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ASHUELOT POND DAM (NH (U) CORPS OF ENGINEERS WALTHAM
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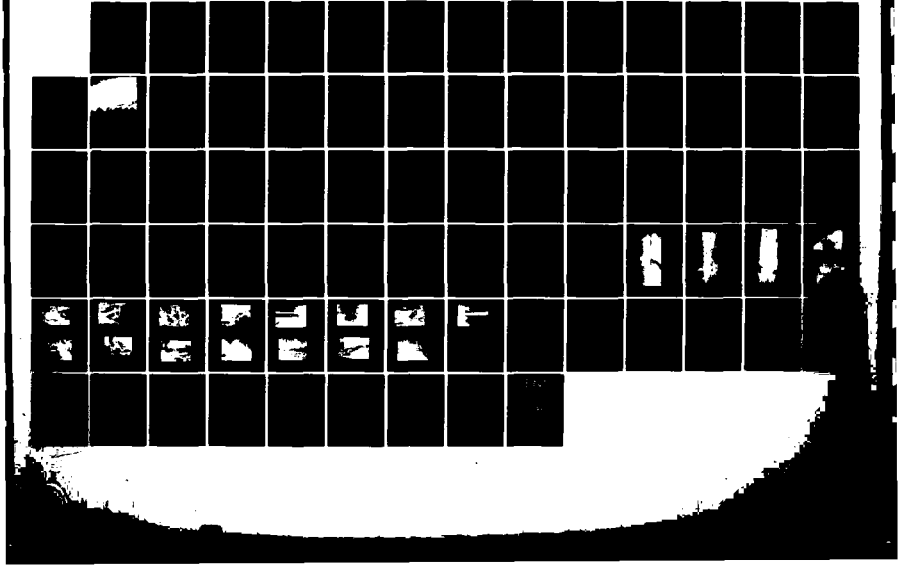
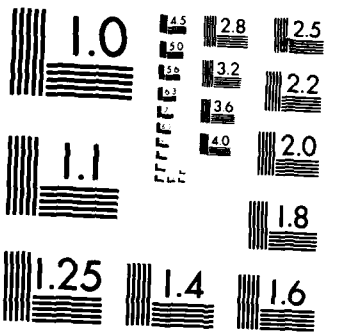




CONNECTICUT RIVER BASIN

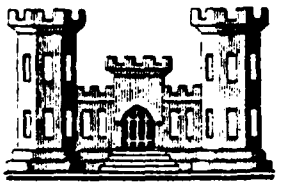
WASHINGTON, NEW HAMPSHIRE

ASHUELOT POND DAM

NH 00237

NHWRB NO. 245.05

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



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

JUNE 1979

UNCLASSIFIED

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Connecticut River Basin
Washington, New Hampshire
Ashuelot River

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

The dam is an earthen dam and stone structure about 190 ft. long with a maximum height of 13. ft. The dam is in fair consition. The inspection revealed seepage near the outlet works and near the right abutment. It is intermediate in size with a significant hazard classification.

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REPLY TO
ATTENTION OF:
NEDED

OCT 15 1979

Honorable Hugh J. Gallen
Governor of the State of New Hampshire
State House
Concord, New Hampshire 03301

Dear Governor Gallen:

Inclosed is a copy of the Ashuelot 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 Water Resources Board, the cooperating agency for the State of New Hampshire.

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 Water Resources Board for your cooperation in carrying out this program.

Sincerely,

MAX B. SCHEIDER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

ASHUELOT POND DAM

NH 00237

NHWRB NO. 245.05

CONNECTICUT RIVER BASIN
WASHINGTON, NEW HAMPSHIRE

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

LETTER OF TRANSMITTAL

FROM THE CORPS OF ENGINEERS TO THE STATE

TO BE SUPPLIED BY THE CORPS OF ENGINEERS

NATIONAL DAM INSPECTION PROGRAM
PHASE I - INSPECTION REPORT
BRIEF ASSESSMENT

Identification No.: 00237

Name of Dam: Ashuelot Pond Dam

Town: Washington

County and State: Sullivan, New Hampshire

Stream: Ashuelot River

Date of Inspection: May 9, 1979

Ashuelot Pond Dam is an earthen and stone structure approximately 190 feet long, with a maximum height of 13 feet. Appurtenant structures consist of two spillways and the outlet works. Both spillways are natural stream channels reinforced with fieldstone at the crests and sides. The outlet works, located near the center of the dam, has two gates and a stoplog section. The dam has been in existence since 1872, however, the date of construction is unknown. No drawings, design calculations, or construction data were available.

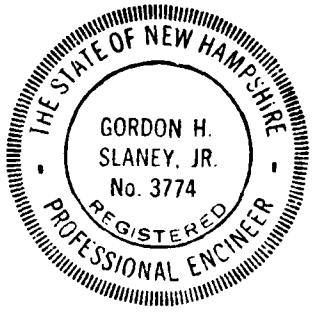
The visual inspection indicated that the dam is in fair condition. The inspection revealed seepage near the outlet works and near the right abutment, and severe erosion on the upstream face of the dam. Also noted during the inspection were several large trees growing on and near the dam, and inoperable gates in the outlet works.

Based on the intermediate size of the dam and its significant hazard classification and according to Corps of Engineers guidelines, the test flood inflow should be of a magnitude ranging from ½ the Probable Maximum Flood (PMF) to the full PMF. The test flood inflow used is equal to ½ the PMF or 22,000 cfs. The routed test flood outflow of 14,800 cfs overtops the dam by 5.9 feet. With the water level at the top of dam, the spillway will pass eight percent of the routed test flood outflow.

It is recommended that the owner engage a qualified professional engineer to investigate spillway adequacy and the potential for overtopping, and to design an acceptable means of removing the trees and their roots from the dam and backfilling the removed stumps and root voids with appropriate material.

Remedial measures include the development of a downstream warning system, repair of the outlet works gates, and repair of the collapsed section of wall in the center of the dam, which forms the upstream face.

The recommendations and remedial measures are described in Section 7 and should be addressed within one year after receipt of this Phase I Inspection Report by the owner.



HOWARD, NEEDLES, TAMMEN & BERGENDOFF
Boston, Massachusetts

Gordon H. Slaney, Jr.

Gordon H. Slaney, Jr.
Project Engineer

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

JOSEPH W. FINEGAN, JR., MEMBER
Water Control Branch
Engineering Division

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

JOSEPH A. MCELROY, CHAIRMAN
Chief, NED Materials Testing Lab.
Foundations & Materials 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 by any chance that unsafe conditions be detected.

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

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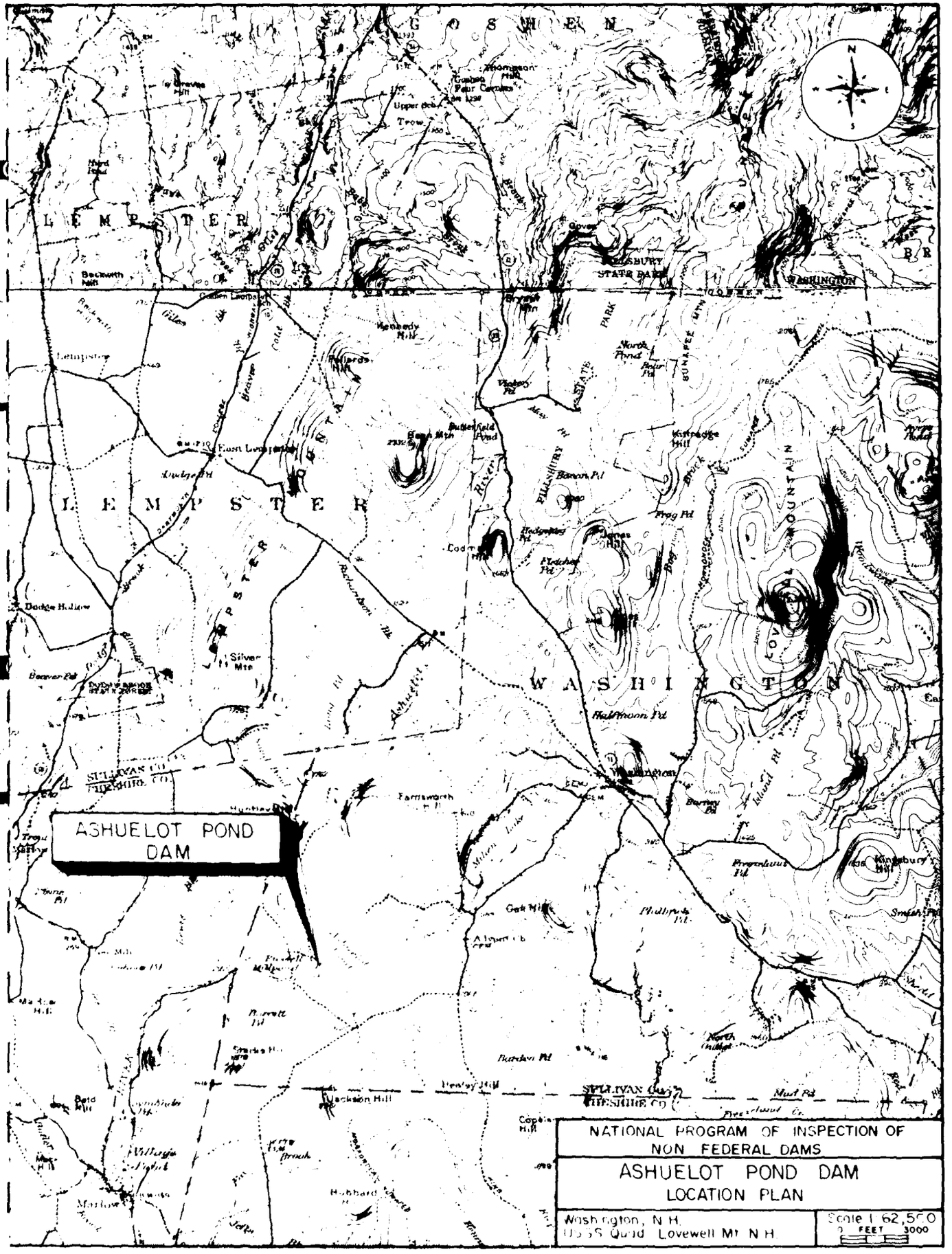
APPENDIXES

ASHLEIGH POND DAM - Overview looking downstream


ASHUELOT POND DAM
NATIONAL PROGRAM OF INSPECTION OF NON FEDERAL DAMS
ASHUELOT POND DAM
LOCATION PLAN
Washington, N.H.
USGS Quad Lovewell Mt. N.H.
Scale 1:62,500
0 FEET 3000

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT
ASHUELOT POND DAM

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. Howard, Needles, Tammen & Bergendoff has been retained by the New England Division to inspect and report on selected dams in the State of New Hampshire. Authorization and notice to proceed were issued to Howard, Needles, Tammen & Bergendoff under a letter of October 23, 1978 from John P. Chandler, Colonel, Corps of Engineers. Contract No. DACW33-78-C-0356 has been assigned by the Corps of Engineers for this work.

b. Purpose

(1) To 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) To encourage and prepare the states to initiate quickly effective dam safety programs for non-Federal dams.

