

AD-A154 919 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
WRIGHTS POND DAM (MA. (U) CORPS OF ENGINEERS WALTHAM MA
NEW ENGLAND DIV APR 80

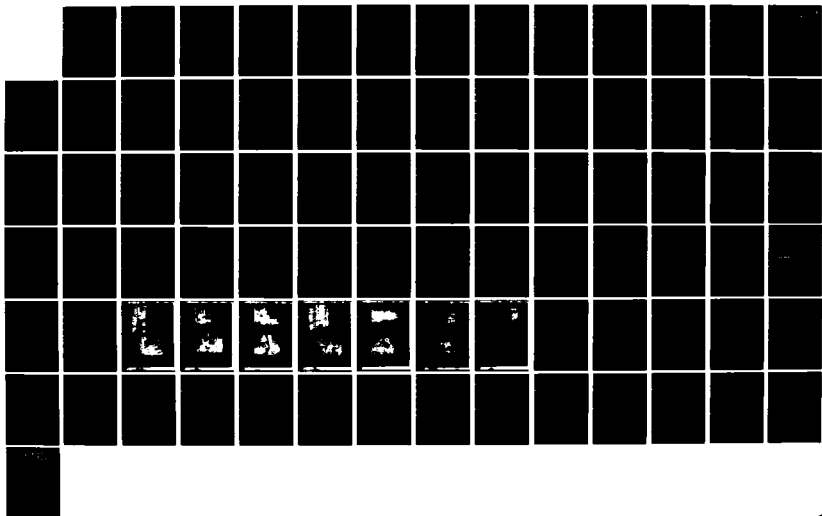
NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
WRIGHTS POND DAM (MA. (U) CORPS OF ENGINEERS WALTHAM MA
NEW ENGLAND DIV APR 80

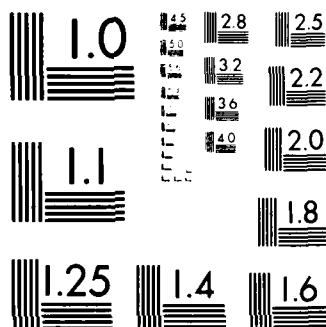
1/1

UNCLASSIFIED F/G 13/13 NL

F/G 13/13 NL

NL





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

FINAL

GEOTECHNICAL ENGINEERING
BRANCH

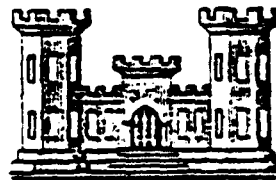
MASSACHUSETTS COASTAL AREA

MEDFORD, MASSACHUSETTS

AD-A154 919

WRIGHTS POND DAM
MA 00454

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



DTIC
SELECTED
JUN 11 1985
G

DISTRIBUTION STATEMENT A

Approved for public release;
Distribution Unlimited

DEPARTMENT OF THE ARMY

NEW ENGLAND DIVISION, CORPS OF ENGINEERS

WALTHAM, MASS. 02154

RECEIVED

MAY 15 1980

DTIC FILE COPY

APRIL 1980

Geotech. Engr. Br.

85 5 22 045

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER MA 00454	2. GOVT ACCESSION NO	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Wright's Pond Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS		8. CONTRACT OR GRANT NUMBER(s)
11. CONTROLLING OFFICE NAME AND ADDRESS DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		12. REPORT DATE April 1980
		13. NUMBER OF PAGES 74
		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		16a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) APPROVAL FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
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, Massachusetts Coastal Area Malden, Massachusetts Stream Tributary to Mystic River		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The dam is a 400 ft. long, 25 ft. hydraulic height earth fill embankment structure, with a small concrete outlet structure near the right abutment. Visual inspection indicated the dam to be in generally fair condition. Erosion was observed growing on both the upstream and downstream slopes. The dam has a small size classification and a high hazard potential class- ification. The owner should institute various remedial measures.		

DISPOSITION FORM

For use of this form, see AR 340-15, the proponent agency is TAGCEN.

REFERENCE OR OFFICE SYMBOL

NEDED-E

SUBJECT

Dam Safety Draft Report

TO

FROM

DATE

CMT 1

Chief, Design Branch

Chairman,
Dam Safety Review Board

3 April 1980

Chief, Geotechnical Engrg. Branch

Chief, Water Control Br.

Attached for your review are two copies of the Architect-Engineer's draft report for Wrights Pond Dam Dam, Identity No. MA 454.
The review board meeting date for this report is 14 April. Please present your comments in writing under the format shown below. Please return one copy with your comments. Cost code for this review is ABA020702000000 (FY80)

Incl (dupe)
as

D. Buono
DIBUONO

NATIONAL PROGRAM OF INSPECTION OF NON-FEDERAL DAMS
DRAFT REPORT REVIEW COMMENTS
DAM, IDENTITY NO. MA 454

BRANCH

Page No. 1

Comments

RECEIVED

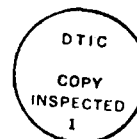
APR - 3 1980

Geotech. Engrg. Br.

NOTE: Bring nine (9) copies of comments to review board meeting.

NATIONAL DAM INSPECTION PROGRAM
PHASE I INVESTIGATION REPORT
BRIEF ASSESSMENT

Accession For	
NTIS GRA&I	☒
DTIC TAB	☐
Unannounced	☐
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A/	



Identification No.: MA 00454

Name of Dam: Wrights Pond Dam

Town: Medford

County and State: Middlesex County, Massachusetts

Stream: Offstream Tributary to Mystic River

Date of Inspection: November 1, 1979

The dam is a 400 foot long, 25 foot hydraulic height earth fill embankment structure, with a small concrete outlet structure near the right abutment. The dam is owned and operated by the City of Medford. It is believed that the dam was constructed about 1890.

There were no indepth engineering data available for review. The condition of the dam was primarily evaluated by visual inspection, past performance history and sound engineering judgement. Visual inspection indicated the dam to be in generally fair condition. Erosion was observed on the upstream slope and trees were observed growing on both the upstream and downstream slopes.

The dam has a small size classification and a high hazard potential classification. Based upon Corps Guidelines, the test flood would be in the 1/2 PMF to PMF range. The PMF was used for the test flood due to the urban residential development within the dam failure impact area. The test flood inflow from the 0.41 s.m. drainage area is 1,230 cfs.

The routed test flood outflow from the pond is 910 and 830 cfs, with 1 foot of stoplogs and without stoplogs in the outlet structure, respectively. The outlet structure will be discharging 30 cfs and 50 cfs or 3.3 and 6 percent of the test flood outflow for the conditions stated above. The dam would be overtopped by about 1.4 and 1.3 feet by the test flood outflow with and without 1 foot of stoplogs in the outlet structure, respectively.

It is recommended that the Owner engage a qualified registered professional engineer to perform the following: detailed hydraulic/hydrologic investigation to determine overtopping potential and need for increasing spillway capacity; provide a drawdown facility; design riprap slope protection for the upstream slope of the dam; determine procedures for removal of trees growing on the dam embankment and within 10 feet of the downstream toe and to assist in the selection of suitable fill materials for backfilling of the voids left in the embankment after removal of the tree root systems; a seismic stability investigation of the dam.

The Owner should institute remedial measures which include: brush should be cleared from the slopes of the dam embankment and from the area within 10 feet of the downstream toe; minor erosion on the crest should be repaired and grassy vegetation should be established on the crest to protect the soil against erosion; the outlet culvert should be cleared of debris and the spalled concrete repaired; establish a formal operational procedure and maintenance program for the dam; operating the existing outlet structure without stoplogs to provide maximum available discharge

and storage capacity; clean out and maintain the downstream outlet channel; develop a formal warning system for warning the downstream dam failure impact area in case of emergency; provide around the clock monitoring of the dam during periods of heavy rainfall; institute a program of annual technical inspection.

The recommendations and remedial measures should be implemented by the Owner within one year after receipt of this Phase I Investigation Report.



Ronald H. Cheney

Ronald H. Cheney, P.E.,
Vice President

Hayden, Harding & Buchanan, Inc.
Boston, Massachusetts

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 aide 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.

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
Letter of Transmittal	
Brief Assessment	
Review Board Page	
Preface	i
Table of Contents	iii-v
Overview Photo	vi
Location Map	vii

REPORT

1. PROJECT INFORMATION	1
1.1 General	1
a. Authority	1
b. Purpose	1
1.2 Description of Project	2
a. Location	2
b. Description of Dam and Appurtenances	2
c. Size Classification	3
d. Hazard Classification	3
e. Ownership	3
f. Operator	3
g. Purpose of Dam	4
h. Design and Construction History	4
i. Normal Operational Procedure	4
1.3 Pertinent Data	4
2. ENGINEERING DATA	9
2.1 Design Data	9
2.2 Construction Data	9
2.3 Operation Data	9
2.4 Evaluation of Data	9

<u>Section</u>	<u>Page</u>
3. VISUAL INSPECTION	10
3.1 Findings	10
a. General	10
b. Dam	10
c. Appurtenant Structures	11
d. Reservoir Area	11
e. Downstream Channel	12
3.2 Evaluation	12
4. OPERATIONAL AND MAINTENANCE PROCEDURES	14
4.1 Operational Procedures	14
a. General	14
b. Description of Warning Systems	14
4.2 Maintenance Procedures	14
a. General	14
b. Operating Facilities	14
4.3 Evaluation	14
5. EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES	15
5.1 General	15
5.2 Design Data	15
5.3 Experience Data	15
5.4 Test Flood Analysis	16
5.5 Dam Failure Analysis	16
6. EVALUATION OF STRUCTURAL STABILITY	18
6.1 Visual Observation	18
6.2 Design and Construction Data	18
6.3 Post-Construction Changes	18
6.4 Seismic Stability	18

<u>Section</u>	<u>Page</u>
7. ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES	19
7.1 Dam Assessment	19
a. Condition	19
b. Adequacy of Information	19
c. Urgency	19
7.2 Recommendations	19
7.3 Remedial Measures	20
a. Operation and Maintenance Procedures	20
7.4 Alternatives	20

APPENDIXES

APPENDIX A - INSPECTION CHECKLIST	A-1
APPENDIX B - ENGINEERING DATA	B-1
APPENDIX C - PHOTOGRAPHS	C-1
APPENDIX D - HYDROLOGIC AND HYDRAULIC COMPUTATIONS	D-1
APPENDIX E - INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS	E-1



Stones and debris are partially blocking the downstream culvert (photograph 6). Also wood is being stored along the outlet channel which could tumble into and block the channel.

e. Downstream Channel

The spillway outlet channel is shown in photograph 7. The channel is not well defined. A few large boulders are lying in the channel floor near the dam. Further downstream, the channel enters a 30 inch metal culvert, photograph 6, and flows into an urban storm drain system. Stones and debris were observed in the channel upstream of the culvert intake. Wood is apparently being stored to the immediate right of the channel. A debris screen located in front of the culvert is in generally good condition.

3.2 Evaluation

Based on the visual inspection, the dam appears to be in generally fair condition.

Continued erosion of the upstream slope could eventually lead to overtopping of the embankment, if left unchecked.

The trees growing on the embankment slopes and at the downstream toe endanger the stability of the dam. Uprooting of these trees by high winds and rotting of the root systems of trees that have died could provide pathways for seepage and lead to internal erosion of the embankment (piping).

The lack of vegetation on the crest renders it less resistant to erosion by runoff from rainfall or due to overtopping if it should occur. Such erosion could result in failure of the dam.

The spillway concrete and stoplogs appear to be in good condition. The concrete lining of the masonry outlet culvert is spalled and partially blocked with debris.

Downstream Slope

The downstream slope of the dam is inclined at 2H:1V and is covered with extensive tree growth, as shown in photograph 3. A number of trees are quite large and have extensive root systems growing into the embankment. The largest of these trees (6 foot diameter base) is shown in photograph 4. This tree and several others on the slope appear to be dead. The downstream slope appears uneven in some areas, probably due to minor erosion. A relatively large erosion gully was observed on the downstream slope near the crest in the central portion of the dam, visible in photographs 2 and 4. No seepage was observed on the downstream side of the dam.

c. Appurtenant Structures

A concrete spillway is located at the right abutment of the dam, as shown in photographs 5 and 10. The spillway appears to be founded on bedrock which outcrops at the right abutment, as can be seen in photograph 5. Most of the spillway outlet channel is in bedrock, as shown in photograph 12. Spalling of the concrete outlet channel can be seen in photograph 11. Debris within the concrete outlet channel was also observed.

No regulating outlets for the reservoir are known. A cast iron object which may be a control valve stem for an old pipe outlet was observed on the upstream slope near the center of the dam, but its use is unknown.

d. Reservoir Area

There are no indications of instability along the banks of the reservoir in the vicinity of the dam.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General

A small flow was discharging from the outlet structure at the time of inspection. Approximately one foot of stoplogs were in place.

b. Dam

The dam is an earth embankment about 25 feet high, 400 feet long, and 12 feet wide at the crest. A concrete spillway is located at the right abutment. No controlled outlets for the reservoir are known. There is a bedrock outcrop at the right abutment of the dam.

Upstream Slope

The upstream slope of the dam is covered with brush, numerous small trees and several dead tree stumps, as shown in photograph 1. There is no riprap protection on the upstream slope, and erosion scarps extending 1-2 feet above the reservoir level have formed along much of the slope, as shown in photograph 1. Erosion gullies up to 4-5 feet wide and 2 feet deep were observed at several locations along the slope.

Crest

The crest of the dam is bare soil with no protective vegetation, as shown in photograph 2. The surface of the crest appears uneven, probably due to minor erosion. No evidence of cracking or misalignment of the crest was observed.

SECTION 2
ENGINEERING DATA

2.1 Design Data

No information was located indicating when or by whom the dam was designed. No indepth design calculations were located.

2.2 Construction Data

No construction data was located for this dam.

2.3 Operation Data

No operational manual exists for this dam.

