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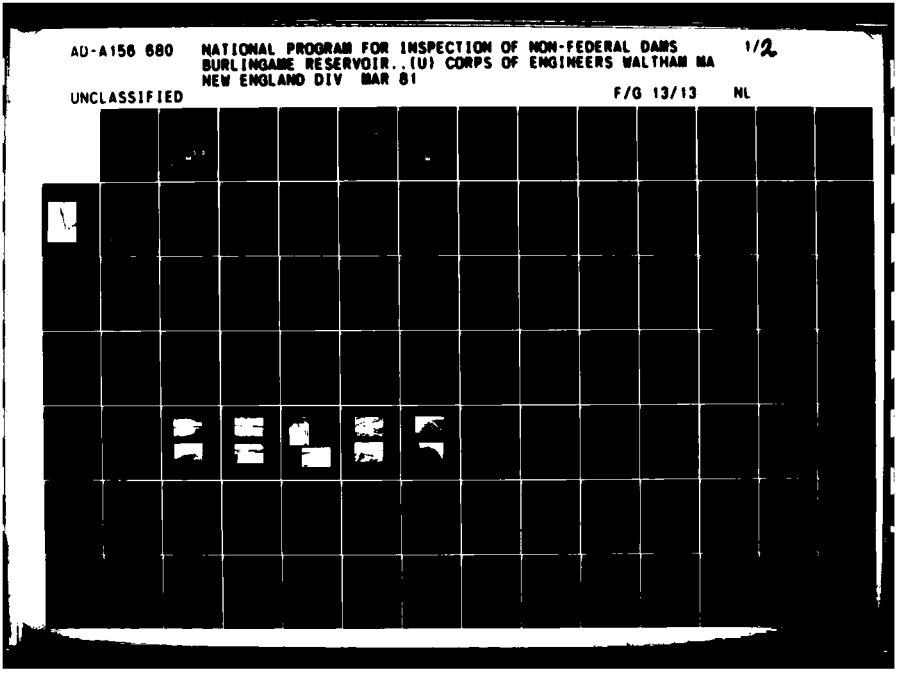

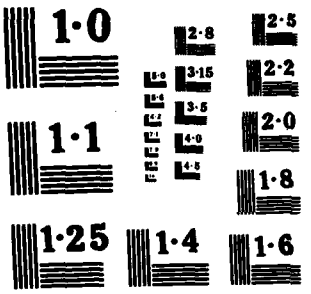
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BLACKSTONE RIVER BASIN
GLOCESTER, RHODE ISLAND

BURLINGAME RESERVOIR
UPPER DAM
RI 01306

PHASE 1 INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

MARCH 1981

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4. TITLE (and Subtitle) Burlingame Reservoir Upper Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT 6. PERFORMING ORG. REPORT NUMBER
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18. SUPPLEMENTARY NOTES

Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Blackstone River Basin
Glocester, Rhode Island
Brandy Brook

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

The dam is an earth embankment dam with stone walls on both the upstream and downstream side. The dam is about 355 ft. long with a maximum height of 10 ft. The dam is judged to be in poor condition. There are several items of concern which require attention. The dam is small in size with a significant hazard potential. The test flood for the dam is ½ the PMF. There are various recommendations which must be undertaken by the owner.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:

NEDED

JUN 05 1981

Honorable J. Joseph Garrahy
Governor of the State of Rhode Island
and Providence Plantations
State House
Providence, Rhode Island 02903

Dear Governor Garrahy:

Inclosed is a copy of the Burlingame Reservoir Upper Dam (RI-01306) Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Management, the owner and the cooperating agency for the State of Rhode Island.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Management for your cooperation in carrying out this program.

Sincerely,

C. E. EDGAR, III
Colonel, Corps of Engineers
Commander and Division Engineer

Incl
As stated

BLACKSTONE RIVER BASIN

GLOCESTER, RHODE ISLAND

BURLINGAME RESERVOIR
UPPER DAM
RI 01306

PHASE 1 INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

MARCH 1981

NATIONAL DAM INSPECTION PROGRAM

PHASE I - INSPECTION REPORT

Identification No.:	RI 01306
Name of Dam:	Burlingame Reservoir Upper Dam
Town:	Glocester
County and State:	Providence, Rhode Island
Stream:	Brandy Brook
Owner:	State of Rhode Island
Date of Inspection:	14 November 1980

BRIEF ASSESSMENT

Burlingame Reservoir Upper Dam is an earth embankment dam with stone walls on both the upstream and downstream side. Earth has been pushed against the wall on the upstream side to create a gradual slope on that face of the dam. The dam is approximately 355 feet long and has an average width of 15 feet along the crest. Its maximum height above the stream bed is 10 feet. The emergency spillway is located on the left side of the dam. It is a stone surfaced earthen spillway approximately 30 feet long at its base. The outlet works is located at the approximate center of the dam. It has a new reinforced concrete intake structure on the upstream side with stoplogs. A stone box culvert reinforced with concrete traverses the dam, and reinforced concrete headwalls complete the outlet works on the downstream side.

The dam was constructed on Brandy Brook which is part of the Blackstone River Basin. The storage capacity of the reservoir at the top of dam elevation of 597 feet is 480 acre feet, and its drainage area is approximately 1.94 square miles. Construction of the dam took place sometime prior to 1890, and the reservoir was formerly known as the Dennis Paine Reservoir. Some reconstruction took place during the WPA period (1935) and later during 1976. Presently it is operated by the State Department of Fisheries for the purpose of raising pike.

As a result of the visual inspection, hydrologic and hydraulic computations, and the review of limited available data regarding this facility, the dam is considered to be in POOR condition. To assure the long term performance of this structure, certain items of concern will require further attention. The integrity of the dam can be affected by further deterioration of the outlet conduit and the outlet structure; these items must be repaired. The project cannot pass the peak test flood outflow without overtopping the dam. The collapsed downstream stone wall must be repaired to alleviate further sloughing of the dam embankment. Also, the stumps from trees recently cut must be removed from the entire area.

The dam is classified as SMALL in size and as having a SIGNIFICANT hazard potential, in accordance with the recomended guidelines established by the Corps of Engineers.

The test flood for this dam is one-half the Probable Maximum Flood (½ PMF). This test flood has an inflow of 2,040 cfs and an outflow discharge equal to 1,730 cfs, which will overtop the dam by 1.3 feet. The maximum outflow capacity of the emergency spillway and outlet works at the top of the dam is 270 cfs, which is approximately 16% of the peak test flood outflow. It is recommended that the owner retain the services of a registered professional engineer to perform a detailed hydrologic and hydraulic analysis to further assess the need for and the means to increase the project discharge capacity and the ability of the dam to withstand overtopping, to assess the condition of the deteriorating outlet conduit and structure and to effect repairs, to analyze the structural stability of the downstream stone wall, and to supervise the removal of trees and stumps from the embankment area of the dam.

The above recommendations and any further remedial measures which are discussed in Section 7 should be instituted within one year of the owner's receipt of this report.

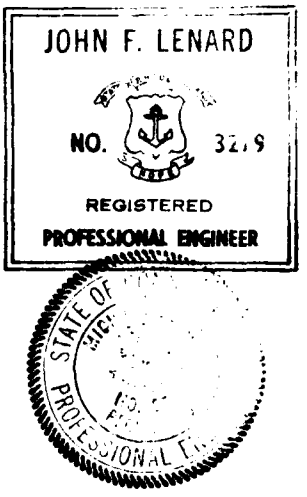
LENARD & DILAJ ENGINEERING, INC.

By: John F. Lenard

John F. Lenard, P.E.
President

Michael Dilaj

Michael Dilaj, P.E., Vice President
Project Manager



This Phase I Inspection Report on Burlingame Reservoir Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgement and practice, and is hereby submitted for approval.

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

JOSEPH W. FINEGAN, JR., MEMBER
Water Control Branch
Engineering Division

ARAMAST MAHTESIAN, CHAIRMAN
Geotechnical Engineering Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation. However, the investigation is intended to identify any need for such studies.

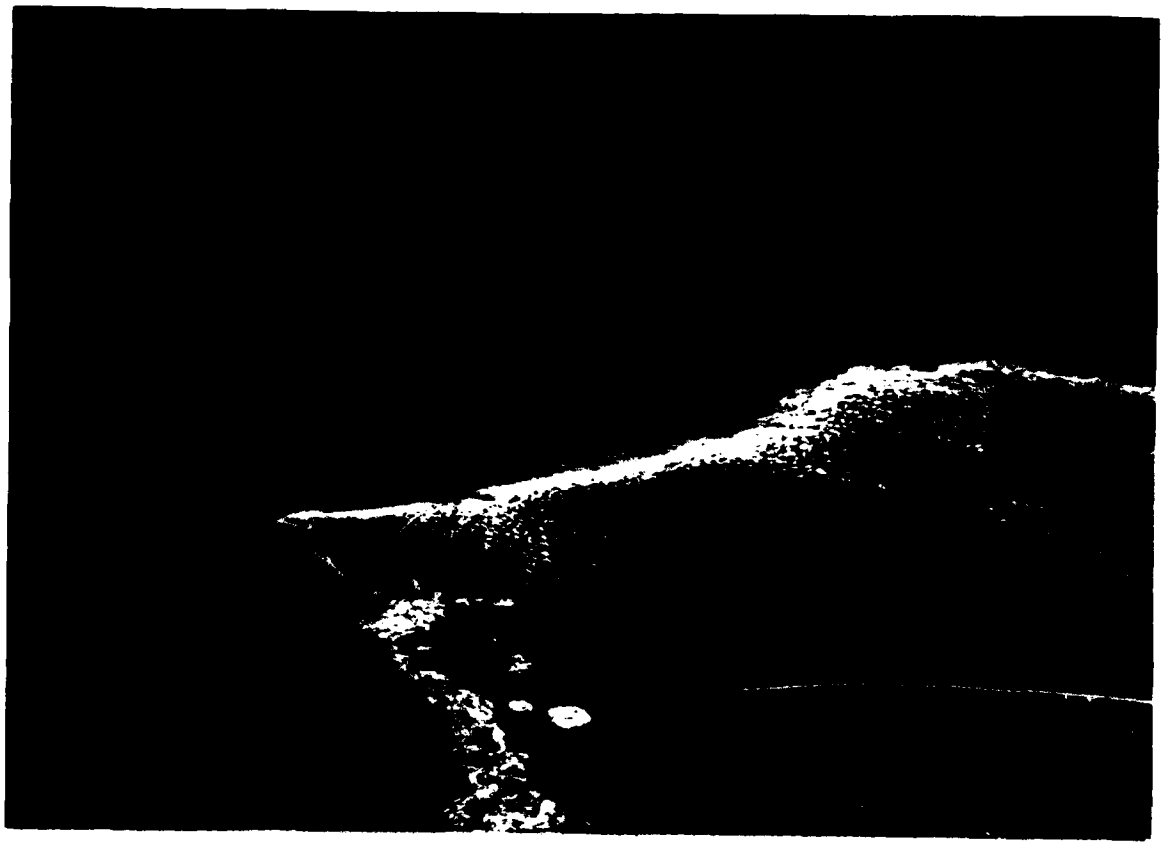
In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions will be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and downstream damage potential.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

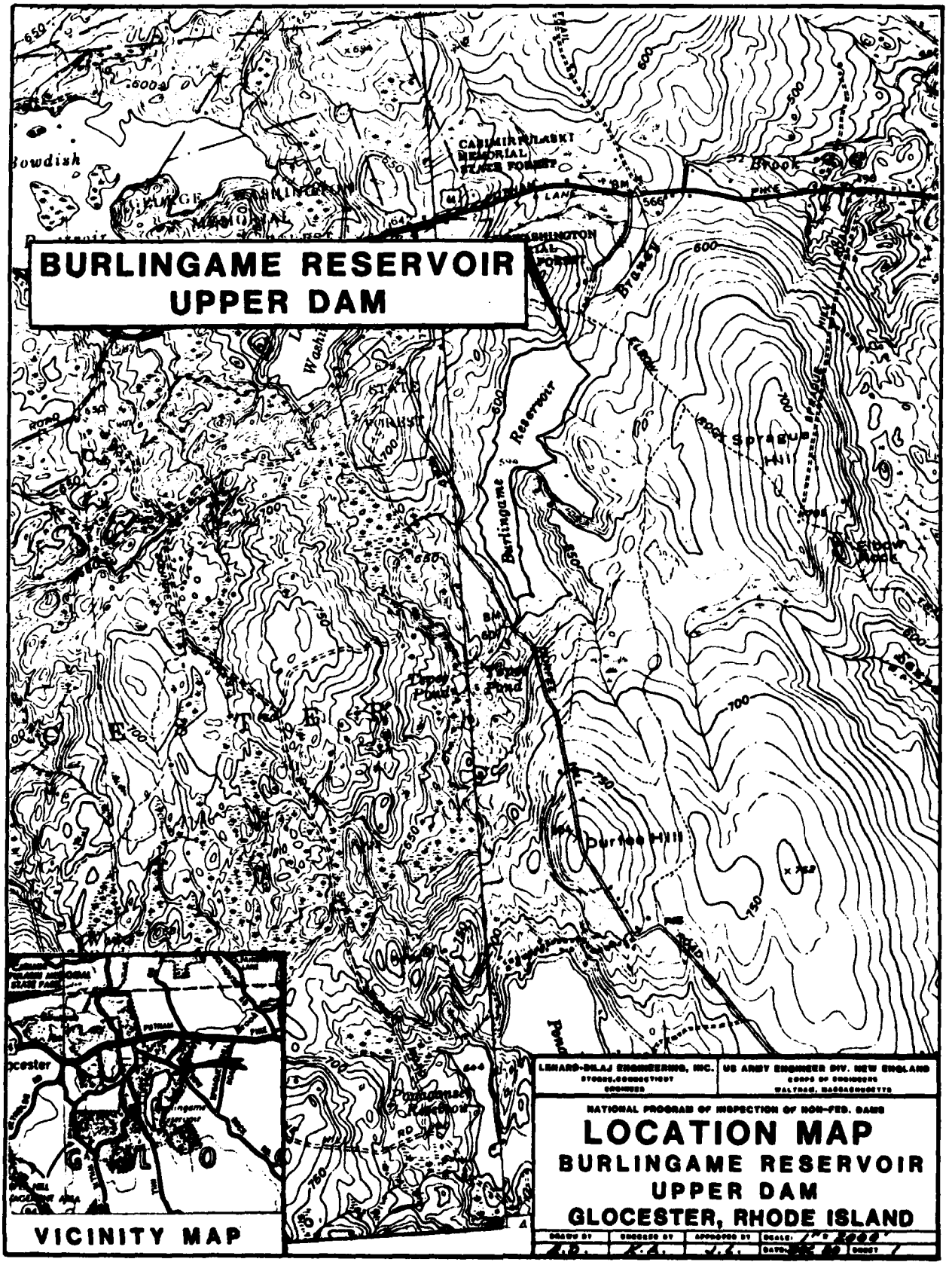
TABLE OF CONTENTS



OVERVIEW PHOTO

TAKEN 15 DECEMBER 1980

	US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS LENARD-DILAJ ENGINEERING, INC. STORRS, CONNECTICUT ENGINEER	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	BURLINGAME RESERVOIR GLOCESTER, RHODE ISLAND RI 01306 JAN. 1981	


BURLINGAME RESERVOIR
UPPER DAM
CASIMIR PULASKI MEMORIAL STATE FOREST
Burlingame Reservoir
Sprague Hill
Burlingame Dam
Upper Pond
Lower Pond
Burlee Hill
Pawcatuck River
VICINITY MAP
LEMARD-DILAJ ENGINEERING, INC.
US ARMY ENGINEER DIV. NEW ENGLAND
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS
LOCATION MAP
BURLINGAME RESERVOIR
UPPER DAM
GLOCESTER, RHODE ISLAND

PHASE I INSPECTION REPORT

SECTION I - PROJECT INFORMATION

1.1 General:

a. Authority: Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Lenard & Dilaj Engineering, Inc. has been retained by the New England Division to inspect and report on selected dams in the States of Connecticut and Rhode Island. Authorization and notice to proceed were issued to Lenard & Dilaj Engineering, Inc. under a letter of 6 November, 1980 from William E. Hodgson, Jr., Colonel, Corps of Engineers. Contract No. DACW33-81-C-0014 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection Program: The purposes of the program are to:

1. Perform technical inspection and evaluation of non-federal dams to identify conditions requiring correction in a timely manner by non-federal interest.

2. Encourage and prepare the states to quickly initiate effective dam inspection programs for non-federal dams.

3. To update, verify and complete the National Inventory of Dams.

c. Scope of Inspection Program: The scope of this Phase I inspection report includes:

1. Gathering, reviewing and presenting all available data as can be obtained from the owners, previous owners, the state and other associated parties.

2. A field inspection of the facility detailing the visual condition of the dam, embankments and appurtenant structures.

3. Computations concerning the hydraulics and hydrology of the facility and its relationship to the calculated flood through the existing spillway.

4. An assessment of the condition of the facility and corrective measures required.

It should be noted that this report does not pass judgment on the safety or stability of the dam other than on a visual basis. The inspection is to identify those features of the dam which need corrective action and/or further study.

1.2 Description of the Project:

a. Location: The project is located on Brandy Brook, a tributary to Pascoag Reservoir, and is located approximately 2 miles upstream from Pascoag Reservoir. The reservoir pond and dam are located in the Town of Glocester, county of Providence, and State of Rhode Island. The dam itself is located just 3,500 feet south of Route 44, and is shown on the Chepachet, Rhode Island USGS quadrangle map, having coordinates 41°54'51" (north latitude) and 71°44'34" (west longitude).

b. Description of Dam and Appurtenances: The dam at Burlingame Reservoir is approximately 355 feet long and consists of an earth embankment with stone walls on both the upstream and downstream side. On the upstream side, earth fill has been deposited against the stone wall, which is now buried. The dam is 10 feet high with a crest width of approximately 15 feet. The typical slope upstream is about 1V:4H and downstream it is 1V:1H, except at the few places where the stone has not crumbled, where it is 4V:1H. A stone surfaced emergency spillway on earth fill is located near the left abutment of the dam. The outlet works consists of a stone box culvert at the approximate center of the dam. There is a new reinforced concrete intake works on the upstream side which controls the water elevation in the reservoir. It is a manually operated facility with stoplogs in the intake to set the water level in the reservoir. On both sides of the intake structure, there are two corrugated metal wingwalls beneath water level to improve the intake conditions. Water is normally lowered during the fall of each year when the fish (pike) in the reservoir are harvested. Prior to harvesting the

fish, the water level is dropped. After the fish have been removed, the water level is again raised to its normal height. With the exception of this operation, no control is exercised over the water level in the reservoir.

c. Size Classification: With the pool level at the top of the dam the impoundment capacity is 480 acre feet. The top of the dam is 10 feet above the stream bed at the discharge conduit. In accordance with the recommended guidelines of the Corps of Engineers, which indicate that a height of 25 to 39 feet and an impoundment capacity of 50 to 999 acre feet is considered small, the dam is classified as SMALL in size on the basis of impoundment capacity.

d. Hazard Classification: The dam is classified as having a SIGNIFICANT hazard potential because it is located in a rural area where the failure discharge can cause damage due to high water, impact from debris, and flooding to State Route 44 and to a home located 3,400 feet downstream of the dam and adjacent to the culvert under Route 44. An economic loss could be felt, depending on the amount of damage caused to the highway and adjacent homes. Flooding from the failure of this dam could result in the possible loss of a few lives. The estimated increase in water depth due to the possible dam failure discharge of 6,000 cfs would be 4 feet in the vicinity of the house at the Route 44 crossing. Pre-failure and post-failure depths would be 1 foot and 5 feet, respectively.

e. Ownership: Burlingame Reservoir Dam is owned by the State of Rhode Island, State Office Building, Providence, Rhode Island.

f. Operator: The State Department of Environmental Management operates the facility. The operating personnel are under the direction of Douglas Follette, Supervisor, Round Top Station, telephone 568-8200.

g. Purpose of the Dam: The dam at Burlingame Reservoir impounds water from Brandy Brook and is used to raise fish for stocking the state's rivers and brooks. Presently, only pike are raised at the facility.

h. Design and Construction History: The dam, formerly known as Dennis Paine's Reservoir, was constructed prior to 1890. Reconstruction of the dam and outlet works took place under the Works Projects Administration in 1935. Further improvements were made in 1941 and after the State of Rhode Island purchased the site

in 1972, the last reconstruction took place. This consisted of the installation of a new outlet facility, reconstruction of the emergency spillway, and placement of material on the upstream side of the dam. Some additional historical information may be found in Appendix B of this report.

i. Normal Operating Procedures: Water elevation is lowered in the reservoir prior to harvesting the pike. After the pike have been removed the reservoir is refilled and no further operation is needed until the following year. Excess water is passed over the emergency spillway.

1.3 Pertinent Data:

a. Drainage Area: Burlingame Reservoir and its drainage area are located in Providence County in the northwest part of Rhode Island. The basin is generally irregular in shape with a longitudinal north-south axis of approximately 2 miles and a width of 1 mile. The total drainage area is 1.94 square miles in size. The topography is generally rolling and hilly terrain with elevations ranging from a low of 594 feet at the spillway level of Burlingame Reservoir to 804 feet at Durfee Hill in the southeastern portion of the basin. Basin slopes are moderate with grades ranging generally from 4% to 10%.

b. Discharge at Dam Site: No discharge records are maintained at this facility. Flashboards are removed to lower the water level when pike are taken out of the pond. Listed below are calculated discharge data for the spillway and outlet works with stoplogs in place.

1. Outlet works:

Size:	2½'x 3' concrete conduit
Invert elevation:	586.5 feet (with stoplogs removed)
Discharge capacity:	120 cfs (at normal pool level 150 cfs (at test flood level)

2. Maximum known flood at dam site: Discharge unknown

3. Ungated emergency spillway capacity at top of dam: 130 cfs at Elev.596.9

4. Ungated emergency spillway capacity at test flood elevation: 450 cfs at Elev.598.2

5. Gated spillway capacity at normal pool elevation: N/A

6. Gated spillway capacity at test flood elevation: N/A

7. Total spillway capacity at test flood elevation 450 cfs at Elev.598.2

8. Total project discharge at top of dam: 270 cfs at Elev.596.9

9. Total project discharge at test flood elevation: 1,730 cfs at Elev.598.2

c. Elevations (Feet above National Geodetic Vertical Datum):

1. Streambed at toe of dam: 586.5

2. Bottom of cutoff: Unknown

3. Maximum tailwater: Unknown

4. Normal pool: 594.0

5. Full flood control pool: N/A

6. Emergency spillway crest: 595.8

7. Outlet works (with stoplogs): 594.0

8. Design surcharge: Unknown

9. Top of dam: 596.9

10. Test flood level: 598.2

d. Reservoir (Length in Feet):

1. Normal pool: 4,500

2. Flood control pool: N/A

3. Outlet works crest pool: 4,500

4. Top of dam: 4,800

5. Test flood pool: 4,900

e. Storage (Ac.-Ft.):

1.	Normal pool:	242
2.	Flood control pool:	N/A
3.	Outlet works crest:	242
4.	Top of dam (Elev. 596.9)	480
5.	Test flood pool:	564

6. Net storage between top of dam (Elevation 596.9) and spillway crest is 193 Ac.-Ft. and represents 1.86 inches of runoff from the drainage area of 1.94 square miles.

7. One foot of surcharge storage equals 0.64 inches of runoff from the drainage area of 1.94 square miles.

f. Reservoir Surface Areas (Acres):

1.	Top of dam:	95
2.	Test flood pool:	103
3.	Flood control pool:	N/A
4.	Normal pool:	69
5.	Outlet works:	69

g. Dam:

1.	Type:	Earth embankment
2.	Length:	355 feet
3.	Height:	10.4 feet
4.	Top width:	15 feet
5.	Side slopes:	Upstream - 1V:4H Downstream - 1V:1H
6.	Zoning:	Unknown
7.	Impervious core:	Unknown
8.	Cutoff:	Unknown
9.	Grout curtain:	Unknown

h.	Diversion and Regulating Tunnel:	N/A
i.	Emergency Spillway:	
	1. Type:	Overflow emergency, broad crest, rough stone surface
	2. Length of weir:	60 feet
	3. Crest elevation:	595.8 feet
	4. Gates:	None
	5. U/S channel:	Natural bed
	6. D/S channel:	Natural bed
	7. Design surcharge:	Unknown
j.	Regulating Outlet:	
	1. Downstream invert:	586.5 feet
	2. Size:	2½'x 3' concrete box culvert
	3. Description:	Water passes over the stoplogs into the intake structure wet well from which it flows into a concrete box culvert that passes beneath the center of the dam.
	4. Control mechanism:	Manually operated stoplogs in intake structure.

SECTION 2

ENGINEERING DATA

2.1 Design: The dam was constructed in 1890 for power generation. Plans for the original construction are not available. Under the Works Projects Administration, the outlet works were constructed and the dam was probably rebuilt. Plans for this reconstruction are reproduced in Appendix B. During 1941 "new sills" were installed; plans for this reconstruction, however, are not available. After the State purchased the site in 1972 they prepared the following contract: "P & D Contract No. 13-75, Concrete Weir Construction." Plans for this work have been reproduced and are attached in Appendix B.

2.2 Construction: Very little is known about the original construction. The Works Projects Administration survey shows existing conditions and also a design for a gate house structure which is not present on the dam at this time. Indications are that upgrading of the dam took place in 1935 under the W.P.A. project and later, in 1941, further improvements on the spillway took place. After the State purchased the site in 1972, both the spillway and the outlet works were reconstructed. Large trees and brush were removed during October of 1980.

