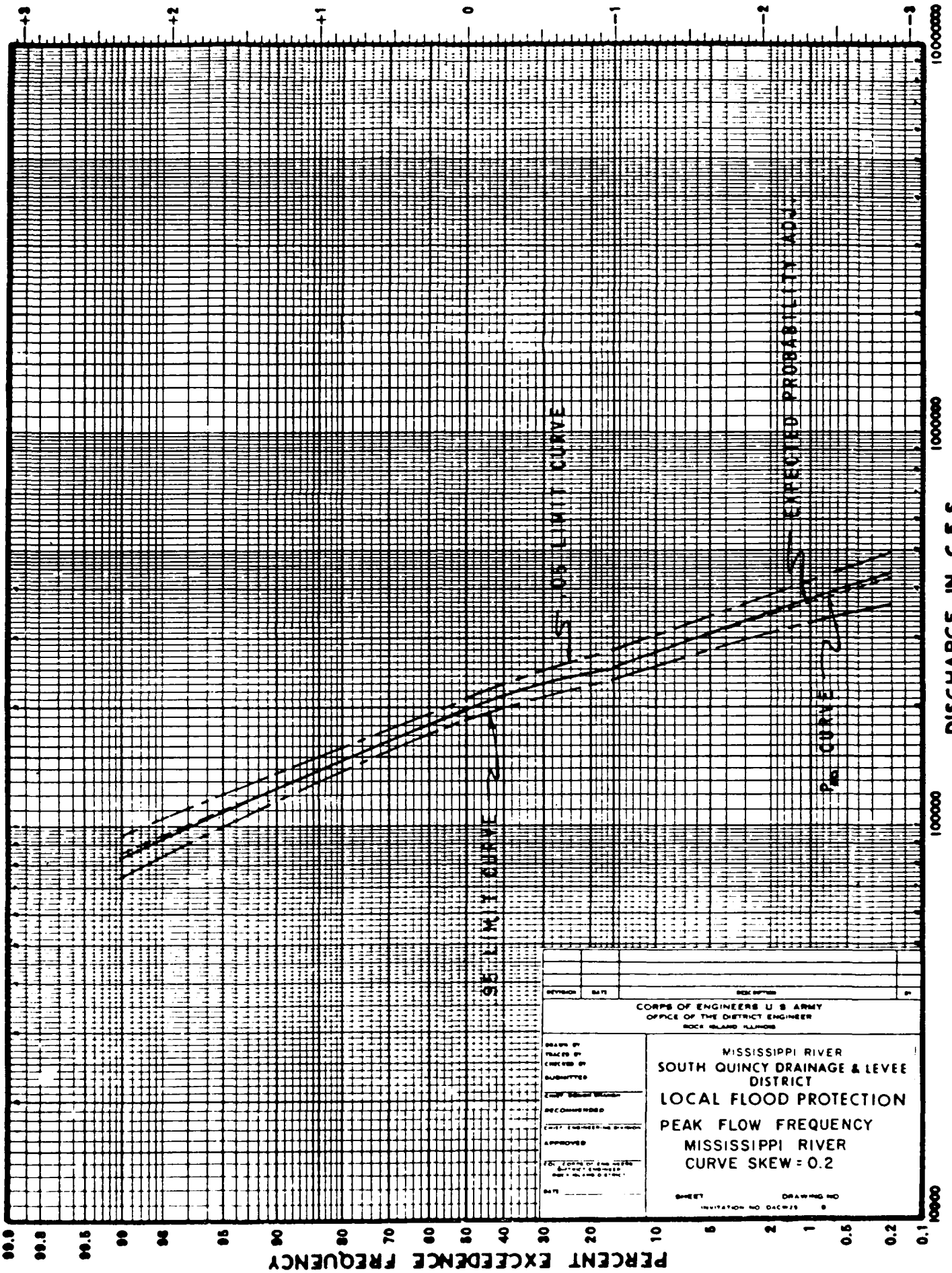
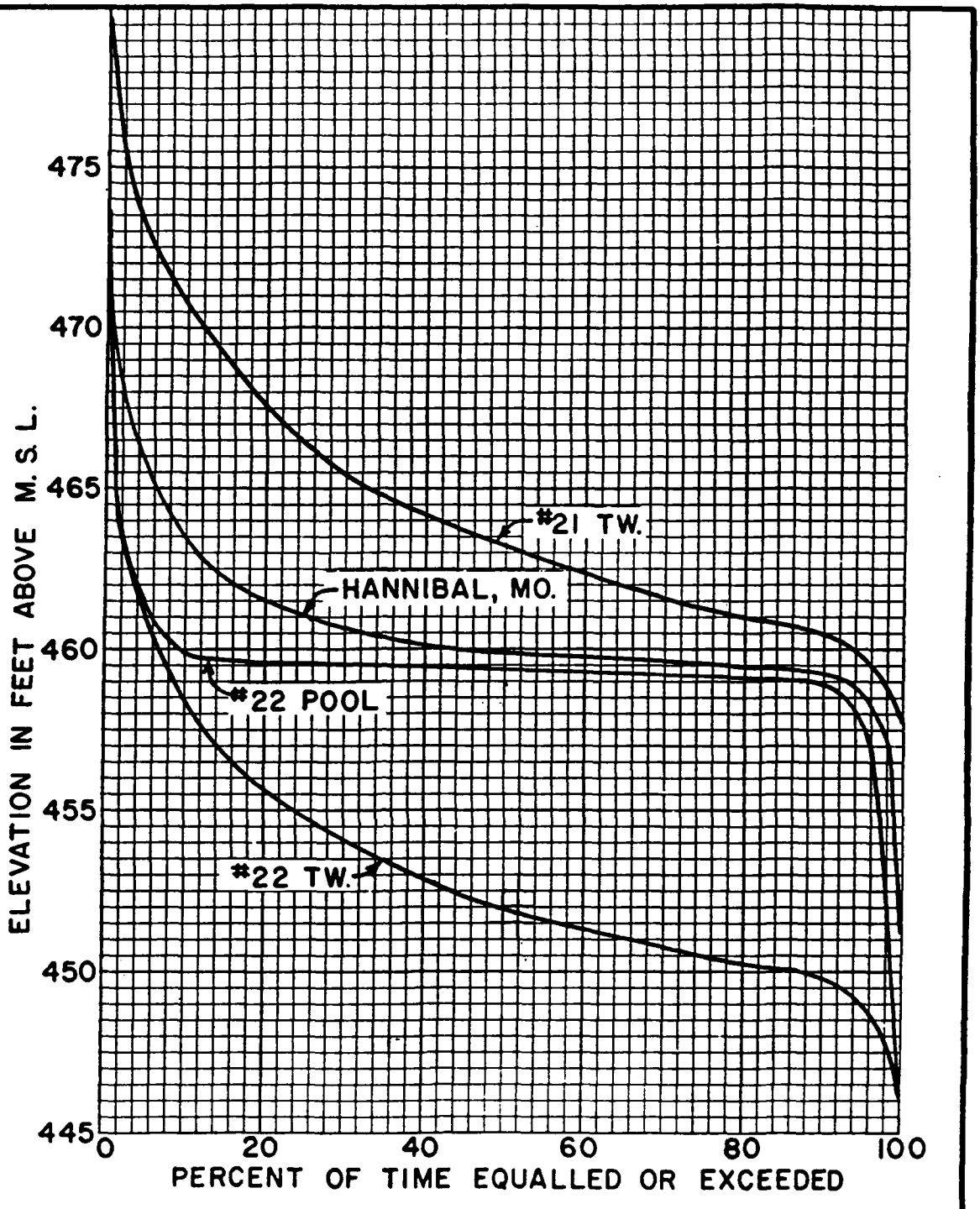

+3
+2
+1
0
-1
-2
-3
10000000
1000000
100000
EXPECTED PROBABILITY ADJ.
95% LIMIT CURVE
P-III CURVE
95% LIMIT CURVE
DISCHARGE IN C.F.S.
99.9
99.8
99.5
99
98
95
90
80
70
60
50
40
30
20
10
5
2
1
0.5
0.2
0.1
PERCENT EXCEEDENCE FREQUENCY
CORPS OF ENGINEERS U S ARMY
OFFICE OF THE DISTRICT ENGINEER
ROCK ISLAND ILLINOIS
MISSISSIPPI RIVER
SOUTH QUINCY DRAINAGE & LEVEE DISTRICT
LOCAL FLOOD PROTECTION
PEAK FLOW FREQUENCY
MISSISSIPPI RIVER
CURVE SKEW = 0.2

PLATE A-1



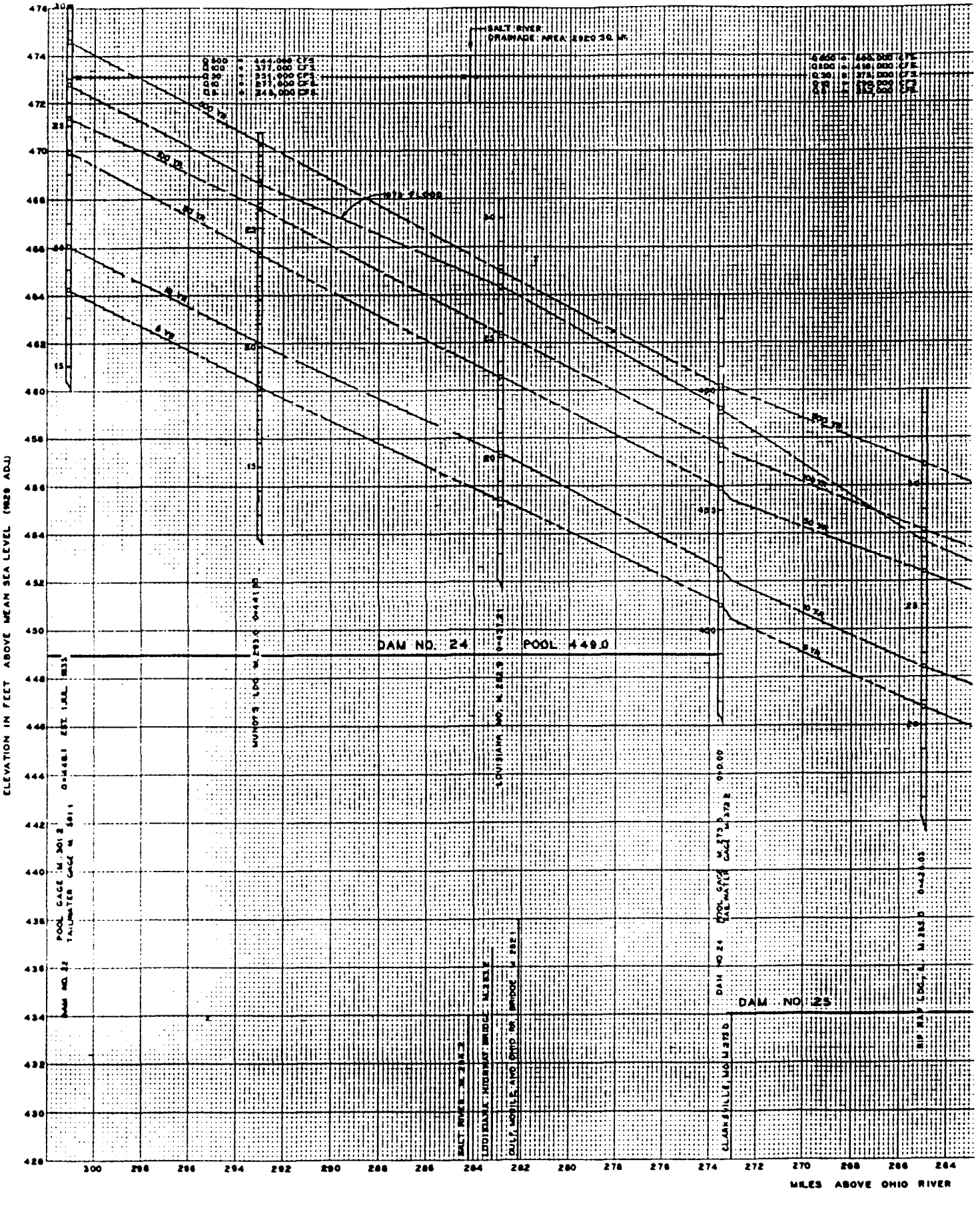
PERIOD OF RECORD
FOR ALL STATIONS
IS
1940 - 1973

UPPER MISSISSIPPI RIVER BASIN
MISSISSIPPI RIVER
RESERVOIR REGULATION MANUAL
NINE FOOT CHANNEL
POOL 22
ELEVATION DURATION
CURVES

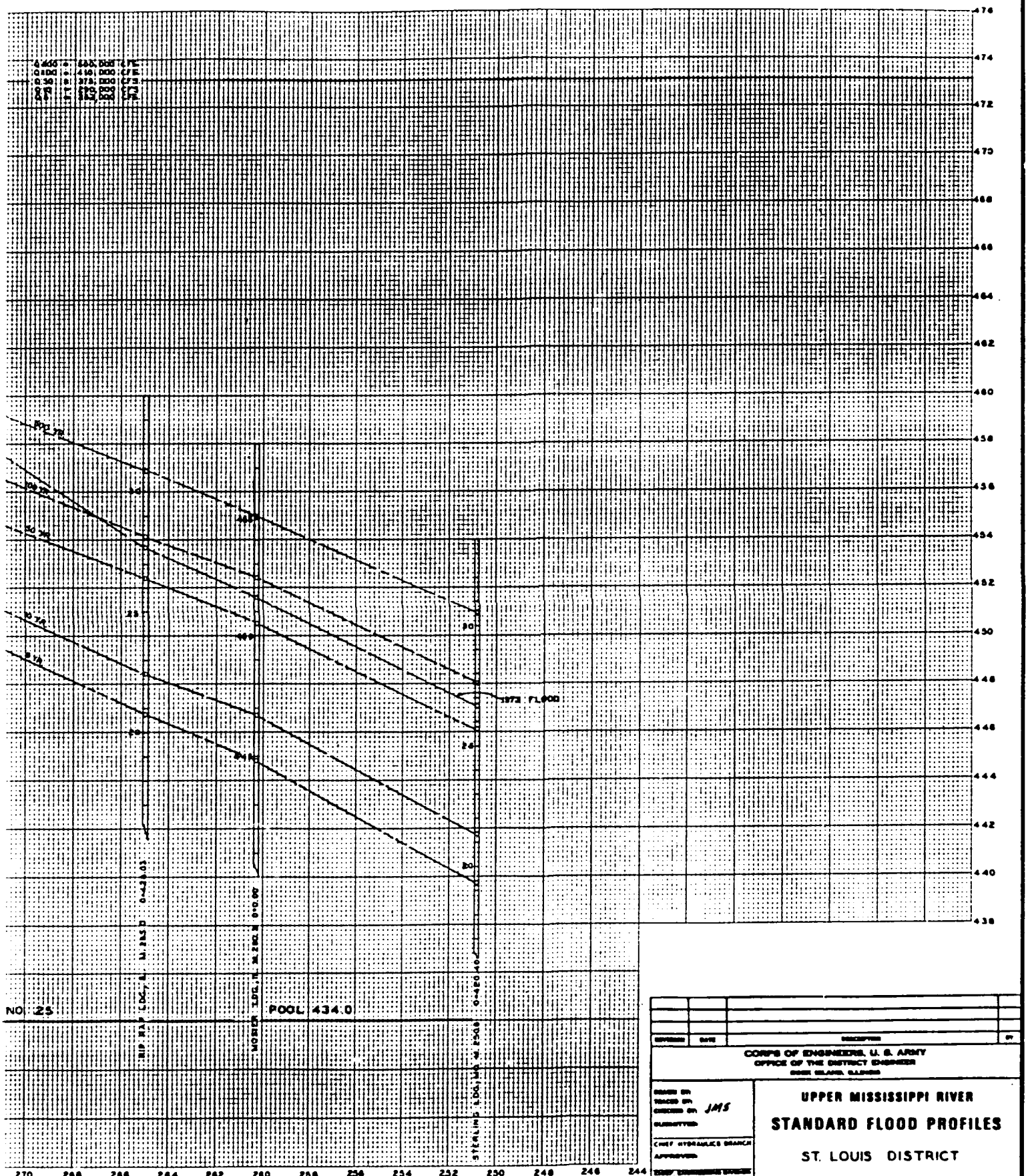
CORPS OF ENGINEERS, U.S. ARMY
ROCK ISLAND, ILLINOIS

ROCK ISLAND DISTRICT
MARCH 1979

PLATE A-2


SALT RIVER
DRAINAGE AREA 6960 SQ. MI.
DAM NO. 24
POOL 449.0
DAM NO. 25
ELEVATION IN FEET ABOVE MEAN SEA LEVEL (1929 ADJ.)
MILES ABOVE OHIO RIVER

U S ARMY



CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DISTRICT ENGINEER

DESIGNED BY
TRACED BY
CHECKED BY JMS
QUANTITIES
CHIEF HYDRAULICS BRANCH
APPROVED
CHIEF ENGINEERING DIVISION
DATE

UPPER MISSISSIPPI RIVER

STANDARD FLOOD PROFILES

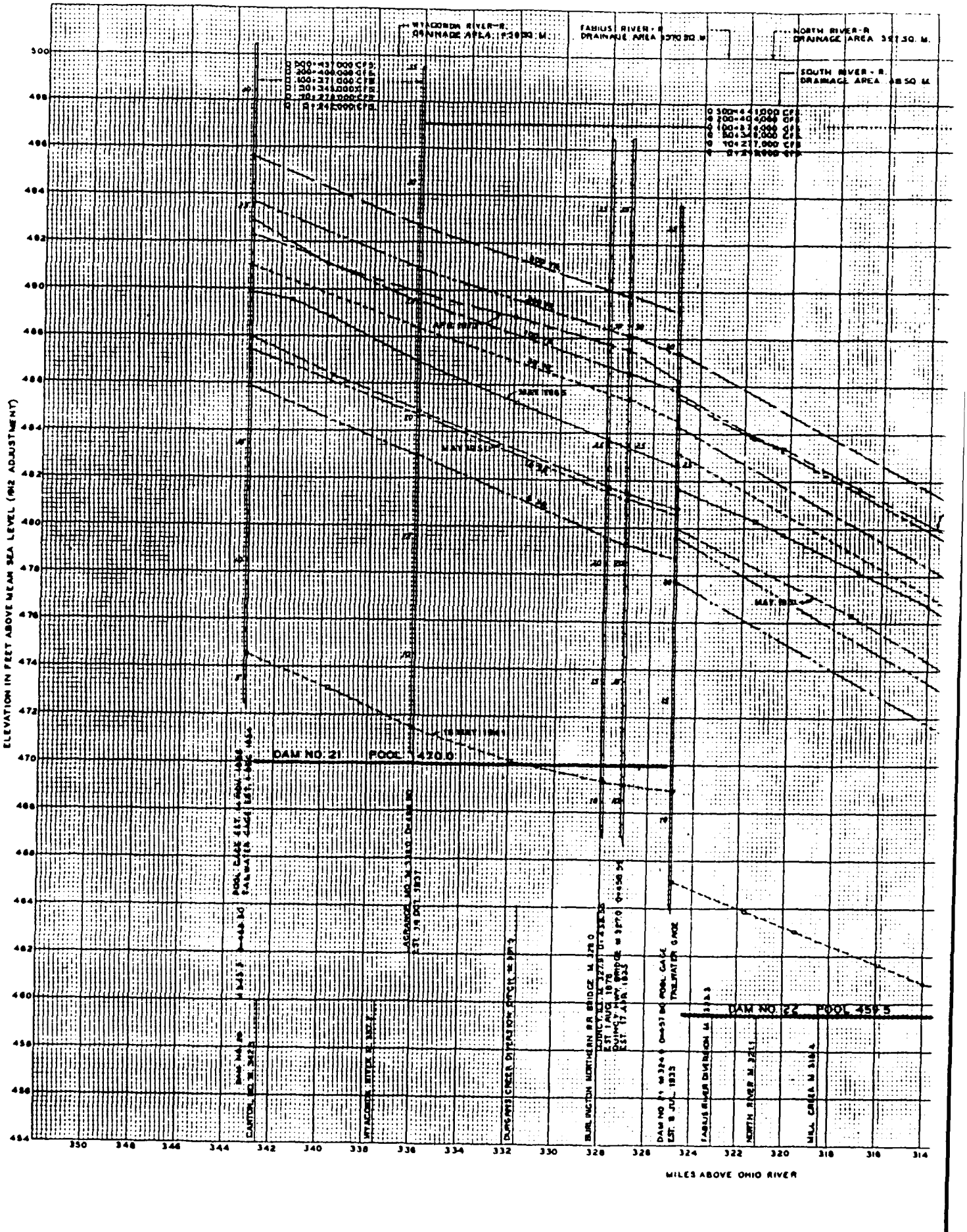
ST. LOUIS DISTRICT

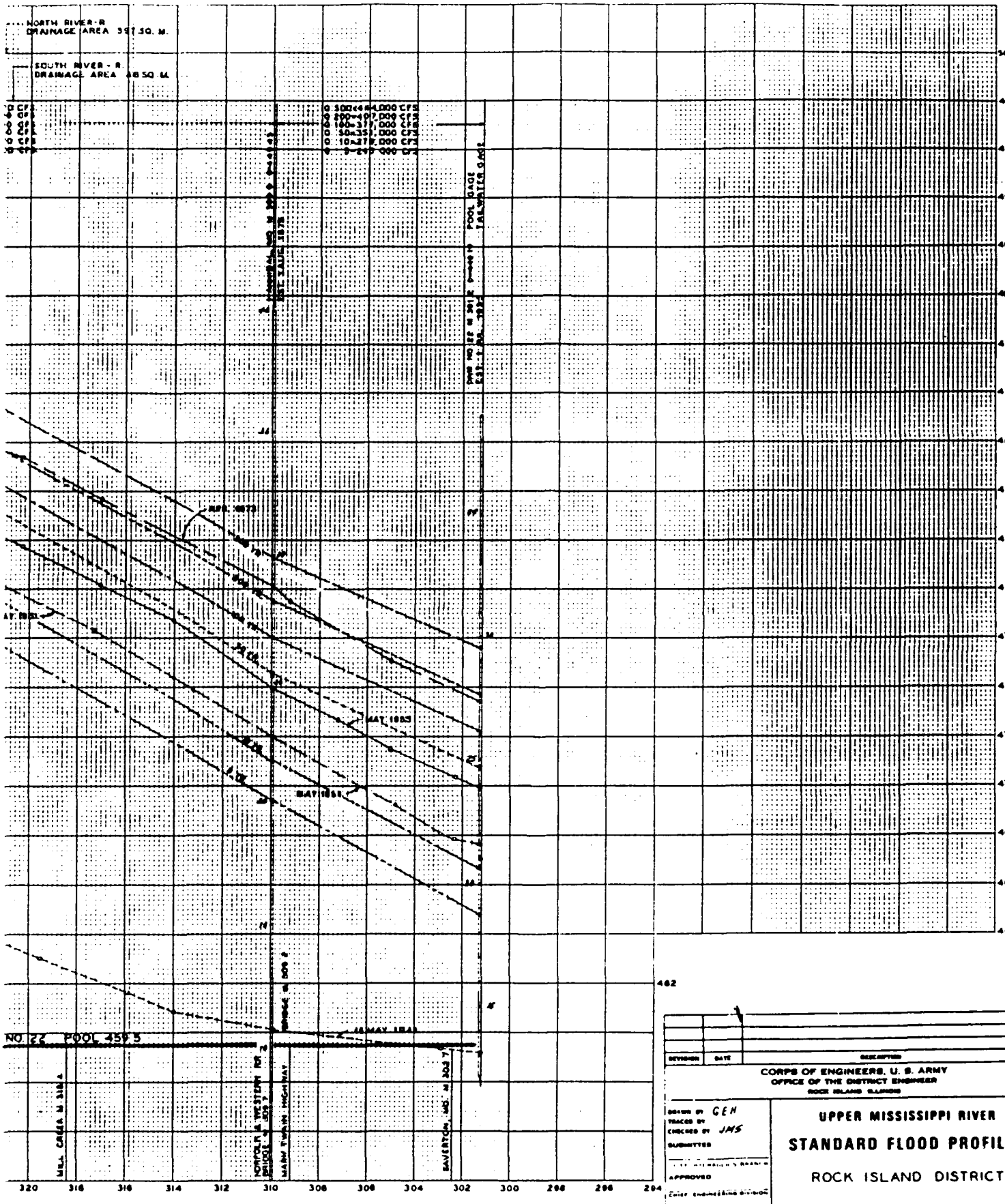
6, 10, 50, 100, & 500 YEAR FLOOD

RIVER MILES 280.6 TO 301.2

DRAWING NO LMS-¼

PLATE A-3


WYACONDA RIVER-R.
DRAINAGE AREA
FABIUS RIVER-R
DRAINAGE AREA
NORTH RIVER-R
DRAINAGE AREA 351 SQ. M.
SOUTH RIVER-R.
DRAINAGE AREA
ELEVATION IN FEET ABOVE MEAN SEA LEVEL (1912 ADJUSTMENT)
MILES ABOVE OHIO RIVER
DAM NO. 21 POOL 420.0
DAM NO. 22 POOL 459.5
MAY 1965
MAY 1851
CANTON, MO. M. 342.2
DURHAM CREEK DIVERSION CANAL M. 339.3
BURLINGTON NORTHERN R.R. BRIDGE M. 328.0
DAM NO. 21 M. 328.4
FABIUS RIVER DIVERSION M. 323.5
NORTH RIVER M. 321.1
MILL CREEK M. 318.4



DIVISION	DATE	DESCRIPTION	BY

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

DESIGN BY GEH
TRACED BY
CHECKED BY JMS
SUBMITTED
APPROVED
Chief Engineering Division
DATE

UPPER MISSISSIPPI RIVER
STANDARD FLOOD PROFILES
ROCK ISLAND DISTRICT

5, 10, 50, 100, 200, & 500 YEAR FLOOD

RIVER MILES 301.2 TO 343.2

DRAWING NO NCR - 6/6

PLATE A-4

SNY ISLAND L&DD PUMP STA NO.1

RATINGS BIG CUTOFF

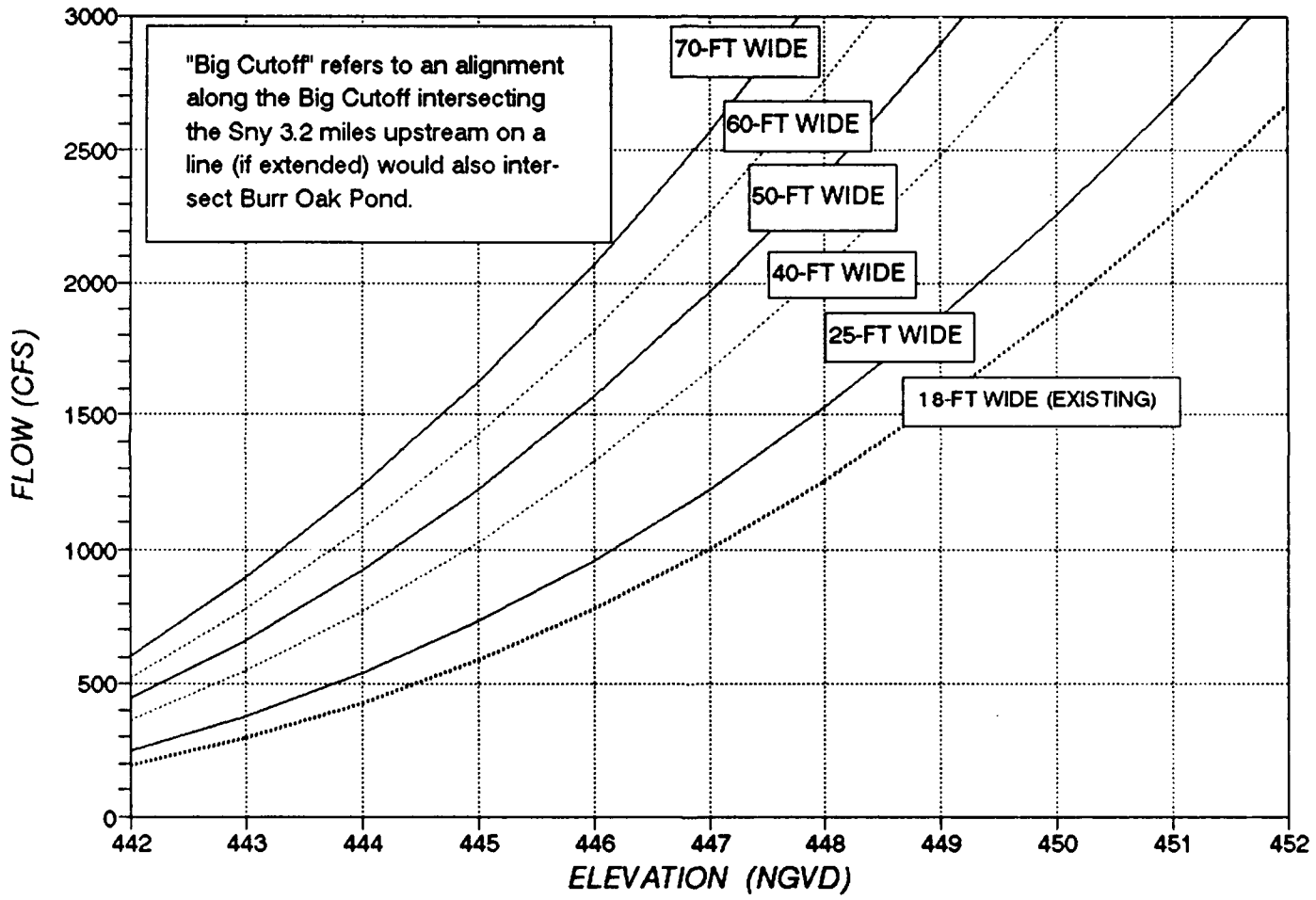
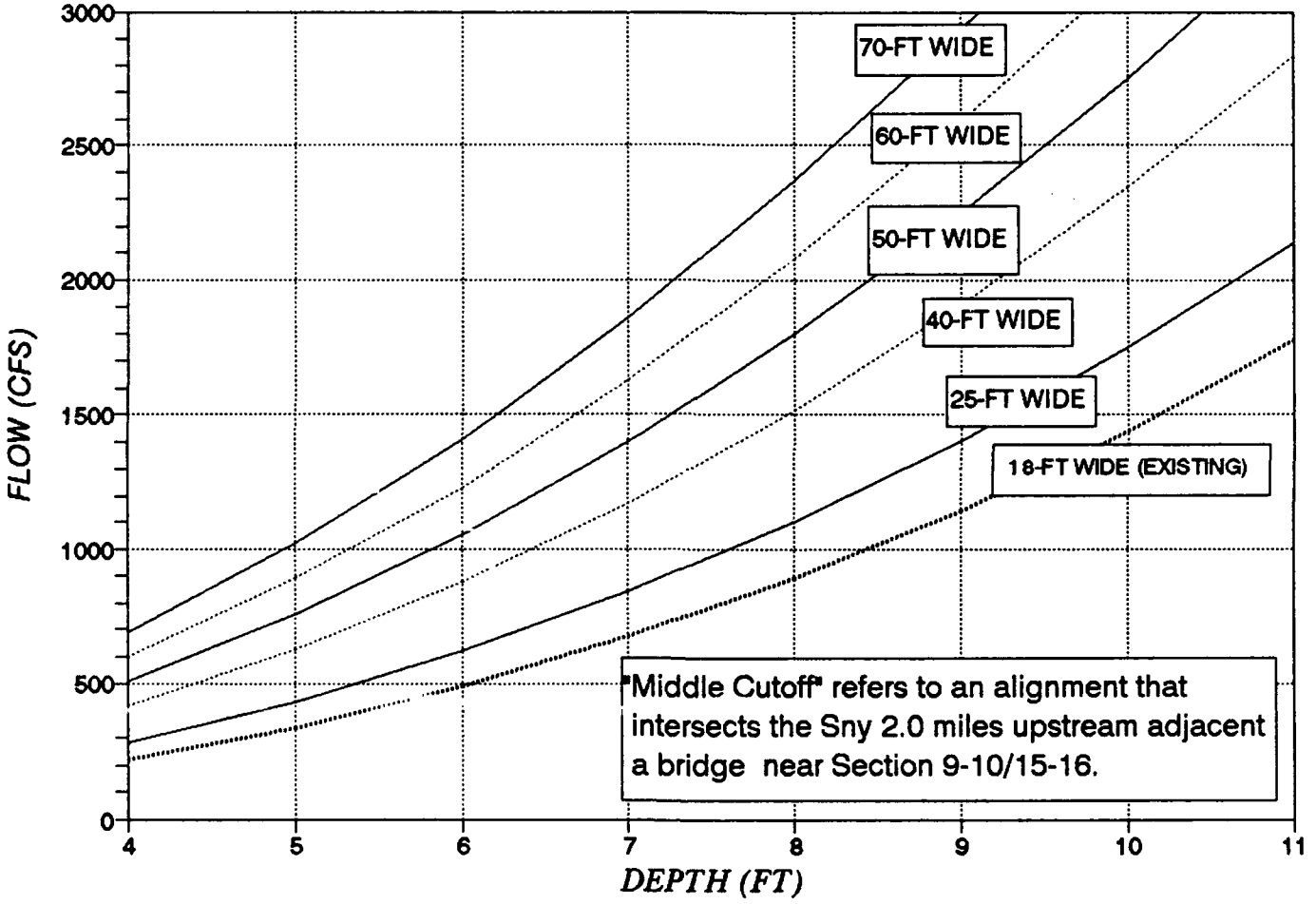


