PISCATAQUA RIVER BASIN
ROCHESTER, NEW HAMPSHIRE

BAXTER LAKE CENTER DIKE
NH 00393

STATE NO 204.10

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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

JULY 1978

85 6 19 038
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Baxter Lake Center Dike  
NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS

U.S. ARMY CORPS OF ENGINEERS  
NEW ENGLAND DIVISION

DEPT. OF THE ARMY, CORPS OF ENGINEERS  
NEW ENGLAND DIVISION, NEDED  
424 TRAPELO ROAD, WALTHAM, MA. 02254

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The dam is 10 ft. high and 240 ft. long. It is an earthen embankment with an 18 inch core wall. The dike is in good condition although there are a few minor concerns that need attention. The dike has no outlet.
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 Baxter Lake Center Dike 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, Baxter Lake Recreation Area, Inc., 22 Concord Street, Nashua, New Hampshire 03060.

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,

P. Chandler
Colonel, Corps of Engineers
Division Engineer
BAXTER LAKE CENTER DIKE
NH 00393

PISCATAQUA RIVER BASIN
ROCHESTER, NEW HAMPSHIRE

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
This Phase I Inspection Report on Baxter Lake Center Dike 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
CHARLES G. TIERSCH, Chairman
Chief, Foundation and Materials Branch
Engineering Division

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

Saul Cooper
SAUL COOPER, Member
Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar
JOE B. FRYAR
Chief, Engineering Division
NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

Identification No.: NH00393
Name of Dam: Baxter Lake Center Dike
Town: Rochester
County and State: Strafford County, New Hampshire
Stream: Rickers Brook
Date of Inspection: 14 June 1978

BRIEF ASSESSMENT

Baxter Lake Center Dike is 10 feet high, 12 feet wide at the crest, and 240 feet long. It is an earthen embankment with an 18-inch core wall. The upstream and downstream faces have 3H:1V side slopes. The upstream slope is faced with riprap. An access road has been built along the crest of the dike. Baxter Lake is impounded by the Main Dam, Center, Westerly, and Easterly Dikes. The lake is 1 mile long, has a surface of over 300 acres, and is used for recreation. Maximum storage is 1,720 acre-feet.

Center Dike is in good condition. Minor concerns to its integrity include a minor seepage at the downstream toe near the east abutment, brush growing on the slopes, and potential erosion of the unpaved roadway.

The dike has no outlet. The test flood would not overtop the dike; however, other dikes in the impounding system would be overtopped. The test flood would rise to within 1.1 feet of the lowest point on the crest.

The owner, Baxter Lake Recreation Area, Inc., should, within four years, retain the services of a registered professional engineer and implement the results of his evaluation of the following recommendation: design remedial measures for the seepage at the downstream toe of the dike near the east abutment. Within one year, the following operation and maintenance measures should be implemented: monitor the seepage weekly, clear brush and trees on the faces and along the access road, and establish a surveillance and warning program to be exercised during floods.

Warren A. Guinan
Project Manager
N.H. P.E. No. 2339
PREFACE

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

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

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

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated “Probable Maximum Flood” for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.
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Figure 1 - Overview of the upstream face of the Center Dike.
1.1 General

a. Authority. Public Law 92-367, August 8, 1978, 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. Baxter Lake is located in both the City of Rochester and the Town of Farmington, New Hampshire. Baxter Lake Center Dike, together with the Main Dam, Westerly and Easterly Dikes impound Baxter Lake (formerly Meader Pond). The Center Dike, as well as the other impounding barriers, are located in Rochester, New Hampshire. Baxter Lake forms the headwaters of Rickers Brook which is confluent with Howard Brook approximately 3 miles downstream. These two brooks combine to form Axe Handle Brook which flows 1.3 miles...
to its confluence with the Cocheco River just north of Gonic, New Hampshire. The Cocheco River then flows south-easterly for a distance of about 16 miles to its confluence with the Piscataqua River. The Cocheco River is a major tributary in the Piscataqua River Basin. Baxter Lake Center Dike is shown on U.S.G.S. Quadrangle, Alton, New Hampshire with coordinates approximately at N 43° 19' 24", W 71° 02' 24", Strafford County, New Hampshire. (See Location Map page iv.)

b. Description of Dike and Appurtenances. Baxter Lake Center Dike is an earthen embankment with an 18-inch concrete core wall. The dike is now about 240 feet long, 12 feet wide at the crest, and 10 feet high above the downstream toe. As originally constructed, the earthen embankment was about 6 inches over the top of the concrete core wall. It was 135 feet long and only about 6 feet in height; however, the dike was widened and raised to its present height to provide an access road in 1942. Upstream, the dike is faced with riprap; brush is growing among the stones. The downstream face is sparsely covered with brush. The crest carries the unpaved access road. The dike has no other appurtenances.

c. Size Classification. Intermediate (Hydraulic height - 7 feet, storage - 1,720 acre-feet) based on storage (≥1,000 to <50,000 acre-feet) as given in the OCE Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification. Significant hazard. A major breach would result in the loss of less than 10 lives and little property damage.

e. Ownership. Baxter Lake Center Dike, along with the Main Dam and Easterly Dike, were originally constructed in 1923 by the Gonic Manufacturing Company for the purpose of storage for hydroelectric generation as well as textile process water. Gonic Manufacturing Company transferred title to the access road over Center Dike to the State of New Hampshire, Fish and Game Department January 24, 1961. In the deed it states that the State of New Hampshire is in no way responsible for water level or maintenance of the dams on Baxter Lake. The deed also reserves the right for continued use of the dike as an access road to the Main Dam and lake. Therefore, Center Dike apparently is the property of and is maintained by Baxter Lake Recreation Area, Inc.

f. Operator. Walter Pheeney, W.T.P. Engineering, Baxter Lake, Rochester, New Hampshire 03867, Phone (603) 332-3733, is responsible for the operation of the Main Dam under the authority of the Baxter Lake Recreation Area, Inc.
g. Purpose of Dike. Baxter Lake Center Dike, as well as the Main Dam and Easterly Dike, were originally constructed to provide industrial water storage for the Gonic Manufacturing Company in Gonic, New Hampshire. Baxter Lake was utilized as upstream storage for hydroelectric generation as well as textile process water. After 1959 its use was strictly as textile process water. Today, Baxter Lake is utilized for recreational purposes only.

h. Design and Construction History. L. E. Scruton, C. E., Portsmouth, New Hampshire, designed the dam and two dikes in 1921. He supervised the construction in 1922 and 1923. In 1941, Harrison G. White Engineers, Springfield, Massachusetts, designed the repairs for the Main Dam and Center Dike. The repairs were made in 1942. From the design plans and correspondence in the files of the New Hampshire Water Resources Board (NHWRB), fill was apparently added to the Center Dike to raise the grade and widen the dike to carry an access road. (See Appendix B.)

i. Normal Operational Procedures. Not applicable; Baxter Lake Center Dike has no outlet facilities. No written maintenance procedures were disclosed.

