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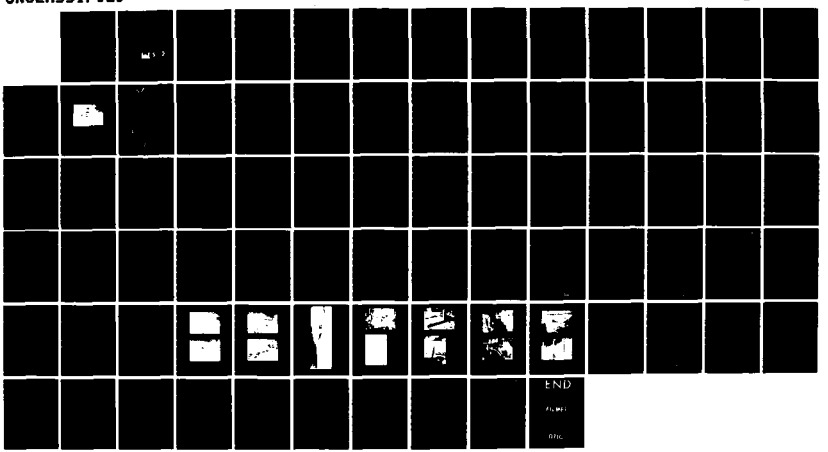
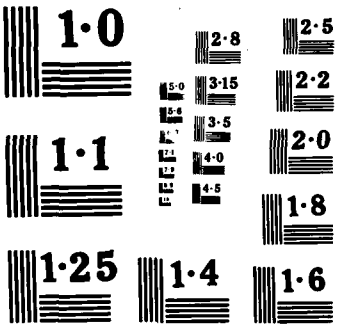
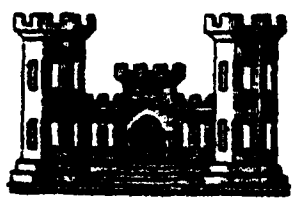




MERRIMACK RIVER BASIN
STERLING, MASSACHUSETTS

HYCREST FARM POND DAM
MA 00673

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



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

FEBRUARY 1979

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18. SUPPLEMENTARY NOTES

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

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

DAMS, INSPECTION, DAM SAFETY,

Merrimack River Basin
Sterling, Massachusetts
Rocky Brook

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

The dam consists of an approximately 300 ft. long earth embankment apparently containing a concrete core wall. The dam is in fain condition. The size is small and the hazard potential is low. There were no evident signs of structural failure or other conditions which would warrent urgent remedial action ,

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

REPLY TO
ATTENTION OF

NEDED

APR 17 1979

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

Dear Governor King:

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

A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. In addition, a copy of the report has also been furnished the owner, White's Black Angus Farm, Inc., Mr. Ben Monroe, President, P.O. Box 225, Sterling, Massachusetts 01564.

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

MERRIMACK RIVER BASIN
STERLING, MASSACHUSETTS

HYCREST FARM POND DAM

MA 00673

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

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

FEBRUARY 1979

PHASE I INVESTIGATION REPORT
NATIONAL DAM INSPECTION PROGRAM

Identification No.:	MA 00673
Name of Dam:	Hycrest Farm Pond
Town:	Sterling
County:	Worcester
State:	Massachusetts
Stream:	Rocky Brook
Date of Site Visit:	16 November 1978

BRIEF ASSESSMENT

This dam consists of an approximately 300-ft. long earth embankment apparently containing a concrete core wall. A 12-ft. long flashboard controlled spillway and a 24-in. diameter gated reservoir drain are located on the left side. The dam was built in 1949 to create a fire protection water supply for the owner's farm. The maximum hydraulic height of the dam is 11 ft. and the storage to the top of the dam is 610 acre-ft.

Hycrest Farm Pond Dam was formerly classified as having a "high" hazard potential in the Corps of Engineers National Inventory of Dams. Due to the lack of downstream development, however, the dam has been reclassified as having a "low" hazard potential in the event it were to fail.

The dam is in fair condition, based on a visual examination of the structure. Although some deficiencies were noted, there was no evidence of settlement, lateral movement or other signs of structural failure or other conditions which would warrant urgent remedial action.

Based on the size (small) and hazard potential (low) classifications and discussions with Corps of Engineers personnel, the test flood for this dam is one-fourth the Probable Maximum Flood (1/4 PMF). With the water level at the top of the dam, the ungated spillway capacity is 540 cfs. Hydraulic analyses indicate that the test flood outflow of 150 cfs (inflow 470 cfs or 2,675 csm) can be passed with a freeboard of 2.8 ft. and a surcharge-storage of 220 acre-ft. remaining if all the flashboards are removed.

At the time of the site visit, however, 3.7 ft. of flashboards were installed to a level just 1.3 ft. below the top of the dam. With this high level of flashboards,

the ungated spillway capacity at the top of dam is 60 cfs (43 percent of the test flood outflow of 140 cfs) and the dam would be overtopped by about 0.2 ft. of water. Since the flashboards cannot be removed easily in the event of high flows, it is recommended in Section 7.2 that the owner engage a registered professional engineer to determine the safe operational level of the flashboards. Meanwhile, the flashboards should be lowered as a precaution, as outlined in Section 7.3.

White's Black Angus Farm, Inc., owner of the dam, should implement several other remedial measures, including monitoring an apparent seepage area, repairing the upstream slope protection, cutting trees and brush on the embankment, and clearing the spillway discharge channel, as outlined in Section 7.3, within one year after receipt of this report. As also recommended, a program of biennial periodic technical inspections should be instituted.

HALEY & ALDRICH, INC.
by:

Harl Aldrich
President

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

Joseph A. McElroy

JOSEPH A. MCELROY, MEMBER
Foundation & Materials Branch
Engineering Division

Carney M. Terzian

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

Joseph W. Finegan, Jr.

JOSEPH W. FINEGAN, JR., CHAIRMAN
Chief, Reservoir Control Center
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, DC 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 Investigations are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the test flood is based on the estimated "probable maximum flood" for the region (greatest reasonably possible storm run-off), or a fraction thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does <u>not</u> include an assessment

of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. General. Hycrest Pond is located in an area which used to be called Stony Hill Swamp. The dam is made of an earth embankment with a concrete corewall. The construction was completed in 1949. The water surface elevation in the pond can be controlled by either changing the number of flashboards on top of the spillway, operating the gate valve on the outlet drain pipe or by both. A majority of the drainage area is covered by dense woods, helping to reduce the impact of a storm.

b. Design Data. No hydrologic or hydraulic design data were available for this dam site. However, the spillway design drawings indicate that the normal pool level was established at El. 752.5. At this level the dam would have a freeboard of 3.5 ft.

c. Experience Data. No data could be found on hydraulic/hydrologic historical occurrences at this dam site.

d. Visual Observations. The top of the flashboards was about 1.3 ft. below the top of the dam. Some leakage through the joints of the flashboards was observed. The hydraulic capacity of the downstream channel is restricted by the existing overgrown vegetation and presence of large boulders.

e. Test Flood Analysis. Based upon the Corps of Engineers guidelines, the recommended test flood for the size "small" and the hazard potential "low" is about 1/4 PMF (Probable Maximum Flood). The PMF was determined using the Corps of Engineers guidelines for "Estimating Maximum Probable Discharges" in Phase I Dam Safety investigations. The watershed terrain was determined to be midway between "rolling" and "mountainous" and an inflow rate of 2675 cfs per square mile was extrapolated for the drainage area of 0.7 square miles. This resulted in a test flood inflow of 470 cfs.

A surcharge-storage routing was performed through Hycrest Pond with utilization of the related stage-discharge and area-volume curves, which are shown in Appendix D. The test flood outflow was estimated for two conditions:

Condition 1: All of the flashboards are removed so that the spillway crest is at El. 751.0. This would result in a test flood outflow of 150 cfs at El. 753.2, 2.8 ft. below the top of the dam.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 Procedures

In general, there are no formal procedures to assure regular maintenance and satisfactory operation of the dam.

4.2 Maintenance of Dam

There are no established procedures or manuals to assure periodic inspection and maintenance of the dam. Remedial measures such as the cutting of brush is reportedly performed when requested by the State.

4.3 Maintenance of Operating Facilities

The spillway structure does not appear to receive regular maintenance. There is no formal plan to maintain the flashboards or reservoir drain and control and to keep the discharge channel free of debris. The manually operated gate for the 24-in. dia. pond drain pipe is reportedly opened every spring. When the pond is lowered to about the level of the fixed spillway crest, the drain pipe is then closed.

4.4 Description of any Warning System in Effect

There is no warning system or emergency preparedness plan in effect for this structure.

4.5 Evaluation

A biennial observation and maintenance program should be established to examine the dam, control tree and brush growth and maintain the slopes and channels. The owner should be prepared to remove flashboards from the spillway structure if necessary.

rolling to steep hills. There appears to be little probability that landslides into the reservoir would cause waves which would overtop the dam. No conditions which might result in a sudden increase in sediment load into the pond were noted.

e. Downstream Channel. Flow from the spillway or drain outlet is carried to a culvert underneath the Upper North Row Road thorough an about 20-ft. wide and 140-ft. long winding channel. The 3-ft. by 3-ft. and about 35-ft. long masonry culvert is a hydraulic bottleneck at this point. The majority of flow would overtop the road during high spillage. Extension of the channel downstream, towards the south, to Rowley Hill Road is through densely wooded land. Large boulders and heavy vegetation were observed in the channel bed. Photos No. 7, 13 and 14 are descriptive shots of the channel.

3.2 Evaluation

Based on the visual examination conducted on 16 November 1978, the Hycrest Farm Pond Dam project is considered to be in fair condition. The noted deficiencies concern a seepage area on the downstream slope, localized areas of riprap erosion and the high level the flashboards are maintained at. The remedial measures outlined in Section 7.3 should be implemented to correct these deficiencies in the dam embankment and spillway structure.

SECTION 3 - VISUAL EXAMINATION

3.1 Findings

a. General. The Phase I visual examination of Hycrest Farm Pond Dam was conducted on 16 November 1978.

In general, the project was found to be in fair condition. Several deficiencies which require correction were noted.

A visual inspection check list is included in Appendix A and selected photographs of the project are given in Appendix C. A "Site Plan Sketch", page C-1, shows the direction of view for each photograph.

b. Dam. The nearly flat crest of the earth embankment was approximately 1.9 ft. above water level. There was no evidence of settlement, cracking or other serious defects. The top of a concrete core wall was exposed in the embankment left of the spillway, Photo No. 1. A similar core wall was not exposed or observed in the longer embankment right of the spillway. The crest of the dam right of the spillway, Photos No. 2 and 3, shows signs of foot and vehicular traffic.

The upstream slope is covered by brush and is generally protected by cobble and boulder size riprap, Photo No. 4. No major sloughing of the slope was evident. However, areas where the riprap has eroded were observed, Photo No. 5. Brush and several young trees have been allowed to grow on the downstream slope, Photo No. 6. Note the bare, eroded tracks from vehicular traffic on the slope, Photo No. 6. A 20-ft. long area of seepage where the downstream embankment was soft and wet from the toe to 4 ft. above the toe is shown in Photos No. 7 and 8 at the location outlined on the Site Plan Sketch, page C-1. No flowing water or evidence of piping was observed at the seepage area.

c. Appurtenant Structures. The spillway and incorporated pond drain structure, Photos No. 9 and 11, are in excellent condition. There is some minor erosion developing on the upstream sidewalls at the water line. The wooden flashboards, Photos No. 10 and 12, are in good condition. The stoplog slots at the pond drain intake, Photo No. 9, are in good condition but no stoplogs were observed. The gate operator handle for the pond drain was not in place. The handle is stored at the Owner's farm office. The operation of the drain was demonstrated on a subsequent site visit on 12 February 1979.

d. Reservoir Area. The area around Hycrest Farm Pond is generally undeveloped. The wooded terrain consists of

SECTION 2 - ENGINEERING DATA

2.1 Design Data

Two design drawings submitted and approved by the County Engineer on 30 August 1949 are the only design data available.

2.2 Construction Data

A representative of the County Engineer was present at the project site for 15 days during the construction of the dam. His report is the only available record of construction.

2.3 Operation Data

Neither the owner or the operator keep any records pertaining to the operation of the dam. Mention of the height of flashboards and the pond level is made in several prior inspection reports.

2.4 Evaluation of Data

a. Availability. A detailed list of all engineering data available for use in preparing this report is included in Appendix B. Selected data from the listing are also included in Appendix B.

b. Adequacy. A review of design and construction data is a highly desirable factor in developing a thorough Phase I assessment. However, there were insufficient engineering data available for this dam to allow for such a review. This evaluation of the dam was therefore based primarily on visual inspection, past performance and engineering judgement.

c. Validity. Since there were no as-built drawings prepared and the construction inspection reports are not detailed, the validity of certain details shown on the two design drawings is questionable. For example, the elevations of the spillway and that of the reservoir drain invert were measured as being approximately 1 ft. higher than those shown on the two design drawings (see pages B-14, B-15 and B-16). Also, there are no records to document the construction of the concrete core wall or the foundation conditions at the dam, as discussed in Section 1.2 h.

g. Dam

1.	Type.....	Earthfill
2.	Length.....	300 ft. (Approx.)
3.	Height.....	11 ft. (Approx.)
4.	Top width.....	25 ft. (Approx.)
5.	Side slopes.....	2H to 1V
6.	Zoning.....	Not known
7.	Impervious core.....	Design drawings show clay backfill upstream of core wall
8.	Cutoff.....	Design drawings show minimum 12-in. thick concrete core wall
9.	Grout curtain.....	Unlikely
10.	Other.....	Core wall was to extend to depths directed by County Engineer

h. Diversion and Regulating Tunnel. Not applicable

i. Spillway

1.	Type.....	Overflow, concrete gravity type; pond level is controlled by flashboards; apron is protected by stone masonry with cement mortar
2.	Length.....	12 ft.
3.	Crest elevation.....	751 (without flashboards)
4.	Gates.....	None (flashboards are currently 3.7 ft. in height)
5.	U/S channel.....	Could not be observed
6.	D/S channel.....	About 15 to 20 ft. wide and about 4 to 5 ft. deep; heavy vegetation and large boulders
7.	General.....	Operational procedures for level control of the pond is important. Culvert underneath the Upper North Row Road is a hydraulic bottleneck for the downstream channel

j. Regulating Outlet. The outlet is controlled by a manually operated sluice gate on the pond side of a 24-in. dia. pipe. The gate operator handle was not in place during the inspection. The invert of the outlet pipe is estimated to be at El. 746.3.

