-- *LAUREL LAKE DAM* --

PHASE I
INSPECTION / EVALUATION REPORT

Dam Name: Laurel Lake Dam

NID ID#: MA00263

Owner: Laurel Lake Water Power, LLC

Town: Lee

Consultant: Scheurer Consulting Engineers

Date of Inspection: September 19, 2022

This Phase I Inspection / Evaluation Report details the inspection and evaluation of the Laurel Lake Dam, located in Lee, Massachusetts. The inspection was conducted on September 19, 2022 by Scheurer Consulting Engineers of Lee, Massachusetts. Laurel Lake Dam is classified as an Intermediate sized, High (Class I) hazard potential dam. An emergency action plan (EAP) was revised for the dam in 2022, and is on file with the dam owner, Emergency Response agencies, and the Department of Conservation and Recreation.

In general, Laurel Lake Dam was found to be in satisfactory condition.

Scheurer Consulting Engineers recommends the following actions be taken to address any deficiencies found at the dam during this inspection and evaluation:

1. No improvements are recommended at this time.

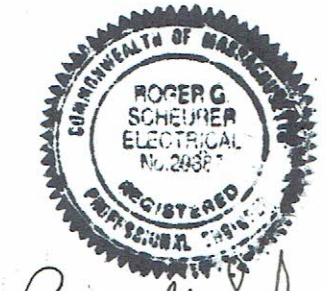
Finally, the dam continues to be maintained in accordance with recommended practices and the Operation and Maintenance procedures for the dam. Minor repairs recommended in the 2020 report were completed.

The following three paragraphs originate from the sample dam inspection format provided by the Massachusetts Department of Conservation and Recreation. The paragraphs are valid for the dam inspection and assessment provided in this report.

The assessment of the general condition of the dam reported herein was based upon available data and visual inspections. Detailed investigations and analyses involving topographic mapping, subsurface investigations, testing and detailed computational evaluations were beyond the scope of this report unless reported otherwise.

In reviewing this report, it should be realized that the reported condition of the dam was based on observations of field conditions at the time of inspection, along with data available to the inspection team. In cases where an impoundment is lowered or drained prior to the 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 critical to note that the condition of the dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the reported 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.



Roger G. Scheurer, P.E.
Massachusetts License No. 29887, Electrical
Owner
Scheurer Consulting Engineers

Roger G Scheurer
9/19/2022

Dam Evaluation Summary Detail Sheet

1. NID ID:	MA00263	4. Inspection Date:	September 19, 2022
2. Dam Name:	Laurel Lake Dam	5. Last Insp. Date:	August 14, 2020
3. Dam Location:	Lee, MA	6. Next Inspection:	September 19, 2024
7. Inspector:	0		
8. Consultant:	0		
9. Hazard Code:	High	9a. Is Hazard Code Change Requested?:	0
10. Insp. Frequency:	2 Years	11. Overall Physical Condition of Dam:	SATISFACTORY
12. Spillway Capacity (% SDF)	90-100% of the SDF		

E1. Design Methodology:	4	E7. Low-Level Discharge Capacity:	4
E2. Level of Maintenance:	4	E8. Low-Level Outlet Physical Condition:	5
E3. Emergency Action Plan:	5	E9. Spillway Design Flood Capacity:	3
E4. Embankment Seepage:	4	E10. Overall Physical Condition of the Dam:	4
E5. Embankment Condition:	5	E11. Estimated Repair Cost:	$2,000
E6. Concrete Condition:	4		

Evaluation Description

E1: DESIGN METHODOLOGY
1. Unknown Design – no design records available
2. No design or post-design analyses
3. No analyses, but dam features appear suitable
4. Design or post design analysis show dam meets most criteria
5. State of the art design – design records available & dam meets all criteria

E2: LEVEL OF MAINTENANCE
1. Dam in disrepair, no evidence of maintenance, no O&M manual
2. Dam in poor level of upkeep, very little maintenance, no O&M manual
3. Dam in fair level of upkeep, some maintenance and standard procedures
4. Adequate level of maintenance and standard procedures
5. Dam well maintained, detailed maintenance plan that is executed

E3: EMERGENCY ACTION PLAN
1. No plan or idea of what to do in the event of an emergency
2. Some idea but no written plan
3. No formal plan but well thought out
4. Available written plan that needs updating
5. Detailed, updated written plan available and filed with MADCR, annual training

E4: SEEPAGE (Embankments, Foundations, & Abutments)
1. Severe piping and/or seepage with no monitoring
2. Evidence of monitored piping and seepage
3. No piping but uncontrolled seepage
4. Minor seepage or high volumes of seepage with filtered collection
5. No seepage or minor seepage with filtered collection

E5: EMBANKMENT CONDITION (See Note 1)
1. Severe erosion and/or large trees
2. Significant erosion or significant woody vegetation
3. Brush and exposed embankment soils, or moderate erosion
4. Unmaintained grass, rodent activity and maintainable erosion
5. Well maintained healthy uniform grass cover

E6: CONCRETE CONDITION (See Note 2)
1. Major cracks, misalignment, discontinuities causing leaks, seepage or stability concerns
2. Cracks with misalignment inclusive of transverse cracks with no misalignment but with potential for significant structural degradation
3. Significant longitudinal cracking and minor transverse cracking
4. Spalling and minor surface cracking
5. No apparent deficiencies

E7: LOW-LEVEL OUTLET DISCHARGE CAPACITY
1. No low level outlet, no provisions (e.g. pumps, siphons) for emptying pond
2. No operable outlet, plans for emptying pond, but no equipment
3. Outlet with insufficient drawdown capacity, pumping equipment available
4. Operable gate with sufficient drawdown capacity
5. Operable gate with capacity greater than necessary

E8: LOW-LEVEL OUTLET PHYSICAL CONDITION
1. Outlet inoperative needs replacement, non-existent or inaccessible
2. Outlet inoperative needs repair
3. Outlet operable but needs repair
4. Outlet operable but needs maintenance
5. Outlet and operator operable and well maintained

E9: SPILLWAY DESIGN FLOOD CAPACITY
1. 0 - 50% of the SDF or unknown
2. 50-90% of the SDF
3. 90 - 100% of the SDF
4. >100% of the SDF with actions required by caretaker (e.g. open outlet)
5. >100% of the SDF with no actions required by caretaker

E10: OVERALL PHYSICAL CONDITION OF DAM
1. UNSAFE – Major structural, operational, and maintenance deficiencies exist under normal operating conditions
2. POOR - Significant structural, operation and maintenance deficiencies are clearly recognized under normal loading conditions
3. FAIR - Significant operational and maintenance deficiencies, no structural deficiencies. Potential deficiencies exist under unusual loading conditions that may realistically occur. Can be used when uncertainties exist as to critical parameters
4. SATISFACTORY - Minor operational and maintenance deficiencies. Infrequent hydrologic events would probably result in deficiencies.
5. GOOD - No existing or potential deficiencies recognized. Safe performance is expected under all loading including SDF

E11: ESTIMATED REPAIR COST
Estimation of the total cost to address all identified structural, operational, maintenance deficiencies. Cost shall be developed utilizing standard estimating guides and procedures

Changes/Deviations to Database Information since Last Inspection

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1.1 GENERAL

1.1.1 Authority

Laurel Lake Water Power, LLC has retained Scheurer Consulting Engineers to perform a visual inspection and develop a report of conditions for the dam at Laurel Lake along the Sargent Brook (a.k.a. Laurel Brook) in the Town of Lee, Massachusetts. This inspection and report were performed in accordance with MGL Chapter 253, Sections 44-50 of the Massachusetts General Laws as amended by Chapter 330 of the Acts of 2002.