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

12. Description of Project

a. Location. Ashuelot Pond Dam is located in the Town of Washington on the Ashuelot River approximately 4.1 miles upstream of Route 123, in the Town of Marlow, New Hampshire. The dam is shown in U.S.G.S. Quadrangle Lovewell Mountain, New Hampshire, with approximate coordinates N43°08'55", E72°09'25", Sullivan County, New Hampshire. The location of Ashuelot Pond Dam is shown on the preceding page.

b. Description of Dam and Appurtenances. Ashuelot Pond Dam is an earthen and stone structure approximately 190 feet in length. Maximum height of the dam is 13.0 feet. Appurtenant works consist of two spillways and the outlet works which is controlled by two gates. The first spillway is located to the immediate left of the dam and consists of the natural stream channel reinforced with field stones. The second spillway is located about 400 feet to the left of the first. The two spillways are separated by what appears to be the natural shoreline. The outlet works structure is placed near the center of the dam and consists of two gates in addition to stoplogs. According to sketches of the dam dated November 1929, the sluiceway for the outlet works is 7.0 feet wide. The sketch shows a trash rack placed over the upstream opening and two gates each 33.5 inches by 36 inches. In addition, there is shown an approach channel to the outlet works about 7 feet wide and with stone walls extending about 25 feet into the reservoir from the dam.

Figure 1, located in Appendix B, shows a plan of the dam and its appurtenant structures. Photographs of each structure are shown in Appendix C.

c. Size Classification. Intermediate (hydraulic height - 13 feet, storage - 4,000 acre-feet) classification based on storage being between 1,000 and 50,000 acre-feet as given in Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification. The potential for damage posed by this dam is classified as significant. The downstream river stage would be about 3.7 feet, with the spillways at full capacity. Failure of the dam at maximum pool (top of dam) would probably result in a total flood wave 9 feet in height along the reach of stream between the dam and Symonds Pond in Marlow. One dwelling, in this reach, would be affected by the flood wave. In Marlow, downstream of Symonds Pond, some structures may experience minor flooding.

e. Ownership. This dam is owned by Lake Ashuelot Estates, Inc.

The dam was formerly owned by Faulkner Colony Mfg. Co.

f. Operator. This dam is operated by the Lake Ashuelot Estates, Inc.

g. Purpose of Dam. The water impounded by this dam is now used for recreation. The pond was originally used as a water supply.

h. Design and Construction History. The date of original construction of this dam is unknown. The dam has

been in existence since 1872. There are no records indicating any major changes to the dam since construction.

i. Normal Operating Procedures. The lake is left to maintain its own level. There is no regular operating procedure.

1.3 Pertinent Data

a. Drainage Area. The area tributary to Ashuelot Pond Dam consists of 27.0 square miles of mountainous, wooded terrain. There is little upstream development. Maximum elevation is 2,332 feet MSL, and the reservoir elevation is 1,445 feet MSL.

The entire shoreline of the lake is heavily wooded, rolling terrain. There are several cottages along the west shore of the pond. There is a wooden plank walkway extending about 80 feet out into the pond from the face of the dam.

b. Discharge at Dam Site

(1) The outlet works for Ashuelot Pond Dam consists of a sluiceway through the embankment with an invert of 1,434.2. A 2.75 foot by 7 foot opening is controlled by stoplogs followed by two 33.5 by 36 inch gates. Discharge through the opening, with the water level at the top of the dam is 350 cfs.

(2) There are no records available of maximum discharge at the dam site. A local observation noted that in 1959 the lake level was almost at the crest of the dam. This level would produce a discharge of approximately 1,000 cfs.

(3) The spillway capacity with the water surface at the top of the dam is approximately 1,120 cfs at elevation 1,447.3 feet.

(4) The spillway capacity with the water surface elevation at the test flood elevation of 1,453.2 feet is approximately 6,230 cfs.

(5) The total project discharge at the test flood elevation of 1,453.2 feet is approximately 14,800 cfs.

c. Elevation (feet above MSL)

(1) Streambed at centerline of dam - 1,433.5±.

(2) Maximum tailwater - unknown.

(3) Upstream invert of outlet works - 1,434.2.

(4) Recreation pool - 1,445.0.

(5) Full flood control pool - N/A.

(6) Spillway crest (permanent spillway) - 1,445.0.

(7) Design surcharge - unknown.

(8) Top Dam - 1,447.3.

(9) Test Flood Surcharge - 1,453.2.

d. Reservoir (miles)

(1) Length of Maximum Pool - N/A.

(2) Length of Recreational Pool - 1.2.

(3) Length of Flood Control Pool - N/A.

e. Storage (gross acre-feet)

(1) Recreation Pool - 2,760.

(2) Flood Control Pool - N/A.

(3) Spillway Crest Pool - 2,760.

(4) Top of Dam - 4,000.

f. Reservoir Surface (acres)

(1) Recreation Pool - 428.

(2) Flood Control Pool - N/A.

(3) Spillway Crest - 428.

(4) Test Flood Pool - 540.

(5) Top Dam - 540 with adjacent swamp.

g. Dam

(1) Type - earth and stone.

(2) Length - 190 feet.

(3) Height - 13 feet.

(4) Top Width - 18.5 feet.

(5) Side Slopes - vertical both up and downstream.

(6) Zoning - unknown.

(7) Impervious core - unknown.

(8) Cutoff - unknown.

(9) Grout Curtain - unknown.

(10) Other - unknown.

h. Diversion and Regulating Tunnel

See Section j below.

i. Spillway

(1) Type - stream channels reinforced with fieldstone.

(2) Length of Weir - two 36 and 50 feet, respectively.

(3) Crest Elevation - 1,445.0 both spillways.

(4) Gates - none.

(5) Upstream Channel - None.

(6) Downstream Channel - the spillway outlet channels are natural stream channels. The outlet channels converge downstream of the dam.

j. Regulating Outlets. The sluiceway through the embankment has a 2.75 foot by 7.0 foot opening set at an invert of 1,434.2. This opening is preceded by a trash rack and stoplogs located upstream of the opening in the outlet works structure. The opening can be controlled by two 33.5 by 36 inch gates. The stoplogs can be used when gate maintenance is required. Maximum capacity of the outlet works is 350 cfs with the water surface at the top of the dam. Records indicate that there is a stone walled approach channel, below the water surface, about 25 feet long, leading to the outlet works. Downstream of the outlet works there is a stone walled channel about 6 feet wide and 40 feet long. This channel converges with the spillway outlet channels.

SECTION 2
ENGINEERING DATA

2.1 Design

No original design data were disclosed for Ashuelot Pond Dam. The original construction date of this dam is unknown, however, it has been in existence since 1872. There are no records indicating any major changes to the dam. No plans of the dam are available, however, there are some sketches dated November 1929, showing details of the outlet works.

2.2 Construction

No construction records are available for use in evaluating the dam.

2.3 Operation

No engineering operational data were disclosed.

2.4 Evaluation

a. Availability. There is no engineering data available for Ashuelot Pond Dam.

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

c. Validity. Since no plans of this dam are available the information shown in this report are based solely on the results of the visual inspection.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General. The field inspection of Ashuelot Pond Dam was made on May 9, 1979. The inspection team consisted of personnel from Howard, Needles, Tammen & Bergendoff and Geotechnical Engineers, Inc. A representative of the New Hampshire Water Resources Board was also present during the inspection. Inspection checklists, completed during the inspection, are included in Appendix A. At the time of inspection, the water level was approximately 2.2 feet below the crest of the dam. The upstream face of the dam could only be inspected above this level.

b. Dam. Visual inspection of the dam indicated that it is in fair condition.

The dam consists of two curved stone walls with an earth fill in beteeen; an outlet structure is at the right side and a spillway is at the left side. The dam has been in existence since 1872.

A second spillway to the left of the dam location was not geotechnically inspected.

Upstream Face

A panoramic view of the upstream face of the dam is shown in Photo No. 1. The upstream face consists of an unmortared stone wall. The stone wall could not be seen in several areas of the left half of the dam. A wooden pier for docking boats is located in the central portion of the dam as shown in Photo No. 1.

Erosion of the earth filling of the dam has occurred in areas where the upstream stone wall is missing or toppled. The most severe erosion was observed about 30 to 40 feet right of the right training wall of the spillway (immediately left of the wooden pier) as shown in Photo No. 1.

Close-up views of this eroded area are shown in Photos No. 11 and 12.

Brush and several groups of trees were observed on the upstream face as shown in Photo No. 1. A sounding of the bottom of the reservoir at the intake structure indicated a distance of 13.2 feet between crest level and reservoir bottom.

Crest

The crest of the dam has a variable width, but is about 18 feet wide on average.

Several areas of the crest are barren, as shown in Photos No. 4 and 5. This erosion has probably been caused by trespassing on the crest. Several trees were observed on the crest, and the roots of trees were observed protruding through the surface of the crest near the left side of the dam, as shown in Photo No. 5.

Downstream Face

The downstream face is an unmortared stone wall of variable height, as shown in Photo No. 5. No misalignment of the stone wall which could be related to instability of the dam was observed. There is a topographic high near the right end of the dam downstream of the stone wall.

Several large trees were observed immediately downstream of the dam. Vegetation was observed growing between the stone blocks of the downstream wall, as shown in Photo No. 6. Seepage was occurring through the downstream face at a location shown in Photo No. 6 at the level of the inspector's feet. The seep, shown in Photo No. 10 was about 8.9 feet below the crest. The water of the seep appeared to be clear.

A small seep was observed from under a large boulder (or possibly bedrock) located about 15 feet downstream of the downstream stone wall and near the right abutment. The seep is about 8.6 feet below the crest elevation and shown in Photo No. 9. This photo also shows the base of a large, dead tree about the boulder or bedrock.

c. Appurtenant Structures. Visual examination of the appurtenant structures at Ashuelot Pond Dam did not reveal any evidence of immediate stability problems.

The spillway structures consists of two natural brook beds reinforced with field stones. The stones are laid out in such a way that there is approximately a three (3) foot step between upstream and tailwater levels. The Ashuelot Pond Dam has two spillways, one 36 feet long located at the left abutment of the actual dam, see Photos No. 13 and 14, and a 50 foot spillway located approximately 400 feet to the left of the first spillway, see Photos 15 and 17. The 50 foot wide spillway appears to be separated from the dam structure. The stone used for the spillway structure is large field stone

placed uniformally along the river width. The river banks of the spillway section are also reinforced by field stone. Both spillway structures appeared to be in good condition. Field examination appears to indicate that the outlet works structure was constructed as shown in Section B-B, Figure 1, located in Appendix B, see Photos No. 6 and 7.

The outlet works structure consists of concrete and masonry walls and a one (1) foot thick cover slab with gate and manhole openings. The outlet works are controlled by wooden gates and stoplogs. At the time of inspection both stoplogs and gates were in place. The concrete surface generally appeared to be in good condition except for some cracks. The masonry walls are in good condition.