2.4 Evaluation of Data

a. Availability

No engineering data was located regarding Wrights Pond Dam. A State Inspection Report for 1974 was made available at the State Department of Environmental Quality Engineering, Division of Waterways, Boston Office.

b. Adequacy

No indepth engineering data was made available. This, therefore, does not permit a structural and hydraulic assessment of the dam from the standpoint of review of design calculations but must be based primarily on the visual inspection, past performance history, and sound engineering judgement.

c. Validity

The field investigation indicates that the external features of the intake structure substantially agree with those shown on the 1974 State Inspection Report sketch. The major discrepancies found were the 5+ foot maximum height and the 150 foot length of the dam indicated within the State Inspection Report.

- (4) Gates ----- None
(5) U/S Channel ----- None
(6) D/S Channel ----- stone masonry 6' x 2.8' box
culvert, discharges to unlined
stream channel

j. Regulating Outlets

There are no known regulating outlets at Wrights

Pond Dam.

e. Storage (acre-feet)

(1)	Normal pool -----	245
(2)	Flood control pool -----	N/A
(3)	Spillway crest pool -----	245 ₊
(4)	Top of dam -----	334 ₊
(5)	Test flood pool -----	381 ₊

f. Reservoir Surface (acres)

(1)	Normal pool -----	24
(2)	Flood control pool -----	N/A
(3)	Spillway crest -----	24
(4)	Test flood pool -----	37
(5)	Top of dam -----	35

g. Dam

(1)	Type -----	gravity earth embankment
(2)	Length -----	400' ₊
(3)	Height -----	25' ₊
(4)	Top Width -----	12'
(5)	Side Slopes -----	u.s. 3:1; d.s. 2:1
(6)	Zoning -----	Unknown
(7)	Impervious Core -----	Unknown
(8)	Cutoff -----	Unknown
(9)	Grout curtain -----	Unknown

h. Diversion and Regulating Tunnel ----- None

i. Spillway

(1)	Type -----	concrete, overflow
(2)	Length of weir -----	2.5'
(3)	Crest elevation -----	136.7 NGVD without stoplogs 137.7 with 1' of stoplogs

4. Ungated Spillway Capacity at Test Flood

The PMF test flood inflow is 1,230 cfs. The spillway discharge with and without 1 foot of stoplogs would be approximately 50 cfs and 30 cfs, respectively. These capacities correspond to 3+ and 6+ percent of the routed test flood outflow.

5. Total Project Discharge at Test Flood Elevation

Under test flood conditions, the total project discharge would be about 830 cfs without stoplogs in the spillway. The total project discharge with 1 foot of stoplogs in place would be approximately 910 cfs. The test flood elevations are 141.3 and 141.4, respectively.

c. Elevation (ft. above NGVD - approximate only)

(1)	Streambed at toe of dam -----	115+
(2)	Bottom of cutoff -----	Unknown
(3)	Maximum tailwater -----	Unknown
(4)	Normal pool -----	137
(5)	Full flood control pool -----	N/A
(6)	Spillway crest -----	136.7 without stoplogs 137.7 with 1' stoplogs
(7)	Design surcharge (Original Design) -----	Unknown
(8)	Top of Dam -----	140+
(9)	Test flood surcharge -----	141.3+ without stoplogs 141.4+ with 1' stoplogs

d. Reservoir (Length in feet)

(1)	Normal pool -----	1800+
(2)	Flood control pool -----	N/A
(3)	Spillway crest pool -----	1800+
(4)	Top of dam -----	1900+
(5)	Test flood pool -----	1950+

b. Discharge at Outlet

1. Outlet Works

The outlet works for this project consist of a concrete spillway which discharges into a concrete lined stone masonry box culvert. The spillway has a 1.2 foot high weir with a 2.5 foot long by 4.7 foot high discharge opening. There are provisions for placing stoplogs on top of the weir to control the outflow from the structure. The crest of the weir is at elevation 136.7, approximately 3.3 feet below the top of the dam, elevation 140. The box culvert, beyond the weir, has dimensions of 6 feet long by 2.8 feet high and discharges into a natural stream channel. Several hundred feet downstream, this stream flows into a 30 inch corrugated metal culvert which is partially blocked by stones. The culvert is connected to a storm drainage system.

2. Maximum Known Flood

No records of maximum impoundment or discharges are available for this project. Information obtained from U.S. Weather Bureau records indicate that about 14 inches of rainfall occurred in the general vicinity of the dam between August 17 and 20, 1955. Data from the same source shows that approximately 5 inches of rainfall occurred in this area during the period of September 17 to 22, 1938. According to the caretaker, the dam was overtopped in approximately 1957.

3. Ungated Spillway Capacity at Top of Dam

The maximum capacity of the outlet structure, without stoplogs, is 50 cfs with the water level at the top of dam, elevation 140. The maximum spillway capacity with 1 foot of stoplogs in place would be 30 cfs for this condition.

g. Purpose of Dam

The purpose of this dam is for recreation. The spillway weir and stoplogs are used to control the water level in Wrights Pond.

h. Design and Construction History

There were no records available to indicate when the dam was built or when subsequent repairs or modifications were made. According to City of Medford Highway Department personnel, the existing concrete spillway was constructed approximately 20 years ago to replace a wooden structure.

i. Normal Operational Procedures

The spillway is the only known operational facility for the dam. According to City of Medford Highway Department personnel, in the summer approximately 2 feet of stoplogs are placed at the spillway inlet to raise the level of the pond for recreational purposes. In the winter the stoplogs are lowered to one foot.

1.3 Pertinent Data

a. Drainage Area

The drainage area, 0.41 s.m. (264 acres) is generally hilly, undeveloped land. Wrights Pond is fed by several small streams. The pond has a beach area and is used for recreation.

Located to the south and southeast of the pond is a heavily developed residential area. State Route 28 and Interstate Route 93 are located several hundred feet to the west of Wrights Pond. The areas to the north and northeast are undeveloped and known as Wrights Park.

There are no other known operational facilities contained at this dam. Water discharged through the spillway flows into a 30 inch corrugated metal pipe culvert, located several hundred feet downstream of the dam, which flows into an urban storm drain system (photograph 6).

c. Size Classification

Based upon Corps Guidelines, the size classification of small requires a storage capacity ranging between 50 to 1000 acre-feet and a hydraulic height ranging between 25 to 40 feet. This dam is classified as small based on its storage capacity of 406+ acre-feet and height of 25+ feet.

d. Hazard Classification

The dam has a high hazard potential due to the potential for the loss of more than a few lives from dam failure flooding. It is estimated that approximately 25 houses would receive excessive, up to 10 feet deep, flood water damage if the dam were to fail. The flood stage could reach depths of 10 feet. The maximum failure discharge, based upon Corps Guidelines, would be 14,700 cfs.

e. Ownership

The dam is owned by the City of Medford, Massachusetts.

f. Operator

The dam is maintained by the City of Medford Highway Department, Mr. Frank Lawsky is the designated caretaker. The address is 85 Salem Street, Medford, Massachusetts 02155; telephone 617-396-5500. The swimming and beach area located at the left abutment area is maintained by the City of Medford Parks Department.

1.2 Description of Project

a. Location

Wrights Pond Dam is located in the City of Medford in Middlesex County, Massachusetts. The dam impounds the waters of Wrights Pond and is located at the southern end of the pond. Wrights Pond Dam is shown on the U.S.G.S. Boston North, Massachusetts Quadrangle Sheet with the approximate coordinates of North $42^{\circ}26'25''$, West $71^{\circ}06'24''$.

b. Description of Dam and Appurtenances

Wrights Pond Dam is a 25+ foot high by 400+ foot long earth embankment structure with a concrete and stone masonry outlet culvert which acts as a spillway. The embankment runs from the northeast to southwest for about 300 feet and then turns sharply to the north for another 100 feet. See drawings in Appendix B and photographs in Appendix C. The crest and downstream face of the dam are generally covered with vegetation including a number of large trees (photograph 9). The dam has a slope on the upstream face of approximately 3H:1V and a slope of approximately 2H:1V on the downstream face. The dam crest is about 12 feet wide.

The concrete spillway has a 2.5 foot long by 4.7 foot high opening, although the weir crest is only 3.3 feet below the top of the dam. There are provisions for placing stoplogs on top of this weir. The spillway discharges into a concrete lined stone masonry box culvert 6 feet long by 2.8 feet high (photograph 12). The culvert discharges into a small unlined channel (photograph 7).

PHASE I
NATIONAL DAM INSPECTION PROGRAM

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority

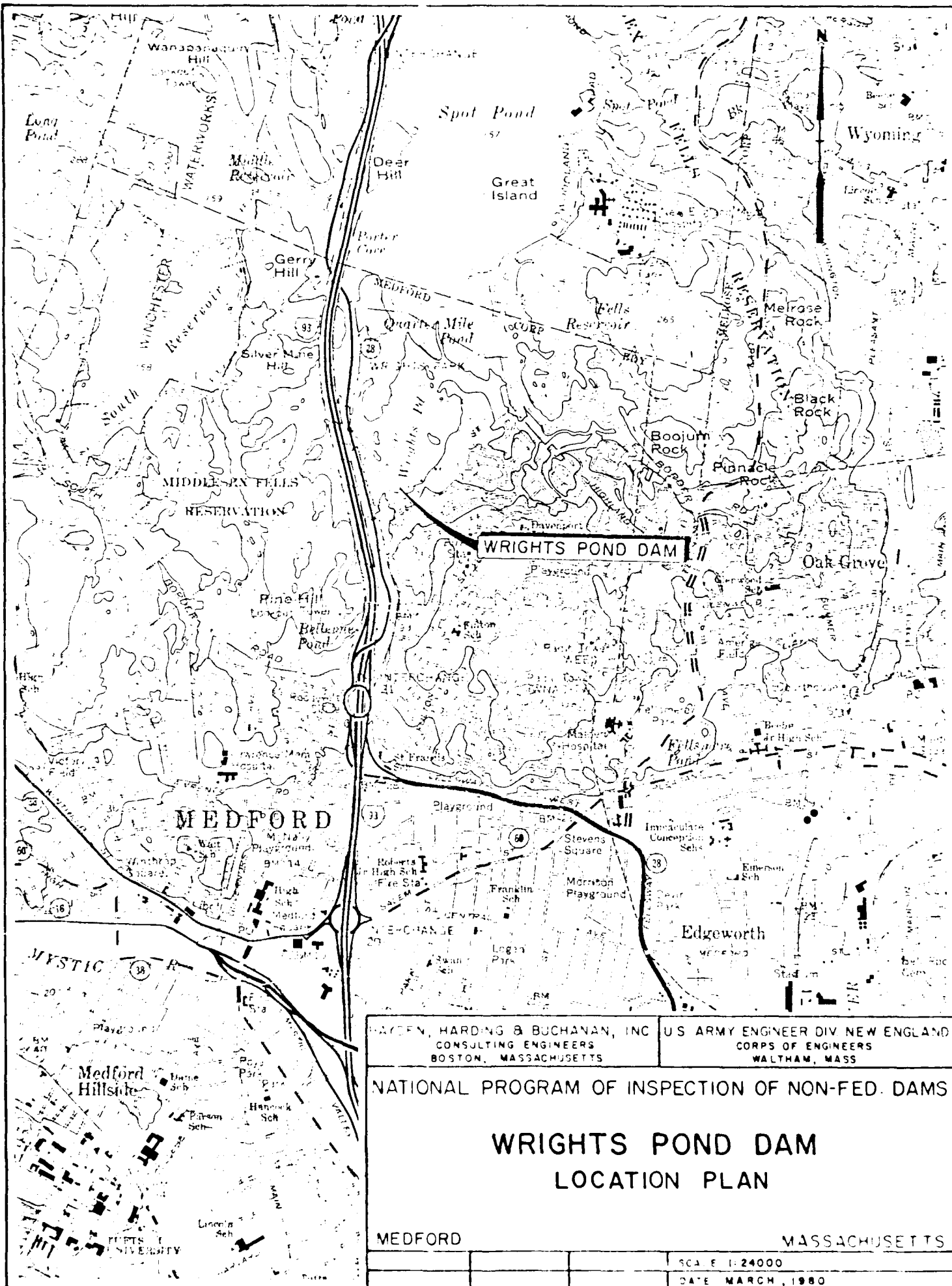
Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Hayden, Harding & Buchanan, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Massachusetts. Authorization and notice to proceed was issued Hayden, Harding & Buchanan, Inc. under a letter of 24 October 1979 from William E. Hodgson Jr., Colonel, Corps of Engineers. Contract No. DACW 33-80-C-0006 has been assigned by the Corps of Engineers for this work.

b. Purpose

(1) Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

(2) Encourage and assist the States to initiate quickly effective dam safety programs for non-Federal dams.

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



SECTION 4
OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operational Procedures

a. General

The purpose of the dam is for recreation. The spillway's manually placed stoplogs are used to control the water surface elevation. In the summer approximately 2 feet of stoplogs are placed at the spillway. In the winter these stoplogs are lowered to one foot.

b. Description

There are no warning systems in effect at this dam.

4.2 Maintenance Procedures

a. General

There are no formal maintenance procedures for the dam. The dam is maintained by the City of Medford Highway Department. The bathing area located at the left abutment area is maintained by the City of Medford, Parks Department.

b. Operating Facilities

Stoplogs are placed at the spillway to control the level of the pond. The Highway Department is responsible for maintenance of the spillway.

4.3 Evaluation

There are no formal written operational or maintenance procedures. The owner should institute a program of annual technical inspection.

SECTION 5

EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General

Wrights Pond is located in the City of Medford, Massachusetts near the Medford-Stoneham-Malden corporate boundaries. The drainage area, 0.41 square miles (264 acres) is made up of hilly, undeveloped land. The pond, which has a surface area of about 35 acres, discharges through a spillway located near the southern portion (right abutment) of the dam.

The area to the south of the pond and along the natural drainage path of its outlet brook has moderate to high density urban residential development. Spot Pond, a large MDC water supply reservoir is located directly to the north. See the drainage area map and drawings in Appendixes B and D.

5.2 Design Data

Hydraulic/hydrologic design data for this project could not be located.

5.3 Experience Data

Records of past flood events and possible overtopping of the dam could not be found. According to City of Medford personnel the dam was overtopped in about 1957.