1.3 Pertinent Data

a. Drainage Area. The drainage area consists of 4 square miles (2,560 acres) of predominately steep-sloping wooded terrain.

b. Discharge at Dike

(1) Outlet works (conduits) - none

(2) The maximum known discharge at dike is unknown.

(3) Ungated spillway capacity at maximum pool elevation - not applicable

(4) Gated (stoplog) spillway capacity at recreational pool elevation - not applicable

(5) Stoplog spillway capacity at maximum pool elevation - not applicable

c. Elevation (ft. above MSL)

(1) Top of dike - 417.2
(2) Maximum pool - design surcharge - unknown
(3) Full flood control pool - not applicable
(4) Recreation pool - 413
(5) Spillway crest - not applicable
(6) Upstream portal invert diversion tunnel - not applicable
(7) Streambed at centerline of dike - 412 (downstream toe as measured at time of inspection)
(8) Maximum tailwater - unknown
d. Reservoir (miles)
(1) Length of maximum pool - 1.0
(2) Length of recreational pool - 1.0
(3) Length of flood control pool - not applicable
e. Storage (acre-feet)
(1) Recreation pool - 1,400
(2) Flood control pool - not applicable
(3) Design surcharge - unknown
(4) Top of dike - 1,720 (storage based on Easterly Dike)
f. Reservoir Surface (acres)
(1) Top of dike - 427
(2) Maximum pool - 324
(3) Flood control pool - not applicable
(4) Recreation pool - 316
(5) Spillway crest - not applicable
g. Dike
(1) Type - earth embankment with concrete core, rock facing on upstream slope
(2) Length - 240'
(3) Height - 10'
(4) Top Width - 12'-13'
(5) Side Slopes - 3H: 1V
(6) Zoning - unknown
(7) Impervious Core - 18-inch concrete core wall
(8) Cutoff - concrete core wall extends to unknown depth
(9) Grout Curtain - unknown

h. Diversion and Regulating Tunnel - not applicable
i. Spillway - none
2.1 Design

No original design data were disclosed for the structures impounding Baxter Lake.

2.2 Construction

Except for inspection reports and design drawings noted below, few other construction data were disclosed for the impounding structures on Baxter Lake. A search of the files of the NHWRB revealed three blueprint design plans dated 1921 and a plan of the reconstruction completed in 1942.

During construction in 1922, the following quotations, taken from reports by B. H. Moxon, State Inspector, were obtained from the files of the NHWRB, successor agency to the Public Service Commission of New Hampshire, the State Agency that was responsible in 1922 for approving plans and making inspections of dam construction:

On Thursday, May 25, 1922, I made an inspection of the several locations where the Gonic Manufacturing Company intend to construct a dam and two dikes. The natural geographical conditions are such that a storage reservoir may be easily obtained.

The site of the Main Dam is just upstream from an old rock-filled dam which was in use probably 75 years ago. It is expected that ledge foundation will be met for the whole distance of the Main Dam. Plans and specifications for this development are on file in the office of the Public Service Commission.

L.E. Scruton of Portsmouth is the engineer and contractor, and the work is being done under contract. The foundation for the Main Dam was not exposed, but an examination
of the cut-off trenches for the
dike walls showed that sufficient-
ly impervious foundation was en-
countered on which to build the
concrete cut-offs. The engineer
was advised that he could proceed
with the work as fast as possible,
but was to advise us at such time
as the foundation for the Main Dam
was cleared. It is expected that
a concrete mix of 1-2½-5 would be
used on this work, the gravel
being natural run of the bank and
testing to that ratio. (Inspection
5/25/22)

On 4/28/23, Gonic Manufacturing Company informed the Public
Service Commission that the work was complete and the pond
was filled. (See Appendix B.)

2.3 Operation

No engineering operational data were disclosed.

2.4 Evaluation

a. Availability. Little engineering data were dis-
closed for the structures impounding Baxter Lake. A search
of the files of the NHWRB revealed only a limited amount of
recorded information.

b. Adequacy. Because of the limited amount of
detailed data available, the final assessments and recom-
mendations of this investigation are based on visual in-
spection and hydrologic and hydraulic calculations.

c. Validity. The plans found for the construction
in 1921-1922 and rehabilitation completed in 1942 are in
general conformity with the structure as seen in the visual
inspection. (For details, see Sections 3 & 6 and Appendix
B.)
SECTION 3  
VISUAL INSPECTION

3.1 Findings

a. General. The Center Dike is a small dike in height but is classified as intermediate because of the size of the impoundment of Baxter Lake. A well-defined valley leads downstream of the Center Dike and this valley is tributary to the channel downstream from the Main Dam. The watershed above the reservoir is gently to steeply sloping and heavily wooded. There are cottages, homes, and trailers around the perimeter of the lake. The lake level is controlled at the Main Dam.

b. Dike. The Center Dike consists of an earthen embankment, 240 feet long, and 12 feet wide at the crest. Design drawings and inspection reports show that it has a concrete core wall - 18 inches wide, extending to an unknown depth, and with its top buried beneath fill under the crest of the dike. Only the earthen embankment is visible. The crest of the dike was approximately 5 feet above the lake level at the time of the inspection. The upstream face of the dike is covered with riprap and dense brush. (See Appendix C - Figure 2.) An unpaved road crosses the dike along the crest. (See Appendix C - Figure 3.) The downstream slope is sparsely covered with brush. (See Appendix C - Figure 4.) One area of minor seepage was observed at the downstream toe of the dike near the east abutment (discharge .001 cfs). (See Appendix C - Figure 5.)

c. Appurtenant Structures. The control structures for Baxter Lake are part of the Main Dam.

d. Reservoir Area. The reservoir slopes are gently sloping and covered with trees and brush. There are some houses, cottages, and trailers along the shoreline. They appear to be sited 4 to 6 feet above the lake level. An extensive trailer-site development is currently underway on the slopes around the lake. Little sedimentation was observed in the reservoir.

e. Downstream Channel. A well-defined valley leads downstream of the dike and this valley is tributary to the Rickers Brook channel downstream of the Main Dam.