2.3 Operation: The dam was originally constructed for mechanical-power generation. There is a power canal and lower dam. A mill was located downstream from this reservoir. Presently the reservoir is used for raising pike for the State of Rhode Island. The reservoir level can be effectively controlled by the new outlet works. It is usually lowered during late fall when the grown pike are taken out. The water level is raised again during the spring. The spillway in not an operational part of the water level control and would be used only in the event of flood flows passing over the dam. Operation of the facility is carried out by the State Department of Environmental Management Round Top Station (Telephone No. 568-8200). Inspection is informal and on an ad hoc basis.

2.4 Evaluation:

a. Availability: Data on the existing dam was provided by the Dam Safety Engineer of the State Division of Land Resources. Older data was obtained from the files of various state agencies.

b. Adequacy: There is adequate information on the outlet structure. However, the limited data available on the dam embankment is inadequate to perform an in-depth structural assessment; therefore, this investigation is based primarily on visual inspection, performance history and hydraulic and hydrologic calculations.

c. Validity: A comparison of records and visual observations reveal no significant observable discrepancies.

SECTION 3

VISUAL INSPECTION

3.1 Findings:

a. General: An inspection of Burlingame Reservoir Dam was performed on November 14, 1980 by Lenard & Dilaj Engineering, Inc., with the assistance of representatives from the Rhode Island Department of Environmental Management. The temperature on this day was in the 30°-40° F range, the weather was clear and sunny, and the ground was clear of snow. At the time of the inspection, the reservoir level was at 591 feet which is 4 feet higher than the invert of the outlet pipe and 3 feet lower than normal pool level.

As a result of the visual inspection, a review of the history, and the general appearance, the dam at Burlingame Reservoir and its appurtenances are judged to be in POOR condition. A considerable part of the downstream stone wall has collapsed. There was an extensive growth of trees on the dam itself and in the immediate vicinity of the dam. These have recently been cut, but stumps still remain.

A new inlet structure for the outlet conduit was constructed in 1976. This is a reinforced concrete structure covered by a grate and controlled by flashboards. The discharge conduit itself is in a deteriorated condition with several large cracks showing on the interior surface (Photo 10). The deteriorated condition of this conduit could lead to a breach of the dam if it collapses when flowing at full capacity.

b. Dam: The dam is an earth embankment with a partially collapsed downstream stone wall. The upstream slope was recently levelled to a more gradual slope by bulldozing sandy soils from the reservoir bottom against the embankment (Photos 1 and 2). According to plans prepared by the Works Project Administration in 1935 there was an upstream stone wall prior to emplacement of fill against the slope. Original construction drawings are available, but it cannot be ascertained that these plans were followed. The plans prepared by the WPA in 1935 are attached in Appendix B. Further improvements were made during 1976 when the outlet structure was reconstructed and improvements were made to the emergency spillway.

1. Crest: The crest of the dam is covered with grass as shown in Photo 6. There is an emergency spillway near the left abutment, as shown on the plot plan. Elevations along the crest of the dam are

uneven; the highest at the approximate center is 597.1 while the average is 596.9 feet. There is a low point where the left abutment joins the natural ground. The spillway crest is 1.1 feet lower than the top of dam elevation. The width and the alignment of the crest are uneven, partially due to the deteriorated downstream wall. Vegetation and tree growth were recently removed from the crest of the dam. During the reconstruction of the outlet works the dam was grouted along the crest near the outlet conduit. A number of holes were drilled approximately 2 feet on center, and 10-12 feet on either side of the conduit. Grouting was then injected to seal the dam in this area. Some of these holes can be noted as a grid pattern on the crest of the dam. There is no information as to the effectiveness of this grouting.

2. Upstream Slope: According to drawings and cross-sections prepared by the Works Projects Administration, there was an upstream stone wall in place prior to the improvements implemented by the State. This recent improvement consisted of bulldozing sandy soils from the reservoir bottom against the upstream slope (Photo 9). Note on the photograph that there is minor erosion at normal water level. The average slope ranges from 1V:5H to 1V:3H.

   The outlet works is located at the approximate center of the dam (Photo 1). There are two corrugated metal wing walls attached to the inlet structure (Photos 3 and 4).

3. Downstream slope: The downstream stone wall can be observed near the right abutment in what is apparently its original configuration (Photo 5). The original slope was 4V:1H. For most of the length of the dam, the wall has apparently collapsed (Photo 6). Stones rolled downstream leaving large voids between the remaining stones. Numerous stones are therefore located along the toe. Trees were recently cut along the downstream slope and the toe of the dam. Numerous stumps, up to 1½ feet in diameter, remain along the downstream side of the dam (Photo 6). Along the left downstream embankment, the slope is approximately 3½:1. Based on visual observation of the downstream side, the crest of the dam appears to have been raised by approximately 6 inches to a foot by scraping material from the toe area and placing it on top of the dam. Available plans, however, do not

indicate this change. Towards the center of the dam, the downstream slope is approximately 1H:1V.

There are wet areas downstream of the dam and to the left of the outlet structure. Since, at the time of inspection, the water level in the reservoir was not significantly higher than these wet areas, they do not appear to be the result of seepage occuring at the time of the inspection.

c. Appurtenant Structures: The appurtenant structures for this dam are the overflow (emergency) spillway and the outlet structure:

1. Overflow emergency spillway: Near the left abutment of the dam is the overflow spillway. The crest in this area is approximately 1.1 feet lower than the rest of the dam. The spillway is a depression in the crest which is approximately 30 feet long at its base, with 15 foot slopes on either side. It is covered with crushed stone to a depth of approximately 12 inches. There is no well-defined discharge channel for spillway flow. Water would flow along a natural low area about 20 feet downstream of and parallel to the dam and then discharge into the stream.

2. Outlet Works: The original box culvert of approximately 3½ feet by 3 feet was reconstructed during 1976 and is now 3 feet by 2½ feet in size. A new intake structure was built (Photo 4), consisting of reinforced concrete construction with a grate and grooves for stoplogs. There are two corrugated metal wing walls attached on both sides of the intake structure (Photos 1 and 3). Minor damage was observed at the edges of this concrete structure (Photo 4).

The outlet conduit has numerous cracks along its entire length (Photo 10), some as large as 2 inches. The outlet structure is also in poor condition (Photos 7 and 8). There are numerous cracks in the concrete work and the left abutment has been undermined. A collapse of this outlet conduit could cause a breach in the dam.

d. Reservoir Area: The reservoir area is in generally good condition with no signs of instability along shoreline slopes. Stumps are visible in some shallow areas, and the shoreline is covered with trees and fairly dense brush.

e. Downstream Channel: The downstream channel for the outlet discharge is the natural streambed. It is narrow and strewn with boulders. Further downstream are the remnants of a second reservoir which has been breached.

3.2 Evaluation: Based on the visual inspection, the overall condition of the dam appears to be poor, with several areas that require attention. Trees and other vegetation were recently cut but tree stumps were not removed. These should be removed and subsequent holes filled in with suitable material. The downstream side of the outlet works and the main conduit through the dam are in serious disrepair, and a collapse of this conduit could cause a breach of the dam. A reconstruction of the conduit and the outlet works on the downstream side is warranted. Most of the downstream stone wall has collapsed, with a consequent sloughing of the earth embankment. The downstream slope should be repaired to stop any further deterioration. As previously noted, the discharge from the emergency spillway does not run along any well-defined channel between the spillway and the stream. Because this discharge runs in close proximity to the toe of the dam, an evalaution of this condition should be made with necessary improvements implemented as soon as possible.

SECTION 4

OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operational Procedures:

a. General: The State of Rhode Island Department of Environmental Management operates the dam and appurtenant facilities. Since the reservoir is used to raise fish (pike), the operating procedure is dependent on their growth. In early spring the pond level is raised and is maintained at spillway level until the fish are harvested in late fall. The Round Top Station is responsible for the maintenance of the facilities.

b. Description of any Warning System in Effect: There is no warning system in effect at this facility.

4.2 Maintenance Procedures:

a. General: No regular maintenance procedure is followed at this dam, but some work is done on an intermittent basis. Large trees and other vegetation were recently removed.

b. Operating Facilities: The outlet works is operated and maintained by the staff of the Department of Environmental Management, as described above. The grate covering the gate mechanism is securely locked in place to prevent any unauthorized use of the facilities. Trash racks are periodically removed and cleaned, as are the stoplogs used to regulate the water level in the reservoir. Minor repairs are required, but overall the outlet works is in good condition.

4.3 Evaluation: There are no set procedures for the maintenance of the dam embankments, emergency spillway, or outlet works. While operational procedures are adequate for the normal operation for which the reservoir is intended, there are no guidelines which may be followed on a regular basis. To assure a consistent long term performance for the facility, a regular maintenance program , operational procedures, and a downstream warning system should be developed, implemented, and followed on a regular basis.

SECTION 5

EVALUATION OF HYDRAULIC/HYDROLOGIC FFATURES

5.1 General: Burlingame Reservoir Dam is an earth embankment dam with a rubble stone face on the downstream side. The dam is approximately 355 feet long, 15 feet wide at the crest, and an average of 7 feet high. The highest point is at the outlet conduit discharge point where the dam reaches a height of 10 feet. The emergency spillway, which is covered with stone, is 30 feet wide with 15 foot side slopes and the crest is 1.1 feet below the top of the dam. For purposes of hydraulic calculation, the spillway crest was considered as a broad crested weir. A 2½'x 3' box culvert passes beneath the center of the dam and is controlled by stoplogs set at an inlet structure on the upstream side of the dam.

The downstream channel is approximately 8 feet wide at the base of the dam from which it spreads out into a ponded swampy area just downstream of the dam. The channel is in generally poor condition, the banks being overgrown with trees and brush.

The watershed encompasses an area of 1.94 square miles and is basically undeveloped. A few houses can be found along the major roads passing through the watershed area.

At the normal pool level set by the stoplogs in the outlet works, Burlingame Reservoir has a storage capacity of 242 acre feet; this increases to 480 acre feet at the top of the dam.

The test flood for this site is half the Probable Maximum Flood (½ PMF), which produces an inflow of 2,040 cfs into Burlingame Reservoir Dam. The corresponding outflow over the dam is 1,730 cfs. Since the capacity of the emergency spillway and primary low level outlet is 270 cfs at the top of the dam, this represents approximately 16% of the test flood outflow. The maximum overtopping for this outflow would be about 1.3 feet.

5.2 Design Data: No design data, other than the sketches shown in the appendix, were available for the original construction of the dam. It could not be confirmed that the dam had actually appeared as shown on the sketches. Some records of the subsequent repairs were found to be available and have been included in the appendix.

5.3 Experience Data: No records on past experience were found to be available for this site.

5.4 Test Flood Analysis: Based on the "Recommended Guidelines for Safety Inspection of Dams", the dam is classified as SMALL in size with a SIGNIFICANT hazard potential. The test flood for these conditions ranges from the 100-year frequency flood to half the Probable Maximum Flood (100-year to ½ PMF). Because of the potential downstream damage involved with failure, the ½ PMF was chosen as the test flood for this dam.

Using the HEC-1 Flood Hydrograph Computer program developed by the Army Corps of Engineers for dam safety investigations, the inflow and outflow for the test flood were found to be equal to 2,040 cfs (1,050 CSM) and 1,730 cfs, respectively, at the dam site. The dam's outflow capacity of 270 cfs represents 16% of this test flood outflow. 1.3 feet of overtopping of the dam would be associated with this outflow. The test flood analysis was based on a normal pool level of 594.0 feet, maintained by the stoplogs at the outlet structure. This level is 1.8 feet below the crest level of the emergency spillway.

Although there is some storage available in the basin, the effect would be negligible during the occurrence of the ½ PMF. Consequently, wetland storage was not considered for the inflow hydrograph, thus giving a more conservative view of the effects at Burlingame Reservoir Dam.

5.5 Dam Failure Analysis: A dam failure analysis was performed using the "Rule of Thumb" method for estimating downstream dam failure hydrographs, as developed by the Corps of Engineers. Failure was assumed to occur when the water level in the reservoir was at the level of the top of the dam. The spillway and low level outlet discharge just prior to the dam's failure would be 270 cfs, producing a depth of flow of approximately 1 foot at a point 3,400 feet downstream of the dam, at which Route 44 and a nearby home, which could be damaged, are located. The calculated dam failure discharge is 6,000 cfs and will produce a depth of flow of approximately 5 feet at the same downstream point near Route 44, which means an increase in water depth at failure of about 4 feet over the pre-failure depth of 1 foot. The failure analysis covered a distance of 7,900 feet downstream, as shown by the calculations in Appendix D. The depth of flow at that point (at the entrance to Pascoag Reservoir) was calculated to be 4.7 feet for the dam failure.

The breach could cause significant damage downstream of the dam and result in the loss of a few lives. One house in the vicinity of Route 44 could be flooded due to these flows and might result in the loss of lives if adequate forewarning were not provided. Serious damage to Route 44 and two additional road crossings further downstream could also result. The dam was therefore classified as having a SIGNIFICANT hazard potential.

SECTION 6

EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observation: The visual inspection indicates that the downstream stone wall has collapsed along most of the length of the dam and that the outlet conduit and outlet structure are in a deteriorated condition.

6.2 Design and Construction Data: There are only sketches available of the original design, which could not be verified as to their accuracy because of subsequent changes.

6.3 Post-construction Changes: There are "as built" drawings prepared by the Works Projects Administration during 1935. These plans indicate the condition of the dam at that time. Additional plans, prepared in 1975 are available for the reconstruction of the discharge conduit. This construction took place in 1976. The only change since that time has been the cutting of trees and vegetation along the downstream slope and adjacent areas during the fall of 1980.

6.4 Seismic Stability: The dam is located near the boundary between Seismic Zones 1 and 2 and, in accordance with the Phase I inspection guidelines, does not warrant seismic stability analysis.

SECTION 7

ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment:

a. Condition: The visual inspection indicated that the Burlingame Reservoir Dam is in POOR condition. The major concerns regarding the long term performance of this dam include:

1. The future integrity of the dam, which can be affected by further deterioration of the outlet conduit and the outlet structure. Failure of the conduit while flowing at full capacity could cause a breach of the dam.

2. Wet areas noted near the left abutment along the toe of the dam which must be monitored and evaluated.

3. The inability of the dam to pass the peak test flood outflow without being overtopped.

4. The collapse of the downstream stone wall and the sloughing occurring as a consequence of this collapse.

5. Tree stumps which have not been removed from the downstream embankment and the toe area of the dam.

6. The proximity of the discharge flow from the emergency spillway to the toe of the dam. The flow runs through the spillway and parallel to the dam until it reaches the discharge channel of the low level outlet; if this situation is allowed to continue, erosion of the toe area of the dam could result.

b. Adequacy of Information: The lack of in-depth engineering data did not allow for a definitive review. Therefore, the adequacy of this dam could not be assessed from a standpoint of reviewing design and construction data. It is based primarily on the visual inspection, the past performance history and sound engineering judgment.

c. Urgency: The recommendations and remedial measures described below should be implemented by the owner within one year after receipt of this Phase I inspection report.

d. Need for Additional Investigation: No data was recovered for this inspection that indicates that formal engineering analyses were performed for this dam. The visual

inspection and operational history indicate that attention should be given to the collection of current data in order that the recommendations listed below may be implemented.

7.2 Recommendations: The owner should engage the services of a qualified registered engineer to accomplish the following:

a. Prepare plans for and carry out the repair of the outlet conduit and outlet structure, filling in the cracks previously noted.

b. Perform a detailed hydrologic and hydraulic analysis to assess the need for and the means to increase the project discharge capacity and the ability of the dam to withstand overtopping.

c. Prepare plans to carry out the repair of the downstream slope of the dam. The present slope should be stabilized and protected. The angle of the slope and the slope protection should be designed by the engineer in accordance with results of a structural analysis of the dam. Develop a program for monitoring the seepage along the downstream toe of the dam, prior to construction.

d. Tree stumps and root systems should be removed only after a procedure for proper backfill and compaction has been developed by the engineer. In addition, the area 30 feet beyond the toe of the dam should be cleared under the supervision of the engineer.

7.3 Remedial Measures:

a. Operating and Maintenance Procedures:

1. Trees and brush in an area 30 feet downstream of the dam should be removed and the excavations backfilled with suitable material. Grass should be planted in the disturbed areas to protect the embankment from erosion.

2. Emergency procedures consisting of an operations plan and a formal warning system for downstream residents should be developed and implemented.

3. Technical inspections of this facility should be made on an annual basis.

4. Monitor the outlet conduit and wet areas for seepage when the impoundment is full and during periods of intense rainfall.

5. Implement and institute a program of regular clearing of the spillway approach and discharge channels and the discharge channel below the outlet structure.

7.4 Alternatives: There are no practical alternatives to the above listed recommendations.

APPENDIX A

INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST
PARTY ORGANIZATION

PROJECT *BURLINGAME RESERVOIR DAM*

DATE *NOVEMBER 14, 1980*

TIME *9 a.m.*

WEATHER *Partly sunny*

W.S. ELEV. _____ U.S. _____ DN.S.

PARTY:

1. *John Lenard, L.D.E.I.*
2. *Michael Dilaj, L.D.E.I.*
3. *Eric Ohlund, L.D.E.I.*
4. *Gregory Blessing, L.D.E.I.*
5. *Gonzalo Castro, GEI*
6. _____
7. _____
8. _____
9. _____
10. _____

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	*Structural*	*John Lenard*	
2.	*Hydraulics*	*Michael Dilaj*	
3.	*Geotechnical*	*Gonzalo Castro*	
4.	*Survey*	*Eric Ohlund*	
5.	*Survey*	*Gregory Blessing*	
6.			
7.			
8.			
9.			
10.			

PERIODIC INSPECTION CHECKLIST

PROJECT *BURLINGAME RESERVOIR DAM* DATE *NOVEMBER 14, 1980*

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
DAM EMBANKMENT	
Crest Elevation	*596.9*
Current Pool Elevation	*594.0*
Maximum Impoundment to Date	*Reportedly not overtopped in last 5 years*
Surface Cracks	*None observed*
Pavement Condition	*Not applicable*
Movement or Settlement of Crest	*Too irregular to judge*
Lateral Movement	*Too irregular to judge*
Vertical Alignment	*Too irregular to judge*
Horizontal Alignment	*Too irregular to judge*
Condition at Abutment and at Concrete Structures	*Good. Possibly low spot at left abutment*
Indications of Movement of Structural Items on Slopes	*Not applicable*
Trespassing on Slopes	*No significant effects of foot trespassing*
Sloughing or Erosion of Slopes or Abutments	*Some erosion of upstream slope at former water levels*
Rock Slope Protection - Riprap Failures	*No rock slope protection*
Unusual Movement or Cracking at or Near Toe	*None observed*
Unusual Embankment or Downstream Seepage	*Wet area about 25 feet downstream from dam right of emergency spillway*
Piping or Boils	*None observed*
Foundation Drainage Features	*None known*
Toe Drains	*None known*
Instrumentation System	*None known*
Vegetation	*Recently cleared of trees. Some stumps of up to 1.5' diameter at downstream toe.*

PERIODIC INSPECTION CHECKLIST

PROJECT *BURLINGAME RESERVOIR DAM* DATE *NOVEMBER 14, 1980*

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
DIKE EMBANKMENT	*There is no dike at this facility.*
Crest Elevation	
Current Pool Elevation	
Maximum Impoundment to Date	
Surface Cracks	
Pavement Condition	
Movement or Settlement of Crest	
Lateral Movement	
Vertical Alignment	
Horizontal Alignment	
Condition at Abutment and at Concrete Structures	
Indications of Movement of Structural Items on Slopes	
Trespassing on Slopes	
Sloughing or Erosion of Slopes or Abutments	
Rock Slope Protection - Riprap Failures	
Unusual Movement or Cracking at or Near Toes	
Unusual Embankment or Downstream Seepage	
Piping or Boils	
Foundation Drainage Features	
Toe Drains	
Instrumentation System	
Vegetation	

PERIODIC INSPECTION CHECK LIST

PROJECT *BURLINGAME RESERVOIR DAM* DATE *NOVEMBER 14, 1980*

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	*Two wingwalls made of steel road barriers*
Slope Conditions	*Not applicable*
Bottom Conditions	*Some silt*
Rock Slides or Falls	*None*
Log Boom	*None*
Debris	*None*
Condition of Concrete Lining	*Not applicable*
Drains or Weep Holes	*Not applicable*
b. Intake Structure	
Condition of Concrete	*Good. Minor cracks and spalling*
Stop Logs and Slots	*Trash racks (screens) removed temporarily*

PERIODIC INSPECTION CHECKLIST

PROJECT *BURLINGAME RESERVOIR DAM* DATE *NOVEMBER 14, 1980*

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER	*There is no control tower.*
a. Concrete and Structural	
General Condition	
Condition of Joints	
Spalling	
Visible Reinforcing	
Rusting or Staining of Concrete	
Any Seepage or Efflorescence	
Joint Alignment	
Unusual Seepage or Leaks in Gate Chamber	
Cracks	
Rusting or Corrosion of Steel	
b. Mechanical and Electrical	
Air Vents	
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	
Service Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System	

PERIODIC INSPECTION CHECKLIST

PROJECT *BURLINGAME RESERVOIR DAM* DATE *NOVEMBER 14, 1980*

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT	
General Condition of Concrete	*Repaired about one month ago. Evidence of displacement across cracks*
Rust or Staining on Concrete	*None observed*
Spalling	*Some spalling along cracks*
Erosion or Cavitation	*None observed*
Cracking	*Yes, see above*
Alignment of Monoliths	*Not applicable*
Alignment of Joints	*Not applicable*
Numbering of Monoliths	*Not applicable*

PERIODIC INSPECTION CHECKLIST

PROJECT *BURLINGAME RESERVOIR DAM* DATE *NOVEMBER 14, 1980*

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	*Outlet head wall*
General Condition of Concrete	*Poor*
Rust or Staining	*None observed*
Spalling	*At racks*
Erosion or Cavitation	*None observed*
Visible Reinforcing	*None observed*
Any Seepage or Efflorescence	*None observed*
Condition at Joints	*No joints*
Drain holes	*None observed*
Channel	*Natural stream bed*
Loose Rock or Trees Overhanging Channel	*Many trees*
Condition of Discharge Channel	*Fair*
Other comments	*Several cracks, left part of wall undermined and log displaced downstream*

PERIODIC INSPECTION CHECKLIST

PROJECT *BURLINGAME RESERVOIR DAM* DATE *NOVEMBER 14, 1980*

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	*Recently cleaned, silt removed*
General Condition	*Good*
Loose Rock Overhanging Channel	*None*
Trees Overhanging Channel	*None*
Floor of Approach Channel	*Reservoir bottom*
b. Weir and Training Walls	*No training walls*
General Condition of Concrete	*Good. Stone placed across weir*
Rust or Staining	*Not applicable*
Spalling	*Not applicable*
Any Visible Reinforcing	*Not applicable*
Any Seepage or Efflorescence	*Not applicable*
Drain Holes	*Not applicable*
c. Discharge Channel	*Channel parallel to dam discharges into outlet channel.*
General Condition	*Not a well-defined channel*
Loose Rock Overhanging Channel	*None*
Trees Overhanging Channel	*Trees recently removed*
Floor of Channel	*Sandy, gravelly*
Other Obstructions	*None*
Other Comments	

PERIODIC INSPECTION CHECKLIST

PROJECT *BURLINGAME RESERVOIR DAM* DATE *NOVEMBER 14, 1980*

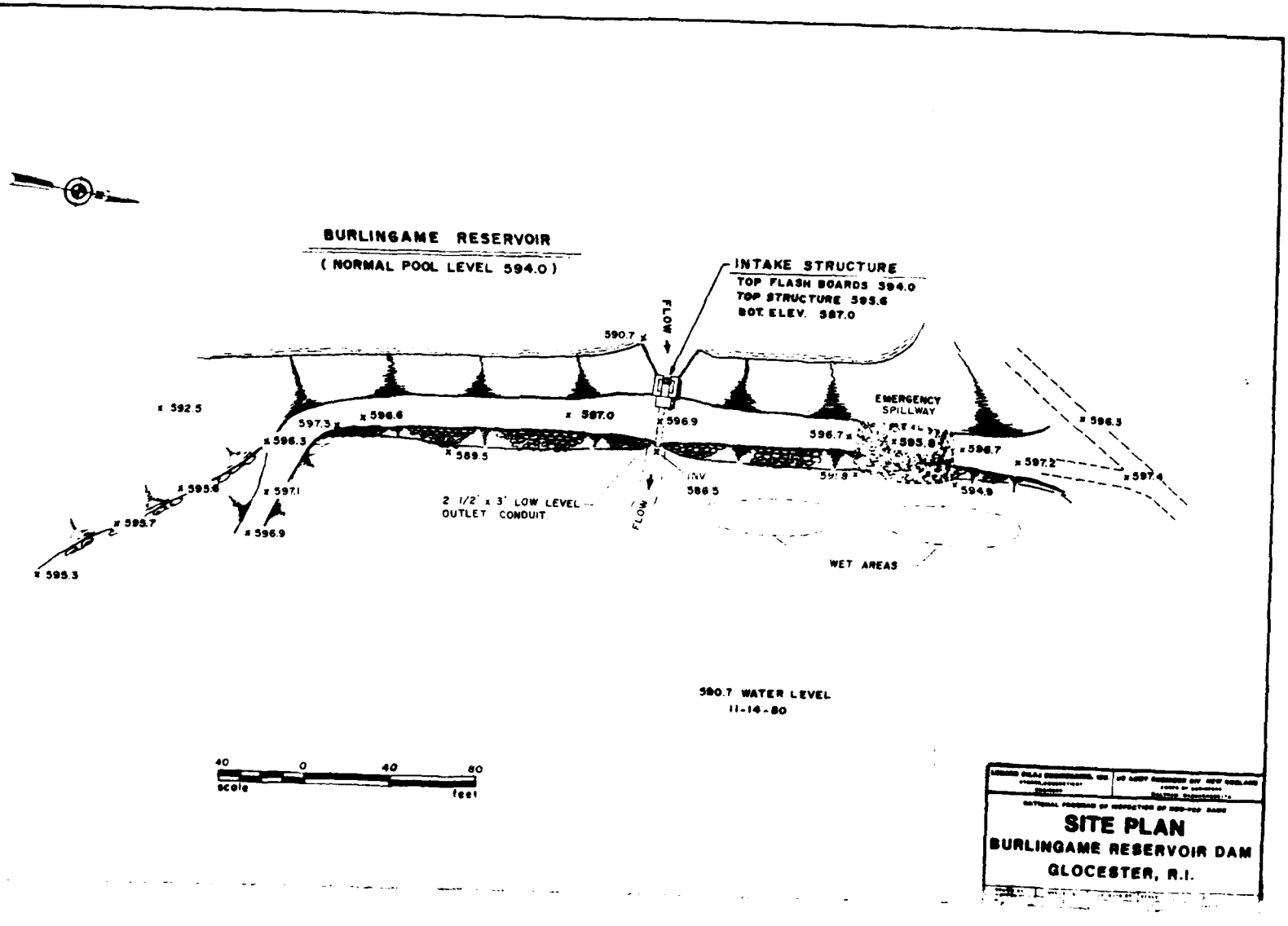
PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - SERVICE BRIDGE	*There is no service bridge.*
a. Super Structure	
Bearings	
Anchor Bolts	
Bridge Seat	
Longitudinal Members	
Underside of Deck	
Secondary Bracing	
Deck	
Drainage System	
Railings	
Expansion Joints	
Paint	
b. Abutment & Piers	
General Condition of Concrete	
Alignment of Abutment	
Approach to Bridge	
Condition of Seat & Backwall	

APPENDIX B

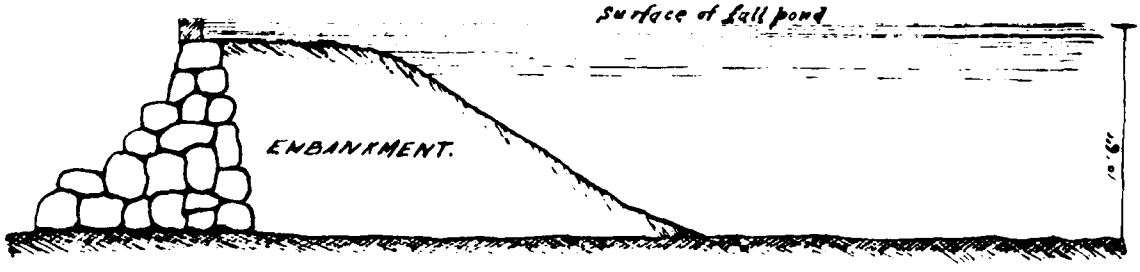
ENGINEERING DATA


BURLINGAME RESERVOIR
(NORMAL POOL LEVEL 594.0)
INTAKE STRUCTURE
TOP FLASH BOARDS 594.0
TOP STRUCTURE 593.6
BOT. ELEV. 587.0
FLOW
590.7
592.5
597.3
596.6
587.0
596.9
596.3
589.5
596.7
595.8
596.7
596.5
597.2
597.4
595.6
597.1
INV
586.5
2 1/2' x 3' LOW LEVEL
OUTLET CONDUIT
FLOW
595.7
596.9
595.3
594.8
WET AREAS
590.7 WATER LEVEL
11-14-80
40 0 40 80
scale
feet
SITE PLAN
BURLINGAME RESERVOIR DAM
GLOCESTER, R.I.