Information obtained from the records of the U.S. Weather Bureau indicate that about 14 inches of rainfall occurred within the general vicinity of Wrights Pond from August 17 to 20, 1955, and about 5 inches occurred from September 17 to 22, 1938.

5.4 Test Flood Analysis

This dam has a small size classification and a high hazard potential. Based upon Corps Guidelines, the test flood would range between 1/2 PMF to PMF. Due to the extensive residential development within the dam failure impact area, the test flood chosen was the PMF. Runoff from the small 0.41 square mile drainage area is beyond the 2 square mile lower limit of the Corps Guidelines chart. For these small drainage areas, test flood runoff rates are based upon 3000 cfs/sm.

Assuming no stoplogs, and the initial pool elevation to be at the spillway elevation, 136.7, the inflow of 1,230 cfs would surcharge the pond to elevation 141.3. This surcharge would overtop the dam by 1.3 feet and result in a routed outflow of 830 cfs. With 1 foot of stoplogs and a pool elevation of 137.7, the pond would be surcharged to elevation 141.4. The routed outflow for this condition would be 910 cfs. The pond would provide stage storage for 5 to 6.2 inches of runoff during test flood conditions. The spillway would pass 30 cfs and 50 cfs, with and without one foot of stoplogs. These discharges correspond to 3.3 and 6 percent of the routed test flood outflows.

During summer operation, with the stoplogs set at a higher level, the spillway discharge capacity would be reduced. The test flood inflow of 1,230 cfs would cause the surcharge elevation and dam overtopping to increase. Routed test flood outflow would also increase.

5.5 Dam Failure Analysis

The failure analysis was performed assuming a pond level at elevation 140, top of dam. The dam has a hydraulic height of 25

feet and a maximum storage capacity of 334 acre-feet. Forty percent of a 175 foot long section of the dam (measured at midheight) at the location of the "original outlet channel" area, was assumed to have failed. Immediately before the failure of the dam, the spillway, with 1 foot of stoplogs in place, would be discharging 30 cfs. This initial flow would not result in any damages to structures or noticeable flooding in downstream areas.

Based on Corps "rule of thumb" guidance, the failure of the dam would result in a peak outflow of 14,700 cfs. Immediately downstream of the dam there is a moderate to heavily developed residential area that would be inundated by the failure discharge. At least 25 homes within this impact area could suffer flood damage. The typical maximum failure flood stage within the dam failure impact area is 10 feet deep. Flood water depths which could cause damage could vary from 2 to 10 feet, depending on the locations and elevations of structures within the impact area. Loss of more than a few lives and excessive property damages could occur as a result of the failure of this dam, thereby providing for a high hazard classification.

SECTION 6
EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observations

The visual inspection indicates the following potential structural problems.

- a. Erosion of the upstream slope which could lead to overtopping.
- b. The presence of large trees on the downstream slope which could cause seepage or erosion problems if a tree blows over and pulls out its roots or if a tree dies and its roots rot.
- c. Lack of vegetation on the crest which makes it more susceptible to erosion during rainstorms or overtopping.

6.2 Design and Construction Data

No original design and construction data are available for the dam.

6.3 Post-Construction Data

The existing concrete spillway facility was constructed about 1960. No additional information was available about post-construction changes.

6.4 Seismic Stability

The dam is located in Seismic Zone 3. Considering its height, a seismic stability investigation should be conducted as recommended in Section 7.2.

SECTION 7

ASSESSMENT, RECOMMENDATION & REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition

Based on a visual inspection, the dam is judged to be in generally fair condition.

b. Adequacy

The information made available, along with the visual inspection, is adequate for a Phase I level of investigation.

c. Urgency

The recommendations and remedial measures presented below should be implemented by the Owner within one year after receipt of this Phase I Inspection Report.

7.2 Recommendations

The Owner should engage a qualified registered professional engineer to:

a. Design riprap slope protection for the upstream slope of the dam.

b. Determine procedures for removal of trees growing on the dam embankment and within 10 feet of the downstream toe and to assist in the selection of suitable fill materials for back-filling of the voids left in the embankment after removal of the tree root systems.

c. Perform a seismic stability investigation of the dam.

d. Perform a detailed hydraulic/hydrologic investigation to determine overtopping potential and the need to increase spillway capacity and discharge channel size.

e. Provide a drawdown facility which could be used to lower the level of the reservoir in the event of an emergency.

7.3 Remedial Measures

a. Operation and Maintenance Procedures

1. Brush should be cleared from the slopes of the dam embankment and from the area within 10 feet of the downstream toe.

2. Minor erosion on the crest should be repaired and grassy vegetation should be established on the crest to protect the soil against erosion.

3. The outlet culvert should be cleared of debris and the spalled concrete repaired.

4. Stones and debris within the downstream channel in front of the 30-inch culvert should be cleared. Wood, which could tumble into and block the outlet channel, should not be stored along the channel banks.

5. The Owner should establish a formal operational procedure and maintenance program for the dam.

6. Until item 7.2.d. is implemented the stoplogs should be removed from the spillway to provide maximum discharge and storage capacity.

7. The Owner should establish a formal downstream warning system in case of an emergency and provide around the clock monitoring of the dam during periods of heavy rainfall.

8. The owner should institute a program of annual technical inspection.

7.4 Alternatives

There are no practical alternatives to the recommendations.

APPENDIX A
INSPECTION CHECKLIST

VIS AL INSPECTION CHECKLIST PARTY ORGANIZATION

PROJECT WRIGHTS POND DAM

DATE Nov. 1, 1979

TIME 9 am

WEATHER Cool (45°), Sunny

M.S. ELEV. 136.7±U.S. — M.S.

PARTY:

- | | |
|---------------------------|-----------|
| 1. <u>R. Cheney, HHB</u> | 5. _____ |
| 2. <u>D. Vine, HHB</u> | 7. _____ |
| 3. <u>D. LaGatta, GEI</u> | 8. _____ |
| 4. <u>D. Shields, GEI</u> | 9. _____ |
| 5. _____ | 10. _____ |

PROJECT FEATURE	INSPECTED BY	REMARKS
1. <u>Embankment Dam</u>	<u>D. LaGatta, D. Shields</u>	
2. <u>Spillway-Outlet Channel</u>	<u>R. Cheney, D. Vine</u>	
3. _____	_____	_____
4. _____	_____	_____
5. _____	_____	_____
6. _____	_____	_____
7. _____	_____	_____
8. _____	_____	_____
9. _____	_____	_____
10. _____	_____	_____

PERIODIC INSPECTION CHECKLIST

PROJECT	<u>WRIGHTS POND DAM</u>	DATE	<u>Nov. 1, 1979</u>
PROJECT FEATURE	<u>Embankment Dam</u>	NAME	<u>D. LaGatta</u>
DISCIPLINE	<u>Geotechnical Engineer</u> <u>Structural Engineer</u>	NAME	<u>D. Shields</u> <u>R. Cheney</u> <u>D. Vine</u>

AREA EVALUATED	CONDITION
<u>DAM EMBANKMENT</u>	
Crest Elevation	140.0 ±
Current Pool Elevation	136.7 ±
Maximum Impoundment to Date	unknown
Surface Cracks	None observed.
Pavement Condition	No pavement, bare soil.
Movement or Settlement of Crest	None observed.
Lateral Movement	None observed.
Vertical Alignment	No misalignment observed.
Horizontal Alignment	No misalignment observed.
Condition at Abutment and at Concrete Structures	Good.
Indications of Movement of Structural Items on Slopes	None.
Trespassing on Slopes	No indications observed.
Sloughing or Erosion of Slopes or Abutments	Erosion scarps on upstream slope extending 1-2 ft above the reservoir level and erosion gullies up to 4-5 ft wide and 2 ft deep.
Rock Slope Protection - Riprap Failures	No riprap on upstream slope.
Spacial Movement or Cracking at or Near Toe	None observed.
Spacial Embankment or Downstream Seepage	None observed.
Sliding or Falls	None observed.
Foundation Drainage Features	None observed.
Tie Drains	None observed.
Instrumentation System	None.
Vegetation	Brush and extensive tree growth on slopes.

PERIODIC INSPECTION CHECKLIST

PROJECT WRIGHTS POND DAM

DATE Nov. 1, 1979

PROJECT FEATURE Embankment - Dike

NAME D. LaGatta

DISCIPLINE Geotechnical Engineer
Structural Engineer

NAME D. Shields
R. Cheney
D. Vine

AREA EVALUATED	CONDITION
DIKE EMBANKMENT	No dikes at this project
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	
Encroaching on Slopes	
Sloughing or Erosion of Slopes or Abutments	
Rock Slope Protection - Riprap Failures	
Spillway Movement or Cracking at or Near Toes	
Spillway Embankment or Downstream Seepage	
Sealing or Leaks	
Foundation Drainage Features	
Toe Drains	
Foundation Inspection	
Observations	

PERIODIC INSPECTION CHECKLIST

PROJECT WRIGHTS POND DAM

Nov. 1, 1979

PROJECT FEATURE Outlet Works - Intake Channel
And Intake Structure

NAME D. LaGatta

DISCIPLINE Geotechnical Engineer
Structural Engineer

NAME D. Shields
R. Cheney
D. Vine

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE</u>	None observed
a. Approach Channel	
Slope Conditions	
Bottom Conditions	
Rock Slides or Falls	
Log Boom	
Debris	
Condition of Concrete Lining	
Drains or Weep Holes	
b. Intake Structure	
Condition of Concrete	
Timber Logs and Slats	
	No intake structure, spillway is described on Page A-9.

PERMANENT INSPECTION CHECKLIST

PROJECT	<u>WRIGHTS POND DAM</u>	DATE	<u>Nov. 1, 1979</u>
PROJECT FEATURE	<u>Outlet Works - Control Tower</u>	NAME	<u>D. LaGatta</u>
DISCIPLINE	<u>Geotechnical Engineer</u> <u>Structural Engineer</u>	NAME	<u>D. Shields</u> <u>R. Cheney</u> <u>D. Vine</u>

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - CONTROL TOWER</u>	
1. Concrete and Structural	None at this Project
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	
2. Mechanical and Electrical	None at this Project
Air Vents	
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	
Service Gates	
Emergency Gates	
Warning Inspection System	
Emergency Power System	
Lighting	

ROUTING INSPECTION CHECKLIST

PROJECT	WRIGHTS POND DAM	DATE	Nov. 1, 1979
PROJECT FEATURE	Outlet Works - Transition And Conduit	NAME	D. LaGatta
DISCIPLINE	Geotechnical Engineer Structural Engineer	NAME	D. Shields R. Cheney D. Vine

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - TRANSITION AND CONDUIT</u> General Condition of Concrete Rust or Staining on Concrete Spalling Erosion or Cavitation Cracking Alignment of Monoliths Alignment of Joints Numbering of Monoliths	None at this project

27°30'

47°02'

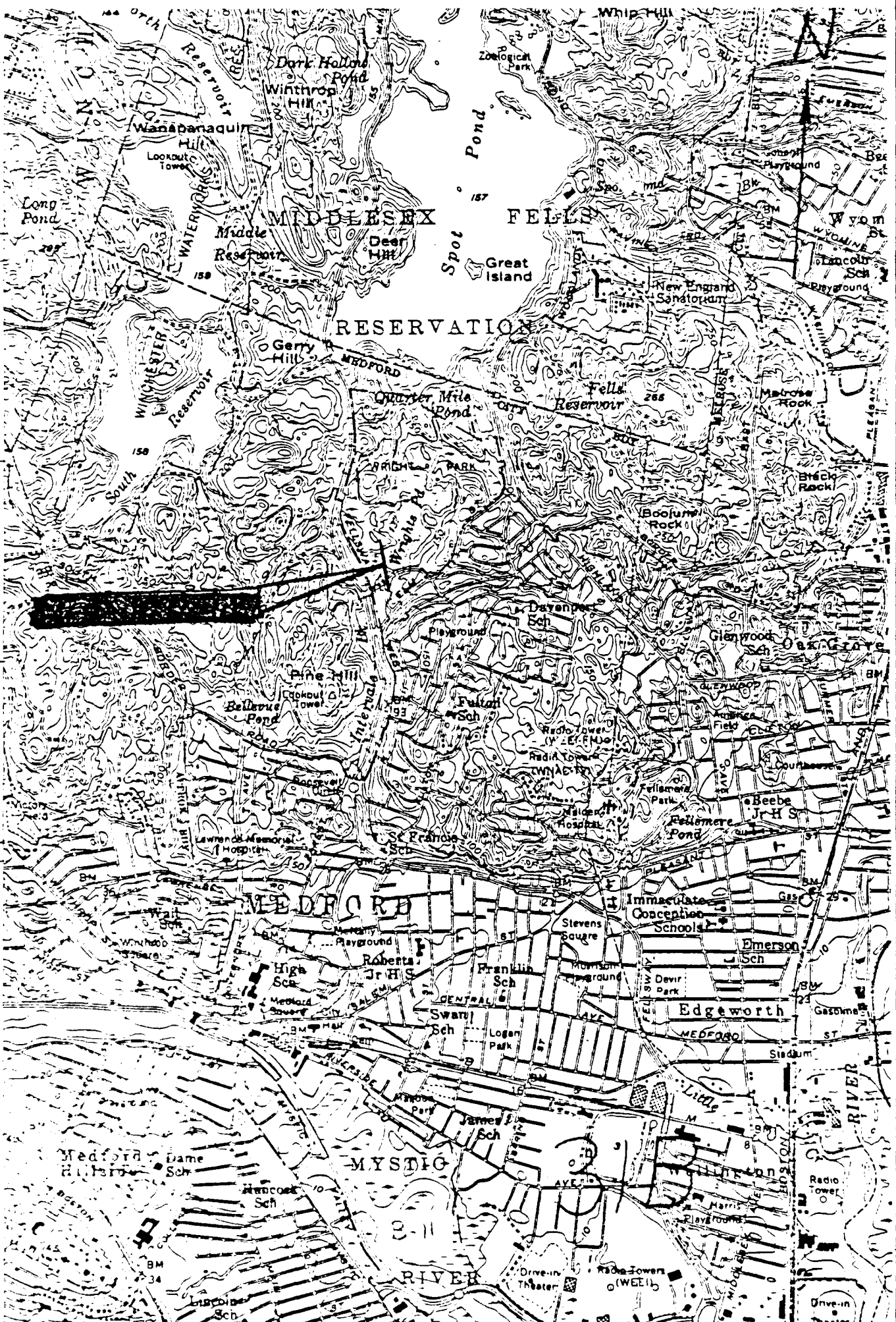
47°01'