PLATE A-

10-13-90

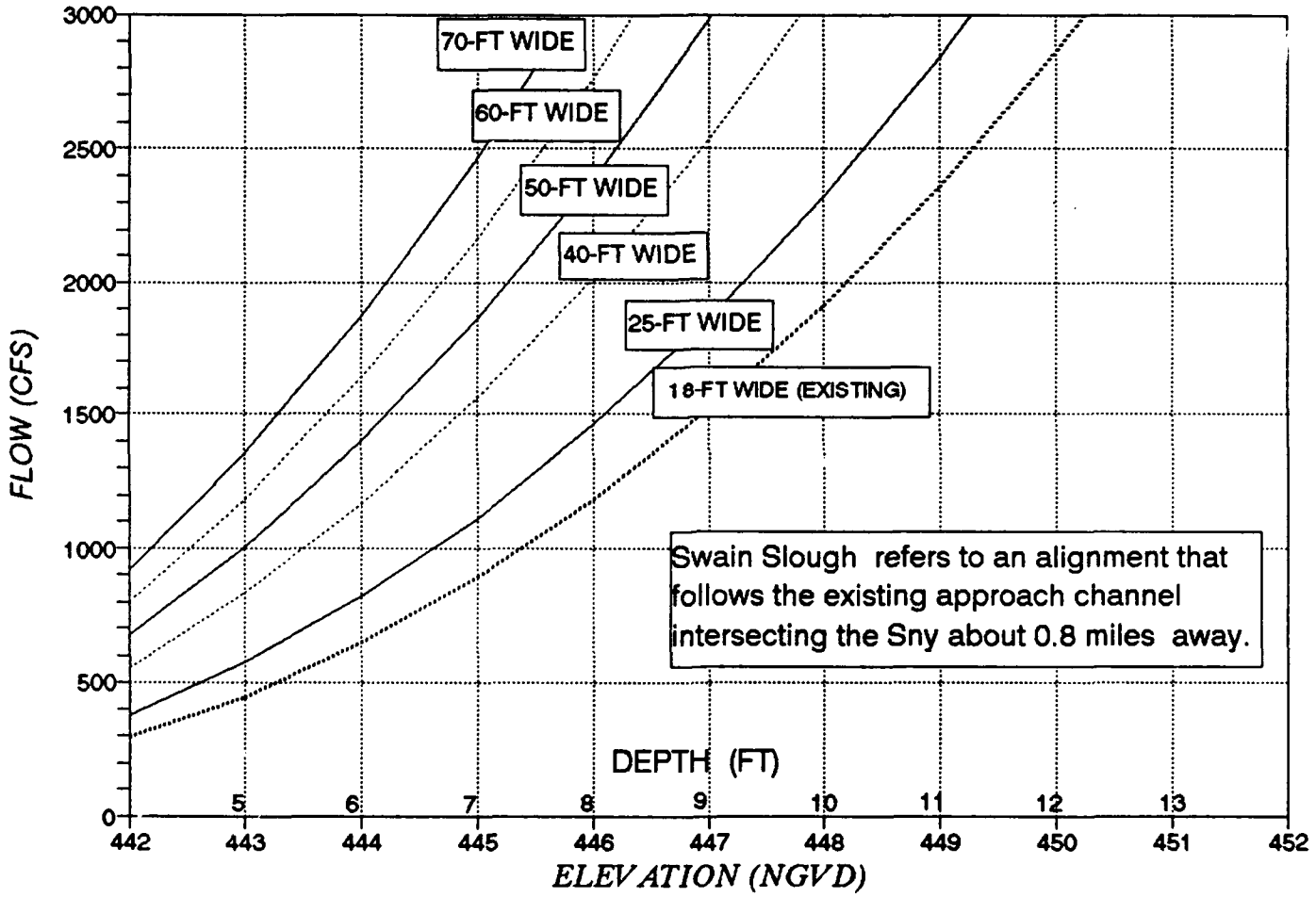
SNY ISLAND L&DD PUMP STA NO.1
RATINGS "MIDDLE CUTOFF"



10-13-90

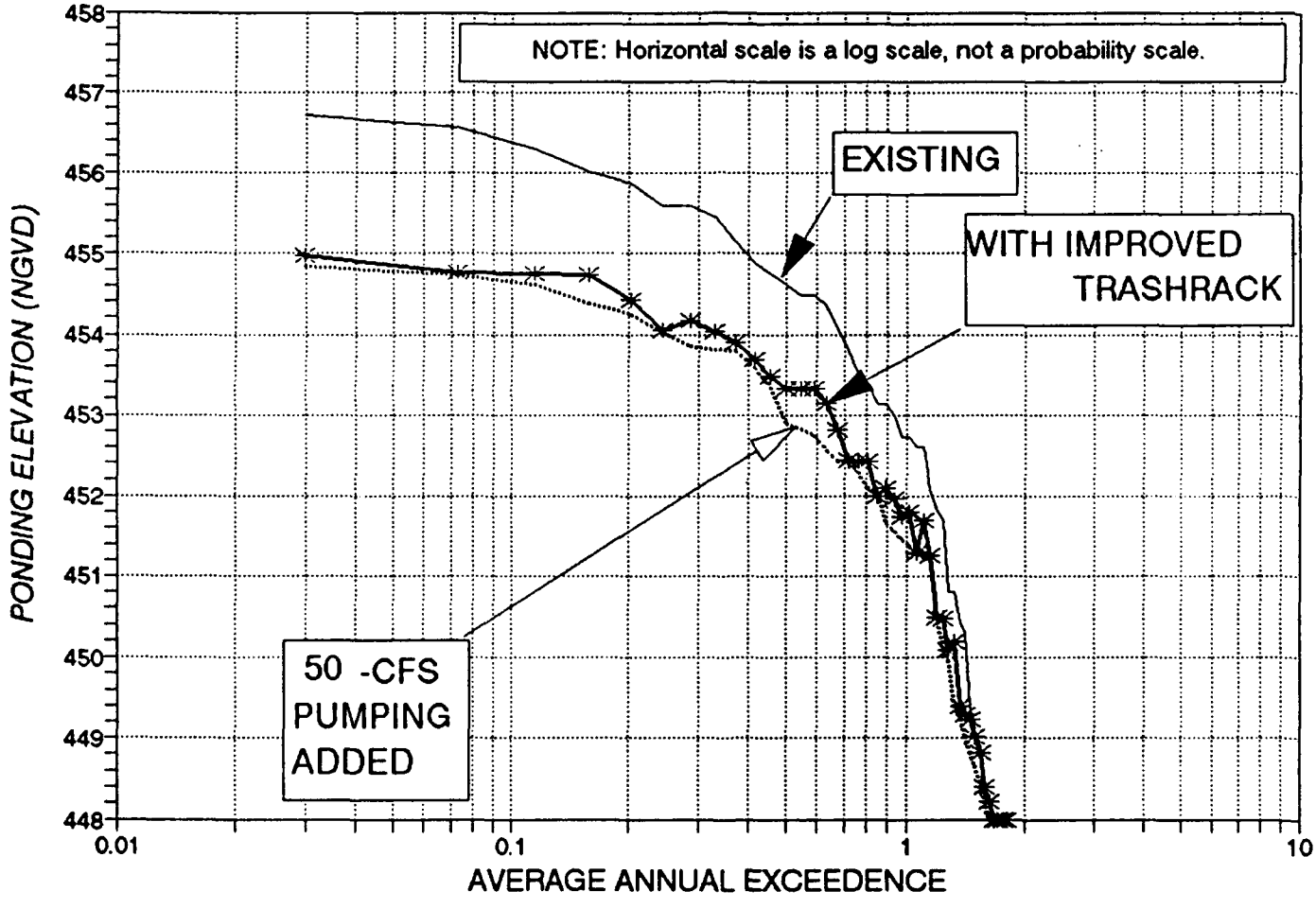
SNY ISLAND L&DD PUMP STA NO.1

RATINGS SWAIN SLOUGH APPROACH

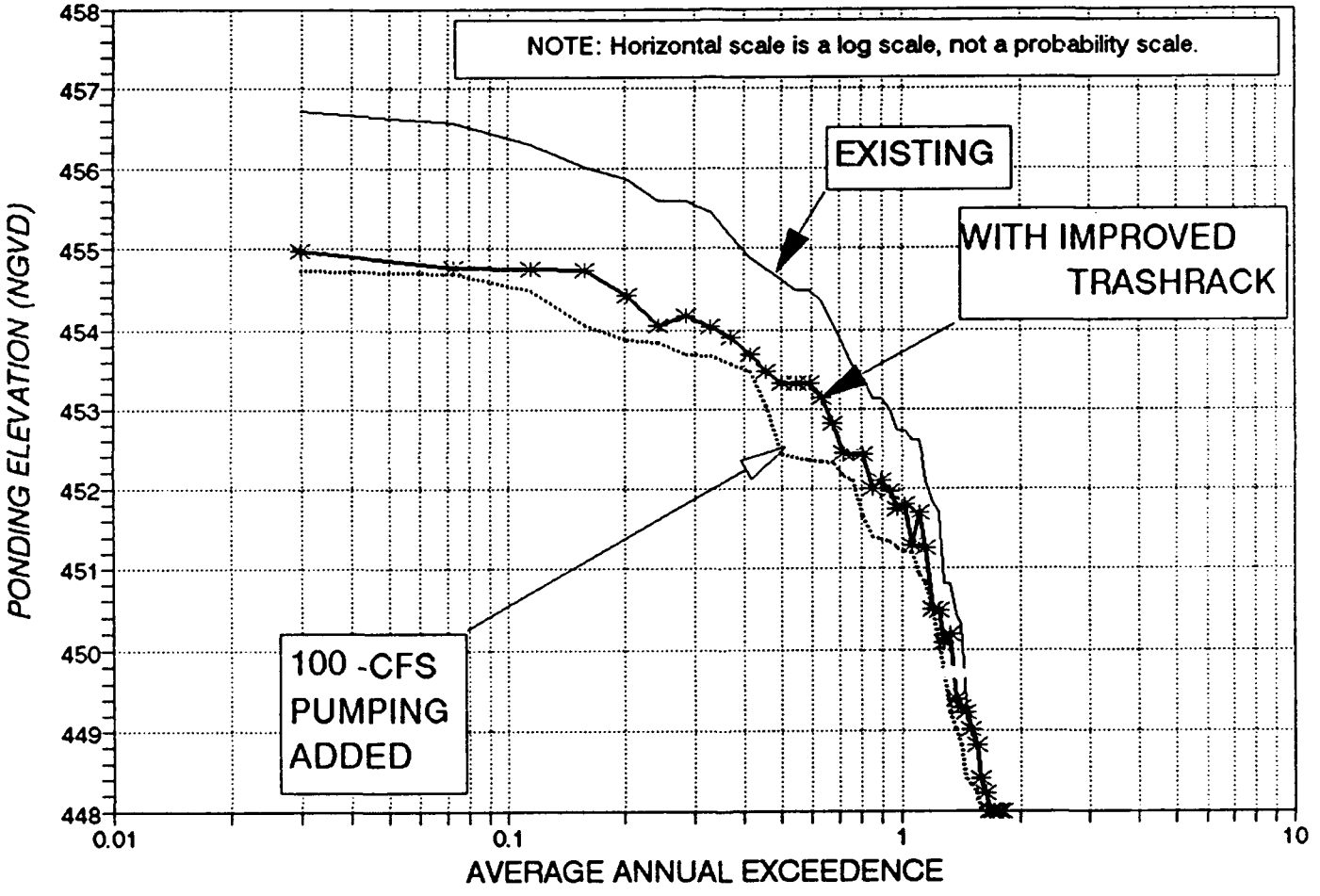


10-13-90

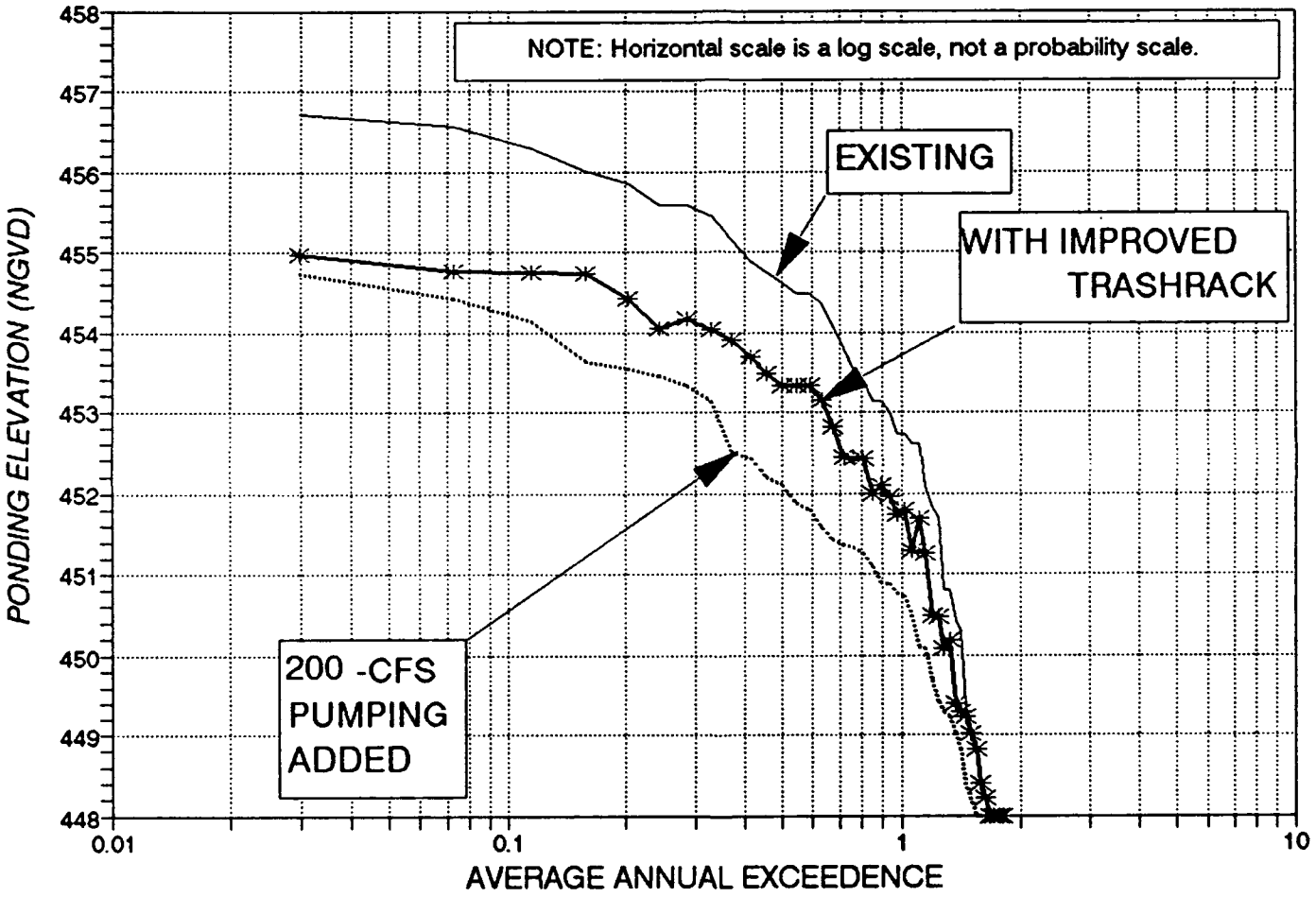
SNY L&DD AREA 1
PONDING FREQUENCY



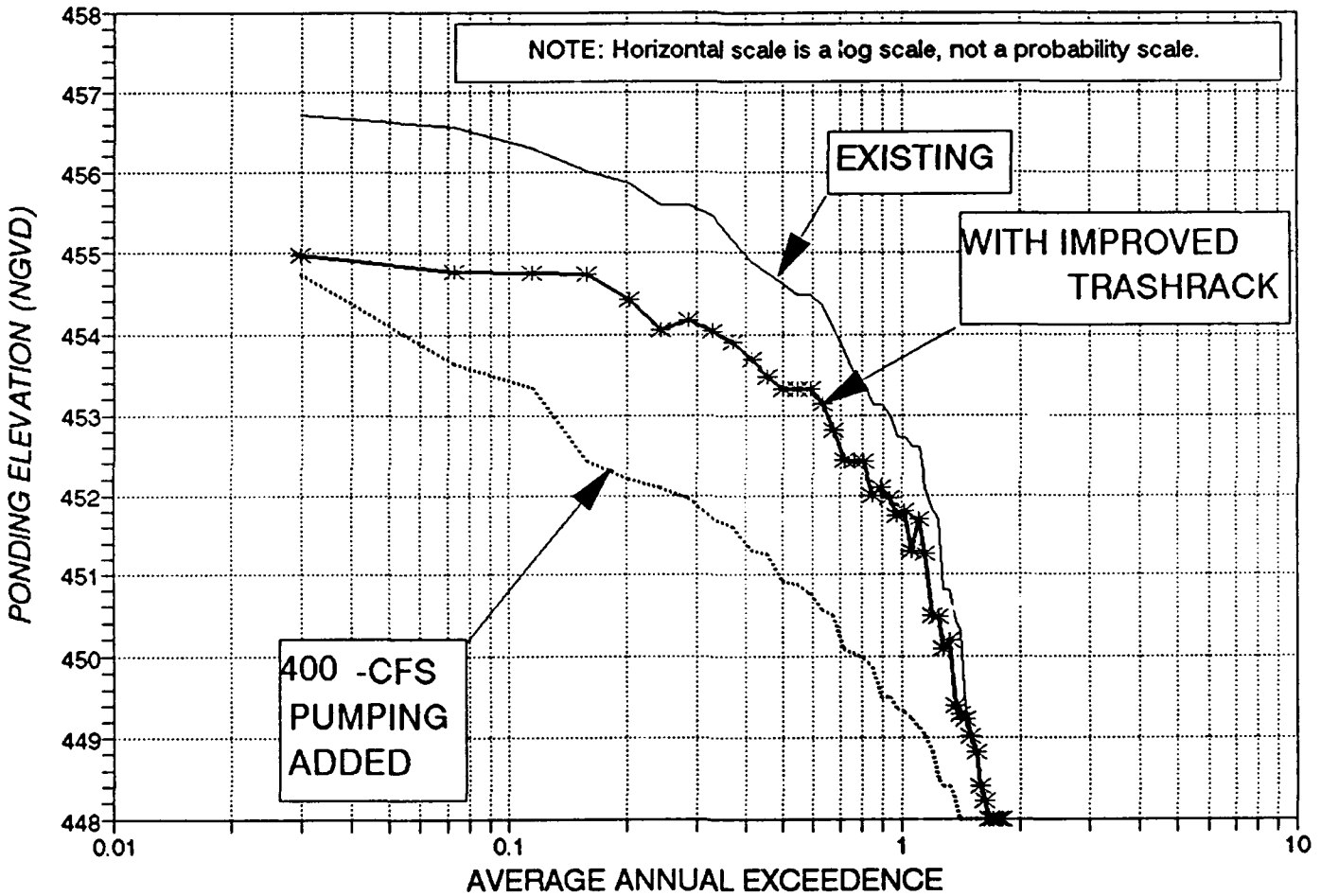
SNY L&DD AREA 1
PONDING FREQUENCY



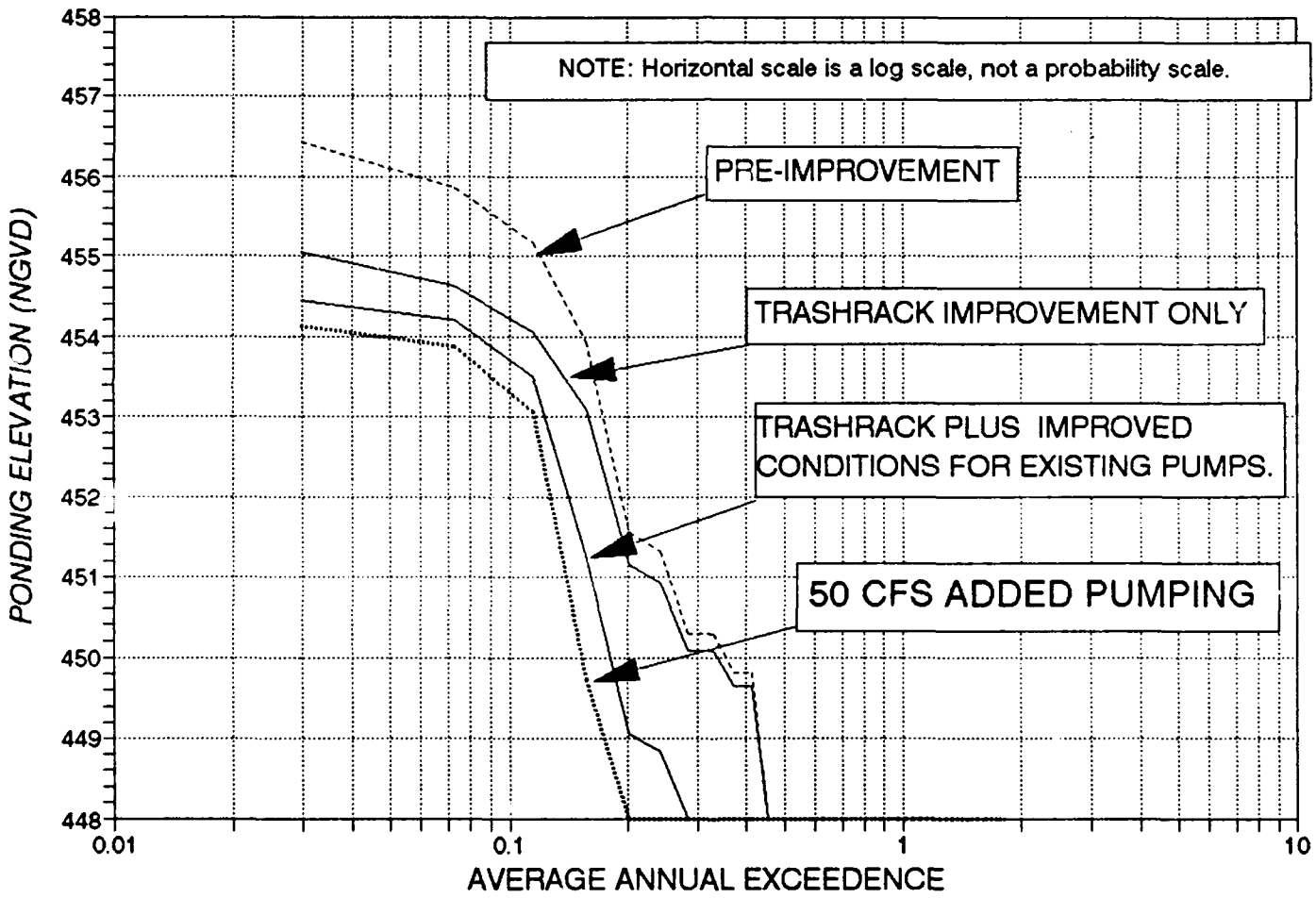
SNY L&DD AREA 1
PONDING FREQUENCY



SNY L&DD AREA 1
PONDING FREQUENCY

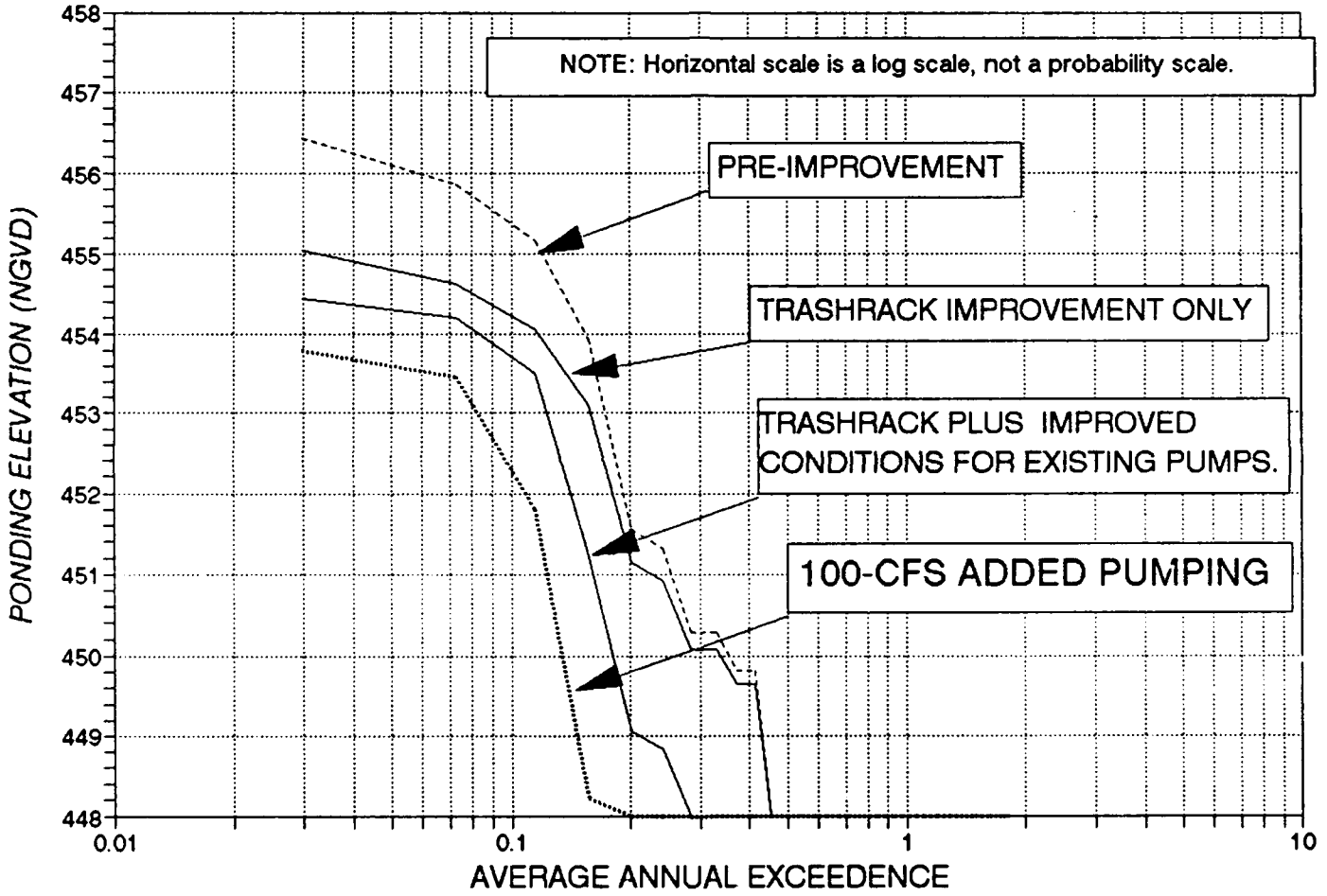


SNY L&DD AREA 1
PONDING FREQUENCY--AG DAMAGES ONLY *



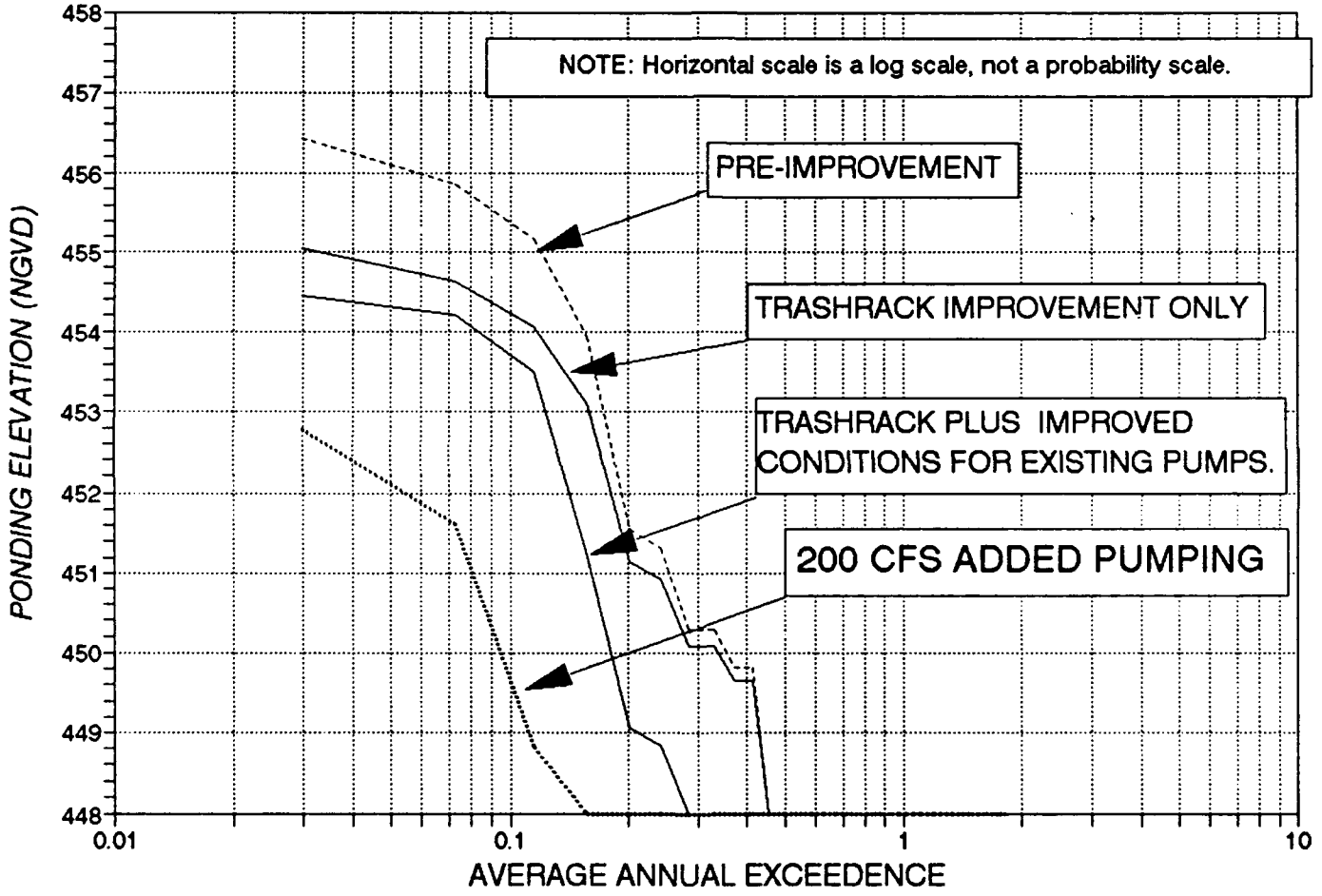
* DRAWDOWN IS MEASURED FROM MIDPOINT OF RISING LIMB OF STAGE HYDROGRAPH.

SNY L&DD AREA 1
PONDING FREQUENCY--AG DAMAGES ONLY *



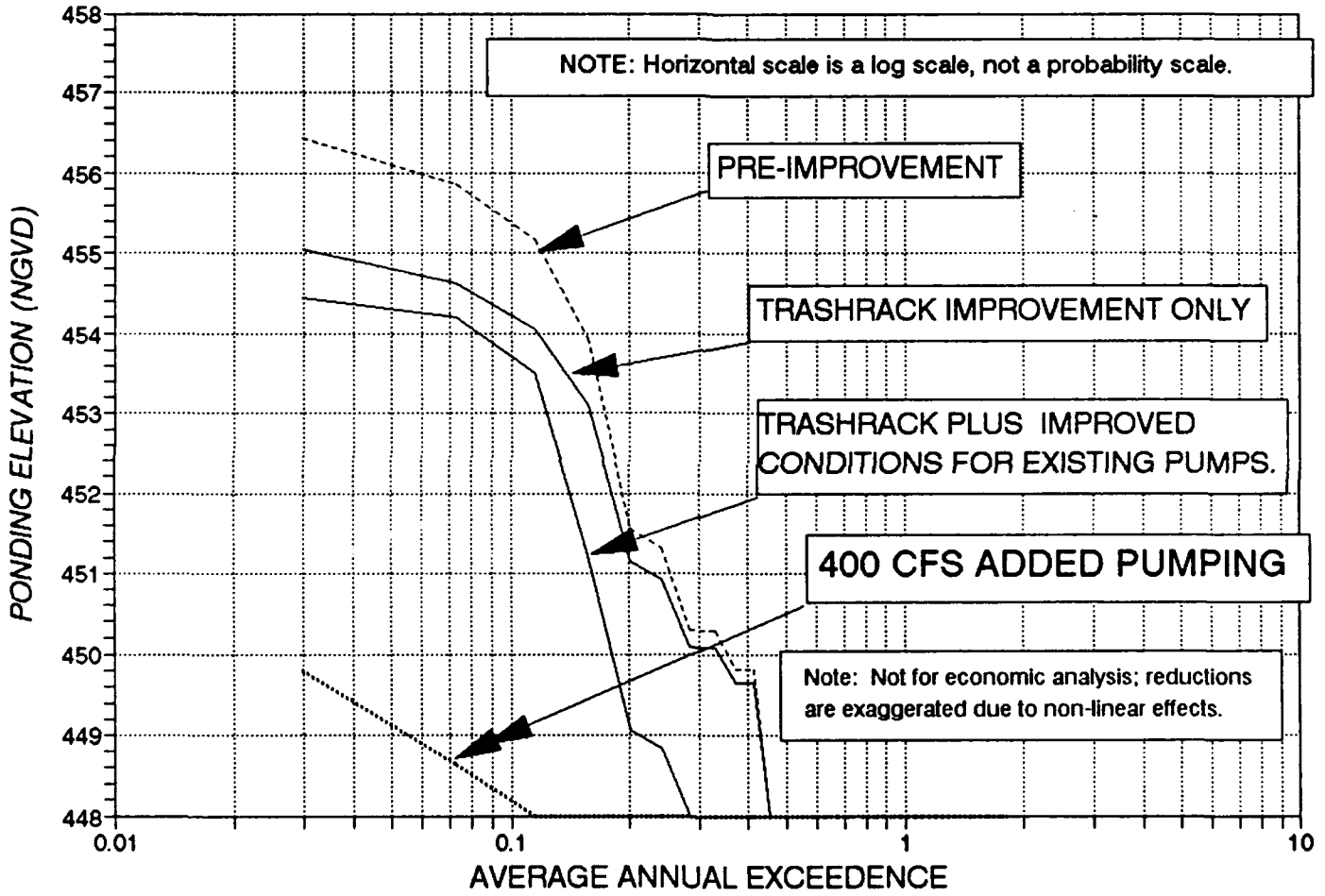
* DRAWDOWN IS MEASURED FROM MIDPOINT OF RISING LIMB OF STAGE HYDROGRAPH.