3.2 Evaluation

Based on the visual inspection, the condition of the Center
Dike on Baxter Lake is good. One minor seepage was observed at the downstream toe near the east abutment; it is not considered to be an immediate problem but should be monitored. Brush is growing extensively on the upstream slope and sparsely on the downstream slope. The crest of the dam carries an unpaved roadway. None of these conditions appear to pose any immediate threat to the stability of the dike.
SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures

No written operational procedures were disclosed. Baxter Lake Main Dam and its overflow spillway are the controlling structures in maintaining the normal lake level throughout the year. Because of the difference in ownership of the Main Dam and Center Dike and of Easterly Dike, the operation and maintenance of the controlling structures are directly related to the conditions they may impose upon the other impounding barriers. A verbal agreement exists between Baxter Lake Recreation Area, Inc. and Lancelot Shores Home Owners Association in Farmington, New Hampshire regarding the level of Baxter Lake. The agreement simply is to maintain the level at recreational (normal) pool throughout the year. The pool level is primarily controlled by operation of the sluice gate.

4.2 Maintenance of Dam

Baxter Lake Center Dike is maintained by the Baxter Lake Recreation Area, Inc.

4.3 Maintenance of Operating Facilities

Not applicable.

4.4 Description of Any Warning System in Effect

No written warning system was disclosed. However, Lonnie Pevear, (603) 332-3600, a maintenance man who works daily at Baxter Lake Recreation Area, is on call at all times to operate the sluice gate. The Easterly Dike is carefully watched by Harry Baxter, owner of the Easterly Dike, for potential overtopping and Lonnie Pevear is contacted when this situation is approached.

4.5 Evaluation

Maintenance and operating procedures should be improved. Although present procedures may satisfy daily normal operations, they are not adequate for an emergency that could be produced by a major storm with high runoff.
5.1 Evaluation of Features

a. Design Data. Design plans of the original construction of the Main Dam and two dikes dated 1921 and the reconstruction plans for the Main Dam and Center Dike along with the limited hydrologic and hydraulic information were obtained from the files of the NHWRB. The above information was assessed to determine its acceptability in evaluating the overtopping potential of the structures impounding Baxter Lake.

Baxter Lake Center Dike is classified as being intermediate in size having a maximum storage of 1,720 acre-feet.

To determine the hazard classification for Baxter Lake Center Dike, 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 Meaderboro Corner on State Route 202A, a distance of about 1.9 miles. Failure of Baxter Lake Center Dike at maximum pool would probably result in an increase in stage of 5.1 feet along the reach. An increase in water depth of this magnitude would probably result in the loss of less than 10 lives, sever Ten Rod Road 0.4 miles downstream of the dike, and cause little other property damage.

As a result of the analysis described above, Baxter Lake Center Dike was classified as Significant Hazard. Using OCE Recommended Guidelines for Safety Inspection of Dams, the recommended spillway test flood as the Probable Maximum Flood. The test flood discharge for Baxter Lake Center Dike, having a drainage area of 4 square miles, was determined to be 2850 cfs.

b. Experience Data. No information regarding past overtopping of Center Dike was found.

c. Visual Observation. No visual evidence of damage to the structure that might have been caused by overtopping was found at the time of inspection. The crest of the dike, forming an unpaved access road, was approximately 5 feet above the lake level at the time of inspection. The upstream face is covered with riprap and is extensively covered with brush. The downstream slope is sparsely covered with brush.
d. Overtopping Potential. Baxter Lake Center Dike, along with the Easterly and Westerly Dikes, and the Main Dam, form the system of barriers which impound Baxter Lake. Baxter Lake Center Dike would not be overtopped by the test flood. The calculated test flood elevation is at least one foot lower than the low point of the crest of the dike. However, other dikes in the impounding system would be overtopped.
6.1 Evaluation of Structural Stability

a. Visual Observations. Visual inspection did not indicate any existing structural problems in the dike. One minor seepage was observed at the downstream toe near the east abutment. Brush is growing extensively on the upstream slope and sparsely on the downstream slope. There is an unpaved roadway on the crest of the dike.

b. Design and Construction Data. One design drawing dated 1921 and inspection reports show that the dike was constructed with earthfill and has an 18-inch wide concrete core wall extending from an elevation about 6 inches below the crest to an unknown depth. No other design and construction data are available except the inspection reports. (See Appendix B.)

c. Operating Records. No operating records were disclosed.

d. Post-Construction Changes. Additional fill was placed in 1942 to carry the access road.

e. Seismic Stability. This dike is in Seismic Zone 2 and hence does not have to be evaluated for seismic stability according to the OCE Recommended Guidelines.
SECTION 7
ASSESSMENTS, RECOMMENDATIONS & REMEDIAL MEASURES

7.1 Dike Assessment

a. Condition. The visual inspection indicates that the Center Dike on Baxter Lake is in good condition.

Three minor conditions should receive attention:

(1) minor seepage at the downstream toe near the east abutment;

(2) brush growing on the upstream and downstream slopes; and

(3) potential erosion of the unpaved roadway on the crest of the dike.

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

c. Urgency. The recommendation in 7.2 below should be implemented within 4 years. The operational and maintenance procedures should be implemented within one year.

d. Need for Additional Information. The information obtained and the visual inspection are adequate for purposes of this evaluation.

7.2 Recommendations

The owner should retain the services of a registered professional engineer to design remedial measures for elimination or control of the seepage at the downstream toe near the east abutment.

7.3 Remedial Measures

a. Alternatives. None recommended (however, see Main Dam report).

b. Operation and Maintenance Procedures.

(1) The upstream slope, downstream slope, and an area 25 feet downstream of the dike should be cleared and maintained free of brush and trees.
(2) The crest roadway should be monitored for erosion and necessary remedial action taken if erosion should start.

(3) The seepage at the downstream toe of the dike should be monitored on a weekly basis.

(4) A surveillance and warning program should be established to follow in the event of flooding.
APPENDIX A

CHECK LIST - VISUAL INSPECTION
## PERIODIC INSPECTION

### PARTY ORGANIZATION

**PROJECT**: Baxter Lake, New Hampshire  
**Center Dike**  
**DATE**: June 14, 1978  
**TIME**: 2:00 P.M.  
**WEATHER**: Cool, windy, partly cloudy  
**W.S. ELEV.**: 412.7  
**U.S. 407.1DN.S.**  

(Feet MSL)

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<tr>
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| 3. Leslie Williams | 8.  
| 5. | 10.  