8. Total project discharge at test flood pool elevation (without flashboards)..... 206 cfs at El. 753.2

c. Elevation (ft. above MSL)

1. Streambed at centerline of dam..... 745.0
2. Maximum tailwater..... Unknown
3. Upstream portal invert diversion tunnel..... Not applicable
4. Recreation pool..... 754
5. Full flood control pool.. Not applicable
6. Spillway crest
   (without flashboards).. 751.0
   (with flashboards)..... 754.7
7. Design surcharge - original design..... Unknown
8. Top of dam..... 756.0
9. Test flood design surcharge..... 753.20 (without flashboards)
   756.25 (3.7 ft. of flashboards)

d. Reservoir

1. Length of maximum pool... 0.6 mi. (Est.)
2. Length of recreation pool..... 0.5 mi. (Est.)
3. Length of flood control pool..... Not applicable

e. Storage (acre-feet)

1. Recreation pool..... 450
2. Flood control pool..... Not applicable
3. Spillway crest..... 250
4. Top of dam..... 610
5. Test flood pool..... 635 (with 3.7 ft. of flashboards and dam being overtopped);
   390 (without flashboards)
6. With 3.7 ft. of flashboards..... 500

f. Reservoir Surface (acres)

1. Recreation pool..... 90
2. Flood control pool..... Not applicable
3. Spillway crest..... 60
4. Test flood pool..... 80 at El. 753.2
5. Top of dam..... 95

design drawing so that there is 5 ft. of freeboard instead of 6 ft. as designed. Also, the top of flashboards is only 1.3 ft. below the top of dam, much higher than desired.

i. Normal Operational Procedures. No formal operational procedures at Hycrest Farm Pond Dam were disclosed. Mr. Cornell stated that the outlet is opened in the spring to let excess flow out. He also indicated that new flashboards were installed within the last three years.

1.3 Pertinent Data

All elevations reported herein are based on Mean Sea Level (MSL) datum, assuming the normal pond level is El. 754. The relationship of MSL datum to that appearing on the 1949 plans is interpreted in the sketch on page B-16.

a. Drainage Area. The Hycrest Farm Pond Dam is located in the town of Sterling. The watershed above the dam is 450 acres (0.70 sq. mi.). The majority of the drainage area consists of wooded rolling to steep hills, with approximately 20 percent of the total area being surface water and 13 percent being meadows.

b. Discharge at Dam Site.

1.	Outlet Works.....	24-in. dia. pipe, invert El. 746.3, controlled with 24-in. sluice gate. See Photos 8 and 10
2.	Maximum known flood at dam site.....	Unknown
3.	Ungated spillway capacity at top of dam.....	540 cfs at El. 756
4.	Ungated spillway capacity at test flood pool elevation.....	150 cfs at El. 753.2
5.	Gated spillway capacity at normal pool elevation.....	Not applicable
6.	Gated spillway capacity at test flood pool elevation.....	Not applicable
7.	Total spillway capacity at test flood pool elevation (if the existing 3.7- ft. high flashboards are left in place).....	80 cfs at El. 756.2

e. Ownership. The name and address of the current owner is:

White's Black Angus Farm, Inc.
Mr. Ben Monroe, President
P.O. Box 225
Sterling, MA 01564

However, the current owner was represented by the tenant of the property during the course of this investigation. The name and address of the tenant is:

Great Eastern Breeders, Inc.
Mr. Evert Cornell, President
P.O. Box 477
Sterling, MA 01564

Prior inspection reports list a Mr. Sawyer as the original owner in 1949 and a Mr. Dino DiCarlo, 34 Hayden Rowe Street, Framingham, MA as the owner from 1964 to 1970. The current owner was not available to confirm this information.

f. Operator. Mr. Evert Cornell, tenant of the property, stated that he has been responsible for operation, maintenance and safety of the dam since 1968. His phone number is (617) 534-6215.

g. Purpose of Dam. The current operator reports that the original purpose of the dam was to create a water supply for fire protection. The only reported reason that the flashboards are maintained at a high level is to flood certain shoreline roads in an attempt to discourage trespassing.

h. Design and Construction History. The dam was designed and constructed by Leonard H. White, Auburn, MA in 1949. The pond now covers the area once known as Stony Hill Swamp. The original grade along the centerline of the dam is shown on a design drawing, page B-14.

The county inspection report of activities during construction of the dam, pages B-3 to B-5, acknowledges the placement and compaction of earth fill but does not mention the nature of underlying soils, excavation bottom or construction of the concrete corewall. It is therefore not known if these items were ever observed for quality control by the county engineer.

The spillway and reservoir drain appear to have been constructed approximately one foot higher than that shown on the

1.2 Description of Project

a. Location. Hycrest Farm Pond Dam is located approximately 3 miles northwest of the center of Sterling, Massachusetts, as shown on the Location Map, page vii. Discharge from the dam is conveyed by Rocky Brook southward for approximately 2.5 miles to where it joins the Stillwater River. Four miles south of this point the river enters the Wachusett Reservoir.

b. Description of Dam and Appurtenances. The Hycrest Farm Pond Dam consists of an approximately 300-ft. long earth embankment designed and assumed to contain a concrete corewall at least 12 in. thick. A flashboard-controlled spillway structure with a gated reservoir drain is located on the left side of the dam. The general configuration of the project is shown on the Site Plan Sketch, page C-1.

The top of the earth embankment is approximately 10 ft. wide at El. 756. Both the upstream and downstream sides are sloped about 2 horizontal to 1 vertical (2H to 1V). The upstream face is generally protected by cobble and boulder riprap. A plan, profile and sections of the proposed earth embankment and corewall are shown on the design drawing, page B-14.

The crest of the concrete and stone masonry spillway is estimated to be at El. 751, about 5 ft. below the top of the embankment. Flow over the 12-ft. long spillway crest is controlled by flashboard planks which totalled 3.7 ft. in height. A gated 24-in. diameter reservoir drain with invert at El. 746.3 discharges on the downstream face of the spillway. A plan, elevation and sections of the spillway structure are shown on the design drawing, page B-15.

c. Size Classification. The storage to the top of the dam is estimated to be 610 acre-ft., and the height of the dam is approximately 11 ft. Storage of less than 1000 acre-ft. and a height of less than 40 ft. classifies the dam in the "small" category according to the guidelines established by the Corps of Engineers.

d. Hazard Classification. The dam was formerly classified as having a "high" hazard potential in the Corps of Engineers National Inventory of Dams. The dam failure analysis, Appendix D, performed for this Phase I Investigation, is the basis for this classification being changed to "low" hazard category. If the dam were to fail, no loss of life is expected from the flood flows and the property damages would be small as described under Section 5.1.f.

PHASE I INVESTIGATION REPORT
NATIONAL DAM INSPECTION PROGRAM

HYCREST FARM POND DAM
MA 00673

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.

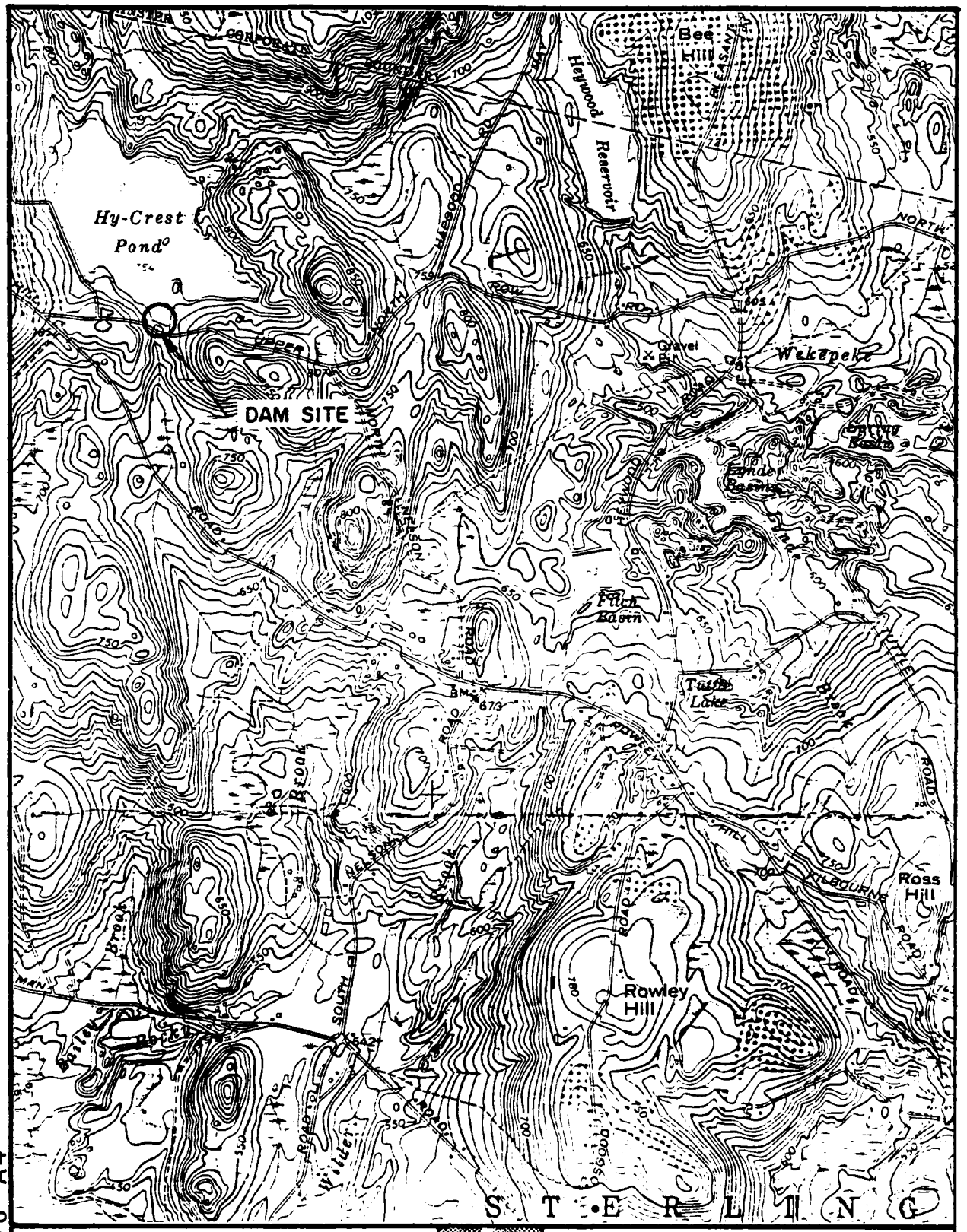
Haley & Aldrich, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Massachusetts. Authorization and notice to proceed were issued to Haley & Aldrich, Inc. under a letter dated 28 November 1978 from Colonel Max B. Scheider, Corps of Engineers. Contract No. DACW33-79-C-0018 has been assigned by the Corps of Engineers for this work. Camp, Dresser & McKee, Inc. was retained as consultant to Haley & Aldrich, Inc. on the structural, mechanical/electrical and hydraulic/ hydrologic aspects of the Investigation.

b. Purpose of Inspection. The primary purposes of the National Dam Inspection Program are to:

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.



FILE NO. 4270 A4

DAM: Hycrest Pond

IDENTIFICATION NO. MA 00673

N

LOCATION MAP
USGS QUADRANGLE
STERLING, MA
APPROX. SCALE: 1"= 2000'

1. Overview of Hycrest Pond Dam from left abutment

TABLE OF CONTENTS (Continued)

Condition 2: The existing 3.7 ft. of flashboards are left in place, so that the spillway crest is at El. 754.7. This would result in a test flood outflow of 140 cfs at El. 756.2 and the dam would be overtopped by 0.2 ft. Spillway capacity at top of dam is 60 cfs (43 percent of test flood outflow).

f. Dam Failure Analysis. Based on Corps of Engineers Guidelines for Estimating Dam Failure Hydrographs and assuming that a failure would have occurred along a 100-ft. section at the mid-height of the dam, the peak failure outflow is estimated to be 2,450 cfs. Two reaches were considered for the flood routing.

Storage volume of the first reach between the dam and Upper North Row Road is negligible. Therefore, it can practically be assumed that the road would be subjected to a flood flow of 2,450 cfs. The estimated maximum capacity of the existing culvert underneath the road is about 70 cfs; thus, most of the flow would run over the road with an estimated water depth of 3.5 ft., assuming the road and the culvert would remain intact.

The second reach for flood routing was selected between the Upper North Row Road and the Rowley Hill Road, a reach of about 2,100 ft. The flood stage for this reach which is, in general, controlled by the capacity of the downstream culvert was estimated to be approximately El. 693.2 at the Rowley Hill Road, which would result in an overtopping of the road by 1.2 ft. The channel in this reach is relatively shallow and the peak flow is expected to overrun the densely wooded banks.

The failure outflow would finally dissipate in an open swampy area approximately 1 mi. downstream of the dam, as shown on the Flood Impact Area Map, page D-1, with no expected loss of life and no damage to property besides that caused by road overtopping.

SECTION 6 - STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations. There was no visual evidence of settlement, lateral movement or other signs of structural instability in the earth embankment or spillway and reservoir drain structure. A soft wet area shown on page C-1, discussed in Section 3.1.b. and noted in Appendix A is an apparent zone of seepage, although no flowing water was observed.

b. Design and Construction Data. Design data in the form of drawings of the original construction (dated 1949) are available. Review of the drawings indicate that the dimensions and configuration of the embankment and spillway are consistent with typical dams of this magnitude. In that no movement or distress has been observed since the original construction, it would be reasonable to conclude that the project is currently stable.

c. Operating Records. No operating records are known to exist for the earth embankment, spillway and outlet structure.

d. Post-Construction Changes. The dam was constructed in 1949. Since that time the only alteration apparent is the removal of a wooden bridge from across the spillway.

e. Seismic Stability. Hycrest Farm Pond Dam is located in a Seismic Zone 2 and in accordance with Recommended Phase I Guidelines does not warrant seismic analysis.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. The visual examination of Hycrest Farm Pond Dam revealed that the structure was in fair condition. Although there were no signs of structure failure or other conditions which would warrant urgent remedial action, several deficiencies were noted.

Based on the results of computations included in Appendix D and described in Section 5, the spillway is capable of passing the test flood, which for this structure is 1/4 PMF, without overtopping the dam. With the water level at the top of the dam, the spillway has a capacity of 540 cfs with all the flashboards removed. The test flood outflow of 150 cfs (214 csm) could then be passed with a freeboard of 2.8 ft. and storage of 220 acre-ft. remaining. With the existing 3.7 ft. of flashboards in place, however, the spillway capacity is reduced to 140 cfs and the dam would be overtopped by 0.2 ft.

b. Adequacy of Information. This evaluation of the dam is based primarily on visual inspection, past performance and engineering judgement. The information was adequate for the purposes of a Phase I Investigation.

c. Urgency. The remedial measures outlined in Section 7.3 should be undertaken by the Owner and completed within one year after receipt of this report.

d. Need for Additional Investigation. An additional investigation should be performed by the Owner as outlined in Section 7.2.

