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NATIONAL DAM SAFETY PROGRAM. URSINO DAM (NJ-00387), ELIZABETH R--ETC(U)
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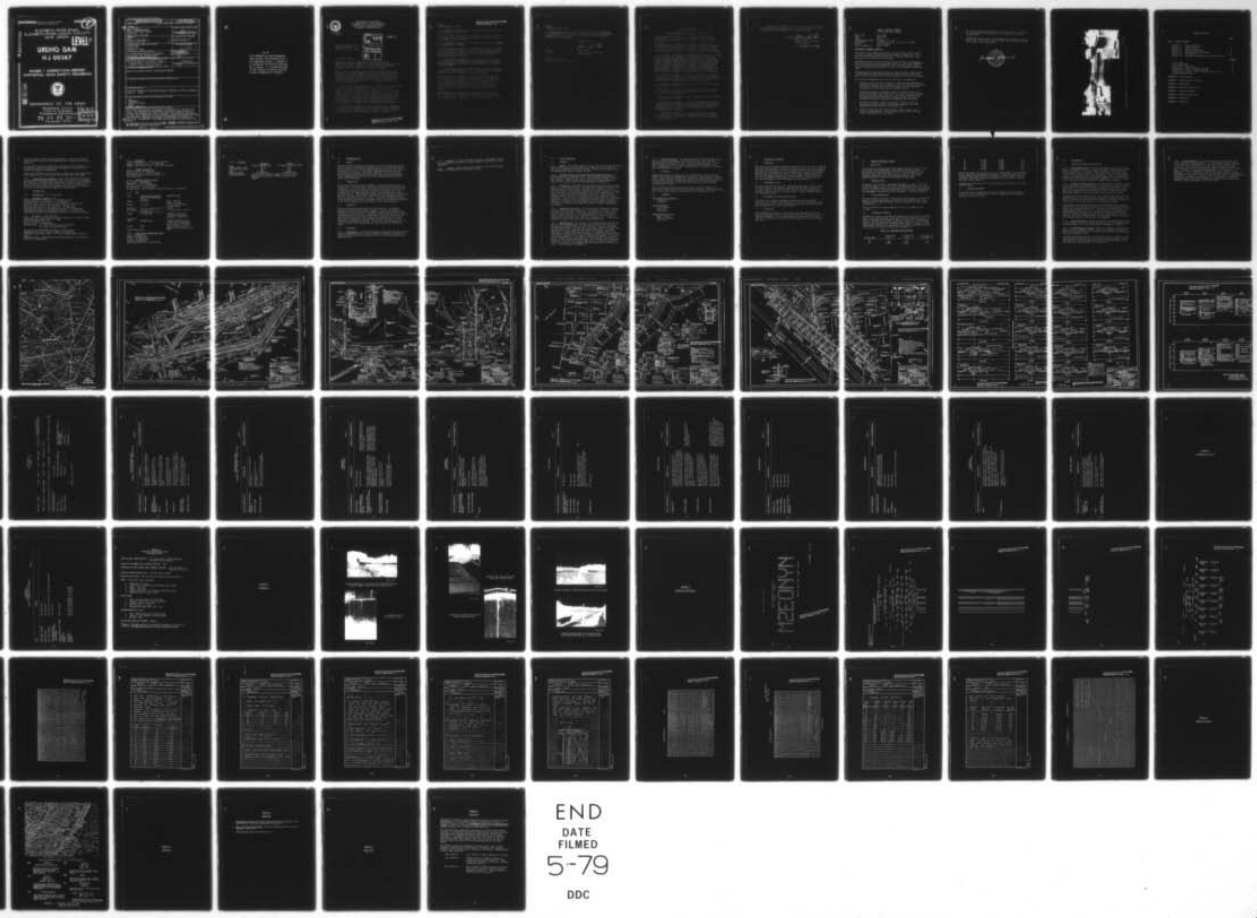

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ELIZABETH RIVER BASIN
ELIZABETH RIVER, UNION COUNTY
NEW JERSEY

LEVEL II

URSINO DAM
NJ 00387

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

DEPARTMENT OF THE ARMY
Philadelphia District
Corps of Engineers
Philadelphia, Pennsylvania

December, 1978

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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Safety
Visual Inspections

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

This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE—2 D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO
NAPEN-D

14 MAR 1979

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, New Jersey 08621

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Ursino Dam in Union County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Ursino Dam, a high hazard potential structure, is judged to be in good overall condition. The emergency spillway is considered inadequate since the protective levees along the reservoir would be overtopped by 33 percent of the Probable Maximum Flood (PMF). To insure adequacy of these structures, the following actions, as a minimum, are recommended:

a. The actual capacity of the emergency spillway should be determined using more precise and sophisticated methods and procedures by a qualified professional consultant, engaged by the owner. This study should be completed within six months from the date of approval of this report. Any remedial measures necessary to insure the adequacy of the emergency spillway and to prevent overtopping of the protective levees along the reservoir should be initiated within calendar year 1980. In the interim, a detailed emergency operation plan and warning system should be promptly developed. Also, during periods of unusually heavy precipitation, around-the-clock surveillance should be provided.

b. Within twelve months of the date of approval of this report the stability of the reservoir's levees should be ascertained by performing engineering studies, investigations and analyses, as deemed necessary, by a qualified professional consultant, engaged by the owner.

c. Within six months from the date of approval of this report, the following actions should be taken:

(1) Remove the welds on the manhole covers to provide quick access to the sluice gates. Heavy duty locks should be installed, in lieu of the welds, to preclude vandalism.

(2) Establish and conduct a regular maintenance procedure, including grass-mowing and tree-removal.

(3) Establish and conduct a periodic inspection program to monitor the various conditions of the concrete gravity control structure, the earth levees and all appurtenant structures. The inspection should be coordinated between the owner, the City of Elizabeth, and the U.S. Army Engineer District, New York.

d. Within twelve months of the date of approval of this report, the upstream end of the reinforced concrete flume should be protected by placing suitably graded riprap to prevent washout of the material behind the spillway.

e. Within three years of the date of approval of this report, the Trotters Lane Bridge should be raised as is recommended in the design documents for the Elizabeth River Flood Control Project.

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman Matthew Rinaldo of the Twelth District. Under the provisions of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

NABEN-D
Honorable Brendan T. Byrne

An important aspect of the Dam Safety Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely yours,

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

1 Incl
As stated

Cy furn:
Mr. Dirk C. Hofman, P.E.
Department of Environmental Protection

URSINO DAM (NJ00387)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 31 May 1978 by Gilbert Associates, Inc., under contract to the U.S. Army Engineer District, Philadelphia, in accordance with the National Dam Inspection Act, Public Law 92-367.

Ursino Dam, a high hazard potential structure, is judged to be in good overall condition. The emergency spillway is considered inadequate since the protective levees along the reservoir would be overtopped by 33 percent of the Probable Maximum Flood (PMF). To insure adequacy of these structures, the following actions, as a minimum, are recommended:

a. The actual capacity of the emergency spillway should be determined using more precise and sophisticated methods and procedures by a qualified professional consultant, engaged by the owner. This study should be completed within six months from the date of approval of this report. Any remedial measures necessary to insure the adequacy of the emergency spillway and to prevent overtopping of the protective levees along the reservoir should be initiated within calendar year 1980. In the interim, a detailed emergency operation plan and warning system should be promptly developed. Also, during periods of unusually heavy precipitation, around-the-clock surveillance should be provided.

b. Within twelve months of the date of approval of this report the stability of the reservoir's levees should be ascertained by performing engineering studies, investigations and analyses, as deemed necessary, by a qualified professional consultant, engaged by the owner.

c. Within six months from the date of approval of this report, the following actions should be taken:

(1) Remove the welds on the manhole covers to provide quick access to the sluice gates. Heavy duty locks should be installed, in lieu of the welds, to preclude vandalism.

(2) Establish and conduct a regular maintenance procedure, including grass-mowing and tree-removal.

(3) Establish and conduct a periodic inspection program to monitor the various conditions of the concrete gravity control structure, the earth levees and all appurtenant structures. The inspection should be coordinated between the owner, the City of Elizabeth, and the U.S. Army Engineer District, New York.

d. Within twelve months of the date of approval of this report, the upstream end of the reinforced concrete flume should be protected by placing suitably graded riprap to prevent washout of the material behind the spillway.

e. Within three years of the date of approval of this report, the Trotters Lane Bridge should be raised as is recommended in the design documents for the Elizabeth River Flood Control Project.

APPROVED: James G. Ton

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

DATE: 14 March 1979

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Ursino Dam
State:	New Jersey
County:	Union
USGS Quadrangle Sheet:	Elizabeth, N.J., N.Y.
Coordinates:	N 40°-40'-30.4" LAT., W 74°-13'-21.5" LONG.
Stream:	Elizabeth River
Date of Inspection:	May 31, 1978

ASSESSMENT OF GENERAL CONDITION

The results of this inspection indicate that this concrete gravity control structure is generally in good condition as defined in Appendix H. It is part of the Elizabeth Flood Control Project. There are some minor cracks along the vertical joints of the wing walls.

The emergency spillway (concrete gravity control structure) is inadequate under the screening criteria established by the U.S. Army Corps of Engineers for this project because the protective levees along the reservoir shore will be overtopped by approximately 33 percent of the probable maximum flood (PMF).

Prolonged high water against the levees may create hazardous conditions due to the presence of weak foundation material beneath portions of the earth levees; additional studies of the static stability of the levees are necessary.

The following recommendations are made for the owner's consideration:

1. Obtain and review the Corps of Engineers' General Design Memorandum to determine the necessity of retaining the service of a qualified consultant to perform a stability analysis and performing additional subsurface investigation for the earth levees, in the near future.

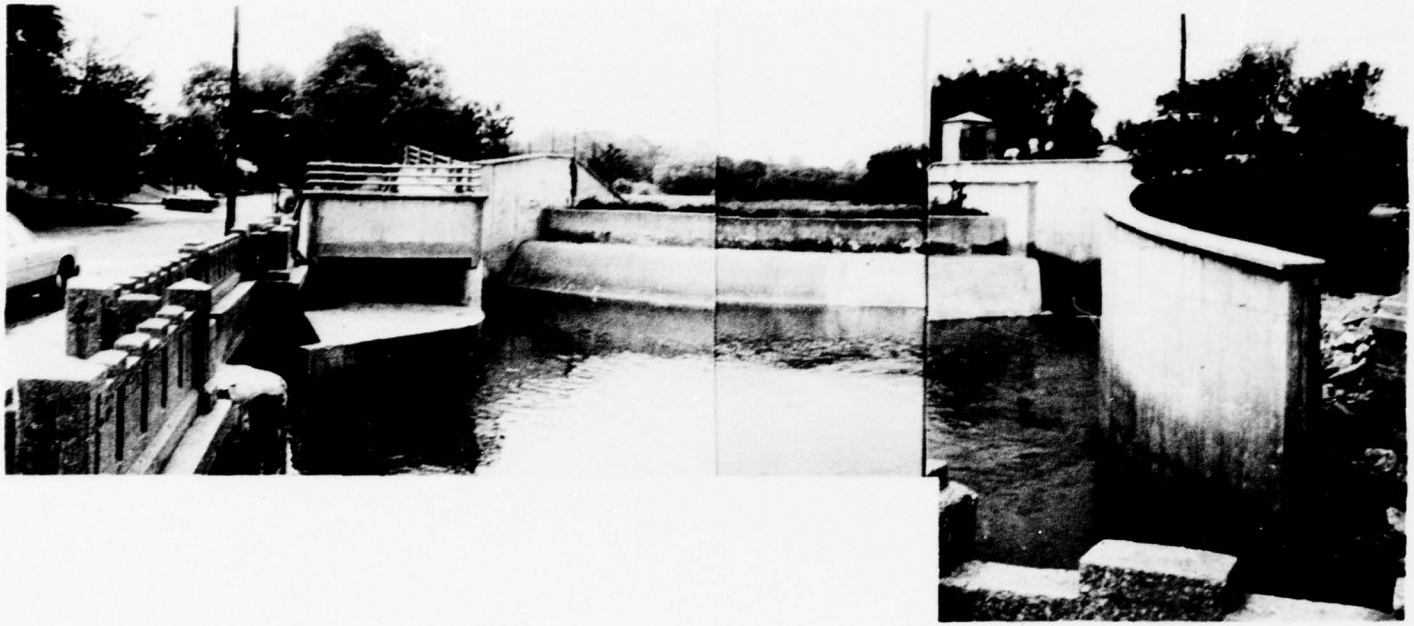
2. Establish and conduct a semiannual inspection program to monitor the various conditions of the concrete gravity control structure, the earth levees and all appurtenant structures. The inspection program should be established soon and coordinated between the Owner; the City of Elizabeth; and the U.S. Army Corps of Engineers, New York District.

3. Establish and conduct a regular maintainance procedure, including grass-mowing and tree-removal, preceding the inspection work. The maintenance procedure should be established soon.

4. Protect the upstream end of the reinforced concrete flume by using riprap to prevent washout of material behind the spillway. This work should be performed in the near future.

5. The Trotters Lane Bridge should be raised in the future. (As part of the downstream flood protection plan, this bridge is slated to be raised by 1981.)

6. The manholes giving access to the drainage structures should have the welds on the covers removed, and heavy duty locks installed to provide quick access to the sluice gates.



May 1978

URSINO FLOOD CONTROL PROJECT LOOKING UPSTREAM FROM TROTTERS LAND BRIDGE

TABLE OF CONTENTS

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
NAME OF DAM: Ursino ID # 00387

1.0 PROJECT INFORMATION

1.1 GENERAL

1.1.1 Authority: Public Law 92-367, 8 August 1972, authorized the Secretary of the Army, through the U.S. Corps of Engineers to initiate a national program of safety inspections of non-Federal dams throughout the United States. Gilbert Associates, Inc. has entered into Contract No. DACW61-78-C-0114 with the Philadelphia Office of the U.S. Army Corps of Engineers to inspect this dam, Gilbert Work Order 06-7249-050.

1.1.2 Purpose of Inspection: The purpose is to conduct a Phase I inspection according to the U.S. Army Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams (Reference 1) and the terms of the contract between the U.S. Corps of Engineers and Gilbert Associates, Inc. The objectives are to expeditiously identify those dams which pose an immediate threat to human life or property, gather information for this report, and recommend future studies and/or obvious remedial actions where they are indicated by the inspection.

1.2 PROJECT DESCRIPTION

1.2.1 Dam and Appurtenances: The Ursino Dam is a 104.5 foot long mass concrete gravity control structure with a maximum height of 13.33 feet. Its spillway section is composed of two drops, the upper drop which is a vertical drop 5 feet high and the lower drop which is curvilinear and 7.83 feet high. At the end of the spillway section between the dam and the left abutment there is a rectangular concrete flume 14.92 feet wide and with a maximum wall height of 20.2 feet through which the normal flows of the Elizabeth River pass. The downstream features include a concrete stilling basin and a transition section that reduces the width of the stilling basin from about 120 feet to 40 feet. This reduction is the end of the existing portion of the flood control structure. Immediately after the reduction there is a small two-arch road bridge at a low elevation. A USGS gaging station is located on the east abutment of the dam and flume.

1.2.2 Location: The Ursino flood control structure is located on the Elizabeth River, just north of Trotters Lane Bridge, about 800 feet west of Route 82 in the city of Elizabeth and 3 miles northwest of Newark Bay, Union County, New Jersey. The location map is shown in Figure 1 and the geologic map is attached in Appendix F.

1.2.3 Size Classification: The dam is classified as a small structure because of its potential for impoundment of flood waters (530 acre-feet), in accordance with Section 2.1.1 of Reference 1. Note: 530 acre-feet is the capacity to the top of the levees.

1.2.4 Hazard Classification: The dam is located upstream of a densely populated valley and flood palin area, which includes several towns. The dam is classified as a high hazard potential based on the requirements of Section 2.1.2 of Reference 1; this classification was verified in the field inpsection, by observation of populated conditions downstream of the dam.

1.2.5 Ownership: The 1973 modifications to the dam as required by the Elizabeth River Flood Control Project were designed by the U.S. Army Corps of Engineers, and constructed under their supervision. The dam has been turned over to the Union County Park Commission, which now owns the dam.

The Chief Engineer for the Union County Park Commission is Mr. Michael Serra. The address is: P.O. Box 275, Elizabeth, New Jersey. The dam is maintained by the city of Elizabeth; the Chief Engineer for the city is Mr. Victor Vinagra.

1.2.6 Purpose of Dam: The Ursino Dam is part of "The Elizabeth River Basin Flood Control Project". This comprehensive flood control plan, under the auspices of the Corps of Engineers, New York District, extends from Route 22 in the north to Arthur Kill in the southeast. The section from Ursino Dam to Arthur Kill remains to be completed. The Ursino detention basin is one of three flood detention basins on the Elizabeth River. The other two are the Route 22 Detention Basin and the Salem Pond Detention Basin. The purpose of Ursino Dam is to attenuate the peak flows during floods, store flood water, and release it slowly (without gates) so that downstream areas are not flooded. The other two dams, when constructed would affect the hydrologic characteristics of the Ursino Dam impoundment but such effects were not studied in this inspection as these effects are beyond the scope of the work reported herein.

1.2.7 Design and Construction History: According to data received from the New Jersey Department of Environmental Protection (NJDEP), the Elizabethtown Water Company, Consolidated operated a water treatment facility at the North Avenue Reservoir located between North Avenue and Trotters Lane from about 1914 to 1927. In 1927, the impounding dam was a 4-1/2-foot wide structure with a crest elevation of 22.53 feet and an outlet structure on the east end of the dam. That summer produced two floods which passed 3 feet of water over the dam with the blowoff gates wide open, overtopped the west embankment, and flooded the Trotters Lane Bridge, located immediately downstream of the dam, and required repairs to the embankment.

Late in 1927 the Ambursen Construction Company of New York City modified the dam so it would impound water to a maximum depth of 16 feet, with a surface area of 10 acres. The river channel opening was increased from 78 sq. ft. to 150 sq. ft. The structure consisted of an ogee spillway section with four automatic crest gates and a 10-foot high by 15-foot wide vertical sluice gate in the flume section at the east end of the dam. A walkway connected both dam abutments.

About the middle of 1965, the Elizabethtown Water Company, Consolidated turned over the Ursino Dam on the Elizabeth River to the Union County Park Commission.

In June 1968, the dam was inspected by the Union County Park Commission at the request of the State of New Jersey, Department of Conservation and Economic Development (see Appendix E).

During 1973 the modifications to the dam, as required by the Elizabeth River Flood Control Project, were completed as described within this report.

1.2.8 Normal Operation Procedure: There are no operational procedures associated with this flood control structure. The structure will regulate the magnitude of incoming floods because under average flow in the Elizabeth River the reservoir is empty and can store a part of the incoming flood. There are no control gates at the structure and, therefore, the regulation of the flood is dictated by the dimensions of the structure.

