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MERRIMACK RIVER BASIN  
ASHLAND, MASSACHUSETTS

ASHLAND RESERVOIR DAM

MA 00439

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PHASE I INSPECTION REPORT  
NATIONAL DAM INSPECTION PROGRAM

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

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number) DAMS, INSPECTION, DAM SAFETY,  Merrimack River Basin Ashland, Massachusetts Cold Spring Brook		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)  The dam is a 1500 foot long, 57 foot high embankment structure with a concrete and clay core. This dam was found to be in generally good condition with no apparent signs of leakage or deterioration. It is intermediate in size and its hazard potential is high. Failure of the dam could cause destruction of dwellings and other property downstream of the dam and would endanger human life.		



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

REPLY TO  
ATTENTION OF:  
NEDED

Honorable Michael S. Dukakis  
Governor of the Commonwealth of  
Massachusetts  
State House  
Boston, Massachusetts 02133

NOV 17 1978

Dear Governor Dukakis:


I am forwarding to you a copy of the Ashland Reservoir 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 Department of Forests and Parks, Commonwealth of Massachusetts, Hopkinton State Park, Route 85, Hopkinton, Massachusetts 01748.

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 yours,

  
JOHN P. CHANDLER  
Colonel, Corps of Engineers  
Division Engineer

Incl  
As stated

ASHLAND RESERVOIR DAM

MA 00439

MERRIMACK RIVER BASIN  
ASHLAND, MASSACHUSETTS

PHASE I INSPECTION REPORT  
NATIONAL DAM INSPECTION PROGRAM

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By _____	
Distribution/ _____	
<b>Availability Codes</b>	
Dist.	Avail and/or Special
A/1	



NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

Identification No.: MA 00439  
Name of Dam: Ashland R. servoir  
Town: Ashland, Massachusetts  
County and State: Middlesex County, Massachusetts  
Stream: Cold Spring Brook  
Date of Inspection: June 12, 1978

BRIEF ASSESSMENT

The Ashland Dam is an 80-year old embankment structure with a concrete and clay core. It is about 1500 feet long at the crest and a height not exceeding 57 feet. Near the right abutment is a granite block cascading spillway 30 feet wide. Freeboard between the spillway crest and the top of the dam is 7 feet. The dam has a drainage area of 3500 acres and impounds a reservoir of 150 acres.

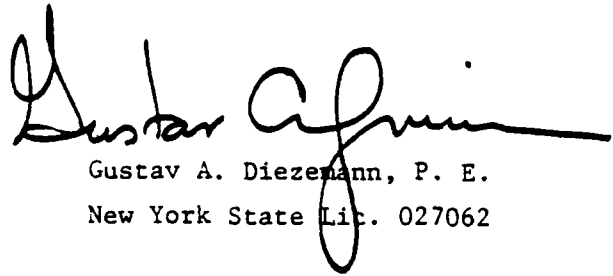
This dam was found to be in generally good condition with no apparent signs of leakage or deterioration. While clogged slightly with growth and debris, the spillway, too, is in good condition. The entire structure appears to be well-engineered and well-constructed and in a surprisingly good state of preservation.

Owing to the impoundment height and storage, Ashland Dam falls within the intermediate size classification. It is in the high hazard potential category and thus hydraulically analyzed using the full probable maximum flood.

Reservoir storage will reduce the maximum probable discharge of 3840 cfs to a test flood of 3450 cfs. The spillway, alone, will pass 1800 cfs (52 percent of the test flood) and, by an overtopping of the embankment of one foot, an additional 3300 cfs can be passed. Thus, the test flood can be passed with the dam overtopped by less than one foot. The Ashland Dam can be considered safe from failure due to overtopping.

A failure of the dam coincident with full spillway discharge, or at any time, could produce a flow approaching 200,000 cfs which would cause destruction of dwellings and other property downstream of the dam and which would endanger human life.

Additional investigations or major modifications are not required. The owner should, however, implement inspection and maintenance procedures, make repairs where necessary, clear the entire spillway channel of growth and debris, reactivate the outlet works, and develop a flood warning system.



Gustav A. Diezenmann, P. E.  
New York State Lic. 027062

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

*Charles G. Tiersch*

CHARLES G. TIERSCH, Chairman  
Chief, Foundation and Materials Branch  
Engineering Division

*Fred J. Ravens, Jr.*

FRED J. RAVENS, Jr., Member  
Chief, Design Branch  
Engineering Division

*Saul Coupler*

SAUL COUPLER, Member  
Chief, Water Control Branch  
Engineering Division

APPROVAL RECOMMENDED:

*Joe B. Fryar*

JOE B. FRYAR  
Chief, Engineering Division

SEP 13 1973

## 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.

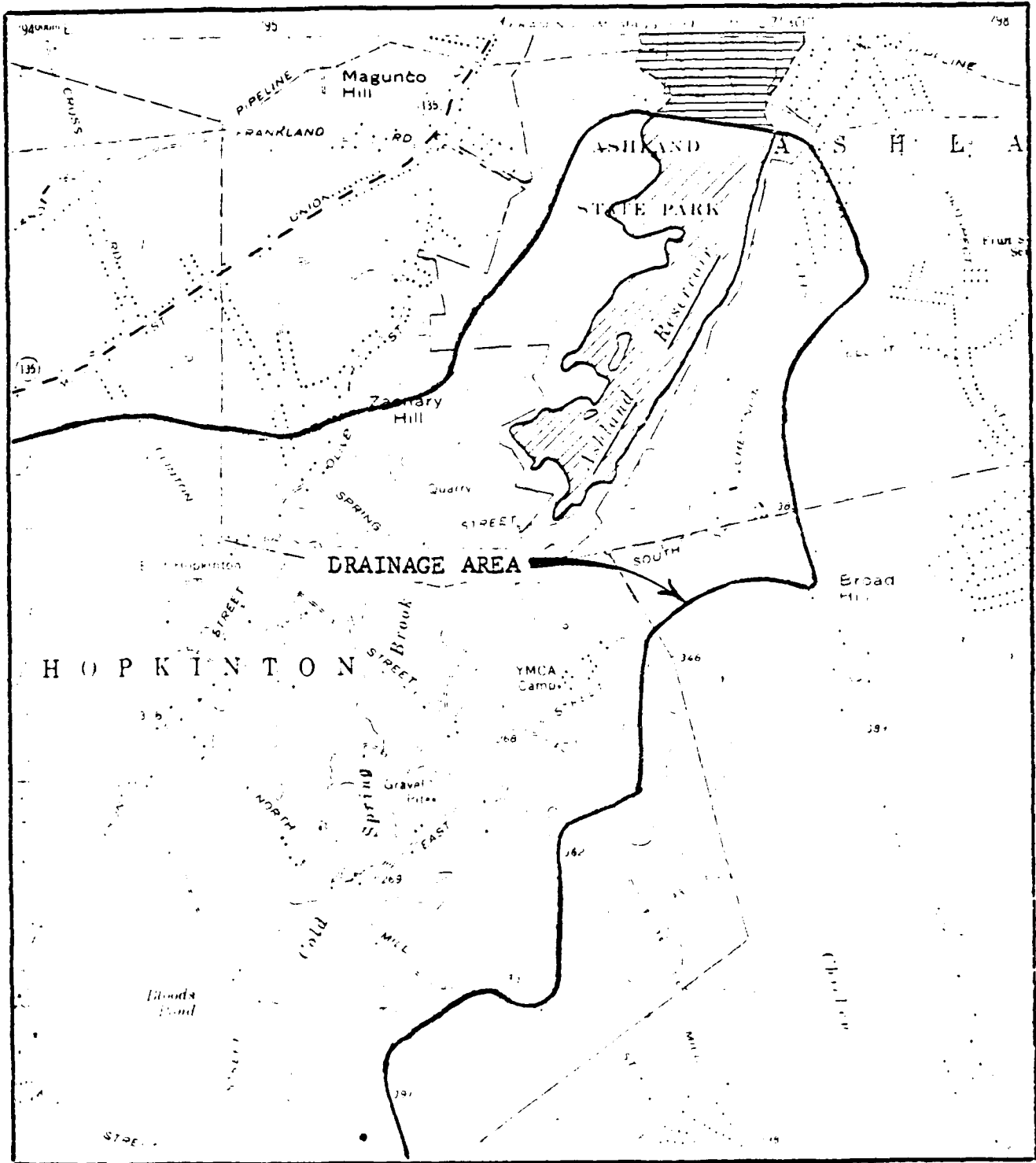
Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because 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.

