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END
**Title:** Laurel Lake Dam  
**Subtitle:** National Program for Inspection of Non-Federal Dams

**Performing Organization:** U.S. Army Corps of Engineers  
**Division:** New England Division

**Report Date:** February 1979

**Number of Pages:** 47

**Abstract:** Laurel Lake Dam is about 390 feet long and 12 feet high. The dam is in fair condition. Slight seepage was observed at the gate house foundation and pavement cracking was observed along the upstream edge of the crest. The dam is intermediate in size and the hazard classification is high.
Honorable Edward J. King
Governor of the Commonwealth of Massachusetts
State House
Boston, Massachusetts 02133

Dear Governor King:

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

A copy of this report has been forwarded to the Department of Environmental Quality Engineering, the cooperating agency for the Commonwealth of Massachusetts. In addition, a copy of the report has also been furnished the owner, Kimberly Clark Corp., Lee, Massachusetts 01238.

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

I wish to take this opportunity to thank you and the Department of Environmental Quality Engineering for your cooperation in carrying out this program.

Sincerely yours,

[Signature]

John P. Chandler
Colonel, Corps of Engineers
Division Engineer
LAUREL LAKE DAM
MA 00263

HOUSATONIC RIVER BASIN
LEE, MASSACHUSETTS

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Identification No.: MA 00263
Name of Dam: LAUREL LAKE DAM
Town: LEE
County and State: BERKSHIRE COUNTY, MA
Stream: SARGENT BROOK
Date of Inspection: 7 September 1978

BRIEF ASSESSMENT

Laurel Lake Dam is approximately 390 feet long and 12 feet high. It consists of an earth embankment with a combination of riprap and concrete wall on its upstream face, a partial vertical stone masonry wall at its downstream face and a paved road on the crest. A gate or valve house is present at the downstream toe. A rectangular channel serving as the spillway is located at the right abutment of the dam.

The dam is in fair condition. Slight seepage was observed at the gate house foundation and pavement cracking was observed along the upstream edge of the crest. The discharge channel and downstream slope of the dam contain overgrown vegetation. Local failures and indications of movement were observed in spillway and discharge channel walls.

Based on the size, intermediate, and hazard classification, high, in accordance with the Corps of Engineers Guidelines, the spillway test flood is the Probable Maximum Flood (PMF). The test flood peak outflow was estimated to be 3,200 cfs and would result in overtopping the dam by approximately 2 feet. Hydraulic analysis indicates that the spillway will only pass 20 percent of the test flood.

Recommended additional investigations by the Owner include a detailed hydrologic-hydraulic study of spillway capacity, an investigation of structural stability of discharge channel and spillway walls and an investigation of seepage at the gate house foundation. Recommended remedial measures include the cutting of overgrown vegetation at the dam and discharge channel, the repair of locally eroded areas and voids in riprap, the removal of debris from the discharge channel and the attending to minor maintenance items at the spillway bridge and gate house. These recommendations and remedial measures as delineated in Section 7 of the report should be undertaken within one year of receipt of the report by the Owner.

CAMP DRESSER & McKee Inc.

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

JOSEPH A. MCELROY, MEMBER
Foundation & Materials Branch
Engineering Division

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

JOSEPH W. FINEGAN, JR., CHAIRMAN
Chief, Reservoir Control Center
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, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

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

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

Phase I Investigations are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the test flood is based on the estimated "probable maximum flood" for the region (greatest reasonably possible storm runoff), or a fraction thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.
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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
LAUREL LAKE DAM
MA 00263

SECTION 1: PROJECT INFORMATION

1.1 General

a. Authority - Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region.

Camp Dresser & McKee Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Massachusetts. Authorization and notice to proceed was issued to Camp Dresser & McKee Inc. under letters of 12 July 1978 and 23 October 1978 from Colonel John P. Chandler, Corps of Engineers. Contract No. DACW 33-78-C-0354 has been assigned by the Corps of Engineers for this work. Haley and Aldrich, Inc. has been retained by Camp Dresser & McKee Inc. for soils and geological portions of the work.

b. Purpose - The primary purpose of the investigation is to:

(1) Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

(2) Encourage and assist the States to initiate quickly five dam safety programs for non-Federal dams.

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

1.2 Description of Project

a. Location - The dam impounds the waters of Sargent Brook to form Laurel Lake. The dam is at the southeast corner of Laurel Lake in the Town of Lee, Massachusetts, as shown on the report's location map. Water discharged from the spillway joins the Housatonic River at the north end of the center of the town. The dam is 500 feet west of U.S. Route 20, 1 mile north of the
SECTION 7: ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition - The visual examination of the Laurel Lake Dam embankment did not reveal any evidence of failure, but it did disclose several deficiencies that should have near-term remedial treatment. In addition, the discharge channel wall exhibits local failures and one of the spillway wingwalls indicates movement has taken place. While failure of these walls may not directly cause a failure of the embankment due to the position of the discharge channel, the debris from such failures may further constrict the discharge channel causing higher lake levels and potential overtopping of the dam. The analysis of the spillway indicates that it is not capable of passing the test flood without overtopping the dam. Because of these, the dam is considered to be in only fair condition.

b. Adequacy of Information - Since there were no available drawings, all information for the Phase I Investigation had to be obtained from visual examination and limited measurements at the site. This information has been sufficient for the purpose of this investigation.

c. Urgency - The recommendations and remedial measures outlined in Sections 7.2 and 7.3 should be undertaken within one year of receipt of this report by the Owner.

d. Need for Additional Investigations - Additional investigations should be performed by the Owner as outlined in the following section.

7.2 Recommendations

It is recommended that the following additional investigations be performed by the Owner:

1. A detailed hydrologic-hydraulic investigation to determine the adequacy of the spillway and discharge channel and any necessary modifications to provide adequate capacity.

2. An in-depth investigation of the discharge channel and spillway walls to determine their structural stability and any necessary modifications to provide stable walls. This may require test excavations, surveys, borings and/or probings to determine the geometry of the walls.
SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations - There was no visible evidence of active dam embankment instability during the site examination on 7 September 1978. The slight flow appearing at the gatehouse showed no evidence of soil erosion or piping, and may not have been due to seepage through the embankment. The cracking along the upstream edge of the pavement does not appear to be recent; it may have been associated with past erosion of the upstream face.

The discharge channel walls do evidence signs of structural instability. Local failures have occurred in the stone masonry wall, toppling stones into the channel. The spillway left downstream concrete wingwall does indicate that movement has taken place.

b. Design and Construction Data - As far as is known, there is no available design or construction data on the Laurel Lake Dam embankment. Without information on the dam cross section and the physical properties of the earth fill, theoretical analyses of embankment structural stability are not possible.

The Laurel Lake Dam is not very high, and, in the absence of significant seepage, the relatively wide embankment would be expected to provide adequate stability under static loading conditions.