1.1.2 Purpose of Work

The purpose of this investigation was to inspect and evaluate the present condition of the dam and appurtenant structures in accordance with 302 CMR 10.07 to provide information that will assist in both prioritizing dam repair needs and planning/conducting maintenance and operation.

The investigation was divided into four parts: 1) obtain and review available reports, investigations, and data previously submitted to the owner pertaining to the dam and appurtenant structures; 2) perform a visual inspection of the site; 3) evaluate the status of an emergency action plan for the site and; 4) prepare and submit a final report presenting the evaluation of the structure, including recommendations and remedial actions, and opinion of probable costs.

1.1.3 Definitions

To provide the reader with a better understanding of the report, definitions of commonly used terms associated with dams are provided in Appendix D. Many of these terms may be included in this report. The terms are presented under common categories associated with dams which include: 1) orientation; 2) dam components; 3) size classification; 4) hazard classification; and 5) miscellaneous.

1.2 DESCRIPTION OF PROJECT

1.2.1 Location

The Laurel Lake Dam is located in the northwest corner of the Town of Lee, Berkshire County, Massachusetts. The Dam is accessed from the center of Lee by traveling northerly along Route 20 about 1 mile, and ½ mile south of the Lee-Lenox town line, and is about 600 feet west of Route 20 at the Southern end of Laurel Lake.

1.2.2 Owner/Operator

	Dam Owner	Dam Caretaker
Name	Laurel Lake Water Power, LLC	Roger Scheurer
Mailing Address	125 Fairview Street	125 Fairview Street
Town	Lee, MA 01238	Lee, MA 01238
Daytime Phone	413-243-1716	413-243-1716
Emergency Phone	413-281-3771	413-281-3771
Email Address	roger@scheurer.us	roger@scheurer.us

1.2.3 Purpose of the Dam

The water impounded by Laurel Lake Dam was previously used for process water at a local paper mill (Schweitzer-Mauduit International, Inc.). The Dam is currently intended for use to create hydroelectric power. Laurel Lake is also used by the public for recreational purposes.

1.2.4 Description of the Dam and Appurtenances

Laurel Lake Dam consists of an earthen embankment measuring approximately 390 ft. long, without the spillway, and is 12 ft. high. The spillway width is approximately 26 ft. wide. Portions of the downstream slope and outermost edges of the crest are vegetated with grass with the central portion of the slope a gabion wall. The remainder of the crest is an 18 ft. to 20 ft. wide paved private road with the upstream slope covered with dumped rip-rap and infilled with smaller hand placed rip-rap.

The spillway has a flat broad crested weir. The channel walls are concrete with the private roadway carried across the spillway on a steel and concrete bridge. The downstream channel was reconstructed using rock filled gabion baskets in 1992.

An inlet structure is located in the upstream center of the dam. The structure was also rebuilt in 1992 and consists of a bar rack for debris screening located in a reinforced concrete structure. A 16 inch discharge pipe extends to a concrete block gate house at the downstream side of the dam. Water is conveyed from the gate house through gate valve controls to either the site of the former paper mill which is approximately 1 mile downstream or out through the back and sidewall of the gate house to the discharge channel.

1.2.5 Operations and Maintenance

Laurel Lake Water Power, LLC provides both operation and maintenance for the dam. These efforts are overseen by Roger Scheurer.

Operations and Maintenance at the Laurel Lake Dam are conducted as outlined in the operations and maintenance manual prepared for the dam in November 2001. As the dam and spillway have not been changed since the manual was prepared, the manual is still valid.

1.2.6 DCR Size Classification

Laurel Lake Dam has a maximum structural height of approximately 12 ft. and a maximum storage capacity of 1577 acre-feet. Therefore, in accordance with Department of Conservation and Recreation Office of Dam Safety classification, under Commonwealth of Massachusetts dam safety rules and regulations stated in 302 CMR 10.00 as amended by Chapter 330 of the Acts of 2002, Laurel Lake Dam is an **Intermediate** size structure.

1.2.7 DCR Hazard Potential Classification

Laurel Lake Dam is located upstream of residential housing and secondary roads. It appears that a failure of the dam at maximum pool will cause serious damage to homes, roads, important public utilities and loss of life. Therefore, in accordance with Department of Conservation and Recreation classification procedures, under Commonwealth of Massachusetts dam safety rules and regulations stated in 302 CMR 10.00 as amended by Chapter 330 of the Acts of 2002, Laurel Lake Dam should be classified as a High-Class I hazard potential dam.

1.3 ENGINEERING DATA

1.3.1 Drainage Area

The drainage area for Laurel Lake Dam is approximately 2.8 square miles and extends through the communities of Lee, Lenox, and Stockbridge. The drainage area consists of rolling wooded area with residential and commercial properties within the drainage basin.

1.3.2 Reservoir

	Length (feet)	Width (feet)	Surface Area (acres)	Storage Volume (acre-feet)
Normal Pool	5,280	1,400	170	977
Maximum Pool	7,400	1,365	232	1,557
SDF Pool	7,500+/-	1,400+/-	252	1,834

1.3.3 Discharges at the Dam Site

There are no records being kept by the dam owner for discharge flows at the dam. A flow test had been performed during operation of the dam in conjunction with the Schweitzer Mauduit, Eagle Mill and it was determined that a permitted continual flow rate of 1,000 gpm is maintained through the discharge line.

1.3.4 General Elevations (feet)

A.	Top of Dam	980.5
B.	Spillway Design Flood Pool	981.1
C.	Normal Pool	977.0
D.	Spillway Crest	977.0
E.	Upstream Water at Time of Inspection	976.8
F.	Streambed at Toe of the Dam	968.5 (est.)
G.	Low Point along Toe of the Dam	969.5 (est.)

1.3.5 Main Spillway Data

A.	Type	Broad crest weir
B.	Weir Length	26 ft.
C.	Weir Crest Elevation	977.0
D.	Upstream Channel	977.0
E.	Downstream Channel	975.0
F.	Downstream Water	N/A

1.3.6 Design and Construction Records and History

No design or operational records other than State inspection reports are available for the original dam.

Improvements, designed by Tighe & Bond to the spillway discharge channel and the downstream face of the dam utilizing gabion baskets with rock fill along with geotextile fabric foundations were incorporated to the dam in 1991 and 1992 along with improvements to the intake structure and trash rack. Plans for this work are available either at the Westfield office of Tighe & Bond, Inc. or from the caretaker. Subsequent improvements have been incorporated on an on-going basis as required to maintain condition of the dam. Improvements include, but are not limited to the following:

- partial repaving of the roadway over the crest of the dam
- re-chinking of the upstream face of the dam with 6" to 8" rip-rap.
- Placement of additional rip-rap at various locations.

1.3.7 Operating Records

Operational records, as required by the Operation and Maintenance Manual, for the dam along with the State inspection reports for the dam are available at the office of Roger Scheurer at 125 Fairview Street in Lee, MA 01238.