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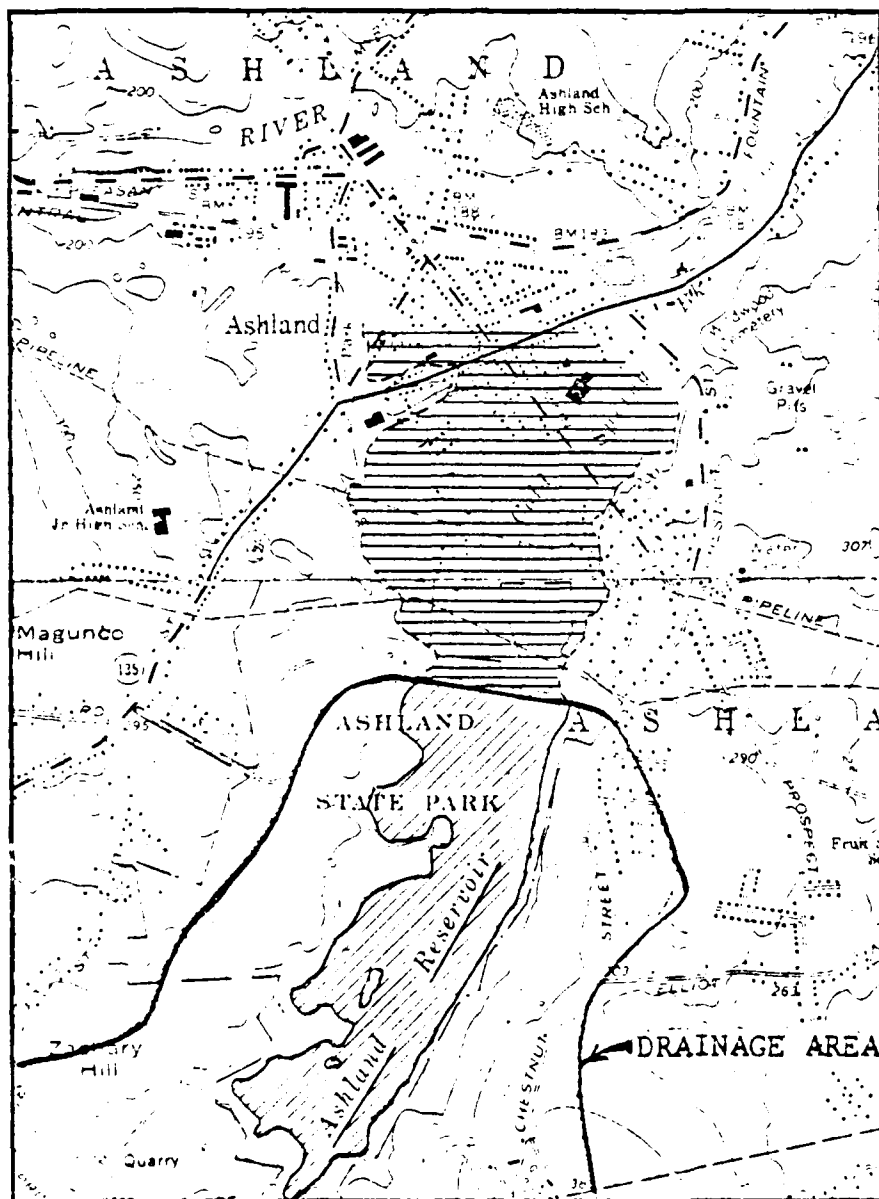
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OVERVIEW PHOTO



ASHLAND RESERVOIR  
 ASHLAND, MASSACHUSETTS  
 Scale 1:24000



ASHLAND RESERVOIR  
 ASHLAND, MASSACHUSETTS  
 Scale 1:24000

INSPECTION CHECK LIST

PROJECT ASHLAND RESERVOIR

DATE \_\_\_\_\_

PROJECT FEATURE \_\_\_\_\_

NAME \_\_\_\_\_

AREA EVALUATED	CONDITION
<u>DIKE EMBANKMENT</u>	- 26 E
Crest Elevation	217 =
Current Pool Elevation	none
Surface Cracks	good
Pavement Condition	none
Movement or Settlement of Crest	none
Lateral Movement	C.K.
Vertical Alignment	C.K.
Horizontal Alignment	good
Condition at Abutment and at Concrete Structures	none
Indications of Movement of Structural Items on Slopes	none temporary
Trespassing on Slopes	none
Sloughing or Erosion of Slopes or Abutments	none
Rock Slope Protection - Riprap Failures	good
Unusual Movement or Cracking at or near Toes	none
Unusual Embankment or Downstream Seepage	none
Piping or Boils	-
Foundation Drainage Features	-
Toe Drains	-
<del>Instruments on System</del>	

VISUAL INSPECTION CHECK LIST  
PARTY ORGANIZATION

PROJECT Asnlana Reservoir

DATE JUNE 12, 1978

TIME 3.00 P.M.

WEATHER Clear & Sunny

W.S. ELEV. 214 U.S. \_\_\_\_\_ DN.S

PARTY:

1. J. Giacchini
2. P. Fischer
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_

PROJECT FEATURE

INSPECTED BY

REMARKS

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_
9. \_\_\_\_\_
10. \_\_\_\_\_

APPENDIX A

## SECTION 7

### ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

#### 7.1 Dam Assessment

a. Condition. This 80-year old fill structure appears to be in good condition with no signs of significant distress or deterioration.

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

c. Urgency. The required repair and maintenance work should be accomplished within two to four years of the receipt of this report by the owner.

d. Need for Additional Investigation. There is no need for additional investigation.

#### 7.2 Recommendations

Additional engineering investigations or major modifications to the dam are not required.

#### 7.3 Operation and Maintenance Procedures

The owner of the dam should develop and implement procedures which would include periodic inspection of the dam for signs of distress, deterioration or vandalism. Repairs and restorations should be made, where required, and the spillway, at least to the end of the constructed channel, should be periodically cleaned of growth and debris.

As a matter of prudence, it should be possible to drain a reservoir of the magnitude of Ashland without breaching the dam. The existing outlet works should be reactivated, the control structure made secure, and the operability of the outlet works periodically tested.

Around the clock surveillance should be provided by the owner during periods of unusually heavy precipitation. The owner should develop a formal warning system with local officials for alerting downstream residents in case of emergency.

SECTION 6  
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

- a. Visual Observations. Nothing was noted which would indicate that the dam was unstable.
- b. Design and Construction Data. No design or construction data are available other than that shown on the drawings contained herein.
- c. Operating Records. Not applicable.
- d. Post Construction Changes. No post construction changes are known to have been made.
- e. Seismic Stability. This dam is located in Seismic Zone 2 and therefore a seismic analysis is not required according to the recommended guidelines.

capacity - results in a peak failure outflow in excess of 327,000 cfs. While this flow can be mitigated by assuming a lesser breach width and consideration of the storage, any major breach in the dam could result in flows which would endanger property and human life.

There is a wide, deep channel making up reach one below the dam. The water level will reach El. 200 in the case of a breach. There is potential hazard in this reach due to the fact that there are a few homes located on a slight rise in the channel. Reach two water level would be approximately El. 194, which floods a large portion of Ashland. Considering the fact that the area flooded includes a playground and school, the hazard to life is great in a situation of a breach of this magnitude.

The areas of impact immediately downstream of the dam are shown on the location map.

## SECTION 5

### HYDRAULIC/HYDROLOGIC

#### 5.1 Evaluation of Features

a. Design Data. The hydraulic/hydrologic analysis was made in accordance with "Preliminary Guidance for Estimating Maximum Probable Discharges in Phase I Dam Safety Investigations", "Estimating Effect of Surcharge Storage on Maximum Probable Discharges", and "Rule of Thumb Guidance for Estimating Downstream Dam Failure Hydrographs" as furnished by the New England Division, Corps of Engineers and "Recommended Guidelines for Safety Inspection of Dams" as issued by the Department of the Army, Office of the Chief of Engineers.

U.S.G.S. Quadrangle maps were used to determine reservoir and drainage areas. Where practicable, spillway dimensions were obtained by direct measurement. Hydraulic coefficients were assigned on the basis of experience and engineering judgment.

b. Experience Data. No specific experience data with respect to the hydraulic/hydrological characteristics of the project are known to exist.

c. Visual Observations. The spillway is in good structural condition, the growth and debris in it not being a serious impediment to the safe discharge of low flows. Overtopping would not significantly spread to either side of the dam, the effective discharge length being about equal to the length of the dam.

d. Overtopping Potential. A Probable Maximum Flood (PMF) of 3,840 cfs was determined. Owing to high hazard potential and intermediate size classification, the PMF was used in the determination of the Peak Outflow (or test flood) of 3,450 cfs. Computational methods, not considering discharge during the storm periods nor the additional reservoir storage available along the banks of the reservoir, indicate that the test flood can be discharged with less than one foot of overtopping of the embankment. Consideration of these effects would reduce the height of overtopping, if not eliminating it completely.

