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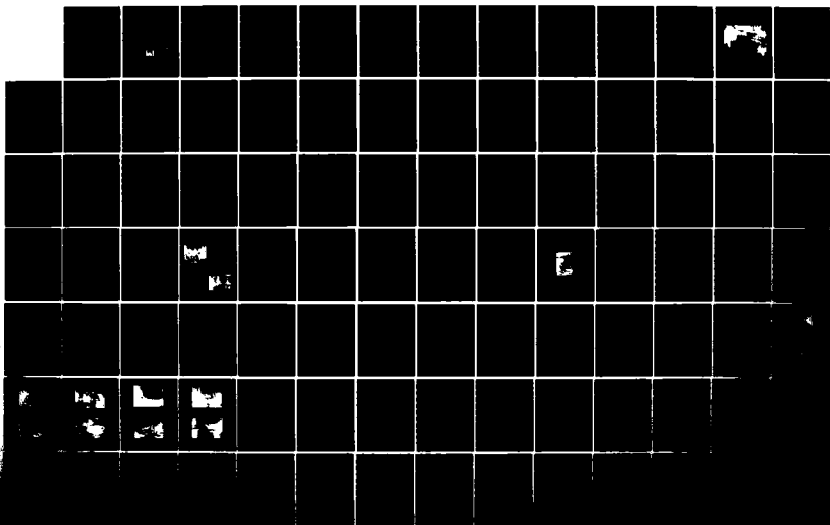
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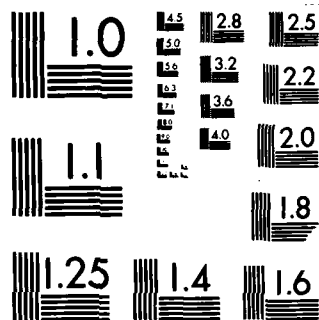
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MERRIMACK RIVER BASIN
WILMOT, NEW HAMPSHIRE

CHASE POND DAM

NH 00255

NHWRB NO. 253.02

PHASE I INSPECTION REPORT NATIONAL DAM INSPECTION PROGRAM



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NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

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CHASE POND DAM
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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

**NATIONAL DAM INSPECTION PROGRAM
PHASE I - INSPECTION REPORT
BRIEF ASSESSMENT**

Identification No.: NH 00255
Name of Dam: Chase Pond
Town: Wilmot Flat
County and State: Merrimack, New Hampshire
Stream: Chase Pond
Date of Inspection: November 27, 1979

Chase Pond Dam is a rock filled log crib with timber planking overflow structure between stone and concrete embankments. The overall length of the dam is 103 feet. The timber overflow section is approximately 12 feet high (neglecting flashboards) by 50.5 feet long and 10 feet wide at the crest. The embankments, which are approximately 5.4 feet higher than the crest of the timber overflow section, are composed of masonry and concrete on the upstream and training wall faces. The downstream faces are composed of unmortared stone and boulders. Both embankments are earth filled. There is no emergency spillway.

The dam impounds Chase Pond and the discharge flows through an unnamed brook approximately 0.2 mile to Tannery Pond. The original purpose of the dam is not known, but its present use is recreational. The pond is 0.40 mile in length with a surface area of about 39 acres. The maximum storage capacity is about 370 acre-feet.

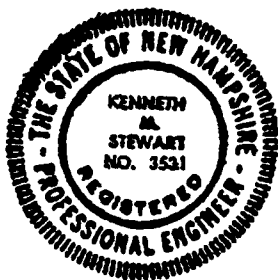
As a result of the visual inspection of this facility, the dam is considered to be in **POOR** condition. Major concerns are: considerable settlement of the log cribbing in the center of the spillway structure; subsidence and a sinkhole on the crest of the embankment at the left abutment; and cracking and significant spalling of concrete in the upstream face of the right abutment and the left training wall.

This dam is classified as **SMALL** in size and a **SIGNIFICANT** hazard structure in accordance with the recommended guidelines established by the Corps of Engineers. The test flood for this dam, therefore, ranges from a 100-year flood to one-half the Probable Maximum Flood (1/2 PMF). The one-half Probable Maximum Flood was selected for the test flood analysis, and the test flood inflow was estimated to be 10,700 cfs. This test flood has an outflow discharge equal to 9,890 cfs and would overtop the dam crest by about 3.8 feet. The maximum spillway discharge capacity (assuming that the flashboards have washed away) with the water level at the dam crest was estimated to be 2,230 cfs or about 21 percent of the test flood discharge. A major breach with the pond surface at the dam crest would increase the stage along the immediate downstream channel by over 5 feet, possibly

damaging two of the dwellings and a barn along this reach. Water would be near the sill of these two dwellings and about 4 to 5 feet above the lower foundation of the barn. A town road and bridge which cross the stream approximately 675 feet below the dam could also be damaged. The increase in the volume of water entering Tannery Pond would significantly increase the stage of the pond approximately 6 to 8 feet, such that three or four houses located near the pond would have water 1 to 2 feet above their sills. The dam at the outlet from Tannery Pond could be overtopped or breached.

It is recommended that the owner engage a qualified registered professional engineer to investigate the settlement in the center of the log crib overflow section, the subsidence and sinkhole on the crest of the embankment at the left abutment, to do a detailed hydrologic-hydraulic investigation to assess further the potential of overtopping the dam, the adequacy of the spillway to pass the test flood, and the need for and the means to increase project discharge capacity, and to assess the need for and means to provide a low level regulating outlet that would allow drawdown of the pond in an emergency. It is also recommended that the owner repair the cracks and spalling of concrete in the upstream face of the right embankment and in the left training wall, clear the embankments and downstream toe of the dam of trees and brush and establish and maintain grassy vegetation on the embankments.

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



A handwritten signature in cursive script that reads "Kenneth M. Stewart".

Kenneth M. Stewart
Project Manager
N.H.P.E. 3531

S E A Consultants Inc.
Rochester, New Hampshire

PREFACE

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

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

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

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

rarity of such a storm event, finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespassing and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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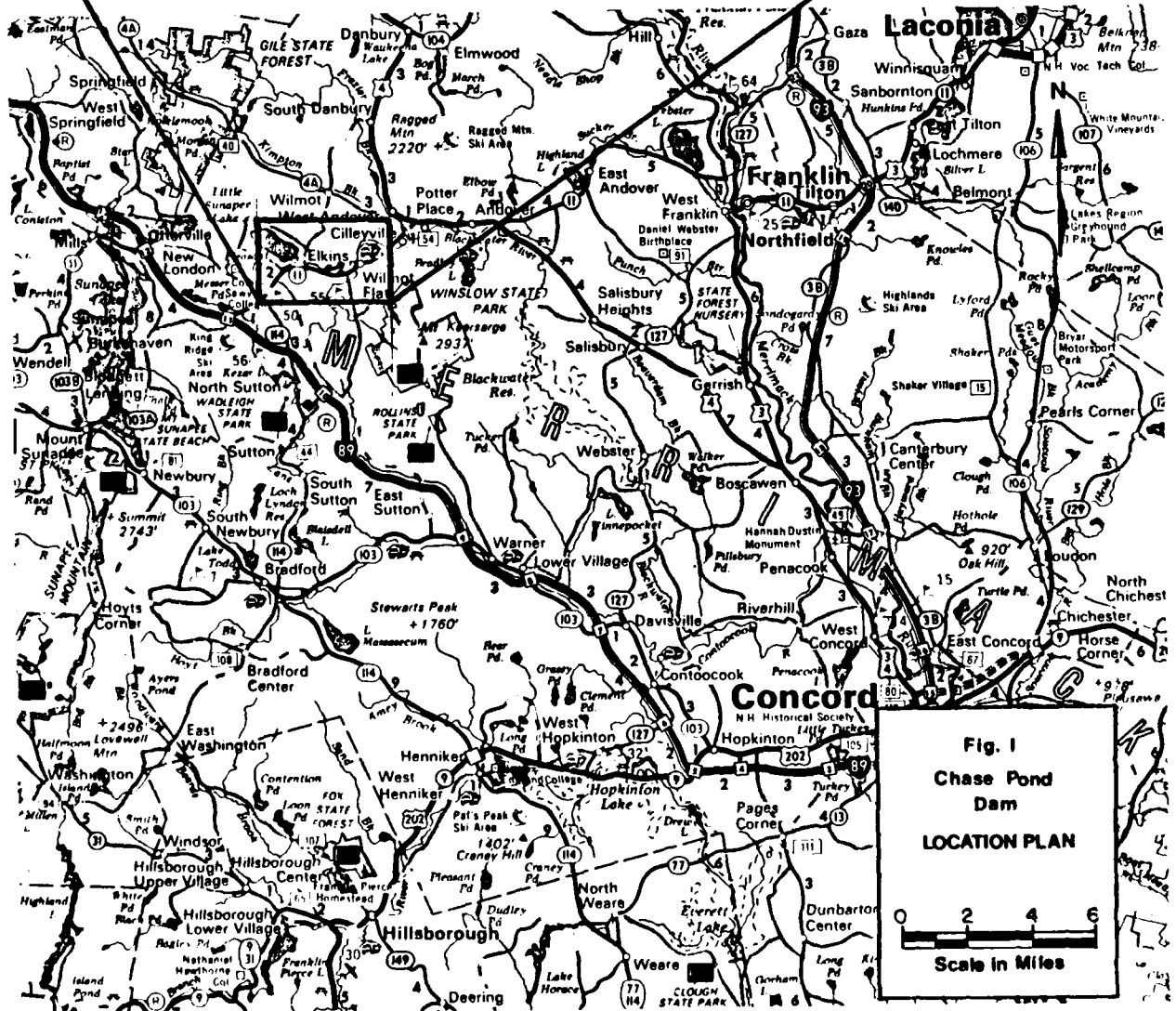
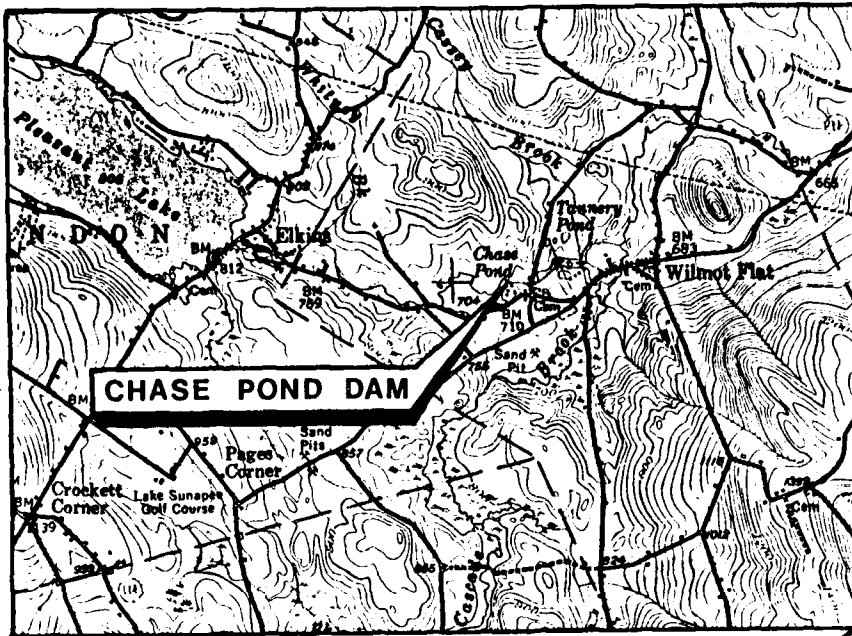
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OVERVIEW PHOTO - CHASE POND DAM



**NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT
CHASE 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. S E A Consultants Inc. 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 S E A Consultants Inc. under a letter of November 5, 1979 from William Hodgson, Jr., Colonel, Corps of Engineers. Contract No. DACW33-80-C-0008 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.

1.2 Description of Project

a. Location. Chase Pond Dam is located in the Town of Wilmot, New Hampshire, approximately 0.8 mile west from the center of town. The dam impounds water creating Chase Pond, which after passing over the spillway flows in an unnamed brook in an easterly direction approximately 0.2 mile to Tannery Pond in Wilmot Flat, New Hampshire. The dam is shown on U.S.G.S. Quadrangle, Mt. Kearsarge, New Hampshire, with coordinates approximately at N 43°25'00", W 71°54'40", Merrimack County, New Hampshire (see Location Plan).

b. Description of Dam and Appurtenances. Chase Pond Dam is a rock filled log crib with timber planking overflow structure between stone and concrete embankments. The overall length of the dam is 103 feet. The timber overflow section is approximately 12 feet (neglecting flashboards) high by 50.5 feet long. The timbers are composed of 8, 10, and 12 inch diameter round logs. The logs are arranged in cribs which are rock filled except for the downstream cribs which have several void areas. The spillway deck is composed of 2" x 8" and 2" x 6" planking, and is about 10 feet wide at the top. A 2.5 foot high flashboard across the top of the spillway deck is also constructed with 2" x 6" and 2" x 8" planking.

The embankments are composed of masonry and concrete on the upstream and training wall faces. The downstream faces are composed of unmortared stone and boulders. Both embankments are earth filled.

c. Size Classification. Small (maximum hydraulic height - 17.2 feet, storage 370 acre-feet) based on storage ($< 1,000$ acre-feet to ≥ 50 acre-feet) as given in the Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification. Significant hazard. A major breach with the pond surface at the dam crest would increase the stage along the immediate downstream channel by over 5 feet, possibly damaging two of the dwellings and a barn along the reach. Water would be near the sills of these two dwellings and about 4 to 5 feet above the lower foundation of the barn which is constructed directly adjacent to the stream channel. A town road and a bridge which cross the stream approximately 675 feet below the dam could also be damaged. The increase in the volume of water entering Tannery Pond would significantly increase the stage of the pond, approximately 6 to 8 feet, such that three of four houses would have water 1 to 2 feet above their sills. The dam at the outlet from Tannery Pond could be overtopped or breached. There appears to be little potential for loss of life.

e. Ownership. No information regarding the original structure or owner was found. Early records indicate it was first rebuilt in 1922, the owner at the time being N.P. Clough & Company. Ownership passed to a John and Myrtle Newcomb in the late 50's, who sold it to its present owner in 1973, that being Mrs. David Romanoff, Village Road, Wilmot Flat, New Hampshire 03287. Telephone No. (603) 526-6490.

f. Operator. The dam is maintained and operated by Mrs. David Romanoff, Village Road, Wilmot Flat, New Hampshire 03287. Telephone No. (603) 526-6490.

g. Purpose of Dam. The original purpose of this dam is not known. During its ownership by N.P. Clough & Company, between the 1920's and 1950's, it was used for industrial conservation. The present purpose of the dam is recreational.

h. Design and Construction History. No information regarding the original design or construction of the dam was found. Early records indicate it was first rebuilt in 1922. The dam was completely washed out during the 1938 flood and was rebuilt in its present form of a stone filled log crib in 1939. The log cribbing and planking was again rebuilt in 1963. In 1973, repairs were made to the concrete on the right abutment. Since that time there is no indication of any further construction being performed.

i. Normal Operating Procedures. The Chase Pond Dam is used primarily to create Chase Pond for recreational purposes. There is no normal operational procedure for this dam.

1.3 Pertinent Data

a. Drainage Area. The drainage area above the Chase Pond Dam covers nearly 13.8 square miles (8,830 acres), consisting of steep mountainous terrain surrounding Chase Pond and Pleasant Lake, which is located upstream from Chase Pond. The majority of the watershed is heavily wooded. Development within the basin is predominantly located near either Pleasant Lake or Chase Pond, since these two water bodies serve as recreational areas.

The topography in the drainage basin ranges from about 1,950 feet (NGVD) to 704 feet (NGVD). A number of small brooks are evident in the watershed, one such brook carries the outflow from Pleasant Lake to Chase Pond.

b. Discharge at Damsite

(1) Discharge at the damsite occurs over the 50.5 feet long timber planking overflow structure constructed between the stone and concrete embankments. The reservoir is maintained at an elevation near 704 feet NGVD, by flashboards which have been installed on top of the timber planking deck. During lower and normal flow periods, the discharge emanates from a 5.6' x 0.84' weir section which has been removed from the flashboard crest near the right embankment, as well as from a triangular shaped weir section near the left embankment. The triangular shaped discharge weir appears to be the result of a misalignment in the flashboard crest, rather than a designed point of discharge.

(2) Maximum known flood at damsite - unknown.

(3) The capacity of the overflow spillway with the flashboards removed and the water surface at the dam crest (elevation 707.8 feet) was estimated to be approximately 2,230 cfs.

(4) The capacity of the overflow spillway with the flashboards removed and the water surface at the test flood elevation (711.6 feet) was estimated to be approximately 4,400 cfs.

(5) The total flow through the rectangular weir section and the triangular weir section was estimated to be approximately 19 cfs with the water surface elevation at the top of the flashboards (elevation 704.0).

