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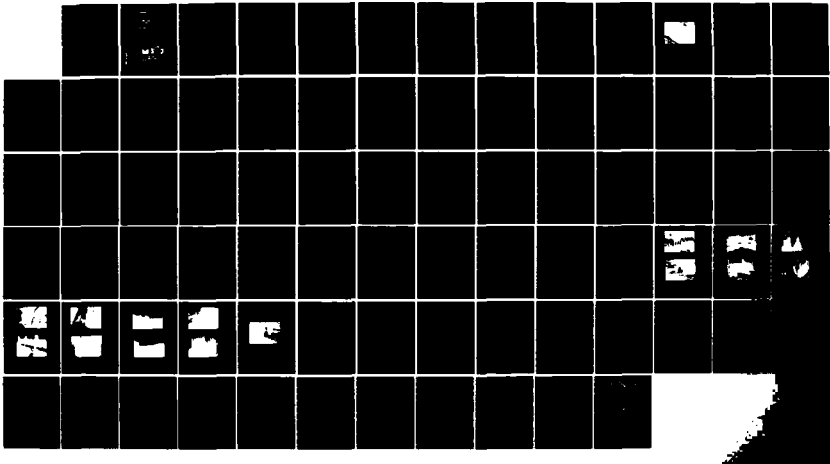

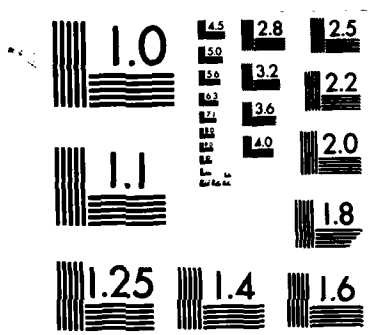

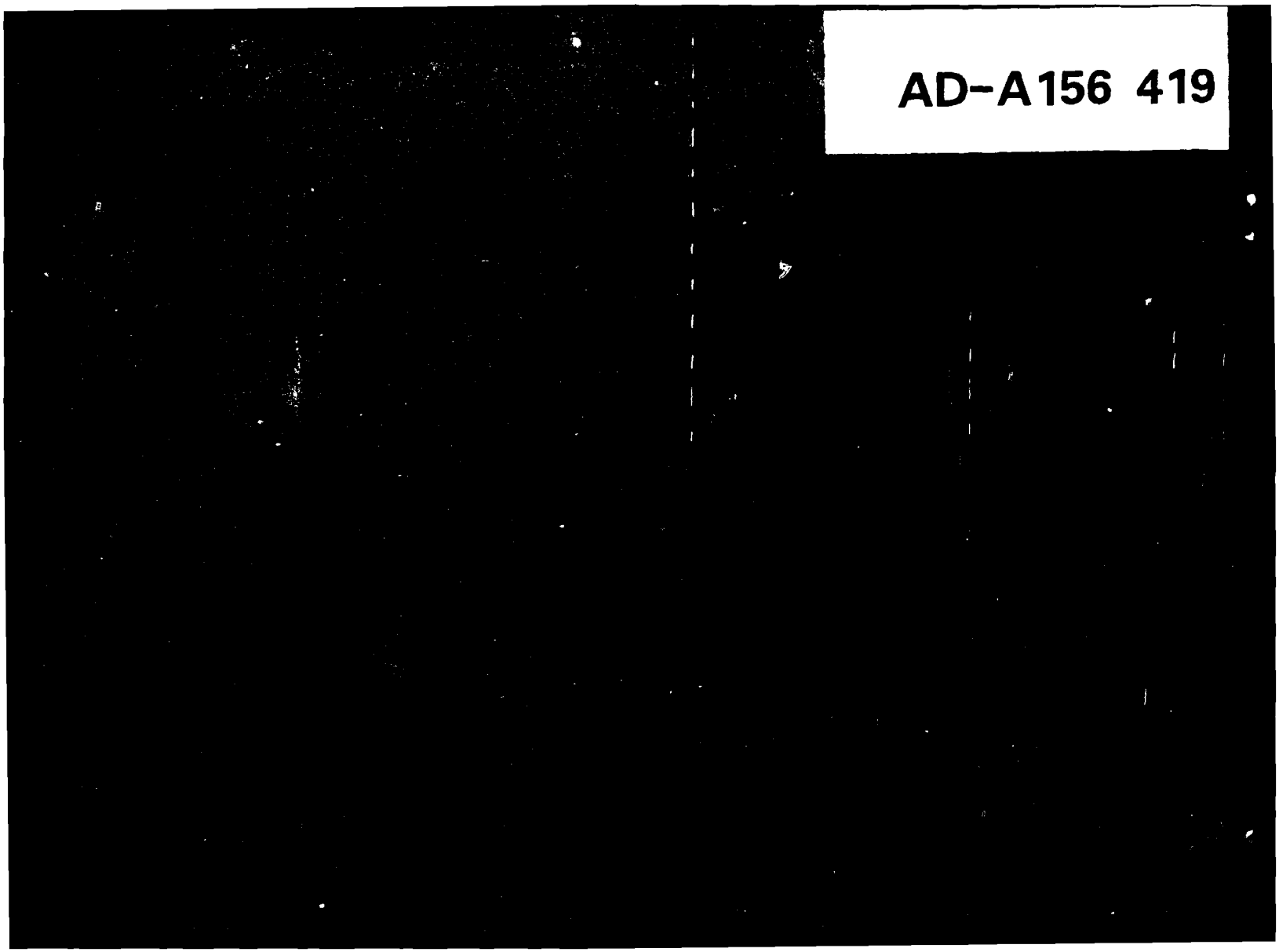

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Piscataqua River Basin
Milton, New Hampshire
Salmon Falls River

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

THe dam is 19 ft high and 156 ft. long. It is a gravity dam consiting of a dry stone masonry bed over which a reinforced concrete superstructure has been built. THe damis in good condition. There are a few minor concerns which should be corrected. Based on size and hazard classifications in accordamce with Corps guidlines the test flood is the PMF. A major breach at top of dam would probably result in th loss of less than a few lives and appreciable property damage.

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

REPLY TO
ATTENTION OF:

NEDED

Honorable Meldrim Thomson, Jr.
Governor of the State of New Hampshire
State House
Concord, New Hampshire 03301

Dear Governor Thomson:

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

A copy of this report has been forwarded to the Water Resources Board, the cooperating agency for the State of New Hampshire. In addition, a copy of the report has also been furnished the owner, The New Hampshire Water Resources Board, 37 Pleasant Street, Concord, New Hampshire 03301.

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

I wish to take this opportunity to thank you and the Water Resources Board for your cooperation in carrying out this program.

Sincerely yours,

JOHN P. CHANDLER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

MILTON THREE PONDS DAM

NH 00320

PISCATAQUA RIVER BASIN
MILTON, NEW HAMPSHIRE

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

Identification No.:	NH00320
Name of Dam:	Milton Three Ponds Dam
Town:	Milton
County and State:	Strafford County, New Hampshire
Stream:	Salmon Falls River
Date of Inspection:	19 June 1978

BRIEF ASSESSMENT

Milton Three Ponds Dam is 19 feet high, is 16½ feet wide, and is 156 feet long. It is a gravity dam, consisting of a dry stone masonry bed over which a reinforced concrete superstructure has been built. The dam spans a middle reach of the Salmon Falls River, and is located in east central New Hampshire. It has two low-level outlet gates; the spillway extends across the length of the dam with 25 bays of stoplogs. Maximum storage capacity is about 15,000 acre-feet. Milton Three Ponds Dam is used for industrial process water as well as for recreational purposes. The pond is about 5 miles in length with a surface area of about 900 acres.

The dam is in good condition. Minor concerns are: the displacement of a few large stones from the downstream face; structural deterioration of the concrete, including cracking, spalling, and erosion that has exposed reinforcing bars; and a minor seepage at the toe of the dam at the west abutment.

Based on size and hazard classifications in accordance with Corps guidelines, the test flood is the Probable Maximum Flood. With stoplogs in place a PMF outflow of 35,000 cfs (324 csm) would overtop the dam by 12.8 feet; therefore the spillway is considered inadequate. With stoplogs, the spillway will pass 1300 cfs or 4 percent of the PMF. With stoplogs removed, the spillway will pass 23,700 cfs. A major breach at maximum pool would probably result in the loss of less than 10 lives and appreciable property damage.

The owner, New Hampshire Water Resources Board, should implement the results of the recommendations given in Section 7.2. within 3 years after receipt of this Phase I inspection report. The operating and maintenance measures recommended in Subsection 7.3.b. should be implemented within one year after receipt of this Phase I inspection report.

Warren A. Guinan

Warren A. Guinan
Project Manager
N.H. P.E. 2339

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

CHARLES G. TIERSCH, Chairman
Chief, Foundation and Materials Branch
Engineering Division

FRED J. RAVENS, Jr., Member
Chief, Design Branch
Engineering Division

SAUL COOPER, Member
Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers (OCE), 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 test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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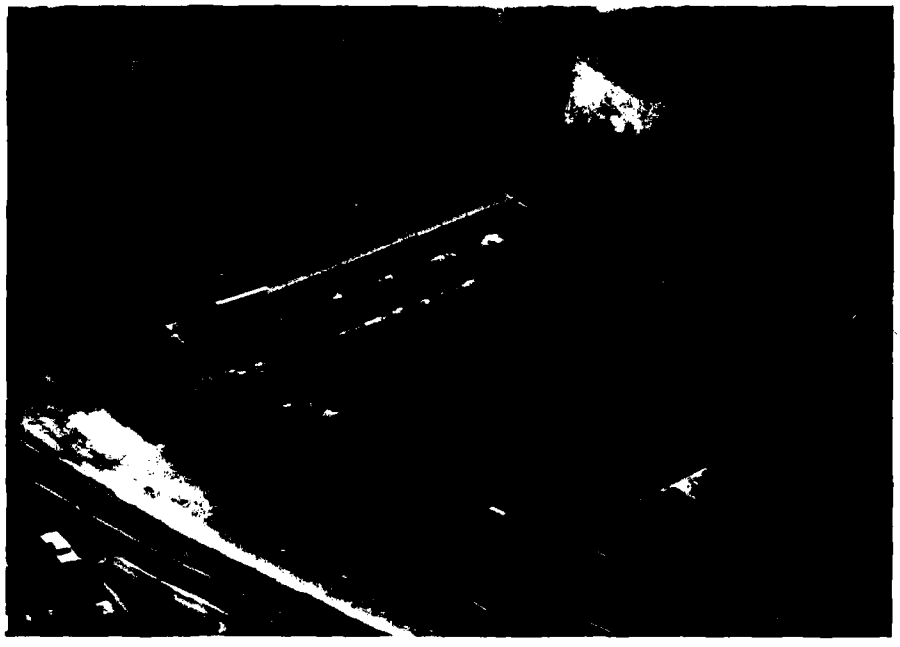
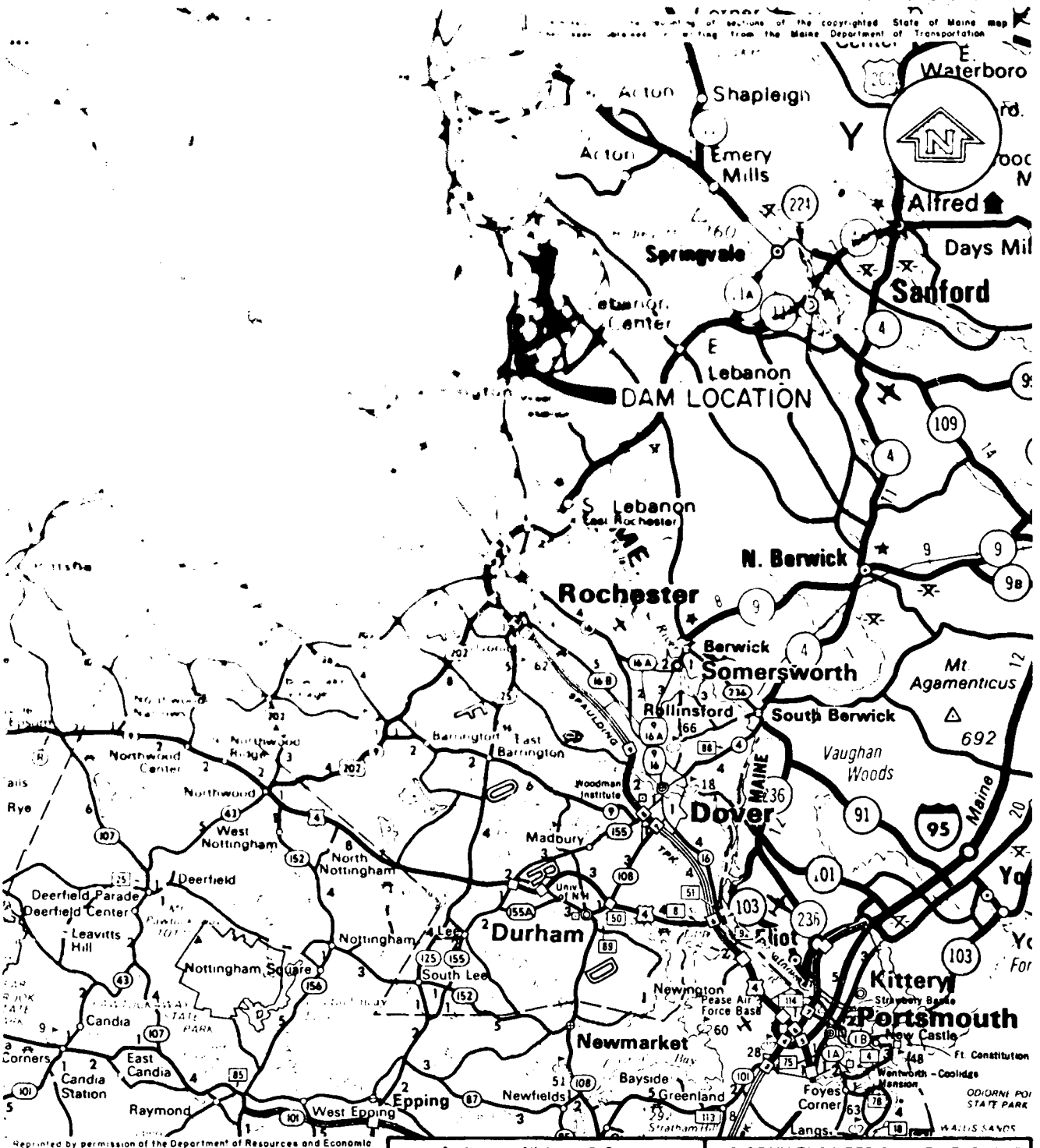


Figure 1 - Overview of Milton Three Ponds Dam.