The absence of design data makes a theoretical analysis of the structural stability of discharge channel and spillway walls not possible. However, visual observations, as stated above, indicate that the structural stability of the walls is in question.

c. Operating Records - No operating records for the dam were located other than recent inspection reports by the state.

d. Post-Construction Changes - There are no available records of post-construction changes but it is understood that the riprap on the upstream face was placed in recent years, the spillway was rebuilt in 1932 and the downstream gatehouse was a later addition.

e. Seismic Stability - Laurel Lake Dam is located in Seismic Zone 1, and in accordance with recommended Phase I Guidelines, does not warrant seismic analysis.
The spillway capacity at top of dam (Elev. 980.5) is approximately 400 cfs. Additional analysis indicates that if the bridge over the spillway was removed or raised, the spillway capacity at top of dam would be about 510 cfs or 28 percent greater than under present conditions. While the bridge raising or removal would have more of an effect on spillway capacity at the test flood elevation, it could not pass more than one third of the test flood peak outflow.

f. Dam Failure Analysis - Dam failure analysis was performed to determine the magnitude of downstream hazards. A peak failure outflow of approximately 5,500 cfs was estimated based on a 20 percent breach width of the dam. The analysis indicates that Theresa Drive, which is approximately 1,400 feet downstream of the dam, would be overtopped by about 5 feet and at least 5 homes in the immediate vicinity would be flooded. U.S. Route 20, which is approximately 3,000 feet downstream of Theresa Drive, would be overtopped by about 2.5 feet and an additional 4 homes would be affected. The dam failure outflow would then enter the Housatonic River, causing flooding to homes and industries located immediately upstream of the U.S. Route 20 bridge over the Housatonic River. The potential loss of life is estimated to be greater than 10 persons. Accordingly, this dam is classified as having a "high" hazard potential.
SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. General - Laurel Lake is a natural occurring, spring-feed body of water. It is reported that the existing dam was constructed around 1900 in order to raise the water level by 3 to 4 feet, thus increasing the storage for use by the owner. The present dam is located approximately 500 feet downstream of the original lake with water depths of only about 4 feet upstream. During the early 1900's a channel was excavated between the dam and the original lake and a wooden conduit installed so that water could be withdrawn from the original lake during droughts. A maximum water depth of 7 feet was measured at the inlet structure of the existing dam.

b. Design Data - No hydraulic/hydrologic design data are available for the dam. Field measurements indicate 3'-6" of freeboard between the spillway crest and top of dam.

c. Experience Data - There are no records of past floods at the dam site. The most significant discharge, according to the dam operator's recollection, occurred on December 31, 1949 when approximately 1 foot of flow was observed at the spillway.

d. Visual Observations - The lake level was below spillway crest at the time of inspection and no flow was present over the spillway. A portion of the spillway approach which was exposed as a result of the low lake level had a moderate growth of weeds. The discharge channel contained a significant growth of weeds and was partially clogged with debris and large stones from the partially failed left channel wall.

e. Test Flood Analysis - Based upon the Corps of Engineers guidelines, the recommended test flood for the size (intermediate) and hazard potential (high) is the Probable Maximum Flood (PMF). The PMF was determined using Corps of Engineers guidelines for "Estimating Maximum Probable Discharge" in Phase I Dam Safety Investigations. The watershed terrain was determined to be rolling and an inflow rate of 2,025 cfs per square mile was adopted for the 2.8 square mile drainage area. The resulting PMF inflow is 5,700 cfs.

Surcharge-storage routing of the PMF inflow through Laurel Lake, which is approximately 10 percent of the total drainage area, resulted in a peak test flood outflow of 3,200 cfs at a surcharge pool elevation of 982.6. At this stage, the dam will be overtopped by approximately 2 feet. The portion of the test flood which discharges through the spillway is 659 cfs or approximately 20 percent of the test flood.
SECTION 4: OPERATIONAL PROCEDURES

4.1 Procedures - In general, there is no established routine for the operation of the dam.

4.2 Maintenance of the Dam - The dam and spillway receive minimal maintenance. There is no established formal procedure for the maintenance of the dam. The downstream face of the dam and the downstream channel from the spillway have become overgrown with weed and brush growth.

4.3 Maintenance of Operating Facilities - There is no formal procedure for the maintenance of operating facilities. While the intake structure appears to have received maintenance, the downstream gatehouse appears to have received no attention. The dam is visited two to three times per week and the bar rack is cleaned on an as needed basis. The gate valves on the transmission pipeline at the dam are kept in the open position.

4.4 Description of any Warning System in Effect - There is no established warning system or emergency preparedness plan in effect for this structure.

4.5 Evaluation - Formal operational procedures, maintenance programs, warning systems and emergency preparedness plans should be established for the dam. Periodic inspections should be made of the dam and tree and brush growth at the dam and spillway should be brought under control. Maintenance of the structure should be performed at regular intervals.
the top of the dam. The right side of the channel is ledge and the left side is a masonry wall. A portion of the wall has collapsed into the channel. At the time of inspection no discharge was occurring and the downstream channel was dry and overgrown with brush.

3.2 Evaluation

The Laurel Lake Dam appears to be performing satisfactorily at the present time. While a number of embankment deficiencies have been observed, there does not appear to be a significant potential for failure as long as the observed conditions do not deteriorate. The facility is generally in fair condition based on the overgrown downstream face of the embankment, the seepage at the gatehouse foundation, the local failures in the discharge channel walls and the obstructions present in the discharge channel.
(4) Stones have been locally toppled from the downstream stone masonry walls.

(5) There is slight water flow, with iron staining, appearing from beneath the downstream gate house, as shown in Photo 8. It is not known whether the flow passes through or under the embankment, or is associated with the outlet conduit.

(6) Local failures have occurred in the discharge channel walls causing stones to fall into the channel as shown in Photo 13.

(7) The discharge channel is overgrown with weeds and brush and contains debris as shown in Photo 13.

(8) The spillway downstream left wingwall has separated from the bridge abutment and is experiencing a degree of tilt. Erosion is present along the base of this wall.

c. Appurtenant Structures - The bridge over the spillway, as shown in Photo 12, is in good condition. The railing and bridge stringers are exhibiting areas of rust and need repainting. The concrete adjacent to the right bridge abutment bearings has cracked.

The downstream gatehouse shown in Photo 7 has essentially been abandoned. Windows are broken and debris and water are present on the floor. The door is in need of repainting.

The outlet works inlet structure and control manhole shown in Photos 10 and 11, respectively, are in excellent to good condition with only minor rusting being noted on the metal work. Minor deterioration of the inlet structure concrete was also observed.

d. Reservoir Area - The area around Laurel Lake is generally wooded and sparsely developed. There are approximately 17 structures located at or below elevation 980.0. Although the dam site is located in the Town of Lee, the northern portion of the lake is within the Town of Lenox.

The side slopes into the pond are highly variable and generally wooded. There is no significant potential for landslides into the pond which could create waves that might overtop the dam. No conditions were noted which could result in a sudden increase in sediment load into the pond.

e. Downstream Channel - The spillway discharge channel is approximately 8 feet to 10 feet wide with an invert about 12 feet below
SECTION 3: VISUAL INSPECTION

3.1 Findings

a. General - The visual examination of Laurel Lake Dam was conducted on 7 September, 1978.

In general, the dam and spillway were found to be in fair condition. The downstream face of the dam is overgrown, hindering a close examination. The discharge channel contains debris and the channel walls are experiencing structural difficulties. The downstream gatehouse has essentially been abandoned. Seepage was noted coming from the gatehouse foundation.

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

b. Dam - The earth embankment is generally in fair condition. There is no visual evidence of major settlement, lateral movement, seepage or erosion, but there has been cracking and local erosion along the upstream edge of the pavement, and the downstream embankment slope is obscured by heavy weed growth.

The discharge channel is also generally in fair condition. The discharge channel from the spillway is partially clogged with debris and tree and brush growth. The left stone masonry wall of the channel has a number of partially failed areas. The left concrete wall at the spillway itself exhibits deterioration and evidences some tilt.

The following specific items were noted:

(1) The upstream edge of the roadway pavement has numerous grass-filled cracks, as shown in Photos 3, 5 and 9. The pavement has also been undercut near the gate valve riser trunk, as shown in Photo 9, and there are bituminous patches and local surface sagging near the bridge.

(2) The downstream slope is irregular and has a heavy cover of weeds, as shown in Photos 4 and 6, that limits observation of the embankment condition.

(3) The upstream riprap is predominantly large angular pieces of rock (limestone), as shown in Photo 1, and has some gaps that have permitted local erosion of the underlying embankment. The riprap cover is particularly thin at the left end of the dam.
SECTION 2: ENGINEERING DATA

2.1 Design Records - There are no known design records for the dam.

2.2 Construction Records - No records of the original construction were located.

2.3 Operation Records - No operational records other than State inspection reports are available for the dam.

2.4 Evaluation - Since no engineering records are available, the evaluation of the dam must be based primarily on the results of the visual examination which is detailed in Section 3.
(7) Impervious Core-----------------------------Unknown
(8) Cutoff--------------------------------Unknown
(9) Grout Curtain-----------------------------Probably none

h. Diversion and Regulating Tunnel------------------------None

i. Spillway

(1) Type-----------------------------------Rectangular channel
(2) Length of weir-----------------------------26 ft.
(3) Crest elevation-----------------------------977.0 (Est.)
(4) Gates--------------------------------None
(5) U/S Channel--------------------------------None
(6) D/S Channel-----------------------------8 to 10 ft. wide and 5 to 6 ft. deep

j. Regulating Outlets - The regulating outlet for this structure consists of a 10-in. C.I. transmission line which conveys the flow approximately 1 mile to a downstream mill. The pipe inlet has a bar rack and gate valve on the upstream face of the dam. A second gate valve and 10-in. C.I. blow-off is located within the gatehouse on the downstream toe of the dam. Both valves are normally in the open position and the flow rate is regulated at the pressure filter located in the downstream mill. Maximum withdrawal is 1500 gpm. A 10 inch filter bypass to a clear well at the mill may be used as an alternate blow-off.
(8) Top of dam------------------------------------------980.5
(9) Test flood design surcharge------------------------982.6

d. Reservoir
(1) Length of test flood pool------------------------1.4 miles
(2) Length of recreation pool------------------------1.0 miles
(3) Length of flood control pool----------------------N/A

e. Storage (acre-feet)
(1) Recreation pool-------------------------------680 (Est.)
(2) Flood control pool-------------------------------N/A
(3) Spillway crest pool-------------------------------680 (Est.)
(4) Top of dam--------------------------------------1,400 (Est.)
(5) Test flood pool------------------------------1,895 (Est.)

f. Reservoir Surface (acres)
(1) Recreation pool-------------------------------170 (Est.)
(2) Flood-control pool-------------------------------N/A
(3) Spillway crest-----------------------------------170 (Est.)
(4) Test flood pool-------------------------------252 (Est.)
(5) Top dam----------------------------------------232 (Est.)

g. Dam
(1) Type------------------------------------------Earth embankment
(2) Length-------------------------------------Approx. 390 ft.
(3) Height-------------------------------------Approx. 12 ft.
(4) Top Width-----------------------------------20 to 25 ft.
(5) Side Slopes-------------------Irregular, Typ. 2:1 or flatter U/S and D/S except where vert. walls
(6) Zoning----------------------------------------Unknown
shown on the USGS quadrangle, Stockbridge, Mass., 1973, was adopted as being the spillway crest elevation. All other elevations given in this report pertaining to the dam site were estimated from the assumed spillway crest elevation.

a. Drainage Area - The drainage area tributary to the dam site is 2.8 square miles. The rolling terrain surrounding the watershed is moderately forested and lightly developed. Laurel Lake accounts for approximately 10 percentage of the total drainage area.

b. Discharge at Dam Site - The maximum known reservoir level was approximately 1 foot above spillway crest on December 31, 1949.

(1) Outlet works size-----------------------------10-in C.I.
(2) Maximum known flood at damsite-------------------Unknown
(3) Ungated spillway capacity at top of dam. 400 cfs at elevation 980.5
(4) Ungated spillway capacity at test flood elevation. 659 cfs at elevation 982.6
(5) Gated spillway capacity at normal pool elevation-------N/A
(6) Gated spillway capacity at test flood elevation-------N/A
(7) Total spillway capacity at test flood elevation. 659 cfs at elevation 982.6
(8) Total project discharge at test flood elevation. 3,200 cfs at elevation 982.6

c. Elevation (ft. above MSL)

(1) Streambed at centerline of dam----------------------969 (Est.)
(2) Test flood tailwater-----------------------------Unknown
(3) Upstream portal invert diversion tunnel-------------N/A
(4) Recreation pool-------------------------------977.0
(5) Full flood control pool----------------------------N/A
(6) Spillway crest----------------------------------977.0
(7) Design surcharge (Original Design)----------------Unknown
c. Size Classification - The hydraulic height of the dam is approximately 12 feet and the estimated total storage capacity at the top of dam is 1,400 acre-feet. According to guidelines established by the Corps of Engineers, the dam is classified in the intermediate category based on the storage capacity.

d. Hazard Classification - The results of the dam failure analysis indicate that a minimum of 9 homes would be affected by the flood wave and the potential loss of life would be greater than 10 persons. Consequently, the dam is the "high" hazard classification.

e. Ownership - The dam is owned by the Kimberly Clark Corp. The Owner's address is: Kimberly Clark Corp., Lee, MA 01238 (Phone: 413/243-1063). Mr. Edward Ochtman, Manager, at the same address is the Owner's representative. Prior owners of the dam include the Peter J. Schweitzer Corp. (before becoming a part of the Kimberly Clark Corp.) and the Smith Paper Company.

f. Operator - Mr. George E. Frulla is assigned the responsibility for the operation of the dam. His address is: Kimberly Clark Corporation, Lee, MA 01238 (Phone: 413/243-1063).

g. Purpose of Dam - The water impounded by the dam is used for processing at a local mill. Laurel Lake is currently being used for recreational purposes also.

h. Design and Construction History - There are no records of the design or construction of this dam. Discussions with local residents indicate that the dam was constructed around the year 1900. The dam increased the storage capacity of Laurel Lake. The spillway at the dam was rebuilt in approximately 1932. In 1968, riprap was placed on the upstream face of the dam.

i. Normal Operational Procedure - There is no established procedure for the operation of the dam. The spillway has a fixed weir crest and requires no adjustment. The condition of the spillway, discharge channel, main dam embankment and the downstream gatehouse indicate little maintenance is performed on a routine basis. The dam is visited two to three times per week and the bar rack is cleaned on an as need basis.

Water is continuously withdrawn by the owner 24 hours per day, 365 days per year. A 10-in. C.I. transmission line conveys the water to a series of pressure filters located at the mill.

1.3 Pertinent Data - There are no known elevations previously established at the dam site. Consequently, the water surface elevation of 977
center of the Town of Lee and 1/2 mile south of the Lee-Lenox boundary line. A private road from U.S. Route 20 passes over the dam and spillway.

b. Description of Dam and Appurtenances - Laurel Lake Dam consists of an earth dam with a rock and concrete spillway at the right abutment. The length of the dam, not including the spillway, is approximately 390 feet. The length of the spillway crest is approximately 26 feet.

The dam embankment is approximately 12 feet high at its maximum point. It has a somewhat irregular cross section. The crest width is approximately 20 to 25 feet and has an 18 to 20 foot wide paved private road. The main portion of the upstream slope contains dumped riprap consisting of large rocks, approximately 3 feet by 5 feet. The riprap apparently covers over an older wall.

A concrete retaining wall is present along the upstream face for approximately the last 100 feet at the west end of the dam. The downstream slope is irregular with roughly a 2 to 1 slope at the ends of the embankment and in the upper regions of the higher portions of the embankment. The lower regions of the downstream slope at the center of the embankment contain a fieldstone retaining wall. Grass, weed and brush growth is present on the downstream slope with tree growth in the lower portions.

The spillway has a concrete weir at its entrance with an elevation at approximately the bottom of the spillway channel. In the area of the dam, the spillway channel appears to be natural ledge rock. The channel walls in the region of the dam are concrete. The private roadway is carried across the spillway on a steel and concrete roadway bridge. The downstream channel from the spillway is lined with fieldstone walls in a state of partial collapse.

An inlet structure is present on the upstream face of the dam approximately at its midpoint. The intake consists of a bar rack in a small reinforced concrete structure and a valve in a steel manhole at the upstream edge of the crest. Water is piped from this manhole through a 10-in. C.I. pipe to a concrete block gatehouse at the downstream face of the dam. The 20 foot by 20 foot by 10 foot high gatehouse contains a 10-in. gate valve and a 10-in. blow-off pipe which discharges through the sidewalk of the structure. Water is conveyed by gravity from the gatehouse to the mill which is approximately 1 mile downstream.
3. An investigation of the seepage visible at the gatehouse foundation to determine its origin and effect, if any, on the dam embankment.

7.3 Remedial Measures

a. Operation and Maintenance Procedures - It is recommended that the following remedial work be undertaken by the Owner to correct deficiencies noted during the visual examination:

1. Cut grass and weeds on the embankment at least once a year, to permit observation of slope conditions and potential seepage locations. Remove trees including their stumps from the downstream toe and backfill the resulting voids.

2. Repair any locally eroded areas in the embankment, and place additional riprap as necessary to fill gaps between the existing riprap stones; this work should include the areas at the left end of the dam and at the gate valve manhole.

3. Remove brush and debris from the discharge channel and cut and remove overhanging trees.

4. Provide maintenance on appurtenant structures including replacement or shuttering of windows and repainting of steel and wood at the spillway bridge, gatehouse and outlet work intake.

Until the slight water flow at the gatehouse and the erosion and pavement cracking along the upstream edge of the dam can be shown to be unchanging long-term conditions and adequate spillway capacity is ensured, it is recommended that the Owner provide surveillance of the Dam during periods of unusually high precipitation or high lake levels. The Owner should also develop a formal maintenance program, formal operational procedures, and a formal emergency procedures plan and warning system in cooperation with local officials in downstream communities. Finally, it is recommended that the Owner establish a formal program of annual technical inspections.

7.4 Alternatives - Not applicable.
APPENDIX A

INSPECTION TEAM ORGANIZATION AND CHECK LIST

VISUAL INSPECTION PARTY ORGANIZATION

Page No.

VISUAL INSPECTION CHECK LIST

Dam Embankment
Spillway
Outlet Works
Hydrologic-Hydraulic Considerations
Field Inspection Sketch

Page No.
A-1
A-2
A-3 & 4
A-5
A-6
A-7
VISUAL INSPECTION PARTY ORGANIZATION
NATIONAL DAM INSPECTION PROGRAM

DAM: Laurel Lake

DATE: 7 September, 1978

TIME: 11:15 a.m.

WEATHER: Partly cloudy-65-70°F - Light to medium N.W. wind

WATER SURFACE ELEVATION UPSTREAM: 12-1/2" below spillway crest

STREAM FLOW: None over spillway

INSPECTION PARTY:
1. Roger H. Wood - Structural & Operations - CDM
2. Charles E. Fuller - Hydraulics-Hydrology - CDM
4. Peter LeCount - Soils - H & A
5. ____________
6. ____________

PRESENT DURING INSPECTION:
1. George E. Frulla - Kimberly Clark Corp.
2. ____________
3. ____________
4. ____________
<table>
<thead>
<tr>
<th>CHECK LIST</th>
<th>CONDITION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>b. Not obvious except slope cut back slightly (1-2 ft.) at left end of rip rap; possible local loss between stones.</td>
</tr>
<tr>
<td></td>
<td>c. Rock Slope Protection: Riprap failures; possible local loss between stones.</td>
</tr>
<tr>
<td></td>
<td>d. Animal Burrows</td>
</tr>
<tr>
<td>2. Crest</td>
<td>2. Grass in pavement cracks.</td>
</tr>
<tr>
<td></td>
<td>b. Few local pavement sags at edges.</td>
</tr>
<tr>
<td></td>
<td>c. Extensive grass-filled cracking on upstream side of pavement.</td>
</tr>
<tr>
<td></td>
<td>d. Cracks &amp; pavement patches &amp; sags indicate local movements/settlement.</td>
</tr>
<tr>
<td></td>
<td>(Typically cracks&lt;1 in. wide &amp; sags 1-2 in.); do not appear recent.</td>
</tr>
<tr>
<td>3. Downstream Slope</td>
<td>3. Heavy grass &amp; weed cover</td>
</tr>
<tr>
<td></td>
<td>b. Local minor erosion where pavement runs off; stone masonry wall locally partly collapsed.</td>
</tr>
<tr>
<td></td>
<td>c. Not evident*</td>
</tr>
<tr>
<td></td>
<td>d. Not evident*</td>
</tr>
<tr>
<td></td>
<td>e. Not evident*</td>
</tr>
<tr>
<td></td>
<td>f. Slight seepage from below bldg. at toe of embankment, has iron stain.*</td>
</tr>
<tr>
<td></td>
<td>g. Not evident*</td>
</tr>
<tr>
<td></td>
<td>h. None observed</td>
</tr>
<tr>
<td></td>
<td>i. None observed</td>
</tr>
<tr>
<td>4. General</td>
<td>4. a., b., c. Slopes very irregular &amp; pavement slightly irregular, but no indication of significant overall movement out of alignment.</td>
</tr>
<tr>
<td></td>
<td>d. Slight settlement behind bridge abutment (2-4 in. max.) and around steel chamber at drain.</td>
</tr>
<tr>
<td></td>
<td>e. Pavement cracks may indicate movement of upstream wall; downstream masonry walls locally collapsed.</td>
</tr>
<tr>
<td></td>
<td>f. Few foot paths on slopes</td>
</tr>
<tr>
<td></td>
<td>g. None evident</td>
</tr>
</tbody>
</table>

*Difficult to observe. APPENDIX A-2
<table>
<thead>
<tr>
<th>CHECK LIST</th>
<th>CONDITION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Approach Channel</strong>&lt;br&gt;a. General Condition&lt;br&gt;b. Obstructions&lt;br&gt;c. Log Boom etc.</td>
<td>1.&lt;br&gt;a. Good condition–Brush Right Side&lt;br&gt;b. None observed&lt;br&gt;c. None observed</td>
</tr>
<tr>
<td><strong>2. Weir</strong>&lt;br&gt;a. Flashboards&lt;br&gt;b. Weir Elev. Control (Gate)&lt;br&gt;c. Vegetation&lt;br&gt;d. Seepage or Efflorescence&lt;br&gt;e. Rust or Stains&lt;br&gt;f. Cracks&lt;br&gt;g. Condition of Joints&lt;br&gt;h. Spalls, Voids or Erosion&lt;br&gt;i. Visible Reinforcement&lt;br&gt;j. General Struct. Condition</td>
<td>2.&lt;br&gt;a. None observed&lt;br&gt;b. None observed&lt;br&gt;c. Grass and weeds in invert.&lt;br&gt;d. No major efflorescence&lt;br&gt;e. None observed&lt;br&gt;g. Invert has shotcrete cover–some cracks&lt;br&gt;h. Loose areas and some spalls in invert&lt;br&gt;i. None observed&lt;br&gt;j. Good condition–There is no formal weir; it is more of an outlet channel</td>
</tr>
</tbody>
</table>
### VISUAL INSPECTION CHECK LIST
#### NATIONAL DAM INSPECTION PROGRAM

**DAM:** Laurel Lake  
**DATE:** Sept. 7, 1978

<table>
<thead>
<tr>
<th>CHECK LIST</th>
<th>CONDITION</th>
</tr>
</thead>
</table>
| 1. Approach Channel  
  a. General Condition  
  b. Obstructions  
  c. Log Boom etc. | 4. b.  
  (1) None observed  
  (2) No major efflorescence  
  (3) None observed  
  (4) Shrinkage cracks—see also 4a(4)  
  (5) Good  
  (6) Minor chips and spalls  
  (7) None observed  
  (8) Good condition |

2. Weir  
  a. Flashboards  
  b. Weir Elev. Control (Gate)  
  c. Vegetation  
  d. Seepage or Efflorescence  
  e. Rust or Stains  
  f. Cracks  
  g. Condition of Joints  
  h. Spalls, Voids or Erosion  
  i. Visible Reinforcement  
  j. General Struct. Condition

3. Discharge Channel  
  a. Apron  
  b. Stilling Basin  
  c. Channel Floor  
  d. Vegetation  
  e. Seepage  
  f. Obstructions  
  g. General Struct. Condition

4. Walls  
  a. Wall Location _____  
     (1) Vegetation  
     (2) Seepage or Efflorescence  
     (3) Rust or Stains  
     (4) Cracks  
     (5) Condition of Joints  
     (6) Spalls, Voids or Erosion  
     (7) Visible Reinforcement  
     (8) General Struct. Condition  
  b. Wall Location Rt. end of Dam

5. Bridge over Spillway

APPENDIX A-4
# VISUAL INSPECTION CHECK LIST
## NATIONAL DAM INSPECTION PROGRAM

**DAM:** Laurel Lake

**DATE:** September 7, 1978

<table>
<thead>
<tr>
<th>CHECK LIST</th>
<th>CONDITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Inlet</td>
<td></td>
</tr>
<tr>
<td>a. Obstructions</td>
<td>a. None observed</td>
</tr>
<tr>
<td>b. Channel</td>
<td>b. Small channel - Intake 4 feet from face of dam.</td>
</tr>
<tr>
<td>d. Screens</td>
<td>d. Bar screen - rusted</td>
</tr>
<tr>
<td>e. Stop Logs</td>
<td>e. None observed</td>
</tr>
<tr>
<td>f. Gates</td>
<td>f. Gate valve in MH</td>
</tr>
<tr>
<td>2. Control Facility</td>
<td></td>
</tr>
<tr>
<td>b. Screens</td>
<td>b. None observed</td>
</tr>
<tr>
<td>c. Stop Logs</td>
<td>c. None observed</td>
</tr>
<tr>
<td>d. Gates</td>
<td>d. One gate on pipe</td>
</tr>
<tr>
<td>e. Conduit</td>
<td>e. Pipe</td>
</tr>
<tr>
<td>f. Seepage or Leaks</td>
<td>f. Seepage from D/S end of Bldg. Fndn.</td>
</tr>
<tr>
<td>3. Outlet</td>
<td></td>
</tr>
<tr>
<td>a. Structure</td>
<td>3. N/A</td>
</tr>
<tr>
<td>b. Erosion or Cavitation</td>
<td></td>
</tr>
<tr>
<td>c. Obstructions</td>
<td></td>
</tr>
<tr>
<td>d. Seepage or Leaks</td>
<td></td>
</tr>
<tr>
<td>4. Mechanical and Electrical</td>
<td></td>
</tr>
<tr>
<td>a. Crane Hoist</td>
<td></td>
</tr>
<tr>
<td>b. Hydraulic System</td>
<td></td>
</tr>
<tr>
<td>c. Service Power</td>
<td></td>
</tr>
<tr>
<td>d. Emergency Power</td>
<td></td>
</tr>
<tr>
<td>e. Lighting</td>
<td></td>
</tr>
<tr>
<td>f. Lightning Protection</td>
<td>No lighting or mechanical equipment currently in use. Pump present in bldg but motor has been removed.</td>
</tr>
</tbody>
</table>
## VISUAL INSPECTION CHECK LIST
### NATIONAL DAM INSPECTION PROGRAM

**DAM:** Laurel Lake  
**DATE:** 7 September 1978

### HYDROLOGIC-HYDRAULIC CONSIDERATIONS:

<table>
<thead>
<tr>
<th>CHECK LIST</th>
<th>CONDITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Upstream Watershed</td>
<td></td>
</tr>
<tr>
<td>a. Type of Terrain</td>
<td></td>
</tr>
<tr>
<td>b. Hydrologic Controls</td>
<td></td>
</tr>
<tr>
<td>2. Reservoir</td>
<td></td>
</tr>
<tr>
<td>a. Type of Terrain</td>
<td></td>
</tr>
<tr>
<td>b. Development</td>
<td></td>
</tr>
<tr>
<td>3. Spillway</td>
<td></td>
</tr>
<tr>
<td>a. Adjacent Low Points</td>
<td></td>
</tr>
<tr>
<td>b. Spillway Approach (Slope)</td>
<td></td>
</tr>
<tr>
<td>c. Spillway Discharge (Slope)</td>
<td></td>
</tr>
<tr>
<td>d. Spillway Type</td>
<td></td>
</tr>
<tr>
<td>4. Downstream Watershed</td>
<td></td>
</tr>
<tr>
<td>a. Reach No. 1</td>
<td></td>
</tr>
<tr>
<td>(1) Control (Bridge, dam, culvert, etc.)</td>
<td>1. Rolling terrain, moderately wooded</td>
</tr>
<tr>
<td>(2) Channel Characteristics</td>
<td></td>
</tr>
<tr>
<td>(3) Development</td>
<td></td>
</tr>
<tr>
<td>(4) Visible Utilities</td>
<td></td>
</tr>
<tr>
<td>(5) Special Problems</td>
<td></td>
</tr>
<tr>
<td>b. Reach No. 2</td>
<td></td>
</tr>
<tr>
<td>(1) Control (Bridge, dam, culvert, etc.)</td>
<td>1. None; one inlet stream</td>
</tr>
<tr>
<td>(2) Channel Characteristics</td>
<td></td>
</tr>
<tr>
<td>(3) Development</td>
<td></td>
</tr>
<tr>
<td>(4) Visible Utilities</td>
<td></td>
</tr>
<tr>
<td>(5) Special Problems</td>
<td></td>
</tr>
</tbody>
</table>

### APPENDIX A-6

- **1.**  
  - a. Rolling terrain, moderately wooded  
  - b. None; one inlet stream

- **2.**  
  - a. Steeply sloped along southwest shoreline and moderate to midly sloped along remainder  
  - b. Approx. 17 cottages and homes along shoreline.

- **3.**  
  - a., b., c. See Field Sketch  
  - d. Rectangular channel under bridge, 26 ft. wide by 13 ft. long.

- **4.**  
  - a. Dam to Theresa Dr.  
  - (1) Theresa Dr. culvert: oval shaped steel pipe, 9-5" wide by 5'-0" high and 50 ft. long.  
  - (2) Channel dry and overgrown with weeds and brush, overbanks wooded.  
  - (3) Two new homes at Theresa Dr.  
  - (4) Telephone and electrical  
  - (5) None  
  - b. Theresa Dr. to Rte. 20  
  - (1) 10'-6" wide by 5'-0" wide box culvert approx. 75 ft. long.  
  - (2) Same as 4.a(2)  
  - (3) 6 homes along Rte. 20  
  - (4) None observed  
  - (5) None observed
APPENDIX B

LIST OF AVAILABLE DOCUMENTS AND PRIOR INSPECTION REPORTS

LIST OF AVAILABLE DOCUMENTS

None Available

PRIOR INSPECTION REPORTS

<table>
<thead>
<tr>
<th>DATE</th>
<th>BY</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>January 29, 1974</td>
<td>Mass. Dept. of Public Works</td>
<td>B-1</td>
</tr>
<tr>
<td>November 16, 1976</td>
<td>Mass. Dept. of Public Works</td>
<td>B-4</td>
</tr>
</tbody>
</table>
L-168

INSPECTION REPORT - DAMS AND RESERVOIRS

1. Location: XXX/Town _______. Dam No. 1-2-3-4-5-6-7.
   Name of Dam: Laurel Lake. Inspected by: RDJordan-PFFezzie.
   Date of Inspection: 1/29/74.

2. Owner/s: per: Assessors _______. Reg. of Deeds _______. Pers. Contact _______.
   Prev. Inspection: __________.

   1. P J Schweitzer Div. Kimberly Clark Corp Lee, MA 203-1000
      Name: St. & No.: City/Town State Tel. No.
   2. Name: St. & No.: City/Town State Tel. No.
   3. Name: St. & No.: City/Town State Tel. No.

3. Carriker [if any] e.g. superintendent, plant manager, appointed by absentee
   owner, appointed by multi owners.
   Name: St. & No.: City/Town State Tel. No.

4. No. of Pictures taken: 3.

5. Degree of Hazard: [if dam should fail completely]*
   1. Minor _______. 2. Moderate _______.
   3. Severe X _______. 4. Disastrous _______.
   *This rating may change as land use changes [future development]

   Operative X _______. yes: _______. no.
   Comments: ________________________________
   ________________________________

   upstream race or Dem: Condition:
   1. Good X _______. 2. Minor Repairs _______.
   Comments: ________________________________
   ________________________________

APPENDIX B-1
   3. Major Repairs
   Comments:

   Comments:

10. Water level & time of inspection: 0.3 ft. above  below  
    top of dam  
    principal spillway  
    other

11. Summary of Deficiencies Noted:
    Growth [Trees and Brush] on Embankment  
    Animal Burrows and Washouts  
    Damage to slopes or top of dam  
    Cracked or Damaged Masonry  
    Evidence of Seepage  
    Evidence of Piping  
    Erosion  
    Leaks  
    Trash and/or debris in leading flow  
    Clogged or blocked spillway  
    Other

APPENDIX B-2
12. Remarks & Recommendations: [Fully Explain]

The brush on the downstream slope has not been removed. This condition was reported in 1972. This brush should be removed to allow for easier inspection. A section of the easterly dry stone masonry channel wall is beginning to tip. This section is located approximately 30' below the spillway. The collapse of the wall would block channel and cause sloughing in the embankment. In the event that this occurred there would be no danger of the dam failing; as the embankment is very wide in this area. However, to avoid costly repairs in the channel, the condition should be corrected. The spillway and embankment sections of the dam appear to be in good shape. No cracks or sloughing was noted.

In my opinion, this dam is safe.

The description of this structure was submitted in 1972. There are no changes to be noted.

For location, see Topo Sheet 2-D.

13. Overall Condition:

1. Safe X
2. Minor repairs needed
3. Conditionally safe - major repairs needed
4. Unsafe
5. Reservoir impoundment no longer exists [explain]
   Recommend removal from inspection list

APPENDIX B-3
INSPECTION REPORT - DAMS AND RESERVOIRS

1. Location: [Town/Lake] [Dam No.] 1-2-150-7
   Name of Dam: Laurel Lake
   Inspected by: RD Jordan - PSpaniel
   Date of Inspection: 11-16-76

2. Owner/s: per: Assessors
   Reg. of Deeds: Pers. Contact

3. Caretaker [if any] e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.
   Name St. & No. City/Town State Tel. No.

4. No. of Pictures taken: 2

5. Degree of Hazard: [if dam should fail completely]
   1. Minor
   2. Moderate
   3. Severe X
   4. Disastrous
   *This rating may change as land use changes [future development]

   Operative: yes: no:
   Comments:

7. Upstream face of Dam: Condition:
   1. Good X
   2. Minor Repairs
   3. Major Repairs
   4. Urgent Repairs
   Comments:

APPENDIX B-4
APPENDIX D-3
ELEVATIONS

There is no known datum established at dam site, therefore, assume spillway crest elev = W.S. El. shown on USGS Quad.

Spillway Crest Elev = 9170
Top of Dam Elev = 992.50

SURFACE AREA (from USGS Quad: STROUDGE, MA. 1973)

D. A. = 19.55 \(\text{sq} \text{mi} = 100 \text{acres} = 2.8 \text{m}^2\)

Surface Area at W.S. El 9170 = 1.85 \(\text{sq m} = 120 \text{ac.} = 4.81 \text{m}^2\)

Surface Area at W.S. El 992.50 = 2.53 \(\text{sq m} = 2.22 \text{ac.} = 0.86 \text{m}^2\)

Surface Area at W.S. El 990.0 = 3.28 \(\text{sq m} = 3.10 \text{ac.} = 1.28 \text{m}^2\)

STORAGE VOLUMES

At Spillway Crest: 1700 ac. \(\times \frac{12}{4} \) avg. depth \(\times \frac{1}{2} = 660 \text{ ac-ft}\)
At Top of Dam: 660 \(+ \frac{120}{120} \times 232 \times 0.50\)

= 660 + 60 \times 1/4 = 700 \text{ ac-ft.}
At El. 990: \(660 \times \frac{232 + 300}{2} \times 0.50 = 400 \text{ ac-ft.}\)

SUE CLASSIFICATION

Hydraulic Ht. = 12 ft.
Storage & Top of Dam = 1400 ac-ft.

HAZARD CLASSIFICATION


Dan failure analysis (pages 1 of 4 thru 4 of 4) indicates that at least 4 homes would be inundated with the project, less to 10 being >10... HIGH Hazard

TEST FLOOD

Intermediate Sue & High Hazard \(\rightarrow\) TEST FLOOD = PMF

APPENDIX D-2
APPENDIX D
OUTLINE OF DRAINAGE AREA AND
HYDRAULIC COMPUTATIONS

OUTLINE OF DRAINAGE AREA

Drainage Area Map ........................................ D-1

COMPUTATIONS

Elevations; Surface Areas; Storage Volume; Size Classification; Hazard Potential Classification;
Test Flood ................................................... D-2
Spillway Sketches and Discharge Capacity .................. D-3
Spillway Capacity (cont.) .................................. D-4
Storage Curve; Spillway Rating Curve ....................... D-5
PMF Determination; Surcharge-Storage Routing and Evaluation ........................................ D-6
Dam Failure Analysis ......................................... D-7-10
12. SPILLWAY APPROACH CHANNEL AND BRIDGE OVER SPILLWAY.

13. VIEW TOWARDS SPILLWAY BRIDGE FROM DOWNSTREAM CHANNEL. NOTE CHANNEL WALL FAILURES.

APPENDIX C-7
10. BAR RACK AT INLET STRUCTURE.

11. VALVE AT INLET STRUCTURE.
8. SEEPAGE AT DOWNSTREAM FOUNDATION OF GATEHOUSE.

9. INLET STRUCTURE AT UPSTREAM FACE OF DAM.
6. DOWNSTREAM FACE OF DAM BEHIND GATEHOUSE.

7. GATEHOUSE.

APPENDIX C-4
4. DOWNSTREAM FACE OF DAM.

5. OVERVIEW OF LAUREL LAKE FROM DAM.
2. UPSTREAM FACE OF DAM FROM RIGHT ABUTMENT. SPILLWAY IN FOREGROUND.

3. UPSTREAM FACE OF DAM FROM LEFT ABUTMENT.
Plan Of Laurel Lake Dam

Note: The circled numbers denote direction of view and photograph number.

National Program of Inspection of Non-Federal Dams
Location of Photographs
Laurel Lake Dam
Lee, Massachusetts
APPENDIX C

SELECTED PHOTOGRAPHS OF PROJECT

<table>
<thead>
<tr>
<th>No.</th>
<th>Title</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Overview of Upstream Face of Dam</td>
<td>C-2</td>
</tr>
<tr>
<td>2.</td>
<td>Upstream Face of Dam from Right Abutment</td>
<td>C-2</td>
</tr>
<tr>
<td>3.</td>
<td>Upstream Face of Dam from Left Abutment</td>
<td>C-2</td>
</tr>
<tr>
<td>4.</td>
<td>Downstream Face of Dam</td>
<td>C-3</td>
</tr>
<tr>
<td>5.</td>
<td>Overview of Laurel Lake from Dam</td>
<td>C-3</td>
</tr>
<tr>
<td>6.</td>
<td>Downstream Face of Dam Behind Gate House</td>
<td>C-4</td>
</tr>
<tr>
<td>7.</td>
<td>Gate House</td>
<td>C-4</td>
</tr>
<tr>
<td>8.</td>
<td>Seepage at Downstream Foundation of Gate House</td>
<td>C-5</td>
</tr>
<tr>
<td>9.</td>
<td>Inlet Structure at Upstream Face of Dam</td>
<td>C-5</td>
</tr>
<tr>
<td>10.</td>
<td>Bar Rack at Inlet Structure</td>
<td>C-6</td>
</tr>
<tr>
<td>11.</td>
<td>Valve at Inlet Structure</td>
<td>C-6</td>
</tr>
<tr>
<td>12.</td>
<td>Spillway Approach Channel and Bridge over Spillway</td>
<td>C-7</td>
</tr>
<tr>
<td>13.</td>
<td>View Towards Spillway Bridge from Downstream Channel</td>
<td>C-7</td>
</tr>
</tbody>
</table>
The heavy brush reported in 1974 has been removed. The embankment appears to be stable, there is no visible evidence of settlement or sloughing.

Approximately 15' of the easterly channel wall below the spillway has collapsed and another 20' will fall in the near future. The easterly wing wall at the spillway bridge is tipped. The failure of the wall has caused a partial blockage of the channel and some erosion of the embankment.

The owner should be advised to clear the channel, repair the wall and take steps to prevent the possible future failure of the wing wall.

As previously reported, the wall failure does not endanger the dam as the embankment is very wide in this area.

For location see Topo Sheet 2-D.

13. Overall Condition:
   1. Safe X
   2. Minor repairs needed X
   3. Conditionally safe - major repairs needed
   4. Unsafe
   5. Reservoir impoundment no longer exists [explain]
      Recommend removal from inspection list

APPENDIX B-6

Comments:________________________________________


Comments:________________________________________

10. Water level 9 time of inspection: ___ ft. above ___. below ___.

   top of dam___

   principal spillway___

   other___

71. Summary of Deficiencies Noted:

   Growth [Trees and Brush] on Embankment___

   Animal Burrows and Nesting___

   Damage to slopes or top of dam___

   Cracked or Damaged Masonry___

   Evidence of Seepage___

   Evidence of Piping___

   Erosion___

   Leaks___

   Trash and/or debris impeding flow___

   Clogged or blocked spillway___

   Other___

APPENDIX B-5
\[ h = 1065.0 - 916.0 = 430.0 \quad e = 975.0 - 976.0 = 10 \]

\[ A = \frac{23.2}{2} \times 1 \frac{1}{2} = \frac{68.5}{2} \]

\[ Q = 0.41 \times 65 \times \left[ \frac{64.4(100-10)}{2} \right]^{\frac{1}{2}} = 400 \text{ cfs} \]

<table>
<thead>
<tr>
<th>W.S. Elevation (ft)</th>
<th>Head (ft)</th>
<th>Flow (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>980.50</td>
<td>4.5</td>
<td>400</td>
</tr>
<tr>
<td>981.00</td>
<td>5.5</td>
<td>402</td>
</tr>
<tr>
<td>982.00</td>
<td>1242</td>
<td>6.0</td>
</tr>
<tr>
<td>983.00</td>
<td>850</td>
<td>6.0</td>
</tr>
<tr>
<td>984.00</td>
<td>7236</td>
<td>8.0</td>
</tr>
</tbody>
</table>

\[ Q = \frac{1}{2} \times 1 \frac{1}{2} \]

\[ L = 26 \text{ ft} \]

\[ (t) \quad \text{Assume abutments are extended vert.} \]
PMF Determination

Drainage Area = 2.8 m², Rolling Terrain

From CEE Guidelines for Estimating PMF Indexes:

\[ \text{Surcharge} = \frac{Q_i}{(1 + \text{SCR})} \text{ where } R.C. = 17'' \text{ and } Q_i = 5700 \text{ cfs} \]

\[ \text{SCR} = 17'' \left( \frac{1}{1 - \frac{Q_i}{1000}} \right) \]

<table>
<thead>
<tr>
<th>( Q_i (\text{cfs}) )</th>
<th>( \text{SCR} (\text{in}) )</th>
<th>( \text{SCR} (\text{ft}) )</th>
<th>( \text{SCR} ) (foot)</th>
<th>( \text{EVI} ) (foot)</th>
<th>( \text{EVI} ) (foot)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4000</td>
<td>60.67</td>
<td>2.07</td>
<td>109.1</td>
<td>982.05</td>
<td>982.05</td>
</tr>
<tr>
<td>3500</td>
<td>72.83</td>
<td>2.41</td>
<td>109.7</td>
<td>983.05</td>
<td>983.00</td>
</tr>
<tr>
<td>3000</td>
<td>90.00</td>
<td>3.00</td>
<td>136.6</td>
<td>983.00</td>
<td>983.00</td>
</tr>
</tbody>
</table>

When the above are plotted on the Stage-Discharge curve, the resulting outflow is 5700 cfs and the corresponding storage is 12.15 x 680 = 8355 cfs.

Evaluation

Test Flood Inflow = 5700 cfs
Test Flood Outflow = 3200 cfs
Res. Flood Surcharge = 16.6 = 982.60

Low point of dam will be overtopped by

982.0 - 980.50 = 1.5 ft.

Spillway capacity at test flood cfs = 982.0

\[(524 - 478) \times 0.6 + 478 = 506 \text{ cfs}\]
DAM FAILURE ANALYSIS

Downstream toe of embankment is 12 ft. max. Below top of dam. All outlets W.S. were 5 ft. below top of dam and water depth ~ 7 ft. max. 7 = 12 ft.

Length of dam net, including spillway is 290 ft.
However, water depths U/S are reported to be 1 ft.
with W/S & spillway crest for approx. 200 ft.
except for excavated channel to outlet. Assume:
Ww = 20% L = 60 x 80 = 72 ft.

Then Qw = 9.27 x (72) x (22.2) x (12) = 3,450 cfs

Reach No. 1
Dan to Theresa Drive ~ 1/4 mi.

From
Field
Insp.

Outlet Length ~ 50 ft.

Flood Q, with U.S. W.S. ~ 9500 ft. L.S. W.S. ~ 9470

\[ Q = CA_0 \left( \frac{2}{1 + \frac{C_2 x 293}{1802}} \right) \]

where
\[ C = 0.7 \]
\[ A_0 = (0.7954)(9.42)(10) = 370 ft^2 \]
\[ h = 37 \]
\[ R = 0.05 \]
\[ L = 50 ft \]
\[ L_2 = 37 \left( 9.42^2 + 5/2 \right)^{1/2} = 156 \]
\[ Q = 69.2 \left[ \frac{(6.25)(0.5)}{1.52 \times 1} \right]^{1/2} = 432. cfs \]

APPENDIX D-7
Natural Cross Section 1/5 of Theresa Drive from 1355 Quartz

\[ Q_h = 3480 \text{ cfs} \]

Say exact capacity with flow over road 450 cfs

\[ Q_w = C\times H^{1/4} \]

where \( C = 2.6 \)
\( L = 100 \text{ ft} \)
\( H = \text{unknown} \)

Then \( H = \left( \frac{Q_w}{CL} \right)^{1/2} = \left( \frac{5000}{2.6 \times 100} \right)^{1/2} = 5 \text{ ft} \)

Then W.S. ELEV = 950.0

6 From 1355 Quartz, no structures are located at or below.

But 9500 cfs at Theresa Dr. However, field inspection indicated two new homes which do not show on.

Good shot (under const. adjacent to cubicle) but that would be affected.

6 Immediately 1/5 of Theresa Dr. There are 6 homes at or below. Brev 1850 according to W.S. Quartz.

REACH NO. 2: 1st sec. N 300' 1/5 of Theresa Drive

\[ Q = N.H.A. \times H^{5/2} \]
\( A = 0.03 \)
\( 5 \times H/100 = 0.0025 \)

A.I.R. vary with depth (c)

APPENDIX D-8
### DAM FAILURE ANALYSIS (Cont.)

<table>
<thead>
<tr>
<th>WS. EL.</th>
<th>Depth (ft)</th>
<th>Area (ft²)</th>
<th>P</th>
<th>P/E/A</th>
<th>Q (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>946.0</td>
<td>6</td>
<td>564</td>
<td>288</td>
<td>3</td>
<td>7,000</td>
</tr>
<tr>
<td>945.0</td>
<td>5</td>
<td>400</td>
<td>240</td>
<td>2.5</td>
<td>1,340</td>
</tr>
</tbody>
</table>

then: \[ Q = \frac{P}{E/A} \]

\[ 945.0 + \left( \frac{945.0 - 944.0}{10} \right) = 945.0 \]

From USGS Quads: Here are at least 3 homes below El. 945.0

Bench No. 3: Ref 20, ~3000 feet of Theresa Dr.

Ref 20:

- E = 1.910.0

- Calvert length ~ 72 ft

- Ref 1.95

- Inv EL = 878.0 (from USGS Quad)

#### Type 2 Flow - Inlet Control

\[ Q = CA \left[ a \left( h_0/2 \right) \right]^{1/2} \]

\[ h_0 = 10.5 \times 5 = 52.5 \text{ ft} \]

<table>
<thead>
<tr>
<th>Net, m</th>
<th>H</th>
<th>H/0</th>
<th>C</th>
<th>Q (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>900</td>
<td>6</td>
<td>1.6</td>
<td>0.52</td>
<td>620</td>
</tr>
<tr>
<td>900</td>
<td>3</td>
<td>2.0</td>
<td>0.69</td>
<td>900</td>
</tr>
<tr>
<td>910</td>
<td>3</td>
<td>2.0</td>
<td>0.63</td>
<td>1130</td>
</tr>
<tr>
<td>912</td>
<td>0</td>
<td>4.0</td>
<td>0.63</td>
<td>1439</td>
</tr>
</tbody>
</table>

### Estimate Storage Volume of Ref 20:

\[ V = \frac{2}{3} \cdot \pi \cdot \left( \frac{180}{2} \right)^2 \cdot \left( \frac{180}{2} \right) \]

- WS. EL 910.0, vol = \( \frac{2}{3} \cdot \pi \cdot (960)^2 \cdot (180) \)

- Since ~1/3 of the surface below spillway crest could not be released, New Sto = Top of Quill = 900 - 680 + 600 = 820 ft³

- 1173 ft³

---

APPENDIX D-9
<table>
<thead>
<tr>
<th>Gp₁ = 5,150 cu ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage E 900 5,150 cu ft + 1,912.5</td>
</tr>
<tr>
<td>Volume 1900 elevation 221,912.5 + 500 + 100</td>
</tr>
<tr>
<td>then Gp₂ = 5,450 (1 - 10/10) = 5,375 cu ft : minimal reduction</td>
</tr>
</tbody>
</table>

At high 925 stage, all homes along Bk 900 will be affected and the Bk 900 channel will be overtopped. The outflow (1,937.5 cu ft) will enter the Housatonic River.

The total risk to life from reaches 12,433 to 10,710.
APPENDIX E
INFORMATION AS CONTAINED IN
THE NATIONAL INVENTORY OF DAMS
## INVENTORY OF DAMS IN THE UNITED STATES

<table>
<thead>
<tr>
<th>STATE DIVISION</th>
<th>STATE COUNTY</th>
<th>CONG. DIST</th>
<th>COUNTY</th>
<th>CONG. DIST</th>
<th>NAME</th>
<th>LATITUDE (NORTH)</th>
<th>LONGITUDE (WEST)</th>
<th>REPORT DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA</td>
<td>NED</td>
<td>299</td>
<td>01</td>
<td></td>
<td>LAUREL LAKE DAM</td>
<td>421R.7</td>
<td>7516.0</td>
<td>00FEB79</td>
</tr>
</tbody>
</table>

### POPULAR NAME

LAUREL LAKE

### REGION BASIN

TR-MISUESATURIC RIVER

### TYPE OF DAM

WEIR/CONCRETE

### YEAR COMPLETED

1960

### PURPOSES

RS

### MAXIMUM STORAGE CAPACITY (AFT)

12

### MAXIMUM ENSOUPDING CAPACITIES

1400

### DIST OWN FED R PHV/FED SCS A VER/DATE

NED N N N N N 07MAR79

### REMARKS

STONE AND CONCRETE

### OWNER

PJ SCHOLLER DIV OF

### ENGINEERING BY


### CONSTRUCTION BY


### REGULATORY AGENCY


### DESIGN

NONE

### CONSTRUCTION

NONE

### OPERATION

NONE

### MAINTENANCE

NONE

### INSPECTION BY

CAMP HESSER AND MCEE INC

### INSPECTION DATE

07SEP78

### AUTHORITY FOR INSPECTION

PL 92-367

### REMARKS

WHY KIMHELY CLARK CORP