### PROJECT FEATURE

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<td>S. Gilman</td>
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<td>3. Soils &amp; Geology</td>
<td>R. Hirschfeld</td>
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PERIODIC INSPECTION CHECK LIST

PROJECT Baxter Lake, New Hampshire  
Center Dike  
DATE June 14, 1978  

PROJECT FEATURE Center Dike  
DISCIPLINE Structural and Soils/ Geology  
NAME  

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<td>Surface Cracks</td>
<td>None visible</td>
</tr>
<tr>
<td>Pavement Condition</td>
<td>Not paved</td>
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<tr>
<td>Movement or Settlement of Crest</td>
<td>None visible</td>
</tr>
<tr>
<td>Lateral Movement</td>
<td>None</td>
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<tr>
<td>Vertical Alignment</td>
<td>Good</td>
</tr>
<tr>
<td>Horizontal Alignment</td>
<td>Good</td>
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<tr>
<td>Condition at Abutment and at Concrete Structures</td>
<td>Good (abutment); core wall not visible</td>
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<tr>
<td>Indications of Movement of Structural Items on Slopes</td>
<td>None</td>
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<tr>
<td>Trespassing on Slopes</td>
<td>Unpaved roadway on crest</td>
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<tr>
<td>Sloughing or Erosion of Slopes or Abutments</td>
<td>None</td>
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<tr>
<td>Rock Slope Protection - Riprap Failures</td>
<td>None</td>
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<tr>
<td>Unusual Movement or Cracking at or near Toes</td>
<td>None</td>
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<tr>
<td>Unusual Embankment or Downstream Seepage</td>
<td>Seepage close to toe of dike near east abutment</td>
</tr>
<tr>
<td>Piping or Boils</td>
<td>None</td>
</tr>
<tr>
<td>Foundation Drainage Features</td>
<td>None</td>
</tr>
<tr>
<td>Toe Drains</td>
<td>None</td>
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<tr>
<td>Instrumentation System</td>
<td>None</td>
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**PROJECT**  Baxter Lake Main Dam  
**DATE**  June 14, 1978  
**PROJECT FEATURE**  Reservoir  
**NAME**  L. Williams

<table>
<thead>
<tr>
<th>AREA EVALUATED</th>
<th>REMARKS</th>
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<tbody>
<tr>
<td>Stability of Shoreline</td>
<td>Good</td>
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<tr>
<td>Sedimentation</td>
<td>No visible problems</td>
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<tr>
<td>Changes in Watershed</td>
<td>Minor</td>
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<tr>
<td>Runoff Potential</td>
<td>Many homes; lowest is 4' above lake</td>
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<tr>
<td>Upstream Hazards</td>
<td>Footbridge, Ten Rod Road, and Meaderboro Corner on State Route 202A</td>
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<tr>
<td>Downstream Hazards</td>
<td>None observed</td>
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<td>Alert Facilities</td>
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<tr>
<td>Hydrometeorological Gages</td>
<td>None observed</td>
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<tr>
<td>Operational &amp; Maintenance Regulations</td>
<td>None observed</td>
</tr>
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APPENDIX B

INSPECTION REPORTS/SKETCHES
March 21, 1977

Donald M. Rapoza

Baxter Lake Dam Nos. 204.09, 204.10, & 204.11

At 6:15 a.m. on March 14, 1977 I received a call from Mrs. Baxter informing me that water was going over the dike and a section of their property and their basement was flooded.

I contacted William Rickey, the owner of the property & Rickey Company, and requested that he make provisions to inspect the property and take the necessary measures to alleviate the flooding conditions. I met Mr. James Naas, project engineer for the Rickey Company and together we viewed the dikes, spillway, and dam and found the following:

**Dam (#204.11)**

Water was 10 inches over the upstream concrete wall and 2 feet below the top of dam. The platform for the gate lifting mechanism was submerged.

**Spillway**

Water was 11" above the concrete abutments. Steel beam was not removed and restricting the discharge from the pond.

**Dike (#204.10)**

No visible problem with the dike. Approximately 5 feet freeboard.

**Dike (#204.09)**

Found the dike was being topped (approximately 1 inch) at midpoint between the abutments and at Mr. Baxter's property, section 27 feet long and 5" max. depth. I also found a longitudinal surface crack almost the entire length of the dikes.
Mr. Nass and I also viewed the two major roads downstream of the structure for additional discharge capacity from Baxter Lake and it was decided after some discussion that the owners were going to lower the lake probably through the gate section and monitor the roadway immediately downstream of the structure to minimize any roadway flooding.

I made mention that the owner was liable for damages caused by his management of lake levels or discharges and strongly suggested that he remove the steel beam located between the concrete abutments in the spillway as the beam was restricting flow from the lake and causing problems with private property and the dike.

While at Mr. Baxter's property I placed two nails into two pines to establish a high water mark and requested that Mr. Baxter measure the water level the following day. I called Mr. Baxter on March 15, 1977 and he reported that the lake had receded approximately 5 inches.
MEMO

From: Donald Rapoza, Civil Engineer
To: Vernon Knowlton, Chief Engineer

October 29, 1976

SUBJECT: INSPECTION OF DAM AND DIKES AT OUTLET OF BAXTER LAKE IN ROCHESTER

DAM #: 204.09 - 204.10 - 204.11

As requested I inspected the dam and dikes on September 17, 1976, at the outlet of Baxter Lake in Portsmouth, N.H.

The dam is presently owned by Richie Builder Associates of Barnstead, N.H. Mr. Richie and Mr. James Fitzpatrick met me at the site and we reviewed the dam and dike and I pointed out some of the following maintenance items which needed their attention:

**Dam #204.11 (Main Structure and Spillway)**

1. **Gate Lifting Mechanism** - Someone has removed parts of the gate lifting mechanism making the gate inoperable. Calculations in our files indicate that flow through the gate is required to pass the 100-year storm.

2. Some concrete is spalling on the upstream facing of the dam.

3. There is a small amount of seepage on the downstream side of dam adjacent to the principal spillway pipe which should be monitored.

4. Expansion joints should be repaired and filled with joint filler.

**Spillway** - The flashboards and pins were removed and a 10 x 27 I Beam was placed between the spillway abutments.
Dom #204.10 (Center Dike)

1. Trees and other woody growth should be removed from the upstream and downstream faces of the dam.

2. There is seepage located at the left abutment on the downstream side of the structure. It is not critical at this time but the owner should be made aware of the potential problem and the area monitored by the owner and the results reported to our office yearly or when any appreciable increases are found at the site.

Dom #204.09 (Lower Dike adjacent to Baxter Property)

1. Trees and all woody growth should be removed from the top and both sides of the structure.

2. Seepage along the toe of the structure should be monitored.

3. Damaged dike areas should be repaired. Mr. Baxter reported that he repaired the dike sometime ago when the dike was breached.

OPERATIONS RECOMMENDATIONS:

The lake should be drawn down to the permanent crest of the spillway section after the recreation season and the boards replaced after spring runoff.
In accordance with Section 20 of Chapter 133, Laws of 1937, the above dam was inspected by me on 26 July 1950.

NOTES ON PHYSICAL CONDITION

Abutments: Good

Spillway: None (a spillway)

Gates: None (a ditch)

CHANGES SINCE LAST INSPECTION

Rebuilt in 1941-1942

FUTURE INSPECTIONS

Yes (YES)

This dam is (is not) a menace because of pondage (of pondage)

REMARKS: Pond down about 18" for spillway sites.