1.3 PERTINENT DATA

1.3.1 Drainage Area: 16.9 square miles

1.3.2 Discharge at Damsite (cfs):
Maximum Known Flood at Dam Site: 4110 (August 28, 1971)
Warm Water Outlet at Pool Elevation: Not Applicable
Diversion Tunnel Low Pool Outlet at Pool Elevation: Not Applicable
Diversion Tunnel Outlet at Pool Elevation: Not Applicable
Gated Spillway Capacity at Pool Elevation: Not Applicable
Gated Spillway Capacity at Maximum Pool Elevation: Not Applicable
Ungated Spillway Capacity at Maximum Pool Elevation: Not Applicable
Total Spillway Capacity at Maximum Pool Elevation: 11,510 (Top of Levee)

1.3.3 Elevation: (Feet above MSL)
Top of Dam: 22.3 (Top of Concrete Control Structure), 31.0 (Top of Levee)
Maximum Pool-Design Surcharge: 33.2 (PMF)
Full Flood Control Pool: 31.0
Recreation Pool: Not Applicable
Spillway Crest: 22.3 (Top of Concrete Control Structure)
12.0 (Invert of Concrete Flume)

Upstream Portal Invert Diversion Tunnel: Not Applicable
Downstream Portal Invert Diversion Tunnel: Not Applicable
Streambed at Centerline of Dam: 8.97 (Top of Concrete Slab in Stilling Basin)
Maximum Tailwater: Unknown (Available downstream rating curve limited to 6,000 cfs; see Appendix D)

1.3.4 Reservoir:
Length of Maximum Pool: 6,000 feet (Estimated)
Length of Recreation Pool: Not Applicable
Length of Flood Control Pool: 5,500 feet (Estimated)

1.3.5 Storage (Acre-Feet):
Recreation Pool: Not Applicable
Flood Control Pool: 530 (Top of Levee)
Spillway Design Flood (SDF) Surcharge: 680
Top of Dam: 530

1.3.6 Reservoir Surface (Acres):
Top of Dam: 60 (Estimated)
Maximum Pool: 65 (Estimated)
Flood-Control Pool: 60 (Estimated)
Recreation Pool: Not Applicable
Spillway Crest: (Top of Concrete Control Structure) 30 (Estimated)

1.3.7 Dam:

	Concrete Gravity Control Structure and Emergency Spillway	Earthfill Levee
Type:		
Length:	104.5 feet	Left: 848 feet Right: 1,104 feet
Height:	13.33 feet	12 feet (maximum above original grade)
Top Width:	7.75 feet at Elevation 22.3	8 feet
Side Slopes:	Vertical, and 0.9 Horizontal:1 Vertical	2-1/2 Horizontal:1 Vertical
Zoning:	Not Applicable	Imperious core 8' wide w/compacted embankment material on either side
Impervious Core	Not Applicable	Compacted impervious fill 8 feet wide for the height of the levee (see Figure 6)
Cutoff:	None	Cutoff trench 5 to 6 feet deep below the impervious core
Grout Curtain:	None	None

1.3.8 Diversion and Regulating Tunnel:
Type: Not Applicable
Length: Not Applicable
Closure: Not Applicable
Access: Not Applicable
Regulating Facilities: Not Applicable

1.3.9 Spillway:

	Emergency	Normal
Type:	Concrete Ogee Spillway	Rectangular Concrete Flume
Length of Weir, feet:	104.5	14.9
Crest Elevation, feet:	22.3	12.0
Gates:	None	None
Upstream Channel:	Elizabeth River	Elizabeth River
Downstream Channel:	Concrete slab with width ranging from 120 feet just downstream of the dam to 40 feet at Trotters Lane Bridge.	

2.0 ENGINEERING DATA

2.1 DESIGN

The latest dam modifications were designed in 1973 by the New York District Office of the U.S. Army Corps of Engineers as part of the Elizabeth River Flood Control Project. Relevant record drawings of this work are on file at the above District Office. The General Design Memorandum and stability calculations for the newly constructed items such as levees, retaining walls, and the modified concrete control structure were requested from the Corps of Engineers, New York District Office, but were not provided for review in this inspection.

2.2 CONSTRUCTION

On the right bank a new concrete abutment was constructed perpendicular to the dam crest. (The horizontal crest gates, vertical gate, and walkway were eliminated.) On the left bank, a new concrete wall was constructed as part of the protection works extending to the existing sluiceway wall. The sluiceway wall was capped and a new wing wall was constructed upstream of the sluiceway wall. The emergency spillway itself was resurfaced and extended upstream. The entire floor area of the stilling basin between the curved walls was paved with reinforced concrete. This work, including construction of the north and south levees, was completed late in 1973 under the supervision of the Corps of Engineers, New York District (See attached Figures).

2.3 OPERATION

There are no operational procedures for this structure. According to information provided by the Corps of Engineers, and the City Engineer of Elizabeth, the sluice gates on the drainage structures upstream of the dam (see Figure 2) are operational. The gates are maintained in the open position allowing stormwater from the projected areas to drain into the basin. The gates will be closed only if the automatic drainage gates on the outlet structures are inoperable (struck in open position) and there is a high stage in the river above Ursino Dam. In this case, the sluice gates will be closed to prevent flow from backing into the protected areas behind the levees.

2.4 EVALUATION

2.4.1 Availability: Very limited foundation exploration data was available; design and construction data were not available. Structural and hydraulic design calculations were not available for any of the work performed on this dam since 1927.

2.4.2 Adequacy: The available record drawings, supplemented by field data gathered on this inspection, appear adequate for this Phase I safety inspection.

2.4.3 Validity: Based on the visual inspection, the record drawings appear to be consistent with existing structures.

3.0 VISUAL INSPECTION

3.1 FINDINGS

3.1.1 General: The visual inspection of the Ursino flood control structure and ancillary structures indicated they were generally in good condition. There was no impounded water behind the dam. The only water visible was in the Elizabeth River which flows past the dam.

3.1.2 Concrete Gravity Control Structure and Emergency Spillway: The dam modification was completed in 1973. The reinforced concrete flume, walls, and the concrete gravity control structure generally appear to be in good condition. There are some minor surface cracks along construction joints of the concrete wing walls (See photographs in Appendix C).

3.1.3 Earth Levees: The dense and long grass cover which existed at the time of the inspection precluded a detailed visual examination of the levees. Observations that could be made of the levee surface showed no critical signs of distress. Minor surface sloughing and erosion occurred in a barren area of the left levee closely adjacent to the new USGS gaging station. All visible drainage structures, including the drop inlet, outlet structure, perimeter drain ditch, and storm drainage box culvert, appeared to be in good repair. The condition of the manual sluice gates could not be determined because the entrances to the structures had been welded shut to preclude vandalism. According to the City Engineer the entire manhole assembly can be removed to gain entry to the structure; otherwise entry is prevented by the welding.

3.1.4 Appurtenant Structures: The stilling basin downstream of the dam had about 1 to 1-1/2 feet of water in it; consequently, the floor could not be inspected and assessed. Considerable silt buildup was visible in the center of the stilling basin. The right abutment wall has a 36-inch pipe with a recessed flap gate; also a box culvert with a 5-foot by 20-foot opening exits at the end of the right wall (see Appendix C). A USGS gaging station is located on the left levee 45 feet above the dam.

3.1.5 Reservoir Area: The reservoir area extends upstream from the dam past the North Avenue Bridge. The entire area is nearly level with the spillway of the concrete gravity control structure, except for the channel of the Elizabeth River. The north and south levees as shown on Figure 2 are approximately 8 feet higher than the crest of the spillway. The entire flood plain is densely vegetated; the crests of the levees and the areas along the left channel walls are bare because of unauthorized entry by "dirt bike riders" according to Mr. Vinagra, Elizabeth City Engineer. The channel of the Elizabeth River is approximately 10 feet lower than the dam crest, and 8 to 10 feet lower than the major part of the detention basin topography. Upstream of the reinforced concrete flume, there is excessive scouring of the soil on the side of the emergency spillway which should be protected by riprap. (See photograph in Appendix C).

3.1.6 Downstream Channel: The downstream channel of the Elizabeth River below the Trotters Lane Bridge is protected with rock riprap with some vegetation growing between the rocks. The downstream flood control project, when completed, will feature a concrete channel from Ursino Dam to U.S. Route 1 (approximately 1-1/4 miles) becoming levees and floodwalls to Arthur Kill (approximately 1-1/2 miles).

3.2 EVALUATION

Judging from the visual inspection, the concrete gravity control structure dam, and the earth levees appeared to be generally in good condition. Minor surface cracks along the construction joints of the wing walls and a partially failed riprap slope near the upstream right side of the flume wall need to be observed periodically to detect any future deterioration and possible eventual need for repair.

The stilling basin and reservoir area adjacent to the dam appeared to be stable and in good condition at the time of the inspection. The long overgrown grass on the levees should be mowed periodically to permit inspection.

3.3 ATTENDEES

Union County Park Commission
- Michael Serra
- K. Knutsen

City of Elizabeth
- Victor Vinagra
- Frank Cyron
- Frank Meilly

Gilbert Associates, Inc.
- Rudy P. Visser
- Rudolph J. Wahanik
- Fine T. Hsu

4.0 OPERATIONAL PROCEDURES

4.1 PROCEDURES

There are no operational procedures associated with the flood control structure. The operational procedures for drainage structures 76, 78, 79, and 80 installed upstream of the dam should consist of closing the manual sluice gates whenever the automatic drainage gates on the aforementioned structures are inoperable when the water level behind the dam is in high stage. However, this is not the case; the manually operated sluice gates are kept in the open position and only the automatic drainage gates on the outlet structures keep river water from flooding the city areas adjacent to the structure.

4.2 MAINTENANCE OF DAM

The dam is maintained by the city of Elizabeth's Department of Public Works. Mr. Victor Vinagra, City Engineer, explained that the lack of vegetation along the crests of the levees and the slope near the USGS gaging station was due to unauthorized entry of motorcyclists. Fences erected by the city are constantly breached.

4.3 MAINTENANCE OF OPERATING FACILITIES

According to Mr. Vinagra, the manholes providing entry into drainage structures 76, 78, and 80 which house the 15-, 24-, and 36-inch sluice gates have been welded shut to prevent vandalism, but the entire manhole casting can be removed to gain entry to the structure.

4.4 EVALUATION

The maintenance procedures for this structure are inadequate in that the grass needed mowing, concrete cracks needed repairing, riprap protection was lacking (paragraph 3.1.5), and fencing which was destroyed has not been replaced. The welded access covers should be opened, and secured with heavy duty locks.

5.0 HYDRAULIC/HYDROLOGIC DESIGN

5.1 DESIGN DATA

Microfilmed data including plans of the dam as it was in 1927 are on file with the New Jersey Department of Environmental Protection Agency, Application #117, dated September 29, 1927. Some hydrologic data were received from the New York District Office of the U.S. Army Corps of Engineers pertaining to the "Elizabeth Flood Control Project," the downstream portion of which will be completed in 1981-1982.

5.2 EXPERIENCE DATA

According to data received, the maximum discharge of record is 4,110 cfs during the August 28, 1971 flood, with a maximum gage height of 18.7 feet. In 1927 the summer produced two floods which passed 3 feet of water over the spillway (elevation 22.58) with the blowoff gates wide open, overtopped the west embankment, and flooded Trotters Lane Bridge. (From microfilm data).

5.3 VISUAL OBSERVATIONS

The area upstream of the dam is nearly level with the crest of the dam, and about 8 to 10 feet higher than the channel of the Elizabeth River. The detention basin between the levees is heavily overgrown with weeds and an occasional tree.

The stilling basin has some accumulation of silt to a depth of 1.0 to 1.5 feet.

5.4 OVERTOPPING POTENTIAL

The PMF and fractions of the PMF were developed for the Lake Ursino drainage basin for existing hydrologic conditions and routed through the reservoir. Backup calculations are included in Appendix D and Table 5-1 summarizes the results. The PMF overtops the earthen levee by about 2.5 feet at the peak water surface elevations and the one-half PMF overtops it by about 1.0 feet. Interpolation indicates that approximately 33 percent of the PMF raises the water surface to the top of the levee at elevation 31.0.

Table 5-1 LAKE URSINO FLOOD ROUTING

Percent PMF	Inflow Peak (cfs)	Outflow Peak (cfs)	Elevation Peak (ft, MSL)
20	7,070	6,920	27.9
25	8,840	8,660	29.2

30	10,600	10,400	30.3
35	12,400	12,300	31.1
40	14,100	14,600	31.4
45	15,900	16,600	31.6
50	17,700	17,900	31.8
100	35,400	36,000	33.2

The PMF development and routing, as well as all percentages, were calculated, without regard to upstream storage structures. These structures (Route 22 and Salem Pond Detention Basins) are probably not large enough to have any substantial impact upon the PMF hydrograph but such an analysis is beyond the scope of this inspection.

Overtopping of the levees will increase the possibility of loss of life and property damage.

5.5 RESERVOIR DRAWDOWN

Ursino Lake does not impound any water during normal conditions because it is only for flood control purposes. Water is impounded from the upstream watershed only during floods.

6.0 DAM STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

6.1.1 Visual Observations: The concrete gravity control structure and earth levees appear to have been stable under the past operating conditions. There is no structural cracking or signs of movement at the base of the concrete gravity control structure. The earth slopes of the levees appear to be in good condition without signs of movement, failure, or detrimental seepage. Scouring and erosion on the steep channel sides in the detention basin area is noticeable and can be seen in Appendix C. There is no riprap on the river side of the earth levees to protect against erosion.

6.1.2 Design and Construction Data: The design data available to Gilbert Associates inspection personnel consist of microfilmed construction drawings of September 1927, and record drawings of the latest construction. This latest work was designed by and constructed under supervision of the U.S. Army Corps of Engineers, New York District, in 1973. (The Corps' General Design Memorandum for the project was not made available for review.)

The concrete gravity control structure, the concrete flume, and walls were founded directly on red shale strata according to the design drawings. The quality of the bedrock is generally fair (average core recovery is only 70%) as indicated by a few test borings in the vicinity of the dam.

The foundation soils beneath the earth levees are mainly loose to medium compact brown silty sand (SM) and brown silt (ML), with some upper layers of organic silt and miscellaneous fills. As shown in the design cross sections, some unstable foundation soils, i.e. very loose organic silt material as revealed by the test borings, were not removed from the foundation area, which may adversely influence the stability of the foundation. Additional subsurface investigation maybe needed to verify removal of soft insitu soils and a stability analysis of the levees is recommended.

6.1.3 Operating Records: The records show that the maximum water level at the spillway of the flood control structure was 18.7 feet (gauge height) during the August 28, 1971 flood, which had a discharge of 4,110 cfs.

6.1.4 Post-Construction Changes: There is no indication of significant post-construction changes at this dam since 1973. However, as discussed before, this structure is part of a large flood control project that has not been fully developed to date.

The overall Elizabeth River Basin Flood Control Plan will consist of three detention basins (Salem Pond, Rt. 22, and Union) and the protection of the river banks by a concrete lined channel from Ursino Dam to Route 1, with flood walls and levees from Route 1 to Arthur Kill.

6.1.5 Seismic Stability: The concrete gravity control structure and earth levees are located within Zone 1 on the Algermissen Seismic Risk Map of the United States (1969 edition). The visual inspection and studies of the concrete dam described herein indicate that the dam apparently has satisfactory static stability conditions and that conventional safety margins exist. Therefore, in accordance with paragraph 3.6.4 of Reference 1 of Appendix G, it may be assumed the concrete dam presents no hazard from an earthquake. As far as the earth levees are concerned, there are uncertainties with respect to the static stability of the dike as indicated in paragraph 6.1.2. Therefore, in accordance with paragraph 3.6.4 of Reference 1 of Appendix G, assessments should be considered regarding seismic stability based on the studies outlined in paragraph 7.2-a. of this report.

7.0 ASSESSMENT, RECOMMENDATIONS/REMEDIAL MEASURES

The assessment, recommendations, and remedial measures contained in this Report are based on the provisions of Appendix H, Conditions.

7.1 DAM ASSESSMENT

7.1.1 Safety: The visual inspection of the Ursino flood control and ancillary concrete structures did not reveal any signs of distress such as structural cracking, base movement, abnormal settlements, seepage or erosion. It is concluded that the concrete structures were in good condition at the time of inspection. However, the presence of weak and poor foundation material beneath portions of the earth levees as described in paragraph 6.1.2 indicates that a foundation and slope stability analysis is needed.

7.1.2 Adequacy of Information: The outer geometry of the concrete gravity control structure as shown in the 1971 record drawings was verified by the visual inspection.

7.1.3 Urgency: No urgent and drastic studies or remedial measures are required at this time.

7.1.4 Necessity for Additional Studies: Additional subsurface information and a foundation and slope stability analysis for critical sections of the levees are needed.

7.2 RECOMMENDATIONS/REMEDIAL MEASURES

The following recommendations/remedial measures are made on the basis of this inspection:

a. The Owner should retain the services of a qualified consultant to review the General Design Memorandum and to determine the necessity of performing stability analysis on the basis of additional subsurface investigation for the earth levees. The owner should have this study performed in the near future.

b. The owner should establish a semiannual inspection program soon to obtain a record of conditions at the concrete gravity control structure. Such a program should include monitoring of seepage during the flood season, condition of concrete, condition of drainage structure and operating facilities, and vandalistic alteration of the earth levees since the U.S. Army Corps of Engineers, New York District inspects the entire Elizabeth River Basin Flood Control Project as least once a year. The Owner and the City of Elizabeth should coordinate inspections to avoid duplication.

c. Regular maintenance procedures, including grass-mowing and tree-removing, should be established soon throughout the detention basin area. This should precede the semiannual inspection work.

d. The upstream end of the reinforced concrete flume should be protected by riprap in the near future to prevent washing out of soil at that point.

e. The Trotters Lane Bridge should be raised in the future. As part of the downstream flood protection plan, this bridge is slated to be raised by 1981.

f. The manholes giving access to the drainage structures should have the weld on the covers removed, and heavy duty locks should be installed to provide quick access to the sluice gates.