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SCALE IN MILES

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MAP BASED ON STATE OF NEW HAMPSHIRE-STATE OF MAINE OFFICIAL HIGHWAY MAPS.

Anderson-Nichols & Co., Inc. CONCORD NEW HAMPSHIRE	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

MILTON THREE PONDS DAM LOCATION MAP

MILTON THREE PONDS — NEW HAMPSHIRE

			SCALE: 1" = 5 Mi.
			DATE: AUGUST 1978

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT
MILTON THREE PONDS DAM

SECTION I
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. Anderson-Nichols & Company, 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 Anderson-Nichols & Company, Inc.under a letter of May 3, 1978 from Ralph T. Garver, Colonel, Corps of Engineers. Contract No. DACW33-78-C-0329 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. Milton Three Ponds Dam occupies an area on the Maine-New Hampshire state line, bordering the Towns of Milton, New Hampshire and Lebanon, Maine. The lake is formed by the confluence of the Branch and Salmon Falls Rivers, and consists of Milton, Town House, and Northeast Ponds. The Salmon Falls River joins the Cocheco River about 25 miles below the dam to form the Piscataqua River. The dam itself is located in Milton, New Hampshire, shown on the U.S.G.S. Quadrangle, Berwick, Maine-New Hampshire, with coordinates approximately at N 43° 24' 56", 70° 59' 08",

Strafford County, New Hampshire. (See Location Map page vii.)

b. Description of Dam and Appurtenances. Milton Three Ponds Dam, as it exists today, is a gravity dam consisting of a dry stone masonry base over which a reinforced concrete superstructure has been built. The dam is 19 feet high, 16½ feet wide, and 156 feet long. The concrete superstructure consists of seven sections of stoplogs, a low-level gated outlet structure, and a reinforced concrete foot bridge. The seven sections of stoplogs are divided as follows: Five sections of four bays each are located to the left (east) of the gate structure, a section of three bays of stoplogs occupies a space vertically above the two-compartmented gated low-level outlet, and a section of two bays right (west) of the gate structure. A wooden gatehouse has been constructed above the three-bay spillway and contains the gate hoisting mechanisms. Two wooden gates, 27" H x 44" W, each fitted with two timber stems with rack and pinion mechanisms are electrically operated by a single motor with a transfer belt drive.

c. Size Classification. Intermediate (Hydraulic height - 18 feet; Storage - 15,000 acre-feet) based on storage ($\geq$ 1000 to $<$50,000 acre-feet) as given in OCE Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification. Significant hazard. A major breach at maximum pool would probably result in the loss of less than 10 lives and appreciable property damage.

e. Ownership. The Great Falls Manufacturing Company purchased the original dam and privilege in 1824. Ownership of Milton Three Ponds Dam passed on to the Public Service Company of New Hampshire sometime between 1922 and 1929. The New Hampshire Water Resources Board (NHWRB) acquired the dam and water rights in December of 1963.

f. Operator. Mr. Vernon K. Knowlton, Chief Engineer, New Hampshire Water Resources Board, 37 Pleasant Street, Concord, New Hampshire 03301, is responsible for the operation of Milton Three Ponds Dam. Phone is (603) 271-3406.

g. Purpose of Dam. The original structure impounding Milton Three Ponds Dam was constructed to provide greater industrial water storage for downstream mills. Under the ownership of the Public Service Company of New Hampshire, Milton Three Ponds Dam was utilized mainly as conservation storage for the generation of hydro-electricity for the region, with some recreational usage. Today, Milton Three Ponds Dam is used primarily for recreation, while also providing water storage for downstream industries.

h. Design and Construction History. Little information was disclosed concerning the original (circa 1824) design and construction of the dam. The dam is reported to have been modified 6 times in the next 91 years as follows: The dam was raised 4 feet in 1835 (called 9 feet high), raised 6 more feet in 1835 and this 6 feet was removed in 1847. The latter 6 feet was reconstructed again at some unknown later date. The dam was raised 2 feet more in 1872 (then called 16 feet); the cement facing and gateways were built in 1915. (See Public Service Company of New Hampshire letter of 9/29/1949, Appendix B.)

In 1924, in correspondence to the New Hampshire Public Service Commission, I.W. Jones & Co., Engineers, reported "...the outlet of Milton Three Ponds. It is about 16 ft. in height by 136 ft. in length. It is composed of wooden bents set about 6 ft. on centers with a walk across the top from which 7 ft. of flashboards can be drawn. It is founded on a rough stone wall, the upstream side of which is faced with concrete. This dam was built in 1873 and the wooden sheet piling originally placed at the upstream side was substituted by concrete about eight years ago. Plans have already been made for replacing the wooden bents with reinforced concrete." (See Appendix B.)

The present outlet facilities at Milton Three Ponds were constructed in 1968 by the NHWRB.

i. Normal Operational Procedures. No formal operational and maintenance procedures were disclosed. Normal pool elevation during the summer months is 413.8 feet MSL. This level is maintained by keeping one of the two waste gates open 3½ inches, supplying a minimum flow of 20-30 cfs for downstream users, and setting the stoplogs at 15.2 feet on the gage (413.8 feet MSL) upstream of the dam. After the recreational season the impoundment is drawn down approximately 6 feet, to 9.0 feet on the gage (407.6 feet MSL) by removing stoplogs. The dam is visited on a weekly basis by the NHWRB. Telecommunication with the dam on a daily basis provides the NHWRB with information on discharge and lake level.

j. Regulating Outlets. The two reinforced concrete low-level outlets have downstream portal openings of about 5' x 5' separated by a 30" wide central pier. The gates are wooden, each is 27" H x 44" W, and they are fitted with two timber lifting stems. The gates can be raised 27 inches.

1.3 Pertinent Data

a. Drainage Area. The drainage area consists of 108 square miles (69,120 acres) of primarily wooded terrain with some urbanized area. The normal recreation level has a surface area of 900 acres, which is equivalent to 1 percent of the watershed.

b. Discharge at Damsite

(1) Outlet Works (conduits) - Two 27" x 44" @ Invert Elevation 400.0 ft. ± MSL. Total capacity - 380 cfs @ 413.8' MSL.

(2) The maximum known flood discharge at the damsite is unknown. However, there was a gaging station on the Salmon Falls River at South Lebanon, Maine (D.A. 137 sq. mi.), and the March 1939 flood produced a peak flow of 5490 cfs.

(3) Stoplog spillway capacity at recreational pool elevation (stoplogs in place) - 0 cfs @ 413.8' MSL.

(4) Stoplog spillway capacity at maximum pool elevation - (stoplogs in place) - 1300 cfs @ 416.2' MSL.

(5) Total project discharge at Test Flood elevation (stoplogs in place) - 35,000 cfs @ 429.0' MSL.

c. Elevation (ft. above MSL)

(1) Top of dam - the crest varies from 416.2 to 417.6

(2) Test Flood pool - 429.0

(3) Design surcharge - original design - unknown

(4) Full flood control pool - not applicable

(5) Recreation pool - 413.8

(6) Top of stoplogs - 413.8

(7) Spillway crest - 408.3 (assuming stoplogs removed)

(8) Upstream portal invert low-level conduit - 400.0

(9) Streambed at centerline of main dam - 398.6 (downstream invert of stilling basin measured 8/2/78)

(10) Maximum tailwater - unknown

d. Reservoir (miles)

(1) Length of maximum pool - 5.0

(2) Length of recreational pool - 4.9

(3) Length of flood control pool - not applicable

e. Storage (acre-feet)

(1) Recreation pool - 12,500

(2) Flood control pool - not applicable

(3) Test flood pool - 43,368

(4) Top of dam - 15,000

f. Reservoir Surface (acres)

(1) Top of dam - 1015

(2) Test flood pool - 2840

(3) Flood control pool - not applicable

(4) Recreation pool - 900

(5) Spillway crest - 375

g. Dam

(1) Type - The structure is basically a gravity dam built on a stone foundation with steel stanchions and a concrete superstructure.

(2) Length - 200' (from past inspection reports)
- 156' (measured)

(3) Height - 19' (structural height)

(4) Top width - 16.5'

(5) Side Slopes - Vertical downstream; approximately 1H:1 3/4V upstream, as shown on design plans

(6) Zoning - unknown

(7) Impervious core - unknown

(8) Cutoff - An upstream cutoff wall is reported to have been placed in 1915. (See Appendix B.)

(9) Grout curtain - unknown

h. Diversion and Regulating Tunnel. The regulating tunnels consist of two reinforced concrete boxes approximately 5' x 5' separated by a 30" pier. The tunnels are fitted with gates 27" H x 44" W.

i. Spillway

(1) Type - Concrete spillway with 25 bays of stoplogs.

(2) Length of weir - 126.25' (20 bays @ 5 foot lengths; 2 bays @ 6 foot lengths and 3 bays at approximately 5 foot lengths.)

(3) Crest Elevation - 408.3' MSL (22 bays on either side of gatehouse); 409.6' MSL (3 bays above low-level outlet)

(4) Gates - not applicable

(5) U/S Channel - Milton Three Ponds

(6) D/S Channel - bottom is covered with sand, gravel, and boulders.

(7) General - The 20 bays of stoplog spillway to the west of the gatehouse are comprised of 5 sections separated by 18" wide concrete piers. Each of the above sections is divided into 4 bays separated by 10" wide steel stanchions, and are at invert elevation 408.3' MSL. The 2 bays of stoplog spillway to the east of the gatehouse are also separated by a 10" wide steel stanchion, and at invert elevation 408.3' MSL. The 3 bays of stoplog spillway below the gatehouse are separated by 30" wide concrete piers. These latter bays are at invert elevation 409.6' MSL.

A four foot wide reinforced concrete walkway has been built over the stoplog spillways on both sides of the gatehouse. This access bridge is 1.5 feet thick. The top of the walkway is at elevation 417.6' MSL.

SECTION 2
ENGINEERING DATA

2.1 Design

A search of the files of the New Hampshire Water Resources Board disclosed only a limited amount of recorded information concerning the design of the present outlet facilities at Milton Three Ponds Dam. Plans of the dam re-construction in 1968 were found and used in the hydraulic computations. (See Appendix D.)

2.2 Construction

No pertinent information regarding the actual construction of the present outlet structure at Milton Three Ponds Dam was disclosed.

2.3 Operation

No formal operational procedures were disclosed. However, correspondence reflecting past operational practice were discovered and validated.

2.4 Evaluation

a. Availability. Only a limited amount of data on the actual design and construction of Milton Three Ponds Dam were disclosed.

b. Adequacy. The information obtained from extensive data collection efforts was not adequate in determining the hydraulic characteristics of Milton Three Ponds Dam. Supplemental data established by field investigation was needed to complete the hydraulic analysis. Because of the limited amount of detailed data available, the final assessments and recommendations of this investigation are based on visual inspection and hydrologic and hydraulic analysis.

c. Validity. The visual inspection is consistent with the 1968 re-construction plans.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General. The dam is classified a low dam and impounds an intermediate-size reservoir. The downstream area is sloping and generally open. The USGS has constructed a concrete gaging weir approximately 150 feet downstream. The watershed above the reservoir is heavily wooded. Numerous buildings and homes are located around the perimeter of the reservoir. A vehicular bridge crosses the upstream channel approximately 150 feet upstream from the dam, and a single track railroad bridge also crosses the upstream channel approximately 600 feet upstream from the dam.

b. Dam. The dam was originally built as a combination timber crib dam and dry stone masonry, and according to available correspondence, the dam was increased in height several times to its present height. The upstream cutoff wall was placed in 1915 and the upper timber crib work was replaced with the present concrete channel, catwalk, and stoplog sections in 1968. (See Appendix C - Figures 2, 3 and 4.) The entire dam above the dry stone masonry base consists of stoplog sections. The stoplogs must be manually removed.

The dry stone masonry base indicated only two minor areas of distress on the downstream face, where rocks had become dislodged from the face.

Two openings were observed in the downstream face of the dry stone masonry base which were low-level outlets that were used at one time. The old openings have a dry masonry arch and appear to be plugged some distance behind the downstream face. The present low-level outlet structure is made of concrete and is located near the west abutment.

A portion of the east abutment has been refaced with concrete. The exposed surface of the older concrete has deteriorated little with only the loss of surface laitance, exposure of some of the coarse aggregate, and minor cracking. (See Appendix C - Figure 6.) The top of the original abutment and one portion of the downstream face has spalled and deteriorated to a depth of approximately 1 inch. (See Appendix C - Figure 7.) Minor movement (less than .10 inch) has occurred between the original concrete abutment and the new concrete stoplog structure. Exposed reinforcing was noted in the base of the stoplog slot above

the water line.

The most severe deterioration of the counterfort wall has occurred on the first wall from the left abutment. Approximately 3 inches of the downstream end of the toe of the wall has spalled. (See Appendix C - Figure 8.) Minor loss of surface laitance has occurred on the counterfort walls and spillway apron where the concrete is in continuous contact with the water, exposing some of the coarse aggregate. Evidence of undercutting was noted at the joint between the bottom of the counterfort wall and the base slab. However, the visual inspection could not determine the depth of undercut or effect on the vertical wall reinforcing.

One minor seepage was noted on the downstream face near the contact of the right (west) abutment and the earth embankment.

C. Appurtenant Structures. Low-level control of the dam is accommodated by two sluice gates, 27 inches high by 44 inches wide, with wooden lifting stems. The gates are electrically operated from one electric motor. The gate equipment appeared to be well maintained and is considered to be in good condition. The electrical service was observed to be of adequate size for the given requirements. It was noted that the wiring within the gatehouse is exposed romex wire without double grounding features. The gatehouse appeared to be in good condition.

The concrete walls and base slabs of the gate structure are concrete. The surface of the concrete has eroded and deteriorated from continuous contact with water which has exposed the surface of the coarse aggregate. (See Appendix C - Figure 5.) Visible portions of the concrete mass did not indicate any evidence of movement or instability.

The exposed steel stoplog support beams and embedded angles had not been painted and revealed some surface corrosion, although it did not appear to impair the structural capability of the supports. (See Appendix C - Figure 9.) The stoplogs were noted to be in good condition except for some leakage through the joints and around the ends of the stoplogs.

The concrete service bridge was observed to have one minor longitudinal crack in the vicinity of the embedded wide flange beam, and one expansion joint is deteriorating and spalling the surrounding concrete. (See Appendix C - Figures 10 and 11.)

d. Reservoir Area. The reservoir slopes are gently to steeply sloping and are generally covered with trees and brush. Some open land, in the form of fields and roadways, is adjacent to the reservoir. Numerous buildings, cottages, and homes are located around the lake. Two bridges traverse the upstream channel; a vehicular bridge approximately 150 feet upstream of the dam (See Appendix C - Figure 12.) and a railroad bridge approximately 600 feet upstream. (See Appendix C - Figure 13.) The east shore of the upstream channel is generally covered with trees and brush. (See Appendix C - Figure 14.) One house is located on the east bank, just upstream of the vehicular bridge. Buildings along the west shore are built on the edge of the channel.

e. Downstream Channel. The bottom of the channel downstream of the dam is covered with sand, gravel, and boulders. The channel is generally clear of debris. A concrete gaging weir has been constructed across the channel approximately 150 feet downstream of the dam. Trees and brush are growing adjacent to the channel. (See Appendix C - Figure 16.)

3.2 Evaluation

Based on the visual inspection, the condition of the Milton Three Ponds Dam is good. The potential problems observed during the visual inspection that may affect the long-term integrity of the dam are as follows:

(1) Large stones that have been dislodged from the downstream face of the dry stone masonry base;

(2) Minor deterioration of the concrete stoplog structures including local spalling and erosion of concrete, loss of surface laitance, exposure of reinforcing;

(3) Corrosion of steel stoplog support beams and embedded angle iron;

(4) Small displacement between old and new concrete on the upstream face at the left abutment;

(5) Small crack in the service bridge deck; and

(6) Electrical work in the gatehouse is not double grounded.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures

No formal operational procedures were disclosed. The dam has been owned and operated by the NHWRB since December of 1963. During the summer months, the lake level is maintained by setting the stoplogs at 15.2 feet on the gage (413.8 feet MSL) upstream of the dam, and keeping one of the two waste gates open 3½ inches. In this manner a minimum flow of 20-30 cfs can be supplied to downstream users.

After the summer recreational season the pool is drawn down 6.2 feet by setting the stoplogs at 9 feet on the gage (407.6 feet MSL). Stoplogs are removed from 6 bays so as to gradually lower the lake level. The dam is visited on a weekly basis by the NHWRB.

4.2 Maintenance of Dam

No formal maintenance procedures were disclosed. The NHWRB is responsible for maintaining the dam at Milton Three Ponds.

4.3 Maintenance of Operating Facilities

No formal maintenance schedule for operating mechanisms was disclosed. Both gates are operated in the spring; maintenance is performed at this time if deemed necessary.

4.4 Description of Any Warning System in Effect

No description of any warning system was disclosed.

4.5 Evaluation

The operating and maintenance procedures for Milton Three Ponds Dam, consisting of a weekly program of inspection, should insure that all problems encountered can be remedied within a reasonable period of time. The NHWRB should also establish a surveillance and warning program to follow in the event of floodflow conditions or imminent dam failure.

SECTION 5
HYDROLOGIC AND HYDRAULIC ANALYSIS

5.1 Evaluation of Features

a. Design Data. No original hydrologic and hydraulic design data (circa 1824) were disclosed for Milton Three Ponds Dam. However, hydrologic and hydraulic information, dating from the ownership of the structure by the Public Service Company of New Hampshire to the present ownership by the New Hampshire Water Resources Board, were found and assessed to determine their acceptability in evaluating the overtopping potential of Milton Three Ponds Dam.

b. Experience Data. No information regarding past overtopping of Milton Three Ponds Dam was disclosed.

c. Visual Observations. No visual evidence was disclosed of damage to the structure caused by overtopping at the time of the inspection.

d. Overtopping Potential. Milton Three Ponds Dam is classified as being intermediate in size having a maximum storage of 15,000 acre-feet. The normal recreation level has a surface area of 900 acres, which is equivalent to 1 percent of the watershed.

To determine the hazard classification for Milton Three Ponds Dam, the impact of failure of the dam at maximum pool was assessed using Guidance for Estimating Downstream Dam Failure Hydrographs issued by the Corps of Engineers. The analysis covered the reach extending from the dam to the Milton Leather Board Company Dam in Milton, New Hampshire, a distance of about one-half mile. Failure of Milton Three Ponds Dam at maximum pool would probably result in an increase in stage of approximately 2 feet along the reach and may cause appreciable damage to the Milton Leather Board Company Dam and other lands in the reach.

As a result of the analysis described above, Milton Three Ponds Dam was classified - Significant Hazard. Using OCE Recommended Guidelines for Safety Inspection of Dams, the recommended spillway test flood is the Probable Maximum Flood. The test floow inflow for Milton Three Ponds Dam, having a drainage area of 108 square miles, was determined to be 42,660 cfs (395 csm). The test flood discharge after routing was determined to be 35,000 cfs (324 csm).

Milton Three Ponds Dam is unable to pass the test flood without overtopping. Because the stoplogs would be difficult to remove during a flooding event of this magnitude, the test flood was calculated assuming stoplogs in place. The water depth over the dam embankment was calculated to be 12.8 feet. The spillway capacity, with all stoplogs removed, is approximately 68 percent of the test flood.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Inspection. The visual inspection revealed a condition which could lead to structural instability. A few stones appear to have fallen out of two areas of the downstream face of the dry masonry base on which the concrete stoplog structure rests. Further deterioration of the dry masonry base would have an adverse effect on the stability of the dam.

Minor deterioration of the concrete stoplog structure was observed, including local spalling and erosion of concrete, loss of surface laitance, rusting of some upstream stoplog angle irons, exposure of some reinforcing in the concrete, a small displacement between old and new concrete on the upstream face at the left abutment, and a small crack in the service bridge. Proper maintenance should prevent these conditions from developing into a serious stability problem.

One minor seepage was observed at the contact between the dam and the west abutment.

b. Design and Construction Data. Available data show the dimensions of the concrete stoplog structure. However, no detailed information was available concerning the dry masonry base under the concrete stoplog section or the concrete cutoff wall that was apparently poured against the upstream side of the dry masonry base. Therefore, the evaluation of the structural stability must be based primarily on the results of the visual inspection.

c. Operating Records. No operating records pertinent to the structural stability of the dam were disclosed.

d. Post-Construction Changes. According to a letter written by the Public Service Company of New Hampshire on September 29, 1949, the original dam was constructed at some unknown date prior to 1824; the dam was raised 4 feet in 1835 and was then called 9 feet high; the dam was raised 6 feet more in 1835 and this 6 feet was removed in 1847 and replaced at some unknown later date; the dam was raised 2 feet more in 1872 and was then called 16 feet high; and the "cement facing" and gateways were built in 1915. The concrete stoplog structure which comprises the top section of the dam today was built in 1968.

e. Seismic Stability. This dam is in Seismic Zone 2 and hence does not have to be evaluated for seismic stability in accordance with the OCE Recommended Guidelines.

SECTION 7
ASSESSMENT, RECOMMENDATIONS & REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. The visual inspection indicates that Milton Three Ponds Dam is in good condition. The spillway, although unable to pass the test flood without causing overtopping of the dam, is not considered seriously inadequate.

The displacement of a few rocks from the downstream face of the dry masonry base does not appear to have significantly affected the stability of the dam as of the time of the visual inspection. However, this condition should be monitored and repairs should be made if there is evidence of any further deterioration of the dry masonry.

Minor structural deterioration, including cracking, spalling, and erosion of concrete, exposure of reinforcing bars, loss of surface laitance of conrete, a crack in the service bridge, and rusting of the upstream stoplog angle irons should be remedied as part of the routine program of maintenance.

A minor seepage at the contact between the dam and the west abutment does not appear serious. It should be monitored and remedial action taken if needed.

The mechanical and electrical equipment appear to be in good condition.

b. Adequacy of Information. The information available is such that the assessment of the condition of the dam must be based primarily on the visual inspection.

c. Urgency. The recommendations made in 7.2 below should be implemented within 3 years after receipt of this Phase I report by the owner. The operating and maintenance procedures given in 7.3 below should be implemented within one year after receipt of this Phase I report by the owner.

d. Need for Additional Investigation. The information available from the visual inspection is adequate to identify the potential problems which are: overtopping, displacement of rocks from the downstream face, minor structural deterioration, and seepage. These problems require the attention of a competent engineer who will have to make additional engineering studies to design or specify remedial measures

to rectify the problems. If left unattended, the problem could lead to instability of the structure.

7.2 Recommendations

The NHWRB should evaluate further the hydraulics and hydrology of dam and increase the spillway capacity, if necessary.

7.3 Remedial Measures

a. Alternatives. The NHWRB should, as a practical alternative pending implementation of the above recommendations, operate the reservoir at lower levels so as to provide more storage for extreme flood events.

b. Operating and Maintenance Procedures.

(1) Repair annually and maintain the structure to eliminate the effects of cracking, spalling, erosion, and loss of surface laitance of the concrete, and rusting of the stoplog angle irons.

(2) Monitor on a weekly basis the minor seepage at the west abutment and the condition of the dry masonry base.

(3) Replace the romex wiring inside the gatehouse with a steel conduit with insulated conductors and a green grounding conductor (double insulating).

(4) Provide around the clock surveillance during periods of unusually heavy precipitation.

(5) Establish a warning system for alerting downstream residents in case of a flood emergency.

(6) Immediately develop flood regulation procedures relating to the operation of the sluice gates, removal of individual stoplogs, and the removal of stoplog sections under emergency flood conditions. This procedure could be based on rainfall, lake levels or a combination of both.

(7) Continue periodic inspection systems on a bi-annual frequency.

APPENDIX A

CHECK LIST - VISUAL INSPECTION

VISUAL INSPECTION CHECKLIST

PARTY ORGANIZATION

PROJECT Milton Three Ponds Dam, N.H. DATE June 19, 1978

TIME 2:00 P.M.

WEATHER Sunny, hot

W.S. ELEV. 413.8 U.S. 398.6 DN.S.

PARTY:

1. Warren Guinan
2. Robert Langen
3. Stephen Gilman
4. Ronald Hirschfeld
5. John Falcione (6 June 1978)
6. Harold Wilcox (6 June 1978)
7.
8.
9.
10.

PROJECT FEATURE	INSPECTED BY	REMARKS
1. Hydrology/Hydraulics	R. Langen	
2. Structural Stability	S. Gilman	
3. Soils & Geology	R. Hirschfeld	
4. Mechanical	J. Falcione	
5. Electrical	H. Wilcox	
6.		
7.		
8.		
9.		
10.		

PERIODIC INSPECTION CHECK LIST

PROJECT Milton Three Ponds Dam, N.H. DATE June 19, 1978

PROJECT FEATURE Dam Embankment NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITIONS
DAM EMBANKMENT	
Crest Elevation	Good, see attached notes.
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	No visible movement.
Trespassing 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	

PERIODIC INSPECTION CHECK LIST

PROJECT Milton Three Ponds Dam, N.H. DATE June 19, 1978

PROJECT FEATURE Upstream Channel NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	
Slope Conditions	Gentle slopes covered with grass, trees and brush, vertical slopes at buildings
Bottom Conditions	Not visible
Rock Slides or Falls	None
Log Boom	None
Debris	None
Condition of Concrete Lining	Not visible
Drains or Weep Holes	None
b. Intake Structure	
Condition of Concrete	Surface laitance eroded
Stop Logs and Slots	Good condition, some leakage

PERIODIC INSPECTION CHECK LIST

PROJECT Milton Three Ponds Dam, N.H. DATE June 19, 1978

PROJECT FEATURE Control Tower NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER	Wooden gatehouse
a. Concrete and Structural	
General Condition	Good
Condition of Joints	No visible movement
Spalling	Little on older concrete section
Visible Reinforcing	See attached notes
Rusting or Staining of Concrete	None visible
Any Seepage or Efflorescence	Little efflorescence at constr. joints
Joint Alignment	Good
Unusual Seepage or Leaks in Gate Chamber	None visible
Cracks	None visible
Rusting or Corrosion of Steel	None visible
b. Mechanical and Electrical	Two wooden sluice gates 27" high by 44" wide lifting stems-electrically operated one motor used by removing belts from Gate #1 and shifting them to sheave of Gate #2. Gates and equipment well maintained and in good condition. No emergency power or lightning protection system . Electrical service - 120/240 volt, 1 phase, 3-wire, 60 ampere. Electrical service deemed to be of adequate size. Panel board consists of 1-50 amp, 2 pole circuit breaker, serving 1 horsepower reversible motor, 1-20 amp circuit breaker servicing lights, and 1-20 amp circuit breaker servicing outlet receptacles. Size and quantity of circuit breakers are sufficient; space available on panel board to add circuits if required. Wiring in gatehouse is romex. Should be replaced with steel conduit and insulating conductors, with green grounding conductor.
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	

PERIODIC INSPECTION CHECK LIST

PROJECT Milton Three Ponds Dam, N.H. DATE June 19, 1978

PROJECT FEATURE Outlet Conduit NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT	Not visible
General Condition of Concrete	
Rust or Staining on Concrete	
Spalling	
Erosion or Cavitation	
Cracking	
Alignment of Monoliths	
Alignment of Joints	
Numbering of Monoliths	

PERIODIC INSPECTION CHECK LIST

PROJECT Milton Three Ponds Dam, N.H. DATE June 19, 1978

PROJECT FEATURE Stoplog Structure NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Concrete	Good
Rust or Staining	None visible
Spalling	Little on old concrete
Erosion or Cavitation	Little visible
Visible Reinforcing	None visible
Any Seepage or Efflorescence	None visible
Condition at Joints	Good - no visible movement
Drain holes	None
Channel	
Loose Rock or Trees Overhanging Channel	A few trees at edges of wide discharge channel
Condition of Discharge Channel	Good

PERIODIC INSPECTION CHECK LIST

PROJECT Milton Three Ponds Dam, N.H. DATE June 19, 1978

PROJECT FEATURE Spillway Weir NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	
General Condition	Good
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	A few on both banks
Floor of Approach Channel	Not visible
b. Weir and Training Walls	
General Condition of Concrete	Generally good-see attached notes
Rust or Staining	
Spalling	Little
Any Visible Reinforcing	
Any Seepage or Efflorescence	
Drain Holes	None observed
c. Discharge Channel	
General Condition	Good
Loose Rock Overhanging Channel	None observed
Trees Overhanging Channel	Some on west bank
Floor of Channel	Boulders, sand, gravel
Other Obstructions	Measuring weir downstream of dam

PERIODIC INSPECTION CHECK LIST

PROJECT Milton Three Ponds Dam, N.H. DATE June 19, 1978

PROJECT FEATURE Service Bridge NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - SERVICE BRIDGE	See attached notes
a. Super Structure	
Bearings	
Anchor Bolts	
Bridge Seat	
Longitudinal Members	Good condition
Under Side of Deck	
Secondary Bracing	
Deck	Good
Drainage System	
Railings	Good
Expansion Joints	
Paint	Good
b. Abutment & Piers	
General Condition of Concrete	Good
Alignment of Abutment	
Approach to Bridge	
Condition of Seat & Backwall	

PROJECT Milton Three Ponds Dam, NH DATE June 19, 1978

PROJECT FEATURE Reservoir NAME R. Langen

AREA EVALUATED	REMARKS
Stability of Shoreline	Good
Sedimentation	No visible problems
Changes in Watershed Runoff Potential	Minor
Upstream Hazards	2 road bridges and 1 RR bridge with small vertical opening; building at pond edge on west side
Downstream Hazards	Several dams on river downstream
Alert Facilities	None observed
Hydrometeorological Gages	Staff gage
Operational & Maintenance Regulations	None observed

MILTON THREE PONDS DAM
ADDITIONAL NOTES

Monolith #1 - Left Abutment

1. The monolith is cast against the concrete abutment placed there many years previous. New concrete - good condition.

2. There is evidence of movement - open crack between new concrete and old on upstream face.

3. There is some spalling of cap on old concrete abutment. Old and new concrete that is now or has been submerged has lost surface laitance.