The stoplogs appear to be in good condition. The gates and trash rack were not inspected as they were below water. The gate stems are rusted and the gates were inoperable, see Photo No. 8. The manhole at the outlet works did not allow for vertical access to the stoplogs.

d. Reservoir Area. The entire shoreline of the pond is wooded, rolling terrain. There are several cottages along the west shore. A wooden plank walkway extends about 80 feet out into the pond from the face of the dam.

e. Downstream Channel. Downstream of the outlet works there is a stone wall channel about 6 feet wide and 40 feet long. The spillway outlet channels are natural stream channels. All three outlet channels converge downstream of the dam. At the time of inspection, there were no significant obstructions in the outlet works channel, however, there were several dead trees in the channel of the 36 foot spillway.

3.2 Evaluation

Visual examination indicates the dam is in fair condition. The inspection of the dam revealed the following:

(a) Seepage at the base of the downstream stone wall to the left of the outlet works.

(b) Minor seepage about 15 feet downstream of the stone wall near the right abutment.

(c) Severe erosion of the upstream face where the stone walls is missing near the center of the dam.

(d) Erosion of the crest of the dam.

(e) Several large trees on and near the dam.

(f) Fallen trees in the channel of the 36 foot wide spillway.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedure

The Ashuelot Pond Dam is used primarily for the storage of water for recreational purposes. There are no regular operating procedures for this dam.

4.2 Maintenance of Dam

There is no regular maintenance for this dam. Occasionally, trees are cut on the dam.

4.3 Maintenance of Operating Facilities

There is no regular maintenance of the operating facilities.

4.4 Description of Warning Systems

There is no warning system in effect for this facility.

4.5 Evaluation

The current operation and maintenance procedures for this dam are inadequate to insure that problems encountered can be remedied within a reasonable period of time.

SECTION 5
HYDROLOGY AND HYDRAULIC ANALYSIS

5.1 Evaluation of Features

a. General. Ashuelot Pond Dam is an earthen and stone structure approximately 190 feet long with a maximum height of 13 feet. Appurtenant structures consist of an outlet works and two spillways. The outlet works is a sluiceway through the dam embankment and can be controlled by stoplogs or gates. One of the spillways is located adjacent to the left abutment of the dam. The second spillway is located about 400 feet to the left of the first spillway. They are separated by what appears to be natural shoreline. Both spillways are natural outlets reinforced with fieldstone at the crest. Ashuelot Pond Dam is classified as intermediate in size with a maximum storage of 4,000 acre-feet.

b. Design Data. No hydrologic or hydraulic design data were disclosed for Ashuelot Pond Dam.

c. Experience Data. There are no records available of maximum discharge at the dam site. A local observation noted that in 1959 the lake level almost reached the crest of the dam. This level would produce a discharge of about 1,000 cfs.

d. Visual Observations. No evidence of damage to any portion of the dam due to overtopping was visible at the time of inspection.

e. Test Flood Analysis. As no detailed design and operational information are available, hydrologic evaluation was performed using dam information gathered by field inspection, watershed size and an estimated test flood equal to 1/2 the Probable Maximum Flood (PMF) as determined by guide curves issued by the Corps of Engineers. Based on a drainage area of 27.0 square miles, it was estimated that the test flood inflow at Ashuelot Pond Dam would be 22,000 cfs. Following the guidance for Estimating Effect of Surcharge Storage on Maximum Probable Discharge results in a routed test flood outflow of 14,800 cfs. As the maximum spillway capacity at the top of the dam is only 1,120 cfs (approximately eight percent of the routed test flood outflow, the test flood will result in the dam being overtopped by approximately 5.9 feet.

f. Dam Failure Analysis. The impact of failure of the dam at maximum pool (top of dam) was assessed using the

"Rule of Thumb" Guidance for Estimating Downstream Dam Failure Hydrographs issued by the Corps of Engineers. The analysis covered the reach extending from the dam to Symonds Pond in Marlow 3.4 miles downstream. Prior to breach of dam, with the spillways at full capacity, the downstream stage would be about 3.7 feet. Failure of the dam with the water level at the top of dam, would probably result in a total flood wave 9 feet high through the reach studied. Of the six dwellings along this reach, one will be affected as it is only four feet above normal water. The flood wave was not routed through Symonds Pond in the Town of Marlow, however, minor flooding in Marlow could be expected as there are many buildings located four to six feet above normal water.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observation. The visual observations did not disclose any immediate stability problems. However, the following problems, if allowed to continue, could threaten the stability of the dam in the future:

(1) Erosion of portions of the upstream face.

(2) Erosion of the crest.

(3) Tree growth on and near the dam.

b. Design and Construction Data. No design and construction data were made available.

c. Operating Records. No operating records were made available.

d. Post-Construction Changes. There is no record of any major changes to the dam since its construction.

e. 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 AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. The visual inspection of Ashuelot Pond Dam indicates the dam is in fair condition. The inspection revealed the following:

(1) Seepage at the base of the downstream stone wall to the left of the outlet works.

(2) Minor seepage about 15 feet downstream of the stone wall near the right abutment.

(3) Severe erosion of the upstream face where the stone wall is missing near the center of the dam.

(4) Erosion on the crest of the dam.

(5) Several large trees on and near the dam.

(6) Inoperable gates in the outlet works.

(7) Several fallen trees in the channel of the 36 foot wide spillway.

The hydraulic analysis reveals that the spillways cannot pass the routed test flood without overtopping the dam.

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

c. Urgency. This dam is in generally fair condition. The recommendations and remedial measures described in Sections 7.2 and 7.3 should be accomplished within one year after receipt of this Phase I Inspection Report by the owner.

d. Necessity of Additional Investigation. No additional investigation is needed to complete the Phase I inspection.

7.2 Recommendations

The owner should engage a qualified registered professional engineer to investigate spillway adequacy and the potential for overtopping, and to design an acceptable means of removing the

trees and their roots from the dam and backfilling the removed stumps and root voids with appropriate material.

7.3 Remedial Measures

(a) A written operational procedure and downstream warning system to follow in the event of emergency conditions should be developed.

(b) Prevent trespassing on the dam and re-establish grassy vegetation on the paths on the crest and refill any voids created by removal of the vegetation.

(c) Repair the stone wall which forms the upstream face and repair the eroded areas.

(d) Monitor seepage areas noted in Section 3.1 every two months and during unusually high pond levels.

(e) Repair the outlet works gates such that they can be operated.

(f) A technical inspection program should be initiated and continued on a yearly basis.

(g) The fallen trees in the channel of the 36 foot wide spillway should be removed.

7.4 Alternatives

There are no practical alternatives to the recommendations of Section 7.2 and 7.3, except that on an interim basis the owner may consider operating the reservoir at a lower level throughout the year so as to provide more storage for extreem flood events.

APPENDIX A

INSPECTION CHECKLIST

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

A-1

PROJECT Ashuelot Pond Dam

DATE May 9, 1979

TIME 10:00 A.M.

WEATHER Fair

W.S. ELEV. 1445.2 U.S. 1437.3 DN.S

PARTY:

1. D. LaGatta - GEI
2. T. Keller - GEI
3. G. Slaney - HNTB
4. S. Mazur - HNTB
5.
6.
7.
8.
9.
10.

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Dam	D. LaGatta, T. Keller	
2.	Spillway, Outlet Works and	S. Mazur, G. Slaney	
3.	Downstream Channel		
4.			
5.			
6.			
7.			
8.			
9.			
10.			

PERIODIC INSPECTION CHECK LIST A-2

PROJECT Ashuelot Pond Dam DATE May 9, 1979

PROJECT FEATURE Embankment Dam NAME D. P. LaGatta

DISCIPLINE Geotechnical Engineer NAME T. O. Keller

AREA EVALUATED	CONDITION
DAM EMBANKMENT	Embankment dam has vertical stone masonry walls on upstream and downstream sides.
Crest Elevation	1,445.2
Current Pool Elevation	Unknown
Maximum Impoundment to Date	None observed.
Surface Cracks	No pavement.
Pavement Condition	None observed.
Movement or Settlement of Crest	None observed.
Lateral Movement	No vertical misalignment observed.
Vertical Alignment	No horizontal misalignment observed.
Horizontal Alignment	Good.
Condition at Abutment and at Concrete Structures	None observed.
Indications of Movement of Structural Items on Slopes	Footpath on crest and boat dock near center of dam.
Trespassing on Slopes	Eroded area on upstream slope about 30' to 40' right of spillway where stone blocks are missing.
Sloughing or Erosion of Slopes or Abutments	No riprap.
Rock Slope Protection - Riprap Failures	None observed.
Unusual Movement or Cracking at or near Toes	Seepage through stone wall immediately left of outlet structure and from underrock near right abutment 15' downstream of dam.
Unusual Embankment or Downstream Seepage	None observed.
Piping or Boils	None observed.
Foundation Drainage Features	None observed.
Toe Drains	None.
Instrumentation System	Many large trees and small brush on dam.
Vegetation	

PERIODIC INSPECTION CHECK LIST

A-3

PROJECT Ashuelot Pond Dam

DATE May 9, 1979

PROJECT FEATURE Intake Channel/Structure

NAME D. LaGatta, T. Keller

DISCIPLINE Geotechnical/Structural/Hydraulic

NAME S. Mazur, G. Slaney

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	No special approach channel.
a. Approach Channel	
Slope Conditions	
Bottom Conditions	
Rock Slides or Falls	
Log Boom	
Debris	
Condition of Concrete Lining	
Drains or Weep Holes	-
b. Intake Structure	
Condition of Concrete	Concrete/stone masonry good condition.
Stop Logs and Slots	Good (inside structure).

PERIODIC INSPECTION CHECK LIST

PROJECT Ashuelot Pond Dam DATE May 9, 1979

PROJECT FEATURE Control Tower NAME S. Mazur

DISCIPLINE Structural Engineer NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER	This facility has no 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 Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System	

PERIODIC INSPECTION CHECK LIST

A-5

PROJECT Ashuelot Pond Dam

DATE May 9, 1979

PROJECT FEATURE Transition and Conduit

NAME

DISCIPLINE

NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT	None.
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 CHECK LIST

PROJECT Ashuelot Pond Dam

DATE May 9, 1979

PROJECT FEATURE Outlet Structure/Channel

NAME T. Keller, D. LaGatta

DISCIPLINE Structural/Hydraulic/Geotechnical Engineers

NAME S. Mazur, G. Slaney

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Concrete	Sluiceway structure is only way of outletting water other than the spillways consists of stop logs and gates. Gates and stop logs appear to be in good condition.
Rust or Staining	
Spalling	
Erosion or Cavitation	
Visible Reinforcing	
Any Seepage or Efflorescence	None observed.
Condition at Joints	Fair
Drain Holes	None observed.
Channel	
Loose Rock or Trees Overhanging Channel	Several trees on channel sides.
Condition of Discharge Channel	Good.