(6) The capacity of the spillway structure with the flashboards still in place was estimated to be 2,680 cfs with the water surface at the test flood elevation (711.6 feet).

(7) The total spillway capacity at the test flood elevation of 711.6 feet was estimated to be 4,400 cfs with the flashboards removed.

(8) The total project discharge with the water surface at the dam crest (elevation 707.8) was estimated to be 2,350 cfs with the flashboards removed. This includes a flow of 120 cfs which by-passes the spillway structure to the north of the dam.

(9) Total project discharge at test flood elevation - 9,890 cfs at 711.6 elevation.

c. Elevation (feet, NGVD) based on elevation of 704.0 shown on U.S.G.S. quad sheet assumed to be pool elevation at top of flashboards.

- (1) Streambed at toe of dam - 690.6
- (2) Bottom of cutoff - unknown
- (3) Maximum tailwater - unknown
- (4) Normal pool - 704.0
- (5) Full flood control pool - N/A
- (6) Spillway crest (flashboards in place) - 704.0
- (7) Design surcharge (Original Design) - unknown
- (8) Top of dam - 707.8
- (9) Test flood design surcharge - 711.6

d. Reservoir (Length in feet)

- (1) Normal pool - 2,100
- (2) Flood control pool - N/A
- (3) Spillway crest pool - 2,100
- (4) Top of dam - 2,600
- (5) Test flood pool - 3,100

e. Storage (acre-feet)

- (1) Normal pool - 190
- (2) Flood control pool - N/A
- (3) Spillway crest pool (top of flashboards) - 190
- (4) Top of dam - 370
- (5) Test flood pool - 530

f. Reservoir Surface (acres)

- (1) Normal pool - 39
- (2) Flood-control pool - N/A
- (3) Spillway crest (top of flashboards) - 39
- (4) Test flood pool - 75
- (5) Top of dam - 57

g. Dam

- (1) Type - concrete and unmortared stone embankments, earth filled; central overflow structure, rock filled log crib with timber planking
- (2) Length - 103 feet
- (3) Height - 17.2 feet (maximum)
- (4) Top width - 8.3 feet
- (5) Side slopes - not applicable
- (6) Zoning - not applicable
- (7) Impervious core - unknown
- (8) Cutoff - unknown
- (9) Grout curtain - none
- (10) Other - none

h. Diversion and Regulating Tunnel - Not applicable

i. Spillway

- (1) Type - rock filled log crib with timber planking overflow structure
- (2) Length of weir - 50.5 feet
- (3) Crest elevation - 704.0 (top of flashboards)
703.2 (invert of rectangular weir section)
701.2 (top of spillway deck)
- (4) Gates - no gates

(5) U/S Channel - Chase Pond. The banks are tree lined and there are several summer cottages on the pond. The slopes around the pond appear to be stable. No evidence of significant sedimentation was observed.

(6) D/S Channel - Water over the spillway discharges into a brook which travels in an easterly direction for about 0.2 mile, where it discharges into Tannery Pond, in Wilmot Flat, New Hampshire. The brook is covered with boulders and overhanging trees exist on its banks. A town road and bridge cross the brook just before it discharges into Tannery Pond.

j. Regulating Outlets. There is no apparent low level regulating outlet incorporated in this dam that would allow drawdown of the pond in an emergency. An inspection report from the State of New Hampshire Water Resources Board made during the 1939 reconstruction indicates provisions were made so that three sections of planking could be removed to drawdown the pond if this became necessary. It was not possible to determine, during the field inspection, if this provision still exists.

SECTION 2 ENGINEERING DATA

2.1 Design

No design data were disclosed for Chase Pond Dam.

2.2 Construction

No construction records were disclosed.

2.3 Operation

No engineering operational data were disclosed.

2.4 Evaluation

a. Availability. No engineering data were available for Chase Pond Dam. A search of the files of the New Hampshire Water Resources Board and direct contact with the owner, revealed a limited amount of recorded information.

b. Adequacy. The final assessments and recommendations of this investigation are based on the visual inspection and the hydrologic and hydraulic calculations.

c. Validity. No engineering data were disclosed to validate.

SECTION 3 VISUAL INSPECTION

3.1 Findings

a. General. Chase Pond Dam impounds a pond of small size. The watershed above the pond consists of steep mountainous terrain. The majority of the drainage basin is heavily wooded and predominantly undeveloped, except for the perimeter of Chase Pond and Pleasant Lake where numerous summer cottages and the town of Elkins are located. The downstream area is rocky in the bed of the brook and wooded on its banks. The area is slightly developed close to where the brook discharges into Tannery Brook.

The field inspection of Chase Pond Dam was made on November 27, 1979. The inspection team consisted of personnel from S E A Consultants Inc. and Geotechnical Engineers Inc. Inspection checklists, completed during the visual inspection, are included in Appendix A. At the time of inspection, water was passing approximately 7 inches deep over the 5.6 foot wide main overflow weir. The pool elevation was at approximately 703.7 NGVD. The upstream face of the dam could only be inspected above this water level.

b. Dam. Chase Pond Dam is a rock filled log crib overflow section between stone and concrete embankments (See Photo No. 2). The overall length of the dam is 103 feet. The central timber overflow section is about 12 feet high, 50.5 feet long, and 10 feet wide at the crest (See Photo Nos. 5 and 9).

At each end of the central, log-crib overflow section, there is a vertical concrete training wall which also serves as a retaining wall for the earthen embankment section that connects the central timber section and the abutment. The upstream side of both embankment sections is retained by a vertical concrete wall (See Photo No. 3). The downstream side of both embankment sections is retained by a dry stone masonry wall (See Photo No. 11), except close to the abutment, where the downstream side of the embankment is an earth slope.

The center of the log-crib spillway section has deflected approximately 1.2 feet in comparison with the top of the cribbing at the training walls (See Photo Nos. 9 and 12).

The downstream lower sections of the wood cribbing are absent of stone fill and many voids exist (See Photo No. 10).

The upstream face of the right embankment has a large vertical crack in the concrete (See Photo No. 4). The left training wall has a large horizontal crack at about the same elevation as the spillway (See Photo No. 6). There is also significant spalling of the concrete at this embankment (See Photo No. 8).

The crest of the embankment section between the central timber section and the right abutment is practically bare of vegetation. There is a tree stump in the dry-stone-masonry wall on the downstream side of this section and there are trees growing at the downstream toe of this wall (See Plans and Details in Appendix B). This is no vegetation and considerable erosion of the downstream slope of this section between the end of the dry-stone-masonry wall and the abutment. The erosion appears to be due to trespassing. The right abutment appears to be bedrock.

The crest of the embankment section between the central timber section and the left abutment has subsided several inches next to the concrete training wall (See Photo No. 7). There is also a sinkhole in the embankment next to the dry-stone-masonry wall on the downstream side of the crest (See Plans and Details in Appendix B and Photo No. 7). The crest is practically bare of vegetation, although there are a few small trees starting to grow. Logs and timbers have been dumped at the downstream toe of this embankment section (See Plans and Details in Appendix B). There are also some trees growing close to the downstream toe.

No evidence of seepage was observed on the downstream side of either embankment section.

c. Appurtenant Structures. There are no appurtenant structures for this dam.

d. Reservoir Area. The slopes around the pond appear to be stable. No evidence of significant sedimentation was observed.

e. Downstream Channel. The downstream channel is covered with boulders. Trees overhang the channel (See Photo Nos. 13 and 14).

3.2 Evaluation

Based on the results of the visual inspection, Chase Pond Dam is considered to be in poor condition.

The large settlement in the center of the log crib spillway section and large voids of stone fill in the downstream cribbing is evidence of a significant structural and stability problem.

Subsidence and a sinkhole on the crest of the embankment between the central timber section of the dam and the left abutment are evidence of a significant stability problem.

The lack of vegetation on the crest of both embankment sections of the dam results in relatively low erosion resistance in case of overtopping of the dam.

Erosion of the downstream slope of the embankment near the right abutment, apparently related to trespassing, could result in loss of the embankment, if not corrected.

Trees growing at the toe of the embankment sections and small trees growing on the crest of the embankment section near the left abutment will eventually attain sufficient size to be a possible cause of seepage and erosion problems if a tree blows over and pulls out its roots, or if a tree dies or is cut and its roots rot. Similarly, the roots connected to the tree stump in the dry-stone-masonry wall on the downstream side of the embankment section near the right abutment will rot and become potential channels of seepage and erosion.

Logs and timbers dumped at the downstream toe of the embankment section near the left abutment make it impossible to inspect that area adequately.

SECTION 4 OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operational Procedures

a. General. The Chase Pond Dam is used primarily to create Chase Pond. There are no written or routine operational procedures.

b. Description of any Warning Systems in Effect. No written warning system exists for the dam.

4.2 Maintenance Procedures

a. General. The owner, Mrs. David Romanoff, is responsible for the maintenance of the dam. No formal maintenance was discussed.

b. Operating Facilities. There are no operating facilities incorporated into this dam.

4.3 Evaluation

The current operation and maintenance procedures for the Chase Pond Dam are inadequate to insure that all problems encountered can be remedied within a reasonable period of time. The owner should establish a written operation and maintenance procedure, as well as establish a warning system to follow in event of flood flow conditions or imminent dam failure.

SECTION 5 EVALUATION OF HYDROLOGIC/HYDRAULIC FEATURES

5.1 General. The Chase Pond Dam consists of a rock filled log crib, approximately 12 feet high, constructed between two stone and concrete embankments. The overall length of the dam is 103 feet. The central overflow spillway extends the entire 50.5 feet length of the log crib, and is formed with timber planking laid over the log crib. Flashboards have been installed to raise the reservoir level to nearly 704 feet NGVD. The dam impounds Chase Pond which serves as a recreational site. The Chase Pond Dam is classified as small in size having a maximum storage of approximately 370 acre-feet at the dam crest. Pleasant Lake is located in the same watershed, approximately 6,600 feet upstream from Chase Pond. Pleasant Lake has a surface area about five times that of Chase Pond, and obviously intercepts the majority of the runoff from the watershed before it reaches Chase Pond.

5.2 Design Data. No hydrologic or hydraulic design data were disclosed.

5.3 Experience Data. No experience data were disclosed. Maximum flood flows or elevations are unknown, although it is known that the dam was washed out in the "1938 Flood".

5.4 Test Flood Analysis. Due to the absence of detailed design and operational information, the hydrologic evaluation was performed utilizing data gathered during field inspection, watershed size and an estimated test flood equal to one-half the Probable Maximum Flood (1/2 PMF). Although the drainage area is mountainous, the "rolling curve" from the Corps of Engineers set of guide curves was used to estimate the maximum probable flood peak flow rate, in order to account for the presence of Pleasant Lake.

Based on an estimated maximum probable flood peak flow rate of 1,550 cfs per square mile and a drainage area of 13.8 square miles, the test flood inflow was estimated to be 10,700 cfs. The test flood was routed through the dam in accordance with the Corps of Engineers procedure for Estimating Effect of Surcharge Storage on Maximum Probable Discharge. The discharge was estimated to be 9,890 cfs. This analysis indicated that the dam crest would be overtopped by approximately 3.8 feet. The maximum spillway capacity (assuming that the flashboards have washed away) with the water level at the dam crest was estimated to be 2,230 cfs, which is only about 21 percent of the test flood discharge.

5.5 Dam Failure Analysis. The impact of dam failure with the reservoir surface at the dam crest was assessed utilizing the "Rule of Thumb" Guidance for Estimating Downstream Dam Failure Hydrographs published by the Corps of Engineers. The analysis covered a reach extending approximately 0.4 miles downstream to Tannery Pond. Based on this analysis, the Chase Pond Dam was classified as a significant hazard.

Since the dam has a long overflow spillway, the discharge emanating from the dam with the water surface at the dam crest (elevation 707.8 feet) and with the flashboards removed would be about 44 percent of the calculated dam failure discharge. Consequently, the impact of the tailwater resulting from the discharge over the overflow spillway was taken into consideration when examining the stage in the downstream reaches. The various stages discussed in the remainder of this section include the effect of the tailwater.

Failure of the Chase Pond Dam with the reservoir surface at the dam crest would increase the stage along the immediate downstream channel by over 5 feet, possibly damaging two of the dwellings and a barn located along this reach. Water would be near the sill level of the two dwellings and would be about 4 to 5 feet above the lower foundation of the barn which is built directly adjacent to the stream channel. A town road and bridge which cross the stream approximately 675 feet below the dam could also be damaged, since it appears that the bridge opening does not have the capacity to handle the dam failure discharge. The increase in the volume of water entering Tannery Pond would significantly increase the stage of the pond approximately 6 to 8 feet, such that three or four houses located near the pond would have water 1 to 2 feet above their sills. The dam at the outlet from Tannery Pond could be overtopped or breached. It appears that there is little potential for loss of life.

SECTION 6 EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observations

The visual examination indicates the following structural problems:

- (1) The large settlement in the center of the log crib overflow section and large voids of stone fill in the downstream cribbing is evidence of a significant structural and stability problem.
- (2) Subsidence and a sinkhole on the crest of the embankment between the central timber section of the dam and the left abutment is evidence of a significant stability problem.
- (3) The lack of vegetation on the crest of both embankment sections of the dam results in relatively low erosion resistance in case of overtopping of the dam.
- (4) Erosion of the downstream slope of the embankment near the right abutment, apparently related to trespassing, could result in loss of the embankment if not corrected.
- (5) Trees growing at the toe of the embankment sections and small trees growing on the crest of the embankment section near the left abutment will eventually attain sufficient size to be a possible cause of seepage and erosion problems if a tree blows over and pulls out its roots, or if a tree dies or is cut and its roots rot.
- (6) The roots connected to the tree stump in the dry-stone-masonry wall on the downstream side of the embankment section near the right abutment will rot and become potential channels of seepage and erosion.
- (7) Logs and timbers dumped at the downstream toe of the embankment section near the left abutment make it impossible to inspect that area adequately.
- (8) Cracks and significant spalling of concrete in the upstream face of the right embankment and in the left training wall.

6.2 Design and Construction Data

No information regarding the original design or construction of the dam was found.

6.3 Post-Construction Changes

Early records indicate the dam was first rebuilt in 1922. It was completely washed out during the 1938 flood and was rebuilt in its present form in 1939. The wood cribbing and planking was again rebuilt in 1963. In 1973, repairs were made to the concrete on the right embankment. Since that time, there is no indication any further construction has been performed.

6.4 Seismic Stability

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

SECTION 7 ASSESSMENT, RECOMMENDATIONS, AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. Based on the results of the visual examination, Chase Pond Dam is considered to be in poor condition. The major concerns are:

- (1) Considerable settlement of the log cribbing in the center of the spillway structure
- (2) Subsidence and a sinkhole on the crest of the embankment section between the central timber section of the dam and the left abutment
- (3) Lack of vegetation on the crest of the embankment sections of the dam
- (4) Trees at the downstream toe of the embankment sections and trees beginning to grow on the crest of the embankment section at the left end of the dam
- (5) Roots connected to a tree stump in the downstream dry-stone-masonry wall at the right end of the dam
- (6) Trees growing at the downstream toe of the dam
- (7) Inadequacy of the spillway to pass the test flood.
- (8) Apparent lack of a low level regulating outlet that would allow drawdown of the pond in an emergency

b. Adequacy of Information. Logs and timbers dumped at the downstream toe of the embankment section at the left end of the dam make it impossible to inspect that area adequately. It should be inspected after the logs and timbers have been removed.

The information available from the present visual inspection is adequate to identify the potential problems listed in 7.2. These problems require the attention of a qualified registered professional engineer who will have to make additional engineering studies to design or specify remedial measures. No other engineering studies are needed for the purposes of this Phase I inspection.

c. Urgency. The owner should implement the recommendations in 7.2 and 7.3 within one year after receipt of this Phase I report.

7.2 Recommendations

The owner should retain a registered professional engineer qualified in the design and construction of dams to do the following:

- (1) Investigate the settlement of the log crib spillway in the center of the structure and design remedial measures, if necessary.
- (2) Investigate the subsidence and sinkhole on the crest of the embankment section at the left end of the dam, and design remedial measures, if necessary
- (3) Do a detailed hydrologic-hydraulic investigation to assess further the potential of overtopping the dam, the adequacy of the spillway to pass the test flood, and the need for and the means to increase project discharge capacity
- (4) Assess the need for and means to provide a low level regulating outlet that would allow drawdown of the pond in an emergency

The owner should implement the recommendations made by the engineer.