4. Upstream stoplog slot has exposed reinforcing - little rusting and staining.

5. Downstream face has tie holes left unfilled.

6. Joint at end of service bridge and abutment - some spalling.

Monolith #2

1. Downstream end spalled/eroded - reinforcing exposed.

2. Surface laitance gone where exposed to moving water.

3. Expansion joint in service bridge is spalling - joint material deteriorating.

4. There is visual evidence of little eroding of concrete at the base of wall and slab.

5. Some rusting of embedded stoplog angle iron.

Monolith #3, #4, #5, #6, #7

1. Some eroding of concrete at wall/slab joint

2. Some eroding at end of Monolith wall end

3. Generally good condition

4. Surface laitance gone on concrete

5. Exposed joint at #5 - caulking gone; cork exposed.

Steel Stoplog Support

The steel has not been painted resulting in some surface corrosion.

Stoplogs

The stoplogs are in generally good condition with numerous minor leaks.

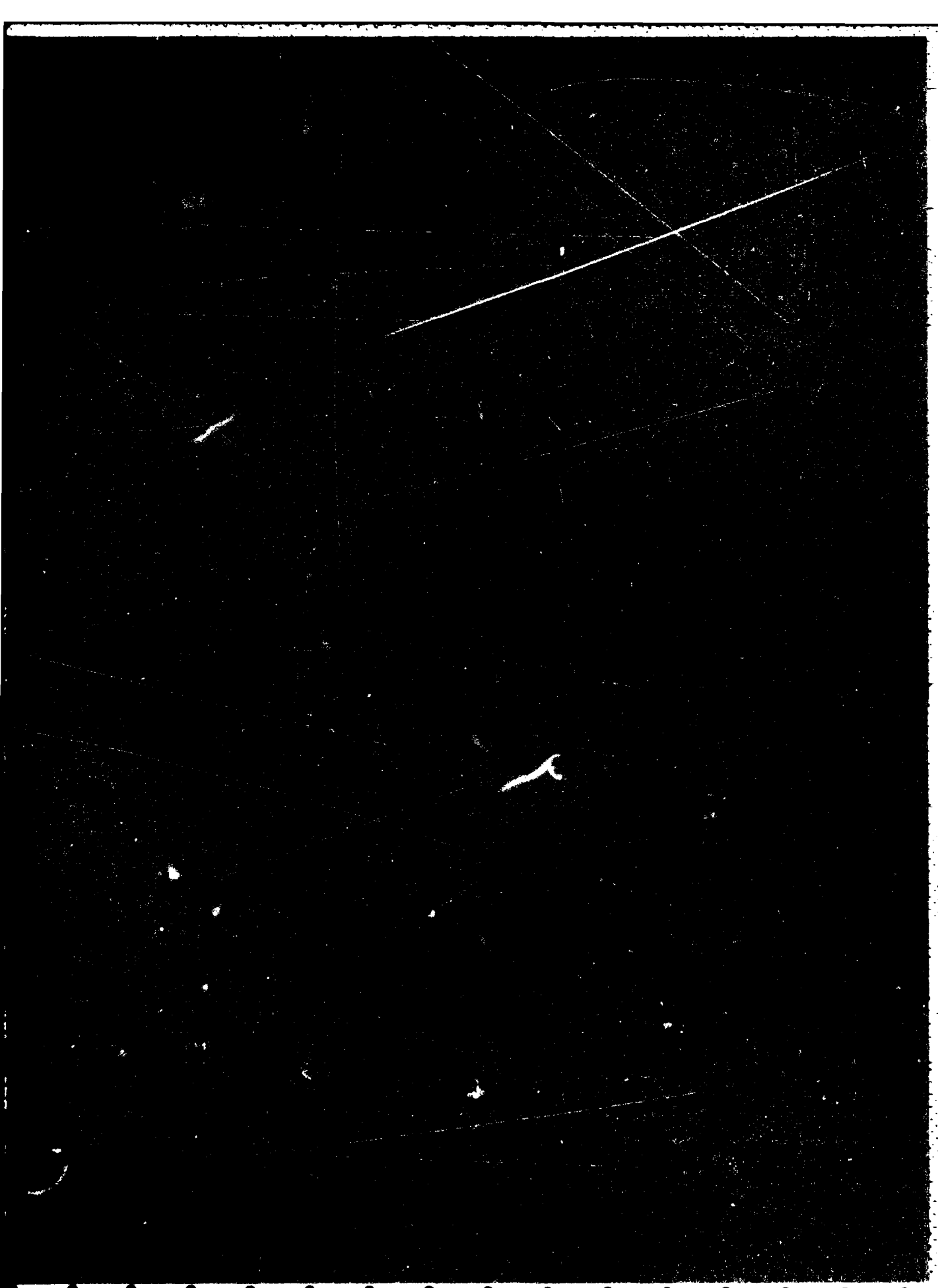
Monolith #8 - Right Abutment

1. Old concrete surface laitance gone. Wall cracked longitudinally with leaching.

2. Crack at joint between service bridge and abutment filled with caulking. Good condition, no apparent movement.

Service Bridge

The deck is cracked longitudinally in area of embedded beam.



NEW HAMPSHIRE WATER CONTROL COMMISSION

REPORT ON DAM INSPECTION

TOWN Milton DAM NO. 161.06 STREAM Salmon Falls River

OWNER Public Service Co. of N.H. ADDRESS Manchester N.H.

In accordance with Section 20 of Chapter 133, Laws of 1937, the above dam was inspected by me on July 29, '50 ~~accompanied by~~

NOTES ON PHYSICAL CONDITION

Abutments Good

Spillway ~~Good~~ Fir cone of downstream brace anchor cuts a rotten horizontal member

Gates operable

Other

CHANGES SINCE LAST INSPECTION None

FUTURE INSPECTIONS 4/55

This dam (is) (~~is not~~) a menace because of ponding and property downstream

REMARKS water 5½' from top of non-overflow concrete.

Copy to Owner	Date

Francis Gilman
INSPECTOR

(Additional Notes Over)

...ublic ... Co. of N. H.

OWNER 1087 Elm Street, Manchester, N. H. CONTRACTOR NO.

	RECEIVED	INVESTIGATED BY	DATE
APPLICATION			

IF DAM IS PROPERLY CONSTRUCTED IT Would BE A MENACE TO THE PUBLIC SAFETY

IS DAM SUBJECT TO PROVISIONS OF P. L. CHAP. 218. SECTS. 15-26? Yes

	RECEIVED	CHECKED BY	DATE
PLANS & SPECIFICATIONS			
	APPROVED BY COMMISSION	COMMISSION CONSTRUCTION INSPECTOR	

FINAL CONSTRUCTION APPROVAL CHARGES PAID

IS DAM SUBJECT TO PERIODIC INSPECTION? Yes

DAM INSPECTION RECORD

SIZE	INSPECTOR	REPORT	CHARGES	PAID	DATE	INSPECTOR	REPORT	CHARGES	P
22'-2"-25	A.C.Blake	10/14/35	$10.00	10/24/35					
	Condition--Good								

FORM E

PUBLIC SERVICE COMMISSION OF NEW HAMPSHIRE—DAM RECORD I-4822

TOWN HILTON | TOWN NO. 6 | STATE NO. ~~72~~ 161

RIVER Salmon Falls River

DRAINAGE AREA 115 Sq. Mi. | POND AREA

DAM Gravity | FOUNDATION NATURE OF Ledge

MATERIALS OF CONSTRUCTION Stone, Timber, Concrete

PURPOSE POWER—CONSERVATION—DOMESTIC—RECREATION—TRANSPORTATION—PUBLIC UTILITY

HEIGHT OF DAM

HEIGHTS, TOP OF DAM TO BED OF STREAM	16'			TOP OF DAM TO SPILLWAY CRESTS 8'
SPILLWAYS LENGTHS	14'-8"	20'-7"	102'-4"	LENGTH OF DAM Approx. 200'
HEIGHTS BELOW TOP OF DAM	5'	8'	5'	
FLASHBOARDS	Removable		24 Bays	
SPILLWAYS HEIGHT ABOVE CREST	5'-7"	-	6'-4"	

OPERATING HEAD | TOP OF FLASHBOARDS TO N. T. W.

CREST TO N. T. W.

WHEELS, NUMBER

KINDS & H. P.

GENERATORS, NUMBER

KINDS & K. W.

H. P. 90 P. C. TIME | H. P. 75 P. C. TIME

100 P. C. EFF. | 100 P. C. EFF.

REFERENCED CASES.

PLANS INSPECTIONS

REMARKS

PUBLIC SERVICE COMMISSION OF NEW HAMPSHIRE—DAM RECORD I-4822

TOWN	Milton	TOWN NO 6	STATE NO [illegible]
RIVER STREAM	Salmon Falls River		
DRAINAGE AREA	[illegible]	POND AREA	
DAM TYPE	Gravity	FOUNDATION NATURE OF	Ledge
MATERIALS OF CONSTRUCTION	Stone, Timber, Concrete		
PURPOSE OF DAM	POWER—CONSERVATION—DOMESTIC—RECREATION—TRANSPORTATION—PUBLIC UTILITY		
HEIGHTS, TOP OF DAM TO BED OF STREAM	16'	TOP OF DAM TO SPILLWAY CRESTS	8'
SPILLWAYS, LENGTHS	14'-8" 20'-7" 102'-4"	LENGTH OF DAM	Approx. 200'
DEPTHS BELOW TOP OF DAM	5' 8' 5'		
FLASHBOARDS TYPE HEIGHT ABOVE CREST	Removable 24 Bays 5'-7" - 6'-4"		
OPERATING HEAD CREST TO N. T. W.		TOP OF FLASHBOARDS TO N. T. W.	
WHEELS, NUMBER KINDS & H. P.			
GENERATORS, NUMBER KINDS & K. W.			
H. P. 90 P. C. TIME 100 P. C. EFF.		H. P. 75 P.C. TIME 100 P. C. EFF.	
REFERENCES, CASES, PLANS, INSPECTIONS			
REMARKS			

OWNER- Public Service Company of N. H.

CONDITION- Good

MENACE- Yes. Will be subject to periodic inspection.

To the Public Service Commission:

The foregoing memorandum on the above dam is submitted covering inspection made October 9, 1935, according to notification to owner dated October 7, 1935, and bill for same is enclosed.

Samuel J. Lord
Hyd. Eng.

Oct. 14, 1935
Copy to Owner

NEW HAMPSHIRE WATER RESOURCES BOARD

INVENTORY OF DAMS AND WATER POWER DEVELOPMENTS

DAM

NAME Ccean NO. 6 — 72 — E 4522
RIVER Little Reids MILES FROM MOUTH D.A.SQ.MI. HE 112
TOWN Hilton OWNER Public Service Co. of N.H. Manchester
LOCAL NAME OF DAM
BUILT DESCRIPTION Granite — Stone Timber Concrete
ouLedge
POND AREA-ACRES {1400 P.S.Co 96.6 WRB} * {12 PSCo 12 WRB} POND CAPACITY-ACRE FT. 13,330 PS 2250 WRB
HEIGHT-TOP TO BED OF STREAM-FT. 16 MAX. MIN.
TOTAL LENGTH OF DAM-FT. 200± MAX. FLOOD HEIGHT ABOVE CREST-FT.
PERMANENT CREST ELEV. U.S.G.S. LOCAL GAGE
SPILLWAY ELEV. U.S.G.S. 107 WRB LOCAL GAGE 7 WRB
OVERALL LENGTHS-FT. 20.583, 102.33 and 14.67 FREEBOARD-FT. 8 and 5 and 5
FLASHBOARDS-TYPE, HEIGHT ABOVE CREST removable 5.583 — 23 bays 6.33
GATES-NO. WIDTH MAX. OPENING DEPTH SILL BELOW CREST

OTHER Condition Good
Flood of hard overspillway 8.7.
Into Salmon Falls R, Piscataqua R, Atlantic Ocean
Storage Reservoir Storage at 12' useful draft.
Assumed C = 2.8

POWER DEVELOPMENT

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

Conservation, Public Utility

REMARKS * Note: Must not be drawn below 9 ft. on the gauge
June, July & August. Full pond = 16 ft on gage. P.S.Co.

10/7/35

Refers to .... Made By ....

— MILTON —

TYPE OF DAM	L	W	H	CONDITION	HOLD WATER	MENACE	INSPECTION DATE	OWNER INTERVIEWED
GRAVITY	165'		18'	POOR	YES	YES	10-8-35	(YES)
"	240'		17'	GOOD	YES	YES	10-8-35	(YES)
[illegible]+GRAVITY	175'		21'	GOOD	YES	YES	10-9-35	(YES)
GRAVITY	[illegible]		35'	GOOD	YES	YES	10-8-35	([illegible])
"A" FRAME	120'		13'	FAIR	YES	YES	10-9-35	([illegible])
GRAVITY	200'		16'	GOOD	YES	YES	10-7-35	(YES)
[illegible]	110'		12'	FAIR	YES	YES	10-7-35	([illegible])
GRAVITY	120'		17'	FAIR	YES	YES	10-9-35	(YES)
"	[illegible]		10'	RUINS	YES	NO	10-9-35	(NO)
				RUINS	NO	NO	10-9-35	(NO)
GRAVITY	150'		14'	FAIR	YES	YES	10-9-35	(YES)
"	170'		10'	FAIR	YES	YES	10-8-35	YES
"	145'		40"	GOOD	YES	NO	10-8-35	NO
G[illegible]	260'		8'	GOOD	YES	NO	10-8-35	NO
Gravity				Ruins	No			

NEW HAMPSHIRE WATER CONTROL COMMISSION

DATA ON DAMS IN NEW HAMPSHIRE

LOCATION STATE NO. 161.06

Town Milton : County Strafford

Stream Salmon Falls R.

Basin-Primary Piscataqua : Secondary Salmon Falls R.

Local Name

Coordinates—Lat. 43° 25.1' = 1200 : Long. 71° 0' = 0500

GENERAL DATA

Drainage area: Controlled Sq. Mi.: Uncontrolled Sq. Mi.: Total (115) 112.WRB Sq. Mi.

Overall length of dam 200 ft.: Date of Construction

Height: Stream bed to highest elev. 12' ft.: Max. Structure (8') ✓ ? ft.

Cost—Dam : Reservoir

DESCRIPTION Gravity

Waste Gates Stone Timber Concrete Foundation ledge

Type

Number : Size ft. high x 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

Length—Total 111' 8" - 20' - 3.2 - 102' 4" Net ft.

Height of permanent section—Max. 5' ft.: Min. ft.

Flashboards—Type Removable 5'7 24 bays 6'4" : Height ft.

Elevation—Permanent Crest : Top of Flashboard

Flood Capacity 5950 cfs.: cfs/sq. mi.

Abutments

Materials:

Freeboard: Max. 8' ft.: Min. ft.

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

OWNER Public Manchester N.H.

REMARKS Condition good Subject to inspection

Data Taken By GWS B-6 Date 3/29

Town No. 3 Town Milton No.

Data by U.S.G.S. File

Owner Great Falls Mfg. Co.

River or Stream Salmon Falls

Public Utility In part Drainage area 126 sq. mi.

Wheel Capacity H. P. { Primary H. P. / 90% time }

Type of Construction Timber and stone

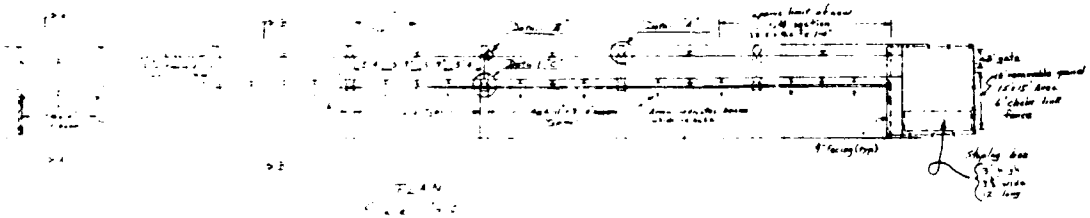
Height 15 ft. Operating Head ft.

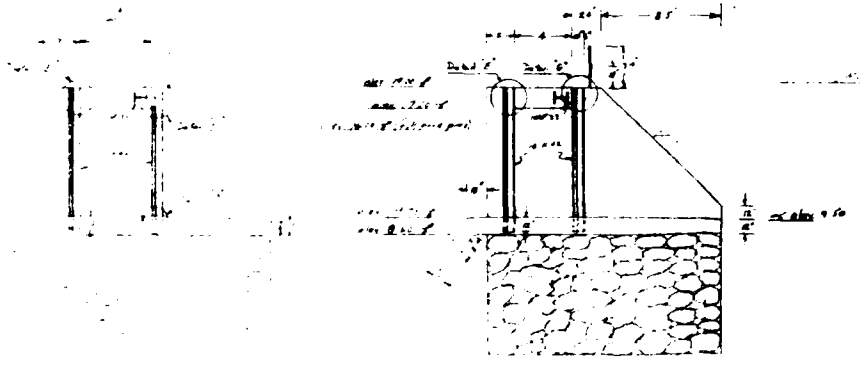
Length 175 ft. Spillway Length (No. 1) 100 ft. (No. 2) ft.

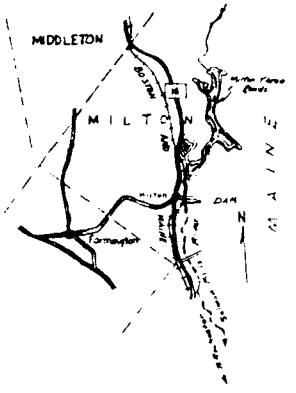
Would Failure of Dam do Harm? Yes

Present Condition Fair Date 1922

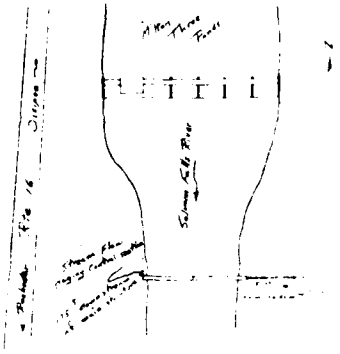
7374







LOCATION MAP
Milton Three Ponds Dam
Scale: 1"=2 miles



GENERAL SITE PLAN
Scale 1"=50'

MILTON THREE PONDS
MILTON
GENERAL PLANS, ELEVATION & [illegible]

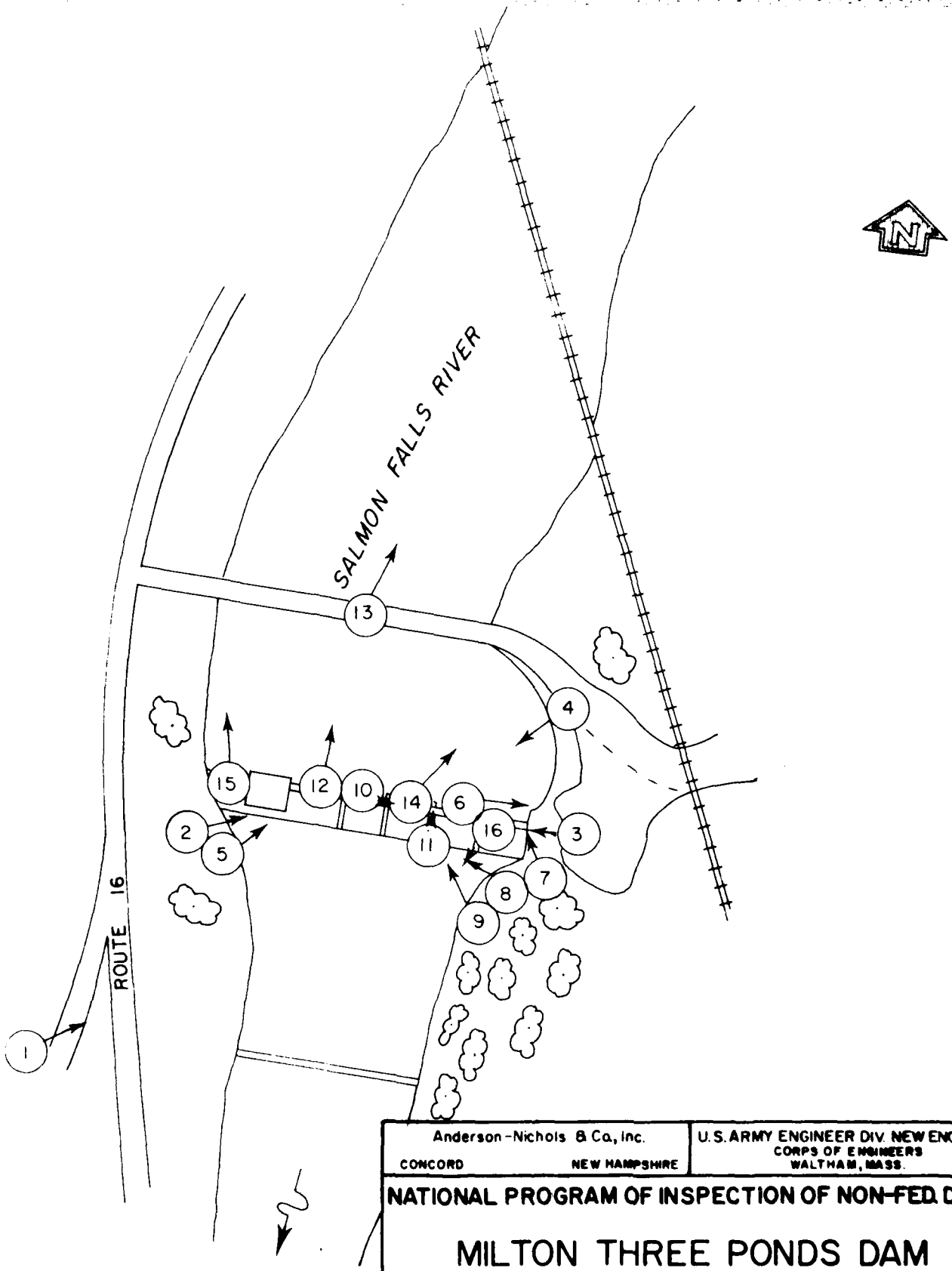
NEW HAMPSHIRE WATER RESOURCES BOARD
CONCORD, N.H.

Scales 1" = [illegible] | Sheet 1 of 4 | X-ref: 967

REPRODUCED AT GOVERNMENT EXPENSE

APPENDIX C

PHOTOGRAPHS



Anderson-Nichols & Co., Inc. CONCORD NEW HAMPSHIRE	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

MILTON THREE PONDS DAM
PHOTO INDEX

SALMON FALLS RIVER NEW HAMPSHIRE

			SCALE: NOT TO SCALE
			DATE: AUGUST 1978

Figure 2 - Downstream face of Milton Three Ponds Dam.

Figure 3 - Looking along the center of Milton Three Ponds Dam from the vicinity of the east abutment.

Figure 4 - Upstream face of Milton Three Ponds Dam.

Figure 5 - Looking at the low-level outlets near the west end of the dam. The abandoned masonry arch outlets are to the right of the concrete outlet works.

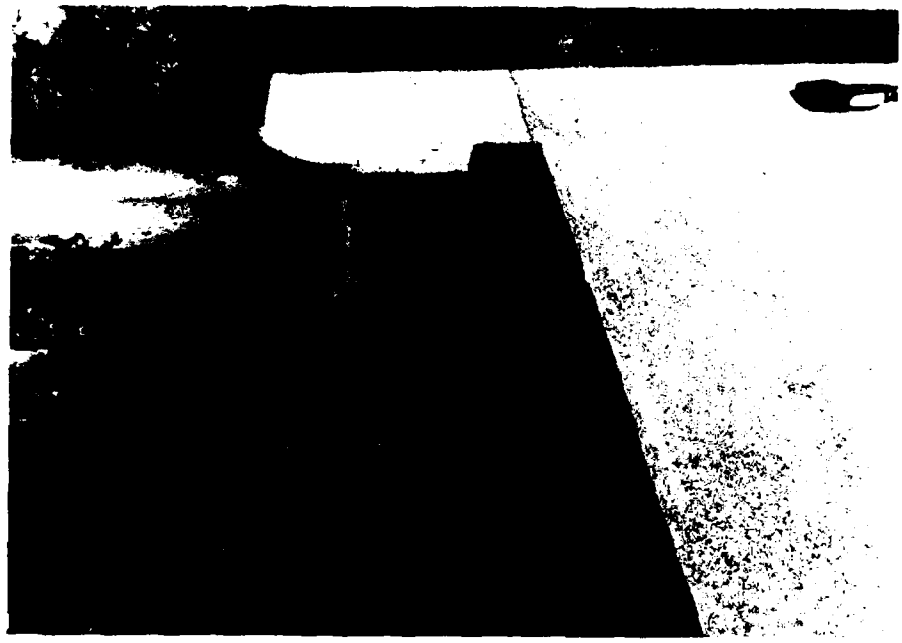


Figure 6 - Close-up view of the sidewall at the east abutment.

Figure 7 - Downstream face of the east abutment.

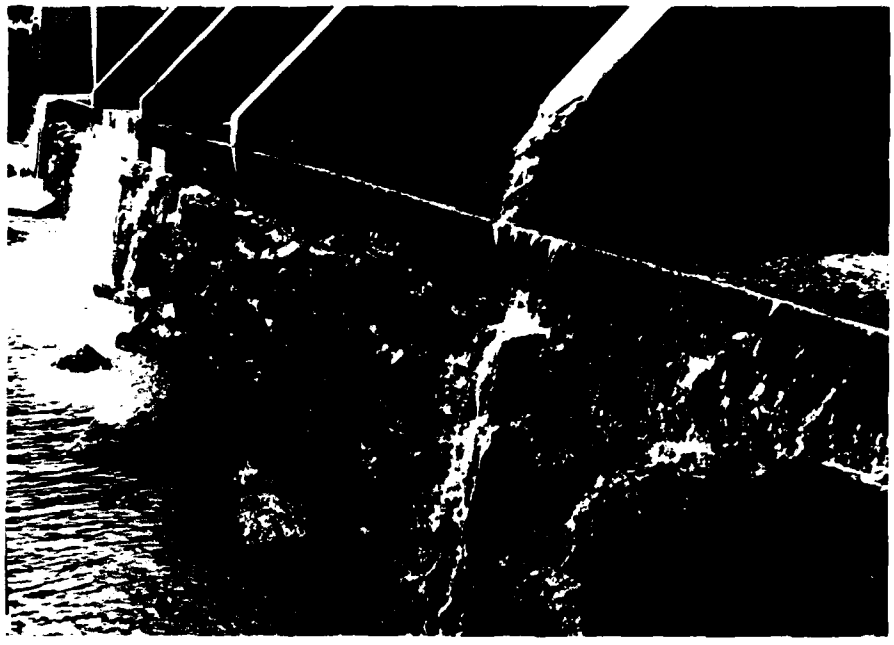


Figure 8 - Close-up view of the downstream face of the dam. Note the spalling on the nearest countefort.

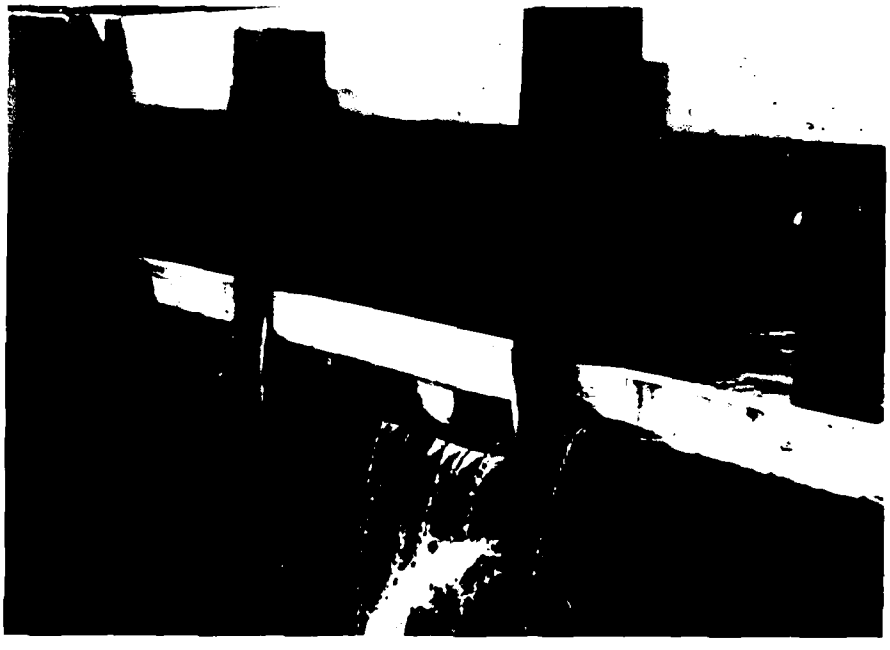


Figure 9 - Looking upstream at the stoplog support beams.

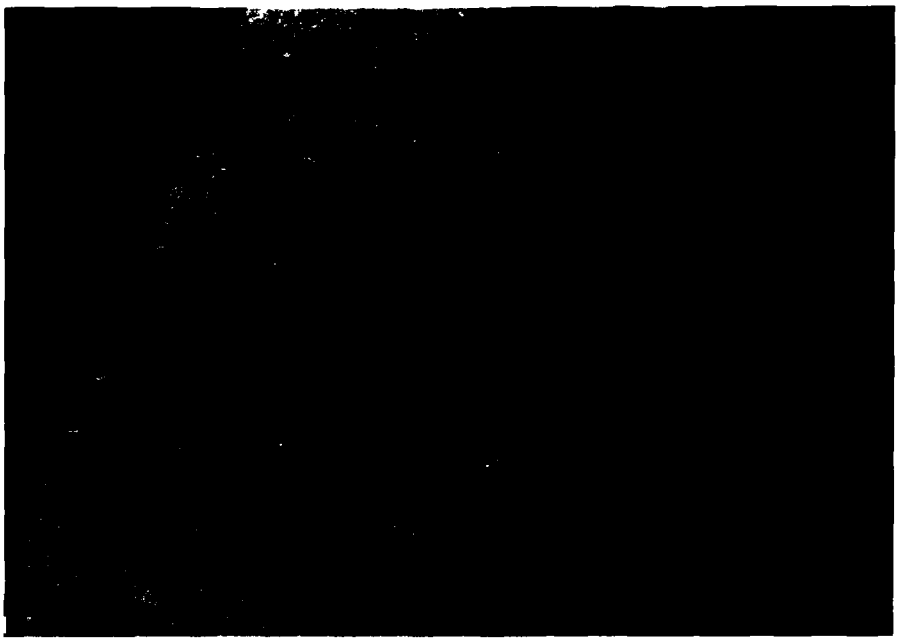


Figure 10 - Crack in top of the concrete service bridge.

Figure 11 - Spalling at an expansion joint in the concrete service bridge.

Figure 12 - Looking upstream at the vehicular bridge, approximately 150 feet upstream of the dam.

Figure 13 - Looking upstream at the railroad bridge, approximately 600 feet upstream of the dam.

Figure 14 - Looking upstream from the dam at the east shore of the approach channel.

Figure 15 - Looking upstream at the west shore of the approach channel.

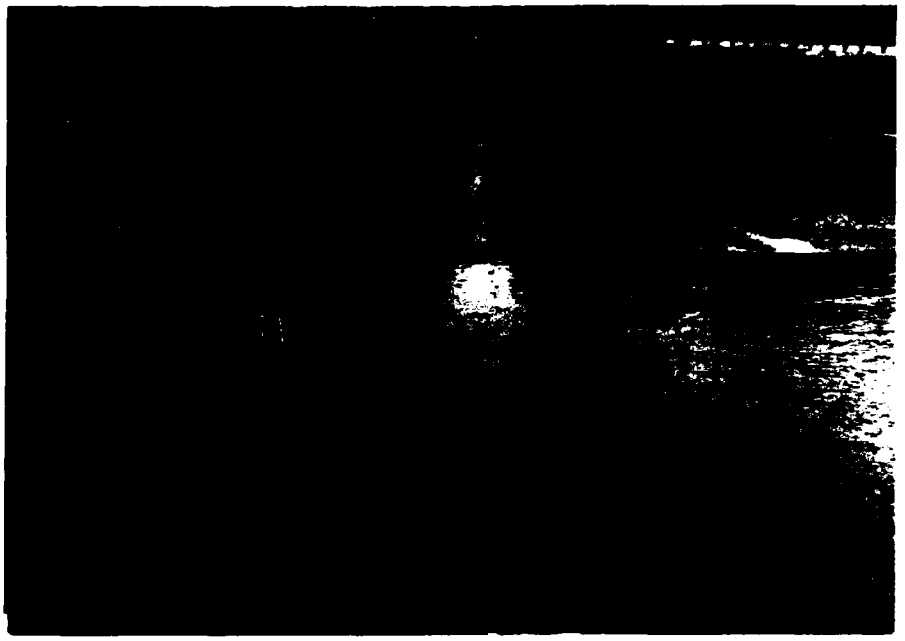
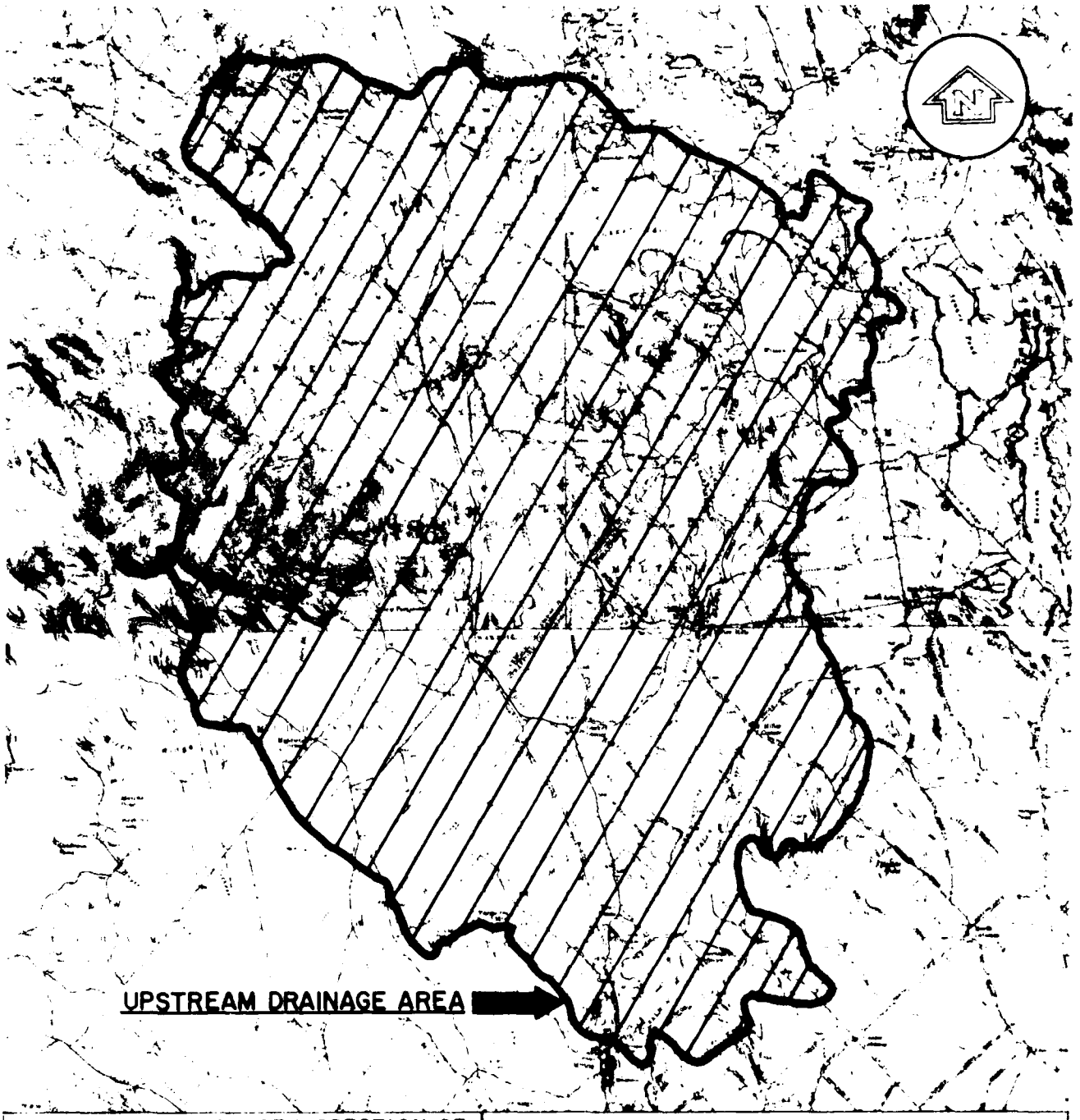


Figure 16 - Looking at the downstream channel from the east abutment of the dam.

APPENDIX D

HYDROLOGY/HYDRAULICS



NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

MILTON THREE PONDS DAM

MILTON, NEW HAMPSHIRE

REGIONAL VICINITY MAP

AUGUST 1978

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASSACHUSETTS

SCALE IN MILES

2 1 0 2 4

MAP BASED ON U.S.G.S 15 MINUTE QUADRANGLE SHEETS ALTON, N.H. 1957, WOLFEBORO, N.H. 1958, NEWFIELD, ME.-N.H., and BERWICK, ME.-N.H.

HYDROLOGY / HYDRAULICS

MILTON THREE PONDS DAM 1/15

STEP 1: Probable Maximum Flood Determination (PMF)
RE: Preliminary Guidance for Estimating Maximum Probable Discharges in Phase I Dam Safety Investigations, NED-COE, March 1978.

Using Flat & Coastal Curve to determine PMF Peak Inflow.

DA = 108 mi^2 - USGS measured & published

PMF = 395 cfs/sq.mi × 108 sq.mi.

PMF = 42,660 cfs (PEAK INFLOW)

Hydraulic Assumptions:
1 waste gate closed
1 gate open 3½"
Normal water level - 15.2 gage = 413.81 MSL

Rating Curve Comps:

@ elev. 413.81 STOPLOG FLOW = 0 cfs
Gate 27"H × 44"W open 3½"

$K_f = \frac{(29.1)(n^2)(L)}{R^{4/3}}$

$= \frac{(29.1)(.02)^2(16.6)}{(0.135)^{4/3}}$

$= 2.79$

A = 3½" × 44" = 1.07 ft^2
P = 7" + 88" = 7.92 ft
R = 1.07/7.92 = 0.135
L = 16.6'
n = 0.02