7.2 Recommendations

White's Black Angus Farm, Inc., owner of the dam, should engage a registered professional engineer to determine the safe operational levels of the flashboards sufficient to pass the test flood without overtopping the dam. As a precaution, the level of the flashboards should be lowered as outlined in Section 7.3, Item No. 1, until the findings of this engineering investigation are implemented.

7.3 Remedial Measures

The dam is generally in fair condition, and it is considered important that the following items be accomplished.

a. Operation and Maintenance Procedures. The following remedial work should be undertaken by the Owner:

1. Lower the level of the flashboards to at least 2.5 ft. below the top of the dam until the safe operational levels are determined by the engineering investigation recommended in Section 7.2.

2. Clear away leaves and vegetation in the vicinity of the apparent seepage area on the downstream slope and make periodic visual observations, noting carefully the extent of the wet area, evidence of active seepage and related information for correlation with rainfall, snowmelt, pond level, etc. The object of this activity will be to determine whether the wet area is related to pond level (and thus seepage) or merely surface manifestations of seasonal effects of rainfall, etc.

3. Repair eroded areas on the upstream slope and place slope protection to the top of the embankment in the areas where it is lacking.

4. Cut and remove trees and brush on the crest and slopes of the embankment. Stumps may be cut flush with the ground and left in place. For the future, the downstream slope should be mowed at least once a year to allow for visual examination of the embankment.

5. Clear brush and debris from the spillway discharge channel.

The owner should prepare an operations and maintenance manual for the dam. The manual should include provisions for biennial technical inspection of the dam and for surveillance of the dam during periods of heavy precipitation and high reservoir water levels. The procedures should delineate the routine operational procedures and maintenance work to be done on the dam to ensure satisfactory operation and to minimize deterioration of the facility.

7.4 Alternatives

Not applicable.

APPENDIX A - INSPECTION CHECK LIST

VISUAL INSPECTION PARTY ORGANIZATION

NATIONAL DAM INSPECTION PROGRAM

Dam: Hycrest Farm Pond

Date: 16 November 1978

Time: 1045-1230

Weather: Clear, cool (40's F)

Water Surface Elevation Upstream: Approximately El. 754.1 (1.9 ft. below top of embankment)

Stream Flow: None (slight leakage through flashboards)

Inspection Party:

Richard P. Stulgis Richard A. Brown Haley & Aldrich, Inc.	- Soils/Geology
A. Ulvi Gulbey Joseph E. Downing	- Hydraulic/Hydrologic
Robert P. Howard Camp, Dresser & McKee, Inc.	- Structural/Mechanical

Present During Inspection (part time):

Mike Pacillo - Mass. Department of Environmental Quality Engineers

VISUAL INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Hycrest Farm Pond Dam DATE: 16 Nov. 78

AREA EVALUATED	CONDITION
DAM EMBANKMENT	
Crest Elevation	Approximately El. 756 and nearly level
Current Pool Elevation	Approximately El. 754.1
Maximum Inpoundment to Date	Unknown
Surface Cracks	None observed
Pavement Condition	Not applicable
Movement or Settlement of Crest	None apparent (surface irregular)
Lateral Movement	None evident
Vertical Alignment	Surface irregular
Horizontal Alignment	Satisfactory
Condition at Abutment and at Concrete Structures	Satisfactory
Indications of Movement of Structural Items on Slopes	None observed
Trespassing on Slopes	Bottles, occasional paper debris indicate trespassing does occur
Animal Burrows in Embankment	None observed
Vegetation on Embankment	Heavy brush and young tree growth on downstream slope. Same on upstream slope above water level
Sloughing or Erosion of Slopes or Abutments	Some surface sloughing along crest of upstream slope (see Photo No. 5). Surface erosion on downstream slope confined to roadway area (see Photo No. 6)
Rock Slope Protection - Riprap Failure	Generally cobble and boulder size, some displaced stone on upstream face above water level
Unusual Movement or Cracking at or near Toes	None observed
Unusual Embankment or Downstream Seepage	Zone of seepage noted in area of downstream slope (see sketch, page C-1) water ponded in ditch at toe of slope
Piping and Boils	None observed
Foundation Drainage Features	None
Toe Drains	None
Instrumentation Systems	None

VISUAL INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Hycrest Farm Pond Dam DATE: 16 Nov. 78

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNEL	
a. Approach Channel	Not applicable - spillway is at edge of pond
General Condition	Not applicable
Loose Rock Overhanging Channel	None observed
Trees Overhanging Channel	None observed
Floor of Approach Channel	Submerged - not visible
b. Weir and Training Walls	
General Condition of concrete	The general condition of the spillway is excellent
Rust or Staining	Minor rust and staining
Spalling	None observed
Any Visible Reinforcing	None observed
Any Seepage or Efflo-resecence	Minor efflorescence observed
Drain Holes	None observed
Flashboards	Wooden flashboards are in good condition. They are secured by nuts threaded rods and could not be removed with water flowing over them
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	Submerged - not visible
Slope conditions	Submerged - not visible
Bottom conditions	Submerged - not visible
Rock Slides or Falls	None observed
Log Boom	None observed
Debris	None observed
Condition of Concrete Lining	Submerged - not visible
Drain of Weep Holes	None observed

VISUAL INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Hycrest Farm Pond Dam DATE: 16 Nov. 78

AREA EVALUATED	CONDITION
b. Intake Structure	
Condition of Concrete	Pond drain structure incorporated within spillway in excellent condition
Stop Logs and Slots	Stop log slots at pond drain intake in excellent condition with some minor erosion at the top. No stop logs observed
Trash Rack	In excellent condition
Gates	Gate operator handle for pond drain was not on the operator and its operation was not demonstrated

APPENDIX B - ENGINEERING DATA

LIST OF AVAILABLE DATA
HYCREST POND DAM

Document	Contents	Location
Plan of Dam Across Stony Hill Swamp, Dam No. 48-18, Leonard H. White, Auburn, MA, 30 August 1949	22-in. by 34-in. drawing showing location, profile and 3 cross-sections of proposed dam	Office of the County Engineer, Room 101, Court House, 2 Main Street, Worcester, MA 01608 and page B-14.
Plan of Elevations and Sections of Dam Across Stony Hill Swamp, Dam No. 48-18, Leonard H. White, Auburn, MA, 30 August 1949	22-in. by 34-in. drawing showing plan, elevation, 2 cross-sections and details of proposed dam	Office of the County Engineer and page B-15.
County inspection reports from 8 September 1949 through 7 December 1949, Dam No. 48-18	Records of inspections on 15 days during the original dam construction period	Office of the County Engineer and page B-3.
County inspection reports from 1949 through 1970	Reports of inspections in 1949, 1956, 1964, 1969 and 1970	Office of the County Engineer and page B-6.
State inspection reports after 1970	29 July 1974 inspection report including description of dam and sketch	Mass. Dept. of Environmental Quality Engineering, Division of Waterways, 100 Nashua Street, Boston, MA 02114 and page B-7.

LIST OF AVAILABLE DATA (continued)
HYCREST POND DAM

Document	Contents	Location
Elevations at Hycrest Pond Dam, Haley & Aldrich, Inc., 16 November 1978	Approximate field measurements relating MSL and 1949 datum elevations	Haley & Aldrich, Inc., 238 Main Street, Cambridge, MA 02142 and page B-16.

TOWN OR CITY Sterling DECREE NO. PLAN NO. DAM NO. 48-18

LOCATION Upper North Row Road. C. C. DOCKET NO.

DESCRIPTION OF DAM

Type Earth Embankment
Length
Height
Thickness top
" bottom
Downstream Slope
Upstream "
Length of Spillway
Size of Gates 24" x 24" Flat frm. side Wedge Sluice
Location of Gates
Flashboards used
Width Flashboards or Gates
Dam designed by
" constructed by R. H White Const Co.
Year constructed 1949

GENERAL REMARKS

Owned by Lester T. Sawyer. Sterling
Inspected by L.O.M. Sept 8-9-10-12-14-15
Oct. 10-22 Nov. 4-11-12-14-19-26-Dec. 7
Bk 195 Pg 58 Constr. record.

DESCRIPTION OF RESERVOIR & WATERSHED

Name of Main Stream Stony Hill Swamp.
" " any other Streams
Length of Watershed
Width " "
Is Watershed Cultivated
Percent in Forests
Steepness of Slope
Kind of Soil
No. of Acres in Watershed 0.75 Sq. Mi.
" " " Reservoir
Length of Reservoir
Width " "
Max Flow Cu. Ft per Sec.
Height of Flashboards Low Water
" " " High "

GENERAL REMARKS

STERLING

HY-CREST DAM (SAWYERS)

Nov. 14. Fill going in OK but lots of grumbling among bosses because of previous week.

Nov 15 Routine established. Fill going in OK. Use trucks for rolling down.

Nov 16. Try out sheepsfoot roller today. Not very successful. Too light. We discard same and go back to Truck rolling. 8 ton against 24 ton Truck.

Nov. 17 Jesse apparently has convinced Mr. Sawyer to put in stone wing walls in place of concrete.

Nov 18 Fill going in fine. Heard that Jesse was told to stay away from Dam until end of Fill placement. Mr Sawyer mentioned that he expected to push large stone in line with bulldozer to represent wing walls. Didnt sound good so called Mr Marden

Nov. 19. Fill going in fine.

Nov. 21 Fill going in fine. Have a letter for Mr Sawyer but didnt see him. About 1 foot to the top.

Nov 22 We reach the top of the fill. Shaping shoulders today. Letter delivered to Mr. Sawyer. Took it home to open.

Nov. 23. Dam & shoulders now shaped. Excess material piled up for future use against stone walls. channel in process of being shaped. Mr. Sawyer now agrees with Mr. Marden on upstream construction