COPY OF FULL REPORT AS CONTAINED IN YEARLY REPORTS

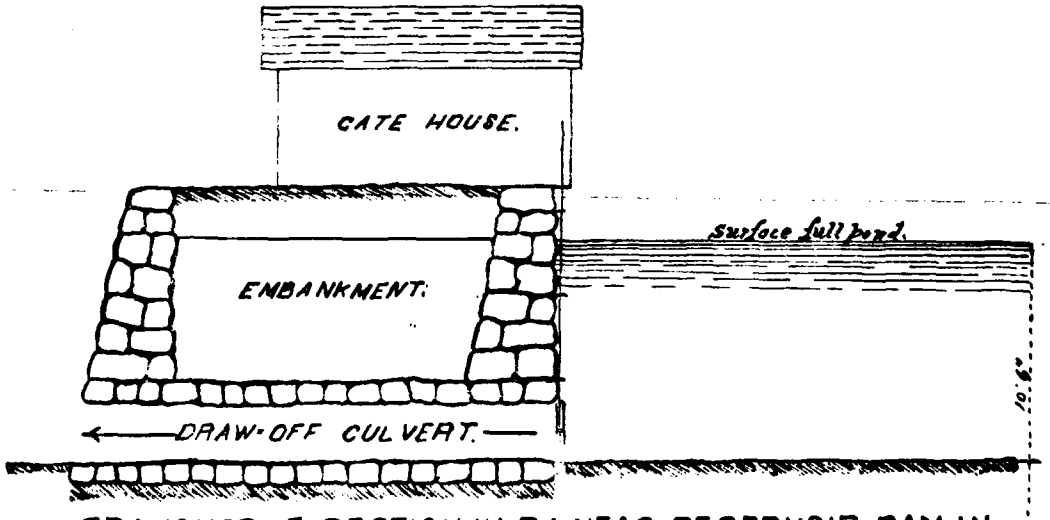
OF COMMISSIONERS OF DAMS AND RESERVOIRS

1890 - p.21 Formerly known as Dennis Paine's Reservoir Dam. The location of this reservoir is at the head waters of Brandy Brook and flows an area of about 100 acres. The dam is an earthen embankment of ordinary fair material in quantity sufficient for any heretofore recorded event. The rollway is 40 feet in length passing in safety all floods occurring under the present commission. The draw-off culvert located at the base of the dam, presents a cross sectional area of 9 feet which has heretofore been sufficient for the reduction of the reservoir. Occasional points in the dam indicate a loss of material from time to time which from its isolated position might have been caused by muskrats or other amphibia. These effects have been repaired as soon as observed by the proprietor, whose name the reservoir bears, and whose individual interest is in its safety. On the same stream and two miles below, the Pascoag reservoir flows an area of 500 acres. The water from these combined sources flows through a populous community where life and property would be endangered by their sudden escape. The positive security of both structures is matter of paramount importance. The accompanying plates numbered 241 to 244 inclusive represent sections in the dam herein reported.



TRANSVERSE SECTION IN ROLLWAY.

Scale 8'-1"



TRANSVERSE SECTION IN PAINE'S RESERVOIR DAM IN GLOCESTER.

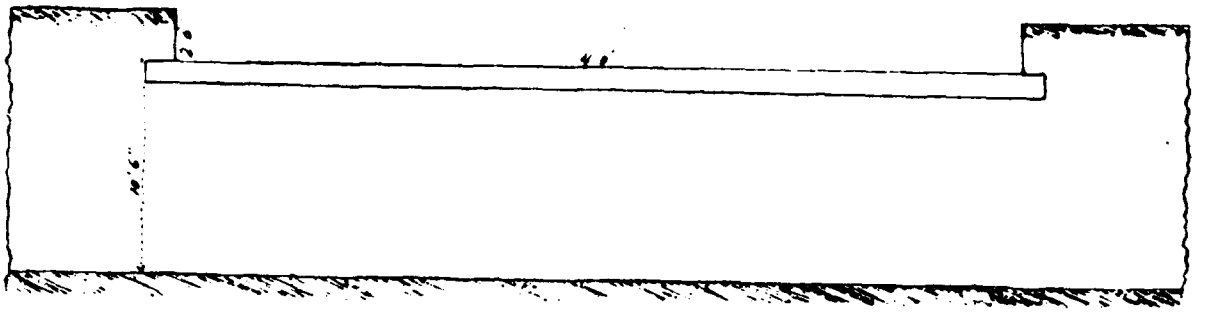
Scale 8'-1"

C-3-34

OLD PLAN FILED WITH STATE
PROBABLY ORIGINAL DAM

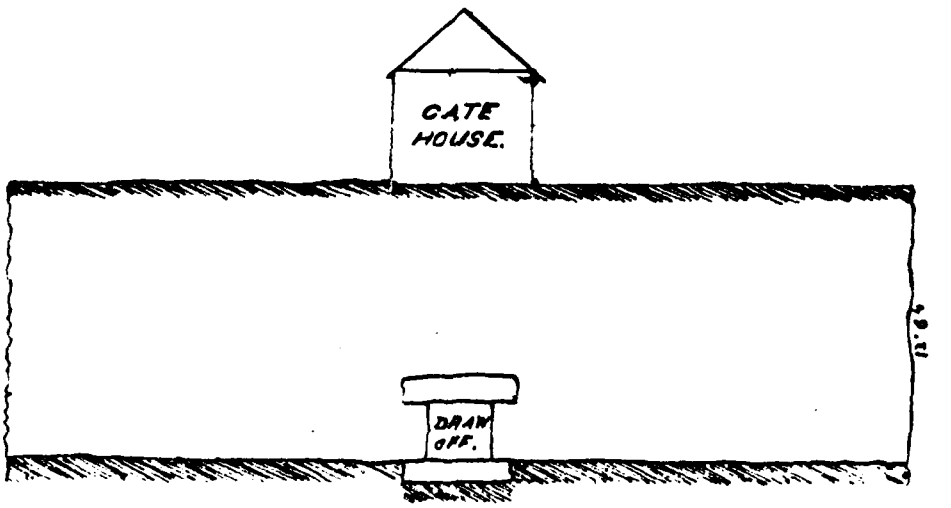
SH. 1 OF 2

B-3



ELEVATION OF ROLLWAY IN PAINE'S RESERVOIR DAM
IN
CLOCESTER.

Scale 8'-1"



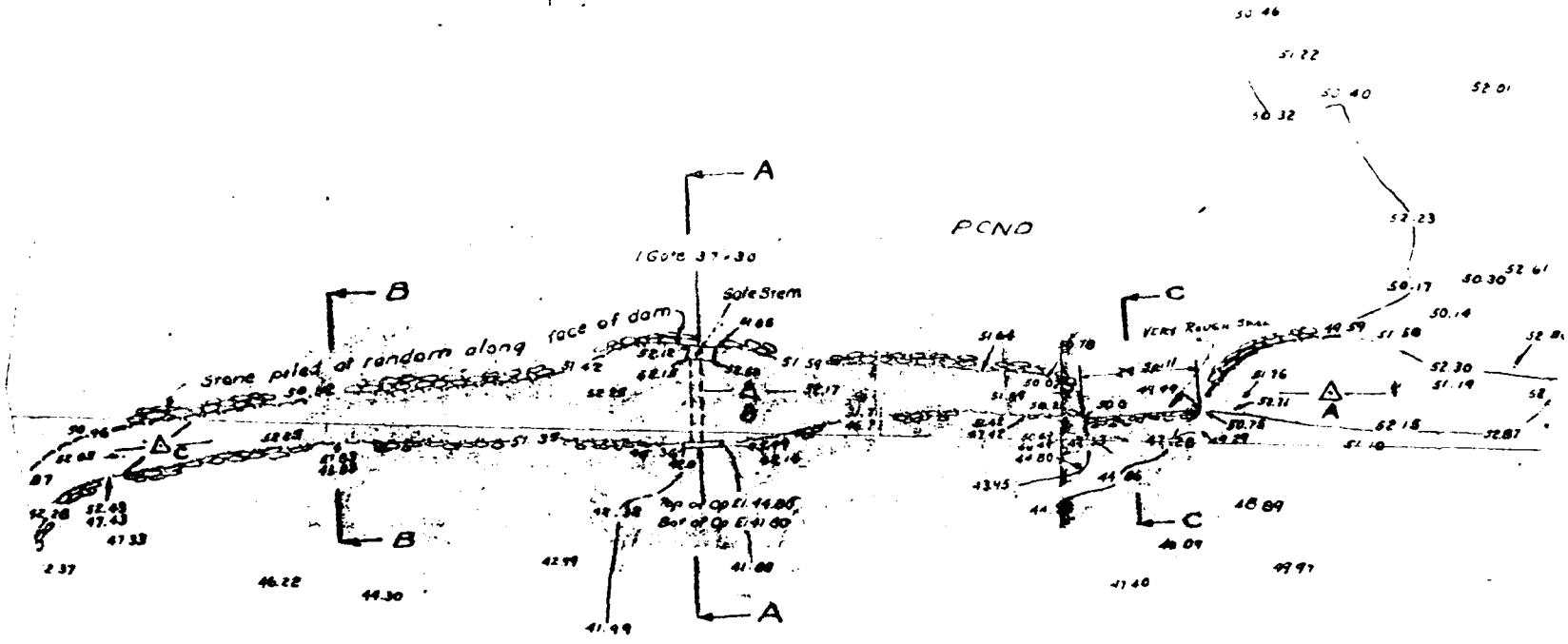
LONGITUDINAL SECTION IN PAINE'S RESERVOIR DAM IN
CLOCESTER.

Scale 8'-1"

B-3-25 A

OLD PLAN (CONT.)

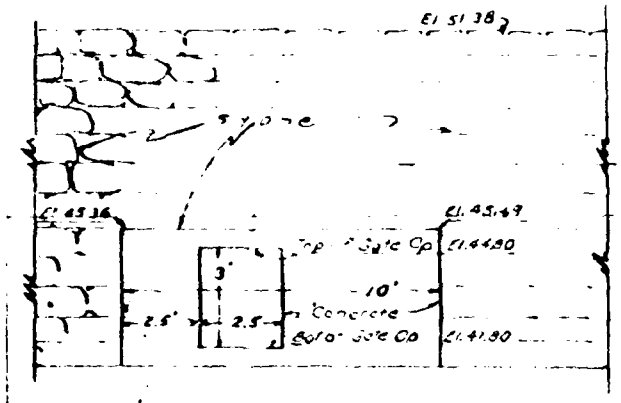
SH. 2 OF 2



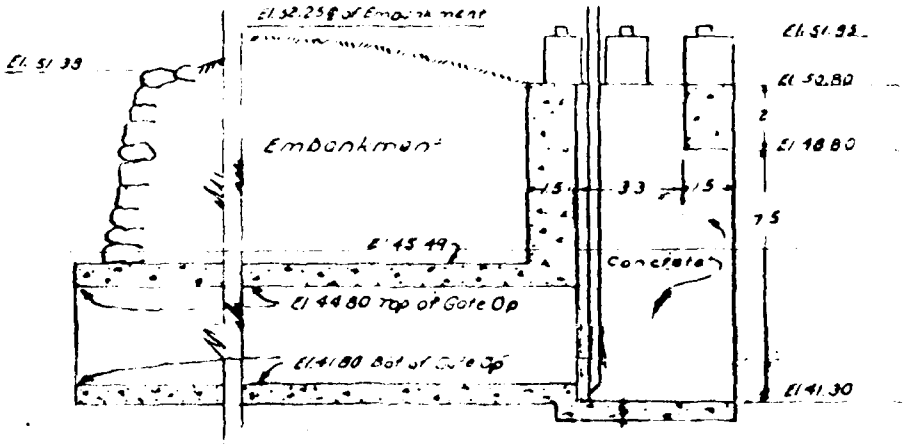
SCALE 1" = 40'

TOPOGRAPHY MAP

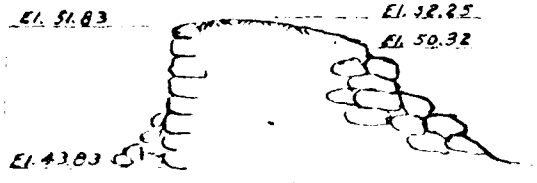
STATE PLAN NO. B-18 BY
WORKS PROJECTS ADMIN.
1935



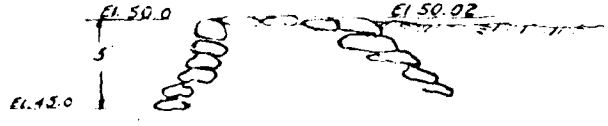
ELEVATION OF GATE OPENING
SCALE 1"=5'
LOOKING UPSTREAM



SECTION A-A
SCALE 1"=5'

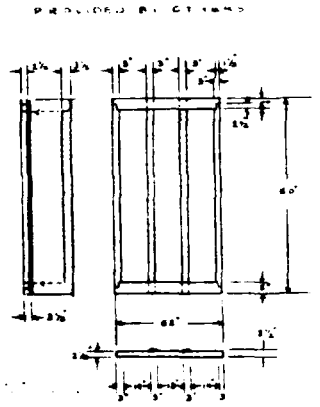


SECTION B-B
SCALE 1"=10'

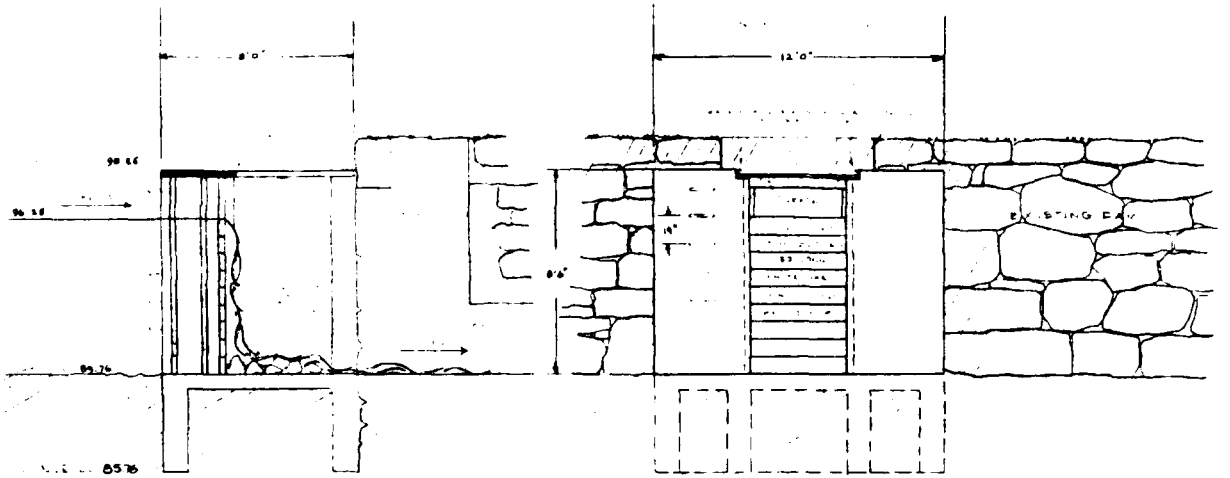


SECTION C-C
SCALE 1"=10'

TOPOGRAPHY MAP
STATE PLAN NO. B-18 BY
WORKS PROJECTS ADMIN.
935

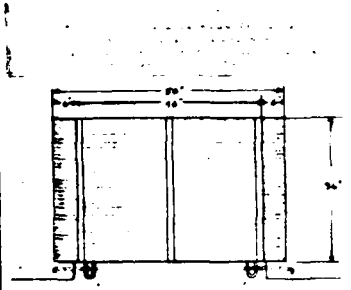


DETAIL TWO SCREENS

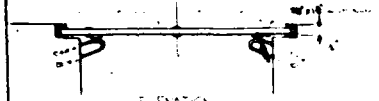


SECTION A-A

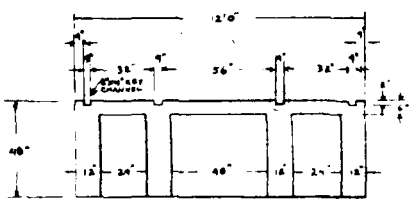
ELEVATION



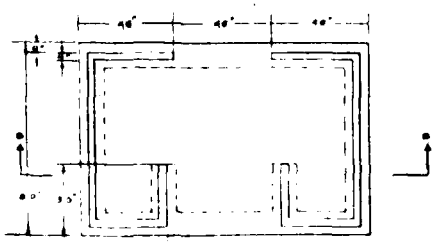
PLAN

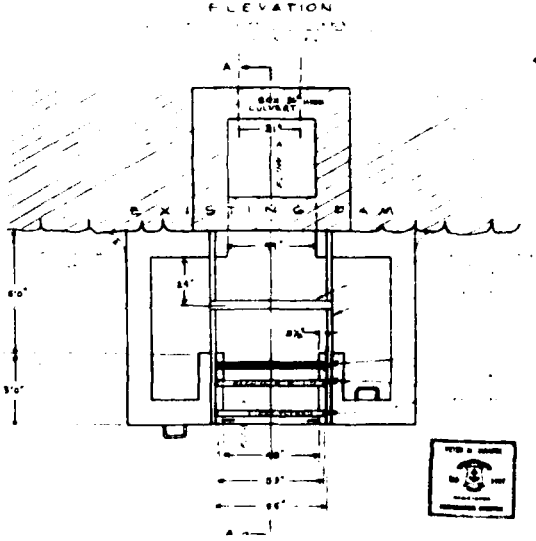


ELEVATION
WELDED A... FLOW GRATE



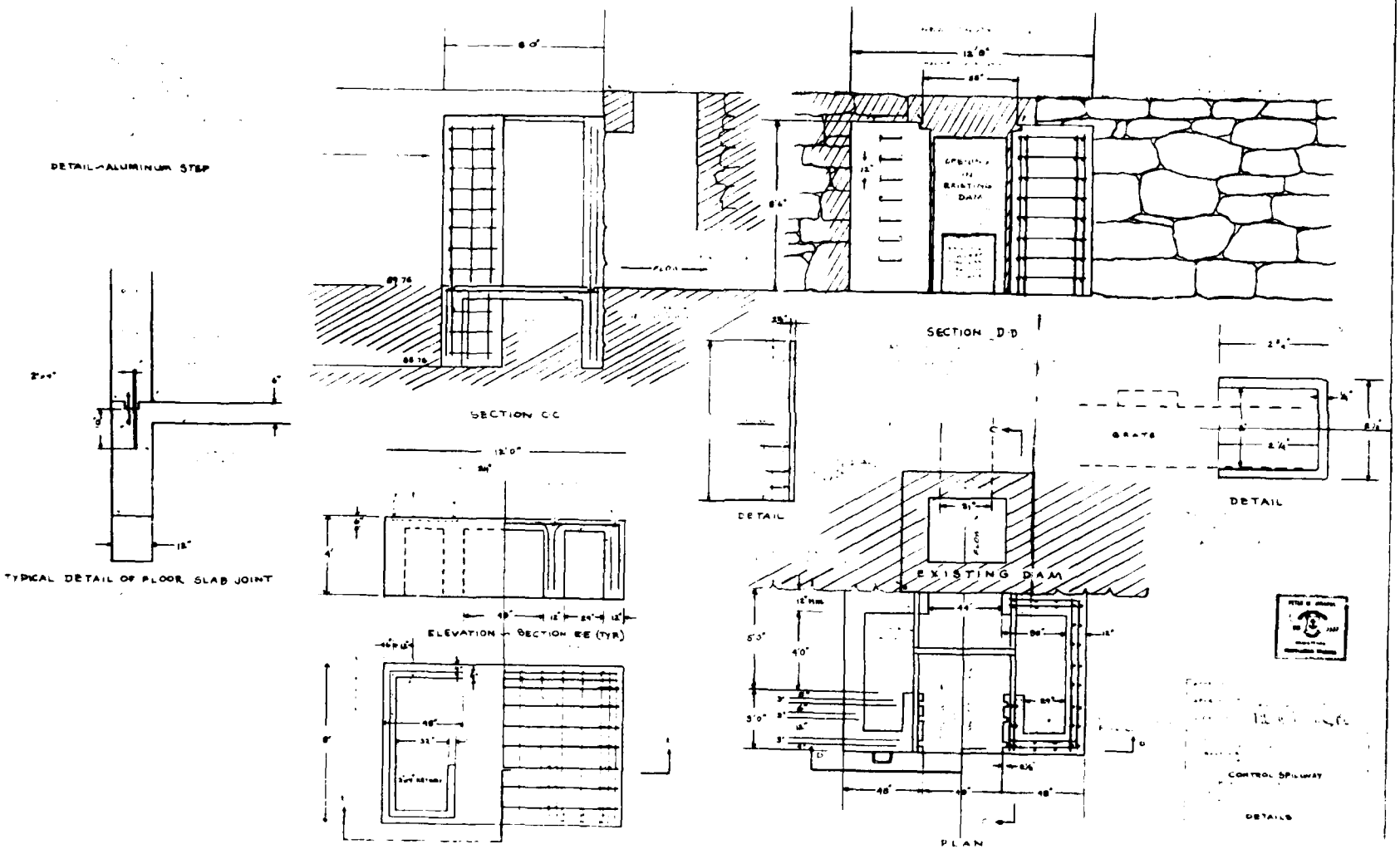
ELEVATION - SECTION B-B

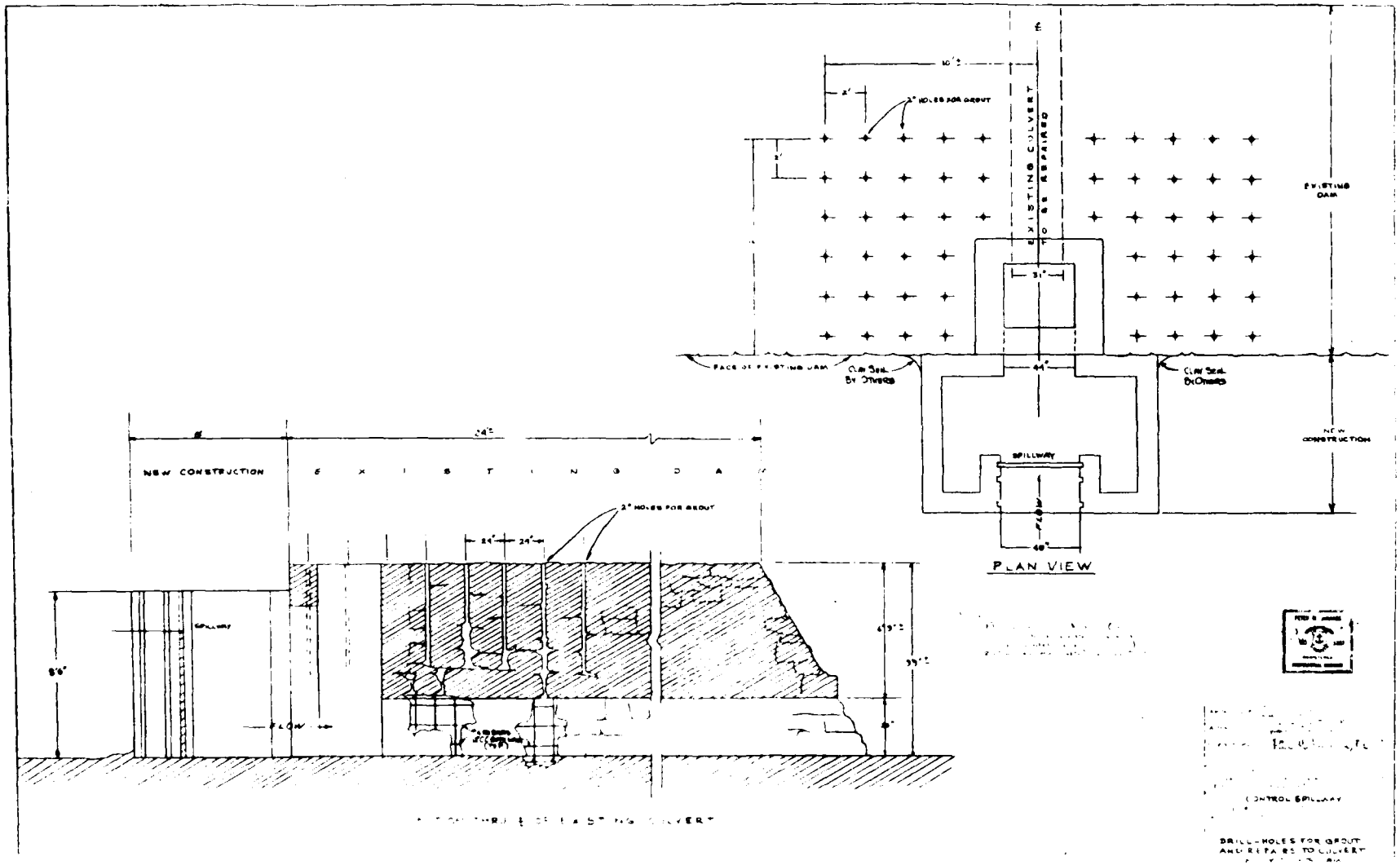




LOCATION

PLAN AND ELEVATION


DETAIL-ALUMINUM STEP
TYPICAL DETAIL OF FLOOR SLAB JOINT
SECTION C-C
SECTION D-D
DETAIL
GRATE
DETAIL
EXISTING DAM
ELEVATION & SECTION E-E (TYP.)
PLAN
CONTROL SPILLWAY
DETAILS