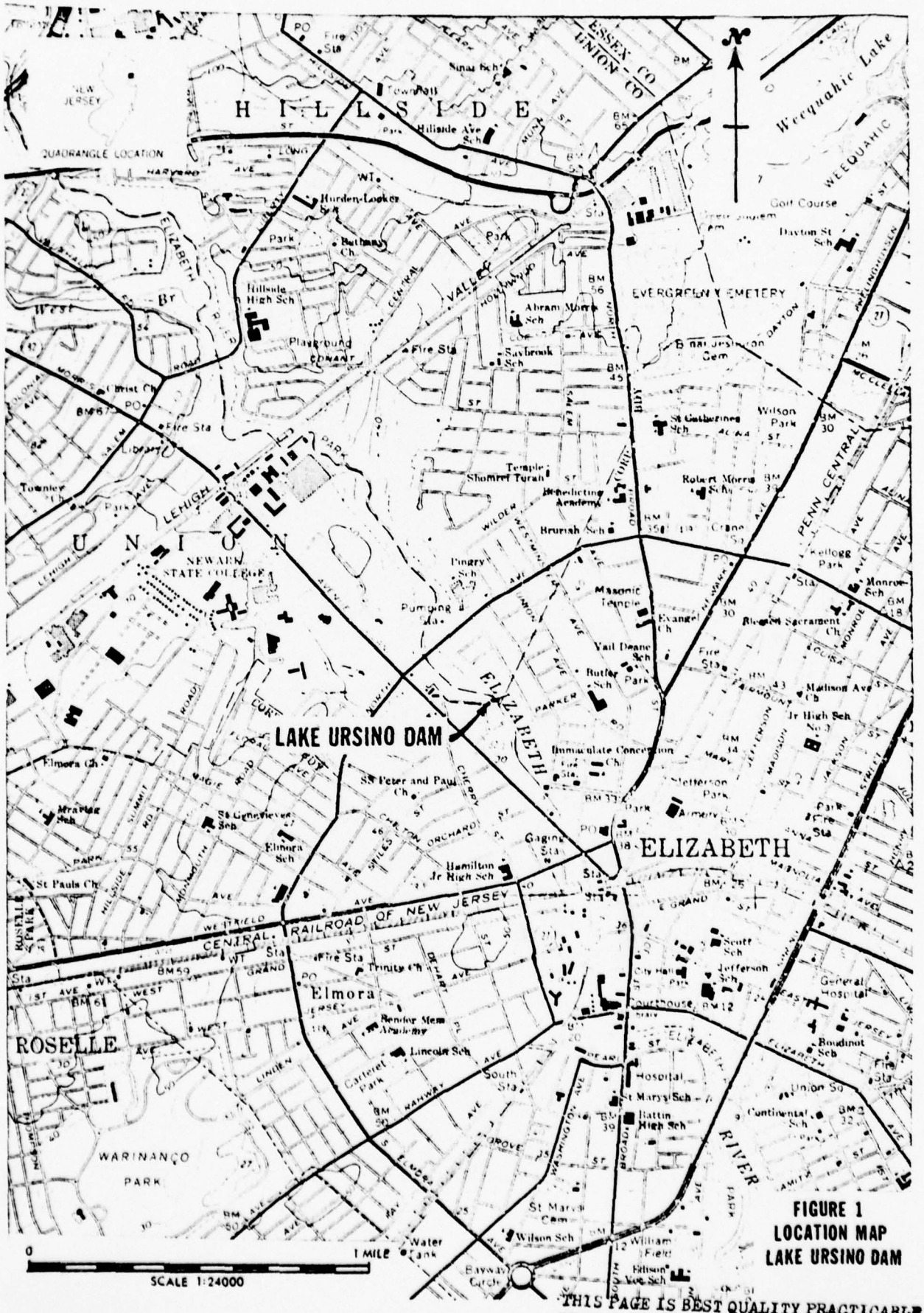
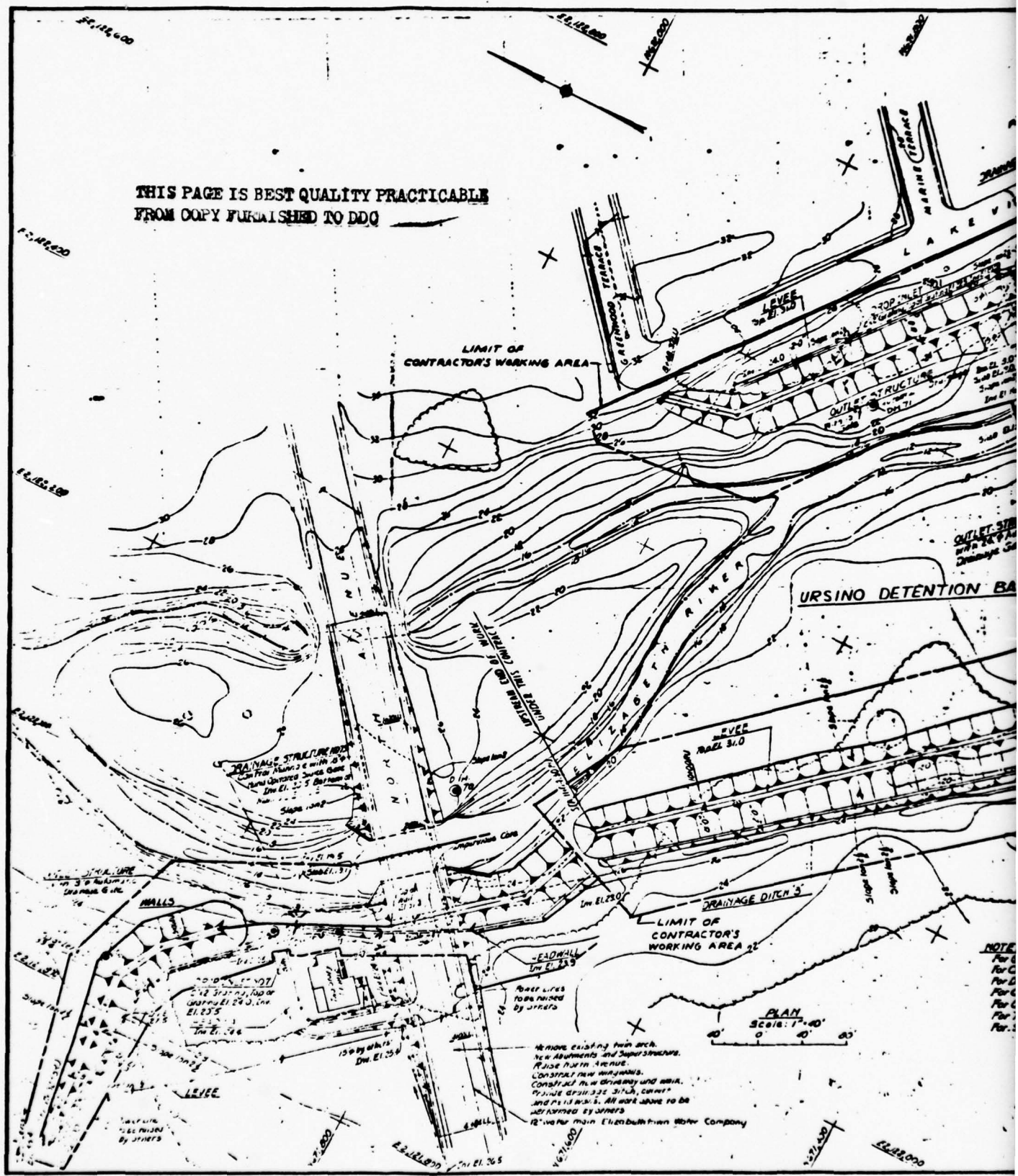
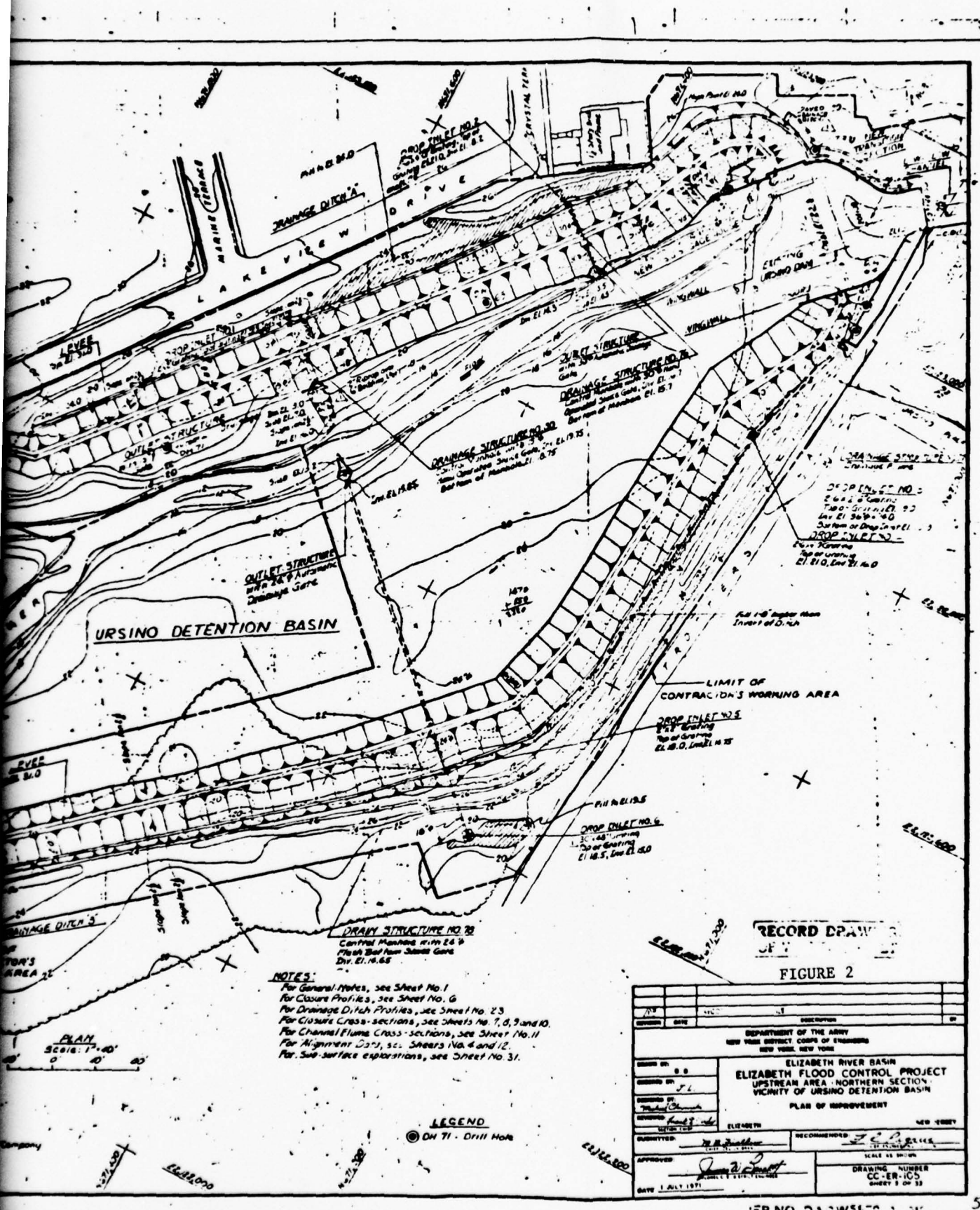


FIGURE 1
LOCATION MAP
LAKE URSINO DAM





NOTES:
For General Notes, see Sheet No. 1
For Closure Profiles, see Sheet No. 6
For Drainage Ditch Profiles, see Sheet No. 23
For Closure Cross-sections, see Sheets No. 7, 8, 9 and 10.
For Channel Flume Cross-sections, see Sheet No. 11
For Alignment Data, see Sheets No. 4 and 12.
For Sub-surface explorations, see Sheet No. 31.

FIGURE 2

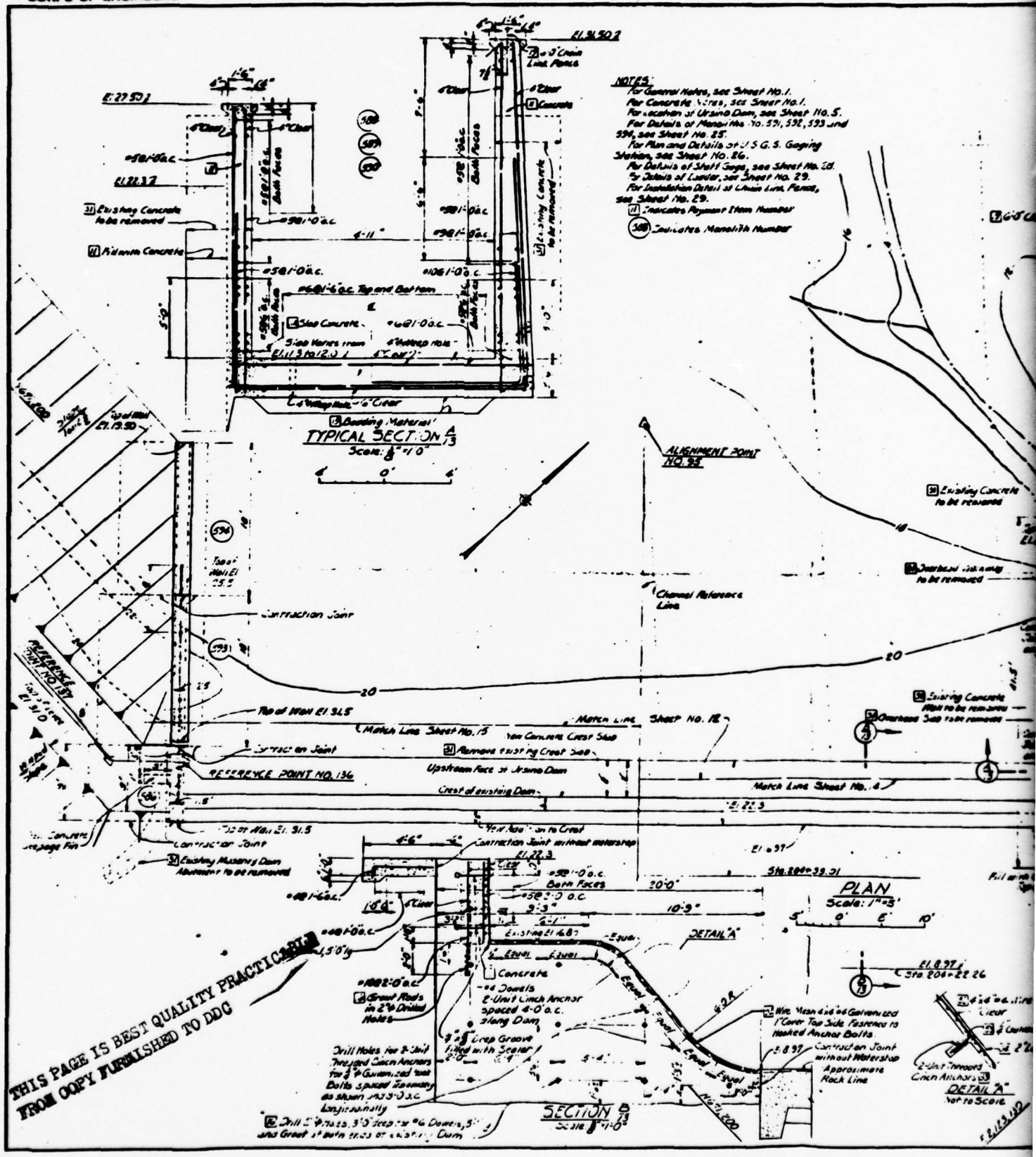
DEPARTMENT OF THE ARMY
NEW YORK DISTRICT CORPS OF ENGINEERS
NEW YORK, NEW YORK

ELIZABETH RIVER BASIN
ELIZABETH FLOOD CONTROL PROJECT
UPSTREAM AREA - NORTHERN SECTION
VICINITY OF URSINO DETENTION BASIN
PLAN OF IMPROVEMENT

DRAWING NUMBER CC-ER-105
SHEET 5 OF 33

DATE 1 JULY 1971

CORPS OF ENGINEERS



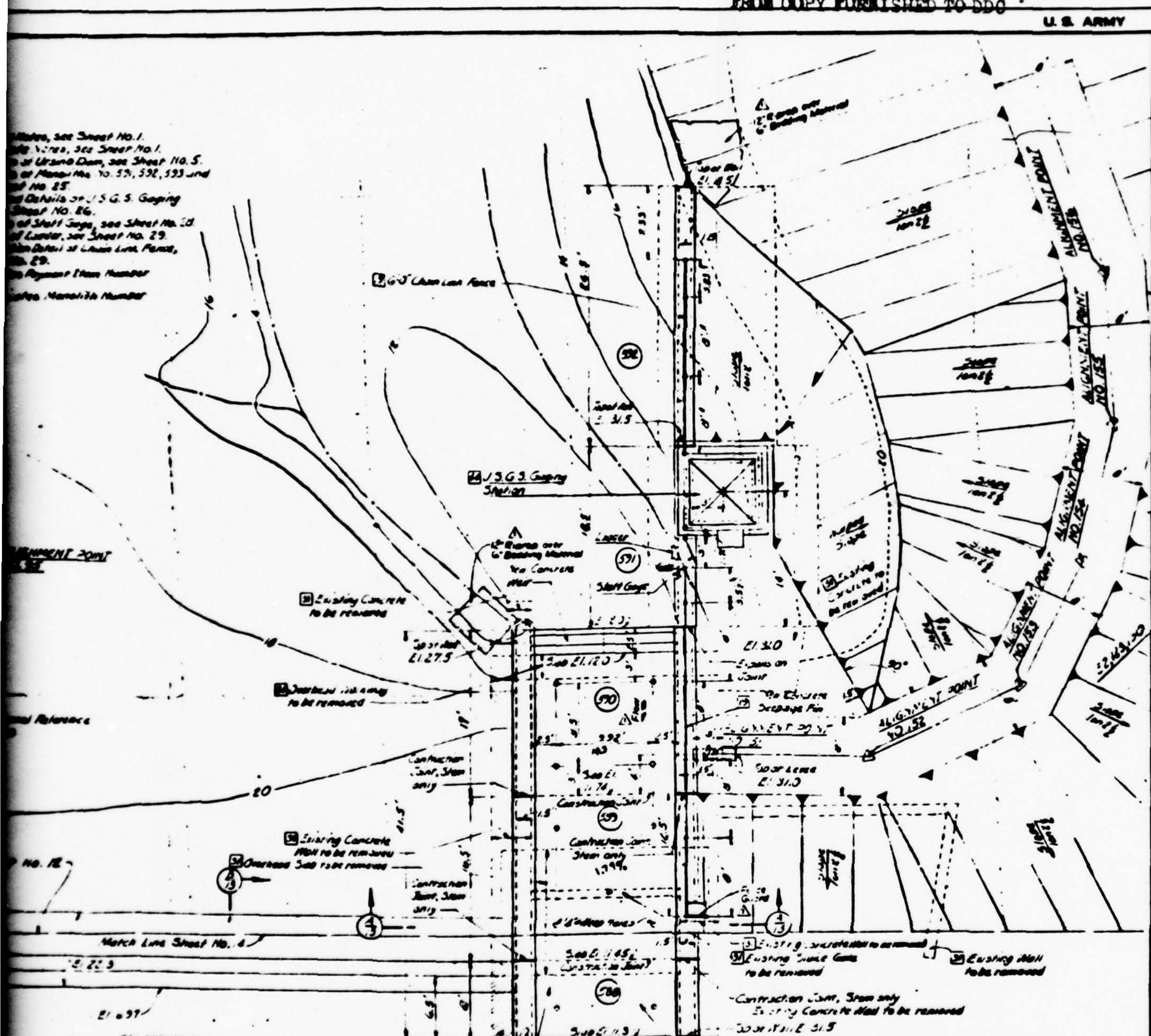
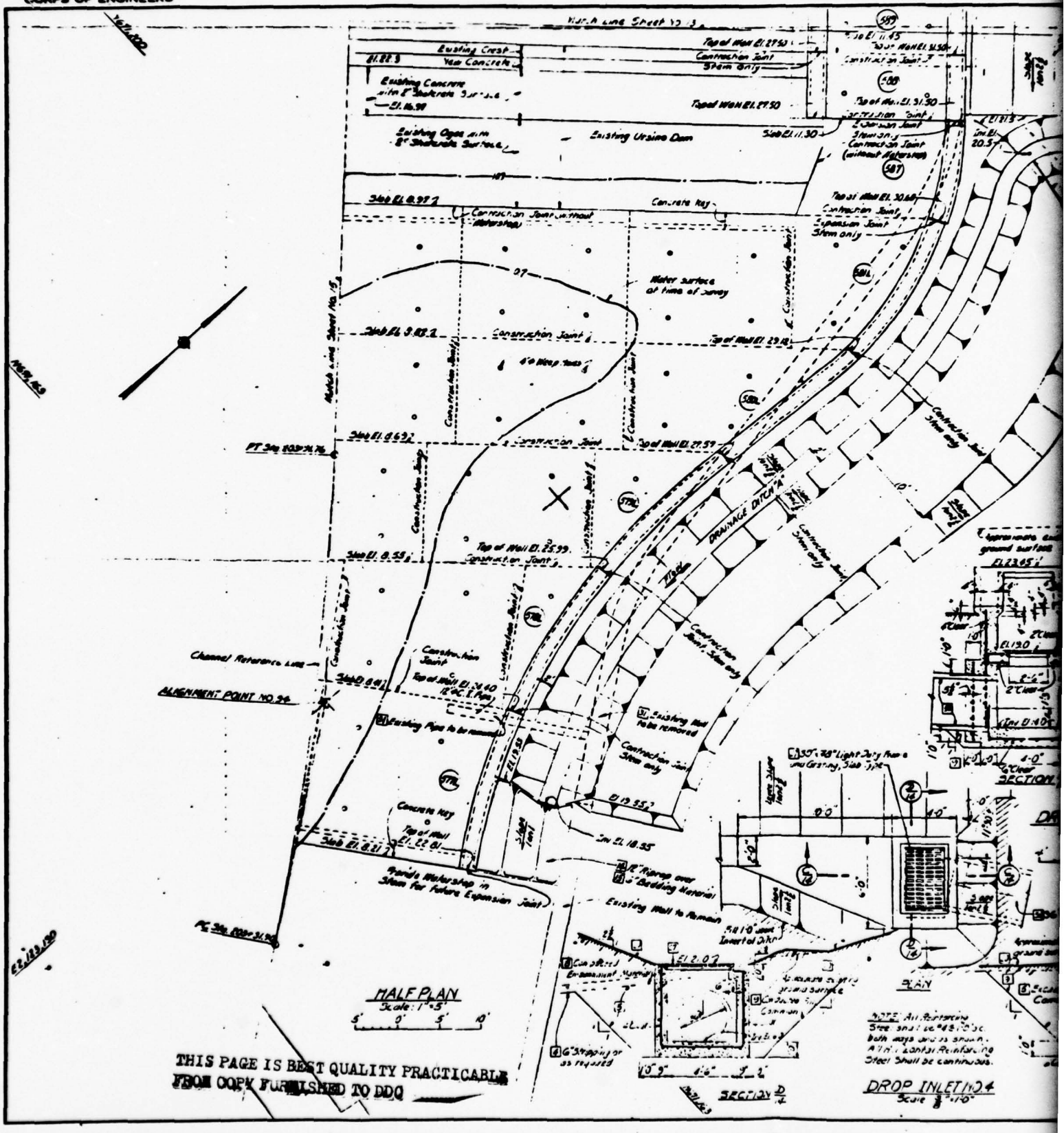