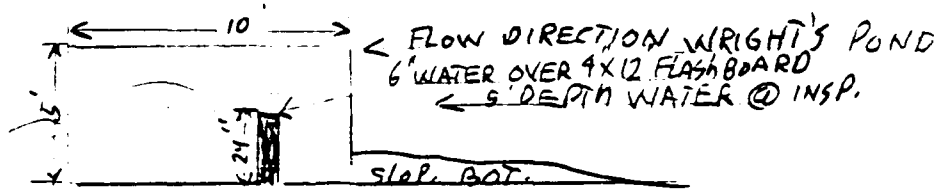
97°58' NW
(LEXINGTON)

44°09'

44°08'

44°07'





X SECTION AA
NOT TO SCALE

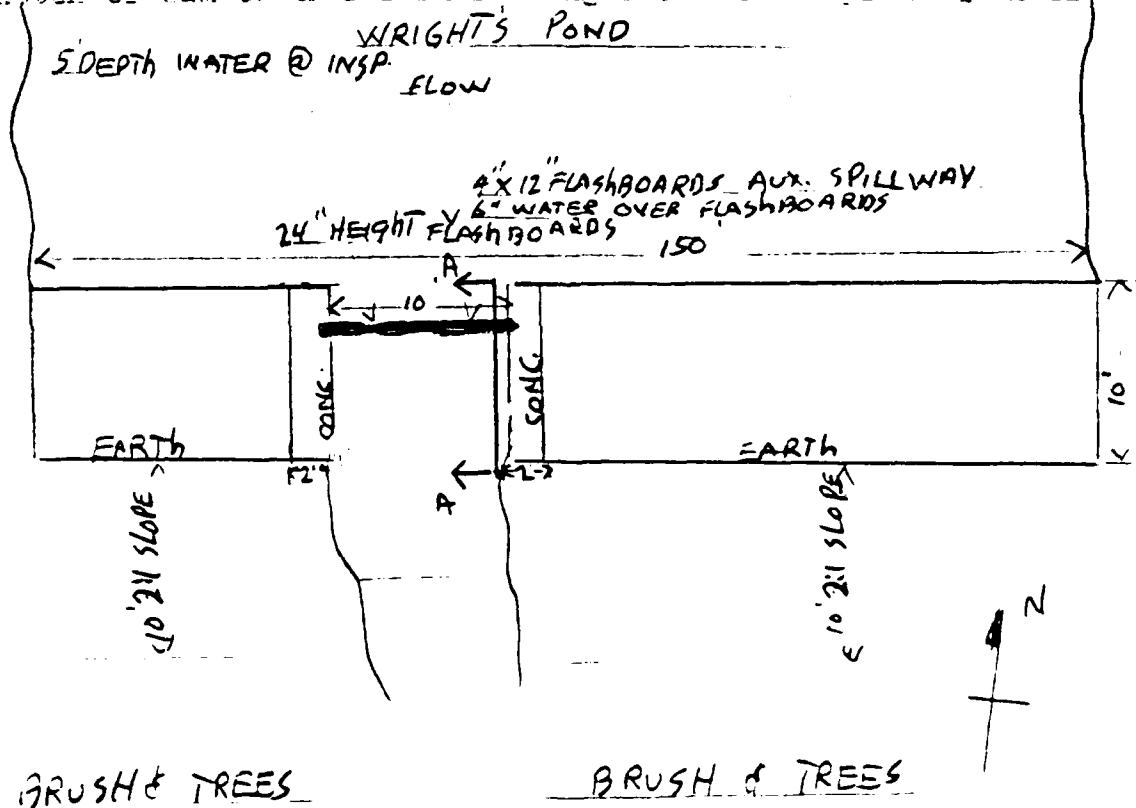
DAM NO. 4-9-176-2

Check to make sure property in event of complete failure.

No. of people EST 50
 No. of houses EST 15
 No. of business NONE
 No. of industries "
 No. of utilities "
 Railroads NONE
 Other dam "
 Other "

Type _____
 Type _____

Attach sketch of dam to this form showing section and plan 8 1/2" x 11" Sheet.



TOP VIEW
SKETCH NOT TO SCALE

DESCRIPTION OF DAM
DISTRICT #4

3. FRANCIS H. PARÉ-KADAM Z. PIZAN Dam No. 4-9-176-2
 4. 3-27-74 City Code MEDFORD
 Name of Dam WRIGHTS POND DAM

5. Location: Topo Sheet No. 31B
 Provide 8 1/2" x 11" in clear copy of topo map with location of Dam clearly indicated.

6. Year built UNKNOWN Years of subsequent repairs UNKNOWN

7. Purpose of Dam: Water Supply _____ Recreational ☒
 Irrigation _____ Other _____

8. Drainage Area: 1/2 SQ. MI. 320 ACRES.

9. Normal Flooding Area: 21 acres: Ave. Depth 5'
 Impoundment: 35 MIL gals; 100 acre ft.

10. Are any types of dwellings located adjacent to pond or reservoir?
 If so, specify: NONE

11. Dimensions of Dam: Length 150' Max. Height 5'
 Slope: Upstream Face 3:1
 Downstream Face 2:1
 Rock core to top 10'

12. Material used in Dam: Materials:

Earth ☒ Concrete Masonry ☒ Stone Masonry _____
 Rockfill ☒ Other _____

13. Is there any of your own land usage downstream of dam? 80% rural;

20 % other types of land use on flood plain downstream of dam which could be damaged or destroyed in the event of a complete dam failure

(12) Remarks & Recommendations: (fully Explain)

DAM IS IN GOOD CONDITION.

(13) Overall Conditions

1. Safe ☒
2. Minor repairs needed ☐
3. Conditionally safe - ☐
4. Unsafe ☐
5. Reservoir impoundment no longer exists ☐
Recommend removal from inspection list ☐

Downstream Face of Dam: Condition: 1. Good ☒ 2. Minor Repairs _____
3. Major Repairs _____ Urgent Repr _____

Comments: _____

Emergency Spillway: Condition: 1. Good _____ 2. Minor Repairs _____
3. Major Repairs _____ 4. Urgent Rep _____

Comments: THERE IS NO EMERGENCY SPILLWAY.

Water level at time of inspection 0.5 ft. above ☒ below _____
top of dam _____ Principal spillway ☒
other _____

(II) Summary of Deficiencies Noted:

Growth (Trees and Brush) on Embankment BRUSH ON EMBANKMENT.
Animal Burrows and Washouts _____
Damage to slopes or top of dam _____
Cracked or Damaged Masonry _____
Evidence of Seepage _____
Evidence of Piping _____
Erosion _____
Leaks _____
Trash and/or debris impeding flow _____
Clogged or blocked spillway _____
Other _____

OK
FILE
LUC

UNIFORM DAM REPORT - DAMS AND RESERVOIRS

NAME OF DAM: MEDFORD
NAME OF DAM: WRIGHTS POND DAM

DAM NO. 4-9-176-2
Inspected by A. Z. PIZAN &
F.H. PARE
Date of Inspection 3-27-'74

1. Owner: City of Medford Ass. ☒ Pres. Inspection ☐

Reg. of Dams ☐ Pers. Control ☐

CITY OF MEDFORD, 85 SALEM ST, MEDFORD, MASS. - 396-5500
City No. 02155 State MASS. Tel. No. 396-5500

2. Name City of Medford City/Town Medford State MASS. Tel. No. 396-5500

3. Name City of Medford City/Town Medford State MASS. Tel. No. 396-5500

4. Caretaker: (if any, e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.)

SAME City/Town Medford State MASS. Tel. No. 396-5500

5. Dam No. 4-9-176-2 Ass. NONE

6. Degree of Damage: (if any, e.g. severe, moderate, minor, etc.)
1. Minor ☒ 2. Moderate ☐
3. Severe ☐ 4. Catastrophic ☐

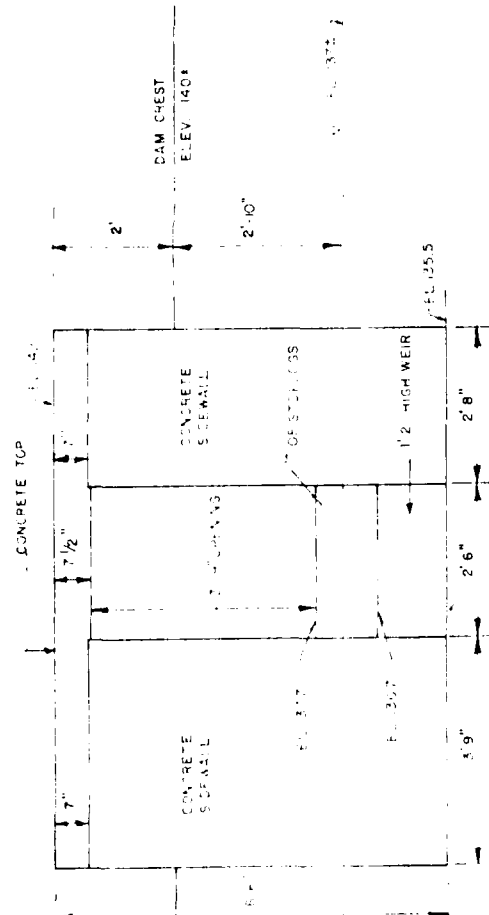
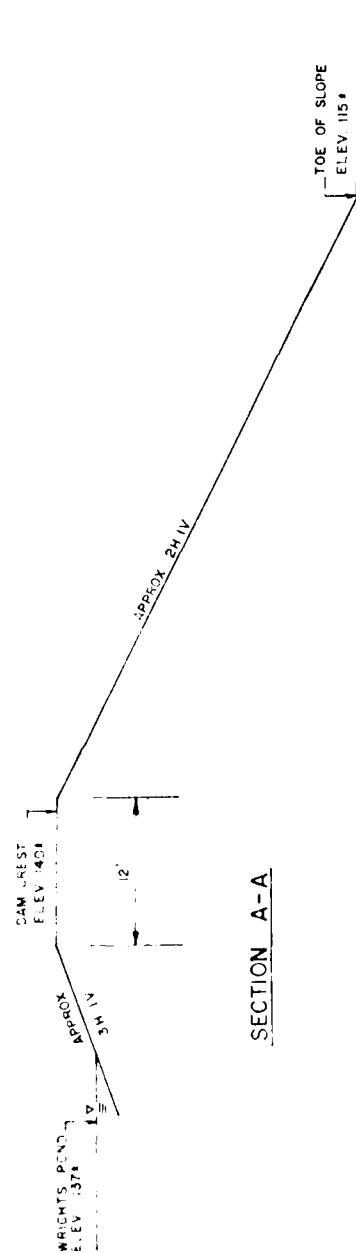
*This section may change to land use changes (future development)

7. Dam Condition: Good ☒ Minor Repairs ☐
8. Dam Condition: Good ☒ Minor Repairs ☐

9. Dam Condition: FLASHBOARDS CONTROL OUTLET FLOW.

10. Dam Condition: Good ☒ Minor Repairs ☐
11. Dam Condition: Good ☒ Minor Repairs ☐

12. Dam Condition: Good ☒ Minor Repairs ☐



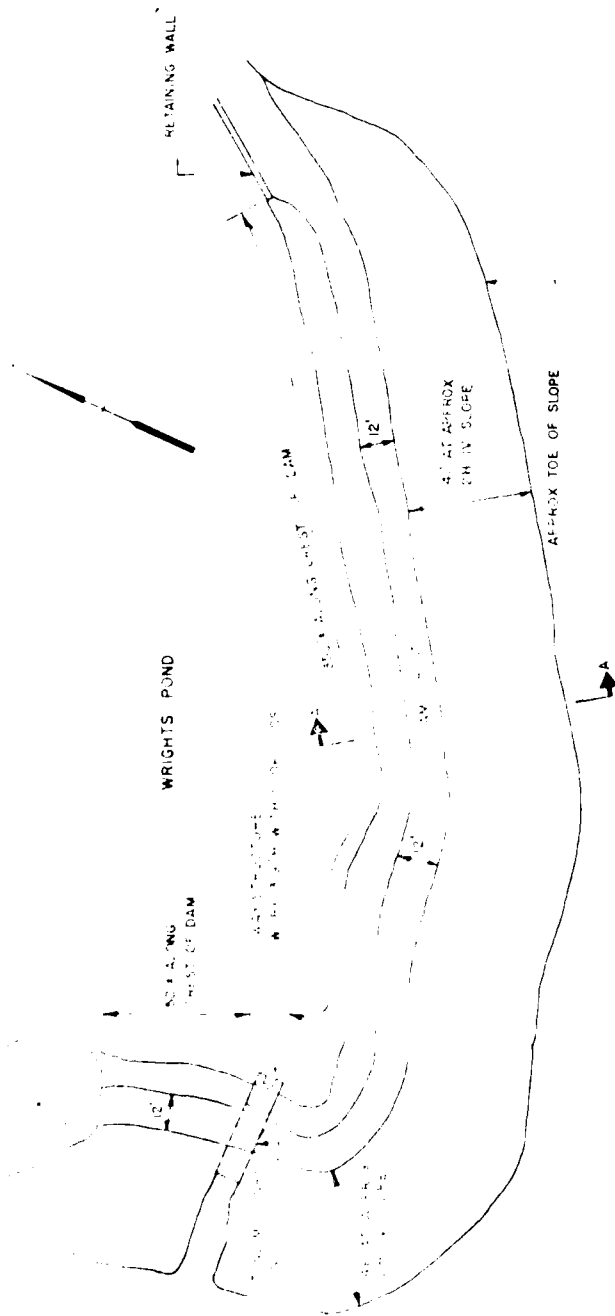
PLAN DEVELOPED FROM ON-SITE INSPECTION

DAVID MARSH & BOWMAN, INC. CONSULTING ENGINEERS BOSTON, MASSACHUSETTS	JOSEPH W. MARSH, ENGINEER CORP. OF ENGINEERS WALTHAM, MASS.
---	---

