

AD-A154 490 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
RUSSELL POND DAM MA 0. (U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV MAY 79

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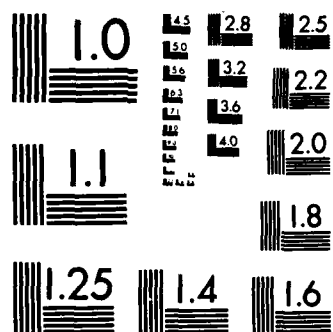
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AD-A154 490

MASSACHUSETTS COASTAL BASIN
KINGSTON, MASSACHUSETTS

RUSSELL POND DAM
MA 00392

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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

MAY 1979

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) -Russell Pond Dam is an earthen dam about 130 ft. long and 15 ft. high. The dam is in poor condition. The embankment contains many trees and bushes. The size classification is small and the hazard classification is significant. Investigations to determine various deficiencies of the dam are recommended.		



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

REPLY TO
ATTENTION OF:

NEDED

OCT 2 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 Russell 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, Mr. Horace C. Weston, Sylvia Place Road, Kingston, Mass. 02354.

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

RUSSELL POND DAM
MA 00392

MASSACHUSETTS COASTAL BASIN
KINGSTON, MASSACHUSETTS

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Identification No.: MA 00392
Name of Dam: RUSSELL POND DAM
Town: KINGSTON
County and State: PLYMOUTH COUNTY, MA
Stream: BRANCH OF FURNACE BROOK
Date of Inspection: 5 December 1978

BRIEF ASSESSMENT

Russell Pond Dam is an earthen dam approximately 130 feet long and 15 feet high. The dam, the age of which is unknown, impounds the waters of a branch of Furnace Brook to form Russell Pond. The pond is used for conservation purposes at present; the former purpose of the pond being to supply water to a downstream mill abandoned years ago. The spillway is a man-made earth channel located approximately 300 feet west of the dam's left abutment. The channel conveys water to Upper Silver Pond which empties into Lower Silver Pond via a fish ladder. Water leaving Lower Silver Pond flows along another fish ladder to Soules Pond where the original watercourse from Russell Pond also empties.

The dam is in poor condition. The embankment contains many trees and bushes. Local depressions are present in the crest and erosion is taking place along its front edge. Active seepage is present at and adjacent to the toe of the dam. There is no formal erosion and wave protection present at the upstream face of the dam nor is there any known reservoir drain. While the outlet channel (spillway) is in better condition; trees, brush and debris are present in and along the channel.

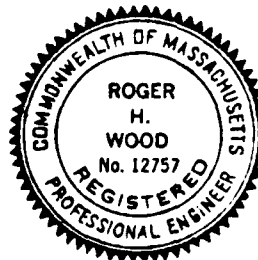
Based on the size classification, small, and the hazard classification, significant, in accordance with the Corps of Engineers guidelines, the spillway test flood is the one quarter Probable Maximum Flood (1/4 PMF). Hydraulic analysis indicates the outlet channel can safely pass the test flood of 40 cfs, with a reservoir stage approximately three inches below the top of the dam. The maximum outlet channel capacity with the reservoir surface at the crest of the dam is 57 cfs.

Investigations to determine the long term effect of the seepage at the dam, the static stability of the dam, a plan for the clearing of trees, brush and debris from the dam and outlet channel, and a method of providing an operable reservoir drain are recommended. Recommended remedial measures include providing upstream slope protection on the embankment and the repair of eroded areas and local depressions in the embankment crest and upstream slope. The Owner should establish a formal operational procedure and maintenance program, develop a formal emergency procedure plan and warning system in cooperation with local officials and institute a program of annual technical inspections. The investigations and remedial measures should be performed within one year of receipt of the report by the Owner.

CAMP DRESSER AND McKEE INC.

Roger H. Wood

Roger H. Wood
Vice President



This Phase I Inspection Report on Russell 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 judgement 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, 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 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 runoff), 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 aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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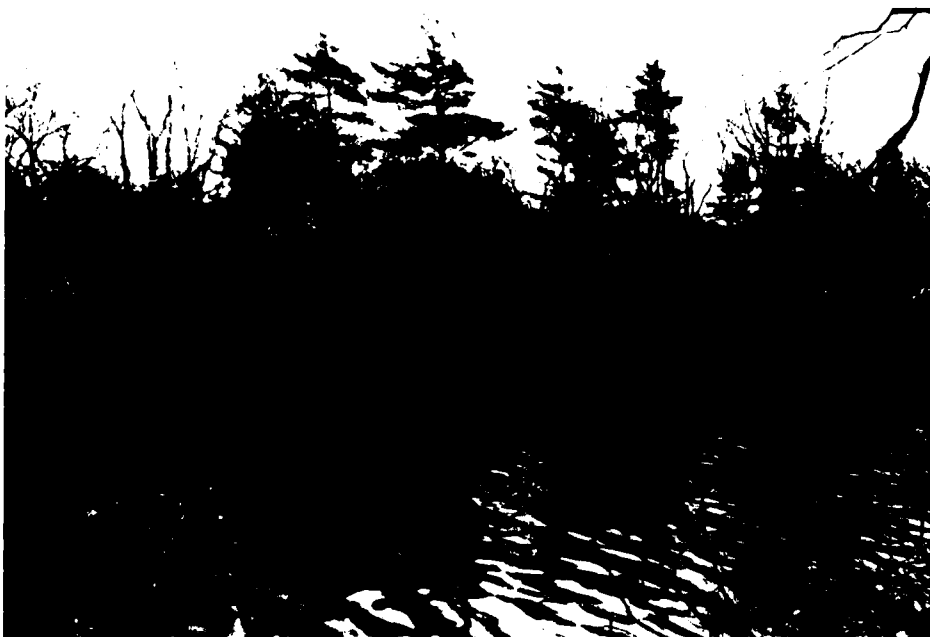
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1. Overview of upstream face of Russell Pond Dam from west side of pond.



2. Overview of upstream face of Russell Pond Dam from spillway area.



DAM Russell Pond

IDENTIFICATION NO. MA 00392



LOCATION MAP
USGS QUADRANGLE
PLYMOUTH AND PLYMPTON, MA.

APPROX. SCALE: 1" = 2000'

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT
RUSSELL POND DAM
MA 00392

SECTION 1: PROJECT INFORMATION

1.1 General

- a. Authority - Public Law 92-367, 8 August 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.

Camp Dresser & McKee 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 to Camp Dresser & McKee Inc. under letters of 12 July 1978 and 23 October 1978 from Colonel John P. Chandler, Corps of Engineers. Contract No. DACW 33-78-C-0354 has been assigned by the Corps of Engineers for this work. Haley and Aldrich, Inc. has been retained by Camp Dresser & McKee Inc. for the soils and geological portions of the work.

- b. Purpose - The primary purpose of the investigation is 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 assist the States to initiate quickly effective dam safety programs for non-Federal dams.
 - (3) Update, verify and complete the National Inventory of Dams.

1.2 Description of Project

- a. Location - Russell Pond Dam is located on a branch of Furnace Brook in the Town of Kingston, Massachusetts as shown on the Location Map. The dam is at the north end of Russell Pond while the earthen channel which serves as the spillway is approximately 300 feet from the left abutment of the dam along the west shore of the pond. Access to the dam and discharge channel is by cart roads from Sylvia Place Road.

APPENDIX A

INSPECTION TEAM ORGANIZATION AND CHECK LIST

Page No.

VISUAL INSPECTION PARTY ORGANIZATION

A-1

VISUAL INSPECTION CHECK LIST

Dam Embankment

A-2

Spillway

A-3

Outlet Works

A-4

- (3) Develop a plan to clear brush and trees from the dam embankment and the lower 20 feet of the outlet channel cut slopes, including stump removal and backfilling, and the establishment of vegetative cover on exposed portions of the crest and slopes.
- (4) Locate and make operational the former reservoir drain or design and construct a method of draining the reservoir during emergencies.

7.3 Remedial Measures

- a. Operation and Maintenance Procedures - It is recommended that the following remedial work be undertaken by the Owner, in addition to the investigations outlined in Section 7.2, in order to correct deficiencies noted during the visual examination:
 - (1) Provide riprap or cobble slope protection on the upstream face of the dam. Restore and re-shape local eroded areas.
 - (2) Re-shape the dam crest to provide uniform freeboard and to facilitate access for maintenance and repair. The extent of the re-shaping will be subject to the results of the evaluation of actual embankment configuration under Section 7.2
 - (3) Remove debris from the outlet channel, including the fallen stones from side walls.
 - (4) Due to the presence of seepage at the downstream toe of the dam, it is recommended that, during periods of high reservoir levels and unusually heavy precipitation, the Owner provide surveillance of the dam. The outlet channel should be checked for debris at regular intervals and during periods of high pond levels due to its susceptibility to blockage.
 - (5) Establish a formal operational procedure and maintenance program, develop a formal emergency procedure plan and warning system in cooperation with local officials and institute a program of annual technical inspections.