Copy to Cover: Date

Inspector: 

(Additional Notes Over)
# NEW HAMPSHIRE WATER CONTROL COMMISSION
## DATA ON DAMS IN NEW HAMPSHIRE

### LOCATION
- Town: Rochester
- County: Strafford
- Stream: Head (Center Dike)
- Basin-Primary: Oguno
- Local Name: Center Dike
- Coordinates—Lat.: 43°20'54"N; Long.: 71°00'50"W

### GENERAL DATA
- Drainage area: Controlled ______ Sq. Mi.; Uncontrolled ______ Sq. Mi.; Total ______ Sq. Mi.
- Overall length of dam ______ ft.; Date of Construction ______
- Height: Stream bed to highest elev. ______ ft.; Max. Structure ______ ft.
- Cost—Dam ______: Reservoir ______

### DESCRIPTION
- Gravvy earth and concrete—Foundation earth

#### Waste Gates
- Type ________________
- Number ________________
- Size ________________ ft. high x ________________ ft. wide
- Elevation Invert ________________
- Hoist ________________

#### Waste Gates Conduit
- Number ________________
- Size ________________ ft.; Length ________________ ft.; Area ________________ sq. ft.

#### Embankment
- Type ________________
- Height—Max. ________________ ft.; Min. ________________ ft.
- Top—Width ________________ ft.; Elev. ________________ ft.
- Slopes—Upstream ________________; Downstream ________________ on ________________ ft.
- Length—Right of Spillway ________________; Left of Spillway ________________

#### Spillway
- Materials of Construction ________________
- Spill over main dam
- Length—Total ______ ft.; Net ______ ft.
- Height of permanent section—Max. ______ ft.; Min. ______ ft.
- Flashboards—Type ________________; Height ______ ft.
- Elevation—Permanent Crest ________________; Top of Flashboard ________________
- Flood Capacity ________________ cfs.; ________________ cfs/sq. mi.

#### Abutments
- Materials: ________________
- Freeboard: Max. ______ ft.; Min. ______ ft.

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

### OWNER
- Genie Mfg. Co.

### REMARKS
- Condition fair; Subject to inspection.
- Use conservation

### Tabulation By
- Date

---

3/1/1934
To the Public Service Commission:

The foregoing memorandum on the above dam is submitted covering inspection made November 19, 1955, according to notification to owner dated November 16, 1955, and bill for same is enclosed.

Samuel J. Lord
Hyd. Eng.

Nov. 25, 1955
Copy to Owner
<table>
<thead>
<tr>
<th>RIVER</th>
<th>Meader Pond</th>
<th>HILLS FROM NORTH</th>
<th>D.A. SQ. FT.</th>
<th>OWNER</th>
<th>TOWN</th>
<th>HAMPTON</th>
<th>LOCAL NAME OF DAM</th>
<th>DESCRIPTION</th>
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<tr>
<th>FLOOD AREA-ARES</th>
<th>DAM Height</th>
<th>FLOOD CAPACITY-ARES</th>
<th>MILES FROM SOUTH</th>
<th>D.A. SQ. FT.</th>
<th>OWNER</th>
<th>TOWN</th>
<th>LOCAL NAME OF DAM</th>
<th>DESCRIPTION</th>
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**POWER DEVELOPMENT**

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<tr>
<th>UNITS</th>
<th>HP</th>
<th>HEAD</th>
<th>C.F.S.</th>
<th>FULL GATE</th>
<th>KW</th>
<th>MALE</th>
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**USE**

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<th>CONSERVATION</th>
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**REMARKS**

<table>
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<tr>
<th>Menace</th>
</tr>
</thead>
</table>

**DATE**

| 11/19/35 |
PUBLIC SERVICE COMMISSION
OF
NEW HAMPSHIRE

CONCORD May 31, 1922.

Hon. John W. Storrs, Commissioner,
Public Service Commission,
Concord, New Hampshire.

Dear Sir:-

In re: The Sonic Manufacturing Company

On Thursday, May 26, 1922, I made an inspection of the site of the development being carried on for the Sonic Manufacturing Company.

The foundation for dams Nos. 2 and 3 had been mostly uncovered, and although practically no ledge was encountered in the trench for the cut-off wall, I believe the intended foundation is unsatisfactory and thoroughly substantial to put the proposed concrete cut-off on. I advised Mr. Scruton, the engineer, that he could proceed with the work on dams Nos. 2 and 3 according to the plans filed with the Public Service Commission.

In conference with Mr. Scruton regarding the spillway capacity of dam No. 1 it was decided that it would be well to augment the proposed spillway capacity by putting in an auxiliary 30-foot overflow to be made at a location near dam No. 1. The top elevation of this overflow would be not more than 3 inches above the...
top of the main spillway, resulting in the availability of
two spillways when water was impounded 6 inches over the
primary spillway. The foundation of dam No. 1 was not
uncovered, but we will be advised when such is ready for
inspections.

The gravel to be used in the concrete mix is
the natural run of the bank and appears to be of a specially
good quality. Mr. Scrutton is personally in charge of all
construction and is living at the site. The cement to be
used has been stored at the dam, and sample concrete blocks
have been made to determine the best mix from the available
gravel.

A later inspection of the foundation of dam No. 1
will be made and a report submitted.

Very truly yours,

B. H. Morom
Inspector.
APPENDIX C

PHOTOGRAPHS
Figure 2 - Looking southwest across the upstream face of the dike from the northeast bank.

Figure 3 - Looking northeast across the top of the dike from the southwest end.
Figure 4 - Looking northeast across the downstream face of the dike from the southwest end.

Figure 5 - Seepage at the downstream toe of the northeast end of the dike.
APPENDIX D

HYDROLOGY/HYDRAULICS
Anderton-Nichols & Company, Inc.

Job No. 3144 - 04, 05, 06 Baxter Lake

Size Classification = Intermediate
Hazard Classification = Significant
Inspection Flood = 1/2 PMF to PMF

Step #1

Use Flat & Coastal

@ 3.98 m², PMF in cfs/m² = 840

PMF Baxter Lake is:

840 cfs/m² x 3.98 m² = 334.3 cfs

Peak Inflow = 3345 cfs

Assumptions:
36" gate @ base of dam closed
Overflow spillway flashboards in — assuming they will not fail at PMF

C Values

Overflow Spillway (sharp crested weir) 4.0
Easterly Dike 2.8
Westerly Dike 2.8
Center Dike 2.7
Main Dam 2.7
Step #2 a:
Determine Surcharge Height to Pass "Qp1" of 3345 cfs.