ALEY & ALDRICH, INC.
AMBRIDGE, MASSACHUSETTS

CLIENT Corps of Engineers

OJECT Hycrest Pond Dam, NH 00673

FILE NUMBER 4270

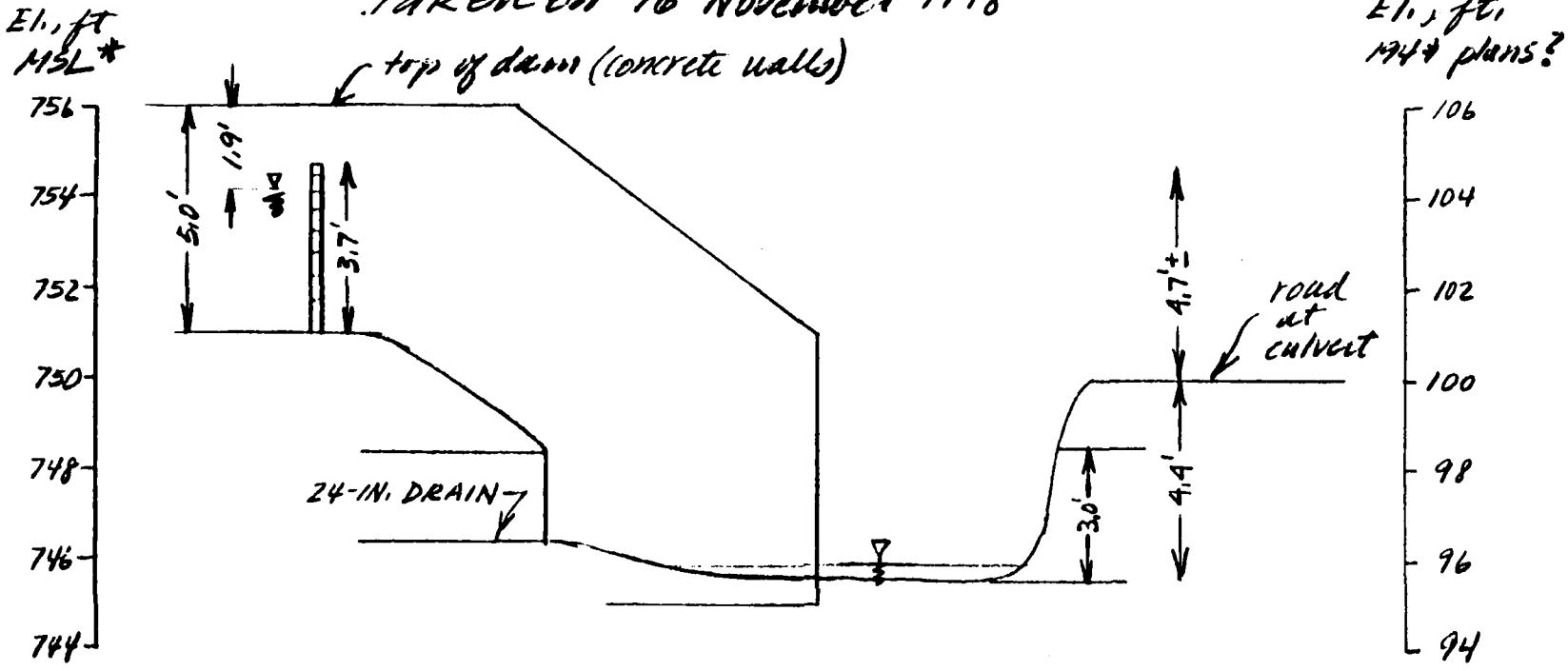
SHEET 1 OF 1

DATE 16 NOV. 78

COMPUTED BY RHB

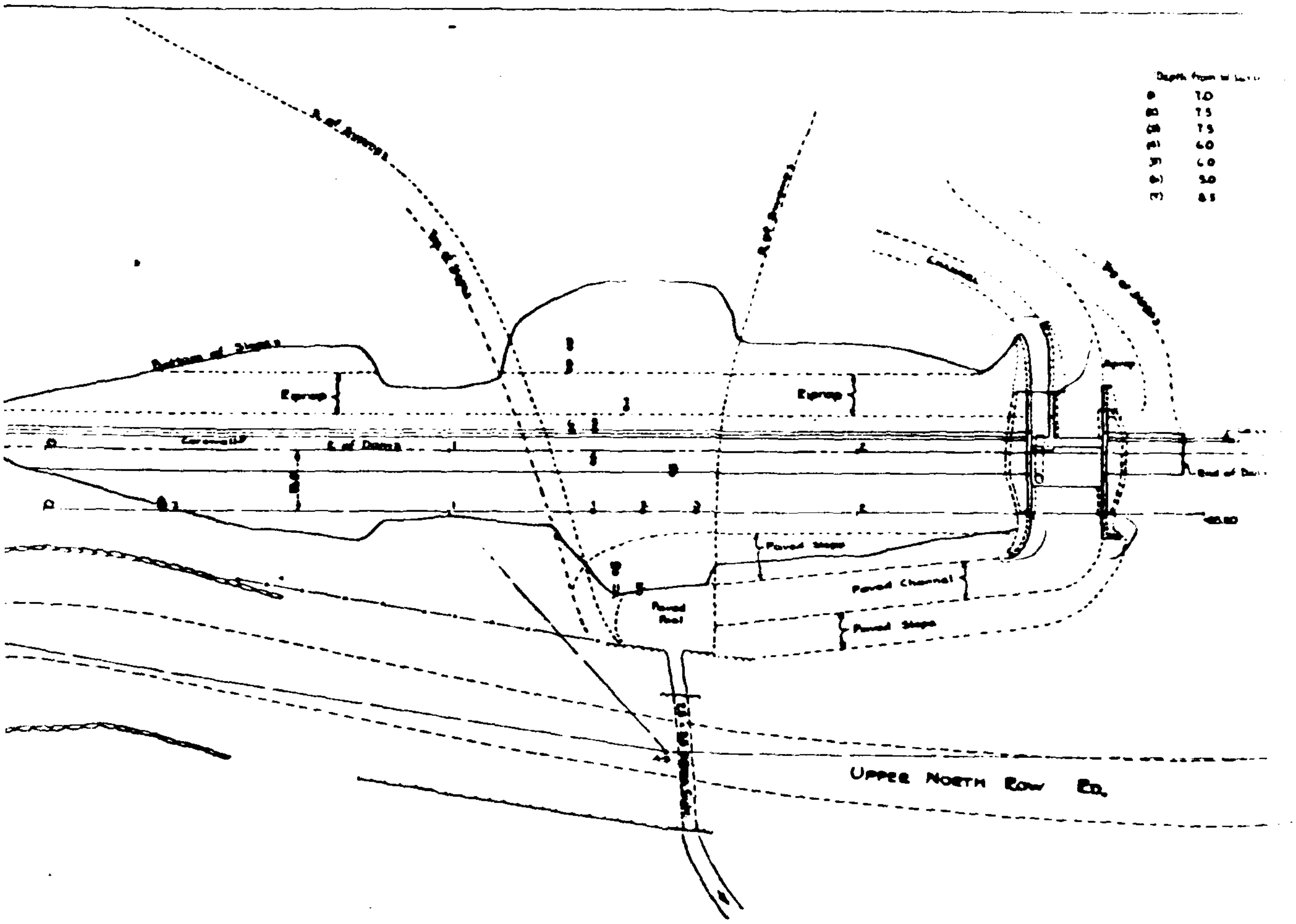
CHECKED BY

Elevations at Hycrest Pond Dam, based on field measurements taken on 16 November 1978



Key elevations: (*Assuming water surface generally El. 754 MSL)

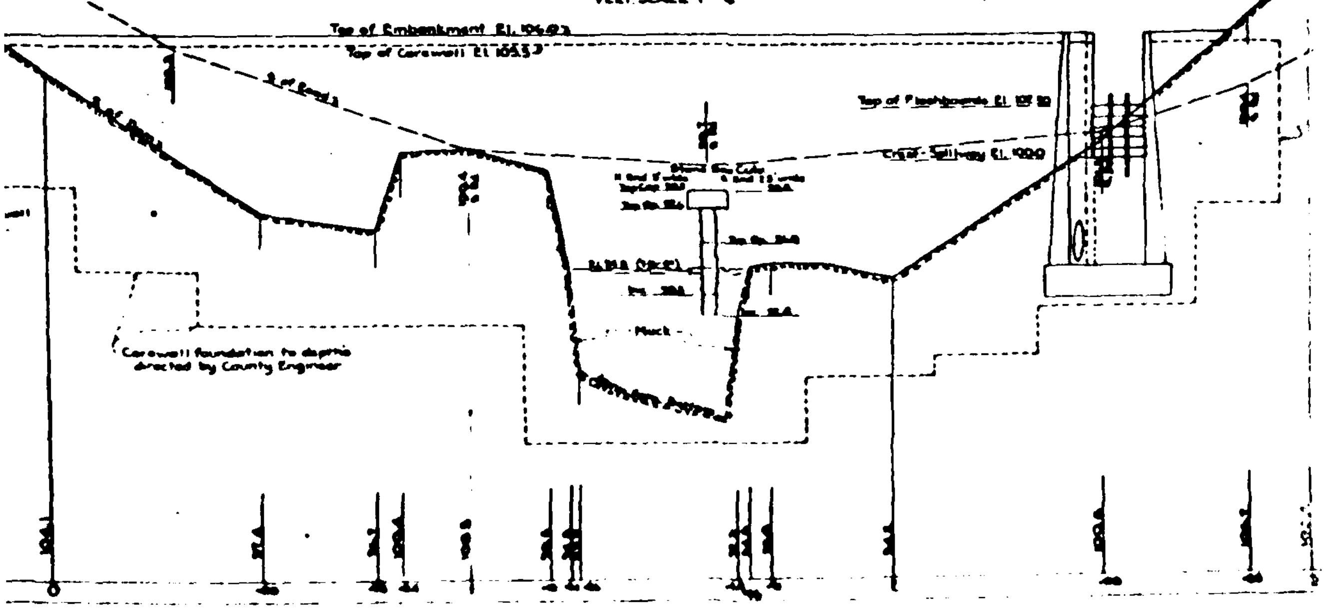
Top of dam	El. 756 MSL
Top of flashboards	754.7
Crest of spillway	751
Top of road	750
Drain invert	746.3
Culvert invert	745.6

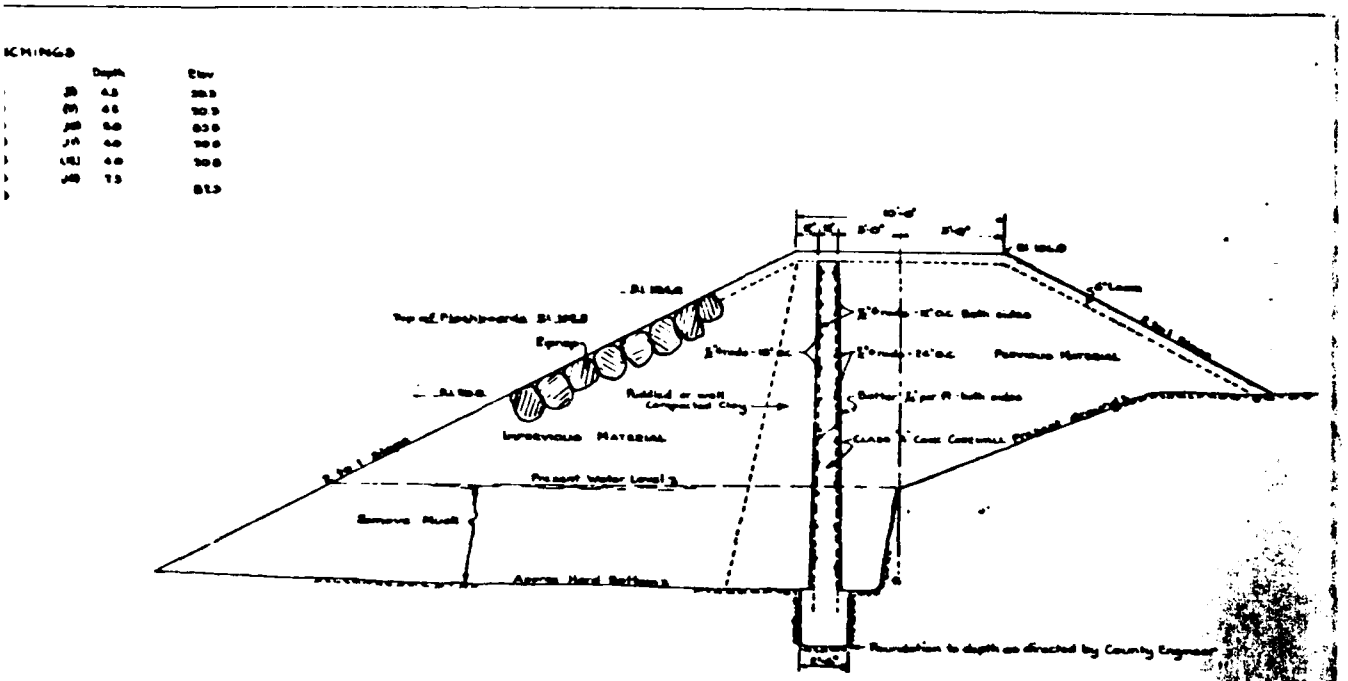


LOCATION PLAN
Scale 1" = 20'

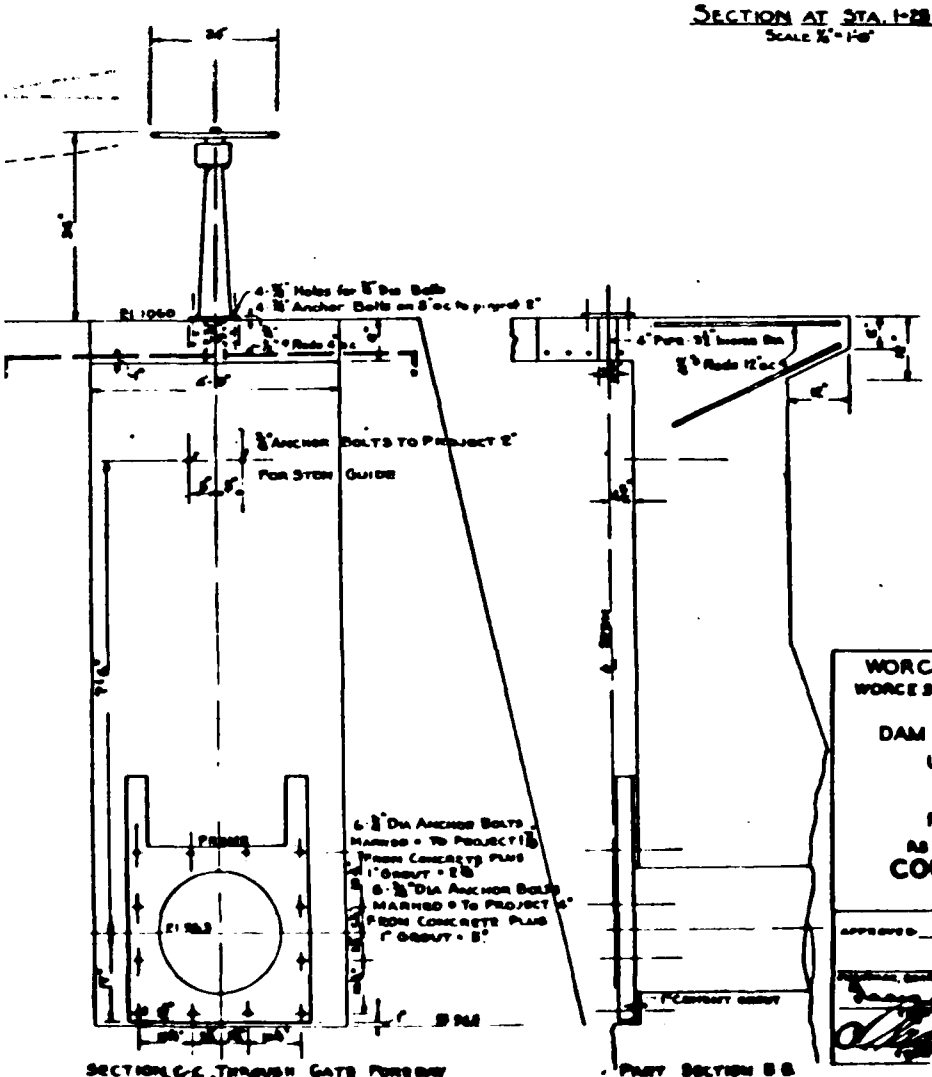
B.M. Spk in Pole #136 Et Sta 1-00±
El. 100.00 (Assumed)

PROFILE ON ℄ OF DAM
Hor. Scale 1" = 20'
Vert. Scale 1" = 4'





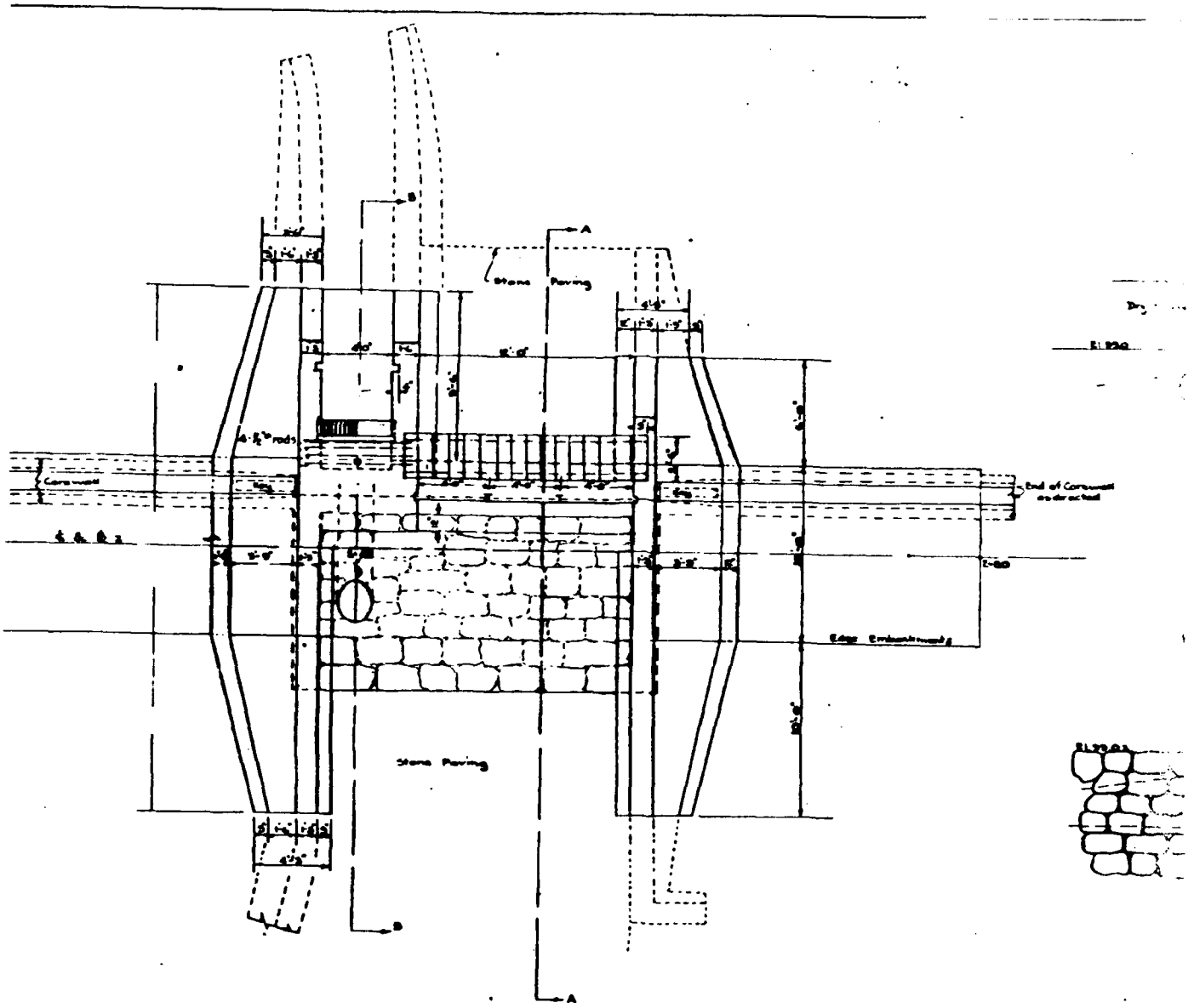
SECTION AT STA. 1+28
SCALE 1/4"=1'-0"