The channel downstream of the dam could probably carry the test flood to the next reservoir without necessarily endangering human life. However, there probably would be some flooding and damage to the low-lying houses and other structures. The U.S.G.S. quad sheets do not permit an accurate analysis.

The application of "rule of thumb" procedures for the estimation of the downstream dam failure hydrograph - with the assumption of a maximum breach width of 30 percent of the dam combined with the spillway

SECTION 4  
OPERATIONAL PROCEDURES

4.1 Procedures

Other than letting the reservoir discharge over the fixed crest spillway, there are no operating procedures.

4.2 Maintenance of Dam

There are apparently no maintenance procedures in effect. There is considerable vegetation and growth at the foot of the downstream dam face.

4.3 Maintenance of Operating Facilities

The operating facilities at the gate house have been closed and abandoned.

4.4 Warning System

There is no warning system.

4.5 Evaluation

There appears to be a complete lack of operational procedures. Recommendations for improving these conditions are given in Section 7.3.

## SECTION 3

### VISUAL INSPECTION

#### 3.1 Findings

a. General. The project, considering its advanced age of over 80 years, appears to have been well conceived, designed, constructed and, in general, maintained.

b. Dam. The dam appears to be in good condition with considerable forest growth and vegetation at the foot of the downstream face. There are no signs of significant misalignment, leakage, distress or deterioration.

c. Appurtenant Structures. The cascading spillway is constructed of granite blocks. While there is some vegetation in the joints and general reservoir debris in the channel, the spillway appears to be in good condition and capable of conveying water in the manner intended. The gatehouse has been abandoned and is in almost complete disrepair.

d. Reservoir Area. The banks surrounding the reservoir are generally flat and wooded. There are no houses along the perimeter of the reservoir.

e. Downstream Channel. Immediately downstream of the dam is a relatively flat, heavily-wooded marsh with several houses along its outer edges and on a spit of higher ground extending downstream into the marsh. For the first 2,000 ft. downstream of the dam, the marsh is about as broad as the dam. Downstream of the wooded marsh, the town of Ashland lies on somewhat higher ground, jutting into the marsh roughly perpendicular to the river channel. At this point the actual channel is quite narrow and the town lies on the left bank flood plain. Downstream of the town, Cold Stream Brook joins the Sudbury River.

#### 3.2 Evaluation

Visual inspection of earthfill structures does not necessarily provide a good insight as to their physical condition. In the case of the Ashland Dam, however, the generally good findings of the visual inspection seem to corroborate its apparently trouble-free operating record.

SECTION 2  
ENGINEERING DATA

2.1 Design

There are drawings available showing the dam cross section, a section through the intake, the spillway cross section, and a general plan of the dam. These drawings are reproduced in this report. The originals of these drawings are in the offices of the Department of Environmental Management located at 100 Cambridge Street in Boston, Massachusetts. Other than these drawings, there are no design data or records available.

2.2 Construction

The Ashland Dam was built around 1900. There are no detailed construction records available.

2.3 Operation

There is no formal operation of the dam. The fixed spillway crest controls the water level of the reservoir, and no operating records are kept.

2.4 Evaluation

a. Availability. Other than the drawings listed above, there are no engineering data available.

b. Adequacy. The lack of in-depth engineering data does not allow for a definitive review. Therefore, the adequacy of this dam, structurally and hydraulically, cannot be assessed from the standpoint of review of design calculations, but must be based primarily on the visual inspection, past performance history, and sound hydrologic and hydraulic engineering judgment.

c. Validity. The limited data available do not furnish a proper basis for a detailed evaluation of this dam.

g. Dam

- |      |                 |  |
|------|-----------------|--|
| (1)  | Type            | Earthfill with concrete core               |
| (2)  | Length          | 1,500 ± feet                               |
| (3)  | Height          | 57 feet                                    |
| (4)  | Top Width       | 20 feet                                    |
| (5)  | Side slope      | 2H:1V Upstream. 2H:1V & 2½ H:1V Downstream |
| (6)  | Zoning          | See drawing                                |
| (7)  | Impervious core | Concrete and clay                          |
| (8)  | Cutoff          | None                                       |
| (9)  | Grout curtain   | Unknown                                    |
| (10) | Other           | N/A  |

h. Spillway

- |     |                 |                                  |
|-----|-----------------|----------------------------------|
| (1) | Type            | Ungated                          |
| (2) | Length of weir  | 30 feet                          |
| (3) | Crest elevation | El. 219 ±                        |
| (4) | Gates           | None                             |
| (5) | U/S Channel     | N/A                              |
| (6) | D/S Channel     | Cascading granite block spillway |
| (7) | General         | N/A                              |

i. Regulating Outlets. There is a 48-inch concrete conduit through the dam at approximately El. 170. The slide gate, formerly controlled from the gate house on the dam, has been permanently closed.

c. Elevation (Feet Above MSL)

(1)	Top of dam	El. 226 ±
(2)	Maximum design surcharge	El. 226 ±
(3)	Full flood control pool	N/A
(4)	Recreation pool	El. 219 ±
(5)	Spillway crest (gated)	El. 219 ± (ungated)
(6)	Upstream portal invert diversion tunnel	N/A
(7)	Streambed at centerline of dam	El. 169 ±
(8)	Maximum tailwater	Impossible to ascertain accurately

d. Reservoir (Feet)

(1)	Length of maximum pool	7,000 ±
(2)	Length of recreation pool	6,000 ±
(3)	Length of flood control pool	N/A

e. Storage (Acre-Feet)

(1)	Recreation pool	3,800 ±
(2)	Flood control pool	N/A
(3)	Design surcharge	4,900 ±
(4)	Top of dam	4,900 ±

f. Reservoir Surface (Acres)

(1)	Top of dam	325
(2)	Maximum pool	325
(3)	Flood control pool	N/A
(4)	Recreation pool	150 ±
(5)	Spillway crest	150 ±

c. Size Classification. Owing to its height of 57 feet and its impoundment of roughly 3800 acre feet below the crest, the dam falls within the intermediate size classification.

d. Hazard Classification. As there are many houses and other structures downstream of the dam which would be endangered if the dam failed, the dam is considered to have a high hazard potential.

e. Ownership. The dam is owned by the Department of Forests and Parks of the Commonwealth of Massachusetts. It was owned formerly by the City of Boston.

f. Operator. Mr. John Pielczarski  
Hopkinton State Park, Route 85  
Hopkinton, Massachusetts  
Office: (617) 435-4303; Home: (617) 943-3776

g. Purpose of Dam. The reservoir impounded by the dam is presently used for recreation purposes. It was formerly part of the water supply system of the City of Boston.

h. Design and Construction History. Other than a drawing, excerpts from which are part of this report, nothing is known of the design and construction history of this project. It was constructed in 1898.

i. Normal Operating Procedures. As the sluices have been permanently closed, there are no operating procedures other than to let water discharge over the ungated spillway.

### 1.3 Pertinent Data

a. Drainage Area. The Ashland Reservoir has approximately 5.48 square miles of drainage area of essentially flat, semi-forested rural land.

b. Discharge at Damsite.

(1) The presently closed outlet works consist of sluices formerly controlled by 48" slide gates operated from a stone and brick gate house on the crest of the dam. The gate house is now partially destroyed and the gate hoist mechanism inoperable.

(2) The maximum known flood at the damsite is unknown.

(3) The ungated spillway capacity before the dam is overtopped is about 1,800 cfs or approximately 52 percent of the test flood.

(4) There is no gated spillway capacity.

(5) There is no gated spillway capacity.

(6) The total spillway capacity at maximum pool elevation is 1800 cfs at El. 226 ±.

PHASE I INSPECTION REPORT

ASHLAND DAM AND RESERVOIR

SECTION I

PROJECT INFORMATION

1.1 General

a. Authority. Public Law 92-367, August 3, 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. Chas. T. Main, 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 were issued to Chas. T. Main, Inc. under a letter of May 3, 1978, from Ralph T. Garver, Colonel, Corps of Engineers. Contract No. DACW33-78-D328 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 prepare the states to initiate quickly effective dam safety programs for non-Federal dams.

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

1.2 Description of Project

a. Location. The Ashland Dam and Reservoir on Cold Stream Brook are located in the Town of Ashland, Middlesex County, Massachusetts.

b. Description of Dam and Appurtenances. The dam is an earthfill structure with concrete core about 1500 feet long and about 57 feet high at maximum section. The cascading spillway is constructed of granite blocks and is 30 feet wide.