EXISTING CULVERT TO BE REPAIRED
2" HOLES FOR GROUT
EXISTING DAM
NEW CONSTRUCTION
SPILLWAY
FLOW
PLAN VIEW
NEW CONSTRUCTION
EXISTING DAM
2" HOLES FOR GROUT
SPILLWAY
FLOW
CONTROL SPILLWAY
DRILL HOLES FOR GROUT AND REPAIRS TO CULVERT

APPENDIX C

PHOTOGRAPHS

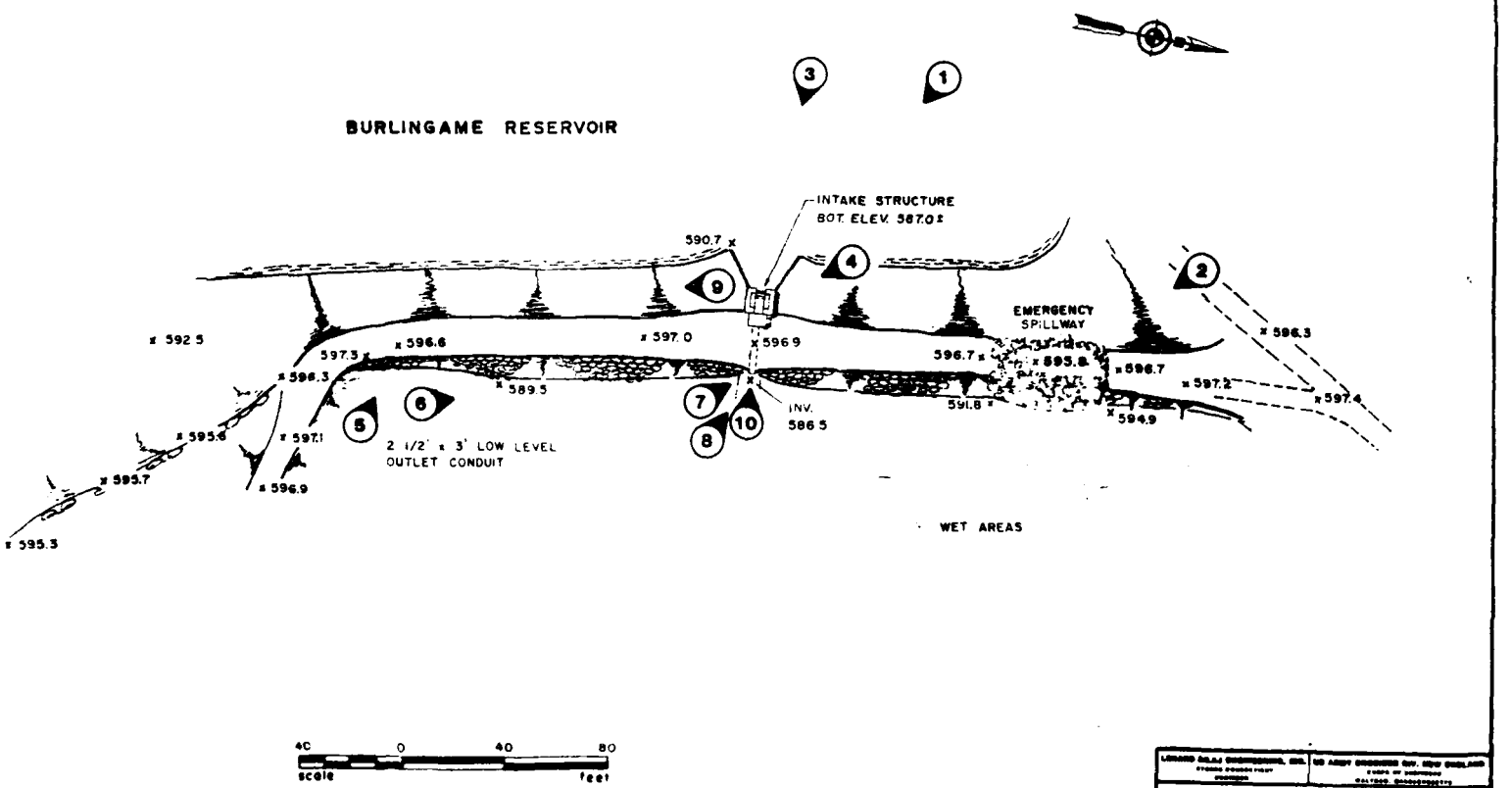


PHOTO INDEX
BURLINGAME RESERVOIR DAM
GLOCESTER, R.I.

Photo 1. Overall view from left abutment. The upstream slope was formed by bulldozing material from the reservoir bottom against the existing stone wall. Outlet works are located at the center.

Photo 2. Emergency spillway. Stones were placed in the last few years.

US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	BURLINGAME RESERVOIR GLOCESTER, RHODE ISLAND RI 01306 JAN. 1981 C-2
LENARD-DILAJ ENGINEERING, INC. STORRS, CONNECTICUT ENGINEER		

Photo 3. Intake structure. Photo taken from dike of fish holding area within the reservoir.

Photo 4. Closeup of inlet structure. Note chipped concrete where grate is attached by padlock. Channels are present for trash racks, which are not in place. The slope near the intake structure is 1V:5.5H.

US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	BURLINGAME RESERVOIR GLOCESTER, RHODE ISLAND RI 01306 JAN. 1981 C-3
LENARD-DILAJ ENGINEERING, INC. STORRS, CONNECTICUT ENGINEER		

Photo 5

Short section of downstream stone wall which is still standing. Measurement indicates a slope of 4V:1H.

Photo 6

Downstream face of dam. Note large stumps of recently cut trees and crumbled wall.

US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	BURLINGAME RESERVOIR GLOCESTER, RHODE ISLAND RI 01306 JAN. 1981 C-4
LENARD-DILAJ ENGINEERING, INC. STORRS, CONNECTICUT ENGINEER		

Photo 7. Outlet headwall. Note cracks on wall and undermining of left abutment.

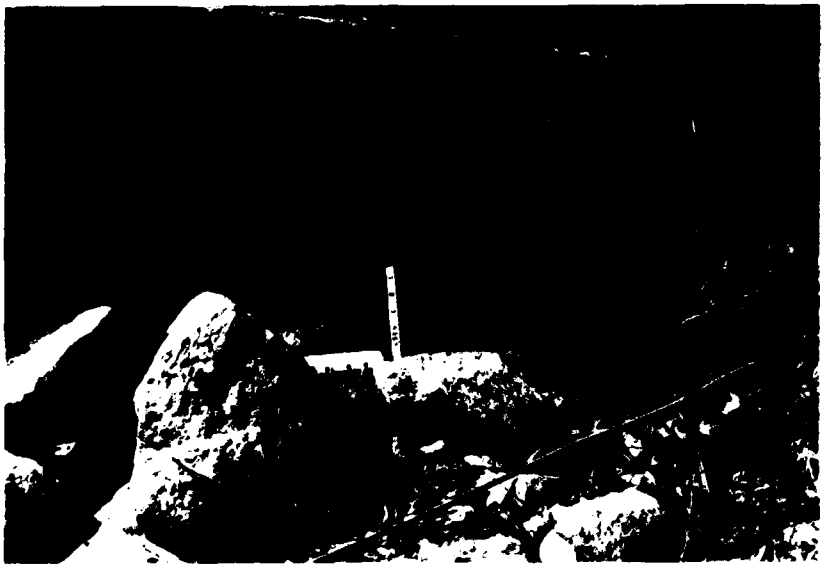


Photo 8. Closeup of left abutment showing the undermined area.

US ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	BURLINGAME RESERVOIR GLOCESTER, RHODE ISLAND RI 01306 JAN. 1981 C-5
LENARD-DILAJ ENGINEERING, INC. STORRS, CONNECTICUT ENGINEER		

Photo 9. Upstream slope of dam. Slope measured approximately 1V:5H. Soil is slightly gravelly sand with some boulders.

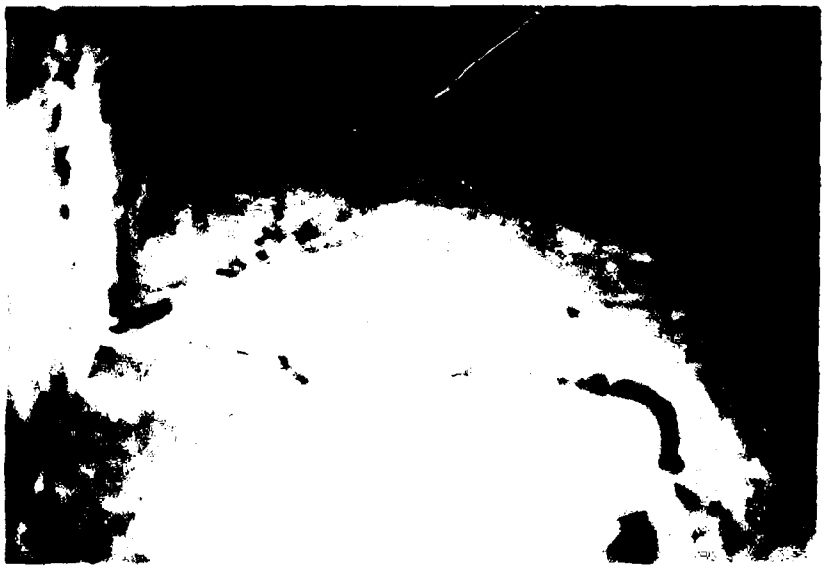


Photo 10. Inside of outlet conduit. Note cracks on the surface of this conduit.

APPENDIX D

HYDROLOGIC AND HYDRAULIC

COMPUTATIONS

LENARD & DILAJ ENGINEERING, INC.
1066 Storrs Road
STORRS, CONNECTICUT 06268
(203) 429-7308

JOB Contract No. DACW33-81-C-0014
SHEET NO _____ OF _____
CALCULATED BY K A DATE 2/5/81
CHECKED BY _____ DATE _____
SCALE None

BULLINGAM-E. REE. DAM

DETERMINATION OF SPILLWAY TEST FLOOD*

A. SIZE CLASSIFICATION

Based on either storage or height

			THIS DAM:
(Small)	Storage	50-999 Ac.-Ft.	435 Ac.Ft.
	Height	25-39 Ft.	10 FT.
Intermediate	Storage	1,000-50,000 Ac.Ft.	
	Height	40-100 Ft.	
Large	Storage	More than 50,000 Ac.-Ft.	
	Height	Greater than 100 Ft.	

B. HAZARD POTENTIAL CLASSIFICATION

Category	Loss of Life	Economic Loss
Low	None expected	Minimal
(Significant)	(Few)	(Appreciable)
High	More than few	Excessive

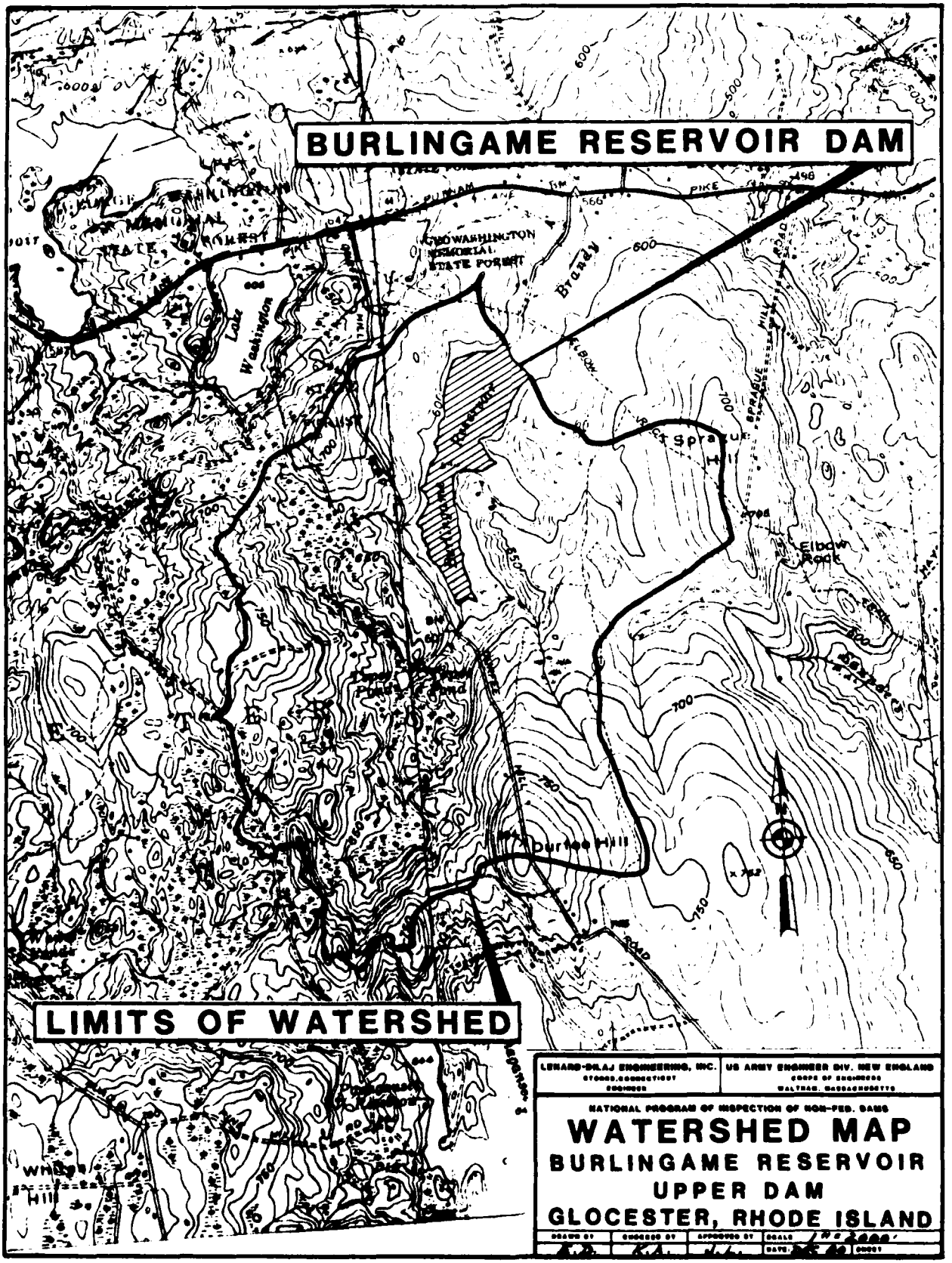
Hazard Classification SIGNIFICANT

C. HYDROLOGIC EVALUATION GUIDELINES

Hazard	Size	Spillway Test Flood
Low	Small	50 to 100-Year Frequency
	Intermediate	100-Year Frequency to ½ PMF
	Large	½ PMF to PMF
(Significant)	(Small)	(100-Year Frequency to ½ PMF)
	Intermediate	½ PMF to PMF
	Large	PMF
High	Small	½ PMF to PMF
	Intermediate	PMF
	Large	PMF

Spillway Test Flood ½ PMF

* Based upon "Recommended Guidelines for Safety Inspection of Dams" Department of the Army, Office of the Chief of Engineers, November 1976.



LENARD-DILAJ ENGINEERING, INC.
STORRS, CONNECTICUT
ENGINEER

US ARMY ENGINEER DIV. NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASSACHUSETTS

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

WATERSHED MAP
BURLINGAME RESERVOIR
UPPER DAM
GLOCESTER, RHODE ISLAND

DRAWN BY	CHECKED BY	APPROVED BY	SCALE 1" = 2000'
			DATE DWG. NO.

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
 LAST MODIFICATION  26 FEB 79
**********

RUN  DATE0 02/05/81.
     TIME0 13.41.47.

                    BURLINGAME RESERVOIR DAM    GLOCESTER  RHODE ISLAND
                    80-27-7
                    JANUARY 1981    DESIGN STORM---½PMF

                                JOB SPECIFICATION
      NQ     NHR    NMIN    IDAY     IHR    IMIN   METRC   IPLT   IPRT  NSTAN
     150       0      30       0       0       0       0      0      4      0
                           JOPER     NWT   LROPT   TRACE
                               5       0       0       0

                        MULTI-PLAN ANALYSES TO BE PERFORMED
                                NPLAN= 1 NRTIO= 6 LRTIO= 1
          RTIOS=    .80    .20    .30    .50    .80   1.00

**********  **********  **********  **********  **********

                        SUB-AREA RUNOFF COMPUTATION

                    CALCULATION OF INFLOW TO BURLINGAME RESERVOIR

                ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME  ISTAGE   IAUTO
                    1       0       0       0       1       0       1       0       0

                                HYDROGRAPH DATA
      IHYDG     IUHG    TAREA     SNAP   TRSDA   TRSPC   RATIO  ISNOW  ISAME  LOCAL
          1        1     1.94     0.00    1.94    0.00   0.000      0      0      0

                                PRECIP DATA
                SPFE      PMS       R6      R12      R24      R48      R72      R96
                0.00    24.80   100.00   111.00   120.00   127.00     0.00     0.00
TRSPC COMPUTED BY THE PROGRAM IS  .600

                                LOSS DATA
      LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
          0    0.00    0.00    1.00    0.00    0.00    1.00    1.00     .20    0.00    0.00

                            UNIT HYDROGRAPH DATA
                        TP=  2.63    CP= .63    NTA=  0

                                RECESSION DATA
                        STRTQ=   -1.80    QRCSN=    -.05    RTIOR= 1.00

UNIT HYDROGRAPH 29 END-OF-PERIOD ORDINATES, LAG=  2.63 HOURS, CP=  .63  VOL= 1.00
      22.     79.    256.    232.    284.    299.    271.    222.    179.    145.
     117.     95.     77.     62.     50.     41.     33.     27.     21.     17.
      14.     11.      9.      7.      6.      5.      4.      3.      3.
       0