7.3 Remedial Measures

a. Operation and Maintenance Procedures. The owner should:

- (1) Repair the cracks and spalling of concrete in the upstream face of the right embankment and in the left training wall
- (2) Maintain the embankment and a zone 25 feet wide at the downstream toe area free of trees and brush
- (3) Establish and maintain grassy vegetation on the embankments
- (4) Clear trees and brush from a zone 25 feet wide on either side of the discharge channel for a distance of 100 feet downstream from the dam
- (5) Engage a registered professional engineer qualified in the design and construction of dams to make a comprehensive technical inspection of the dam once every year
- (6) Establish a surveillance program for use during and after periods of heavy rainfall, and also a warning system to follow in case of emergency conditions

7.4 Alternatives

There are no practical alternatives to the recommendations of Section 7.2 and 7.3.

APPENDIX A
INSPECTION CHECK LIST

INSPECTION CHECK LIST

PARTY ORGANIZATION

PROJECT: Chase Pond Dam, NH

DATE: November 27, 1979

TIME: 1:15 P.M.

WEATHER: Cool, sunny

W.S. ELEV. 703.7 U.S. 691.2 DN.S.
(U.S.G.S. Datum)

PARTY:

1. Kenneth Stewart, S E A
2. Robert Durfee, S E A
3. Bruce Pierstorff, S E A
4. Philip Ricardi, S E A
5. Ronald Hirschfeld, GEI

6. Kenneth Stern, NHWRB
7. Richard DeBold, NHWRB
8.
9.
10.

PROJECT FEATURE	INSPECTED BY	REMARKS
1. <u>Structural stability</u>	<u>K. Stewart/R. Durfee</u>	
2. <u>Hydrology/hydraulics</u>	<u>B. Pierstorff/P. Ricardi</u>	
3. <u>Soils and geology</u>	<u>R. Hirschfeld</u>	
4. <u></u>		
5. <u></u>		
6. <u></u>		
7. <u></u>		
8. <u></u>		
9. <u></u>		
10. <u></u>		

INSPECTION CHECK LIST

PROJECT: Chase Pond Dam, NH

DATE: November 27, 1979

PROJECT FEATURE: Dam Embankment

NAME: _____

DISCIPLINE: _____

NAME: _____

AREA EVALUATED

CONDITIONS

DAM EMBANKMENT

Crest Elevation

Left End of Over-
Flow Section to
Left Abutment

Right End of
Overflow Section
to Right Abutment

707.8

Current Pool Elevation

703.7

Maximum Impoundment to Date

Unknown

Surface Cracks

None observed

None observed

Pavement Condition

Not paved

Not paved

Movement or Settlement of Crest

General subsidence,
up to 1 ft with sink-
holes next to dry stone
masonry wall at d.s.
edge of crest

None observed

Lateral Movement

None observed

None observed

Vertical Alignment

See "Movement or
Settlement of Crest"

None observed

Horizontal Alignment

Good

Good

Condition at Abutment and at
Concrete Structures

Subsidence next to
concrete wall at left
end of overflow section

Good

Indications of Movement of Structural
Items on Slopes

None observed

None observed

Trespassing on Slopes

Timbers and logs
dumped against d.s.
toe

Footpath on d.s.
slope next to right end
of overflow section

Vegetation on slopes

One small tree on
crest. Several trees
at d.s. toe

Several trees at
d.s. toe

Sloughing or Erosion of Slopes
or Abutments

None observed

None observed

Rock Slope Protection - Riprap Failures

No rip rap

No riprap

Unusual Movement or Cracking at or Near Toe

None observed

None observed

Unusual Embankment or
Downstream Seepage

None observed

None observed

Piping or Boils

None observed

None observed

Foundation Drainage Features

None observed

None observed

Toe Drains

None observed

None observed

Instrumentation System

None observed

None observed

INSPECTION CHECK LIST

PROJECT: Chase Pond Dam, NH DATE: November 27, 1979
 PROJECT FEATURE: Dike Embankment NAME: _____
 DISCIPLINE: _____ NAME: _____

AREA EVALUATED	CONDITIONS
<u>DIKE EMBANKMENT</u> Crest Elevation Current Pool Elevation Maximum Impoundment to Date Surface Cracks Pavement Condition Movement or Settlement of Crest Lateral Movement Vertical Alignment Horizontal Alignment Condition at Abutment and at Concrete Structures Indications of Movement of Structural Items on Slopes Trespassing on Slopes Vegetation on Slopes Sloughing or Erosion of Slopes or Abutments Rock Slope Protection - Riprap Failures Unusual Movement or Cracking at or near Toes Unusual Embankment or Downstream Seepage Piping or Boils Foundation Drainage Features Toe Drains Instrumentation System	No dike

INSPECTION CHECK LIST

PROJECT: Chase Pond Dam, NH

DATE: November 27, 1979

PROJECT FEATURE: Intake Channel

NAME: _____

DISCIPLINE: _____

NAME: _____

AREA EVALUATED

CONDITIONS

OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE

No intake channel or intake structure

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

Stop Logs and Slots

INSPECTION CHECK LIST

PROJECT: Chase Pond Dam, NH

DATE: November 27, 1979

PROJECT FEATURE: Control Tower

NAME: _____

DISCIPLINE: _____

NAME: _____

AREA EVALUATED

CONDITIONS

OUTLET WORKS - CONTROL TOWER

No control tower

a. Concrete and Structural

General Condition

Condition of Joints

Spalling

Visible Reinforcing

Rusting or Staining of Concrete

Any Seepage or Efflorescence

Joint Alignment

Unusual Seepage or Leaks in
Gate Chamber

Cracks

Rusting or Corrosion of Steel

b. Mechanical and Electrical

Air Vents

Float Wells

Crane Hoist

Elevator

Hydraulic System

Service Gates

Emergency Gates

Lightning Protection System

Emergency Power System

Wiring and Lighting System
in Gate Chamber

INSPECTION CHECK LIST

PROJECT: Chase Pond Dam, NH

DATE: November 27, 1979

PROJECT FEATURE: Transition and conduit

NAME: _____

DISCIPLINE: _____

NAME: _____

AREA EVALUATED

CONDITIONS

OUTLET WORKS - TRANSITION AND CONDUIT

General Condition of Concrete

Rust or Staining on Concrete

Spalling

Erosion or Cavitation

Cracking

Alignment of Monoliths

Alignment of Joints

Numbering of Monoliths

No transition and conduit

INSPECTION CHECK LIST

PROJECT: Chase Pond Dam, NH

DATE: November 27, 1979

PROJECT FEATURE: Outlet Structure

NAME: _____

DISCIPLINE: _____

NAME: _____

AREA EVALUATED

CONDITIONS

OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL

General Condition of Concrete

Rust or Staining

Spalling

Erosion or Cavitation

Visible Reinforcing

Any Seepage or Efflorescence

Condition at Joints

Drain holes

Channel

Loose Rock or Trees Overhanging
Channel

Condition of Discharge Channel

No outlet structure, or outlet channel

INSPECTION CHECK LIST

PROJECT: Chase Pond Dam, NH

DATE: November 27, 1979

PROJECT FEATURE: Spillway Weir

NAME: _____

DISCIPLINE: _____

NAME: _____

AREA EVALUATED

CONDITIONS

OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS

a. Approach Channel

General Condition

Good

Loose Rock Overhanging Channel

None

Trees Overhanging Channel

Some trees overhanging, but channel is wide

Floor of Approach Channel

Not visible beneath pond surface

b. Weir and Training Walls

General Condition of Concrete

Wood crib weir with concrete training walls

Rust or Staining

Fair, a few large cracks

Spalling

None visible

Any Visible Reinforcing

Moderate

Any Seepage or Efflorescence

None

Drain Holes

Moderate through 2" x 8" stop logs on top of cribbing

c. Discharge Channel

General Condition

None

Loose Rock Overhanging Channel

Fair

Trees Overhanging Channel

None observed

Floor of Channel

Trees overhang channel

Other Obstructions

Bedrock and large boulders

None observed

INSPECTION CHECK LIST

PROJECT: Chase Pond Dam, NH

DATE: November 27, 1979

PROJECT FEATURE: Service Bridge

NAME: _____

DISCIPLINE: _____

NAME: _____

AREA EVALUATED

CONDITIONS

OUTLET WORKS - SERVICE BRIDGE

No service bridge

a. Super Structure

Bearings

Anchor Bolts

Bridge Seat

Longitudinal Members

Under Side of Deck

Secondary Bracing

Deck

Drainage System

Railings

Expansion Joints

Paint

b. Abutment & Piers

General Condition of Concrete

Alignment of Abutment

Approach to Bridge

Condition of Seat & Backwall

APPENDIX B
ENGINEERING DATA

AVAILABLE ENGINEERING DATA

No Engineering Data other than past inspection reports from the State of New Hampshire Water Resource Board were available.

PAST INSPECTION REPORTS

M E M O

Date: November 30, 1979

To: Vernon A. Knowlton,
Chief Engineer

From: Ken Stern,
Water Resources Engineer

Subject: Chase's Pond Dam, No. 253.02, Wilmot Flat

On November 27, 1979 Dick DeBold and I accompanied the inspection team from SEA Consultants. The dam is a log crib with timber planking between stone and concrete abutments. It appears to be in good condition. The crest has a 6 to 9 inch sag. The abutments are in good condition with the exception of a crack in the left concrete facing and some minor erosion of the right embankment. The dam is classified as a menace structure due to possible damage to a downstream bridge. The potential for loss of life is slight. There is a dam downstream at Tannery Pond that has very little freeboard and would probably fail if Chase Pond Dam failed.

I believe any action on this dam can wait until the Corps' report is received.

Ken

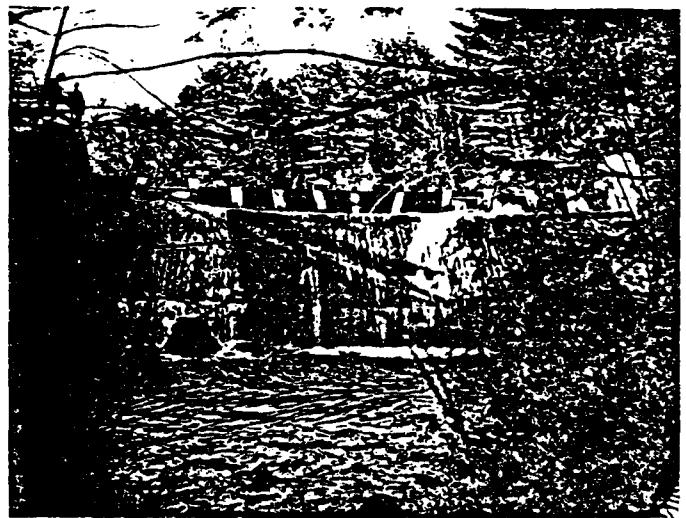
KS:paf

Dam No. 253.02, Chase's Pond Dam, inspected by Ken Stern on November 27, 1979

View from upstream



View from downstream



NEW HAMPSHIRE WATER RESOURCES BOARD

INSPECTION REPORT

Town: WILMOT FLAT Dam Number: 253.02

Name of Dam, Stream and/or Water Body: CHASE'S POND DAM

Owner: JOHN G + MYRTLE NEWCOMB?
DAVID ROMANOFF? Telephone Number: _____

Mailing Address: VILLAGE RD WILMOT FLAT

Max. Height of Dam: 10' Pond Area: 36 ACRES Length of Dam: 100'

FOUNDATION: UNKNOWN - TILL W/ LARGE BOULDERS

OUTLET WORKS:

50' LONG TIMBER SPILLWAY - SLOPING U/S TIMBER SHEETING

8' FT WIDE BROAD CREST W/TIMBER PLANKING

45° SLOPING D/S TIMBER PLANKING NO BALLAST UNDER
D/S PLANKING

STOP LOGS @ + 18" SOME BAYS HIGHER SOME LOWER - NON FAILING

VERY LITTLE IF ANY BALLAST IN DAM

SPILLWAY SAGS 6 TO 9" @ MIDPOINT

ABUTMENTS: RT - SPLIT STONE W/ U/S CONC FACING NO SEEPAGE SOME TREES

LT - STONE W/ U/S CONC WALL - SOME SETTLEMENT + EROSION

YOUNG TREE + BUSH GROWTH

CRACK IN LT. ABUTMENT

EMBANKMENT: LT - BETWEEN STONE WALLS - GOOD MOSS COVER

SOME SMALL TREES

RT - SOME MINOR EROSION D/S END OF STONE WALL

SOME GROUND COVER SOME BARE EARTH

SPILLWAY: Length: 50' Freeboard: 5.5' FROM PERMANENT CREST

SEEPAGE: Location, estimated quantity, etc.

NONE OBSERVED THROUGH ABUTS

LEAKAGE THROUGH PLANKING

Changes Since Construction or Last Inspection:

Tail Water Conditions:

FREE FLOWING TO NEXT POND

1 BRIDGE D/S 40' WIDE 9' HIGH OPENING

Overall Condition of Dam: FAIR - SAGGING

Contact With Owner: NO

Date of Inspection: 11/27/79

Suggested Reinspection Date _____

Class of Dam: MENACE (LOW HAZARD)

POSSIBLE LOSS OF LIFE
@ D/S ROAD CROSSING AND
HOUSE BUT NOT LIKELY

Signature Kenneth Allen

Date _____

COMMENTS:

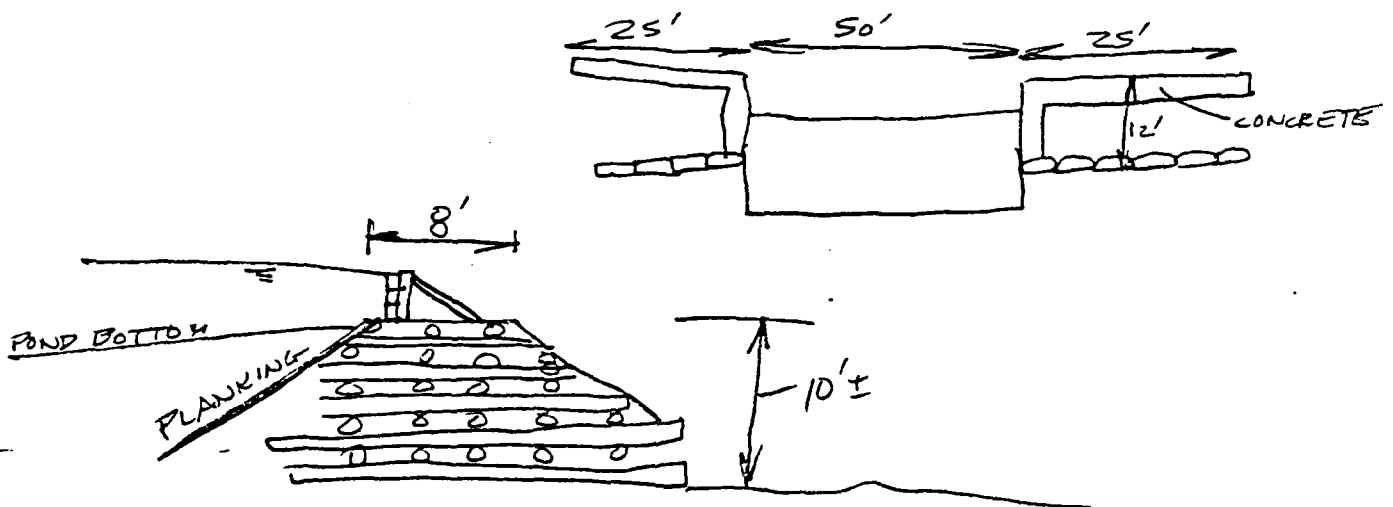
CLEAR TREE & BRUSH GROWTH

STOP LOGS NON FAILING

MONITOR SAG

SKETCH OF DAM

(Show Plan, Elevation & Cross Sections)



N. H. WATER RESOURCES BOARD
Concord, N. H. 03301

DAM SAFETY INSPECTION REPORT FORM

Town: Wilmot Dam Number: 253.02

Inspected by: SCB Date: 22 Nov 1971

Local name of dam or water body: _____

Owner: David Romanoff Address: Village Rd Wilmot Flat

Owner was/was not interviewed during inspection.

Drainage Area: _____ sq. mi. Stream: _____

Pond Area: _____ Acre, Storage _____ Ac-Ft. Max. Head _____ Ft.

Foundation: Type _____, Seepage present at toe - Yes/No, _____

Spillway: Type _____, Freeboard over perm. crest: _____,

Width _____, Flashboard height _____,

Max. Capacity _____ c.f.s.

Embankment: Type _____, Cover _____ Width _____,

Upstream slope _____ to 1; Downstream slope _____ to 1

Abutments: Type _____, Condition: Good, Fair, Poor

Gates or Pond Drain: Size _____ Capacity _____ Type _____

Lifting apparatus _____ Operational condition _____

Changes since construction or last inspection: _____

Downstream development: _____

This dam would/would not be a menace if it failed.