INSPECTION CHECK LIST

PROJECT ASHLAND RESERVOIR

DATE \_\_\_\_\_

PROJECT FEATURE \_\_\_\_\_

NAME \_\_\_\_\_

AREA EVALUATED	CONDITION
<p><u>CONCRETE DAM</u></p> <p>Concrete Surfaces</p> <p>Structural Cracking</p> <p>Movement -- Horizontal &amp; Vertical Alignment</p> <p>Junctions</p> <p>Drains -- Foundation, Joint, Face</p> <p>Water Passages</p> <p>Seepage or Leakage</p> <p>Monolith Joints -- Construction Joints</p> <p>Foundation</p>	<p style="text-align: center;"><u>APPLICABLE</u></p>

INSPECTION CHECK LIST

PROJECT ASHLAND RESERVOIR

DATE \_\_\_\_\_

PROJECT FEATURE \_\_\_\_\_

NAME \_\_\_\_\_

AREA EVALUATED	CONDITION
<p><u>OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE</u></p> <p>a. Approach Channel</p> <ul style="list-style-type: none"><li>Slope Conditions</li><li>Bottom Conditions</li><li>Rock Slides or Falls</li><li>Log Boom</li><li>Debris</li><li>Condition of Concrete Lining</li><li>Drains or Weep Holes</li></ul> <p>b. Intake Structure</p> <ul style="list-style-type: none"><li>Condition of Concrete</li><li>Stop Logs and Slots</li></ul>	<p style="text-align: center;">N/A</p> <p style="text-align: center;">APPLICABLE</p>

INSPECTION CHECK LIST

PROJECT ASHLAND RESERVOIR

DATE \_\_\_\_\_

PROJECT FEATURE \_\_\_\_\_

NAME \_\_\_\_\_

AREA EVALUATED

CONDITION

OUTLET WORKS - TRANSITION AND CONDUIT

General Condition of Concrete

Rust or Staining on Concrete

Spalling

Erosion or Cavitation

Cracking

Alignment of Monoliths

Alignment of Joints

Numbering of Monoliths

NOT

APPLICABLE

INSPECTION CHECK LIST

PROJECT ASHLAND RESERVOIR

DATE \_\_\_\_\_

PROJECT FEATURE \_\_\_\_\_

NAME \_\_\_\_\_

AREA EVALUATED	CONDITION
<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	
b. Weir and Training Walls	
General Condition of Concrete	good
Rust or Staining	none
Spalling	none
Any Visible Reinforcing	none
Any Seepage or Efflorescence	none
Drain Holes	none
c. Discharge Channel	
General Condition	good
Loose Rock Overhanging Channel	none
Trees Overhanging Channel	none
Floor of Channel	discharge channel is blocked
Other Obstructions	

INSPECTION CHECK LIST

PROJECT ASHLAND RESERVOIR

DATE \_\_\_\_\_

PROJECT FEATURE \_\_\_\_\_

NAME \_\_\_\_\_

AREA EVALUATED	CONDITION
<p><u>OUTLET WORKS - CONTROL TOWER</u></p>	
<p>a. Concrete and Structural</p>	
<p>General Condition</p>	
<p>Condition of Joints</p>	
<p>Spalling</p>	
<p>Visible Reinforcing</p>	
<p>Rusting or Staining of Concrete</p>	
<p>Any Seepage or Efflorescence</p>	<p><u>1.05</u></p>
<p>Joint Alignment</p>	<p><u>1.05</u></p>
<p>Unusual Seepage or Leaks in Gate Chamber</p>	<p><u>1.05</u></p>
<p>Cracks</p>	
<p>Rusting or Corrosion of Steel</p>	
<p>b. Mechanical and Electrical</p>	
<p>Air Vents</p>	
<p>Float Wells</p>	
<p>Crane Hoist</p>	
<p>Elevator</p>	
<p>Hydraulic System</p>	
<p>Service Gates</p>	
<p>Emergency Gates</p>	
<p>Lightning Protection System</p>	
<p>Emergency Power System</p>	
<p>Wiring and Lighting System</p>	



INSPECTION CHECK LIST

PROJECT ASHLAND RESERVOIR

DATE \_\_\_\_\_

PROJECT FEATURE \_\_\_\_\_

NAME \_\_\_\_\_

AREA EVALUATED

CONDITION

OUTLET WORKS - SERVICE BRIDGE

a. Super Structure

Bearings

Anchor Bolts

Bridge Seat

Longitudinal Members

Under Side of Deck

Secondary Bracing

Deck

Drainage System

Railings

Expansion Joints

Paint

b. Abutment & Piers

General Condition of Concrete

Alignment of Abutment

Approach to Bridge

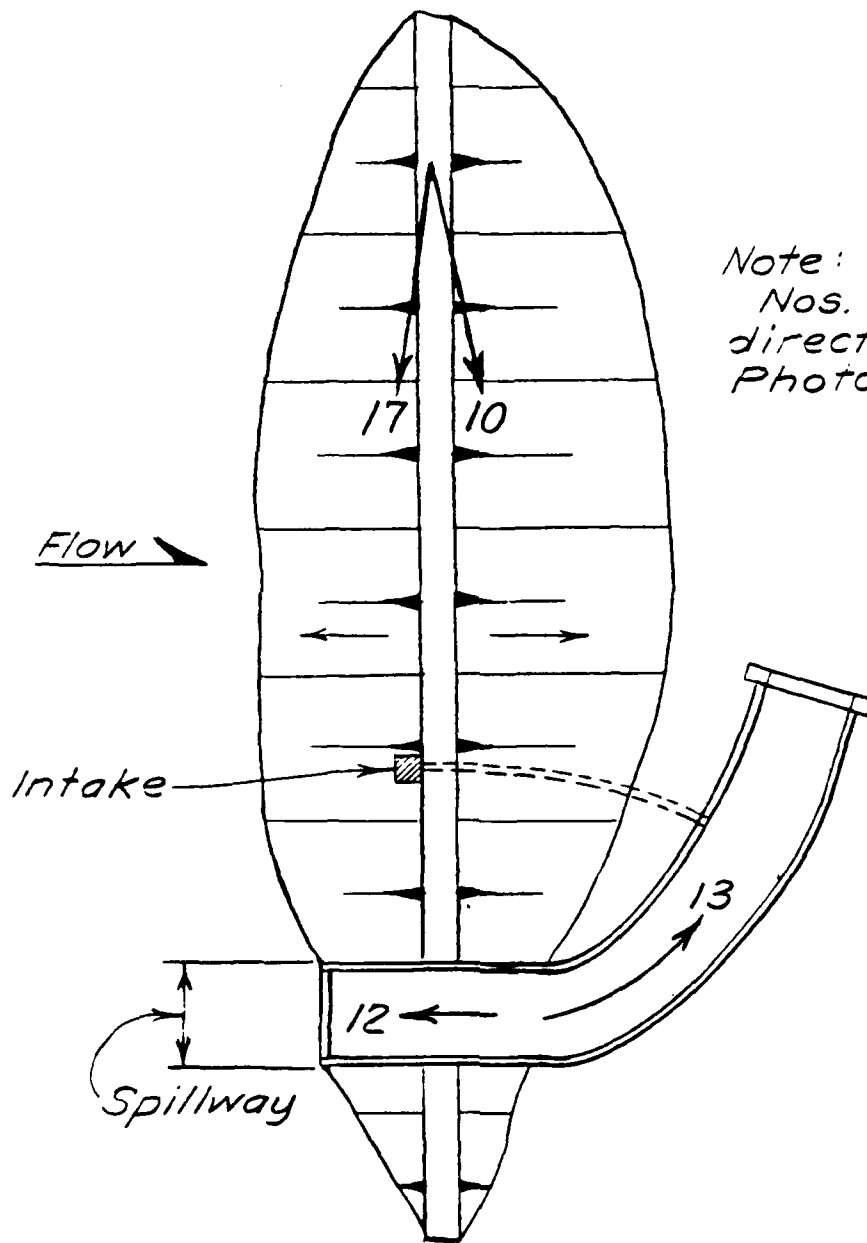
Condition of Seat & Backwall

APPENDIX B

A few drawings were available at the Bureau of Environmental Management located at 100 Cambridge Street, Boston, Massachusetts. Excerpts from these drawings follow.