                            END-OF-PERIOD FLOW
 MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS   COMP Q      MO.DA  HR.MN  PERIOD   RAIN   EXCS   LOSS   COMP Q
```

(1)

SUM 25.20 19.65 5.55 58647.
(640.)(499.)(141.)(1660.70)

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTED FLOWS THROUGH BURLINGAME RESERVOIR DAM AND SPILLWAY

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
2	1	0	0	2	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-594.	-1

STAGE	594.00	595.00	595.80	596.90	598.00	600.00	602.00	604.00	606.00	608.00
FLOW	130.00	139.00	145.00	280.00	550.00	1341.00	2395.00	3657.00	5094.00	6688.00
SURFACE AREA=	69.	88.	101.	111.	120.	127.	134.	140.	145.	
CAPACITY=	0.	157.	345.	557.	788.	1035.	1296.	1570.	1855.	
ELEVATION=	594.	596.	598.	600.	602.	604.	606.	608.	610.	

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
594.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
596.9	2.6	1.5	295.

(2)

UNITED COMPUTING SYSTEMS, INC.

OVN

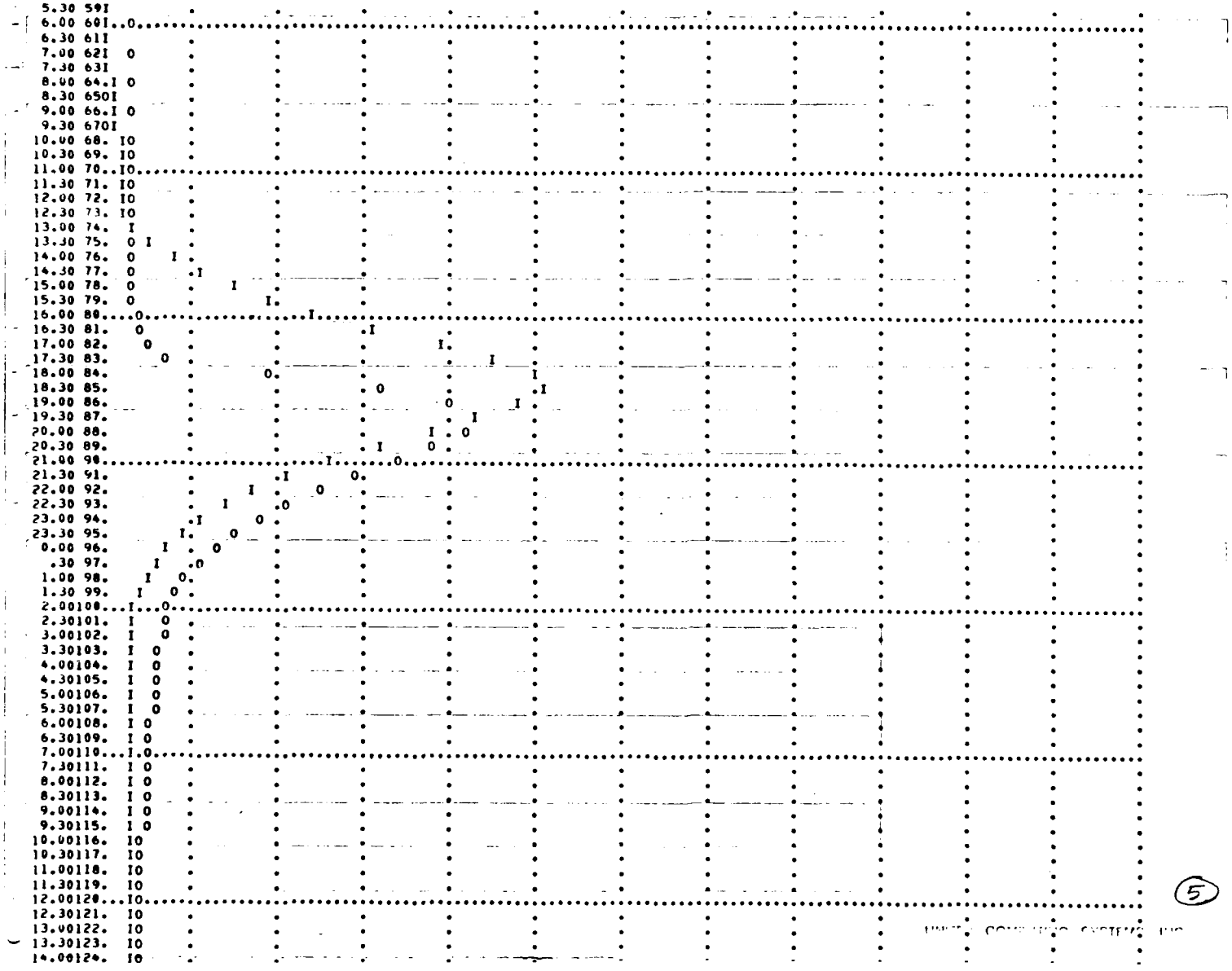
PEAK OUTFLOW IS 1725. AT TIME 43.50 HOURS

OVF

STATION 2

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

	0.	400.	800.	1200.	1600.	2000.	2400.	0.	0.	0.	0.	0.	0.
.30	1I												
1.00	2I O												
1.30	3I												
2.00	4I O												
2.30	5I												
3.00	6I O												
3.30	7I												
4.00	8I O												
4.30	9I												
5.00	10I..O												
5.30	11I												
6.00	12I O												
6.30	13I												
7.00	14I O												
7.30	15I												
8.00	16I O												
8.30	17I												
9.00	18I O												
9.30	19I												
10.00	20I..O												
10.30	21I												
11.00	22I O												
11.30	23I												
12.00	24I O												
12.30	25I												
13.00	26I O												
13.30	27I												
14.00	28I O												
14.30	29I												
15.00	30I..O												
15.30	31I												
16.00	32I O												
16.30	33I												
17.00	34I O												
17.30	35I												
18.00	36I O												
18.30	37I												
19.00	38I O												
19.30	39I												
20.00	40I..O												
20.30	41I												
21.00	42I O												
21.30	43I												
22.00	44I O												
22.30	45I												
23.00	46I O												
23.30	47I												
0.00	48I O												
.30	49I												
1.00	50I..O												
1.30	51I												
2.00	52I O												
2.30	53I												
3.00	54I O												
3.30	55I												
4.00	56I O												
4.30	57I												
5.00	58I..O												


5.30 59I
6.00 60I..O
6.30 61I
7.00 62I O
7.30 63I
8.00 64.I O
8.30 650I
9.00 66.I O
9.30 670I
10.00 68. IO
10.30 69. IO
11.00 70..IO
11.30 71. IO
12.00 72. IO
12.30 73. IO
13.00 74. I
13.30 75. O I
14.00 76. O I
14.30 77. O .I
15.00 78. O I
15.30 79. O I.
16.00 80....O I
16.30 81. O .I
17.00 82. O I.
17.30 83. O I
18.00 84. O. I
18.30 85. O .I
19.00 86. O I
19.30 87. I
20.00 88. I O
20.30 89. I O
21.00 90....I..O
21.30 91. .I O.
22.00 92. I O
22.30 93. I .O
23.00 94. .I O
23.30 95. I. O
0.00 96. I . O
.30 97. I .O
1.00 98. I O.
1.30 99. I O
2.00100...I..O
2.30101. I O
3.00102. I O
3.30103. I O
4.00104. I O
4.30105. I O
5.00106. I O
5.30107. I O
6.00108. I O
6.30109. I O
7.00110...I.O
7.30111. I O
8.00112. I O
8.30113. I O
9.00114. I O
9.30115. I O
10.00116. IO
10.30117. IO
11.00118. IO
11.30119. IO
12.00120...IO
12.30121. IO
13.00122. IO
13.30123. IO
14.00124. IO

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .10	RATIO 2 .20	RATIO 3 .30	RATIO 4 .50	RATIO 5 .80	RATIO 6 1.00
HYDROGRAPH AT	1	1.94	1	407.	814.	1221.	2035.	3256.	4070.
		(5.02)		(11.53)	(23.05)	(34.58)	(57.63)	(92.21)	(115.26)
ROUTED TO	2	1.94	1	140.	258.	746.	1725.	3025.	3853.
		(5.02)		(3.96)	(7.31)	(21.12)	(48.85)	(85.65)	(109.11)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	594.00	594.00	596.90
STORAGE	0.	0.	238.
OUTFLOW	130.	130.	280.

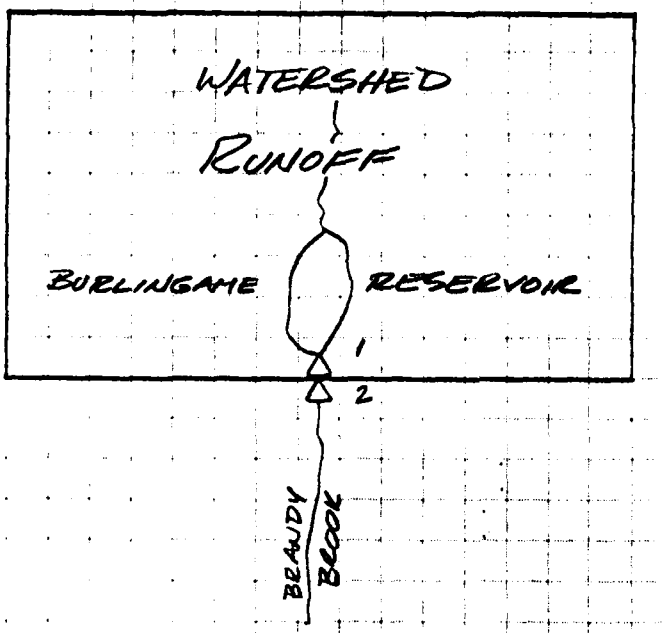
RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	595.10	0.00	82.	140.	0.00	46.00	0.00
.20	596.72	0.00	222.	258.	0.00	46.00	0.00
.30	597.47	.57	293.	746.	6.00	44.50	0.00
.50	598.18	1.28	363.	1725.	8.50	43.50	0.00
.80	598.87	1.97	436.	3025.	10.50	43.00	0.00
1.00	599.27	2.37	478.	3853.	12.00	43.00	0.00

LENARD & DILAJ ENGINEERING, INC.
1066 Storrs Road
STORRS, CONNECTICUT 06268
(203) 429-7308

JOB BURLINGAME RESERVOIR DAM
SHEET NO. 1 OF 9
CALCULATED BY K.A. DATE 1/21/81
CHECKED BY MR DATE 1/26/81
SCALE

80-27-7

SCHEMATIC



1- BURLINGAME RESERVOIR INFLOW
2- " " " ROUTED THROUGH DAM

LENARD & DILAJ ENGINEERING, INC.
1066 Storrs Road
STORRS, CONNECTICUT 06268
(203) 429-7308

JOB BURLINGAME RESERVOIR DAM
SHEET NO 2 OF 9
CALCULATED BY K.A. DATE 1/22/81
CHECKED BY M.R. DATE 1/26/81
SCALE

WATERSHED AREA

CHEPACHET QUAD:

7201
7713
512 grads ⇒ 1.17 S.M.

7713
8222
509 grads ⇒ 1.16 S.M.

8735
9245
510 grads ⇒ 1.16 S.M.

1.16 S.M.

THOMPSON QUAD:

7748
8091
343 grads ⇒ 0.78 S.M.

8442