Suggested reinspection date: _____

Remarks: See F Moore's Report 11 Sep 69

all concrete work in his Report has been Repaired

WILMOT - #253.02

NOVEMBER 22, 1974





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

IN REPLY REFER TO

NEDPL-P

9 August 1974

RECEIVED

Mr. David Romanoff
Village Road
Wilmot Flat, N. H. 03287

8-12-1974
NEW HAMPSHIRE
WATER RESOURCES BOARD

Dear Mr. Romanoff:

This is to inform you of the results of our reconnaissance investigation of the condition of Chase Pond Dam in Wilmot Flat, New Hampshire. Our study was initiated in response to a letter of 24 April 1974 from Congressman James C. Cleveland, on your behalf. The investigation was conducted under authority contained in Section 205 of the 1948 Flood Control Act, as amended.

Members of my staff met with you on 26 June 1974 to inspect the problem area. Our investigation disclosed that the dam is utilized strictly for recreation and is privately owned. In addition, the dam serves no flood control purpose. Any recreational benefits, accruable to repair or reconstruction of the dam or any appurtenant structures, could not balance the cost of such construction work. Therefore, Federal assistance is not justified in either a policy or economic sense under the authority contained in Section 205 of the 1948 Flood Control Act, as amended.

While the Corps of Engineers is unable to provide aid to you under existing authorities, the following information may be helpful to you.

Chase Pond Dam is a rock filled, timber crib overflow structure which impounds a pond having a surface area of 36 acres. The timber overflow section is about 12 feet high and 35 feet long. The timbers are composed of 8, 10, and 12-inch round logs which are in fairly good condition. These timbers are arranged in cribs which are rock filled except for the downstream cribs, which have several large void areas. The spillway deck planks, composed of 2" x 8" and 2" x 6" planks, are also in good condition except for a few nails which are exposed. The deck-planking in the middle of the structure shows signs of minor settlement.

NEDPL-P

9 August 1974

Mr. David Romanoff

The non-overflow abutments are composed of unmortared masonry, partially faced with concrete, and are about six feet higher than the overflow section. It was observed that the right abutment rests on bedrock while the left abutment foundation conditions could not be accurately determined within the scope of our study but, most likely, it is also founded on bedrock. The concrete facing on the left abutment showed some cracking and deterioration. A scour hole, about 3 feet deep, has been formed at the downstream toe of the overflow section. This scour hole did not appear to be undermining the cribs.

All evidence suggests that there is no serious threat to the stability of the dam and overall the dam is considered safe. However, the following remedial work should be undertaken to prevent future deterioration of the structure:

1. The nails in the deck planking which are loose should be redriven.
2. The concrete facing on the left abutment shows some cracking and deterioration of the concrete. These cracks should be sealed. This abutment will probably require a refacing, similar to that performed on the right abutment in 1973.
3. Settlement of the spillway deck planking is probably caused by minor adjustment and deterioration of the underlying timber crib and support beams. A periodic measurement of the settlement could be made to establish a time pattern of any future movements.

The item of improved flow control at Chase Pond Dam and coordination with controlled discharge from upstream lakes was evaluated. However, regulation of stream flow lies within the jurisdiction of the New Hampshire Water Resources Board and you may wish to obtain information directly from them. You should address correspondence to:

Chairman, New Hampshire Water Resources Board,
37 Pleasant St., Concord, N. H. 03301 (Tel. No. 603-271-3406)

NEDPL-P
Mr. David Romanoff

9 August 1974

Lastly, the problem of cleanup of stumps on the bottom of the lake, in addition to cleanup of the shoreline, was considered. It is suggested that before you pursue any cleanup of the pond itself, you should consult with the proper State agency that would have an interest in this problem. On this matter you should contact:

Director
New Hampshire Water Supply and Pollution Control Commission
105 Loudon Road
Concord, New Hampshire 03301
Telephone No. 603-271-3503

While the Corps of Engineers is unable to provide aid to you under existing authorities, I hope these suggestions and referrals will prove to be of assistance to you.

Sincerely yours,

JOSEPH L. IGNAZIO
Chief, Planning Division

copy furnished: ✓
Mr. Vernon Knowlton
N. H. Water Resources Board
37 Pleasant Street
Concord, N. H. 03301

DATE: September 15, 1969
FROM: Francis C. Moore
SUBJECT: Chase Pond Dam, Wilmot #253.02
TO: Vernon A. Knowlton
Water Resources Engineer

On September 11, 1969, In inspected Chase Pond dam in Wilmot. This dam is in good condition. The dam is rated as a potential menace if allowed to fall into disrepair as there are bridges and roads downstream.

The owner, John G. and Myrtle Newcomb should be notified that within a few years the upstream wing wall to the spillway (looking downstream) should be refaced with concrete as it is deteriorating considerably.

This dam should be reinspected in 1974 to determine its safety.

FCM/jb

N. H. WATER RESOURCES BOARD
Concord, N. H. 03301

DAM SAFETY INSPECTION REPORT FORM

Town: WILMOT Dam Number: 253, 22
Inspected by: Frank J. Mason Date: Aug 11 1967
Local name of dam or water body: Chase Pond
Owner: Wm. G. & M. J. McNamee Address: Wilmot + 564 N.H.
Owner ~~was~~ was not interviewed during inspection.
Drainage Area: 12.7 sq. mi. Stream: Unnamed
Pond Area: 37 Acre, Storage 150± Ac-Ft. Max. Head 12 Ft.
Foundation: Type Ledge on about 4' probably under spillway Seepage present at toe -- Yes/No, No
Spillway: Type Staplogs in bays, Freeboard over perm. crest: 5.5,
Width 50', Flashboard height 2.0'
Max. Capacity 2 1500 c.f.s.
Embankment: Type Concrete bulkhead, Cover 2000 Width 14'
Upstream slope vert. to 1; Downstream slope vert. to 1
Abutments: Type Ledge, Condition: Good Fair, Poor
Gates or Pond Drain: Size Staplogs Capacity 4' w.d. x 2' h. Type plank (2")
Lifting apparatus Wine Operational condition Good
Changes since construction or last inspection: Some deterioration of
concrete on spillway, about 4' down overflow abutment
on right side.
Downstream development: Brush & trees
This dam would/would-not be a menace if it failed.
Suggested reinspection date: 1974
Remarks: Staplogs or flashboards would probably not
fail with heavy surcharges as they are
buried in downstream side with heavy timbers
to prevent dam is good.
Spillway is in good condition - 30% approved

THE STATE OF NEW HAMPSHIRE

County of Merrimack ss. July 12 1963.

STATEMENT OF INTENT TO ~~CONSTRUCTION~~
RECONSTRUCT A DAM AT CHASE POND, WILMOT, N. H.

TO THE WATER RESOURCES BOARD:

In compliance with the provisions of RSA 482:3.

~~We~~,
I, JOHN G. NEWCOMB
(Here state name of person or persons, partnership, association, corporation,
etc.)

hereby state our intent to the Water Resources Board ~~to reconstruct~~, to reconstruct, and/or
to make repairs to, a dam ~~along~~ or (cross out portion not applicable) across:

The northeast corner of Chase Pond where a dam now exists
(Here state name of stream or body of water)

At a point See above
(Here give location, by distance from mouth of stream, county or
municipal boundary)

in the town (s) of Wilmot (Wilmot Flat) New Hampshire

in accordance with PRELIMINARY PLANS, and SPECIFICATIONS FILED WITH THIS STATEMENT
AND MADE A PART HEREOF.

~~We~~,
I, understand that more detailed plans and specifications may be requested
by the Board in conformance with RSA 482:4 and that, if such plans are requested,
construction will not commence until such plans have been filed with and approved
by the Board.

The purpose of the proposed construction is ^{to} maintain Chase Pond for scenic,
(Here briefly state use to
fishing, boating and other recreation purposes.
which stored water is to be put)

The construction will consist of log cribbing with two inch planks. In other
(Here give brief description of
words, the existing structure will be duplicated, with the exception of a gate added to
work contemplated including height of dam)
the upper structure so that the water level can be lowered during the winter and spring
seasons. The present height of the dam, which is about 17 feet, will not be increased.

All land to be flowed ^{is not}
_{is} owned by applicant.

John J. Mawcomb

Address Village Road

Wilmot Flat, New Hampshire

Note: This statement together with plans, specifications and information and
data filed in connection herewith will remain on file in the office of
the Water Resources Board. This statement is to be filed in duplicate.

NEW HAMPSHIRE WATER CONTROL COMMISSION
DATA ON DAMS IN NEW HAMPSHIRE

LOCATION

STATE NO. 253.02

Town Wilmot : County Merrimack
Stream Chase Pd.
Basin-Primary Merrimack R. : Secondary Contoocook R.
Local Name
Coordinates—Lat. 43° 25' : Long. 71° 55' - 1.650ft

GENERAL DATA

Drainage area: Controlled.....Sq. Mi.: Uncontrolled..... Sq. Mi.: Total 11.5 Sq. Mi.
Overall length of dam 129 ft.: Date of Construction re-built 1922
Height: Stream bed to highest elev. 17 ft.: Max. Structure 15 ft.
Cost—Dam : Reservoir

DESCRIPTION Stone, Blocks, Concrete, earth, timber

Waste Gates

Type stone opening
Number : Size 2 ft. high x 2 ft. wide
Elevation Invert : Total Area sq. ft.
Hoist

Waste Gates Conduit

Number : Materials
Size ft.: Length ft.: Area sq. ft.

Embankment

Type
Height—Max. ft.: Min. ft.
Top—Width : Elev. ft.
Slopes—Upstream on : Downstream on
Length—Right of Spillway : Left of Spillway

Spillway

Materials of Construction plank
Length—Total 50 ft.: Net ft.
Height of permanent section—Max. 15 ft.: Min. ft.
Flashboards—Type None : Height ft.
Elevation—Permanent Crest 704 : Top of Flashboard
Flood Capacity cfs.: cfs/sq. mi.

Abutments

Materials:
Freeboard: Max. 2 ft.: Min. ft.

Headworks to Power Devel.—(See "Data on Power Development")

OWNER N.P. Clough & Co. Mr. John G. Newcomb, V. 1194 Rd. Wilmot, N.H.

REMARKS

Condition fair Dam is menace. Use is conservation for Ind.

Tabulation By RLT Date 9/26/39
R&B21234 B-18

MEMORANDUM

Case No. C90-C

TO: Richard S. Holmgren, Chief Engineer

RE: Case No. C90-C - Dam No. 253.02 - Chase Pond in Wilmot Flat

Made final inspection of construction of dam at Wilmot Flat on March 6, 1939. Was accompanied by representative of N.P. Clough Company and Mr. Simpson, land owner on the pond.

The dam is completed as specified with the following changes: Instead of allowing for 40 inches of freeboard, there is now an allowance of 54 inches of freeboard. There are at present installed 30 inches of flashboards and it is understood that another 10 inches will bring the pond to its natural high water level. No gate was incorporated in the structure for drawdown of the pond but provision was left for taking out three sections of planking on the upstream face if this became necessary. The flashboard bays are 8.6 feet in length using 2 x 10 stop planks. The planks are fitted with eyes for hooking out in case removal is desired of any number of stop planks. The standards holding the stop planks are feathered on to the planking with braces against the downstream face of the dam. Mr. Stanley who was present at the latter part of the inspection was of the opinion that in case of extreme head or ice pressure, these members would fail, giving us a clear spillway. There is some bending of the stop planks due to the extreme length of the bay and subject to your approval, Mr. Stanley will cut the bay length to 4.3 feet with a weaker member in the center designed to let the stop planks go out with a head at abutment height.

Subject to that change, I recommend that final approval be given to the dam, and I believe that this approval if given immediately would help Mr. Stanley as the group are holding up his pay subject to final approval of the structure by the Water Control Commission.

Respectfully submitted,


Charles D. Colman
Assistant Engineer

3/8/39

Rec'd 10/12/38

Jacobson	
Holmgren	✓
Chapman	✓

WATER CONTROL COMMISSION

STATE OF NEW HAMPSHIRE

Concord, New Hampshire

October 11, 1938.

N P Clough & Co.,
Wilmot Flat N H

RE: Chase Pond Dam. W. C. C. No 253.02

Gentlemen:

In order that we may determine the magnitude and extent of the flood of September 21-24 just passed, we are requesting the various dam owners in the State to supply us with the following information:

1. Was this dam injured? Ans. yes
2. If so, to what extent? Ans. Washed Chute out
3. Did all flashboards go out? Ans. yes
4. What was the maximum height of water over the permanent crest of spillway? Ans. three feet
5. At what day and hour did the maximum flood height reach your dam? Ans. 8 PM Wednesday Sept. 21, 1938

6. Any other interesting information regarding the flood or rain fall may be given on the back of this sheet, or attach sheets.

Will you please return this letter with as much information as you can give us as promptly as possible. A self-addressed envelope is attached hereto.

We thank you for your cooperation.

Very truly yours,

Richard S. Holmgren

Richard S. Holmgren
Chief Engineer

CDC:GMB
Enc.

Case No. 253.02
Case No. C90-C

Form WCC.1
7/30/37

THE STATE OF NEW HAMPSHIRE

County of Newmarket, ss. Dec 9 1938

PETITION FOR APPROVAL OF THE CONSTRUCTION OR REPAIR OF

DAM AT Chase Pond Walnut H

TO THE WATER CONTROL COMMISSION:

In compliance with the provisions of Laws of 1937, c.133, an Act establishing a Water Control Commission,

We, W P Clough & Co Inc
I, (Here state name of person or persons, partnership, association,
corporation, etc.)

hereby petition the Water Control Commission for approval to construct,
to reconstruct, to ~~make repairs to~~, a dam along, or (cross out portion
not applicable) across Blackwater river
(Here state name of stream or body of water)

at a point 1/4 mile above Village of Walnut Flat
(Here give location, by distance from mouth of stream,

county or municipal boundary)

in the town (s) of

in accordance with preliminary plans, and specifications filed with
this application and made a part hereof.

7/30/37

The purpose of the proposed construction is

for mill
(here briefly)

work also summer people
state use to which stored water is to be put)

The construction will consist of

timber crib
(Here give brief description of

work contemplated including height of dam)

9 feet

All land to be flowed ~~is not~~
is owned by applicant.

Seal:

D. P. Chong & Co. Inc.

Wheat Flat

Address

NH

Note: This application together with plans, specifications and information and data filed in connection herewith, will remain on file in the office of the Water Control Commission.

INVENTORY OF DAMS AND WATER POWER DEVELOPMENTS

BASIN <u>Merrimack</u>		NO. <u>2 - 475 - I-3905</u>	
RIVER <u>Chase Pond</u>		MILES FROM MOUTH <u>D.A.SQ.MI. 11.5</u>	
TOWN <u>Wilmot</u>		OWNER <u>N.P. Clough & Co. Wilmot Fla</u>	
LOCAL NAME OF DAM			
BUILT <u>rebuilt 1922</u>	DESCRIPTION <u>Gravity — Stone, Blocks, Concrete</u>		
<u>Timber, Earth or Earth & Lodge</u>			
<u>(Concrete & Earth AE) Photos shows plank Spillway</u>			
POND AREA-ACRES <u>37.10</u>		POND CAPACITY-ACRE-FT. <u>MAX.</u>	
HEIGHT-TO-P TO BED OF STREAM-FT. <u>17</u>		MIN.	
OVERALL LENGTH OF DAM-FT. <u>129</u>		MAX. FLOOD HEIGHT ABOVE CREST-FT. <u>LOCAL GAGE</u>	
PERMANENT CREST ELEV. U.S.G.S. <u>704 USGS</u>		LOCAL GAGE	
TAILWATER ELEV. U.S.G.S. <u>703</u>		LOCAL GAGE <u>2.0</u>	
SPILLWAY LENGTHS-FT. <u>50</u>		FREEBOARD-FT. <u>None</u>	
FLASHBOARDS-TYPE, HEIGHT ABOVE CREST		<u>None</u>	
WASTE GATES-NO. WIDTH MAX. OPENING		DEPTH STILL BELOW CREST	

REMARKS Condition Fair

4H. Into Blackwater R. Centoncock R.