1.4 SUMMARY DATA TABLE

1.1 Summary Data Table

Required Phase I Report Data	Data Provided by the Inspecting Engineer
National ID #	MA00263
Dam Name	Laurel Lake Dam
Dam Name (Alternate)	0
River Name	Sargeant Brook
Impoundment Name	Laurel Lake
Hazard Class	High
Size Class	Intermediate
Dam Type	Earthen Embankment
Dam Purpose	Industrial Water Supply
Structural Height of Dam (feet)	12
Hydraulic Height of Dam (feet)	8.5
Drainage Area (sq. mi.)	2.8
Reservoir Surface Area (acres)	232
Normal Impoundment Volume (acre-feet)	680
Max Impoundment Volume ((top of dam) acre-feet)	1557
SDF Impoundment Volume* (acre-feet)	1834
Spillway Type	Concrete broadcast
Spillway Length (feet)	26
Freeboard at Normal Pool (feet)	5
Principal Spillway Capacity* (cfs)	640
Auxiliary Spillway Capacity* (cfs)	N/A
Low-Level Outlet Capacity* (cfs)	19
Spillway Design Flood* (flow rate - cfs)	545
Winter Drawdown (feet below normal pool)	N/A no standard drawdown
Drawdown Impoundment Vol. (acre-feet)	N/A
Latitude	N 42 19.3
Longitude	W 73 15.6
City/Town	Lee
County Name	Berkshire
Public Road on Crest	No
Public Bridge over Spillway	No
EAP Date (if applicable)	0
Owner Name	Laurel Lake Water Power, LLC
Owner Address	125 Fairview Street
Owner Town	Lee, MA 01238
Owner Phone	413-243-1716
Owner Emergency Phone	413-281-3771
Owner Type	Private
Caretaker Name	Roger Scheurer
Caretaker Address	125 Fairview Street
Caretaker Town	Lee, MA 01238
Caretaker Phone	413-243-1716
Caretaker Emergency Phone	413-281-3771
Date of Field Inspection	9/19/2022
Consultant Firm Name	Scheurer Consulting Engineers
Inspecting Engineer	Roger Scheurer
Engineer Phone Number	413-281-3771

*In the event a hydraulic and hydrologic analysis has not been completed for the dam, indicate "No H&H" in this table, recommendation section shall include specific recommendation to hire a qualified dam engineering consultant to conduct analysis to determine spillway adequacy in conformance with 302 CMR 10.00.

2.1 VISUAL INSPECTION

Laurel Lake Dam was inspected on September 19, 2022. At the time of the inspection, the weather was sunny, 68°F and no significant rainfall had occurred. Photographs to document the current conditions of the dam were taken during the inspection and are included in Appendix A. The level of the impoundment was at approximate elevation 976.8'. Underwater areas were not inspected. A copy of the inspection checklist is included in Appendix B.

2.1.1 General Findings

In general, Laurel Lake Dam was found to be in Satisfactory condition with few concerns. The specific concerns are identified in more detail in the sections below:

2.1.2 Dam

- **Abutments** – The right and left abutments are in good condition with no observable cracks, depressions, animal burrows, seepage, wet areas, vegetation or trees.

- **Upstream Face** – The face is covered with machine placed large boulders with smaller stones blended in to chink in between the larger stones, all to armor the upstream face of the dam crest to below the water line. To the right end of the dam the boulders appear to be covering an old concrete wall.

- **Crest** – The dam crest has generally good horizontal and vertical alignment. Repairs to the bituminous concrete surface are visible. Crack sealing was completed in 2022. Some cracking of the roadway surface remains, but, is not significant to the stability of the dam structure at this time. See photos 5, and 6 – Appendix A.

- **Downstream Face** – The face is generally vegetated with grass that is well maintained. There is a gabion basket wall system along the central portion of the slope directly uphill of the gate house. See photos 2, 5, 6, 7, 8, 10, 15 and 16 – Appendix A.

- **Drains** – The dam intake structure on the upstream side of the crest consists of a trash rack with a 16 inch gravity fed pipe that passes through the dam embankment. The pipe is controlled by a gate valve at the intake structure and inside the gate house. One of the discharge lines is routed to the former Eagle Mill of the Schweitzer-Mauduit complex about a mile downstream where the water had been used for process water. There is a by-pass pipe with two parallel 12" valves on the main which allows for water to be discharged to the main spillway channel. See photos 17, 18 and 19 – Appendix A. Minor concrete repairs should be completed.

- **Instrumentation** – A staff gage is bolted to the concrete wall at the outlet structure for use in measuring overflow at the spillway.

- **Access Roads and Gates** – A private road crosses the crest of the dam and spillway. The road is controlled through a locked gate across the width of the road left (easterly) of the dam. Foot traffic is permitted across the crest for recreational purposes. There is no other fence or gate system at the dam area.

2.1.3 Appurtenant Structures

- **Primary Spillway** – The primary spillway is a flat concrete broad crested weir with no stop log structure. The intake area to the spillway is currently clear and unobstructed. The spillway channel crosses below a concrete and steel bridge before turning left and discharging down a gabion basket lined channel to the toe area of the dam. See photos 7, 9, 10, 11, 12, 15 – Appendix A. Minor cracks are evident in the wall of the spillway.

- **Low-Level Outlets** – See drains in 2.1.2

- **Auxiliary/Emergency Spillway** – Not Applicable

- **Dikes** – Not Applicable

2.1.4 Downstream Area

Discharges from the dam are directed along Sargent Brook which is a brook course having steep, forested, side banks. This brook flows southerly though a residential development, passing under Laurel Street – Route 20 and continues to its discharge point at the Housatonic River which is approximately 0.8 miles downstream and approximately 100 ft. lower in elevation than the dam crest.

2.1.5 Reservoir Area

The area around Laurel Lake is generally wooded and sparsely developed with the exception of the area immediately adjacent to Route 20 on the east side of the lake. The slopes of to the lake are rolling terrain and generally wooded. See photo 1 and 4 – Appendix A.

2.2 CARETAKER INTERVIEW

The Caretaker and inspecting engineer are one and the same.

2.3 OPERATION AND MAINTENANCE PROCEDURES

Operation and Maintenance Procedures are undertaken on a periodic basis as outlined in the Operation and Maintenance Manual prepared for the Laurel Lake Dam in November 2001.

2.3.1 Operational Procedures

Operation Procedures are undertaken on a periodic basis as outlined in the Operation and Maintenance Manual prepared for the Laurel Lake Dam in November 2001.

2.3.2 Maintenance of Dam and Operating Facilities

Maintenance of the dam and operating facilities are undertaken on a periodic basis as outlined in the Operation and Maintenance Manual prepared for the Laurel Lake Dam in November 2001.

2.4 EMERGENCY WARNING SYSTEM

An Emergency Action Plan (EAP) was revised June 6, 2022, by Laurel Lake Water Power, LLC and submitted to the Emergency Response agencies, Department of Conservation and Recreation and MEMA.

2.5 HYDROLOGIC/HYDRAULIC DATA

A hydrological and hydraulic analysis was completed by Tighe & Bond in October 2001 for Laurel Lake. As the dam and spillway have not been changed since this analysis, those results are still valid.