SNY L&DD AREA 1
PONDING FREQUENCY--AG DAMAGES ONLY *



* DRAWDOWN IS MEASURED FROM MIDPOINT OF RISING LIMB OF STAGE HYDROGRAPH.

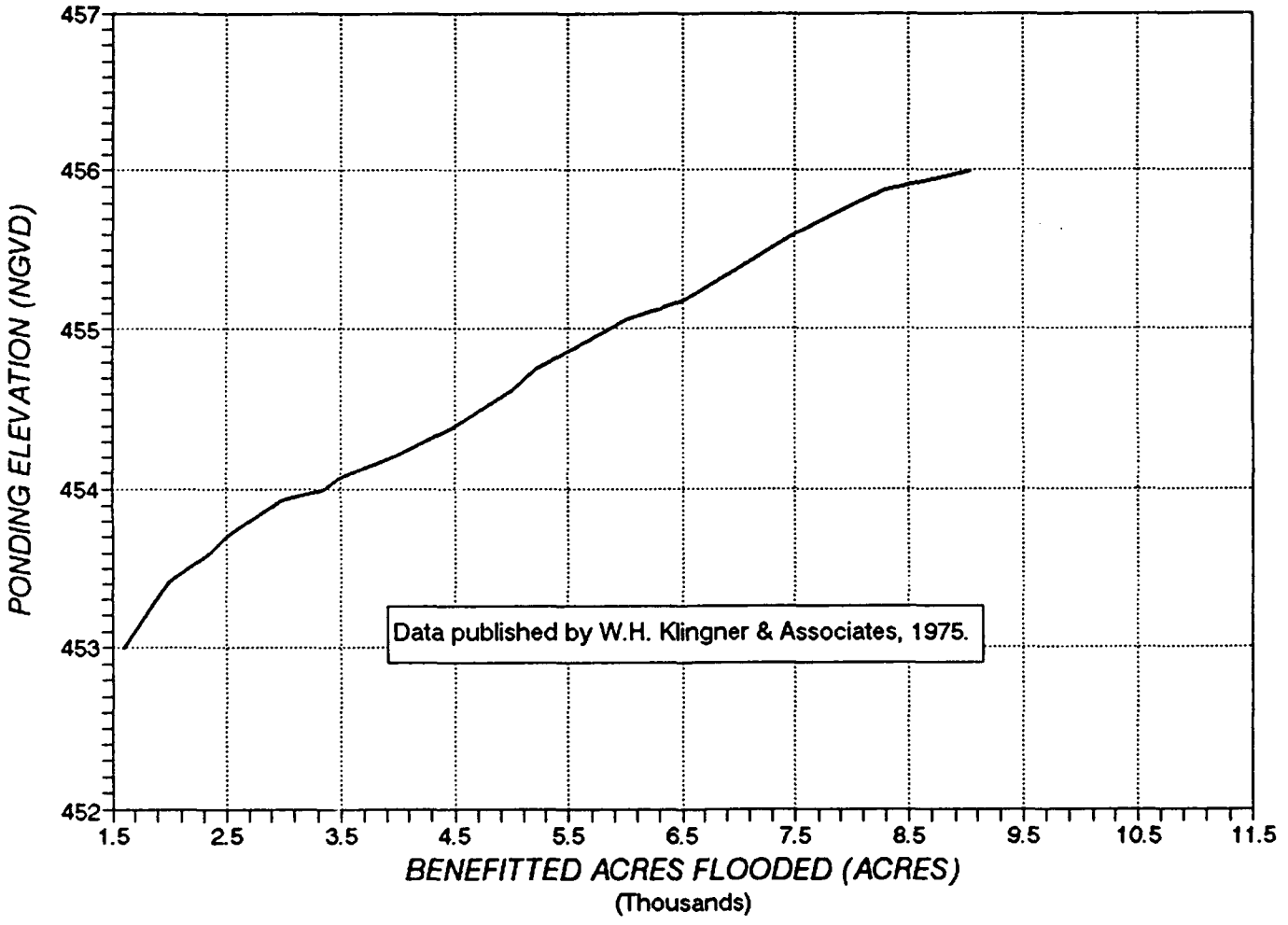
SNY L&DD AREA 1
PONDING FREQUENCY--AG DAMAGES ONLY *



* DRAWDOWN IS MEASURED FROM MIDPOINT OF RISING LIMB OF STAGE HYDROGRAPH.

SNY ISLAND L&DD PUMP STATION NO. 1

PONDING VS BENEFITTED ACRES FLOODED



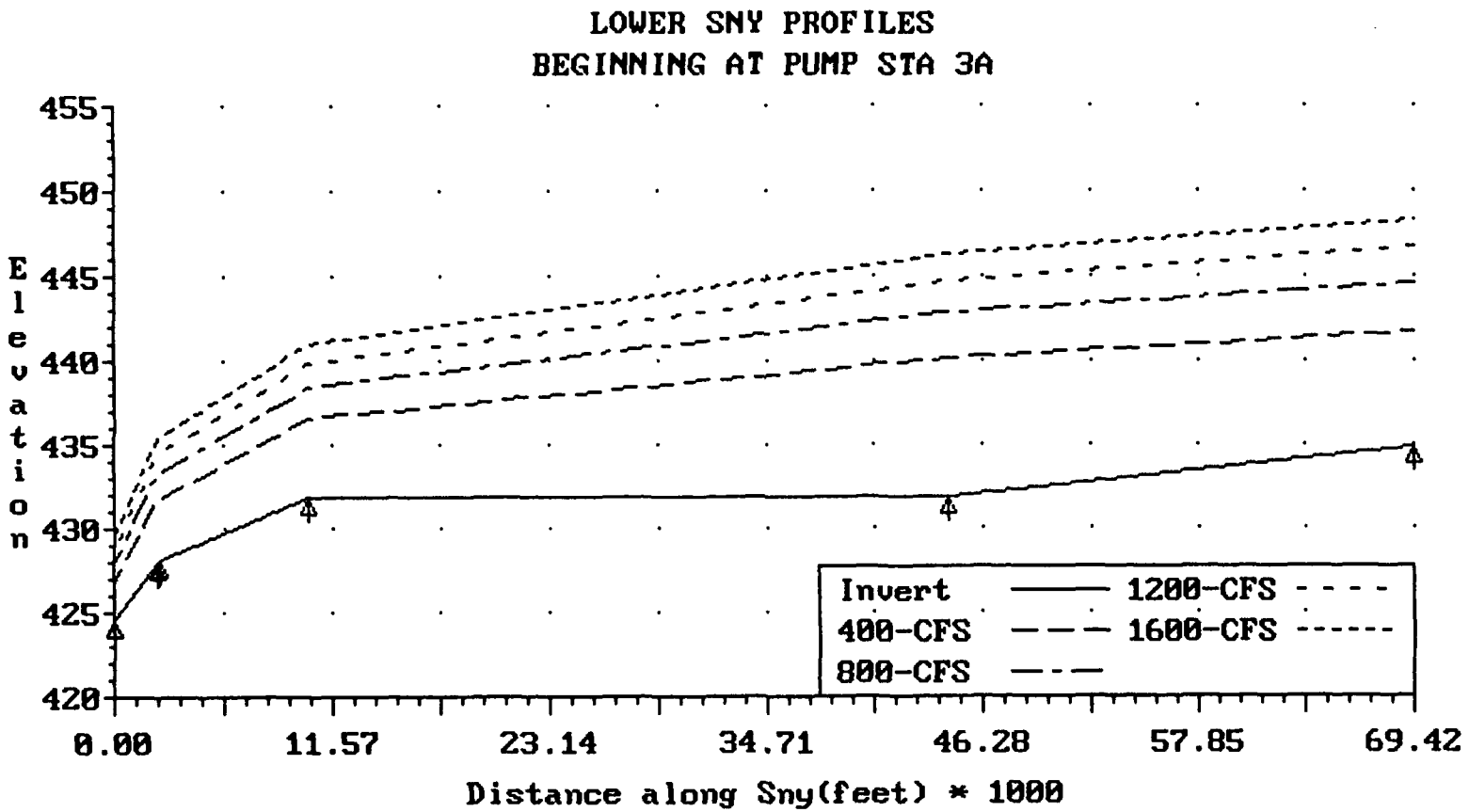

LOWER SNY PROFILES
BEGINNING AT PUMP STA 3A
Elevation
455
450
445
440
435
430
425
420
0.00
11.57
23.14
34.71
46.28
57.85
69.42
Distance along Sny(feet) * 1000
Invert
400-CFS
800-CFS
1200-CFS
1600-CFS

PLATE A-17

SNY AREA 3A

ELEVATION--FREQUENCY

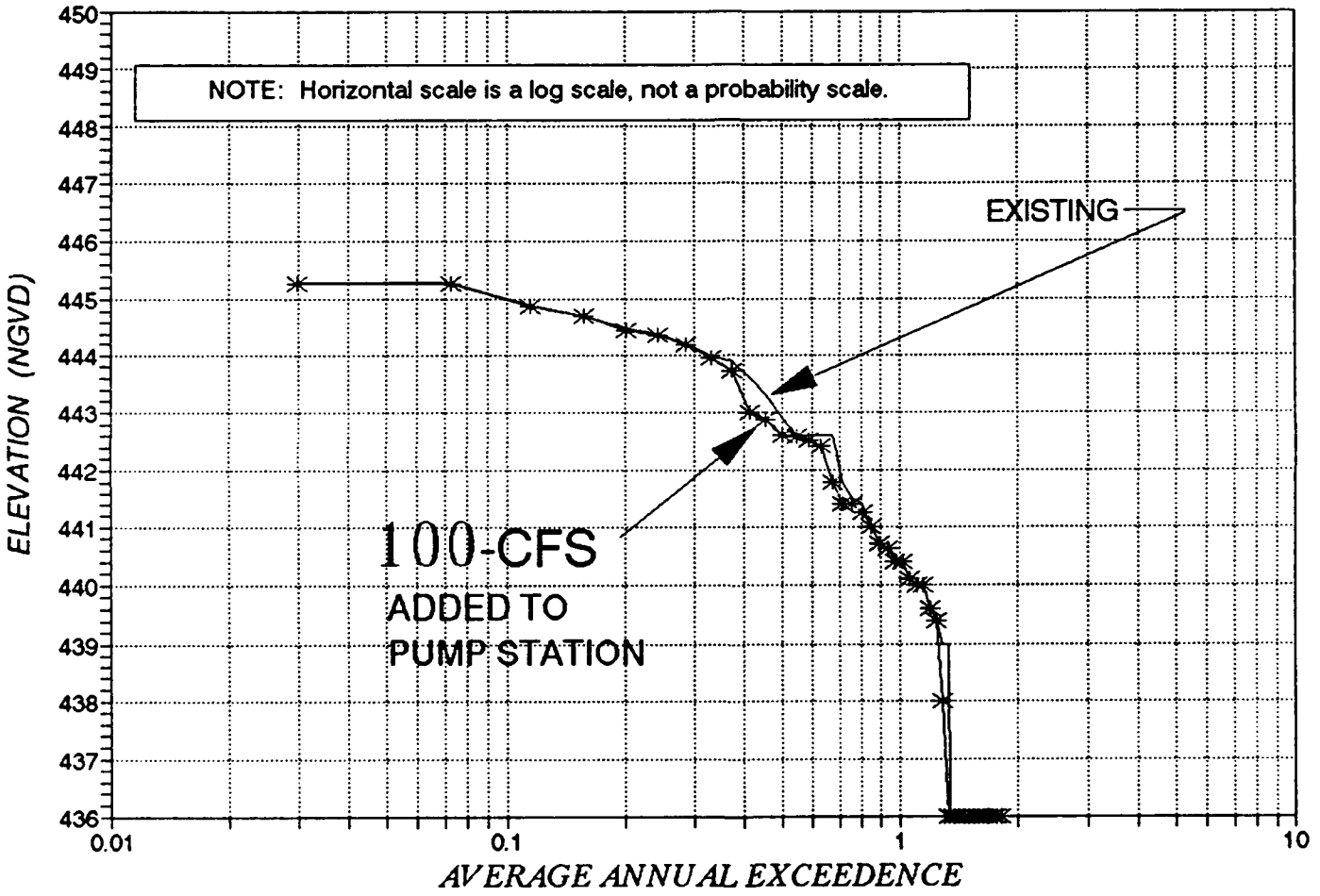
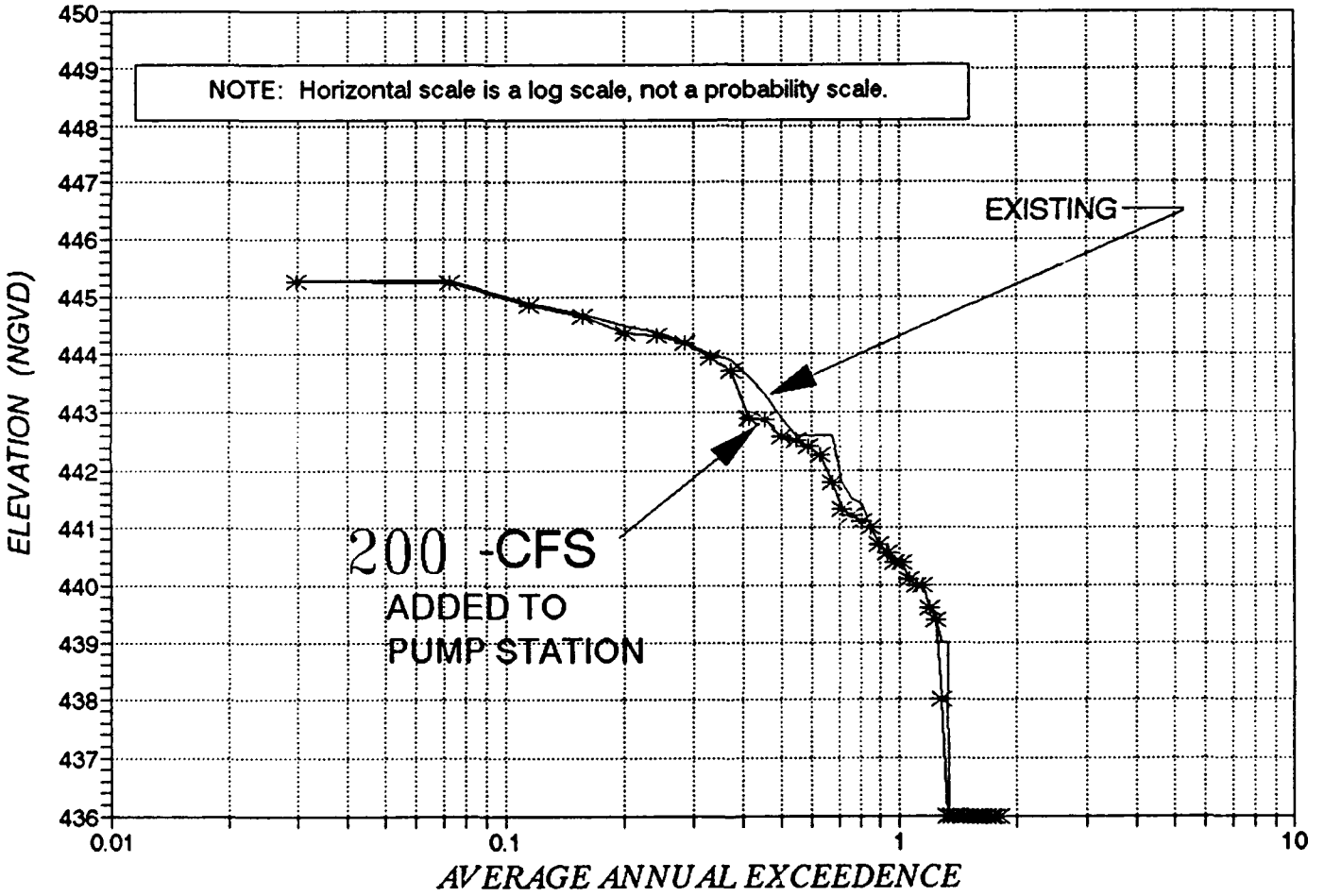


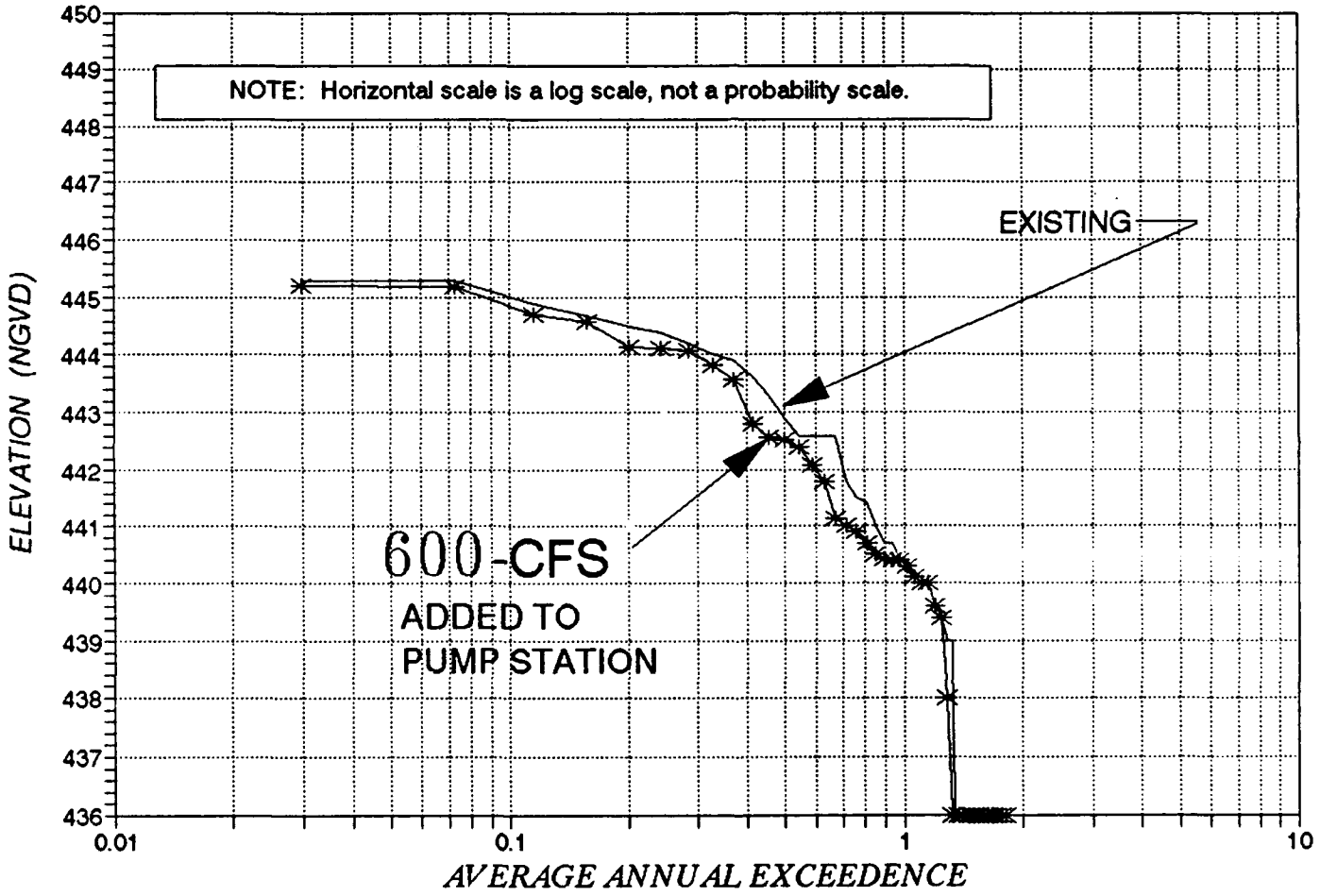
PLATE A-18

SNY AREA 3A
ELEVATION--FREQUENCY



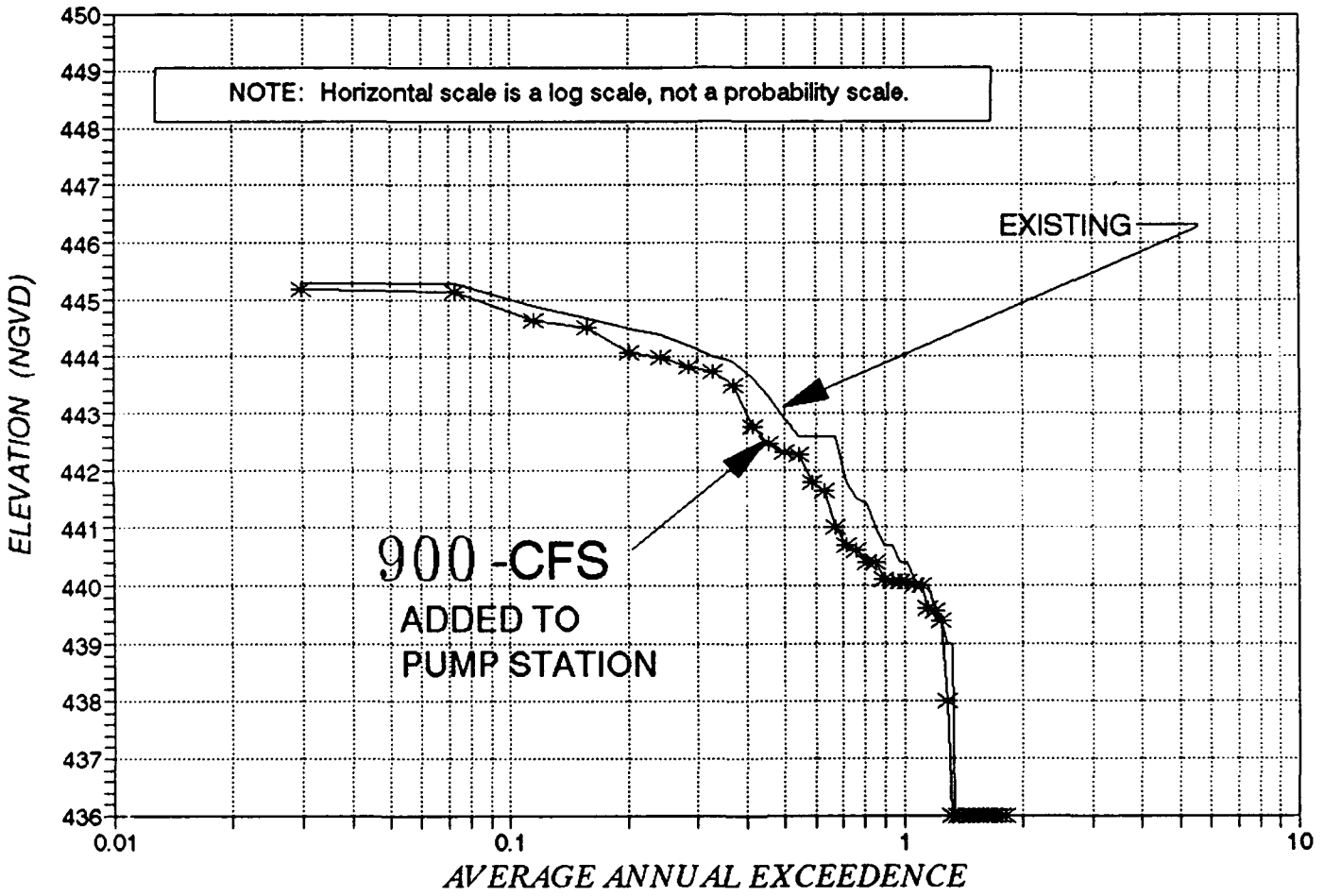
SNY AREA 3A

ELEVATION--FREQUENCY



11-28-90

SNY AREA 3A
ELEVATION--FREQUENCY



11-28-90

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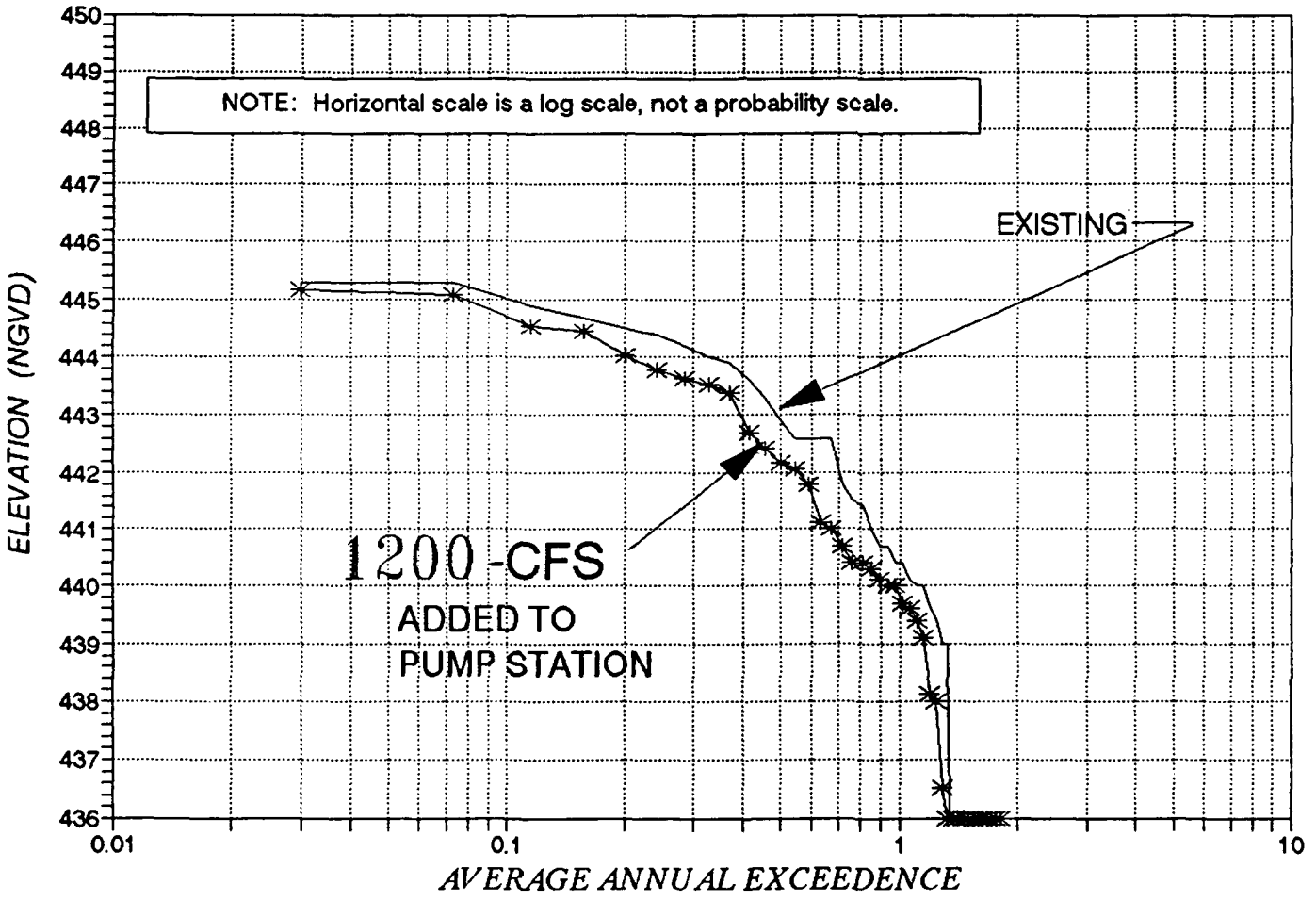
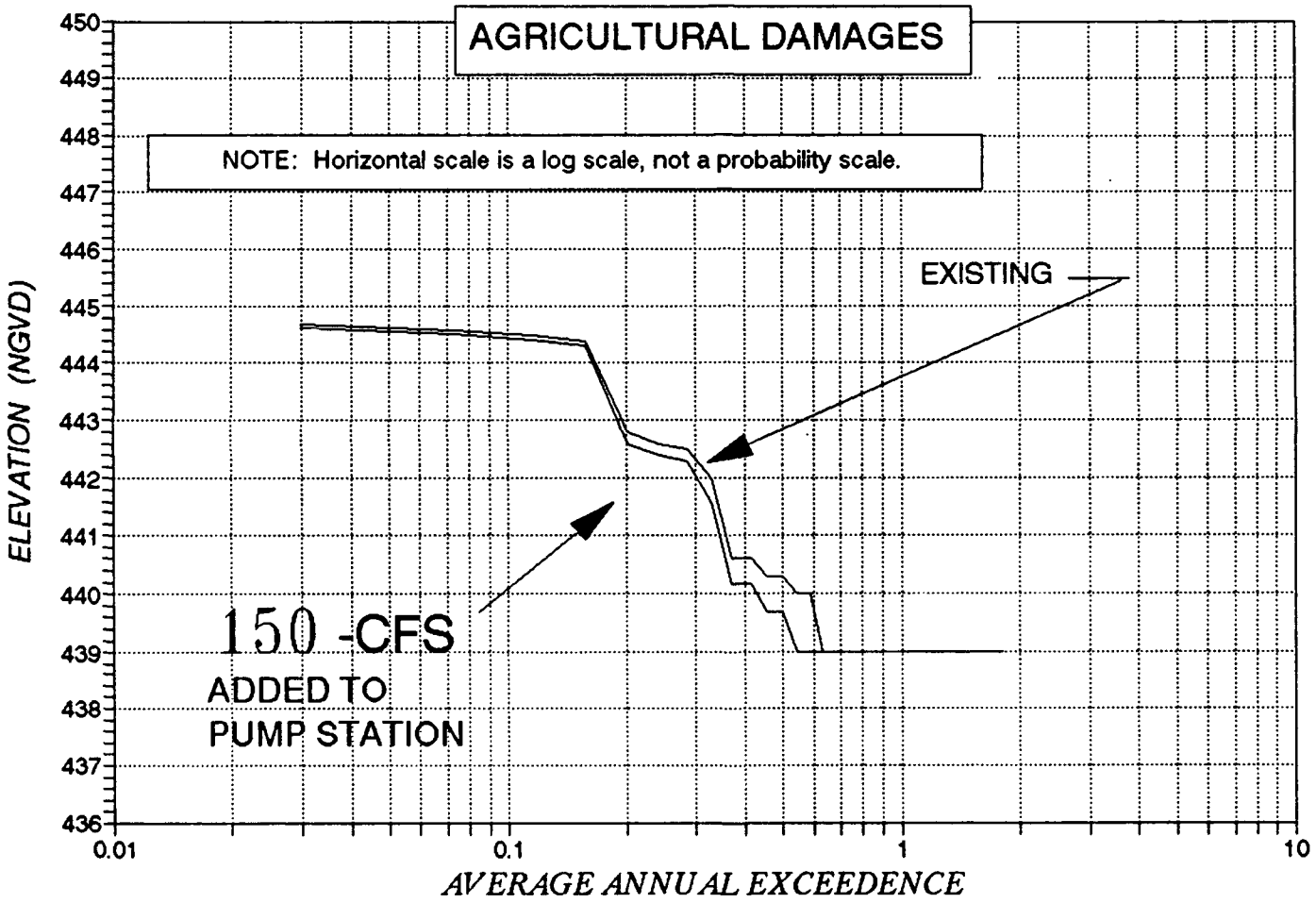
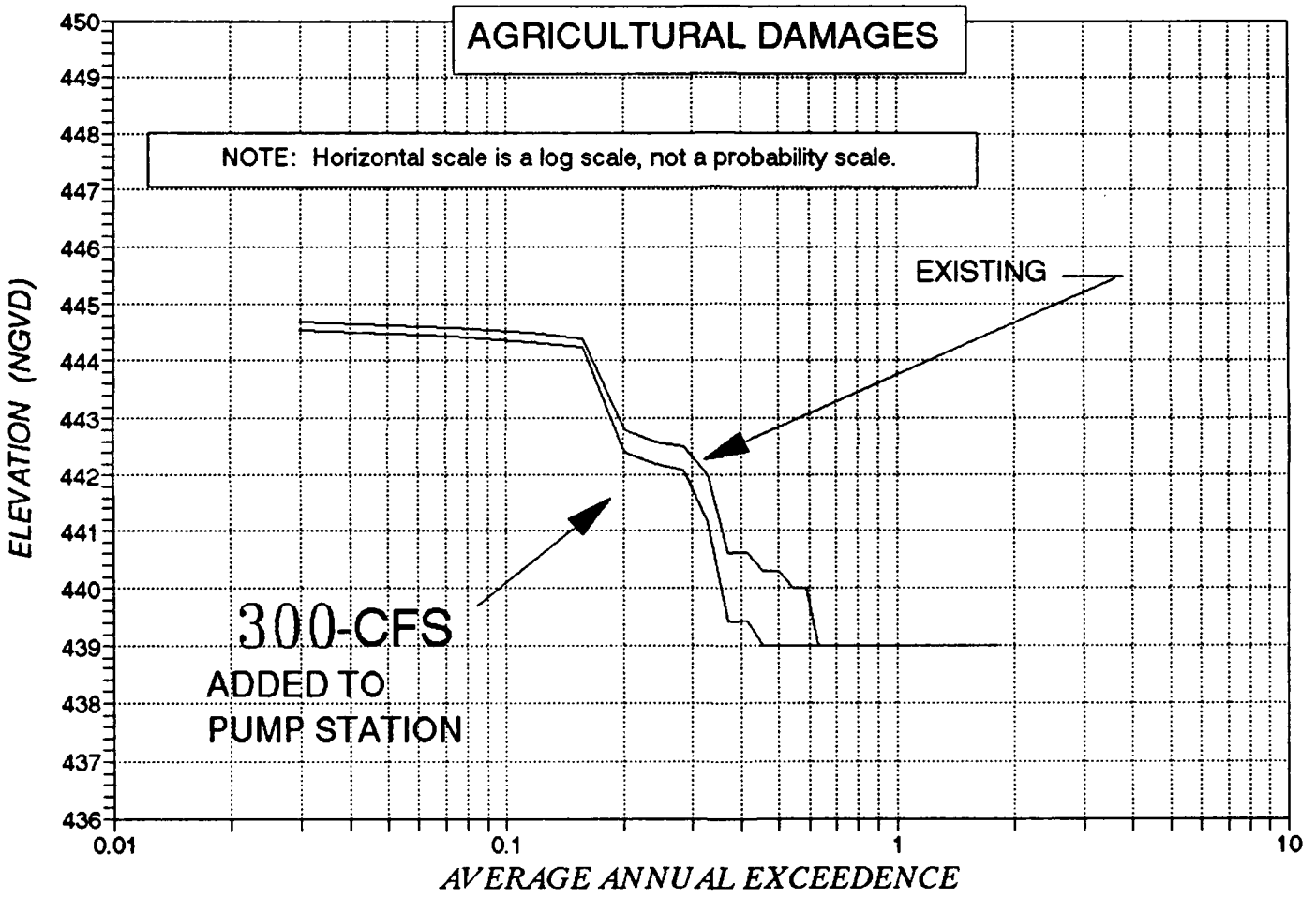
ELEVATION--FREQUENCY