7.4 Alternatives - There are no recommended alternatives.

SECTION 7: ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

- a. Condition - The visual examination of Russell Pond Dam did not reveal any evidence of impending failure or conditions which would warrant urgent remedial treatment. However, because of the need for maintenance and additional investigation that is outlined hereinafter, the project is considered to be in poor condition.
- b. Adequacy of Information - All of the information for the Phase I Investigation had to be obtained from visual examination and limited measurements at the site. This information has been sufficient for the purpose of this investigation, but it does not permit detailed evaluation of static stability, seismic stability and the seepage.
- c. Urgency - The recommended additional investigations and remedial measures outlined in Sections 7.2 and 7.3, respectively, should be undertaken within one year of receipt of this report by the Owner.
- d. Need for Additional Investigations - Additional investigations should be performed by the Owner as outlined in the following section.

7.2 Recommendations

It is recommended that the Owner engage a qualified registered professional engineer to perform the following:

- (1) An investigation to determine whether or not the seepage that is occurring at the right abutment slope and at the downstream toe of the dam can have a significant effect on long-term dam stability. This would include regular monitoring of the observed seepage locations, including checks during higher-than-normal pond levels, to determine if conditions are changing with time.
- (2) Topographic survey of the dam embankment, including underwater portions, and an engineering evaluation of actual embankment configuration with respect to stability under static loading conditions. If the survey does not provide sufficient information to confirm adequate stability it may be necessary to carry out test borings and/or test excavations to determine the character of the embankment material and whether or not there is a core wall.

SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

- a. Visual Observation - There was no visible evidence of dam embankment instability during the site examination on 5 December 1978. The seepage at the downstream toe of the embankment showed no evidence of active erosion or piping and is not considered to pose an immediate hazard to the stability of the downstream slope. However, the seepage could have a significant effect on the long-term stability of the dam.
- b. Design and Construction Data - There is substantially no design or construction information on the dam embankment. Thus, theoretical analysis of the structural stability of the embankment is not possible.

The dam has apparently been stable under past static loading conditions, but whether or not the continuing seepage can cause future instability has not been determined.

- c. Operating Records - There are no operating records available for the dam other than county and state inspection reports.
- d. Post-Construction Changes - Without design or "as-built" drawings, it is not known if there have been significant post-construction changes to the embankment.
- e. Seismic Stability - Russell Pond Dam is located in Seismic Zone 3. Due to the proximity of the dam to the Seismic Zone boundary line, the relatively low height of dam and the classification of the dam as having only a significant hazard potential, a seismic analysis is not considered warranted.

- f. Dam Failure Analysis - Dam failure analysis was performed in order to assess the downstream hazards in the event of dam failure. A peak failure outflow of approximately 7,800 cfs was estimated based on a breach width of approximately 80 feet and with the pond level at the top of the dam (78.3 feet above NGVD). The analysis indicates that a road approximately 500 feet downstream of the dam would be overtopped by almost 4 feet, and Elm Street, approximately 1,300 feet downstream of the dam, be overtopped by a little more than half a foot. The dam failure outflow would probably cause no property damage downstream of Soules Pond and would have little or no effect on the Jones River. A total of 4 or 5 buildings downstream of the dam would probably be flooded. The potential loss of life is estimated to be a few persons. Accordingly, Russell Pond Dam is classified as having a "significant" hazard potential.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

- a. General - Russell Pond is formed by the Russell Pond Dam which is said to have been constructed in the nineteenth century to provide water power for a nearby mill. The dam impounds the waters of a branch of Furnace Brook. The pond level is controlled by the opening beneath a fieldstone bridge, which crosses the outlet channel. The opening is approximately 2.5 ft. wide, 2.25 ft. high and 12 ft. long. The outlet channel flows from the pond to Upper and Lower Silver ponds, the discharge from which flows to Soules Pond. Furnace Brook receives flow from Soules Pond and discharges into the Jones River.
- b. Design Data - No hydraulic/hydrologic design data are available for the dam.
- c. Experience Data - There are no records of past floods at the dam site.
- d. Visual Observations - The pond level was approximately 8 inches above the high point in the outlet channel at the time of inspection. The outlet channel and opening beneath the bridge appeared to be in fair hydraulic condition. The crest elevation of the dam varies with the low point approximately 2.3 feet above the high point in the outlet channel.
- e. Test Flood Analysis - Based on the Corps of Engineers guidelines, the recommended test flood for the size (small) and hazard potential (significant) is between the 100-year flood and one-half of the Probable Maximum Flood (PMF). Because of the relatively small size of the dam, the 1/4 PMF, which is generally greater than or equal to the 100-year flood, was adopted as the test flood. The 1/4 PMF inflow was determined using Corps of Engineers guidelines for "Estimating Maximum Probable Discharge" in Phase I Dam Safety Investigations. The watershed terrain is characterized as rolling, and a PMF inflow rate of 2,870 cubic feet per second (cfs) per square mile was adopted for the 0.16-square-mile drainage area. The resulting test flood inflow is 113 cfs.

Surcharge-storage routing of the test flood inflow through Russell Pond resulted in a peak test flood outflow of 40 cfs at a surcharge pond stage of 78.1 feet above NGVD. At this stage, which is 2.1 feet above the spillway crest, the dam will not be overtopped.

SECTION 4: OPERATIONAL PROCEDURES

- 4.1 Procedures - In general, there is no established routine for the operation of the dam.
- 4.2 Maintenance of the Dam - The dam and outlet channel receive minimal maintenance. There is no established formal procedure for the maintenance of the dam. Large trees grow on much of the dam, and along the outlet channel, and the center portion of the dam shows signs of erosion.
- 4.3 Maintenance of Operating Facilities - There are no operating facilities for Russell Pond.
- 4.4 Description of any Warning System in Effect - There is no established warning system or emergency preparedness plan in effect for this structure.
- 4.5 Evaluation - A formal maintenance program, warning system and emergency preparedness plan should be established for the dam and spillway. Maintenance of the dam and spillway should be performed at regular intervals. The seepage at the toe of the dam should be kept under observation and the outlet channel checked for debris at frequent intervals.

c. Appurtenant Structures - The fieldstone bridge over the outlet channel, as shown in Photos 9 and 10, is in good condition. There is no apparent reservoir drain or other means of lowering the water level below the spillway crest.

d. Reservoir Area - The area around Russell Pond is generally wooded and lightly developed. There appears to be no structure below elevation 80.

The side slopes of the pond vary from very steep and wooded on the west to moderately steep and open on the south and east. There is no apparent potential for significant landslides into the pond which could create waves that might overtop the dam. No conditions were noted which could result in a sudden increase in sediment load in the pond.

e. Downstream Channel - The outlet channel to Upper Silver Pond is partly obstructed by the small waterway through the stone bridge, and by scattered trees, stumps and fallen stones from the low walls. It could have a major blockage if uprooting of one of the larger trees on the steep cut slope caused slope movement into the narrow channel.

3.2 Evaluation - The Russell Pond Dam embankment and outlet channel appear to be performing satisfactorily at the present time. Previous inspection reports indicate that the seepage at the toe of the embankment is a long-standing condition. However, the continuing seepage, the lack of upstream slope protection, the low section of the dam crest, and the numerous large trees along the dam could provide significant potential for embankment failure under conditions of higher-than-normal water levels and high winds. The outlet channel, which is the only observed method of controlling the pond water level, is susceptible to blockage due to the constriction of the bridge, the trees on the side slopes and the present debris within the channel.

SECTION 3: VISUAL INSPECTION

3.1 Findings

- a. General - The visual examination of Russell Pond Dam was conducted on 5 December 1978.

In general, the dam was found to be in poor condition. Brush and large trees cover much of the embankment, and local erosion is visible in several locations. Seepage was noted at the toe of the dam. The discharge channel and spillway were found to be in fair condition.

A visual inspection checklist is included in Appendix A, and selected photographs of the project are given in Appendix C.

- b. Dam - There was no obvious visual evidence of major lateral movement or settlement of the irregular dam embankment, but there has been erosion of the upstream face, and there is local seepage and a general cover of trees and brush.

The following specific items were noted during the site examination:

- (1) The dam crest and slopes have numerous trees, ranging up to 24 inches in diameter, along with scattered stumps and clumps of brush, as shown in Photos 1 through 5.
- (2) The irregular upstream face has no stone protection, and has been locally eroded to a near-vertical slope under tree roots, as shown in Photo 5.
- (3) The irregular crest varies in width and freeboard, as shown in Photos 3 and 4, inviting local overtopping and erosion in the event of unusually high water levels and high winds. At one point, toward the center of the dam, the crest is nearly a foot lower than elsewhere.
- (4) There was active seepage with rust staining at the downstream toe of the right side of the dam. Part of the flow originated at the toe where the embankment slope is steepest, but most appeared to be coming from a saturated natural slope immediately downstream from the right abutment, as shown in Photo 6. The combined flow, estimated at 1 to 2 gallons per minute, did not show evidence of soil particle movement.
- (5) Brush has been dumped over the slope at the right abutment.

SECTION 2: ENGINEERING DATA

- 2.1 Design Records - There are no known design records for the dam.
- 2.2 Construction Records - No records of the original construction were located.
- 2.3 Operation Records - No operational records other than State inspection reports are available for the dam.
- 2.4 Evaluation - Since no engineering records are available, the evaluation of the dam must be based primarily on the results of the visual examination which are detailed in Section 3.

- (4) Test flood pool-----13.3
- (5) Top of dam-----13.4
- g. Dam
- (1) Type-----Earth embankment
- (2) Length-----Approx. 130'
- (3) Height-----15'± max.
- (4) Top width-----8-10' typ., 6' min.
- (5) Side slopes-----Irregular upstream, varies to as steep as 1.5:1 downstream
- (6) Zoning-----Unknown
- (7) Impervious Core-----Unknown
- (8) Cutoff-----Unknown
- (9) Grout curtain-----Probably none
- h. Diversion and Regulating Tunnel-----None
- i. Spillway
- (1) Type-----vegetated channel
passing through a 2.5 ft. w by
2.25 ft. h opening beneath a field-
stone bridge
- (2) Length of weir-----2.5 ft.
- (3) Crest elevation-----76.0 MSL
- (4) Gates-----None
- (5) U/S Channel-----None
- (6) D/S Channel-----woodland stream
- j. Regulating Outlets-----None known

- (8) Total project discharge at test flood elevation
40 cfs @ 78.1 elev.

c. Elevation (ft. above MSL)

- (1) Streambed at centerline of dam-----63.3 (Est)
(2) Test flood tailwater-----N/A
(3) Upstream portal invert diversion tunnel-----N/A
(4) Normal pool-----76.0
(5) Full flood control pool-----N/A
(6) Spillway crest-----76.0
(7) Design surcharge (Original Design)-----Unknown
(8) Top of dam-----Varies, low point at 78.3
(9) Test flood design surcharge-----78.1

d. Reservoir

- (1) Length of test flood pool-----1,730 ft
(2) Length of normal pool-----1,700 ft
(3) Length of flood control pool-----N/A

e. Storage (acre-feet)

- (1) Normal pool-----41.3
(2) Flood control pool-----N/A
(3) Spillway crest pool-----41.3
(4) Top of dam-----71.0
(5) Test flood pool-----68.9

f. Reservoir Surface (acres)

- (1) Normal pool-----12.4
(2) Flood-control pool-----N/A
(3) Spillway crest-----12.4

- g. Purpose of the Dam - Russell Pond Dam was originally constructed to provide a head of water to a downstream mill. The mill no longer exists, and the outlet is apparently discontinued. The dam currently provides a conservation/recreation pond.
 - h. Design and Construction History - There are no records of the design or construction of this dam. The owner indicated that the dam was probably built in the nineteenth century.
 - i. Normal Operational Procedure - There is no established procedure for the operation of the dam. The condition of the spillway, discharge channel and main dam embankment indicates that little maintenance is performed on a routine basis. Use of the dam by the public in the past resulted in erosion of the embankment. Public use of the dam is now prohibited.
- 1.3 Pertinent Data - There are no known elevations previously established at the dam site. Elevations used in this report are on NGVD (National Geodetic Vertical Datum), formerly referred to as Mean Sea Level Datum (MSL). The water surface elevation (76 feet above NGVD) shown on the USGS Quadrangle, Plymouth, Mass., 1962, was adopted as the spillway crest elevation. All other elevations given in this report pertaining to the dam site were estimated from the assumed spillway crest elevation.
- a. Drainage Area - The drainage area tributary to the dam site is 0.16 square mile. The rolling terrain surrounding Russell Pond is moderately forested and lightly developed. Russell Pond accounts for approximately 12 percent of the total drainage area.
 - b. Discharge at Dam Site - There are no records of discharges at the dam site.
 - (1) Outlet works size-----2.5 ft. wide vegetated channel
 - (2) Maximum known flood at damsite-----Unknown
 - (3) Ungated spillway capacity at top of dam
57 cfs @ 78.3 elev.
 - (4) Ungated spillway capacity at test flood elevation
40 cfs @ 78.1 elev.
 - (5) Gated spillway capacity at normal pool elevation-----N/A
 - (6) Gated spillway capacity at test flood elevation-----N/A
 - (7) Total spillway capacity at test flood elevation
40 cfs @ 78.1 elev.

- b. Description of Dam and Appurtenances - Russell Pond Dam consists of an earth embankment approximately 130 ft. long, with no spillway or outlet structure at the dam location. There is a separate outlet channel cut through a glacial esker formation on the west side of Russell Pond to the adjacent Upper Silver Pond.

The dam embankment has a height of about 15 ft. and a crest that is typically 8 to 10 ft. wide. The upstream slope is irregular, and the steepest portion of the downstream slope is approximately 1.5 horizontal to 1 vertical. Both the crest and the slopes are vegetated, there being no riprap or other erosion protection. Each abutment consists of a gradual transition to wooded natural ground.

The outlet channel is about 3 to 5 ft. wide at the bottom and has steep wooded earth slopes cut at approximately 1.5 to 1. Where the cut is deepest, there are low, 2- to 3-ft.-high rock walls at the bottom. A small fieldstone bridge crosses the channel close to Russell Pond. The bridge is approximately 12 feet wide and spans approximately 4 feet across the outlet channel.

No other outlet, controlled or uncontrolled, is known to exist. At one time there probably was a conduit leading north from the left abutment of the dam to a mill or waterwheel approximately 200 feet away on the south shore of Lower Silver Pond. The blocked outlet works is still present at Lower Silver Pond, and a slight, linear depression in the ground extends from the structure almost to the dam at Russell Pond. No evidence of an intake structure was observed at Russell Pond. Although none is evident at present, there probably was a pond drain, as reports indicate that, years ago, the pond was drained during the summers.

- c. Size Classification - Russell Pond dam has a height of approximately 15 feet and a storage capacity of 71 acre-feet at the top of the dam. According to guidelines established by the Corps of Engineers, the dam is classified in the small category.
- d. Hazard Classification - Based on the results of the dam failure analysis included in Section 5 of this report, two roads and a few buildings would be affected by a dam failure. The estimated loss of life would be a few persons. It is recommended, therefore, that the dam be classified in the significant hazard category.
- e. Ownership - The dam is owned by Mr. Horace C. Weston, Sylvia Place Road, Kingston, Massachusetts 02364 (phone 617-585-2524).
- f. Operator - Mr. Horace C. Weston, the Owner, also serves as the Operator of the dam.

VISUAL INSPECTION PARTY ORGANIZATION
NATIONAL DAM INSPECTION PROGRAM

DAM: Russell Pond

DATE: December 5, 1978

TIME: 0800

WEATHER: Partly Cloudy - 50° F

WATER SURFACE ELEVATION UPSTREAM: 8" above spillway crest

STREAM FLOW: 5.4+ cfs (s = 0.0045, n = 0.035, TW = 5'; D = 0.67')

INSPECTION PARTY:

1. Roger H. Wood - Structural & Operation
2. Charles E. Fuller - Hydraulics & Hydrology
3. Joseph E. Downing - Ass't. Hydraulics & Hydrology
4. William C. Rowe - Ass't. Structural
5. Peter L. LeCount - (H & A) Soils
6. _____

PRESENT DURING INSPECTION:

1. _____
2. _____
3. _____
4. _____

VISUAL INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Russell Pond

DATE: 5 December 1978

EMBANKMENT: Dam

CHECK LIST	CONDITION
1. Upstream Slope a. Vegetation b. Sloughing or Erosion c. Rock Slope Protection - Riprap Failures d. Animal Burrows 2. Crest a. Vegetation b. Sloughing or Erosion c. Surface cracks d. Movement or Settlement 3. Downstream Slope a. Vegetation b. Sloughing or Erosion c. Surface cracks d. Animal Burrows e. Movement or Cracking near toe f. Unusual Embankment or Downstream Seepage g. Piping or Boils h. Foundation Drainage Features i. Toe Drains 4. General a. Lateral Movement b. Vertical Alignment c. Horizontal Alignment d. Condition at Abutments and at Structures e. Indications of Movement of Structural Items f. Trespassing g. Instrumentation Systems	1. a. Brush, trees→15" dia., stumps, grass & weeds. b. Irregular slope, locally eroded nearly vertical under tree roots. c. None d. None observed 2. a. Grass, trees, brush b. Low between rocks at possible old spillway. c. None evident d. Not evident because irregular. 3. a. Brush, trees→24" dia., few stumps (leaf covered) b. Steep slope in seepage area may have sloughed in past. c. None evident d. None observed e. Flat slope below steep in seepage area may reflect past soil mov't. f. Extensive seepage & saturated soil in area on right side that appears to be natural slope; brush dumped over upper part of slope. g. Seepage areas show stain, but no indication of active soil mov't. h., i. None 4. a., b., c. Irregular shape obscures alignment and any possible evidence of movement. d. Embankment blends into natural ground. e. Rocks below slope may have been dislodged from old structure (or may have been used in old repair). f. Scattered cans & trash, minor g. None

VISUAL INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Russell Pond

DATE: 5 Dec 1978

SPILLWAY: _____

CHECK LIST	CONDITION
1. Approach Channel a. General Condition b. Obstructions c. Log Boom etc.	1. a. Good b. Brush on banks c. None
2. Weir a. Flashboards b. Weir Elev. Control (Gate) c. Vegetation d. Seepage or Efflorescence e. Rust or Stains f. Cracks g. Condition of Joints h. Spalls, Voids or Erosion i. Visible Reinforcement j. General Struct. Condition	2. There is no structural weir at this dam. The outlet is a man-made channel at the northwest side of the pond. The invert and side slopes are soil which has become vegetated with brush & trees over the years forming more or less a natural woodland stream. For the purpose of this inspection, the weir area is considered at the field-stone-earth bridge over the channel. The channel is considered in good to fair condition.
3. Discharge Channel a. Apron b. Stilling Basin c. Channel Floor d. Vegetation e. Seepage f. Obstructions g. General Struct. Condition	3. a. & b. None c.-g. The earth channel is in a steep earth cut which has become vegetated. There is evidence of former low fieldstone walls at the bottom of the cut but they have crumbled and/or overtopped with soil. No major obstructions were observed. The channel invert has become a woodland stream in good to fair condition.
4. Walls a. Wall Location _____ (1) Vegetation (2) Seepage or Efflorescence (3) Rust or Stains (4) Cracks (5) Condition of Joints (6) Spalls, Voids or Erosion (7) Visible Reinforcement (8) General Struct. Condition	4. (see 3)
5. Spillway Bridge	5. Fieldstone bridge covered with earth. Approximately 12 feet wide and spanning 4 feet $\pm$. Visually from the sides, it does not appear that it will collapse in the immediate future and block the channel, but there is no positive way to determine it by a visual inspection.

VISUAL INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Russell Pond

DATE: 5 Dec 1978

OUTLET WORKS: _____

CHECK LIST	CONDITION
1. Inlet a. Obstructions b. Channel c. Structure d. Screens e. Stop Logs f. Gates 2. Control Facility a. Structure b. Screens c. Stop Logs d. Gates e. Conduit f. Seepage or Leaks 3. Outlet a. Structure b. Erosion or Cavitation c. Obstructions d. Seepage or Leaks 4. Mechanical and Electrical a. Crane Hoist b. Hydraulic System c. Service Power d. Emergency Power e. Lighting f. Lightning Protection	1., 2., 3., 4. There was no observed reservoir drain, outlet gates or transmission line from the pond. There was no observed method of lowering the water level in the pond. There is an indication that at one time there was a conduit or channel extending from the left abutment of the dam to a former structure, probably a mill, on the southeast shore of the second pond downstream. The remains of the structure indicate that it was a small building constructed of rubble quarry stone probably constructed in 1800. There is evidence that the drop in water surface occurred within the building. The outlet channel is still present but is now blocked with debris. No flowing water was observed at the structure. There is a depression in the ground from this structure which leads almost to Russell Pond indicating a filled-in channel, collapse of an underground conduit or loss of earth into a conduit. No indication of an inlet or former intake was observed at Russell Pond.

APPENDIX B

LIST OF AVAILABLE DOCUMENTS AND
PRIOR INSPECTION REPORTS

Page No.

LIST OF AVAILABLE DOCUMENTS

None Available

PRIOR INSPECTION REPORTS

<u>Date</u>	<u>By</u>	
August 1936	Plymouth County Engineering Department	B-1
September 1938	Plymouth County Engineering Department	B-1
February 1939	Plymouth County Engineering Department	B-1
July 1941	Plymouth County Engineering Department	B-1
April 1943	Plymouth County Engineering Department	B-1
July 1945	Plymouth County Engineering Department	B-1
October 1949	Plymouth County Engineering Department	B-1
September 1951	Plymouth County Engineering Department	B-1
February 1953	Plymouth County Engineering Department	B-1
December 1954	Plymouth County Engineering Department	B-1
May 1957	Plymouth County Engineering Department	B-1
September 1959	Plymouth County Engineering Department	B-1
September 1961	Plymouth County Engineering Department	B-1
November 1963	Plymouth County Engineering Department	B-1
December 1965	Plymouth County Engineering Department	B-1
November 1967	Plymouth County Engineering Department	B-1
October 1969	Plymouth County Engineering Department	B-1
March 22, 1974	Mass. Department of Public Works	B-3
March 17, 1976	Mass. Department of Public Works	B-6
April 15, 1974	Mass. DPW - Description of Dam	B-9

DAM NO... 79

Maximum Head in Feet (Full Pond Level to Bottom of Spillway) 16'-6"

Length 125 feet Width 12 feet

Length of Overflow or Spillway *None in dam.* Outlets (Pipes or Flumes)

Dam Constructed by Date

[illegible]

Evidence of Leakage *Some Leakage at base of dam. Not serious at this time.*

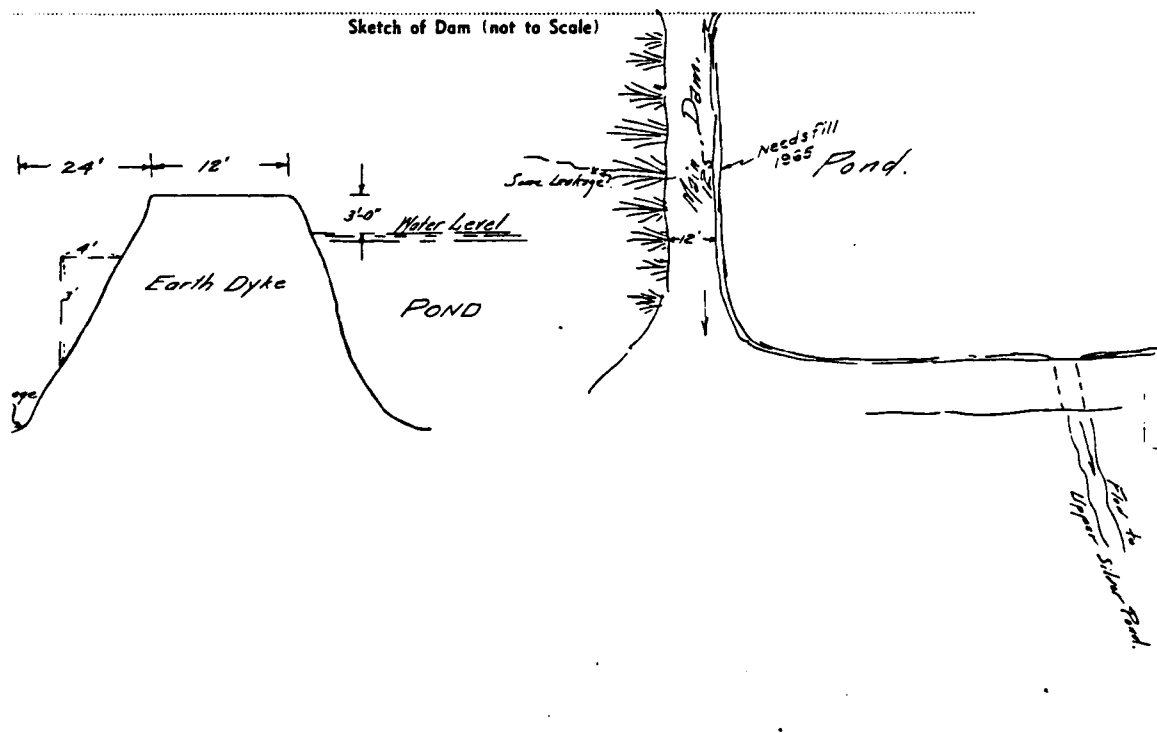
Condition Generally good.

Topography of Country Below Series of Ponds and Jones River Valley - Irregular.

Nature, extent, proximity, etc. of buildings, roads or other property in danger if failure should occur

Failure would wash out Elm St. and new cut-off, carrying out Soule's Pond. Probably no damage to any buildings.

Remarks and Recommendations This dam closes the old water course running the water into Upper Silver Pond. Present outlet of ample capacity. Unchanged Sept. 1938 & Feb. 1939. Unchanged July 1941. Unchanged April, 1943. Unchanged July, 1945. Unchanged October 1949. Sound - no change Sept. 1951. No changes - sound Feb. 1953. Good - no change Dec. 1954. No changes - good May 1957. No change - good Sept. 1959. Good - some trees down on dam Sept. 1961. Good - Nov. 1963. Fair - Needs fill on main dam Dec. 1965. Fair - still needs fill Nov. 1967. Fair - needs fill on '65 Oct. 1969.



INSPECTION REPORT - DAMS AND RESERVOIRS

1. Location: City/Town Kingston Dam No. 7-12-145-1
 Name of Dam Russell Pond Inspected by: K. B. Harrison & A. Bumpus
 Date of Inspection 3-22-74

2. Owner/s: Per: Assessors ✓ Prev. Inspection _____
 Reg. of Deeds _____ Pers. Contact _____

1. Harace C. Weston Tinian Road Kingston N.H.
 Name St. & No. City/Town State Tel. No.

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

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 None

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: No outlet control - water flowing freely through brook outlet on N.W. side (not through dam) to Upper Silver Place Pond Dam #7-12-145-1.

7. Upstream Face of Dam: Condition:

Conditions:

1. Good ✓ 2. Minor Repairs ✓

3. Major Repairs _____ 4. Urgent Repairs _____

Comments: Dike needs fill in upper middle of dike as noted in 1965 (See Sketch). Large trees & brush should be cut.

8. Downstream Face of Dam: Dam No. 7-12-145-1
Condition: 1. Good ☒ 2. Minor Repairs ☒
3. Major Repairs _____ 4. Urgent Repairs _____
Comments: Large trees & brush need cutting

9. Emergency Spillway: None
Condition: 1. Good _____ 2. Minor Repairs _____
3. Major Repairs _____ 4. Urgent Repairs _____
Comments: Brook outlet on N.W. side (not through dam)
to Upper Illinois Place Pond

10. Water Level at Time of Inspection:
2.5 ft. above _____ below ☒ top of dam ☒
principal spillway _____ other _____

11. Summary of Deficiencies Noted:
Growth (Trees & Brush) on Embankment Yes - numerous
Animal Burrows & Washouts No
Damage to Slopes or Top of Dam No
Cracked or Damaged Masonry No
Evidence of Seepage No
Evidence of Piping No
Erosion Yes - as noted - on delta main dyke
Leaks No
Trash and/or Debris Impeding Flow No
Clogged or Blocked Spillway No
Other _____

12. Remarks & Recommendations: (Fully Explain)

*This dam closed the old water course. The water is now
carrying into Upper Silver Place Road via brook outlet
on N.W. side (See Sketch)*

*Note If this dam failed, 5[±] homes plus Old Elm St
could be flooded out.*

*Dike has not been maintained for many years. Numerous
large trees & brush both faces should be cut. Erosion
in approx. center of dike mentioned in County Records (1965)
which has not been filled.*

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 ☐

INSPECTION REPORT - DAMS AND RESERVOIRS

1. Location: Kingston Dam No. 7-12-145-1
 Name of Dam Ball's Pond Inspected by: K. B. Harrison & G. C. Burges

Date of Inspection: 3-17-76

2. Owner/s: Per: Assessors ☒ Prev. Inspection 3-12-74

Reg. of Deeds _____ Pers. Contact _____

1. Harvey C. Weston, Indian Pond Rd Kingston, Mo.
 Name St. & No. City/Town State Tel. No.

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

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: _____

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: No outlet control - water flowing freely through break outlet on N.W. side (not through dam) to Upper Silvan Place Pond Dam # 7-12-145-2

7. Upstream Face of Dam: Silvan Place Pond Dam # 7-12-145-2

Conditions:

1. Good ☒ 2. Minor Repairs ☒

3. Major Repairs _____ 4. Urgent Repairs _____

Comments: No work done since previous report. The dam still needs fill in middle at some, and large trees & brush still need cutting.

INSPECTION REPORT - DAMS AND RESERVOIRS

.2.

Dam No. 7-12-145-1

8. Downstream Face of Dam:

Conditions:

1. Good ☒ 2. Minor Repairs ☒
3. Major Repairs ☐ 4. Urgent Repairs ☐

Comments: Same as upstream face.9. Emergency Spillway: None

Conditions:

1. Good ☐ 2. Minor Repairs ☐
3. Major Repairs ☐ 4. Urgent Repairs ☐

Comments: Break outlet on N.W. side of Pond
to Upper Silver Pine Pond (Dam # 7-12-145-2)10. Water Level at Time of Inspection: (at lowest point of dam)

1.0 ft. ☐ above ☒ below ☒ top of dam.
☐ principal spillway ☐ other

11. Summary of Deficiencies Noted:

Growth (Trees & Brush) on Embankment Yes - numerous
Animal Burrows & Washouts No
Damage to Slopes or Top of Dam No
Cracked or Damaged Masonry No
Evidence of Seepage Yes - in line with low point of dyke.
Evidence of Piping No
Erosion Yes - middle of dyke.
Leaks No
Trash and/or Debris Impeding Flow No
Clogged or Blocked Spillway No
Other

INSPECTION REPORT - DAMS AND RESERVOIRS

7-12-145-1

.3.

Dam No.

7-12-145-2

12. Remarks & Recommendations (fully explain)

*As per report this dam closed the old water
course. Water now running into Upper Silver
Pond via break outlet to same.*

*No work has been done on this dam since
previous report of 3-22-74. Large trees &
brush still need cutting & eroded area in
the center of the dyke has existed since 1965*

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 ☐

DESCRIPTION OF DAM

DISTRICT 7

Submitted by K.B. Horvath Dam No. 7-12-145-1

Date 4-15-74 City/Town Kingston

Name of Dam Russell Pond

1. Location: Topo Sheet No. 4.5 A

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

2. Year Built Unknown Year/s of Subsequent Repairs None

3. Purpose of Dam: Water Supply _____ Recreational ✓
Irrigation _____ Other To change course of flow.

4. Drainage Area: 2 Sq.Mi. _____ Acres

5. Normal Ponding Area: _____ Acres _____ Ave. Depth
Impoundment: 22,000,000 Gals. _____ Acre Ft.

6. No. and Type of Dwellings Located Adjacent to Pond or Reservoir
i.e. Summer Homes, etc. 5 Homes

7. Dimensions of Dam: Length 125' Max. Height 18'
Slopes: Upstream Face Vert to 4' wide
Downstream Face 24' wide
Width Across Top 12' 5"

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

CLIENT COF
 PROJECT Dam Inspection
 DETAIL Russell Pond Dam

 JOB NO 380-5-14
 DATE CHECKED 5/4/79
 CHECKED BY JED

 PAGE 4 of 6
 DATE 4/18/79
 COMPUTED BY PFH

Stage - Discharge Characteristics of Russell Pond

Outlet Spillway 2.5' x 2.25' Stone Box Culvert Inv. El. 76
n = 0.02 S = 0.01

Below El. 78.3, open channel flow $Q = \frac{1.486 C A R^{2/3} S^{1/2}}{n}$

Above El. 78.3, orifice flow $Q = C A \sqrt{2gH}$

Assume inlet control because downstream slope is steep.

$$C = \left[+ 0.4 R^{0.3} + \frac{0.0045 L}{R^{1.15}} \right]^{-1/2} = 0.83$$

Elev.	H (ft)	Q (cfs)
76.0	0	0
77.0	1.0	13
78.0	2.0	31
78.3	2.3	57
80.0	4.0	75
81.0	5.0	84
82.0	6.0	92

Dam Low Point at El. 78.3 $Q = CLH^{3/2}$ $C = 2.5$

Elev.	Top Width (ft)	Avg L (ft)	H (ft)	Q (cfs)
78.3	0	0	0	0
80.0	210	105	1.7	582
81.0	240	120	2.7	1,330
82.0	340	170	3.7	3,025

Road Above Outlet Spillway $Q = CLH^{3/2}$ $C = 2.5$

Elev.	Top Width (ft)	Weir L (ft)	H (ft)	Q (cfs)
81.0	0	0	0	0
82.0	33	16.5	1	41

Summary

Elev.	Q _{spill}	Q _{dam}	Q _{road}	Q _{TOTAL}
76.0	0	0	0	0
77.0	13	0	0	13
78.0	31	0	0	31
78.3	57	0	0	57
80.0	75	582	0	657
81.0	84	1,330	0	1,414
82.0	92	3,025	41	3,158

CLIENT COE
 PROJECT Dam Inspection
 DETAIL Russell Pond Dam

JOB NO 380-5-14
 DATE CHECKED 6/4/79
 CHECKED BY JED

PAGE 3 of 6
 DATE 4/17/79
 COMPUTED BY PFH

Fourth downstream reach: From Cross-Section 2 to Cross-Section 1

$$Q_{p1} = 2061 \text{ cfs (From 3rd reach)}$$

Stage in 4th reach when outflow is 2061 cfs is El. 20.80
 Storage " " " at El. 20.80 is 8.4 ac.-ft. = V_1

$$Q_{p2} = 2061 \left(1 - \frac{8.4}{2.8}\right) \ll 0 \text{ cfs}$$

Stage in 4th reach when outflow is 0 cfs is El. 20
 Storage " " " at El. 20 is 0 ac.-ft. = V_2

$$V_3 = \frac{8.4 + 0}{2} = 4.2 \text{ ac.-ft} > 2.8 \Rightarrow Q_{p3} < 0 \text{ cfs}$$

$$V_4 = \frac{4.2 - 0}{2} = 2.1 \text{ ac.-ft}$$

$$Q_{p4} = 2061 \left(1 - \frac{2.1}{2.8}\right) = 515 \text{ cfs} \quad \text{Outflow from 4th reach}$$

Stage in 4th reach when outflow is 515 cfs is El. 20.2

No buildings affected by dam-break wave.

Dam break wave will have little or no effect
 on the Jones River, approximately 1,100 feet downstream
 of Cross-Section 1.

Dam failure analysis indicates that 4 or 5 buildings
 may be affected by dam-break wave. Estimated
 potential loss of life is a few persons.

$\therefore$ SIGNIFICANT HAZARD

TEST FLOOD: 100 yr. to $\frac{1}{2}$ PMF Range; Use $\frac{1}{4}$ PMF

Drainage area of Russell Pond is 0.158 sq. mi., and
 terrain is rolling. $\therefore$ PMF = 2870 cfs per sq. mi.

$$\text{Test Flood} = \left(\frac{1}{4}\right) (2870 \text{ cfs/mi}^2) (0.158 \text{ mi}^2) = 113 \text{ cfs}$$

$$\frac{1}{4} \text{ PMF Runoff Volume} = 5'' \pm$$

CLIENT COE
 PROJECT Dam Inspection
 DETAIL Russell Pond Dam

JOB NO 380-5-14
 DATE CHECKED 5/4/79
 CHECKED BY JED

PAGE 2 of 6
 DATE 4/17/79
 COMPUTED BY PEH

Second downstream reach: From 1st downstream road to Elm St.

$$Q_{p1} = 5646 \text{ cfs} \quad (\text{From 1st reach})$$

Stage in 2nd reach when outflow is 5646 cfs is El. 50.57
 Storage " " " at El. 50.57 is 6.3 ac.-ft. = V_1

$$Q_{p2} = 5646 \left(1 - \frac{6.3}{19.7}\right) = 3840 \quad (\text{Note: 19.7 ac.-ft. is the storage below El. 71.79 in 1st reach})$$

Stage in 2nd reach when outflow is 3840 cfs is El. 50.38
 Storage " " " at El. 50.38 is 5.4 ac.-ft. = V_2

$$V_3 = \frac{6.3 + 5.4}{2} = 5.8 \text{ ac.-ft.}$$

$$Q_{p3} = 5646 \left(1 - \frac{5.8}{19.7}\right) = 3984 \text{ cfs} \quad \text{Outflow from 2nd reach}$$

Stage in 2nd reach when outflow is 3984 cfs is El. 50.39

2 buildings just downstream of Elm St. may be affected by dam-break wave.

Depth of flow over Elm St. = 0.7' ±

Third downstream reach: From Elm St. to Cross-Section 2

$$Q_{p1} = 3984 \text{ cfs} \quad (\text{From 2nd reach})$$

Stage in 3rd reach when outflow is 3984 cfs is El. 26.96
 Storage " " " at El. 26.96 is 6.3 ac.-ft. = V_1

$$Q_{p2} = 3984 \left(1 - \frac{6.3}{5.8}\right) < 0 \text{ cfs}$$

Stage in 3rd reach when outflow is 0 cfs is El. 25
 Storage " " " at El. 25 is 0 ac.-ft. = V_2

$$V_3 = \frac{6.3 + 0}{2} = 3.2 \text{ ac.-ft.}$$

$$Q_{p3} = 3984 \left(1 - \frac{3.2}{5.8}\right) = 1786 \text{ cfs}$$

Stage in 3rd reach when outflow is 1786 cfs is 25.88
 Storage " " " at El. 25.88 is 2.8 ac.-ft. = V_4

$$Q_{p4} = 3984 \left(1 - \frac{2.8}{5.8}\right) = 2061 \text{ cfs} \quad \text{Outflow from 3rd reach}$$

Stage in 3rd reach when outflow is 2061 cfs is 26.0

No buildings affected by dam-break wave.

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JOB NO 380-S-14
 DATE CHECKED 5/4/79
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SIZE CLASSIFICATION

Height: Top of dam El. 78.3
 Toe of dam El. 63.3
 15.0 ft.

Storage at top of dam:

Dead Storage (below spillway) 41.3 acre-ft.
 Surge Storage (to top of dam) 29.7 acre-ft.
 71.0 acre-ft.

∴ Size Classification: SMALL

DAM FAILURE ANALYSIS

$$Q_p = 8/27 W_b \sqrt{g} Y_o^{3/2}; \text{ Let } W_b = 80 \text{ ft. \& } Y_o = 15 \text{ ft.}$$

$$Q_p = (8/27)(80')(32.2)^{1/2}(15')^{3/2} = 7814 \text{ cfs}$$

First downstream reach: From dam to 1st downstream road

Stage in 1st reach when outflow is 7814 cfs is El. 72.62
 Storage " " " at El. 72.62 is 22.0 ac.-ft. = V_1

$$Q_{p2} = Q_p \left(1 - \frac{V_1}{S}\right) = 7814 \left(1 - \frac{22}{71}\right) = 5393 \text{ cfs}$$

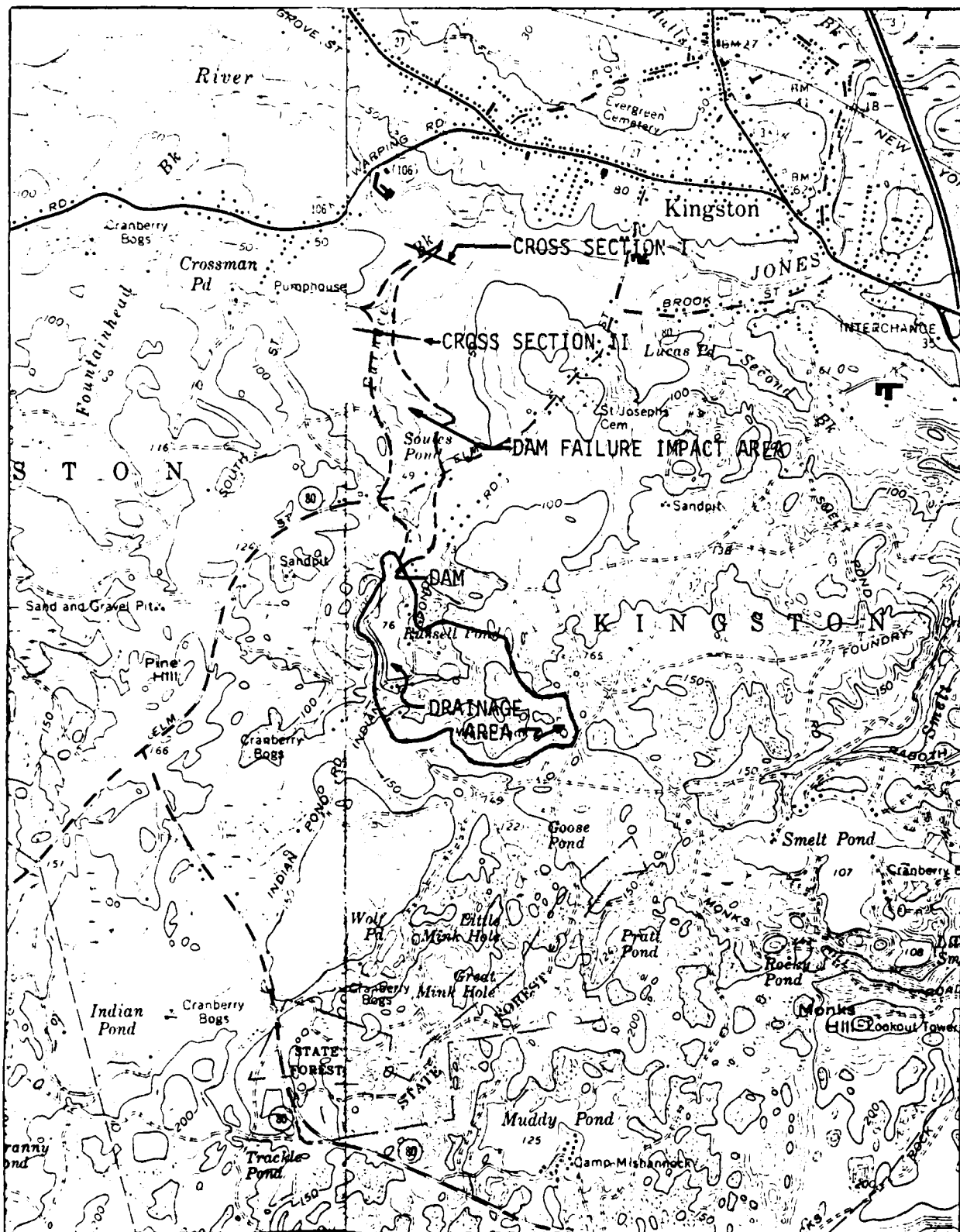
Stage in 1st reach when outflow is 5393 cfs is El. 71.69
 Storage " " " at El. 71.69 is 17.4 ac.-ft. = V_2

$$V_3 = \frac{22 + 17.4}{2} = 19.7 \text{ ac.-ft.}$$

$$Q_{p3} = 7814 \left(1 - \frac{19.7}{71}\right) = 5646 \text{ cfs Outflow from 1st reach}$$

Stage in 1st reach when outflow is 5646 cfs is El. 71.79

2 or 3 buildings may be affected by dam-break wave.
 Depth of flow over 1st downstream road = 3.8' ±



DAM RUSSELL POND

IDENTIFICATION NO. MA 00392



DRAINAGE AREA AND DAM FAILURE
IMPACT AREA MAP USGS QUADRANGLES

PLYMOUTH AND PLYMPTON, MA.

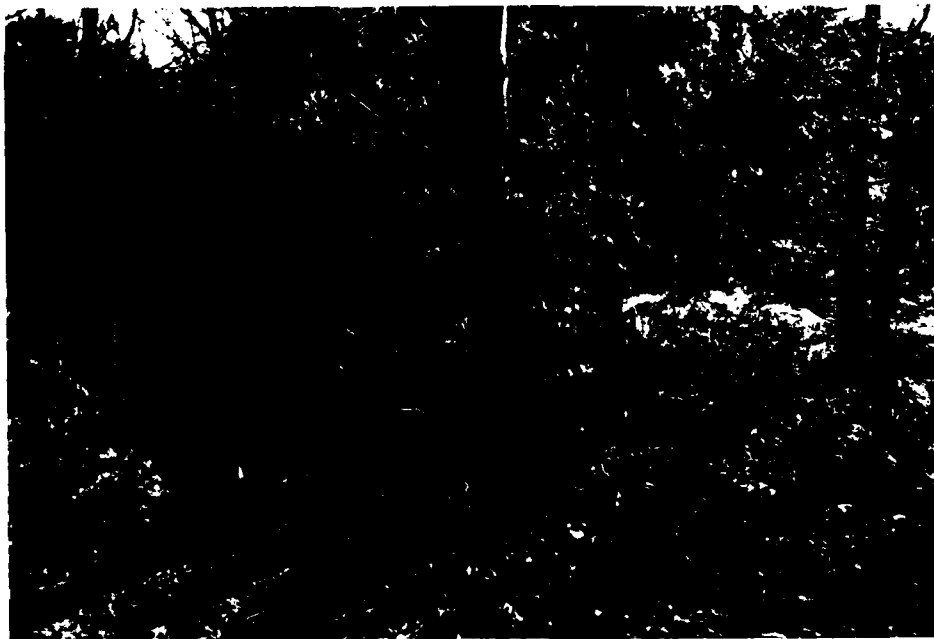
APPROX. SCALE: 1" = 2000'

APPENDIX D
OUTLINE OF DRAINAGE AREA AND
HYDRAULIC COMPUTATIONS

	<u>Page No.</u>
<u>OUTLINE OF DRAINAGE AREA</u>	
Drainage Area Map	D-1
Size Classification, Elevations, Storage Volumes, Dam Failure Analysis	D-2
Test Flood	D-4
Stage-Discharge Capacity	D-5
Stage-Storage-Area Relationships, Stage-Discharge- Storage Curve, Stage-Area Curve	D-6
Surcharge-Storage Routing	D-7



11. Outlet channel downstream of bridge.



12. Downstream face of dam from left abutment.



9. Upstream face of bridge over outlet channel.



10. Downstream face of bridge over outlet channel.



7. Foundation of former downstream mill.



8. Russell Pond upstream of outlet channel.



5. Exposed tree roots and eroded vertical portion of upstream face of dam.



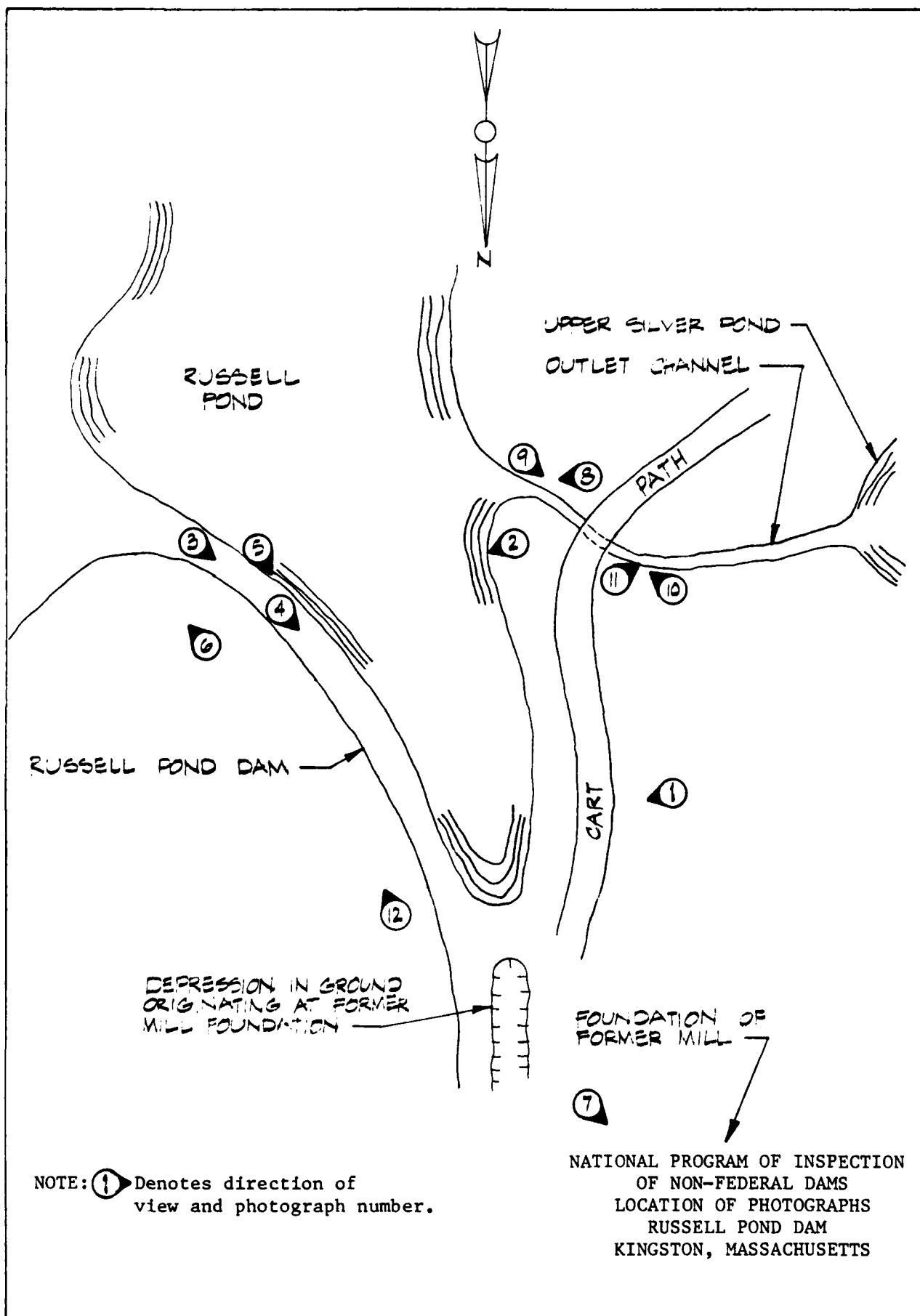
6. Seepage at toe of dam.