A summary of available information from the hydrological and hydraulic analysis is available in that report, with key information noted below:

A. Spillway Design Flood (SDF) Return Period	½ PMF
B. SDF Inflow (cfs)	6,300
C. SDF Outflow (cfs)	2,200
D. Spillway Capacity (cfs)	545
E. Depth of Overtopping for SDF (ft))	1.1
F. Duration of Overtopping for SDF (hours)	Unknown

2.6 STRUCTURAL STABILITY/OVERTOPPING POTENTIAL

2.6.1 Structural Stability

A stability analysis for Laurel Lake Dam was not within the scope of this report. At the time of the inspection, neither the dam, gatehouse nor the spillway indicated any signs of instability.

2.6.2 Overtopping Potential

As shown in the 2001 Hydraulic and Hydrologic Analysis completed by Tighe & Bond, overtopping of the dam during the ½ PMF event will be 1.1 feet.

Based on the fact that Laurel Lake Dam has a crest width of 20 to 25 ft., has a paved road across it to access private property and the upstream and downstream slopes are well armored with either large rock rip-rap or gabion baskets with well established vegetative growth, overtopping should not result in failure or significant damage to the dam.

3.1 ASSESSMENTS

In general, the overall condition of Laurel Lake Dam is Satisfactory.

The following recommendations and remedial measures generally describe the recommended approach to address current deficiencies at the dam. Prior to undertaking recommended maintenance, repairs, or remedial measures, the applicability of environmental permits needs to be determined for activities that may occur within resource areas under the jurisdiction of local conservation commissions, MADEP, or other regulatory agencies.

3.2 STUDIES AND ANALYSES

The Emergency Action Plan (EAP) was updated June 6, 2022 and no further action is required at this time.

3.3 RECURRENT MAINTENANCE RECOMMENDATIONS

Continue yearly maintenance of the dam surfaces including mowing of grass area and clearing of woody vegetative growth along the dam and spillway areas.

3.4 RECOMMENDATIONS, MAINTENANCE AND MINOR REPAIRS

The following is recommended to be carried out by the dam owner.

- Gate house corner near the drains needs concrete repair.

3.5 REMEDIAL MODIFICATION RECOMMENDATIONS

At this time there are no remedial measures recommended which alter the current configuration or design of the dam that are necessary to meet stability, seepage or safety concerns or to comply with current state requirements.

3.6 ALTERNATIVES

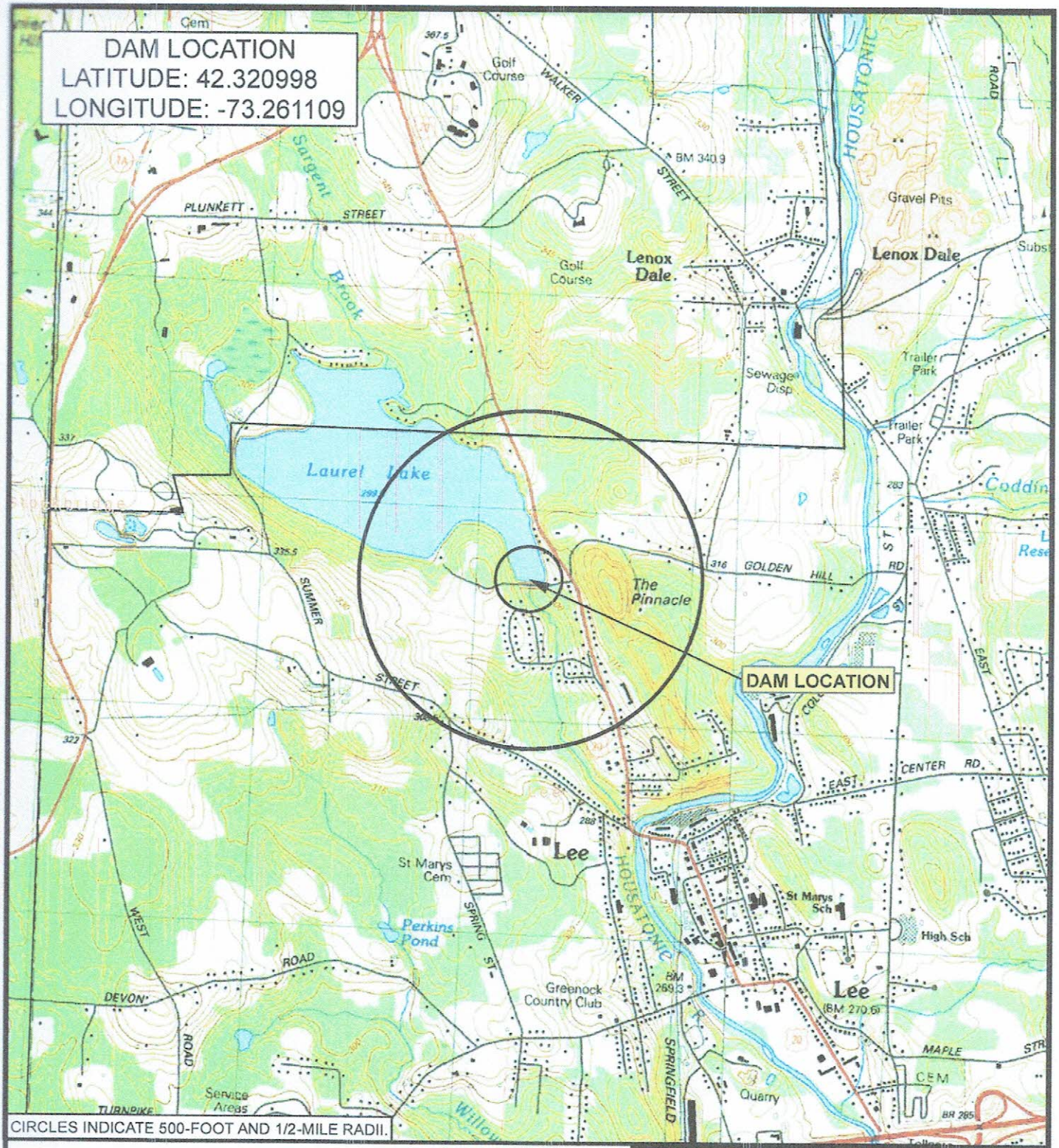
At this time there are no alternatives to be considered or proposed for this site.

3.7 OPINION OF PROBABLE CONSTRUCTION COSTS

The following opinion of probable construction costs have been developed for the studies, analyses, recommendations and remedial measures noted above. The probable construction costs are based on very limited investigations. Once further detailed investigations are performed the scope of work may change, affecting the actual construction costs. The amounts include engineering, permits and contingencies where applicable. Tasks that can be carried out by the owner are noted as Force Account.

Recommendations

1. Concrete repairs at corner of gatehouse near drains.		$2,000
	Total	**$2,000**



BASED ON USGS TOPOGRAPHIC MAP FOR
STOCKBRIDGE & EAST LEE
MASSACHUSETTS QUADRANGLES
REVISED 1987
3-METER & 6-METER CONTOUR INTERVAL

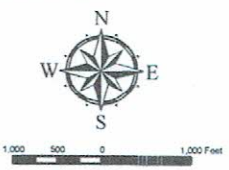


FIGURE 1
SITE LOCUS

LAUREL LAKE DAM
LEE, MASSACHUSETTS
MA00263

Tighe&Bond

SCALE 1:25,000 DECEMBER 2008

V:\Projects\L\L0532\Maps\LaurelLake_usgs.mxd

LAUREL LAKE DAM

in

LEE, MASSACHUSETTS

Prepared for

LAUREL LAKE WATER POWER, L.L.C.