SNY AREA 3A
ELEVATION--FREQUENCY



SNY AREA 3A
ELEVATION--FREQUENCY



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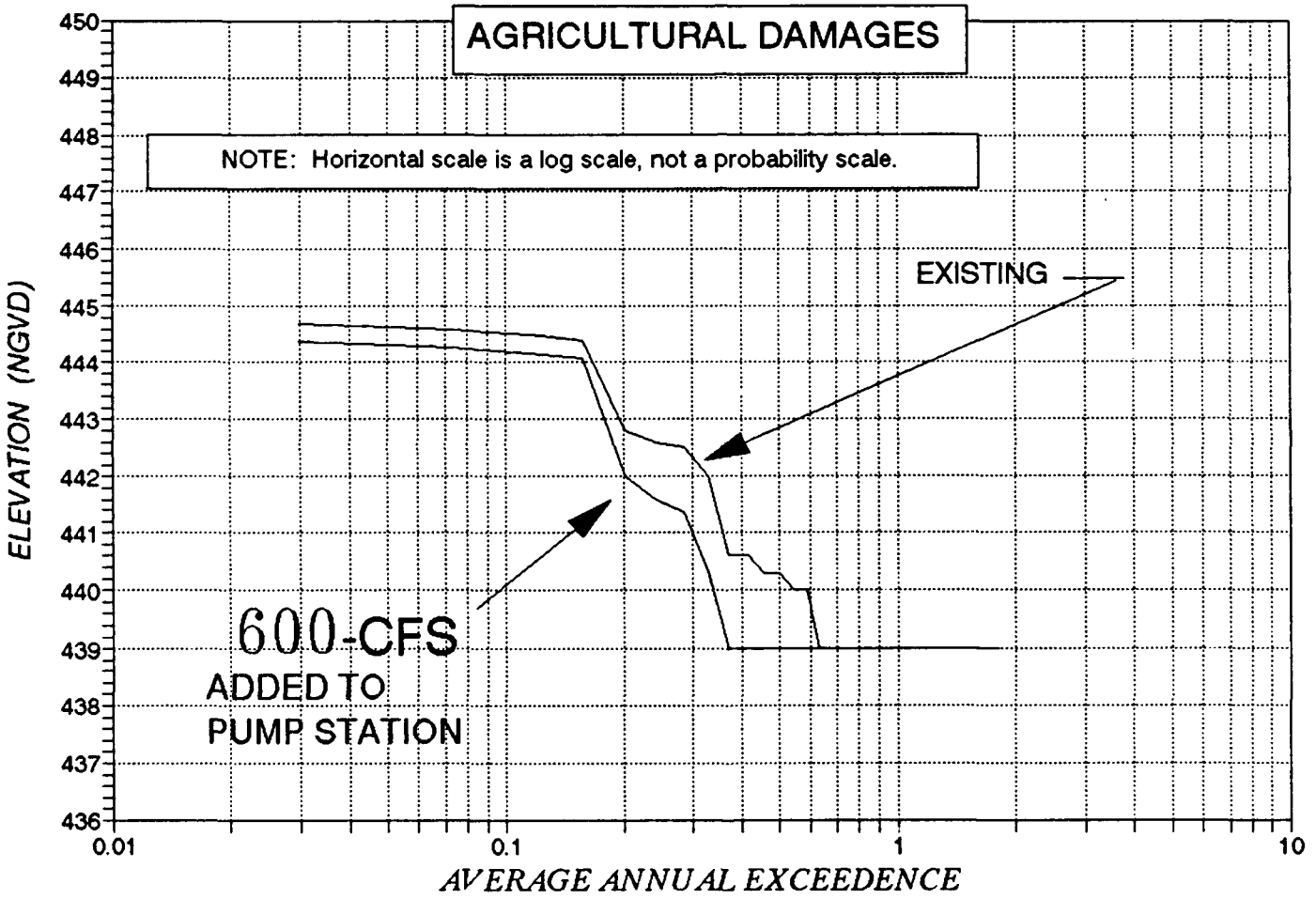
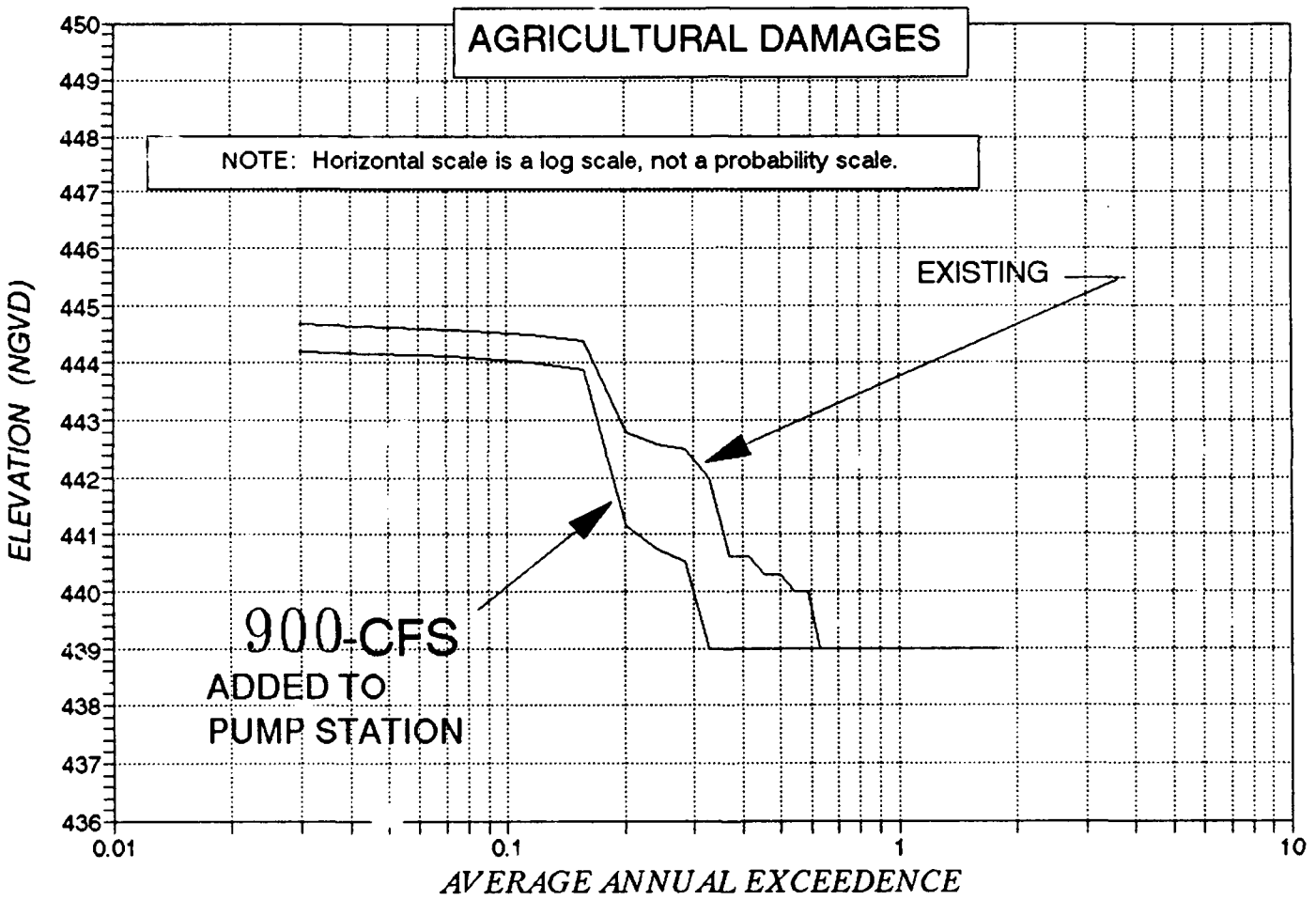
ELEVATION--FREQUENCY



SNY AREA 3A
ELEVATION--FREQUENCY



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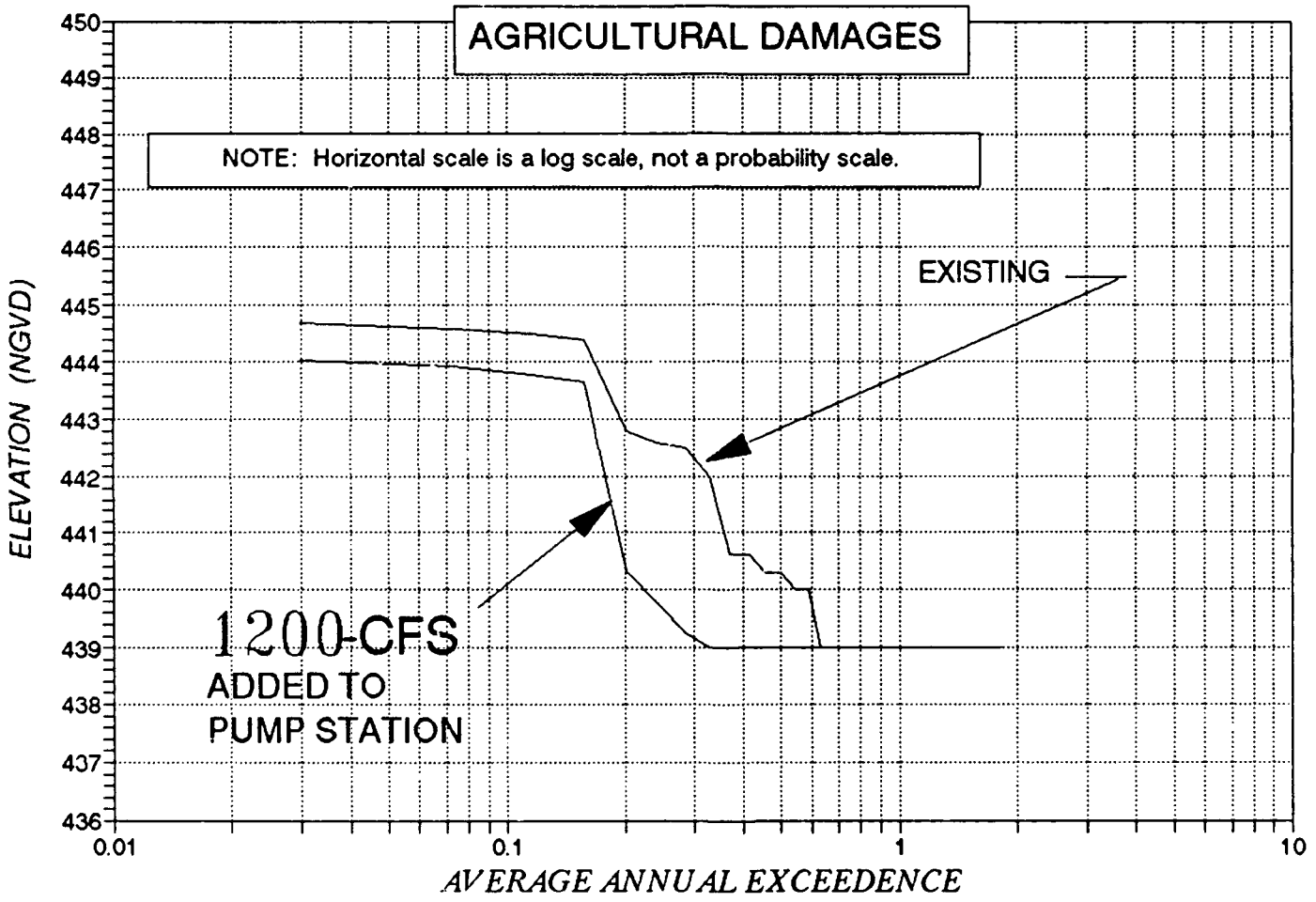
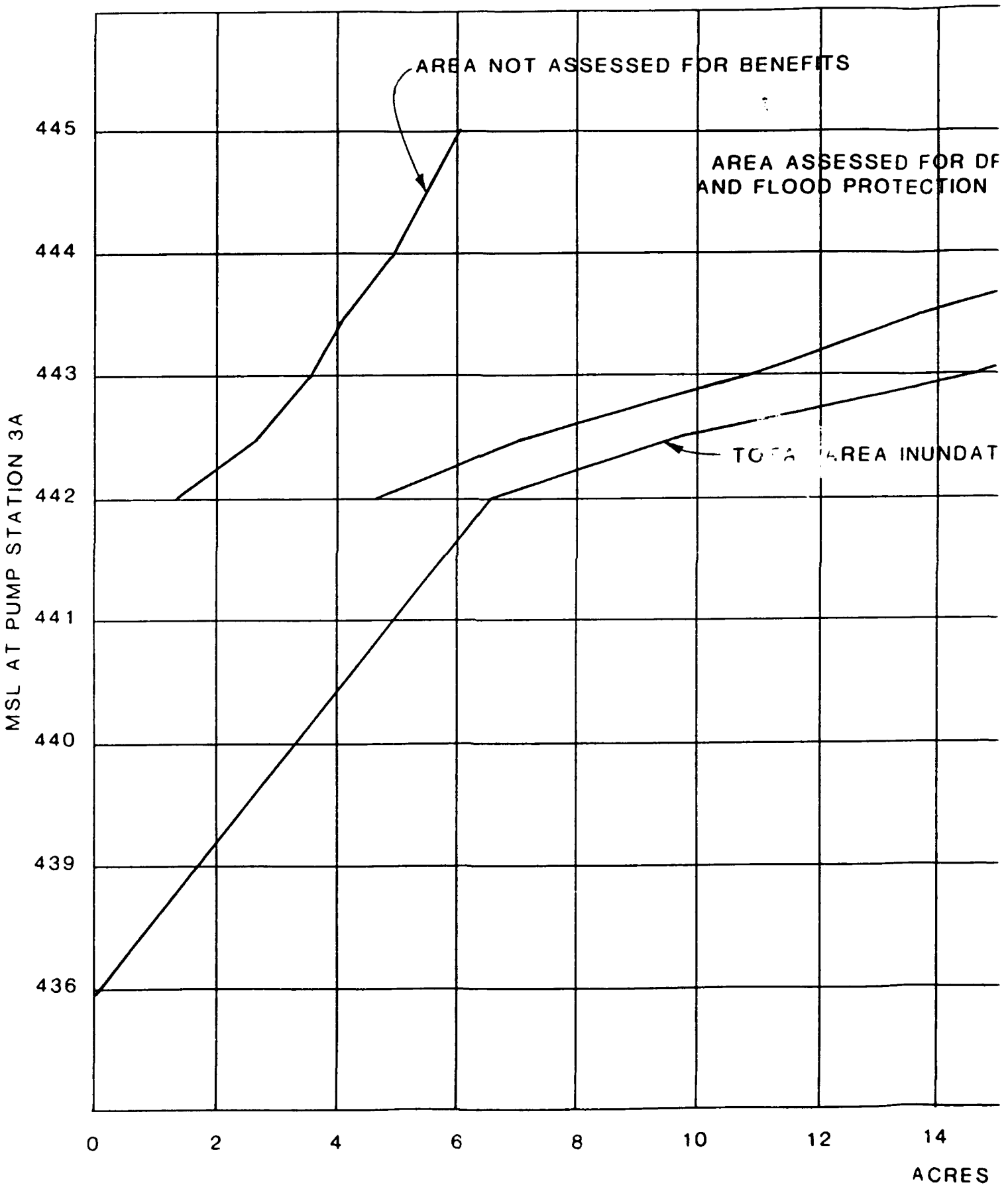
ELEVATION--FREQUENCY

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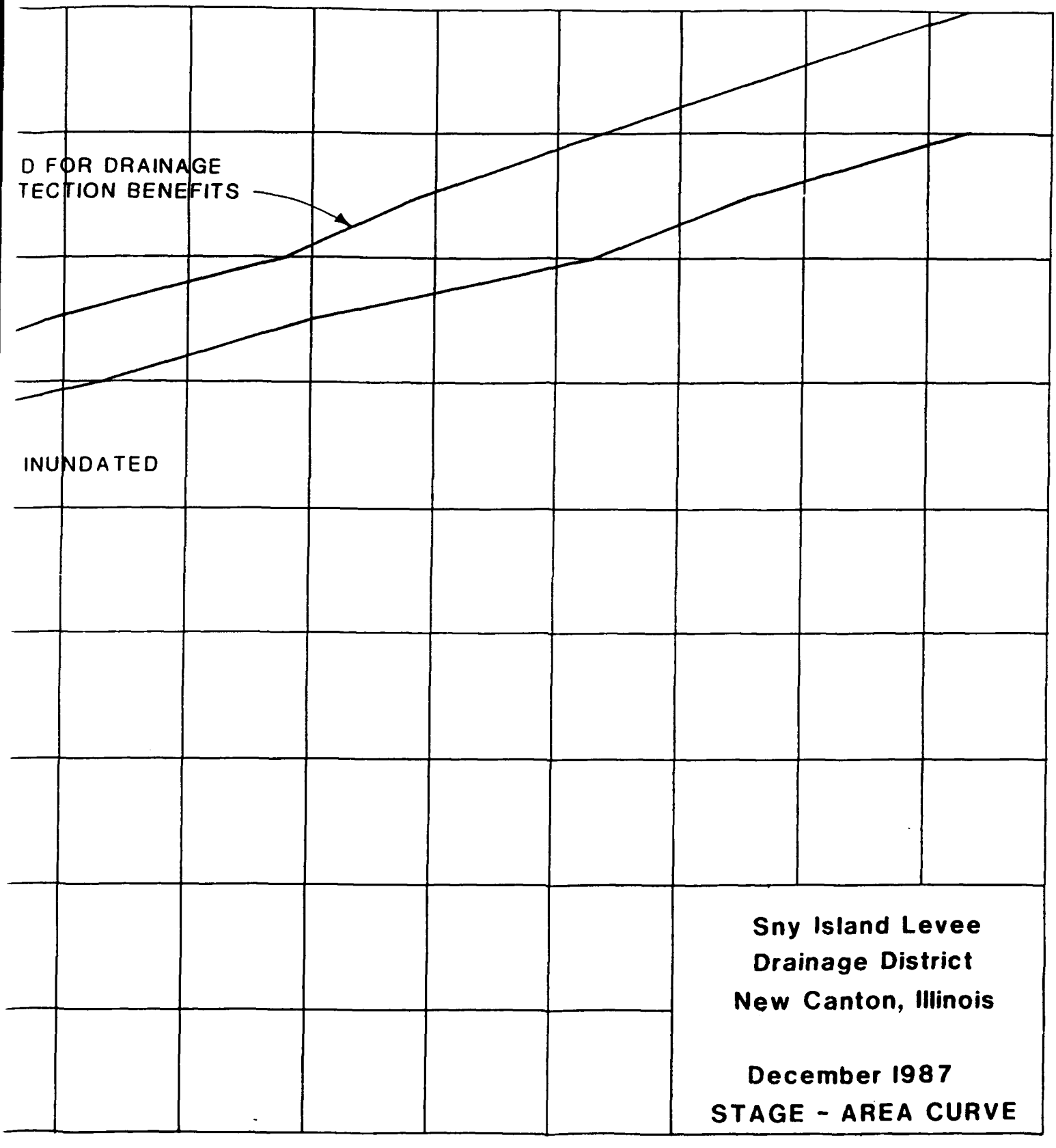
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Drainage District
New Canton, Illinois
December 1987
STAGE - AREA CURVE
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ACRES (1000)

PLATE A-28

APPENDIX B

ECONOMIC AND SOCIAL ANALYSIS

RECONNAISSANCE REPORT
FOR
SECTION 205 FLOOD DAMAGE REDUCTION STUDY

THE SNY ISLAND LEVEE DRAINAGE DISTRICT
ADAMS, PIKE, AND CALHOUN COUNTIES, ILLINOIS

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APPENDIX B
ECONOMIC AND SOCIAL ANALYSIS

SECTION 1 - INTRODUCTION

PURPOSE

This appendix describes the economic and social analysis for providing interior drainage damage reduction measures for the Sny Island Levee Drainage District (SILDD) located along the Mississippi River in western Illinois.

Throughout this analysis, price levels are stated as of June 1991, with the Federal discount rate of 8-3/4 percent for water resource projects being used to amortize costs and to discount benefits to a common period of time.

SECTION 2 - STUDY AREA CHARACTERISTICS

GENERAL

The SILDD is centrally located on the western border of Illinois, along the east bank of the Mississippi River, in Adams, Pike, and Calhoun Counties. The Sny Drainage District comprises a long, narrow strip of Mississippi River bottomland, consisting of over 110,000 acres of land. The study project area encompasses the two areas served by Pumping Station No. 1 and Pumping Station No. 3A (see plate B-1).

SOCIOECONOMIC CONDITIONS

Communities located within the SILDD are New Canton, Shephard, Hull, Fall Creek, East Hannibal, and Pittsfield, Illinois. The area is predominantly rural and is agriculturally oriented. The nearest industrial centers are Quincy, Illinois, and Hannibal, Missouri; both are within a 30-40 minute

drive of the center of the project area. Major highways traversing the area are Highways 96, 54, old Highway 36, and the new Highway 36 presently under construction.

Pike county's 1980 population was 18,896, with the largest concentration of its inhabitants in the city of Pittsfield (1985 pop. 3,862). The remaining population resides on farms and in small communities scattered throughout the county. Population and comparative population trends are shown in table B-1.

TABLE B-1

Population Trends

	Pop. 1970	Pop. 1980	Pop. 1985	Est. 1990
New Canton	486	420	N/A	405
Pittsfield	4,244	4,170	3,862	4,231
Quincy	45,288	42,554	55,440	55,870
Hannibal, MO	20,028	18,811	22,722	23,504
Pike County, Ill	19,185	18,896	18,219	17,577

Sources: State of Illinois, Bureau of The Budget, *Illinois Population Trends 1980 to 2025*; U.S. Bureau of the Census.

As shown in table B-2, employment in the study area is concentrated in agriculture, wholesale and retail trade, and manufacturing.

TABLE B-2

1985 Labor Force Data, Pike County

	Percent Distribution
Agriculture	30.6
Wholesale and Retail Trade	19.1
Manufacturing	15.5
Professional and Related Services	15.2
Finance, Insurance, Real Estate and Personal Services	6.4
Construction	5.6
All Other	6.3

Source: Claritas Corporation, RESIDE 1985, *The National Encyclopedia of Residential Zip Code Demography*.

STUDY AREA

The study area is defined as that area immediately or directly affected by the project. The study area includes land between Pumping Stations Nos. 1 and 3A, indicated on plate B-1 as Zones A through R of the SILDD. Ninety percent of the area served by Pumping Station No. 1 is within Pike County, and all of the area served by Pumping Station No. 3A is within Pike County. Located within this area are farmsteads with and without grain storage, rural residences, drainage ditches, and public roads. Estimated cropped acreage for the 1991 season is 10 percent wheat, 45 percent corn, and 45 percent soybeans.

SECTION 3 - FLOOD DAMAGE

EXISTING FLOOD PROTECTION

The SILDD is a federally constructed flood protection project which has been completed and operational since July 1967. The drainage district consists of three pumping stations, diversions for five upland streams, retarding/desilting reservoirs, and a closing levee to prevent Mississippi River backup in the lower reaches of the Sny. The project consists of peripheral levees, leveed diversions for major upland creeks, retarding reservoirs, and three pumping stations. A 10-year frequency design for interior drainage was used to size the pumps. Frequent and prolonged interior flooding has caused the drainage district to request further assistance to alleviate the interior flood damages.

HISTORIC FLOODING

Pumping Stations Nos. 1, 3A, and 4 are located on the Sny channel and were designed to handle inflow generated by a 24-hour, 10-year storm. Stations Nos. 1 and 3A each receive local runoff plus outflow from one major retarding reservoir and several smaller reservoirs. From 1967 through 1985, the original 10-year design elevation for interior flooding was exceeded 11 out of 21 years in the vicinity of Pumping Station No. 3A. At Pumping Station No. 3A, the maximum elevation reached affects and/or floods about 10 percent of the lowlands drained by the pump station. Average duration of flooding was approximately 7 days. Similar interior flooding is documented at Pumping Station No. 1.

METHODOLOGY

The economic analysis was performed in accordance with Public Law 89-80, Guidelines Sections III and IV.

The 1987 survey was updated in March 1990. The field inventory determined the ground and first floor elevations of all structures based on elevations from U.S. Geological Survey quad maps and contour maps of the area provided by the SILDD. Structural values were determined for farmstead, farm outbuildings, rural residences, and other properties in the study area. Ground and first floor elevations, structure type, and flood damage data were used to establish elevation-damage relationships. Agricultural damages were determined using the methodology described under "Agricultural Damage" in this appendix.

FLOOD DAMAGES

This section details the damages caused by the interior flooding in the study area. Flood damages were computed using stage versus acres flooded curves for the two respective areas served by Pumping Stations Nos. 1 and 3A. SILDD officials have compiled a computer data base on the 5,200 tracts lying within the district boundaries. Each tract includes the tract's elevation relative to the average elevation of the water in the Sny channel, cropped acreage, acreage of drainage right-of-way, public roads, railroads and utilities, and low-lying acreage considered not to be benefitted by the current drainage system. The computer summarized acreage inundated based on pump bay elevations at Pumping Stations Nos. 1 and 3A, making possible a more accurate estimate of damages to crops and other property at the various levels of flooding.

AGRICULTURAL DAMAGES

Damage per acre for the growing season was calculated by relating the annual precipitation to the specific crop's growing season for potential damage. Farm production costs, as referenced in table B-3, were updated to current price levels as indicated by the U.S. Department of Commerce *Summary of Current Business*. Yield information was obtained from drainage district officials and the Agricultural Stabilization and Conservation Service.

Crop yields in the area served by Pumping Station No. 3A are the highest in the county. Because of a difference in soil types in the two pumping station areas, the yields in the area of Pumping Station No. 1 are slightly lower than those in No. 3A. Crop prices used were those required by regulation. A composite damage estimate was arrived at based on the percent distribution of corn, soybeans, and wheat. The composite damage per acre

was multiplied by average annual acres flooded under with- and without-project conditions to determine average annual damages and benefits.

Table B-3 shows the average dollar damage analysis for corn grown in Pike County. This analysis also was done for wheat and soybeans. The weighted average dollar damage for the study area is $93.27 for crops grown in the Pumping Station No. 1 area, and $103.70 per acre for crops grown in the Pumping Station No. 3A area. No future increases in agricultural damages were calculated. Total agricultural damages are shown in table B-4.

ROADS AND DRAINAGE DITCH DAMAGES

Because of the interior drainage problem, at various times, different stretches of the rural roads are impassable or unreachable. There are 303 acres of township roads in the study area. Township roads are a combination of gravel and either an oiled or coated surface. The cost to repair shoulders and embankments at current prices is $600/mile for paved surface highways and $1,000/mile for township roads. This cost includes reshaping and adding gravel. The cost to repair seal-coated roads varies from $0.80 to $1.70/square yard, or from $9,000 to $16,900/mile, depending upon the total area to be repaired, whether scarring, shaping, or priming is needed, etc. As these roads are the only means for access to homesteads in the area and because of the frequency of inundation, it is extremely difficult to restrict traversing the roads until the roadways are dry and the understructure has firmed.

An additional damage item is the expense for the maintenance of drainage ditches in the project area. After each instance of interior flooding, the affected ditches must be cleaned out. Costs for cleaning out drainage ditches were estimated based on current expenses of $54 per acre incurred at other drainage districts in the state. Damages for road repair and maintenance and for drainage ditch cleanout are shown in table B-4.

RURAL RESIDENCES AND FARMSTEADS

Very few rural residences and farmsteads are located within the interior drainage problem areas. The average value for the structures is $29,000 for the rural residences and farmhouses, and $41,000 for outbuildings. Damages are shown in table B-4.

ELEVATION-DAMAGES

Table B-4 sets out the existing damages by flood frequency in the project area for the two pumping stations.

TABLE B-3

AVERAGE ANNUAL DAMAGES: CORN

PROJECT: SNY INTERIOR DRAINAGE DISTRICT
STATE: ILLINOIS COUNTY: Pike County

PRICE LEVEL: J/91 YIELD Per ACRE: 152 Bushels PRICE: 2.04 per Bushel

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SPT	OCT	NOV	DEC	TOTAL
Total Variable Costs (1)	0.00	0.36	3.86	10.75	118.91	16.05	8.12	5.45	10.73	3.91	0.00	0.00	178.14
Expended	0.00	0.36	4.23	14.97	133.88	149.93	158.05	163.50	174.24	178.14	178.14	178.14	
Unexpended	178.14	177.78	173.92	163.17	44.27	28.22	20.09	14.64	3.91	-0.00	-0.00		
								(3)	(3)	(3)			
Gross Cash Yield (2)	-	-	-	310.08	310.08	310.08	310.08	310.08	232.56	62.02	-		
Acreage Planted				30%	95%	100%							
CROP LOSS:				(4)	(5)	(6)							
Expended for Replanting				3.22	66.69	137.68							
Expected reduced yield				0.00	46.51	139.54							
Total: Replanting + Reduced Yield				3.22	113.20	277.21							
ADJUSTED CROP LOSS (7)	N/A	N/A	N/A	N/A	N/A	N/A	289.99	295.44	228.65	62.02	-		
TOTAL CROP LOSS	0	0	0	3.22	113.20	277.21	289.99	295.44	228.65	62.02			
Damage Factor (8)	5%	4%	8%	10%	11%	13%	10%	10%	12%	7%	6%	5%	1.00
Damages per Acre	0	0	0	0.32	12.90	35.76	27.84	29.84	26.75	4.40	0.00	0.00	
AVERAGE ANNUAL DAMAGES PER ACRE													$137.82

(1) Firm Enterprise Data System, National Economic Div., ERS out of Oklahoma State University, Stillwater, OK: Total Costs for the State of Illinois: Costs of Production (1983 - updated to indicated price level).
(2) Average Yield in Bushels/Acre * Normalized Price.
(3) Five-year Average Harvest Times: 25% by Sept; 80% by Oct; 100% by Nov.
(4) 1/3 Apr average variable costs
(5) 1/2 May + Apr average variable cost; crop yield reduced by 15%.
(6) 1/2 June + May + April average variable costs; crop reduced 45%. No replanting in July, so floods from July on result in Total Crop Loss.
(7) Cash Yield less Unexpended Costs
(8) Damage Factor is the percent of expected total runoff occurring in a given month.
N/A Not applicable.

TABLE B-4

Frequency-Damage Relationships
Pumping Stations Nos. 1 and 3A
(June 1991 Price Levels)

Elevation	Farmsteads and Rural Residences	Grain Storage	Road Repair and Drainage Ditch Cleanout	Agricultural Damages
PUMPING STATION NO. 1				
452	$ 0	$ 0	$ 0	$ 0
453	9,000	0	96,000	149,000
454	23,000	0	176,000	317,000
455	62,000	0	369,000	685,000
456	122,000	0	853,000	849,000
PUMPING STATION NO. 3A				
441	$ 0	$ 0	$ 0	$ 0
442	9,000	0	102,000	48,177
443	45,000	4,000	113,000	244,705
444	201,000	14,000	290,000	684,283
445	391,000	24,000	513,000	1,435,266

EXPECTED FUTURE CONDITIONS

The existing interior drainage problems result in increasing expenses and crop losses to the farmers. The cost of adequately maintaining township roads because of the interior drainage problem is a continually increasing expense.