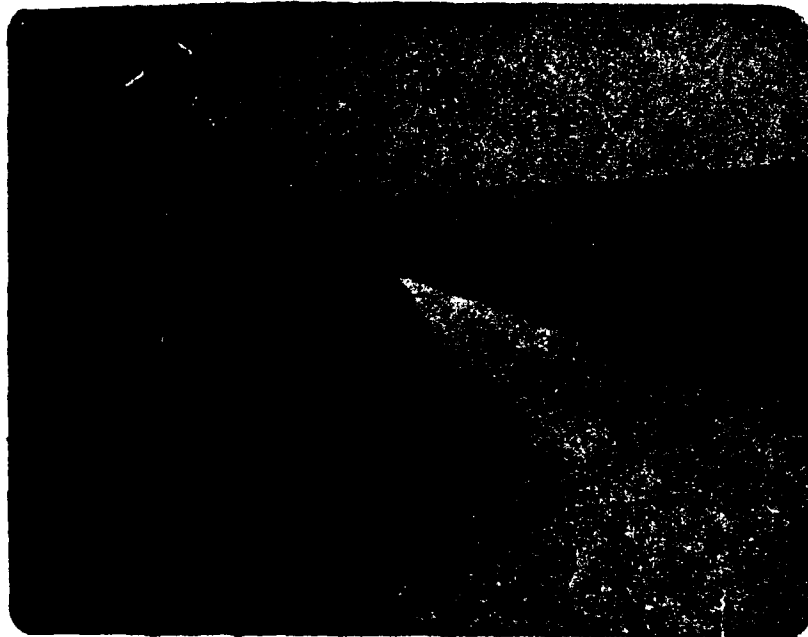


APPENDIX C



Note:  
Nos. denote  
direction of  
Photos.

PLAN  
ASHLAND RESERVOIR



10

Downstream View of Embankment

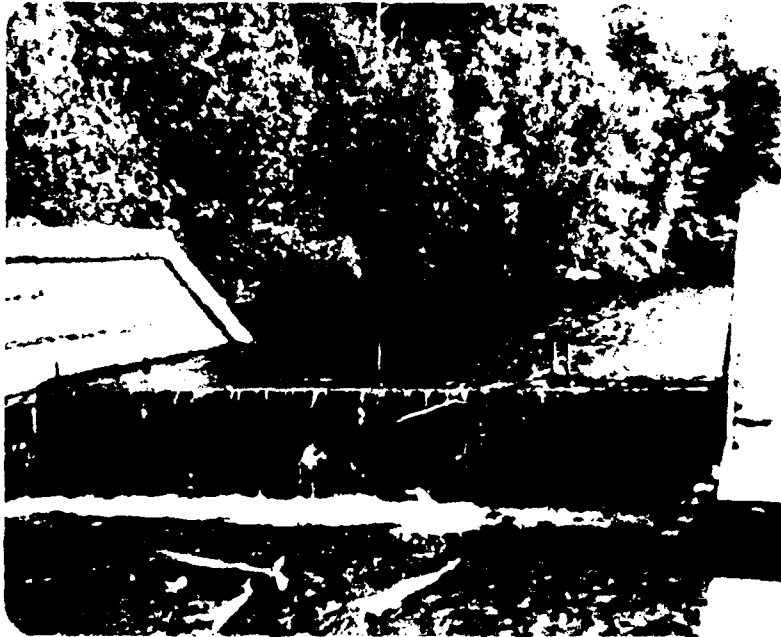


17

Upstream View of Embankment

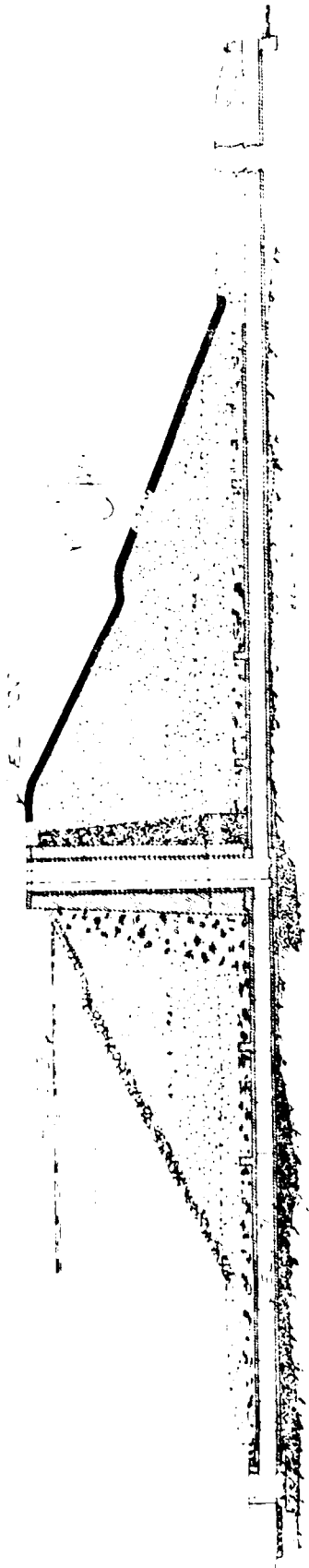


Downstream View of Spillway Channel



Downstream View of Spillway

ASHLAND RESERVOIR



SECTION OF DAM AT 48 INCH OUTLET

SECTION THRU INTAKE  
ASHLAND RESERVOIR





# INVENTORY OF DAMS IN THE UNITED STATES

STATE NUMBER	DIVISION	COUNTY	CONTRACT	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	RECENT DATE
MA 439	NED	MA 017 05		ASHLAND RESERVOIR DAM	4215.0	7127.5	08SEP78

POPULAR NAME	NAME OF IMPROVEMENT
	ASHLAND RESERVOIR

REGULATIONS	NEAREST DOWNSTREAM CITY-TOWN-VILLAGE	DIST FROM DAM (MILE)	POPULATION
01 06 COLD SPRING BROOK	ASHLAND	6	9000

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STRAINING	WATER CONTROL	WINDMILL	WATER WHEEL	WATER TURBINE	WATER WHEEL	WATER TURBINE	DIST	OWN	FED	R	PRV/FED	SCS A	VER/DATE
MCTYPG	1895	R	57	50	475	5750				N	N	N	N	N	N	31AUG/8

REMARKS

D/S HAS CAPACITY	SPILLWAY TYPE	MAXIMUM DISCHARGE (CFS)	VOLUME OF DAM (CU FT)	POWER CAPACITY INSTALLED (KW)	NAVIGATION LOCKS
1	U	1800	234000		

OWNER: DEPT OF FORESTS + PARKS

ENGINEERING BY:

CONSTRUCTION BY:

REGULATORY AGENCY: NONE

DESIGN: NONE

CONSTRUCTION: NONE

OPERATION: NONE

MAINTENANCE: NONE

INSPECTION BY: CHAS. T. MAIN, INC.