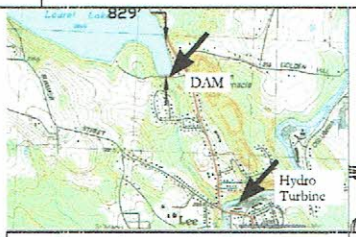
MAY 2010

BEING THAT LAND DESCRIBED IN
BERKSHIRE MIDDLE REGISTRY OF DEEDS BOOK: 4277 PAGE: 282
GRANTOR: Schweitzer-Maudit International, Inc.
GRANTEE: Laurel Lake Water Power, L.L.C.
DATED: 04/22/2009

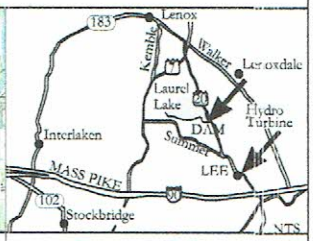
Site Maps

Arrow indicates site location.

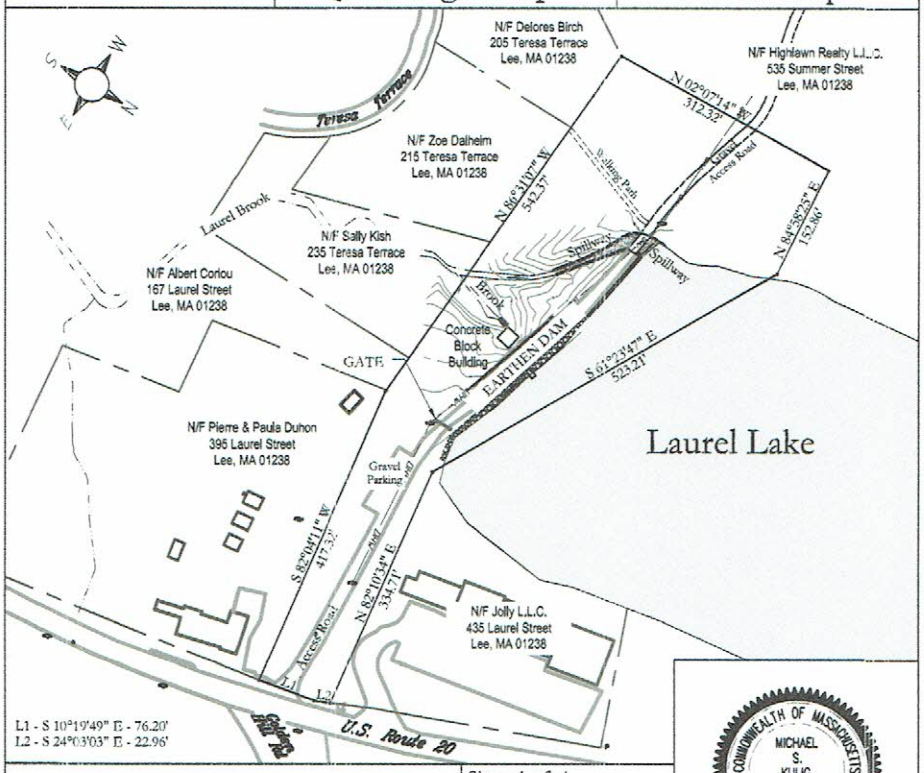
Nearest opposite shore is North 829' from shoreline at Laurel Lake Dam



Quadrangle Map



Locus Map



L1 - S 10°19'49" E - 76.20'
L2 - S 24°03'03" E - 22.96'

Scale Bar

0 80 160 320

Scale: 1" = 160' - 0"

Sheet 1 of 4	
Scale: As Noted	
Date: 03/25/2010	
Drawn by: AMB	

COMMONWEALTH OF MASSACHUSETTS
MICHAEL S. KULIG
No. 39471
REGISTERED PROFESSIONAL CIVIL ENGINEER

Plans accompanying petition of:
Laurel Lake Water Power, L.L.C.
for Dam on Laurel Lake
Lee, Massachusetts

LAUREL LAKE DAM

in

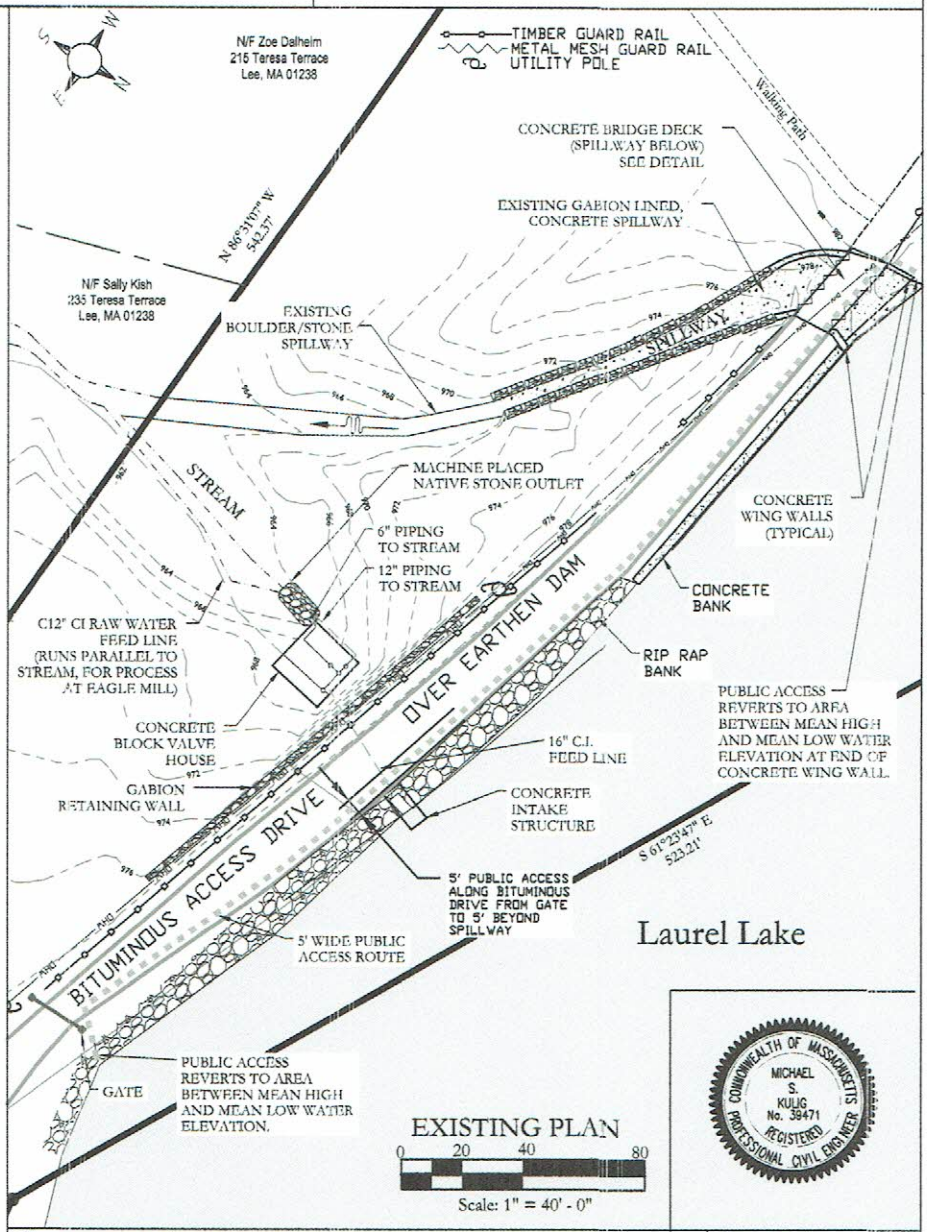
LEE, MASSACHUSETTS

Prepared for

LAUREL LAKE WATER POWER, L.L.C.