PERIODIC INSPECTION CHECK LIST

A-7

PROJECT Ashuelot Pond Dam — DATE May 9, 1979

PROJECT FEATURE Spillway/Channel — NAME D. LaGatta

DISCIPLINE Geotechnical, Structural, Hydraulic Engineers — NAME G. Slaney, S. Mazur

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	Approach channel is reservoir.
General Condition	
Loose Rock Overhanding Channel	
Trees Overhanging Channel	
Floor of Approach Channel	
b. Weir and Training Walls	
General Condition of Concrete	The spillway consists of two natural brooks reinforced with field stones. Both spillway structures appear to be in good condition. (See text Section 3.1).
Rust or Staining	
Spalling	
Any Visible Reinforcing	
Any Seepage or Efflorescence	
Drain Holes	None.
c. Discharge Channel	
General Condition	Good.
Loose Rock Overhanging Channel	None observed.
Trees Overhanging Channel	Trees on sides of channel.
Floor of Channel	Bouldery; some trees on floor.
Other Obstructions	None observed.

PERIODIC INSPECTION CHECK LIST

A-8

PROJECT Ashuelot Pond Dam

DATE May 9, 1979

PROJECT FEATURE Service Bridge

NAME

DISCIPLINE

NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - SERVICE BRIDGE	
a. Super Structure	This facility has no service bridge.
Bearings	
Anchor Bolts	
Bridge Seat	
Longitudinal Members	
Under Side of Deck	
Secondary Bracing	
Deck	
Drainage System	
Railings	
Expansion Joints	
Paint	
b. Abutment & Piers	
General Condition of Concrete	
Alignment of Abutment	
Approach to Bridge	
Condition of Seat & Backwall	

APPENDIX B

1. List of Design, Construction and Maintenance Records
2. Past Inspection Reports
3. Plan and Details

AVAILABLE ENGINEERING DATA

No plans are available for Ashuelot Pond Dam, however several sketches dated November 14, 1929, showing the outlet works, are available at the State of New Hampshire Water Resources Board, 37 Pleasant Street, Concord, New Hampshire 03301.

PAST INSPECTION REPROTS

DATE May 16, 1969

FROM Francis C. Moore

SUBJECT Inspection of Ashuelot Pond Operation

TO Vernon A. Knowlton

In the afternoon of May 15, I visited Ashuelot Pond to observe the lake operations. The following was found:

1. Lake was 2.3 feet below full pond.
2. One gate had 3.5' stick up to gate stem and other 1.8'.
3. Heavy flow below dam in brook covering gate outlet substantially.
4. Emergency spillway (35' long) has abutments about 3'high to top of embankment and shows no signs of flash board installation in past. If any had been used, it must have been over 30 years ago as projecting rocks in pond show no evidence of it.
5. There is a serious but not menacing leak in masonry wall just to the right of the gate outlet in dam. This leak is located about 3.2 feet below full pond elevation and extends 6' to 8' in length. Some seeping occurs at same elevation over and a little to left of gate outlet. In all, it will furnish ample fish water but should be watched.
6. There is a dragline on the shore diagonally across pond but not operating at 4:00 P.M. A bulldozer apparently was operating in the woods on the Ashuelot Lake Estates area.

FCM/jb

DATE November 4, 1968

FROM Francis C. Moore

SUBJECT Ashuelot Pond Dam #245.05 (Washington)

TO Vernon A. Knowlton

On November 1, 1968, I visited Ashuelot Pond in Washington to inspect the dam, spillway gates, etc. As the level of Ashuelot Pond had been lowered 7.3' from full pond, a good inspection was possible. The level may drop to 8.5' before it stabilizes. The west gate was opened 3 feet (full). The east gate was apparently closed. The downstream channel was running full to top of the masonry walls bordering the outlet ditch. The intake channel was about 8 feet wide and 2.3 feet deep but the water covered the upstream gate opening.

Full pond is about 3 1/2 feet from top of earth embankment (masonry faced) dam. The original control of the stream from Ashuelot Pond was apparently located near the upstream face of the dam and at an elevation about 7 1/2 feet below the top of dam embankment (this is about 4 feet below the spillway crest).

Many uncovered boulders stand on the bottom of the pond upstream of the spillway and dam. It seems that dirt has been eroded considerably from the sides of these boulders due to flow, frost action, ice, etc.

The original natural level of Ashuelot Pond was estimated from the upstream area and downstream area which, near the channels, both up and downstream, were definitely excavated and possibly the side slopes to the downstream channel.

Bulldozing operations were in progress when I visited the site. The area from the present pond surface to the shore was cleaned of boulders and surface graded from a point about 150 feet east to 300 feet east of the east end of the spillway. The boulders were pushed into piles at each end of the graded area but as yet do not restrict the flow out the spillway.

There were some stones in the upstream wall disloged about 20 feet east of the gate section which should be relaid. The channel to the gate has been cleaned but the east gate should be opened (and then if desired closed) to see that it operates satisfactorily. Also, if to be used in the future, the condition of the gate itself should be checked.

In order to increase the capacity of the 35' spillway, a sturdy concrete sill with top located two feet below the present invert elevation should be constructed with approach and discharge channels lowered at least two feet. Flashboards designed to fail with 18" head should be removed in late fall and replaced after the bulk of the spring runoff had passed. This would allow much more freeboard at flood times.

A 2 1/2' wide plank catwalk has been constructed from the dam to a 30 c.y. boulder out about 50 feet from shore. An anchor to the catwalk has been attached to the downstream masonry face of the dam with steel cables running to a steel plate about 2 feet below top of the masonry wall. This catwalk is about 30' east of the gate section.

FCM/jb

State of New Hampshire

WATER RESOURCES BOARD

STATE HOUSE ANNEX
CONCORD 03301

September 13, 1968

Douglas S. Hatfield, Jr., Esquire,
Central Square
Hillsborough, New Hampshire 03244

Dear Mr. Hatfield:

Mr. Vernon Knowlton has referred your request for determination of the natural mean high water level of Ashuelot Pond in Washington, N. H., to me for findings. The following level has been determined to be the probable natural mean high water level of Ashuelot Pond:

Natural high water mark at Ashuelot Pond is 3-1/2 feet below the crest of the spillways which is about 43.0 feet on the plan of cross sections of proposed dredging and filling at Ashuelot Pond by Donald R. Mellen, Surveyor, dated August 31, 1968. As dredging is planned to elevation 41.4 feet on the assumed bench mark, there will have to be a petition under RSA 482-A:2 to the Governor and Council to do this.

The dam is essentially sound. The gates, however, are inoperable and should be rebuilt and made operable preferably in a tamper proof gate house (concrete blocks or equivalent). The chamber walls at and in front of the gates should be thoroughly sealed to prevent leaking around the gates and into the embankment. Also, the two side spillways (about 35' and 50' long) should have an upstream cutoff wall extending into the ground for definite cutoff, poured against the existing rocks to the same level as the top of boulders are now. This would reduce leakage. Some up and down stream clearance of rocks and bush in the channels at these two spillways would improve flow conditions at high water. All trees on the dam embankment should be cut, to prevent damage if the trees overturned.

Trusting this is the information desired, I remain,

Very truly yours,

Francis C. Moore
Civil Engineer

FCM/m

MEMORANDUM

From: Francis C. Moore
Civil Engineer

August 20, 1965

Re: Ashuelot Pond, Washington Inspection

To: Walter G. White
Chairman

As requested, I met Mrs. James N. Cover, 29 Union Street, Peterboro, at Ashuelot Pond dam on the afternoon of August 13. Also, there were several other members of the Ashuelot Pond Association present. The following information was obtained:

The pond level is down from 18 to 24 inches below full pond.

The gates were closed, gate house has been removed and the gate stems sealed in with concrete and now inoperable.

Due to very substantial leaks in the gates, the local camp owners sealed off these leaks with two mattresses. In time the gate boards will fail causing a serious lowering of Ashuelot Pond.

Around the downstream face of the outlet, considerable leakage exists and reportedly to be considerably more extensive at full pond. (It appears this leakage comes from the gate chamber.)

The two spillways appear to be substantial, but the individual boulders forming the spillways have 1 to 2 inch openings between rocks permitting discharges to 6 to 9 inches below full pond.

It was reported that three weeks ago the level was at spillway crest (about 18 inches higher). I question whether the pond would drop that rapidly.

The embankment appears to be in good condition. It has an earth fill between double masonry walls, unmortared.

The Association has cleared trees from the top of embankment as they feared they would weaken the masonry walls. This, I believe, was done with permission of the owner, Barker Realty Company of Keene.

A road to public waters has been established just above the right abutment of the embankment. The ramp is poor as there are several boulders at the water's edge.

There are about eighty camps around Ashuelot Pond. Over ninety per cent of them belong to Ashuelot Pond Association.

Present flow from Ashuelot Pond does not appear to be excessive for this time of year, drainage area (26 3/4 sq. mi.) and fish flow.

The Ashuelot Pond Association members report that Barker Realty Company, Inc. is not interested in selling its interest in the dam.

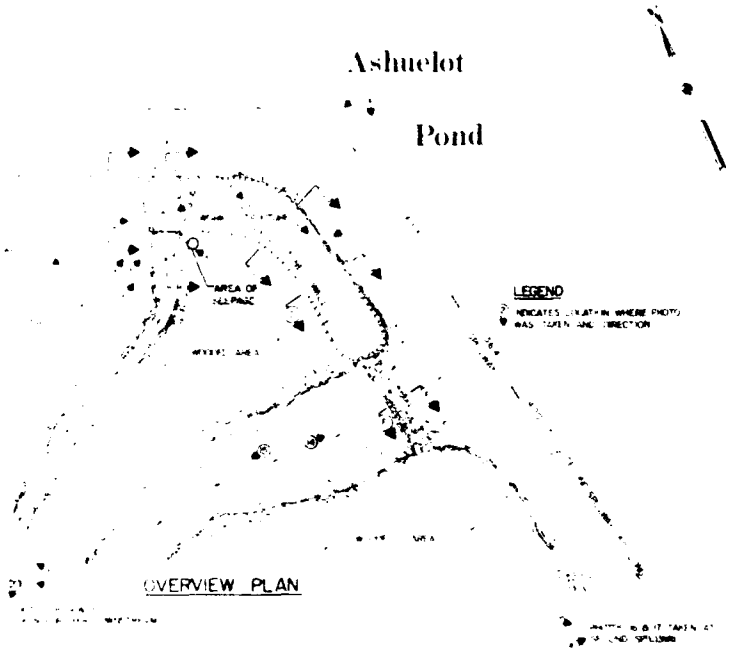
I told the Ashuelot Pond Association that the State was in no position to take over Ashuelot Pond at the present time. The State would not pay over one dollar for the dam and water rights even when money became available. The usual way for the State to acquire it was for a bill to be introduced into the Legislature (1967 session) to take it over, pay for repairs and exempt it from property taxes. If the Association and/or the dam owners on Ashuelot Pond submitted a written petition stating the dam was in disrepair, this Board might request the owner to make necessary repairs.