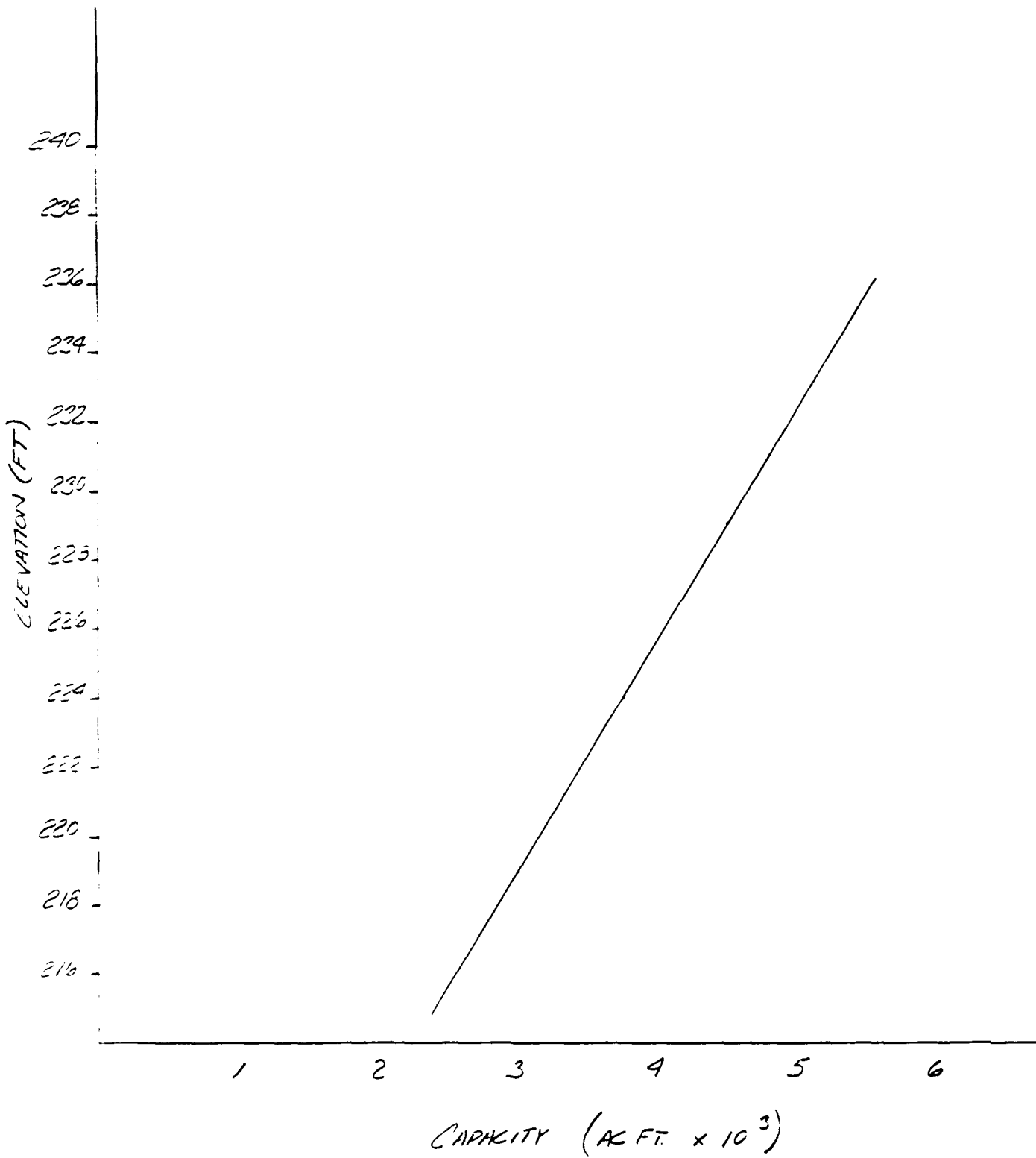
INSPECTION DATE: 12JUN78

AUTHORITY FOR INSPECTION: PL92-367

REMARKS

APPENDIX E  
INFORMATION AS CONTAINED IN  
THE NATIONAL INVENTORY OF DAMS

Client C. OF E Job No. \_\_\_\_\_ Sheet \_\_\_\_\_ of \_\_\_\_\_  
Subject ASHLAND - By J. VEITCH Date 22 MAY 1979  
CAPACITY CURVE Ckd. \_\_\_\_\_ Rev. \_\_\_\_\_



REACH ②

EL. 150  $Q = 1938 \left(30 \left(\frac{1938}{1570}\right)^{4/3} (.002)\right)^{1/2} = 2,990 \text{ CFS}$   
 185  $Q = 11163 \left(30 \left(\frac{11163}{2173}\right)^{4/3} (.002)\right)^{1/2} = 44,590 \text{ CFS}$   
 190  $Q = 23723 \left(30 \left(\frac{23723}{2775}\right)^{4/3} (.002)\right)^{1/2} = 133,125 \text{ CFS}$   
 195  $Q = 33598 \left(30 \left(\frac{33598}{3358}\right)^{4/3} (.002)\right)^{1/2} = 275,910 \text{ CFS}$   
 200  $Q = 55004 \left(30 \left(\frac{55004}{3475}\right)^{4/3} (.002)\right)^{1/2} = 469,520 \text{ CFS}$

CRITICAL CASE P.F.O.  $Q = 327,400$

REACH I  $Q = 327,400$  EL. 199.5'

HOMES on high ground, MID CHANNEL FLOODED.  
 HIGH HAZARD to life & PROPERTY.

II  $Q = 236,570$  EL. 193.8'

EXCESSIVE FLOODING to ASHLAND. HAZARD to life  
 SIGNIFICANT.

CASE II TEST FLOOD 3450 cfs.

REACH I EL. 180.5' only slight possibility of flooding.

II EL.  $\leq 180$ . slight flooding to homes on  
 Main St, ASSUMING culvert  
 plugged & flow backing up to  
 street. el. . No hazard to life.

REACH I.  $Q = 327,400$  cfs P.F.O EL. = 199.5

$$V_1 = \frac{19.5}{20} \frac{(39025)(1500)}{43560} = 1310 \text{ AC FT} \quad S = 4275 \text{ AC FT} \quad /$$

$$Q_{P2} (\text{TRIAL}) = 327,400 \left(1 - \frac{1310}{4275}\right) = 227,075 \text{ cfs}$$

$$I_2 = \frac{15.8}{19.5} (1310) = 1061 \text{ AC FT.} \quad V_{AVG} = 1186 \text{ AC FT}$$

$$Q_{P2} = 327,400 \left(1 - \frac{1186}{4275}\right) = 236,570 \text{ cfs} = Q_{P1} \quad \text{REACH II}$$

REACH II.  $Q_{P1} = 236,570$  cfs EL = 193.8

$$V_1 = \frac{18.8}{20} \frac{(38598)(1500)}{43560} = 1249 \text{ AC FT}$$

$$Q_{P2} (\text{TRIAL}) = 236,570 \left(1 - \frac{1249}{4275}\right) = 167,453 \text{ cfs}$$

$$I_2 = \frac{16.3}{18.8} (1249) = 1083 \text{ AC FT.} \quad V_{AVG} = 1166 \text{ AC FT}$$

$$Q_{P3} = 236,570 \left(1 - \frac{1166}{4275}\right) = 172,046 \text{ cfs}$$

Cheer C of E

Job No. \_\_\_\_\_

Sheet 7 of \_\_\_\_\_

Project ASHLAND

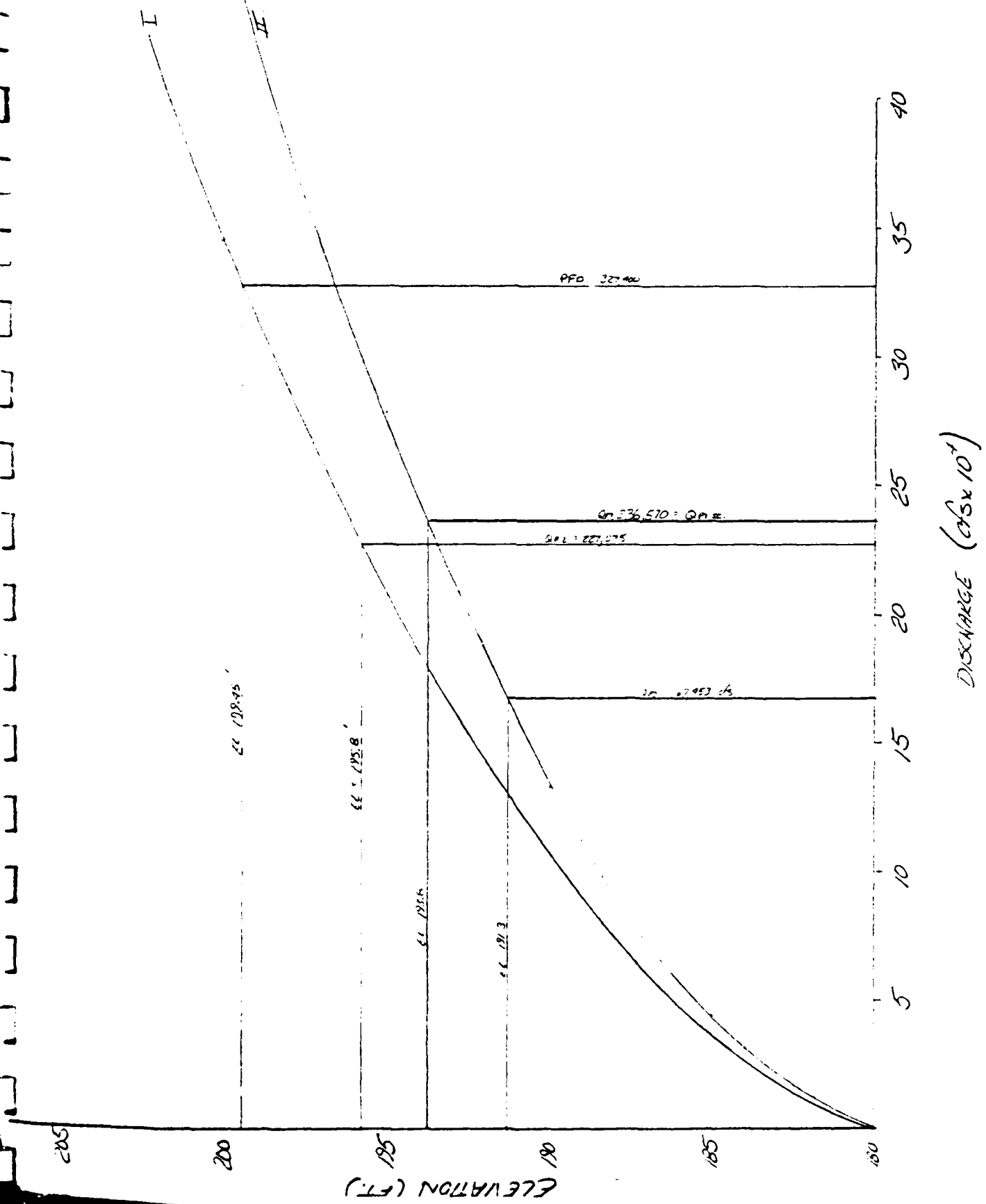
By VEITCH

Date 28 AUG 1978

CHANNEL FITTING CURVES

Ckd. \_\_\_\_\_

Rev. \_\_\_\_\_



AREA, Wetted P. Cak.