FIGURE 3

IFB NO DACW51-72-B-0010

CORPS OF ENGINEERS



U. S. ARMY

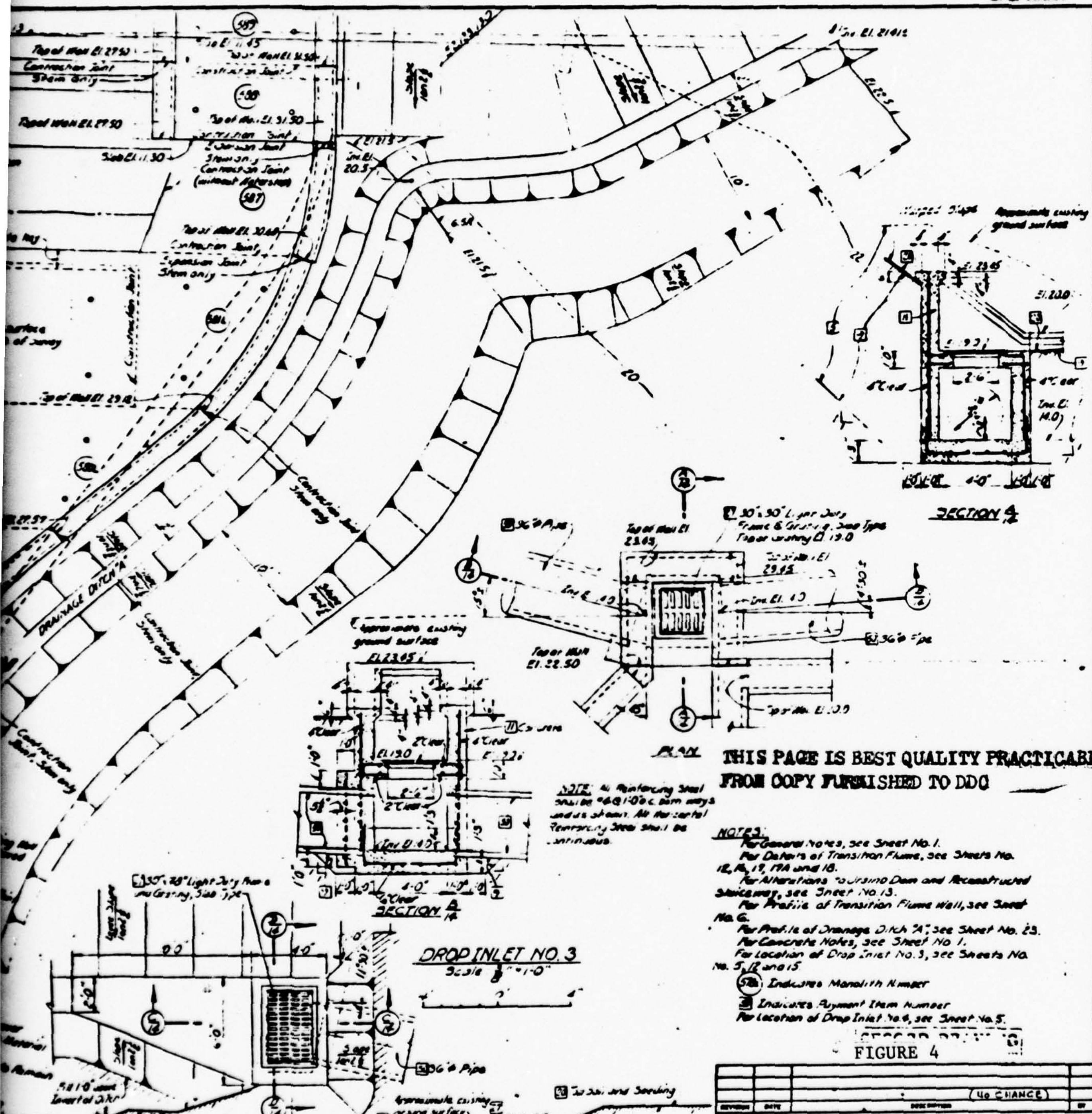
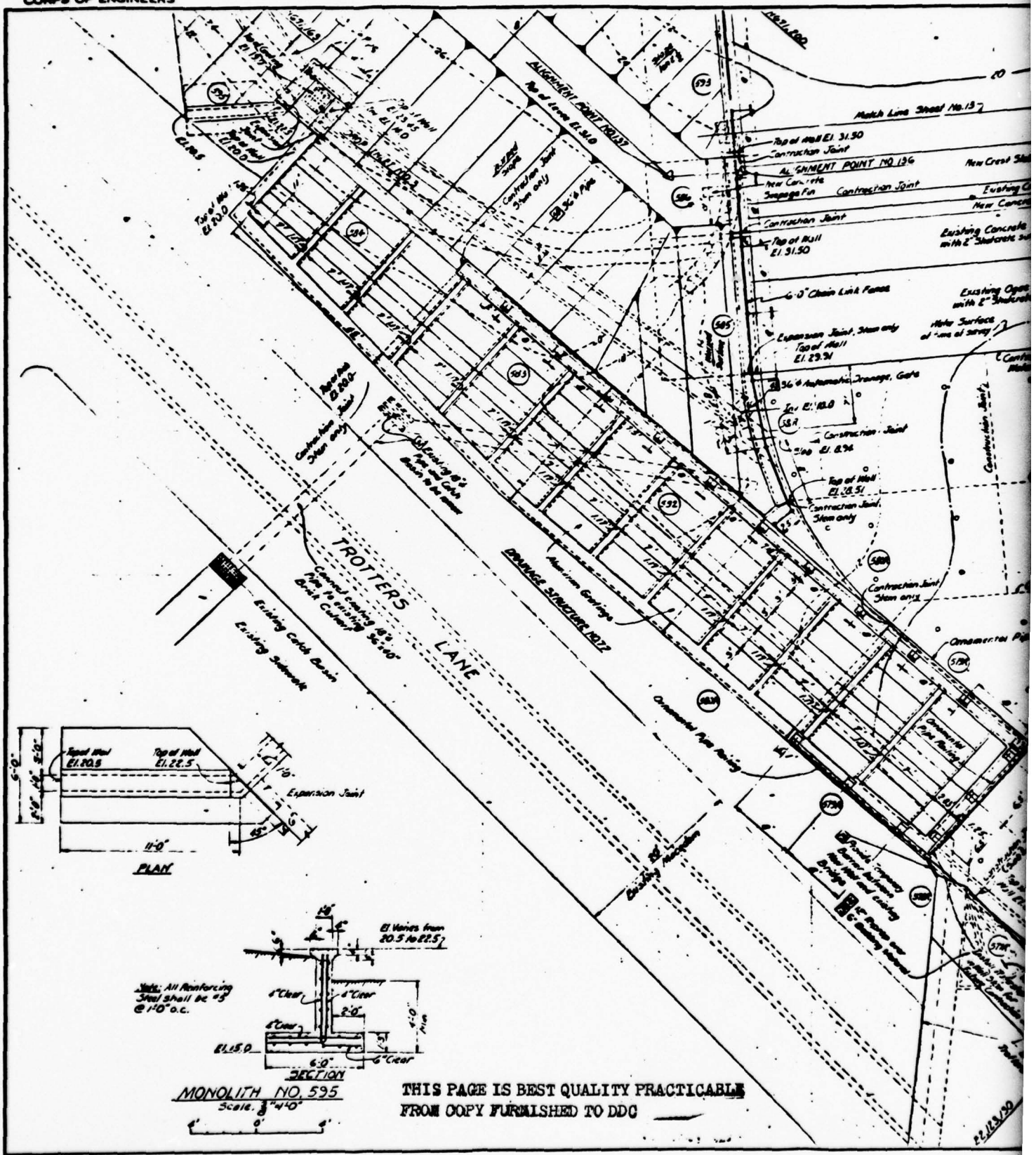


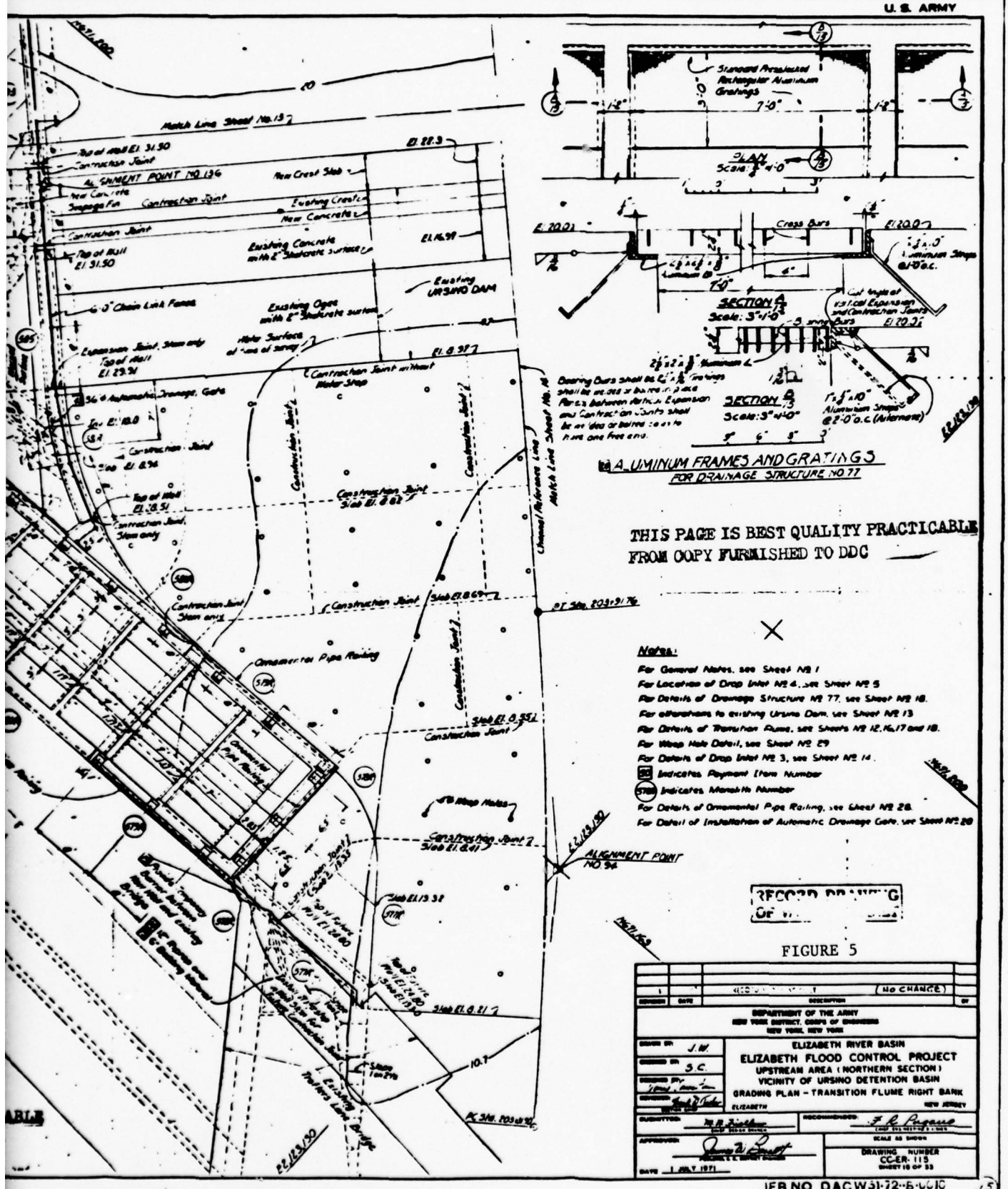
FIGURE 4

IFB NO DACW51-72-B-0010

CORPS OF ENGINEERS



U. S. ARMY



ALUMINUM FRAMES AND GRATINGS
FOR DRAINAGE STRUCTURE NO. 77

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FROM COPY FURNISHED TO DDC

Notes:

For General Notes, see Sheet No. 1
For Location of Drop Inlet No. 4, see Sheet No. 5
For Details of Drainage Structure No. 77, see Sheet No. 18.
For alterations to existing Ursino Dam, see Sheet No. 13
For Details of Transition Flume, see Sheets No. 12, 16, 17 and 18.
For Weep Hole Detail, see Sheet No. 29
For Details of Drop Inlet No. 3, see Sheet No. 14.
(58) Indicates Payment Item Number
(57M) Indicates Monolith Number
For Details of Ornamental Pipe Railing, see Sheet No. 28.
For Detail of Installation of Automatic Drainage Gate, see Sheet No. 28

RECORD DRAWING OF ...

FIGURE 5

1		(NO CHANGE)	
REVISED	DATE	DESCRIPTION	BY

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
NEW YORK, NEW YORK

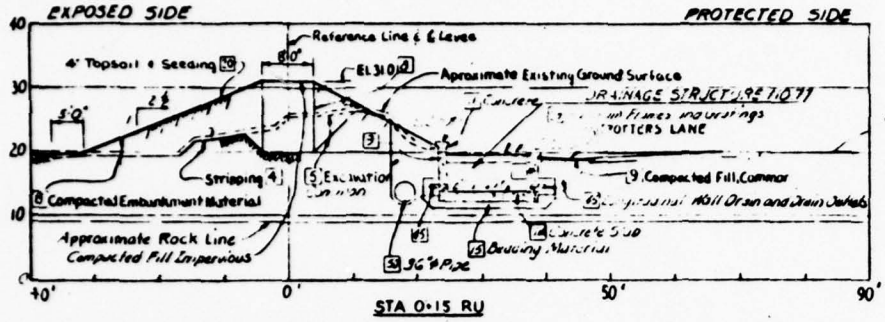
DESIGNED BY J.W.
DRAWN BY S.C.
TRACED BY
CHECKED BY

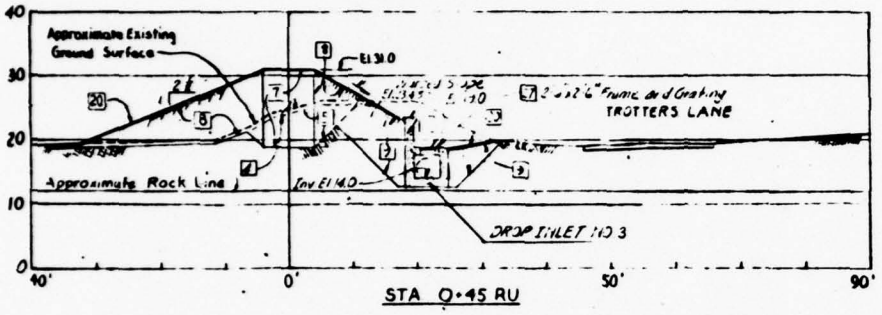
ELIZABETH RIVER BASIN
ELIZABETH FLOOD CONTROL PROJECT
UPSTREAM AREA (NORTHERN SECTION)
VICINITY OF URSINO DETENTION BASIN
GRADING PLAN - TRANSITION FLUME RIGHT BANK
ELIZABETH NEW JERSEY

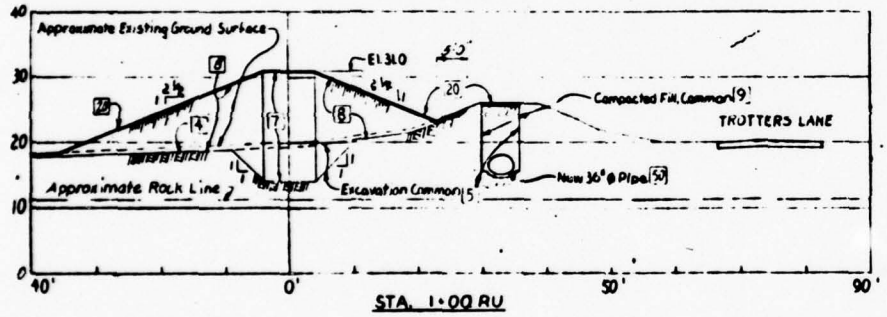
SUBMITTED
RECOMMENDED
APPROVED
DATE 1 JULY 1971

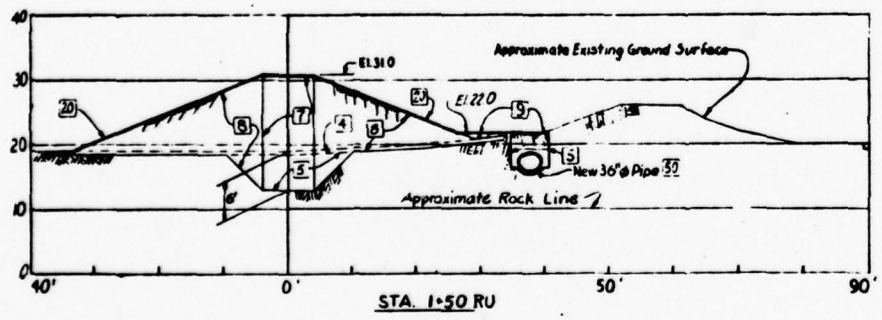
SCALE AS SHOWN
DRAWING NUMBER CC-ER-115
SHEET 10 OF 33

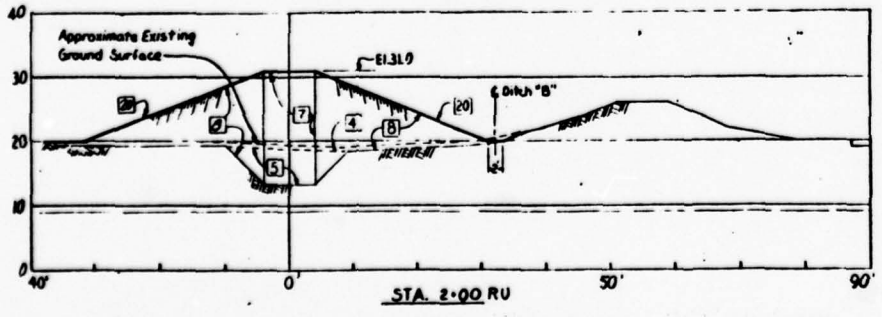
IFB NO DACW51-72-B-0010

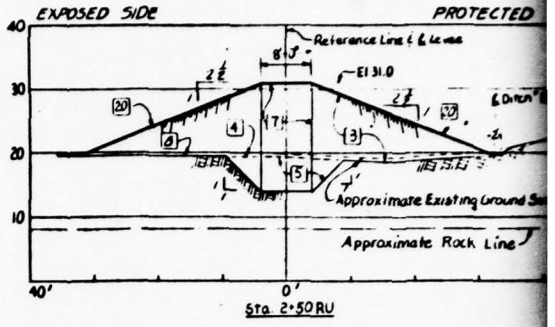


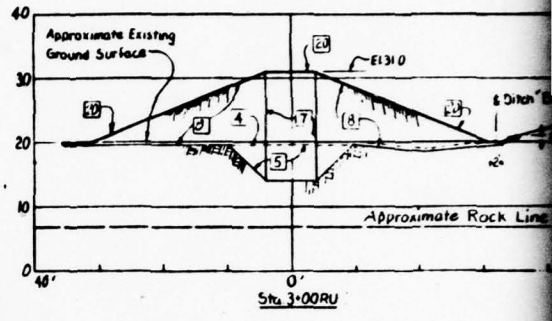


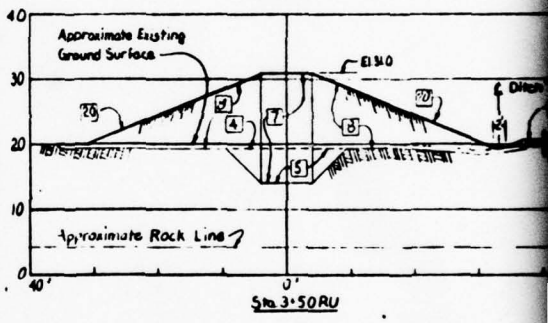


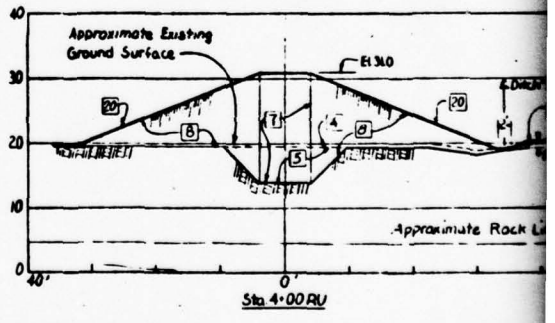


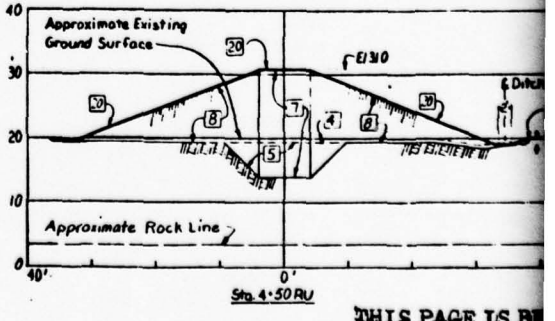






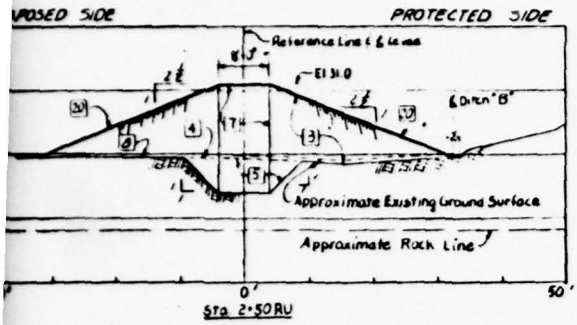






ELEVATIONS ARE IN FEET ABOVE MEAN SEA LEVEL

Scale: 1" = 10'



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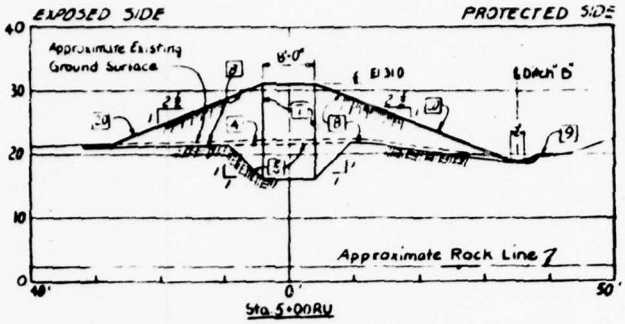

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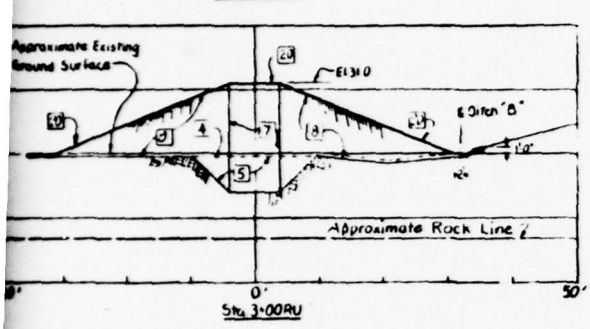
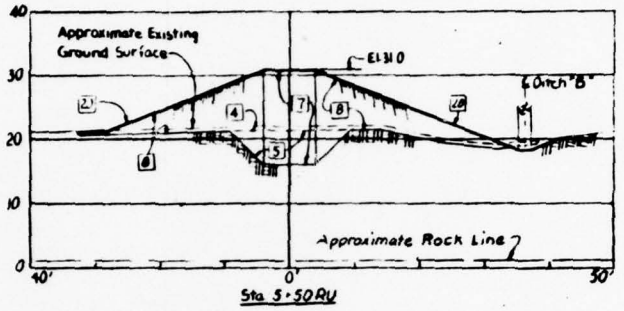


Sta 3+00 RU



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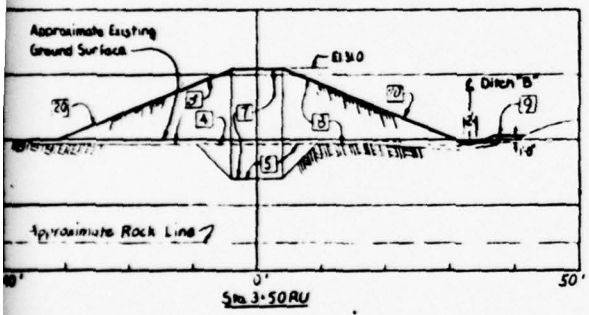

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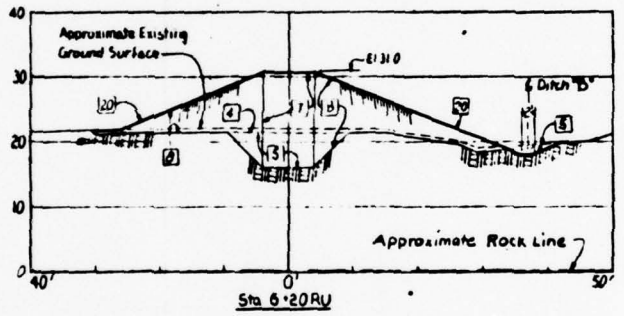
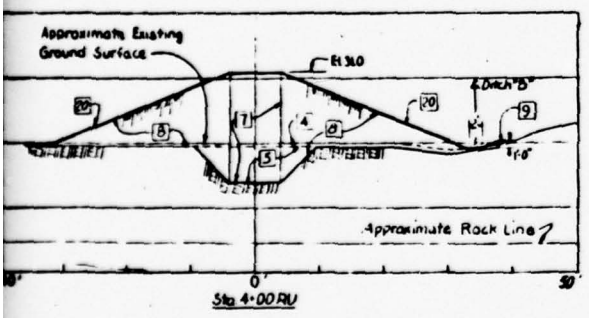


Sta 6+20 RU



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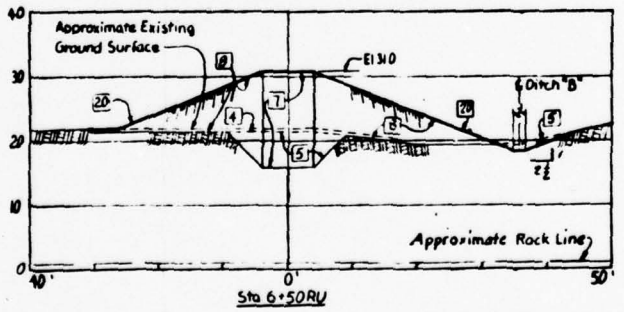

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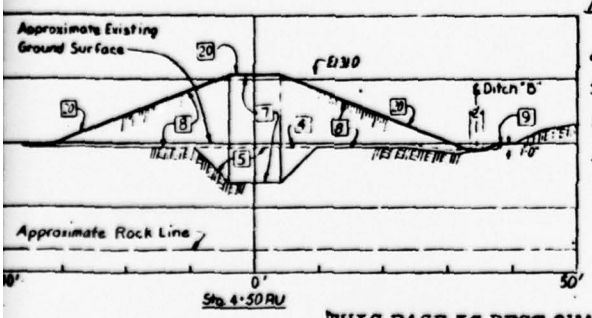


Sta 4+50 RU

Scale: 1" = 10'
10 0 10 20

NOTES

For General Notes, see Sheet No. 1.
Cross-sections are taken looking in direction of decreasing Stations.
For Location of Cross-sections, see Sheet No. 5.
For Profile of Drainage Ditch "B" see Sheet No. 23
For Details of Drop Inlet No 3, see Sheet No. 14
For Details of Drainage Structure No 77, see Sheet No. 18
[3] Indicates Payment Item Number.

FIGURE 6

REVISION	DATE	DESCRIPTION	BY
		(NO CHANGE)	

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
NEW YORK, NEW YORK

DESIGN BY: J.D.
CHECKED BY: M.B.
RECOMMENDED BY: Chief, Engineering Division
REVIEWED: Chief, Design Section

ELIZABETH RIVER BASIN
ELIZABETH FLOOD CONTROL PROJECT
UPSTREAM AREA (NORTHERN SECTION)
VICINITY OF URSINO DETENTION BASIN

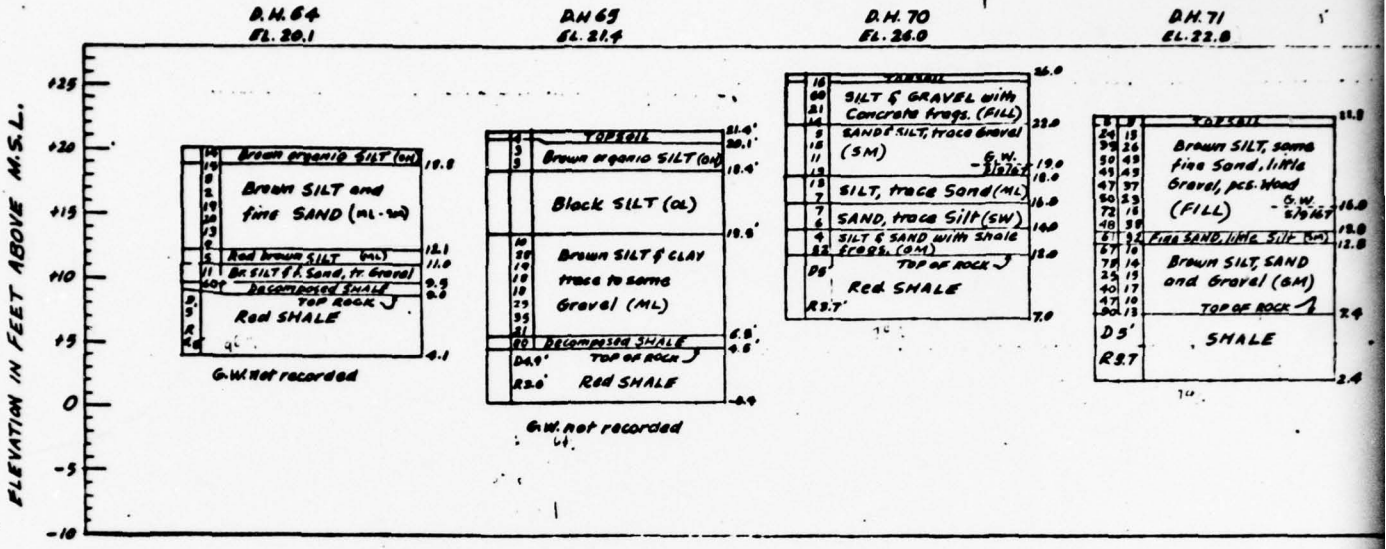
CLOSURE CROSS-SECTIONS
Sta 0+15 RU THRU Sta 6+50 RU

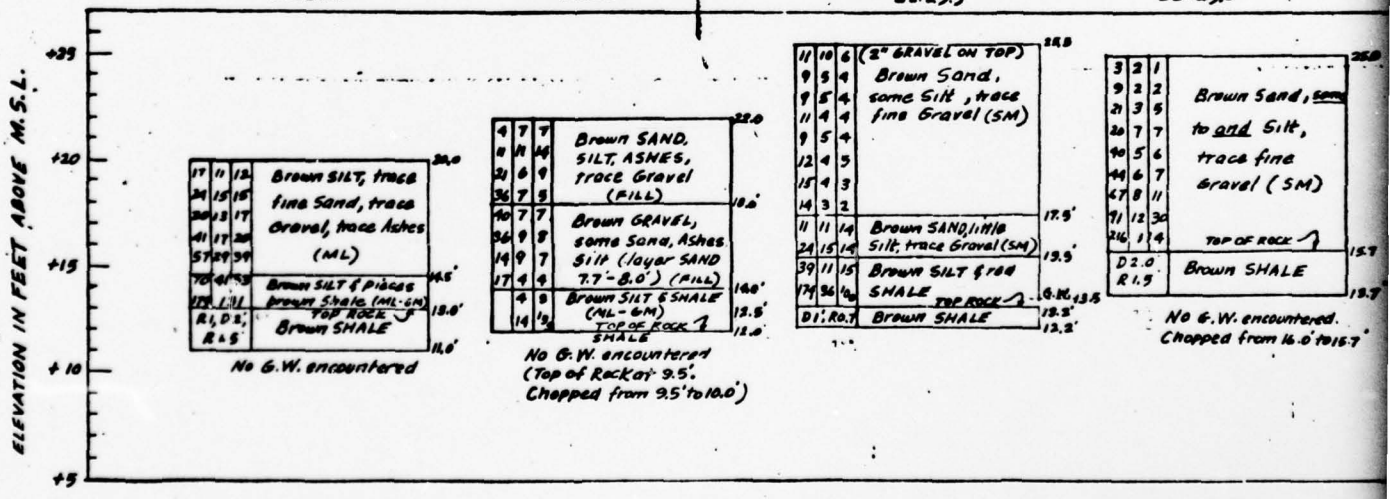
ELIZABETH NEW JERSEY

SUBMITTED: Chief, Design Branch
RECOMMENDED: Chief, Engineering Division
APPROVED: Colonel, C.E., District Engineer
DATE: 1 JULY 1971
SCALE AS SHOWN
DRAWING NUMBER CC-ER-10 (SHEET 7 OF 33)

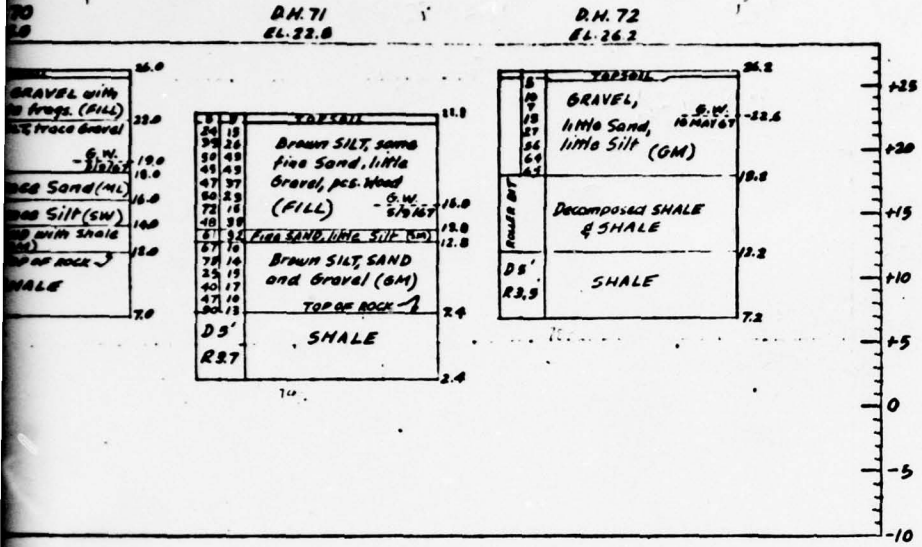
2

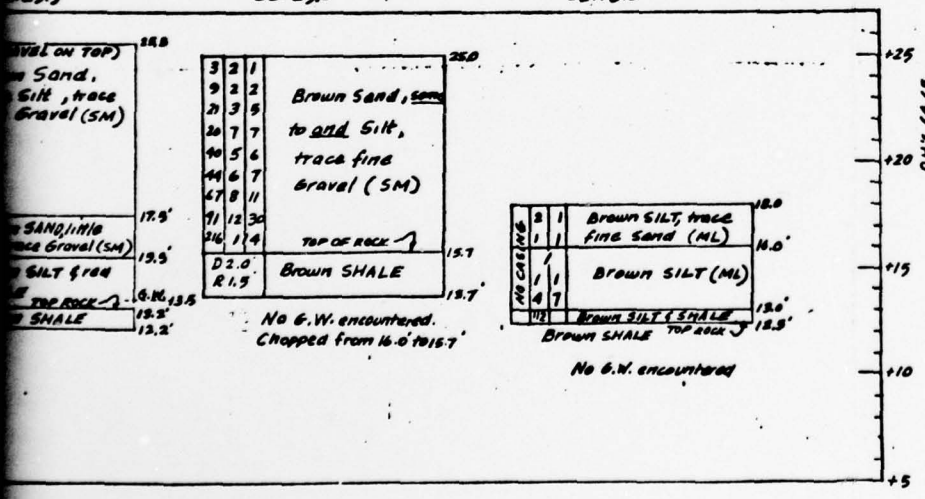
CONTRACT NO. DACW51-72-C-0011





NOTE: 1) In all Drill Holes - the top one foot of ROCK is decayed, with SILT filled seams.
2) D.H.'s 70 & 72 done with 4" casing 3" spoon, 300 LB. Hammer, 18" drop.





NOTE: 1) In all Drill Holes - the top one foot of ROCK is decayed, with SILT filled seams.
2) D.H.'s 70-72 done with 4" casing 3" spoon, 300 LB. Hammer, 18" drop.

GENERAL NOTES

1. The soil logs, notes and other test data shown are the result of interpretations made by representatives of the Corps of Engineers from personal observations made during the exploration period of the following: a) samples of subsurface materials recovered during explorations, b) records of explorations as prepared by the drill operators and Government inspectors and c) other records pertinent to surface and subsurface conditions. The samples and records are available for inspection upon request to Chief, Foundations and Materials Branch, New York District, Corps of Engineers, New York, N.Y.

2. Explanation of the classifications and terms

a. Bedrock – Natural solid mineral matter occurring in great thickness and extent as its natural location. It is classified according to geological type and structure (strata, bedding, etc.) and described as solid, weathered, broken, fragmented or decomposed depending on its condition.

b. Soils – Soil-rock or other unconsolidated accumulations of particles produced by the physical and chemical disintegration of rocks, and which may or may not contain organic matter.

Size Component Terms		Proportion Terms by Weight
Boulder	larger than 8 inches	Major Component as shown in the soil horizon capitalized
Cobble or Small Stone	8 inches to 3 inches	Minor Component percentage terms of Total sample mix.
Gravel	3 inches to 4.76 mm (#4 sieve)	
coarse	3 inches to ¾ inches	and 45 to 35 percent
medium	¾ inches to 4.76 mm	some 20 to 45 percent
Sand	4.76 mm (#4 sieve) to 0.074 mm (#200 sieve)	little 10 to 20 percent
coarse	4.76 mm to 2.00 mm (#10 sieve)	trace 1 to 10 percent
medium	2.00 mm to 0.42 mm (#40 sieve)	
fine	0.42 mm to 0.074 mm (#200 sieve)	
Silt and Clay	Less than 0.074 mm. Distinction between ... based on Plasticity Index and Liquid Limit.	

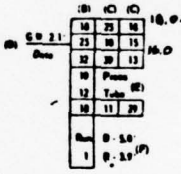
c. Gradation Terms – The terms coarse, medium and fine are used to describe gradation of Sand and Gravel. When no gradation term is used, the component is graded from coarse to fine. Other gradings are used, such as medium to fine, fine, etc.

d. The terms used to describe the various soil components and proportions are arrived at by visual examination of the recovered soil samples. Other terms are used when the recovered samples are not truly representative of the natural materials, such as, soil containing numerous cobbles and boulders which cannot be sampled, finely stratified soils, organic soils, and fills. The terms (SW-GM) etc. refer to the Unified Soil Classification System as per Manual EM. 1110-2-1906 dated 12 June 1968.

e. Ground Water – The data shown directly below the ground water (G.W.) is the date on which the water level in the exploration was measured. The measurement was made during exploration work or immediately after completion, unless otherwise noted. The depth recorded is influenced by exploration methods, the soil type and weather conditions during exploration. Where no water was found it is so indicated. It is anticipated that the ground water will rise during periods of wet weather. In addition, perched ground water above the water levels indicated (or above the bottom of the hole where no ground water is indicated) may be encountered in sand strata or zones of rock.

LEGEND

- DH-# – DRILL HOLE
- TP-# – TEST PIT
- AH-# – AUGER HOLE



(A) Surface elevation or top surface of water at time and location of exploration. DATUM M.S.L.

(B) Blows per foot on 2½ diameter casing using 300 pound hammer dropped 24 inches, except where otherwise noted.

(C) Blows per 6 inches on sample spoon, 2 inches O.D. and 1 3/8 inches I.D. using 140 pound hammer dropped 30 inches, except where otherwise noted. The symbol P indicates that the soil sampler was pushed into the subsoil by hand or by the weight of the hammer.

(D) Ground Water Data G.W. see General Note 2e.

(E) Undisturbed Sample – 3 inch diameter, pressed hydraulically unless otherwise noted.

(F) Rock or Boulder Drilling Data D – Length drilled, R – amount recovered of length drilled using NX diamond bit, unless otherwise noted. Where indicated, the pieces refer to the number of natural breaks in the recovered core as evaluated by the Government Inspector or Geologist.

DH's 64,65, 70 thru 72

THIS PAGE IS BEST QUALITY PRACTICABLE FROM COPY FURNISHED TO DDC

Subsurface explorations were performed during DH 64 & 65, 70-72 JULY 1966 & OCT. 1967
DH 73U-77U, Dec. 1970

FIGURE 7

RECORD DRAWING OF WORK BUILT

REVISION	DATE	DESCRIPTION	BY

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
NEW YORK, NEW YORK

DRAWN BY: SS
CHECKED BY: JK
INSPECTED BY: SS & JD
REVIEWED: [signature]

ELIZABETH RIVER BASIN
ELIZABETH FLOOD CONTROL PROJECT
UPSTREAM AREA (NORTHERN SECTION)
VICINITY OF URSINO DETENTION BASIN
SUB-SURFACE EXPLORATIONS
ELIZABETH NEW JERSEY

SUBMITTED: [signature]
RECOMMENDED: [signature]
APPROVED: [signature]
DATE: 1 JULY 1971
SCALE AS SHOWN
DRAWING NUMBER CC-EN-131
SHEET 31 OF 33

IFB NO DACW51-71-B-0033 (31)

APPENDIX A

VISUAL CHECKLIST

Check List
Visual Inspection
Phase 1

Name Dam: Ursino County: Union State: New Jersey Coordinators: Corps of Engineers Philadelphia District

Date(s) Inspection: March 31, 1978 Weather: Clear Temperature: 83°F

Estimated Pool Elevation at Time of Inspection: 14.1 feet MSL Tailwater at Time of Inspection: 14.0 MSL

Gilbert Associates, Inc.
Inspection Personnel:

Fine T. Hsu

Rudy P. Visser

Rudolph J. Wahanik

Also Present:

Union County Park Commission:

Michael Serra

K. Knutsen

City of Elizabeth, Dept. of Public Works:

Victor Vinagra

Frank Cyron

Frank Meilly

Rudy P. Visser - Recorder

CONCRETE/MASONRY DAMS
(CONCRETE DROP STRUCTURE, OVERFLOW TYPE)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SEEPAGE OR LEAKAGE	No seepage or leakage was observed on the faces and abutments of the drop structure.	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	The junctions of structure to abutment/embankment were in good condition.	
DRAINS	No internal drain or blowoff pipe drain systems were observed in the field.	
WATER PASSAGES	The concrete surface of the drop structure showed no erosion and cavitation effects.	
FOUNDATION	The discharge channel is lined with concrete in good condition. There is no evidence of undermining of the toe.	
SURFACE CRACKS CONCRETE SURFACES	A spalled area was found at the construction joint in the channel section and in a wing wall.	
STRUCTURAL CRACKING	None Observed	

CONCRETE/MASONRY DAMS
(CONCRETE DROP STRUCTURE, OVERFLOW TYPE)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
VERTICAL AND HORIZONTAL ALIGNMENT	No deviation from the alignments were visible.	
MONOLITH JOINTS	The monolith joints were in good condition.	
CONSTRUCTION JOINTS	These were in good condition except for two spalled areas (see Appendix C).	

EMBANKMENT
(EARTH LEVEES)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None was observed.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None was observed.	Dense and untrimmed grass cover prevented a detailed visual check of the toe area.
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Minor surface sloughing and erosion of embankment slope was observed in a barren area adjacent to the new USGS gaging station. Most of the embankment slopes were covered by dense and long grass.	The grass and some brushes should be mowed periodically. A few trees growing on the upstream side of the control structure should be removed.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	No apparent deviation of the alignment of the crest was observed.	
RIPRAP FAILURES	Not applicable (no riprap protection was designed or installed along the upstream slope).	

EMBANKMENT
(EARTH LEVEES)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Junction of embankment and natural ground, concrete wing wall and embankment appear to be in good condition.	
ANY NOTICEABLE SEEPAGE	None was observed.	
STAFF GAGE AND RECORDER	A new USGS gaging station on the top of the left embankment at the dam was observed.	
DRAINS	All visible drainage structures, sluice gates, drop inlet and outlet structure, periphery drain ditch, and drainage flume, appear to be in good repair.	

OUTLET WORKS

Sheet 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Not Applicable	
INTAKE STRUCTURE	Not Applicable	
OUTLET STRUCTURE	Not Applicable	
OUTLET CHANNEL	The rectangular side channel built on the left abutment of the dam is in good condition. The bottom of the channel is at the level of the streambed to allow all water flow to bypass the dam.	None
EMERGENCY GATE	Not Applicable	

UNGATED SPILLWAY

Sheet 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	A 15-foot wide channel spillway with cantilever type concrete walls is located on the left side of the overflow concrete dam. The face of the spillway was submerged and the walls were recently constructed and were in good condition.	
APPROACH CHANNEL	Scouring and erosion of the backfill or natural channel material was apparent in the vicinity of the right approach channel. The bedding material and riprap slope may have partially failed.	The eroded area and failed riprap slope should be rehabilitated.
DISCHARGE CHANNEL	The concrete lined channel bottom was submerged at the time of inspection. The channel walls are relatively new and are generally in good condition except some minor spalling at construction joints.	
BRIDGE AND PIERS	The old Trotters Lane Bridge and piers with 25 foot spans is located about 100 feet below the concrete overflow dam. The concrete surface of the bridge and piers were badly spalled and scaled.	It is doubtful that the old bridge can allow the safe discharge of the PMF or one-half PMF without being overtopped. This bridge should be raised (As part of the downstream flood protection plan, the bridge will be raised.)

GATED SPILLWAY

Sheet 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	Not Applicable	
APPROACH CHANNEL	Not Applicable	
DISCHARGE CHANNEL	Not Applicable	
BRIDGE AND PIERS	Not Applicable	
GATES AND OPERATION EQUIPMENT	Not Applicable	

INSTRUMENTATION

Sheet 1

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	Alignment and reference points were designed along the top of the earth dike as shown in the design drawings.	
OBSERVATION WELLS	None observed.	
WEIRS	None observed.	
PIEZOMETERS	None observed.	
OTHER	U.S.G.S. Gaging station on left abutment.	

RESERVOIR
(DETENTION BASIN)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	The detention basin is formed by continuous earth levees with side slopes of 2.5 horizontal to 1 vertical on the east and west sides. The channel of the Elizabeth River lies about 8 feet below the bottom of the reservoir and has variable side slopes cut in the natural soils. Most of the slopes are apparently not stable as evidenced by channel erosion.	
SEDIMENTATION	Sediments carried by the low flow in the channel were not discernible during the inspection.	

DOWNSTREAM CHANNEL

Sheet 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	The Elizabeth River streambed has natural slopes with some riprap protection; slopes are vegetated. Accumulated sediments were observed in the stilling basin between the dam and the Trotters Lane Bridge.	
SLOPES	The river channel slopes vary from 1:1 to near vertical.	
APPROXIMATE NO. OF HOMES AND POPULATION	Five square miles of densely populated area within the city of Elizabeth.	

APPENDIX B

ENGINEERING DATA LIST

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
PLAN OF DAM	Microfilmed data from N.J. Department of Environmental Protection; (NJDEP); record drawings of 1973 modifications from U.S. Army Corps of Engineers, New York District Office.
REGIONAL VICINITY MAP	USGS 7-1/2 minute quadrangle, Elizabeth, N.J.-N.Y. 1967
CONSTRUCTION HISTORY	From microfilm data of NJDEP
TYPICAL SECTIONS OF DAM	Microfilm data and record drawings of 1973.
HYDROLOGIC/HYDRAULIC DATA	From U.S. Corps of Engineers, New York District.
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS	Same as above
RAINFALL/RESERVOIR RECORDS	Same as above
DESIGN REPORTS	None Available to Inspection Personnel
GEOLOGY REPORTS	None Available to Inspection Personnel

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
DESIGN COMPUTATIONS	None available to Inspection Personnel from U.S. Army Corps of Engineers
HYDROLOGY & HYDRAULICS	Some data received from U.S. Army Corps of Engineers
DAM STABILITY	None received from U.S. Army Corps of Engineers
SEEPAGE STUDIES	Not applicable
MATERIALS INVESTIGATIONS	None available
BORING RECORDS	For 1973 modifications only
LABORATORY	None available
FIELD	None available
POST-CONSTRUCTION SURVEYS OF DAM	None available
BORROW SOURCES	None available
SPILLWAY PLAN	From record drawings of U.S. Army Corps of Engineers
SECTIONS	
DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS	Not applicable

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
MONITORING SYSTEMS	Not applicable
MODIFICATIONS	Not applicable
HIGH POOL RECORDS	Estimated data from U.S. Army Corps of Engineers
POST-CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None available
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None available
MAINTENANCE	By city of Elizabeth, no records.
OPERATION	By city of Elizabeth, no records.
RECORDS	By city of Elizabeth, no records.

CHECKLIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA*

DRAINAGE AREA CHARACTERISTICS: 16.9 square miles, densely populated, 3.8 miles from river mouth

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): None

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 31.0 feet (Top of levee) and 530 acre ft.

ELEVATION MAXIMUM DESIGN POOL: 31.0 feet (Top of levee)

ELEVATION TOP OF DAM: 22.3 feet (top of concrete control structure)

CREST: Of concrete control structure

a. Elevation - 22.3 feet
b. Type - Broad - crested weir with 5-foot drop to ogee
c. Width - 7.75 feet
d. Length - 104.5 feet
e. Location Spillover - Full length of dam (104.5 feet)
f. Number and Type of Gates - None

OUTLET WORKS:

a. Type - Concrete flume, 43.5 feet long
b. Location - Left side of control structure
c. Entrance inverts - 12.0 feet
d. Exit inverts - 11.3 feet
e. Emergency draindown facilities - None

HYDROMETEOROLOGICAL GAGES:

a. Type - USGS surface water elevation gage
b. Location - East abutment of dam and flume
c. Records - None

MAXIMUM NON-DAMAGING DISCHARGE: Unknown

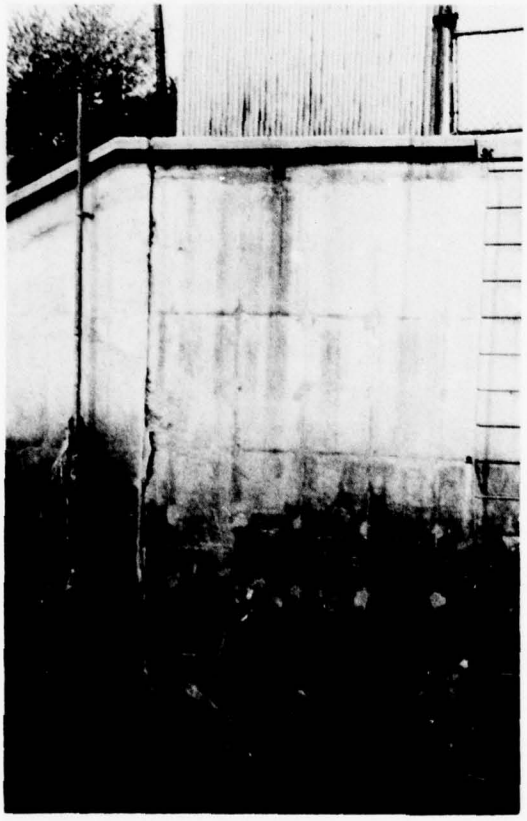
*Summary of Engineering Data (In accordance with Appendix I of Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams).

APPENDIX C

PHOTOGRAPHS

May 1978

LOOKING DOWNSTREAM AT ELIZABETH RIVER AND URSINO DAM WITH CONCRETE CHANNEL SECTION AND USGS GAGING STATION



LEFT CHANNEL WALL WITH SPALLING AT JOINT

May 1978

RETAINING WALL WITH STORM WATER FLUME ALONG TROTTERS LANE

May 1978

RETAINING WALL JOINT WITH SPALLING ALONG STORM WATER FLUME

May 1978

May 1978

LOOKING UPSTREAM AT URSINO DETENTION BASIN WITH EAST LEVEE

May 1978

LOOKING UPSTREAM ALONG THE ELIZABETH RIVER
WITH DRAINAGE STRUCTURE NO. 76 AND EAST LEVEE

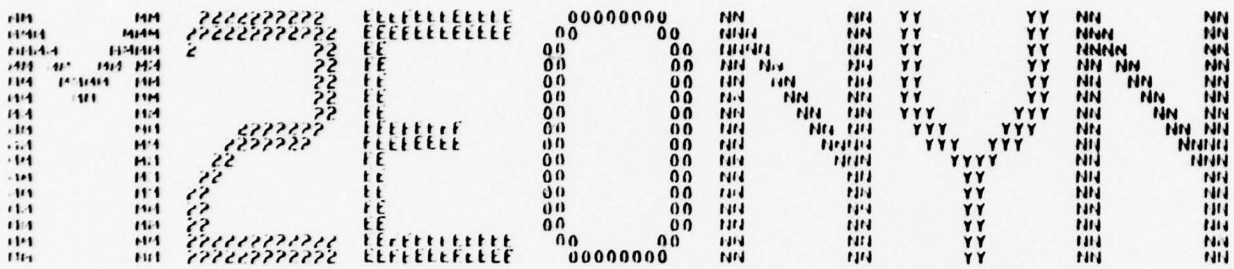
APPENDIX D

HYDRAULIC COMPUTATIONS

6000 REMOTE BATCH

UNITED COMPUTING 67. APEX/SL D.2.4

15.43.10. 12/05/78.



HEC 1 RUN FOR LAKE URSINO

R. a. Pettit 12-5-78

HEC-1 VERSION DATED JAN 1973
UPDATED AUG 74
CHANGE NO. 01

FLOOD ROUTING THROUGH LAKE ORSINO
NEW JERSEY DAM INSPECTIONS
PROBABLE MAXIMUM FLOOD

JOB SPECIFICATION

NO	NDAY	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
40	1	0	1	1	-0	-0	2	-0	-0

JOPER NWT
5 -0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 8 LRTIO= 1

RTIOS= 1.00 .20 .25 .30 .35 .40 .45 .50

SUB-AREA RUNOFF COMPUTATION

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	0	-0	-0	-0	-0	-0

HYDROGRAPH DATA

IHDRO	IHOG	IAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	-1	16.90	-0.00	16.90	-0.00	-0.000	-0	-0	-0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
-0.00	22.10	117.00	121.00	132.00	142.00	-0.00	-0.00

TRSPC COMPUTED BY THE PROGRAM IS .810

LOSS DATA

STRKR	DLTKR	RTIOK	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
-0.00	-0.00	1.00	-0.00	-0.00	1.00	1.00	.20	-0.00	.45

GIVEN UNIT GRAPH, NUNGO= 15

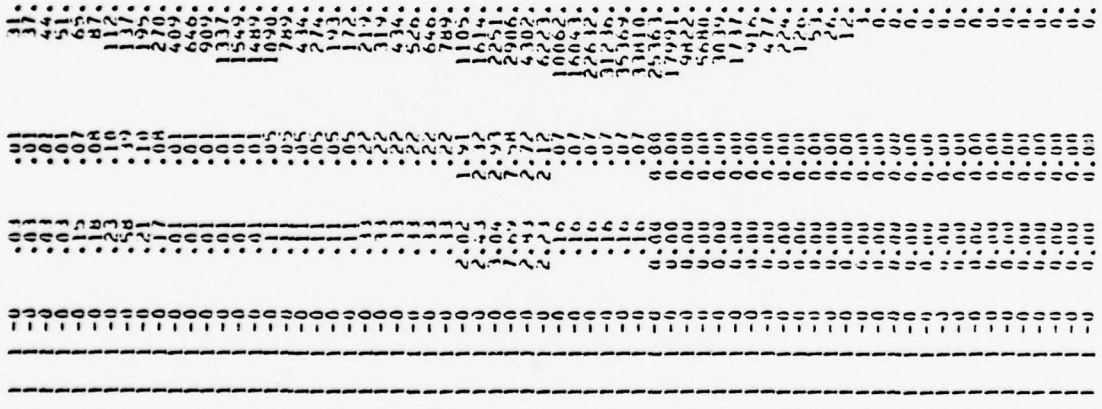
0.	65.	135.	195.	450.	735.	1785.	2280.	2205.	1335.
908.	470.	195.	120.	45.					

UNIT GRAPH TOTALS 10405. CFS OR 1.00 INCHES OVER THE AREA

RECESSION DATA
STRTQ= 0.00 QRCSN= 0.00 RTIOR= 1.00

END-OF-PERIOD FLOW

	TIME	RAIN	EXCS	COMP Q
1	1 -0	.01	.00	0.
1	1 -0	.01	.00	0.
1	1 -0	.01	.00	1.
1	1 -0	.01	.00	1.
1	1 -0	.01	.00	3.
1	1 -0	.01	.00	5.
1	1 -0	.03	.01	12.
1	1 -0	.03	.01	21.



1	1	-0	0.00	0.00	0.
1	1	-0	0.00	0.00	0.
1	1	-0	0.00	0.00	0.
1	1	-0	0.00	0.00	0.
1	1	-0	0.00	0.00	0.
1	1	-0	0.00	0.00	0.
1	1	-0	0.00	0.00	0.
1	1	-0	0.00	0.00	0.
1	1	-0	0.00	0.00	0.
1	1	-0	0.00	0.00	0.
1	1	-0	0.00	0.00	0.
1	1	-0	0.00	0.00	0.
1	1	-0	0.00	0.00	0.
1	1	-0	0.00	0.00	0.
		SUM	25.66	22.56	246319.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	35369.	27734.	9791.	3421.	246321.
INCHES.		15.27	21.56	22.60	22.60
AC-FT		13759.	19429.	20368.	20368.

PEAK FLOW SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS

OPERATION	STATION	PLAN	1.00	.20	.25	RATIOS APPLIED TO FLOWS .30	.35	.40	.45	.50
HYDROGRAPH AT	1	1	35802.	7074.	8842.	10611.	12379.	14147.	15916.	17684.
		2	0.	0.	0.	0.	0.	0.	0.	0.
ROUTED TO	1	1	35077.	6920.	8656.	10388.	12273.	14607.	16572.	17851.
		2	0.	0.	0.	0.	0.	0.	0.	0.

GILBERT ASSOCIATES, INC.
ENGINEERS AND CONSULTANTS
READING, PA.

CLIENT: COE
PROJECT: N.J. DAM INSPECTIONS
FILING CODE:
NO. 78-7694 050 | PAGE 1 OF
SYSTEM: URSINO DAM
ORIGINATOR: R.A. Pratt
DATE: 9-15-78
CALCULATION FOR: HYDROLOGY
REVIEWER: D. Veil
DATE: 9-15-78

RESULTS

A) DRAINAGE AREA -
FROM USGS "1974 WATER RESOURCES DATA FOR NEW JERSEY":
DRAINAGE AREA = 16.9 SQUARE MILES

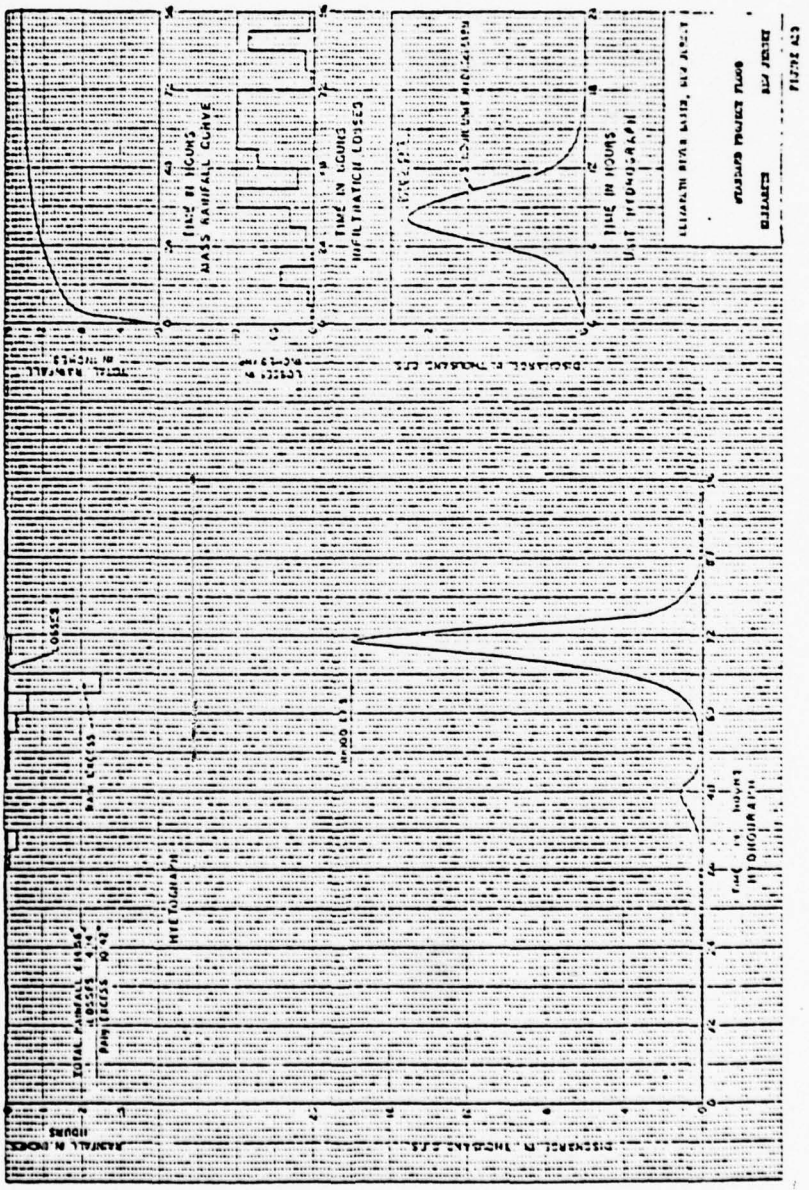
B) UNIT HYDROGRAPH -
FROM FIGURE A10 SUPPLIED BY NEW YORK COE
UNIT HYDROGRAPH FOR STANDARD PROJECT FLOOD -

TIME (HR)	GRAPH Q (CFS)	ADJUSTED Q* (CFS)
1	50	45
2	100	90
3	170	155
4	280	260
5	500	460
6	1080	990
7	1750	1600
8	2280	2090
9	2120	1940
10	1650	1510
11	1000	920
12	420	390
13	220	200
14	130	120
15	80	70
16	50	45
17	20	20

* FLOWRATES WERE ADJUSTED TO MAKE TOTAL VOLUME = 1" CONVERSION FROM DRAINAGE AREA OF 18.0 SQ. MI. TO 16.9 SQ. MI.

FILING CODE

GAI 350 REV. 10-72



GILBERT ASSOCIATES, INC.
ENGINEERS AND CONSULTANTS
READING, PA.

CLIENT: COE
PROJECT: N. J. DAM INSPECTIONS
FILING CODE
W.O.
PAGE 14 OF

SYSTEM: URSINO DAM
ORIGINATOR: R. A. Path
DATE: 11-30-78

CALCULATION FOR: HYDROLOGY
REVIEWER: DC Beachwood
DATE: 12-6-78

RESULTS

THE UNIT HYDROGRAPH ON THE PREVIOUS PAGE HAS BEEN ADJUSTED TO THE CORRECT DRAINAGE AREA OF 16.9 SQ. MILES BY MULTIPLYING EACH GIVEN UNITGRAPH ORDINATE BY 16.9/18.0, THE RATIO OF DRAINAGE AREAS.

HOWEVER, THIS UNIT GRAPH IS FOR A 3-HOUR DURATION OF UNIT PRECIPITATION AND MUST BE CONVERTED TO A 1-HOUR UNIT GRAPH. THIS IS DONE BY THE METHOD OUTLINED IN TABLE 7-1 OF HYDROLOGY FOR ENGINEERS, BY LINSLEY, KOHLER, AND PAULHUS.

TIME (HR)	3-HR UNITGRAPH	S-CURVE	1-HR UNIT GRAPH
1	45	45	65
2	90	90	135
3	155	155	195
4	260	305	450
5	460	550	735
6	990	1145	1785
7	1600	1905	2280
8	2090	2640	2205
9	1940	3085	1335
10	1510	3415	990
11	920	3560	370
12	390	3600	195
13	200	3615	120
14	120	3680	45
15	70	3670	0
16	45	3660	0
17	20	3700	0

FILING CODE

GAI 350 REV. 10-72

GILBERT ASSOCIATES, INC.
ENGINEERS AND CONSULTANTS
READING, PA.

CLIENT: COE
PROJECT: N. J. DAM INSPECTIONS
FILING CODE
W.O. | PAGE 3 OF

SYSTEM: LAKE URSINO
ORIGINATOR: R. A. Luft
DATE: 9-15-78
CALCULATION FOR: HYDROLOGY
REVIEWER: D. Veil
DATE: 9-15-78

RESULTS

c). PROBABLE MAXIMUM PRECIPITATION

FROM HM REPORT NO. 33 -

INDEX PMP = 22.1 INCHES

PERCENT OF INDEX PMP

DURATION (HRS)	ZONE 1 %	ZONE 6 %	AVE. %
6	111	113	112
12	123	123	123
24	133	132	132
48	142	142	142

D) LOSSES

LOSSES HAVE BEEN ESTIMATED AT
INITIAL LOSS = 1.0 INCH
CONSTANT LOSS RATE = 0.20 INCH/HR

E) PERCENT IMPERVIOUSNESS

FROM NEW JERSEY DEP "SPECIAL REPORT 38" -

IMPERVIOUSNESS FOR ELIZABETH RIVER
DRAINAGE BASIN AT ELIZABETH, N.J. = 45 %

FILING CODE

GAI 350 REV. 10-72

GILBERT ASSOCIATES, INC.
ENGINEERS AND CONSULTANTS
READING, PA.

CLIENT: COE
PROJECT: N.J. DAM INSPECTIONS
FILING CODE
W.O.
PAGE: 4 of
SYSTEM: LAKE URSINO
ORIGINATOR: R.A. Pitt
DATE: 9-15-78
CALCULATION FOR: HYDRAULICS
REVIEWER: D. Veil
DATE: 9.15.78
RESULTS

F) HYDRAULICS

A RATING CURVE HAS BEEN OBTAINED FROM NEW YORK COE FOR THE SECTION AT THE DAMSITE. ANOTHER RATNG CURVE FOR A SECTION BELOW URSINO DAM INDICATES THAT ITS BACKWATER SHOULD NOT SIGNIFICANTLY AFFECT THE CONTROL AT THE DAM. THE DAMSITE RATING CURVE IS SHOWN ONLY UP TO ELEVATION 28.0 AND MUST BE EXTENDED HIGHER.

ASSUME WEIR TYPE CONTROLS = $Q = CLH^{3/2}$

1) SIDE CHANNEL - L = 14.9 FT
AT ELEVATION 22.3, Q_{CH} = 1450 CFS

$C = 1450 / (14.9 * 10.3^{1.5}) = 2.94$

AT ELEVATION 16.0, Q_{CH} = 300 CFS

$C = 300 / (14.9 * 4^{1.5}) = 2.51$

C IS INCREASING SO LET IT EQUAL 3.00 FOR ELEVATIONS ABOVE 22.3

2) SPILLWAY - L = 104.5 FT
AT ELEVATION 28, TOTAL Q = 7000 CFS
Q_{CH} = 2860, Q_{SP} = 7000 - 2860 = 4140

FILING CODE

GAI 350 REV. 10-72

GILBERT ASSOCIATES, INC.
ENGINEERS AND CONSULTANTS
READING, PA.

CLIENT: COE
PROJECT: N.J. DAM INSPECTIONS
FILING CODE:
W.O.:
PAGE: 5 OF
SYSTEM: LAKE URSINO
ORIGINATOR: R.A. Pratt
DATE: 9-15-78
CALCULATION FOR: HYDRAULICS
REVIEWED: D. Veil
DATE: 9.15.78
RESULTS:

$C = 4140 / (104.5 \times 5.7^{1.5}) = 2.91$

3) OVERTOPPING OF LEVEE - L = 2320 FT
WHEN POOL ELEVATION GOES ABOVE 31.0,
LEVEE IS OVERTOPPED AND FUNCTIONS AS
A BROAD-CRESTED WEIR WITH BREADTH = 8 FT.
C = 2.70

4) STORAGE VOLUMES OBTAINED FROM TABLE
SUPPLIED BY NEW YORK COE AND
INTERPOLATION MADE FROM 0.0 AT
ELEVATION 12.0 TO 8.3 AT
ELEVATION 17.0.

5) STORAGE - OUTFLOW RELATION

ABOVE ELEV. 28.0 -
$Q_{CH} = 44.7 H_{CH}^{1.5}$

$Q_{SP} = 304 H_{SP}^{1.5}$

ABOVE ELEV. 31.0 -

$Q_{OT} = 6.260 H_{OT}^{1.5}$

FILING CODE

GAI 350 REV. 10-72

GILBERT ASSOCIATES, INC.
ENGINEERS AND CONSULTANTS
READING, PA.

CLIENT: COE
PROJECT: N.J. DAM INSPECTIONS
FILING CODE
W.O. | PAGE OF

SYSTEM: URSINO DAM
ORIGINATOR: R.A. Pitt
DATE: 12-5-78

CALCULATION FOR: HYDROLOGY
REVIEWER: DC Beechwood
DATE: 12-6-78

RESULTS

CORRESPONDENCE HAS BEEN RECEIVED FROM THE NEW YORK OFFICE OF THE COE SUPPLYING INFORMATION TO DEVELOP THE VOLUME - DISCHARGE RELATION FOR HEC 2 INPUT.

THE INFORMATION ON THIS PAGE WAS USED FOR THE STAGE - STORAGE RELATION AND THAT ON THE FOLLOWING TWO PAGES WAS USED FOR STAGE - DISCHARGE.

Estimated Storage

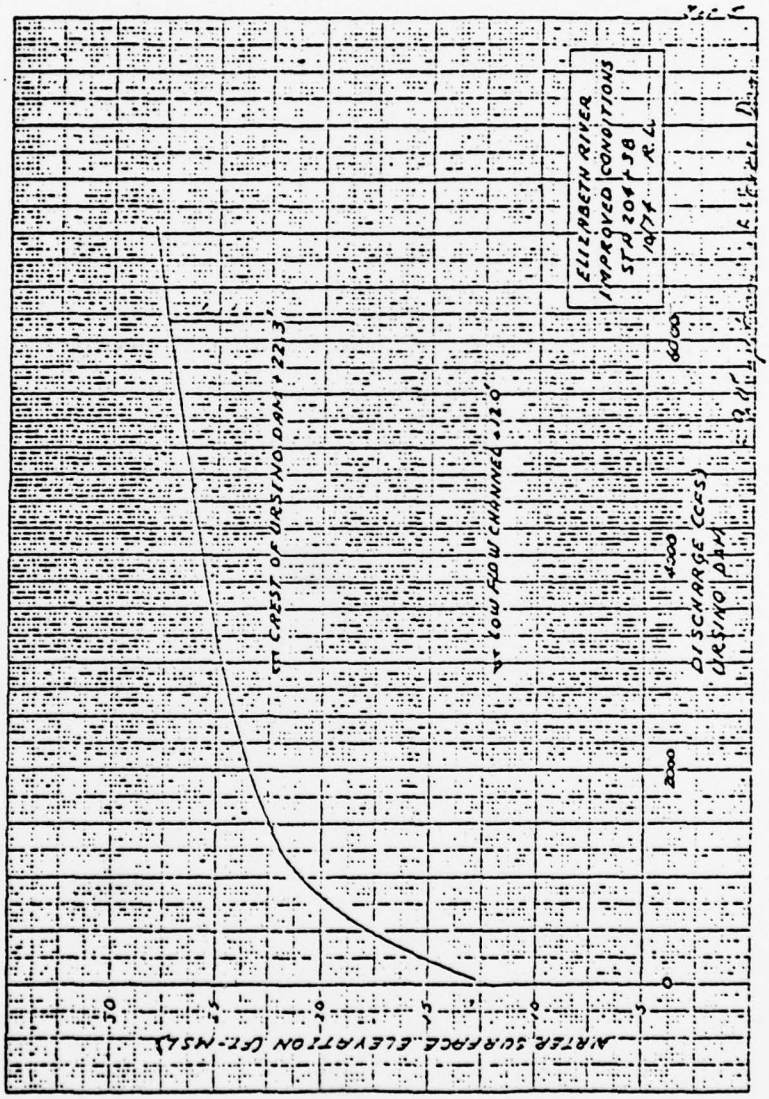
↓

Ursino Detention Reservoir

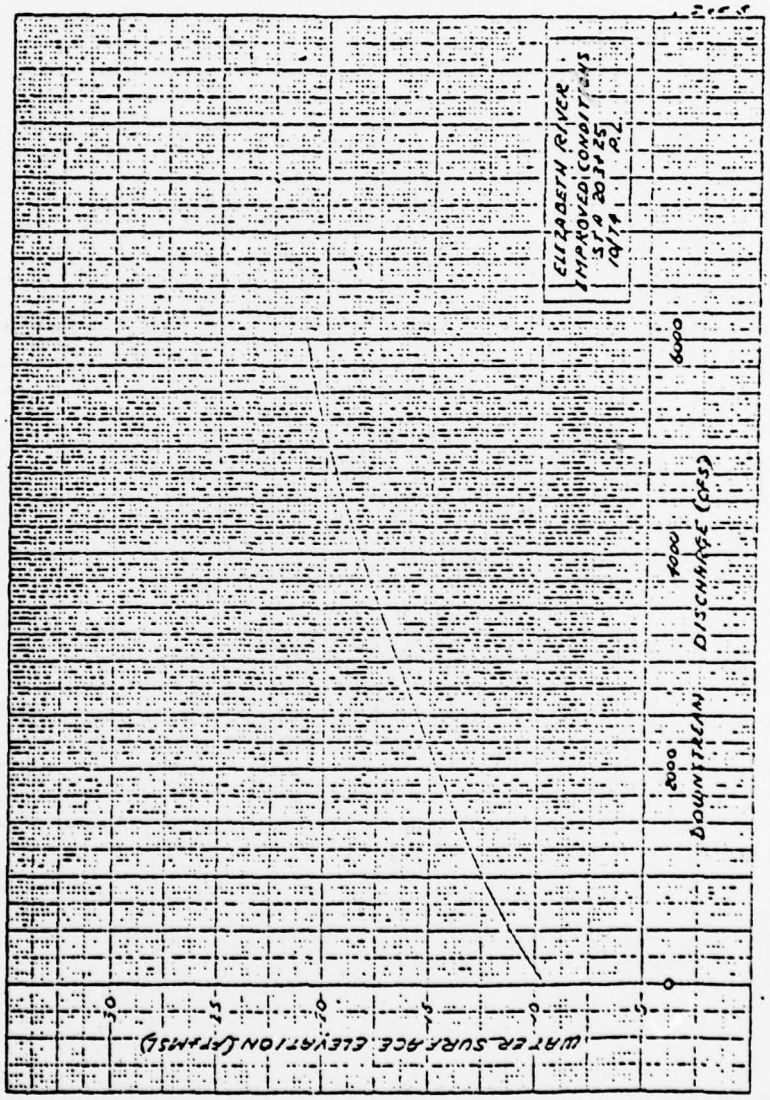
Elev ft. m.s.l.	Storage Ac-Ft	Discharge cfs	Δt	S/Δt
16		0	0	0
17	8.3	230	7.2	12.[illegible]
18	18.4	[illegible]0	12.5	[illegible]
19	30.3	[illegible]	[illegible]	[illegible]
20	44.8	[illegible]	[illegible]	[illegible]
21	64.3	[illegible]	55.1	117.4
22	91.8	[illegible]	[illegible]	161.6
23	1240	[illegible]	[illegible]	213.[illegible]
24	166.4	5350	[illegible]	277.[illegible]
25	205.0	[illegible]	[illegible]	[illegible]
26	246.8	7500	[illegible]	403.0
27	290.0	9230	191.7	[illegible]
28	350.0	11200	[illegible]	[illegible]3.3
29	410.0	[illegible]	275.0	[illegible]
30	470.0	[illegible]	316.7	[illegible]
31	530.0	[illegible]	[illegible]	[illegible]
32	590.0			

FILING CODE

GAI 350 REV. 10-72



CC Ltr BK Carter
Rec. 9/12/78.



LAKE URSINO DAM

GILBERT ASSOCIATES, INC.
ENGINEERS AND CONSULTANTS
READING, PA.

CLIENT: COE
PROJECT: N. J. DAM INSPECTIONS
FILING CODE
W.O.
PAGE 6 OF
SYSTEM: LAKE URSINO
ORIGINATOR: R. A. Pratt
DATE: 9-15-78
CALCULATION FOR: HYDRAULICS
REVIEWER: D. Veil
DATE: 9.15.78
RESULTS

STORAGE - OUTFLOW RELATION

POOL ELEV. (FT, MSL)	STORAGE VOL. (AC-FT)	CHANNEL Q (CFS)	SPILLWAY Q (CFS)	OVERTOP Q (CFS)	TOTAL Q (CFS)
12	0	-	-	-	0
14	3	-	-	-	120
16	6	-	-	-	300
18	18	-	-	-	530
20	45	-	-	-	800
22	92	-	-	-	1300
22.3	101	-	-	-	1450
24	166	-	-	-	2350
26	247	-	-	-	4400
28	350	-	-	-	7000
29	410	3140	5270	-	8410
30	470	3420	8500	-	9920
31	530	3710	7800	-	11510
32	590	4000	9190	6260	19450
33	650	4310	10640	17720	32700
34	710	4620	12170	32550	49300

FILING CODE

GAI 350 REV. 10-72

GILBERT ASSOCIATES, INC.
ENGINEERS AND CONSULTANTS
READING, PA.

CLIENT: COE

PROJECT: N. J. DAM INSPECTIONS

FILING CODE

W.O. | PAGE OF

SYSTEM: URSINO DAM

ORIGINATOR: R. A. Pratt
DATE: 12-5-78

CALCULATION FOR: HYDROLOGY / HYDRAULICS

REVIEWER: D.C. Beechwood
DATE: 12-6-78

RESULTS

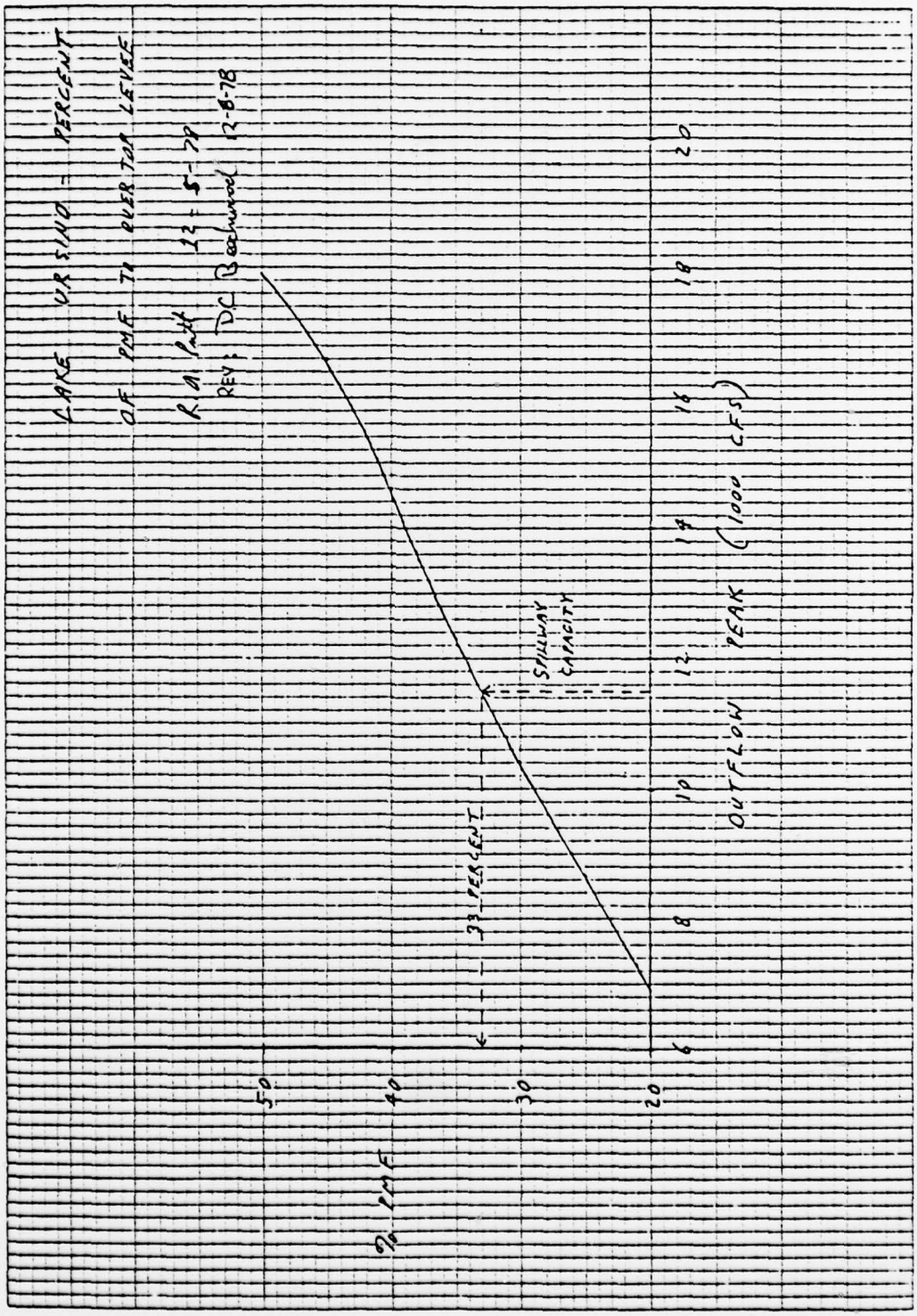
THE RESULTS OF THE COMPUTER SIMULATION OF PMF DEVELOPMENT AND ROUTING -

PERCENT PMF	INFLOW PEAK (CFS)	OUTFLOW PEAK (CFS)	ELEV. PEAK (FT, MSL)
100	35,400	36,000	33.2
20	7,070	6,920	27.9
25	8,840	8,660	29.2
30	10,600	10,400	30.3
35	12,400	12,300	31.1
40	14,100	14,100	31.4
45	15,900	16,100	31.6
50	17,700	17,900	31.8

PERCENT PMF VS. OUTFLOW PEAK HAS BEEN PLOTTED ON THE FOLLOWING PAGE AND THE PERCENT OF PMF WHICH OVERTOPS THE LEVEE HAS BEEN FOUND TO BE 33 PERCENT

FILING CODE

GAI 350 REV. 10-72



APPENDIX E

INSPECTION REPORTS

APPENDIX E

INSPECTION REPORTS

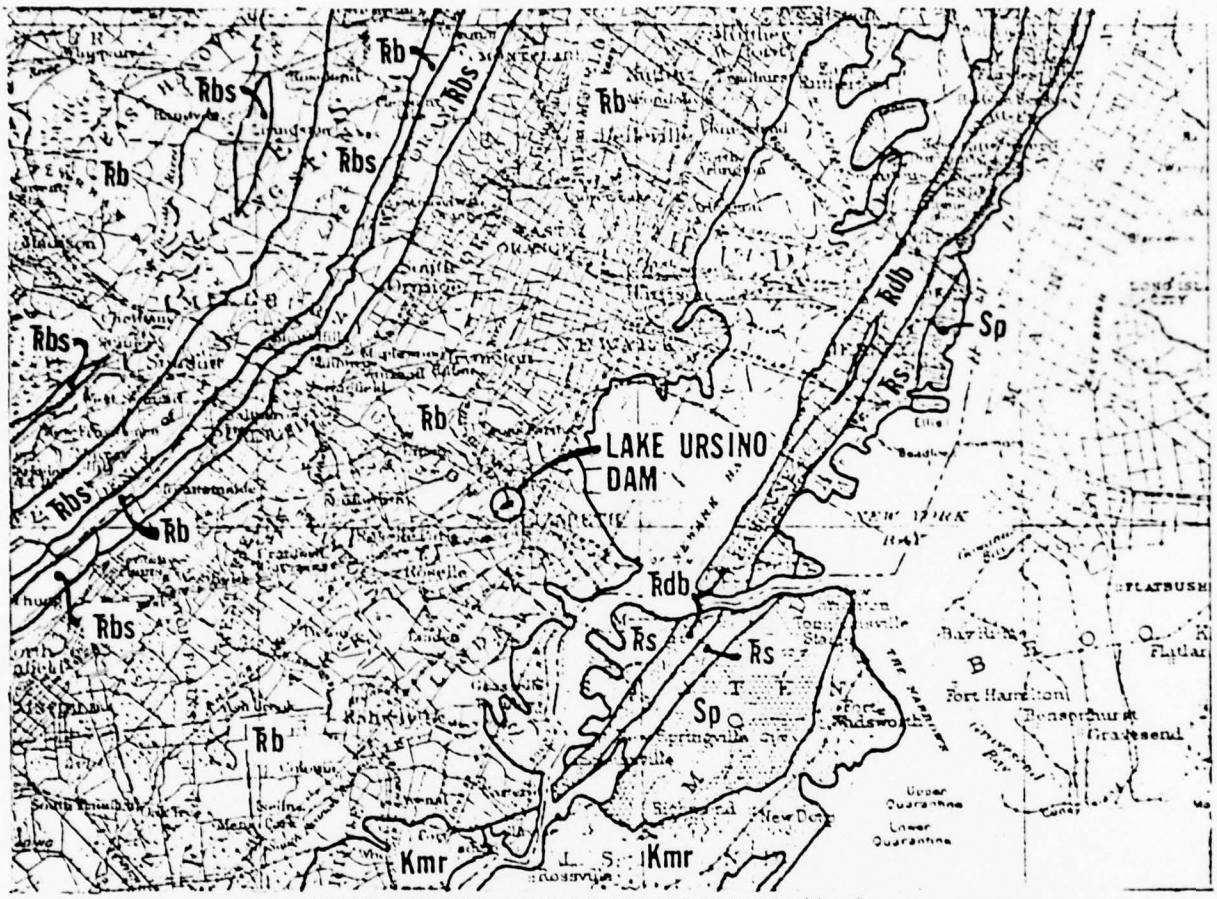
Microfilm data from New Jersey Department of Environmental Protection yielded very poor copies and could not be reproduced.

1. An inspection report of the Ursino Dam by Robert G. Schaeffer, P.E. Chief, Engineering Department of the Union County Park Commission dated July 18, 1968 mentions that the dam (with an elevation of 22.5 feet) was overtopped on May 29, 1968 by 2.2 feet of water, and on March 7, 1967 by 4.9 feet of water.

2. John N. Brooks, Hydraulic Engineer for the State of New Jersey makes mention in a report dated September 22, 1927 of conversations with Mr. Radcliff, Chemist for the Elizabethtown Water Company. Mr. Radcliffe reported that in the past summer a flood occurred which produced a water depth of 3 feet on the existing spillway (crest elevation 22.53) with the blowoff gates wide open and overtopped the west embankment at two points. The bridge below the dam was flooded. John Brooks calculated a runoff of 117 second feet per square mile. (1977 cfs based on 16.9 square mile drainage basin.)

APPENDIX F

REGIONAL GEOLOGIC MAP



SCALE: 1:250,000 (approximately 4 miles to an inch)

3 2 1 0 4 8 12 Miles

Kmr CRETACEOUS

MAGOTHY AND RARITAN FORMATIONS

DARK LIGNITIC SAND AND CLAY, CONTAINING SOME GLAUCONITE NEAR THE TOP (MAGOTHY). OVERLYING WITH SLIGHT UNCONFORMITY VARIABLE SANDS AND CLAYS, CHIEFLY LIGHT COLORED (RARITAN).

Rb TRIASSIC

(NEWARK GROUP)

(BRUNSWICK FORMATION)

SOFT RED SHALE WITH SANDSTONE BEDS, THE LATTER MORE ABUNDANT TOWARD THE NORTHEAST; CONGLOMERATE BEDS (TRC) ALONG NORTHWESTERN BORDER WITH QUARTZITE OR LIMESTONE PEBBLES IN RED MATRIX.

Rs STOCKTON FORMATION

GRAY FELDSPATHIC SANDSTONE (ARKOSE) CONGLOMERATE, AND RED SHALE; CONGLOMERATE BEDS (TRC) ALONG NORTHWESTERN BORDER WITH QUARTZITE OR LIMESTONE PEBBLES IN RED MATRIX.

Rbs TRIASSIC

(NEWARK GROUP)

BASALT FLOWS

FINE-GRAINED TRAP ROCK IN EXTENSIVE FLOWS, CHIEFLY IN THE WATCHUNG MOUNTAINS: IN PART VESICULAR

Rdb DIABASE

COARSE-GRAINED TRAP ROCK, CHIEFLY INTRUSIVE SHEETS IN THE NEWARK FORMATIONS. ALSO DIKES, A FEW BASALTIC (RBS).

Sp POST-ORDOVICIAN

SERPENTINE

FROM HYDRATION OF BASIC IGNEOUS ROCKS (HOBOKEN AND STATEN ISLAND).

SOURCE: GEOLOGIC MAP OF NEW JERSEY, ATLAS SHEET 40 1910 - 1912

APPENDIX F - REGIONAL GEOLOGIC MAP SHOWING DAM LOCATION

APPENDIX G

REFERENCES

APPENDIX G

REFERENCES

1. Recommended Guidelines for Safety Inspection of Dams, Department of the Army, Office of the Chief of Engineers, Washington, D.C.

2. HEC-1 Flood Hydrograph Package, Hydrologic Engineering Center, Corps of Engineers, January 1973.

3. USGS Quadrangle sheets for Elizabeth, N.J.

APPENDIX H

CONDITIONS

APPENDIX H

CONDITIONS

This Report is based on a visual inspection of the dam, a review of available engineering data, and a hydrologic analysis performed during a Phase I investigation as set forth in the Recommended Guidelines for Safety Inspection of Dams, as modified by the contract between the U.S. Corps of Engineers and Gilbert Associates, Inc., Contract No. DACW61-78-C-0114.

The foregoing review, inspection, and analysis are by their nature limited in scope. It is possible that hazardous conditions exist and that conditions exist which with time might develop into safety hazards and that these conditions are not detectable by means of the aforesaid review, inspection, and analysis. Accordingly, Gilbert Associates, Inc. cannot and does not warrant or represent that conditions which are hazardous do not exist, or that conditions do not exist which with time might develop into safety hazards.

As required by the Corps of Engineers, the terms "good", "fair", "poor", "condition" have been used in this Report to characterize the information obtained from the aforesaid review, inspection, and analysis. The definitions of these terms as used are:

"good condition"	-	minor studies or remedial measures are required.
"fair condition"	-	sizeable studies or remedial measures are required due to the deficiencies which could be hazardous depending on conditions. Immediate attention is required.
"poor condition"	-	major studies or remedial measures are required due to deficiencies which could be hazardous depending on conditions. Immediate studies or corrective action is required.