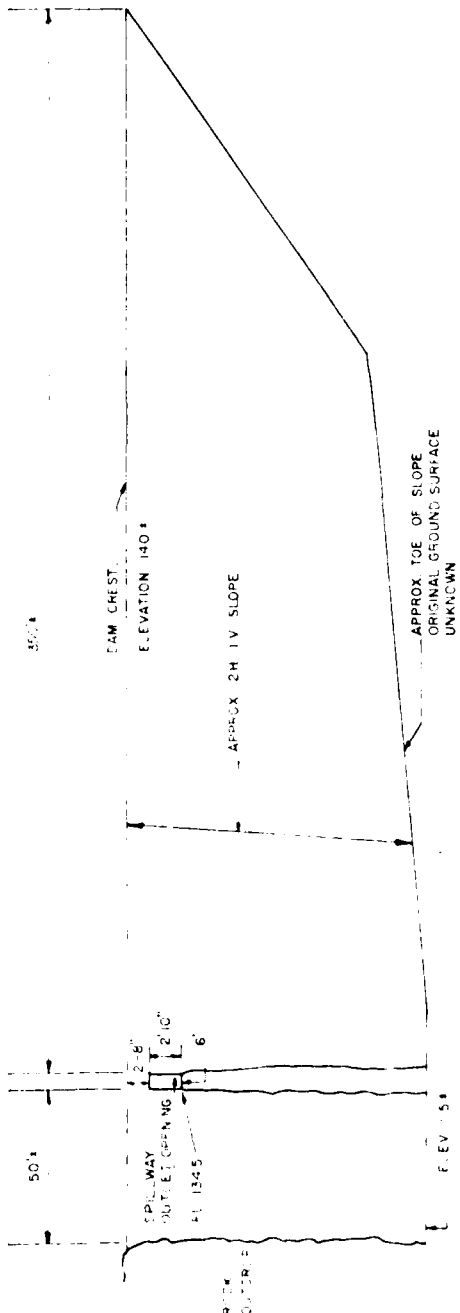
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

WRIGHTS POND DAM
SECTION & SPILLWAY

WILSON



PLAN



DOWNSTREAM ELEVATION

B-3

FOR SECTION A-A SEE SHEET B-4

PLAN DEVELOPED FROM ON SITE INSPECTION

DAVID N. HARDING & ASSOCIATES, INC.		U.S. ARMY ENGINEER DISTRICT NEW ENGLAND	
DESIGN ENGINEERS		CORPS OF ENGINEERS	
BOSTON, MASSACHUSETTS		WALTON, MASSACHUSETTS	
NATIONAL PROGRAM OF INSPECTION OF NOTIFIED DAMS			
MEDFORD		MASSACHUSETTS	
DATE: 10/1/64		DATE: 10/1/64	

WRIGHTS POND DAM PLAN & ELEVATION

LIST OF ENGINEERING DATA

A State Inspection Report for March, 1974, is available from the Department of Environmental Quality, Waterways Division, 100 Nashua Street, Boston, Massachusetts.

No additional engineering data was located.

APPENDIX B
ENGINEERING DATA

PERIODIC INSPECTION CHECKLIST

PROJECT	<u>WRIGHTS POND DAM</u>	DATE	<u>Nov. 1, 1979</u>
PROJECT FEATURE	<u>Outlet Works - Service Bridge</u>	NAME	<u>D. LaGatta</u>
DISCIPLINE	<u>Geotechnical Engineer</u>	NAME	<u>D. Shields</u>
	<u>Structural Engineer</u>		<u>R. Cheney</u>
			<u>D. Vine</u>

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - SERVICE BRIDGE</u>	
a. Super Structure	None at this project
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	

PERIODIC INSPECTION CHECKLIST

PROJECT WRIGHTS POND DAM

DATE Nov. 1, 1979

PROJECT FEATURE Outlet Works - Spillway Weir,
Approach and Discharge Channels

NAME D. LaGatta

DISCIPLINE Geotechnical Engineer

NAME D. Shields

Structural Engineer

R. Cheney

D. Vine

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS</u>	
a. Approach Channel	none observed
General Condition	
Loose Rock Overhanging Channel	
Trees Overhanging Channel	
Floor of Approach Channel	
b. Weir and Training Walls	
General Condition of Concrete	fair
Rust or Staining	none observed
Spalling	heavy on walls
Any Visible Reinforcing	none observed
Any Seepage or Efflorescence	none observed
Drain Holes	None observed
c. Discharge Channel	
General Condition	not well defined
Loose Rock Overhanging Channel	None.
Trees Overhanging Channel	Not significant.
Floor of Channel	Bedrock.
Other Obstructions	Few boulders in the channel near the dam.

PERIODIC INSPECTION CHECKLIST

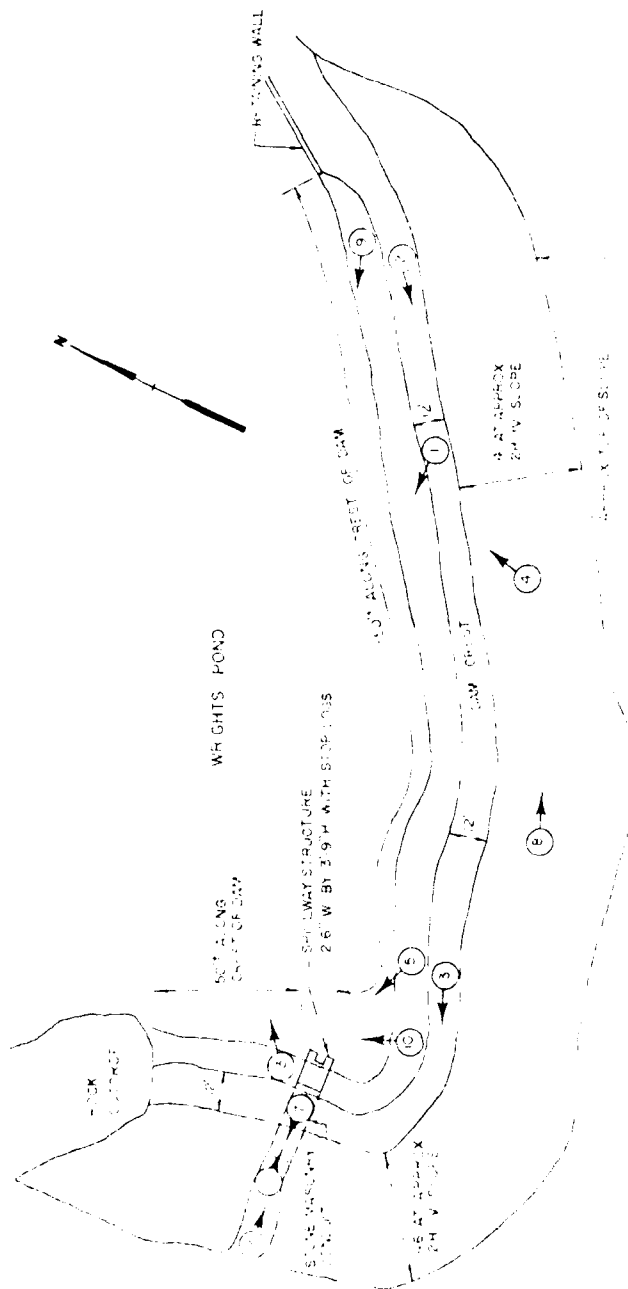
PROJECT WRIGHTS POND DAM DATE Nov. 1, 1979

PROJECT FEATURE Outlet Works - Outlet Structure and NAME D. LaGatta
Outlet Channel

DISCIPLINE Geotechnical Engineer NAME D. Shields
Structural Engineer R. Cheney
D. Vine

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - OUTLET STRUCTURE AND</u> <u>OUTLET CHANNEL</u> General Condition of Concrete Rust or Staining Spalling Erosion or Cavitation Visible Reinforcing Any Seepage or Efflorescence Condition at Joints Drain holes Channel Loose Rock or Trees Overhanging Channel Condition of Discharge Channel	None at this project

APPENDIX C
PHOTOGRAPHS



U.S. ARMY CORPS OF ENGINEERS

WRIGHTS POND DAM
INSPECTION REPORT
NOV 1964
P. 1

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

WRIGHTS POND DAM
PHOTO LOCATION



PHOTO NO. 1 - Upstream slope of
the Dam.



PHOTO NO. 2 - Crest of Dam, viewed from the left
abutment.



PHOTO NO. 3 - Trees on downstream slope. Tree near crest in left center of photo appears to be dead.



PHOTO NO. 4 - Tree with 6 foot diameter base growing on the downstream slope approximately 14 feet from the centerline of the crest. The tree appears to be dead. (Rule extended to 6 feet in photo.)



PHOTO NO. 5 - Spillway structure. Note bedrock at the right abutment.



PHOTO NO. 6 - Photo showing the outlet channel downstream of Dam. Discharge flows into a 30 inch corrugated metal pipe set in stone masonry headwall which can be seen in center of photo. A metal debris screen is located in front of the 30 inch pipe. On the day of the field inspection, approximately one foot of this pipe was blocked with stones.



PHOTO NO. 7 - Spillway outlet
channel, looking downstream
from the spillway.



PHOTO NO. 8 - Downstream slope in the central portion
of the Dam, looking left from about midslope.



PHOTO NO. 9 - View of Wrights Pond Dam taken looking right from left abutment. Note trees growing along upstream face of dam. The spillway structure is shown in the right center of the photo. Also note ledge outcrop to right of spillway.



PHOTO NO. 10 - Spillway structure for Wrights Pond. Photo was taken from upstream face of Dam near the clump of trees growing on the Dam shown in the center of Photo 9. Water flows over weir in this structure and into a 6 foot by 2 foot 10 inch rectangular culvert.



Photo taken looking through the outlet
culvert from the downstream end. Culvert is made
of concrete lined mortared granite. Note heavy
accumulation of debris in channel. The weir
with about one foot of flashboards in place is
shown in the left center of photo.



View of culvert outlet and weir
structure from the downstream end.
The weir is visible in the center of the photo.

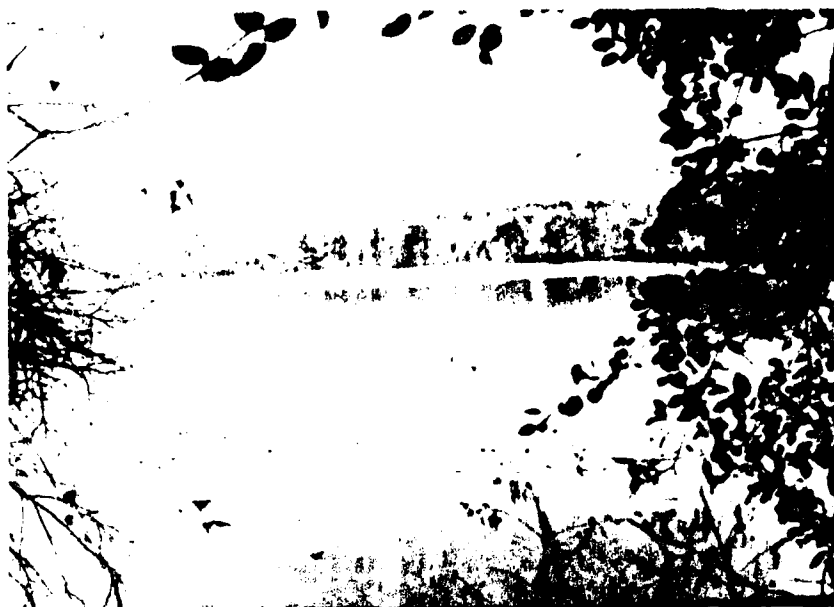


PHOTO NO. 13 - Looking Northward across Wrights Pond
From the Dam embankment near the spillway structure.

APPENDIX D
HYDROLOGIC AND HYDRAULIC COMPUTATIONS

JOB NO. 79206.1
DATE 12/19/79
BY EDD
CHK'D BY M4



HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON — WEST HARTFORD

SHEET NO. D2

JOB Dams
SUBJECT Wrights Pond Dam
CLIENT Corps

Wrights Pond Dam - built in late 1800's

Height of Dam: 25' ±

No emergency spillway. - outlet structure

Earth embankment structure with only one known outlet - concrete weir outlet structure with provisions for stop logs discharges through stone-masonry culvert to small brook downstream.

Storage capacity: 334 ± a-f (to top of dam)

Size Class: Small (by both Height & Storage Capacity)

Drainage Area: 0.41 s.m. (264 acres)

Hazard Potential: High (25 homes)

Test Flood: 1/2 to full PMF : Use full PMF urban area

[3000 csm from Corps Guidelines for small areas 2 s.m. or less] $Q_{PMF} = 3000 \text{ csm} \times 0.41 \text{ s.m.} \times 1 = 1,230 \text{ cfs}$ Inflow
 $V_{PMF} = 19 \text{ in} \times 264 \text{ ac} \times \frac{1 \text{ ft}}{12 \text{ in}} = 418 \text{ ac-ft}$ (runoff)

With 1' stop logs @ Outlet $Q_{out} = 910 \text{ cfs}$. Outlet $Q = 30 \text{ cfs}$ or 3.3% Test Flow
 $EL = 141.4$

Without stop logs @ Outlet $Q_{out} = 830 \text{ cfs}$. Outlet $Q = 50 \text{ cfs}$ or 6% Test Flow
 $EL = 141.3$

Failure Outflow: mid-height breach width = 175' ± at "original channel area".

$$Q_F = \frac{8}{27} (0.4 \times 175) (\sqrt{3.2}) (25)^{3/2} = 14,700 \text{ cfs}$$

Dam fails with pool level at crest of dam (elevation 140 ±)

10. 79 206.1
2116179
EDD
BY MA



HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON — WEST HARTFORD

SHEET NO. D 3

JOB Dams
SUBJECT Wright Pond Dam
CLIENT Corps

Storage Capacity - Elev's obtained from USGS Quad Map & field sketches of structure

Elev. (NGVD)	Area (ac)	Ave Area (ac)	D ft	Stor. (ac-ft)	Cum Stor. (ac-ft)	
✓ 115±	0	—	—	—	—	
130	14.69	7.35	15	110.3	110.3	
✓ 137	23.98	19.29	7	135.0	245.3	Normal pool
✓ 140±	34.89	29.39	3	98.2	333.5	Top Dam
✓ 142	37.64	36.27	2	72.5	406.0	(Assumed)

Outlet Capacity - Test Flood

Dam has only one outlet - discharge controlled by weir with provisions for stop logs. See sketches in report. Check discharges for weir with & without stop logs.