MAY 2010

BEING THAT LAND DESCRIBED IN
BERKSHIRE MIDDLE REGISTRY OF DEEDS BOOK: 4277 PAGE: 282
GRANTOR: Schweitzer-Maudit International, Inc.
GRANTEE: Laurel Lake Water Power, L.L.C.
DATED: 04/22/2009



Plans accompanying petition of: Laurel Lake Water Power, L.L.C. for Dam on Laurel Lake Lee, Massachusetts	Sheet 2 of 4 Scale: As Noted Date: 03/25/2010 Drawn by: AMB

LAUREL LAKE DAM

in

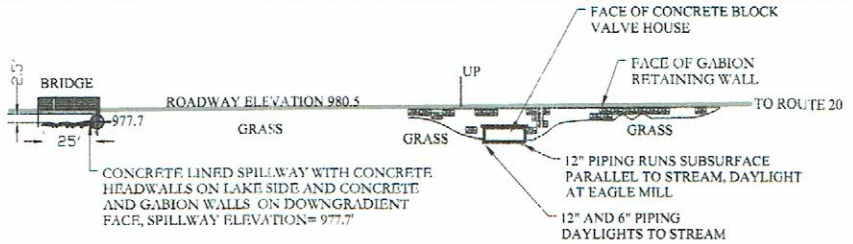
LEE, MASSACHUSETTS

Prepared for

LAUREL LAKE WATER POWER, L.L.C.

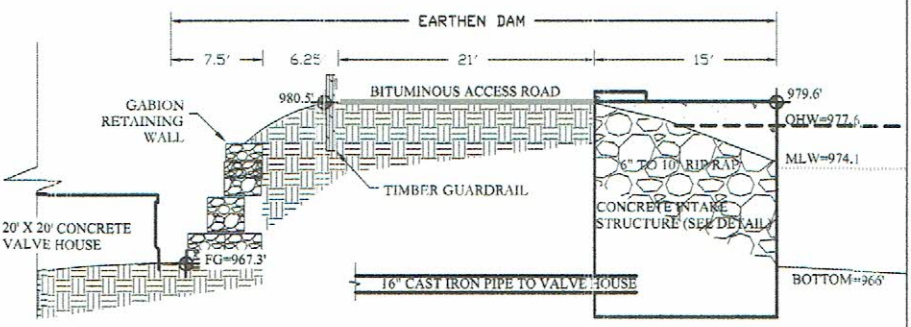
MAY 2010

BEING THAT LAND DESCRIBED IN
BERKSHIRE MIDDLE REGISTRY OF DEEDS BOOK: 4277 PAGE: 282
GRANTOR: Schweitzer-Maudit International, Inc.
GRANTEE: Laurel Lake Water Power, L.L.C.
DATED: 04/22/2009



LAUREL LAKE DAM SOUTH ELEVATION

Scale: 1" = 60' - 0"



LAUREL LAKE DAM CROSS SECTION

Scale: 1" = 10' - 0"

GENERAL NOTES:

ELEVATIONS NOTED HEREON ARE REFERENCED TO NGVD 1929. MASS D.O.T. BENCHMARK LOCATED APPROXIMATELY 50' NORTH OF LAUREL LAKE BOAT RAMP, BRASS RIVET IN ROCK OUTCROP ELEVATION=982.93

ORDINARY HIGH AND LOW WATER LEVELS SHOWN HEREON IS BASED ON HISTORIC MAPPING AND RECORDS OF MEAN WATER LEVELS AS MAINTAINED BY THE OWNERS AS PART OF THE NORMAL OPERATIONS AND MAINTENANCE OF THE LAUREL LAKE DAM.

HISTORIC HIGH WATER MARK OF LAUREL LAKE, AS DETERMINED THROUGH HEARING IN BOSTON, 1943, IS FOUND AT ELEVATION 972'. THE LIMITS OF THE POND IN ITS NATURAL STATE ARE SHOWN ON PLAN ENTITLED, "LAUREL LAKE, LENOX & LEE, DEPARTMENT OF PUBLIC WORKS OF MASSACHUSETTS, JUNE 1931", SIGNED BY FRANCIS L. BELLEW, DISTRICT WATERWAYS ENGINEER AND LAY APPROXIMATELY 900' NORTH OF THE DAM.

ACCORDING TO F.E.M.A. COMMUNITY PANEL #250028 0006 B, 100-YR BASE FLOOD ELEVATIONS ARE UNDETERMINED FOR THIS AREA OF THE LAKE. REFERENCE IS MADE TO THE NORTH SIDE OF THE LAKE WHERE SARGENT BROOK ENTERS, 100-YR FLOOD ELEVATION=978' (SHOWN AS THE FREE SURFACE OF LAUREL LAKE)

IN ACCORDANCE WITH 310 CMR 9.35 (3)(b) ON-FOOT PASSAGE: THE LICENSEE SHALL ALLOW THE PUBLIC TO PASS FREELY OVER A FIVE FEET WIDE PASSAGE AROUND THE EXISTING OUTLET STRUCTURE. ON FOOT PASSAGE SHALL BE ACCESSIBLE BELOW THE HIGH WATER MARK, INCLUDING OVER THE EXISTING SPILLWAY AND ALONG THE LENGTH OF THE PROPERTY SHORELINE.

COMMONWEALTH OF MASSACHUSETTS
MICHAEL S. KULIG
No. 39471
REGISTERED PROFESSIONAL CIVIL ENGINEER

Plans accompanying petition of: Laurel Lake Water Power, L.L.C. for Dam on Laurel Lake Lee, Massachusetts	Sheet 3 of 4 Scale: As Noted Date: 03/25/2010 Drawn by: AMB