	el.	A. (F <sup>2</sup> )	Σ A	W.P. (ft)	Σ W.P.
SECTION ONE:	180	325	325	500	500
	185	4910	5235	150	1050
	190	5730	10965	150	1200
	195	6670	17635	285	1485
	200	8138	25773		1770
SECTION TWO:	180	2475	2475	2020	2020
	185	10100	12575	265	2285
	190	12190	24765	265	2550
	195	13325	38090	225	2775
	200	19188	52278		2900
SECTION THREE:	180	1400	1400	1120	1120
	185	3350	4750	940	2060
	190	12940	22690	940	3000
	195	16415	39105	400	3400
	200	18625	57730		4050

STAGE PATING

REACH ① USING AVE AREA & W.P.  $S = .002$   $R = .05$   $C = 30$

EL. 180  $Q = A C R^{2/3} S^{1/2} = 1400 (30) \left( \frac{1400}{1960} \right)^{2/3} (.002)^{1/2} = 1830 \text{ CFS}$

185  $Q = 2905 (30) \left( \frac{2905}{1663} \right)^{2/3} (.002)^{1/2} = 36,500 \text{ CFS}$

190  $Q = 17865 (30) \left( \frac{17865}{1675} \right)^{2/3} (.002)^{1/2} = 107,725 \text{ CFS}$

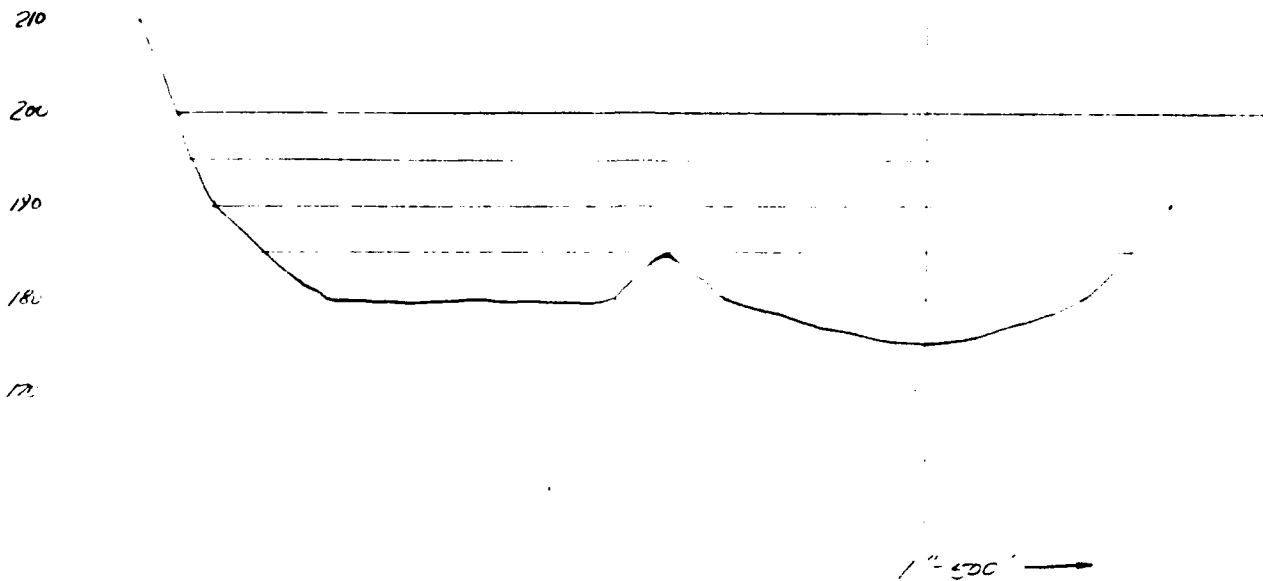
195  $Q = 27863 (30) \left( \frac{27863}{2130} \right)^{2/3} (.002)^{1/2} = 207,590 \text{ CFS}$

200  $Q = 39025 (30) \left( \frac{39025}{2335} \right)^{2/3} (.002)^{1/2} = 345,483 \text{ CFS}$

Client COFE Job No. \_\_\_\_\_ Sheet 5 of \_\_\_\_\_  
 Subject ASHLAND RES By J. VEITCH Date 12 JULY 1979  
 Ckd. \_\_\_\_\_ Rev. \_\_\_\_\_

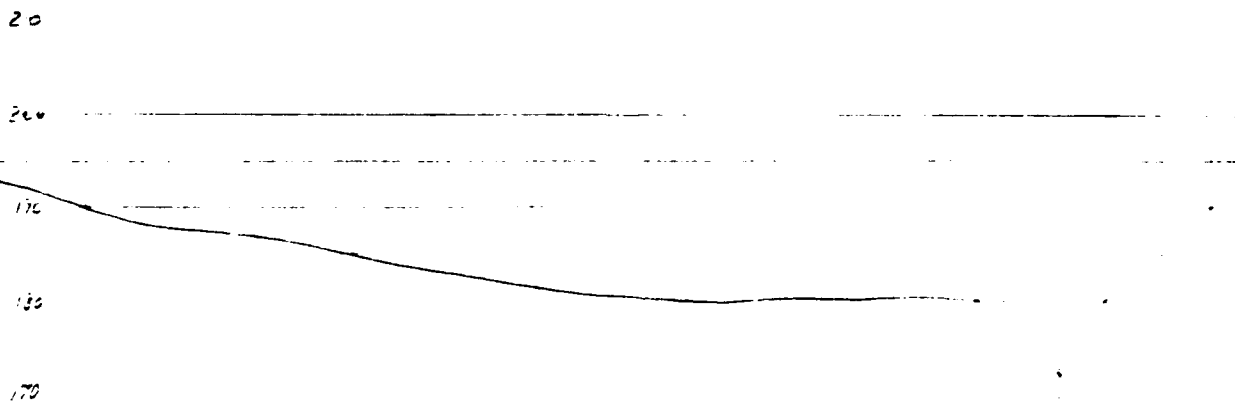
SECTION TWO  
 1500' below DAM

L.D.



SECTION THREE  
 3000' below DAM

L.D.



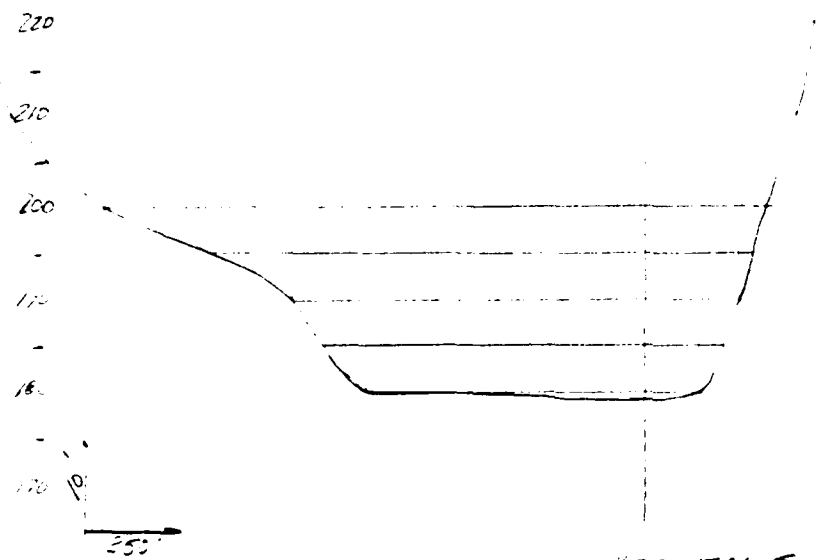
Client CAF E Job No. \_\_\_\_\_ Sheet 1 of \_\_\_\_\_  
 Subject ASHLAND RES By J VEITZ Date 17 JULY 1975  
 Ckd. \_\_\_\_\_ Rev. \_\_\_\_\_

USING USGS QUAD SHEETS:

REACH #1.

SLOPE =  $\frac{2}{3000}$  = .002      n = .05      C = 30

L.D.



HORIZONTAL SCALE: 1" = 500'

SECTION ONE JUST below DAM.