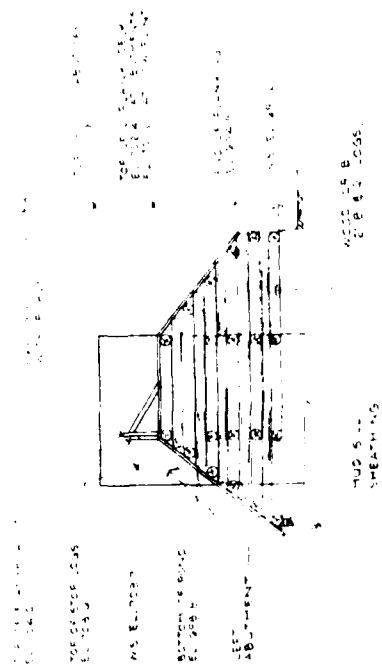
Co-ordinates from AE
43° 25' - 500 yds
71° 55' - 550 yds

UNITS	NO.	RATED	HEAD	C.F.S.		
		HP	FEET	FULL GATE	KW	MAKE
USE						

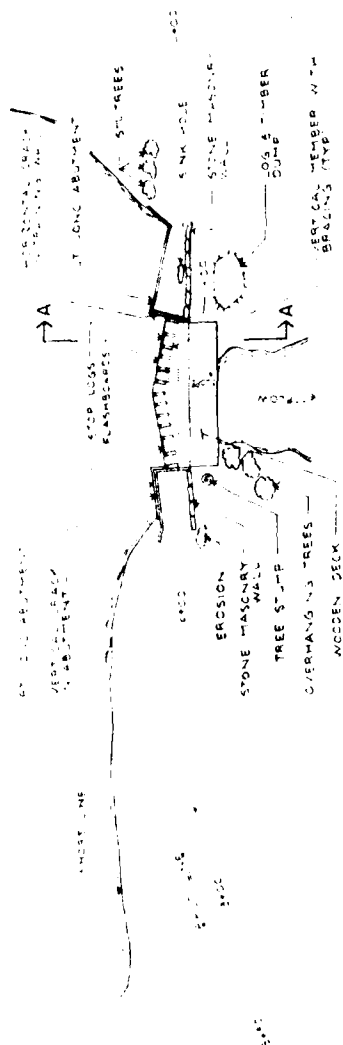
REMARKS Monaco
A.E. got information from H. Rayno

DATE 10/9/33 AE
8/31/34

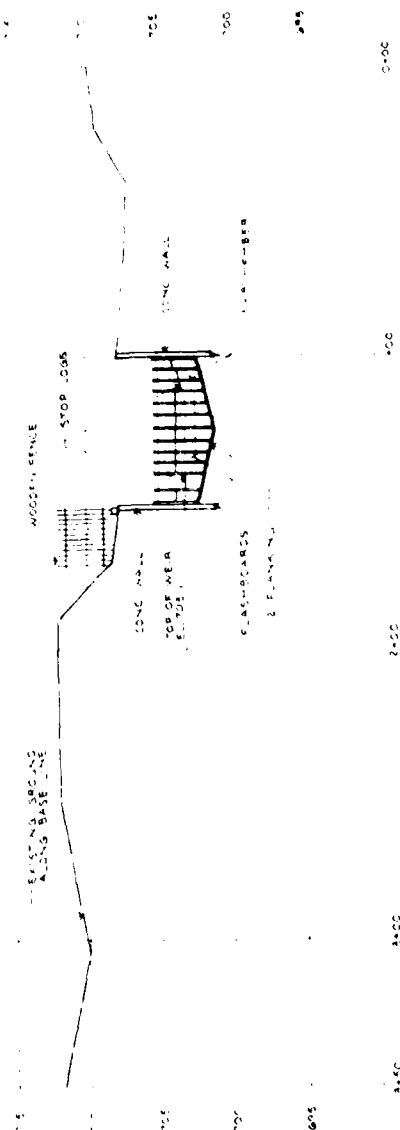
PLANS AND DETAILS



SECTION A-A



PLAN



PROF

LAST FIRST NAME

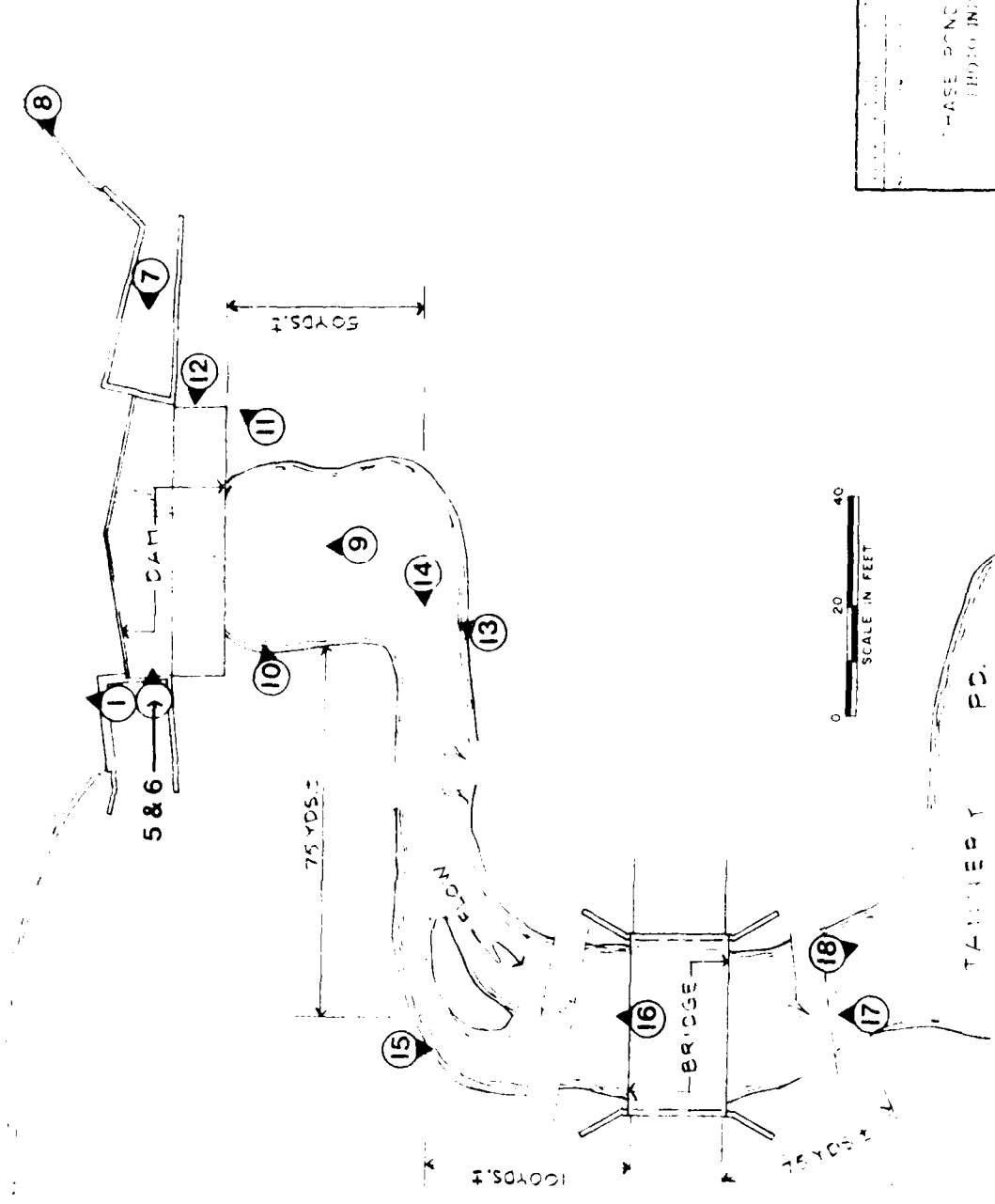
APPENDIX C

SELECTED PHOTOGRAPHS

384

CHASE

POND



CHASE POND DAM
INDONESIA



Photo No. 1 - General view of reservoir from
right abutment.

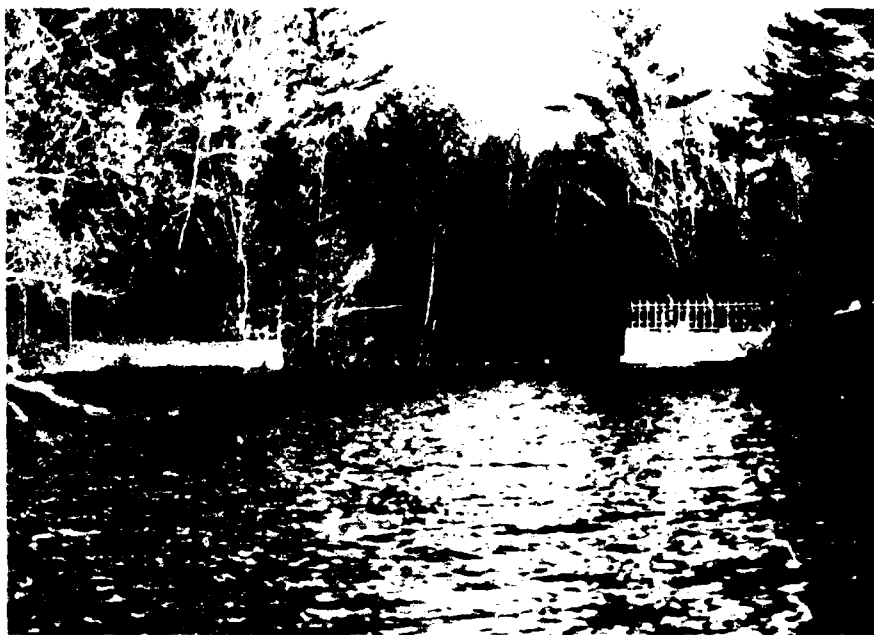


Photo No. 2 - General view of dam from
reservoir.



Photo No. 5 - View of crest of dam and left abutment from right abutment.

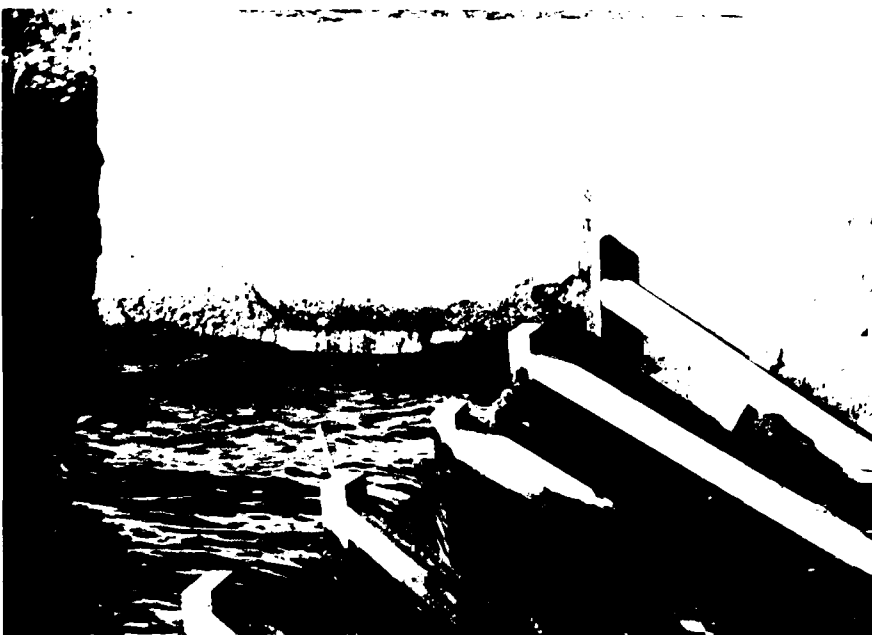


Photo No. 6 - Closeup of spalling & cracking of concrete training wall at left end of overflow section (same view as 5).

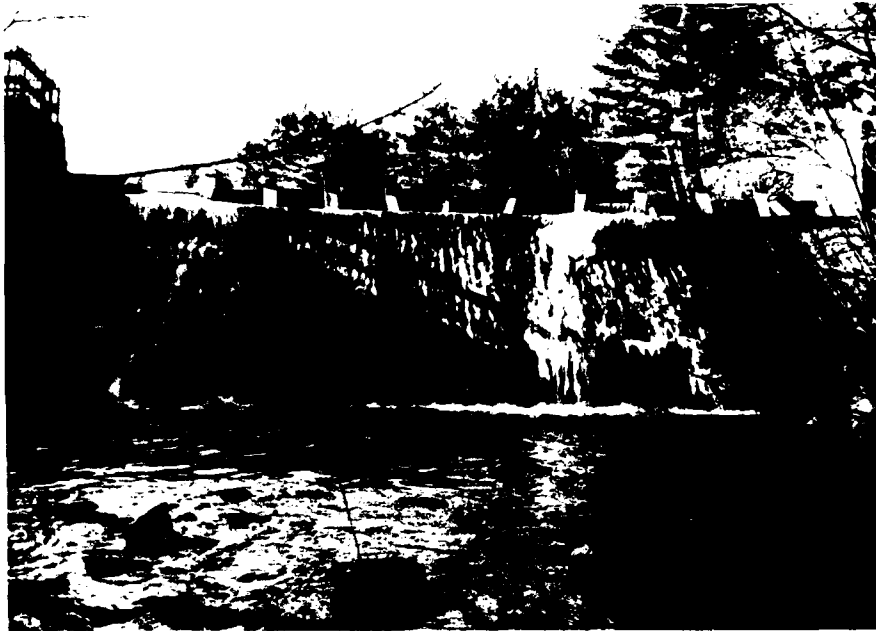


Photo No. 9 - View of overflow section looking upstream (Note depression of wood crib planking).



Photo No. 10 - Closeup of wood crib overflow section at left abutment.



Photo No. 13 - General view of dam from downstream channel.



Photo No. 14 - General view of downstream channel immediately below dam.



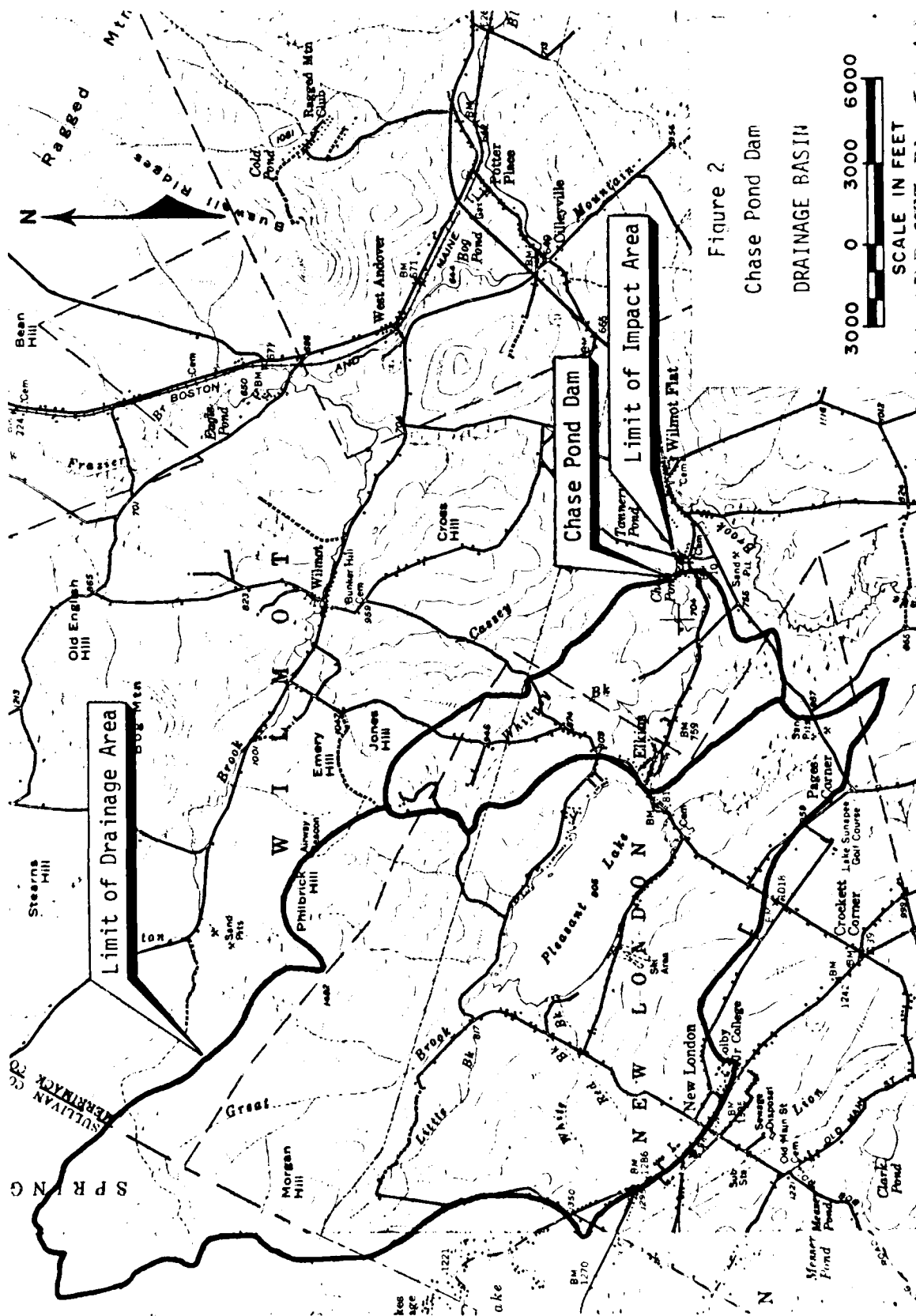
Photo No. 17 - View of channel and bridge
looking upstream.