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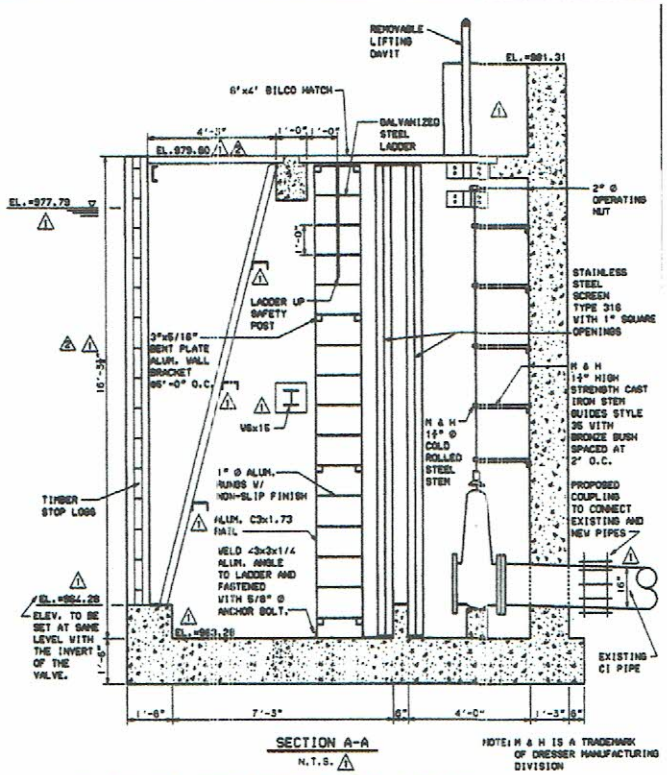
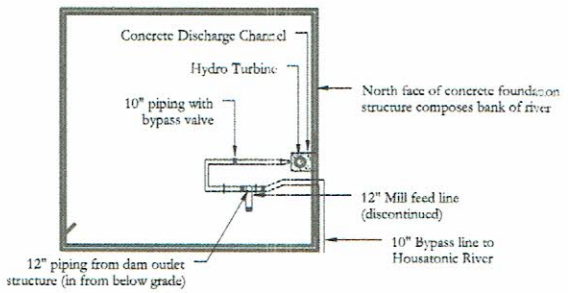


INTAKE STRUCTURE CROSS SECTION



EAGLE MILL FILTER HOUSE PLAN VIEW

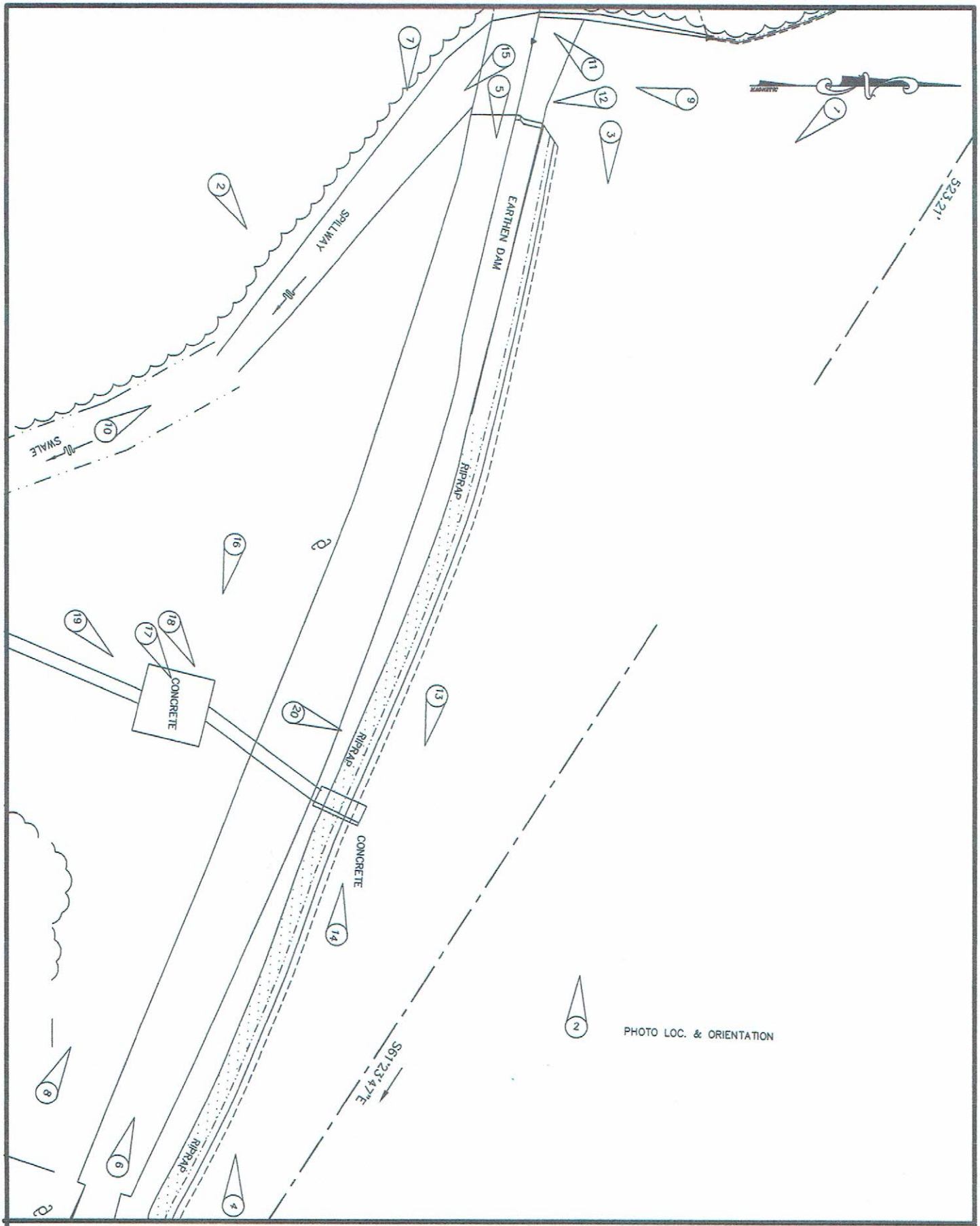
Scale: 1" = 20' - 0"

COMMONWEALTH OF MASSACHUSETTS
MICHAEL S. KULIG
No. 39471
REGISTERED PROFESSIONAL CIVIL ENGINEER

Plans accompanying petition of: Laurel Lake Water Power, L.L.C. for Dam on Laurel Lake Lee, Massachusetts	Sheet 4 of 4 Scale: As Noted Date: 03/25/2010 Drawn by: AMB