Entrance & exit losses ≈ 1.10
Total K = 3.89

$3.89 = \frac{1}{C^2}$ C = 0.51

$Q = CA\sqrt{2gh}$ $\quad C = 0.51$, $A = 1.07$, $g = 32.2$, $h = 13.6$

$= (0.51)(1.07)\sqrt{64.4 \cdot 13.6}$

$= \underline{16.1 \text{ cfs}}$ = GATE CAPACITY @ NORMAL POOL

@ elev 416.11 = LC OF WALKWAY = low pt to right

GATE CAPACITY $\quad Q = CA\sqrt{2gh}$

$= (0.51)(1.07)\sqrt{(64.4)(15.9)}$

$= 17.5$ cfs

STOPLOG SPILLWAY $\quad Q = CLH^{3/2}$

$= (2.8)(126.25)(2.3)^{3/2}$

$= 1233$ cfs

TOTAL $Q = 17.5 + 1233 = \underline{1250 \text{ cfs}}$

@ elev 416.8 = LOW PT TO LEFT OF DAM

GATE CAPACITY $\quad Q = (0.51)(1.07)\sqrt{(64.4)(16.59)}$

$= 17.8$ cfs

STOPLOG SPILLWAY $\quad Q = CA\sqrt{2gh}$

$k = \frac{1}{C^2}$; $K_f = \frac{(29.1)(n^2)(L)}{R^{4/3}}$; $R = \frac{A}{P}$

$A = (126.25)(2.3) = 290.4 \text{ ft}^2$

$P = 2(126.25) + 2(2.3) + 24(2.3) = 312.3$

$R = \frac{290.4}{312.3} = 0.93$

$K_f = \frac{(29.1)(0.015)^2(0.33)}{(0.93)^{4/3}} = 0.002$

entrance & exit = 1.1 $\Rightarrow$ SAY TOT K = 1.1

$K = \frac{1}{C^2}$ $\quad 1.1 = \frac{1}{C^2}$ $\quad C = 0.95$

$Q = CA\sqrt{2gh}$

$= (0.95)(290.4)\sqrt{(64.4)(3.03)}$

$= 3856$ cfs

OVERLAND FLOW $\quad Q = CLH^{3/2}$

$= (2.6)(6.5)(0.7)^{3/2} = 9.9$ cfs

TOTAL $Q = 17.8 + 9.9 + 3856 = \underline{3885 \text{ cfs}}$

@ elev 417.61 = TOP OF CONCRETE WALKWAY

WIER CAPACITY $\quad Q = (0.51)(1.07)\sqrt{(64.4)(17.4)}$

$= 18.3$ cfs

STOPLOG SPILLWAY $\quad Q = (0.95)(290.4)\sqrt{(64.4)(3.84)}$

$= 4338$ cfs

OVERLAND FLOW – LEFT $Q = CLH^{3/2}$

$Q = (2.6)(18)(0.6)^{3/2} + (2.6)(75.5)(0.2)^{3/2}$

$= 21.8 + 17.6 = 39.4$

OVERLAND FLOW – RIGHT $Q = CLH^{3/2}$

$Q = (2.6)(12.5)(1.2)^{3/2} + (2.6)(33)(0.2)^{3/2}$

$= 42.7 + 7.7 + 2.6(99)(0.2)^{3/2}$

$= 42.7 + 7.7 + 23.0 = 73.4$ cfs

TOTAL $Q = 18.3 + 4338 + 39.4 + 73.4 = 4470$ cfs

@ elev. 418.2

GATE CAPACITY $Q = (0.51)(1.07)\sqrt{(64.4)(18.0)}$

$= 18.6$

STOPLOG SPILLWAY $Q = (0.95)(290.4)\sqrt{64.4(4.43)}$

$= 4660$

OVERLAND BFLOW TOP WALKWAY $Q = 39.4 + 73.4 = 112.8$

Q OVERTOP DAM $Q = CLH^{3/2}$

$= (2.7)(386)(0.6)^{3/2} = 485$

TOTAL $Q = 18.6 + 4660 + 112.8 + 485 = 5275$ cfs

② elev. 418.9

GATE CAPACITY $Q = (0.51)(1.07)\sqrt{64.4(18.7)} = 18.9$

SPILLWAY $Q = (0.95)(290.4)\sqrt{64.4(5.13)} = 5014$

OVERLAND FLOW BELOW WALKWAY $Q = 112.8$

Q OVERTOP $Q = CLH^{3/2}$

$= (2.7)(428.5)(0.7)^{3/2} + 485 = 1163$

TOTAL $Q = 18.9 + 5014 + 112.8 + 1163 = 6310$ cfs

③ elev. 420.3

GATE CAPACITY $= Q = 4.38\sqrt{20.1} = 19.6$

SPILLWAY $= Q = 2214\sqrt{6.53} = 5658$

BELOW WALKWAY $= Q = 112.8$

OVERTOP $= (2.7)(446)(0.1)^{3/2} + (2.7)(462)(1.3)^{3/2} + 1163$

$= 38.1 + 1848.9 + 1163 = 3050$ cfs

TOTAL $Q = 19.6 + 5658 + 112.8 + 3050 = \underline{\underline{8840}}$

④ elev. 424.6

GATE $Q = 4.38\sqrt{20.1 + 4.3} = 21.6$

SPILLWAY $Q = 2214\ (6.53 + 4.3)^{0.5} = 7286$

BELOW WALKWAY $Q = 112.8$

OVERTOP $= (2.7)(476)(0.2)^{3/2} + 2.7(509)(4.1)^{3/2} + 3050$

$Q = 115 + 11409 + 3050 = 14574$

TOTAL $Q = 21.6 + 7286 + 112.8 + 14574 = \underline{\underline{22000}}$

@ elev. 431.1

GATE $Q = 4.38\sqrt{24.4 + 6.5} = 24.3$

STOPLOG $Q = 2214\sqrt{10.83 + 6.5} = 9217$

WKWY $Q = 112.8$

$Q_{OVERTOP} = (2.7)(554)(1)^{3/2} + (2.7)(576)(0.4)^{3/2} +$

$(2.7)(595)(5.1)^{3/2} + 14574 =$

$= 1496 + 393 + 18503 + 14574 = 34966$

TOTAL $Q = 24.3 + 9217 + 112.8 + 34966 = \boxed{44320}$

@ elev. 430

GATE = $Q = 4.38\sqrt{24.4 + 5.4} = 23.9$

STOPLOG = $Q = 2214\sqrt{10.83 + 5.4} = 8919$

WKWY $Q = 112.8$

$Q_{OVERTOP}$ $Q = 1496 + 393 + 14574 + (2.7)(592.5)(4)^{3/2}$

$= 29261$

TOTAL $Q = 23.9 + 8919 + 112.8 + 29261 = \boxed{38317}$

@ elev. 430.8

GATE $Q = 4.38\sqrt{29.8 + 0.8} = 24.2$

STOPLOG $Q = 2214\sqrt{16.23 + 0.8} = 9137$

WKWY $Q = 112.8$

$Q_{combined} = 1496 + 212 + 1473 + [illegible] = 33641$

Total Q = 24.2 + 9137 + 112.8 + 33641 = 42915

@ PMF inflow (42,660) elev. = 430.8

Volume of Surcharge

STOR @ normal = 13330 AF
STOR @ PMF > 430.8 = 49500 AF
∴ Surcharge STOR = 36170 AF

$36170\ AF \times \frac{1}{108\ mi^2} \times \frac{1\ mi^2}{640\ A} = 0.523'$
$0.523' = 6.28''$ runoff over basin

$Q_{p2} = Q_{p1} \times \left(1 - \frac{STOR1}{19}\right)$

$= 42,660 \times \left(1 - \frac{6.28}{19}\right)$
$= 28,560\ cfs$

Surcharge height to pass $Q_{p2} = 28,560$ cfs from rating curve - elev. = 426.7

Stor @ 426.7 = 37250 AF
Stor @ 414.6 = 13330 AF
∴ STOR 2 = 23,920 AF

$23920 \times \frac{1}{108\ mi^2} \times \frac{1\ mi^2}{640\ A} = 0.346'$
$0.346' = 4.15''$

STOR 1 = 6.28" } AVE = 5.215"
STOR 2 = 4.15" }

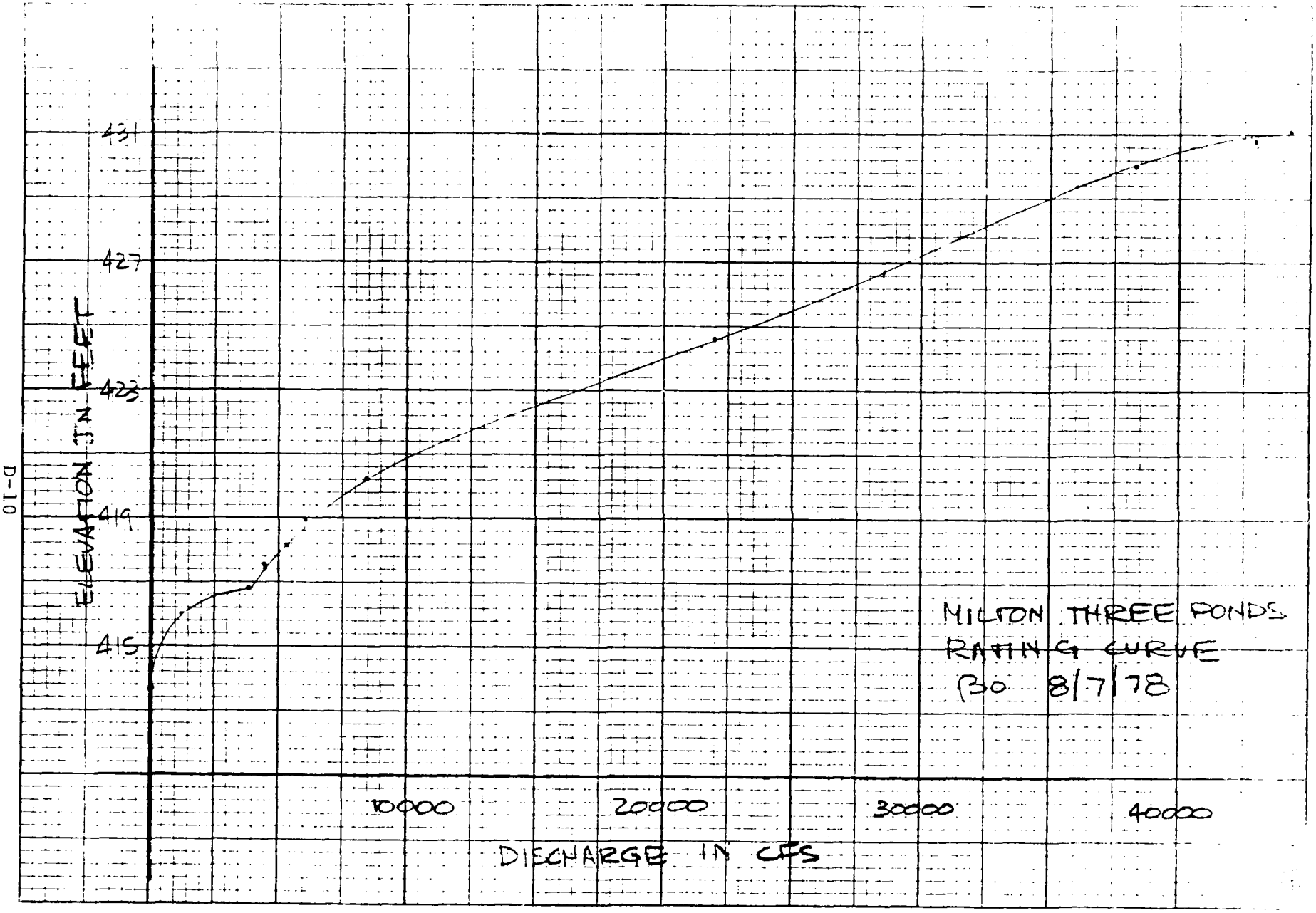
$5.215'' \times 108\ mi^2 \times 1'/12'' \times \frac{640\ A}{1\ mi^2} = 30,038\ AF$

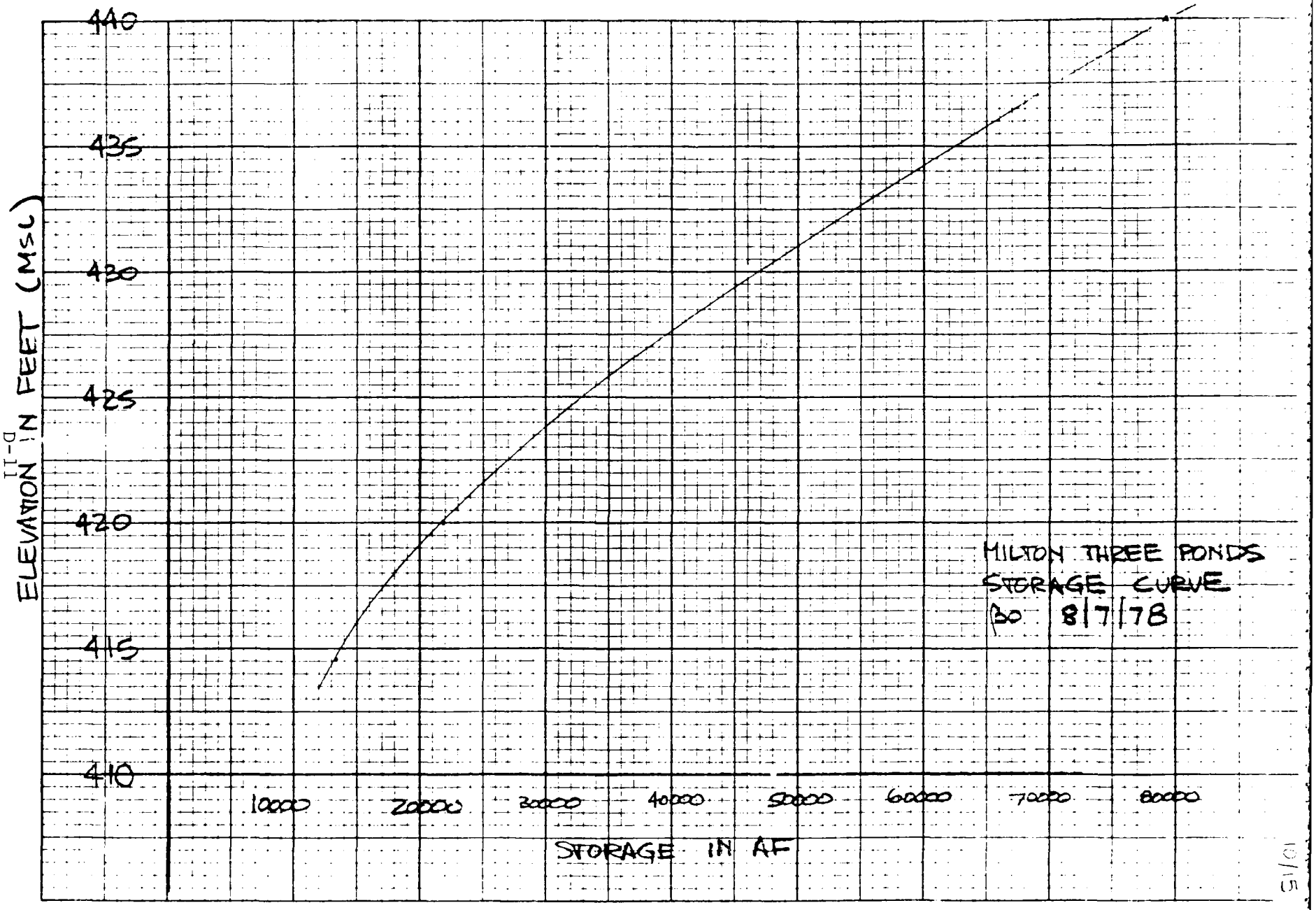
8/15

From storage/elev. curve
30,038 + 13330 = 43368 AF
@ 43368 AF – elev. = 429.0
@ 429.0 MSL – 35,000 cfs

Q_{p3} = PMF = 35,000 cfs @ 429.0' MSL

½ Q_{p3} = 17,500 cfs ⇒ 423.3' MSL


431
427
423
419
415
ELEVATION IN FEET
10000
20000
30000
40000
DISCHARGE IN CFS
MILTON THREE PONDS
RATING CURVE
BO 8/7/78


440
435
430
425
420
415
410
ELEVATION IN FEET (MSL)
10000
20000
30000
40000
50000
60000
70000
80000
STORAGE IN AF
MILTON THREE PONDS
STORAGE CURVE
BO 8/7/78

FULTON THREE PONDS
STOPLOG CAPACITIES
BO 8/15/78

$Q = CLH^{3/2}$

① @ RECREATIONAL POOL = 413.8

22 BAYS @ INVERT 408.3
3 BAYS ABOVE WASTE GATES @ INVERT 409.6

$Q = CLH^{3/2}$

$Q = (2.9)(12 + 100)(413.8 - 408.3)^{3/2} = 4190$ cfs
$(2.9)(14.25)(413.8 - 409.6)^{3/2} = 356$ cfs
4546 cfs

SAY 4550 cfs

② MAXIMUM POOL = 416.2

@ this elevation - stoplog opening acts like orifice under pressure flow.

