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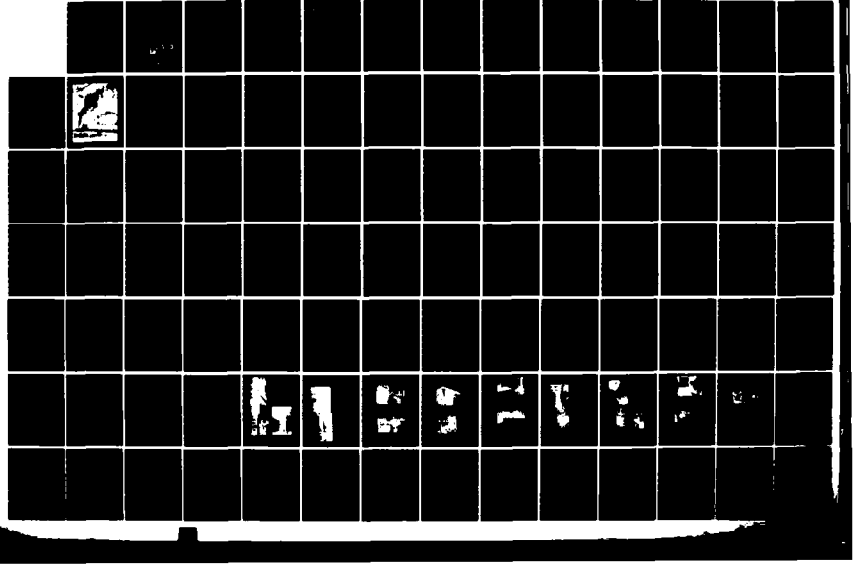

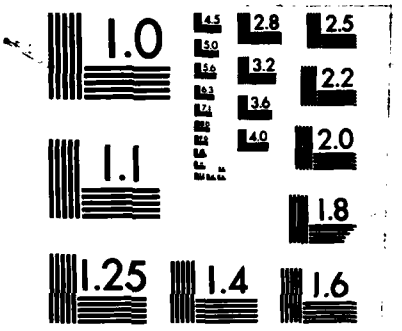

MERRIMACK RIVER BASIN
CHELMSFORD, MASSACHUSETTS

RUSSELL MILL POND
MA 01219

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY

NEW ENGLAND DIVISION, CORPS OF ENGINEERS

WALTHAM, MASS. 02154

MARCH 1980

*UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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

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Merrimack River Basin
Chelmsford Massachusetts
Pond Brook

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

The dam is of irregular composition consisting of stone and earth embankments, two sluiceways, a spillway and several stone masonry wall sections. The dam has a hydraulic height of 11 ft. and an overall length of about 120 ft. It is small in size with a hazard potential of significant. Generally, the dam is in good condition.

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REPLY TO
ATTENTION OF
NEDED

JUL 10 1980

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

Dear Governor King.

Inclosed is a copy of the Russell Mill Pond 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, Mr. L. Charlton Greene, Chelmsford, Massachusetts 01824.

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

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

Sincerely,

MAX B. SCHEIDER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

NATIONAL DAM INSPECTION PROGRAM
PHASE I INVESTIGATION REPORT
BRIEF ASSESSMENT

Identification No.:	MA 01219
Name of Dam:	Russell Mill Pond Dam
Town:	Chelmsford
County and State:	Middlesex County, Massachusetts
Stream:	Pond Brook
Date of Inspection:	November 2, 1979

The dam is of irregular composition consisting of stone and earth embankments, two sluiceways, a spillway and several stone masonry wall sections. The dam has a hydraulic height of 11 feet and an overall length of approximately 120 feet. The dam is owned and operated by Mr. L. Charlton Greene of Chelmsford, Massachusetts. It is believed that the dam was constructed in the mid 1600's.

There was no indepth engineering data available for review. Therefore, the adequacy of the dam was primarily evaluated by visual inspection, past performance history and sound engineering. judgement. The dam has a size classification of small and a hazard potential classification of significant. Based upon Corps Guidelines, the test flood analyzed was the 100 year flood (approximated by using 1/4 PMF). The test flood inflow from the 10.25 square mile drainage area would be 1,170 cfs. The test flood discharge would be 1,040 cfs and 1,050 cfs with and without flashboards at the spillway, respectively. The corresponding surcharge elevations are 128.3± and 128.2±, respectively. The

The top of dam, elevation 127, is overtopped in both cases. The spillway and sluiceways have a combined capacity of 230 cfs or 22 percent of the test flood outflow with flashboards and 345 cfs of 33 percent of the test flood outlfow without flashboards.

The dam is in generally good condition. However, it is rated as fair due to the inadequate spillway capacity, seepage through the stone masonry below the right sluiceway outlet pipe, and the voids beneath the cracked concrete floor of the spillway. It is recommended that the Owner engage a qualified registered professional engineer to perform a detailed hydraulic/hydrologic investigation to determine overtopping potential and need for increasing the total discharge capacity of the dam; design a means to prevent water from seeping through the masonry below the right sluiceway outlet pipe and investigate the voids beneath the spillway cap.

The Owner should institute remedial measures which include: removing brush and trees; operating the spillway without flashboards and establish a formal operational procedure for continued removal of stoplogs from the sluiceways at least 24 hours prior to any anticipated significant storm. Also the Owner should establish a formal warning system for alerting the downstream area in case of an emergency and for around the clock monitoring of the dam during periods of heavy rainfall.

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

Ronald H. Cheney, P.E.
Vice President

Hayden, Harding & Buchanan, Inc.
Boston, Massachusetts

This Phase I Inspection Report on Russell Mill 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.

ARAMAST MAHTESIAN, MEMBER
Geotechnical Engineering Branch
Engineering Division

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

RICHARD DIBUONO, CHAIRMAN
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

PREFACE

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

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

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to

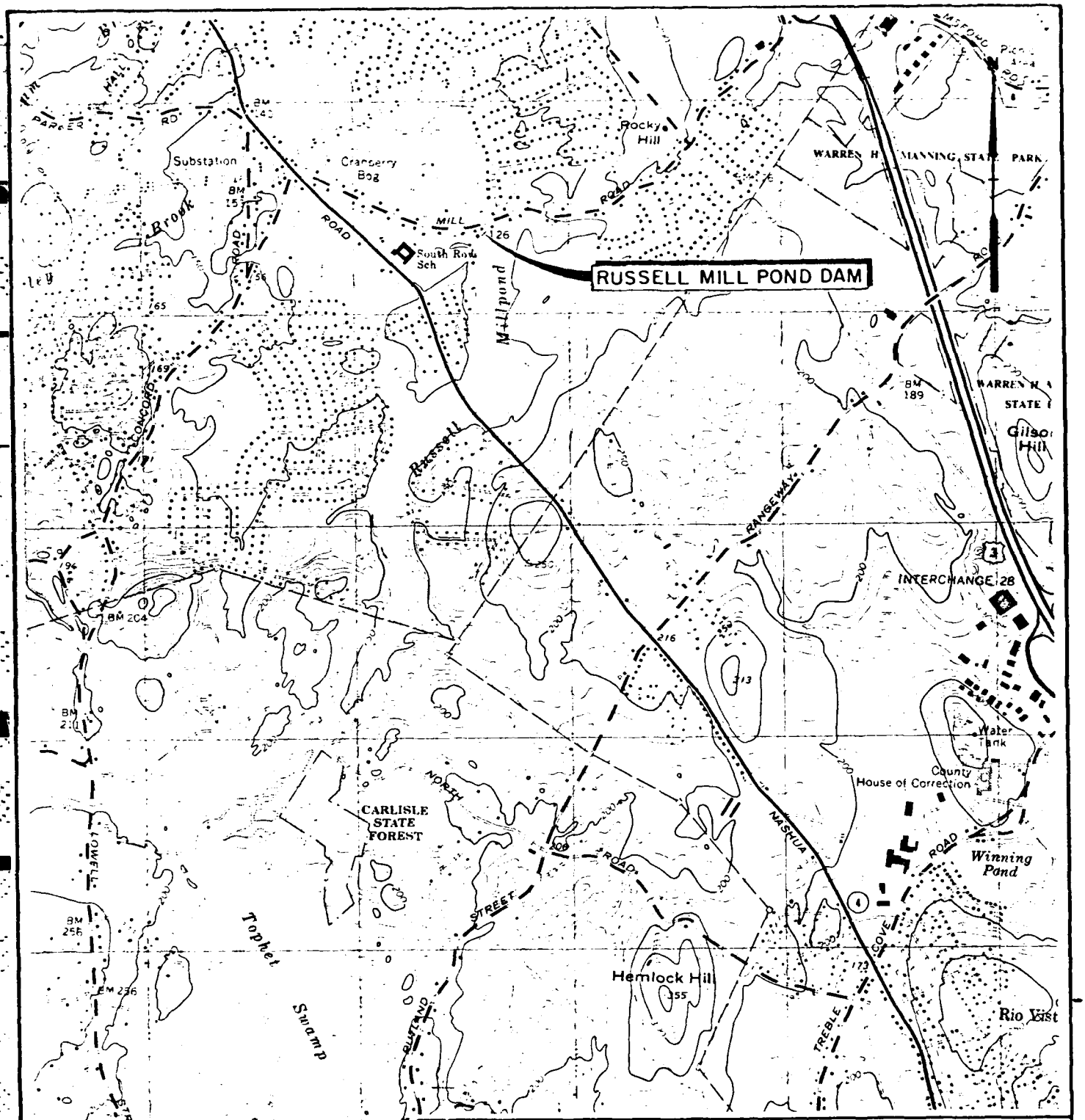
assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

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

The Phase I Investigation does <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.

TABLE OF CONTENTS

APPENDIXES



HAYDEN, HARDING & BUCHANAN, INC. CONSULTING ENGINEERS BOSTON, MASSACHUSETTS	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

RUSSELL MILL POND DAM

LOCATION PLAN

CHELMSFORD MASSACHUSETTS

			SCALE 1:25000
			DATE FEBRUARY, 1980

PHASE I
NATIONAL DAM INSPECTION PROGRAM

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority

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

b. Purpose

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

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

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

1.2 Description of Project

a. Location

Russell Mill Pond Dam is located in the Town of Chelmsford in Middlesex County, Massachusetts. The dam is located just south of Mill Road, approximately 3,000 feet east of the Mill Road-Boston Road (Route 4) intersection. The dam impounds the waters of Pond Brook to form Russell Mill Pond. Russell Mill Pond Dam is shown on the Billerica, Massachusetts Quadrangle, with the approximate coordinates of North 40°34'40", West 71°20'00".

b. Description of Dam and Appurtenances

The dam is of irregular composition consisting of stone and earth embankments, 2 outlet sluiceways, a spillway and several stone masonry wall sections, photograph 1, Appendix C. The dam has a height of approximately 11 feet and an overall length of about 120 feet. The spillway is 24± feet long, having an 18 inch upstream concrete sill, a wood deck foot bridge and a stone masonry downstream face. It is divided into three bays with provisions for 8± inches of flashboards. Without flashboards, the spillway has a 1'-2" freeboard. The right sluiceway, photograph 5, has an upstream slotted opening with provisions for stoplogs. The sluice opening outlets into a 4 foot diameter pipe which discharges at the downstream face as shown at left side of photograph 2. The left sluiceway, photograph 6, has a 3 foot long by 6 foot high opening. During the field inspection, there were 3'-3" of wood stoplogs in place to keep the pond at at its normal level of elevation 124±. There is a small

wooden frame structure located atop this sluiceway, photograph 6. Between the left sluiceway and the spillway is a 60± foot long wall. Downstream of this wall there is a variable width earth embankment (or natural ground) having a vertical stone masonry wall on the downstream face, photographs 1, 4 and 6.

Between the right sluiceway and the spillway, there is a 13 foot long by 8± foot wide concrete slab, which appears to have been poured atop a stone masonry embankment. There is a wood frame 2 story building with attic located to the left of the spillway, directly downstream of the concrete wall and earth embankment mentioned above, photograph 1. There is a 100± foot long concrete wingwall extending upstream of the right abutment, photograph 1. Water from the 2 sluiceways and spillway converge approximately 100 feet downstream of the crest. The combined channel then travels to the left of a 2 story structure as shown by photograph 3, then continuing under Mill Road as shown by photograph 7.

c. Size Classification

The dam has a size classification of small based on its hydraulic height of 11± feet and its storage capacity of 150 acre-feet.

d. Hazard Classification

This project has a hazard classification of significant. Based on Corps Guidelines, the assumed dam failure outflow is 1,230 cfs. Prior to dam failure, sluiceway and spillway discharge will flood the outlet channel, but will not damage any homes. The failure flood stage will be about four feet deep between the homes and

Mill Road, including initial flood stage. Two homes and one commercial building located immediately downstream of the dam will receive flooding damage of about one to two feet deep. Loss of life due to dam failure flooding is possible.

e. Ownership

The dam has been owned by Mr. L. Charlton Greene since 1954.

f. Operator

The dam is operated and maintained by Mr. L. Charlton Greene of 99 Mill Road, Chelmsford, Massachusetts 01824. (Telephone 617-256-7754).

g. Purpose of Dam

The present purpose of the dam is recreation. The original purpose of the dam was for milling operations.

H. Design and Construction History

The dam is believed to have been constructed in 1656. In 1954, the dam was bought by the present Owner. He made major repairs at that time, and has since made annual repairs. Renovations by the Owner have included, new stone masonry walls at the right sluiceway area, repair of the spillway and service deck, and general maintenance of the facility.

i. Normal Operational Procedure

The Owner regulates the water level of the pond by varying the height of stoplogs and flashboards in the sluiceway and spillway. He will lower the water level during periods of anticipated high precipitation. He normally flushes out intakes when they become clogged with leaves or debris.

1.3 Pertinent Data

a. Drainage Area

The total drainage area, 10.25 s.m. (6,560 acres), is basically wooded undeveloped land. The main drainage brook is Pond Brook. The brook flows about seven miles before entering Russell Mill Pond. Russell Mill Pond is about 1.2 miles long.

The sub-drainage areas above Heart Pond and the cranberry bog are 2.52 s.m. (1,610 acres) and 1.6 s.m. (1,025 acres), respectively. Within these areas, swamps and ponds account for about 30 percent of the sub-drainage areas. The swamp and pond areas are located along Pond Brook. The brook is 2.5 miles long in these areas with a change in elevation of 28 feet. Heart Pond and the bog are about two miles long, with no effective change in elevation occurring.

Runoff from the drainage areas above Heart Pond and the cranberry bog will be retarded and reduced. This is due to the storage characteristics of the swamp and pond areas, which are significant. Also, small roadway culverts and railroad embankments act to retard and reduce runoff.

The drainage area below the cranberry bog is 6.13 s.m. (3,925 acres). Swamps account for only 0.75 s.m. of the drainage area but, they intercept runoff from about 3 s.m. (1,920 acres) of land. These swamps are located on the south side of Pond Brook. They will act to retard and reduce runoff from the 3 s.m. of land.

Below the cranberry bog, the brook flows about two miles, with a change in elevation of 65 feet, before flowing into Russell Mill Pond. The general slope of the brook is relatively flat, with the majority of the change in elevation occurring near North Road, about 2,500 feet before the pond, within a 1,000 foot long section.

Below Russell Mill Pond, very little development occurs near the long, wide, swampy River Meadow Brook channel as it flows 2.5 miles north to the Merrimack River, at Lowell, Massachusetts. See the drainage area map in Appendix D.

b. Discharge at Damsite

1. Outlet Works

The outlet works for this project are a stoplog controlled four foot diameter pipe and a stoplog controlled six foot by three foot sluiceway channel. These outlets are shown in the photographs in Appendix C and the drawings in Appendix B.

The four foot pipe has an invert elevation of 120±. Under normal conditions, with stoplogs set at elevation 124±, it has a discharge capacity of 47± cfs, with the water surface at elevation 127± (top of dam).

The six by three foot sluiceway has an invert elevation of 120±. With stoplogs in place to elevation 124±, it has a capacity of 52 cfs, with the water surface at elevation 127±.

2. Maximum Known Flood at Damsite

No records of maximum flooding at the damsite are available. United States Weather Bureau records indicate that

from August 17 to 20, 1955 and during September 17 to 22, 1938, about 8 inches of rainfall occurred near the general location of the project.

The USGS gage station, #995, near Lowell, on the Concord River, recorded a peak discharge of 5,410 cfs on January 28, 1979, for a 312 s.m. (adjusted) drainage area. The gage has been in operation since 1936.

3. Ungated Spillway Capacity at Top of Dam

The ungated spillway crest is at elevation 125±. It has a capacity of 68 cfs and 160 cfs with and without 8 inch flashboards, respectively, when the water surface is at elevation 127±, top of dam.

4. Ungated Spillway Capacity at Test Flood Elevation

The test flood will surcharge the reservoir to elevation 128.3 and 128.2, with and without flashboards, respectively. The corresponding spillway discharges are 105 cfs and 230 cfs. This equals 10 and 22 percent of the test flood outflows of 1,040 cfs and 1,050 cfs, respectively.