This dam in its present condition, having two inoperable and old gates, should be classed as in disrepair. Barker Realty Company, Inc., 210 West Street, Keene, N. H. should be notified of the findings of this inspection and requested to make necessary changes and repairs.

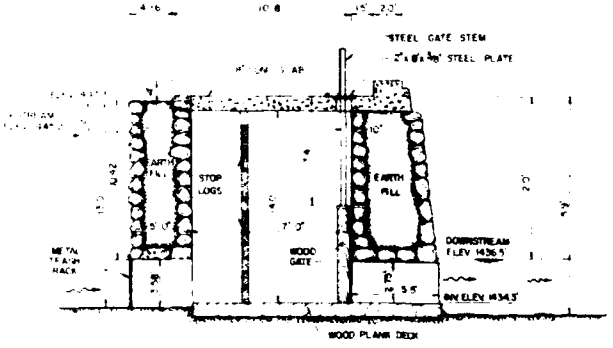
Actually, the spillways and gates (if operable) will pas 72% of a 100 year frequency flood flow.

Francis C. Moore
Civil Engineer

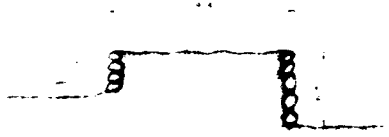
FCM/cam



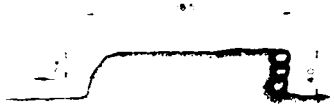
OVERVIEW PLAN



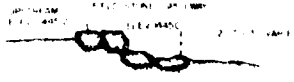
SECTION B-B



SECTION A-A



SECTION D-D



SECTION E-E

1. THE INFORMATION SHOWN ON THESE DRAWINGS IS BASED ON THE ORIGINAL CONSTRUCTION PLANS AND VISUAL OBSERVATIONS MADE DURING THE FIELD INSPECTION. DIMENSIONS OR MATERIALS INDICATED ON THESE DRAWINGS WHICH WERE BELOW GRADE OR WATER DURING THE TIME OF INSPECTION WERE NOT VERIFIED.

2. THE ELEVATIONS SHOWN ARE NEW [illegible] DATUM.

ASHUELOT POND DAM

APPENDIX C

PHOTOGRAPHS

FOR LOCATION OF PHOTOS, SEE FIGURE 1
LOCATED IN APPENDIX B

PHOTO NO. 1 - View of upstream side of dam.

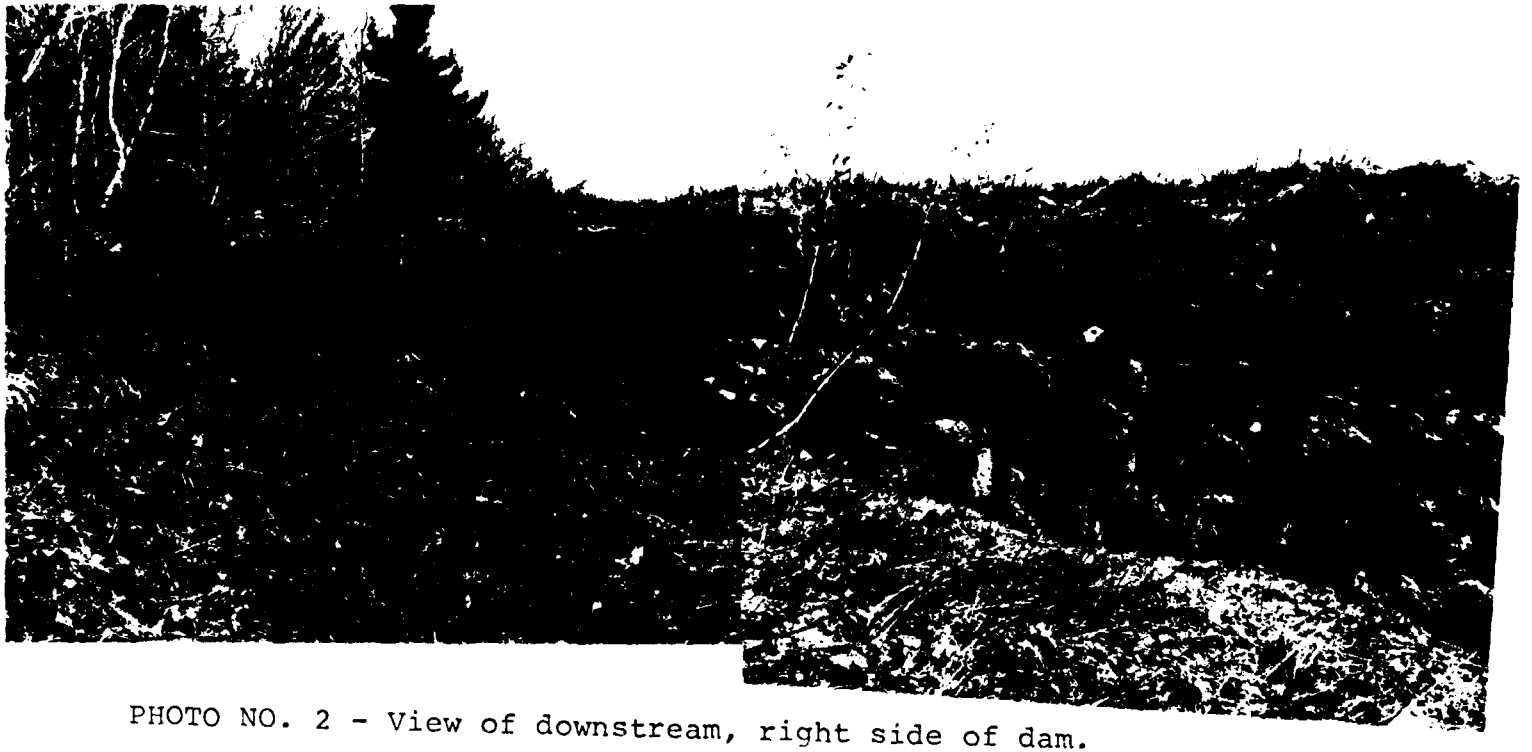


PHOTO NO. 2 - View of downstream, right side of dam.

PHOTO NO. 3 - View of downstream, center of dam.

PHOTO NO. 4 - View of dam crest from right abutment.

PHOTO NO. 5 - View of crest near left side, showing trees and footpath, note roots protruding through footpath.

PHOTO NO. 6 - View of stonewall downstream and left of outlet works. Seepage from under base of wall near man in photo.

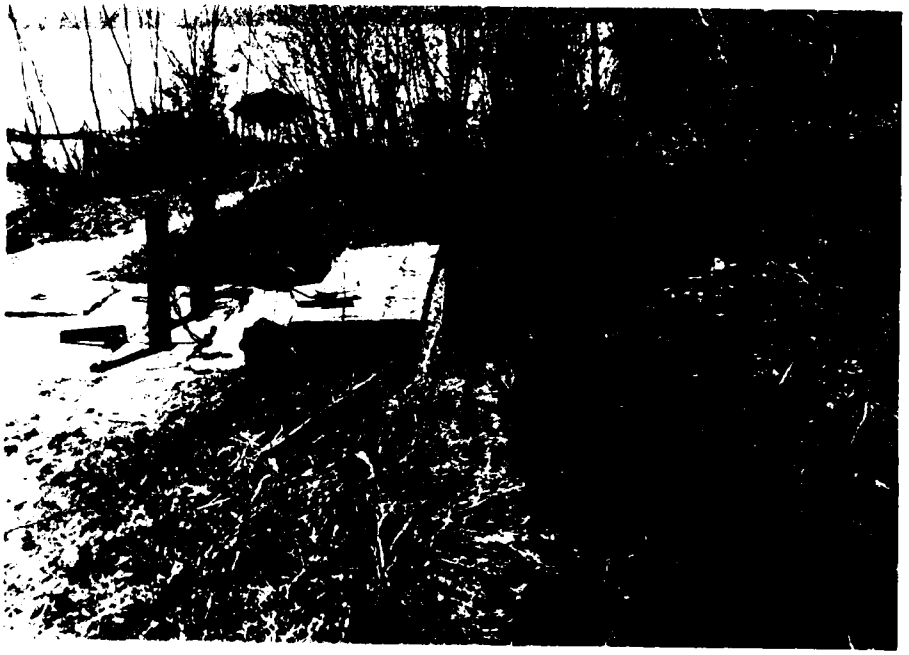


PHOTO NO. 7 - View of outlet works structure and downstream side of dam.

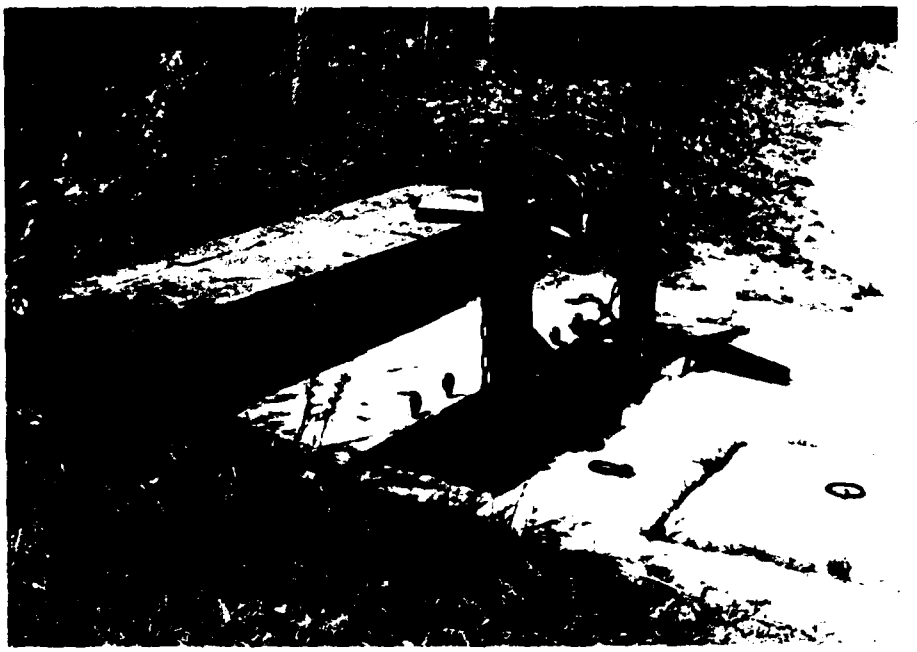


PHOTO NO. 8 - View of gate operating mechanizm.

PHOTO NO. 9 - Minor seepage from under boulder (or bedrock) at location of shovel. Scale open to 3 feet.

PHOTO NO. 10 - Close-up view of seep from under base of stone wall to left of outlet works.

PHOTO NO. 11 - Eroded area of upstream face in central portion of dam, See Photo No. 12.

PHOTO NO. 12 - Erosion of upstream face in central portion of dam. Stone wall is absent in area. See Photo No. 11.