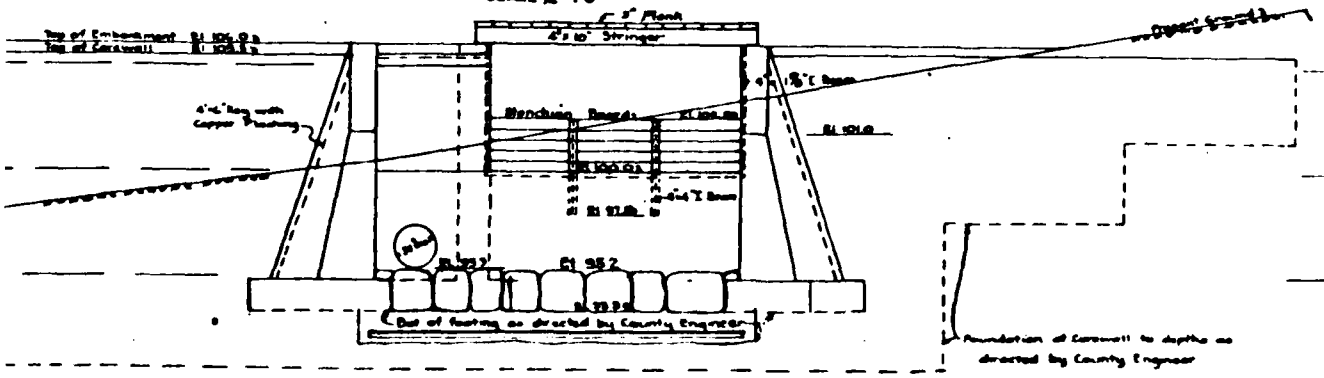
WORCESTER COUNTY COMMISSIONERS
WORCESTER COUNTY ENGINEERING DEPARTMENT
PLAN OF
DAM ACROSS STONY HILL SWAMP
UPPER NORTH ROW ROAD
STERLING, MASS.
FOR LESTER T. SAWYER
AS FILED AND APPROVED BY THE
COUNTY COMMISSIONERS
SCALES AS NOTED

APPROVED AUGUST 30 1965

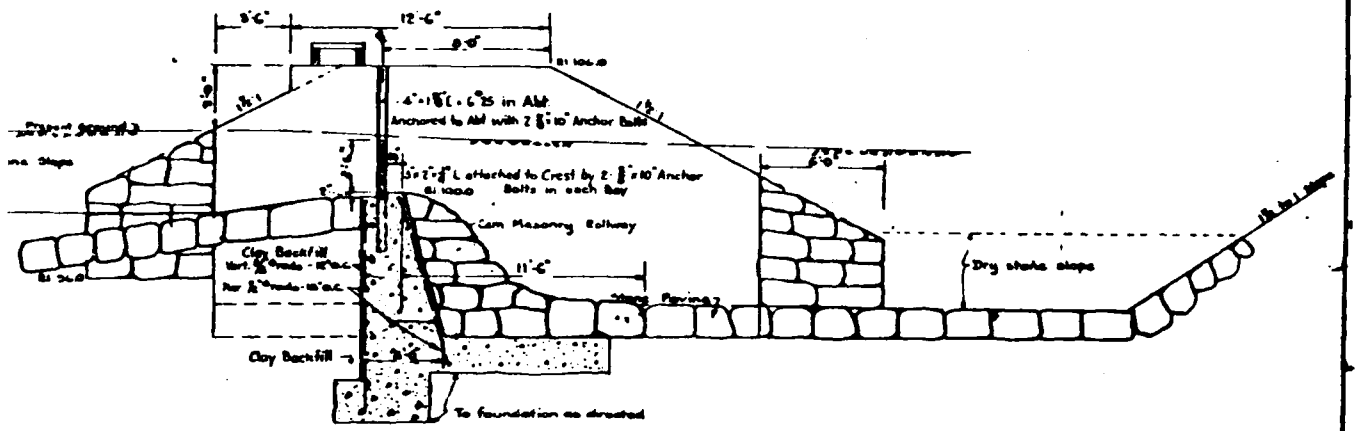
DAM NO. 48-18



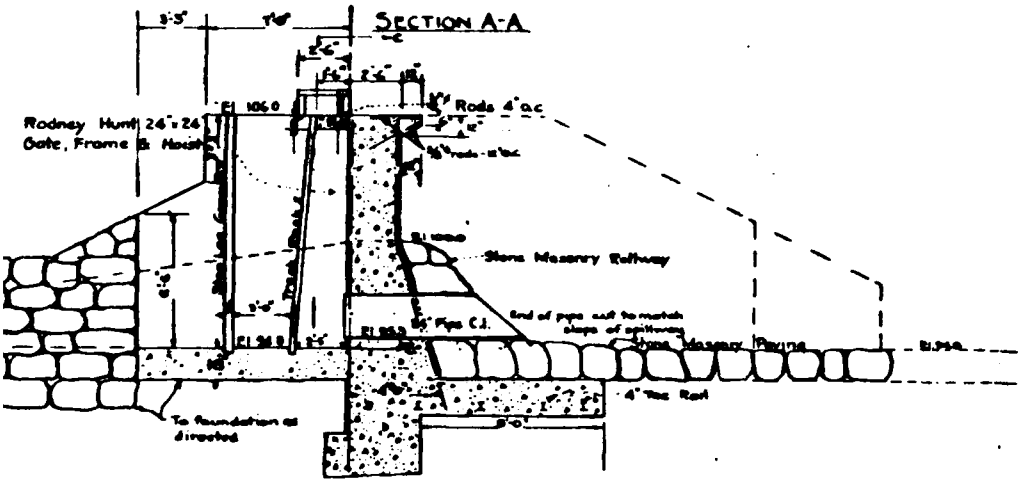
PLAN OF SPILLWAY
SCALE 1/4"=1'-0"



ELEVATION OF SPILLWAY
SCALE 1/4"=1'-0"



SECTION A-A



SECTION B-B
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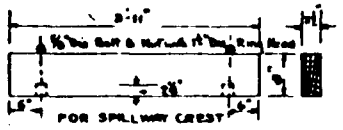
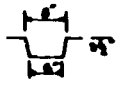


12 STANCHION BOARDS LIKE ABOVE
SCALE ¾" = 1'-0"

KEY FOR SPILLWAY FOOTINGS

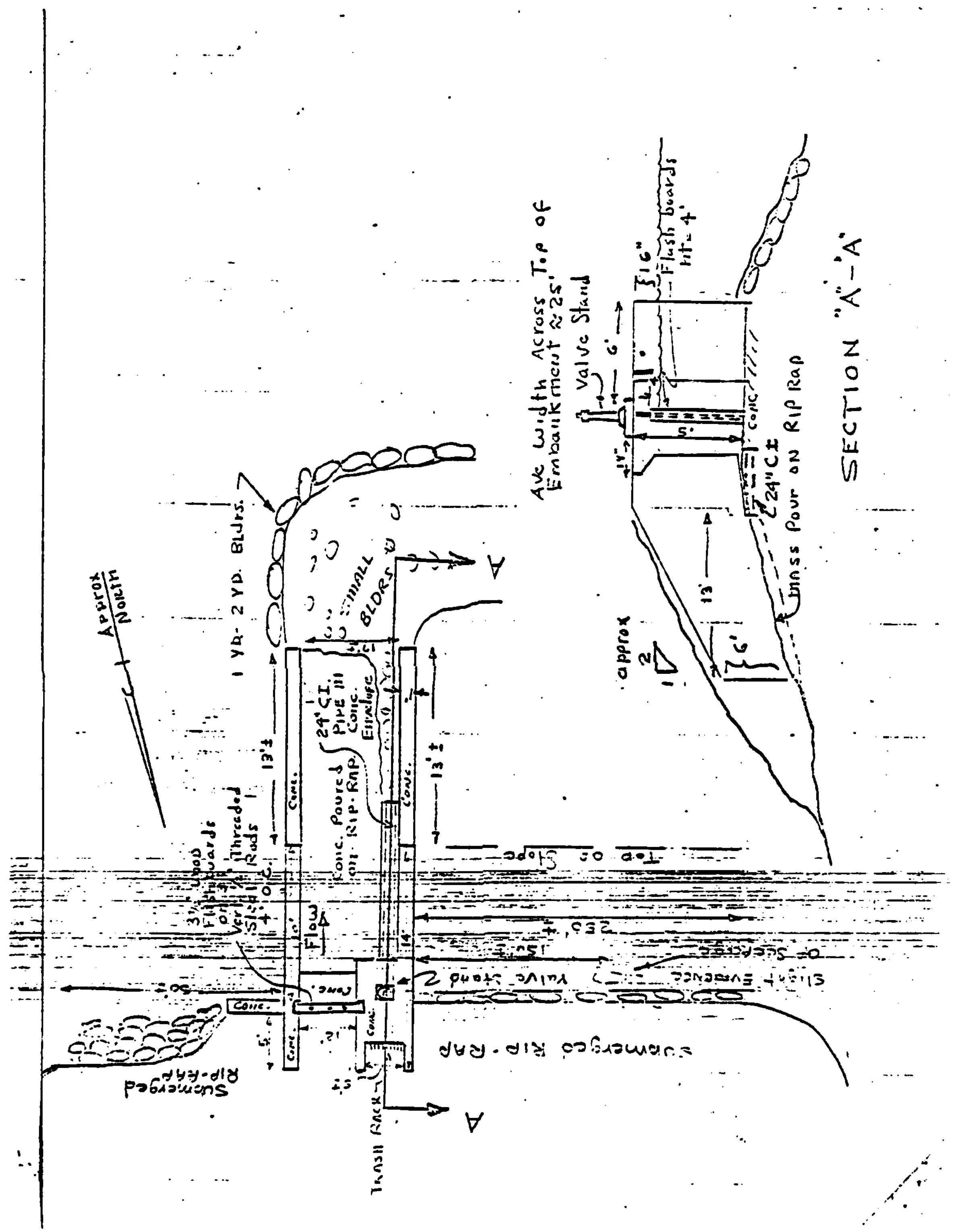


KEY FOR CORDWALL FOOTINGS

CLASS 'A' CONCRETE (MDPW SPECS) IN CORE WALLS & SPILLWALLS

WORCESTER COUNTY COMMISSIONERS
WORCESTER COUNTY ENGINEERING DEPARTMENT
PLAN OF ELEVATIONS & SECTIONS OF
DAM ACROSS STONY HILL SWAMP
UPPER NORTH ROW ROAD
STERLING, MASS.
FOR LESTER T. SAWYER
AS FILED AND APPROVED BY THE
COUNTY COMMISSIONERS
SCALES AS NOTED

APPROVED: AUGUST 30, 1948
AUGUST 30, 1948
DAM NO. 48-18



Approx North
1 YD - 2 YD. BLdrs.
SMALL BLDRS
24" C.I. PIPE IN CONC. ENVELOPE
Conc. Poured on Rip-Rap
Valve Stand
Submerged Rip-Rap
Trash Rack
Top of Slope
Flow
A
A
Ave Width Across Top of Embankment ≈25'
Flash boards Ht=4'
Mass Pour on Rip Rap
approx
SECTION "A"-"A"

DAM NO. 3-14-222-12.

10. Risk to life and property in event of complete failure.

No. of people 20.

No. of homes 5.

No. of Businesses 0.

No. of industries 0 Type

No. of utilities 2 Type H-T-T Electric Line WACHUSETT Reservoir DOWNSTREAM

Railroads

Other dams

Other Upper North Row Rd would be INUNdated

11. Attach Sketch of dam to this form showing section and plan on 8½" x 11" sheet.

12. How to Locate: TRAVELLING Rte 12 N.B. TURN LT. @ MONUMENT IN Sterling Center - HEAD UP Rowley HILL Rd FOR 3½ miles± TURN Rt onto UPPER North Row Rd. Dam IS Located 0.6± miles down THE Rd ON YOUR Left.

DESCRIPTION OF DAM

DISTRICT 3

Submitted by W. REGAN Dam No. 3-14-222-18

Date 7/29/74 ~~City~~/Town STERLING

Name of Dam LOWEST POND

1. Location: Topo Sheet No. 204

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

2. Year built 1949 Year/s of subsequent repairs ____

3. Purpose of Dam: Water Supply ____ Recreational ____

Irrigation ____ Other AGRICULTURAL

4. Drainage Area: 0.75 sq. mi. ____ acres

5. Normal Ponding Area: 80± acres; Ave. depth ____

Impoundment: — gals.; — acre ft.

6. No. and type of dwellings located adjacent to pond or reservoir ____ i.e. summer homes, etc. ____

7. Dimensions of Dam: Length 300'+ Max. Height 12'

Slopes: Upstream Face 2:1

Downstream Face 2:1

Width across top 25'

8. Classification of Dam by Material:

Earth Fill Conc. Masonry ____ Stone Masonry ____

Timber ____ Rockfill ____ Other RIP-RAP Face

9. A. Description of present land usage downstream of dam:

100 % % rural; ____ % urban.

B. Is there a storage area or flood plain downstream of dam which could accomodate the impoundment in the event of a complete dam failure? yes ✓ no ____.