TRIAL #1
Assume Elevation of 415.0

Q over flow spillway = CLH^{3/2}

\[ Q = 4.0 \left( \frac{18}{2} \right) (0.25) \sqrt{2} + 4.0 \left( \frac{1}{2} \right) (2.75) \sqrt{2} + 4.0 \left( \frac{1}{2} \right) (1.75) \sqrt{2} + 4.0 \left( \frac{1}{2} \right) (1.75) \sqrt{2} \]

= 9 + 31 + 32 + 204
= 282 cfs

Q eastern dyke = CLH^{3/2}

\[ Q = 2.8 \left( \frac{1}{2} \right) (2) \left( \frac{1}{2} \right) + 2.8 \left( \frac{1}{2} \right) (2.25) \left( \frac{1}{2} \right) + 2.8 \left( \frac{1}{2} \right) (2.5) \left( \frac{1}{2} \right) + 2.8 \left( \frac{1}{2} \right) (0.5) \left( \frac{1}{2} \right) + 2.8 \left( \frac{1}{2} \right) (1.0) \left( \frac{1}{2} \right) + 2.8 \left( \frac{1}{2} \right) (0.8) \left( \frac{1}{2} \right) \]

= 29 + 35 + 140 + 25 + 50 + 99 + 23 + 20
= 421 cfs

Q tot = 282 + 421
= 703 cfs

TRIAL #2
Assume Elevation of 416.0

Q over flow spillway = CLH^{3/2}

\[ Q = 4.0 \left( \frac{1}{2} \right) (0.25) \sqrt{2} + 4.0 \left( \frac{1}{2} \right) (2.75) \sqrt{2} + 4.0 \left( \frac{1}{2} \right) (2.75) \sqrt{2} \]

= 9 + 109 + 100 + 401
= 619 cfs
**Q: EASTERLY DIKE = CLH^3/2**

\[ Q = 2.8 \left( \frac{2+3}{2.0} \right)^{3/2} + 2.8 \left( \frac{2.5}{1.0} \right)^{3/2} + 2.8 \left( \frac{2}{1.5} \right)^{3/2} + 2.8 \left( \frac{250}{0.5} \right)^{3/2} \]

\[ = 170 + 35 + 140 + 5\times0 + 772 + 25 + 23 + 169 \]

\[ = 1684 \text{ cfs} \]

**Q: WESTERLY EMBANKMENT = CLH^3/2**

\[ Q = 2.8 \left( \frac{2.4}{0.5} \right)^{3/2} + 2.8 \left( \frac{2.4}{0.5} \right)^{3/2} + 2.8 \left( \frac{200}{0.5} \right)^{3/2} \]

\[ = 2 + 2 + 198 \]

\[ = 202 \]

**Q: Total = 619 + 1684 + 202**

\[ = 2505 \text{ cfs} \]

- Dev. of 416.0
- Contained by center dike
- Contained by main dam embankment
TRIAL #3
Assume elec. @ 416.3

Q, average spillway = CLH \frac{3}{2}

\[
Q = 4.0 \times 0.25 \times (3.05)^{3/2} + 4.0 \times (13.5) \times (3.05)^{3/2} + 4.0 \times (12) \times (3.05)^{3/2} + 4.0 \times (22) \times (3.05)^{3/2}
\]

= 9 + 144 + 120 + 469

= 750 cfs

Q, eastern dike = CLH \frac{3}{2}

\[
Q = 2.8 \times (2.50)^{3/2} + 2.8 \times (12.5)^{3/2} + 2.8 \times (1.0)^{3/2} + 2.8 \times (250)^{3/2} + 2.8 \times (250)^{3/2} + 2.8 \times (250)^{3/2}
\]

= 244 + 519 + 1014 + 35 + 140 + 25 + 23 + 239

= 2239 cfs

Q, westerly embankment = CLH \frac{3}{2}

\[
Q = 2.8 \times (2.10)^{3/2} + 2.8 \times (2.00)^{3/2} + 2.8 \times (0.8)^{3/2}
\]

= 18 + 20 + 40

= 439 cfs

416.3 @ top of main dam embankment
416.3 contained by center dike

Q, tot = 3428 cfs

Swimming Height to Pass PMF is 3.3' above

416.3 @ spillway (416.3 - 413.0 = 3.3') and
4.3' above permanent water level spillway crest.
Step 2. b.

Determine Volume of Surcharge in Inches

Normal Ac-Ft. Storage = 1400
Surface Area = 316 acres = 13764960 ft²
Normal Pool @ Elevation 413.

Frustum of Pyramid

\[ V = \frac{1}{3} h (b_1 + b_2 + \sqrt{b_1 b_2}) \]

Enlarged surface area in ft²

Normal pool surface area in ft²

@ Elevation 420

Surface area = 461 acres = 20081160 ft²

\[ V = \frac{1}{3} \left( 13764960 + 20081160 + \sqrt{13764960 \times 20081160} \right) \]

= \frac{1}{3} \left( 33846120 + 16625774 \right)

= \frac{1}{3} \left( 56471894 \right)

= 11.77611527 \times 107 ft³ \times \frac{12^2 \text{ in}^2}{1 \text{ ft}^2} = 2705 \text{ ac-ft}

Surcharge Height to PASS PME is 3.3'

Volume = 5.3 \times 10^7 ft³

Spillway Volume = 0 ft³

5.3 \times 10^7 \text{ ft}^3 \times \frac{1}{3} \text{ in}^2 \times \frac{12 \text{ in}}{1 \text{ ft}^2} = 0.48 \text{ ft}

0.5 \text{ ft} \times 12 \text{ in} = 5.73 \text{ inches runoff}

\[ Q_{pz} = Q_{po} \times \left( 1 - \frac{500}{150} \right) \]

\[ Q_{pz} = 3.345 \text{ cfs} \times \left( 1 - \frac{5.73}{12} \right) \]

\[ Q_{pz} = 3.345 \text{ cfs} \times 0.70 \]

\[ Q_{pz} = 2289 = 2340 \text{ cfs} \]
Step 38
Determine discharge height of "STOR 2" to pass "Q" of 2340 cfs.