$Q = CA\sqrt{2gh}$ ← FOR LARGE BAYS

$K = \frac{1}{C^2}$ $\quad K_f = \frac{(29.1)(n^2)(L)}{R^{4/3}}$ $\quad R = \frac{A}{P}$

$1.1 = \frac{1}{C^2}$

$C = 0.95$

$A_1 = 112 \times (416.1 - 408.3) = 874$

$P = (2 \times 112) + (22 \times 7.8) = 396$

$R = 2.21 \qquad R^{4/3} = 2.88$

$K_f = \frac{(29.1)(0.015)^2(0.33)}{2.88} =$ negligible

entrance < exit ≈ 1.1

$$Q_1 = CA\sqrt{2gh}$$

$$= (0.95)(874)\sqrt{64.4\,(416.2 - 408.3 + 2.6)} = 21{,}590$$

$Q_2 = CA\sqrt{2gh}$ ← FOR SMALLER BAYS

$A = 14.25 \times (416.1 - 409.6) = 93$

$P = (2 \times 14.25) + (3 \times 6.8) = 49$

$R = 1.90 \qquad R^{4/3} = 2.36$

$$K_f = \frac{(29.1)(0.015)^2(0.33)}{2.36} = \text{negligible}$$

$\therefore C = 0.95$

$$Q_2 = (0.95)(93)\sqrt{(64.4)(416.2 - 409.6 + 2.2)} = 2103$$

TOTAL Q thru stoplog Bays = 21590 + 2103 = 23690

SAY 23700 cfs

DIS Hazard Analysis - use maximum pool elevation of 416.2 to determine breach discharge.

Storage @ time of failure - 15,000 ac-ft

$Q_B = \frac{3}{2}(1)b\sqrt{g}(y)^{3/2}$

$Q_B = (3/2)(0.4 \times 156)(\sqrt{32.2})(416.2 - 408.6)^{3/2}$

$Q_B = 2198$ (upstream bed)

Q THRU REST OF DAM:

gate = 18 cfs = 18 cfs

stoplog = $2.8 \cdot 90 \cdot (2.3)^{3/2}$ = 879 cfs

897 cfs

Total Q = $Q_{DAM} + Q_B$ = 3095 cfs

@ maximum pool - stoplog capacity with all stoplogs removed = 23,700 cfs

PMF discharge - 35,000 cfs

½ PMF - 17,500 ∴ analysis only needs to be done @ maximum pool breach.

Use rating curve established from typical section of downstream reach.

Q of 3095 cfs - Stage 4.7'

Reach length - 2112'

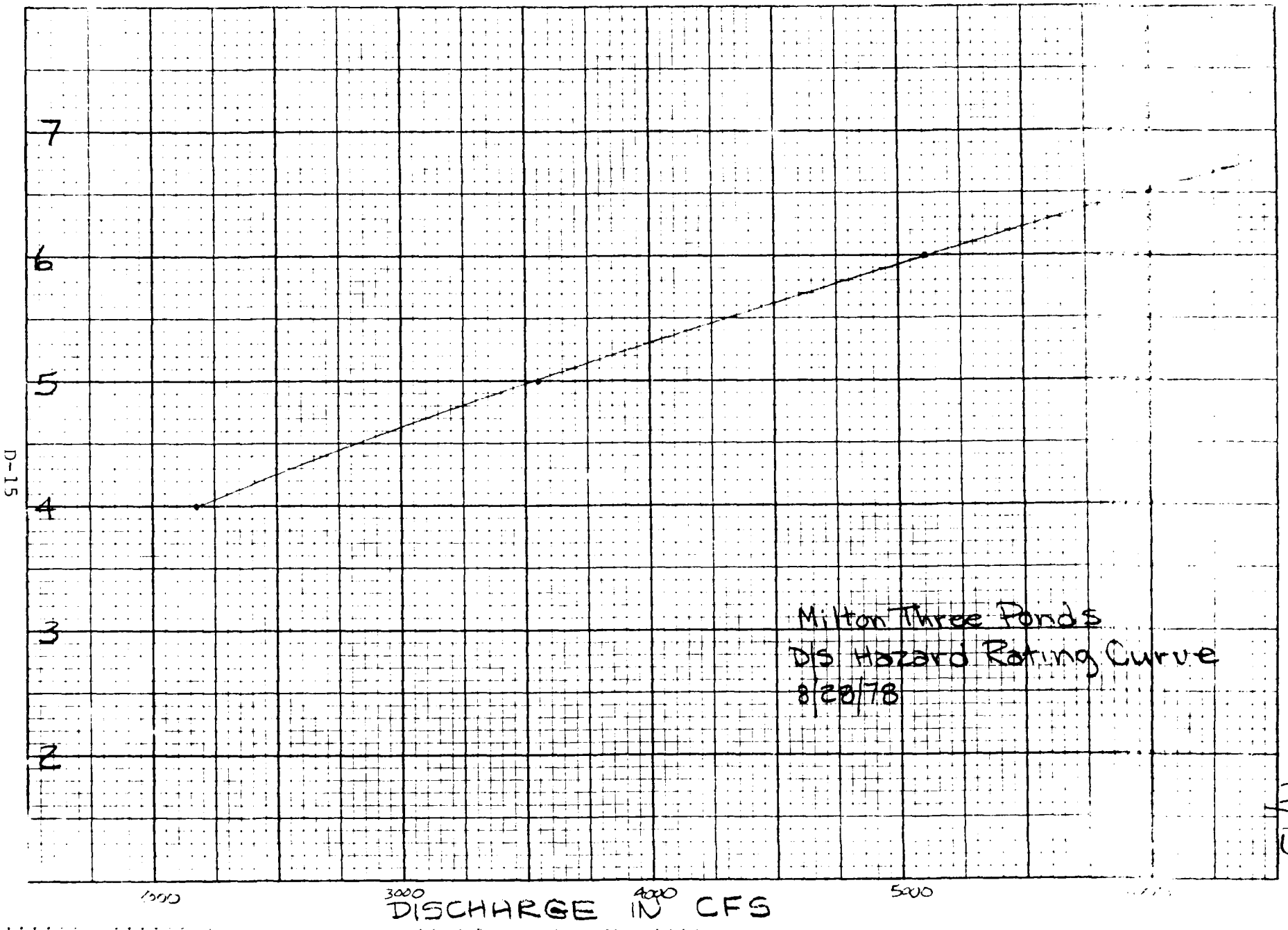
Area @ 4.7' stage - $A = \frac{1}{2}(4.7)(75+220) = 693 ft^2 \approx$ 34 AC-FT

Since storage in reach is so minimal as compared to total storage use stage of 4.7' ≈ 5' stage @ next dam downstream.

Hazard Classification - based on 5' increase in stage

Antecedent discharge ≈ 1300 cfs - Stage 3'

Increase in stage ∴ 2' at next d/s dam


7
6
5
4
3
2
3000
4000
5000
DISCHARGE IN CFS
Milton Three Ponds
DS Hazard Rating Curve
8/28/78

10/3/78

Milton Three Ponds Dam
Calculate gate capacity @ normal pool elevation of 413.8

Gates - 21" H x 44" W
Area = 8.25 ft²
WP = 11.83
R = 0.70

$K_f = \frac{(29.1)(0.02)^2(16.6)}{(0.70)^{4/3}} = 0.31$

L = 16.6'
n = 0.02

entrance & exit losses = 1.10
$K_{TOTAL} = 1.41$

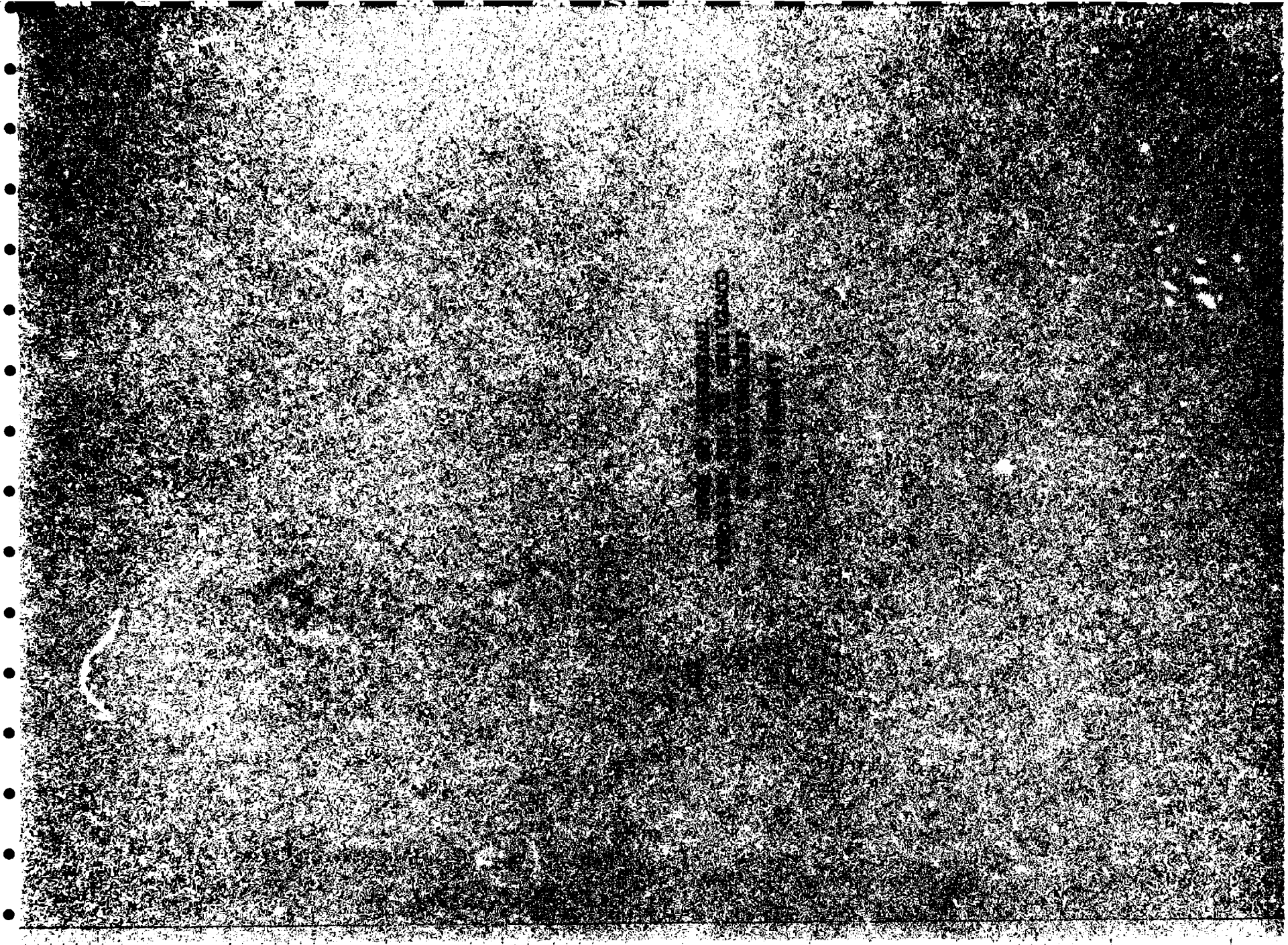
$1.41 = \frac{1}{C^2}$ $C = 0.84$

$Q = CA\sqrt{2gh}$

C = 0.84
A = 8.25
g = 32.2
h = 413.8 - 402.3 = 11.5

$Q = (0.84)(8.25)\sqrt{2(32.2 \times 11.5)}$
$= 188.6 \approx 190$ cfs / each gate

Total discharge capacity of both gates @ normal pool = 190 cfs x 2 = 380 cfs



INVENTORY OF DAMS IN THE UNITED STATES

(1) STATE	(2) IDENTITY NUMBER	(3) DIVISION	(4) STATE	(5) COUNTY	(6) CONGR DIST.	(7) STATE	(8) COUNTY	(9) CONGR DIST.	(10) NAME	(11) LATITUDE (NORTH)	(12) LONGITUDE (WEST)	(13) REPORT DATE DAY | MO | YR
NH	320	NED	NH	017	01				MILTON THREE PONDS DAM	4324.8	7059.2	08SEP78

(14) POPULAR NAME	(15) NAME OF IMPOUNDMENT
MILTON DAM	MILTON THREE PONDS

(16) REGION	(17) BASIN	(18) RIVER OR STREAM	(19) NEAREST DOWNSTREAM CITY-TOWN-VILLAGE	(20) DIST FROM DAM (MI.)	(21) POPULATION
01	04	SALMON FALLS RIVER	MILTON	0	1859

(22) TYPE OF DAM	(23) YEAR COMPLETED	(24) PURPOSES	(25) STRUCTURAL HEIGHT (FT.)	(26) HYDRAULIC HEIGHT (FT.)	(27) IMPOUNDING CAPACITIES MAXIMUM (ACRE-FT.)	(28) IMPOUNDING CAPACITIES NORMAL (ACRE-FT.)
GRCITBPG	1824	RO	19	19	15000	12500

DIST	OWN	FED R	PRV/FED	SCS A	VER/DATE
NED	N	N	N	N	18AUG78

(29) REMARKS

(30) D/S HAS	(31) SPILLWAY CREST LENGTH	(32) SPILLWAY TYPE	(33) SPILLWAY WIDTH (FT.)	(34) MAXIMUM DISCHARGE (FT.)	(35) VOLUME OF DAM (CY)	(36) POWER CAPACITY INSTALLED (MW)	(37) POWER CAPACITY PROPOSED (MW)	(38) NAVIGATION LOCKS NO	(39) LENGTH (FT.)	(40) WIDTH (FT.)	(41) LENGTH (FT.)	(42) WIDTH (FT.)	(43) LENGTH (FT.)	(44) WIDTH (FT.)	(45) LENGTH (FT.)	(46) WIDTH (FT.)
1	200	C	126	23700												

(47) OWNER	(48) ENGINEERING BY	(49) CONSTRUCTION BY
NH WATER RESOURCES BOARD		

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

(51) INSPECTION BY	(52) INSPECTION DATE DAY | MO | YR	(53) AUTHORITY FOR INSPECTION
ANDERSON-NICHOLS + COMPANY, INC.	19JUN78	P.L. 92-367

(54) REMARKS

END

FILMED

8-85

DTIC