PHOTO NO. 13 - Spillway on left side of dam (36') as viewed from reservoir.

PHOTO NO. 14 - View of crest of 36 foot wide spillway.

PHOTO NO. 15 - View of channel downstream of 36 foot spillway.

PHOTO NO. 16 - View of 50 foot wide spillway and channel.

PHOTO NO. 17 - Crest of 50 foot wide spillway.

PHOTO NO. 18 - View of bridge over Ashuelot Brook between dam and town of Marlow.

PHOTO NO. 19 - View of channel downstream of dam.

PHOTO NO. 20 - View of Symonds Pond and Route 123 bridge in Marlow.

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

HNTB HOWARD NEEDLES TAMMEN & BERGENDOFF	Made by RY	Date 5/21/79	Job No 5628-11-14
	Checked by	Date 6/4/79	Sheet No 1
For Ashuelot Pond Dam			

Hydraulics & Hydrology

Ashuelot Pond Dam Located across the Ashuelot River in the Town of Washington, N.H. in the Connecticut River Basin.

Classification: Size: Intermediate
Hazard: Significant

Basic Data D.A. = 27.0 sq. mi. ~ 70 feet per mile
3.5% Lakes & swamps

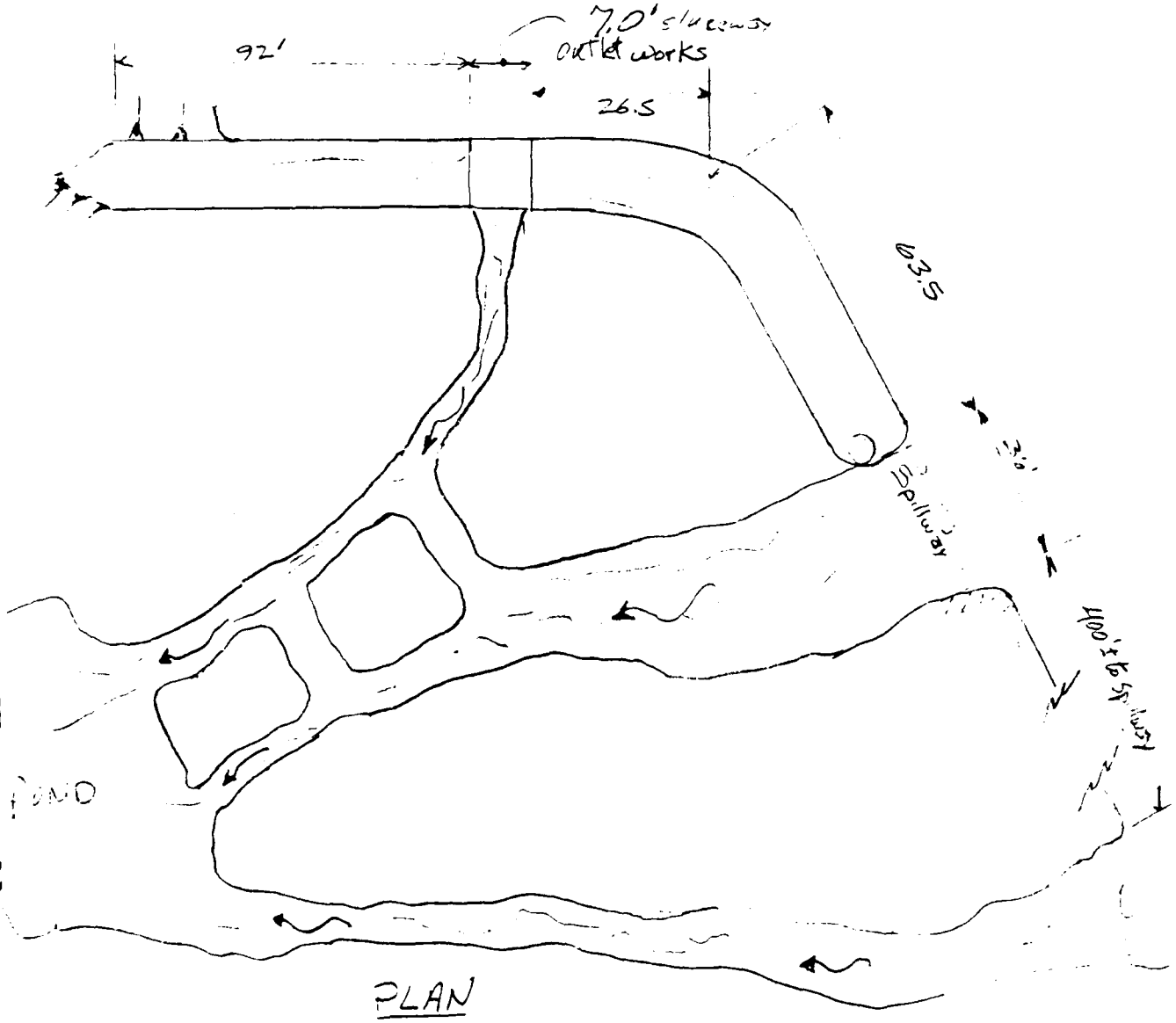
Reservoir Normal: elev - 1445 MSL
2760 acre ft
Max. elev. - 1447.3
4000 acre-ft
540 acre-ft

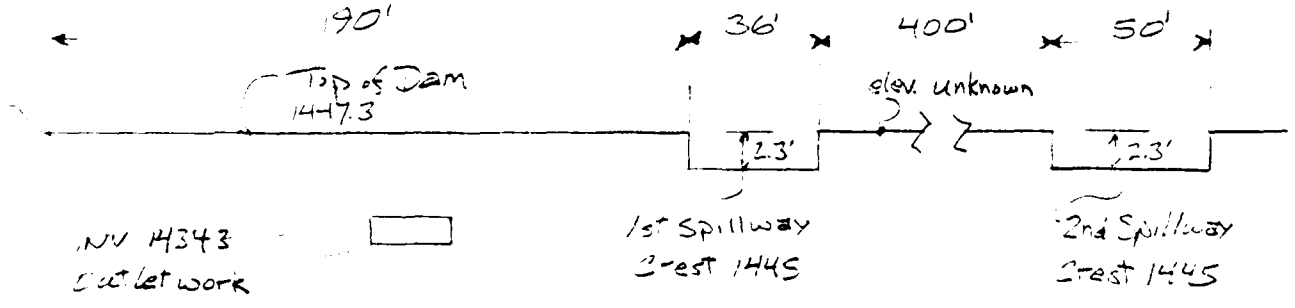
Dam:- Earth & Stone
Length 190 ft
Max. height 13 ft.

Spillway:- 2 - 50ft } natural Channel
36 ft }
Crest 1445.0

Outlet Works: 2.75'x 7.0' orifice
gates
Stop logs

HNTB HOWARD NEEDLES TAMMEN & BERGENDOFF	Made by RY	Date 5/21/79	Job No 5628.11.14
	Checked by [illegible]	Date 6/4/79	Sheet No 2
For Ashuelot			





Longitudal Profile

HNTB HOWARD NEEDLES TAMMEN & BERGENDOFF	Made by RV	Date 5/21/79	Job No 562R.11.14
	Checked by [illegible]	Date 6/4/79	Sheet No 3
For Ashuelot			

Step 1 Calculation of Test Flood Inflow

Classification - Intermediate Storage 4000 acre-ft
Significant

Hydrologic Evaluation Guideline Recommends

½ PMF to PMF for Test Flood Inflow

Upstream basin 470 ft/mi ; 3.5% lakes & swamps

Use mountainous curve

PMF = 1630 cfs/mi²

½ PMF = 1630 cfs/mi² × 27 mi² × ½ = 22,000 cfs

Test Flood Inflow = 22,000 cfs

Step 2 Calculation of Test Flood Surcharge

Consider - Outlet gates closed

However $Q_{gates} = C A \sqrt{2gh}$ h = 10.25 ft

C = 0.7

A = 2.75 · 7 = 19.25 ft²

$Q = .7(19.25)(1.02)(10.25)^{1/2}$

Q = 350 cfs

HNTB HOWARD NEEDLES TAMMEN & BERGENDOFF	Made by RY	Date 5/22/79	Job No 628-11-14
	Checked by [illegible]	Date [illegible]	Sheet No 4
For Ashuelot			

Spillways - fieldstone reinforced stream channel

Use d_c control

2 Spillways - 36 and 50 ft - Total 86'

invert - 1445.0

$$d_c = \left[\frac{Q_c}{5.67\, b}\right]^{2/3} \qquad \frac{V^2}{2g} + d_c = \text{Lake elevation} - \text{Spillway crest}$$

$$Q_c = d_c^{3/2}(5.67)(b) \qquad b = 86'$$

thus $d_c/2 + d_c$ = Lake W.S. - Spillway crest = Total head

Flow over dam crest - broad crest weir

$$Q_d = CLh^{3/2} \qquad C = 3.09 \quad L = 190\text{ft} \quad h = (H - 2.3)$$

$$Q = 587(H-2.3)^{3/2}$$

Stage - Discharge (See fig 1)

Elev Lake W.S.	H	d_c	Q_s	$(H-2.3)$	Q_d	Q_{Total}
1447.3	2.3	1.53	930 cfs			930 cfs
1449	3.0	2	1380	.7	340	1720
1450	5.0	3.33	2970	2.7	2600	5570
1452	7.0	4.67	4920	4.7	5980	10,900
1454	9.0	6.00	7170	6.7	10,180	17,350
1455	10.0	6.67	8390	7.7	12,540	20,930
1455.5	10.5	7.00	9030	8.2	13780	22,810

HNTB HOWARD NEEDLES TAMMEN & BERGENDOFF	Made by RY	Date 5/22/79	Job No 562-11-14
	Checked by	Date 6/1/79	Sheet No 5
For Ashuelot			

Step 3 Calculation of Surcharge Effect

Surface Area 540 acres (above 1445.0)
Vertical prism (above 1445.0)

Q_{P_1} = 22,000 cfs. ½PMR = 19"/2

Surcharge$_1$ = 10.25 ft.

$$Stor_1 = \frac{10.25\,ft \times 12\,in/ft \times 540\,acres}{27\,mi^2 \times 640\,acres/mi^2} = (.38)(10.25) = 3.84\,in$$

$$Q_{P_2} = Q_{P_1} \times \left(1 - \frac{Stor_2}{9.5}\right)$$

Elev	Surcharge	Stor	Q_{P_2}
1455.	10.0	3.80	13,200
1452	7.0	2.66	15,840
1450	5.0	1.90	17,600
1447	2.0	.76	20,240