Photo No. 18 - General view of downstream area
approximately 100 yards below
bridge (Tannery Pond).

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS



CLIENT Rocky Dept
PROJECT Rocky Creek Dam
DETAIL Drainage Calculations

JOB NO. 744-797
COMPTD. BY TRB
CK'D. BY AM

PAGE 27
DATE 12/20/84
DATE 12/20/84

I. Basic Data

A. Drainage Area

1. 13.8 square miles - as defined on U.S.G.S. sheets and then planimeted
2. Drainage area would classify as a mountain stream since Pleasant Lake intercepts a large portion of the runoff will drop down to rolling terrain to estimate MPF Peak Flow Rates.

B. Dam and Storage Information

1. Dam Classification: SMALL (less than 1000 acre-ft and ≥ 50 acre-ft)

as indicated below, the storage at the crest of dam was estimated to be 370 acre-ft.

2. Hazard Potential: SIGNIFICANT
Failure of dam could result in damage to 5 to 6 homes, a farm, a town road and other potential for loss of life and property.

3. Storage Information

Descriptive Information	Elevation* (ft)	Surface Area (acres)	Storage (acre-ft)
Crest of dam (concrete abutment)	707.5	57	370
Top of flashboards (assumed concrete)	704.0	39	140

CLIENT State of New Hampshire JOB NO. 374-100 PAGE 2 of 2
PROJECT State of New Hampshire COMPTD. BY W. J. P. DATE 12/20/89
DETAIL Hydrology Report CK'D. BY W. J. P. DATE 12/20/89

3 Storage Info - CONTINUED

Descriptive Information	Elevation * (+)	Surface Area (acres)	Storage (cu ft)
Pool level observed during inspection	703.7	33	173
Permanent overflow Spillway	701.2	19	42
Pool Bottom	≈ 691	0	0

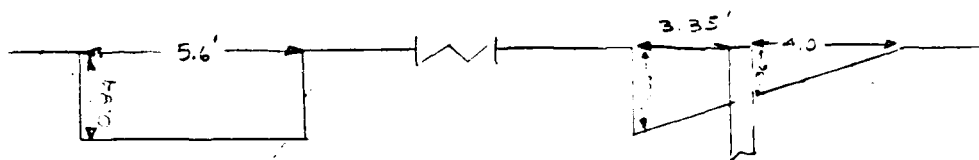
- * Notes (1) elevations: U.S.G.S datum was taken for pool elevation from a quadrangle sheet - elevation 704.000 from the top of flashboards
- (2) Normal pool taken the same point as pool elevation
- (3) Surface area at top of dam determined from pool defined by interpolation of 707.8 contour on U.S.G.S map between pool surface and the 720.0 contour
- (4) Other intermediate surface area approximated
- (5) Storage at top of dam (approx. 700 ft) estimated by assuming water into symmetrical frustum and determining the volume of the frustum with the elevation of the volume of a symmetrical frustum

C Spillway Information

1. Permanent spillway consists of the dam and the concrete portion of the spillway which is a concrete structure. The concrete abutments, Flashboards have been added to the top of the dam to increase the pool elevation. The concrete abutments have been removed and

CLIENT State of N.H. JOB No. 274-7901 PAGE 3 of 12
PROJECT State Pond Dam COMPTD. BY RWP DATE 12/20/74
DETAIL Hydrology - Gales CK'D. BY CHS DATE 12/20/74

Since the main overflow weir, and a second
seem was apparently misaligned during construction
and serves as a secondary overflow weir.



main weir

secondary weir

1. for subsequent calculations of spillway
capacity it is assumed that the secondary
will be washed away and the main crest will
remain intact.

2 Discharge over spillway given by (Standard Handbook for CE's Merritt)

$$Q = CLH^{3/2} \quad (\text{Standard Handbook for CE's Merritt})$$

where Q = discharge, cfs
 C = discharge coeff. = 2.6
 L = weir length, feet
 H = head over weir, feet

II Estimate Surge Storage on Maximum Discharge

A Develop stage-discharge curve for outflow from dam

1 define sources of outflow

a flow over "permanent spillway" (deck or wooden
- flash boards washed away)

b. natural low point at north end of dam - spillway
will occur above elevation 707.2

(1) treat as broad-crested weir with $C=2.6$

CLIENT Army Corps JOB No. 234-7901 PAGE 4 of 27
PROJECT Eastport Dam COMPTD. BY SWP DATE 2/20/79
DETAIL Hydrologic Data CK'D. BY WJ DATE 2/27/79

1 natural low point to south of dam -
outflow will occur above elevation 700.00
1) treat as road-crested weir

2. Spillway Outflow

Elevation (feet)	C	L (feet)	H (feet)	O
701.2	—	—	0.0	0.0
702	2.6	31	0.8	8'
703		50.5	1.8	313
704			2.8	615
705			3.8	973
706			4.8	1330
707			5.8	1830
708			6.8	2330
709			7.8	2860
710			8.8	3430
711			9.8	4030
712			10.8	4660
	▽	▽		

3 Natural low point to north of dam plus 100 ft crest above elev. 707.2

Elevation (feet)	C	L (feet)	H (feet)	O
707.2	—	—	0.0	0.0
708	2.6	70	0.8	175
709		100	1.8	613
710		142	2.8	1730
711		185	3.8	3530
712		230	4.8	6290
	▽			

SIEIA CONSULTANTS INC.
ENGINEERS / PLANNERS

BOSTON, MASS.
ROCHESTER, N.H.

CLIENT Camp Co. JOB NO. 274-7901 PAGE 5 of 27
PROJECT Co. 3 Pond Dam COMPTD. BY BWP DATE 12/20/20
DETAIL Hydrologic Calcs CK'D. BY LJS DATE 2/27/21

4 Natural "low" flow - to south of dam

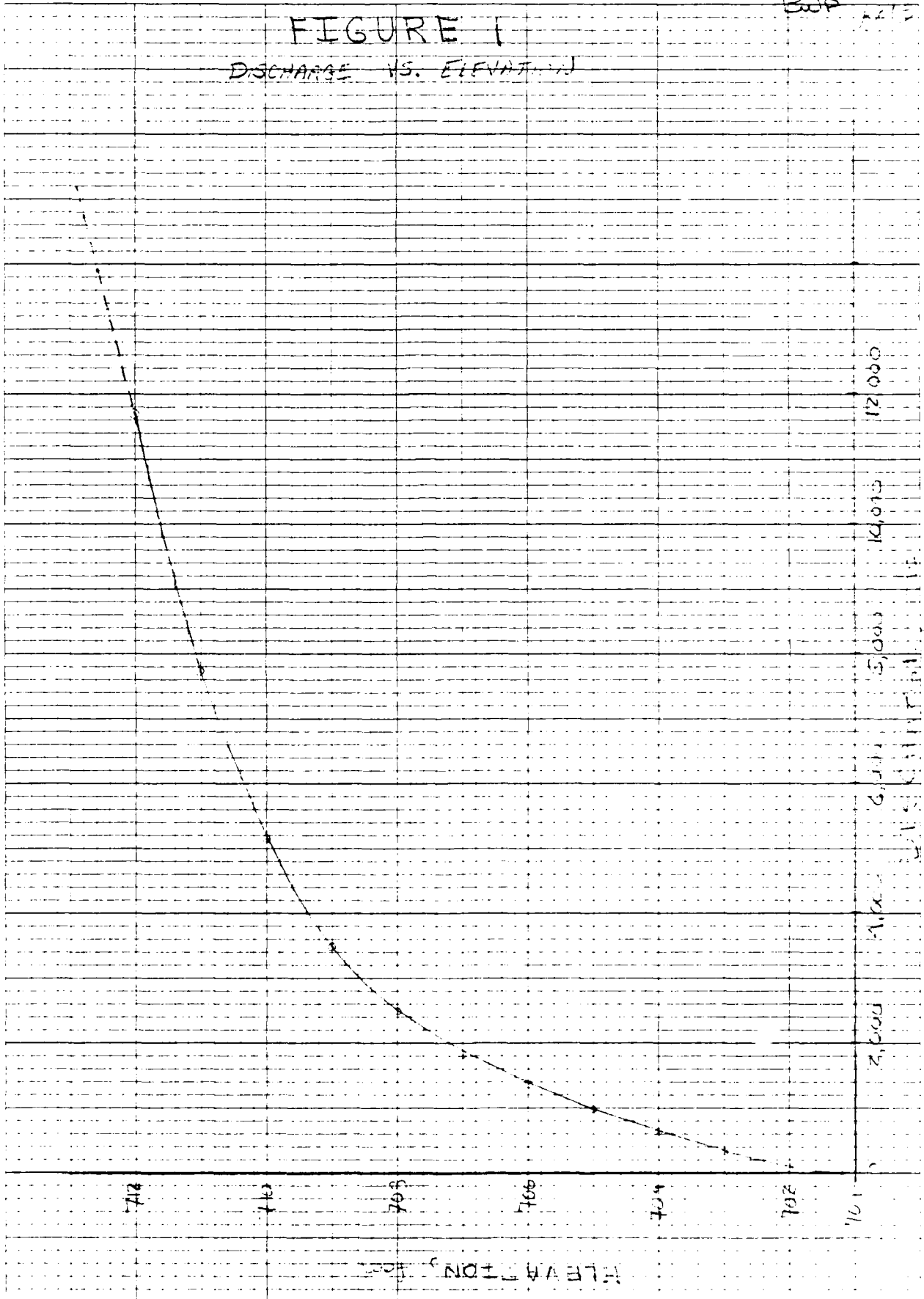
Elevation (feet)	C	L (feet)	H (feet)	Q cfs
710	—	—	0.0	0.0
711	2.6	51	1.0	133
712	2.6	105	2.0	772

5 Total outflow - discharge vs elevation

Elevation (feet)	Q Spillway	Q NORTH	Q SOUTH	Q TOTAL
701.2	0	0	0	0
702	81			81
703	317			317
704	615			615
705	973			973
706	1380			1380
707	1830	↓		1830
708	2330	175		2510
709	2860	628		3480
710	3430	1730	↓	5160
711	4030	3560	73	7660
712	4660	6290	772	11720

Summarized graphically in Figure 1

FIGURE 1
DISCHARGE VS. ELEVATION



CLIENT Army Corps JOB No. 274-7901 PAGE 3 of 37
PROJECT Little Pond Dam COMPTD. BY DL DATE 2/20/79
DETAIL Hydrologic Gages CK'D. BY AMS DATE 2/20/79

B. Effect of surcharge storage on max prob. discharge

1. Pertinent Data

- Drainage area = 13.3 sq. mi
- Characteristics of drain - basin has mountainous terrain, however use rolling curve to account for effect of P. resistant
- test flood = $1/2$ PMF (small size and significant variation)
- follow Army Corps' procedure

2. STEP 1: Determine Peak Inflow Q_{p1} from Guide Curve

- the maximum probable discharge was estimated at 1550 cfs/sq. mi

$$\therefore \text{PMF} = (1550 \text{ cfs/sq. mi}) (13.3 \text{ sq. mi}) \\ \approx 21,400 \text{ cfs}$$

$$Q_{p1} = 1/2 \text{ PMF} \approx 10,700 \text{ cfs}$$

3. STEP 2: Determine surcharge height to dam Q_{p1} , STOR, and Q_{p2}

- from Figure 1 determine surcharge height to pass $Q_{p1} = 10,700 \text{ cfs}$

$$\text{Surcharge elev} = 71.3$$

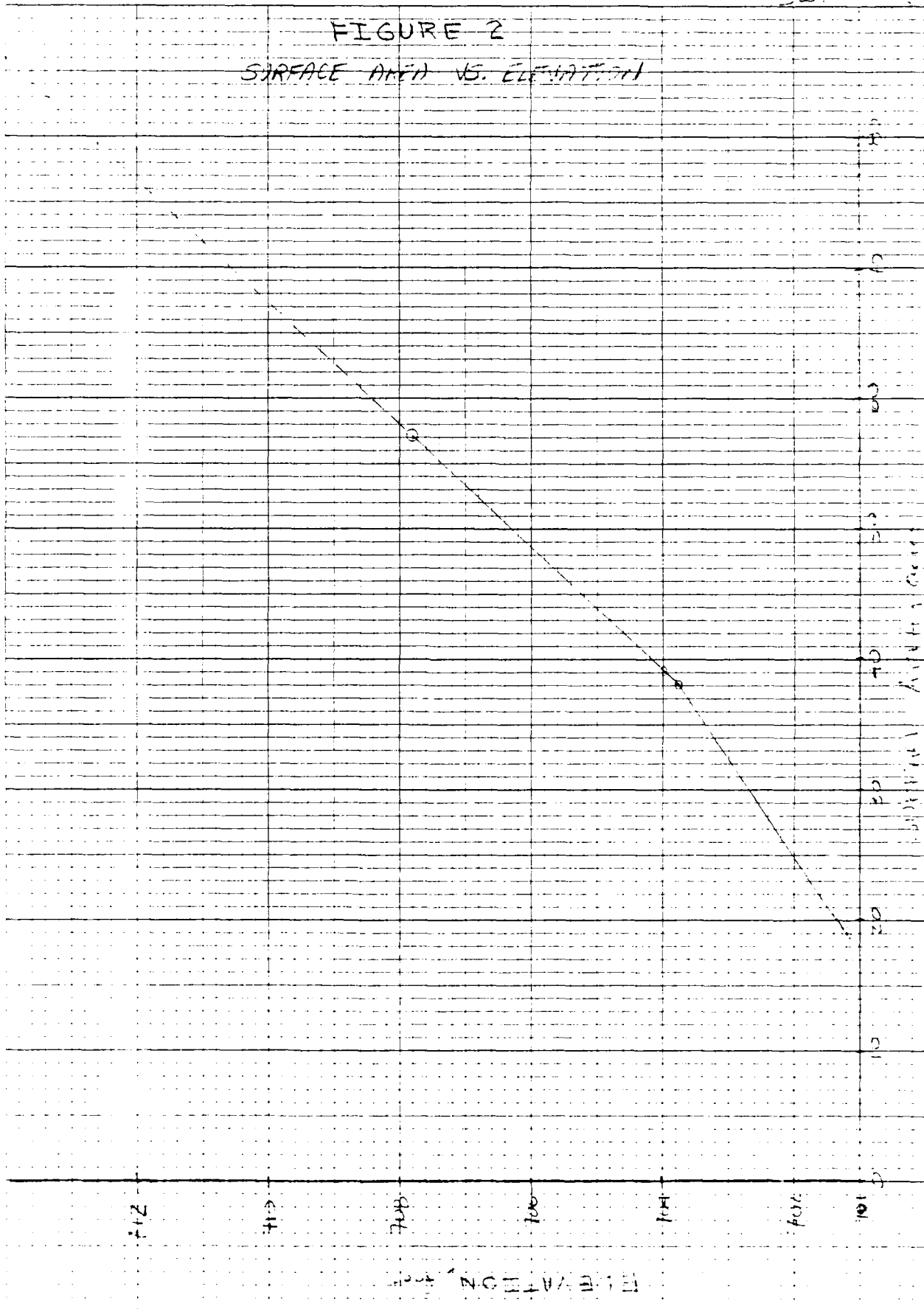
$$\text{Top of dam crest} = 70.4$$

$$\text{Surcharge crest} = 7.9 \text{ ft} = \frac{71.3 - 70.4}{1.2}$$

- determine volume of surcharge (STOR) from Figure 2

1. The volume of surcharge is determined from the area under the surcharge curve. The area under the curve is determined by the method of moments.

FIGURE 2
SURFACE AREA VS. ELEVATION



BOSTON , MASS.
ROCHESTER , N.H.