Rocky Brook Meadow,
Stillwater River Meadow

DAM NO. 3-14-222-18

12. Remarks & Recommendations: (Fully Explain)

Trees & Brush along entire embankment Should be Removed, Flashboards Should be replaced

Note: This Dam is in the MDC- protected Protected watershed Area - Its outflow ends up in the Wachusett Reservoir

13. Overall Condition:

1. Safe _____
2. Minor repairs needed ✓
3. Conditionally safe - major repairs needed _____
4. Unsafe _____
5. Reservoir impoundment no longer exists (explain)

   Recommend removal from inspection list _____

DAM NO. 3-14-282-18

8. Downstream Face of Dam:

Condition: 1. Good _____ 2. Minor Repairs _____

3. Major Repairs ___ 4. Urgent Repairs _____

Comments: Slight Evidence of Ponding 150 ft W. of Stuicoway Remove Trees & BRUSH

9. Emergency Spillway:

Condition: 1. Good _____ 2. Minor Repairs ✓

3. Major Repairs ___ 4. Urgent Repairs _____

Comments: Replace Flashboards

10. Water Level at time of inspection: 1/2 ft. above ___ below ✓

top of dam _____ principal spillway _____

other Top of Flashboards

11. Summary of Deficiencies Noted:

Growth (Trees and Brush) on Embankment ✓

Animal Burrows and Washouts None Noted

Damage to slopes or top of dam None

Cracked or Damaged Masonry None

Evidence of Seepage Yes - See (8) & Sketch (Slight)

Evidence of Piping NO

Erosion NO

Leaks only Through Flashboards

Trash and/or debis impeding flow NO

Clogged or blocked spillway NO

Other _____

INSPECTION REPORT - DAMS AND RESERVOIRS

1. Location: ~~City~~/Town STERLING Dam No. 3-14-282-18

Name of Dam LINCRAFT POND Inspected by Reagan, Riskalla

Date of Inspection 7/29/74

2. Owner/s: per: Assessors ✓ Prev. Inspection

Rec. of Deeds Pers. Contact

Whites Black Angus Farm Inc.

1. Ben MONROE PRES. P.O. Box 225 Sterling, MASS.
Name St. & No. City/Town State Tel. No.

2. _____
Name St. & No. City/Town State Tel. No.

3. _____
Name St. & No. City/Town State Tel. No.

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

Name: St. & No.:

City/Town: State: Tel.No.:

4. No. of Pictures taken 6

5. Degree of Hazard: (if dam should fail completely)*

1. Minor _____ 2. Moderate ✓

3. Severe _____ 4. Disastrous _____

* This rating may change as land use changes (future development)

6. Outlet Control: Automatic _____ Manual ✓

Operative ✓ yes; _____ No.

Comments: Gate valve closed, water Leaking Through Flash boards

7. Upstream Face of Dam: Condition:

1. Good _____ 2. Minor Repairs ✓

3. Major Repairs ___ 4. Urgent Repairs ___

Comments: Remove Trees & Brush

September [illegible], 1974

Dan Monroe, President
White's Black Angus Farm, Inc.
P. O. Box 225
Sterling, Massachusetts

RE: Inspection-Dam #3-14-282-18
Sterling
Hy-Crest Pond Dam

Dear Mr. Monroe:

On July 29, 1974, an engineer from the Massachusetts Department of Public Works made a visual inspection of the above dam, owned by White's Black Angus Farm, Inc.

The inspection was made in accordance with Chapter 253 of the Massachusetts General Laws, as amended by Chapter 595 of the Acts of 1970 (Dam-Safety Act).

The results of the inspection indicate that this dam is safe; however, the following conditions were noted that require attention:

1. The flashboards leak and should be repaired or replaced as necessary.

2. Remove the growth of brush and trees from the embankment of the dam and establish a good growth of turf.

We call these conditions to your attention now, before they become serious and more expensive to correct.

Very truly yours,

[illegible] L. [illegible], P.E.
Acting Deputy Chief Engineer

LRA:jmp
cc: J J Lydon
[illegible] Pagan

TOWN Sterling DAM NO. 48:18

LOCATION Northerly side-Upper North Row STREAM Peaky Brook "Sawyer Pond."

WORCESTER COUNTY ENGINEERING DEPARTMENT
WORCESTER, MASSACHUSETTS

DAM INSPECTION REPORT

Owned by Dino Di Carlo 34 Hayden Rowe St Place Framingham Use Recreation and Storage Pond.

Inspected by W.C.E. Date Aug 29 1970

Type of Dam Earth and concrete Condition Good to fair

SPILLWAY

Flashboards in Place Yes Recent Repairs _____

Condition All of the 4" boards should be replaced-suitable hooks

Repairs Needed or rings should be installed for removing the boards.

The boards should be carried no higher than 2' below the top of the dams.

EMBANKMENT

Recent Repairs _____

Condition Remove all brush and small trees from this embankment.

Repairs Needed All low places should be filled with suitable material.

GATES

Recent Repairs _____

Condition There is a small leak at the gate outlet

Repairs Needed _____

OUTLETS

Low Outlets _____

_____ County Engineer

Nov. 24. Thanksgiving. Evidently the bulldozer man used this morning to work on the channels.

Nov 25 Rain.

Nov 26 Cut out ditch for one wall and started some.

Nov 28 More help now. Used Sawyer truck to haul in stone for walls. Shaped out other two ditches. No stones laid.

Nov. 29 Rain

Nov. 30. West Gate wall completed. We are beginning to concentrate more on getting this done. Mr. Sawyer still not in agreement on rollway. Hate to push too hard. Maybe another letter is necessary. Trash rack is already ordered from Rodney Hunt. Mr. Ralph White came and seemed satisfied with progress.

Dec 1. East spillway wall built. West spillway wall started. Enough men on hand now to really get going. Letting Mr. Sawyer think it over.

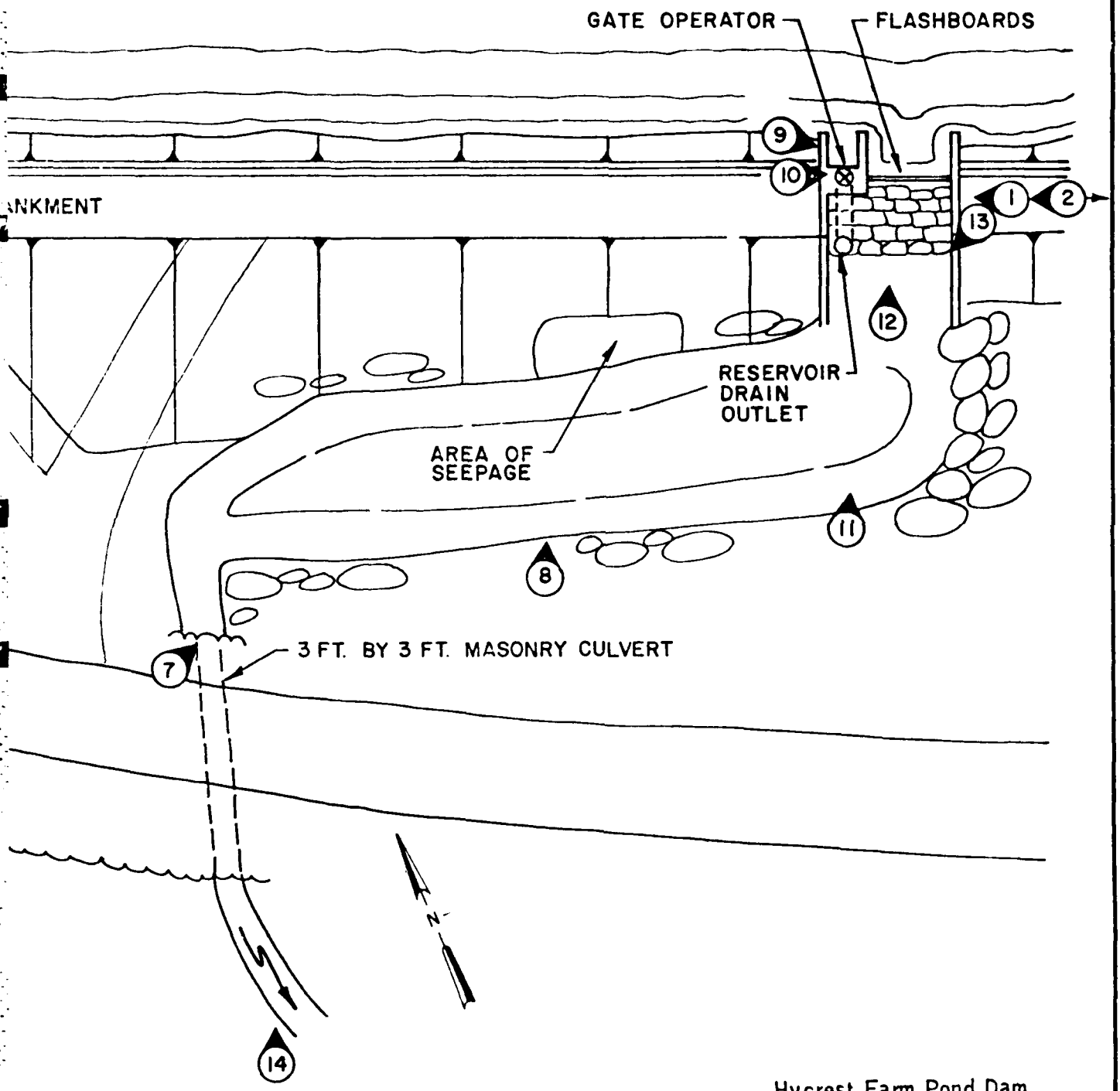
Dec 2 Mr. Sawyer agreed to do rollway as I wish according to Mr. Mardens plan. Bulldozer cleaning out upstream channel. Removing huge boulders.

Dec. 3 Snowing. No work

Dec 5 Stone platform for Rollway laid. 5 yd grout used in area. Started rollway. Two trucks hauling stone PM.

APPENDIX C - PHOTOGRAPHS

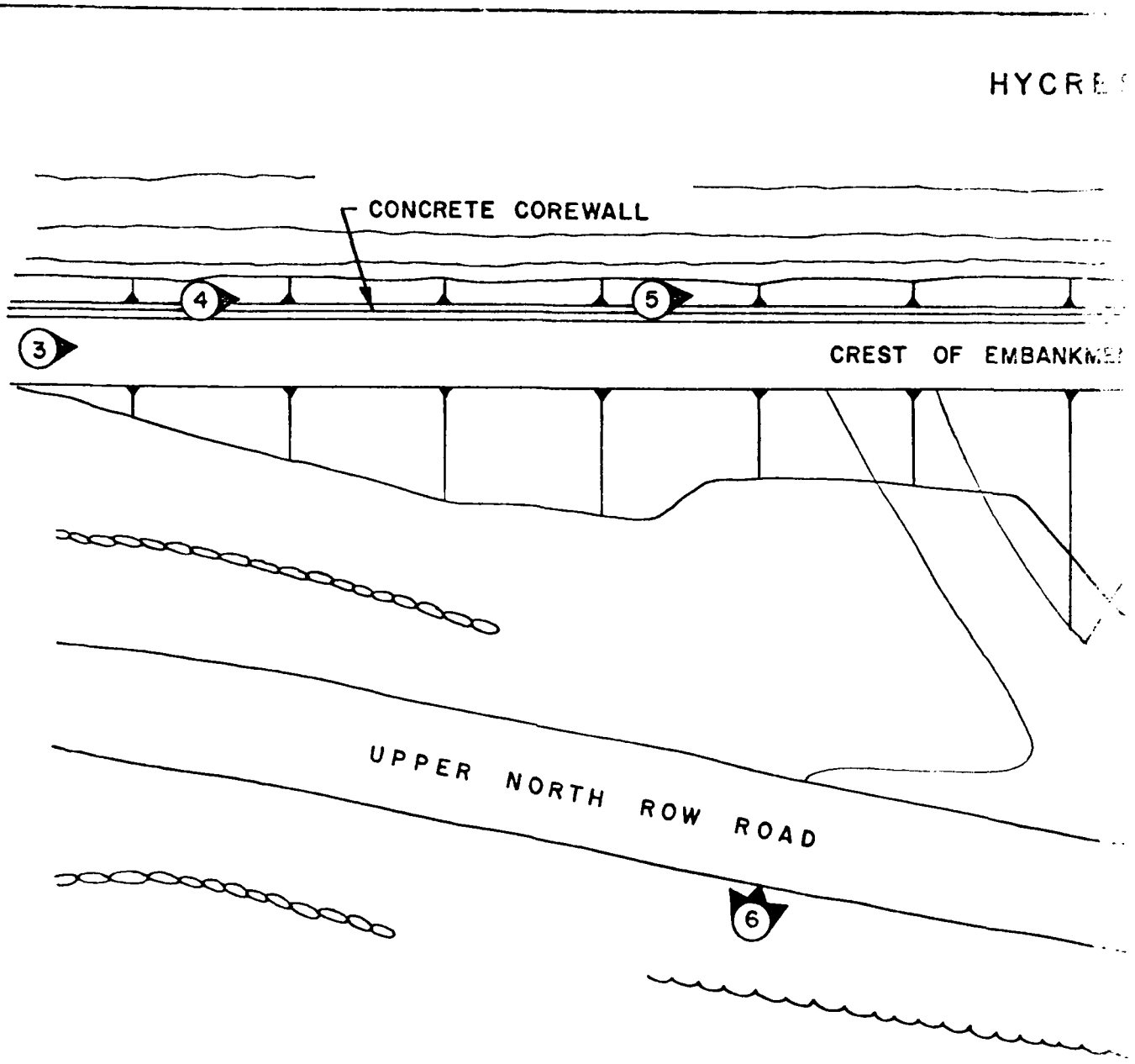
CREST POND



Hycrest Farm Pond Dam
Sterling, MA

SITE PLAN SKETCH

Scale: 1"=20' February 1979



NOTE:

PLAN DEVELOPED FROM 1949 PLAN ENTITLED "DAM ACROSS STONY HILL SWAMP", APPENDIX B-14, AND FIELD OBSERVATIONS ON 16 NOVEMBER 1978.

LEGEND

(5) PHOTO NO. AND DIRECTION OF VIEW.