Trial #1
Assume elevation of A 5.7

Q scour flow spillway = CLH^3/2

\[ Q = 4.0(18)(0.25)^{3/2} + 4.0(42.11)(2.45)^{3/2} + 
    4.0(22)(2.45)^{3/2} + 4.0(22)(2.45)^{3/2} \]

\[ = 9 + 84 + 74 + 337 \]
\[ = 504 \text{ cfs} \]

Q oeserly side = CLH^3/2

\[ Q = 2.8(1/35)(1.7)^{3/2} + 2.8(125)(1.0)^{3/2} + 
    2.8(100)(1.0)^{3/2} + 2.8(100)(1.0)^{3/2} + 
    2.8(100)(0.3)^{3/2} + 2.8(100)(1.5)^{3/2} \]

\[ = 109 + 35 + 140 + 205 + 352 + 25 + 23 + 103 \]
\[ = 1192 \]

Q waterly side = CLH^3/2

\[ Q = 2.8(200)(0.2)^{3/2} \]
\[ = 50 \text{ cfs} \]

Q tot = 504 + 1192 + 50
\[ = 1746 \text{ cfs} \]

\@ Elev. 415.7 Q tot = 1746 cfs

Contains by center dike & main dam
Trial #2

Assume elevation of 415.9

Q weir flow spillway = CLH^1/2

\[ Q = 4.0 \left( 10 \times 0.25 \right)^{3/2} + 4.0 \left( 12 \times 2.65 \right)^{3/2} + 
4.0 \left( 10.5 \times 2.65 \right)^{3/2} + 4.0 \left( 22 \times 2.65 \right)^{3/2} \]

\[ = 9 + 104 + 91 + 380 = 584 \text{ cfs} \]

Q easterly dike = CLH^1/2

\[ Q = 2.8 \left( 12 \times 2.5 \times 2.5 \times 1.0 \right)^{1/2} + 
2.8 \left( 12 \times 0.9 \times 1.0 \times 2.5 \right)^{1/2} + 
2.8 \left( 150 \times 1.4 \times 2.5 \times 1.0 \times 2.5 \right)^{1/2} + 
2.8 \left( 2 \times 100 \times 0.3 \times 2.5 \times 1.0 \times 2.5 \right)^{1/2} \]

\[ = 157 + 35 + 299 + 140 + 696 + 25 + 23 + 155 = 1530 \text{ cfs} \]

Q westerly dike = CLH^1/2

\[ Q = 2.8 \left( 12 \times 0.9 \times 0.4 \times 2.5 \right)^{1/2} + 
2.8 \left( 2 \times 200 \times 0.4 \times 2.5 \right)^{1/2} \]

\[ = 1.4 + 1.4 + 1.4 = 4.2 \]

\[ = 145 \text{ cfs} \]

Q total = 584 + 1530 + 145 = 2259 cfs

At elevation 415.9 (2.9' above spillway boards, 3.9' above permanent spillway crease) is discharge is 2259 cfs. Center dike & main dam embankment contains.
Refer to Strange Elevation Curve:

@ 4,393.9
Surface Height = 2340 cfs:

Volume = \(4.6 \times 10^7 \text{ ft}^3\)

\[
4.6 \times 10^7 \frac{\text{ft}^3}{\text{ac}} \times \frac{1}{3.98 \text{ m}^2} \times \frac{1}{5280 \text{ ft}^2} = 0.41 \text{ ft}
\]

0.41 \text{ ft} \times 12 \frac{\text{ft}}{\text{in}} = 5.0 \text{ in} \text{ runoff}

Step 3b.

\[\text{STOR 1} = 5.73'' \text{ runoff}\]
\[\text{STOR 2} = 5.0'' \text{ runoff}\]

Average = 5.37'' runoff or 0.45'

\[
0.45' \times \frac{398 \text{ m}^2}{1} \times \frac{(2340)^2 \text{ ft}^2}{1 \text{ ft}^2} = 5.0 \times 10^7 \text{ ft}^3
\]

Refer to Strange Elevation Curve:

5.0 \times 10^7 \text{ ft}^3 \text{ reads ELEVATION} = 416.1

Refer to Elevation vs Discharge Curve:

Elevation 416.1 = 2850 cfs

Elevation Top Boards = 413.0
Elevation Spillway Concrete = 412.0
Elevation low pt. eastern dyke = 414.0
Elevation low pt. western dyke = 415.0
Elevation low pt. center dyke = 417.2
Elevation top dam embankment = 416.3
## CONCLUSIONS:

PMF Discharge = 2850 cfs
Elevation 416.1

PMF is contained by the Center Dike and the Main Dam Embankment.
PMF ELEVATION 416.1 is:

2.1' over low pt. easterly dike
3.1' over spillway boards (normal pool)
4.1' over spillway concrete pad
0.6' over low pt. westerly dike
and
1.1' below center dike low pt.
0.2' below top main dam embankment

\( \frac{1}{2} \) PMF = 1425 cfs
Elevation 415.55

\( \frac{1}{2} \) PMF Elevation 415.55 is:

1.55' over low pt. easterly dike
2.55' over spillway boards (normal pool)
3.55' over spillway concrete pad
0.6' just overtopping westerly dike

and
1.65' below low pt. center dike
0.75' below top main dam embankment

\text{Storage normal = 1400 ac feet @ elev 413}
\text{Storage maximum = 1720 ac feet @ elev 414}

\text{Surface Areas:}
\text{at elev 413 = 316 acres}
\text{elev 414 (maximum storage) = 324 acres}
\text{elev 416.3 (top mound) = 414 acres}
\text{elev 417.2 (low pt center dike) = 427 acres}
To determine surface areas:

use frustrum of pyramid equation

\[ \text{Vol. (acre-feet)} = \frac{1}{3} h \left( B_1 + B_2 + \sqrt{B_1 B_2} \right) \]

- \( h \): elevation above normal pool
- \( B_1 \): surface area normal pool (acres)
- \( B_2 \): surface area - enlarged (acres)

All parameters are known (determined) except for \( B_2 \): solve for \( B_2 \) using quadratic equation

\[ B_2 = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \]

1. At normal pool: el. 413.0 - surface area = 316. acres
2. At pond: el. 414.0

volume = 320 acre-feet = \( \frac{1}{3} \) \( 316 \) \( \sqrt{316 B_2} \) = \( \frac{1}{3} \) \( 316 + B_2 + \sqrt{316 B_2} \)

\[ 960 = \left( 316 + B_2 + \sqrt{316 B_2} \right) \]

\[ 644 - B_2 = \sqrt{316 B_2} \quad \text{(square both sides)} \]

\[ B_2^2 - 1288B_2 + 644^2 = 316 B_2^2 \]

\[ B_2^2 - 1604 B_2 + 644^2 = 0 \]

solve for \( B_2 \) using quadratic equation

\[ a = 1 \]
\[ b = -1604 \]
\[ c = 644^2 \]

\[ B_2 = \frac{1604 \pm \sqrt{(-1604)^2 - 4 \cdot 1 \cdot 644^2}}{2 \cdot 1} \]

\[ B_2 = 324 \text{ acres} \quad \text{el. 414} \]

D-13
(3) AT pond     el. 416.3  

volume = 1200 acre-ft = \frac{1}{3} \times 3.3 \times (316 + B_2 + \sqrt{316B_2})