If no action is taken, interior drainage flooding will continue to occur as a result of flood events exceeding the protection capabilities of the existing interior drainage facilities. The resultant continuing expenses and losses will become a drain of economic resources for the SILDD community.

ALTERNATIVE PLANS

PUMPING STATION NO. 1

Consideration was given to increasing the efficiency of Pumping Station No. 1. An analysis was made of using a floating boom to relieve the debris buildup on the existing trash rack. This will increase the efficiency of flow through the existing trash rack and into the pumping station.

In addition to the floating boom, an increase in pumping capacity also was analyzed. Pumping capacities considered were 50, 100, 200, and 400 cubic feet per second (cfs). The 50-, 100-, and 400-cfs capacities were unacceptable alternatives because of either marginal benefits or the necessity to increase the intake channel. The economic analysis considered adding 200 cfs pumping capacity in conjunction with the floating boom.

PUMPING STATION NO. 3A

Pumping capacity increases from 100 through 1,200 cfs were considered, with only the 600 and 900 cfs capacities providing benefits which could be measured.

HORTON-DUTCH DIVERSION

Constructing a diversion channel to connect the Horton-Dutch Reservoir to the Mississippi River was considered in an Initial Appraisal performed under the authority of Section 216 of the 1970 Flood Control Act. The Horton-Dutch Reservoir is currently drained into the Sny waterway.

SECTION 4 - BENEFIT AND COST ANALYSIS

BENEFITS

This section presents an assessment of benefits that would be associated with the reduction of flood damages in the study area. Benefits are calculated as the difference between the "with-project" and the "without-project" average annual damages. Benefit categories include existing inundation damage reduction and employment benefits.

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REDUCTION STUDY THE SNY ISLAND LEVEE DRAINAGE DISTRICT ADAMS PIKE AND CALHOUN COUNTIES ILLINOIS(U) ARMY ENGINEER DISTRICT ROCK ISLAND IL AUG 91

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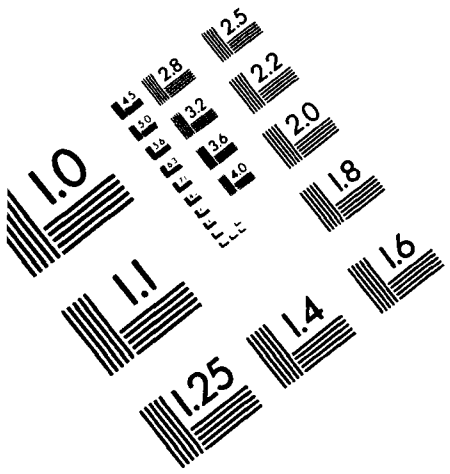

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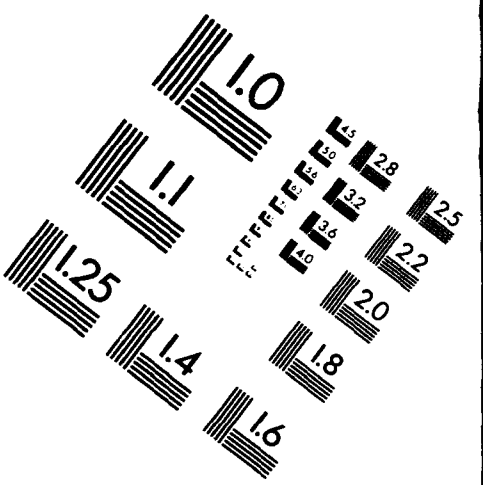

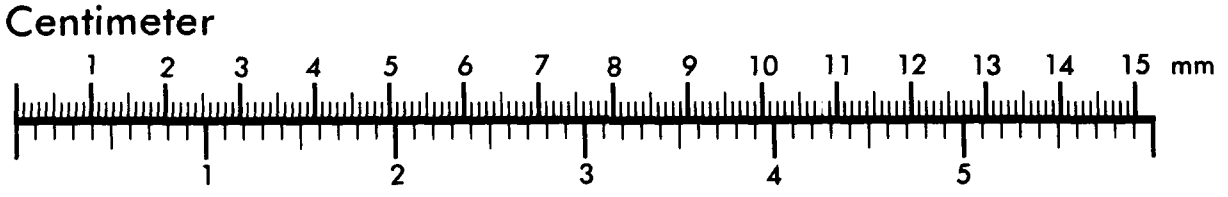

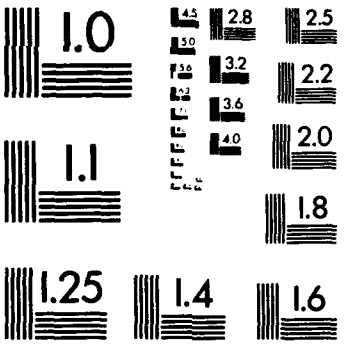

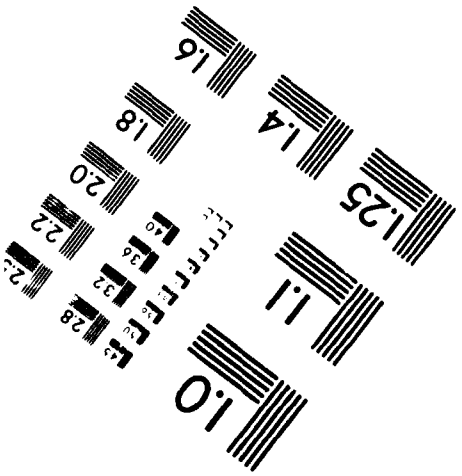

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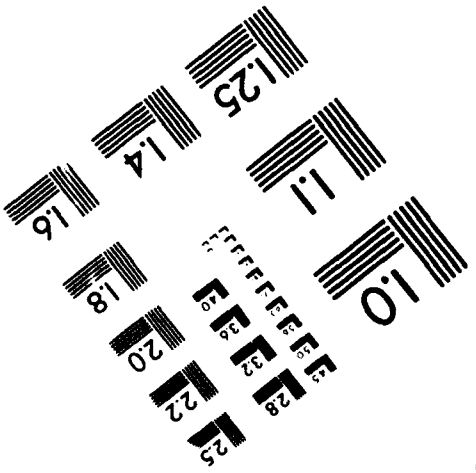


INTERIOR FLOOD DAMAGE REDUCTION

Table B-5 summarizes the average annual benefits, average annual damages, and the with-project average annual residual damages.

TABLE B-5

Average Annual Benefits and Residual Damages
8-3/4 Percent Discount Rate, June 1991 Price Levels
(In Thousands)

PUMPING STATION NO. 1

		Floating Boom		Added 200 cfs	
	Total Average Annual Damages	Average Annual Benefits	Average Annual Residual Damages	Average Annual Benefits	Average Annual Residual Damages
Agriculture	$117	$ 66	$ 51	$ 96	$ 21
Farmsteads	58	41	17	49	9
Roads and Drainage Ditches	471	336	135	392	79
TOTALS	$646	$443	$203	$537	$109

PUMPING STATION No. 3A

		Added 600 cfs		Added 900 cfs	
	Total Average Annual Damages	Average Annual Benefits	Average Annual Residual Damages	Average Annual Benefits	Average Annual Residual Damages
Agriculture	$462	$122	$340	$147	$315
Farmsteads	150	14	136	26	124
Roads and Drainage Ditches	205	46	159	51	154
TOTALS	$817	$182	$635	$224	$593

HORTON-DUTCH DIVERSION

The Horton-Dutch Diversion alternative, as presented in the Section 216 Initial Appraisal, was briefly evaluated utilizing the information gathered during the reconnaissance study. The cost of the Horton-Dutch Diversion at June 1991 price levels is $5,580,600, with average annual costs of $521,000

at an 8-3/4 percent discount factor. Since the diversion would only reduce the stage-frequency curve at Pumping Station No. 3A an amount comparable to adding the 900-cfs pumping capacity, it is apparent that the more costly Horton-Dutch Diversion is not economically justified. It also is evident that since the benefits for the diversion and the 900-cfs pumping capacity are similar, the pumping station would be the more economically efficient alternative.

EMPLOYMENT BENEFITS

This section presents an evaluation of benefits that would result from the direct use of otherwise unemployed or underemployed labor resources during project construction. Pike County, Illinois, is an area with substantial and persistent unemployment and is eligible to claim employment or redevelopment benefits in Fiscal Year 1990, pursuant to the Area Redevelopment Act (Public Law 87-27).

Employment benefits are based on project construction costs, exclusive of lands and damages, engineering and design, and supervision and administration. It is estimated that 40 percent of the project construction costs would be allocated to on-site labor. These labor costs would be divided between skilled, semi-skilled, and other personnel (with percentage allocations of 40, 50, and 10 percent, respectively).

Construction employment in the Pike County area is generally gained through union membership. Contractors seeking to hire labor contact the local unions involved for a referral list of workers. When contacted, unions refer unemployed workers on a priority basis. Therefore, the local hire rate for all labor categories was estimated at 90 percent. This percentage exceeds *Principles and Guidelines* standards, but is more realistic in highly unionized areas. For example, during construction of the Clinton, Iowa, Local Flood Protection project, payroll records and interviews indicated that more than 90 percent of hired labor was from the local area.

The calculation of employment benefits is detailed in table B-6 for the 200 cfs additional pumping capacity at Pumping Station No. 1. The amount of wages to be paid to locally underemployed or unemployed workers for the Pike County portion of the project area served is $530,000. The resulting redevelopment benefit was discounted at an 8-3/4 percent discount rate to represent average annual benefits. Annual employment benefits amount to $44,000. A similar analysis was done for the other alternatives.

TABLE B-6

Employment Benefits
June 1991 Price Levels, 8-3/4 Percent Discount Rate

A. Estimated on-site labor costs, total project: $1,464,800
Percent of Project Area in Pike County: 90%
Percent to Labor 40%

B. Allocation of on-site labor costs by category:

Labor Category	On-Site Labor Costs ($)	Percent Allocation	Amount of Wages ($)
Skilled	527,328	40	210,931
Semi-Skilled	527,328	50	263,664
Other	527,328	10	52,733

C. Allocation of wages to locally unemployed or underemployed:

Labor Category	Amount Wages ($)	% to Locally Unemployed/ Underemployed Labor	Wages to Previously Unemployed/ Underemployed Labor ($)
Skilled	210,931	90	189,838
Semi-Skilled	263,664	90	237,298
Other	52,733	90	47,460
TOTALS	527,300		474,600

D. Benefit Computation:

Year	Local Wage Amount ($)	Time to Base Year	Future Value of 1.00	Local Wage Value in Base Year($)
1995	474,600	0.5	1.04438	494,900
Amortized at 8-3/4 Percent, 50-Year Period of Analysis				0.08884
Annual Employment Benefit				$ 43,970
			(Rounded)	$44,000

AVERAGE ANNUAL DAMAGES AND BENEFITS

Average annual farmstead and drainage ditch cleanout damages were calculated using annual ponding-elevation frequency curves (Appendix A). Average annual benefits for the study area are derived from interior inundation reduction and employment benefits. Table B-7 summarizes the average annual damages and benefits of the proposed project.

TABLE B-7

Average Annual Damages and Benefits
June 1991 Price Levels (In Thousands)

PUMPING STATION No. 1

	Average Annual Damages	Floating Boom Average Annual Benefits	Added 200 cfs Average Annual Benefits
Agriculture	$117	$ 66	$ 96
Farmsteads	58	41	49
Roads & Drainage Ditches	471	336	392
Employment Benefits		5	44
Total	$646	$448	$581

PUMPING STATION No. 3A

	Average Annual Damages	Added 600 cfs Average Annual Benefits	Added 900 cfs Average Annual Benefits
Agriculture	$462	$122	$147
Farmsteads	150	14	26
Roads & Drainage Ditches	205	46	51
Employment Benefits	0	94	127
Total	$817	$276	$351

AVERAGE ANNUAL COSTS

Construction costs, and operation and maintenance costs detailed in this report are at June 1991 price levels. The SILDD already holds all lands, easements, and fee titles needed for these alternative plans at both pumping stations.

Interest during construction and annualized costs were computed using an 8-3/4 percent discount rate for a 1-year construction period with a one-half year time to base year. A 50-year period of analysis was used. Tables B-8 and B-9 summarize the calculations for interest during construction and the project average annual costs.

TABLE B-8

Interest During Construction
June 1991 Price Levels (In Thousands)

	Alternative	Project Cost	Interest During Construction
Pumping Station No. 1			
	Floating Boom	$ 162,600	$ 7,000
	200 cfs Added	1,464,800	62,700
Pumping Station No. 3A			
	600 cfs Added	2,808,000	120,300
	900 cfs Added	3,797,000	162,700

TABLE B-9

Average Annual Costs
June 1991 Price Levels (In Thousands)

	Pumping Station No. 1		Pumping Station No. 3A	
	Boom	200 cfs	600 cfs	900 cfs
Project Costs	$162.6	$1,464.8	$2,808.0	$3,797.4
Interest During Construction	7.0	62.7	120.3	162.6
Total First Cost	$169.6	$1,527.5	$2,928.3	$3,960.0
Interest and Amortization	15.1	135.7	260.1	351.8
Operations and Maintenance	9.0	20.0	63.0	68.0
Total Average Annual Cost	$ 24.1	$ 155.8	$ 324.0	$ 420.0

ECONOMIC SUMMARY

Table B-10 presents a summary economic analysis for the described projects. The only economically feasible plans are for Pumping Station No. 1.

Constructing a floating boom, with a project benefit-to-cost ratio (BCR) of 19, has net benefits of $423,900. Construction of the floating boom and increasing pumping capacity by an additional 200 cfs yields net benefits of $425,200, with a BCR of 4. Construction of the floating boom with an additional 200 cfs pumping capacity has a higher net benefit and is the NED plan.

TABLE B-10

Economic Analysis Summary
June 1991 Price Levels (in thousands)

	PUMPING STATION No. 1	
	Floating Boom	200 cfs Added
Total First Costs	$169.6	$1,527.5
Average Annual Cost	24.1	155.8
Average Annual Benefit	448.0	581.0
Net Annual Benefits	423.9	425.2
Benefit-to-Cost Ratio	18.6	3.7

	PUMPING STATION No. 3A	
	Added 600 cfs	Added 900 cfs
Total First Costs	$2,928.3	$3,960.1
Average Annual Cost	324.0	420.0
Average Annual Benefit	276.0	351.0
Net Annual Benefits	(48.0)	(69.0)
Benefit-to-Cost Ratio	0.85	0.84

SECTION 5 - FINANCIAL ANALYSIS

COST DISTRIBUTION

Based on current cost-sharing provisions, Federal and non-Federal costs will be distributed as shown in table B-11.

TABLE B-11

Project Cost Distribution

Total Project Cost Estimate	$1,527,500	
Federal Cost Estimate	1,145,625	
Non Federal Cost Estimate		$381,875
Cash Contributions		19,090

ABILITY TO PAY

The sponsor of this project is the SILDD. Based on the provisions of Section 103 of Public Law 99-662, the local sponsor has the ability to provide its normal share of the project costs. The analysis, illustrated in table B-12, is based upon the project BCR and the project area per capita income. The district does not qualify for reduced cost-sharing.

TABLE B-12

Ability To Pay Analysis
Sny Island Levee Drainage District,
Pike County, Illinois

Annual Cost	$155,800	Cost and Benefits
Annual Benefits	581,000	are for Flood
Total Cost	$1,527,500	Control.
Local Share	381,875	
B/C Ratio	3.7	

State Factor	106.04	Sum of State and County
County Factor	77.69	Factors must be < 163.2
Total	183.73	to be eligible

Base Benefits Floor	93%	1/4 BCR
% Local Share	25%	
Eligibility Factor	-1.82	

NOT QUALIFIED

FINANCIAL CAPABILITY

The local sponsor is the SILDD, who will be providing all lands, easements, and relocations. The SILDD is willing and capable of financing the sponsor's share of the cost of constructing the flood control project. A Letter of Understanding regarding funding for the sponsor's share for the project construction cost is included in Appendix D, Pertinent Correspondence.

SECTION 6 - SOCIOECONOMIC IMPACTS

DISCUSSION OF IMPACTS

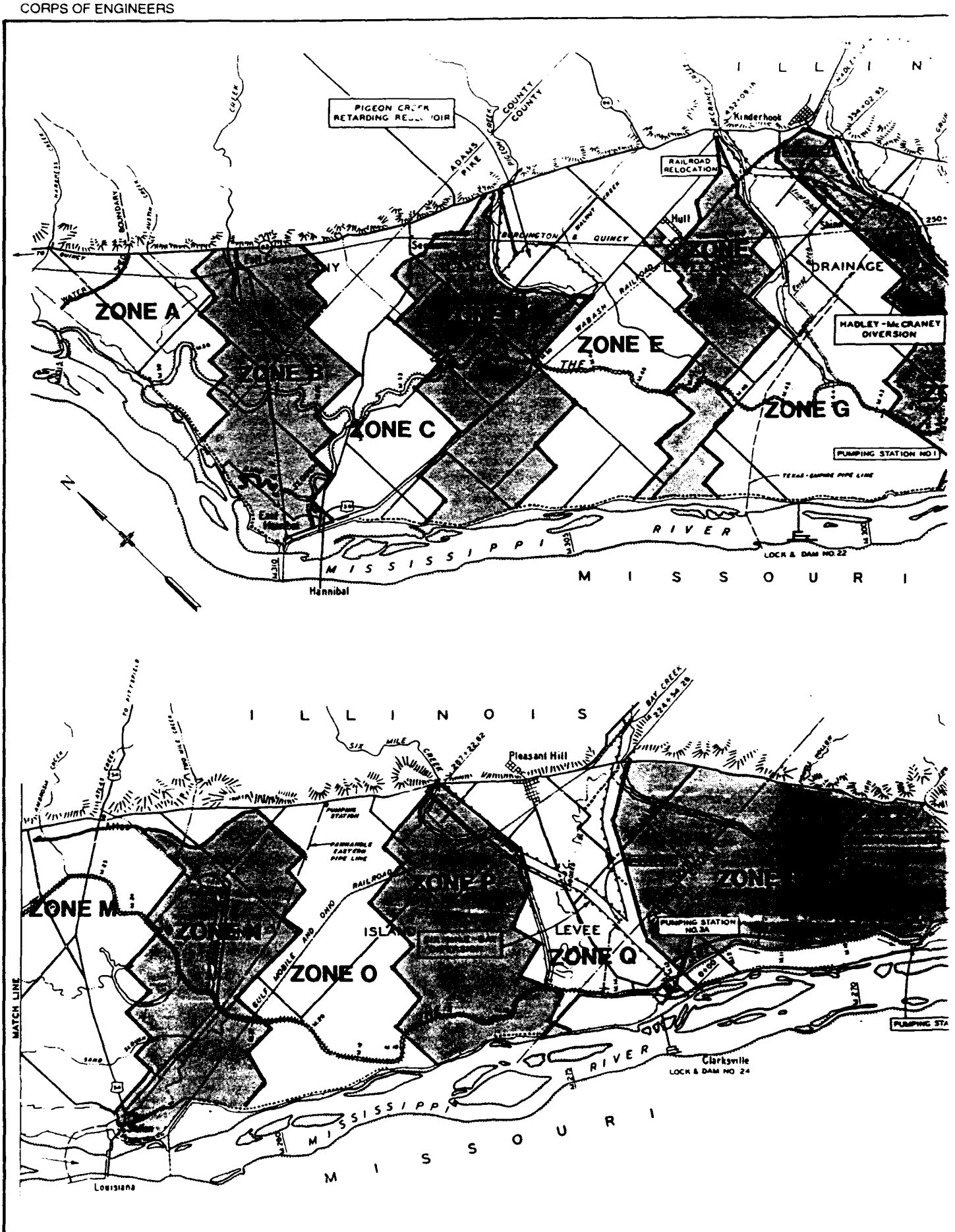
The socioeconomic impacts associated with providing flood damage reduction measures for the SILDD generally would be positive. The project involves upgrading the existing pumping stations (or adding an additional pumping station), and would help solidify and enhance community cohesion by reducing the threat of flooding and securing the economic viability of farming in the floodplain. In addition, the project would require no residential relocations and would result in no impacts to community or regional growth.

Public services to and from the affected area would be better maintained, and public facilities would benefit from reduced flood-related damages. The community also would benefit from reduced life, health, and safety risks faced by residents during flood events.

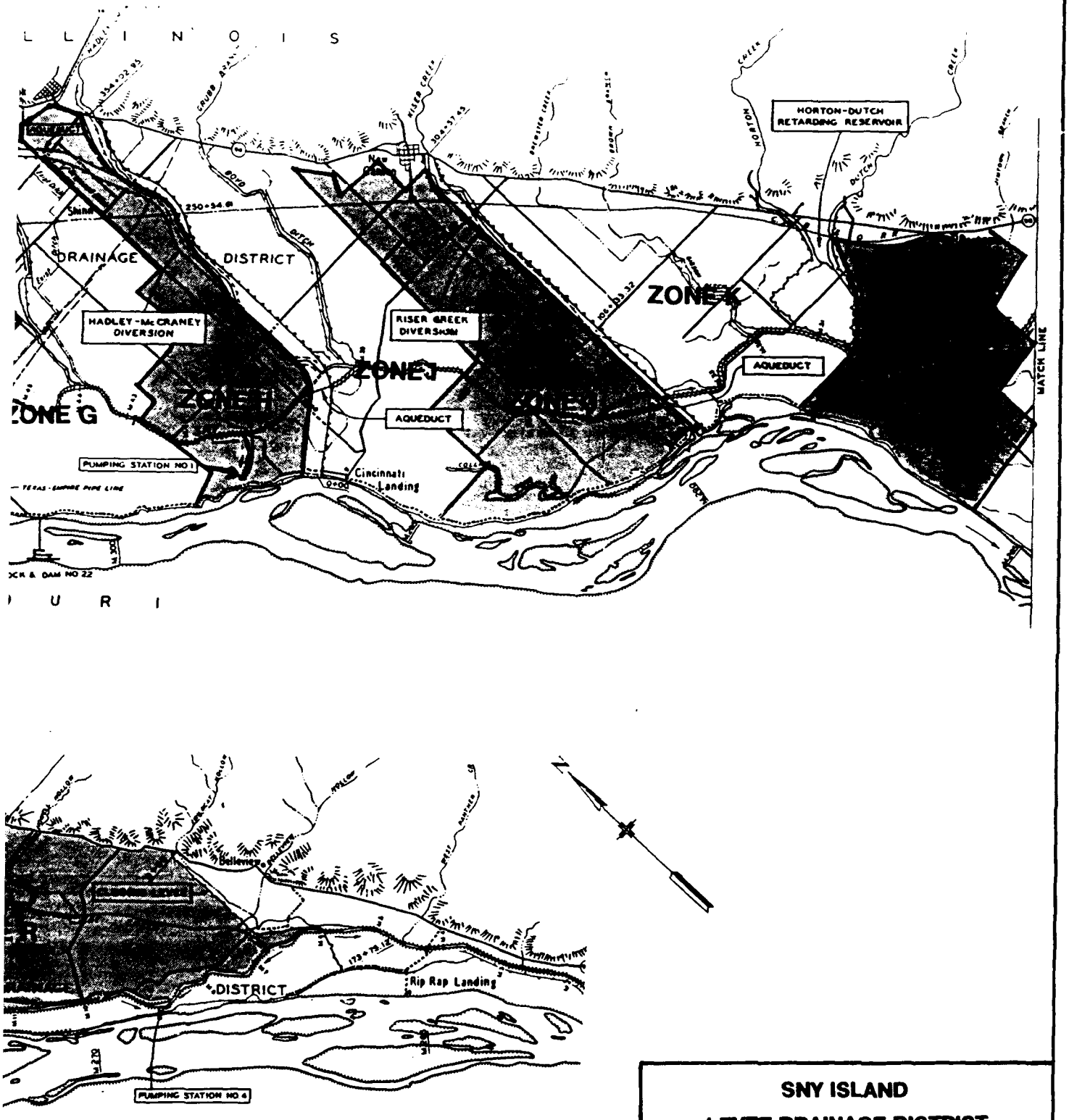
The project would increase the economic viability of the area and could result in increased property values and related tax revenues for the properties within the project area. Project construction would increase employment in Pike County, Illinois, and the surrounding area. Increased business or industrial activity during project construction would positively impact the area economy. No direct long-term impacts to area business activity would be noticed, and no business or farm relocations would be required.

Heavy machinery would generate temporary increases in noise levels during construction; however, noise disturbances to residents, businesses or recreationists would be minimal. Increased noise levels would temporarily impact wildlife in the vicinity. The aesthetics of the affected riverfront property would not be adversely impacted, as the project will increase existing pumping capacity.

CORPS OF ENGINEERS



U.S. ARMY



SNY ISLAND
LEVEE DRAINAGE DISTRICT
ILLINOIS

ZONES A–R

PLATE B–1

APPENDIX C

ENVIRONMENTAL ANALYSIS

RECONNAISSANCE REPORT
FOR
SECTION 205 FLOOD DAMAGE REDUCTION STUDY

THE SNY ISLAND LEVEE DRAINAGE DISTRICT
ADAMS, PIKE, AND CALHOUN COUNTIES, ILLINOIS

APPENDIX C
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THE SNY ISLAND LEVEE DRAINAGE DISTRICT
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APPENDIX C
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NATURAL RESOURCES

EXISTING CONDITIONS

Although the land within the Sny Island Levee Drainage District (SILDD) is intensively farmed in row crops, the area is interspersed with tracts of bottomland forest, open water areas, and remnant emergent wetlands. These areas provide habitat values for species adapted to agricultural environments and those which utilize more than one habitat type.

The Planning Aid Letter, dated December 11, 1990, provided to the Rock Island District by the U.S. Fish and Wildlife Service (USFWS), notes four federally listed endangered species which may occur in the project area: the gray bat (*Myotis grisescens*), the Indiana bat (*Myotis sodalis*), the bald eagle (*Haliaeetus leucocephalus*), and the fat pocketbook pearly mussel (*Potamilus capax*). A copy of the Planning Aid Letter is in Appendix D, Pertinent Correspondence.

Pin Oak Lake, a 298-acre tract of land located in portions of sec. 8, 9, and 16, T. 5 S., R. 7 W., is described in the *Illinois Natural Areas Inventory* as medium to high quality bottomland forest with four natural wetland openings. The Planning Aid Letter states that this area consists primarily of undisturbed or slightly disturbed wet-mesic floodplain forest and shrub swamp-pond. The Illinois Department of Conservation (IDOC) notes that Big Britches Natural Heritage Landmark also is located in this area. The Mark Twain Wildlife Area is located within the area draining to Pumping Station No. 3A.

PROJECT IMPACTS

The potential for impacts to natural resources is expected to be lowest for alternatives involving minimal alteration of existing physical features and structures. For example, cleanout or redesign of the trash rack at Pumping Station No. 1A, or the addition of a pump at Station No. 3A, primarily would involve modifications to existing structures. Therefore, these

actions would be expected to have only very minor impacts on fish and wildlife resources.

Alternative plans involving construction of new facilities, or substantial expansion of existing facilities, could have impacts ranging from minor to severe, depending on the nature and scope of the proposed activity. Impacts of widening the existing channel of Swain Slough would not be expected to be significant, provided that all dredged material is placed at existing sites and not in wetlands.

Constructing a new pumping station and connecting Iowa Cutoff to the Sny, or extending Big Cutoff to connect with the Sny, would be expected to have significant impacts requiring mitigation to replace or enhance habitat. The IDOC indicated that extending Swain Slough or Big Cutoff to the Sny would likely adversely affect Pin Oak Lake Natural Area or Big Britches Natural Heritage Landmark.

Additionally, any plan designed to reduce flood flows which indirectly resulted in draining existing wetlands would constitute a conversion under the "Swampbuster" provisions of the Flood Security Act and could affect the eligibility of landowners in the area to receive USDA program benefits.

FUTURE STUDIES

An Environmental Assessment (EA) will be prepared during the feasibility study. This document will identify impacts to natural and man-made resources associated with the alternative plans and potential disposal areas. Studies associated with EA preparation will include:

a. Phase I cultural resources survey of area affected by proposed plan and potential borrow and disposal areas, if any.

b. If construction of the proposed plan involves placing dredged or fill material in wetlands or other waters of the United States, a Section 404 evaluation may be required. Additional studies may be required if previously unknown resources, which may be significantly affected by proposed actions, are identified during field surveys or coordination with other agencies.

CULTURAL RESOURCES

PREVIOUS INVESTIGATIONS

Both cultural resource studies and geomorphological investigations have been conducted in the vicinity of the current project area.

Cultural Resource Studies

The Illinois State Museum (ISM) site location and survey area printouts show one study which covered a portion of the current project area. This is the McNerney (n.d. [1978?]) report that includes the Cash Island Narrow. No sites were recorded in the vicinity of the current Cash Island Narrow channel and pumping station proposal. However, this was a reconnaissance survey and did not include complete Phase I fieldwork (McNerney n.d.:11) within the boundary as shown on the ISM maps provided to the Corps of Engineers. The fact that the entire area of U.S. Fish and Wildlife Service ownership (Delair Division) in the Cash Island Narrow area is marked as surveyed on the ISM maps is misleading. Under the Delair Division heading, the McNerney report states that:

> The occurrence of two prehistoric sites attests to the suitability of the area for prehistoric human use and occupation. A field survey should establish the significance of these two sites and may locate additional sites" [emphasis added] (McNerney n.d.:26).

The ISM maps also show that a portion of the shoreline of an unnamed island just across from Pumping Station No. 1 has been surveyed (plate C-7). This area might be a part of the Udesen and Koski (1978) survey, but their river and shore mile listing (Udesen and Koski 1978:2) gives only a 0.2-mile survey area on an island at river miles 297.4-297.6. The area on the ISM map is well over one-half mile in length. No sites are recorded on this island; in fact, no sites were recorded by Udesen and Koski (1978:2 and 16) in the entire 15.1 miles of shoreline in their project.

Only three previously recorded sites (11PK24, 11PK25, and 11PK69) are within potential impact areas of any of the current proposals, and all occur in the Pumping Station No. 1 vicinity in Cincinnati Township (T. 5 S., R. 7 W.), Pike County, Illinois. Site 11PK24 has conflicting locations on the ISM maps (1:24,000-scale printouts) and Anderson's (1989) Plate 2E.

Just upstream of the Pumping Station No. 1 vicinity, Houart, *et al.* (1979) conducted an intensive surface survey with shovel testing. Their survey area covered 206 acres along a corridor measuring 500 feet in width by 3.4 miles in length, and was located just inside the levee between river miles 301.7 and 305.4. Two historic sites and 28 prehistoric sites, Middle Archaic to Late Woodland, were recorded.

Houart, *et al.* (1979:44) stated that the sites "uniquely represent a segment of Mississippi River shoreline that has been preserved from destruction by river meander erosion cutting and alluviation" and continued by noting that these sites represented the "only known area of preserved archaeological shoreline settlement in this entire region of the Mississippi River valley."

Geomorphological Studies

Only the northern part of the Pumping Station No. 1 vicinity that lies on the USGS Hull, Illinois - Missouri, 7.5-minute quadrangle map has geomorphological landforms delineated in detail. Leigh's (1985:Figure 4) more generalized map shows the Pumping Station No. 1 vicinity within the Sny Meander Belt on the south and within the Mississippi River Backswamps at the north. Additional information was sought from Ms. Julieann Van Nest at the Center for American Archaeology (CAR) in Kampsville, Illinois, regarding any geomorphological mapping for the current project locations. She stated that no information was available in the CAR files.

The nearest detailed geomorphological work has been conducted around Hull, Illinois, for the FAP 408 highway project. Conner, *et al.* (1984) and Leigh (1985) summarize this work. In the village of Hull, approximately 4 miles to the north of the Pumping Station No. 1 vicinity, Leigh's (1985:14) Core No. 630 revealed Holocene deposits reaching to between 14 and 15 feet below the present surface. The depths of Holocene deposits in the current project areas are undocumented; however, there is little reason to doubt that these exist at some significant depth and incorporate buried sites.

Leigh's (1985:Figure 4) map is reproduced here adding only the Pumping Station No. 1 vicinity upstream and downstream limits (arrows) and the relevant township and range lines (plate C-5). The upstream portion of the Big Cutoff Channel Construction, long route, (plate C-2) extends into the Mississippi River Backswamps as mapped by Leigh; the other portions of proposals under study in this vicinity lie within Leigh's Sny Meander Belt.

Anderson (1989:Plate 2E) shows virtually no (less than 10 centimeters) post-settlement alluvium over the portions of the Pumping Station No. 1 vicinity that are on the Hull quadrangle. His mapping does not extend south of this quadrangle. However, it would be fairly safe to assume that the same, shallow, post-settlement deposits are characteristic of the entire Pumping Station No. 1 vicinity, and perhaps the entire interior of the SILDD land in the areas extending to the south into Calhoun County.