Broad crested weir $Q = CLH^{3/2}$

No Stop Logs [See Page 5] 1' Stop Logs

H ft	H ^{3/2}	C	L ft	Q cfs	H ft	H ^{3/2}	C	L ft	Q cfs
1	1	2.98	2.5	7.5	1	1	2.98	2.5	7.5
2	2.83	3.30	"	23.3	2	2.83	3.30	"	23.3 ✓
3	5.70	3.32	"	43.2 ✓	2.3	3.49	3.31	"	28.9
3.3	5.99	"	"	49.7					

Max. capacity of outlet = 50± cfs without overtopping dam
PMF inflow = 1230 cfs.

∴ Dam overtopped with or without stoplogs in place.

JOB NO 79.206.1
 DATE 12/15/79
 BY FDD
 CHECKED BY MA



HAYDEN, HARDING & BUCHANAN, INC.
 CONSULTING ENGINEERS
 BOSTON — WEST HARTFORD

SHEET NO D4
 JOB Dams
 SUBJECT Wright's Pond Dam
 CLIENT Corps

say PMF overflows top of dam for $200 \pm'$

again weir flow: $Q = CLH^{3/2}$

H ft	$H^{3/2}$	C	L ft	Q cfs
1	1	2.63	200	526
2	2.83	"	"	1489 ✓
1.75	2.32	"	"	1218
1.70				1165

A) $Q_{P1} = 1230 \text{ cfs} \pm$ Elev₁ = $147.7 \pm'$ No Stop logs

Elev₀ = $136.7 \pm'$ Stor₁ = $395.1 - 245.3 = 149.8 \text{ ac-ft}$ or $6.81''$

Stor₀ = 245.3 ac-ft

$Q_{P2} = 1230 \left(1 - \frac{6.81}{19}\right) = 789 \text{ cfs}$ Elev₂ = $141.25 \pm'$ ✓

Stor₂ = $380.6 - 245.3 = 135.3 \text{ ac-ft}$ or $6.15''$

$Q_{P3} = 1230 \left(1 - \frac{6.15}{19}\right) = 831 \text{ cfs}$ Elev₃ = $141.30 \pm'$

B) $Q_{P1} = 1230 \text{ cfs} \pm$ Elev₁ = 141.8 1' Stop logs

Elev₀ = $137.7 \pm'$ Stor₁ = $397 - 275 = 122 \text{ ac-ft}$ or $5.55''$

Stor₀ = 275 ac-ft

$Q_{P2} = 1230 \left(1 - \frac{5.55}{19}\right) = 871 \text{ cfs}$ Elev₂ = $141.37 \pm'$

Stor₂ = $384 - 275 = 109$ or $4.95''$

$Q_{P3} = 1230 \left(1 - \frac{4.95}{19}\right) = 909 \text{ cfs}$ Elev₃ = $141.41 \pm'$

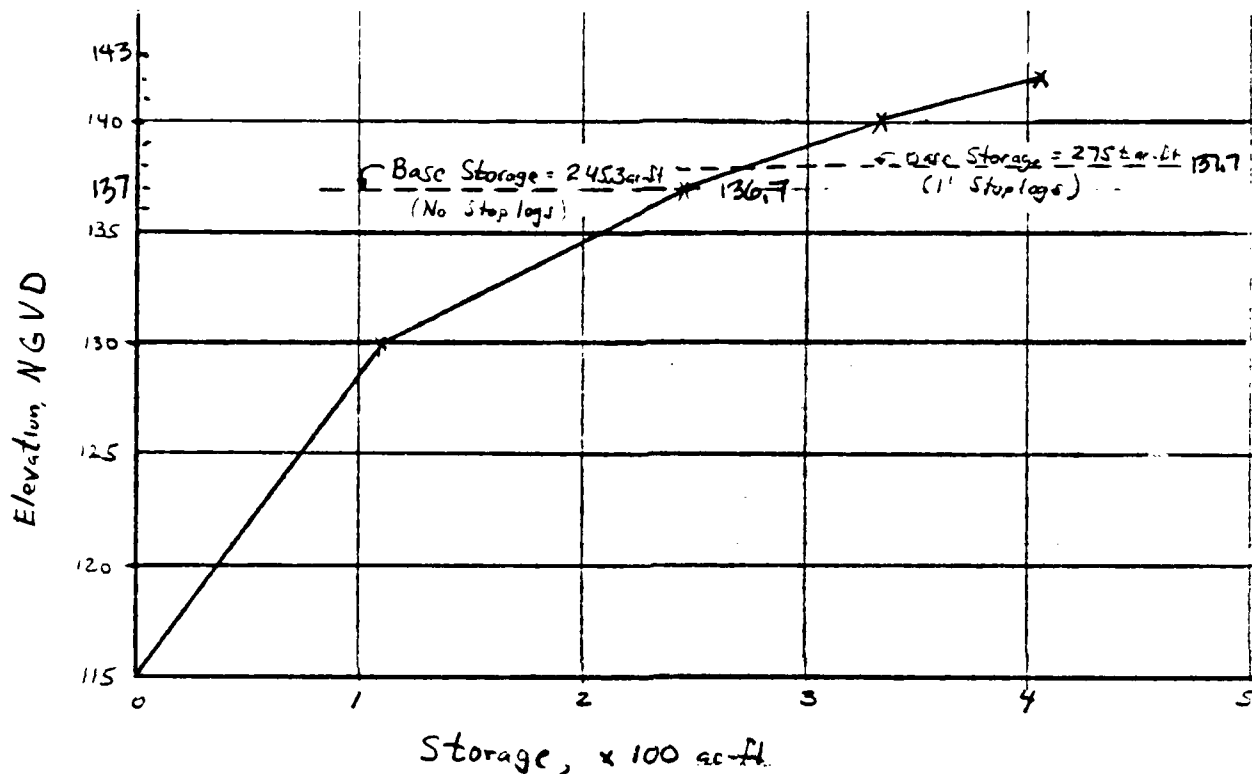
78.206.1
12/13/79
FDD



HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON — WEST HARTFORD

SHEET NO. D5

JOB Dams
SUBJECT Wright's Pond Dam
CLIENT Corps



Summarizing Test Flood: Full PMF

For No Stop Logs: Dam overtopped by 1.3' ±

$$Q_{out} = 831 \text{ cfs} \pm$$

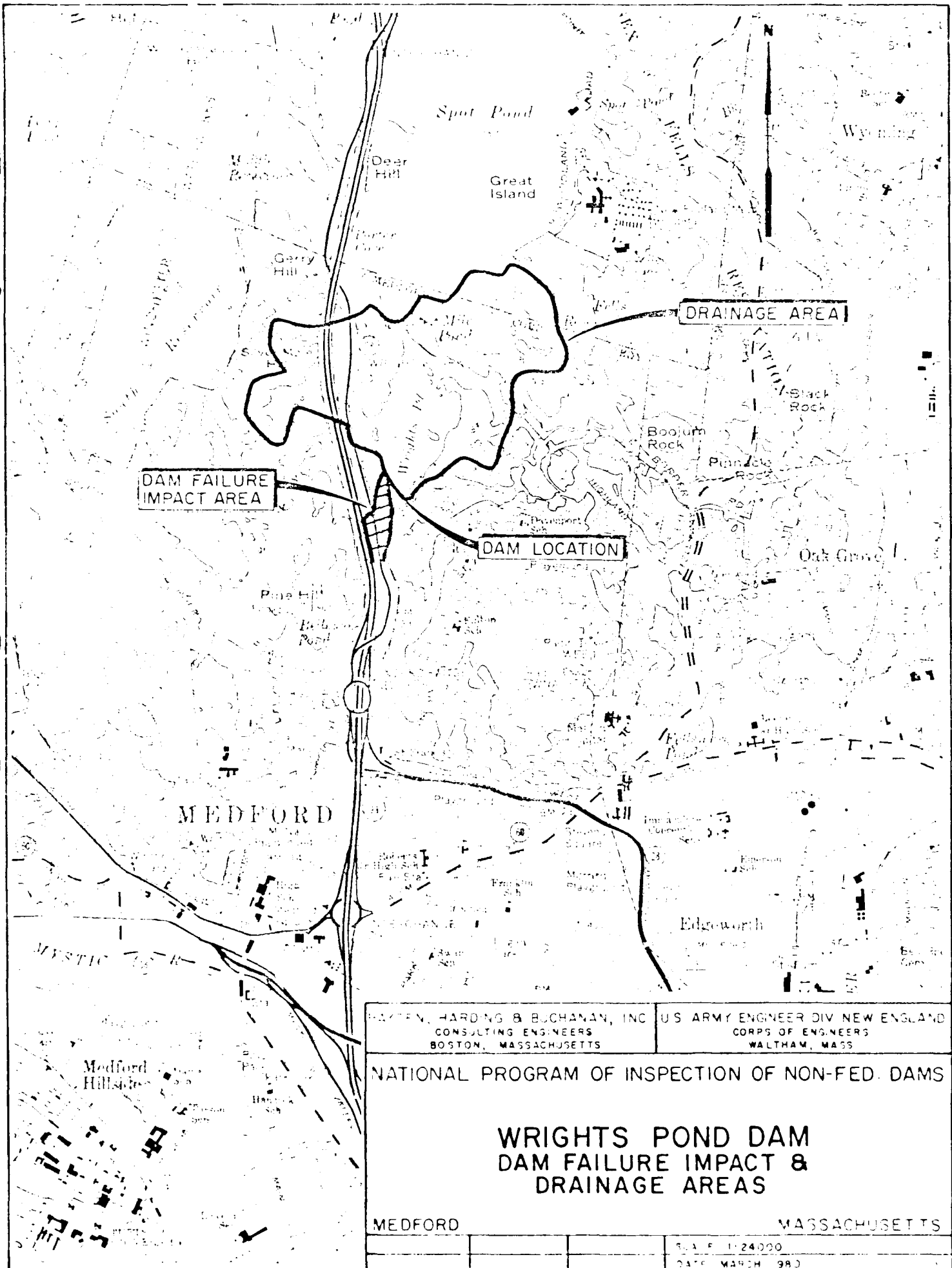
For 1' Stop Logs: Dam overtopped by 1.4' ±

$$Q_{out} = 909 \text{ cfs} \pm$$

With No stop logs, Spillway can pass 50% of or approximately 4% of Test Flood or 1230 cfs.

APPENDIX E

INFORMATION AS CONTAINED IN THE
NATIONAL INVENTORY OF DAMS



HARTEN, HARDING & BUCHANAN, INC
CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS

U.S. ARMY ENGINEER DIV NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

WRIGHTS POND DAM DAM FAILURE IMPACT & DRAINAGE AREAS

MEDFORD

MASSACHUSETTS

SCALE 1:24000

DATE MARCH 1980



JOB NO. 79206.1
 DATE 12/18/79
 BY FDD
 CH'D BY WMA



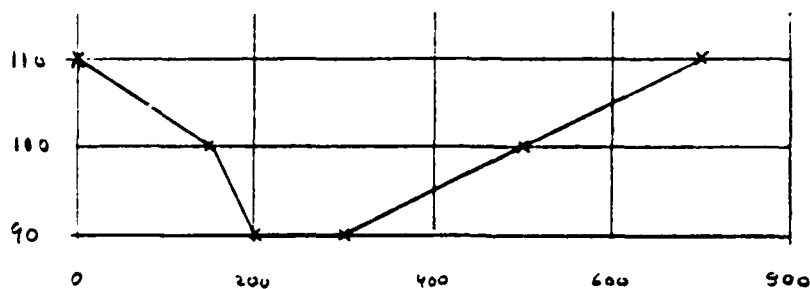
HAYDEN, HARDING & BUCHANAN, INC.
 CONSULTING ENGINEERS
 BOSTON — WEST HARTFORD

SHEET NO. D15

JOB Dams
 SUBJECT Wright's Pond Dam
 CLIENT Corps

Section - taken looking upstream

Sta. 7+50



Elev.	Area sf
100	2250
110	7500

$$S = \frac{10}{900} = 0.0125\%$$

$n = 0.10$ (heavy resistant 41 develop)