2

FILE NO 4270 B7

HALEY & ALDRICH, INC
CAMBRIDGE MASSACHUSETTS

2. Top of embankment from left abutment

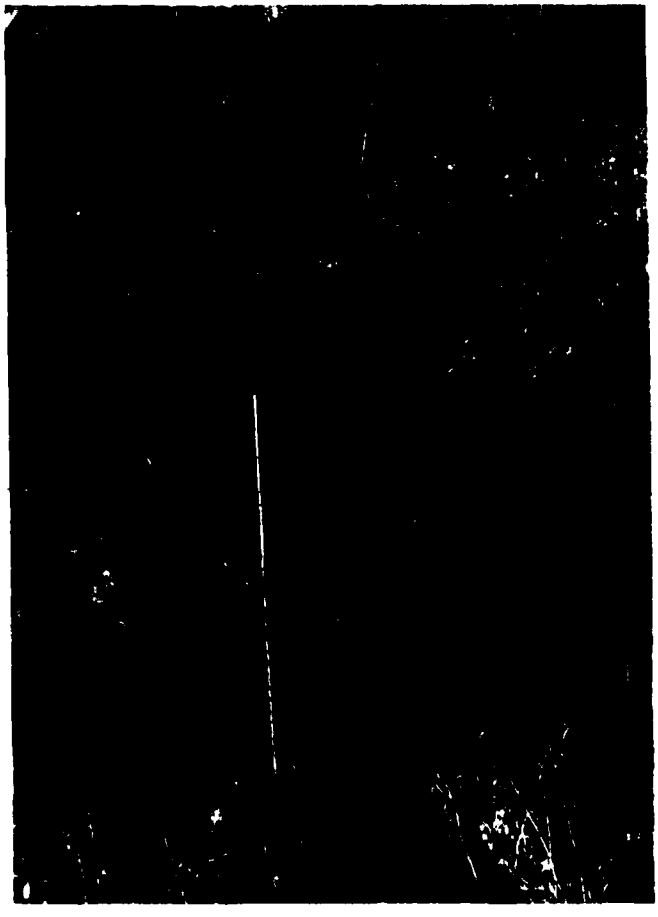
3. Top of embankment from right abutment

4. Riprap and brush on upstream slope

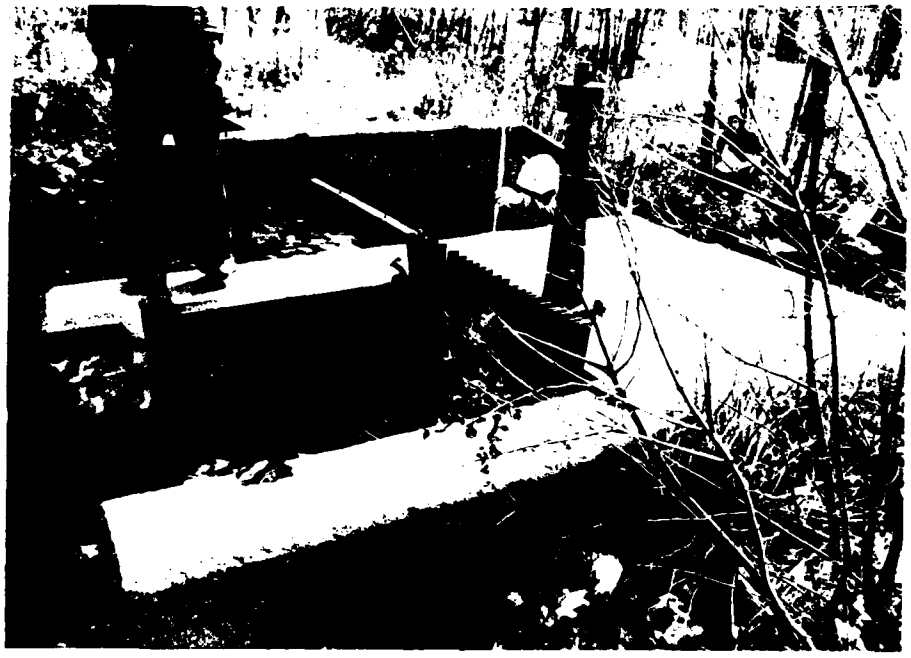
5. Area of erosion of upstream slope

6. Elevation view of downstream side

7. Downstream slope at zone of seepage



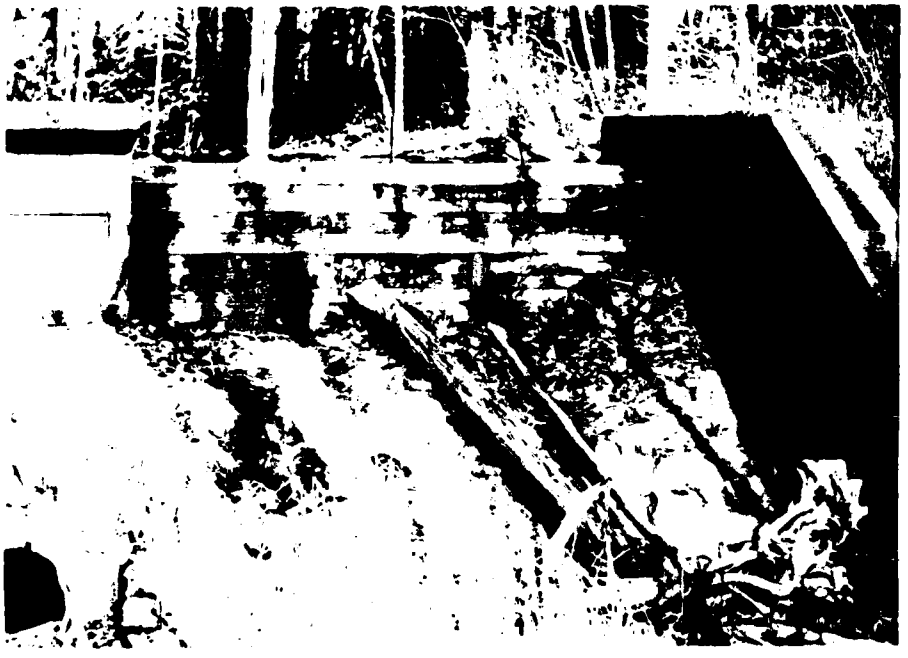
8. Observer showing height of seepage zone



9. Upstream side of spillway and outlet structure

10. Closeup of flashboard support system

11. Downstream side of spillway and outlet structure

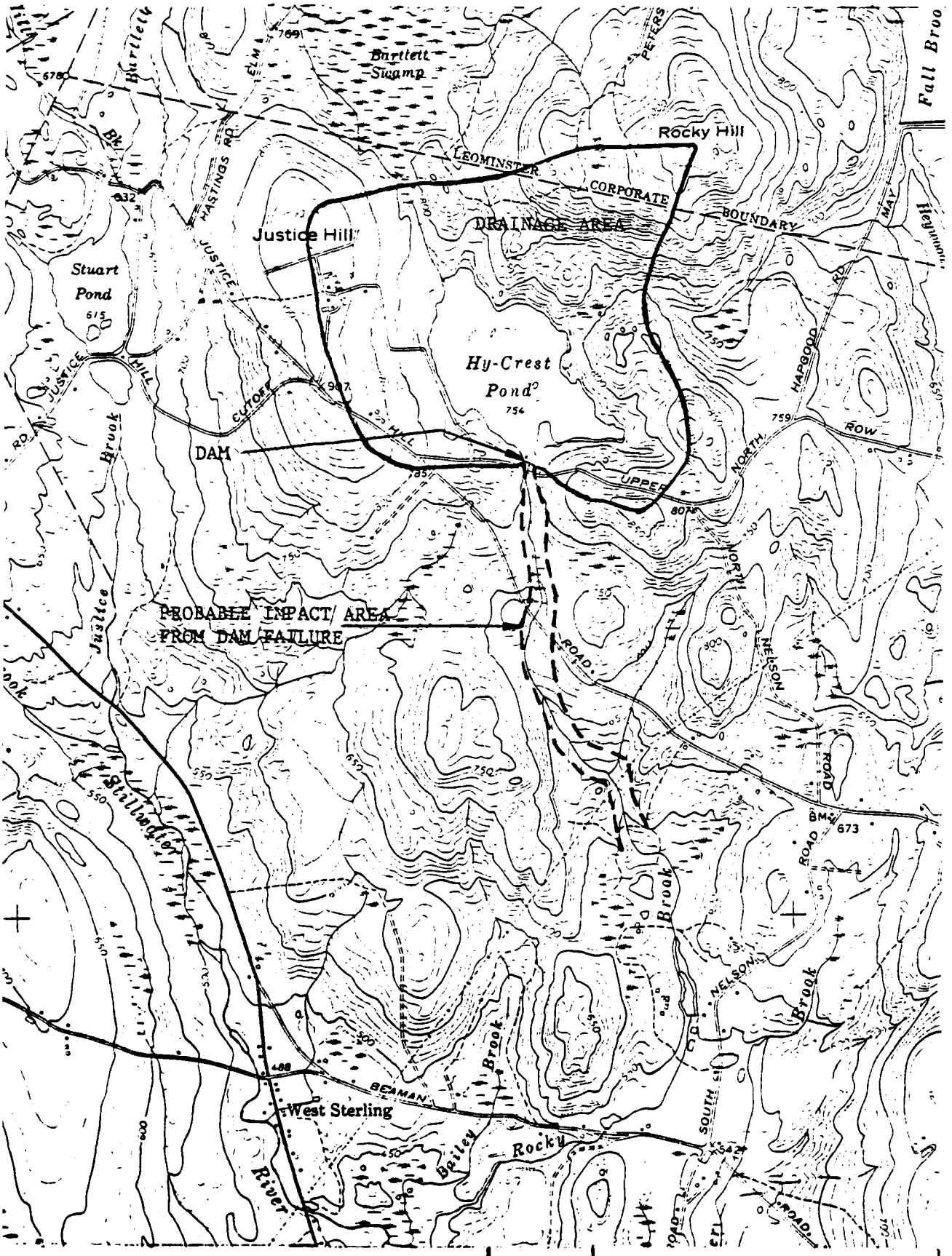


12. Elevation view of flashboards

13. Downstream channel near spillway

14. Channel downstream of Upper North Row Road

APPENDIX D - HYDROLOGIC AND HYDRAULIC COMPUTATIONS



CAMP DRESSER & McKEE Inc.
Consulting Engineers
Boston, Mass.

N

HYCREST POND DAM
DRAINAGE AREA AND
FLOOD IMPACT AREA
SCALE: 1:24,000

D-1

Size Classification

Height : $756.0 - 745.0 = 11\text{-ft} < 40\text{-ft}$

Storage : 610 acre-ft @ El. $756 < 1000$ ac-ft.

} SMALL

Hazard Potential classification

No dwellings are observed within the potential flood plain from the failure of the dam : no loss of life is expected ;

Economic Loss is estimated to be minimal with some possible damages to two secondary roads.

Category : LOW

Test Flood Development

Size : Small
Hazard : Low

} $Q_T = \frac{1}{4}$ PMF

Drainage Area : 450 acres = 0.7 sqmi

Topography of the D.A. : midrange between rolling and mountainous terrain.

PMF Peak Flow Rate: 2675 cfs/sqmi (From COE curves)

$Q_{PMF} = 0.7 \times 2675 = 1870$ cfs

TEST FLOOD INFLOW: 470 cfs

Surcharge - Storage Routing

Test Flood Inflow : 470 cfs

WSE in the pond : 755.50 (From Stage-Discharge Curve)

Note : condition at the spillway : all flash-boards removed (Test Condition 1)

Surcharge @ El. 755.50 = 325 ac-ft. (from Stage-Surcharge curve)

Surcharge - Runoff = $\frac{325}{450} \times 12 = 8.7$ -in = STOR 1

$Qp_2 = 470\left(1 - \frac{8.7}{5}\right) = (-)$ indicates less surcharge.

Assume STOR 2 = 0 STOR av = 4.35"

Qp_2 = 56 cfs → WSE : 752.10

Surcharge Vol. : 70 ac-ft.
STOR = 1.86" too small

Try STOR av = 3.4"

$Qp_3 = 470\left(1 - \frac{3.4}{5}\right) = 150$ cfs → WSE = 753.2

V = 130 → STOR = $\frac{130}{450} \times 12 = 3.46" \approx$ O.K.

Test Flood Outflow : 150 cfs.

Test Condition 2 : Top of the flashboards at el. 754.7:

Normal Vol. (Reservoir) = 500 ac-ft. (From Area-Vol. curve)

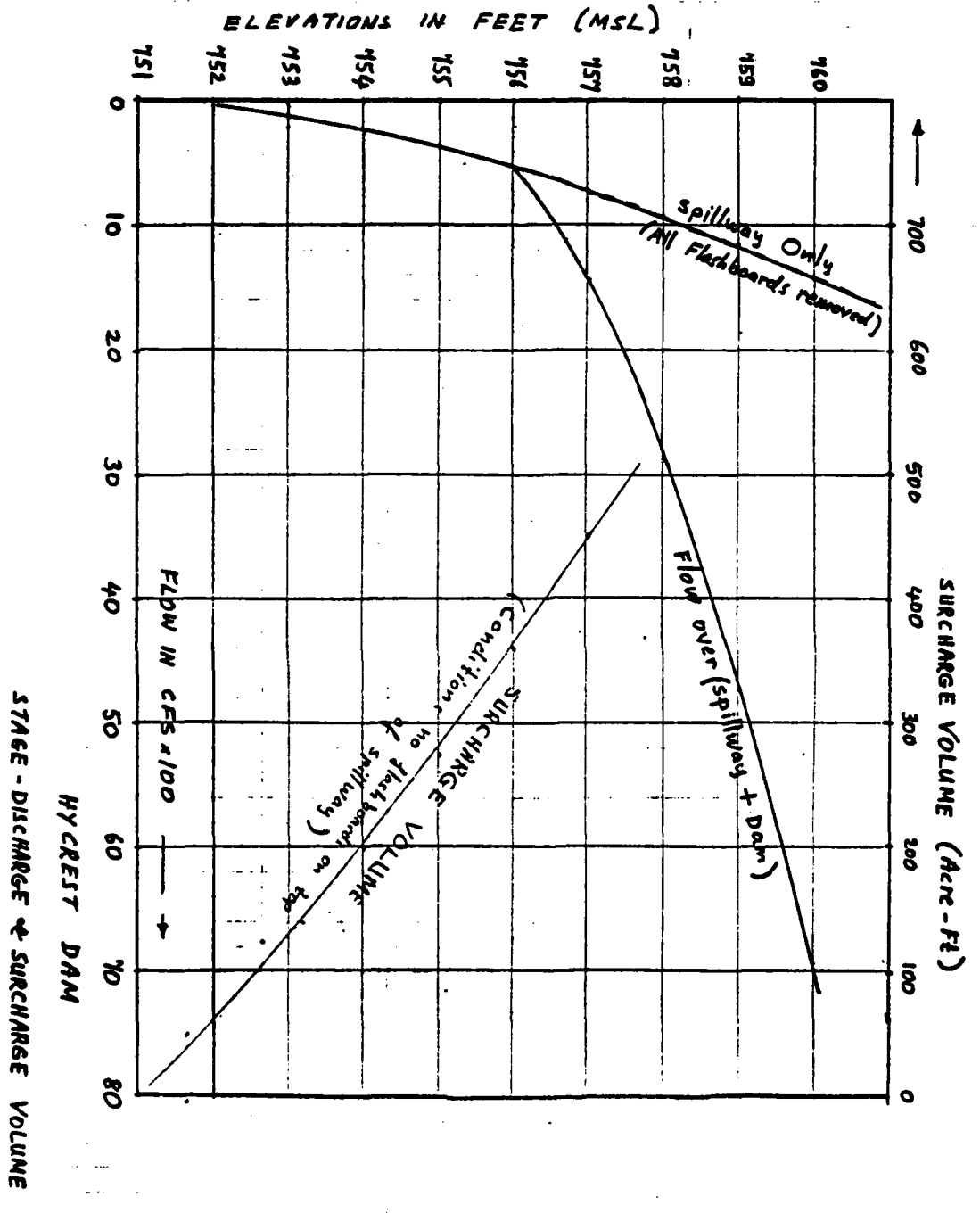
Q inflow = 470 cfs → El. : by trial and error

CAMP DRESSER & McKEE
Environmental Engineers
Boston, Mass.