RECONNAISSANCE EFFORTS

Site Visit

Field reconnaissance focused on areas where harvested fields had been rain-washed and where crop residue left at least 25 percent ground visibility. Because harvest was in progress, these conditions were met in only a few locations. Plates C-6 through C-9 are USGS, 7.5-minute quadrangle map segments showing survey areas. All survey areas were walked in intervals of approximately 8 meters; this is true for all areas surveyed and is not entered on the maps. Four transects were walked on all of the small linear

strips, giving a corridor roughly 30 meters wide along slough and field edges. Plates C-6 through C-9 contain information on ground visibility, ground cover conditions, and surface area for each survey parcel.

The total acreage for all parcels surveyed was 46.0 or approximately 186,000 square meters. Seven previously unrecorded sites and one isolated find spot were located. Completed site forms accompanied the report to the SHPO enclosed in a Corps of Engineers letter dated November 14, 1990. Three previously recorded sites are within or immediately adjacent to the impact zones of the current proposals.

Nineteenth Century Maps

No cultural features aside from agricultural fields or levees were noted in maps by Farquhar (1878) and Townsend, *et al.* (1903-1905).

Scott's Landing (plate C-8) in the Horton-Dutch Creek vicinity was identified on maps by MacKenzie (1887-1888), Union Atlas Company (1876), and Warren (1866-1869). It should be noted that copies of the Warren map in the Corps library did not extend far enough south to include the Pumping Station No. 3A vicinity of the present study.

Clark's Ferry (sec. 8, T. 8 S., R. 4 W.) on the Union Atlas Company (1876) Calhoun County map is probably now completely destroyed or highly disturbed by the Sixmile Creek Diversion Ditch and associated levees. In any case, it was well away from the present impact area for expansion of capacity at Pumping Station No. 3A, being to the southwest and across the Sny from the pumping station.

Plate C-7 gives the location of a farmstead (southwest quarter of sec. 23, T. 5 S., R. 7 W.) as shown on the Union Atlas Company (1876) Pike County map in the area just south of Swain Slough in the Pumping Station No. 1 vicinity. The present proposal for widening the slough at this point would not extend beyond the existing spoil banks on either side of the slough. The farmstead may be outside this area or may have already been partially or wholly impacted by channel work.

The Mississippi River Commission maps in the Corps library cover the river down to Lock and Dam No. 22; below this point the river is in the St. Louis District. Therefore, only the map covering the Pumping Station No. 1 vicinity was searched. This map (Mississippi River Commission 1881) shows a building in the swamp on Swain Slough (plate C-10). The farmstead (plate C-7) which shows on the Union Atlas Company map does not appear on this Mississippi River Commission map.

Twentieth Century Maps

Plate C-11, a segment of the twentieth century Brown map (1929-1930:Sheet No. 111), shows four buildings at the location of the historic site, Bell #4 (11PK839). The Brown maps were not completely searched for other historic sites in the impact area. These maps, and other twentieth century maps, may reveal other historic sites and should be consulted prior to the surveys that will be required if any proposals in this study are recommended for implementation.

Pumping Station No 1 Vicinity
(Plates C-2, C-6, C-7, C-10, and C-11)

The four parcels surveyed in this vicinity total 34 acres (plates C-6 and C-7). Five previously unknown archeological sites were recorded.

The three previously recorded archeological sites within the current project area all occur in the impact zone of the Pumping Station No. 1 vicinity. Site 11PK24 on the Hull Quadrangle has two conflicting locations. Both appear to be within the impact area of the current proposals. Sites 11PK25 and 11PK69 are on the Ashburn Quadrangle.

Site 11PK24 is identified by Anderson (1989:Plate 2E) as a Woodland habitation site. No information is currently available in Corps records regarding the nature or cultural affiliation of the two remaining sites.

This survey found two chert flakes (Isolated Find #1) located about 140 meters south of the ISM location of 11PK24. A single transect was walked on the eastern portion of the ISM location and revealed no cultural material.

The Dunker (11PK840) and Bell #2 (11PK837) sites are lithic scatters of unknown prehistoric cultural affiliation. Bell #1 (11PK836) and Bell #3 (11PK838) are Woodland sites, the latter containing a shell midden that continues to at least 92 centimeters below the present surface in one place. Bell #4 (11PK839) is a scatter of historic debris.

These Woodland sites lie between 0.5 and 0.75 mile from the present shoreline of the Mississippi River and reinforce Houart's (1979) findings of shoreline stability over a considerable time period in this vicinity.

Horton-Dutch Creek Vicinity
(Plates C-3 and C-8)

Approximately 11.8 acres were surveyed in this area (plate C-8). The Shinn (11PK841) and the Little Shinn (11PK842) sites were recorded. Both sites

probably extend beyond the strip of land surveyed. The Shinn Site may extend both east and west of the survey area while the Little Shinn Site can extend only to the east.

The Little Shinn Site is a lithic scatter of unknown prehistoric cultural affiliation. The Shinn Site is a lithic scatter that produced a single point base assignable to the Late Archaic-Early Woodland Turkey Tail Cluster (Justice 1987:173-179).

Both sites lie within less than 0.5 mile of the present Mississippi River shoreline, providing additional confirmation that much of the shoreline along the Sny reflects a long period of channel stability.

Pumping Station No. 3A Vicinity
(Plates C-4 and C-9)

Only 0.2 acre was surveyed in this vicinity (plate C-9); no previously recorded sites and no newly recorded sites are in this portion of the study area.

The Cash Island Narrow channel and pumping station alternative is within the boundary of a reconnaissance survey conducted for the U.S. Fish and Wildlife Service in the 1,500-acre Delair Division in southwestern Pike County, Illinois (McNerney n.d.). McNerney (n.d.:27) does mention a structure on the river near the Cash Island Narrow which is on a Mississippi River Commission map not in the Corps library (Chart No. 124).

An existing farmstead on the banks of the Iowa Cutoff alternative (plate C-9 would undergo significant impacts and would require evaluation should this area be recommended for channelization.

FUTURE STUDIES

All proposed actions to reduce flood damages currently under study will require intensive Phase I cultural resource survey combined with extensive geomorphological investigations. Preliminary opinions indicating potential National Register eligibility have been made for four sites (Bell #1, 11PK836; Bell #3, 11PK838; Dunker, 11PK840; and Shinn, 11PK841). The SHPO has concurred with the Corps' opinion that Bell #2 (11PK837) does not meet the criteria for inclusion in the National Register. All other known sites require some level of additional investigation before an eligibility opinion is possible.

The current level of study does not permit the precise definition of the ultimate project impact zones. Nevertheless, general requirements for an eventual intensive Phase I cultural resource survey and geomorphological investigation are outlined below.

The nature and spacing of geomorphological tests must be appropriate for locating potentially significant resources. A combination of coring and backhoe trenches will be required to adequately assess potential cultural resource impacts. Noting the considerable variation in site sizes from the Houart, *et al.* (1979:Figures 7-10) survey, it is reasonable to assume that buried sites also will range from the very small to the moderately large in areal extent. The sampling problems involved in locating such sites should be taken into account.

All channel excavations, fill placement, access roads, equipment staging areas, and any other potentially ground disturbing activity areas will require investigation.

The recent preliminary reconnaissance documented the existence and potential for additional historic and prehistoric sites. The search of historic records will require expansion beyond the limited scope of the preliminary reconnaissance. Existing sites (11PK24, 11PK25, 11PK69, and Scott's Landing) will require additional background records research and perhaps field investigations prior to making formulating an initial opinion as to National Register of Historic Places eligibility. Standing structures at the Iowa Cutoff and at the pumping stations will also require evaluation.

CONCLUSIONS

The need for intensive Phase I survey combined with geomorphological testing has been documented for all portions of the project area.

The section of the Mississippi River in the vicinity of the SILDD has been identified as unique due to the relative stability of the river channel over time. This has allowed shoreline sites of considerable age to remain relatively undisturbed up to the present day. This in not the case for many parts of the Mississippi River Valley where active channel migration has destroyed numerous archeological sites.

The potential for buried cultural deposits has been amply documented in the project area by both direct archeological observation and by indirect evidence from the available geomorphological studies.

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1881 *Survey of the Mississippi River, Chart No. 127.* Mississippi River Commission. Julius Bien and Co., Photo. Lith.

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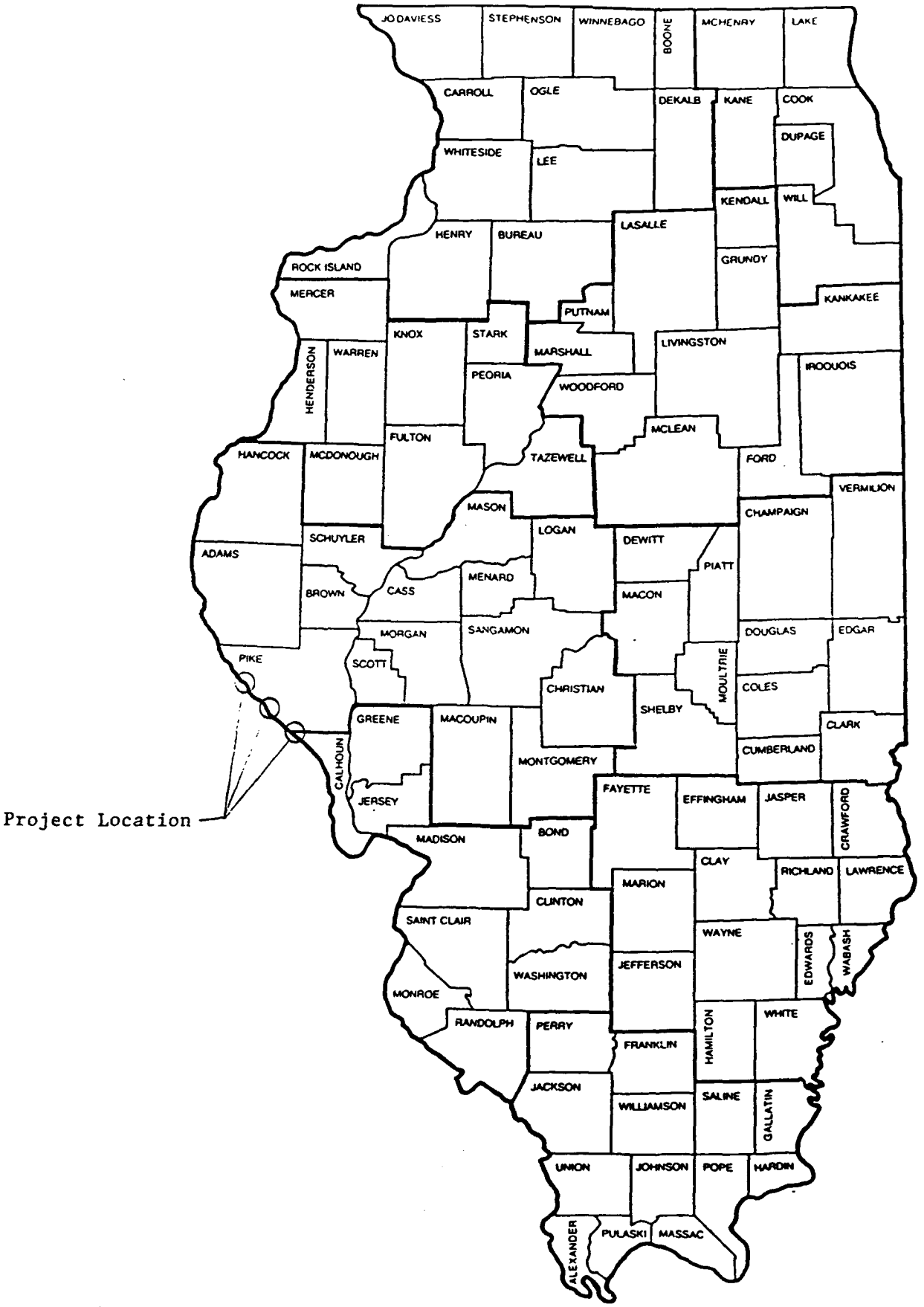
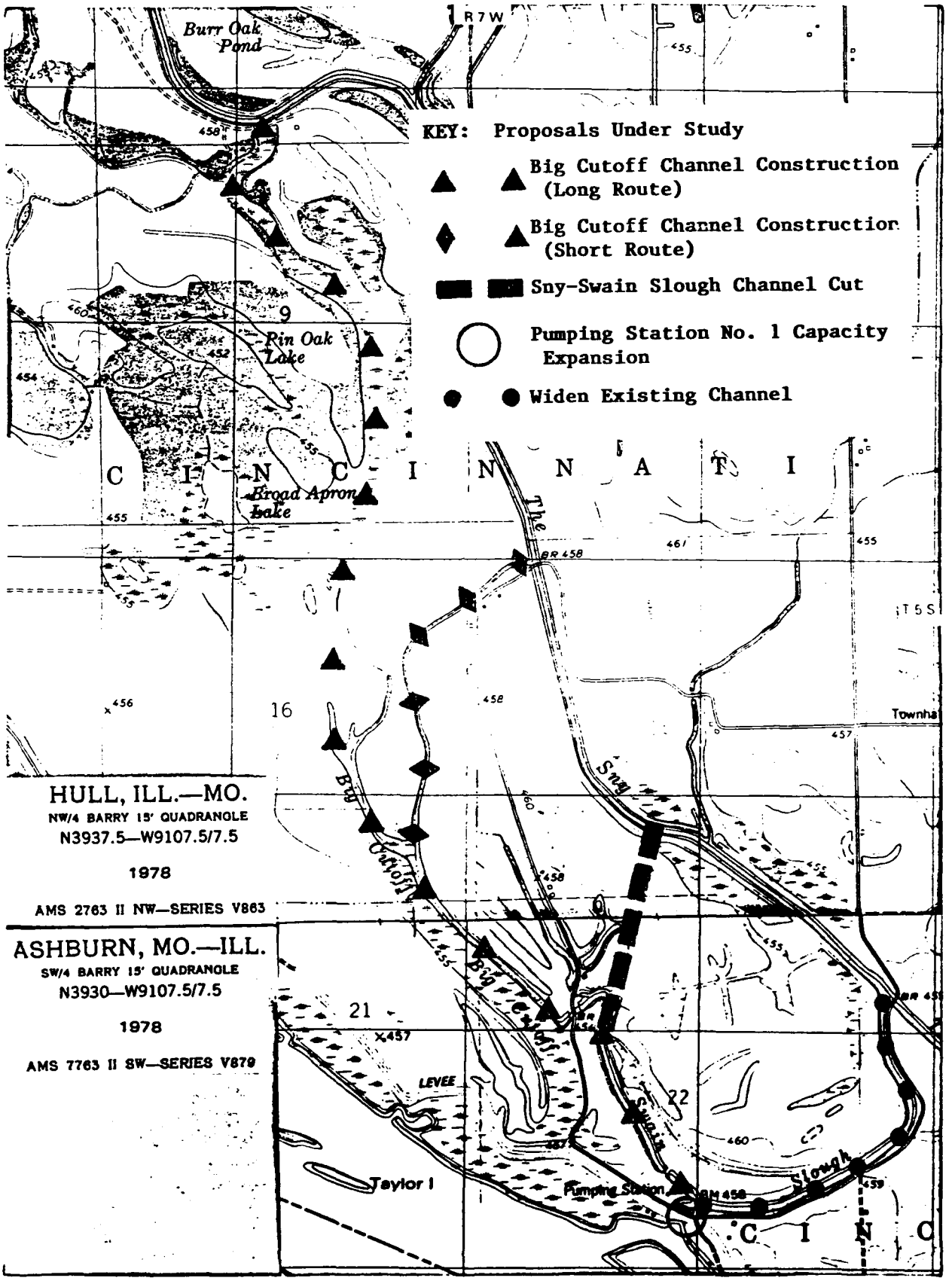


Project Location

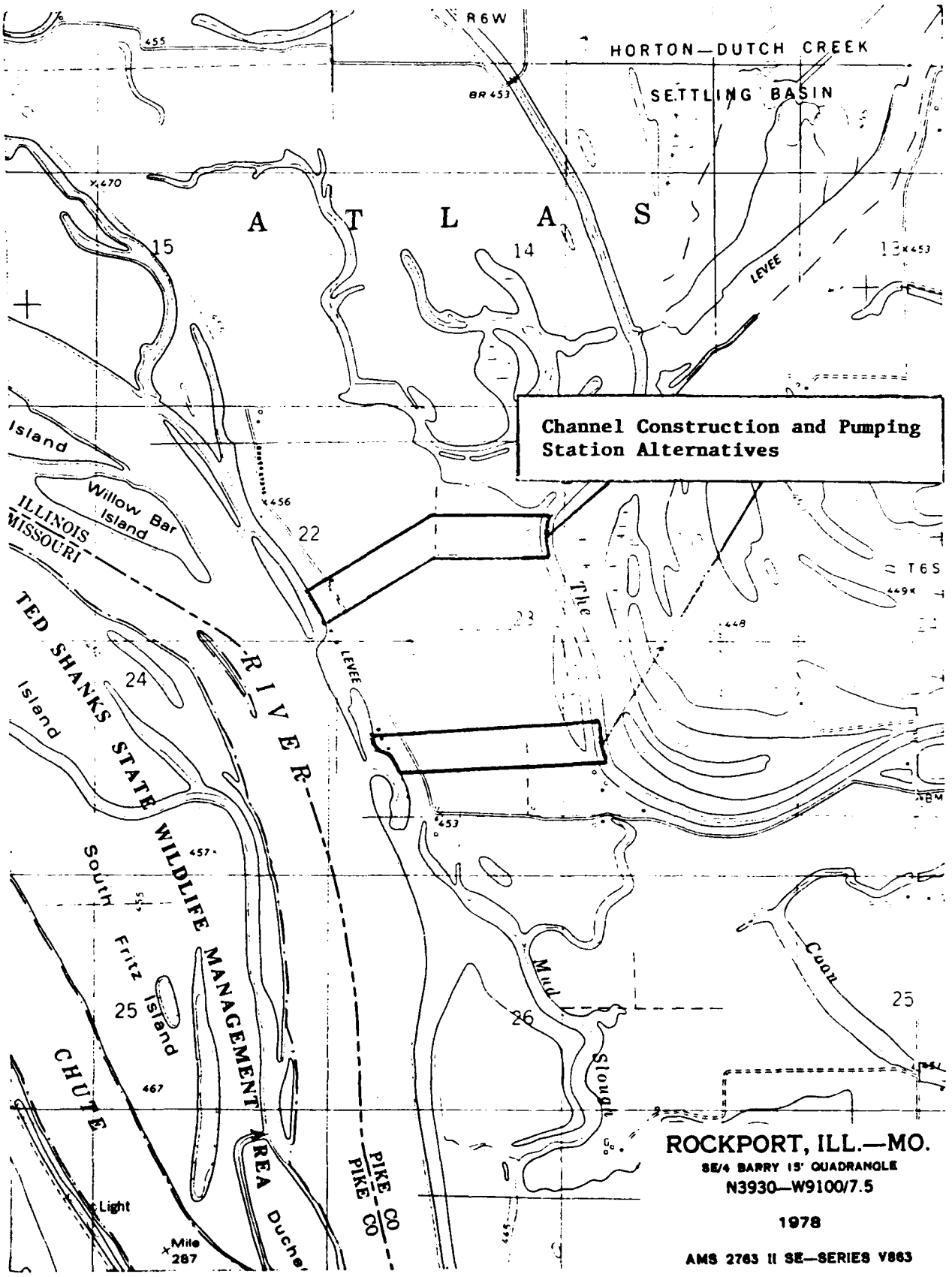
Project Location in Illinois.

PLATE C-1



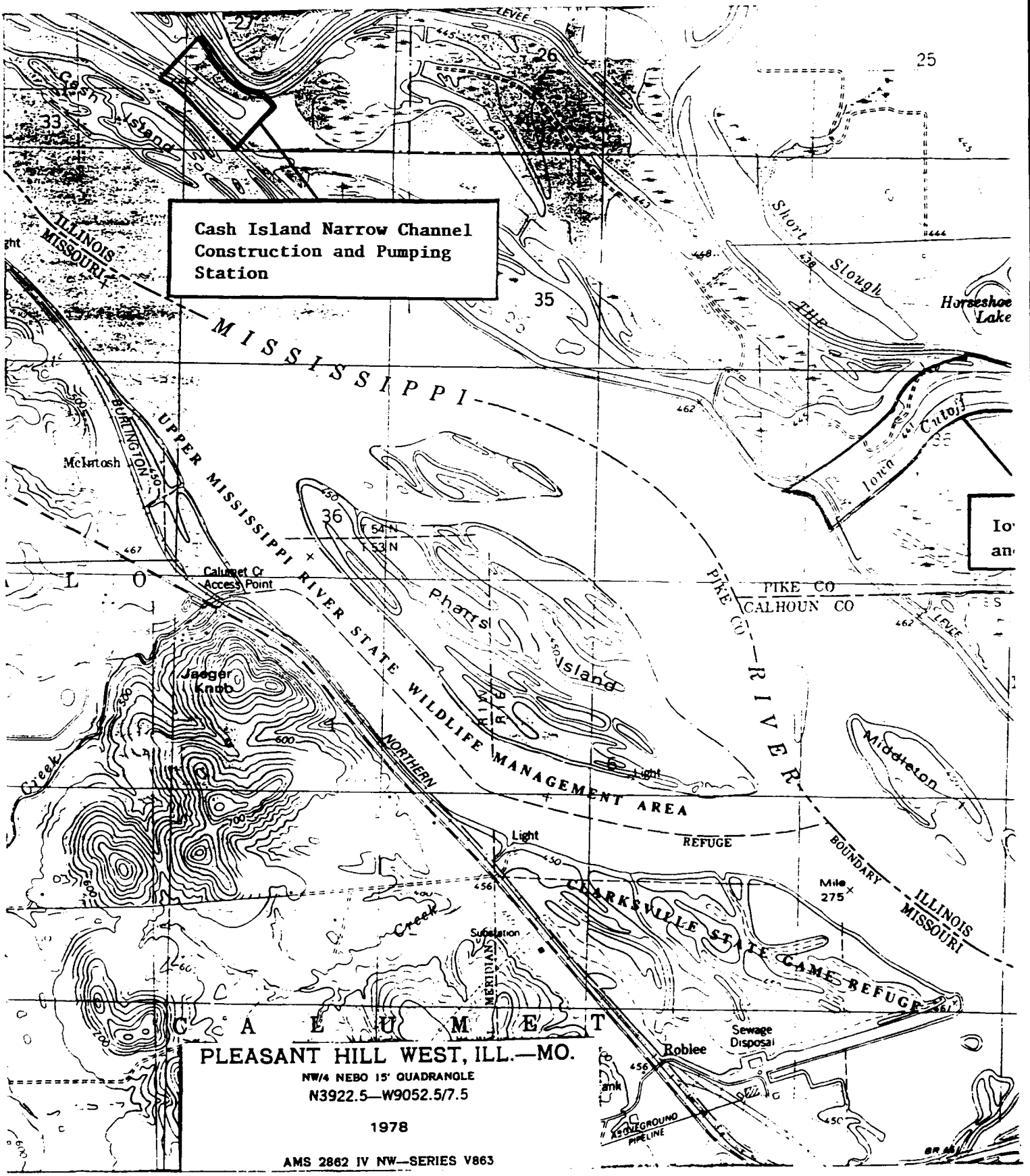
Pumping Station No. 1 Vicinity, Proposals Under Study.

PLATE C-2



Horton-Dutch Creek Vicinity, Proposals Under Study.

PLATE C-3



Pumping Station No. 3A Vicinity, Proposals Under Study.

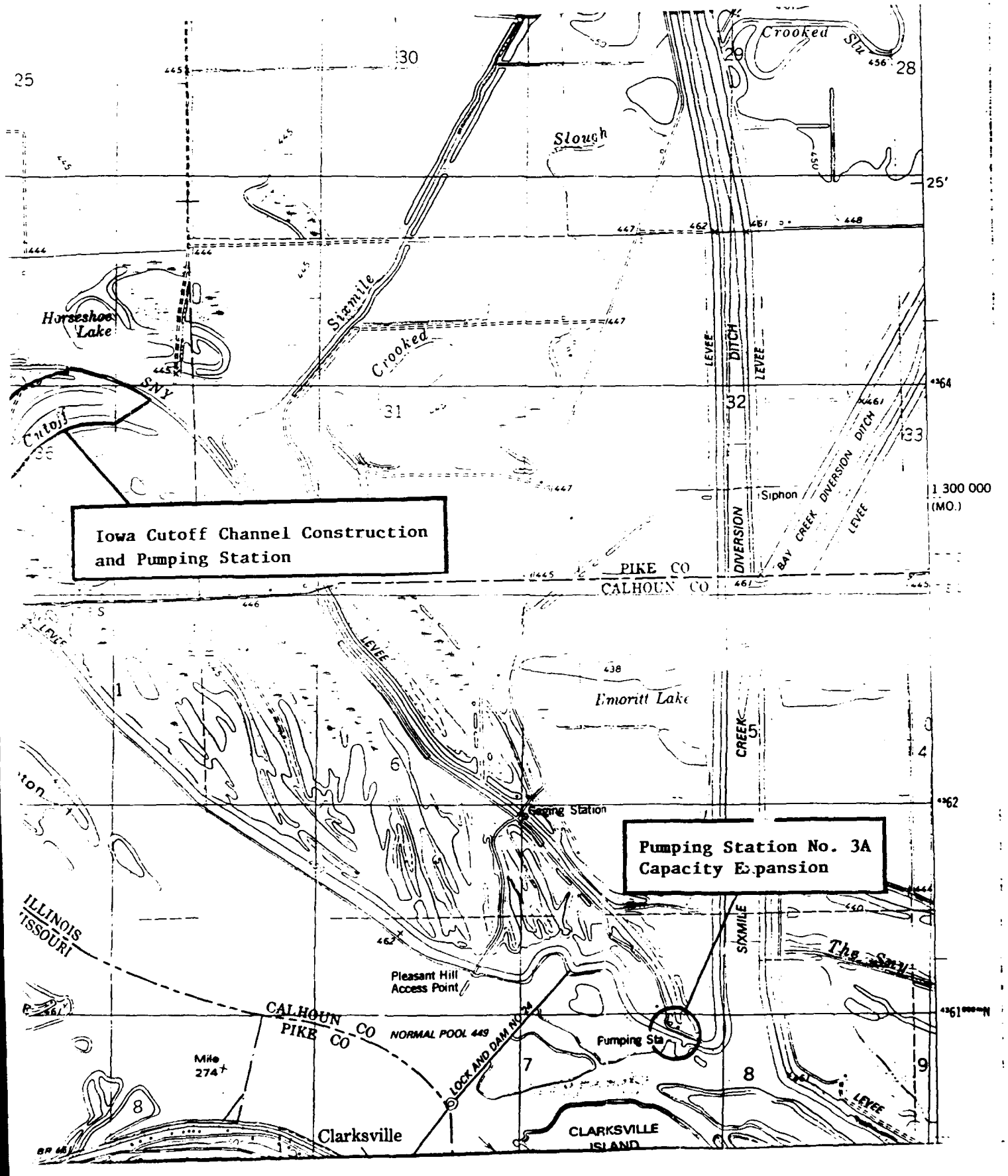
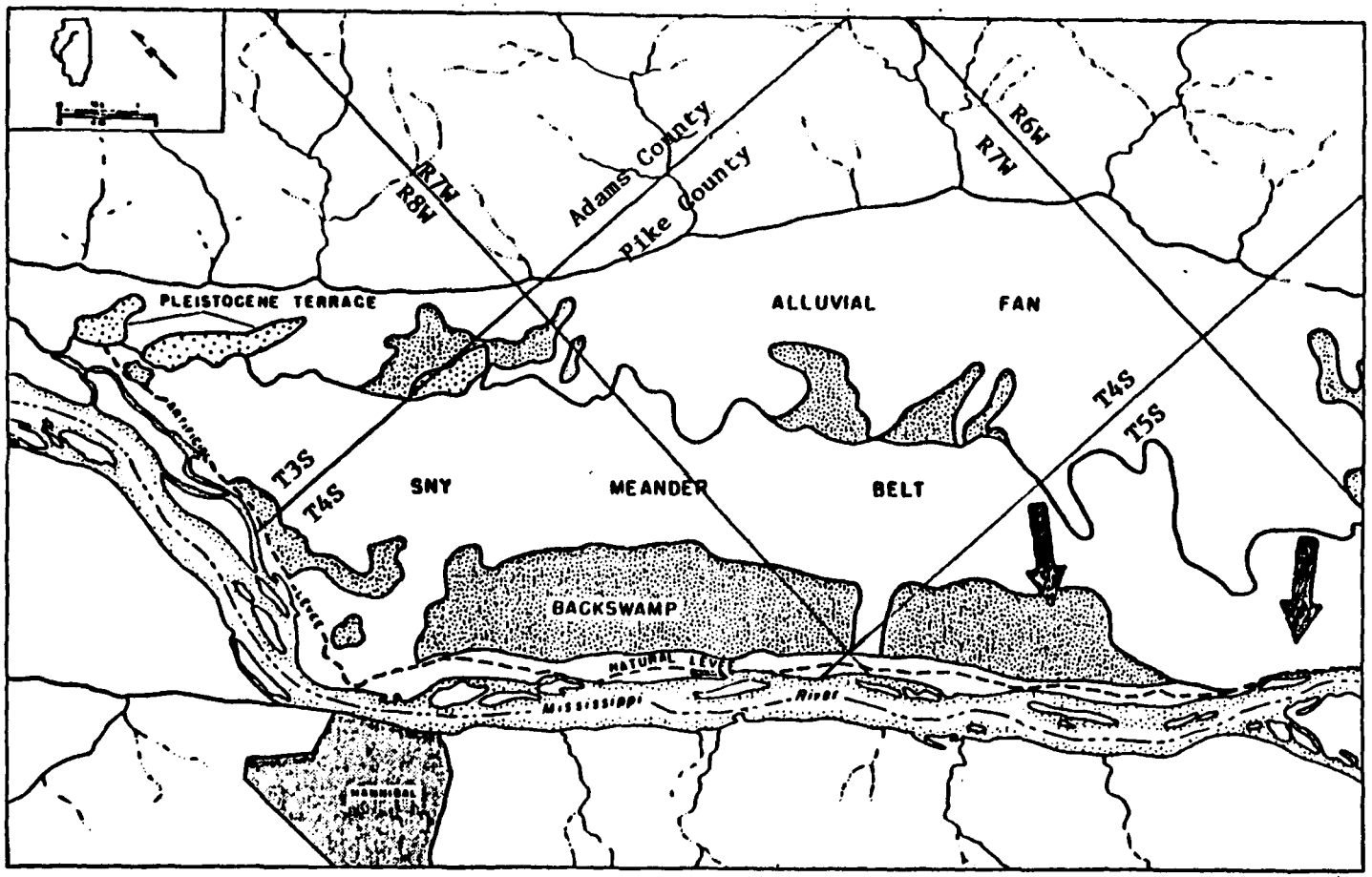
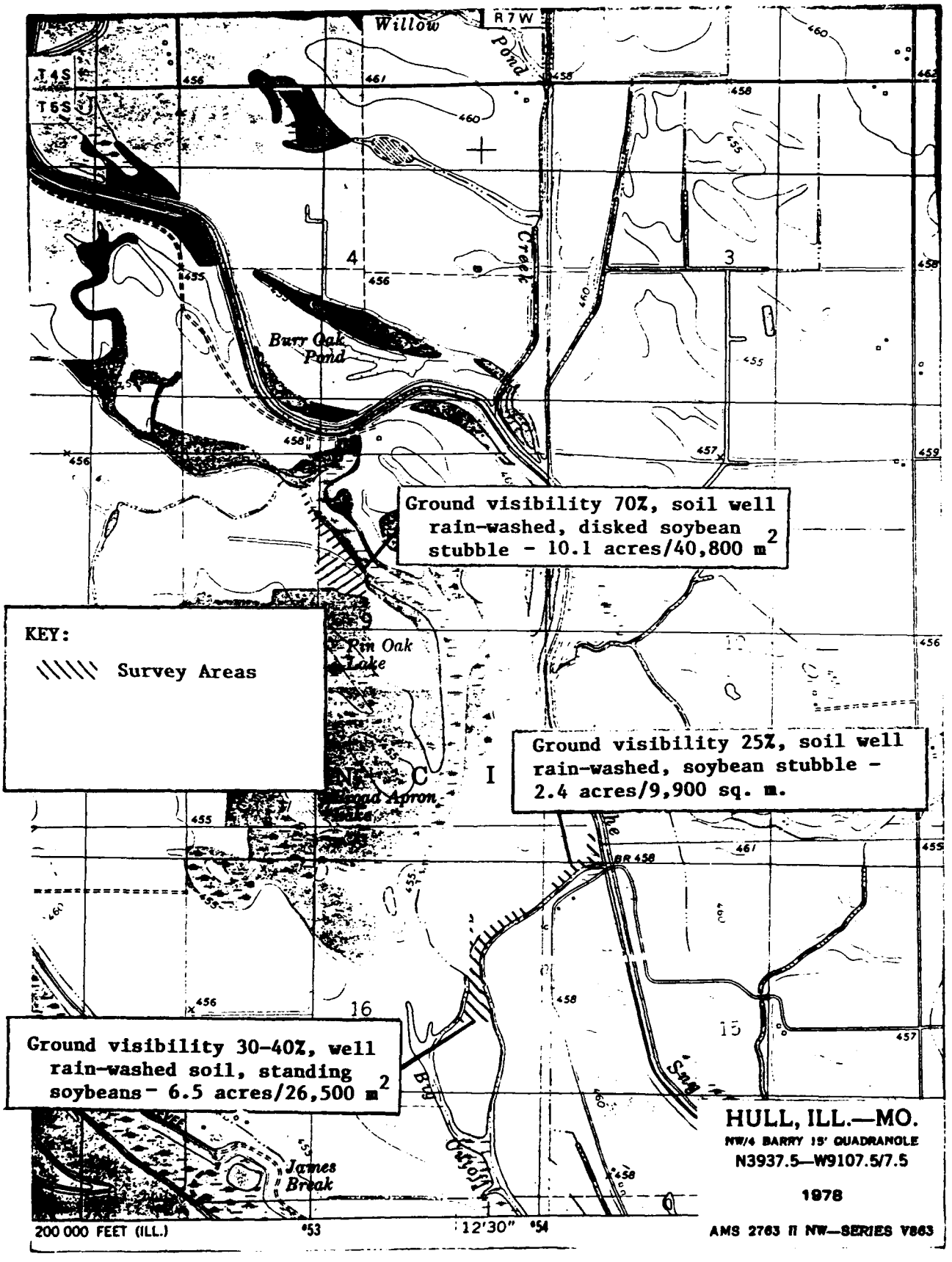

Iowa Cutoff Channel Construction and Pumping Station
Pumping Station No. 3A Capacity Expansion
Crooked Slu
Slough
Horseshoe Lake
Sixmile
Crooked
LEVEE
DITCH
LEVEE
DIVERSION DITCH
BAY CREEK
LEVEE
Siphon
PIKE CO
CALHOUN CO
Emoritt Lake
CREEK
SIXMILE
Gaging Station
ILLINOIS
MISSOURI
Pleasant Hill Access Point
CALHOUN CO
PIKE CO
NORMAL POOL 449
LOCK AND DAM NO. 24
Pumping Sta
Mile 274
Clarksville
CLARKSVILLE ISLAND
LEVEE
1 300 000 (MO.)