B NO. 79.206.1
 TE 12/19/79
FDD
 D BY WV



HAYDEN, HARDING & BUCHANAN, INC.
 CONSULTING ENGINEERS
 BOSTON — WEST HARTFORD

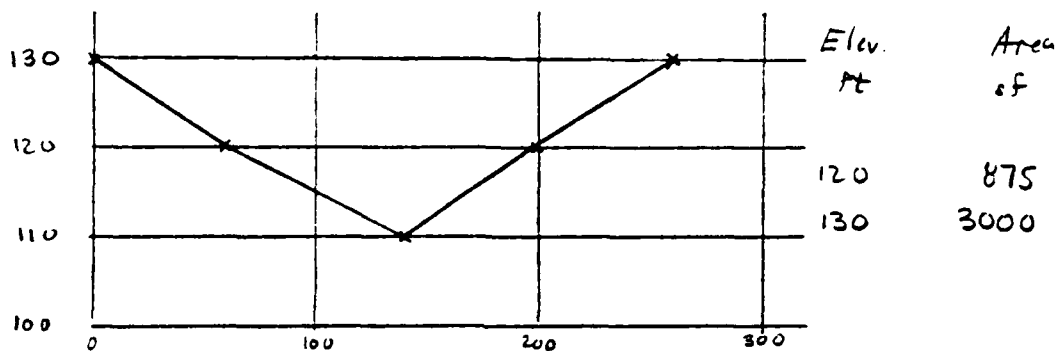
SHEET NO. D14

JOB Dams
 SUBJECT Wrights Pond Dam
 CLIENT Corps

Failure of Wrights Pond Dam

Sections taken looking upstream

Sta. 0+50 downstream



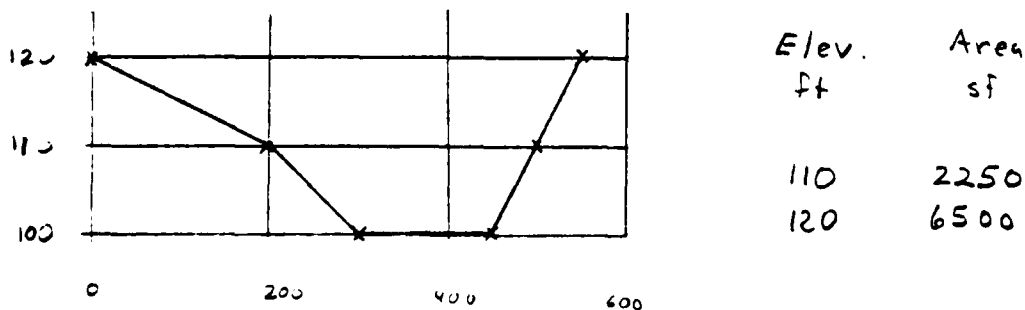
$$\text{slope} = \frac{30}{200} = 0.15'$$

$n = 0.100$ (medium trees, med.-hvy. brush)

Sta 3+00 downstream

(Road crossing)

(assume any culverts blocked.)



$$\text{slope} = \frac{10}{800} = 0.0125$$

$n = 0.10$ (low: no. shrub trees, streets)

JOB NO. 79.206.1
DATE 12.19.79
BY FDD
CH'D BY WV



HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON — WEST HARTFORD

SHEET NO. D 13

JOB Dams
SUBJECT Wright Pond Dam
CLIENT Curp

$$Q_{p1} = 14,265 \text{ cfs} \quad d_1 = 10.4' "$$

$$Vol_1 = \frac{2393 + 2235}{2} \times \frac{450}{43560} = 23.9 \text{ ac-ft}$$

$$Q_{p2} = 14,265 \left(1 - \frac{23.9}{3335}\right) = 13,243 \text{ cfs} \quad d_2 = 10.1' "$$

$$Vol_2 = \frac{2265 + 2235}{2} \times \frac{450}{43560} = 23.3 \text{ ac-ft}$$

$$Vol_{ave} = \frac{23.9 + 23.3}{2} = 23.6 \text{ ac-ft}$$

$$Q_{p2} = 14,265 \left(1 - \frac{23.6}{3335}\right) = 13,256 \text{ cfs} \quad d_2 = 10.1' \pm$$

$$Q_{out} = 13,256 \text{ cfs} \quad Elev = 100' \pm$$

Impact Area: Although the impact area for the failure of this dam is not extensive, it does include heavily built up areas (i.e. those denoted by "red tint" on the U.S.G.S. Quad Sheet). With the calculated velocities (6 fps or better) and depths (up to 10 feet in places), excessive damages to homes, structures, and roadways could be expected from the outflow of Wrights Pond due to failure of the dam. The loss of possibly several lives could occur as a result of this event.

Sta 0+00 to 7+50 ±

Within this impact area there are at least 25 residential buildings. Damage beyond this location will occur.

JOB NO. 79.206.1
 DATE 12/15/79
 BY DD
 CH'D BY MA

HH & B HAYDEN, HARDING & BUCHANAN, INC.
 CONSULTING ENGINEERS
 BOSTON — WEST HARTFORD

SHEET NO. D 12
 JOB Dams
 SUBJECT Wright Pond Dam
 CLIENT Corps

$$Q_{p1} = 14,656 \text{ cfs. } d_1 \approx 10.0' \pm$$

$$Vol_1 = \frac{865 + 2250}{2} \times \frac{250}{43,560} = 8.94 \text{ ac-ft}$$

Average End Area

$$Q_{p2} = 14,656 \left(1 - \frac{8.94}{333.5}\right) = 14,263 \text{ cfs. } d_2 = 9.9'$$

$$Vol_2 = \frac{865 + 2220}{2} \times \frac{250}{43,560} = 8.85 \text{ ac-ft}$$

$$Vol_{ave} = \frac{8.94 + 8.85}{2} = 8.90 \text{ ac-ft}$$

$$Q_{p3} = 14,656 \left(1 - \frac{8.90}{333.5}\right) = 14,265 \text{ cfs. } d_2 = 9.9'$$

$$Q_{out} = 14,265. \text{ Elev.} = 110.1' \pm$$

Sta 7+50

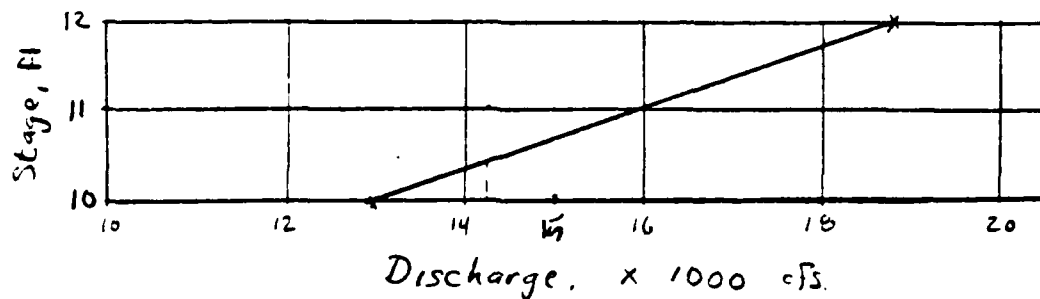
$$S = 0.0125$$

$$n = 0.10$$

$$V = F'R^{2/3}$$

$$V = 1.66 R^{2/3}$$

D ft	WP ft	A sf	$R^{2/3}$	F'	V fps	Q cfs	Elev. MSL
10	350	2250	3.48	1.66	5.77	12994	100
12	420	3020	3.75✓	"	6.22✓	18799✓	102



JOB NO. 79.206.1
 DATE 12/16/79
 BY FDD
 CH'D BY MA



HAYDEN, HARDING & BUCHANAN, INC.
 CONSULTING ENGINEERS
 BOSTON — WEST HARTFORD

SHEET NO. D 11

JOB Dam
 SUBJECT Wright's Pond Dam
 CLIENT Corps

$$Q_{P_1} = 14,700 \text{ cfs} \quad d_1 \approx 10.0' \checkmark$$

f and area in s.f.

$$Vol_1 = 875 \times \frac{50}{43,560} = 1.00 \text{ ac-ft}$$

$$Q_{P_2} = 14,700 \left(1 - \frac{1}{333.5}\right) = 14,655 \text{ cfs} \quad d_2 = 9.9'$$

$$Vol_2 = 858 \times \frac{50}{43,560} = 0.98 \text{ ac-ft} \quad Vol_{ave} = 0.99 \text{ ac-ft}$$

$$Q_{P_2} = 14,700 \left(1 - \frac{.99}{333.5}\right) = 14,656 \text{ cfs} \quad d_2 = 10' \pm$$

$$Q_{out} = 14,656 \text{ cfs} \quad Elev = 120.1' \pm$$

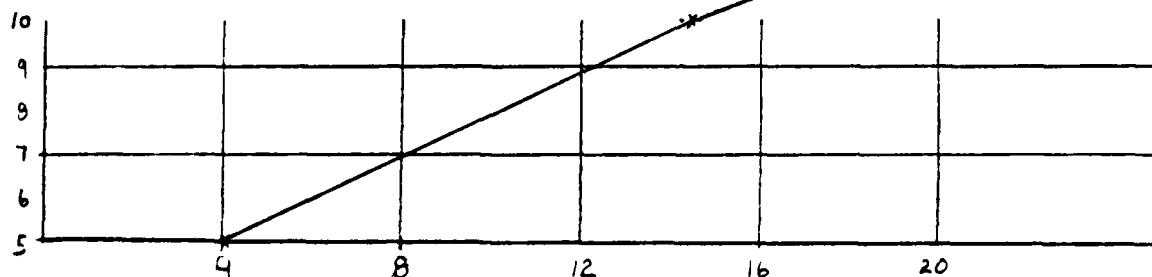
Sta 3+00

$$\text{slope} = 0.0125' \quad n = 0.10$$

$$V = F' R^{2/3} \quad F' = \frac{1.486}{0.10} (.0125)^{1/2} = 1.66 \checkmark$$

$$V = 1.66 R^{2/3}$$

D	WP	A	$R^{2/3}$	F'	V	Q	Elev
ft	ft	s^2			fps	cfs	MSL
10	300	2250	3.86	1.66	6.43	14,469	110
11	325	2563	3.99	"	6.62	16,971	111
5	225	938	2.60	"	4.32	4,048	105



IS NO. 79.206.1
 DATE 12/18/79
 BY FDD
 AND BY MA



HAYDEN, HARDING & BUCHANAN, INC.
 CONSULTING ENGINEERS
 BOSTON — WEST HARTFORD

SHEET NO. D10

JOB Dams
 SUBJECT Wrights Pond Dam
 CLIENT Corps

Failure Discharge

$$Q_f = 14,700 \text{ cfs.}$$

Base Flow = 30-50 ± cfs @ time of failure —
 not significant compared to failure discharge,
 so will not include in routing.

Sta. 0+50

$$\text{slope} = 0.15\%$$

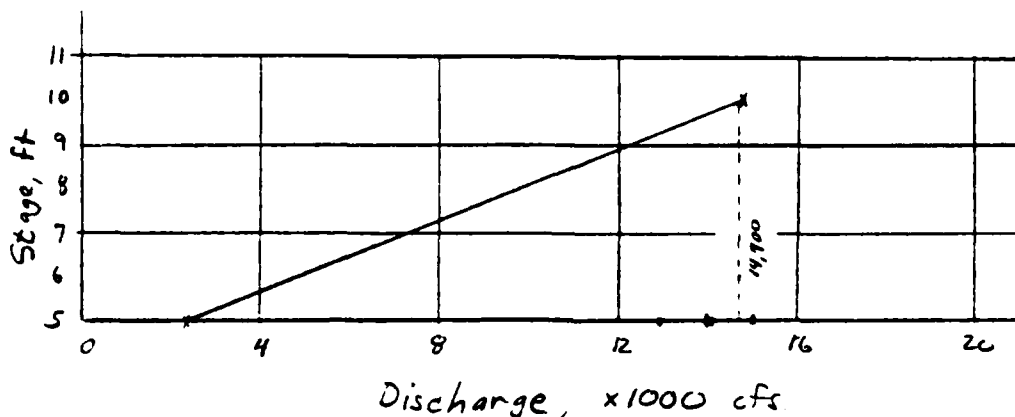
$$n = 0.10$$

$$V = f' R^{2/3}$$

$$V = 5.76 R^{2/3}$$

$$f' = \frac{1.486}{0.10} (0.15)^{1/2} = 5.76 \checkmark$$

D	WP	A	$R^{2/3}$	P'	V	Q	Elev.
ft	ft	sq ft			fps	cfs	MSL
10	175	875	2.94 ✓	5.76	16.93 ✓	14816 ✓	120
5	975	219	1.85	"	10.64	2331	115



$$Q_p = 14,700 \text{ cfs} \quad d_1 \approx 10.0'$$

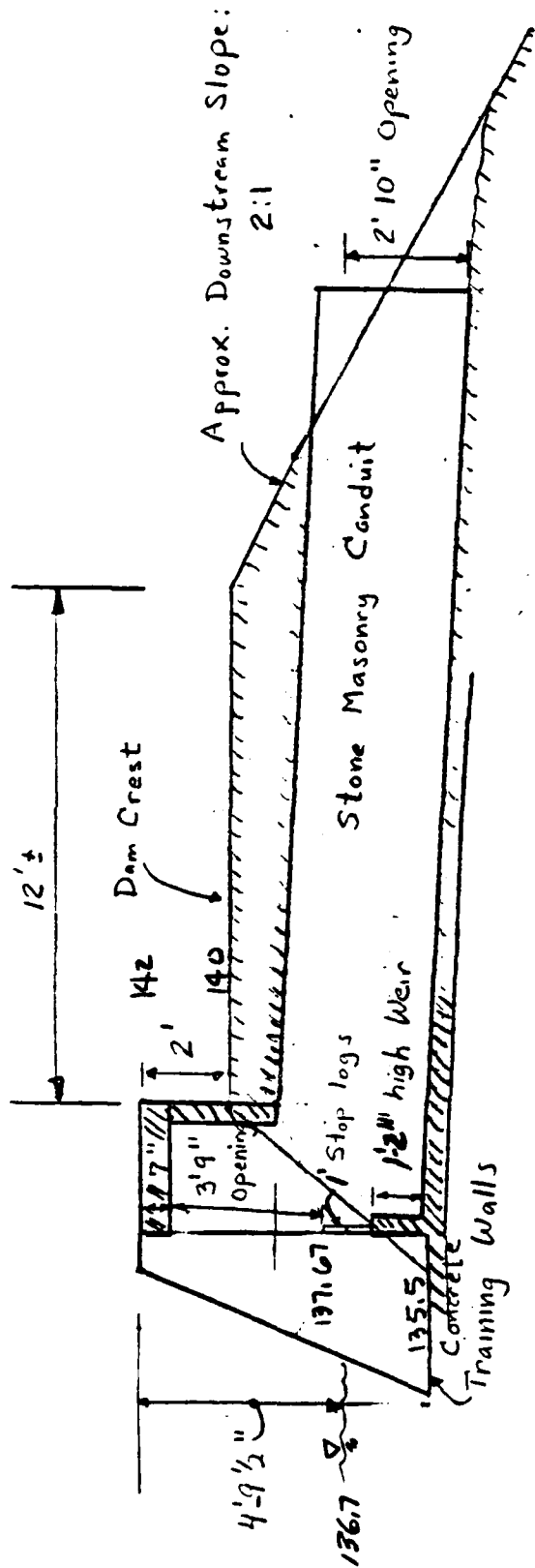
JOB NO. 79.206.1
 DATE 12/18/79
 BY FDD
 CH'D BY MA