CLIENT H & A
PROJECT COE Dam Inspection
DETAIL Hycrest Dam

JOB NO. 561-9-RE-12
DATE CHECKED 12/22/78
CHECKED BY AHG

PAGE 3
DATE 11/24/78
COMPUTED BY K.S.Chin

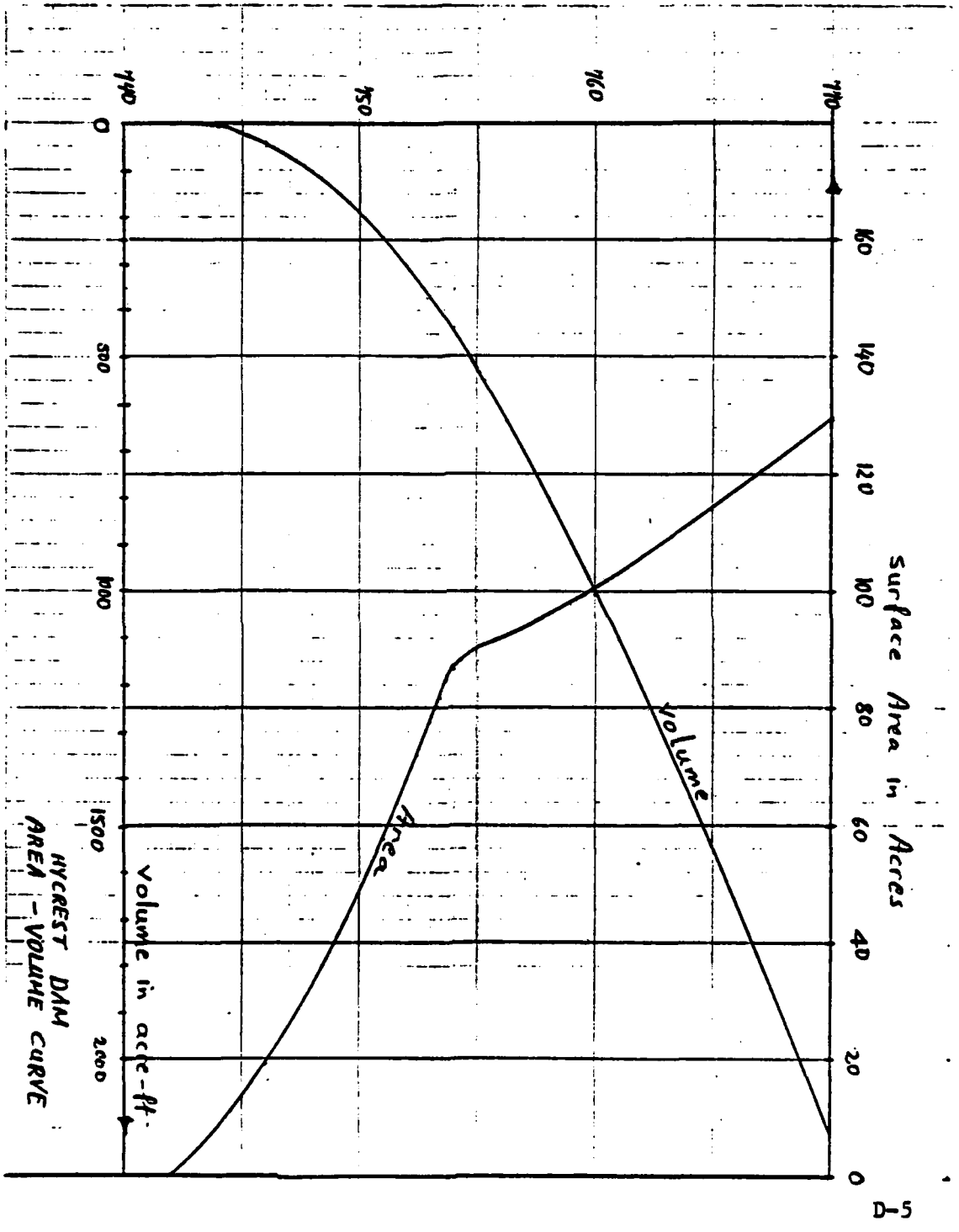


CAMP DRESSER & McKEE
Environmental Engineers
Boston, Mass.

CLIENT Corps of Engineers
PROJECT COE Dam Inspection
DETAIL Hycrest Dam

JOB NO. 561-9-RT-12
DATE CHECKED 12/20/78
CHECKED BY AHG

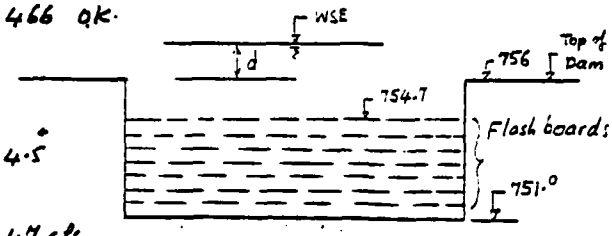
PAGE 4
DATE 11-27-78
COMPUTED BY K.S. Chin



$470 = 3.5 \cdot 12 (1.2 + d_1)^{1.5} + 2.5 \cdot 275 \cdot d_1^{1.5} = 513 > 470$

$d_1 = 0.70$ $Q = 513 > 470$

Try $d_1 = 0.65$ $Q = 466$ o.k.



HGL El. 756.65

$STOR = \frac{670-500}{450} 12 = 4.5"$

$Q_{p_2} = 470 \left(1 - \frac{4.5}{5}\right) = 47$ cfs

El. : 755.5 → Vol. 580 ac-ft. Surcharge = 580 - 500 = 80 ac-ft

$STOR. = \frac{80}{450} 12 = 2.13"$ STOR Ave. 3.5"

$Q_{p_3} = 470 \left(1 - \frac{3.5}{5}\right) = 140$ cfs

$140 = 3.5 \cdot 12 (1.2 + d_2)^{1.5} + 688 d_2^{1.5}$

$d_2 = 0.2$ ft. $Q = 132$ cfs ≈ 140 cfs o.k.

HGL El. = 756.2 Res. Volume: 635 ac-ft.

Surcharge : 135 acre-ft → 3.6" ≈ 3.5" o.k.

Conclusion : Dam would be overtopped by about 0.2-ft of water if the existing flash boards are all left in place.

Tailwater Analysis

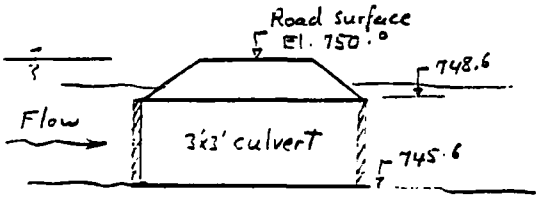
Capacity of the channel downstream from the dam is controlled by the capacity of the road culvert:

$Q = C\,a\,\sqrt{2gh}$

$a = 9\ \square'$

WSEl. = 750.0

$Q = 75$ cfs.



If $Q > 75$ the road would be overtopped.

For test flood outflow of 150 cfs. the road would be overtopped by about 0.1-ft of water.

Max. WSE downstream channel: 750.1

Spillway won't be submerged.

Dam Failure Analysis

$Q_{p_1} = \frac{8}{27} W_b \sqrt{g} Y_o^{3/2}$ Dam Length @ Mid-height = 100'

$W_b = 0.40 \times 100\text{-ft} = (\text{breach width}) = 40\text{-ft}$.

$Y_o = 756 - 745 = 11\text{-ft}$.

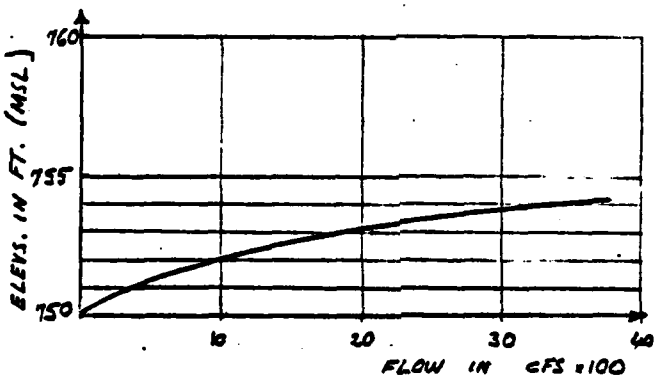
$Q_{p_1} = 2450$ cfs

Storage Volume (S) at time of failure: 610 acre-ft.

Reach 1. in the downstream channel: from the dam to the Upper North Row Rd:

L = 140 ft.; the effect of the storage here would be negligible.

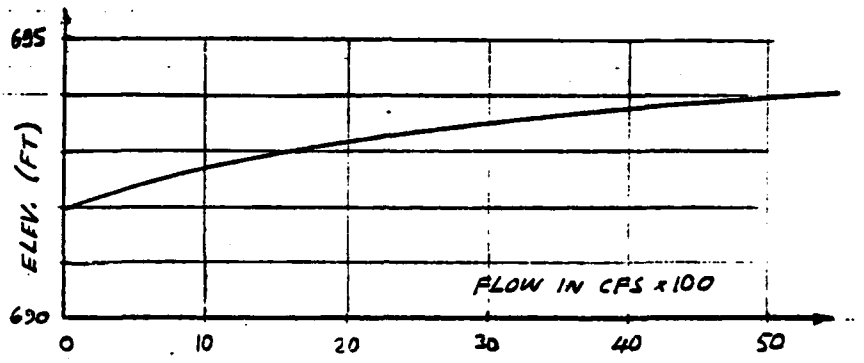
An approximate stage-discharge curve for the Upper North Row Road is shown below (discharge through the existing culvert ignored)



For Q = 2450 cfs HGL el. = 753.5

Channel Inv. El. = 745.6

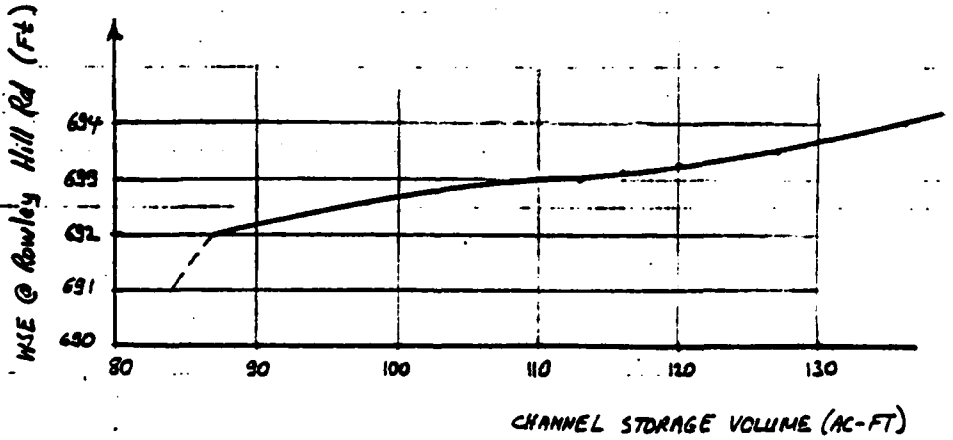
Downstream Channel - Reach 2: this "Reach" is between Upper North Row Road and Rowley Hill Road: Approximate flood stages for the Rowley Hill Road is shown below (a relatively small capacity of the existing culvert is ignored).



For Q = 2450 cfs HGL El = 693.3 Ft.

Channel Inv. El. 687.7 Ft.

Stage vs. channel storage is shown below:



V_1 = 120 ac-ft for WSE : 693.3

Q_{p_2} (trial) $= 2450\left(1 - \frac{120}{610}\right) = 1{,}968$ cfs

HGL El. @ Rowley Hill Rd = 693.20

Channel Storage Volume V_2 = 116 ac-ft.

V_{av} = 118 ac-ft.

$Q_{p_2} = 2450\left(1 - \frac{118}{610}\right) = 1976$ cfs

WSE @ Rowley Hill Rd = 693.20

Overflow : 693.20 − 692.0 = 1.2 feet.

Conclusion: Flood water would be about 1.2 feet above the road surface.

The channel (Rocky Brook) reaches to the Stillwater river at a point about 2.5 miles away from the Rowley Hill road. The Stillwater river is a tributary to Wachusett Reservoir.

APPENDIX E - INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

STATE	IDENTITY NUMBER	DIVISION	STATE	COUNTY	CONGR. DIST.	STATE	COUNTY	CONGR. DIST.	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE DAY MO YR
[illegible]	[illegible]	[illegible]		27	02				[illegible]CREST PARK POND	422[illegible]	7104.3	15JAN79

POPULAR NAME	NAME OF IMPOUNDMENT
[illegible]CREST POND	HY-CREST POND

REGION	BASIN	RIVER OR STREAM	NEAREST DOWNSTREAM CITY–TOWN–VILLAGE	DIST FROM DAM (MI.)	POPULATION
1	5	ROCKY BROOK	STERLING	0	4961

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STRUCTURAL HEIGHT (FT.)	HYDRAULIC HEIGHT (FT.)	IMPOUNDING CAPACITIES MAXIMUM (ACRE-FT.)	NORMAL (ACRE-FT.)	DIST	OWN	FED R	PRV/FED	SCS A	VER/DATE
[illegible]	1942	0	20	11	610	453	[illegible]	N	N	N	N	21FEB79

REMARKS

D/S HAS	SPILLWAY CREST LENGTH	TYPE	WIDTH (FT.)	MAXIMUM DISCHARGE (FT.)	VOLUME OF DAM (CY)	POWER CAPACITY INSTALLED (MW)	PROPOSED (MW)	NO	NAVIGATION LOCKS LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)
[illegible]	500	[illegible]	12	[illegible]	7000											

OWNER	ENGINEERING BY	CONSTRUCTION BY
[illegible]	LEONARD H. WHITE	LEONARD H. WHITE

REGULATORY AGENCY DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
[illegible]	NONE	NONE	[illegible]

INSPECTION BY	INSPECTION DATE DAY MO YR	AUTHORITY FOR INSPECTION
[illegible] & ALDRICH, INC.	16NOV78	PUBLIC LAW 92-367

REMARKS

END

FILMED

8-85

DTIC