3. Dam crest from east abutment.



4. Eroded section in middle of dam crest, looking from east to west.



APPENDIX C

SELECTED PHOTOGRAPHS OF PROJECT

LOCATION PLAN

Location of Photographs

Page No.

C-1

PHOTOGRAPHS

<u>No.</u>	<u>Title</u>	<u>Page No.</u>
1.	Overview Of Upstream Face Of Russell Pond Dam From West Side Of Pond	iv
2.	Overview Of Upstream Face Of Russell Pond Dam From Spillway Area	iv
3.	Dam Crest From East Abutment	C-2
4.	Eroded Section In Middle Of Dam Crest, Looking From East To West	C-2
5.	Exposed Tree Roots And Eroded Vertical Portion Of Upstream Face Of Dam	C-3
6.	Seepage At Toe Of Dam	C-3
7.	Foundation Of Former Downstream Mill	C-4
8.	Russell Pond Dam Upstream Of Outlet Channel	C-4
9.	Upstream Face Of Bridge Over Outlet Channel	C-5
10.	Downstream Face Of Bridge Over Outlet Channel	C-5
11.	Outlet Channel Downstream Of Bridge	C-6
12.	Downstream Face Of Dam From Left Abutment	C-6

DAM NO. 7-12-145-1

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 accommodate the impoundment in the event of a complete dam failure yes ✓ no very questionable.

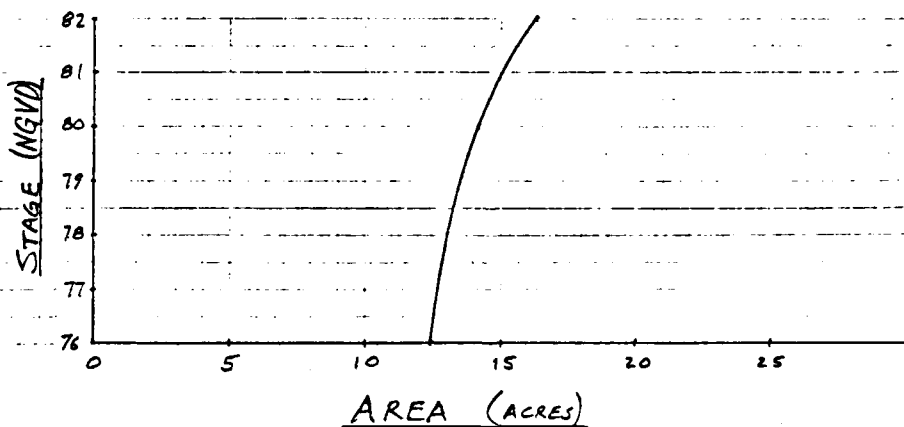
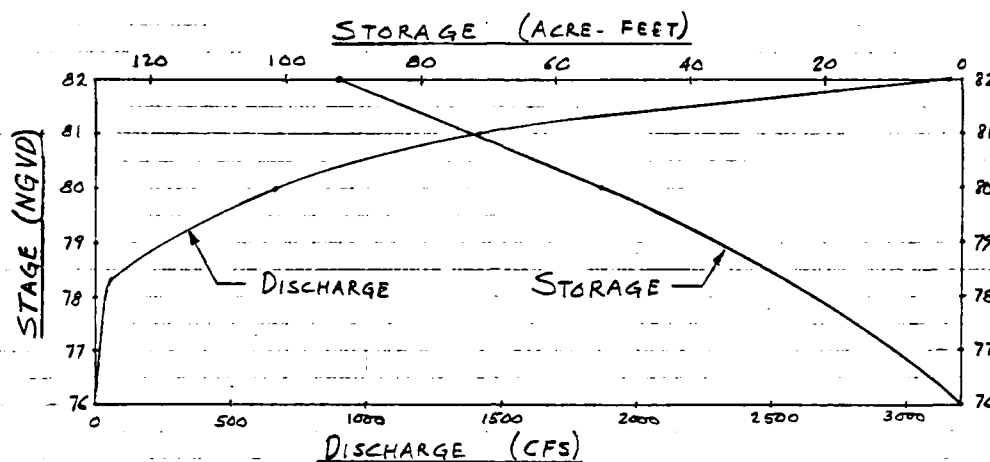
10. Risk to Life and Property in Event of Complete Failure
- | | | |
|-------------------|--|------------------------------------|
| No. of People | <u>18^c</u> | |
| No. of Homes | <u>Probably 10</u> | |
| No. of Businesses | <u>0</u> | |
| No. of Industries | <u>0</u> | Type _____ |
| No. of Utilities | <u>5</u> | Type <u>Tel Elect & Water.</u> |
| Railroads | <u>0</u> | |
| Other Dams | <u>0</u> | |
| Other | <u>old Elm St. (now called Silvia Arose Rd.)</u> | |

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

CLIENT COE
 PROJECT Dam Inspection
 DETAIL Russell Pond Dam
JOB NO 380-5-14DATE CHECKED 5/4/79CHECKED BY JEDPAGE 5 of 6DATE 4/18/79COMPUTED BY PFH

Stage - Storage - Area Characteristics of Russell Pond

Elev.	Area (acres)	Avg. Area (acres)	H (ft)	Storage Above Spillway (acre-ft)
76.0	12.4	0	0	0
80.0	14.2	13.3	4	53.2
90.0	24.8	19.5	10	248.2



CLIENT COE
 PROJECT Dam Inspection
 DETAIL Russell Pond Dam

 JOB NO 380-5-14
 DATE CHECKED 5/4/79
 CHECKED BY VED

 PAGE 6 of 6
 DATE 4/18/79
 COMPUTED BY PFH

SURCHARGE - STORAGE ROUTING

$$Q_{p1} = \text{Inflow} = \text{Test Flood} = 113 \text{ cfs}$$

Stage when outflow is 113 cfs is El. 78.46
 Storage at El. 78.46 is 32.7 ac.-ft.

$$\text{Runoff Volume} = \frac{32.7 \text{ ac.-ft.}}{(0.158 \text{ mi}^2)(53.3 \frac{\text{ac.-ft.}}{\text{inch} \cdot \text{mi}^2})} = 3.9 \text{ " runoff} = V_1$$

$$Q_{p2} = Q_A \left(1 - \frac{V_1}{S}\right) = 113 \left(1 - \frac{3.9 \text{ "}}{5.0 \text{ "}}\right) = 25 \text{ cfs}$$

Stage when outflow is 25 cfs is El. 77.7
 Storage at El. 77.0 is 22.6 ac.-ft.

$$\text{Avg. Storage} = \frac{32.7 + 22.6}{2} = 27.6 \text{ ac.-ft.}$$

Stage when storage is 27.6 ac.-ft. is El. 78.10
 Outflow at El. 78.10 is 40 cfs

$$\therefore \text{Test Flood Outflow} = 40 \text{ cfs}$$

The test flood outflow does not overtop the dam.

APPENDIX E
INFORMATION AS CONTAINED IN
THE NATIONAL INVENTORY OF DAMS

~~RUSSELL POWELL DAM~~

ON 07 11 95 5114

PLACITA

21

2

REMARKS

1

OWNER

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11 2020 AT THE NEW YORK

END

FILMED

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