CLIENT Army Corps JOB NO. 374-790 PAGE 9 of 24
PROJECT 2nd and 3rd COMPTD. BY BWP DATE 2/20/70
DETAIL to bridge table CK'D. BY RLS DATE 2/20/70

(2) Since storage curve changes slope at approx. elev 704 top of flash boards will in air storage above and below 704 separately

$$\begin{aligned} \text{STOR}_1 &= \frac{\text{Volume of Storage (as acre-inches)}}{\text{drainage area}} \\ &= \frac{\left[\left(\frac{75.5 + 39}{2} \right) (7.8) + \left(\frac{39 + 19}{2} \right) (2.3) \right] (12 \text{ in/ft})}{(13.9 \text{ sq mi}) (640 \text{ acres/sq mi})} \\ &= 0.72 \text{ inches} \end{aligned}$$

c determine Q_{p2}

$$Q_{P2} = Q_{P1} \left(1 - \frac{\text{STOR}_1}{9.5} \right)$$

for 9.5 and consider
1/2 PROF

$$= (10,700 \text{ cts}) \left(1 - \frac{2.72}{9.5} \right)$$

$$Q_{P2} = 9,890 \text{ cfs}$$

4 STEP 3: Determine surcharge weight and $STOR_3$
 $\rightarrow$ pass Q_{P2} and then J_{F3}

a. from Figure 1 determine surge height $\rightarrow$
 Data: $Q_{p2} = 9,800 \text{ cfs}$

Surcharge clear = 711.6 -
top of f.b. = $\frac{704.0}{7.3} = 704.0$
Spillway crest = $\frac{701.2}{2.3}$

CLIENT <u>Army Corps</u>	JOB NO. <u>274-7901</u>	PAGE <u>10 of 27</u>
PROJECT <u>Chad Pond Dam</u>	COMPTD. BY <u>BWP</u>	DATE <u>12/20/74</u>
DETAIL <u>Hydraulic Calcs</u>	CK'D. BY <u></u>	DATE <u></u>

b. determine $STOR_3$

$$STOR_2 = \frac{\left[\frac{(75.0 + 39)}{2} \right] (-7.6) + 91.2}{(13.9 \text{ sq.m.} \cdot 640 \text{ A/sq.m.})} (12 \text{ in/ft})$$

$$= 0.70 \text{ inches}$$

c. Average $STOR_1$ and $STOR_2$

$$STOR_{AVG} = \frac{STOR_1 + STOR_2}{2}$$

$$= \frac{0.72 \text{ in} + 0.70 \text{ in}}{2}$$

$$= 0.71 \text{ inches}$$

$STOR_2$ and $STOR_{AVG}$ agree to within 2%, therefore
accept test 1 and discharge = 9,390 cfs at an elevation
of 711.6 feet.

5. In Conclusion

a. Test 1 with discharge = 9,390 cfs and a spill
over top of the dam crest (top of abutment, say 3.3 feet

b. Spillway Capacity - flashboards removed

(1) with water surface at dam crest - 707.8 feet

$$Q = (2.6)(50.5 \text{ ft})(707.8 \text{ ft} - 701.2 \text{ ft})^{3/2} \approx 22300 \text{ cfs}$$

(2) with water surface at top flood elevation - 711.6 ft

$$Q = (2.6)(50.5 \text{ ft})(711.6 \text{ ft} - 701.2 \text{ ft})^{3/2} \approx 44000 \text{ cfs}$$

CLIENT Army Corps JOB NO. 274-290 PAGE 11 of 27
PROJECT Chase Pond Dam COMPTD. BY BWP DATE 2/22/70
DETAIL Hydrologic Calcs CK'D. BY ... DATE ...

III using "Rule of Thumbs" Guidance for Estimating Downstream Dam Failure Hydrographs Examining impact of dam failure

Pertinent Data

- a Failure occurs when reservoir level at crest
of dam (top of abutment) - crest elev = 707.3
- b Storage at crest elevation estimated to be
approximately 370 acre-ft

A REACH 1

1 STEP 1 : Determine reservoir storage at time
of failure
from previous calcs storage = 230 acre-ft

2 STEP 2: Determine Peak Failure Out-flow (Q_{p1})

$$Q_{p1} = 9/27 W_b \sqrt{g} Y_0^{3/2}$$

where W_b = Bread width (use 40% of
total length
= (0.40)(105 feet)
= 42 feet

Y_0 = Total height from river bed to
pool level at failure
pool level = 707.3 ft
channel bottom $\approx$ 690.6 ft
17.2 ft

$$Q_{p1} = (9/27)(42 \text{ ft})(32.7)^{1/2}(17.2 \text{ ft})^{3/2}$$
$$= 5,040 \text{ cfs}$$

CLIENT City of Lowell JOB NO. 274-7901 PAGE 12 of 27
PROJECT Lowell Park Dam COMPTD. BY BOP DATE 12/22/99
DETAIL Automatic Gates CK'D. BY DATE

3. STEP 3 . Prepare stage-discharge curve for Reach 1.

a. Parameter Data

- (1) Reach length - 675 feet
- (2) Slope 0.022
- (3) Manning's "n" = 0.053
- (4) Channel shape - trapezoidal (side slope 1:1, slope changes at elev. 550' - where channel width = 210')
- (5) Base width $\approx 20'$

b. see Figure 3 for stage-discharge curve

4. STEP 4: Estimate Reach Outflow

a. Determine stage for $Q_{p1} = 5,040 \text{ cfs}$ from Figure 3. and find volume in reach

(1) Stage = 4.8 feet

(2) Volume in reach = (reach length) $\times$ (cross-sectional area of channel)

$$X\text{-Area} = (0.5(4.14)(20+210)) + 0.5(0.7(210-20)^2) \\ = 626 \text{ ft}^2$$

$$\text{Volume} = V_1 = \frac{(675 \text{ ft})(626 \text{ ft}^2)}{43,560 \text{ ft}^2/\text{acre}}$$

$$= 9.7 \text{ acre-ft}$$

$$V_1 < \frac{S}{2} \quad \text{Reach number 1}$$

b. determine Q_{p2} (reaches)

$$Q_{p2}(\text{reaches}) = Q_{p1} \left(1 - \frac{V_1}{S}\right)$$

$$= (5,040 \text{ cfs}) \left(1 - \frac{9.7}{375}\right)$$

CLIENT <u>Frank Tapp</u>	JOB NO. <u>274-7901</u>	PAGE <u>2 of 27</u>
PROJECT <u>Cadiz Pond Dam</u>	COMPTD. BY <u>ELP</u>	DATE <u>12/22/01</u>
DETAIL <u>Hydrologic Data</u>	CK'D. BY <u> </u>	DATE <u> </u>

$$Q_{P2}(\text{cfs}) = 4910 \text{ cfs}$$

c. Compute V_2 using $Q_{P2}(\text{cfs})$.

From Figure 2 determine stage for $Q_{P2}(\text{cfs})$.

$$\text{Stage} = 4.8 \text{ ft}$$

$$X\text{-Area} = (0.5)(4.1)(20+210) + (0.5)(0.7)(210+270) \\ \approx 626 \text{ ft}^2$$

$$V_2 = \frac{(675 \text{ ft})(626 \text{ ft}^2)}{43,560 \text{ ft}^2/\text{acre}}$$

$$V_2 = 9.7 \text{ acre-ft}$$

d. Average V_1 and V_2 and compute Q_{P2}

$$\begin{aligned} (1) \text{Vavg} &= \frac{V_1 + V_2}{2} \\ &= \frac{9.7 \text{ acre-ft} + 9.7 \text{ acre-ft}}{2} \\ &= 9.7 \text{ acre-ft} \end{aligned}$$

$$\begin{aligned} (2) Q_{P2} &= Q_{P1} \left(1 - \frac{\text{Vavg}}{S}\right) \\ &= (5,040 \text{ cfs}) \left(1 - \frac{9.7}{370}\right) \\ &= 4,910 \text{ cfs} \end{aligned}$$

3 Reach 2

1 STEP 3: Prepare stage-discharge curve for Reach 2

a. Part reach data

$$1 \text{ Reach Length} = 300'$$

$$2 \text{ slope} = 0.0052$$

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CLIENT <u>Town Corp.</u>	JOB NO. <u>274-7901</u>	PAGE <u>14 - 27</u>
PROJECT <u>Stage Pond No.</u>	COMPTD. BY <u>WJP</u>	DATE <u>2/25/70</u>
DETAIL <u>Hydrologic Calc.</u>	CK'D. BY <u>WJS</u>	DATE <u>2/25/70</u>

3 Manning's "n" = 0.08

4 Channel shape - trapezoidal

5 base width - 100'

1 see Figure 3 for curve

2 STEP 4:

a Determine stage for $Q_{P2} = 4,910$ cfs from Figure 3 and volume in reach

(1) Stage = 7.1 ft

(2) Volume in reach

$$V_1 = \frac{(800 \text{ ft}) [(0.5)(7.1)(100 + 265)]}{43,560 \text{ ft}^2/\text{acre}}$$

$$= 23.8 \text{ acre-ft}$$

$$V < \frac{S}{2} \text{ reach length}$$

b Determine Q_{P3} (TRIAL)

$$Q_{P3} (\text{TRIAL}) = Q_{P2} \left(1 - \frac{V}{S}\right)$$

$$= (4,910 \text{ cfs}) \left(1 - \frac{23.8}{370}\right)$$

$$Q_{P3} (\text{TRIAL}) = 4,590 \text{ cfs}$$

c. Compute V_2 using Q_{P3} value

from Figure 3 determine stage for Q_{P3}

Stage = 6.9 ft

$$V_2 = \frac{(800 \text{ ft}) [(0.5)(6.9)(100 + 260)]}{43,560 \text{ ft}^2/\text{acre}}$$

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PROJECT Wash - 1st Div COMPTD. BY SDH DATE 1/22/88
DETAIL Hydrologic Data CK'D. BY DATE

$$V_2 = 22.8 \text{ ac-ft}$$

d. Average V and V_2 and V_3

$$(1) V_{avg} = \frac{23.8 \text{ ac-ft} + 22.8 \text{ ac-ft}}{2}$$

$$= 23.3 \text{ ac-ft}$$

$$(2) Q_{P3} = Q_{P2} - \frac{V_{avg}}{S}$$

$$= (4910 \text{ cfs}) - \frac{23.3}{3.0},$$

$$Q_{P3} = 4,600 \text{ cfs}$$

C Reach 3

1. STEP 3: Prepare stage-discharge curve for Reach 3

a. Pertinent Data

1. Reach length = 650 feet
2. Slope = 0.0052
3. Manning's n = 0.03
4. Channel shape = trapezoidal
5. base width = 100 feet

b. see Figure 3 for curve

2. STEP 4:

a. Determine stage for $Q_{P3} = 4,600 \text{ cfs}$ from Figure 3 and volume of reach

$$Q_{P3} \text{ stage} = 5.1$$

3. Volume of reach

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PROJECT Croft Pond Dam COMPTD. BY BJP DATE 12 22 77
DETAIL Hydrologic Calc CK'D. BY ... DATE ...

$$V_1 = \frac{(650 \text{ ft}) [(0.5)(5.1') (5' - 5.5')]}{43,560 \text{ ft}^2/\text{acre}}$$

$$= 24.5 \text{ acre-ft}$$

$$V < \frac{S}{2} \text{ reach length OK}$$

b. Determine $Q_{P4(\text{TRIAL})}$

$$Q_{P4(\text{TRIAL})} = Q_{P3} \left(1 - \frac{V_1}{S}\right) \\ = (4600 \text{ cfs}) \left(1 - \frac{24.5}{370}\right)$$

$$Q_{P4(\text{TRIAL})} = 4,300 \text{ cfs}$$

c. Compute V_2 using $Q_{P4(\text{TRIAL})}$

from Figure 3 determine stage for $Q_{P4(\text{TRIAL})}$

$$\text{Stage} = 5.0 \text{ feet}$$

$$V_2 = \frac{(650 \text{ feet}) [(0.5)(5.0') (100' + 540')]}{43,560 \text{ ft}^2/\text{acre}}$$

$$V_2 = 23.9 \text{ acre-ft}$$

d. Average V_1 and V_2 and compute Q_{P4}

$$(1) V_{\text{avg}} = \frac{24.5 \text{ acre-ft} + 23.9 \text{ acre-ft}}{2} \\ = 24.2 \text{ acre-ft}$$

$$(2) Q_{P4} = Q_{P3} \left(1 - \frac{V_{\text{avg}}}{S}\right) \\ = (4600 \text{ cfs}) \left(1 - \frac{24.2}{370}\right)$$