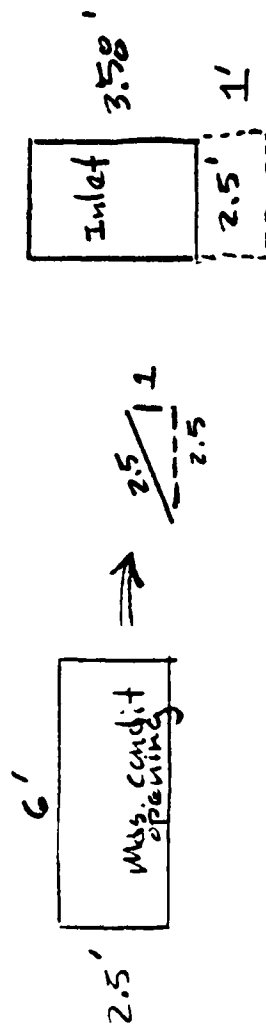
HAYDEN, HARDING & BUCHANAN, INC.
 CONSULTING ENGINEERS
 BOSTON — WEST HARTFORD

SHEET NO. D9

JOB Dam
 SUBJECT Wright Pond Dam
 CLIENT Corps



Section View
 Approx. Scale: Hcr. & Vert. 1" = 4'



NO. 79.206.1
 DATE 12/14/79
 FDD
 BY m4



HAYDEN, HARDING & BUCHANAN, INC.
 CONSULTING ENGINEERS
 BOSTON — WEST HARTFORD

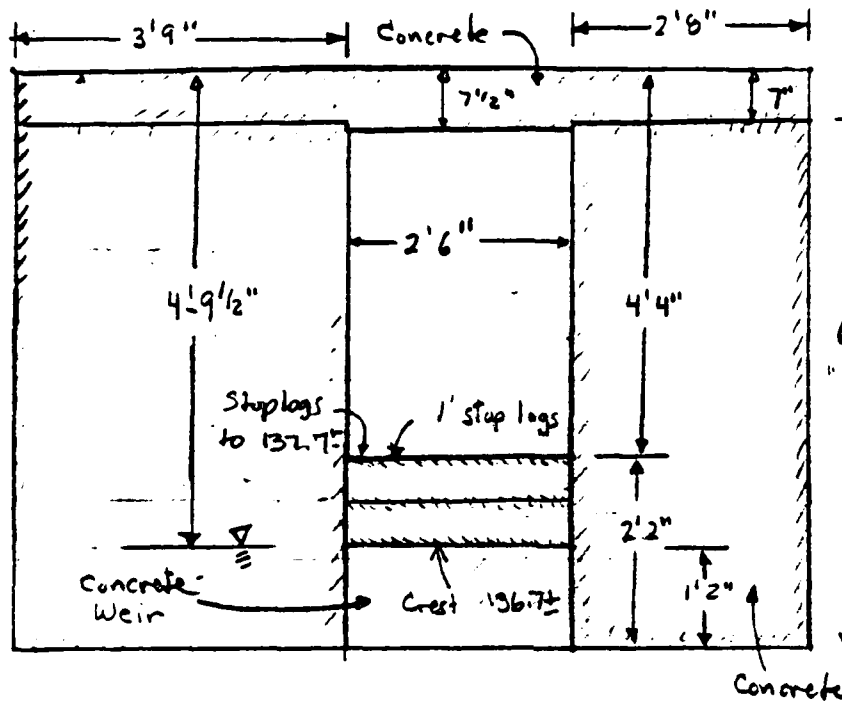
SHEET NO. D 8

JOB Dams
 SUBJECT Wright Pond Dam
 CLIENT Corps

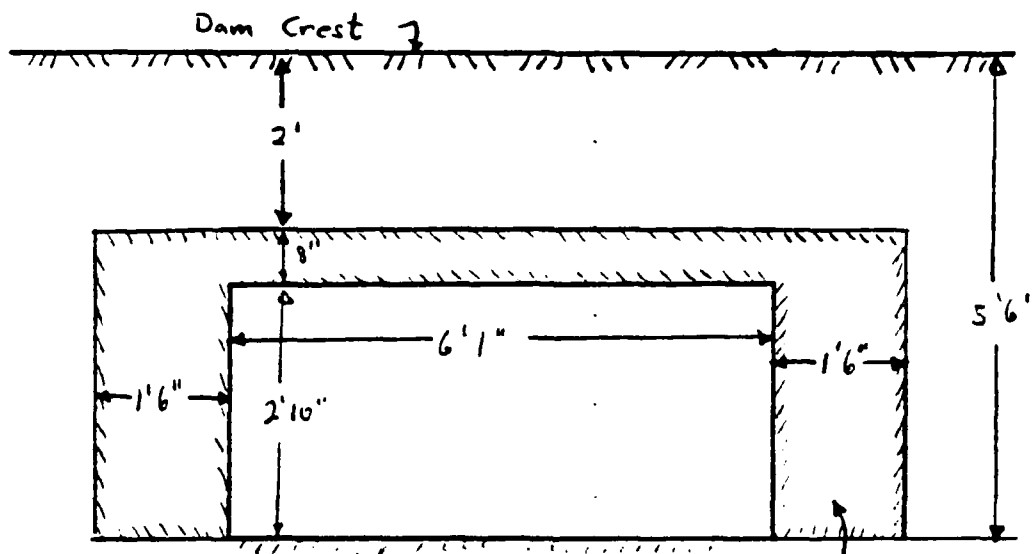
Outlet Structure - Elevation

Approx. Scale: Horiz. Vert.

1" = 2'



Upstream View



Downstream View

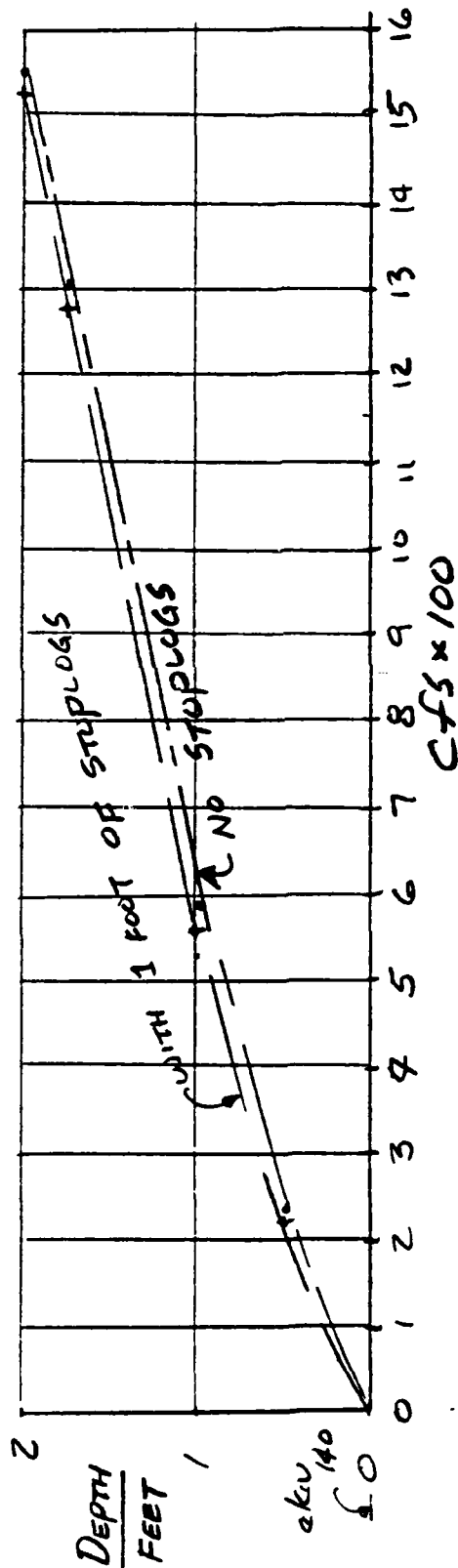
Concrete Lined
Masonry

JOB NO. F206.1
 DATE 9-22-80
 BY MA
 CH'D BY _____



HAYDEN, HARDING & BUCHANAN, INC.
 CONSULTING ENGINEERS
 BOSTON — WEST HARTFORD

SHEET NO. D7A
 JOB Dams
 SUBJECT Wright's
 CLIENT CEE



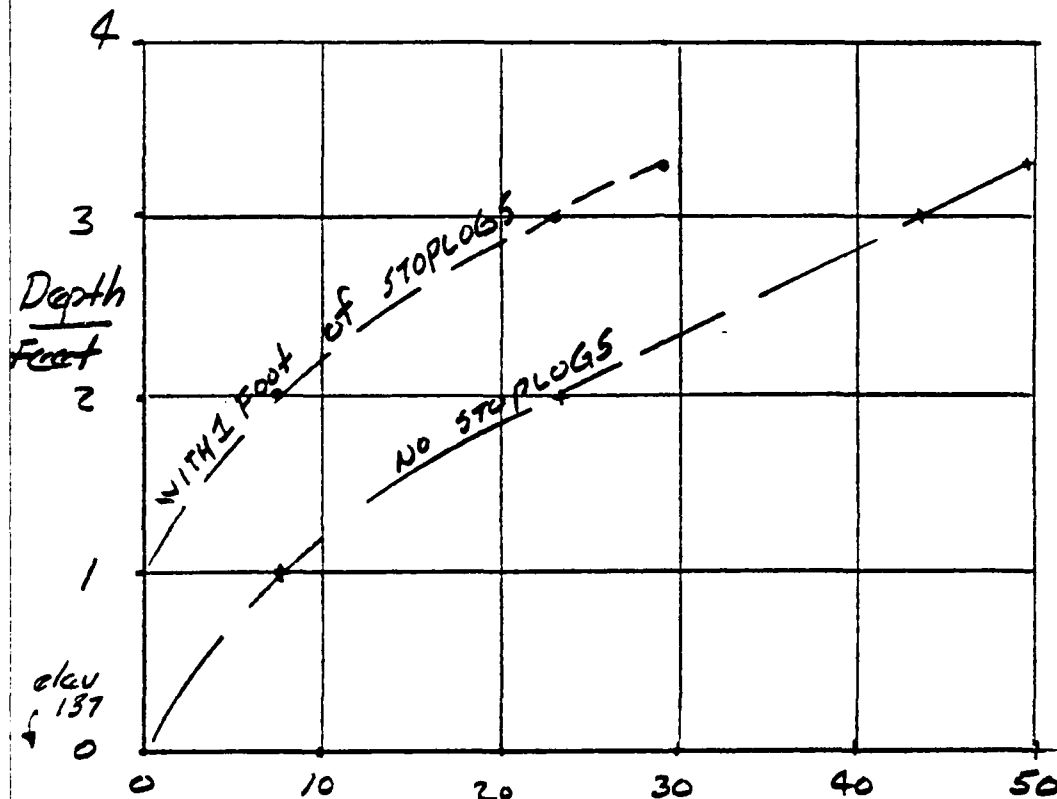
Combined Discharge Capacity
Outlet Structure & Overflow

D NO. 79.206.1
DATE 4-22-80
MA
D BY _____



HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON — WEST HARTFORD

SHEET NO. D7
JOB Dams
SUBJECT WICKS
CLIENT COE



Outlet Discharge Capacity
cfs

JOB NO. 79.206.1
 DATE 11/18/60
 BY FDD
 CH'D BY WAT

HH & B HAYDEN, HARDING & BUCHANAN, INC.
 CONSULTING ENGINEERS
 BOSTON — WEST HARTFORD

SHEET NO. D6
 JOB Dams
 SUBJECT Wright's Pond Dam
 CLIENT Corps

Check Storage Routing for 1/2 PMF:

C) $Q_{P1} = 615 \text{ cfs} \pm$ Elev = $141.03 \pm$ No Stoplogs
 $Stor_1 = 335.7 - 245.3 = 90.4 \text{ ac-ft or } 4.11' \text{ in}$
 $Q_{P2} = 615 \left(1 - \frac{4.11}{9.5}\right) = 349 \text{ cfs}$ Elev₂ = $140.7 \pm$
 $Stor_2 = 334.0 - 245.3 = 88.7 \text{ ac-ft or } 4.03' \text{ in}$
 $Stor_{ave} = \frac{4.11 + 4.03}{2} = 4.07 \text{ in}$
 $Q_{P3} = 615 \left(1 - \frac{4.07}{9.5}\right) = 352 \text{ cfs}$ Elev₃ = $140.7 \pm$

D) $Q_{P1} = 615 \text{ cfs}$ Elev. = $141.07 \pm$ 1' Stoplogs
 $Stor_1 = 338.5 - 245.3 = 93.5 \text{ ac-ft or } 4.23' \text{ in}$
 $Q_{P2} = 615 \left(1 - \frac{4.23}{9.5}\right) = 341 \text{ cfs}$ Elev₂ = $140.6 \pm$
 $Stor_2 = 334.0 - 245.3 = 88.7 \text{ ac-ft or } 4.03' \text{ in}$
 $Stor_{ave} = 4.13 \text{ in}$
 $Q_{P3} = 615 \left(1 - \frac{4.13}{9.5}\right) = 348 \text{ cfs}$ Elev₃ = $140.6 \pm$

Summarizing for 1/2 PMF:

For either spillway condition (No stoplogs or 1' stoplogs)

Dam overtopped by 0.7' $\pm$

$Q_{out} = 350 \text{ cfs} \pm$

For No Stoplogs Spillway $Q = 50 \text{ cfs} \pm$ or 14% 1/2 PMF Outflow
 " 1' " " $Q = 30 \text{ cfs} \pm$ or 8.6% " " "

END

FILMED

7-85

DTIC