Client C. I. E.

Job No. \_\_\_\_\_ Sheet 3 of \_\_\_\_\_

Subject STORAGE

By \_\_\_\_\_ Date \_\_\_\_\_

Ckd. \_\_\_\_\_ Rev. \_\_\_\_\_

### STORAGE IN RESERVOIR

Surface area = 150 acms

depth at dam = 57 assume  $K = .5$

$$S = 150 \times 57 \times 0.5 = 4275 \text{ AF}$$

### PEAK FAILURE OUTFLOW (Qp.)

$$Q_p = 2.47 W_s \sqrt{3} y_o^{3/2} \quad y_o = 57'$$

ASSUME 30%  $.3(1500) = 450$

$$Q_p = 2.47(450)(1.322)(57)^{1.5}$$

$$= 325,600 \text{ cfs.} \quad + 1800 \text{ cfs}$$

$$= 327,400 \text{ cfs} \quad (\text{DRENCH \& SPILLWAY CAPACITY})$$



RMF = 3,840 cfs = 9.2' - orora class. - 150 ft Int.  
 Reservoir Area. 150 acres  
 Drainage Area 55 mi<sup>2</sup> = 3,520 acres  
 Spillway 20' C = 3.25  
 7 days  
 Length of dam 1,500' C = 2.25

Surcharge ht to pass Op<sub>1</sub> (see curve) = 7.7'

$$STOR_1 = \frac{150 \times 7.7 \times 12}{3,520} = 3.9" \text{ 1 unit. If}$$

$$Op_2 = Op_1 (1 - STOR_1/12) = 3,840 (1 - 0.327) = 2,545 \text{ cfs}$$

From curve, surcharge to pass Op<sub>2</sub> = 7.4'

$$STOR_2 = \frac{150 \times 7.4 \times 12}{3,520} = 3.78"$$

$$\Delta \text{ Net Stor} = STOR_1 - STOR_2 = 0.12"$$

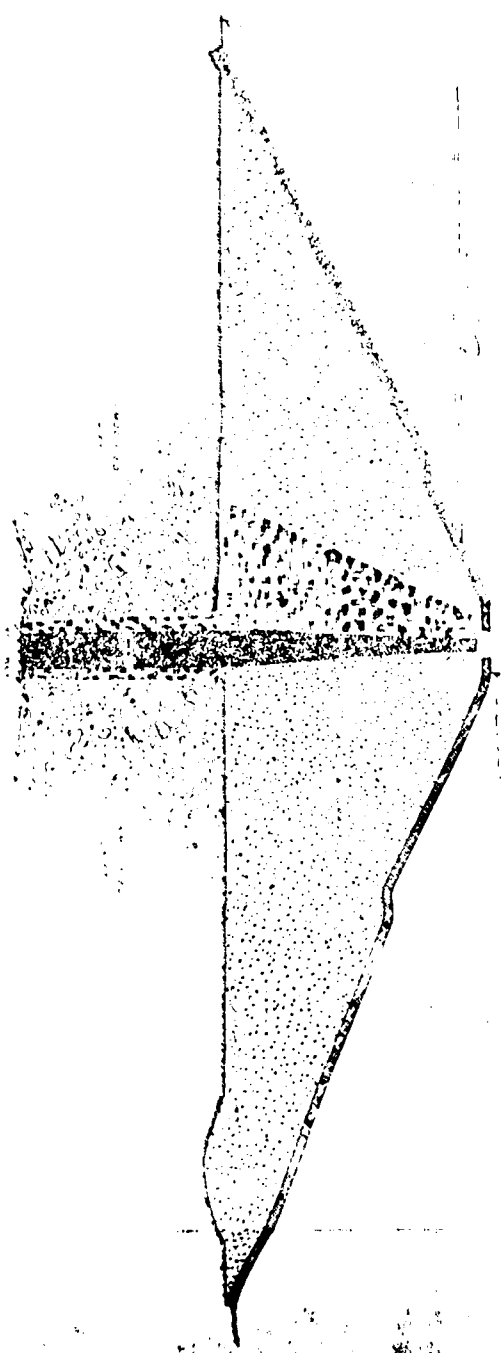
$$\Delta \text{ Net Surcharge} = \frac{0.12 \times 3,840}{150 \times 12} = 7.55'$$

$$Op_3 = 2,450 \text{ cfs}$$

∴ Structure will pass Pe. 10. - 100 (Op<sub>3</sub>) and most  
 exceeding 1' overtopping; - over time -  
 erosion.

APPENDIX D

SECTION OF DAM

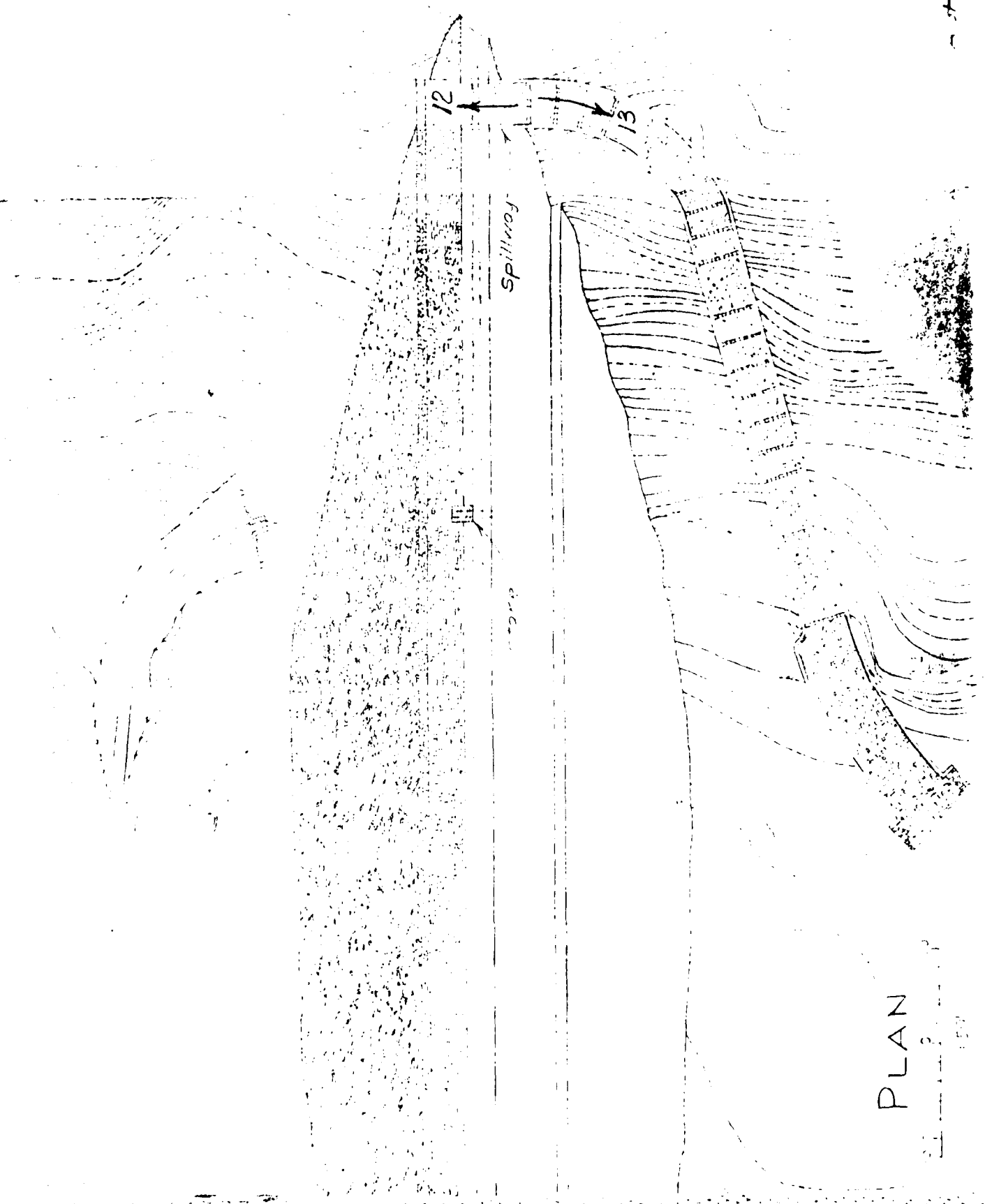


DAM SECTION  
ASHLAND RESERVOIR

1952  
S. J. ...  
P. ...

HOSPITAL ...  
GENERAL ...

... ISLAND RESERVE



PLAN

1952

PLAN

NOT INCLUDING GOVERNMENT EXPENSE



**END**

**FILMED**

**7-85**

**DTIC**