See figure 1 for Plot of above and final outflow

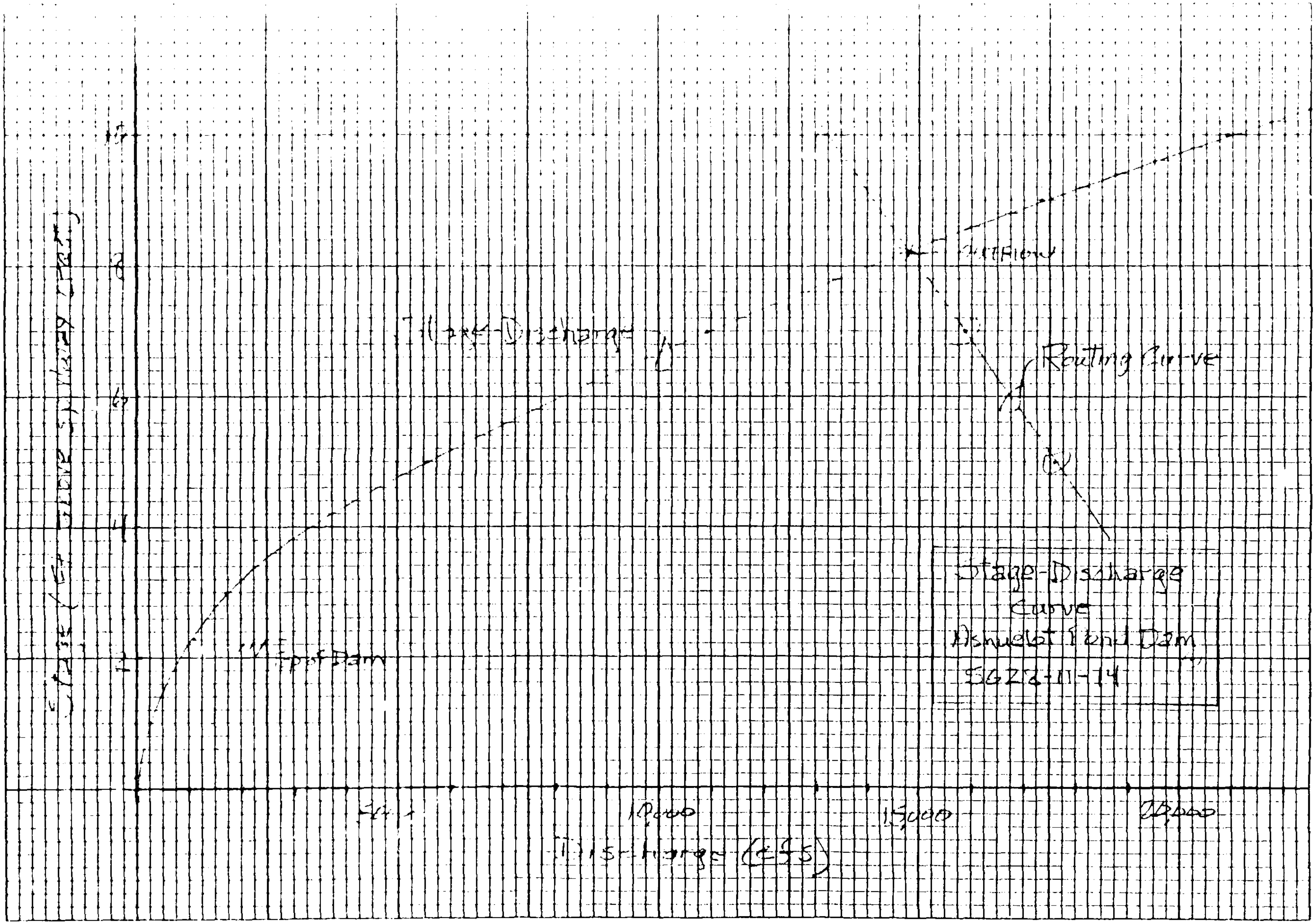
From Figure 1 Outflow 14,800 cfs

Stage 8.2 ft. above spillway
5.9 ft. above dam

Elev 1453.2 ft.

Conclusions

1. Reservoir storage will reduce the Test Flood at the outlet from 22,000 cfs to 14,800 cfs or by 33%.
2. The spillway and storage capacity can pass 50% of the Test Flood, or at the top of dam the spillways can pass 67% of the Test Flood.
3. At the test flood Elev of 1453.2 the dam will be overtopped by 5.9 ft.


Stage-Discharge Curve
Knuebel Pond Dam
5G22-11-14
Stage-Discharge
Routing Curve
Inflow
Top of Dam
Discharge (cfs)
5000
10,000
15,000
20,000
2
4
6
8
10

HNTB HOWARD NEEDLES TAMMEN & BERGENDOFF	Made by RY	Date 5/21/79	Job No 5628-11-14
	Checked by	Date 6/4/79	Sheet No 6
For Bishuelot Pond Dam			

Estimate of Downstream Damage

"rule of thumb"

Step 1. Reservoir Storage

Normal pool . 2760 acre-ft
@ 1445.0

Maximum pool : 4000 acre-ft
@ 1447.3

Surface area above 1445.0 540 acres includes adjacent swamp area.

Step 2 Peak Failure Outflow

$Q_{P_1} = 8/27 \cdot \sqrt{g} \cdot W_b \cdot Y_o^{3/2}$ + Spillway flow at top of dam

W_b = 40% of dam width = (.40)(190)

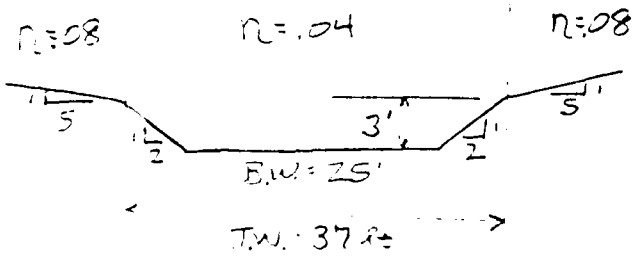
Y_o = height of stream bed to max pool. - 13 ft

$Q_{P_1} = 8/27 \sqrt{g} (.40)(190)(13)^{3/2} = 5984 \sim$ 6000 cfs

Spillway outflow at top of dam 1120 cfs

7120 cfs

Step 3 Stage-Discharge Rating Curve



Reach Characteristics

L = 17,700 feet

S = .0161'

η = .04 channel

η = .08 overbank

HNTB HOWARD NEEDLES TAMMEN & BERGENDOFF	Made by RY	Date 5/21/78	Job No 5628-11-14
	Checked by	Date	Sheet No 7
For Ashuelot			

Stage - Discharge

Stage - ft	Discharge cfs
3	800
5	2150
7	4160
9	6880
10	8510

Step 7 Outflow, Reach

$Q_{P_1} = 7120$ cfs $L = 17{,}700$ ft

Stage = 9.15 feet area = 510 sq ft

$$V_1 = \frac{17{,}700 \text{ ft} \times 510 \text{ sq ft}}{43560} = 207 \text{ acre-ft} < \frac{4000}{2}$$

Reach length OK.

$$Q_{P_2 \text{ Trial}} = Q_{P_1}\left(1 - \frac{V_1}{S}\right) = 7120\left(1 - \frac{207}{4000}\right) = 6751 \text{ cfs}$$

Stage 2 = 8.95 feet area = 490 sq ft.