1091 = 316 + B_2 + \sqrt{316B_2}

775 - B_2 = \sqrt{316B_2}

B_2^2 - 1550B_2 + 775^2 = 316B_2

B_2^2 - 1866B_2 + 775^2 = 0

B_2 = 414 acres  @ el. 416.3

(4) AT pond    el. 415.9  

volume = 1050 acre-ft = \frac{1}{3} \times 2.9 \times (316 + B_2 + \sqrt{316B_2})

770 - B_2 = \sqrt{316B_2}

B_2^2 - 1540B_2 + 770^2 = 316B_2

B_2^2 - 1856B_2 + 770^2 = 0

B_2 = 410 acres  @ el. 415.9

(5) AT pond    el. 417.2  

volume = 1575 acre-ft = \frac{1}{3} \times 4.2 \times (316 + B_2 + \sqrt{316B_2})

1121 = 316 + B_2 + \sqrt{316B_2}

805 - B_2 = \sqrt{316B_2}

B_2^2 - 1610B_2 + 805^2 = 316B_2

B_2^2 - 1946B_2 + 805^2 = 0

B_2 = 427 acres  @ el. 417.2

---
Hazard Analysis - using maximum pool elevation of 414 ft to determine breach discharge.

Storage time of Failure = 1720

Step 2: \[ Q_p = \frac{2g}{3} \sqrt{y_o} y_0^{3/2} \]

- \( W_b \) = breach width
- \( g = 32.2 \text{ ft/sec}^2 \)
- \( y_0 \) = pool elev. - river bed

@ Baxter Lake Easterly Dike:

- \( W_b = 100 \) ft (length @ easterly end)
- \( g = 32.2 \text{ ft/sec}^2 \)
- \( y_o = 414 - 408 = 6 \)

From above equation: \( Q = 2471 \) cfs

Assume all other structures hold. Since all structures drain into same downstream reach:

\[ Q = \text{outflow from other structures + breach Q} \]

- breach Q = 2471
- stoplog spillway (stoplogs removed)
- main dam - gate closed
- westerly dike
- center dike

2637 = total Q

Use the rating curve established from typical section of downstream reach (dike to Route 202A, about 1.9 miles downstream). - Page

Q of 2637 - Stage 5.9'

Reach length = 10031

\( Q_p = \frac{2637}{685 \text{ ft}^2} = 158 \text{ AC-FT} \)

\( Q_{p2} = 2637 \left( 1 - \frac{15.8}{5.9} \right) \]

- 2395 cfs

Stage = 5.5'

\( Q_{p3} = 134 \text{ AC-FT} \)
Ande* Nichols & Company, Inc.

JOB NO. 3141-04

Subject: Revised D.I.S. Hazard Analysis

Data 14th 18
Computed by: Williams
Checked:

ORIFICE EQUATION:

\[
Kf = \frac{29.1(0.022)^2}{(2)^{0.13}} = 0.31
\]

\[
K = \frac{R - 2.0}{g} = 0.85
\]

\[
Q = CA \sqrt{2gh}
\]

Assume wssl @ top of road

\[
Q = 0.85(B/2)(32.2 \times 8.4)
\]

\[
Q = 1000 \pm \text{cfs}
\]

Road Data: Opening Area = 54 ft²

Length 46'

HW Available = 2.2'

Pipe Arch = 7 rise:10 span

@ 202 A - can handle 3877 cfs - safety pass breach flow

Kf = \frac{29.1(0.022)^2}{(3)^{0.13}} = 0.09

\[
L = 32.5'
\]

H.W. = 2.4'

n = 0.02

R = \frac{165}{55} = 3.0

Entrance & exit losses = 1.2

\[
\text{Tot K} = 1.3 \quad \text{K = 2.3} = 0.88
\]

Assume wssl @ top of road

\[
Q = CA \sqrt{2gh}
\]

\[
Q = 0.88(165) \sqrt{2(32.2 \times 8.4)}
\]

\[
Q = 3377 \text{ cfs}
\]
DisHazard Analysis - Using maximum pool (elev. 414 based on easterly dike) to determine breach discharge.

Storage @ time of failure = 1720

Step 2: \( Q_p = \frac{\%_1 W_0 \sqrt{g} y_0^{3/2}}{W_b} \)

- \( W_b = \) breach width
- \( g = 32.2 \) ft/sec\(^2\)
- \( y_0 = \) pool elev. = river bed
- \( W_0 = 55' \)
- \( y_0 = 32.2 \) ft/sec\(^2\)
- \( y_0 = 414 - 403 = 11 \)

From above equation: \( Q = 3374 \) cfs

Assume all other structures hold.

\( \frac{3374}{166} = \) breach \( Q \)

\( \frac{3374}{3540} = \) total breach \( Q \)

Use rating curve established from typical section of downstream reach - See page 16

\( Q = 3540 \) cfs - Stage = 7.0'

Reach length = 10081'

Area @ 7'th stage = 890 ft\(^2\) = 205 AC-FT

\( Q_p2 = 3540 \left( 1 - \frac{205}{1170} \right) \)

\( Q_p2 = 3118 \) cfs

Stage = 6.5'

Area @ 6.5' stage = 785 ft\(^2\) = 181 AC-FT

\( Q_p2 = 3540 \left( 1 - \frac{181}{1170} \right) \)

\( Q_p2 = 3143 \) cfs

Stage = 6.6'

Ten Road Road overtopped

Rate 202A - value of overtopping

For analysis of flow capacity - see page 18.
Hazard Analysis - using maximum pool (elev. 41.4 based on eastern dike) to determine breach discharge.

Storage at time of failure = 1,720

Step 2: \( Q_p = \frac{5}{2} W_b \sqrt{g} \sqrt{g/2} \)

\( W_b = \) breach width
\( g = 32.2 \text{ ft/sec}^2 \)
\( g/2 = \) pool elevation - river bed

@ Baxter Lake Center Dike

\( W_b = 80' \) (at left end)

\( g = 32.2 \text{ ft/sec}^2 \)
\( g/2 = 41.4 - 40.7 = 6.3 \)

From above equation: \( Q = 212.7 \)

Total Q:

\( 212.7 \) - Center dike breach
\( 165 \) - stoplog spillway

Use rating curve established from typical section of downstream reach. - See page 16.

\( Q = 2293 \text{ cfs} \) - Stage = 5.4'

Reach length = 10031

View at 5.4' stage - \( 500A^2 = 129 \text{ AC-Ft} \)

\( Q_p^2 = 2293(1 - \frac{129}{129}) \)

\( = 2121 \text{ cfs} \)

Stage = 5.1' stage - \( 510A^2 = 117 \text{ AC-Ft} \)

\( Q_p^2 = 2293(1 - \frac{129}{129}) \)

\( = 2129 \text{ cfs} \)

Stage = 5.1'

Ten Road Road overtopped

Route 202A can handle flow

For analysis of flow capacity see page 18.
APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS