

AD-A154 478 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
UPPER PORTER POND DAM. (U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV JAN 80

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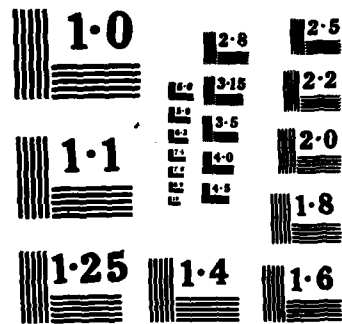
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PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM



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NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154**

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The dam is a gravel and clay fill embankment about 340 feet long with a maximum height of about 11 feet and a top width averaging 80 feet. The dam appears to be in fair condition. The upstream slope and crest are well maintained. It has a classification of small in size and a significant hazard potential. The owner should retain the services of a registered professional engineer for various purposes.		



DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF:
NEDED

MAY 30 1980

Honorable Edward J. King
Governor of the Commonwealth of
Massachusetts
State House
Boston, Massachusetts 02133

Dear Governor King:

Inclosed is a copy of the Upper Porter Pond Dam 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 Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. In addition, a copy of the report has also been furnished the owner, the city of Brockton.

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 Quality Engineering for your cooperation in carrying out this program.

Sincerely,


MAX B. SCHEIDER

Colonel, Corps of Engineers
Division Engineer

Incl
As stated

UPPER PORTER POND DAM

MA 00425

TAUNTON RIVER BASIN
BROCKTON, MASSACHUSETTS

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

Identification No.: MA 00425
Name of Dam: Upper Porter Pond Dam
Town: Brockton
County and State: Plymouth, Massachusetts
Stream: Beaver Brook
Date of Inspection: October 17, 1979

BRIEF ASSESSMENT

Upper Porter Pond Dam is a gravel and clay fill embankment approximately 340 feet long with a maximum height of about 11 feet and a top width averaging 80 feet. The upstream slope on either side of the terraced spillway is about 3H:1V and the downstream slope is approximately 2H:1V. The broad crested stone masonry terraced spillway is located approximately 200 feet left of the right abutment of the dam. This structure was built in 1940 as part of the City of Brockton's park development program.

The dam appears to be in fair condition. The upstream slope and crest are well maintained. The lower portion of the downstream slope appears to be structurally sound; however, small trees and brush on the upper portion of the slope increase the potential for seepage and introduce the possibility of embankment damage should the trees be uprooted. Several areas along the upper portion of the downstream slope show evidence of surface erosion.

Upper Porter Pond Dam has a maximum storage capacity of approximately 79 acre-feet and a maximum height of about 11 feet. Therefore, the dam is classified in the "Small" size category. Approximately 35 inhabitable structures are located downstream of Thirty Acre Pond, which is located immediately downstream of Lower Porter Pond, which is immediately downstream of Upper Porter Pond. A densely populated urban neighborhood is located downstream of the 35-home community. A failure of Upper Porter Pond Dam could cause appreciable property damage but little or no loss of life in the downstream communities. Therefore, the dam is classified in the "Significant" hazard category. The recommended test flood range for a "Small" size, "Significant" hazard dam is from the 100-year flood to one-half of the Probable Maximum Flood (PMF). The selected test flood for this structure is one-half of the PMF.

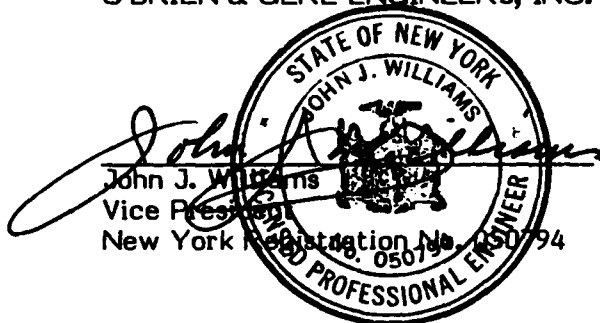
The test flood peak inflow to Upper Porter Pond was computed as 2,500 cfs. The routed test flood outflow of 2,475 cfs overtops the embankment by 1.4 feet.

The spillway is capable of discharging 508 cfs prior to overtopping of the embankment, which is about 21 percent of the routed test flood outflow.

Within one year after receipt of this Phase I inspection report, the Owner should retain the services of a registered professional engineer, experienced in the design and construction of dams, for the following purposes: (1) perform a detailed hydrologic and hydraulic study to assess the need for increasing the project discharge capacity; (2) study the possibility of Waldo Lake (upstream of Upper Porter Pond) overflowing the area along the D. W. Field East Parkway and evaluate the consequences of such an occurrence; (3) direct the removal of trees from the downstream slope of the embankment; and (4) investigate the seismic stability of the dam. Voids left in the embankment by the removal of trees should be filled with suitable, thoroughly compacted material.

In addition, the Owner should implement the following operational and maintenance procedures: (1) areas on the downstream slope with surface irregularities should be backfilled with suitable, thoroughly compacted materials and provided with suitable vegetative cover; (2) operability of the pond drain sluice gate should be verified, and the gate should be repaired if necessary; (3) develop and implement an ongoing operation and maintenance program; (4) a program of annual periodic technical inspection should be instituted; and (5) a formal surveillance and flood warning plan, including round-the-clock monitoring during heavy precipitation, should be developed.

O'BRIEN & GERE ENGINEERS, INC.



Date 28 FEB 1980

This Phase I Inspection Report on Upper Porter Pond 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 judgment and practice, and is hereby submitted for approval.



RICHARD DIBUONO, MEMBER
Water Control Branch
Engineering Division

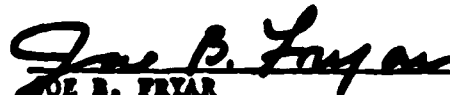


ARAMAST MAHTESIAN, MEMBER
Geotechnical Engineering Branch
Engineering Division



CARNEY M. TERZIAN, CHAIRMAN
Design 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 investigation, 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 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 spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the 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.

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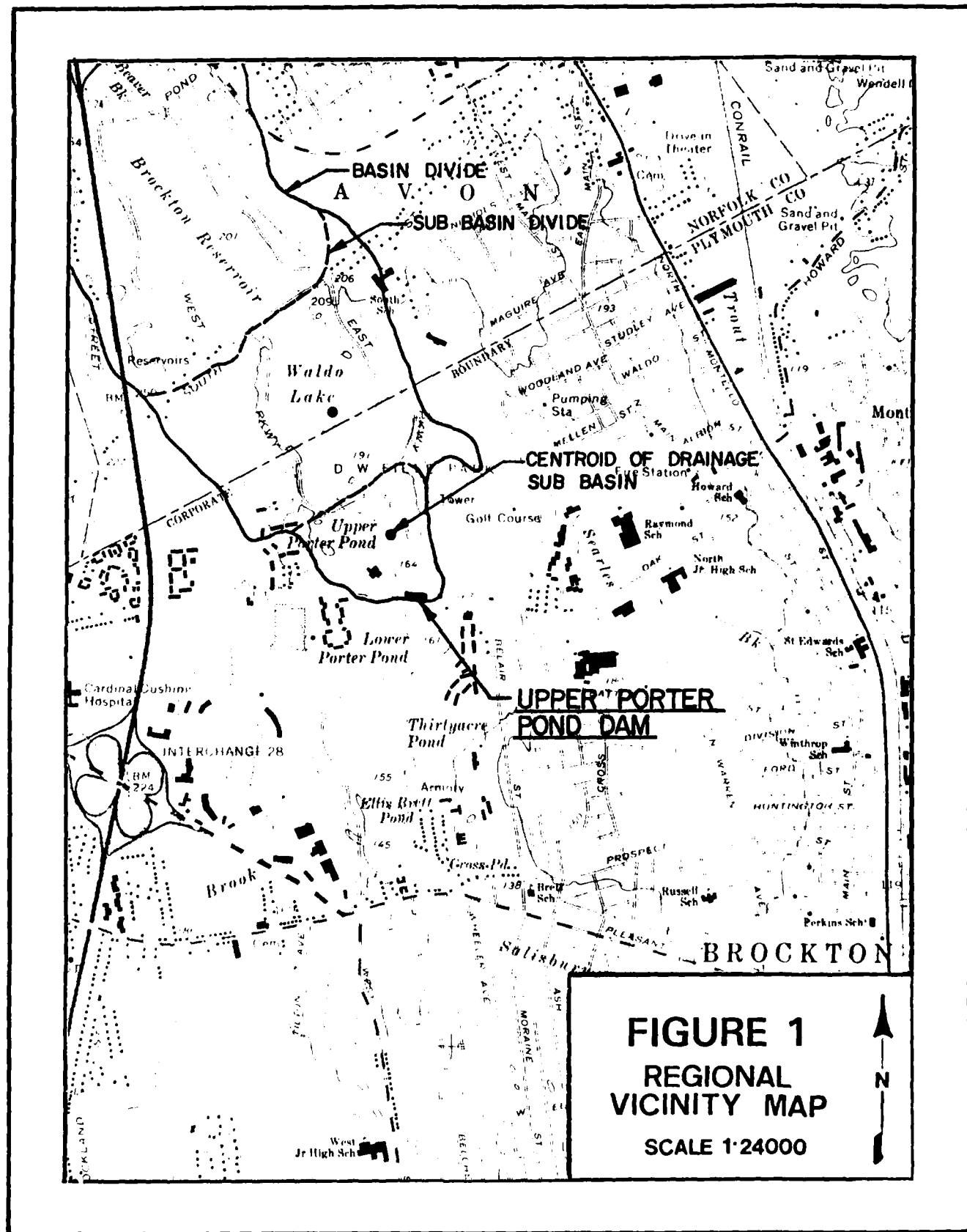
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DOWNSTREAM OVERVIEW OF THE UPPER PORTER POND DAM. (10/17/79)



UPSTREAM OVERVIEW OF THE UPPER PORTER POND DAM. (10/17/79)



NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT
UPPER PORTER POND DAM

SECTION I

PROJECT INFORMATION

1.1 General

a. Authority. The National Dam Inspection Act (Public Law 92-367), August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate the National Program for Inspection of Dams 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. O'Brien & Gere Engineers, Inc. has been retained by the New England Division to inspect and report on selected dams in the Commonwealth of Massachusetts. Authorization and Notice to Proceed were issued to O'Brien & Gere Engineers, Inc. by a letter from the Corps of Engineers dated November 6, 1979 and signed by Col. William E. Hodgson, Jr. Contract No. DACW33-80-C-0014 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection. The purpose of performing technical inspection and evaluation of non-federal dams is to:

- 1) Identify conditions which threaten the public safety and make the Owner aware of any deficiencies to permit him to correct them in a timely manner.
- 2) Encourage and prepare the states to initiate effective dam safety programs for non-federal dams as soon as possible.
- 3) Update, verify, and complete the National Inventory of Dams.

1.2 Description of Project (Information for this dam was obtained from the City of Brockton and the Massachusetts Department of Environmental Quality and Engineering (DEQE))

a. Location. Upper Porter Pond Dam is located on Beaver Brook within the City of Brockton, Massachusetts. Lower Porter Pond and Thirty Acre Pond are located downstream of Upper Porter Pond Dam. A 35-home community located about 0.25 miles downstream of Thirty Acre Pond is considered the major damage center. Beaver Brook joins Lovett Brook to form Salisbury Brook about 0.75 miles downstream of Upper Porter Pond and Salisbury Brook joins Trout Brook to form the Salisbury Plain River about 3 miles downstream of Upper Porter Pond. The dam and damage center are shown on the "Brockton, Massachusetts" USGS Quadrangle at coordinates N 42° 06.1' and W 71° 02.6'. A regional vicinity plan of Upper Porter Pond is included as Figure 1, page vi.

b. Description of Dam and Appurtenances. Upper Porter Pond Dam is a gravel and clay fill embankment approximately 340 feet long with a maximum embankment height of 11 feet. The embankment has the following features:

1) The upstream slope of the embankment varies along the length of the dam because of the size and configuration of the spillway at the center of the dam. On either side of the terraced spillway, the upstream slope averages approximately 3H:1V and has a well maintained grass cover.

2) The crest of the dam is approximately 80 feet wide and is almost completely paved due to the presence of Oak Street.

3) The downstream slope of the embankment is approximately 2H:1V from the shoulder of Oak Street to the downstream toe of the dam. The slope is partially covered with grass with areas of rock fill and bare earth. Several small trees are growing on the downstream slope. At the spillway outlet and extending for a distance of approximately 50 feet in either direction, the lower portion of the slope is retained by an inclined stone masonry wall. Photos of the downstream slope have been included on page 3 of Appendix C.

The spillway is located approximately 200 feet left of the right abutment of the dam. The inlet consists of a 25-foot wide broad crested weir with a terraced spillway discharging to a 30-foot diameter stilling pool. From the spillway pool, water flows through a 15-foot wide by 6.75-foot high stone arch under Oak Street to Lower Porter Pond. Sketches of the spillway have been included in Appendix B of this Report.

A low level outlet gate is located approximately 80 feet east of the main spillway inlet. This gate, if operable, will permit draining of the pond via a 48-inch diameter conduit to Lower Porter Pond. A location plan of the low level discharge gate and conduit is included on page 2 of Appendix B.

c. Size Classification. Upper Porter Pond Dam has a maximum embankment height of approximately 11 feet which places it in the "Small" size category for height because it is less than 40 feet high. It also falls into the "Small" size category for storage since the maximum storage capacity is 79 acre-feet which is less than the 1,000 acre-foot limit for "Small" size structures. Therefore, Upper Porter Pond Dam is classified as "Small."

d. Hazard Classification. Upper Porter Pond Dam is located immediately upstream of Lower Porter Pond. Approximately 35 homes are located about 0.25 miles downstream of Thirty Acre Pond Dam which is approximately 2,000 feet downstream of Lower Porter Pond Dam. In addition, the discharge from Thirty Acre Pond passes through two small ponds, a narrow man-made channel approximately one mile long and into a 1,800 foot long underground culvert. The region of potential flooding which borders the man made channel and which is upstream of the culvert is a densely populated urban neighborhood. The dam is classified as "Significant" hazard since flood waters resulting from failure of Upper Porter Pond Dam could cause appreciable property damage but little or no loss of life at the initial downstream damage center. This assessment is based on the breach analysis,

Which computed a stream depth of 1.5 feet at the initial downstream damage center.

e. Ownership. The dam is owned by the City of Brockton, Department of Parks and Recreation, City Hall, Brockton, MA 02401, Telephone 617-580-1100.

f. Operator. Operation and maintenance of the dam is performed under the direction of Mr. John Dorgan, Sr., Commissioner for Daniel W. Field Park. His office is located at City Hall, Brockton, MA 02401, Telephone 617-580-1100.

g. Purpose of Dam. The dam impounds Upper Porter Pond which lies within the D.W. Field Park in the City of Brockton, Massachusetts. The pond was originally constructed and is currently maintained for aesthetic and recreational purposes.

h. Design and Construction History. The dam was constructed in 1940 as a project of the Works Progress Administration. No design and construction data has been located.

Since that time, the only major construction took place in 1968 when new concrete floors were installed on the spillway steps and in the stilling pool.

i. Normal Operating Procedures. No operating records or maintenance information is available according to Mr. John Dorgan, Sr., Park Commissioner. It is not known if the sluice gate is operable. To Mr. Dorgan's knowledge, it has not been operated for several years.

The reservoir is self-regulating with the normal pool slightly above the crest elevation of the spillway.

1.3 Pertinent Data

a. Drainage Area. The area draining into Upper Porter Pond is 3.3 square miles to the north of the dam. The watershed is relatively flat and wooded with some residential developments and low-lying marshes in the upper reaches. Two reservoirs (Brockton Reservoir and Waldo Lake) are located upstream of Upper Porter Pond within the drainage area. The normal pool surface area of the three reservoirs covers approximately 8 percent of the total drainage area.

b. Discharge at Damsite.

1) Outlet Works. Upper Porter Pond may be drained via a gated 48-inch diameter pipe which is located approximately 80 feet to the east of the service spillway. The estimated discharge capacity is about 40 cfs when the reservoir surface is at the top of the dam.

2) Maximum Known Flood At Damsite. There is no known flood data available for this site.

3) Ungated Spillway Capacity at Top of Dam. The total spillway capacity at the top of dam elevation 171.0 is 508 cfs.

4) Ungated Spillway Capacity at Test Flood Elevation. At test flood Elev. 172.4, the spillway capacity is 802 cfs.

5) Gated Spillway Capacity at Normal Pool Elevation. Not Applicable.

6) Gated Spillway Capacity at Test Flood Elevation. Not Applicable.

7) Total Spillway Capacity at Test Flood Elevation. At test flood Elev. 172.4, the spillway capacity is 802 cfs.

8) Total Project Discharge at Top of Dam. The total spillway capacity at the top of dam Elevation 171.0 is 508 cfs.

9) Total Project Discharge at Test Flood Elevation. The combined discharge capacity of the spillway and the flow over the dam at test flood Elev. 172.4 is 2,476 cfs.

c. Elevation. (Feet above NGVD)

Streambed at Toe of Dam	160+
Bottom of Cutoff	NA
Maximum Tailwater	164+
Recreation Pool	167.5
Full Flood Control Pool	NA
Spillway Crest (gated)	NA
Design Surge (Original Design)	Unknown
Top of Dam	171.0
Test Flood Pool Design Surge	172.4

d. Reservoir Length. (Feet)

Normal Pool	1,300+
Flood Control Pool	NA
Spillway Crest Pool	1,300+
Top of Dam	1,350+
Test Flood Pool	1,400+

e. Storage. (Acre-Feet)

Normal Pool	28
Flood Control Pool	NA
Spillway Crest Pool	28
Top of Dam	79
Test Flood Pool	109

f. Reservoir Surface. (Acres)

Normal Pool	11
Flood Control Pool	NA
Spillway Crest	11
Top of Dam	19
Test Flood Pool	21

g. Dam Data.

Type	Earth embankment
Length	340 feet ±
Height	11 feet ±
Top Width	80 feet ±
Side Slopes (Upstream)	3H:1V
(Downstream)	2H:1V
Zoning	Unknown
Impervious Core	Unknown
Cutoff	Unknown
Grout Curtain	Unknown

h. Diversion and Regulating Tunnel.

Not Applicable

i. Spillways.

Type	Broad crested masonry weir
Length of weir	25 feet
Crest Elevation	167.5
Gates	None
Upstream Channel	None
Downstream Channel	Directed under Oak Street Bridge into Lower Porter Pond

j. Regulating Outlets.

Invert	Elev. 160.0 (estimated)
Size	48-inch diameter
Description	Conduit with sluice gate mechanism on upstream end.
Control Mechanism	Hand operated sluice gate
Other	NA

SECTION 2

ENGINEERING DATA

2.1 Design

The following information was made available for review of Upper Porter Pond Dam:

1. Report entitled "Master Plan Study of D.W. Field Park", April 1968 prepared by Camp, Dresser and McKee, Boston, MA.

2. Dam inspection report prepared by Commonwealth of Massachusetts, DEQE, December, 1972.

3. Drawing for proposed dam construction, 1939.

Notes: The principal design features for this dam are shown on the sketches enclosed in Appendix B.

2.2 Construction

No information is available concerning construction of the dam except that it was part of the Works Progress Administration Program in 1940.

2.3 Operation

According to the Park Commissioner, Mr. John Dorgan, Sr., no operational data is available for this site.

2.4 Evaluation

a. Availability. Engineering data studied and reproduced for this Report was obtained from the following sources:

1) The inspection report and sketches included in Appendix B were obtained from the Commonwealth of Massachusetts, DEQE.

2) Proposed 1939 plans and sections of the dam were obtained from the City of Brockton.

b. Adequacy. Sufficient information has been obtained during the field investigations, from drawings, reports and through subsequent conversations with the Owner's representative to conduct a Phase I dam evaluation.

c. Validity. Based upon field observations, it appears that the drawing dated December 13, 1939, which includes details of the proposed dam construction, is valid.

SECTION 3

VISUAL INSPECTION

3.1 Findings

a. General. The Upper Porter Pond Dam was inspected on October 17, 1979. At the time of inspection, the depth of flow was approximately six inches at the center of the service spillway. Underwater areas were not inspected.

Observations and comments made during the field inspection appear on a checklist included as Appendix A of this report.

b. Dam. The dam appears to be in fair condition with a well-maintained upstream slope consisting of an irregularly shaped lawn area with an average slope of approximately 3H:1V. The area is best illustrated on the overview photos on page v of this report.

The crest of the embankment is almost entirely paved and appears to be in good condition. There is no indication of settlement, pavement cracking, or other defects which could indicate structural deficiencies.

There are several trees, heavy brush and evidence of erosion on the upper portion of the downstream slope of the embankment. The downstream overview photo on page v and the photos shown on page 3 of Appendix C illustrate these features. The downstream embankment slope averages 2H:1V.

c. Appurtenant Structures. The spillway and stone arch culvert appear to be in good condition. At the time of the inspection, the outlet gate was submerged and the handwheel operator was not in place.

d. Reservoir Area. The area surrounding the pond consists primarily of well-maintained grass areas which slope gradually up from the edge of the pond. Portions of the surrounding area are forested.

e. Downstream Channel. Discharge from the spillway flows directly into Lower Porter Pond; it then flows southerly into Thirty Acre Pond, then into Ellis Brett Pond, and finally into Cross Pond. Downstream of Cross Pond, the discharge flows into a narrow man-made channel approximately one mile long and then into a 1,800-foot long underground culvert. Several photographs have been included in Appendix C to illustrate downstream channel conditions.

3.2 Evaluation

The dam appears to be in fair condition. The downstream slope of the embankment shows signs of erosion and is overgrown with heavy vegetation. Photographs 5 and 6 included in Appendix C illustrate these conditions.

SECTION 4

OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operational Procedures

a. General. According to Mr. John Dorgan, Sr., Commissioner for D.W. Field Park, no formal operating procedures have been established.

b. Description of Any Warning System in Effect. According to Mr. Dorgan, no flood warning system is in effect for Upper Porter Pond Dam.

4.2 Maintenance Procedures

a. General. Other than periodic mowing of the area just to the north of Oak Street, no maintenance tasks are performed on a routine basis.

b. Operating Facilities. Operability of the low level sluice gate has not been verified. According to Mr. Dorgan, responsibility for maintenance of the facility rests with the Park Commission.

4.3 Evaluation

Current operational procedures are inadequate to ensure operability of the low level sluice gate in an emergency situation. In addition, the maintenance program has not provided for proper maintenance of the downstream slope of the embankment.

SECTION 5

EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General

Upper Porter Pond Dam has an elongated watershed about 3.8 miles long and 0.9 miles wide. The drainage area is wooded with some residential developments and low-lying marshes in the upper reaches. The topography ranges from Elev. 250 to Elev. 167.5 at the normal (recreation) pool. There are two impoundments upstream of Upper Porter Pond: Brockton Reservoir and Waldo Lake. The normal pool storage capacities of these two reservoirs are about 190 and 180 acre-feet, respectively. It was noted during the visual inspection that the area east of Waldo Lake may be lower in elevation than the top of the dam, thus forming a saddle about 2,000 feet long. Therefore, large inflows into Waldo Lake might be diverted over this saddle into the adjacent watershed. This would in turn reduce the impact of the selected test flood upon Upper Porter Pond Dam and its downstream hazard area.

5.2 Design Data

Neither hydraulic nor hydrologic design data are available for Upper Porter Pond Dam.

5.3 Experience Data

There are no records of high reservoir pools or dam overtoppings at this site.

5.4 Test Flood Analysis

The recommended test flood range for a "Small" size, "Significant" hazard dam is from the 100-year flood to one-half of the Probable Maximum Flood (PMF). Due to the potential for property damage and the possibility of loss of life (although remote) in the downstream damage center, the selected test flood is one-half of the PMF.

Hydrologic and hydraulic calculations were performed with the assistance of the HEC-1-DB computer program. The flood hydrographs were constructed from the Snyder unit hydrographs using average coefficients, an initial infiltration of zero and a constant loss rate of 0.05 inches per hour. The Hop Brook Adjustment Factor was used to reduce the Probable Maximum Precipitation based on the drainage area. The routing sequence consisted of dividing the watershed into sub-basins for each impoundment and routing the inflow hydrographs through each reservoir. Stage vs. Discharge and Stage vs. Storage relationships above the spillway crest and the top of the dam were developed for all 5 dams in the system to obtain outflow hydrographs. All impoundments were assumed to be at their respective spillway crest elevations at the beginning of the storm event. Possible overflow effects to the east of Waldo Lake were not included in the routing procedure.

The test flood peak inflow to Upper Porter Pond was computed as 2,500 cfs. The routed test flood outflow of 2,475 cfs overtopps the embankment by 1.4 feet. The spillway is capable of discharging 508 cfs prior to overtopping to the embankment, which is about 21 percent of the routed test flood outflow.

5.5 Dam Failure Analysis

A failure of the embankment was simulated by the HEC-1-DB computer program assuming a 136-foot wide and 6-foot deep breach with vertical side slopes developing within one hour. The failure is assumed to occur with the reservoir surface at the top of dam elevation. The resulting outflow was routed to the damage center, which was assumed to be the community of approximately 35 homes downstream of Thirty Acre Pond. The channel cross-section utilized in the computer program for the hazard area was taken at a point 1,200 feet downstream of Thirty Acre Pond and is shown on page D-12. The increase in stream depth at this location was computed to be 1.5 feet. This depth of flow could cause appreciable property damage and little or no loss of life in the downstream damage center. In addition, failure of Upper Porter Pond Dam would cause Lower Porter Pond Dam to be overtopped by about 0.2 feet.

SECTION 6

EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observations

At the time of inspection, no signs of structural instability were observed. The upstream slope of the embankment could be readily observed since it is mowed on a regular basis. The downstream slope could not be observed as easily because of the vegetation, but it appears to be stable with only slight surface irregularities. No cracking or depressions were observed along the crest of the embankment.

The spillway appears to be in good condition. No signs of mortar deterioration, settlement, or seepage were observed. Underwater areas were not inspected.

6.2 Design and Construction Data

The dam, as it now exists, was constructed in 1940 under the Works Progress Administration Program. Prior to that time, there was a road crossing at the site with a stone double arch culvert connecting Upper and Lower Porter Ponds.

According to the D.W. Field Park Commissioner, Mr. John Dorgan, Sr., no design data is available. However, drawings of the proposed dam construction in 1940 were obtained from Mr. John Holmgren, Engineer for the City of Brockton. Portions of these drawings are included in Appendix B.

6.3 Post Construction Changes

The only known construction modification was made in 1968 when concrete was placed on the spillway and stilling pool floors. It appears that the stones on the terraced spillway were re-pointed at the same time.

6.4 Seismic Stability

Upper Porter Pond Dam is located in Seismic Zone 3 on the "Seismic Zone Map of Contiguous States." Therefore, according to the Recommended Guidelines for Safety Inspection of Dams, a seismic stability analysis should be performed as recommended in Section 7.

SECTION 7

ASSESSMENT, RECOMMENDATIONS & REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. Based upon visual inspection of the site on October 17, 1979, the dam appears to be in fair condition. The upstream slope of the embankment is well maintained with no visible deficiencies. Oak Street, which traverses the dam crest, is also well maintained and appears to be in good condition.

The downstream slope of the embankment is approximately 2H:1V. The lower portion of the slope consists of hand placed riprap which appears to be structurally sound. However, the presence of small trees and heavy vegetation on the upper portion of the slope increases the potential for seepage and introduces the possibility of embankment damage should the trees be uprooted by high winds. In addition, several areas along the downstream slope have developed surface irregularities due to erosion.

The test flood peak inflow to Upper Porter Pond was computed as 2,500 cfs. The routed test flood outflow of 2,475 cfs overtops the embankment by 1.4 feet. The spillway system is capable of discharging 508 cfs prior to overtopping of the embankment, which is about 21 percent of the routed test flood outflow. A failure of the dam would cause a rise in stream elevation of approximately 1.5 feet at the downstream damage area which could result in appreciable property damage but little or no loss of life.

b. Adequacy of Information. Sufficient information has been obtained during the field investigations, from drawings and reports, and through subsequent conversations with the Owner's representative to conduct a Phase I Dam evaluation.

c. Urgency. The recommendations and remedial measures described in this Section should be implemented within one year of receipt of this Phase I Inspection Report.

7.2 Recommendations

The following recommendations should be implemented by a registered professional engineer experienced in the design and construction of dams:

- 1) A detailed hydrologic and hydraulic study should be made to assess the need for increasing the project discharge capacity.

- 2) It appears that Waldo Lake, upstream of Upper Porter Pond, could overflow in the area along the D.W. Field East Parkway prior to overtopping the dam crest. A study should be made to examine this possibility and to evaluate the consequences of such an occurrence.

3) The downstream slope of the embankment should be cleared of trees and heavy brush. Any remaining voids in the embankment should be backfilled with suitable, thoroughly compacted material.

4) The seismic stability of the dam should be investigated utilizing conventional equivalent static load methods.

7.3 Remedial Measures

a. Operation and Maintenance Procedures.

1. Areas on the downstream slope with surface irregularities should be backfilled with suitable, thoroughly pacted material and provided with a suitable vegetative cover.

2. Operability of the pond drain sluice gate should be verified and the gate should be repaired if necessary. The gate operator should be stored in a convenient location for emergency use.

3. Develop and implement an ongoing operation and maintenance program.

4. A program of annual periodic technical inspection should be instituted.

5. A formal surveillance and flood warning plan, including round-the-clock monitoring during heavy precipitation, should be developed.

7.4 Alternatives

As an alternative to the above recommendations and remedial measures, the dam could be breached and the pond drained.

APPENDIX A
INSPECTION CHECKLIST

VISUAL INSPECTION CHECK LIST

INSPECTION TEAM ORGANIZATION

Project: Upper Porter Pond Dam
National I.D. #: MA 00425
Location: Brockton, Mass.
Type of Dam: Earth Embankment
Inspection Date(s): October 17, 1979
Weather: Clear, Warm, Mid 60's
Pool Elevation: 167.5± MSL

Inspection Team

Leonard Beck	O'Brien & Gere	Structures
Steven Snider	O'Brien & Gere	Foundations & Materials
Alan Hanscom	O'Brien & Gere	Structures
Rodney Georges	Bryant & Associates	Hydrology/Hydraulics

*Mr. John J. Williams, Vice-President, O'Brien & Gere has visited the site but not necessarily in conjunction with the inspection team.

Owner's Representative

Mr. John Dorgan, Sr. ; Park Commissioner ;
D.W. Field Park ; Brockton, Mass.

VISUAL INSPECTION CHECK LIST

Project: Upper Porter Pond Dam

National I.D. #: MA 00425

Date(s): October 17, 1979

AREA EVALUATED	CONDITIONS
<u>DAM EMBANKMENT</u>	
Crest Elevation	171.0
Current Pool Elevation	167.5
Maximum Impoundment to Date	Unknown
Surface Cracks	None Observed
Pavement Condition	Top of dam road surface in good condition.
Movement or Settlement of Crest	None Observed
Lateral Movement	None Observed
Vertical Alignment	No vertical misalignment observed
Horizontal Alignment	No horizontal misalignment observed
Condition at Abutment and at Concrete Structures	Satisfactory, no settlement or erosion observed.
Indications of Movements of Structural Items on Slopes	None observed
Trespassing on Slopes	Downstream slope shows indications
Vegetation on Slopes	Good upstream, poor downstream with bare areas & trees growing on slope.
Sloughing or Erosion of Slopes or Abutments	Downstream shows erosion indications in bare areas.
Rock Slope Protection - Riprap Failures	None observed

VISUAL INSPECTION CHECK LIST

Project: Upper Porter Pond Dam

National I.D. #: MA 00425

Date(s): October 17, 1979

AREA EVALUATED	CONDITIONS
<u>OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS</u>	
a. Approach Channel	
General Condition	Good
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Approach Channel	Concrete - very good
b. Weir and Training Walls	
General Condition of Concrete	Stone masonry - good cond.
Rust or Staining	None
Spalling	NA
Any Visible Reinforcing	NA
Any Seepage or Efflorescence	None observed
Drain Holes	None observed
c. Discharge Channel	
General Condition	Very Good

VISUAL INSPECTION CHECK LIST

Project: Upper Porter Pond Dam

National I.D. #: MA 00425

Date(s): October 17, 1979

AREA EVALUATED	CONDITIONS
<u>OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS (Con't)</u>	
Loose Rock Overhanging Channel	<i>None</i>
Trees Overhanging Channel	<i>None</i>
Floor of Channel	<i>Spillway Floor - new (1968)</i>
Other Obstructions	<i>None observed</i>
Miscellaneous	<i>Stone arch culvert - good condition w/ concrete floor</i>

VISUAL INSPECTION CHECK LIST

Project: Upper Porter Pond Dam
 National I.D. #: MA 00425
 Date(s): October 17, 1979

AREA EVALUATED	CONDITIONS
<u>OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE</u>	
a. Approach Channel	
Slope Conditions	<i>Unknown, Submerged</i>
Bottom Conditions	<i>Unknown, Submerged</i>
Rock Slides or Falls	<i>None</i>
Log Boom	<i>NA</i>
Debris	<i>None</i>
Condition of Concrete Lining	<i>Appears very good.</i>
Drains or Weep Holes	<i>None</i>
b. Intake Structure	
Condition of Concrete	<i>Stone Masonry - good cond.</i>
Stop Logs and Slots	<i>NA</i>

VISUAL INSPECTION CHECK LIST

Project: Upper Porter Pond Dam

National I.D. #: MA 00425

Date(s): October 17, 1979

AREA EVALUATED	CONDITIONS
<u>OUTLET WORKS - TRANSITION AND CONDUIT</u>	
General Condition of Concrete	<i>Stone masonry - good cond.</i>
Rust or Staining on Concrete	<i>NA</i>
Spalling	<i>NA</i>
Erosion or Cavitation	<i>None</i>
Cracking	<i>None observed</i>
Alignment of Monoliths	<i>NA</i>
Alignment of Joints	<i>NA</i>
Numbering of Monoliths	<i>NA</i>

APPENDIX B

ENGINEERING DATA

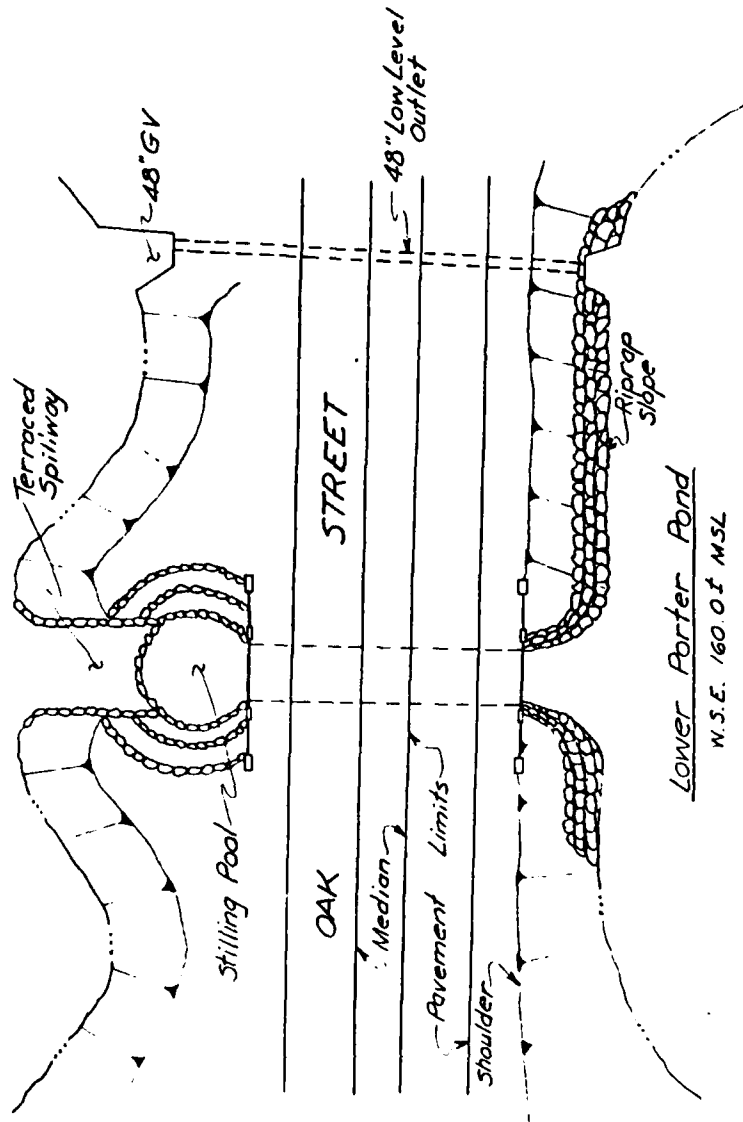
APPENDIX B

ENGINEERING DATA

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<i>PLAN & SECTIONS OF THE DAM (DEQE FILES)</i>	<i>B-2</i>
<i>DESCRIPTION OF DAM (DEQE FILES)</i>	<i>B-3</i>
<i>BROCKTON RESERVOIR DAM SYSTEM</i>	<i>B-4</i>
<i>PLAN & SECTIONS OF PROPOSED DAM @ UPPER PORTER POND (DEQE FILES)</i>	<i>B-5</i>

Upper Porter Pond
N.S.E. 167.5 ± MSL



GENERAL DAM DATA
a) Type - Earth Embankment
b) Length - 340 feet
c) Height - 11 feet
d) Top Width - 80 feet
e) Side Slopes - $4\frac{1}{2} : 1$ ~ $3H : 1V$
 $2\frac{1}{2} : 1$ ~ $2H : 1V$

Lower Porter Pond
N.S.E. 160.0 ± MSL

U.S. ARMY CORPS OF ENGINEERS
NEW ENGLAND DIVISION
Contract No. DACW 33-80-C-0014
UPPER PORTER POND DAM

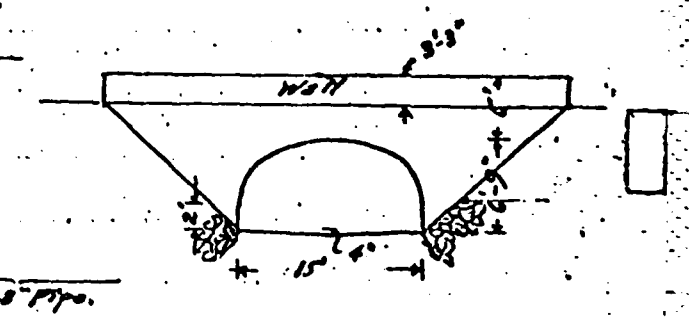
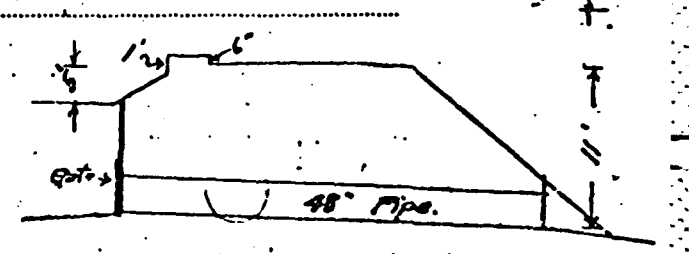
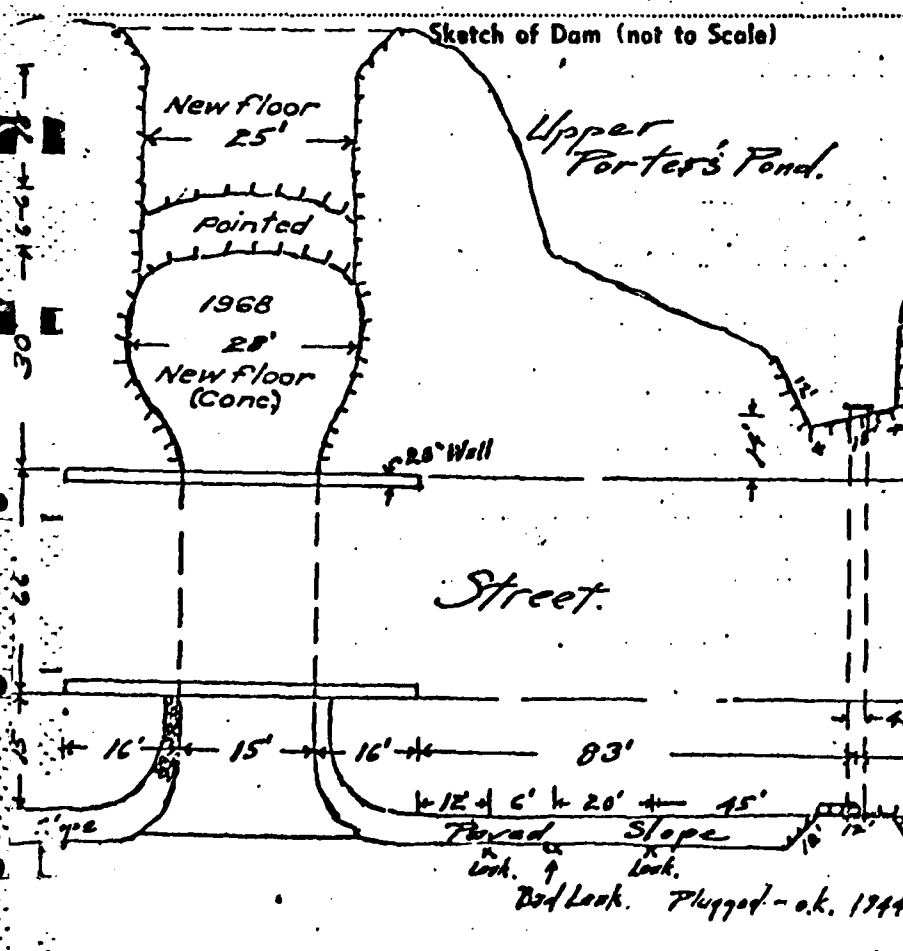
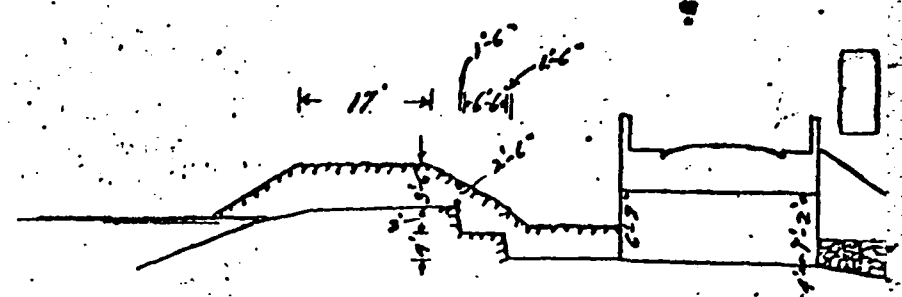
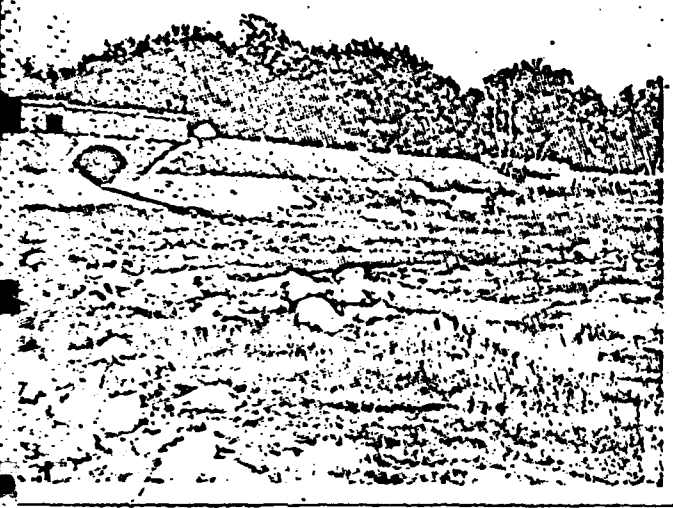
SITE PLAN

OTBRIEN & SONS

DATE: JANUARY 1980
SCALE: NONE

B-1

7-12-44-8



Lower Porter's Pond.

DESCRIPTION OF DAM

DISTRICT 7

Submitted by A. DUGAN Dam No. 7-12-44-8

Date 12-5-72 City/Town BROCKTON

Name of Dam UPPER PORTER POND

1. Location: Topo Sheet No. 32 D

Provide 8½" x 11" in clear copy of topo map with location of Dam clearly indicated.

2. Year Built 1939 - 1940 Year/s of Subsequent Repairs _____

3. Purpose of Dam: Water Supply _____ Recreational X
Irrigation _____ Other _____

4. Drainage Area: 7 Sq.Mi. _____ Acres

5. Normal Ponding Area: _____ Acres _____ Ave. Depth
Impoundment: 7,000,000 Gals. _____ Acre Ft.

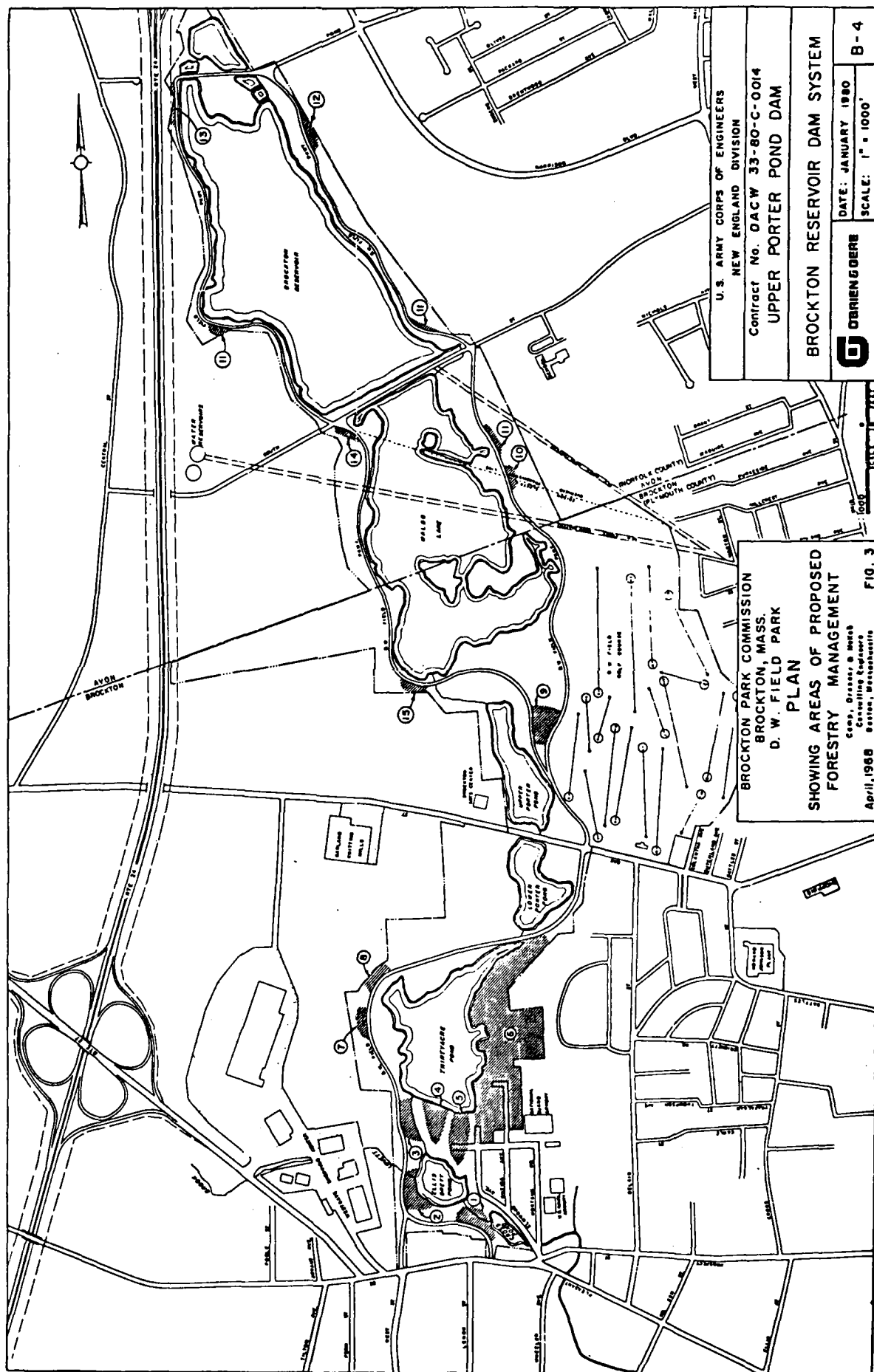
6. No. and Type of Dwellings Located Adjacent to Pond or Reservoir
i.e. Summer Homes, etc. NONE

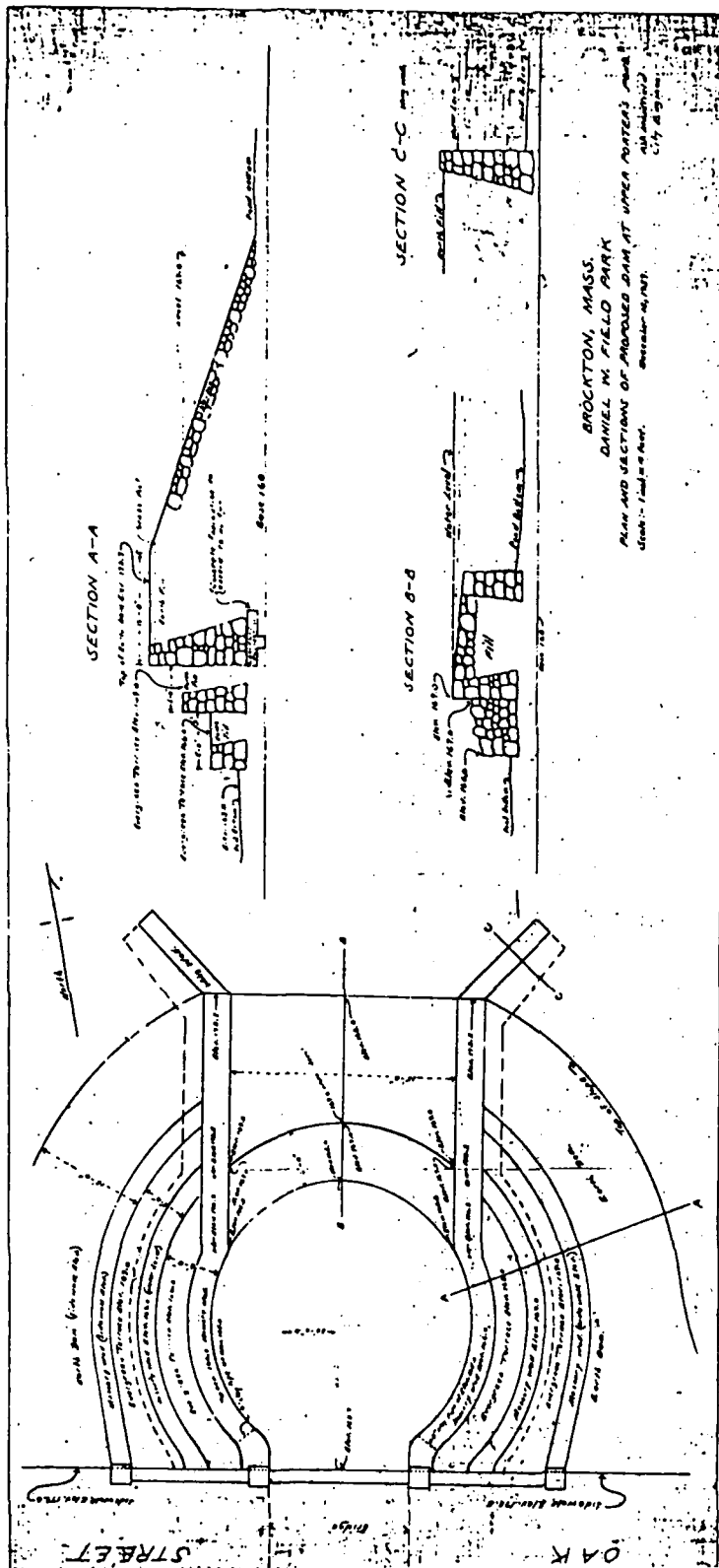
7. Dimensions of Dam: Length 340' Max. Height 11'
Slopes: Upstream Face 4'
Downstream Face 6'
Width Across Top 80'

8. Classification of Dam by Material:
Earth X Conc. Masonry _____ Stone Mason. _____
Timber _____ Rockfill _____ Other _____

Exhibit 1

From Commonwealth of Massachusetts DEQE Files





U.S. ARMY CORPS OF ENGINEERS	
NEW ENGLAND DIVISION	
Contract No. DACW 33-80-C-0014	
UPPER PORTER POND DAM	
SITE PLAN & SPILLWAY SECTIONS	
 DD FORM 100-1	DATE: JANUARY 1980
	SCALE: NONE
B-5	

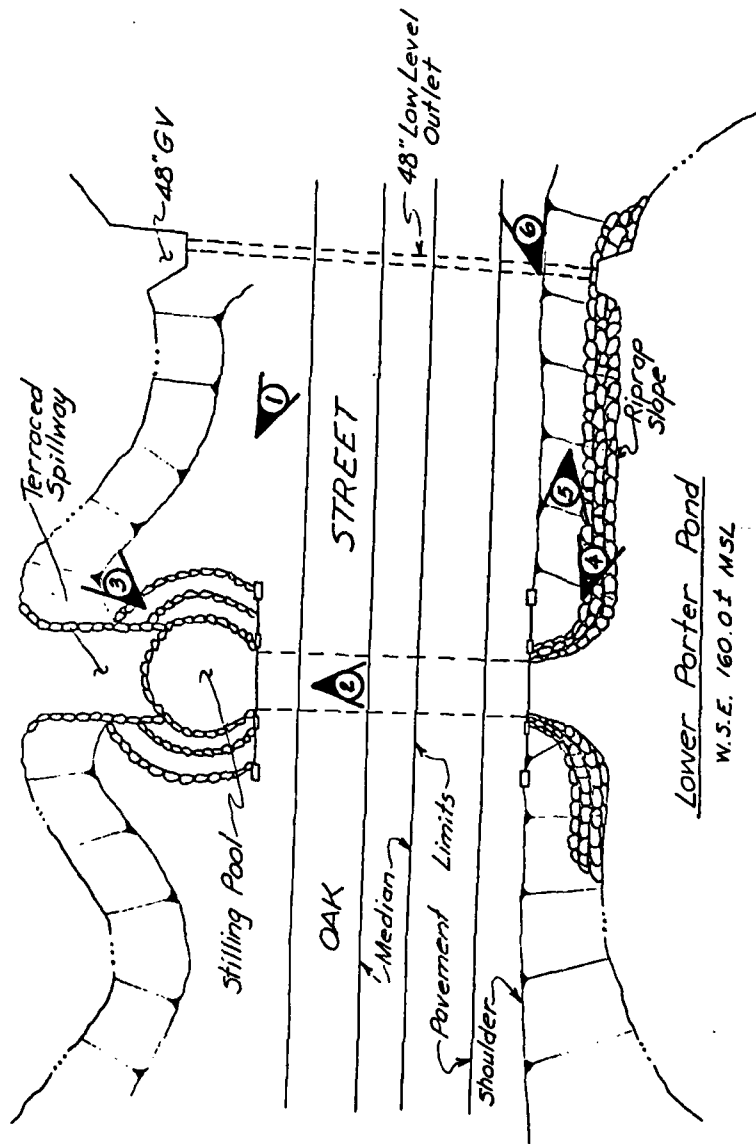
APPENDIX C

PHOTOGRAPHS

APPENDIX C
SELECTED PHOTOGRAPHS OF PROJECT

<u>LOCATION PLAN</u>		<u>Page</u> <u>No.</u>
Site Plan Sketch		A
Regional Plan		B
<u>PHOTOGRAPHS</u>		<u>Page</u> <u>No.</u>
<u>No.</u>		
1.	Spillway as viewed looking northwest.	1
2.	Spillway as viewed looking upstream.	1
3.	Bridge built in the dam downstream of the spillway.	2
4.	Downstream of the bridge which is downstream of the spillway.	2
5.	Downstream slope of the dam showing Lower Porter Pond to the right.	3
6.	Varying conditions of the downstream slope of the dam.	3
7.	Brockton Reservoir Dam spillway about one mile upstream of Upper Porter Pond Dam.	4
8.	Waldo Lake Dam spillway approximately 700 yards upstream of Upper Porter Pond Dam.	4
9.	Lower Porter Pond Dam approximately 350 yards downstream of Upper Porter Pond Dam.	5
10.	30 Acre Pond Dam spillway about 1050 yards downstream of Upper Porter Pond Dam.	5
11.	E. Brett Pond (drained) inlet structure about 1500 yards downstream of Upper Porter Pond Dam.	6
12.	Cross Pond spillway approximately 1800 yards downstream of Upper Porter Pond Dam.	6
13.	Typical reach of Salisbury Brook Channel between one and two miles downstream of Upper Porter Pond Dam.	7
14.	Entrance to approximately 600 yard long box culvert for Salisbury Brook in Brockton about 2 miles downstream of Upper Porter Pond Dam.	7

Upper Porter Pond
W.S.E. 167.5 ± MSL

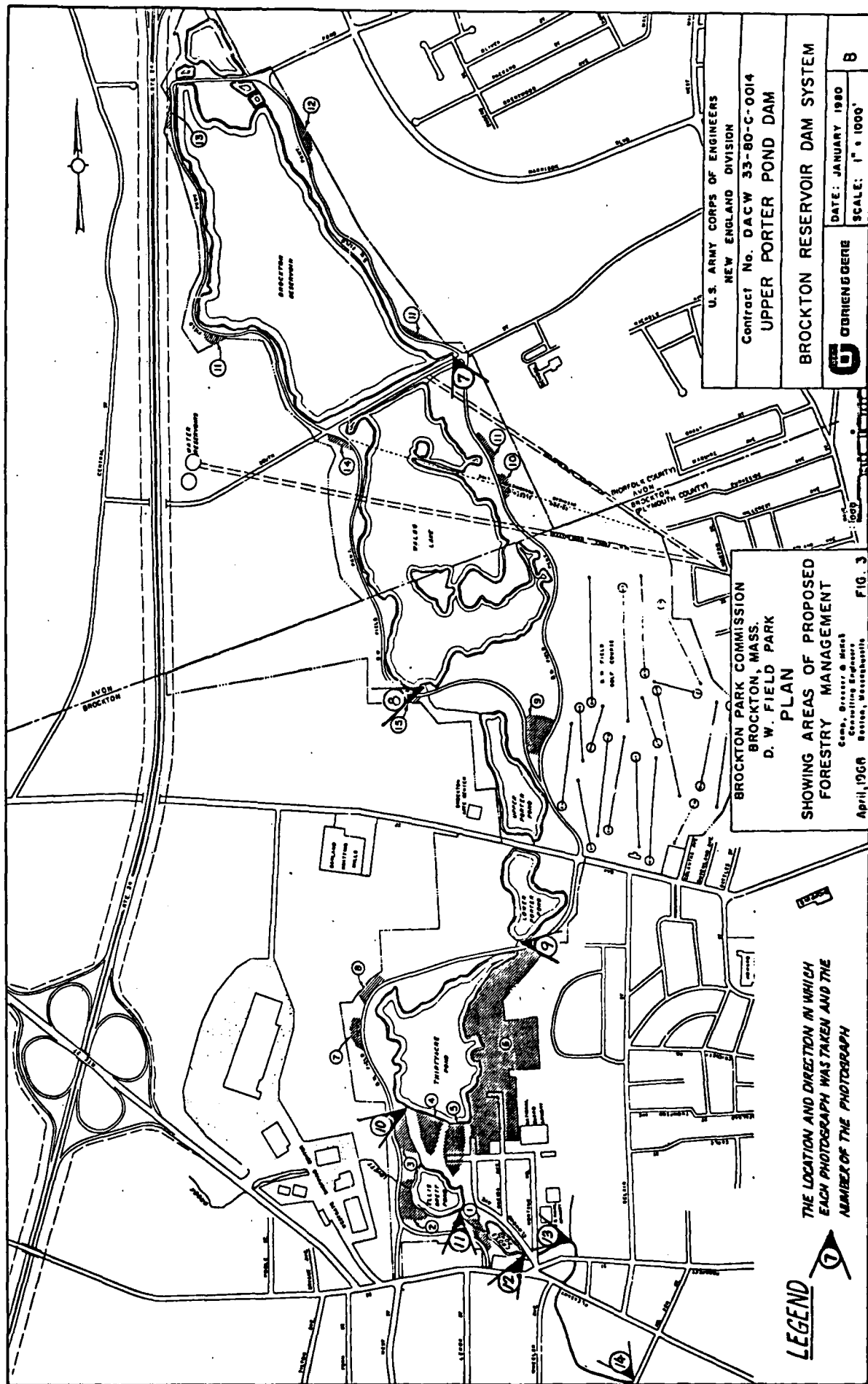


Lower Porter Pond
W.S.E. 160.0 ± MSL

- GENERAL DAM DATA
- a) Type - Earth Embankment
 - b) Length - 340 feet
 - c) Height - 11 feet
 - d) Top Width - 80 feet
 - e) Side Slopes - $U/S \approx 3H:1V$
 $D/S \approx 2H:1V$

U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION	
Contract No. DACW 33-80-C-0014 UPPER PORTER POND DAM	
SITE PLAN	
CDRIEN GORE	DATE: JANUARY 1980 SCALE: NONE
A	

LEGEND ① THE LOCATION AND DIRECTION IN WHICH EACH PHOTOGRAPH WAS TAKEN AND THE NUMBER OF THE PHOTOGRAPH





1. SPILLWAY AS VIEWED LOOKING NORTHWEST. (10/17/79)



2. SPILLWAY AS VIEWED LOOKING UPSTREAM. (10/17/79)



3. BRIDGE BUILT IN THE DAM DOWNSTREAM OF THE SPILLWAY. (10/17/79)



4. DOWNSTREAM OF THE BRIDGE WHICH IS DOWNSTREAM OF THE SPILLWAY. (10/17/79)



5. DOWNSTREAM SLOPE OF THE DAM SHOWING LOWER PORTER POND TO THE RIGHT.
(10/17/79)



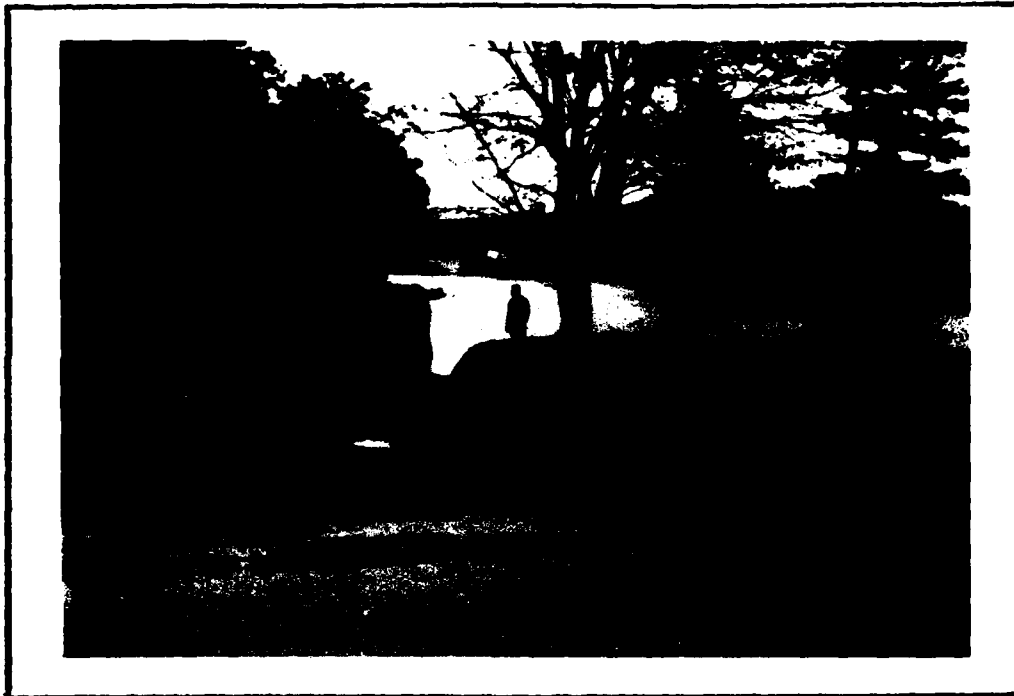
6. VARYING CONDITIONS OF THE DOWNSTREAM SLOPE OF THE DAM.
(10/17/79)



7. BROCKTON RESERVOIR DAM SPILLWAY ABOUT ONE MILE UPSTREAM OF UPPER PORTER POND DAM. (10/17/79)



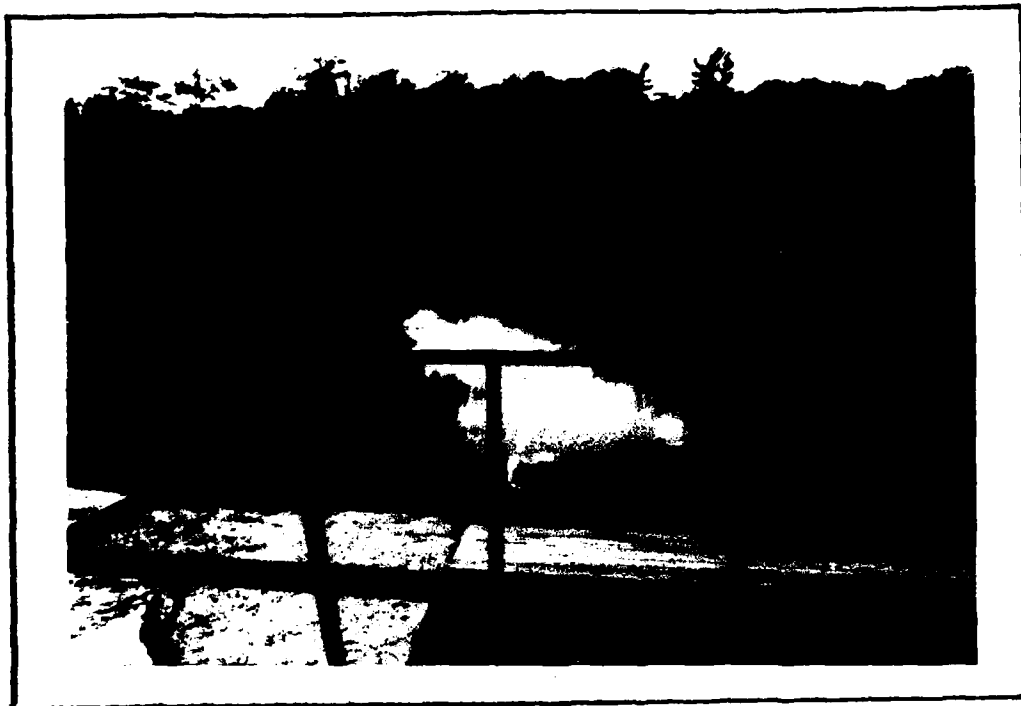
8. WALDO LAKE DAM SPILLWAY APPROXIMATELY 700 YARDS UPSTREAM OF UPPER PORTER POND DAM. (10/17/79)



9. LOWER PORTER POND DAM APPROXIMATELY 350 YARDS DOWNSTREAM OF UPPER PORTER POND DAM.



10. 30 ACRE POND DAM SPILLWAY ABOUT 1050 YARDS DOWNSTREAM OF UPPER PORTER POND DAM. (10/17/79)



11. E. BRETT POND (DRAINED) INLET STRUCTURE ABOUT 1500 YARDS
DOWNSTREAM OF UPPER PORTER POND DAM.



12. CROSS POND SPILLWAY APPROXIMATELY 1800 YARDS DOWNSTREAM OF
UPPER PORTER POND DAM. (10/17/79)



13. TYPICAL REACH OF SALISBURY BROOK CHANNEL BETWEEN ONE AND TWO MILES DOWNSTREAM OF UPPER PORTER POND DAM. (10/17/79)



14. ENTRANCE TO APPROXIMATELY 600 YARD LONG BOX CULVERT FOR SALISBURY BROOK IN BROCKTON ABOUT TWO MILES DOWNSTREAM OF UPPER PORTER POND DAM. (10/17/79)

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

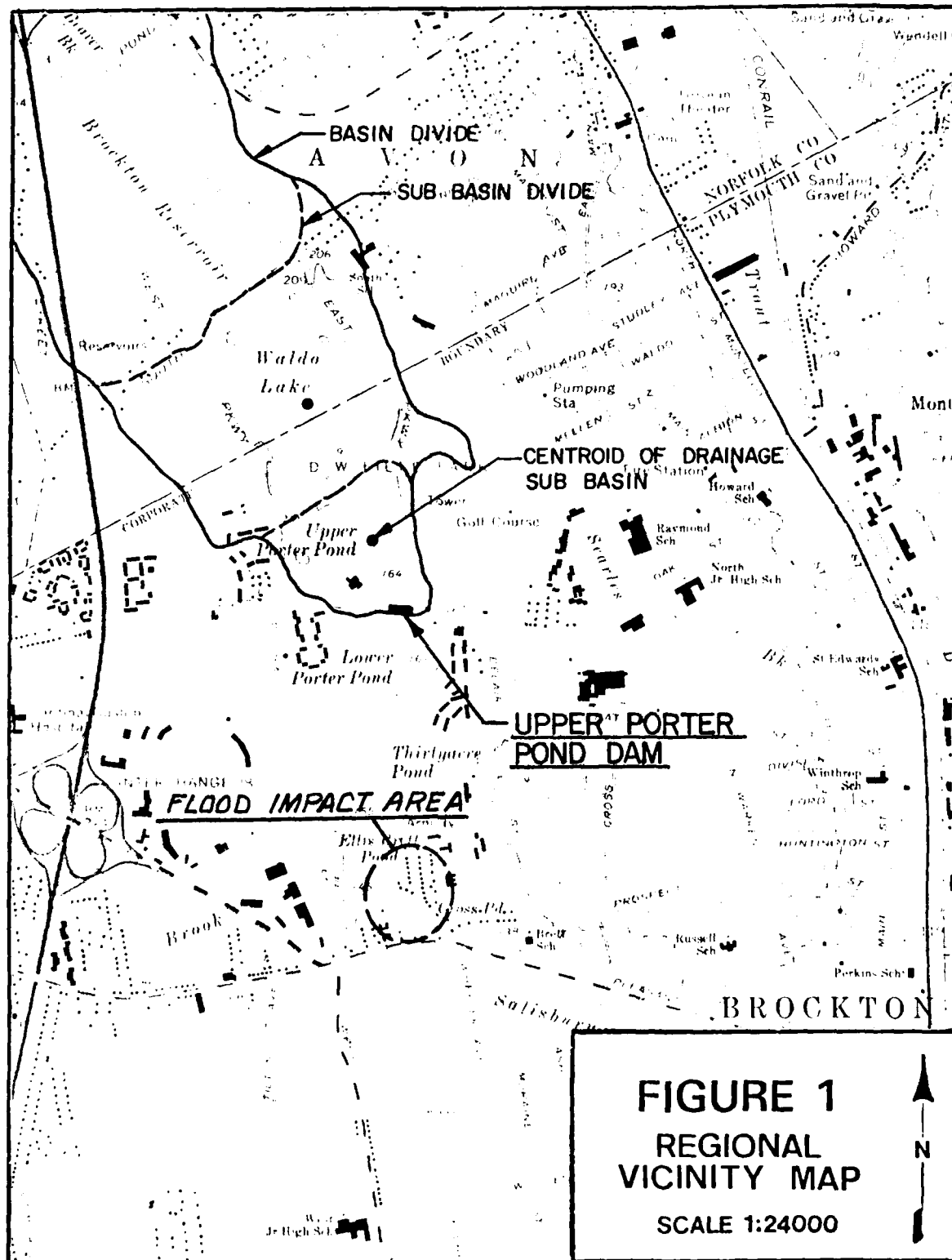
SUBJECT	UPPER PORTER POND DAM	SHEET	BY	DATE	JOB NO
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APPENDIX D

HYDROLOGIC & HYDRAULIC COMPUTATIONS

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STAGE-DISCHARGE & STAGE-STORAGE GRAPHS	D-4
T _p COMPS., PMP DATA, ELEV. SKETCH DAM & SPWY. (BROCKTON DAM)	D-5
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STAGE-DISCHARGE & STAGE-STORAGE COMPS. (WALDO LAKE DAM)	D-8
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HEC-1 DAM SAFETY VERSION, COMPUTER OUTPUT	D-13 to D-23
HEC-1 DAM SAFETY VERSION, BREACH ANALYSIS, COMPUTER OUTPUT	D-24 to D-30



BRYANT ASSOCIATES, INC.
648 Beacon Street
BOSTON, MASSACHUSETTS 02215
(617) 247-1800

JOB RED-COE, UPPER PORTER POND DAM
SHEET NO D-2 OF _____
CALCULATED BY RG DATE _____
CHECKED BY SHS DATE _____
SCALE _____

UPPER PORTER DAM - H & H

SUBDRAINAGE AREA = 0.11 sq. Mi

SNYDER HYDROGRAPH COEFFICIENTS

$C_t = 2.0$

$C_p = 0.5$

T_p COMPUTATIONS

$L = 0.44$ MILES

$L_{ca} = 0.22$ MILES

$T_p = C_t \cdot (L \times L_{ca})^{.3}$

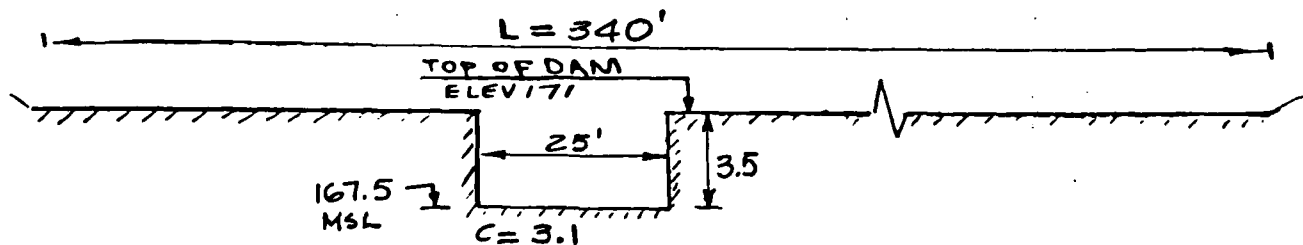
$T_p = 2 \times (.44 \times .22)^{.3} \approx \underline{\underline{1.0 \text{ Hour}}}$

PMP DATA

FROM HMS #33 THE 24 HOUR 200 sq. Mi INDEX RAINFALL IS 21.5

6hr. %	OF INDEX FOR THIS BASIN	= 111
12hr. %	" " " " "	= 124
24hr. %	" " " " "	= 133

DAM ELEVATION & LENGTH and SPILLWAY DIMENSIONS SKETCH



$C = 2.8$ TOP OF DAM

LOOKING DOWNSTREAM

D-2

BRYANT ASSOCIATES, INC.
648 Beacon Street
BOSTON, MASSACHUSETTS 02215
(617) 247-1800

JOB NED-COE, UPPER PORTER POND DAM

SHEET NO D- 3 OF

CALCULATED BY RG DATE

CHECKED BY SHS DATE

SCALE

UPPER PORTER DAM - H & H

STAGE DISCHARGE

(H=0 @ SPILLWAY CREST) ELEVATION = 167.5 MSL

1) SPILLWAY: $C = 3.1$ $L = 25'$ $Q_s = CLH^{1.5}$

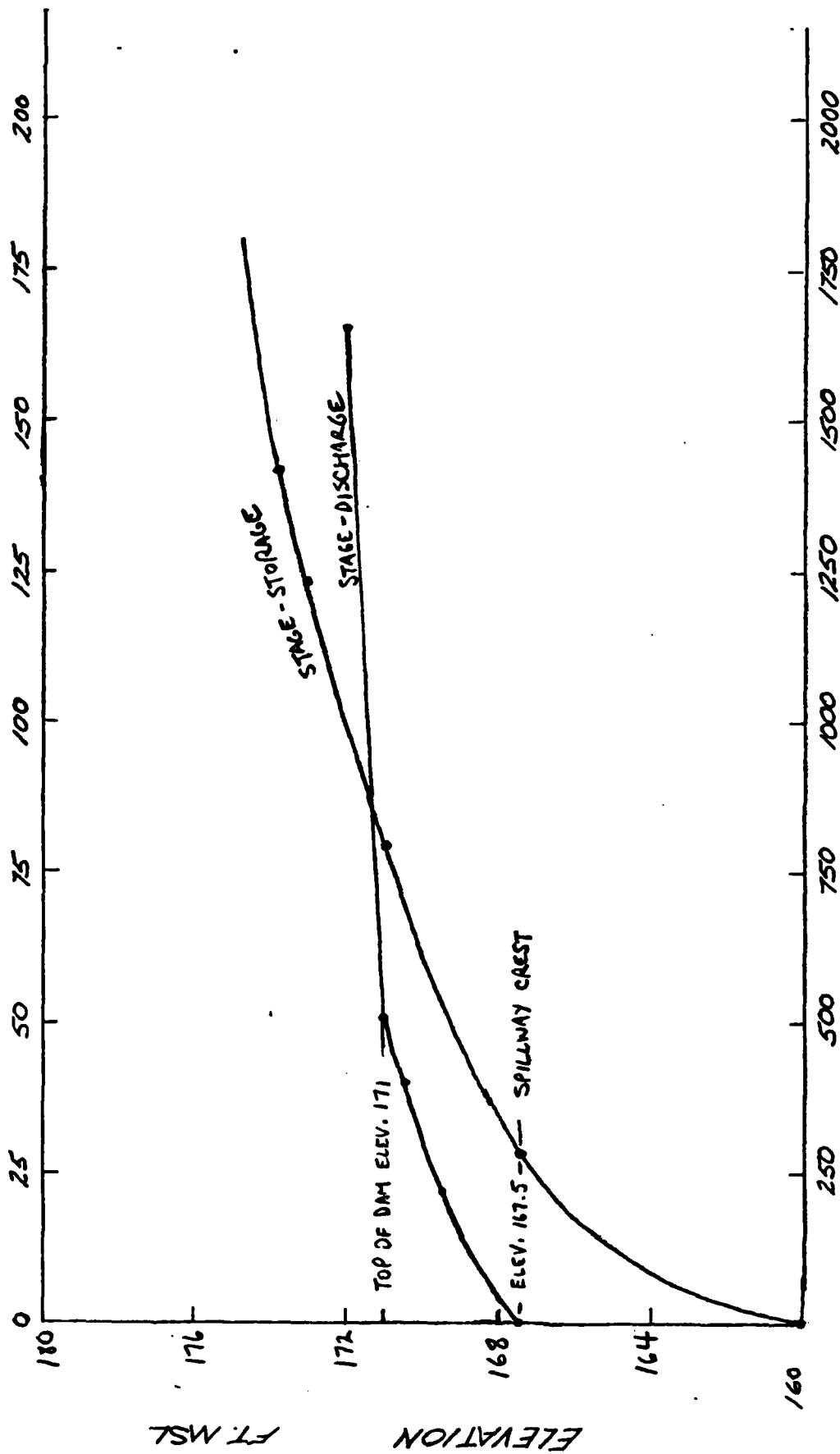
2) TOP OF DAM: $C = 2.9$ $L = 340 - 25 = 315$ $Q_{TOP} = CL(H - 3.5)^{1.5}$

ELEVATION MSL	H FT.	Q_s CFS	Q_{TOP} CFS	ΣQ CFS
167.5	0	0	0	
168.5	1	78	0	78
169.5	2	219	0	219
170.5	3	403	0	403
171.0	3.5	508	0	508
172.0	4.5	740	913	1,653
173.0	5.5	1,000	2,584	3,584
174.0	6.5	1,284	4,747	6,031
175.0	7.5	1,592	7,308	8,900
176.0	8.5	1,921	10,213	12,134

STORAGE

	ELEV. (MSL)	AREA (AC) (PLANIMETERED FROM USGS)	STORAGE (AC. FEET) (COMP. BY HEC-1 PROGRAM)
	160	0	0
NORMAL POOL	167.5	11	28
TOP OF DAM	171	19	79

STORAGE A-F



DISCHARGE CFS.

UPPER PORTER POND DAM

STAGE VS. STORAGE

STAGE VS. DISCHARGE

APPENDIX D

BRYANT ASSOCIATES, INC.
648 Beacon Street
BOSTON, MASSACHUSETTS 02215
(617) 247-1800

JOB NED-COE, UPPER PORTER POND DAM

SHEET NO. D-5 OF _____

CALCULATED BY RG DATE _____

CHECKED BY SHS DATE _____

SCALE _____

BROCKTON LAKE DAM - H & H

11

DRAINAGE AREA = 2.8 sq. Mi

SNYDER HYDROGRAPH COEFFICIENTS

$$C_L = 2.0$$

$$C_P = 0.5$$

T_P COMPUTATIONS

$$L = 2.70 \text{ MILES} \quad L_{ca} = 1.40 \text{ MILES}$$

$$T_P = C_L \cdot (L \times L_{ca})^{.3}$$

$$T_P = 2.0 \times (2.7 \times 1.4)^{.3} = \underline{\underline{3.0 \text{ HOURS}}}$$

PMP DATA

FROM HMS #33 THE 24 HOUR 200 sq. Mi INDEX RAINFALL IS 21.5

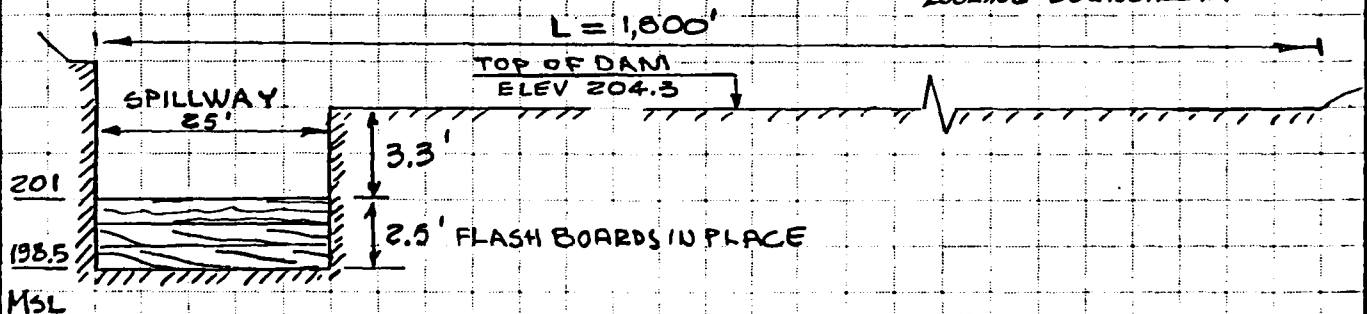
6hr. % OF INDEX FOR THIS BASIN = 111

12hr. % " " " " " = 124

24hr. % " " " " " = 133

DAM ELEVATION & LENGTH and SPILLWAY DIMENSIONS SKETCH

LOOKING DOWNSTREAM



LOOKING DOWNSTREAM

$C = 3.3$ w/ BOARDS

$C = 2.9$ TOP OF DAM

$C = 2.9$ w/out

D-5

BRYANT ASSOCIATES, INC.
648 Beacon Street
BOSTON, MASSACHUSETTS 02215
(617) 247-1800

JOB NED-COE, UPPER PORTER POND DAM

SHEET NO. D-6 OF _____

CALCULATED BY RG DATE _____

CHECKED BY SHS DATE _____

SCALE _____

BROCKTON LAKE DAM - H&H cont'd

STAGE DISCHARGE WITH FLASHBOARDS

(H=0 @ SPILLWAY CREST.)

1) SPILLWAY : $C = 3.3$ $L = 25'$ $Q_s = CLH^{1.5}$

2) TOP OF DAM : $C = 2.9$ $L = 1800 - 25 = 1775$ $Q_{dam} = CL(H - 3.3)^{1.5}$

ELEVATION MSL	H Ft.	Q_s CFS	Q_{top} CFS	ΣQ CFS
201	0	0	0	0
202	1	83	0	83
203	2	233	0	233
204	3	429	0	429
204.3	3.3	495	0	495
205	4	660	3,015	3,675
206	5	922	11,410	12,332
207	6	1,213	22,837	24,050
208	7	1,528	36,635	38,163
209	8	1,867	52,450	54,317
210	9	2,228	70,050	72,278

SPILLWAY DISCHARGE WITH NO FLASHBOARDS FOR TOP OF DAM EL.

$C = 2.8$ $L = 25$ $Q = CL(H + 2.5)^{1.5}$
 $Q = 978$ CFS

STORAGE

	ELEV. (MSL)	AREA (AC.) (PLANIMETERED FROM USGS)	STORAGE (ACRE FEET) (COMPUTED BY HEC-1 PROGRAM)
	194.3	0	0
NORMAL POOL	201	85	190
TOP OF DAM	204.3	—	493
	210	126	1133

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JOB NED-COE, UPPER PORTER POND DAM

SHEET NO. D-7 OF _____

CALCULATED BY RG DATE _____

CHECKED BY SHS DATE _____

SCALE _____

WALDO LAKE DAM - H&H

11

SUBDRAINAGE AREA = 0.38 sq. Mi.

SNYDER HYDROGRAPH COEFFICIENTS

$C_t = 2.0$ $C_p = 0.5$

T_p COMPUTATIONS

$L = 0.85$ MILE

$L_{ca} = 0.28$

$T_p = C_t \cdot (L \times L_{ca})^{0.2}$

$T_p = 2 \times (.85 \times .28)^{0.2}$

$T_p \approx \underline{\underline{1.25 \text{ HOURS}}}$

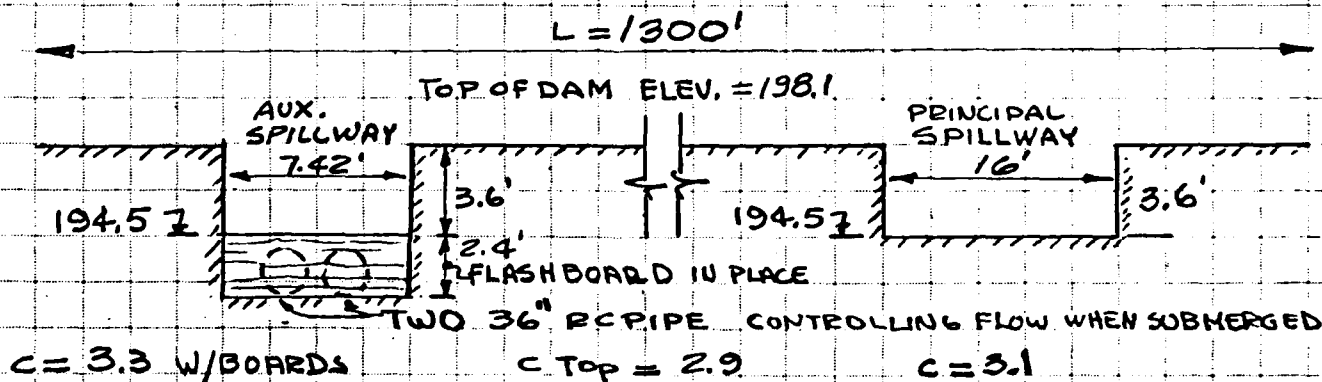
PMP DATA

FROM HMS #33 THE 24 HOUR 2.00 sq. Mi INDEX RAINFALL IS 21.5

6 hr. %	OF INDEX FOR THIS BASIN	= III
12 hr "	" " " " "	= 124
24 hr "	" " " " "	= 193

DAM ELEVATION & LENGTH and SPILLWAYS DIMENSIONS SKETCH.

LOOKING DOWNSTREAM



LOOKING DOWNSTREAM

D-7

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JOB NED-COE, UPPER PORTER POND DAM
SHEET NO. D-8 OF _____
CALCULATED BY RG DATE _____
CHECKED BY SHS DATE _____

SCALE _____

WALDO LAKE DAM H&H cont'd

STAGE DISCHARGE

$H=0$ @ SPILLWAY CREST

- 1) SERVICE SPILLWAY: $C=3.1$ $L=16'$ $Q_1 = CLH^{1.5}$
2) AUXILIARY SPILLWAY: $C=3.3$ $L=7.42'$ $Q_2 = CLH^{1.5}$
3) $H > 3.6$ PIPE CONTROL $Q_3 = .65AY\sqrt{2gd}$
4) TOP OF DAM $C=2.9$ $L=300'$ $Q_4 = CL(H-3.6)^{1.5}$

d = depth of water to centroid of pipe

ELEVATION MSL	H FT	Q_1	Q_2	Q_3	Q_4	ΣQ
			CFS			
194.5	0	0	0		0	
195.5	1	50	25		0	75
196.5	2	140	69	PIPE	0	209
197.5	3	258	127	FLOW	0	418
198.1	3.6	339	160		0	499
198.5	4	397	6	173	936	1,500
199.5	5	555	41	188	6,132	6,916
200.5	6	729	91	202	13,764	14,786
201.5	7	919	154	215	23,209	24,497
202.5	8	1,122	226	227	34,168	35,743

SURCHARGE STORAGE

	ELEVATION (MSL)	AREA (AC)	STORAGE (AC. FEET)
NORMAL POOL (FROM)	194.5	77.	0
TOP OF DAM (TO)	198.1	-	342
	200	137	581

PLANIMETERED
FROM USGS

COMPUTED
BY HEL-1
PROGRAM

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(617) 247-1800

JOB NED-COE, UPPER PORTER POND DAM

SHEET NO D-9 OF

CALCULATED BY RG DATE

CHECKED BY SHS DATE

SCALE

LOWER PORTER DAM - H & H

11

SUBDRAINAGE AREA

= 0.08 sq. Mi

SNYDER HYDROGRAPH COEFFICIENTS

$$C_t = 2.0$$

$$C_p = 0.5$$

T_p COMPUTATIONS

$$L = 0.64 \text{ MILES}$$

$$L_{ca} = 0.23 \text{ MILES}$$

$$T_p = C_t \cdot (L \times L_{ca})^{.3}$$

$$T_p = 2 \times (.64 \times .23)^{.3} \approx \underline{\underline{1.13 \text{ HOURS}}}$$

PMP DATA

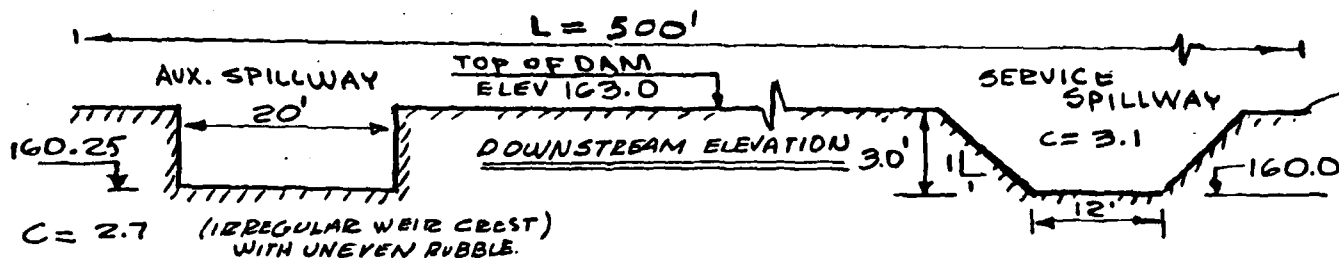
FROM HMS #33 THE 24 HOUR 200 sq. Mi INDEX RAINFALL IS 21.5

Chr. % OF INDEX FOR THIS BASIN = 111

12hr. % " " " " " = 124

24hr. % " " " " " = 133

DAM ELEVATION & LENGTH and SPILLWAY DIMENSIONS SKETCH



$C = 2.9$ TOP OF DAM

LOOKING DOWNSTREAM

D-9

BRYANT ASSOCIATES, INC.
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(617) 247-1800

JOB NEED-COE, UPPER PORTER POND DAM

SHEET NO. D-10

OF

CALCULATED BY RG

DATE

CHECKED BY SHS

DATE

SCALE

LOWER PORTER DAM cont'd

STAGE DISCHARGE

$H = 0$ @ SERVICE SPILLWAY CREST (ELEV. 160.0 MSL)

- 1) SERVICE SPILLWAY : $C = 3.1$ $L = 12'$ $Z = 1$
 $b_0 = 12'$ FOR $H \leq 3$ $Q = C \left(\frac{b_0 + b_H}{2} \right) H^{1.5}$
 FOR $H > 3$ $Q_1 = C \left[\left(\frac{b_0 + b_H}{2} \right) 3^{1.5} + 1.8 \times (H - 3)^{1.5} \right]$
- 2) AUXILIARY SPILLWAY : $C = 2.7$ $L = 20'$ $Q_2 = C L (H - 0.25)^{1.5}$
- 3) TOP OF DAM : $C = 2.9$ $L = 200 - 38 = 162'$ $Q_3 = C L (H - 3)^{1.5}$

ELEVATION MSL	H Ft	Q_1 CFS	Q_2 CFS	Q_3 CFS	ΣQ CFS
160	0	0	0	0	0
161	1	40	35	0	75
162	2	123	125	0	248
163	3	242	246	0	488
164	4	297	392	1,339	2,028
165	5	399	559	3,790	4,748
166	6	532	745	6,962	8,239
167	7	688	947	10,718	12,353
168	8	865	1,165	14,979	17,009

STORAGE

	ELEVATION (FT.)	AREA (AC.) (PLANIMETERED FROM USGS)	STORAGE (AC-FEET) (COMP. BY HEC-1 PROGRAM)
	157	0	0
NORMAL POOL	160	8	24
TOP OF DAM	163	—	54
	170	24	177

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JOB NED-COE, UPPER PORTER POND DAM

SHEET NO. D-11 OF _____

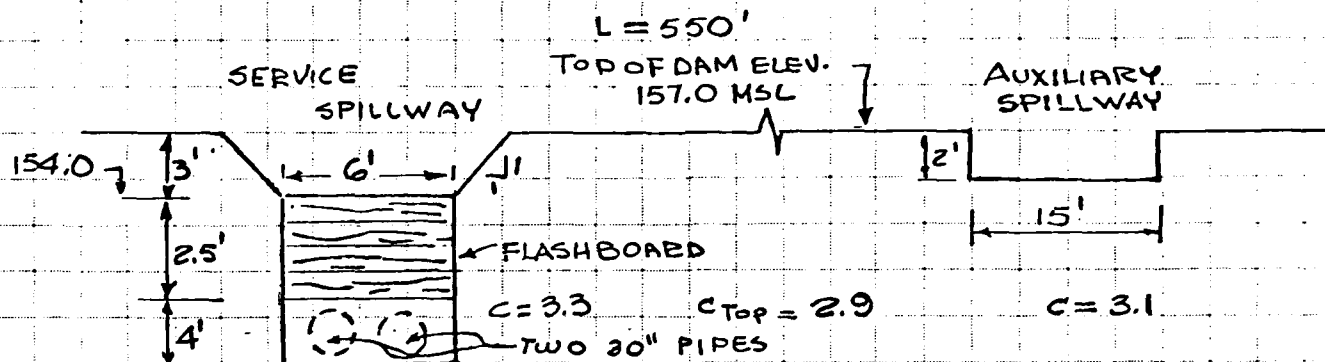
CALCULATED BY RG DATE _____

CHECKED BY SHS DATE _____

SCALE _____

THIRTY ACRE POND

DAM ELEVATION & LENGTH and SPILLWAYS DIMENSIONS SKETCH



STAGE DISCHARGE

H = 0 @ SERVICE SPILLWAY CREST (ELEV. = 154.0 MSL)

1) SERVICE SPILLWAY FOR $H \leq 3$ $Q_1 = C \left(\frac{b_o + b_H}{2} \right) H^{1.5}$

FOR $H > 3$ $Q_1 = C \left[\left(\frac{b_o + b_H}{2} \right) 3^{1.5} + 12 \times (H-3)^{1.5} \right]$

2) AUXILIARY SPILLWAY

$Q_3 = C L (H-1)^{1.5}$

3) TOP OF DAM: L = 523'

$Q_4 = C L (H-3)^{1.5}$

ELEVATION MSL	H FT.	Q ₁	Q ₂	Q ₃	Q ₄	EQ CFS
154	0	0		0	0	
155	1	23		0	0	23
156	2	75	PIPE FLOW	47	0	122
157	3	111	143	131	0	285
158	4	40	152	242	1517	1951
159	5	112	160	372	4290	4934
160	6	206	168	520	7881	8775

SURCHARGE STORAGE

PLANIMETERED
FROM USGS

COMPUTED BY
HEC-1 PROGRAM

	ELEVATION	AREA (AC.)	STORAGE (AC. FEET)
NORMAL POOL	154	26	0
TOP OF DAM	157	-	86
	160	37	188

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JOB NED-COE, UPPER PORTER POND DAM

SHEET NO D-12 OF _____

CALCULATED BY RG DATE _____

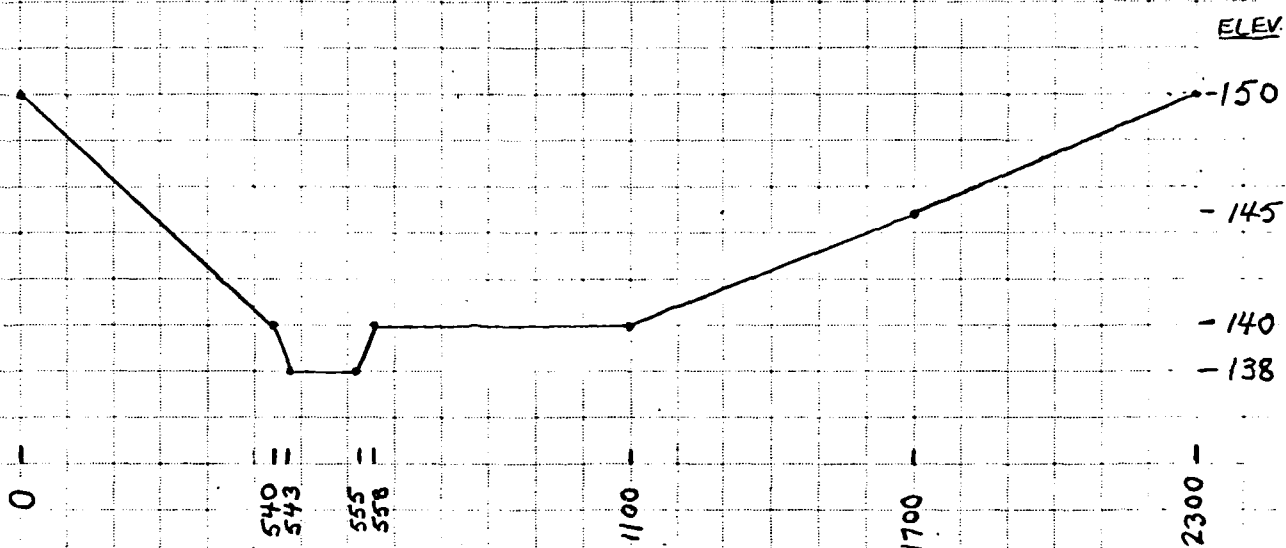
CHECKED BY SHS DATE _____

SCALE _____

BROCKTON
DOWNSTREAM ROUTING

SECTION @ HAZARD AREA

1200 FEET DOWNSTREAM OF THIRTYACRE POND DAM



MANING'S COEFFICIENTS : CHANNEL $\rightarrow$ 0.03
OVERBANKS $\rightarrow$ 0.08

CHANNEL SLOPE : .008 FT./FT.

FLOOD ROUTING THROUGH UPPER PORTER POND DAM WITHOUT BREACHING

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

INPUT

HYDROLOGIC ANALYSIS OF UPPER PORTER POND DAM									
NATIONAL DAM SAFETY PROGRAM									
NEW ENGLAND DIVISION - CORPS OF ENGINEERS									
1	A	1	0	0	0	0	0	0	0
2	A	1	0	0	0	0	0	0	0
3	A	1	0	0	0	0	0	0	0
4	B	300	0	0	0	0	0	0	0
5	B1	5	0	0	0	0	0	0	0
6	J	1	9	1	0	0	0	0	0
7	J1	1	2	3	4	5	6	7	8
8	K	0	0	0	0	0	0	0	0
9	K1	0	0	0	0	0	0	0	0
10	M	1	2	8	0	3	37	1	1
11	P	0	21	5	111	124	133	0	0
12	T	0	0	0	0	0	0	0	0
13	W	3	0	0	0	0	0	0	0
14	X	1	7	0	1	2	0	1	1
15	K	1	0	0	0	0	0	0	0
16	K1	0	0	0	0	0	0	0	0
17	Y	1	1	1	1	1	1	1	1
18	Y1	1	1	1	1	1	1	1	1
19	Y4	201	202	203	204	204.3	205	206	207
20	Y4	210	202	203	204	204.3	205	206	207
21	Y5	0	83	233	429	495	3675	12332	24050
22	Y5	70278	0	85	126	0	0	0	0
23	SA	0	85	126	0	0	0	0	0
24	SE	194.3	201	210	0	0	0	0	0
25	SS	201	0	0	0	0	0	0	0
26	SO	204.3	0	0	0	0	0	0	0
27	K	0	0	0	0	0	0	0	0
28	K1	0	0	0	0	0	0	0	0
29	M	1	1	0	38	3	37	1	1
30	P	0	21	5	111	124	133	0	0
31	W	1	25	0	5	0	0	0	0
32	X	1	7	0	1	2	0	1	1
33	K	1	0	0	0	0	0	0	0
34	K1	0	0	0	0	0	0	0	0
35	K1	0	0	0	0	0	0	0	0
36	K	1	0	0	0	0	0	0	0
37	K1	0	0	0	0	0	0	0	0
38	Y	1	1	1	1	1	1	1	1
39	Y1	1	1	1	1	1	1	1	1
40	Y4	194.5	195.5	196.5	197.5	198.1	198.5	199.5	200.5
41	Y5	0	75	209	418	499	1500	6916	14786
42	SA	77	137	0	0	0	0	0	0
43	SE	194.5	200	0	0	0	0	0	0
44	SS	194.5	0	0	0	0	0	0	0
45	SO	198.1	0	0	0	0	0	0	0
46	K	0	0	0	0	0	0	0	0
47	K1	0	0	0	0	0	0	0	0
48	M	1	1	0	11	0	3	37	1
49	P	0	21	5	111	124	133	0	0
50	T	0	0	0	0	0	0	0	0
51	W	1	0	5	0	0	0	0	0
52	X	1	7	0	1	2	0	1	1
53	K	2	0	0	0	0	0	0	0
54	K1	0	0	0	0	0	0	0	0
55	K	1	0	0	0	0	0	0	0
56	K1	0	0	0	0	0	0	0	0
57	Y	1	1	1	1	1	1	1	1
58	Y1	1	1	1	1	1	1	1	1
59	Y4	167.5	168.5	169.5	170.5	171	172	173	174
60	Y5	0	78	219	403	508	1653	3584	6031
61	SA	0	11	19	0	0	0	0	0
62	SE	160	167.5	171	0	0	0	0	0
63	SS	167.5	0	0	0	0	0	0	0
64	SO	171	0	0	0	0	0	0	0
65	K	99	0	0	0	0	0	0	0

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

HUM DATED 02/11/80.
TIME 0 14.36.06.

HYDROLOGIC ANALYSIS OF UPPER PORTER POND DAM
NATIONAL DAM SAFETY PROGRAM
NE# ENGLAND DIVISION - CORPS OF ENGINEERS

JOB SPECIFICATION									
NO	NH#	NHIN	IDAY	IMH	IMIN	METRC	IPLT	IPRT	INSTAN
300	0	10	0	0	0	0	0	0	0
			JUPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED

PERCENTAGES OF PMF USED → RTIOS= .10 .20 .30 .40 .50 .60 .70 .80 1.00
NPLAN# 1 NRTIOS# 9 LRTIOS# 1

INFLOW HYDROGRAPH DEVELOPMENT FOR BROCKTON RESERVOIR

SUB-AREA RUNOFF COMPUTATION

INFLOW TO BROCKTON LAKE

ISTAU	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
BROCK	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IRYDG	IURG	IAREA	SNAP	IRSDA	IRSPC	RATIO	ISNDW	ISAME	LOCAL
1	1	2.80	0.00	3.37	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	21.50	111.00	124.00	133.00	0.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LROPT	STARR	DLTKR	RTIOL	EMAIN	STHRS	RTIOL	STRTL	CNSYL	ALSHX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	0.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA

TP= 3.00 CP= .50 NTA= 0

RECESSION DATA

STRTIO= -1.70 QRCSEN= -.10 RTIOL= 2.00

UNIT HYDROGRAPH END-OF-PERIOD ORIGINATES: LAKE 2.99 HOURS, CP= .50 VOL= .98

4.	14.	30.	44.	69.	91.	115.	141.	167.	194.
220.	243.	263.	274.	293.	303.	310.	313.	309.	299.
287.	276.	255.	254.	244.	234.	224.	215.	207.	194.
190.	175.	164.	162.	155.	149.	143.	137.	132.	132.
126.	121.	116.	112.	107.	103.	99.	95.	91.	87.

44.	55.	37.	24.	16.	80.	77.	74.	71.	68.	65.	63.	60.	58.
53.	51.	35.	22.	15.	49.	47.	45.	43.	40.	38.	36.	34.	32.
28.	26.	24.	22.	20.	18.	16.	14.	13.	12.	11.	10.	9.	8.

END-OF-PERIOD FLOW

MO.DA	HR.MM	PERIOD	MAIN	EACS	LOSS	COMP 0	MO.DA	HR.MM	PERIOD	RAIN	EACS	LOSS	COMP 0
-------	-------	--------	------	------	------	--------	-------	-------	--------	------	------	------	--------

SUM 22.MA 21.6A 1.20 230485.
(581) (551) (30) (6526.61)

PRINTED IN U.S.A.

HYDROGRAPH ROUTING														
ROUTED OUTFLOW FROM BROCKTON LAKE DAM														
ISTAU		ICOMP	IECON	ITAPE	JPLI	JPRI	INAME	ISTAGE	IAUTO					
DAM 0		1	0	0	0	0	1	0	0					
ROUTING DATA														
QLUSS		CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR						
0.0		0.000	0.00	1	1	0	0	0						
NSTPS		NSTOL	LAG	AMSKK	X	ISK	STORA	ISPRAT						
1		0	0	0.000	0.000	0.000	-201.	-1						
STAGE	291.00	202.00	203.00	204.00	204.30	205.00	206.00	207.00	208.00	209.00				
	210.00													
FLOW	0.00	83.00	233.00	429.00	495.00	3675.00	12332.00	24050.00	38163.00	54317.00				
	70278.00													
SURFACE AREA=		0.	85.	126.										
CAPACITY=		0.	190.	1133.										
ELEVATION=		194.	201.	210.										
STAGE - STORAGE DATA FOR BROCKTON RESERVOIR DAM														
SPILLWAY CREST ELEVATION		→ 201.0	CHSL	SPWID	COUW	EXPW	ELEVEL	COOL	CAREA	EXPL				
		→ 201.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
DAM DATA														
		TOPEL	COUD	EXPD	DAMWID									
		→ 204.3	0.0	0.0	0.0									
.1 PMF		TOP OF DAM ELEVATION → 204.3												
PEAK OUTFLOW IS		208.	AT TIME	23.00	HOURS									
.2 PMF														
PEAK OUTFLOW IS		478.	AT TIME	22.33	HOURS									
.3 PMF														
PEAK OUTFLOW IS		1295.	AT TIME	19.67	HOURS									
.4 PMF														
PEAK OUTFLOW IS		1826.	AT TIME	14.00	HOURS									
.5 PMF														
PEAK OUTFLOW IS		2302.	AT TIME	18.83	HOURS									
ROUTED OUTFLOWS FROM														

LOCAL RUNOFF TO WALDO LAKE

*****															*****																											
SUB-AREA RUNOFF COMPUTATION																																										
INFLOW TO WALDO LAKE LESS BROCKTON																																										
ISIAQ	ICUMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO																																		
WALDO	0	0	0	0	0	1	0	0																																		
HYDROGRAPH DATA																																										
THYDS	1	.38	0.00	3.37	0.00	0.000	0	1	0																																	
PRECIP DATA																																										
SPFE	PMS	R6	R12	R24	R48	R72	R96																																			
0.00	21.50	111.00	124.00	133.00	0.00	0.00	0.00																																			
TRSPC COMPUTED BY THE PROGRAM IS .800																																										
LOSS DATA																																										
LRPT	STKR	DLTKR	RTIOL	ERATN	STRKS	RTIOL	STRL	CNSTL	ALSHX	RTIMP																																
0	0.00	0.00	1.00	0.00	0.00	1.00	0.00	.05	0.00	0.00																																
UNIT HYDROGRAPH DATA																																										
TP= 1.25 CP= .50 NTA= 0																																										
RECESSION DATA																																										
STHTQ= -1.70 QRCSN= -.10 RTIOM= 2.00																																										
UNIT HYDROGRAPH 59 END-OF-PERIOD ORIGINATES. LAG= 1.26 HOURS, CP= .50 VOL= 1.00																																										
4.	16.	32.	50.	69.	85.	95.	99.	86.																																		
78.	71.	64.	58.	53.	48.	43.	39.	36.																																		
29.	27.	24.	22.	20.	18.	16.	15.	13.																																		
11.	10.	9.	8.	7.	7.	6.	6.	5.																																		
4.	4.	3.	3.	3.	3.	2.	2.	2.																																		
2.	1.	1.	1.	1.	1.	1.	1.	1.																																		
END-OF-PERIOD FLOW																																										
0	HR.MN	PERIOD	RAIN	EACS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EACS	LOSS	COMP Q																													
SUN 22.00 21.00 1.20 319H5.																																										
(581.1(551.1(30.1(905.71)																																										
*****															*****																											

D- 16

COMBINE HYDROGRAPHS

COMBINE HYDROGRAPHS -

COMBINE HYDROGRAPHS

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPHY	INAME	ISTAGE	IAUTO
TAL	2	0	0	0	0	1	0	0
.....								
HYDROGRAPH ROUTING								
ROUTED OUTFLOW FROM WALDO LAKE								
ISTAO	ICOMP	IECON	ITAPE	JPLT	JPHY	INAME	ISTAGE	IAUTO
WALDO	1	0	0	0	0	1	0	0
ROUTING DATA								
QLOSS	CLOSS	AVG	IMES	IAPT	IPMP	LSTR		
0.0	0.000	0.00	1	1	0	0		
NSIPS	NSTOL	LAG	AMSKK	X	TSK	STORA	ISPRAT	
1	0	0	0.000	0.000	0.000	-195.	-1	
STAGE	194.50	196.50	197.50	198.10	198.50	199.50	200.50	202.50
FLOW	0.00	209.00	418.00	499.00	1500.00	6916.00	14786.00	24497.00
} STAGE FOR								
}								
SURFACE AREA= 77. 137.								
CAPACITY= 0. 581.								
ELEVATION= 195. 200.								
} STAGE-STORAGE DATA								
FOR WALDO LAKE DAM								
SPILLWAY CREST ELEVATION → 194.5								
TOPEL COOD EXPO DAM MID								
→ 198.1 0.0 0.0 0.								
TOP OF DAM ELEVATION → 198.1								
.1 PMF	PEAK OUTFLOW IS	142. AT TIME	29.67 HOURS					
.2 PMF	PEAK OUTFLOW IS	351. AT TIME	27.67 HOURS					
.3 PMF	PEAK OUTFLOW IS	804. AT TIME	22.33 HOURS					
.4 PMF	PEAK OUTFLOW IS	1674. AT TIME	20.50 HOURS					
.5 PMF	PEAK OUTFLOW IS	2445. AT TIME	19.50 HOURS					
.6 PMF	PEAK OUTFLOW IS	3081. AT TIME	19.17 HOURS					
.7 PMF	PEAK OUTFLOW IS	3644. AT TIME	19.00 HOURS					
				ROUTED OUTFLOWS FROM WALDO LAKE				

368

PEAK OUTFLOW IS 4179. AT TIME 19.00 HOURS

272

PEAK OUTFLOW IS 5285. AT TIME 19.43 HOURS

LOCAL RUNOFF TO UPPER PORTER POND

SUB-AREA RUNOFF COMPUTATION														
INFLOW TO UPPER PORTER POND LESS WALDO LAKE														
ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO						
UPORT	0	0	0	0	0	1	0	0						
HYDROGRAPH DATA														
IMYDG	IUNG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL					
1	1	.11	0.00	3.37	0.00	0.000	0	1	0					
PRECIP DATA														
SPFE	PHS	R6	R12	R24	R48	R72	R96							
0.00	21.50	111.00	124.00	133.00	0.00	0.00	0.00							
TRSPC COMPUTED BY THE PROGRAM IS .800														
LOSS DATA														
LROPT	STKR	DLTKR	RTIUL	ERAIN	STRKS	RTIOK	STRIL	CNSTL	ALSMX	RTIMP				
0	0.00	0.00	1.00	0.00	0.00	1.00	0.00	.05	0.00	0.00				
UNIT HYDROGRAPH DATA														
TP	1.00	CP	.50	NTA	0									
RECESSION DATA														
STRTU	-1.70	ORCSN	-.10	RTIOR	2.00									
UNIT HYDROGRAPH 40 END-OF-PERIOD ORIGINATES. LAG= 1.00 HOURS, CP= .50 VOL= 1.00														
2.	16.	24.	31.	35.	35.	32.	28.	25.						
22.	20.	15.	13.	12.	10.	9.	8.	7.						
6.	6.	5.	4.	4.	3.	3.	2.	2.						
2.	2.	1.	1.	1.	1.	1.	1.	1.						
1.	0.	0.	0.	0.	0.	0.	0.	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	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
SUM 22.04 21.68 1.20 9280.														
(581.1 (551.1 (30.1 (262.78)														
COMBINE HYDROGRAPHS														
COMBINE HYDROGRAPHS - COMBINING UPPER PORTER POND LOCAL RUNOFF														
AND WALDO LAKE ROUTED OUTFLOW														
COMBINE HYDROGRAPHS														
ISTAU	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO						
TOTAL	2	0	0	0	0	1	0	0						

HYDROGRAPH ROUTING

ROUTED OUTFLOW FROM UPPER PORTER POND

ISTAU IICORP IECUN IYAPE JPLT JPRY INAME IYAGE IAUO
UPUNT 1 0 0 0 0 1 0 0

ROUTING DATA
QLOSS CLOSS AVG IRES ISAME IORT 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 -168. -1

STAGE 167.50 168.50 169.50 170.50 171.00 172.00 173.00 174.00 175.00 176.00 } STAGE-DISCHARGE DATA FOR
FLOW 0.00 78.00 219.00 403.00 508.00 1653.00 3584.00 6031.00 8900.00 12134.00 } UPPER PORTER POND DAM

SURFACE AREA= 0. 11. 19. }
CAPACITY= 0. 28. } STAGE-STORAGE DATA FOR
ELEVATION= 160. 168. 171. } UPPER PORTER POND DAM

SPILLWAY CREST ELEVATION → 167.5

DAM DATA
TOPEL COOD EXPD DAMWID
171.0 0.0 0.0 0.0

.1 PMF
PEAK OUTFLOW IS 141. AT TIME 30.83 HOURS

.2 PMF
PEAK OUTFLOW IS 347. AT TIME 28.83 HOURS

.3 PMF
PEAK OUTFLOW IS 798. AT TIME 22.67 HOURS

.4 PMF
PEAK OUTFLOW IS 1653. AT TIME 20.67 HOURS

.5 PMF
PEAK OUTFLOW IS 2476. AT TIME 19.67 HOURS

.6 PMF
PEAK OUTFLOW IS 3144. AT TIME 19.33 HOURS

.7 PMF
PEAK OUTFLOW IS 3738. AT TIME 19.00 HOURS

.8 PMF
PEAK OUTFLOW IS 4297. AT TIME 19.00 HOURS

.9 PMF
PEAK OUTFLOW IS 5461. AT TIME 18.83 HOURS

ROUTED OUTFLOWS FROM
UPPER PORTER POND DAM

TEST FLOOD

AREA IN SQUARE MILES (SQUARE KILOMETERS)												
OPERATION	STATION	AREA	PLAN	RATIO 1	RATIO 2	RATIO 3	RATIO 4	RATIO 5	RATIO 6	RATIO 7	RATIO 8	RATIO 9
				.10	.20	.30	.40	.50	.60	.70	.80	1.00
RATIOS APPLIED TO FLOODS												
HYDROGRAPH AT	BROCK	2.80 (7.25)	1	465.	931.	1396.	1862.	2327.	2792.	3258.	3723.	4654.
ROUTED TO	DAM 0	2.80 (7.25)	1	208.	478.	1245.	1826.	2302.	2765.	3224.	3694.	4639.
HYDROGRAPH AT	WALDO	.38 (.98)	1	102.	204.	307.	409.	511.	613.	715.	817.	1022.
2 COMBINED	TAL	3.18 (8.23)	1	217.	502.	1418.	2073.	2631.	3164.	3691.	4218.	5334.
ROUTED TO	WALDO	3.18 (8.23)	1	142.	351.	804.	1674.	2445.	3081.	3644.	4179.	5285.
HYDROGRAPH AT	UPPORT	.11 (.28)	1	33.	67.	100.	133.	166.	200.	233.	266.	333.
2 COMBINED	TOTAL	3.29 (8.52)	1	142.	351.	811.	1695.	2497.	3160.	3749.	4304.	5451.
ROUTED TO	UPPORT	3.29 (8.52)	1	141.	347.	798.	1653.	2476.	3144.	3734.	4297.	5441.
TEST FLOOD PEAK INFLOW ROUTED TEST FLOOD OUTFLOW												

TEST FLOOD PEAK INFLOW

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1

[illegible]

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

RUN DATE 02/12/80.
 TIME 10:11:00.

HYDROLOGIC ANALYSIS OF UPPER PORTER POND DAM
 NATIONAL DAM SAFETY PROGRAM
 NEW ENGLAND DIVISION CORPUS OF ENGINEERS

JOB SPECIFICATION

NO	NUN	NATN	IBAY	IBR	IBIN	IBTC	IPLT	IPRT	IPSTN
300	0	10	0	0	0	0	0	-4	0
JOPEN NNT LROPT TRACE									
5 0 0 0 0									

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

NO INFLOW → RTIOS= 0.00

HYDROGRAPH ROUTING

ROUTED OUTFLOW FROM UPPER PORTER POND

ISIAN	IEUMP	IECON	ITAPE	UPLT	UPRT	INAME	ISTAGE	IRUTO
UPUNT	1	0	0	0	0	1	0	0
ROUTING DATA								
BCSS	CLSS	AVG	IRSS	ISAME	IPRT	IPMP	ISTR	
0.0	0.000	0.00	1	1	0	0	0	
NSTPS NSTOL LAG AMSKK A TSK STORA ISPHAT								
1	0	0	0.000	0.000	0.000	-171.	-1	

STAGE - DISCHARGE DATA FOR
 UPPER PORTER POND DAM

STAGE	167.50	168.50	169.50	170.50	171.00	172.00	173.00	174.00	175.00	176.00
FLOW	0.00	78.00	219.00	403.00	508.00	1653.00	3584.00	6031.00	8900.00	12134.00

SURFACE AREA= 0. 11. 19.
 CAPACITY= 0. 28. 79.
 ELEVATION= 160. 168. 171.

SPILLWAY CREST ELEVATION → 167.5

DAM DATA
 TOPEL COOD EXPD DAMWID
 171.0 0.0 0.0

DAM BREACH DATA
 BREACH ELEV 136. 165.00 1.00 171.00 171.00
 BREACH DATA 2 1.00 171.00 171.00 171.00

BEGIN DAM FAILURE AT 0.00 HOURS

PEAK OUTFLOW IS 855. AT TIME .58 HOURS

→ PEAK BREACH DISCHARGE

BREACH DATA - FAILURE BEGINS IMMEDIATELY
 WITH RESERVOIR SURFACE AT TOP OF DAM

HYDROGRAPH ROUTING														
UPPER PORTER BREACH THROUGH LOWER PORTER POND														
ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO						
LPURT	1	0	0	0	0	1	0	0						
ROUTING DATA														
QLOSS	CLOSS	AVG	IMES	ISAME	IOPT	IPMP	LSTR							
0.0	0.000	0.00	1	1	0	0	0							
DAM DATA														
NSTPS	NSTOL	LAG	AMSK	X	TSK	STORA	ISPRAT							
1	0	0	0.000	0.000	0.000	-160.	-1							
STAGE	160.00	161.00	162.00	163.00	164.00	165.00	166.00	167.00	168.00	STAGE-DISCHARGE DATA FOR LOWER PORTER POND DAM				
FLOW	0.00	75.00	240.00	480.00	2020.00	4748.00	8239.00	12353.00	17009.00					
SURFACE AREA = 0. 8. 24. }														
CAPACITY = 0. 24. }														
ELEVATION = 151. 160. 170. }														
SPILLWAY CREST ELEVATION → 160.0														
DAM DATA														
TOPEL	COOP	ESPO	DAMWID											
163.0	0.0	0.0	0.0											
TOP OF DAM ELEVATION → 163.0														
PEAK OUTFLOW IS 111. AT TIME 1.00 HOURS														
ROUTED OUTFLOW AT LOWER PORTER POND DAM DUE TO BREACH OF UPPER PORTER POND DAM														
HYDROGRAPH ROUTING														
UPPER PORTER BREACH THROUGH THIRTYACRE POND														
ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO						
LPURT	1	0	0	0	0	1	0	0						
ROUTING DATA														
QLOSS	CLOSS	AVG	IMES	ISAME	IOPT	IPMP	LSTR							
0.0	0.000	0.00	1	1	0	0	0							
DAM DATA														
NSTPS	NSTOL	LAG	AMSK	X	TSK	STORA	ISPRAT							
1	0	0	0.000	0.000	0.000	-154.	-1							
STAGE	154.00	155.00	156.00	157.00	158.00	159.00	160.00	160.00	160.00	STAGE-DISCHARGE DATA FOR THIRTYACRE POND DAM				
FLOW	0.00	23.00	122.00	285.00	1951.00	4934.00	8775.00	8775.00	8775.00					

HYDROGRAPH ROUTING

CHANNEL ROUTING TO HAZARD CENTER

ISTAU	ICOMP	IECON	ITAPE	JPLT	JPRF	INAME	ISTAGE	IAUTO
HAZARD	1	0	0	0	0	1	0	0
ROUTING DATA								
Q-CROSS	EL-ELEV	AVG	THES	ISAME	ISPT	IPMP	LSFR	
0.0	0.000	0.00	1	1	0	0		
MSFMS	MSFOL	LRO	RMSK	X	TSK	STORA	ISPRAT	
1	0	0	0.000	0.000	0.000	-1.	0	

NORMAL DEPTH CHANNEL ROUTING

Q-MT11 Q-MT12 Q-MT13 EL-MV1 EL-MAX RENTH SEL
 .0800 .0300 .0800 138.0 150.0 1200. .00800 } CHANNEL CHARACTERISTICS AT DOWNSTREAM DAMAGE AREA

CHANNEL INVERT ELEVATION

CROSS SECTION COORDINATES--STA-ELEV+STA-ELEV--ETC

0+00 150+00 5+00 10+00 140+00 5+300 138+00 555+00 138+00 558+00 140+00 } CHANNEL CROSS-SECTION AT DOWNSTREAM DAMAGE AREA

STORAGE	0+00	112+05	135+01	161+49	189+08	210+58	249+99	283+32	318+56	355+70	398+77	438+19
OUTFLOW	0.00	25.09	42600.04	53046.66	64559.63	77215.15	91030.89	104025.57	122218.70	139630.39	158281.17	173+88
STAGE	138+00	138+03	138+26	139+58	146+21	146+84	147+47	148+11	148+74	149+37	150+00	150+00
FLOW	0.00	25.09	42600.04	53046.66	64559.63	77215.15	91030.89	104025.57	122218.70	139630.39	158281.17	158281.17
MAXIMUM STAGE-15	138+00	138+03	138+26	139+58	146+21	146+84	147+47	148+11	148+74	149+37	150+00	150+00

STAGE STORAGE AND
 STAGE-DISCHARGE DATA
 FOR THE DOWNSTREAM
 CHANNEL

STREAM ELEVATION AT DAMAGE CENTER

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1

[illegible]

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1

ELEVATION	STORAGE	OUTFLOW
100	0	0
105	10	0
110	40	0
115	100	0
120	250	0
125	500	0
130	1000	0
135	1500	0
140	2000	0
145	2500	0
150	3000	0
155	3500	0
160	4000	0
165	4500	0
170	5000	0
175	5500	0
180	6000	0
185	6500	0
190	7000	0
195	7500	0
200	8000	0
205	8500	0
210	9000	0
215	9500	0
220	10000	0
225	10500	0
230	11000	0
235	11500	0
240	12000	0
245	12500	0
250	13000	0
255	13500	0
260	14000	0
265	14500	0
270	15000	0
275	15500	0
280	16000	0
285	16500	0
290	17000	0
295	17500	0
300	18000	0
305	18500	0
310	19000	0
315	19500	0
320	20000	0
325	20500	0
330	21000	0
335	21500	0
340	22000	0
345	22500	0
350	23000	0
355	23500	0
360	24000	0
365	24500	0
370	25000	0
375	25500	0
380	26000	0
385	26500	0
390	27000	0
395	27500	0
400	28000	0
405	28500	0
410	29000	0
415	29500	0
420	30000	0
425	30500	0
430	31000	0
435	31500	0
440	32000	0
445	32500	0
450	33000	0
455	33500	0
460	34000	0
465	34500	0
470	35000	0
475	35500	0
480	36000	0
485	36500	0
490	37000	0
495	37500	0
500	38000	0
505	38500	0
510	39000	0
515	39500	0
520	40000	0
525	40500	0
530	41000	0
535	41500	0
540	42000	0
545	42500	0
550	43000	0
555	43500	0
560	44000	0
565	44500	0
570	45000	0
575	45500	0
580	46000	0
585	46500	0
590	47000	0
595	47500	0
600	48000	0
605	48500	0
610	49000	0
615	49500	0
620	50000	0
625	50500	0
630	51000	0
635	51500	0
640	52000	0
645	52500	0
650	53000	0
655	53500	0
660	54000	0
665	54500	0
670	55000	0
675	55500	0
680	56000	0
685	56500	0
690	57000	0
695	57500	0

INITIAL VALUE	
160.00	
<u>24.</u>	
0.	

SPILLWAY CREST
160.00
24.
0.

TOP OF DAM
163.00
54.
488.

[illegible]

SUMMARY OF DAM SAFETY ANALYSIS

[illegible]

D-30

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

STATE	MA	COUNTY	MA	DIST.	MA	CONC.	MA	NAME	UPPER PORTER POND	LATITUDE (NORTH)	4206	LONGITUDE (WEST)	7102	REPORT DATE DAY	04	REPORT DATE MO	JAN	REPORT DATE YR	80
-------	----	--------	----	-------	----	-------	----	------	-------------------	------------------	------	------------------	------	-----------------	----	----------------	-----	----------------	----

POPULAR NAME	NAME OF IMPONDIMENT
	UPPER PORTER POND

NEAREST DOWNSTREAM CITY - TOWN - VILLAGE	POPULATION
BRACKTON	89000

TYPE OF DAM	YEAR COMPLETED	PURPOSES	HYDRAULIC HEIGHT (FT.)	IMPONDING CAPACITIES (ACRES-FT.)	MAXIMUM	NORMAL
WEPG	1940	4	11	79	28	

DIST OWN FED R PRV/FED ACS A VER/DATE
NED N N N N

REMARKS

D/S HAS	SPILLWAY	MAXIMUM DISCHARGE (CFS)	VOLUME OF DAM (CY)	POWER CAPACITY (MW)	INSTALLED	PROVIDED	NO.	LENGTH	WIDTH	LENGTH	WIDTH	LENGTH	WIDTH
2	340	25	508	7000									

OWNER	ENGINEERING BY	CONSTRUCTION BY
CITY OF BROCKTON MASS	UNKNOWN	UNKNOWN

DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	MA DECE	MA DECE

INSPECTION BY	INSPECTION DATE DAY	MO	YR	AUTHORITY FOR INSPECTION
O'BRIEN + GENE ENGINEERS INC.	170CT79			PL 92-367

REMARKS
TERRACED SPILLWAY

END

FILMED

6-85

DTIC