$$V_2 = \frac{17{,}700 \times 490}{43560} = 199 \text{ acre-ft}$$

$$V_{ave} = \frac{207 + 199}{2} = 203 \text{ acre ft}$$

$$Q_{P_2} = 7120\left(1 - \frac{203}{4000}\right) = 6760 \text{ cfs}$$

End of reach at Symonds Pond in Marlow

Stage = 8.97 ft ~ say 9.0 ft

10x10 TO THE INCH

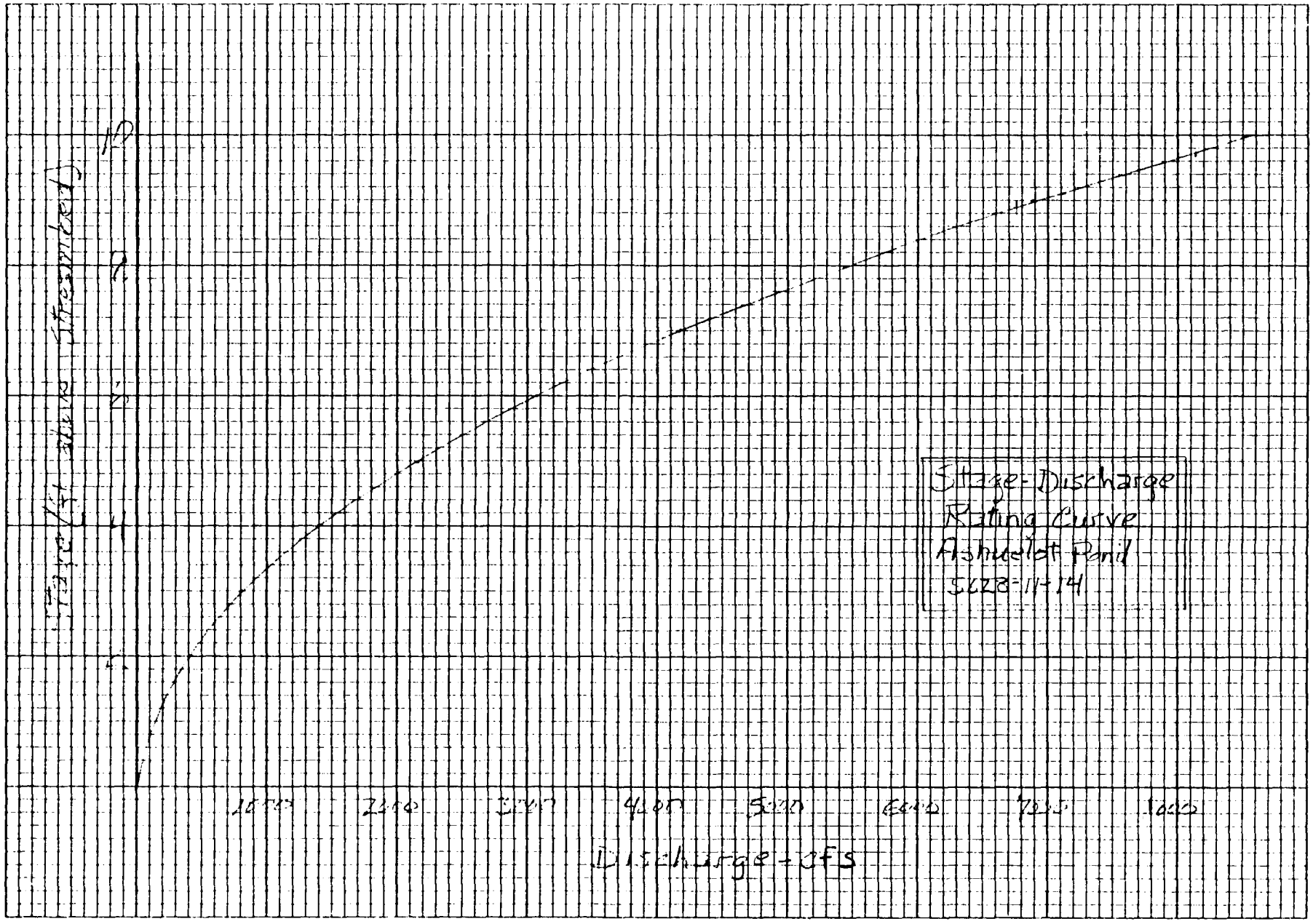
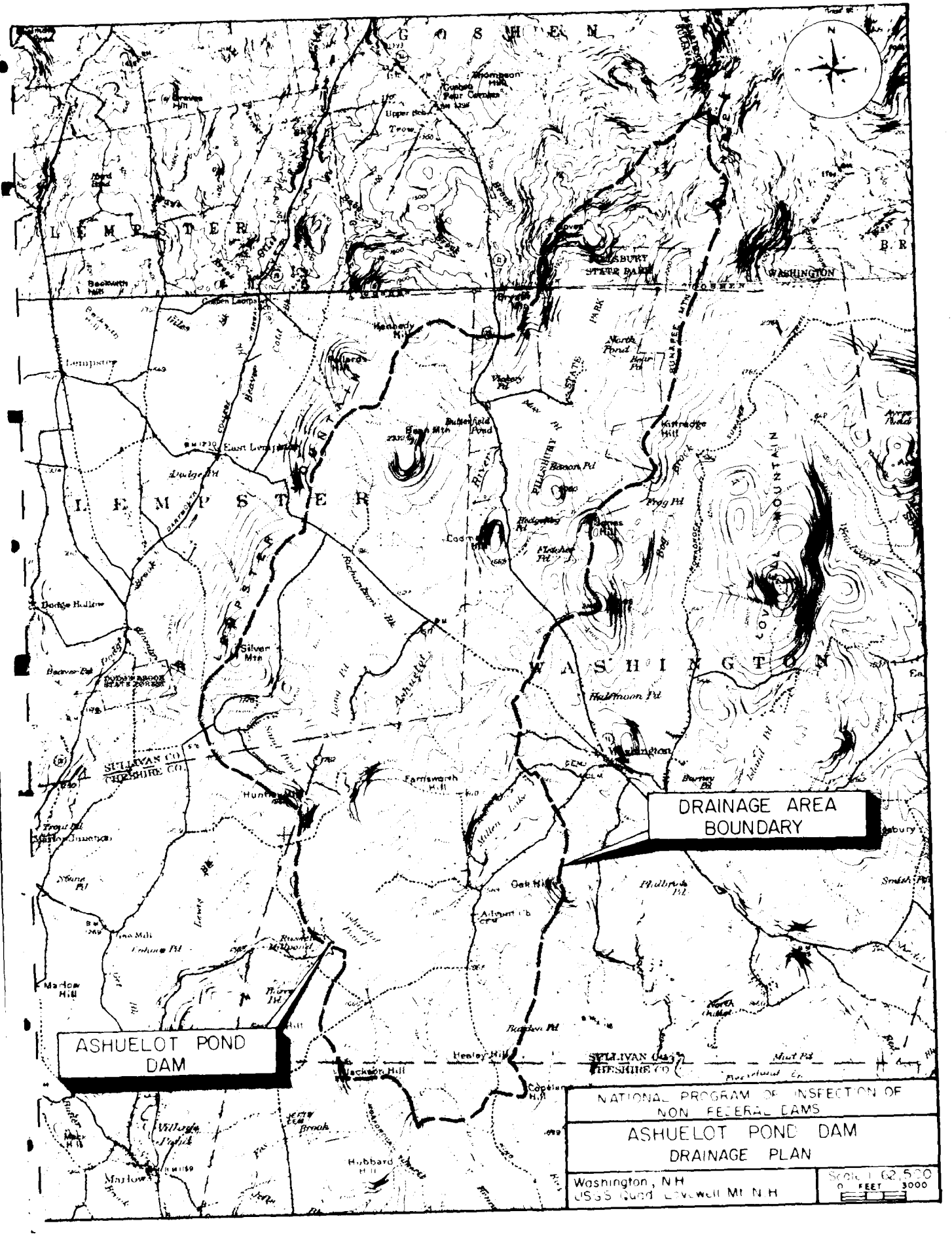


FIGURE 11

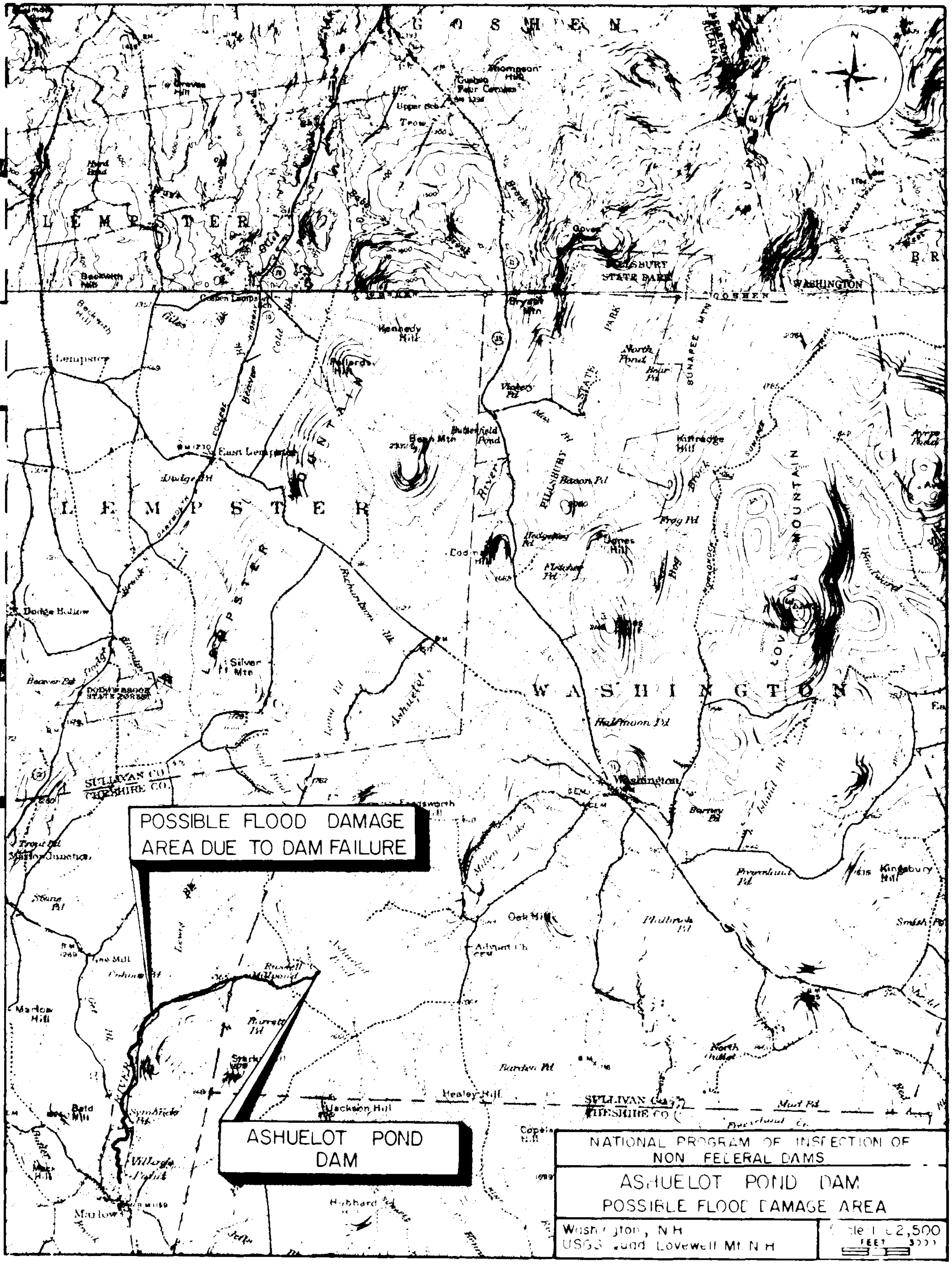


NATIONAL PROGRAM OF INSPECTION OF NON-FEDERAL DAMS

ASHUELOT POND DAM
DRAINAGE PLAN

Washington, N.H.
USGS Quad Lovewell Mt. N.H.

Scale 1:62,500
0 FEET 3000


POSSIBLE FLOOD DAMAGE AREA DUE TO DAM FAILURE
ASHUELOT POND DAM
NATIONAL PROGRAM OF INSPECTION OF NON FEDERAL DAMS
ASHUELOT POND DAM
POSSIBLE FLOOD DAMAGE AREA
Washington, N.H.
USGS Lovewell Mt. N.H.
GOSHEN
LEMPSTER
WASHINGTON
SULLIVAN CO.
CHESHIRE CO.
LOVELL MOUNTAIN
Pillsbury State Park
Silver Mtn
Bean Mtn
Kennedy Hill
Oak Hill
Healey Hill
Jackson Hill
East Lempster
Lempster
Dodge Hollow
Marlow
Marlow Hill
Russell Millpond
Barrett Pd
Barden Pd
Halfmoon Pd
Millen Lake
Kittredge Hill
Kingsbury Hill
Frog Pd
Bacon Pd
Bryant Mtn
Butterfield Pond
Ashuelot

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

STATE	IDENTITY NUMBER	DIVISION	STATE	COUNTY	CONGR DIST.	STATE	COUNTY	CONGR DIST.	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE DAY	MO	YR
NH	237	NED	NH	019	02				ASHUELOT POND DAM	4308.9	7209.4	22	JUN	79

POPULAR NAME	NAME OF IMPOUNDMENT
	ASHUELOT POND

REGION	BASIN	RIVER OR STREAM	NEAREST DOWNSTREAM CITY-TOWN-VILLAGE	DIST FROM DAM (MI.)	POPULATION
01	08	ASHUELOT RIVER	MARLOW	3	390

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STRUC. HEIGHT (FT.)	HYDRAU. HEIGHT (FT.)	IMPOUNDING CAPACITIES MAXIMUM (ACRE-FT.)	IMPOUNDING CAPACITIES NORMAL (ACRE-FT.)	DIST	OWN	FED R	PRV/FED	SCS A	VER/DATE
REEHPG	1872	R	13	13	4000	2760	NED	N	N	N	N	

REMARKS
22-PRIOR TO

D/S HAS	SPILLWAY CREST LENGTH	SPILLWAY TYPE	SPILLWAY WIDTH (FT.)	MAXIMUM DISCHARGE (FT.)	VOLUME OF DAM (CY)	POWER CAPACITY INSTALLED (MW)	POWER CAPACITY PROPOSED (MW)	NAVIGATION LOCKS NO.	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)
2	190	U	86	1120	1200											

OWNER	ENGINEERING BY	CONSTRUCTION BY
LAKE ASHULOT ESTATES INC		

REGULATORY AGENCY			
DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	NONE	NONE

INSPECTION BY	INSPECTION DATE DAY	MO	YR	AUTHORITY FOR INSPECTION
HOWARD NEEDLES TAMMEN BERGENDOFF	09	MAY	79	PUBLIC LAW 92-367 8AUG1972

REMARKS
46-NO KNOWN ADDRESS

END

FILMED

8-85

DTIC