8782
340 grads ⇒ 0.78 S.M.

9129
9468
339 grads ⇒ 0.77 S.M.

0.78 S.M.

TOTAL 1.94 S.M.

LENARD & DILAJ ENGINEERING, INC.
1066 Storrs Road
STORRS, CONNECTICUT 06268
(203) 429-7308

JOB BURLINGAME RESERVOIR DAM
SHEET NO. 3 OF 9
CALCULATED BY K.A. DATE 1/22/81
CHECKED BY M.R. DATE 1/26/81
SCALE

RESERVOIR SURFACE AREAS

ELEV. 594 (PRIMARY SPILLWAY FOR LOW LEVEL OUTLET)

44 grads
47 "
49 " } ⇒ 47 grads

69 Ac.

ELEV. 600

75 grads
76 "
77 " } ⇒ 76 grads

111 Ac.

ELEV. 610

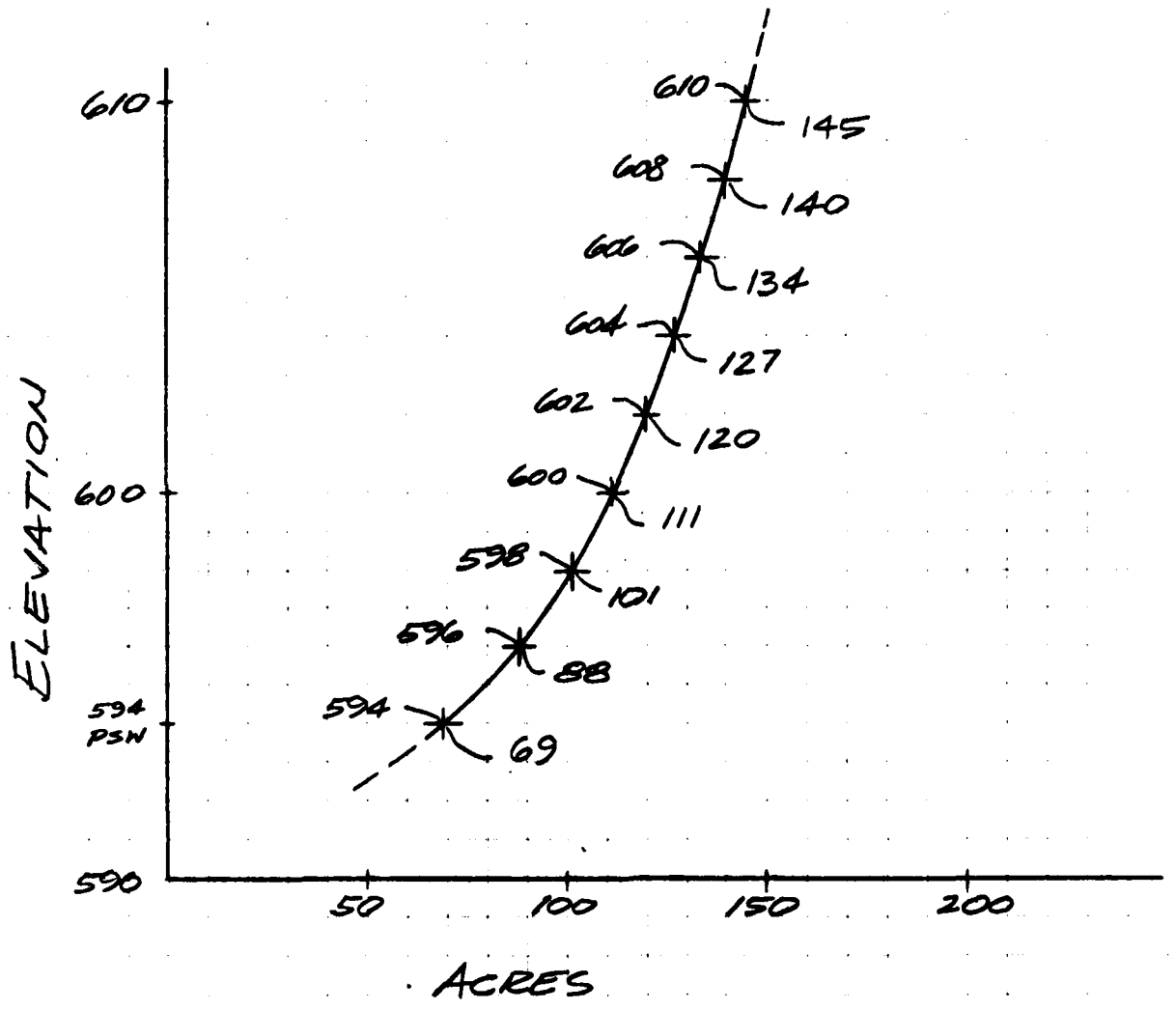
97 grads
99 "
100 " } ⇒ 99 grads

145 Ac.

LENARD & DILAJ ENGINEERING, INC.
1066 Storrs Road
STORRS, CONNECTICUT 06268
(203) 429-7308

JOB BURLINGAME RESERVOIR DAM
SHEET NO. 4 OF 9
CALCULATED BY K. A. DATE 1/22/81
CHECKED BY M. R. DATE 1/26/81
SCALE

RESERVOIR SURFACE AREAS (CONT.)



NOTE: STORAGE BELOW PRIMARY SPILLWAY (LOW LEVEL OUTLET STRUCTURE) IS APPROX. 240 AC.-FT.

LENARD & DILAJ ENGINEERING, INC.
1066 Storrs Road
STORRS, CONNECTICUT 06268
(203) 429-7308

JOB BURLINGAME RESERVOIR DAM
SHEET NO 5 OF 9
CALCULATED BY K. A. DATE 1/22/81
CHECKED BY M. R. DATE 1/26/81
SCALE

PRECIPITATION

U.S. WEATHER BUREAU
TECH. PAPER NO. 40

PMF - 6 HOUR — 24.8 INCHES

LAG TIME (SNYDER'S)

$$t_p = C_t (L L_{CA})^{0.3}$$

$C_t = 2.0$

$L = 14,150' = 2.68$ MI.

$L_{CA} = 4900' = 0.93$ MI.

$$t_p = 2.0[(2.68)(0.93)]^{0.3}$$

$t_p = 2.63$ HRS.

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JOB BURLINGAME RESERVOIR DAM
SHEET NO 6 OF 9
CALCULATED BY K.A. DATE 1/23/81
CHECKED BY M.R DATE 1/26/81
SCALE

LOW LEVEL OUTLET

CONTROL: BOX CULVERT 3'H × 2.5'W

$$Q = A\sqrt{\frac{2gH}{K}}$$

$A = bh = (3)(2.5) = 7.5\ FT^2$
$g = 32.2\ FT/S^2$
$K = 1.6$

DISCHARGE:

ELEV.	A	g	K	H	Q (CFS)
594.0	7.5	32.2	1.6	6.0	117
595.0				7.0	126
595.8				7.8	133
596.0				8.0	135
596.9				8.9	142
598.0				10.0	150
600.0				12.0	165
602.0				14.0	178
604.0				16.0	190
606.0				18.0	202
608.0	7.5	32.2	1.6	20.0	213
DESIGN STORM (1/2PMF)					
598.2	7.5	32.2	1.6	10.2	152

NOTE: INVERT ELEV. = 586.5'
CENTER LINE ELEV. = 588.0'

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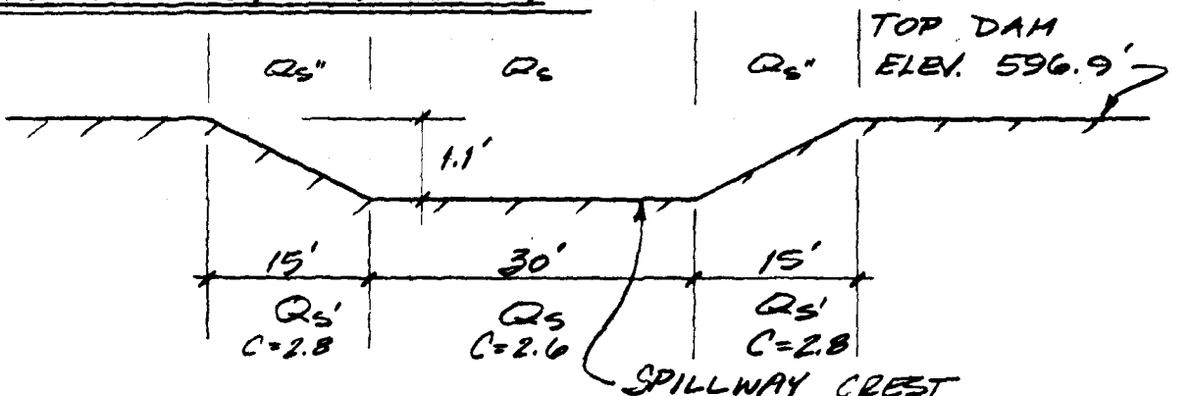
JOB BURLINGAME LAKE DAM
SHEET NO. 7 OF 9
CALCULATED BY K. A. DATE 1/23/81
CHECKED BY M. R. DATE 1/26/81
SCALE

EMERGENCY SPILLWAY



$Q_s = CLH^{1.5}$
$Q_s' = CL(H/2)^{1.5} + H^2$ $(H \leq 1.1)$
$Q_s'' = CL(H-1.1)^{1.5}$ $(H > 1.1)$

DISCHARGE:

ELEV.	Q_s	Q_s'	Q_s''	Q_{TOTAL} (CFS)
595.8	0	0	0	0
596.9	90	37	0	127
598.0	255	37	97	389
600.0	671	37	458	1166
602.0	1204	37	967	2208
604.0	1832	37	1589	3458
606.0	2541	37	2306	4884
608.0	3324	37	3106	6467
DESIGN STORM (½ PMF)				
598.2	290	37	125	462

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JOB BURLINGAME — [illegible] DAM
SHEET NO 8 OF 9
CALCULATED BY K.A. DATE 1/23/81
CHECKED BY MR DATE 1/30/81
SCALE

DISCHARGE SUMMARY

ELEV.	Q SPILLWAY	Q CULVERT	Q TOTAL
594.0	0	117	117
595.0	0	126	126
595.8	0	133	133
596.9	127	142	269
598.0	389	150	539
600.0	1166	165	1331
602.0	2208	178	2386
604.0	3458	190	3648
606.0	4884	202	5086
608.0	6467	213	6680
DESIGN STORM (1/2 PMF)			
598.2	452	152	604

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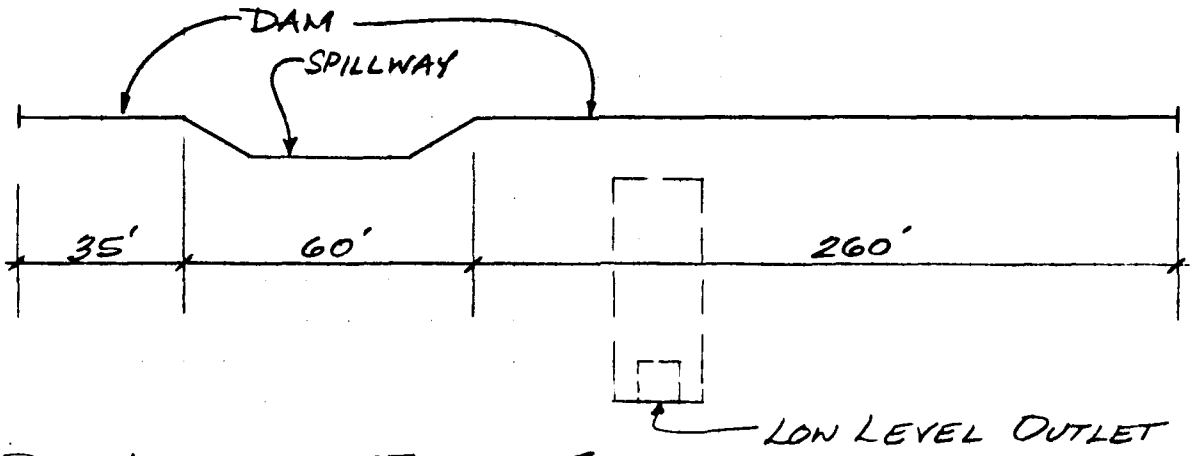
JOB BURLINGAME K[illegible] RESERVOIR DAM
SHEET NO 9 OF 9
CALCULATED BY K. A. DATE 1/23/81
CHECKED BY M. E. DATE 1/26/81
SCALE

DAM LENGTH



DAM LENGTH = TOTAL − SPILLWAY

$L = 35' + 260'$

$L = 295'$

DISCHARGE COEFFICIENT OVER DAM

$C = 2.6$

ELEVATIONS

TOP DAM: 596.9'
TOP OUTLET STRUCTURE: 595.5'
TOP CONTROLLING FLASHBOARD: 594.0'
EMERGENCY SPILLWAY CREST: 595.8'
INVERT OF BOX CULVERT OUTLET: 586.5'

HEIGHT DAM: 10.4'

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JOB BOELINGAME L. ELDER DAM
SHEET NO 1 OF 11
CALCULATED BY Mek DATE 1/15/81
CHECKED BY K.A. DATE 2/4/81
SCALE

DAM FAILURE ANALYSIS

S = STORAGE AT TIME OF FAILURE

= STORAGE AT SPILLWAY + FREEBOARD STORAGE

= (3.5)(69 ac) + 238

= 242 + 238

S = 480 ac.ft.

Q_{p1} = PEAK OUTFLOW AT TIME OF FAILURE

$= 8/27\ W_b \sqrt{g}\ y_o^{3/2}$

W_b = 40% OF DAM LENGTH AT MIN. HEIGHT
= (.40)(266 ft)
= 106.4 ft.

y_o = TOTAL HEIGHT FROM RIVER BED TO POOL LEVEL AT TIME OF FAILURE
= 10.4'

g = 32.2 ft/sec²

$Q_{p1} = 8/27\ (106.4)(\sqrt{32.2})(10.4)^{3/2}$

Q_{p1} = 6000 cfs

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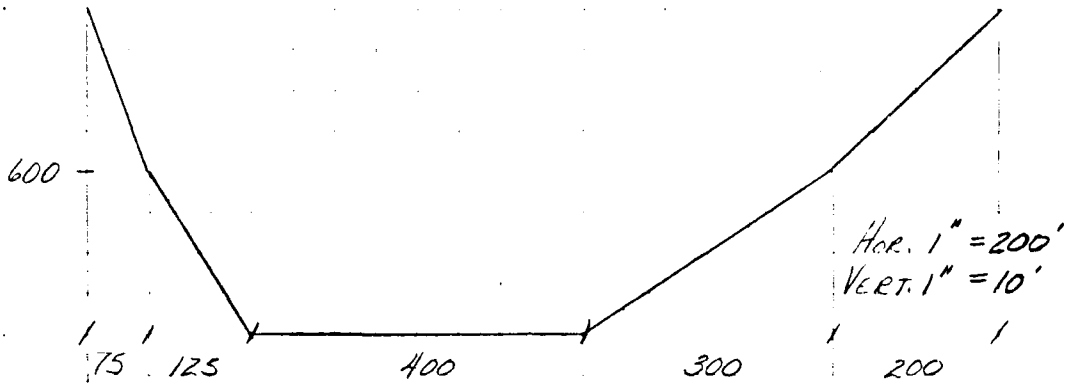
JOB BURLINGHALE L. KUOIR DAM
SHEET NO 2 OF 11
CALCULATED BY Mek DATE 1/14/81
CHECKED BY K.A. DATE 2/4/81
SCALE

SECTION 1



H	A	WP	R	V	Q
1	421	442	1.0	2.9	1,214
2	884	485	1.8	4.4	3,939
3	1390	528	2.6	5.7	7,923
4	1938	570	3.4	6.8	13,112
5	2531	613	4.1	7.7	19,504
6	3165	655	4.8	8.6	27,099

$S = .01$
$n = .050$
$L = 375'$

$R = A/WP$

$V = \frac{1.49\, R^{2/3} S^{1/2}}{n}$

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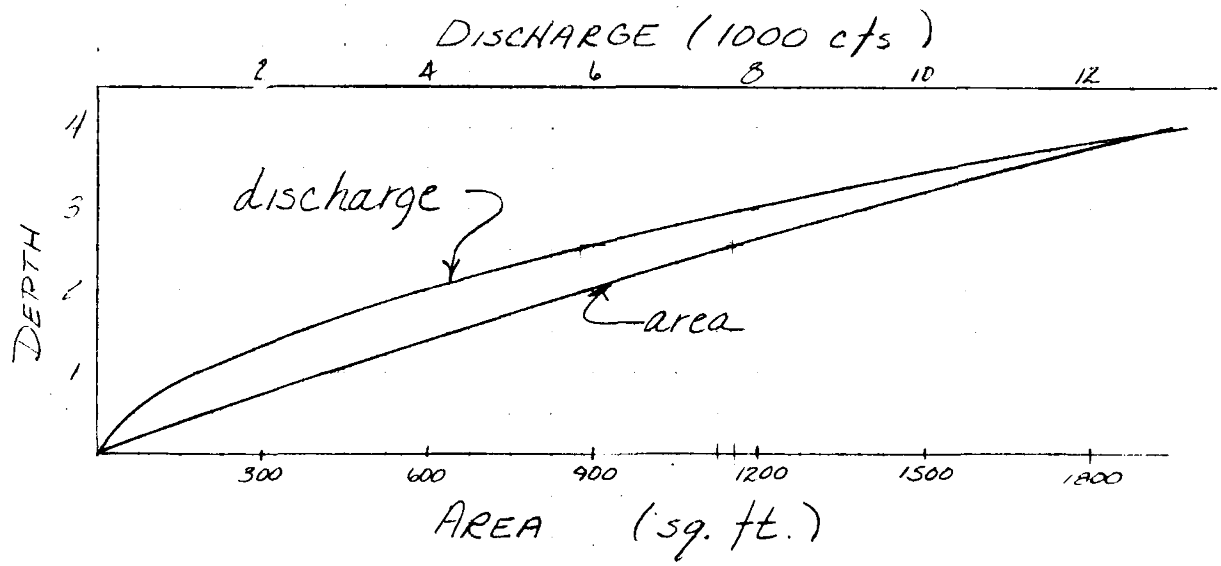
JOB Burlingame Reservoir Dam
SHEET NO 3 OF 11
CALCULATED BY Mek DATE 1/14/81
CHECKED BY K.A. DATE 2/4/81
SCALE

Section 1



Q_{p1} = 6000 cfs

H_1 = 2.60 ft.

A_1 = 1160 sq ft.

V_1 = 10.0 ac. ft

Q_{p2} (TRIAL) = 5875 cfs

H (TRIAL) = 2.5 ft

A (TRIAL) = 1125 sq. ft

V (TRIAL) = 9.7 ac ft

Q_{p2} - 5877 cfs

H_2 - 2.5 ft

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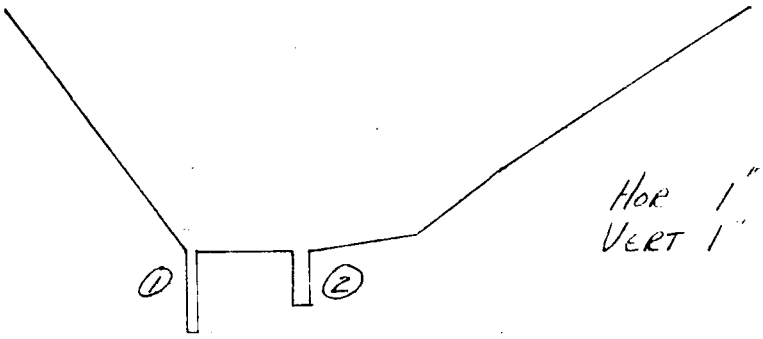
JOB Burlington [illegible]
SHEET NO 4 OF
CALCULATED BY Wen DATE 1/11/91
CHECKED BY K.A. DATE 2/4/91
SCALE

SECTION 2 STATION 6+75



H_1	$Q_1 = C_1 L_1 H_1^{1.5}$	where:
1	23	$C = 2.3$
2	65	$L = 10$
3	120	
4	184	
5	257	

H_2	$Q_2 = C_2 L_2 H^{1.5}$	where:
-		$C = 2.3$
-		$L = 20$
1	46	
2	130	
3	239	

	A	WP	R	V	Q_3
6	220	281	.8	3.2	696
7	528	326	1.6	5.1	2717
8	873	381	2.3	6.5	5668

	Q_1	Q_2	Q_3	ΣQ
1	23	-	-	23
2	65	-	-	65
3	120	46	-	166
4	184	130	-	314
5	257	239	-	496
6	257	239	696	1192
7	257	239	2717	3213
8	257	239	5668	6164

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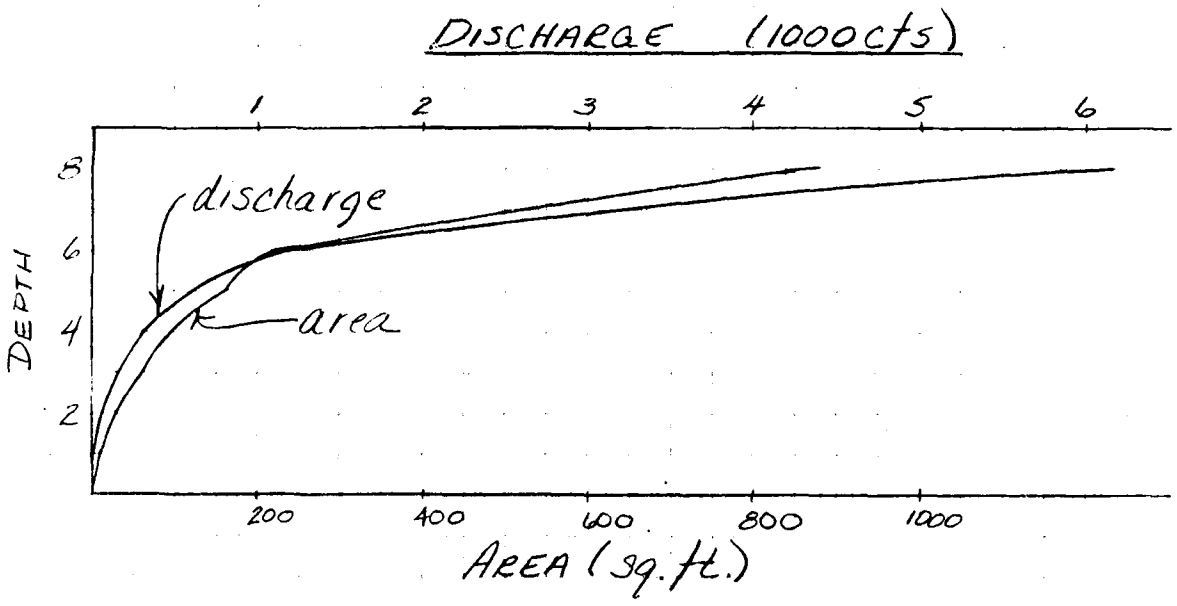
JOB BURLINGAME L. ROCK DAM
SHEET NO 5 OF 11
CALCULATED BY MEK DATE 1/15/81
CHECKED BY K. A. DATE 2/4/81
SCALE

SECTION 2



Q_{p_2} = 5877 cfs — Q_{p_2} (TRIAL) = 5803

H_1 = 8.0 ft — H (TRIAL) = 7.9 ft

A_1 = 870 sq ft. — A (TRIAL) = 840 sq ft

V_1 = 6.0 ac. ft. — V (TRIAL) = 5.8 ac ft

Q_{p_3} = 5805 cfs

H_3 = 7.9 ft *

*NOTE: This is from the lowest point in channel from top dam H_3 is 2.9 ft.

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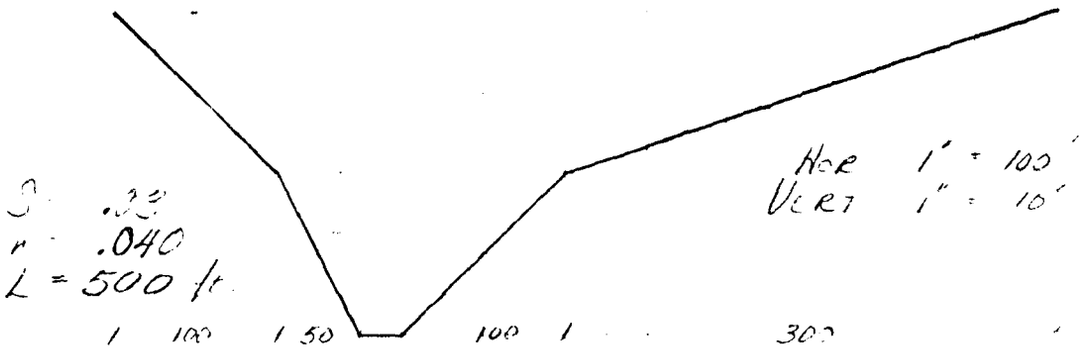
JOB PORTWOOD I ... Ct.
SHEET NO 6 OF ...
CALCULATED BY NLL DATE 1/25/91
CHECKED BY K. A. DATE 2/4/91
SCALE ...

SECTION 3 STATION 11+75



H	A	WP	R	V	Q
1	32	40	.8	5.8	181
2	80	55	1.5	8.1	(94)
3	142	70	2.0	10.2	1448
4	220	86	2.6	12.2	2684
5	312	101	3.1	13.7	4281
6	420	116	3.6	15.2	6384

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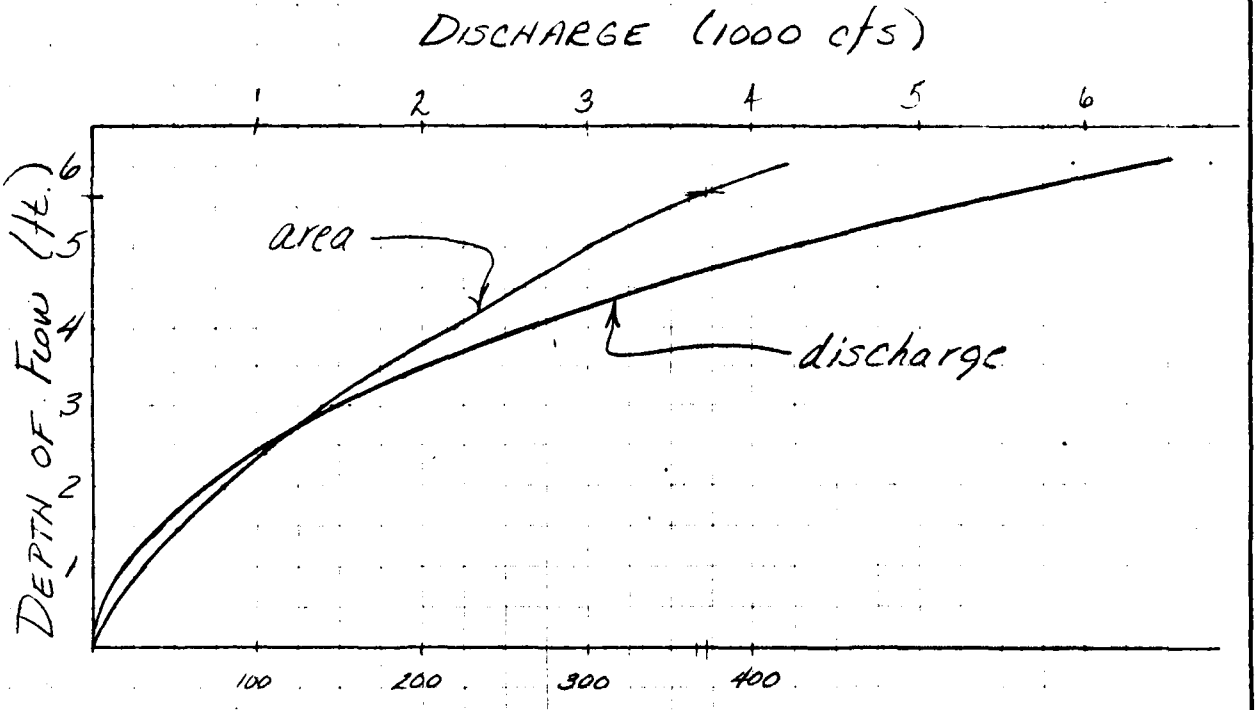
JOB BULLYGAME I - CREDIT DAM
SHEET NO 7 OF 17
CALCULATED BY MEK DATE 1/15/81
CHECKED BY K.A. DATE 2/4/81
SCALE

SECTION 3



Qp_3 = 5805 cfs — Qp_4 (TRIAL) 5752

H_3 = 5.8 ft — H (TRIAL) 5.7 ft

A_3 = 381 sq ft — A (TRIAL) 375 sq ft

V_3 = 4.4 ac.ft. — V (TRIAL) 4.3 ac ft

Qp_4 = 5752 cfs

H_4 = 5.7 ft.

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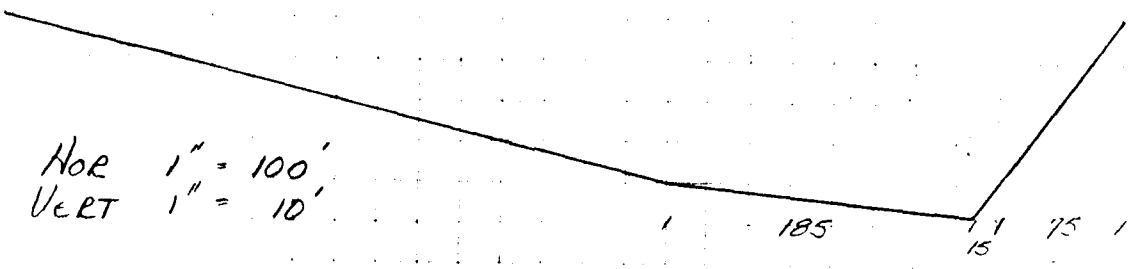
JOB BURLINGAME RESERVOIR DAM
SHEET NO. 8 OF 17
CALCULATED BY Mek DATE 1/15/81
CHECKED BY K.A. DATE 2/4/81
SCALE

SECTION 4 — STATION 21+75



H	A	WP	R	V	Q
1	50	100	0.5	2.1	104
2	200	200	1.0	3.3	662
3	424	248	1.7	4.7	2011
4	695	295	2.3	5.9	4086
5	1014	343	3.0	6.8	6911

L = 1000 ft
S = .01
n = 0.045

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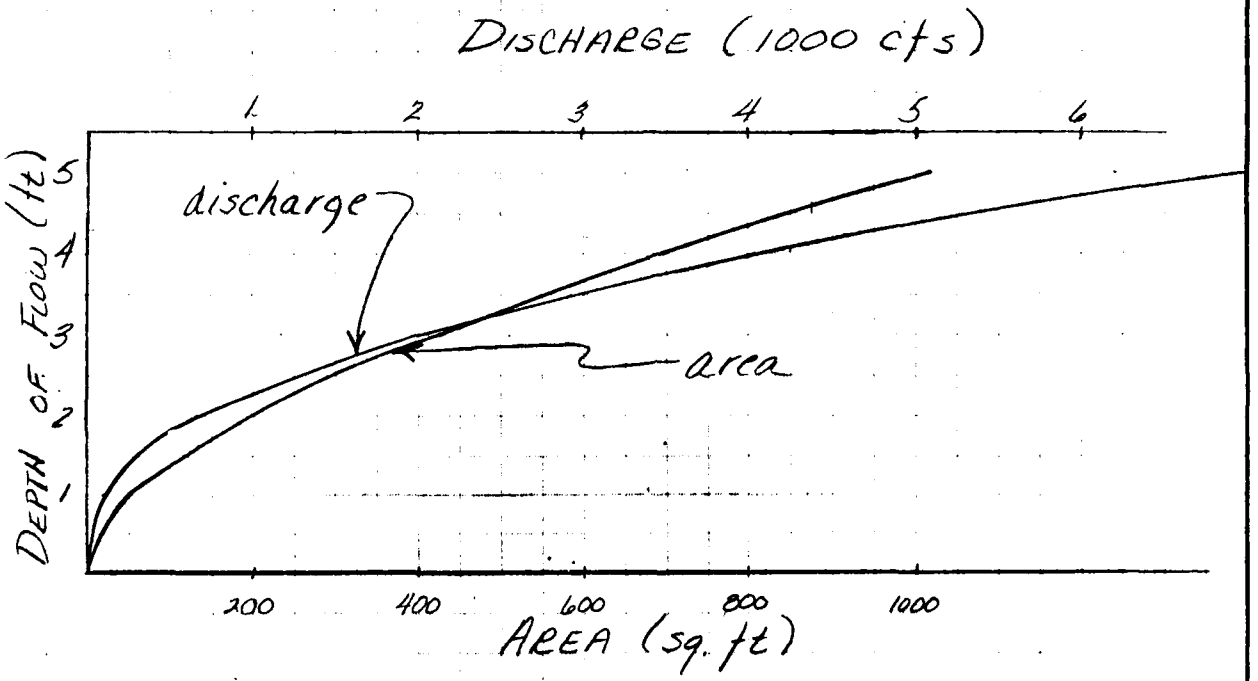
JOB BURLINGAME RESERVOIR DAM 7
SHEET NO. 9 OF 11
CALCULATED BY MeA DATE 1/15/81
CHECKED BY K.A. DATE 2/4/81
SCALE

SECTION 4



Q_{p4} = 5752 cfs Q_{p5} (TRIAL) = 5512 cfs

H_4 = 4.6 ft H (TRIAL) = 4.5 ft

A_4 = 872 sq. ft A (TRIAL) = 850 sq. ft

V_4 = 20.0 ac. ft V (TRIAL) = 19.5 ac ft

Q_{p5} = 5515 cfs

H_5 = 4.6 ft.

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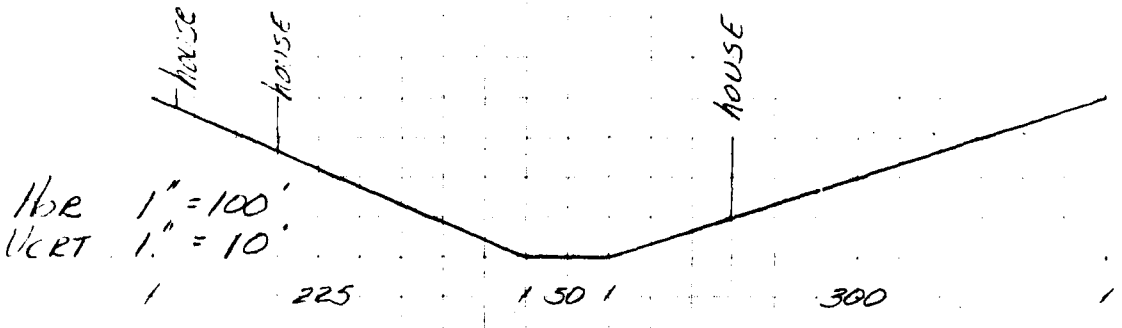
JOB BURLINGAME RESERVOIR DAM
SHEET NO. 10 OF 17
CALCULATED BY MeL DATE 1/15/81
CHECKED BY K.A. DATE 2/4/81
SCALE

SECTION 5 STATION 33+75



H	A	WP	R	V	Q
1	116	102	0.7	2.4	186
2	205	155	1.3	3.5	737
3	386	208	1.8	4.5	1740
4	620	260	2.4	5.3	3307
5	906	313	2.9	6.1	5503
6	1245	365	3.4	6.7	8111

$L = 1200'$
$S = .01$
$n = 0.050$

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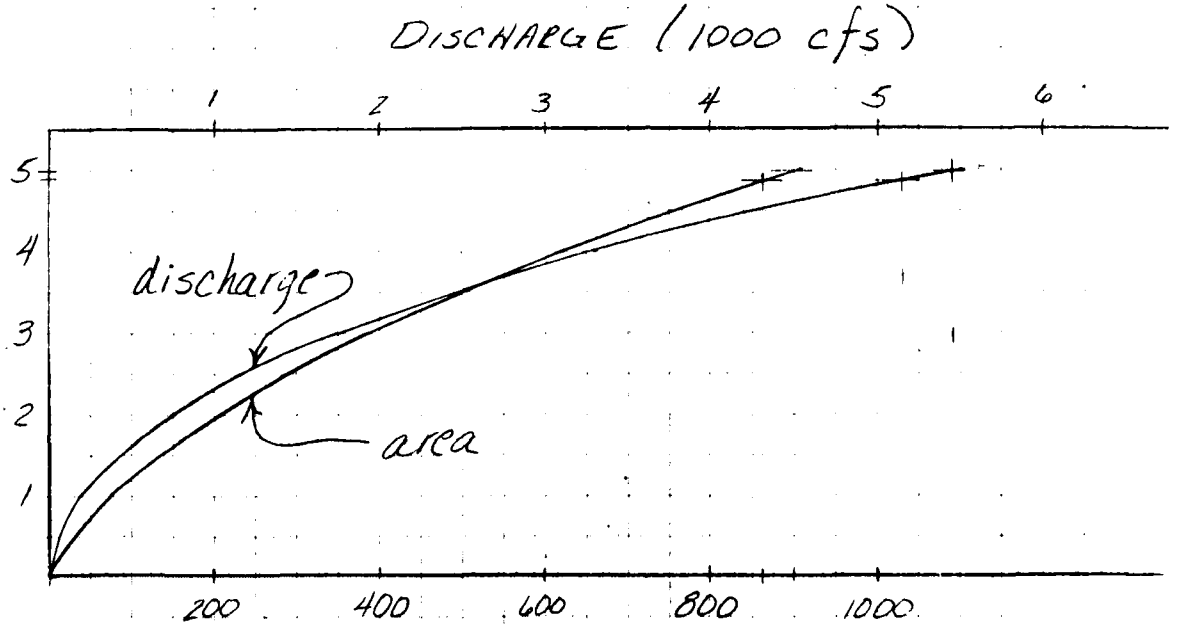
JOB BURLINGAME RESERVOIR Dam
SHEET NO 11 OF 1
CALCULATED BY MCL DATE 1/15/81
CHECKED BY K. A. DATE 2/4/81
SCALE

SECTION 5



Q_{p_5} = 5515 cfs — Q_{p_6} (TRIAL) = 5230 cfs

H_5 = 5.0 ft — H (TRIAL) = 4.9

A_5 = 900 sq. ft — A (TRIAL) = 865

V_5 = 24.8 ac. ft. — V (TRIAL) = 23.8 ac ft

Q_{p_6} = 5236 cfs

H_6 = 4.9 ft

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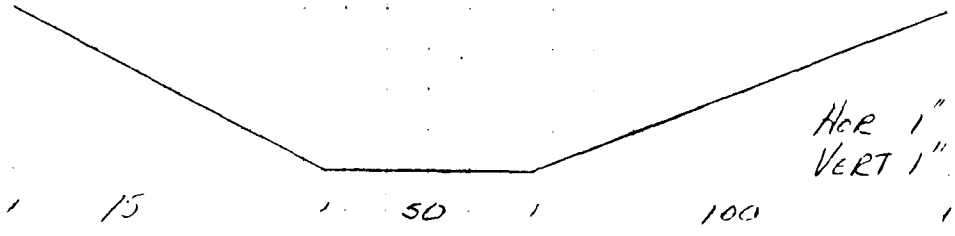
JOB BURLINGAME RESERVOIR DAM
SHEET NO. 12 OF 17
CALCULATED BY MEK DATE 1/15/81
CHECKED BY K. A. DATE 2/5/81
SCALE

SECTION 6 STATION 40+75



H	A	WP	R	V	Q
1	59	68	0.9	3.0	177
2	135	85	1.6	4.4	594
3	229	103	2.2	5.4	1237
4	340	120	2.8	6.4	2176
5	469	138	3.4	7.3	3424
6	615	155	4.0	8.1	4982
7	770	170	4.5	8.7	6699

L = 700'
S = .014
n = 0.055

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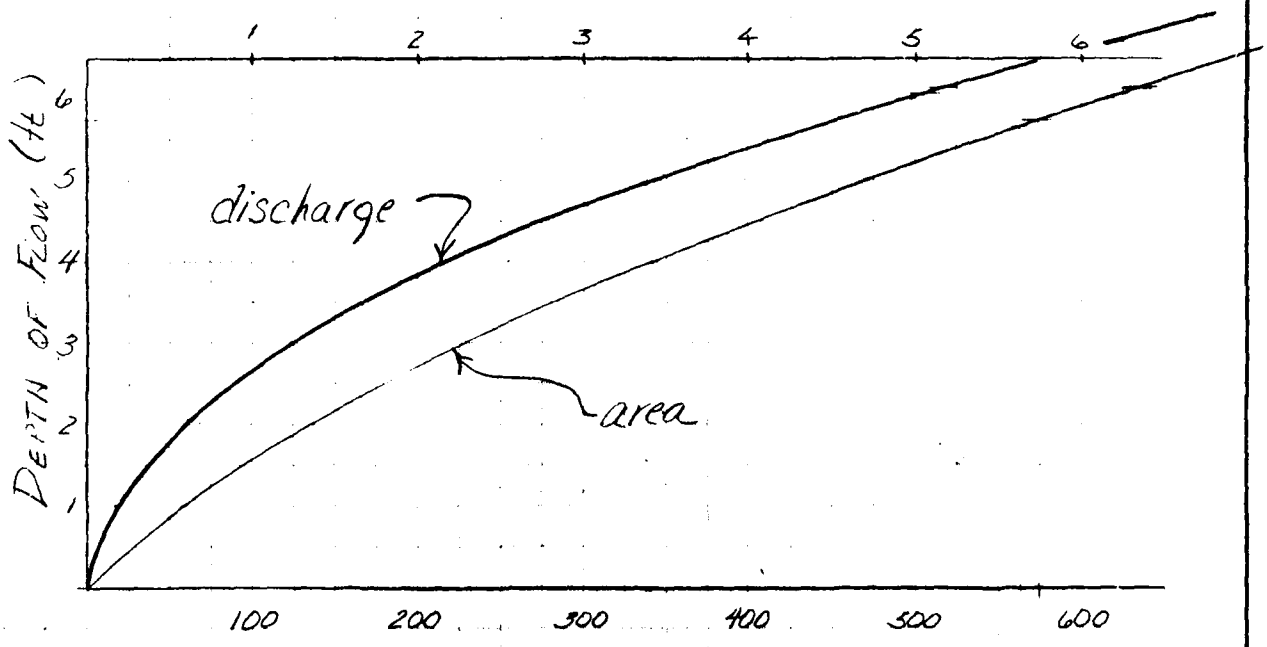
JOB BURLINGAME RESERVOIR DAM
SHEET NO 13 OF 11
CALCULATED BY MEH DATE 1/19/81
CHECKED BY K. A. DATE 2/5/81
SCALE

SECTION 6



Q_{p_6} = 5236 cfs
H_6 = 6.1 ft
A_6 = 635 sq ft
V_6 = 10.2 ac ft

Q_{p_7} = 5125 cfs
H (TRIAL) = 6.0 ft
A (TRIAL) = 625 sq. ft
V (TRIAL) = 10.0 ac. ft.

Q_{p_7} = 5126 cfs
H_7 = 6.0 ft

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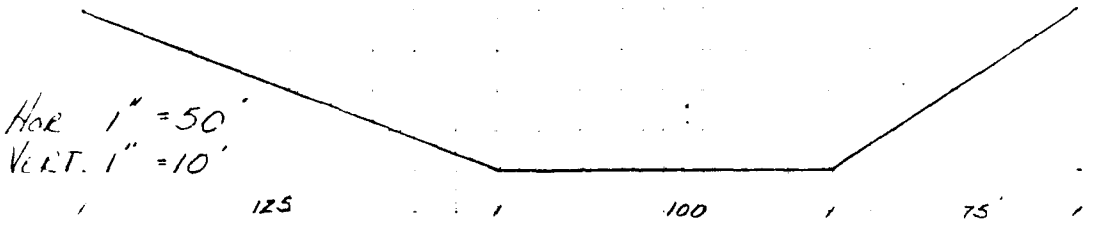
JOB BURLINGAME RESERVOIR DAM
SHEET NO 14 OF 17
CALCULATED BY MEH DATE 1/19/81
CHECKED BY K.A. DATE 2/5/81
SCALE

SECTION 7 STATION 67+75