PLATE C-4



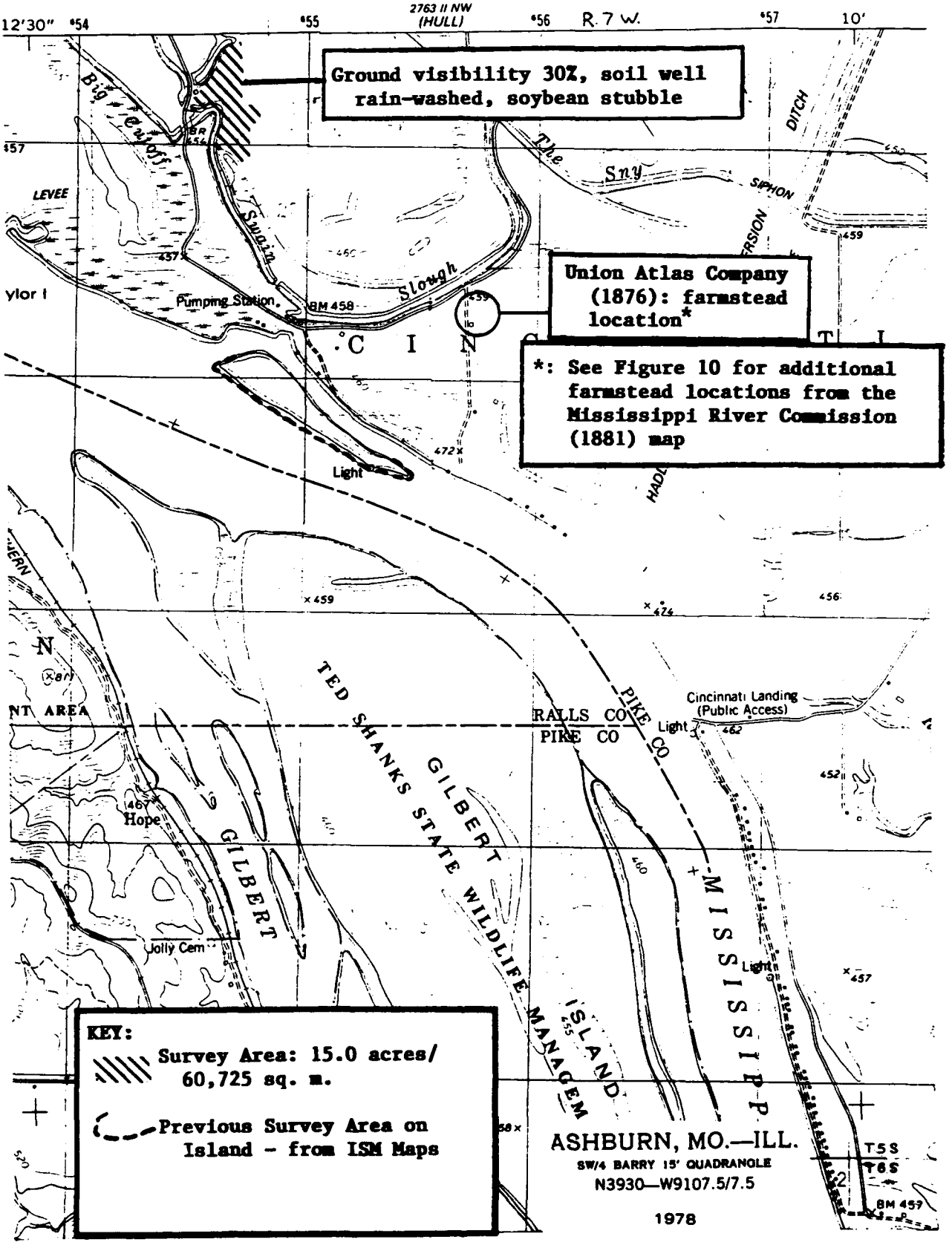
Landforms in the Pumping Station No. 1 Vicinity (arrows show the upstream and downstream limits of proposals under study; base map directly from Leigh (1985: Figure 4).

PLATE C-5



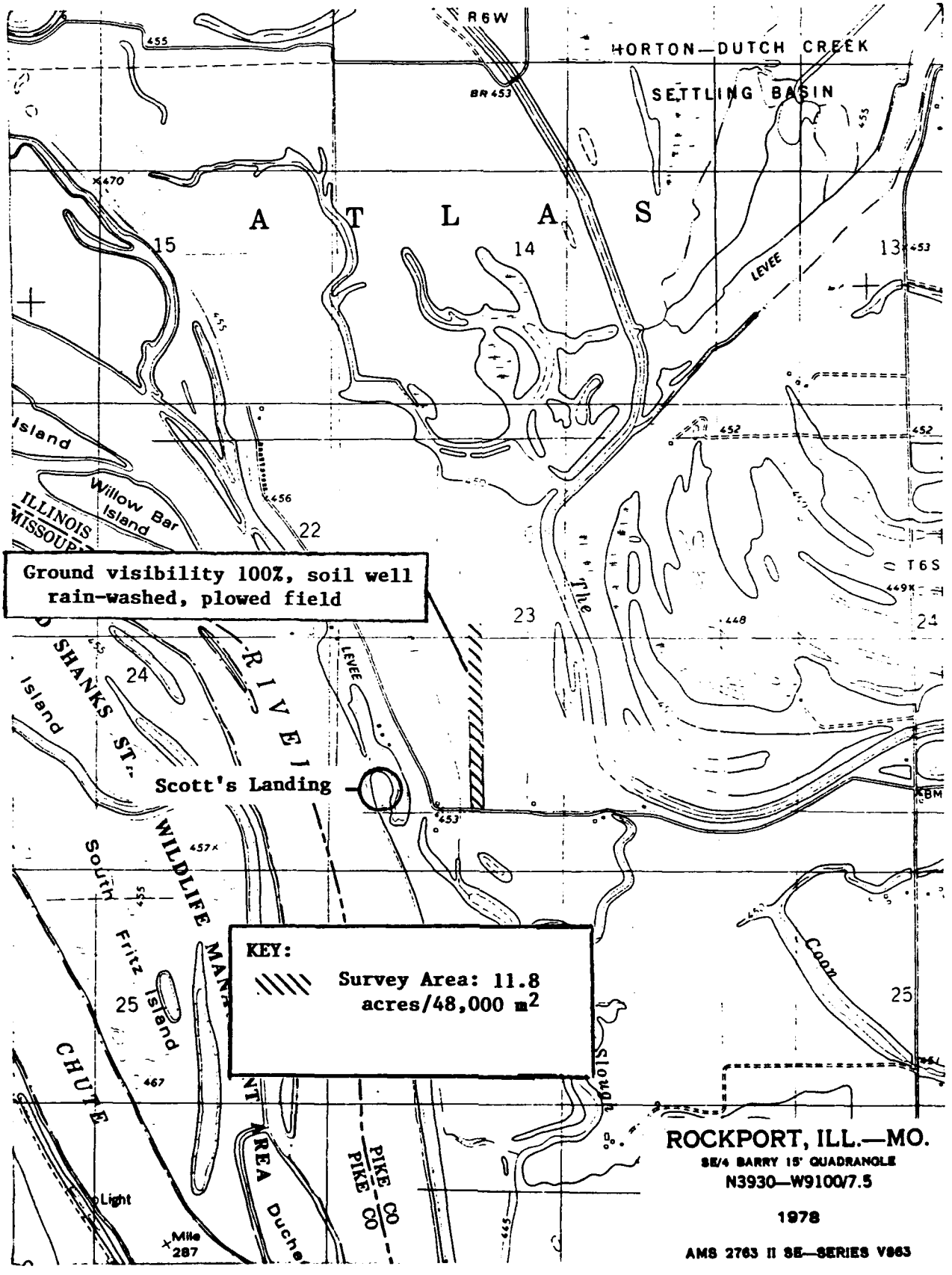
Pumping Station No. 1 Vicinity, Survey Areas, Hull Quadrangle.

PLATE C-6



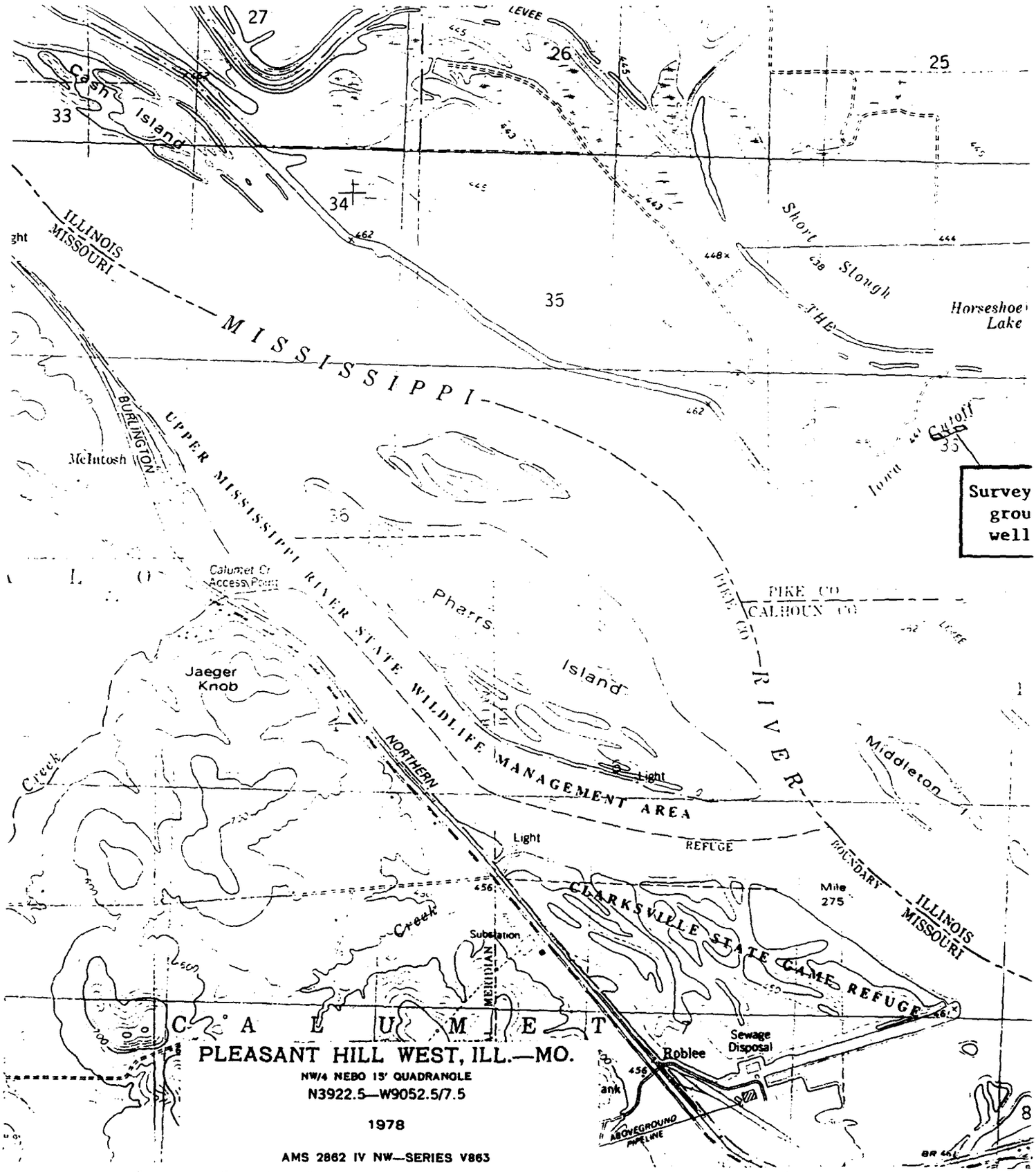
Pumping Station No. 1 Vicinity, **Survey Area, Ashburn Quadrangle.**

PLATE C-7



Horton-Dutch Creek Vicinity, Survey Area, Rockport Quadrangle.

PLATE C-8



Pumping Station 3A Vicinity, Survey Area, Pleasant Hill (West) Quadrangle.

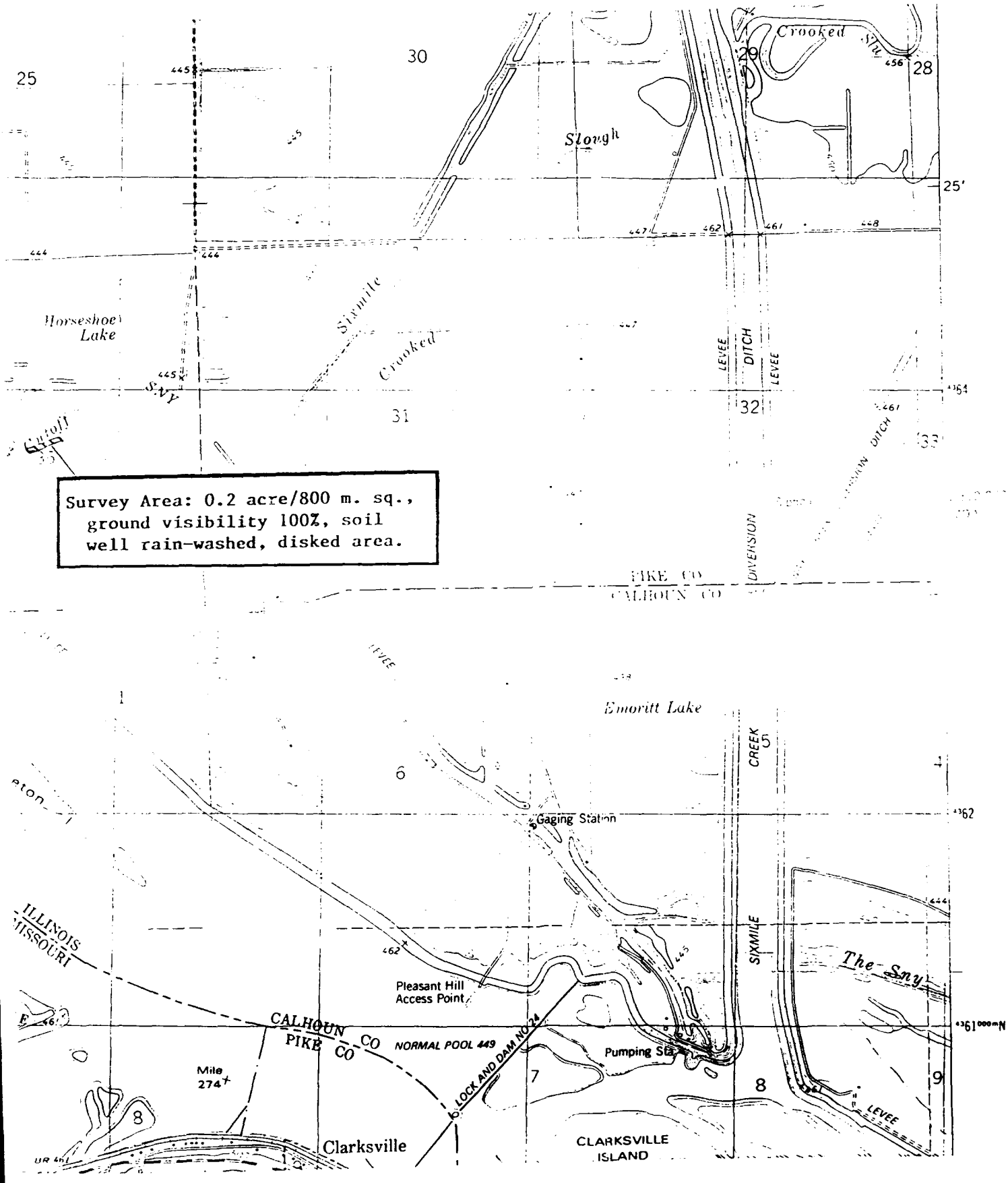
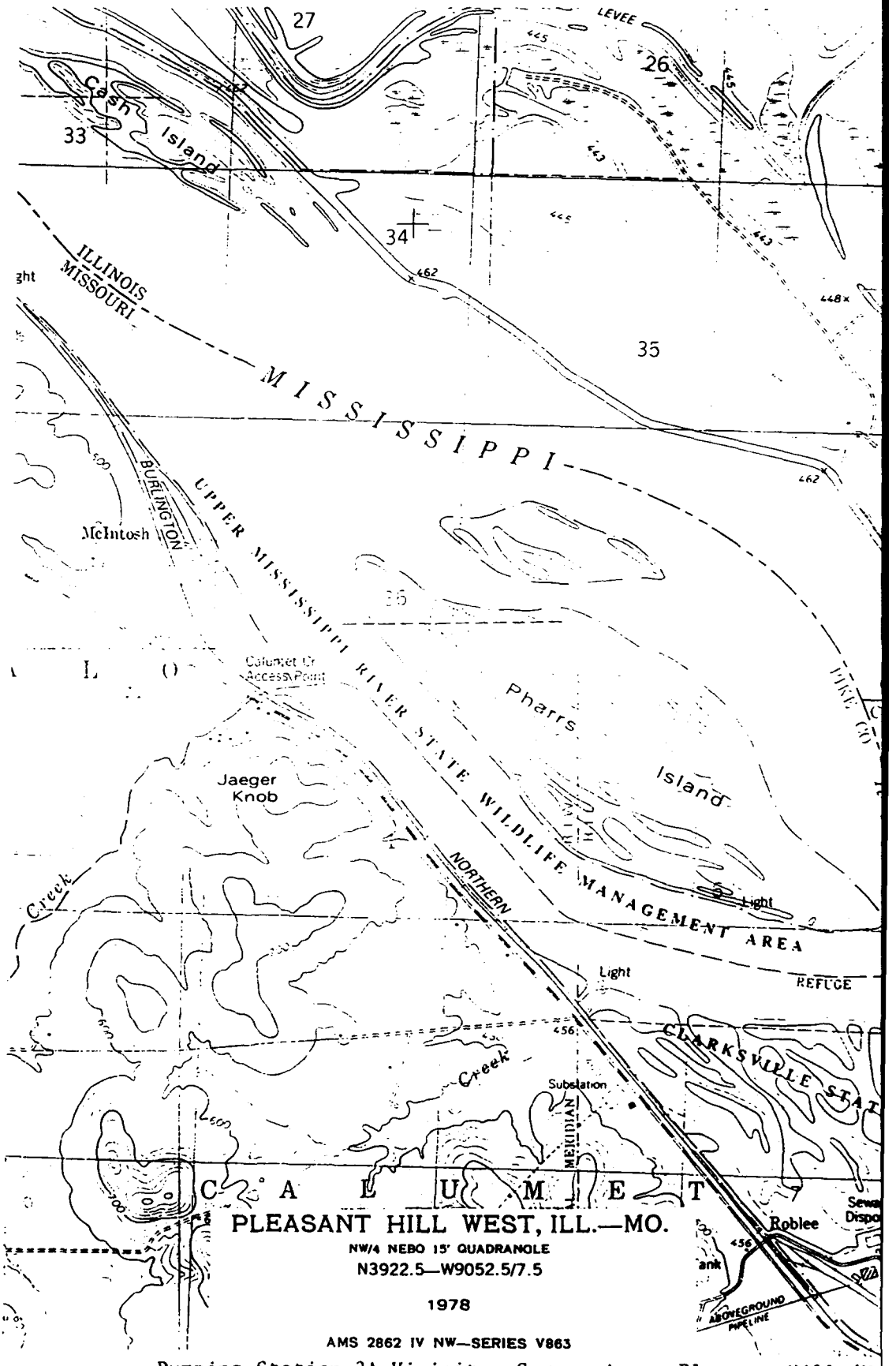
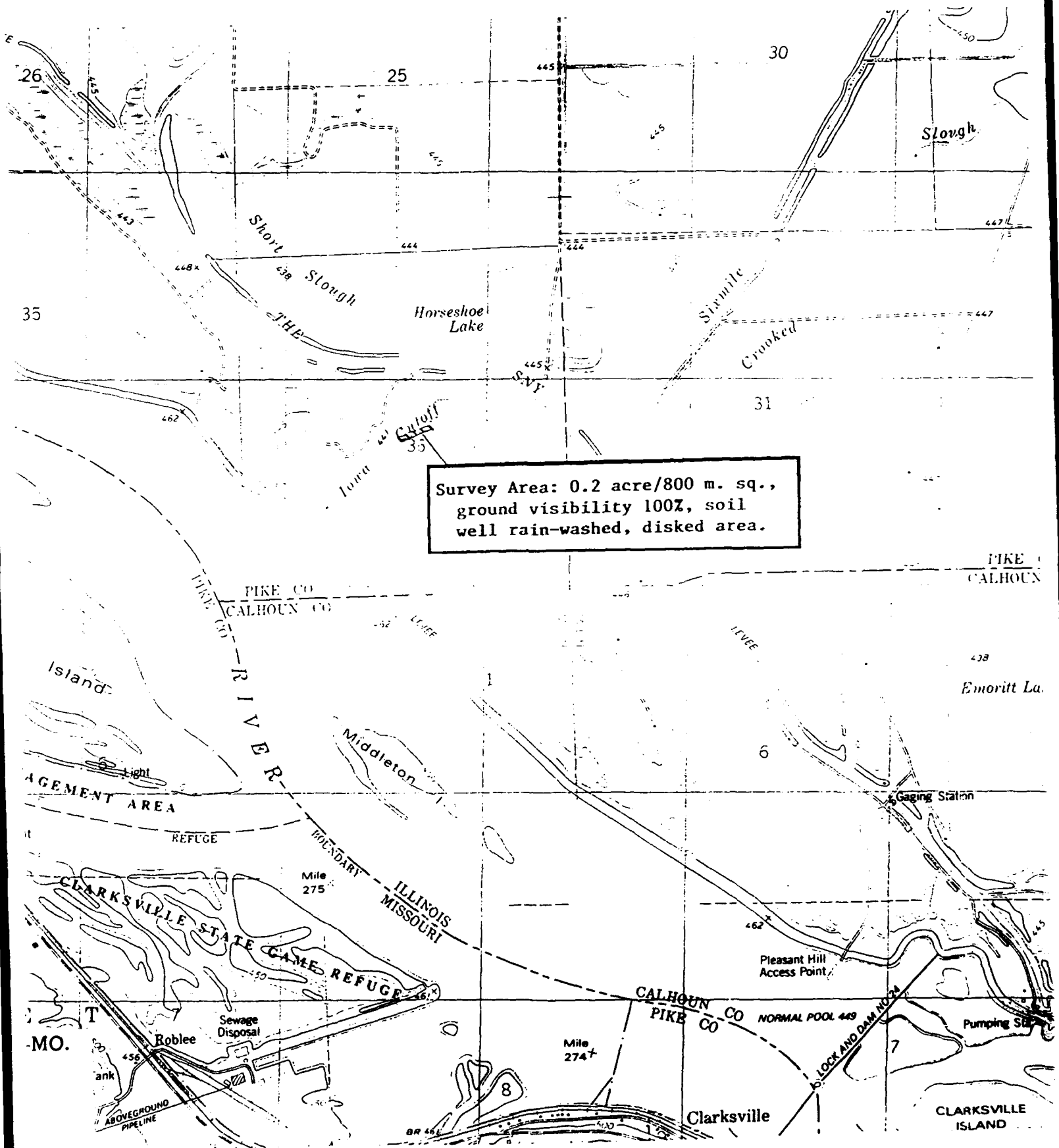

Survey Area: 0.2 acre/800 m. sq., ground visibility 100%, soil well rain-washed, disked area.
Crooked
Slough
Horseshoe Lake
Sixmile
Crooked
LEVEE
DITCH
LEVEE
DIVERSION
PIKE CO
CALHOUN CO
Emoritt Lake
CREEK
Gaging Station
ILLINOIS
MISSOURI
Pleasant Hill Access Point
SIXMILE
The Sny
CALHOUN CO
PIKE CO
NORMAL POOL 449
LOCK AND DAM NO 24
Pumping Sta
Mile 274+
Clarksville
CLARKSVILLE ISLAND
LEVEE

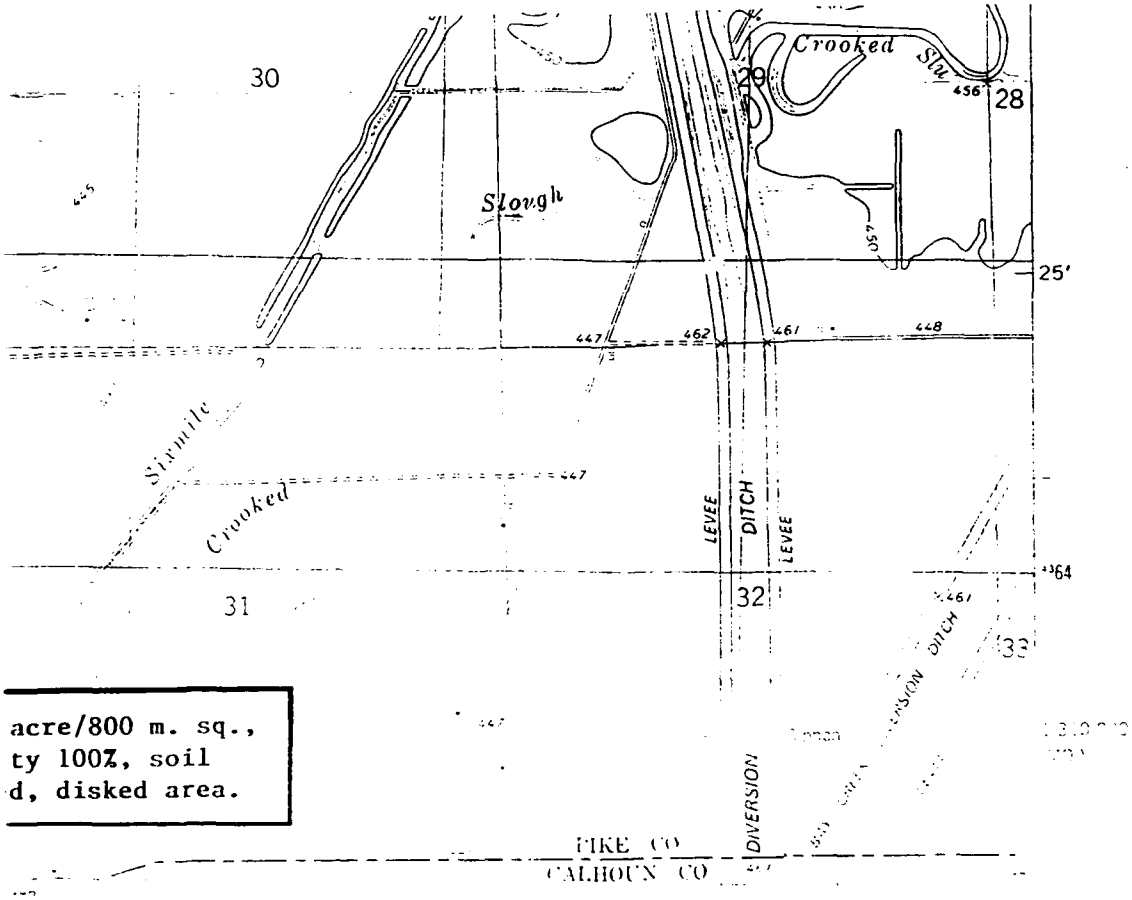
PLATE C-9



Pumping Station 3A Vicinity, Survey Area, Pleasant Hill (We



rea, Pleasant Hill (West) Quadrangle.



acre/800 m. sq.,
ty 100%, soil
d, disked area.