5. Total Project Discharge at Top of Dam

With the water surface at elevation 127, the two sluiceways and spillway discharge is 167 cfs and 260 cfs with and without flashboards. This assumes the two other outlet works are functioning with stoplogs at elevation 124±.

6. Total Project Discharge at Test Flood Elevation

When water is at the test flood elevations of 128.3 and 128.2, with and without flashboards, the total project discharge is 1,040 cfs and 1,050 cfs, respectively. The two sluiceways

and spillway will be discharging 230 cfs and 345 cfs at the above conditions. These discharges correspond to 22 and 33 percent of the test flood outflows, respectively.

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

1. Streambed at toe of dam ---------- 116±
2. Bottom of cutoff ---------- unknown
3. Maximum tailwater --- 121± (test flood conditions)
4. Normal pool ---------- 124±
5. Full flood control pool ---------- N/A
6. Spillway crest ---------- 125.0±
   125.7± with flashboards
7. Design surcharge (Original Design) ------- unknown
8. Top of dam ---------- 127±
9. Test flood surcharge ------ 128.3 with flashboards
   128.2 without flashboards

d. Reservoir (Length in feet)

1. Normal pool ---------- 6,500±
2. Spillway crest pool ---------- 6,500±
3. Top of dam ---------- 6,600±
4. Test flood pool ---------- 6,700±
5. Flood control pool ---------- N/A

e. Storage (acre-feet)

1. Normal pool ---------- 51
2. Spillway crest pool ---------- 76
3. Top of dam ---------- 150
4. Test flood pool ---------- 200
5. Flood control pool ---------- N/A

f. Reservoir Surface (acres)

1. Normal pool ---------- 24
2. Spillway crest ---------- 28
3. Top of dam ---------- 46

4. Test flood pool ---------- 54

5. Flood-control pool ---------- N/A

g. Dam

1. Type --- gravity, earthen, stone and concrete masonry

2. Length ---------- 120'±

3. Height ---------- 11'± (hydraulic)

4. Top Width ---------- 8'±

5. Side Slopes ---------- d.s. vertical at spillway, u.s. vertical at spillway

6. Zoning ---------- unknown

7. Impervious Core ---------- unknown

8. Cutoff ---------- unknown

9. Grout curtain ---------- unknown

h. Diversion and Regulating Tunnel - none at this project

i. Spillway

1. Type ---------- broad-crested

2. Length of weir ---------- 24'±

3. Crest elevation -------- 125± without flashboards
125.7± with flashboards

4. Gates ---------- none

5. U/S Channel ---------- opens directly into pond

6. D/S Channel ---------- opens directly into brook

j. Regulating Outlets

The regulating outlets are the 6 x 3 foot stone sluiceway and 4 foot diameter metal pipe. Both are controlled with stop-logs. The approximate invert of each is at elevation 120±.

SECTION 2

ENGINEERING DATA

2.1 Design Data

Due to the age of the structure, no design data was located for this dam.

2.2 Construction Data

No construction data was located for this dam.

2.3 Operation Data

No operational manual exists for this dam.

2.4 Evaluation of Data

a. Availability

Due to the age of the structure, no engineering data was located regarding Russell Mill Pond Dam. A State Inspection Report dated 1974 was made available at the State Department of Environmental Quality Engineering, Division of Waterways, Boston Office.

b. Adequacy

The lack of indepth 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 engineering judgement.

c. Validity

The visual inspection of this facility indicated reasonably good agreement with the limited information supplied by the State Inspection Report.

SECTION 3

VISUAL INSPECTION

3.1 Findings

a. General

At the time of inspection the water in the reservoir was about 3 feet below the top of the dam.

b. Dam

The dam consists of 1) hand-placed stone ranging in size from boulders to cobbles (not mortared), 2) cut stone blocks (not mortared), 3) rounded cobbles (mortared), and 4) concrete. The dam is about 120 feet in length and about 11 feet high. The dam has outlet sluiceways next to the right and left abutments and has a spillway adjacent to the right sluiceway. The foundation material of the dam is unknown. However, rock outcrops next to the downstream face of the dam indicate that the dam may rest on bedrock, photographs 2 and 9.

The visible portion of the concrete wall forming the upstream face of the dam is in good condition. Brush growth was observed next to the upstream face between the spillway and right outlet works, photograph 4.

The crest of the dam is in good condition, photograph 9. No evidence of cracking or misalignment of the crest that could be attributed to movement of the dam was observed.

An overall view of the downstream face of the dam from the right abutment to the left end of the spillway is shown in

photograph 9. The only seepage observed through the downstream face was near the right outlet pipe and is discussed in Section 3.1.c. A group of three trees about 12 to 16 inches in diameter were observed about 5 feet from the downstream face of the dam and to the right of the spillway.

c. Appurtenant Structures

Seepage was observed through the stone blocks on the downstream side of the dam near the 48 inch diameter steel outlet pipe. Seepage was observed through a vertical joint to the left of the steel pipe at an elevation slightly higher than the elevation of water in the steel pipe, photograph 10. Several seeps were observed through stone blocks below the steel pipe, photographs 10 and 11.

No seepage was observed through the stonework on the downstream side of the dam below the spillway section. A crack in the transverse direction was observed in the concrete floor of the spillway. A small void was observed beneath the concrete floor near the transverse crack and was apparently caused by erosion. The discharge channel of the spillway and right sluiceway consists of bedrock and cobbles, photograph 9.

The outlet adjacent to the left abutment is shown in photograph 12 and the discharge channel for this outlet is shown in photographs 6 and 13. The discharge channel contained several 1 to 6 inch diameter trees.

d. Reservoir Area

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

observed adjacent to the right training wall. Some siltation of the reservoir was observed.

e. Downstream Channel

No significant obstructions were observed in the downstream channel, photograph 3.

3.2 Evaluation

Visual inspection indicates the dam is in generally good condition.

Seepage observed through stone blocks near the right outlet pipe do not represent an immediate stability problem but the recommendations in Section 7.2 should be implemented.

SECTION 4

OPERATIONAL & MAINTENANCE PROCEDURES

4.1 Operational Procedures

a. General

The present purpose of this dam is recreation. Stoplogs are used in the sluiceway inlets to control the water level of the pond. The spillway has provisions for 8 inches of flashboards. The Owner will lower the water level during periods of anticipated high precipitation.

b. Description of Warning Systems

There are no warning systems in effect at this dam.

4.2 Maintenance Procedures

a. General

Mr. L. Charlton Greene, the Owner and caretaker, resides in the residence directly downstream of the dam. He normally maintains the facility as required.

b. Operating Facilities

There is no formal operational procedure for this facility. The Owner regulates the water level of the pond. He flushes out intakes when they become clogged with leaves or debris and makes any necessary repairs.

4.3 Evaluation

There is no formal maintenance procedure for the dam. Trees and brush should be removed as described in Section 7.3.a.1. Seepage at the right outlet pipe and the voids beneath the concrete slab in the spillway should be investigated as described in

Section 7.2.a. The level of the reservoir should be maintained as described in Section 7.3.a.3. The dam should be inspected every year by a qualified registered professional engineer who can identify areas of concern, which if left unchecked, could jeopardize the safety of the dam.

SECTION 5

EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General

Russell Mill Pond is located in the southeastern section of the Town of Chelmsford. It impounds Pond Brook. The pond has a surface area of about 28 acres and a maximum storage capacity of 150 acre-feet.

Pond Brook is about 8.1 miles long, including three ponds and a cranberry bog which are formed by impounding the brook. Runoff is effectively retarded and reduced at these ponds and the swamps within the drainage area. See the discussion in Section 1.3.a.

See Appendixes B, C and D for drawings, photographs and hydraulic calculations.

5.2 Design Data

The original dam was believed to be built in the 1600's. There is no design data available for review.

5.3 Experience Data

There are no records of past flood experiences or the occurrence of the dam being overtopped. According to United States Weather Bureau records from August 17 to 20, 1955 and during September 17 to 22, 1938, about 8 inches of rainfall occurred near the general location of the project.

The USGS gage station, #995, near Lowell, on the Concord River, recorded a peak discharge of 5,410 cfs on January 28, 1979, for a 312 s.m. (adjusted) drainage area. The gage has been in operation since 1936.

5.4 Test Flood Analysis

The dam has a small size classification and a significant hazard potential. Based on Corps Guidelines, the test flood should be in the 100 year to 1/2 PMF range. Due to the rural character of the impact area (there are 3 structures within the impact area) the 100 year flood (approximated by using storm runoff equal to 1/4 PMF) was used for the test flood.

The discussion in Section 1.3.a. described the characteristics of the 10.25 s.m. drainage area. Runoff from the 4.12 s.m. drainage area above Heart Pond and the cranberry bog will be significantly retarded and reduced. This is due to the significant storage capacity of Heart Pond and the cranberry bog and the relatively small discharge capacities of their outlet structures.

At Heart Pond, the railroad culvert, embankment and Acton Road control outflow. The railroad culvert and embankment will act to reduce the inflow of 440± cfs. The pond will provide 450± acre-feet of storage. Total runoff from the 2.52 s.m. (1,610 acre) drainage area above the pond is about 640 acre-feet, thus about 70 percent of total runoff is storage. The outflow through the railroad culvert is about 125 cfs. This will flow into the cranberry bog, just downstream of Acton Road.

At the cranberry bog, the total storage capacity under typical operating conditions is 452± acre-feet. The storage ponds and bog have a "small" discharge capacity. Any significant runoff must "fill" the ponds and bog and then flow over Curve Road to enter Pond Brook and flow to Russell Mill Pond.

Total runoff from the 1.6 s.m. (1,025 acres) drainage area above the bog is about 406 acre-feet. The storage capacity of the bog area is greater. The discharge from the bog (including that from Heart Pond) would not be significant, probably on the order of 100± cfs. This amount of outflow would not impact Russell Mill Pond.

For this analysis, only the 6.13 s.m. drainage area below Heart Pond and the cranberry bog was used to determine peak inflow at Russell Mill Pond. The peak inflow of 1,170 cfs was determined by using 700 c.s.m. from 6.13 s.m. plus a 100 cfs outflow from Heart Pond and the cranberry bog.

Discharge from the dam is controlled by the stoplogs and flashboards at the sluiceways and spillway. See photographs 1, 2, 4, 5 and 7. Under normal conditions, the stoplogs are at elevation 124± and 8± inch high flashboards are in place at the spillway. Using these conditions, the test flood will surcharge the pond to elevation 128.3±. The dam, top elevation of 127±, is overtopped by 1.3± feet. The pond will provide stage storage of 169± acre-feet or 0.52± inch of runoff from the 3,925± acre drainage area. The two sluiceway outlets and the spillway will have a discharge of 230± cfs or 22 percent of the test flood discharge of 1,040± cfs.

Removing these flashboards and maintaining the stoplogs at the other two outlets, the two sluiceway outlets and the spillway discharge increases to 345± cfs, or 33 percent of the test flood outflow. The test flood outflow and surcharge elevation are 1,050± cfs and 128.2±, respectively, under these changed conditions.

5.5 Dam Failure Analysis

Dam failure analysis was performed assuming the initial water surface elevation at 127±, top of dam. Just prior to failure, the discharge is 260± cfs and the flood stage is at elevation 119±, at the Mill Road culvert.

The dam failure discharge is 1,230± cfs. This assumes 40 percent of the 50 foot long, 11 foot high dam along the natural streambed fails. The downstream channel is narrow, constricted and "flat". See photographs 3, 7 and 8. The Mill Road culvert, about 200± feet downstream and the flat swamp beyond, will cause a flow restriction. The flow of 260 cfs just prior to dam failure will flood the downstream channel and overtop Mill Road by about two feet.

Dam failure flood stage at Mill Road will increase to elevation 121±, about 4 feet deep, including initial 260 cfs flow.

The 260 cfs flood stage at elevation 119 will just flood (up to first floor level) the three structures (2 residential, one commercial) near the dam. Dam failure flood stage, at elevation 121±, will cause flood damage on the first floor level of one to two feet at these structures. Loss of life due to dam failure is possible.

There are no other residential structures along the outlet brook for several thousand feet downstream. The downstream channel conditions will dissipate the remaining failure flow of about 1,000 cfs.

SECTION 6

EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observations

The visual observations did not disclose any immediate stability problems; however, the following items if left unattended could lead to future problems:

1) seepage through the dam near the right sluiceway outlet pipe.
2) voids beneath the concrete floor of the spillway.

6.2 Design and Construction Data

Design and construction data were not available. Sketches of the dam showing a plan view and cross section are included in the State Inspection Report dated August 19, 1974.

6.3 Post-Construction Changes

According to a letter from the L. Charlton Greene Company dated November 26, 1973, the dam was in need of repair in 1954 and had to be rebuilt. The extent of repairs made at this time is unknown. According to the above letter, the dam was again in need of repairs in 1973.

6.4 Seismic Stability

The dam is located in Seismic Zone 2 and in accordance with the recommended Phase I guidelines, does not warrant seismic analysis.

SECTION 7

ASSESSMENT, RECOMMENDATIONS & REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition

The visual inspection indicates that the dam is in generally good condition, but due to the inadequate spillway capacity, seepage through the stone masonry below the right sluiceway outlet pipe and the voids beneath the cracked concrete floor of the spillway, the dam is rated as fair.

b. Adequacy of Dam

The information made available and the visual inspection are adequate for a Phase I level of investigation.

c. Urgency

The recommendations and remedial measures of Section 7.2 and 7.3 should be implemented within one year after receipt of this Phase I Inspection Report by the Owner.

7.2 Recommendations

a. The Owner should engage a qualified registered professional engineer to (1) design and implement a means to prevent water from seeping through the masonry below the right sluiceway outlet pipe (2) investigate and repair the voids beneath the concrete slab in the spillway.

b. The Owner should engage a qualified registered professional engineer to perform a detailed hydraulic/hydrologic investigation

APPENDIX A

INSPECTION CHECKLIST

VISUAL INSPECTION CHECK LIST
LAKE ORGANIZATION

PROJECT: RUSSELL MILL POND DAM

DATE: Nov. 2, 1979

TIME: 1 pm

WEATHER: Sunny, 65°F

W.S. ELEV. 124+ U.S. ____ DN.S.

PARTY:

1. R. Cheney, HHB
2. D. Vine, HHB
3. D. LaGatta, GEI
4. T. Keller, GEI
5. ____
6. ____
7. ____
8. ____
9. ____
10. ____

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Spillway	All	
2.	Outlet Works	All	
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

PERIODIC INSPECTION CHECKLIST

PROJECT RUSSELL MILL POND DAM DATE Nov. 2, 1979

PROJECT FEATURE Masonry Dam NAME D. LaGatta, T. Keller

DISCIPLINE Geotechnical Engineer NAME R. Cheney

Structural Engineer

AREA EVALUATED	OBSERVATION
DAM EMBANKMENT	Dam is comprised of cut stone blocks (unmortared), rounded cobbles (mortared), and concrete.
Crest Elevation	127±
Current Pool Elevation	124±
Maximum Impoundment to Date	Unknown
Surface Cracks	None of significance.
Pavement Condition	Concrete pavement in good condition.
Movement or Settlement of Crest	None observed.
Lateral Movement	None observed.
Vertical Alignment	No vertical misalignment observed.
Horizontal Alignment	No horizontal misalignment observed.
Condition at Abutment and at Concrete Structures	Good.
Indications of Movement of Structural Items on Slopes	None.
Trespassing on Slopes	Tourist attraction.
Sloughing or Erosion of Slopes or Abutments	None observed.
Rock Slope Protection - Riprap Failures	None.
Unusual Movement or Cracking at or near Toe	None observed.
Unusual Embankment or Downstream Seepage	Small seeps through joints of stone blocks to left and below right outlet pipe.
Piping or Boils	None.
Foundation Drainage Features	None.
Toe Drains	None.
Vegetation	None.
Other	Three trees to left of right outlet, downstream of face.

PERIODIC INSPECTION CHECKLIST

PROJECT RUSSELL MILL POND DAM DATE Nov. 2, 1979

PROJECT FEATURE Masonry Dam NAME D. LaGatta, T. Keller

DISCIPLINE Geotechnical Engineer NAME R. Cheney

Structural Engineer

AREA EVALUATED	CONDITION	
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	LEFT OUTLET	RIGHT OUTLET
a. Approach Channel	Below surface of reservoir.	Below surface of reservoir.
Slope Conditions		
Bottom Conditions		
Rock Slides or Falls		
Log Boom		
Debris		
Condition of Concrete Lining		
Drains or Weep Holes		
b. Intake Structure		
[illegible]	Good	Good
[illegible]	Good	Good

PERIODIC INSPECTION CHECKLIST

PROJECT RUSSELL MILL POND DAM DATE Nov. 2, 1979

PROJECT FEATURE Control Tower NAME D. LaGatta, T. Keller

DISCIPLINE Geotechnical Engineer NAME R. Cheney

Structural Engineer

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

PERIODIC INSPECTION CHECKLIST

PROJECT RUSSELL MILL POND DAM DATE Nov. 2, 1979

PROJECT FEATURE Outlet Works NAME D. LaGatta, T. Keller

DISCIPLINE Geotechnical Engineer NAME R. Cheney

Structural Engineer

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT	There is no Transition or Conduit.
General Condition of Concrete	
Rust or Staining on Concrete	
Spalling	
Erosion or Cavitation	
Cracking	
Alignment of Monoliths	
Alignment of Joints	
Numbering of Monoliths	

PERIODIC INSPECTION CHECKLIST

PROJECT RUSSELL MILL POND DAM DATE Nov. 2, 1979

PROJECT FEATURE Outlet Structures NAME D. LaGatta, T. Keller

DISCIPLINE Geotechnical Engineer NAME R. Cheney

Structural Engineer

AREA EVALUATED	CONDITION	
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	LEFT OUTLET	RIGHT OUTLET
General Condition of Concrete	Good	Good
Rust or Staining	None Observed	None Observed
Spalling	None Observed	None Observed
Erosion or Cavitation	None Observed	None Observed
Visible Reinforcing	None Observed	None Observed
Any Seepage or Efflorescence	None Observed	None Observed
Condition at Joints	Good	Good
Drain holes	None.	None.
Channel		
Loose Rock or Trees Overhanging Channel	None of significance	None of significance
Condition of Discharge Channel	Some 1 to 6 inch diameter trees in channel.	Good.

PERIODIC INSPECTION CHECKLIST

PROJECT RUSSELL MILL POND DAM DATE Nov. 2, 1979

PROJECT FEATURE Spillway NAME D. LaGatta, T. Keller

DISCIPLINE Geotechnical Engineer NAME R. Cheney

Structural Engineer

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	Approach channel below reservoir level.
General Condition	
Loose Rock Overhanging Channel	
Trees Overhanging Channel	
Floor of Approach Channel	
b. Weir and Training Walls	
General Condition of Concrete	Fair - small void beneath concrete slab.
Rust or Staining	None Observed
Spalling	None Observed
Any Visible Reinforcing	None Observed
Any Seepage or Efflorescence	None Observed
Drain Holes	None.
c. Discharge Channel	
General Condition	Good.
Loose Rock Overhanging Channel	None.
Trees Overhanging Channel	None of significance.
Floor of Channel	Bedrock, cobbles and boulders.
Other Obstructions	None.

PERIODIC INSPECTION CHECKLIST

PROJECT: RUSSELL MILL POND DAM — DATE: Nov. 2, 1979

PROJECT FEATURE: Service Bridge — NAME: D. LaGatta , T. Keller

DISCIPLINE: Geotechnical Engineer — NAME: R. Cheney

Structural Engineer

AREA EVALUATED	CONDITION
OUTLET WORKS - SERVICE BRIDGE	There is a wooden "service bridge" across the spillway. The entire structure appears to be in good condition.
a. Super Structure	
Bearings	
Anchor Bolts	
Bridge Seat	
Longitudinal Members	
Underside of Deck	
Secondary Bracing	
Deck	
Drainage System	
Railings	
Expansion Joints	
Paint	
b. Abutments & Piers	
General Condition of Concrete	
Alignment of Abutment	
Approach to Bridge	
Condition of Seat & Backwall	

APPENDIX B

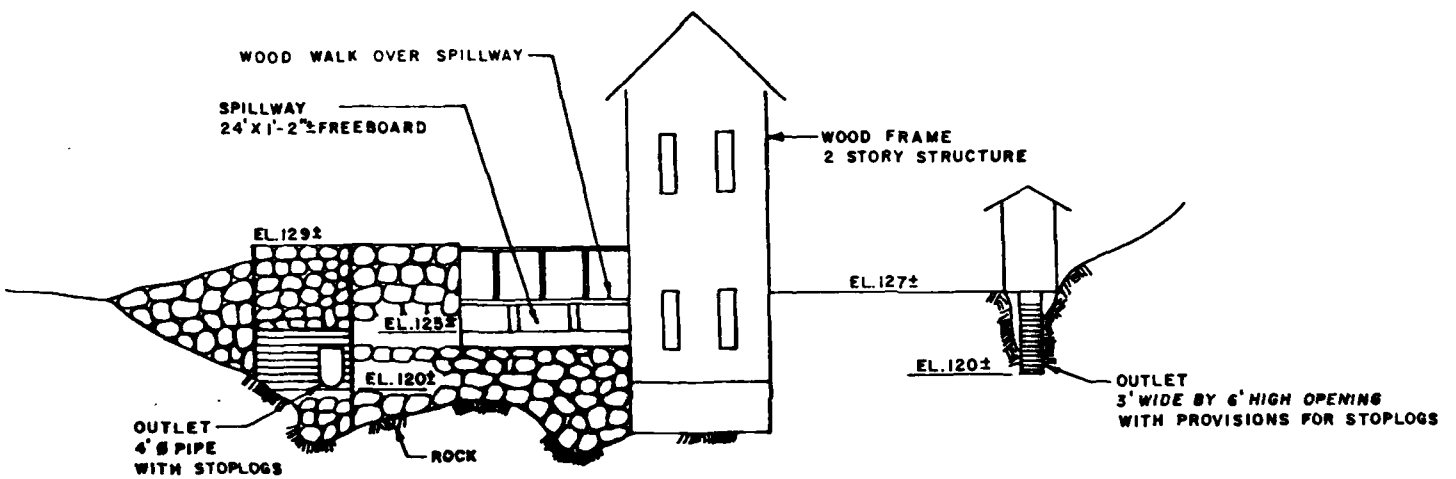
ENGINEERING DATA

LIST OF ENGINEERING DATA

1. A State Inspection Report dated 1974 was made available at the Department of Environmental Quality Engineering, Division of Waterways, 100 Nashua Street, Boston, Massachusetts.

2. Some correspondence by the Owner between the years 1973 and 1974 was also made available at the Department of Environmental Quality Engineering.

No additional Engineering Data was located.



ELEVATION

RUSSELL MILL POND DAM

NOTE:
PLAN DEVELOPED FROM ON-SITE INSPECTION

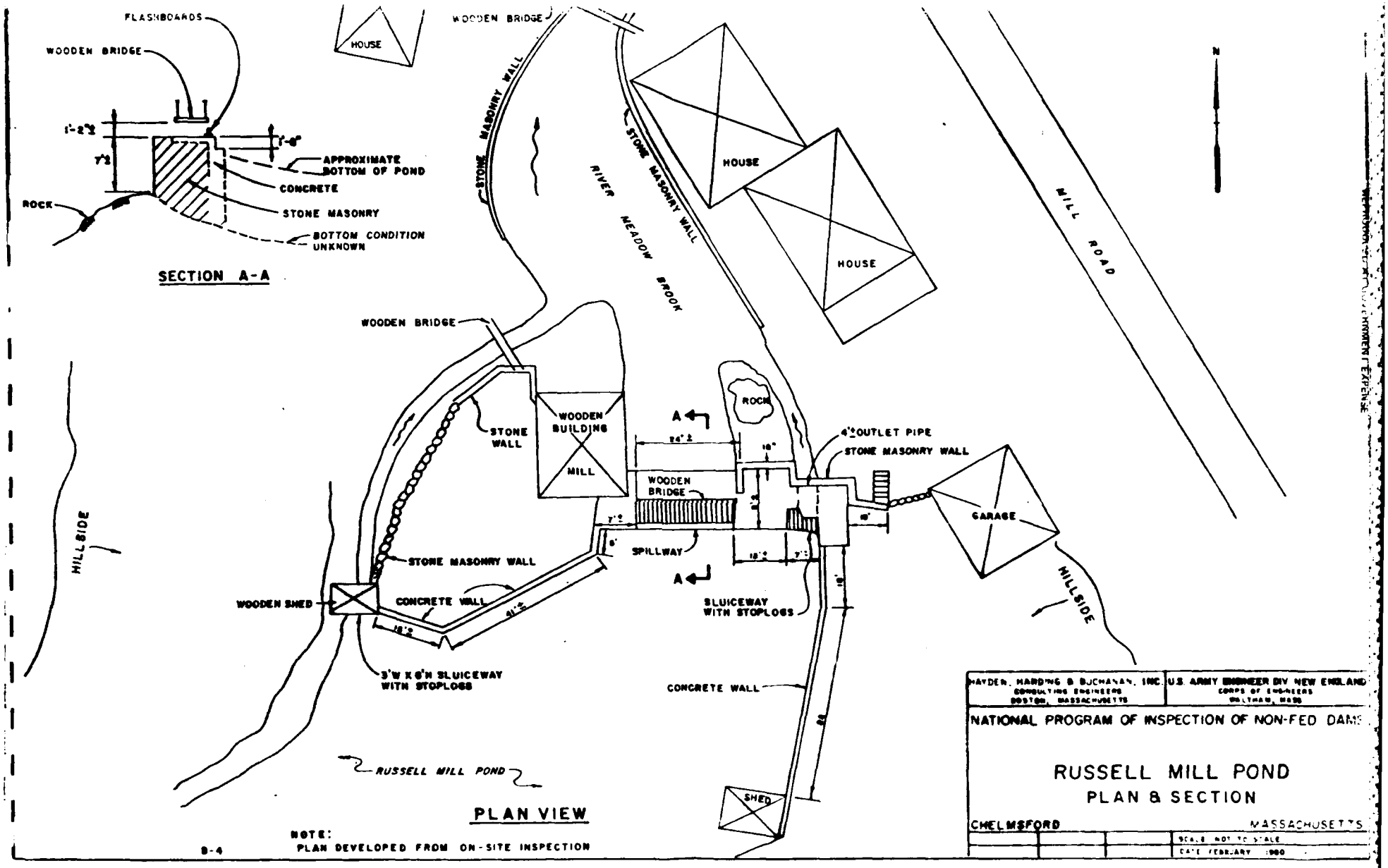
HAYDEN, HARDING & BUCHANAN, INC CONSULTING ENGINEERS BOSTON, MASSACHUSETTS	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

RUSSELL MILL POND DAM
ELEVATION

CHELMSFORD MASSACHUSETTS

SCALE NOT TO SCALE
DATE FEBRUARY, 1980


FLASHBOARDS
WOODEN BRIDGE
1'-2½"
7'-3"
1'-6"
APPROXIMATE BOTTOM OF POND
CONCRETE
ROCK
STONE MASONRY
BOTTOM CONDITION UNKNOWN
SECTION A-A
HOUSE
WOODEN BRIDGE
STONE MASONRY WALL
RIVER MEADOW BROOK
HOUSE
HOUSE
MILL ROAD
N
WOODEN BRIDGE
STONE WALL
WOODEN BUILDING
MILL
ROCK
4" OUTLET PIPE
STONE MASONRY WALL
WOODEN BRIDGE
GARAGE
HILLSIDE
STONE MASONRY WALL
SPILLWAY
SLUICEWAY WITH STOPLOGS
WOODEN SHED
CONCRETE WALL
3'W X 6'H SLUICEWAY WITH STOPLOGS
CONCRETE WALL
HILLSIDE
RUSSELL MILL POND
SHED
PLAN VIEW
NOTE:
PLAN DEVELOPED FROM ON-SITE INSPECTION
HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS
U.S. ARMY ENGINEER DIV NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS
RUSSELL MILL POND
PLAN & SECTION
CHELMSFORD
MASSACHUSETTS
SCALE NOT TO SCALE
DATE FEBRUARY 1980

OK FILE LRC

INSPECTION REPORT - DAMS AND RESTRICTORS

(1) Location: City/Town Chelmsford. Dam No 4-9-56-1

Name of Dam Russell's Mill Pond Dam Inspected by C. Johns & V. Murphy

Date of Inspection 8/19/74

(2) Owners: per: Assessors _____ Prior Inspection _____

Reg. of Deeds _____ Per. Contact ✓

1. Lloyd C. Greene, Jr. 99 Mill Road Chelmsford
Name St. & No. City

2. _____ 256-7754
Name St. & No. City

3. _____
Name St. & No. City

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

Same as above
Name St. & No. City

(4) No. of Pictures taken ✓

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

1. Minor _____ 2. Moderate ✓

3. Severe _____ 4. Discontinue _____

* This rating may change as land use changes in area of influence

(6) Outlet Control: Automatic _____ Manual ✓

Operative _____ yes _____

Comments: Control & emergency flood gates controlled by flashboards

(7) Upstream Face of Dam Condition: 1. Good ✓

2. Poor

Comments: Slight spalling of concrete - to be repaired by owner

B4a

DAM NO

(8) Downstream Face of Dam: Condition 1. Good ✓ 2. Minor Repairs ____
3. Major Repairs ____ 4. Urgent Repairs

Comments: ____

(9) Emergency Spillway: Condition: 1. Good ✓ 2. Minor Repairs ____
3. Major Repairs ____ 4. Urgent Repairs

Comments: ____

(10) Water Level @ time of inspection 0.5' below ____ dam ✓
top of dam ✓ Principal Spillway ____
Other ____

(11) Summary of Deficiencies Noted

Growth (Trees and Brush) on Embankment ~~None~~

Animal Burrows and Washcuts None

Damage to slopes or top of dam None

Cracked or damaged masonry spalling-(minor-owner to repair)

Evidence of Seepage None

Evidence of Piping None

Erosion None

Leaks None

Trash and/or debris impending flow None

Clogged or blocked spillway No

Other None

(12) Remarks & Recommendations: (Fully Explain)

Dam appears to be in good condition -

(13) Overall Condition:

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

Recommend removal from inspection list

DESCRIPTION OF DAM
DISTRICT ____

Submitted by C. Johnson & U. Murphy

Date 8/19/74

Dam No. 4-9-56-1
Name of Dam Chelmsford
Name of Pond Russell's Mill Pond Dam

1. Location (Topo Sheet No. 25 D)
Provide 8½" x 11" in clear copy of topo map with location of dam clearly indicated.

2. Year built: 1954 Year(s) of subsequent repairs Annual
Repairs made by owner

3. Purpose of dam: Water Supply ____ Recreation ✓
Irrigation ____ Other ____

4. Drainage Area 1¼ sq mi Approx. 640 ← NOT CONSISTENT

✓ 5. Normal Ponding Area ____ acres Ave. Depth 5' Impoundment 130,000,000 gals ? Asper owner

6. No. and type of dwellings located adjacent to reservoir (i.e. summer homes etc.) 4

7. Dimensions of Dam: Length ± 136' Max. Height 12'
Slopes: Upstream 4:1
Downstream 3:1
Width across top 11'7"

8. Classification of Dam by Materials:
Earth ____ Concrete ____ Masonry ✓ Steel ____ Timber ✓
Timber ____ Rockfill ____ Other ____

9. A. Description of present land usage in watershed above dam 100 % woodland

B. Is there a storage area of flat plain land above dam to accommodate the impoundment in the event of a dam failure?
no ✓ yes ____

DAM NO

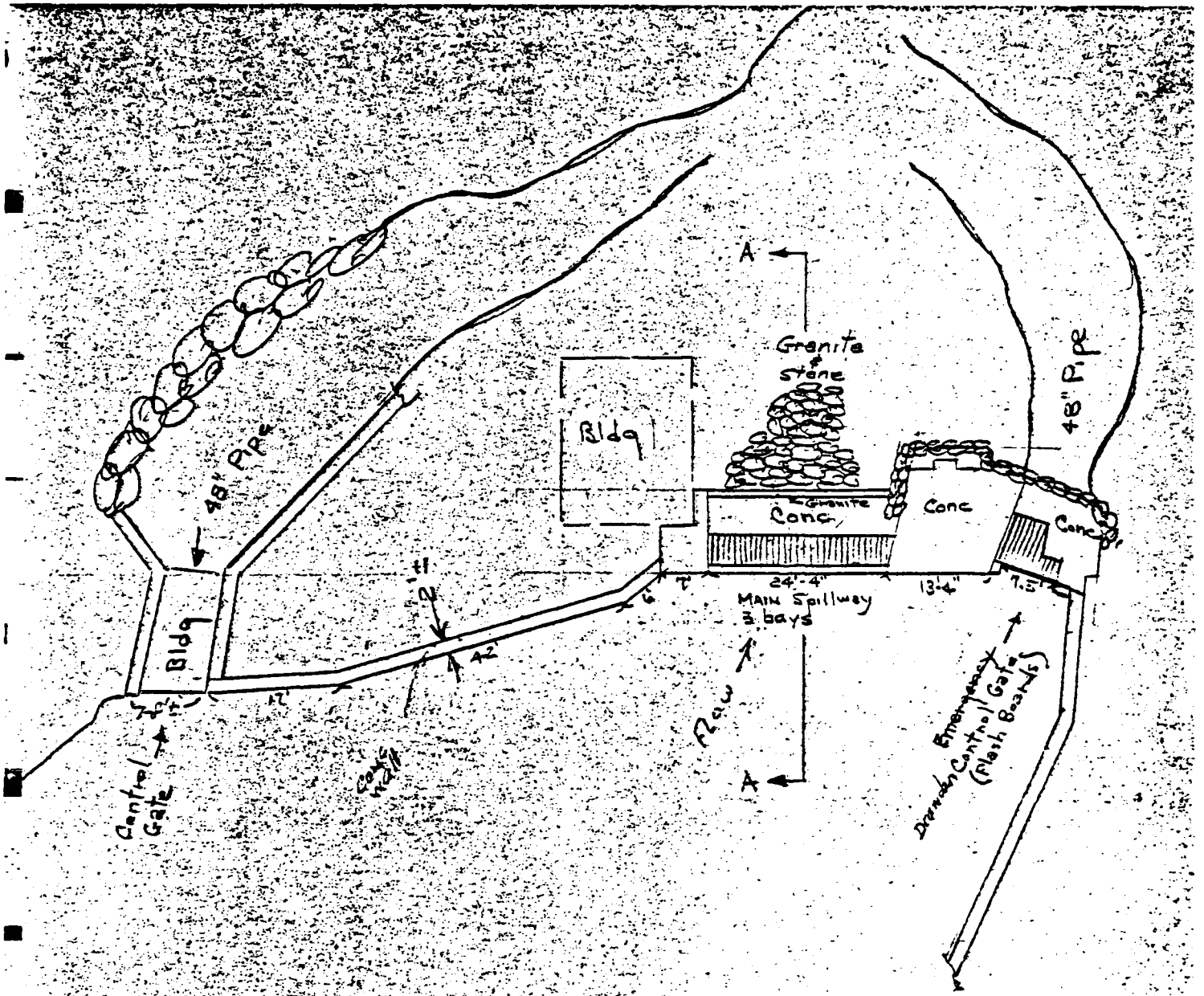
11. Risk to life and property in event of complete failure

No. of people	3	
No. of homes	4	
No. of businesses	1	
No. of industries	0	Type
No. of utilities	0	Type
Railroads	0	
Other dams	0	
Other	0	

12. Attach sketch of dam to this form showing [illegible] and mark [illegible] other

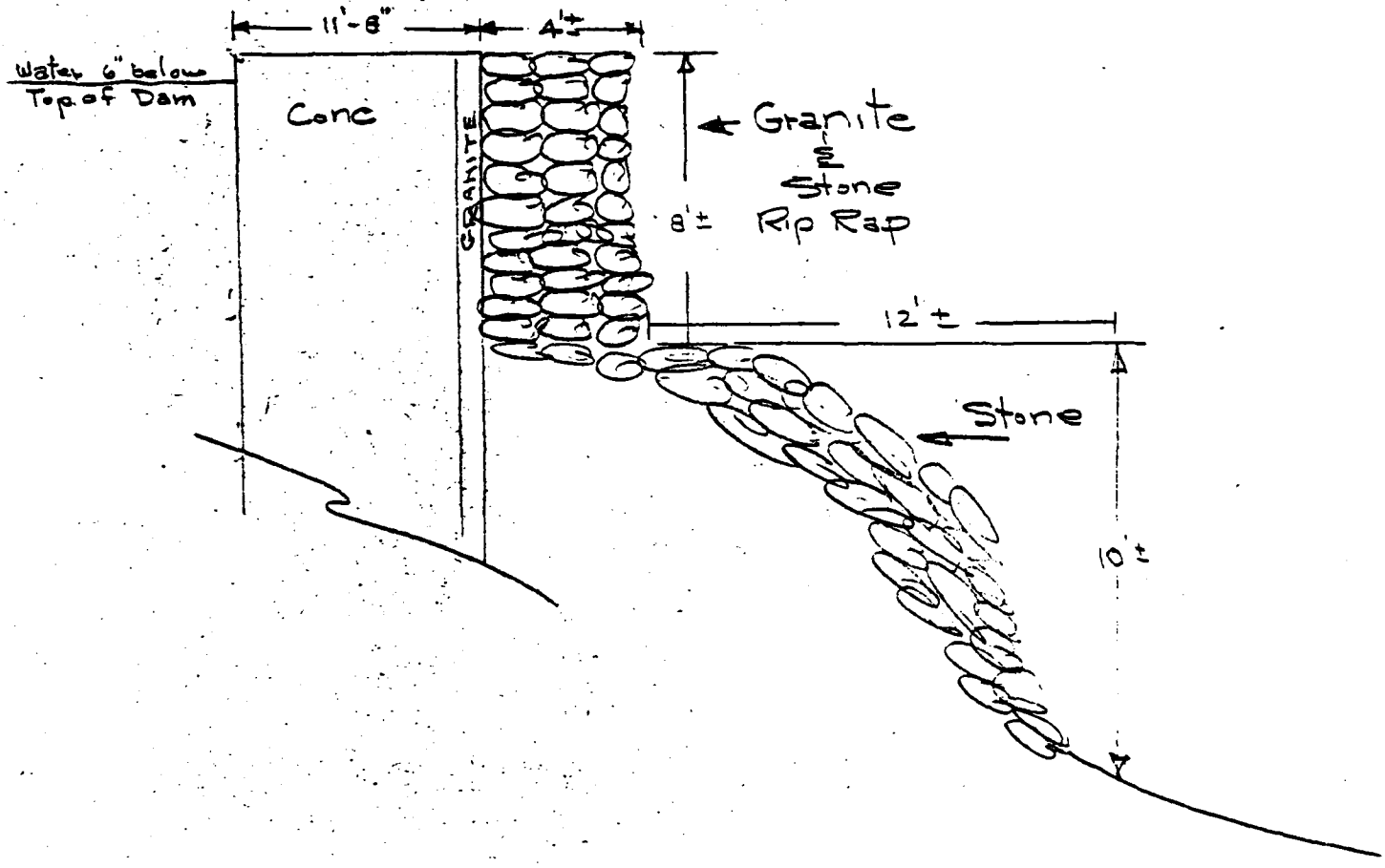
See attached sheet

12a. How to locate dam.

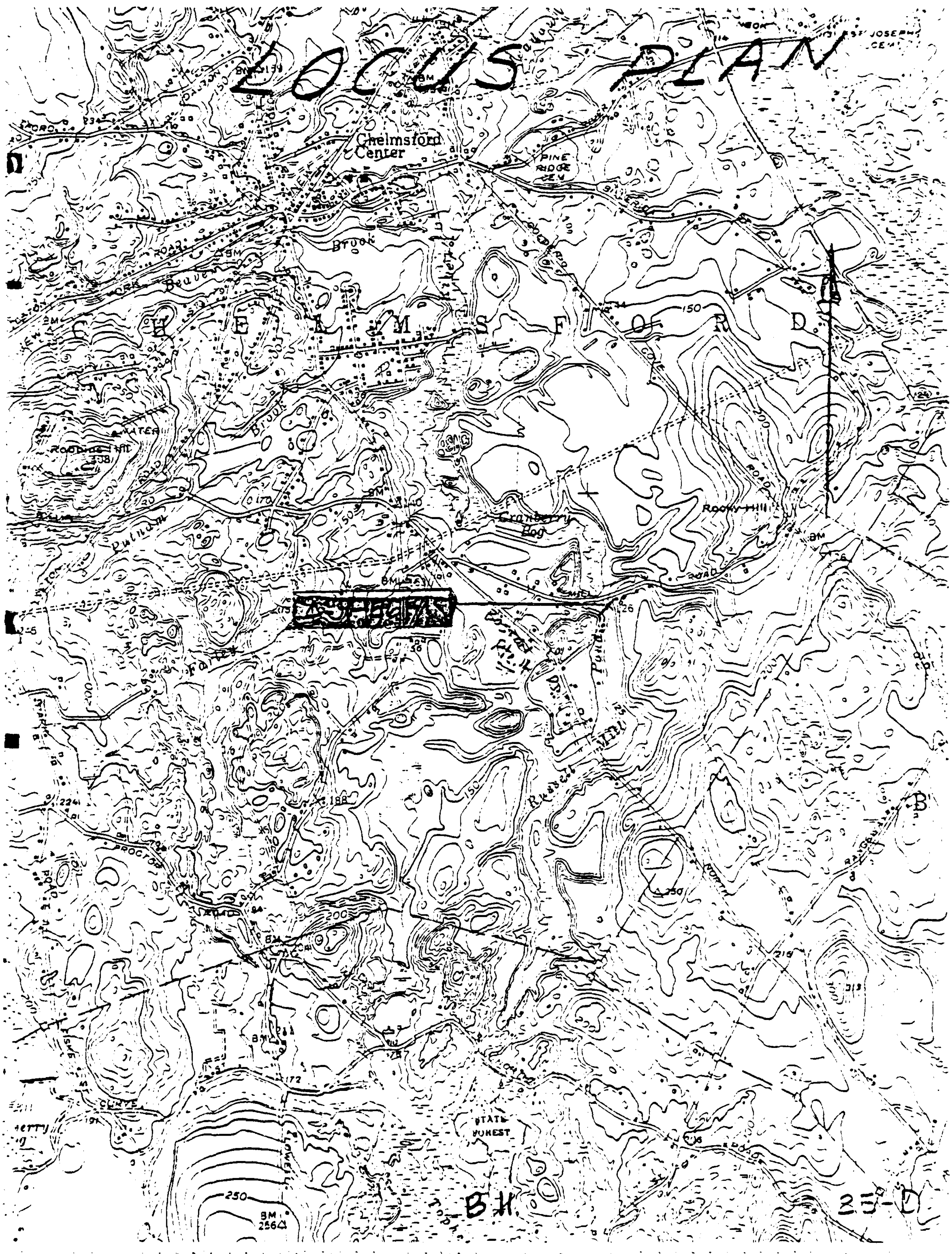

A
Granite
Stone
Bldg
48" Pipe
48" Pipe
Granite
Conc
Conc
Conc
Bldg
24'-4"
13'-4"
7.5'
MAIN Spillway
3 bays
Flow
A
Control Gate
Emergency Control Gate (Flash Boards)

N

PLAN VIEW


11'-8"
4'±
Water 6" below Top of Dam
Conc
GRANITE
Granite & Stone Rip Rap
8'±
12'±
Stone
10'±

SECTION A-A


LOCUS PLAN
Chelmsford
Center
PINE
RIDGE
CEM
Brook
C H E L M S F O R D
Cranberry
Bog
ROCKY HILL
STATE
FOREST
BH 23-D

July 9, 1973

Mr. Lloyd C. Greene
99 Mill Road
Chelmsford, Mass.

Dear Mr. Greene:

Please be advised that the Board of Selectmen at their meeting June 25, 1973, requested that you furnish them your reasons or problems for not allowing the pond to fill up this year.

An early reply would be appreciated.

Very truly yours,

Evelyn M. Haines
Administrative Assistant

EMH:gs

B 12

Ltg 7/30/23
15
gw
wlh
air

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Manufacturers of Unified
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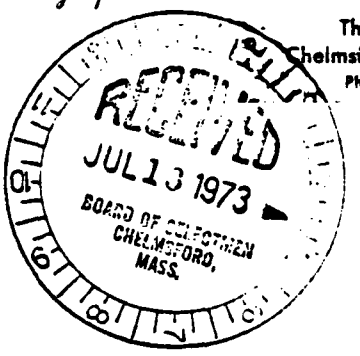
Phone: 256-7754

The Millstream
Chelmsford, Mass. 01824
Phone: 256-7754

July 12, 1973



Board of Selectmen,
Town Hall,
Chelmsford, Mass. 01824

Gentlemen:

Thankyou for your letter of July 9, 1973 and your expressed concern of our problems relating to Russells Mills Pond and dam.

As many years have elapsed since the last time the dam was extensively repaired, it is now again in need of major repairs. Until such repairs are made, it is the duty of the riparian owner to keep the water at the safest level consistent with conditions.

This action was delayed as long as possible but by the winter of 1972-73 it became quite clear that repairs could be delayed no longer.

Perhaps at the State or Federal level there may be a chance of aid, and I would welcome any information in this direction.

Respectfully yours,

Lloyd C. Greene, Jr.

LCG amc

B13

September 27, 1973

Mr. Lloyd C. Greene, Jr.
The Millstream
Chelmsford, Mass.

Dear Mr. Greene:

The Board of Selectmen would appreciate meeting with you on October 20, 1973, at 9:00 A.M. to view the Mill Pond dam.

Would you kindly advise me if this date and time is convenient in order that I may notify the Selectmen that you will be available on this date.

Very truly yours,

Evelyn M. Haines
Administrative Assistant

EMH:mm

Copy for
each Selectman w/m

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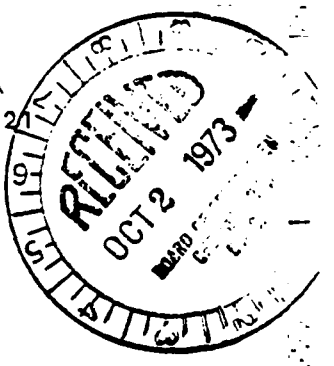

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The Millstream
Chelmsford, Mass. 01824
Phone: 256-7754

The Millstream
Chelmsford, Mass. 01824
Phone: 256-7754

Sept. 29, 1973

Board of Selectmen,
Town Hall,
Chelmsford, Mass. 01824

ATTN: Mrs. E. M. Haines, Adm. Asst.

The date of Oct. 20, 1973 at 9 o'clock in the AM will be most convenient for me to meet the selectmen at my mill dam at The Millstream.

I will have the gate to the parking lot directly opposite the site, open for their convenience in parking. Hoping for a nice sunny day to aid in the viewing, I am:

Respectfully yours,

LCG

LLoyd C. Greene, Jr.

November 6, 1973

Mr. Lloyd C. Greene, Jr.
99 Mill Road
Chelmsford, MA

Dear Mr. Greene:

The Board of Selectmen at their meeting October 25, 1973, requested that you submit in writing your specific requests that you wish the Board of Selectmen to consider regarding the Mill Pond Dam.

An early reply would be appreciated.

Very truly yours,

Evelyn M. Haines
Administrative Assistant

EMH/bat

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Manufacturers of Unified
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Chelmsford, Mass. 01824
Phone: 256-7754

The Millstream
Chelmsford, Mass. 01824
Phone: 256-7754

Nov. 26, 1973

Board of Selectmen,
Town Hall,
Chelmsford, Mass.

In response to your letter of Nov. 6, 1973, requesting my specific requests relative to my dam at Russell's Mills Pond, off Mill Road, I submit the following for your consideration.

When I purchased the mill site (Adams Mill) and riparian rights in 1954, the dam was greatly deteriorated, and as a consequence had to be largely re-built. Since then no major repairs have been undertaken and as a consequence of the wear and tear of Mother Nature over the years, the dam is again in need of extensive repairs and some upgrading in the type of gates to be installed for the safer operation of the dam. Enclosed is a copy of a letter just received from the Mass. Dept. of Public Works calling attention of dam owners, to their responsibility regarding certain measures to be taken to assure safety of an operating dam.

The repairs and improvements will require use of stone masons and other related labor, as well as much material and time. As your office knows, all this is quite expensive and I will need financial help in carrying out this effort. In order to provide for the continual safe maintenance of this dam, it is my hope that the board will be able to provide and annual allowance to avoid periodic lump sum such as needed now. When I carried out the 1954-1955 repairs, the local property taxes were very modest and so all extra money was plowed into the dam and appurtenances. Now, faced with expensive repairs, very large local property taxes, and an income no larger than 1954-1955, I could not undertake any repairs in 1973, after drawing down the waters of Russell's Mills Pond, as required by safety regulations contained in Chapter 256, par. #47, Annotated Laws of Mass.

A further reference in Chapter 253 implies that "anyone" deriving a benefit from a dam maintained by another, is liable for a share of the maintenance. Since 1954 the Russells Mills Pond has grown in importance to the town almost as fast as the community itself has mushroomed to over 33,000 population. Many new homes have been built along the pond shores and overview, affording residents scenic views and waterfront activity. The balance of the shoreline is frontage to the Town Forest and other conservation land, providing water for trees, plants, animals and waterfowl. The Russell's Mills Dam impounds over 130,000,000 gallons of water and in addition makes possible the slow run-off of water from vast upland swamp areas, thus supplying water in the

critical dry months of summer, to the wells located off Mill Road, belonging to the Center Water District. During one very dry summer, the Center Water District Commissioners asked me to open the flood gates of the pond and supply them several millions of gallons of water, which I did, thus aiding the wells, which were running dangerously low. In a similar manner I have supplied water for the Chelmsford Fire Dept. so they could test out new equipment at a time when local water supply was very low. This mill pond provides a safety factor in any future emergency, whether it would aid the fire department or provide drinking water, with simple filtering. It provides much pleasure for persons living in the mill pond vicinity and especially useful to the children each summer that come to Camp Paul, our good neighbor.

This invaluable resource can be maintained with only a modest annual commitment from the town. Costs are minimal due to my performing all the caretaking services of water level control by means of opening and closing the flood gates, removal of much floating trash coming down the pond and jamming operation of the gates if not promptly attended to. A constant weather vigil is maintained to prepare for possible flooding from heavy rains, hurricanes, winter thaws, and large spring run-offs. Experience in this instance and close knowledge of the dam operation is most critical to avoid unecessary water drain-off consistent with flood safety. Any vacation time under these requirements presents a bit of a problem and it might be advisable if a member of the Chelmsford Fire Department could be instructed in the manner of opening the spillways in case of an emergency when I might be away or even incapacitated. It would be most helpful if a means could be found to inform people in and around the pond shoreline to refrain from thowing trash such as branches, logs, auto wheel cans, bottles, plastics all kinds, into the pond and clogging the dam wate gates.

Just a short time ahead will bring us to the U.S. Bicentennial celebration and I hope that Chelmsford being an historic colonial town will be planing an active role in this event. If, with help, the dam and appurtenances can be repaired during 1974, I will plan and install the overshoot water wheel, which will then complete the restoration of this historic site, and provide for a nominal supply of electric generation. Yankee Magazine and possibly two others will be doing a story report with pictures of the restoration of the Adams Mill Site (Adams Grant) which will then be 320 years young. It would then be the only operating overshoot water mill in this entire Minute Man Area of historic towns, thus drawing a goodly number of bicentennial visitors and others in the years to come, and adding its mite to the towns economy.

Respectfully yours,

Lloyd C. Greene, Jr.

LCG

Board Of Selectmen
Town Hall
1 North Road
Chelmsford, Mass. 01824

EVELYN M. HAINES
ADMINISTRATIVE ASSISTANT
TEL. 256-2441

December 17, 1973

Bruce Campbell
Commonwealth of Mass.
Department of Public Works
Office of the Commissioner
100 Nashua Street
Boston, Mass. 02114

Dear Mr. Campbell:

Please be advised that the Board of Selectmen at their meeting Dec. 3 requested that the Department of Public Works make an inspection of the Russels Mill Pond in the Town of Chelmsford. In order to alleviate any questions regarding this request, I am enclosing for your review all correspondence regarding this subject.

If, however, I can be of further assistance to you, kindly contact my office.

Very truly yours,

Evelyn M. Haines
Administrative Assistant

EMH/bat

B 19

January 7, 1974

Charles F. Mistretta
District Highway Engineer
519 Appleton Street
Arlington, Massachusetts

RE: Inspection Request
Chelmsford
Russels Mill Pond Dam

Dear Mr. Mistretta:

Enclosed is a copy of a letter, with attachments, dated December 17, 1973, from the Chelmsford Administrative Assistant Evelyn M. Haines, requesting an inspection of the above dam.

At your earliest convenience would you kindly have this dam inspected and submit the "inspection and description reports" of same.

Thanking you in advance for your cooperation.

Very truly yours,

Fred C. Schwelm

FRED. C. SCHWELM, P.E.
Deputy Chief Engineer

LRA:vlc
enc.
cc. L. LaBelle

4RA

January 7, 1974

Board of Selectmen
Town Hall
1 North Road
Chelmsford, Massachusetts 01824

RE: Inspection Request
Chelmsford,
Russels Mill Pond Dam

Gentlemen:

As requested in Evelyn M. Haines' letter, dated December 17, 1973, an inspection of the above dam has been ordered.

When the inspection has been completed and a report submitted to this office you and the owner will be advised of our findings.

If you have any further questions please do not hesitate to contact us.

Very truly yours,

F.C. Schweiker

FRED. C. SCHWEIKER, P.E.
Deputy Chief Engineer

LRA:vlc
cc. C. F. Mistretta
L. LaBella

Board Of Selectmen
Town Hall
1 North Road
Chelmsford, Mass. 01824

EVELYN M. HAINES
ADMINISTRATIVE ASSISTANT
TEL. 256-2441

July 31, 1974

Fred C. Schwelm, P.E.
Deputy Chief Engineer
Department of Public Works
100 Nashua Street
Boston, Mass. 02114

Dear Mr. Schwelm:

In accordance with your letter of January 7, 1974, the Board of Selectmen would appreciate receiving a status report on the inspection of Russels Mill Pond Dam, Chelmsford, Mass.

Dam # 4-9-56-1

An early reply would be appreciated.

Very truly yours,

Evelyn M. Haines
Administrative Assistant

EMH/bat

DEPARTMENT OF PUBLIC WORKS
DEPUTY CHIEF ENGINEER
WATERWAYS

RECEIVED AUG 1 1974

Referred To Pasquesy
Report back to
File

B 22

Board Of Selectmen
Town Hall
1 North Road
Chelmsford, Mass. 01824

EVELYN M. HAINES
ADMINISTRATIVE ASSISTAN
TEL. 256-2441

August 15, 1974

DEPARTMENT OF PUBLIC WORKS
DEPUTY CHIEF ENGINEER
WATERWAYS

RECEIVED AUG 16 1974

Referred To
Report back to
File

Fred C.Schwelm, P.E.
Dept. of Public Works
Deputy Chief Engineer
100 Nashua St.
Bostnn, Mass. 02114

Dear Mr. Schwelm:

Attached please find pending correspondence of which we have not, to date, received a reply from you regarding this correspondence.

Would you kindly furnish a status report on this outstanding item.

An early reply would be appreciated.

Very truly yours,

Evelyn M. Haines
Administrative Assistant

EMH/bat
Enclosure (s)

B 23

JHP

August 28, 1974

Gerald J. Lannan, Chairman
Board of Selectmen
Town Hall
1 North Road
Chelmsford, Massachusetts 01824

RE: Dam No. 4-4-98-1
Russells Mill Pond Dam
Chelmsford

Dear Mr. Lannan:

Reference is made to the most recent letter, dated August 15, 1974, from Evelyn Haines, Administrative Assistant, regarding the status of the dam at Russels Mill Pond.

May I first express my apology for the long delay in responding to that letter. We have had several changes of dam inspection personnel who cover those dams in Middlesex County and I suspect that the initial copy of your letter requesting an inspection and report had been misplaced.

A visual inspection of the dam was made by Department engineers on August 19, 1974. The results of the inspection indicate that this dam is safe. The only deficiency noted was that of minor spalling of concrete, which the owner, Mr. Lloyd C. Greene, Jr., indicated he would repair. The report indicates that the dam is in good condition.

I hope that this information will be helpful. Please contact us if we can be of further assistance.

Very truly yours,

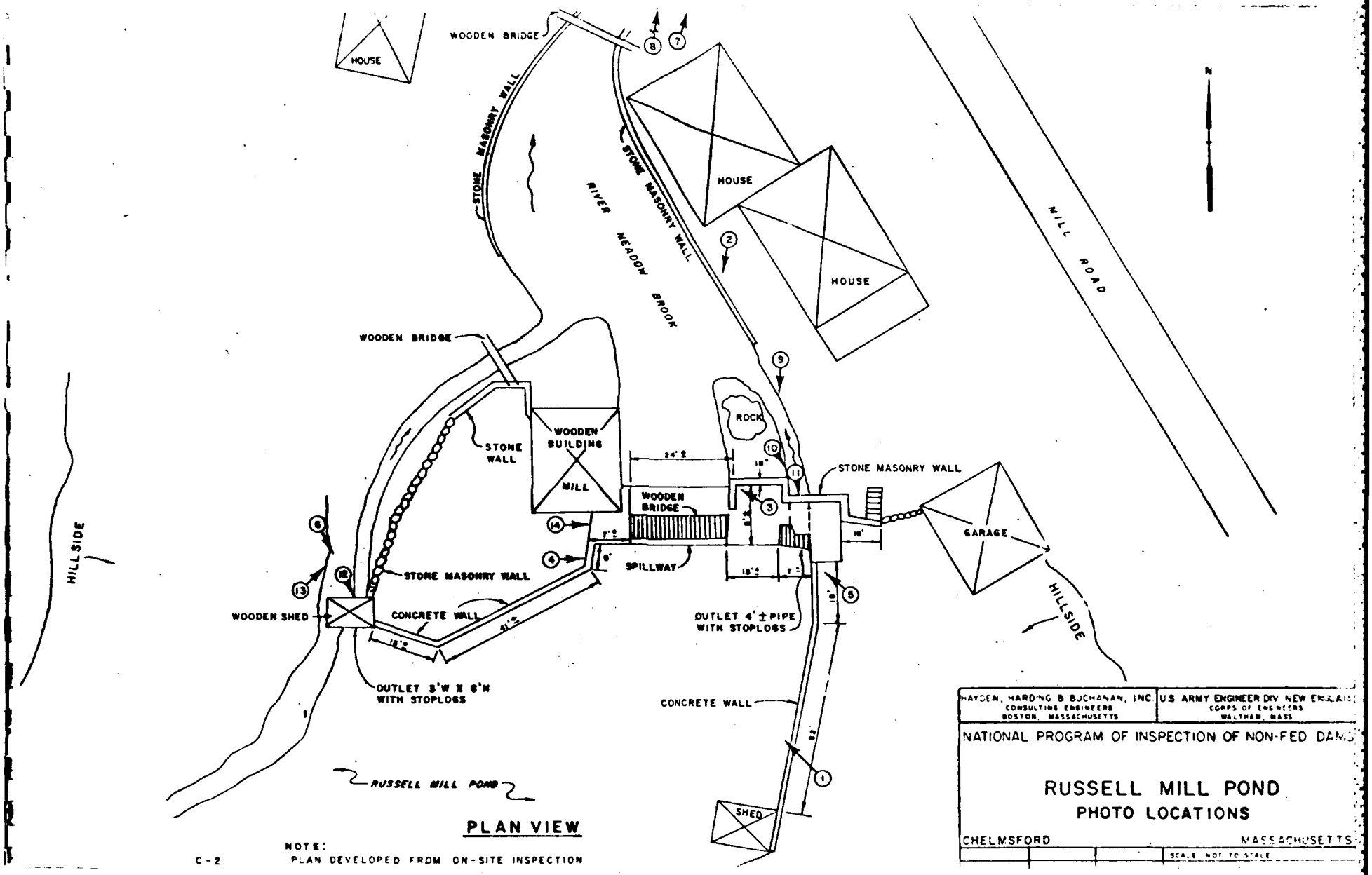
JCS
JHB
JHP:bmb
cc: Charles F. Mistretta
Vincent Murphy

LINCOLN A. JEAF, P.E.
Associate Commissioner

B 24

APPENDIX C

PHOTOGRAPHS


WOODEN BRIDGE
HOUSE
STONE MASONRY WALL
STONE MASONRY WALL
RIVER MEADOW BROOK
HOUSE
HOUSE
MILL ROAD
N
WOODEN BRIDGE
STONE WALL
WOODEN BUILDING
MILL
ROCK
STONE MASONRY WALL
WOODEN BRIDGE
GARAGE
HILLSIDE
STONE MASONRY WALL
SPILLWAY
WOODEN SHED
CONCRETE WALL
OUTLET 4'± PIPE WITH STOPLOGS
HILLSIDE
OUTLET 3'W X 6'H WITH STOPLOGS
CONCRETE WALL
RUSSELL MILL POND
SHED
PLAN VIEW
NOTE:
PLAN DEVELOPED FROM ON-SITE INSPECTION
HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS
U.S. ARMY ENGINEER DIV. NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS
RUSSELL MILL POND
PHOTO LOCATIONS
CHELMSFORD
MASSACHUSETTS
SCALE: NOT TO SCALE

C-2

MATCH LINE SEE BELOW

MATCH LINE SEE ABOVE

PHOTO NO. 1 - View of upstream face of Dam. Shown are the spillway, the 3 x 6 foot sluiceway below the small wood shed at the far left of the spillway, and the 4 foot pipe sluiceway to the right of the spillway, below the wood deck area. Beyond the spillway is the outlet channel area of Photo No. 3.

PHOTO NO. 2 - View of downstream face of Dam. At the left is the 4 foot outlet pipe. The spillway is at the center area. The discharge channel from the 3 x 6 foot sluiceway outlet is on the right of the mill building. Much of the stone masonry Dam has been rebuilt, as evidence in this photo by the use granite slabs at the 4 foot outlet pipe.

PHOTO NO. 3 - Outlet channel area immediately downstream of the Dam.

PHOTO NO. 4 - This view shows the upstream face of the spillway and the location of the 4 foot pipe in Photo No. 5. Flashboards are in place at the spillway, which vary in height. Much of the pond is silted-in, as evidenced by the growth of weeds at the spillway.

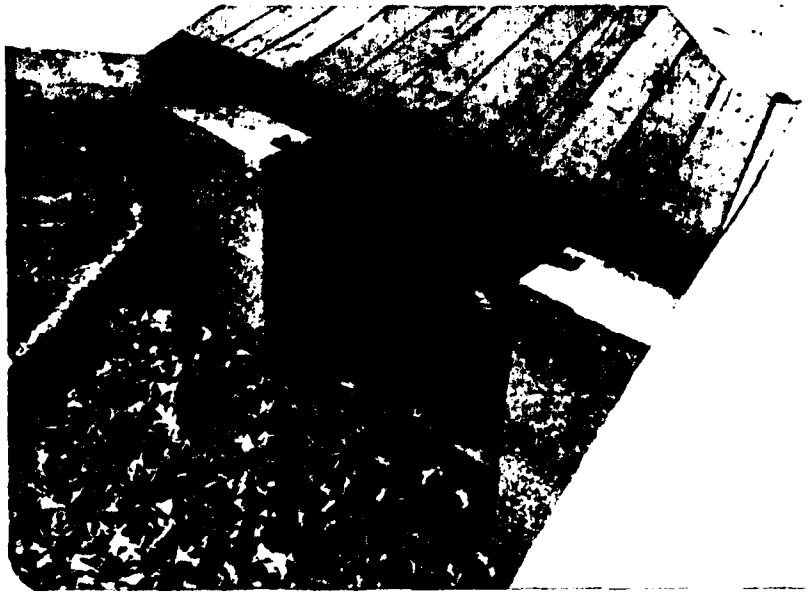


PHOTO NO. 5 - This is the sluiceway for the 4 foot outlet pipe. Stoplogs are used to control the water level. There are provisions for about 6 feet of stoplogs.

PHOTO NO. 6 - The downstream side of the 3 x 6 foot outlet structure is shown here. There are provisions for about 6 feet of stoplogs.

PHOTO NO. 7 - The Mill Road Bridge over Meadow Brook is shown here. Flow through the culvert opening is restricted by the downstream water level and an 8 inch gas main which blocks part of the opening.

PHOTO NO. 8 - This view shows the downstream channel just past Mill Road. This photo shows typical channel conditions that exist for over 2½ miles. The water surface level is controlled by a cranberry bog 3,000 feet downstream.

PHOTO NO. 9 - Panoramic view of the downstream face of the Dam from the right abutment to the left end of the spillway.

PHOTO NO. 10 - Seepage through stone blocks on the downstream face of the Dam adjacent to the right sluiceway outlet pipe.

PHOTO NO. 11 - Close-up view of seepage through stone blocks on the downstream face of the Dam, below the right sluiceway outlet pipe.

PHOTO NO. 12 - Left sluiceway outlet structure as viewed from downstream side of Dam.

PHOTO NO. 13 - Discharge channel of left sluiceway outlet as viewed from the left outlet.

PHOTO NO. 14 - Crest of Dam as viewed from the left outlet structure.

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

JOB NO. 79206.1
DATE 12/29/79
BY [illegible]
CH'D BY FDD

HH&B HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON — WEST HARTFORD
Rev 3-14-80

SHEET NO. D2
JOB Dams
SUBJECT Russell Mill
CLIENT CCE

Russell Mill Dam

Built: Prior to 1800
Drainage Area: 10.25 s.m. (6560± a) / 6.13* s.m. below Cranberry bog / 4.12 s.m. above bog
Storage Capacity: 150 a-ft

Height: 11'±.

Hazard Class: Significant (3 structures)

Size Class: Small.

Test Flood: 100 yr to ½ PMF range.

Use 100yr Storm (≈ ¼ PMF (flood)) (rural area) (3 structures)

Q_{INFLOW} $\frac{1}{4}$ × 6.13* × 700 csm = 1072 cfs
+ 100 cfs from upstream areas
NO FLASHBOARDS Total Q_{IN} = 1172 cfs

Outflow = 1046. cfs at Elev 128.2
Test flood over tops dam by 1.2'±

Spillway passes 230. cfs or 22.%± test fld.

all outlets pass 345. cfs or 33.%± " "

WITH FLASHBOARDS (8"±) Existing Conditions

Outflow = 1041 cfs at elev 123.3
Dam over topped by 1.3 ft±
Spillway Passes 105. cfs or 10.% ± test fld
all outlets pass 230. cfs or 20.% " "

---

* Note 6.13 s.m. drainage area for test flood analysis used due to characteristics of 4.12 s.m. above Heart Pond & cranberry bog, see PS D7A & D7B

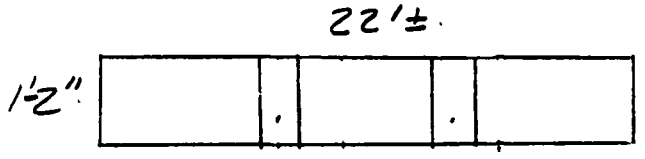
JOB NO. 792061
DATE 12/2/79
BY MA
CH'D BY FDD

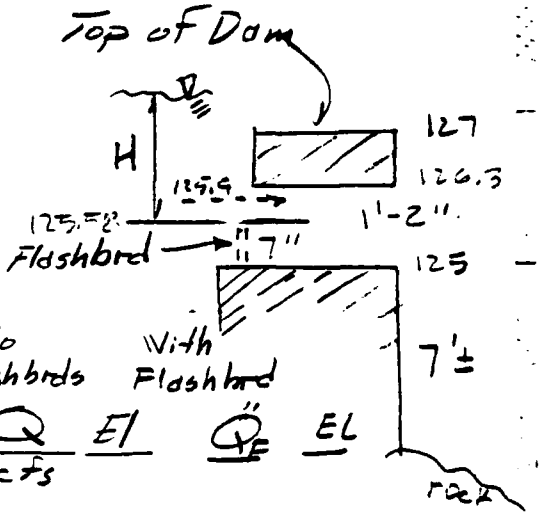
HH&B HAYDEN, HARDING & BUCHANAN, INC.
CONSULTING ENGINEERS
BOSTON — WEST HARTFORD

SHEET NO. D3
JOB DAMS
SUBJECT RUSSELL MILL
CLIENT COE

DISCHARGE

A, Spillway





$Q = C L H^{3/2}$

D	C	L	$H^{3/2}$	Q	El	Q_E	EL
f		f		cfs			
0.5	2.7	19.	0.35.	18.	125.5	18	126.0±
1	2.68	"	1	51.	126.0	23	126.3
1'-2"	2.66	"	1.26.	64.	126.3	—	—

Orifice $Q = C a \sqrt{2gH}$ $C = .72 + .0074(6.3) = .76$

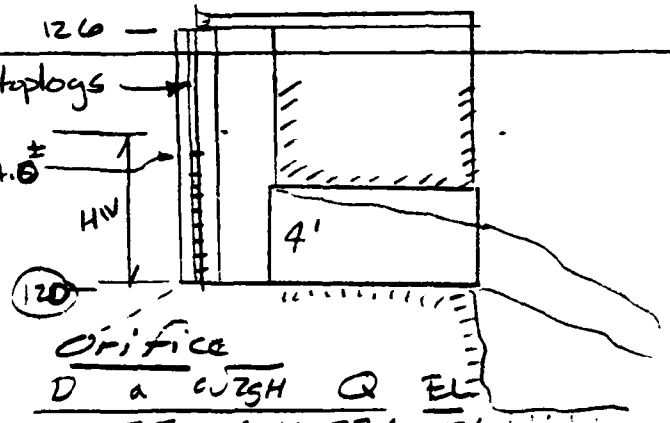
D	a	$C\sqrt{2gH}$	Q	El	A	Q_E	EL
1	22.23.	6.1.	135.6.	126.58	11.sf	68	127
2	"	8.6.	191.7.	127.58		96	128
3	"	10.6.	234.8.	128.58		118	129
4	"	12.2.	271.1.	129.58		136	130
5	"	13.64.	303.	130.58	11.	150	131

JOB NO. 792061
DATE 12 Feb 79
BY MA
CH'D BY FDD

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

SHEET NO. D 4
JOB [illegible]
SUBJECT RUSSELL MILL
CLIENT COE

Discharge



B. 4 ft. ϕ pipe

HW	HW/D	Q
4	1	70
5	1.25	90
6	1.5	100
8	2	125
10	2.5	150

Orifice

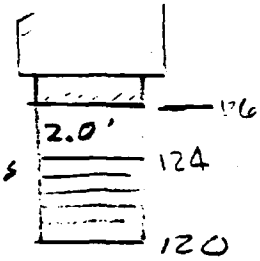
D	a	$C\sqrt{2gH}$	Q	EL
1	5.5	6.1	33.6	126
2	5.5	8.6	47.3	127
3		10.6	58.3	128
4		12.2	67.1	129
5	↓	13.6	74.8	130
6	5.5	15	82.5	131

$V = \frac{1.49}{.06}(2^{2/3})\sqrt{.06}\,R^{2/3}\,6.07$

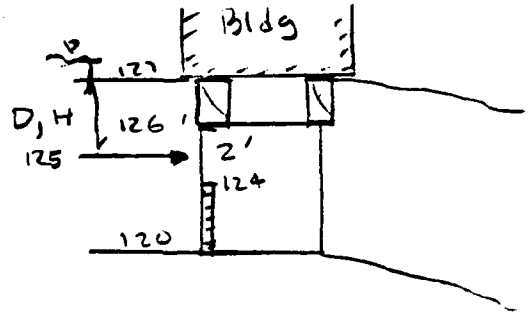
$S = \frac{6}{100} = .06$

C. 3'x 6' opening

D	WP	A	$R^{2/3}$	(6.07)	Q
6	16	18	1.08	6.56	118.0 ← no staplogs



Orifice $C = .74 + .0074(3) = 0.76$



D	a	$C\sqrt{2gH}$	Q	El
f	sf		cfs	
1	6	6.1	37	126
2		8.6	52	127
3		10.6	64	128
4		12.2	73	129
5		13.64	82	130
6	↓	15	90	131

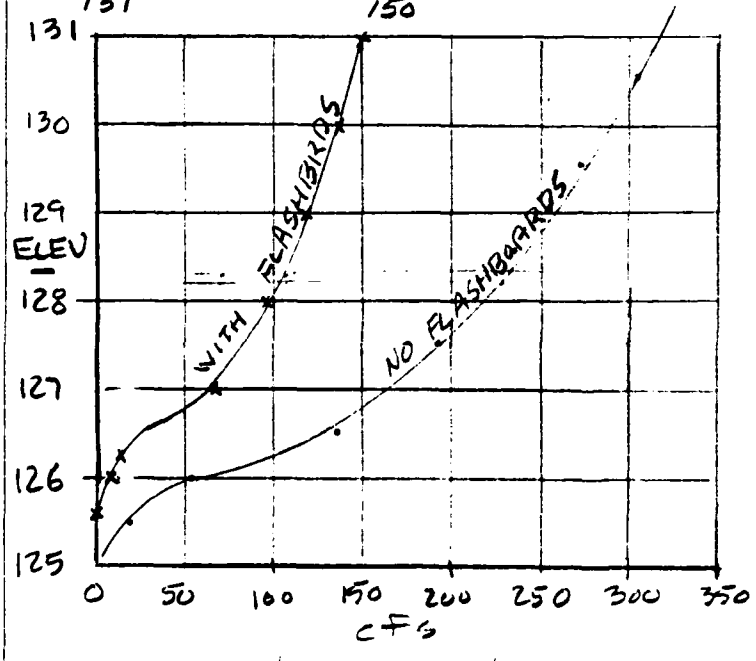
JOB NO. 792061
DATE 121976
BY MA
CH'D BY FDD

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

SHEET NO. D 5
JOB DAMS
SUBJECT RUSSELL
CLIENT COE

DISCHARGE - COMBINED - EXISTING CONDITIONS

D	ELEV	A. SPILLWAY	B. 4' PIPE	C. 3'x6'	(A+B+C) Combined
					NO FLASHBR.
0	124	0	0	0	0
1	125	0	11	8	19
2	126	51	34	37	122
3	127	160	47	52	259
4	128	215	58	64	337
5	129	255	67	73	395
6	130	290	75	82	447
7	131	315	83	90	488
					WITH FLASHBRDS
	124	0	Same	Same	0
	125	0			19
	126	0			71
	127	68			167
	128	96			218
	129	118			258
	130	136			293
	131	150			323



Spillway - Only

(A.)

JOB NO. 792061
DATE 12/26/79
BY MA
CH'D BY FDD

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

SHEET NO. I 0
JOB DAMS
SUBJECT RUSSELL MILL
CLIENT COE

Rev 3-14-80

Discharge over top of dam - No Flashbrd

Q_{In} = 1172 cfs H_1 = 128.3 D.

Str_1 = 220 - 51 = 169 a-f or 0.52" of runoff

D	L	C	$H^{1.5}$	Q	overflow at dam Elev.
1	200'±	2.6	1.	520.	128.0
2	"	"	2.83	1470.	129.0
1.5	"	"	1.84.	955.	128.5
0.5	"	"	0.35.	184.	127.5

2

See Combined discharge graph on page D-10 for Stage - Discharge

$$Q_{P_2} = 1172 \left(1 - \frac{0.52}{4.75.}\right) = 1044. \text{ cfs}$$

(4.75. = 100 YR)

H_2 = 128.2 Str_2 = 213 - 51 = 162 or 0.5"

$$Q_{P_3} = 1172 \left(1 - \frac{0.51}{4.75.}\right) = 1046. \text{ cfs}$$

Elev = 128.2

WITH Flashboards Q_{P_1} = 1172 cfs h_1 = 128.5 S_1 = 179 a-f or .55"

$Q_{P_2} = 1172\left(1 - \frac{.55}{4.75}\right) = 1036$ h_2 = 128.25 S_2 = 164 a-f or .51"

$Q_{P_3} = 1172\left(1 - \frac{.53}{4.75}\right) = 1041$ cfs El = 128.3±

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

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

D7
SHEET NO.
JOB DAMS
SUBJECT Russell Mill
CLIENT COE

Rev 3-14-80 MA

Stage Storage

ELEV	Area a	Ave Area a	Stor a-f	Accm Stor a-f
140	120	108.5	542	1296
135	97	85	425	753
130	73	55	220	328
126	37	32.5	32.5	108
125	28	19	77	77
121	10	—	—	—
124	24	17	51	—

JOB NO. 79206.1
DATE 3-17-80
BY MA
CH'D BY FDD

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

SHEET NO. D7A
JOB Dams
SUBJECT Russell Mill
CLIENT CCE

Storage Potential In Watershed Above Cranberry Bog

Crabbery Bog

Bog Area 35.8 a × 2' = 72 a-f

Pond Area

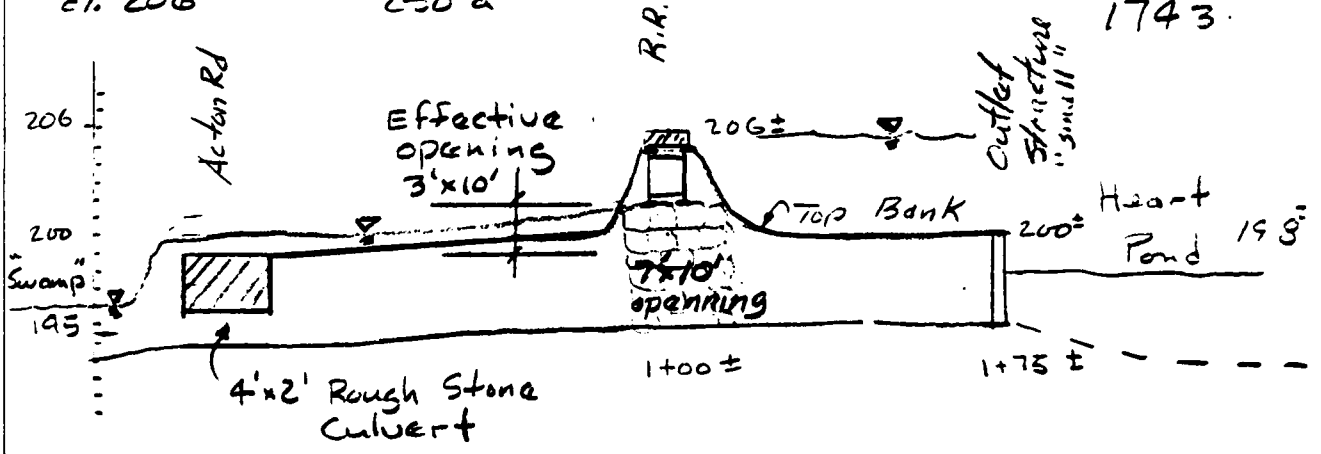
East 60 a × 3' = 180 a-f
West 67 a × 3' = + 200 a-f
452

Heart Pond control @ R.R. elev 206±.

El. 198 Pond 151 a
181 × 2 362 a-f

El. 200 211 a
230 × 6' + 1381 a-f
1743

El. 206 250 a



Railroad about 1± mile long & flat, this is only major opening, all roads are at grade crossings smaller cross culverts (2'x2', 18"ø) less to other potential storage areas

JOB NO. 79206.1
DATE 3-17-80
BY MA
CH'D BY FDD

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

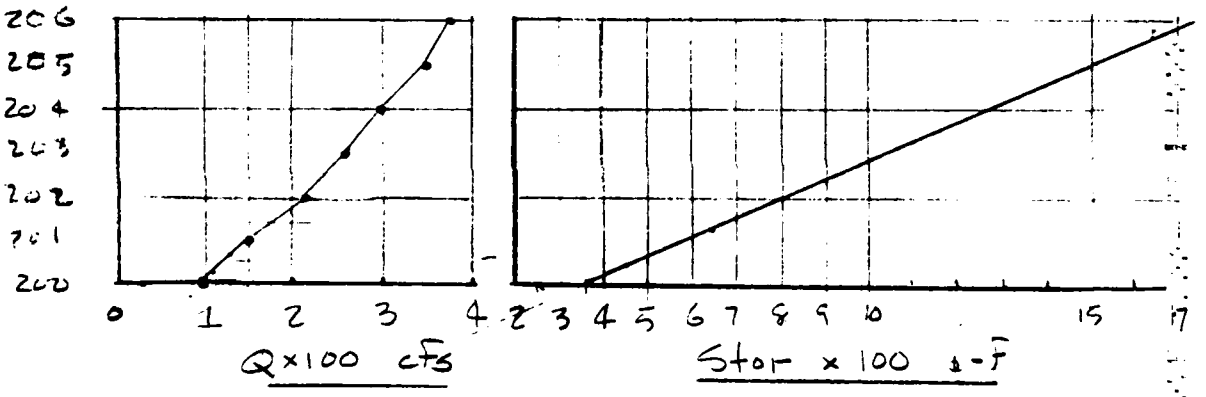
SHEET NO D7B
JOB Dams
SUBJECT Russell Mill
CLIENT CCE

Heart Pond

Drainage Area = $2.52^{\pm}$ s.m., $1610^{\pm}$ a
Total Runoff = $4.75'' \times \frac{1}{12} \times 1610 = 638$ a-f
Max Pot. Storage = $174\frac{1}{3}$ a-f
Ave Slope = $\frac{11.4' + 0}{6000}(5280) = 10$ f/m.

Peak inflow = $2.52 \times \frac{1}{4} \times 700$ csm = $440^{\pm}$ cfs
& considers 10.25 s.m.

Discharge 3'x8' culvert (1' Tw.)



$Q_{P_1} = 440^{\pm}$ cfs can't develop this since Stor. controls Qout
For total Stor of 638 a-f, el = 201.5
Due to ponds stor capacity & "small, controlled discharge" peak discharge to bog will be "small", on the order of 125 cfs as at elev $200.5^{\pm}$ stor = $450^{\pm}$ a-f & since we have discharge while water is being stored, ave discharge approximately will be $125^{\pm}$ cfs (routed thru outlet & pond).

JOB NO. 79206.1
DATE 3-17-80
BY MA
CH'D BY FDD

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

SHEET NO. D7C
JOB Dams
SUBJECT Russell Mill
CLIENT Corps

Cranberry Bog

Drainage Area = 1.6± s.m. or 1025± a
Total Runoff = 4.75" × 1/12 × 1025 a = 406 a-f
Ave slope ≈ 10'/7000' × 5280 = 7.5 '/mi but this is through water stor areas – changes occur at dikes & outlets.

The bog and storage ponds comprise a "total" stor. & discharge project with "small" outlet structures & "large" storage areas. Discharge is normally kept "small" since the operators want to store a maximum amount of water. The storage volume and levels observed are typical for operation.

Peak inflow = 125+ 1.6 × 1/4 × 700 ≈ 405. cfs
(700 csm used since we are considering a 10.25 s.m. area, not a small isolated area)

Available stor ≈ 452 a-f since the outlets are controlled & "small", consider Qout to be small (less than 150 cfs) due to nature of bog & its characteristics of operation.

Qout from both Head Pond & bog will not have significant, if noticeable effect on Russell Millpond. There is additional storage along Pond Brook & the swamps in the area below the bog. Consider Russell Millpond having direct runoff area of 6.13± s.m. for peak inflow from test flood.

$Q_{P_1} = 440$ $El_1 = 206$ $St_1 = 1743$ of on 13" > 4.75

$St_{on\ ave} = \frac{13+0}{2} = 6.5 > 4.75$

$St_{on\ ave} = \frac{6.5+0}{2} = 3.25 < 4.75$

$Q_{P_6} = 440\left(1 - \frac{3.25}{4.75}\right) = 140$ cfs $El_6 = 201$

$St_6 = 580$ of on 4.32" ave = 3.79

$Q_{P_7} = 440\left(1 - \frac{3.8}{4.75}\right) = 88$ $El_7 = 199.75$

$St = 325$ on 2.42" ave 3.1"

$Q_{P_8} = 440\left(1 - \frac{3.1}{4.75}\right) = 152$ $El = 201$ $St = 4.3$

ave = 3.71

$Q_{P_9} = 440\left(1 - \frac{3.71}{4.75}\right) = 96$ $El = 200.$ $St = 350$ on 2.60"

ave = 3.16

$Q_{P_{10}} = 440\left(1 - \frac{3.16}{4.75}\right) = 147$ $El = 201 \pm$ $St = 580$ on 4.32"

Let $Q_{out\ ave} \approx 125$ cfs

JOB NO. 792061
DATE 3-17-80
BY MA
CH'D BY FDD

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BOSTON — WEST HARTFORD

SHEET NO D7E
JOB Dams
SUBJECT Russell Mill
CLIENT COE

Drainage Area To Heart Pond = 2.52 sm

Swamp Area (above El 200) = 0.40 sm

Heart Pond El 197 0.26 sm
El 200 0.40 sm

} .2 sm

Cranberry Bog below Heart Pond = 1.6 sm

Upper Pond El. 195± 0.20 sm
Lower Pond & Bog El. 190± 0.24 sm

} includes swamp area above lines

Total Drainage Area to Bog Outlet = 4.12 sm

$$\frac{\text{Swamp/Pond}}{\text{Total}} = \frac{1.24}{4.12} = 0.30 \text{ or } 30\%$$

Drainage Area between Bog & Russell Millpond

6.13 s.m. (3925 a)

Swamp Area 0.75 s.m.

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DATE 12/9/74
BY MA
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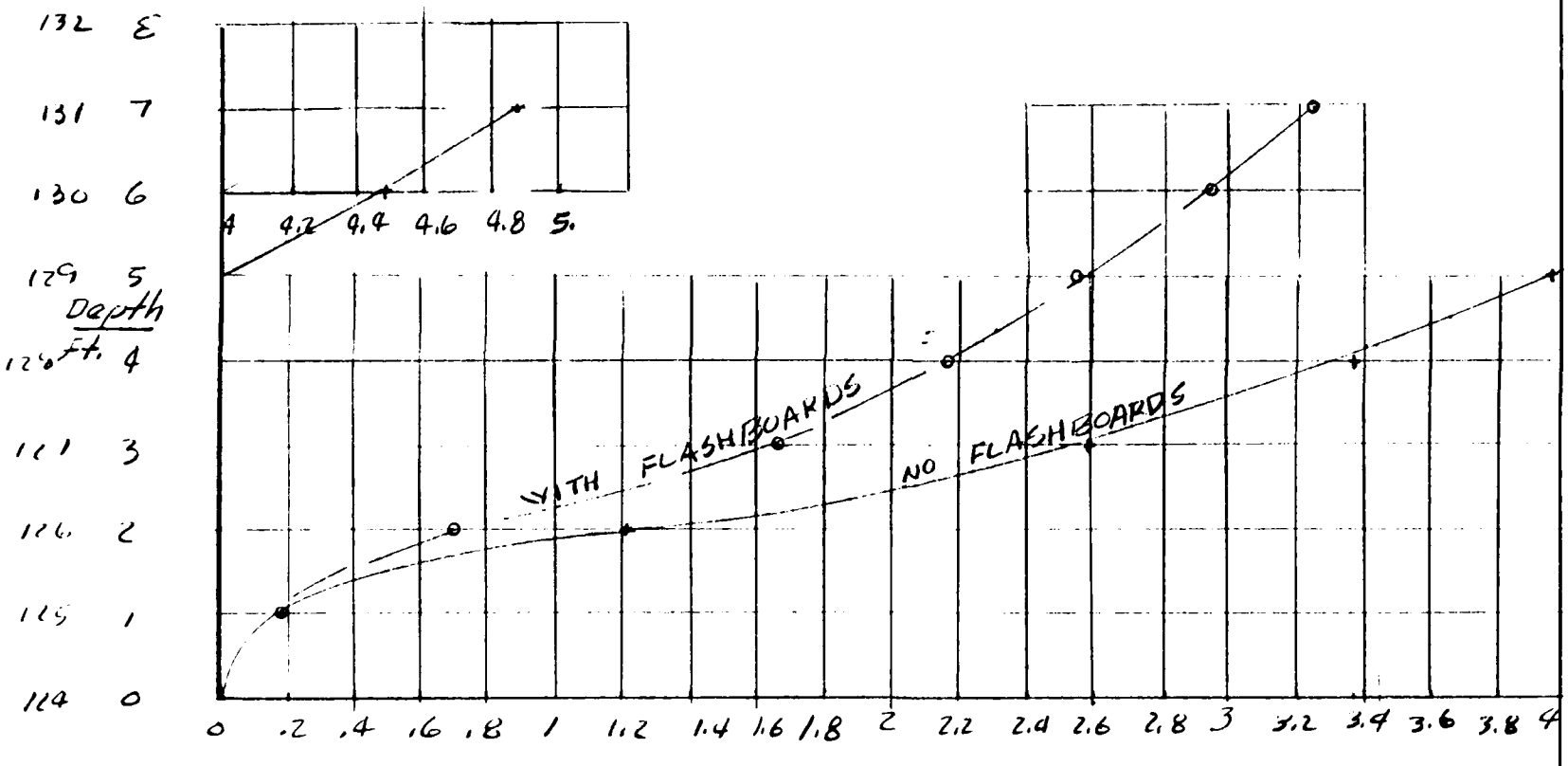
BOSTON — WEST HARTFORD

JOB DAMS
SUBJECT RUSSELL
CLIENT COE

SHEET NO D8



Outlets Combined - Existing Conditions
(outlets using stoplogs)
(A+B+C)

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DATE 121979
BY MA
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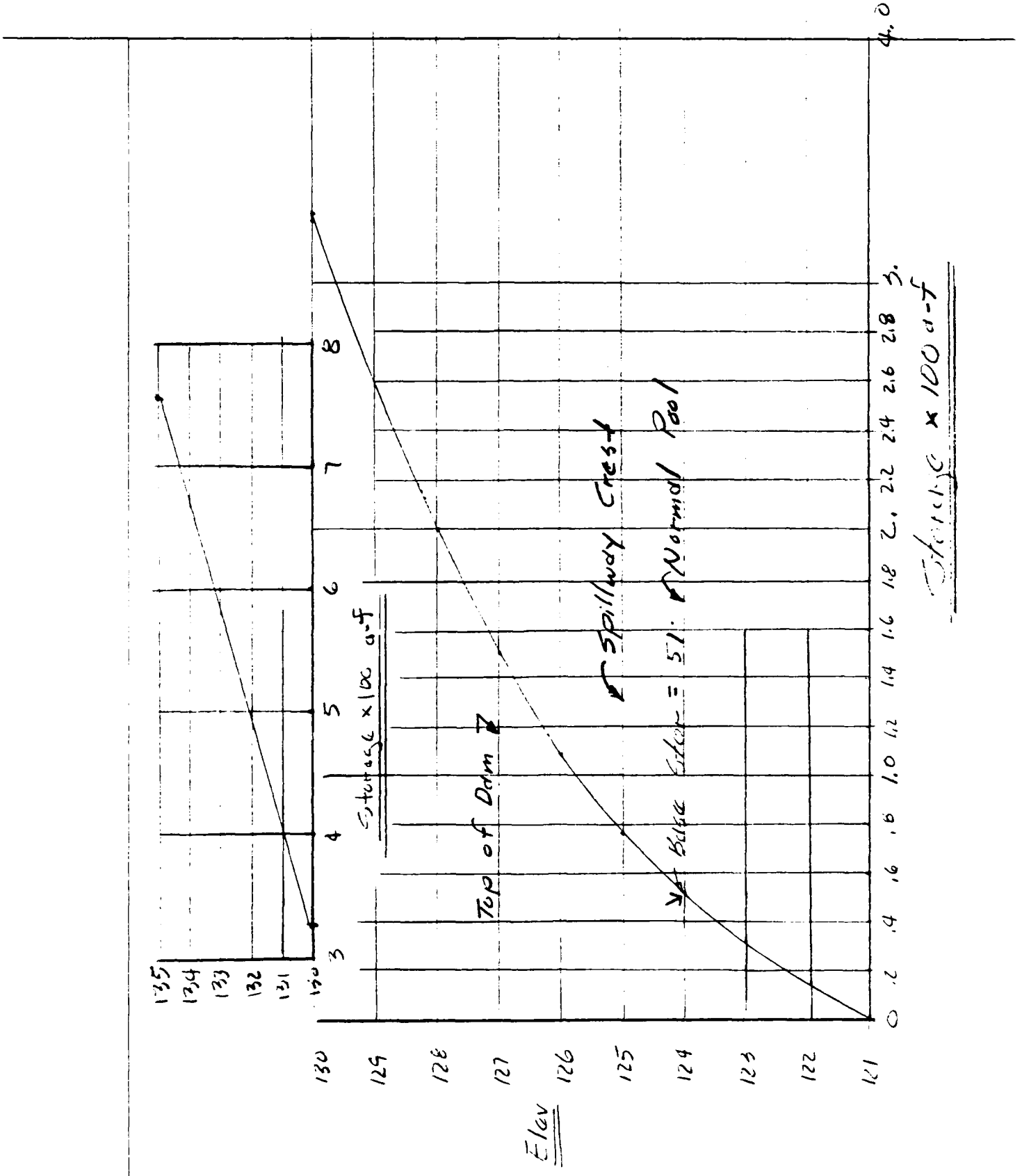
BOSTON — WEST HARTFORD

SHEET NO. D9
JOB DAMS
SUBJECT RUSSELL
CLIENT COE



JOB NO 792061
DATE 12/5/79
BY MA
CH'D BY FDD

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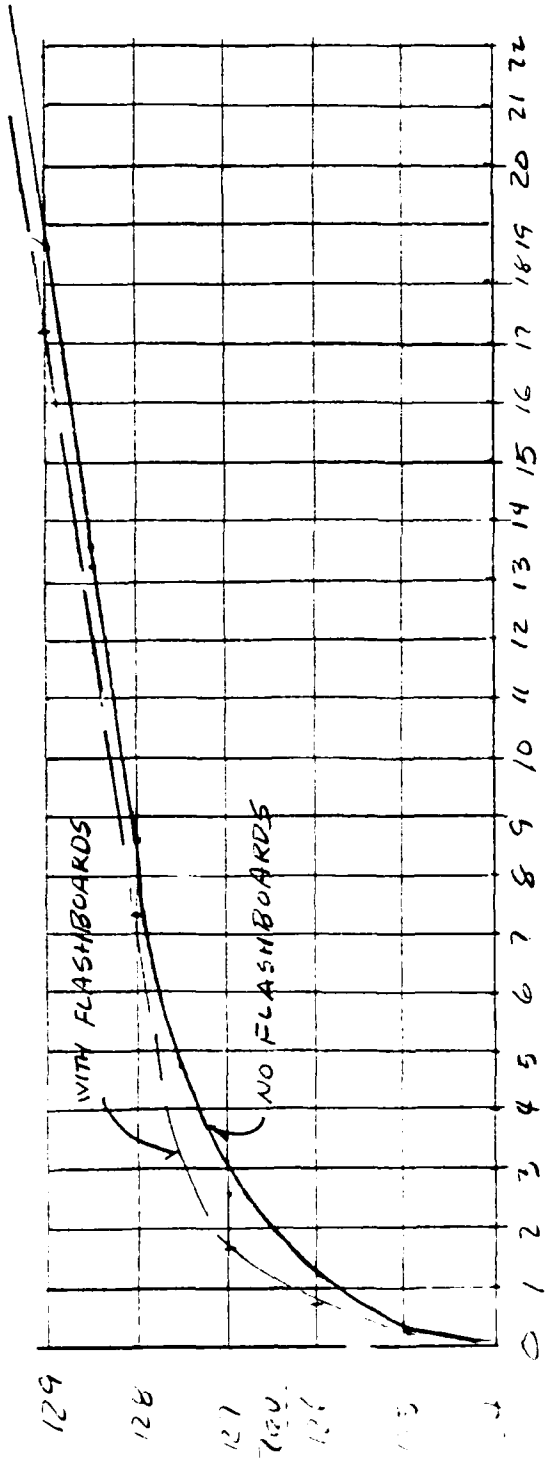
BOSTON — WEST HARTFORD

SHEET NO D10
JOB DAMS
SUBJECT RUSSELL MILL
CLIENT COE

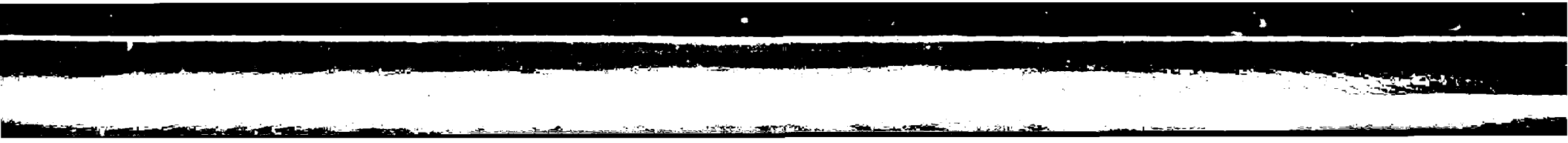


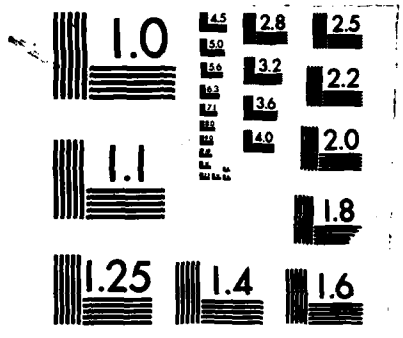
$$\frac{\text{Discharge}}{\text{Discharge}} \times 100 \text{ cfs}$$

$$\left[\frac{\text{Combined - all outlets + overflow}}{(A+B+C+D)}\right]$$

AD-A155 384 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS 2/2
RUSSELL MILL POND (MA.. (U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV MAR 80

UNCLASSIFIED F/G 13/13 NL





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BOSTON — WEST HARTFORD

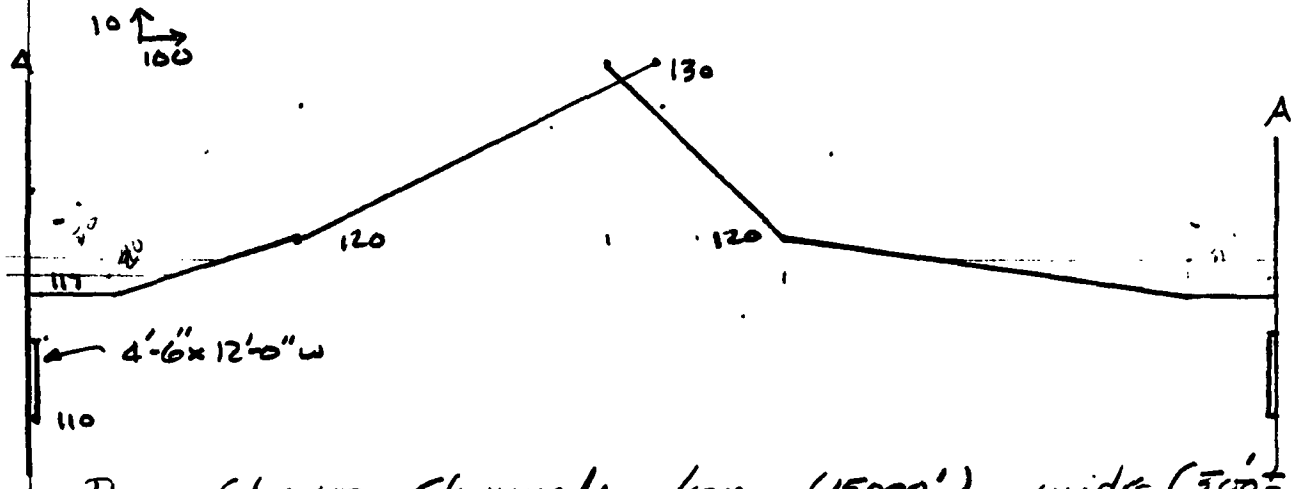
SHEET NO D 11
JOB DAMS
SUBJECT RUSSELL
CLIENT COE

DAM FAILURE ANALYSIS

$Q = \frac{8}{27}(0.4 \times 50) \times (\sqrt{32.2}) \times (11)^{1.5} = 1227.$ cfs

Dam is 50'± wide at natural stream area..

Sta 2400 $Q_{P_1} = 1227$ cfs Mill Road



Down Stream Channel: long (15000'), wide (500'±)

Slope = $\frac{10}{15000} = 0.00067$ ft/ft Sta 30+00± - Cranberry bog controls Sta 30+00±.

$V = \frac{1.486}{0.06} \cdot R^{2/3} (0.00067)^{1/2} = R^{2/3}(0.641)$

D	WP	A	$R^{2/3}$	(0.641)	V	Q
1	200	160	0.86	"	0.55	88
2	285	395	1.24	"	0.8	315
5	500	1825	2.38	"	1.53	2785
3	425	750	1.46	"	0.94	700
4	460	1140	1.84	"	1.18	1342

JOB NO. 792061
DATE 122179
BY MA
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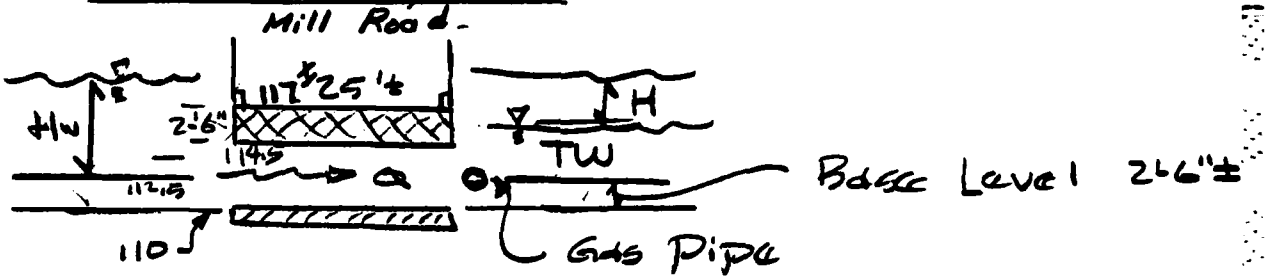
SHEET NO D 12
JOB DAMS
SUBJECT RUSSELL
CLIENT COE

Sta 2+00

Culvert Capacity 4'-6"x12'-0"



culvert size reduced to 2'x 12'± by outlet channel conditions

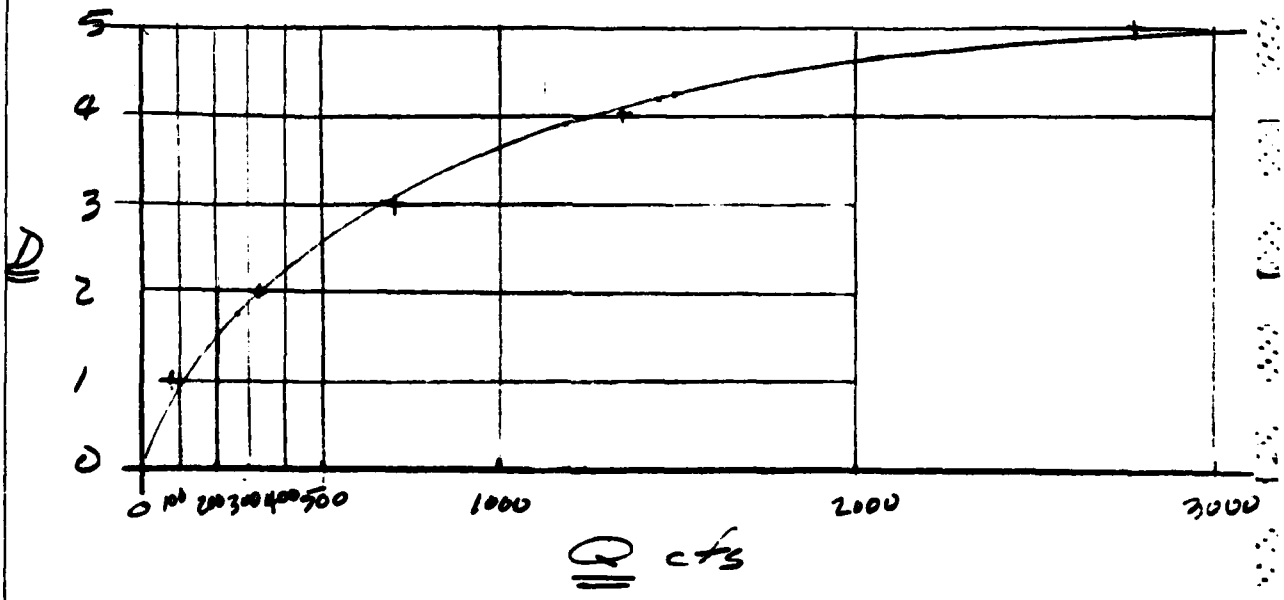
Baseflow Prior To Failure = 260± cfs

Top of dam = 127 elev.

Capacity of 2'x12' culvert

$$Q = 24\left(\frac{1.486}{0.06}\right)\left(\frac{24}{16}\right)^{0.67}(0.00067)^{1/2} = 20 \text{ cfs}$$

roadway must be over topped
(test flood TW ± 117 + 3.75 ± 121 ±)



Roadway Stage Discharge

JOB NO. 792061
DATE 122179
BY MA
CH'D BY FDD

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BOSTON — WEST HARTFORD

SHEET NO. D 13
JOB Dikes
SUBJECT RUSSELL
CLIENT COE

Sta 2+00

Q_{P_1} = 1227 cfs + 260 ≃ 1490.

d_1 = 4.25 Str_1 = 3 ± a f (no base flow included)

base flow ≃ 260 d_b = 1.75 ft.

flood stage ≃ 117 + 1.75 = 118.75.

Hazard: house at station 0+75 damaged by base flood

Failure Flow Flooding, change in stage over base = 2.5 ft.

$Q_{P_2} = 1227 \left(1 - \frac{3}{150}\right) \approx 1202 \pm$ cfs

d_2 = 3.9 Str_2 = 5.

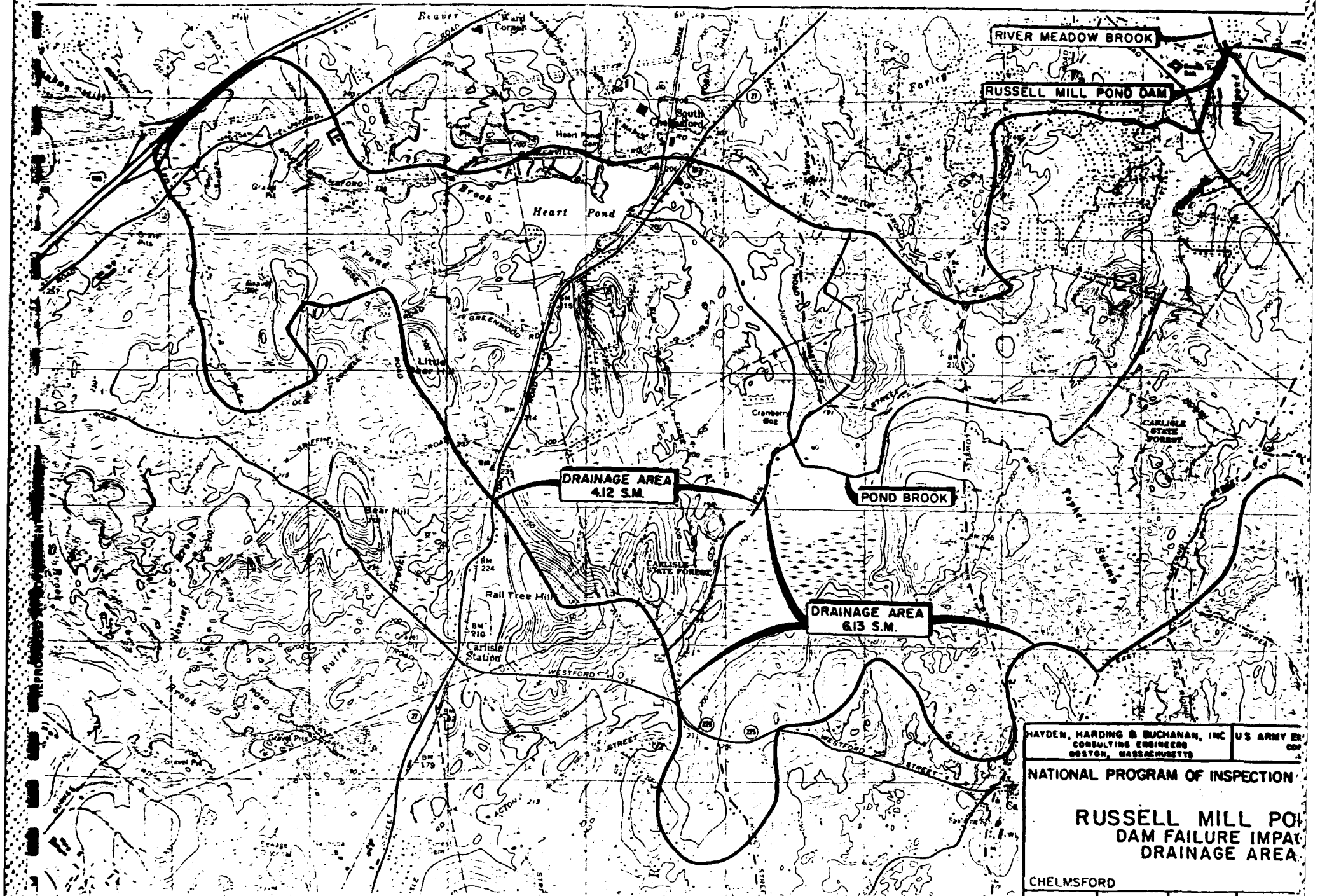
$Q_{P_3} = 1227 \left(1 - \frac{5}{150}\right) = 1185$ cfs

Stage = 3.9 ± or elev 121 ±

Damage due to Flooding by failure - over base flow conditions

House	first flr. elev	base — damage	failure - damage
2 (Attached)	119	118.75 basements	121 first flr 2
1 (Garage)	120 ±	" "	" " 1'
1	120 ±	" "	" " 1'
1 (Mill)	123 ±	0 "	0 basement

Hazard potential: Significant
No other structures near channel for 5500'


RIVER MEADOW BROOK
RUSSELL MILL POND DAM
DRAINAGE AREA
4.12 S.M.
POND BROOK
DRAINAGE AREA
6.13 S.M.
Heart Pond
Rail Tree Hill
Carlisle Station
CARLISLE STATE FOREST
HAYDEN, HARDING & BUCHANAN, INC
CONSULTING ENGINEERS
BOSTON, MASSACHUSETTS
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NATIONAL PROGRAM OF INSPECTION
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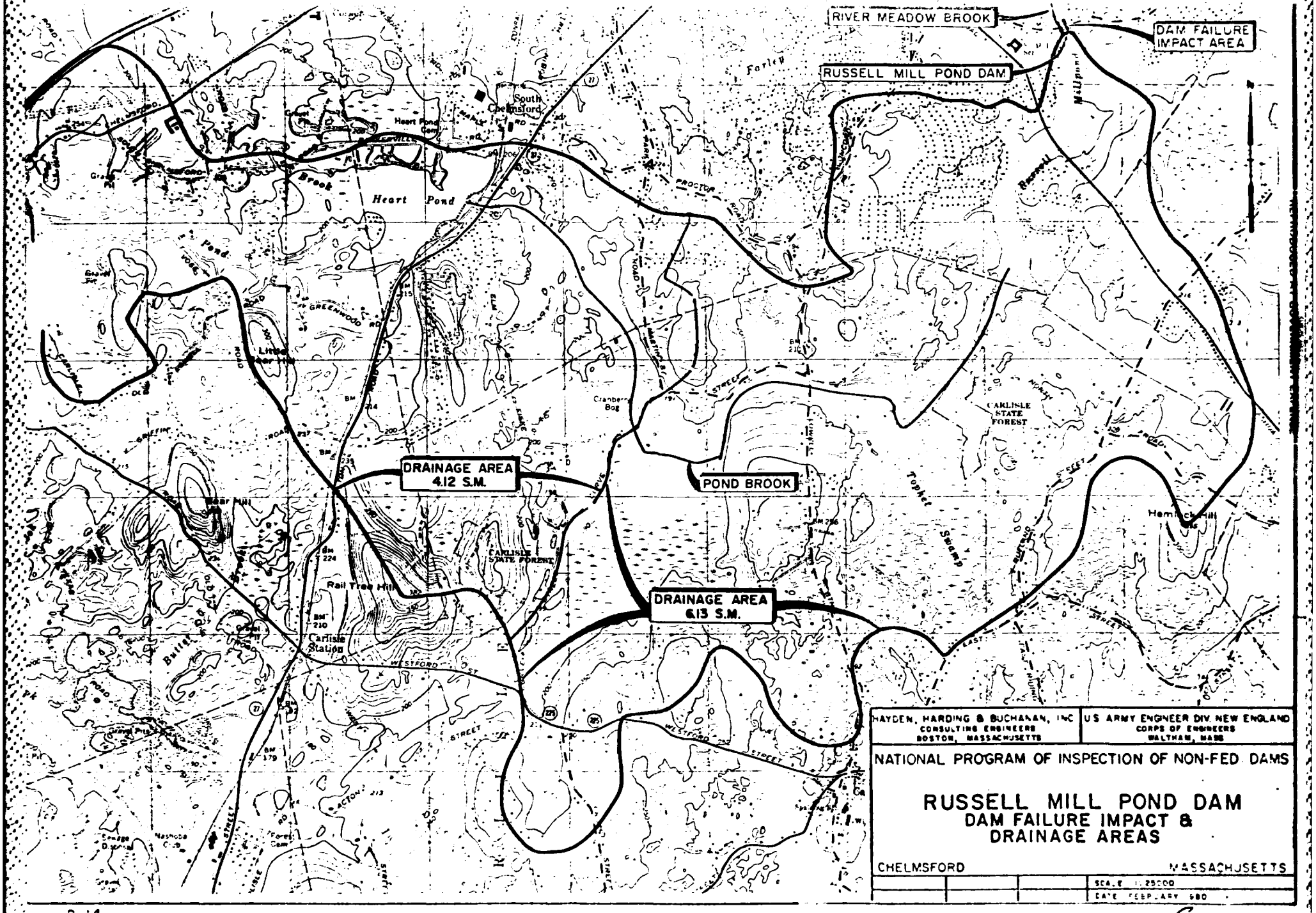
DAM FAILURE IMPA
DRAINAGE AREA
CHELMSFORD

1 of 2



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

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

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

RUSSELL MILL POND DAM
DAM FAILURE IMPACT & DRAINAGE AREAS

CHELMSFORD MASSACHUSETTS

SCALE 1:25000

DATE FEBRUARY 1980

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

(1) STATE	(2) IDENTITY NUMBER	(3) DIVISION	(4) STATE	(5) COUNTY	(6) CONGR DIST.	(7) STATE	(8) COUNTY	(9) CONGR DIST.	NAME	(10) LATITUDE (NORTH)	(11) LONGITUDE (WEST)	(12) REPORT DATE DAY | MO | YR
MA	1219	NED	MA	017	05				RUSSELL MILL POND DAM	4234.7	7120.0	15FEB80

(13) POPULAR NAME	(14) NAME OF IMPOUNDMENT
	RUSSELL MILL POND

(15) REGION	(16) BASIN	(17) RIVER OR STREAM	(18) NEAREST DOWNSTREAM CITY–TOWN–VILLAGE	(19) DIST FROM DAM (MI.)	(20) POPULATION
01	06	RIVER MEADOW BROOK	CHELMSFORD	0	31400

(21) TYPE OF DAM	(22) YEAR COMPLETED	(23) PURPOSES	(24) STRUCTURAL HEIGHT (FT.)	(25) HYDRAULIC HEIGHT (FT.)	(26) IMPOUNDING CAPACITIES MAXIMUM (ACRE-FT.)	(27) IMPOUNDING CAPACITIES NORMAL (ACRE-FT.)	DIST	OWN	FED R	PRV/FED	SCS A	VER/DATE
MSNRGDT	1800	H	14	11	150	51	NED	N	N	N	N	

(28) REMARKS

21=CONCRETE WALLS & STONE MASONRY 22=ORIG DAM

(29) O/S HAS	(30) SPILLWAY CREST LENGTH	(31) SPILLWAY TYPE	(32) SPILLWAY WIDTH (FT.)	(33) MAXIMUM DISCHARGE (FT.)	(34) VOLUME OF DAM (CY)	(35) POWER CAPACITY INSTALLED (MW)	(36) POWER CAPACITY PROPOSED (MW)	(37) NAVIGATION LOCKS NO.	(38) LENGTH (FT.)	(39) WIDTH (FT.)	(40) LENGTH (FT.)	(41) WIDTH (FT.)	(42) LENGTH (FT.)	(43) WIDTH (FT.)	(44) LENGTH (FT.)	(45) WIDTH (FT.)
2	120	C	24	136	3200											

(46) OWNER	(47) ENGINEERING BY	(48) CONSTRUCTION BY
L. CHARLTON GREENE	UNKNOWN	UNKNOWN

(49) REGULATORY AGENCY DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	NONE	NONE

(50) INSPECTION BY	(51) INSPECTION DATE DAY | MO | YR	(52) AUTHORITY FOR INSPECTION
HAYDEN, HARDING & BUCHANAN, INC.	02NOV79	PUBLIC LAW 92-367

(53) REMARKS

31=PROVISIONS FOR 8 INCHES OF FLASHBOARDS

END

FILMED

8-85

DTIC