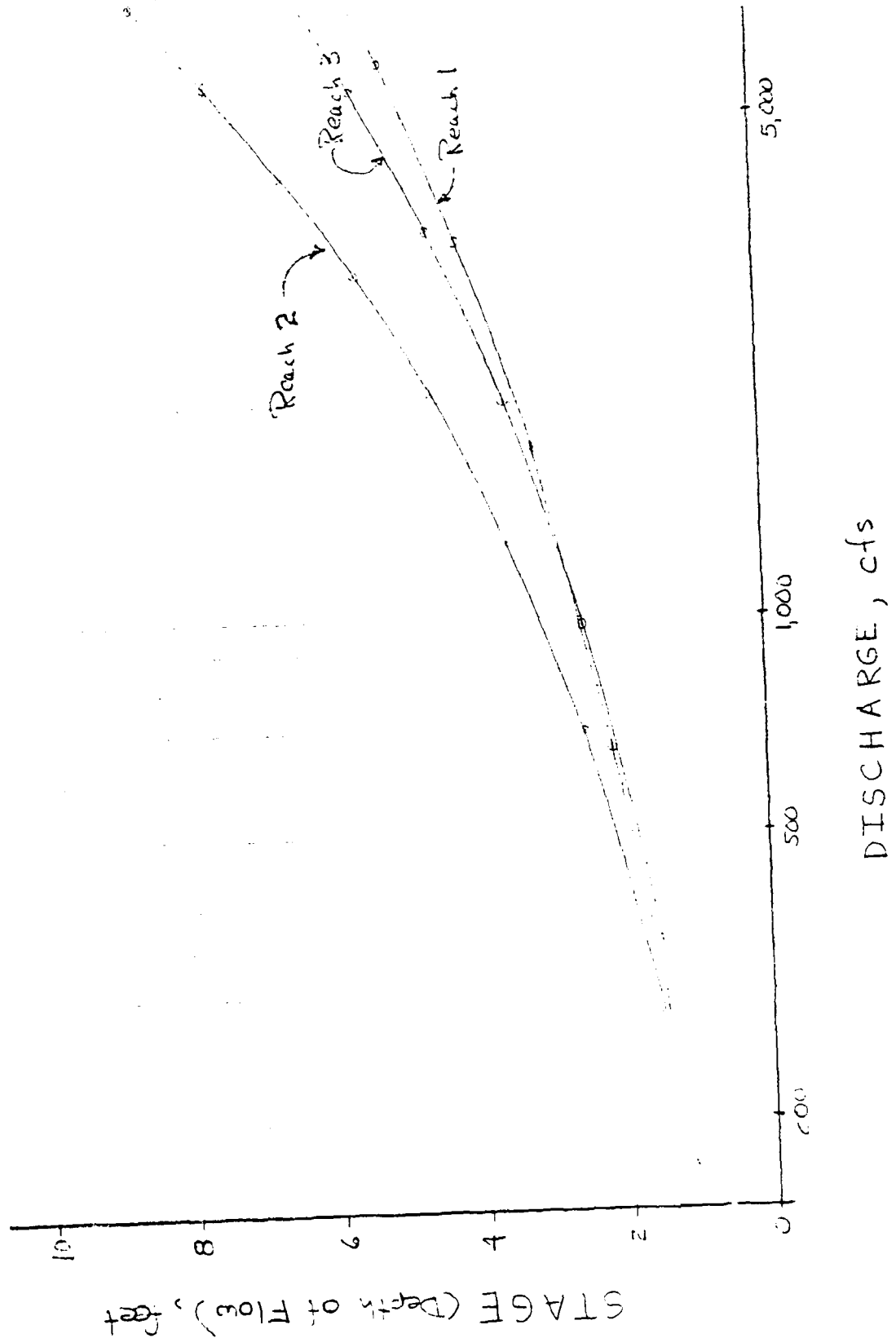
$$Q_{P4} = 4,300 \text{ cfs}$$

John Ford Lam

File # 274-790

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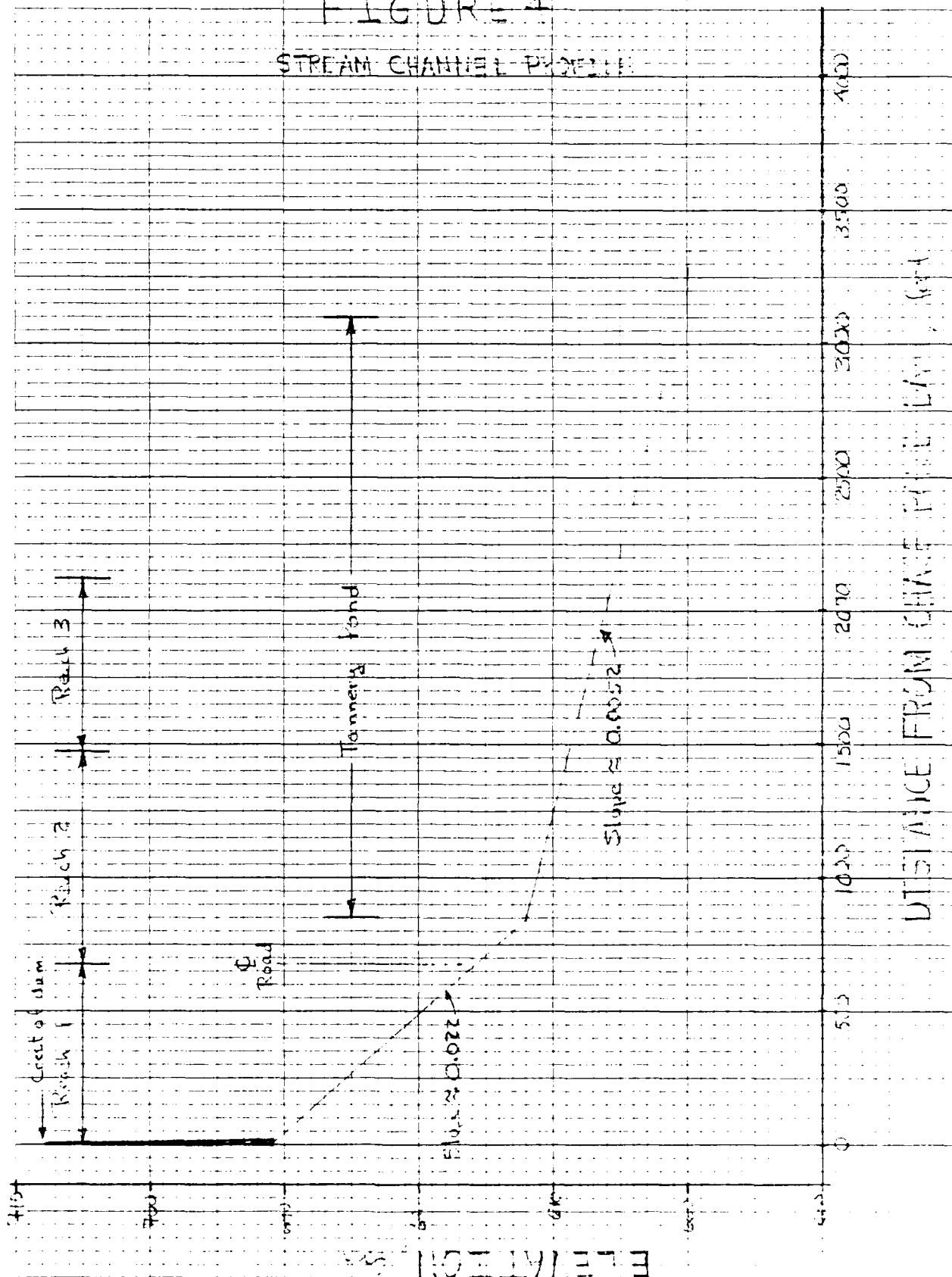
FIGURE 3
DISCHARGE vs STAGE



274-230

274-230

FIGURE 1
STREAM CHANNEL PROFILE



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PROJECT Glenn Dam COMPTD. BY BJP DATE 7-8-80
DETAIL Hydrologic Data CK'D. BY DATE

II. Examine the impact of tailwater on downstream stage during the "Rule of Thumb" Guidance for Estimating Downstream Dam Failure Hydrographs.

A. Reach 1

1. STEP 3 Prepare stage-discharge curve for Reach 1

a. Pertinent data

(1) Use stage-discharge curve prepared previously for dam failure analysis - see Figure 3

(2) $Q_{p1} = 2230$ cfs - water at top of dam - assumed removed

a. Determine stage for $Q_{p1} = 2230$ cfs from Figure 3 and find volume in reach

(1) Stage (depth of flow) = 3.5 feet

(2) Volume in reach = (reach length) $\left(\frac{\text{cross-sectional area of channel}}{\text{area of channel}} \right)$

$$\begin{aligned} \text{X-area} &= (0.5)(3.5 \text{ ft})(20 \text{ ft} + 18 \text{ ft}) \\ &= 355 \text{ ft}^2 \end{aligned}$$

$$\begin{aligned} \text{Volume} = V_1 &= \frac{(355 \text{ ft}^2)(0.75 \text{ mi})}{43,560 \text{ ft}^2/\text{acre}} \\ &= 5.5 \text{ acre-ft} \end{aligned}$$

$$V_1 < \frac{3}{2} \text{ reach length of}$$

b. Determine $Q_{p2}(\text{TRIAL})$

$$Q_{p2}(\text{TRIAL}) = Q_{p1} \left(1 - \frac{V_1}{V_1 + V_2} \right)$$

$$Q_{p2}(\text{TRIAL}) = (2230 \text{ cfs}) \left(1 - \frac{5.5}{5.5 + 5.5} \right)$$

$$Q_{p2} = 2200 \text{ cfs}$$

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PROJECT Channel Deepening COMPTON DATE 3/2/80
DETAIL Hydrologic Data CK'D. BY DATE

c. Compute V_2 using $Q_{P2}(20)$

From Figure 3 determine $Q_{P2}(20)$ (20) (20) (20)

$$\text{Stage} = 3.4 \text{ feet}$$

$$\begin{aligned} X\text{-area} &= (0.5)(3.4 \text{ ft})(20 \text{ ft} + 179 \text{ ft}) \\ &= 338 \text{ ft}^2 \end{aligned}$$

$$V_2 = \frac{(338 \text{ ft}^2)(675 \text{ ft})}{43,660 \text{ ft}^2/\text{acre}}$$

$$V_2 = 5.2 \text{ acre-ft}$$

d. Average V_1 and V_2 and V_3

$$(1) V_{\text{avg}} = \frac{V_1 + V_2}{2}$$

$$V_{\text{avg}} = \frac{5.5 \text{ acre-ft} + 5.2 \text{ acre-ft}}{2}$$

$$V_{\text{avg}} = 5.4 \text{ acre-ft}$$

$$(2) Q_{P2} = Q_{P1} \left(1 - \frac{V_{\text{avg}}}{V} \right)$$

$$Q_{P2} = (2230 \text{ cfs}) \left(1 - \frac{5.4}{370} \right)$$

$$Q_{P2} = 2200 \text{ cfs}$$

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PROJECT Large Dam Program COMPTD. BY EM DATE 1-1-75
DETAIL Hydrologic Calcs. CK'D. BY KMS DATE 1-1-75

B. Reach 2

1. STEP 3: Prepare stage-discharge curves for Reach 2
Prepared for dam failure analysis.

a. Pertinent Data

- (1) Reach length = 300 feet
- (2) Channel slope = 0.0052
- (3) Manning n = 0.08
- (4) Channel shape = trapezoidal
- (5) Base width $\approx$ 100 feet

b. See Figure 1 for stage-discharge curves

2. STEP 4: Estimate Reach outflow

a. Determine stage for $V_1 = 1,200 \text{ cfs}$ from Figure 1
and find volume in reach.

- (1) Stage (depth of flow) = 4.7 feet
- (2) Volume in reach = (reach length) $\left(\frac{\text{cross-sectional area of channel}}{2} \right)$

$$X\text{-area} = (0.5)(4.7 \text{ ft}) (100 \text{ ft} - 200 \text{ ft})$$

$$= 729 \text{ ft}^2$$

$$\text{Volume} = V_1 = \frac{(729 \text{ ft}^2)(300 \text{ ft})}{43,560 \text{ ft}^2/\text{acre}}$$

$$= 13.4 \text{ acre-ft}$$

$$V_1 < \frac{S}{2} \text{ (check condition)}$$

b. Determine $Q_3(\text{TRIAL})$

$$Q_3(\text{TRIAL}) = Q_2 \left(1 - \frac{V_1}{S} \right)$$

$$Q_3(\text{TRIAL}) = (2,200 \text{ cfs}) \left(1 - \frac{13.4}{100} \right)$$

$$Q_{03} = 1,920 \text{ cfs}$$

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PROJECT:
DATE:

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PROJECT Channel Bank Erosion COMPTD BY DATE 1-2-81
DETAIL Hydrologic Calcs. CK'D BY DATE

c. Compute V_2 using Q_{P3}

From Figure 3 determine V_2

$$\text{Stage} = 4.6 \text{ feet}$$

$$\begin{aligned} \text{X-area} &= (0.5)(4.6 \text{ ft})(100 \text{ ft}) \\ &= 708 \text{ ft}^2 \end{aligned}$$

$$V_2 = \frac{(708 \text{ ft}^2)(800 \text{ ft})}{43,560 \text{ ft}^2/\text{acre}}$$

$$V_2 = 13.0 \text{ acre-ft}$$

d. Average V_1 and V_2 and compute V_3

$$(1) \quad V_{\text{avg}} = \frac{V_1 + V_2}{2}$$

$$V_{\text{avg}} = \frac{13.4 \text{ acre-ft} + 13.0 \text{ acre-ft}}{2}$$

$$V_{\text{avg}} = 13.2 \text{ acre-ft}$$

$$(2) \quad Q_{P3} = Q_{P2} \left(1 - \frac{V_{\text{avg}}}{V_2} \right)$$

$$Q_{P3} = (2,200 \text{ cfs}) \left(1 - \frac{13.2}{13.0} \right)$$

$$Q_{P3} = 2,120 \text{ cfs}$$

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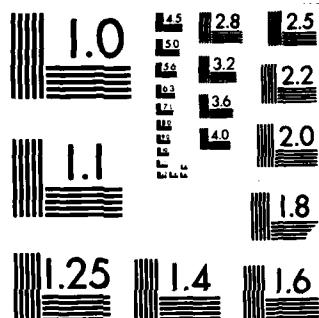
NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
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PROJECT ... COMPTD. BY BWP DATE 2/9/85
DETAIL Hydrologic Calcs. CK'D. BY KMS DATE 5/10/85

C. Reach 3

1. STEP 3: Prepare stage-discharge curve for Reach 3 - *previously prepared for dam failure analysis*

a. Pertinent Data

- (1) Reach length = 650 feet
- (2) Channel slope = 0.0052
- (3) Manning n = 0.09
- (4) Channel shape - trapezoidal
- (5) Base width $\approx$ 100 feet

b. See Figure 3 for stage-discharge curve

2 STEP 4: Estimate Reach Outflow

a. Determine stage for $Q_{P3} = 2,120 \text{ cfs}$ from Figure 3 and find volume in reach

- (1) Stage (depth of flow) = 3.6 feet
- (2) Volume in reach = (reach length) (cross-sectional area of channel)

$$\begin{aligned} \text{X-area} &= (0.5)(3.6 \text{ ft})(100 \text{ ft} + 430 \text{ ft}) \\ &= 936 \text{ ft}^2 \\ \text{Volume} = V_1 &= \frac{(936 \text{ ft}^2)(650 \text{ ft})}{43,560 \text{ ft}^2/\text{acre}} \\ &= 14.0 \text{ acre-ft} \end{aligned}$$

$$V_1 < \frac{S}{2} \therefore \text{reach length OK}$$

b. Determine $Q_{P4}(\text{TRIAL})$

$$Q_{P4}(\text{TRIAL}) = Q_{P3} \left(1 - \frac{V_1}{S} \right)$$

$$Q_{P4}(\text{TRIAL}) = (2,120 \text{ cfs}) \left(1 - \frac{14.0}{3.0} \right)$$

$$Q_{P4} = 2,040 \text{ cfs}$$

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c. Compute V_2 using $Q_{P-1}(\text{TRIAL})$

From Figure 3 determine stage for $Q_{P-1}(\text{TRIAL})$

$$\text{Stage} = 3.5 \text{ feet}$$

$$\begin{aligned} X\text{-area} &= (0.5)(3.5 \text{ ft})(100 \text{ ft} + 110 \text{ ft}) \\ &= 893 \text{ ft}^2 \end{aligned}$$

$$V_2 = \frac{(893 \text{ ft}^2)(650 \text{ ft})}{43,560 \text{ ft}^2/\text{acre}}$$

$$V_2 = 13.3 \text{ acre-ft}$$

d. Average V_1 and V_2 and compute S_4

$$(1) V_{\text{avg}} = \frac{V_1 + V_2}{2}$$

$$V_{\text{avg}} = \frac{14.0 \text{ acre-ft} + 13.3 \text{ acre-ft}}{2}$$

$$V_{\text{avg}} = 13.7 \text{ acre-ft}$$

$$(2) Q_{P4} = Q_{P3} \left(1 - \frac{V_{\text{avg}}}{S} \right)$$

$$Q_{P4} = (2,120 \text{ cfs}) \left(1 - \frac{13.7}{370} \right)$$

$$Q_{P4} = 2,040 \text{ cfs}$$

CLIENT Acme Corp JOB No. 224-7-01 PAGE 25 of 27
PROJECT Casco Pond Dam COMPTD. BY ELP DATE 5/2/82
DETAIL Hydrologic Calc. CK'D. BY ELP DATE 5/2/82

D. Summary of Impact of tailwater on Stage at downstream reaches

1. determine total stage by adding the tailwater discharge and the dam failure discharge, and finding the stage for this total in Figure 3, ie

$$Q_{P\text{TOTAL}} = Q_{P\text{Failure}} + Q_{P\text{TAILWATER}}$$

2. Reach 1

$$\begin{aligned} Q_{P1\text{TOTAL}} &= 4,910 \text{ cfs} + 2,200 \text{ cfs} \\ &= 7,110 \text{ cfs} \end{aligned}$$

$$\text{STAGE} = 5.5 \text{ feet}$$

3. Reach 2

$$\begin{aligned} Q_{P2\text{TOTAL}} &= 4,600 \text{ cfs} + 2,120 \text{ cfs} \\ &= 6,720 \text{ cfs} \end{aligned}$$

$$\text{STAGE} = 5.2 \text{ feet}$$

4. Reach 3

$$\begin{aligned} Q_{P3\text{TOTAL}} &= 4,300 \text{ cfs} + 2,040 \text{ cfs} \\ &= 6,340 \text{ cfs} \end{aligned}$$

$$\text{STAGE} = 5.9 \text{ feet}$$

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PROJECT Chato Pond Dam COMPTD. BY BWF DATE 12/23/74
DETAIL Hydrodynamic Calcs. CK'D. BY AKS DATE 12/27/74

V Additional Discharge Calculations

A. Flow over Flanconds -

Will be a submerged weir flow situation, and is defined by

$$\frac{Q_s}{Q} = \left[1 - \left(\frac{H_2}{H_1} \right)^n \right]^{0.385}$$

where Q_s = discharge of submerged weir, cfs

Q = discharge of unsubmerged weir, cfs

H_2 = height of water surface above weir crest, downstream of weir, ft

H_1 = height of water surface above weir, upstream of weir, ft

n = $\frac{3}{2}$ for rectangular weir

1. Water surface at crest of dam

2. Compute Q for free discharge with $Q = C L H^{3/2}$

$$Q = (3.5)(50.5')(3.8')^{3/2}$$

$$\approx 1310 \text{ cfs}$$

b. find H_2 from Figure 1 (since this represents flow over spillway structure with Flanconds removed)

$$\text{for } Q = 1310 \text{ cfs} \quad \text{elev} \approx 705.9$$

$$H_2 = 705.8 - 704.0 \\ = 1.8 \text{ feet}$$

$$\text{c. Thus } Q_s = Q \left[1 - \left(\frac{H_2}{H_1} \right)^n \right]^{0.385}$$

$$= (1310 \text{ cfs}) \left[1 - \left(\frac{1.8}{3.8} \right)^{3/2} \right]^{0.385}$$

$$\boxed{Q_s = 1125 \text{ cfs}}$$

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PROJECT State Pond Dam COMPTD. BY BWP DATE 11/1/79
DETAIL Hydrologic Calcs CK'D. BY KMS DATE 11/5/79

2. Water surface at test flood elevation

a. Q and discharge

$$Q = (35 + 0.5') (7.6')^{3/2}$$

$$\approx 3700 \text{ cfs}$$

b. from Figure 1

$$\text{for } Q = 3,700 \text{ cfs } \text{elev} = 709.2 \text{ ft}$$

$$H_2 = 709.2 - 704.0$$

$$= 5.2 \text{ feet}$$

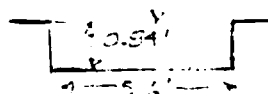
$$\text{c. Thus } Q_s = (3,700) \left[1 - \left(\frac{5.2}{7.6} \right)^{3/2} \right]^{0.395}$$

$$Q_s \approx 2680 \text{ cfs}$$

3. Capacity of weir sections at normal pool

Take normal pool at 704.0 compute discharge
Through weir sections

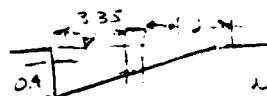
a. rectangular weir section



$$Q = (3.3) (5.6') (0.84')^{3/2}$$

$$\approx 14 \text{ cfs}$$

b. triangular weir section



use avg $H \approx 0.334$
and no outlet weir design

$$Q = (3.3) (7.35) (0.33')^{3/2}$$

$$\approx 5 \text{ cfs}$$

$$\text{c. Total} = 14 \text{ cfs} + 5 \text{ cfs}$$

$$= 19 \text{ cfs}$$

END

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