H	A	WP	R	V	Q
1	110	120	0.9	4.6	506
2	240	140	1.7	7.0	1680
3	390	160	2.4	8.8	3432
4	560	180	3.1	10.5	5880

$L = 2700'$
$S = 0.033$
$n = 0.055$

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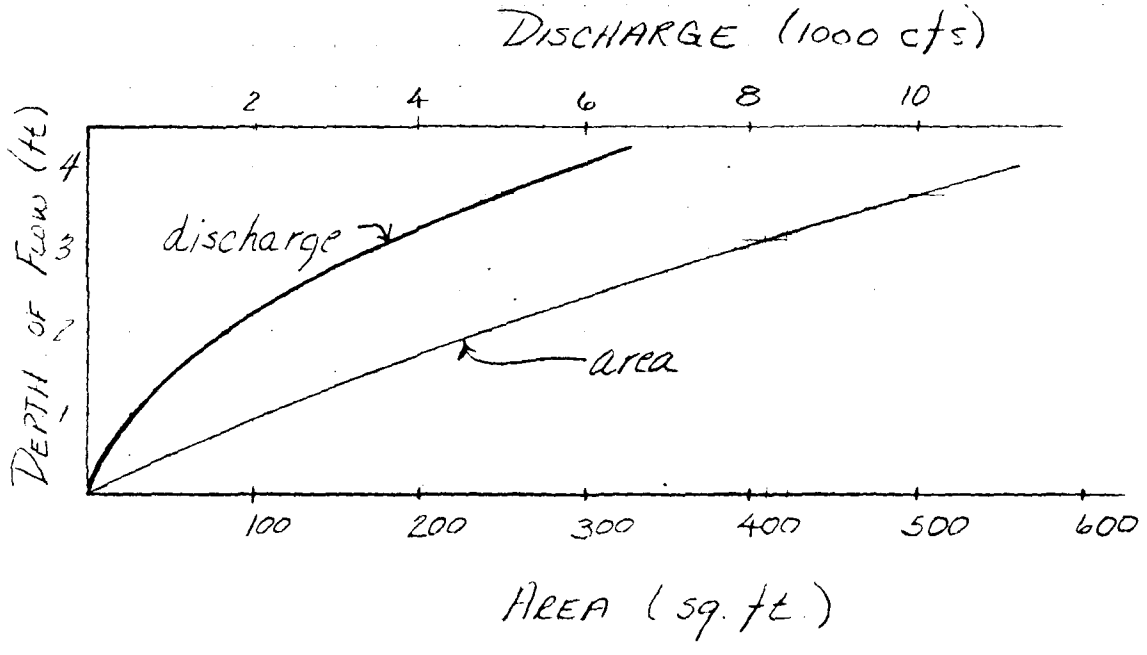
JOB BURLINGAME RESERVOIR DAM
SHEET NO 15 OF 11
CALCULATED BY MEK DATE 1/19/91
CHECKED BY K.A. DATE 2/5/91
SCALE

SECTION 7



Q_{p7} = 5126 cfs
H_7 = 3.7 ft.
A_7 = 500 sq. ft.
V_7 = 31.0 ac ft.

Q_{p8} (TRIAL) = 4795 cfs
H (TRIAL) = 3.6 ft
A (TRIAL) = 475 sq. ft
V (TRIAL) = 29.4 ac ft

Q_{p8} = 4803 cfs
H_8 = 3.6 ft.

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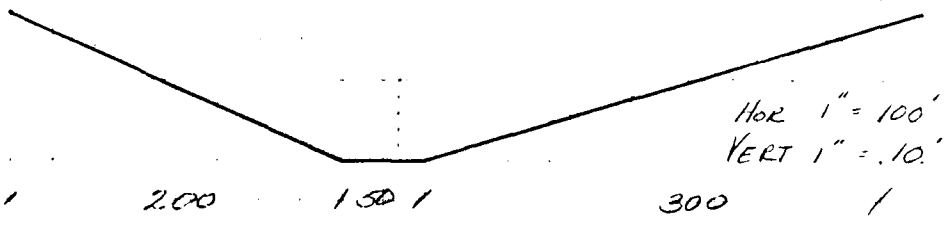
JOB BURLINGAME RESERVOIR DAM
SHEET NO. 16 OF 17
CALCULATED BY MEK DATE 1/19/81
CHECKED BY K.A. DATE 2/5/81
SCALE

SECTION B

STATION 78+75



H	A	WP	R	V	Q
1	75	100	0.8	2.3	173
2	204	154	1.3	3.2	653
3	390	205	1.9	4.1	1599
4	630	265	2.4	4.8	3024
5	925	320	2.9	5.5	5088

L = 1100
S = .0082
n = 0.05

AD-A156 680 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS BURLINGAME RESERVOIR..(U) CORPS OF ENGINEERS WALTHAM MA NEW ENGLAND DIV MAR 81 2/2

UNCLASSIFIED F/G 13/13 NL

END
DATE FILMED
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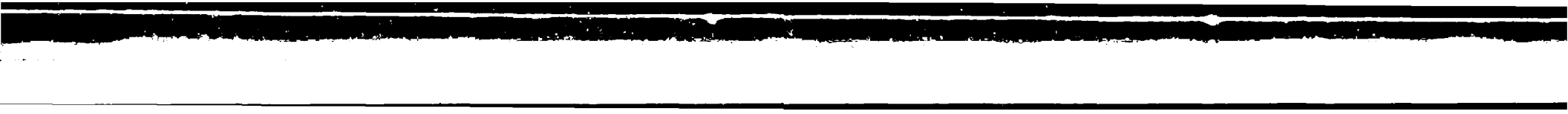

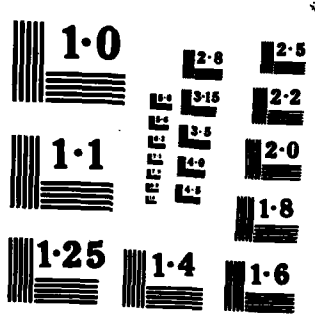
1·0
1·1
1·25
1·4
1·6
1·8
2·0
2·2
2·5
2·8
3·15

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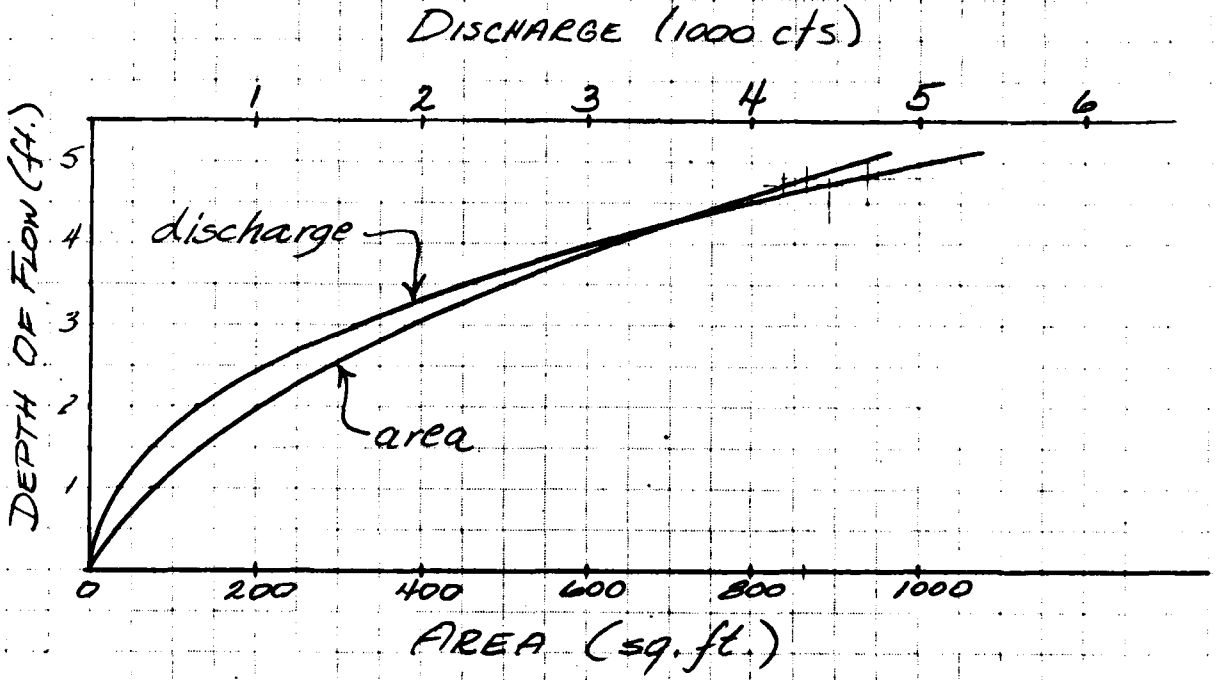
JOB BURLINGAME RESERVOIR DAM
SHEET NO. 17 OF 17
CALCULATED BY MeL DATE 11/19/81
CHECKED BY K.A. DATE 2/5/81
SCALE

SECTION B



Q_{PB} = 4803 cfs Q_{Pg} (TRIAL) = 4585 cfs

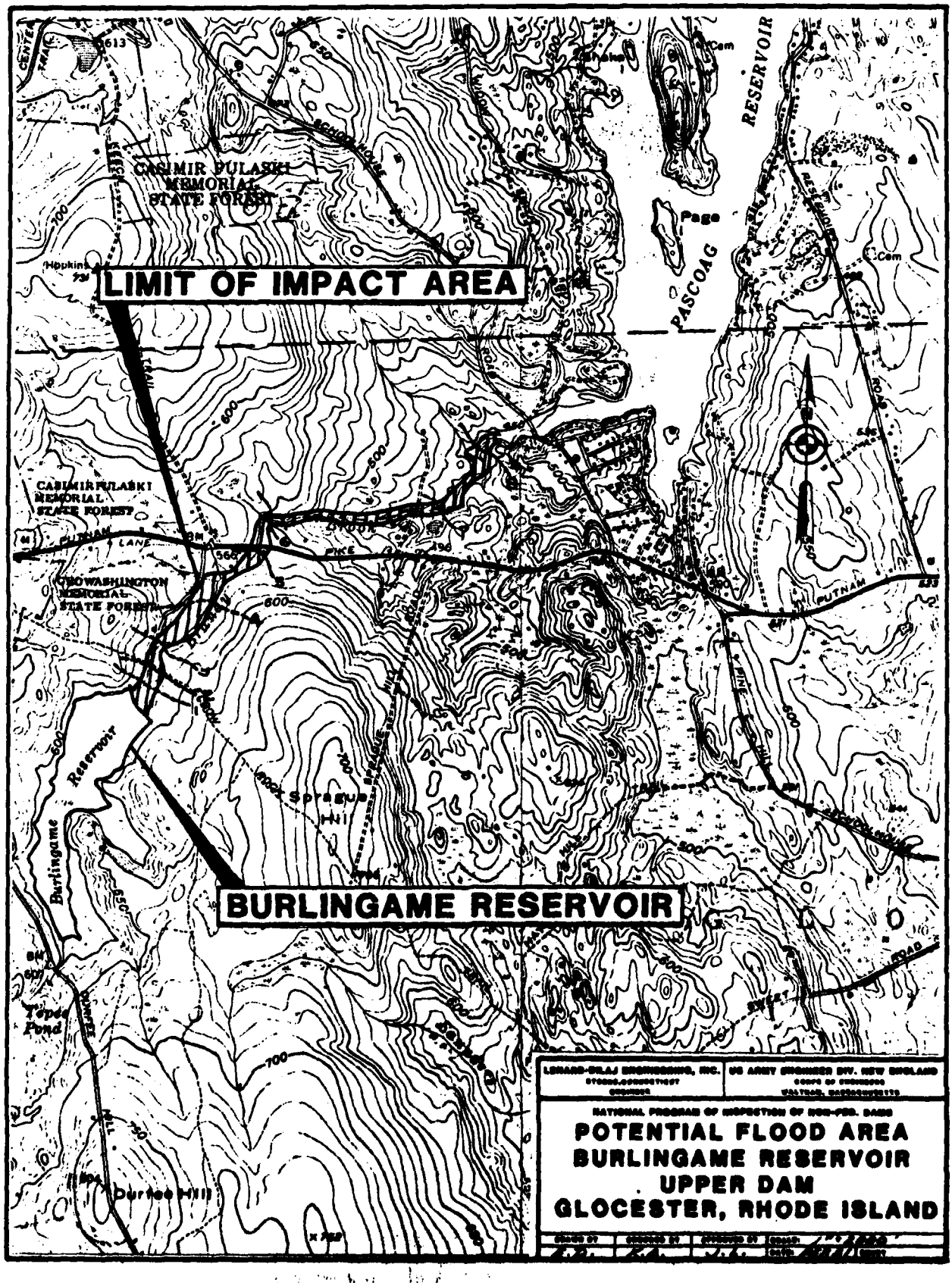
H_B = 4.8 ft. H (TRIAL) = 4.7 ft.

A_B = 865 sq. ft. A (TRIAL) = 840 sq. ft.

V_B = 21.8 ac. ft. V (TRIAL) = 21.2 ac. ft.

Q_{Pg} = 4588 cfs

H_g = 4.7 ft.

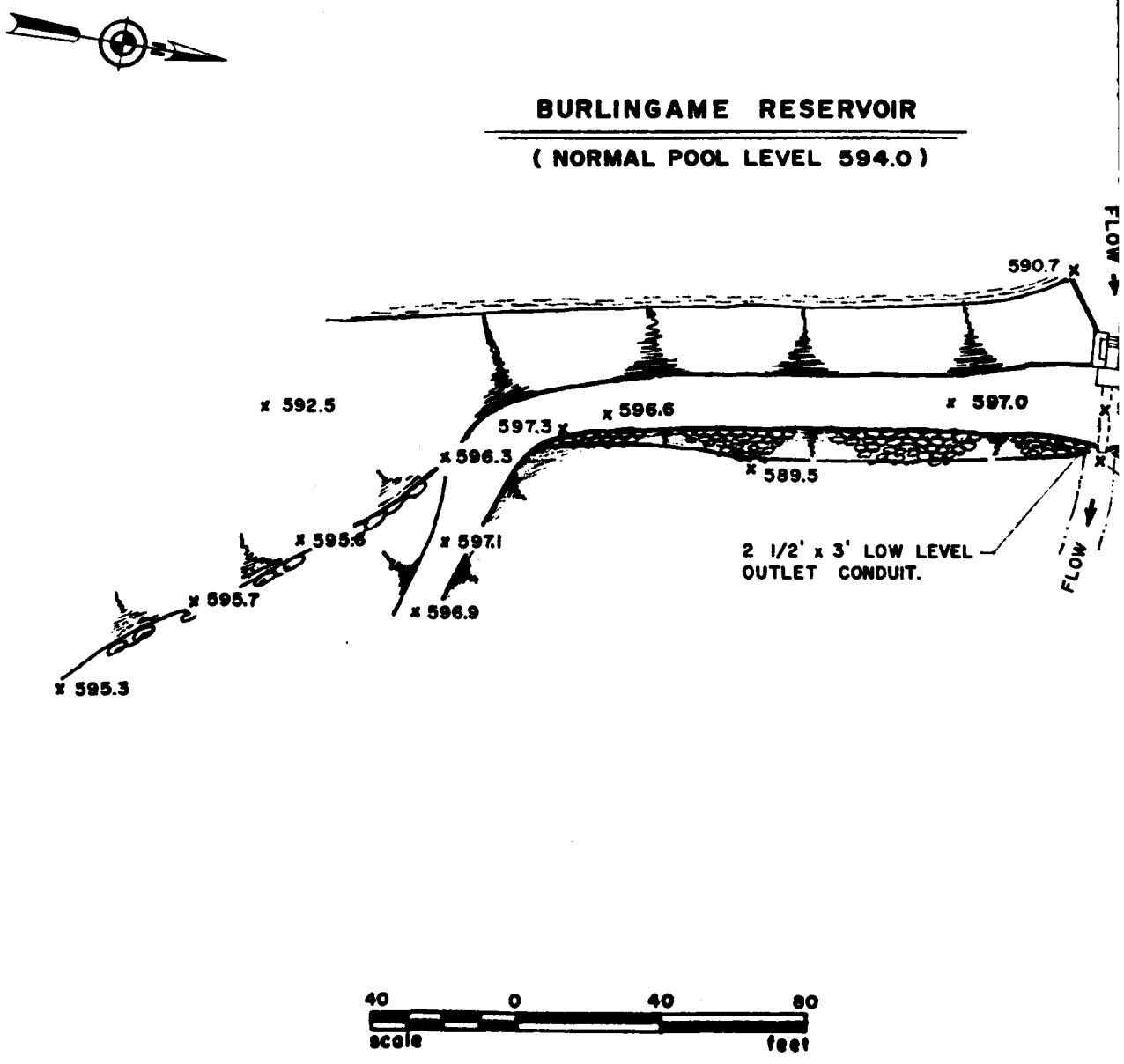

LIMIT OF IMPACT AREA
BURLINGAME RESERVOIR
CASIMIR PULASKI MEMORIAL STATE FOREST
PASCOAG RESERVOIR
Page
Sprague Hill
Burlingame Reservoir
Topde Pond
Burlingame
Burlingame Hill
POTENTIAL FLOOD AREA
BURLINGAME RESERVOIR
UPPER DAM
GLOCESTER, RHODE ISLAND

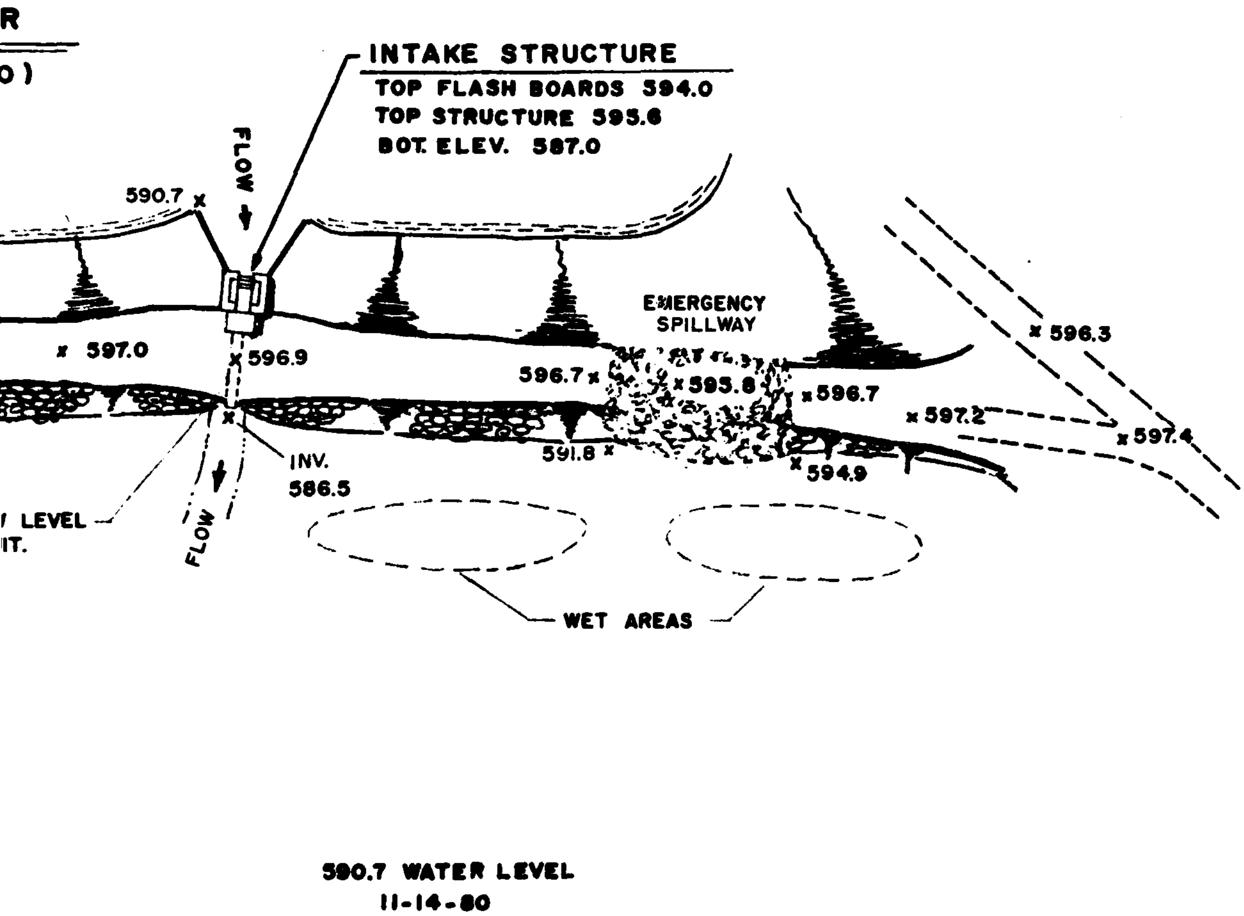
APPENDIX E

INFORMATION AS CONTAINED IN THE

NATIONAL INVENTORY OF DAMS

NOT AVAILABLE AT THIS TIME


BURLINGAME RESERVOIR
(NORMAL POOL LEVEL 594.0)
590.7
FLOW
592.5
596.6
597.0
597.3
596.3
589.5
595.8
597.1
595.7
596.9
595.3
2 1/2' x 3' LOW LEVEL
OUTLET CONDUIT.
FLOW
40
0
40
80
scale
feet



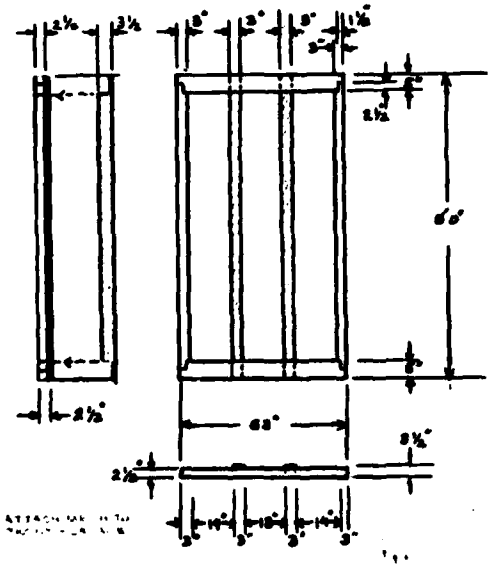
US ARMY ENGINEER DIV. NEW ENGLAND

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

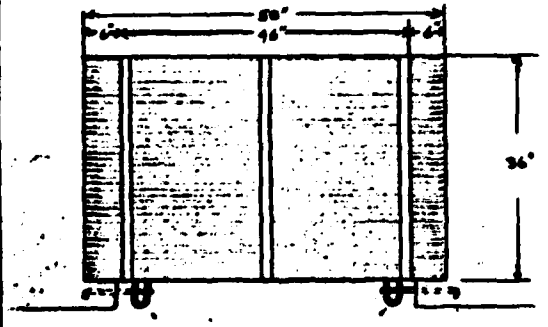
SITE PLAN
BURLINGAME RESERVOIR DAM
GLOCESTER, R.I.

SCALE: 1" = 40'

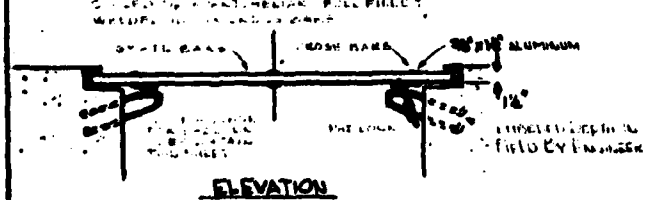
PROVIDED BY OTHERS



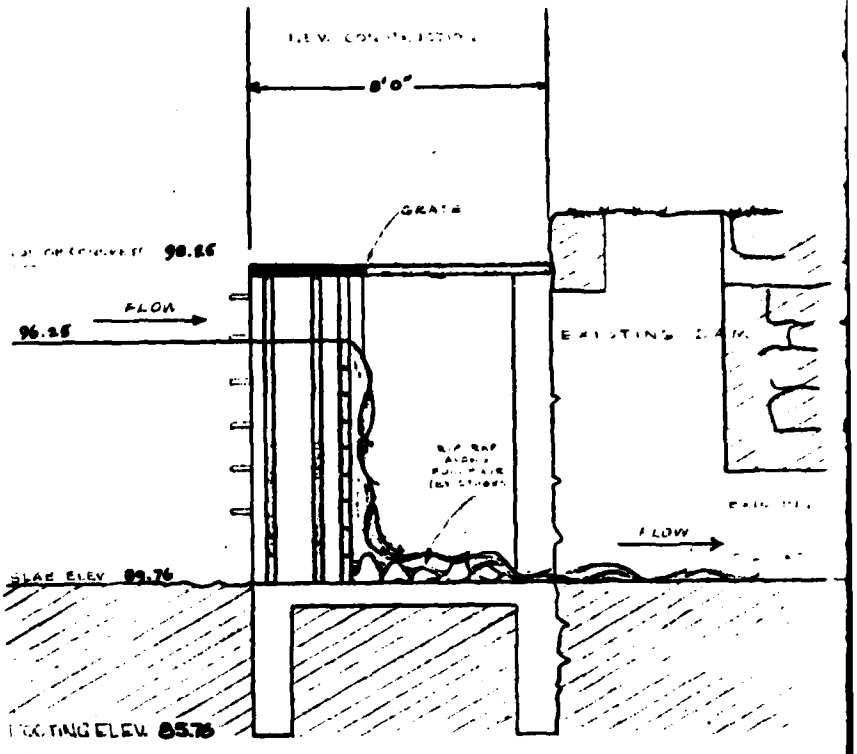
DETAIL TWO SCREENS



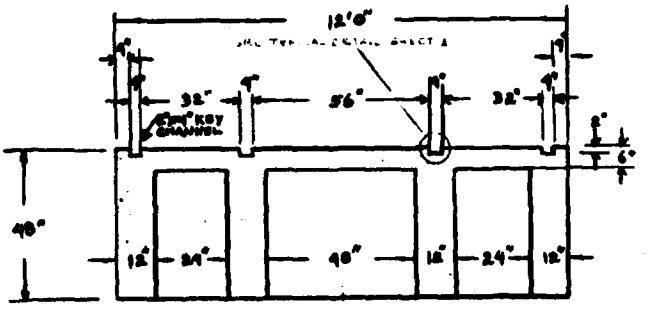
PLAN



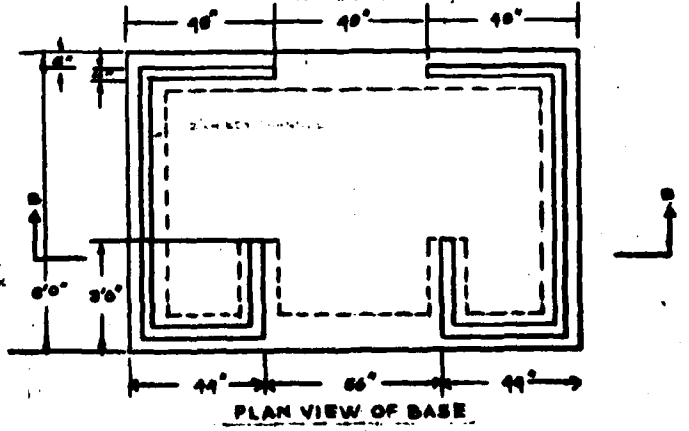
ELEVATION
WELDED ALUMINUM GRATE



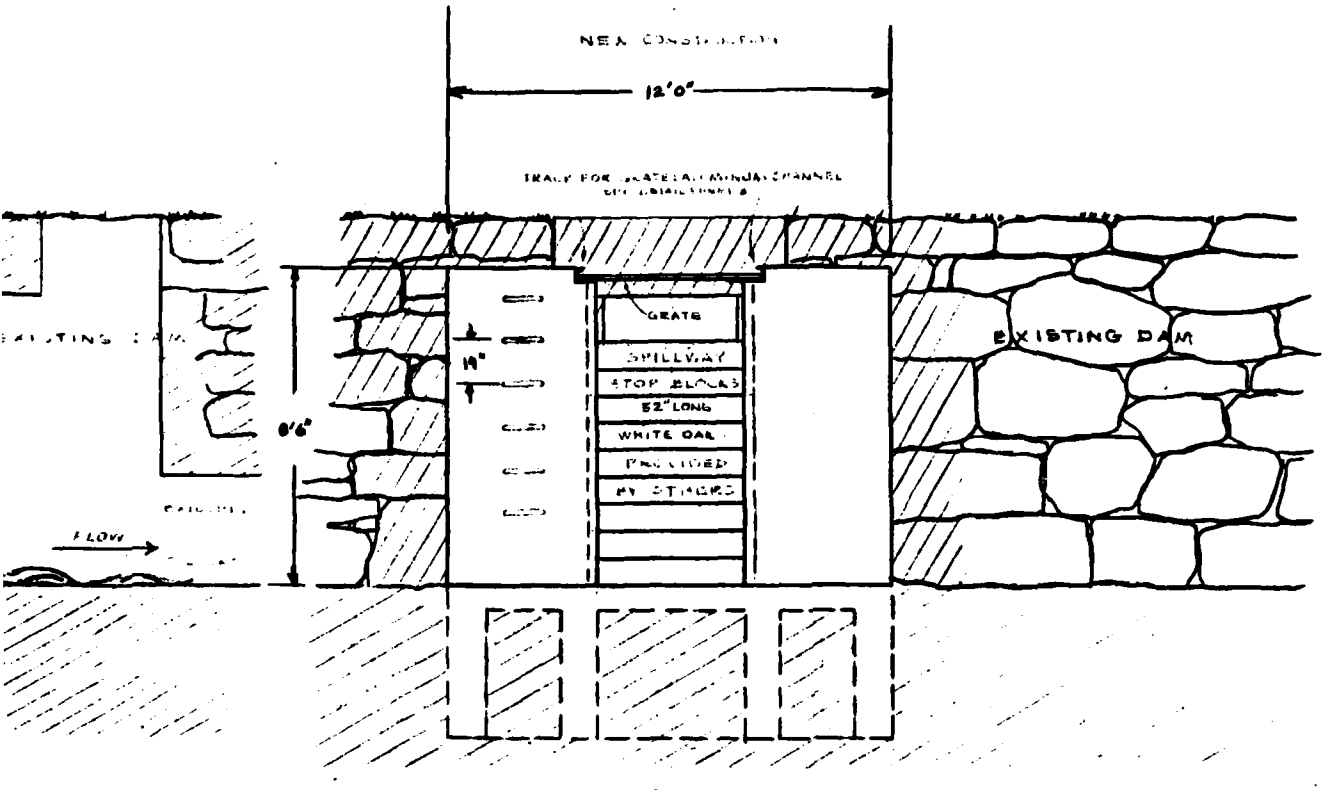
SECTION A-A



ELEVATION — SECTION BB



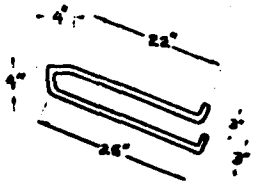
PLAN VIEW OF BASE
MONOLITHIC SLAB FOUNDATION



ELEVATION

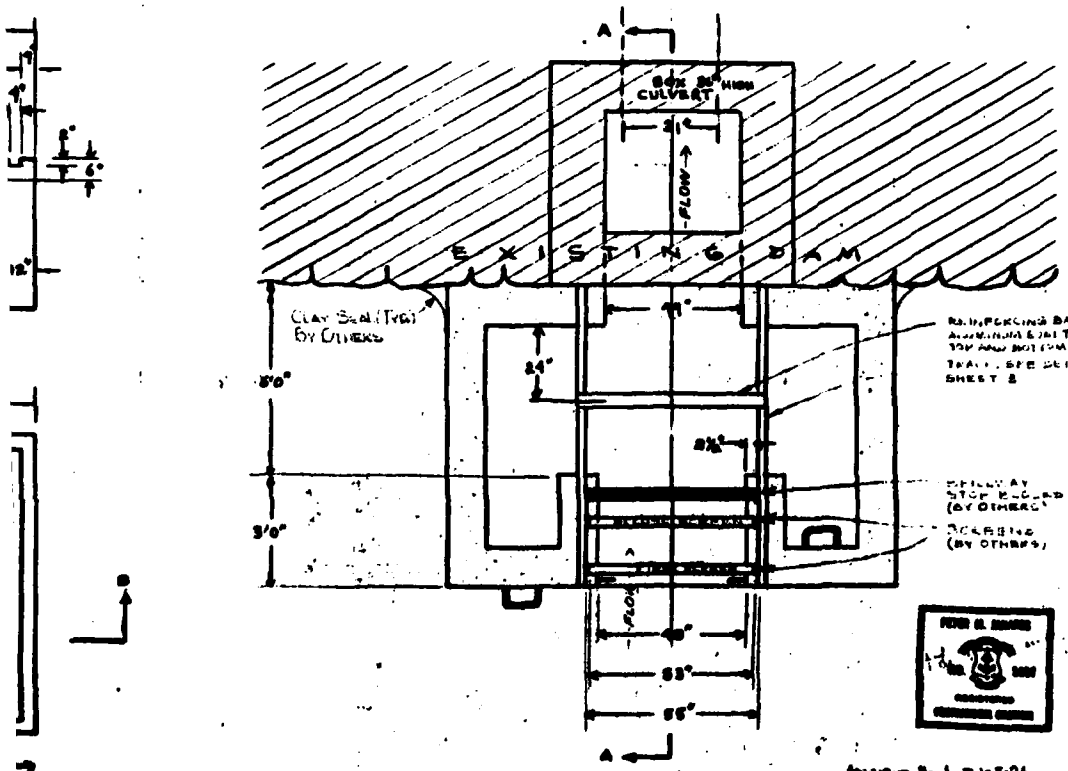
AS SEEN FROM UPSTREAM

SCALE: 1"= 2'



LOCK ANCHOR

½" Φ STAINLESS STEEL



PLAN

SCALE: 1"= 2'

APPROVED BY

APPROVED BY

SUBMITTED BY P.E.

STATE OF

DEPARTMENT OF NATURAL

DIVISION OF

CONTROL SPILLWAY

DUKEE HILL

PLAN AND ELEVATION

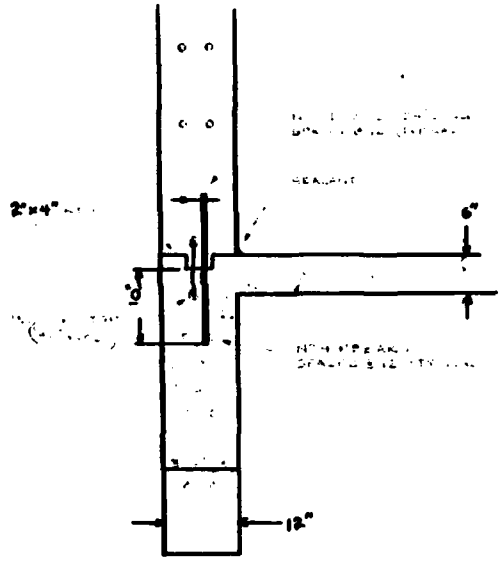
DRAWN BY

CHECKED BY

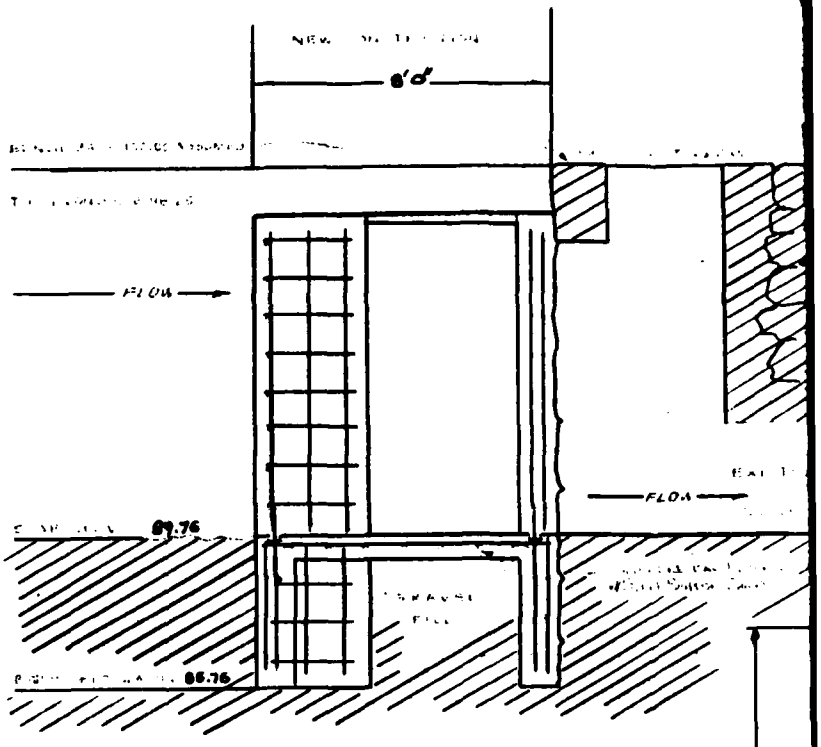
DATE

Addition No. 1 - 1-8-96

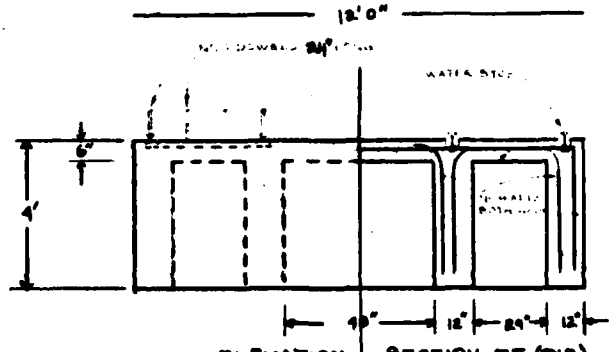
DETAIL OF ALUMINUM STEP



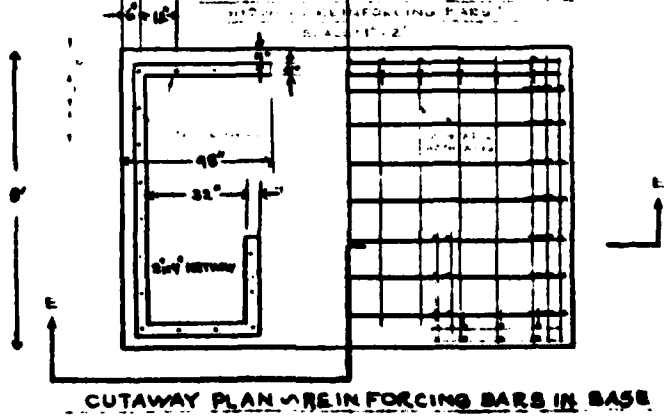
TYPICAL DETAIL OF FLOOR SLAB JOINT



SECTION C-C

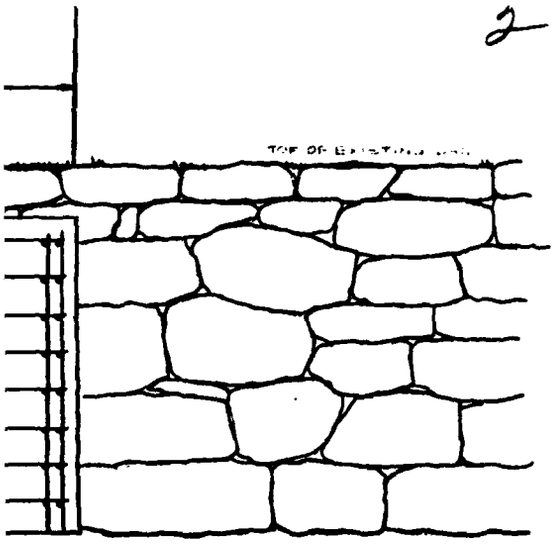


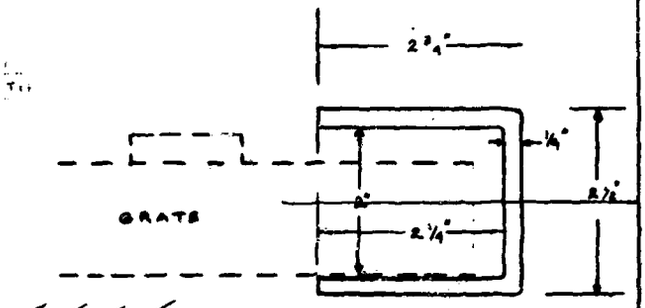
ELEVATION & SECTION E-E (TYP.)



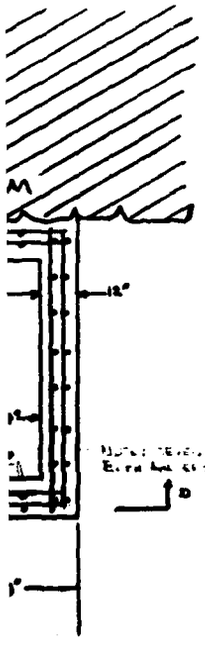
CUTAWAY PLAN OF REINFORCING BARS IN BASE

2





DETAIL



PETER M. JOHNSON
NO. 3327
REGISTERED PROFESSIONAL ENGINEER

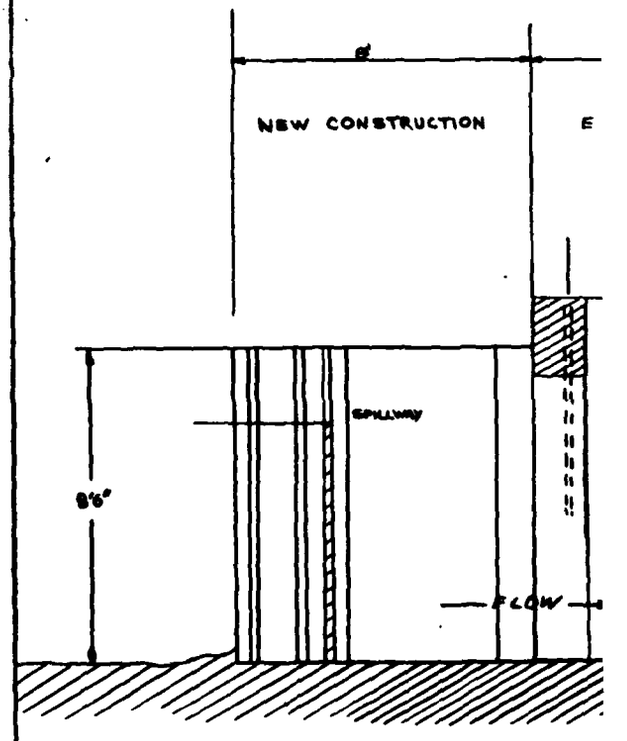
APPROVED BY
DRAWN BY

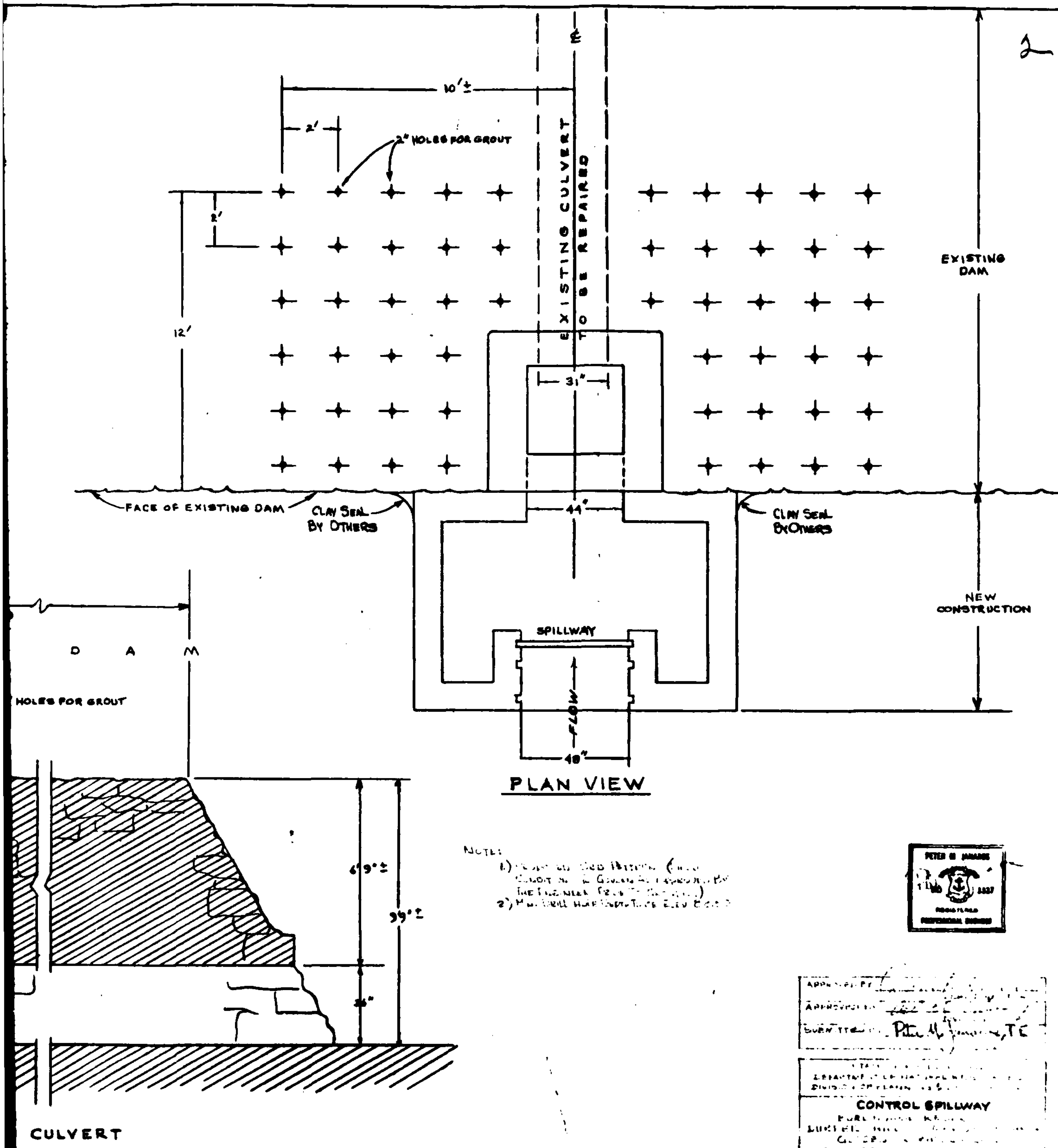
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF PLANNING & ENGINEERING

CONTROL SPILLWAY

DETAILS

Addendum No. 1 - 3-5-76





PLAN VIEW

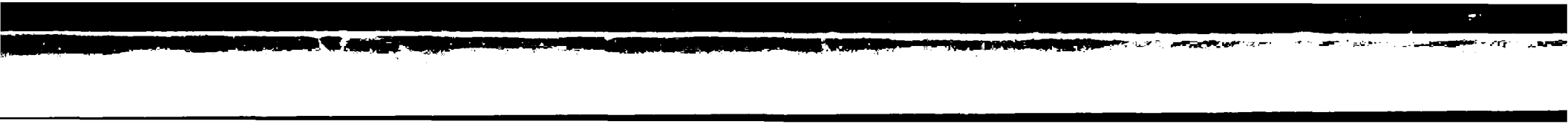
NOTES:

APPROVED BY
APPROVED BY
SUBMITTED BY Peter M. Jamane, PE

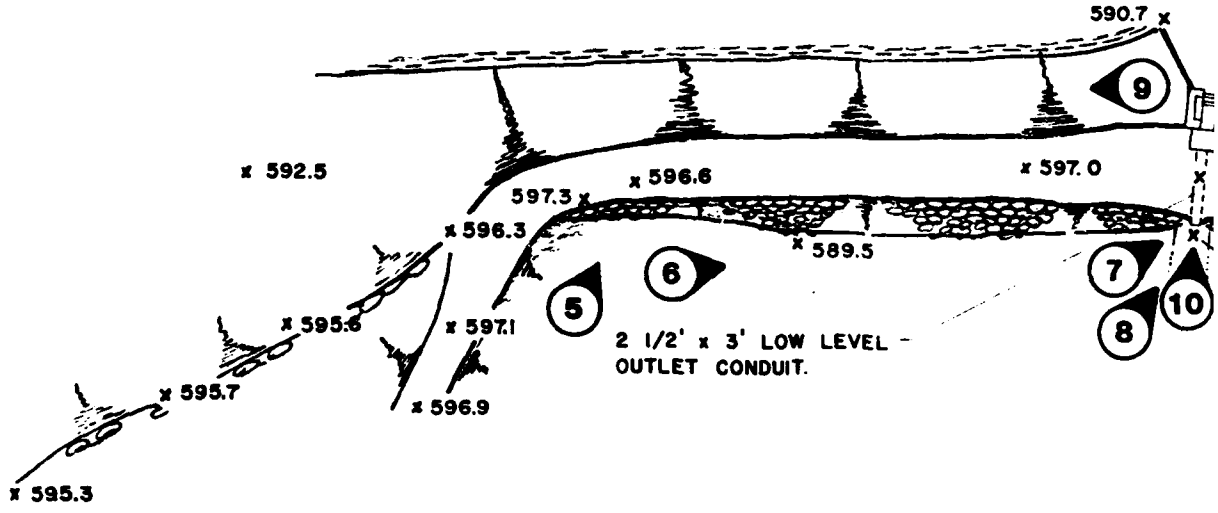
CONTROL SPILLWAY

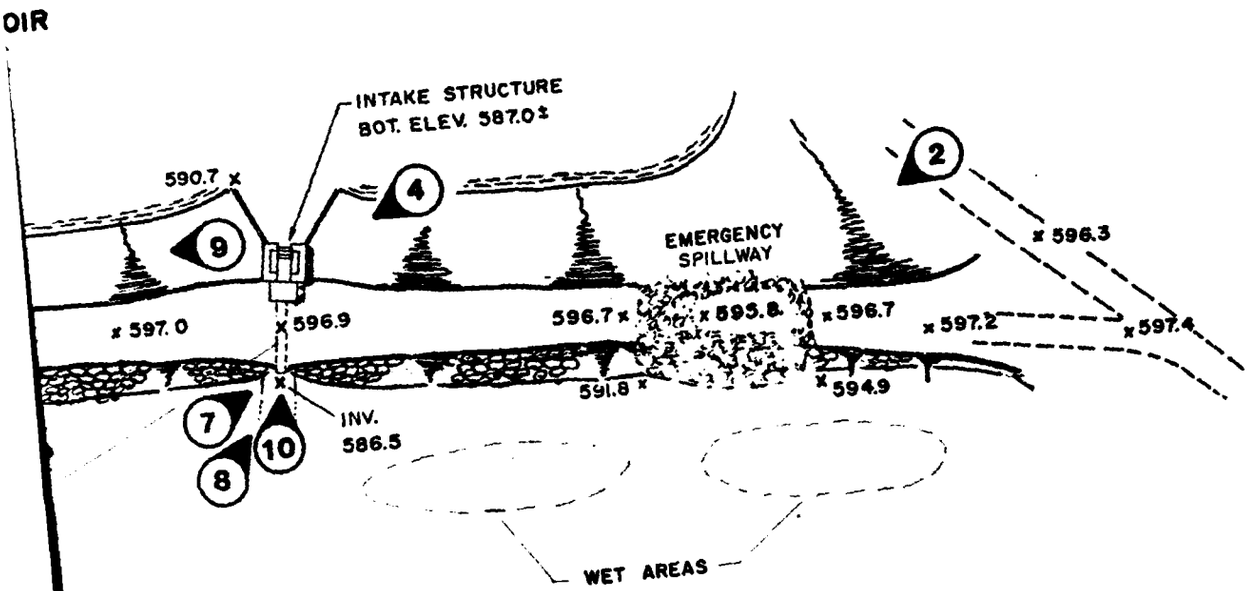
DRILL-HOLES FOR GROUT AND REPAIRS TO CULVERT IN EXISTING DAM

Addendum No 1 - 1-5-76



BURLINGAME RESERVOIR





LEONARD MILAJ ENGINEERING, INC.
STORRS, CONNECTICUT

US ARMY ENGINEER DIV. NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASSACHUSETTS

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

PHOTO INDEX
BURLINGAME RESERVOIR DAM
GLOCESTER, R.I.

DRAWN BY	CHECKED BY	APPROVED BY	SCALE: 1" = 40'
E/O	RA		DATE: JAN 81 SHEET

END

DATE
FILMED

9-85