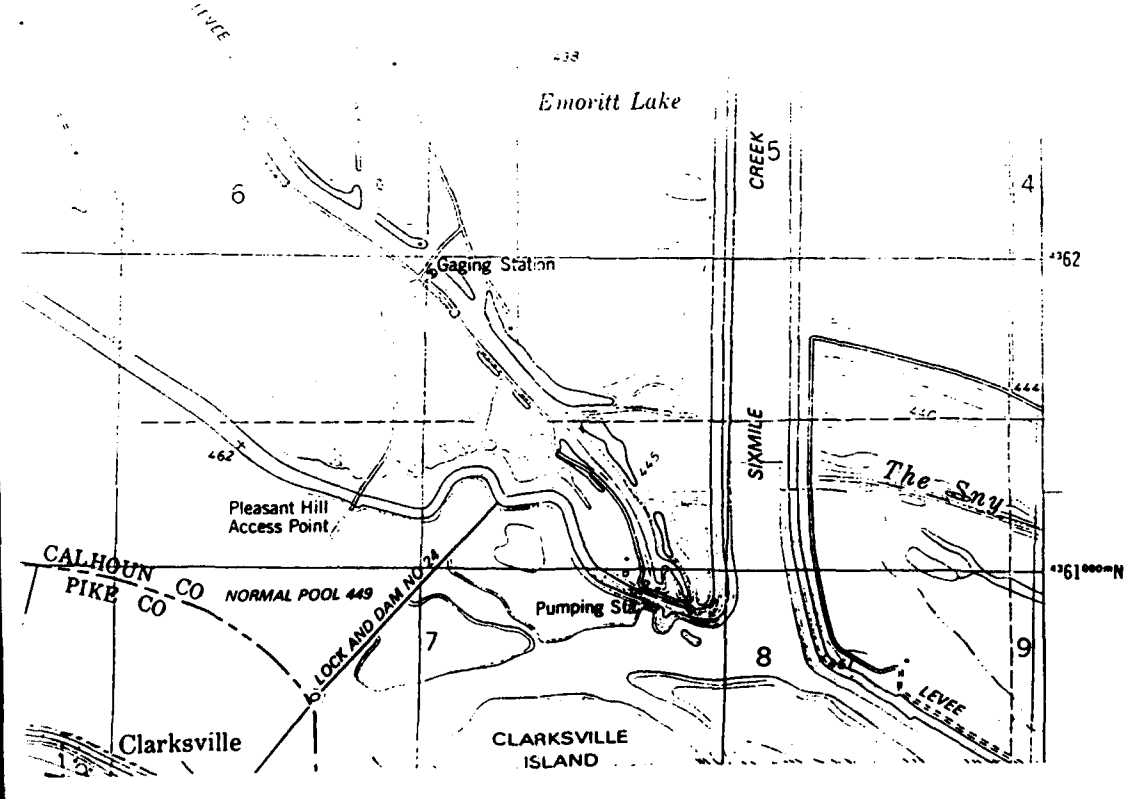
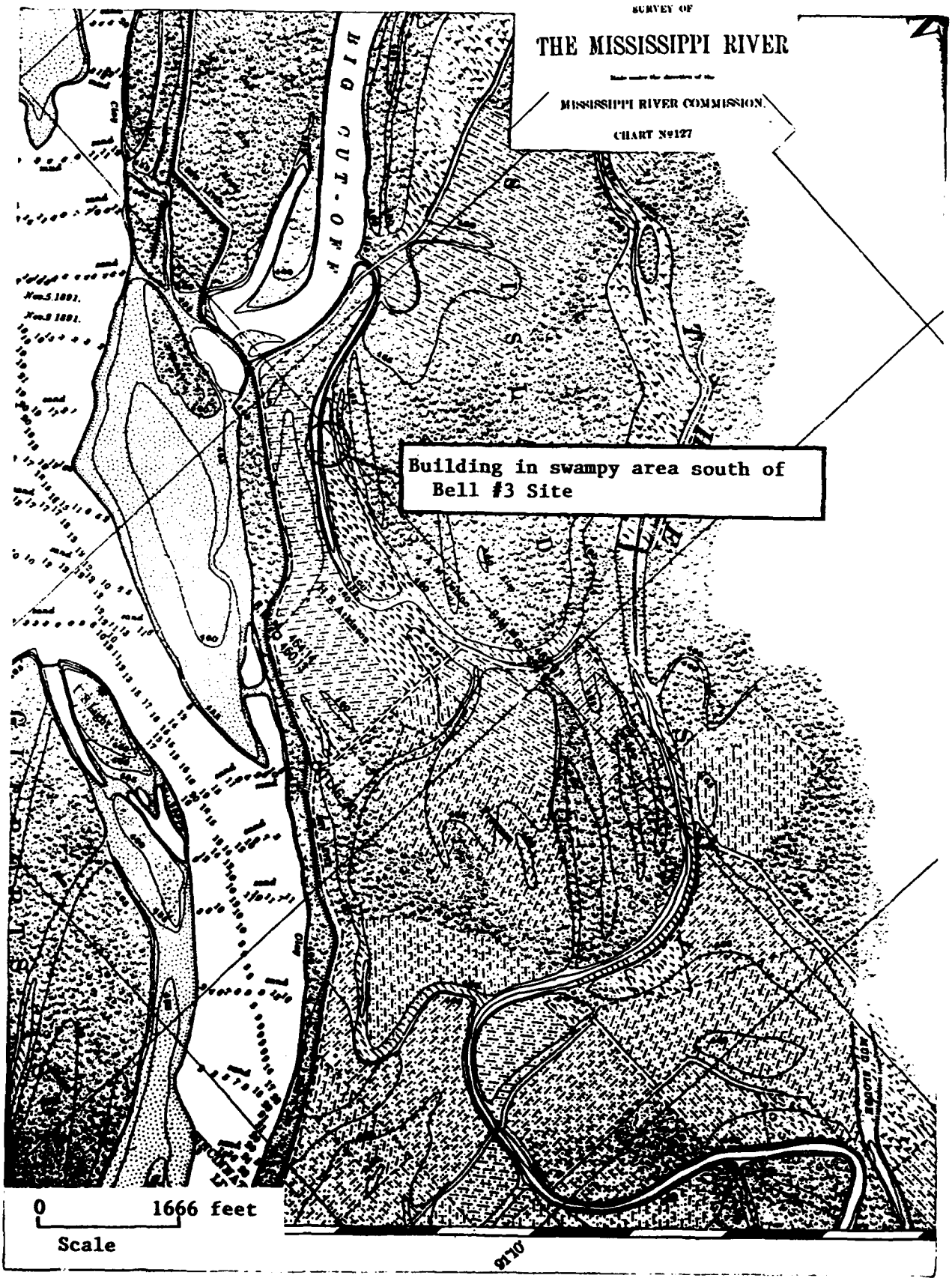


PLATE C-9

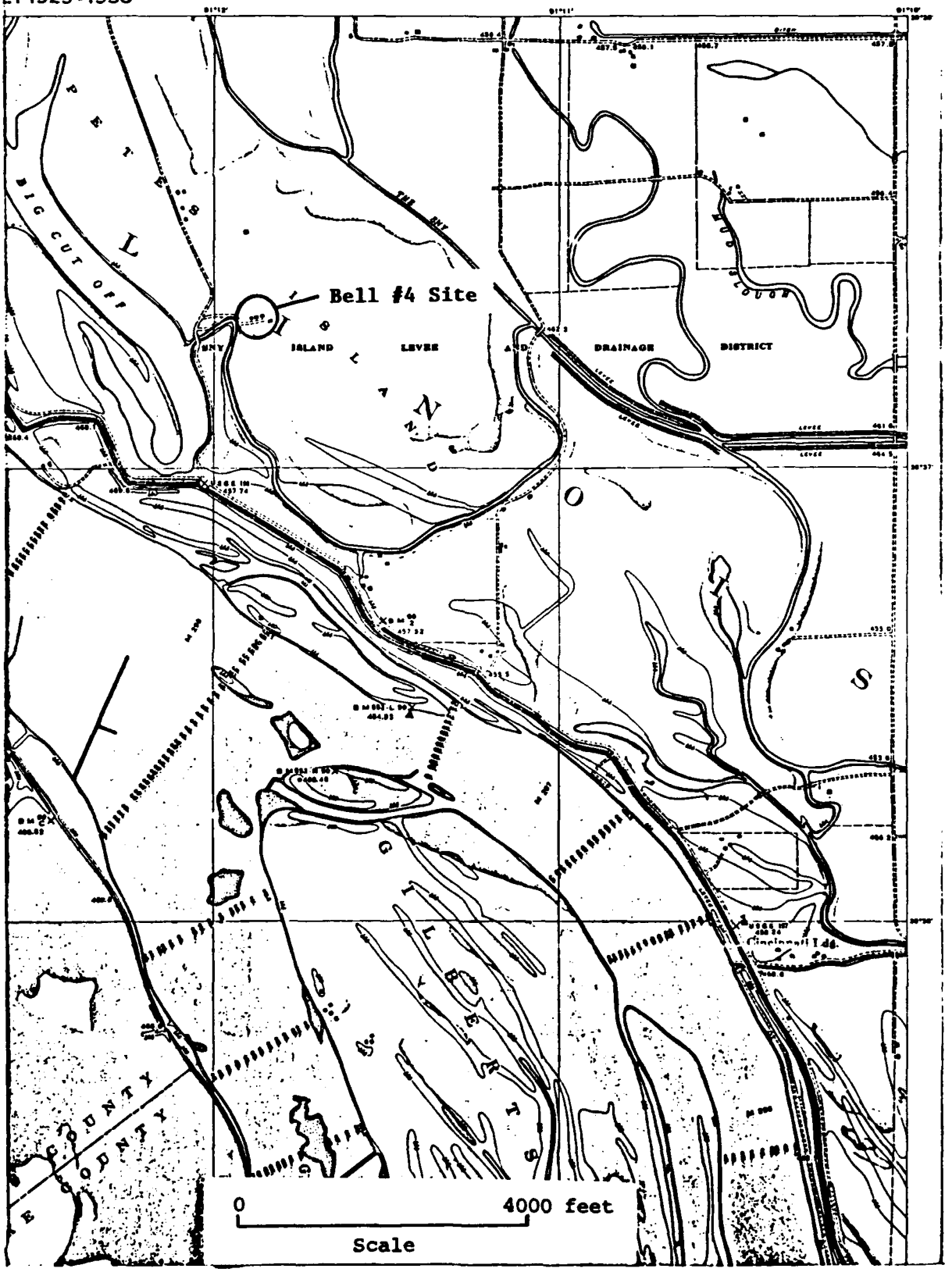


Mississippi River Commission (1881) Chart No. 127 Showing a Building in the Swain Slough Locality, Pumping Station No. 1 Vicinity.

PLATE C-10

ISSISSIPPI RIVER
DTA, TO GRAFTON, ILLINOIS
EY 1929 - 1930

SHEET NO. 111



Brown (1929-1930) Sheet No. 111 Showing Bell #4 Site.

PLATE C-11

APPENDIX D

PERTINENT CORRESPONDENCE

RECONNAISSANCE REPORT
FOR
SECTION 205 FLOOD DAMAGE REDUCTION STUDY

THE SNY ISLAND LEVEE DRAINAGE DISTRICT
ADAMS, PIKE, AND CALHOUN COUNTIES, ILLINOIS

APPENDIX D
PERTINENT CORRESPONDENCE

TABLE OF CONTENTS

SNY ISLAND LEVEE DRAINAGE DISTRICT

110,000 Acres in Adams, Pike and Calhoun Counties
PHONE: 426-2521 — NEW CANTON, ILLINOIS 62356

January 13, 1989

District Engineer
U.S. Army Corps of Engineers
ATTN: Planning Division
Clock Tower Building
Rock Island
IL 61204-2004

Dear Sir:

I have been informed that the President's new budget did not contain provisions for further funding for the completion of the Reconnaissance Study on the Dutch/Horton Reservoir. In order to take advantage of facts gained through the initial appraisal completed in June of 1988, and keep the project alive the Commissioners of the Sny Island Levee Drainage District respectfully request that the Corps of Engineers continue and complete the Reconnaissance Study under Section 205 as per our letter of June 25, 1987, Small Flood Control Projects.

It is the understanding of the District that on completion of the Reconnaissance Study, should the study so warrant the Corps of Engineers will then undertake a Feasibility Study which must be funded 50/50 by the Corps and the District, of which a portion of the District's share could be "work in kind".

It is further understood that after completion of the feasibility phase, the Corps will determine which method of funding is applicable and at that time the Sny will enter into a local cooperation agreement, should it be mutually determined that the project is cost effective and within the economic capability of the District.

Thank you for your consideration in this matter, please advise if further information is required.

Respectfully Submitted,
SNY ISLAND LEVEE DRAINAGE DISTRICT

Board of Commissioners

Jack L. Borrowman

George D. Borrowman

J. Fred Schwartz

John H. Reiter, Superintendent

JHR/jc

Illinois Historic
Preservation Agency

Old State Capitol • Springfield, Illinois 62701 • (217) 782-4836

217/785-4997

ADAMS, CALHOUN AND PIKE COUNTIES
Reconnaissance Study for
Flood Damage Reduction
The Sny Channel

IHPA LOG #90040404

April 25, 1990

Mr. John R. Brown
Colonel, U.S. Army
District Engineer
U.S. Army Engineer District, Rock Island
Attention: Planning Division
Clock Tower Building - Post Office Box 2004
Rock Island, Illinois 61204-2004

Dear Sir:

Thank you for requesting comments from our office concerning the possible effects of the project referenced above on cultural resources. Our comments are required by Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations, 36 CFR 800: "Protection of Historic Properties".

Numerous historic and prehistoric archaeological sites are potentially located within this study area. Any project proposals should include plans for identifying these resources and ensure that impacts on cultural resources will be adequately addressed. We look forward to receiving a report on this study and to working with your office in the future.

If you have any further questions, please contact Paula G. Cross, Staff Archaeologist, Illinois Historic Preservation Agency, Old State Capitol, Springfield, Illinois 62701, 217/785-4998.

Sincerely,

Theodore Hild

Theodore W. Hild
Deputy State Historic
Preservation Officer

TWH:PGC:bb

Illinois Department of Conservation
life and land together

LINCOLN TOWER PLAZA • 524 SOUTH SECOND STREET • SPRINGFIELD 62701-1787
CHICAGO OFFICE • ROOM 4-300 • 100 WEST RANDOLPH 60601
MARK FRECH, DIRECTOR - KATHY SELCKE, ASSISTANT DIRECTOR

November 28, 1990

Mr. Dudley M. Hanson, P.E.
Chief, Planning Division
Rock Island Dist. Corps of Engineers
Clock Tower Building, P.O. Box 2004
Rock Island, IL 61204-2004

Dear Mr. Hanson:

Thank you for your October 15, 1990 letter concerning your on-going reconnaissance study for the Sny Island Levee and Drainage District, Pike and Calhoun Counties, Illinois.

The Department has no records of the occurrence of endangered or threatened species in the areas which would be directly affected by any of the three alternatives being considered as a means to increase flow through the Sny. Implementation of any of the alternatives would not be likely to have adverse effects on listed species.

Alternative (a) as described in the Corps' letter would be likely to adversely affect the Pin Oak Lake Natural Area and Big Britches Natural Heritage Landmark. These areas are located immediately adjacent to Big Cutoff in Sections 8, 9, and 16, T5S, R7W in Pike County. The Natural Areas Inventory describes the Pin Oak Lake Natural Area as a "large tract of medium and high quality bottomland forest, with four natural wetland openings in the forest." Big Britches is a 145-acre portion of an area which is being voluntarily protected by its owner.

While we are not personally familiar with the hydrological relationship between Pin Oak Lake and Big Cutoff it appears on topographic maps that the areas are connected. Excavation of Big Cutoff could cause changes in the water levels of Pin Oak Lake and alterations of the natural communities found there. For this reason, we would strongly recommend that any alternation of Big Cutoff be avoided.

Based on the information you have provided, we would encourage the Corps to adopt alternative (b), the addition of a pump to pump station No. 3A. This alternative does not require the alteration of existing habitat conditions along the Sny. Alternatives (a) and (c), because they include alteration of existing drainage patterns, present much greater potential for damage to areas adjacent to the sloughs and cutoffs.

Please keep us advised of your study progress. Thank you for the opportunity to comment.

Sincerely,

Mark Frech

Mark Frech
Director

cc: USFWS, Rock Island

United States Department of the Interior

Fish and Wildlife Service
Rock Island Field Office (ES)
1830 Second Avenue, Second Floor
Rock Island, Illinois 61201

TAKE PRIDE IN AMERICA

In Reply Refer to:

COM: 309/793-5800
FTS: 782-5800

December 11, 1990

Colonel John R. Brown
District Engineer
U.S. Army Engineer District
Rock Island
Clock Tower Building, P.O. Box 2004
Rock Island, Illinois 61204-2004

Dear Colonel Brown:

This constitutes our Planning Aid Letter for your Reconnaissance Study of flooding problems along The Sny, Pike and Calhoun Counties, Illinois. The study is being conducted under the authority of Section 205 of the Flood Control Act of 1948. Agricultural lands, residential properties and structures are subject to flooding from The Sny. Your study will investigate the feasibility of passing storm runoff and excess levee seepage more effectively in order to reduce flood damages and potential.

This letter will identify the fish and wildlife resources of the project area, any problems or concerns associated with those resources, and potential impacts that may be realized from the various alternatives that have been proposed to date.

DESCRIPTION OF THE PROJECT AREA

The project area consists of the Sny Island Levee and Drainage District, particularly properties located west of the main stem levee on The Sny, Big Cutoff (slough), Swain Slough, Iowa Cutoff and the Mississippi River in the immediate vicinity of the a proposed pumping station (river miles 276 and 278).

Fish and Wildlife Resources

We investigated the fish and wildlife resources of the study area in September of this year and the following information summarizes our findings.

The lands along The Sny are primarily agricultural. Most are intensively farmed and in row crops. The area provides wildlife

habitat values primarily for species adapted to agricultural environments, such as deer, raccoons, rabbits, mice and other small mammals, songbirds, crows, hawks, pheasants and others. Scattered throughout the area are remnant tracts of bottomland hardwood wetlands, sloughs, oxbow lakes and drainage ditches which provide habitat values for turkey, waterfowl, wading and shore birds such as herons, egrets, and sandpipers; muskrats, beavers, deer, foxes, coyotes, squirrels and various amphibians and reptiles.

Swain Slough is currently maintained for drainage from The Sny to Pumping Station No. 1, and from the Pumping Station to the township road, a distance of about 1 3/4 mile. It is mostly bordered by cropland and its banks are vegetated by grasses and other herbaceous vegetation. Near the township road is a section of bottomland hardwoods comprised of mature (40-60 foot high) silver maple and cottonwood trees. Above the township road, Swain Slough enters Big Cutoff.

Big Cutoff is a fairly high quality open water/emergent wetland that developed in a meander remnant of the Mississippi River. It is bordered on the west by mature bottomland timber comprised primarily of silver maple and cottonwoods. The other side consists of a narrow crop field bordered by mature bottomland forest. Portions of Big Cutoff in this area have been cleaned out in order to maintain drainage. This situation exists for about 0.7 mile upstream of the township road where Big Cutoff divides into two small drainageways.

One of the small drainageways, bordered on both sides by cropland, extends north and east for about one mile where it joins The Sny. The other is a continuation of Big Cutoff north for about two miles to The Sny, but is not joined with it. For the first 1/2 to 3/4 mile, it is bordered on both sides by cropland, with scattered small blocks of trees along its banks. At this point, Big Cutoff spreads out into a complex of bottomland forested wetland and remnant meander lakes. One of these is Pin Oak Lake (see discussion of Natural Areas).

Iowa Cutoff is a high quality remnant meander lake that consists primarily of open water with a fringe of emergent marsh. It is bordered on both sides by mature bottomland timber consisting of silver maple, cottonwood and sycamore.

We have no fisheries data for The Sny or the more permanent sloughs and oxbow lakes. However, they likely provide habitat for such species as carp, catfish, largemouth bass, bluegill, crappie, and smaller forage species such as gizzard shad and bluntnose minnow. A list of those species collected in the Mississippi River in Pool 24 is found in Table 1.

Threatened and Endangered Species

Our information indicates there are four federally-listed endangered species that may occur in the vicinity of the project.

The gray bat (Myotis grisescens) utilizes caves for summer roosts and winter hibernation. It feeds over rivers, streams and lakes within one kilometer of their caves. No caves are located within the project area, and no impacts to this species are anticipated.

The Indiana bat (Myotis sodalis) is listed as statewide in distribution. It frequents the corridors of small streams with well developed riparian woods as well as mature upland forests. It forages for insects by flying beneath the tree canopy, and roosts and rears its young beneath the loose bark of large dead trees that are generally greater than sixteen inches in diameter. It winters in caves and abandoned mines. There are no known hibernation sites in the vicinity, but summer habitat may exist. Any alternative that requires clearing of trees should include a survey for this species, unless the trees are cleared between the dates of September 1 and April 30.

The bald eagle (Haliaeetus leucocephalus) is listed as breeding and wintering in Calhoun and Pike Counties. In the winter, this species feeds on fish in the open water areas created by dam tailwaters, the warm water effluents of power plants and municipal and industrial discharges, or in power plant cooling ponds. The more severe the winter, the greater the ice coverage and the more concentrated the eagles become. They roost at night in groups in ravines adjacent to the river that are protected from the harsh winter elements. They perch in large shoreline trees to rest or feed on fish. The only restrictions that apply to the eagle are that it not be harassed, harmed or disturbed when present.

The fat pocketbook pearly mussel (Potamilus capax) historically occurred in the Mississippi River but has not been collected alive for many years. However, in 1986, a fresh dead shell was recovered from the Mississippi River at river mile 287.0. In addition, a transplantation of live fat pocketbook mussels has been attempted by the Missouri Department of Conservation into several sites on the Mississippi River in the 1989. One of those sites is located at River Mile 291.2 adjacent to Blackbird Island.

Natural Areas

Information available to us also indicates the presence of one 298-acre area listed on the Illinois Natural Areas Inventory. Pin Oak Lake, and surrounding wetlands, is located at the upper end of Big Cutoff in NE 1/4 of Section 8, Section 9 and the N 1/2 of Section 16, Range 7 West, Township 5 South. It consists

primarily of undisturbed or slightly disturbed wet-mesic floodplain forest and shrub swamp/pond.

PROJECT ALTERNATIVES AND IMPACTS

Five alternative actions, besides no action, are being studied.

Alternative 1. This plan would improve the efficiency of Pumping Station No.1 by expanding the Swain Slough/Big Cutoff channel north from the pumping station to The Sny. From the point where Big Cutoff divides into two drainageways, two alternatives have been identified. **Alternative 1A** would expand the drainageway north and east for about one mile to The Sny. **Alternative 1B** would expand the northerly extension of Big Cutoff for about 2 miles connecting with The Sny.

Impacts due to deepening and/or widening Swain Slough from the pumping station to the township road are minimal since it has been maintained before. Presuming the disposal of excavated material is in the same sites that were previously used, we anticipate no impact. If, however, disposal occurs in wetland areas, then the impacts would be greater. Expanding Big Cutoff above the township road would have impacts mainly in the deposition of spoil material. Since most of this section has not been maintained before, new disposal sites would need to be found. In areas where there is cropland adjacent to the channel(s), the material could be placed with little or no impact. However, if material is to be deposited in wetlands, either emergent or forested, the impacts could be severe. Alternative 1A consists of about 2.25 miles of channel improvement while Alternative 1B consists of about 3.50 miles above the pumping station. By opening the upper end of Big Cutoff to The Sny, the quality of Pin Oak Lake and associated wetland and aquatic habitats may be compromised by sedimentation and/or deposition of dredged material. Alternative 1B may also facilitate the drainage of wetlands in the area and render them susceptible to tillage.

Alternative 2. This alternative involves widening the existing channel of Swain Slough from The Sny to Pumping Station No.1, a distance of about one mile. Presuming all dredged material would be disposed of at existing disposal sites and not in any wetlands, the impacts of this alternative would be negligible.

Alternative 3. This involves adding an additional pump at Pumping Station 3A located at Mississippi River mile 273. The site is at the very downstream end of The Sny and includes one existing pump and an inlet/outlet channel for a second pump. The area is park-like with mowed grasses and scattered mature silver maple and cottonwood trees. People use the site as an access point for fishing.

Addition of a second pump at this site would have negligible impacts on wildlife resources. Operation of the pump may have some impact by entraining small fish, eggs or larvae from the drainage channel.

Alternative 4A. This involves the creation of a new pumping station upstream of Pumping Station No. 3A at Mississippi river mile 276. Iowa Cutoff would be connected to The Sny and the pumping station would be constructed at the levee. Connecting this lake to The Sny would alter the water quality of the lake as well as the fishery composition. It is likely that the lake has better water quality than The Sny because it is less susceptible to runoff laden with suspended sediment and agricultural chemicals. Secondly, it is likely that the fringe of emergent wetland vegetation would ultimately disappear, either through natural causes (i.e. sedimentation in the littoral zone) or because of the need to maintenance dredge the lake at some point in the future. In addition, disposal of the excavated material may impact forested or emergent wetlands in the area. Operation of the pumping station may have some impact by entraining small fish, eggs and larvae from the channel.

Alternative 4B. Construction of the pumping station at Mississippi river mile 278 would require that a channel be excavated to The Sny, a distance of about 1/8 mile. All or a portion of this channel would be constructed through bottomland forest habitat. Operation of the pump station may have some impact by entraining small fish, eggs and larvae from the channel and the Sny.

Alternative 5. This involves cleaning out or redesigning the trash rack at Pumping Station 1A so that it precludes the backup of water in The Sny and drainage channels. This would involve the modification of existing structures only and, therefore, would have no impact on any fish and wildlife resources.

RECOMMENDATIONS

We list the alternative actions in the following order of increasing impacts:

Alternative 5. - cleaning or modifying trash racks

Alternative 3. - adding a pump to Pumping Station 3A

Alternative 2. - expanding the existing channel from The Sny to Pumping Station 1

Alternative 4B.- creation of a new pumping station at river mile 278

Alternative 1A - expanding Swain Slough/Big Cutoff to The Sny via the northeasterly drainageway

Alternatives 1B or 4A - expanding Swain Slough/Big Cutoff to The Sny via Pin Oak Lake or connecting Iowa Cutoff to The Sny and constructing a new pumping station at river mile 276

Furthermore, given existing information, we believe Alternatives 5, 3 and 2 could be accomplished without mitigation of project impacts. Alternatives 4B and 1A could possibly be accomplished without mitigation, depending on the location of spoil disposal sites. Alternatives 1B and 4A would definitely require mitigation of project impacts, probably in the form of habitat creation or enhancement. At the present time, we deem the impacts of 1B and 4A to be unacceptable and recommend against their selection.

We wish to caution your staff that any plans designed to efficiently pass flood waters should not drain existing wetlands in the Sny Island Levee and Drainage District. Deepening and widening ditches and drainageways may result in increasing the scope and effect of the system, which would constitute conversion under the "Swampbuster" provisions of the Food Security Act. Not only would such conversion be contrary to the intent of national policy and Federal legislation, the conversion of wetlands could result in landowners in the levee district being ineligible for USDA program benefits under the recently enacted 1990 Farm Bill.

This letter provides comment under the authority of and in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) and the Endangered Species Act of 1973, as amended. We look forward to working with your staff as your studies of flooding problems on the Sny progress. If you have any questions, please contact Gerry Bade of this office.

Sincerely,

Richard C. Nelson
Field Supervisor

cc: IDOC (Lutz)

GB:sjg

Table 1. Abundant (A), Common (C), Occasional (O), Uncommon (U) and Rare (R) fish species recorded from Mississippi River Pool 24.

Chestnut Lamprey	(Ichthyomyzon castaneus)	O
Silver lamprey	(Ichthyomyzon unicuspis)	U
Lake sturgeon	(Acipenser fulvescens)	R
Pallid sturgeon	(Scaphirhynchus albus)	R
Shovelnose sturgeon	(Scaphirhynchus platorhynchus)	O
Paddlefish	(Polyodon spathula)	O
Spotted gar	(Lepisosteus oculatus)	U
Longnose gar	(Lepisosteus osseus)	C
Shortnose gar	(Lepisosteus platostomus)	C
Bowfin	(Amia calva)	C
American eel	(Anguilla rostrata)	O
Skipjack herring	(Alosa chrysochloris)	O
Gizzard shad	(Dorosoma cepedianum)	A
Goldeneye	(Hiodon alosoides)	O
Mooneye	(Hiodon tergisus)	O
Northern pike	(Esox lucius)	O
Common carp	(Cyprinus carpio)	A
Speckled chup	(Hybopsis aestivalis)	C
Silver chub	(Hybopsis storeriana)	C
Emerald shiner	(Notropis atherinoides)	A
River shiner	(Notropis biennius)	A
Ghost shiner	(Notropis buchanani)	C
Bigmouth shiner	(Notropis dorsalis)	O
Spottail shiner	(Notropis hudsonius)	C
Red shiner	(Notropis lutrensis)	C
Spotfin shiner	(Notropis spilopterus)	O
Sand shiner	(Notropis stramineus)	O
Suckermouth minnow	(Phenacobius mirabilis)	U
Bluntnose minnow	(Pimephales notatus)	O
Fathead minnow	(Pimephales promelas)	U
Bullhead minnow	(Pimephales vigilax)	A
River carpsucker	(Carpiodes carpio)	C
Quillback	(Carpiodes cyprinus)	C
Highfin carpsucker	(Carpiodes velifer)	O
Blue sucker	(Cycleptus elongatus)	U
Smallmouth buffalo	(Ictiobus bubalus)	C
Bigmouth buffalo	(Ictiobus cyprinellus)	C
Black buffalo	(Ictiobus niger)	U
Silver redhorse	(Moxostoma anisurum)	U
Golden redhorse	(Moxoxtoma erythrurum)	R

Shorthead redhorse	(Moxoxtoma macrolepidotum)	O
Black bullhead	(Ictalurus melas)	O
Yellow bullhead	(Ictalurus natalis)	O
Channel catfish	(Ictalurus punctatus)	C
Stonecat	(Noturus flavus)	O
Tadpole madtom	(Noturus gyrinus)	U
Flathead catfish	(Pylodictus olivaris)	C
Blackstripe topminnow	(Fundulus notatus)	O
Mosquitofish	(Gambusia affinis)	C
Brook silverside	(Labidesthes sicculus)	O
White bass	(Morone chrysops)	C
Yellow bass	(Morone mississippiensis)	O
Rock bass	(Ambloplites rupestris)	R
Green sunfish	(Lepomis cyanellus)	O
Warmouth	(Lepomis gulosus)	O
Orangespotted sunfish	(Lepomis humilis)	C
Bluegill	(Lepomis macrochirus)	A
Smallmouth bass	(Micropterus dolomieui)	U
Largemouth bass	(Micropterus salmoides)	C
White crappie	(Pomoxis annularis)	C
Black crappie	(Pomoxis nigromaculatus)	C
Western sand darter	(Ammocrypta clara)	O
Johnny darter	(Etheostoma nigrum)	U
Logperch	(Percina caprodes)	O
River darter	(Percina shumardi)	C
Sauger	(Stizostedion canadense)	C
Walleye	(Stizostedion vitreum)	O
Freshwater drum	(Aplodinotus grunniens)	A

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT, CORPS OF ENGINEERS
CLOCK TOWER BUILDING—P.O. BOX 2004
ROCK ISLAND, ILLINOIS 61204-2004

REPLY TO ATTENTION OF:

November 14, 1990

Planning Division

RECEIVED
NOV 15 1990
PRESERVATION SERVICES

IHPA REVIEW
H/A
AC 11-15-90
AR Concur 11-29-90 jw
File

Mr. Theodore Hild
Deputy State Historic
Preservation Officer
Illinois Historic
Preservation Agency
Old State Capitol
Springfield, Illinois 62704

Dear Mr. Hild:

The Rock Island District of the U.S. Army Corps of Engineers (Corps) is conducting a Reconnaissance Study at the request of the Sny Island Levee Drainage District (SILDD) under authority of Section 205 of the 1948 Flood Control Act, as amended. Please reference your Project Log No. 90040404.

A preliminary cultural resource reconnaissance report was prepared for this study by Corps archeologist, Mr. Ron Pulcher. The report is entitled Preliminary Cultural Resource Reconnaissance for the Section 205 Flood Damage Reduction Study, The Sny Channel, Adams, Calhoun, and Pike Counties, Illinois (enclosure 1).

It is the opinion of the Corps that the four sites named Bell #1, Bell #3, Dunker, and Shinn appear to be potentially eligible for inclusion in the National Register of Historic Places (NR) and will require Phase II testing for NR eligibility.

It is the opinion of the Corps that the five sites Little Shinn, Bell #4, 11PK24, 11PK25, and 11PK69 all require further research and investigation prior to arriving at any statement of potential NR eligibility.

It is the opinion of the Corps that the site named Bell #2 does not meet the criteria for inclusion in the NR due to its small areal extent, a lack of diversity in material remains, and the lack of potential for subsurface remains which these conditions indicate.

Should the present study recommend implementation of any of the proposals currently under consideration, the Corps will continue to coordinate with your agency regarding the nature and extent of future cultural resource studies.

We request your comments on the enclosed report within 30 days. If you have any questions regarding this matter, please call Mr. Ron Pulcher of our Environmental Analysis Branch at 309/788-6361, Ext. 6384, or you may write to the following address:

District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division
Clock Tower Building - P.O. Box 2004
Rock Island, Illinois 61204-2004

Sincerely,

Dudley M. Hanson, P.E.
Chief, Planning Division

Enclosure

CONCUR

By: _____
Deputy State Historic Preservation Officer

Date: DEC 12 1990

Illinois Department of Conservation
life and land together

LINCOLN TOWER PLAZA • 524 SOUTH SECOND STREET • SPRINGFIELD 62701-1787
CHICAGO OFFICE • ROOM 4-300 • 100 WEST RANDOLPH 60601
MARK FRECH, DIRECTOR - KATHY SELCKE, ASSISTANT DIRECTOR

February 1, 1991

Colonel John R. Brown
District Engineer
U.S. Army Engineer District, Rock Island
Clock Tower Building - P.O. Box 2004
Rock Island, IL 61204-2004

Dear Colonel Brown:

The Department has reviewed the USFWS December 11, 1990 Planning Aid Letter for your reconnaissance study of flooding problems along the Sny, Pike and Calhoun Counties, Illinois.

The Department supports the letter's conclusions and recommendations. Please keep us informed on study progress.

Sincerely,

Mark Frech

Mark Frech
Director

MF:RWL:ts

cc: USFWS, Rock Island

COMMISSIONERS
GEORGE D. BORROWMAN
Pleasant Hill, Illinois
J. FRED SCHWARTZ
Hull, Illinois
JACK L. BORROWMAN
New Canton, Illinois

SNY ISLAND LEVEE DRAINAGE DISTRICT

110,000 Acres in Adams, Pike and Calhoun Counties
PHONE: 426-2521 — NEW CANTON, ILLINOIS 62356

STAFF
JOHN H. REITER
Superintendent/Treasurer
MATTHEW A. HUTMACHER
Attorney

September 3, 1991

Colonel John R. Brown
District Engineer
U.S. Army Engineer District, Rock Island
ATTN: Planning Division
Clock Tower Building, P.O. Box 2004
Rock Island
IL 61204-2004

Dear Colonel Brown:

The purpose of this letter is to state the Sny Island Levee Drainage District's (SILDD) understanding and capability of its financial obligations as a local sponsor associated with continued study and potential implementation of flood damage reduction measures within our drainage district. Specific reference is given to subsequent efforts to the ongoing Section 205 Reconnaissance Study for flood damage reduction along the Sny Channel.

The next step of the Corps of Engineers' process is the Feasibility Phase. We understand that this phase would be cost-shared equally (50/50) between the Corps and the SILDD. We also understand that up to one-half of our share may be in the form of in-kind services. Our cash contribution must be provided at feasibility study initiation, or an initial allocation with subsequent payments made to match Federal allocations to ensure uninterrupted study progress.

The next step is implementation, which includes preparation of plans and specifications, and construction. We understand that our financial responsibilities can range from the minimum 25-percent to the maximum 50-percent of the total implementation cost. Our share will be based on providing lands, easements, rights of way, relocations, and disposal areas at 100-percent our expense. In addition, we are responsible for a minimum of a 5-percent cash contribution. If those items total less than 25-percent of the total implementation cost, we are responsible for additional cash contributions to make up the difference.

Should our drainage district choose to pursue a project through the Section 205 program, our share will be financed through current revenues, funds on hand or a combination of the preceding.

Sincerely,
SNY ISLAND LEVEE DRAINAGE DISTRICT

J. Fred Schwartz, Commissioner

George D. Borrowman, President

Jack L. Borrowman, Secretary

JHR/jc

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September 3, 1991

Colonel John R. Brown
District Engineer
U. S. Army Corps of Engineers
Attn: Planning Division
Clock Tower Building-P.O. Box 2004
Rock Island
Illinois
61204-2004

Dear Colonel Brown:

The purpose of this letter is to notify the Corps of Engineers that the Sny Island Levee Drainage District Commissioners after consideration and discussion of the conclusion of the Reconnaissance Report for Section 205 Flood Damage Reduction Study, have decided that at this time, due to the excessive financial expenditures required through further study and construction and the ongoing costs that would be acquired from additional facilities, it does not appear to be in the best interest of the District to proceed with the Feasibility Phase of the project.

Thank you for your time and effort on our behalf.

Sincerely,
SNY ISLAND LEVEE DRAINAGE DISTRICT

George D. Borrowman, President

Jack L. Borrowman, Secretary

J. Fred Schwartz, Commissioner

JHR/jc

REVISED JULY 1992

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SECTION 205 FLOOD DAMAGE REDUCTION STUDY
THE SNY ISLAND LEVEE DRAINAGE DISTRICT
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