APPENDIX A

PHOTOGRAPHS



SCHEURER CONSULTING ENGINEERS, 125 FAIRVIEW ST, LEE, MA 01238 413-281-3771

PHOTOGRAPH LOCATION SKETCH

LAUREL LAKE DAM INSPECTION - 2014

Photo 1 – ***Overview of dam from upstream***

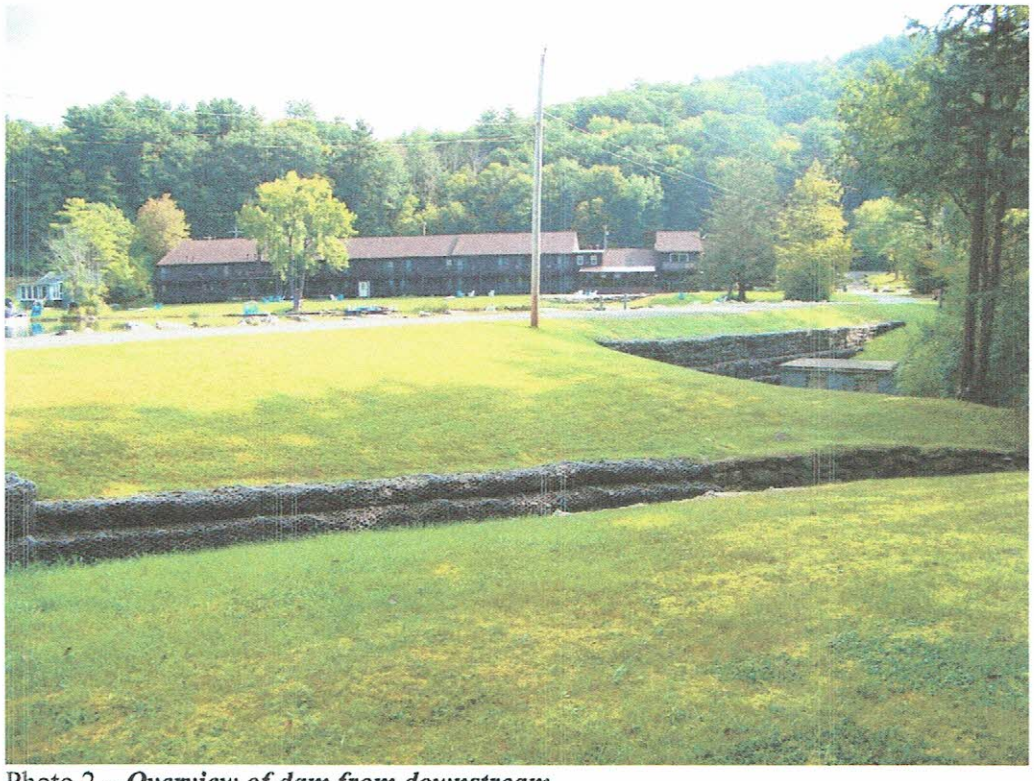


Photo 2 – ***Overview of dam from downstream***

Photo 3 – ***Overview of upstream face from right abutment***

Photo 4 – ***Overview of upstream face from left abutment***

Photo 5 – ***Overview of dam crest from right abutment***

Photo 6 – ***Overview of dam crest from left abutment***

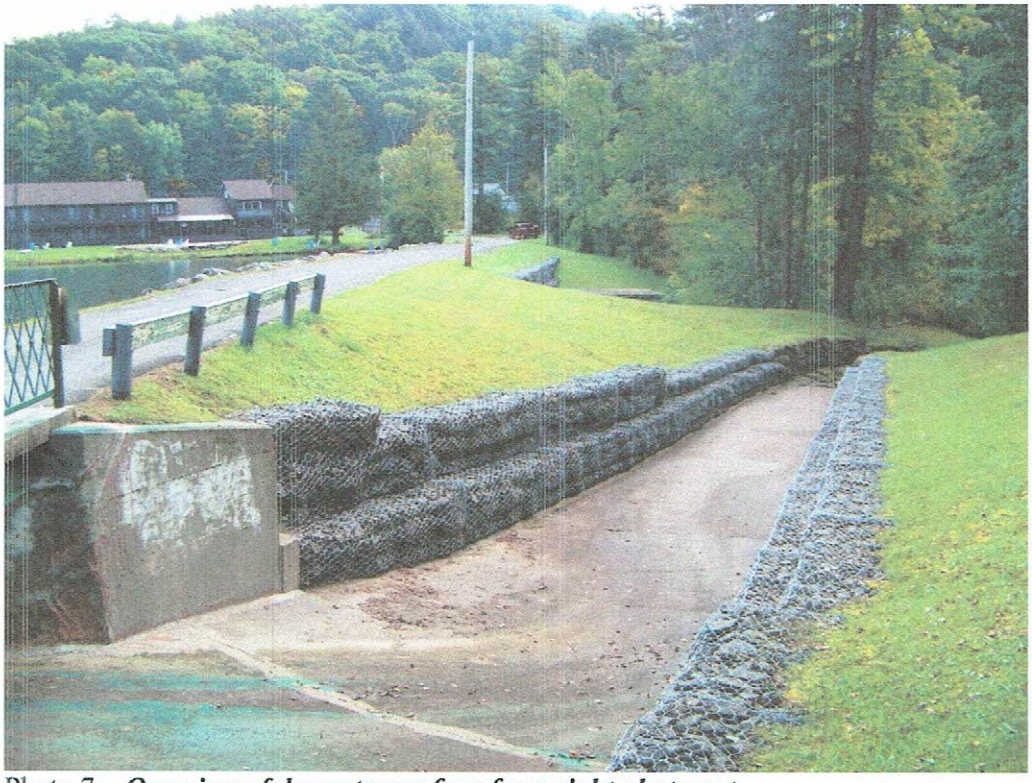


Photo 7 – ***Overview of downstream face from right abutment***

Photo 8 – ***Overview of downstream face from left abutment***

Photo 9 – ***Overview of spillway from upstream***

Photo 10 – ***Overview of spillway from downstream***

Photo 11 – ***Overview of right training wall***

Photo 12 – ***Overview of left training wall***

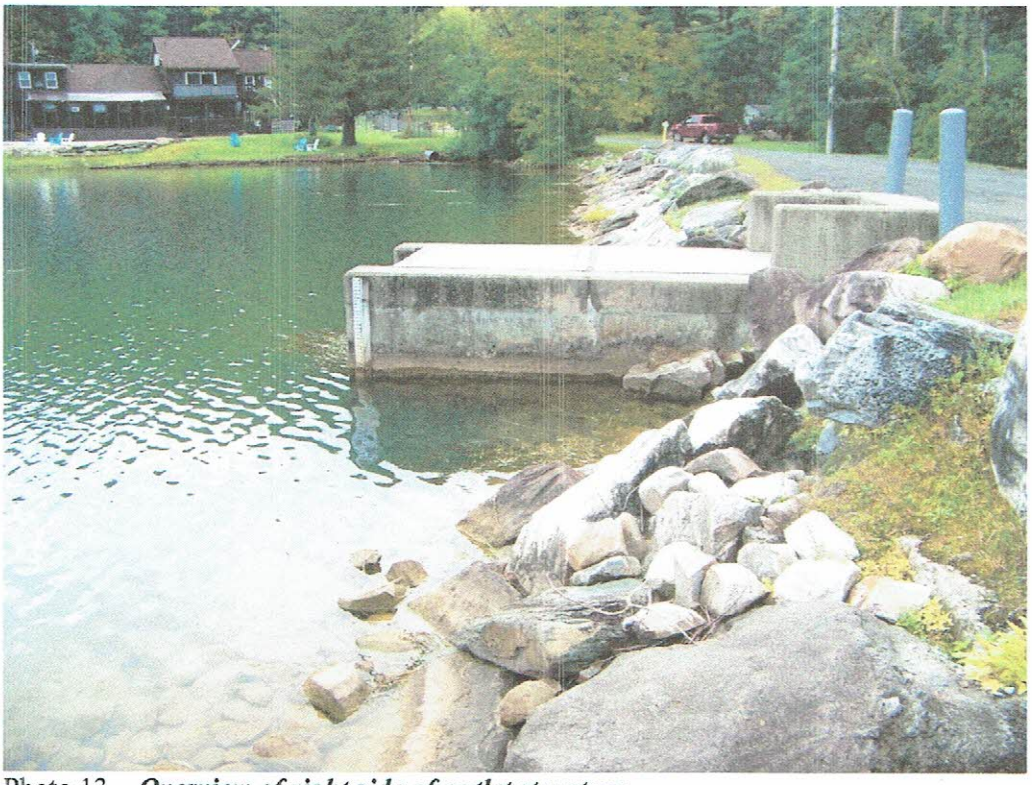


Photo 13 – ***Overview of right side of outlet structure***

Photo 14 – ***Overview of left side of outlet structure***

Photo 15 - ***Overview of downstream channel***

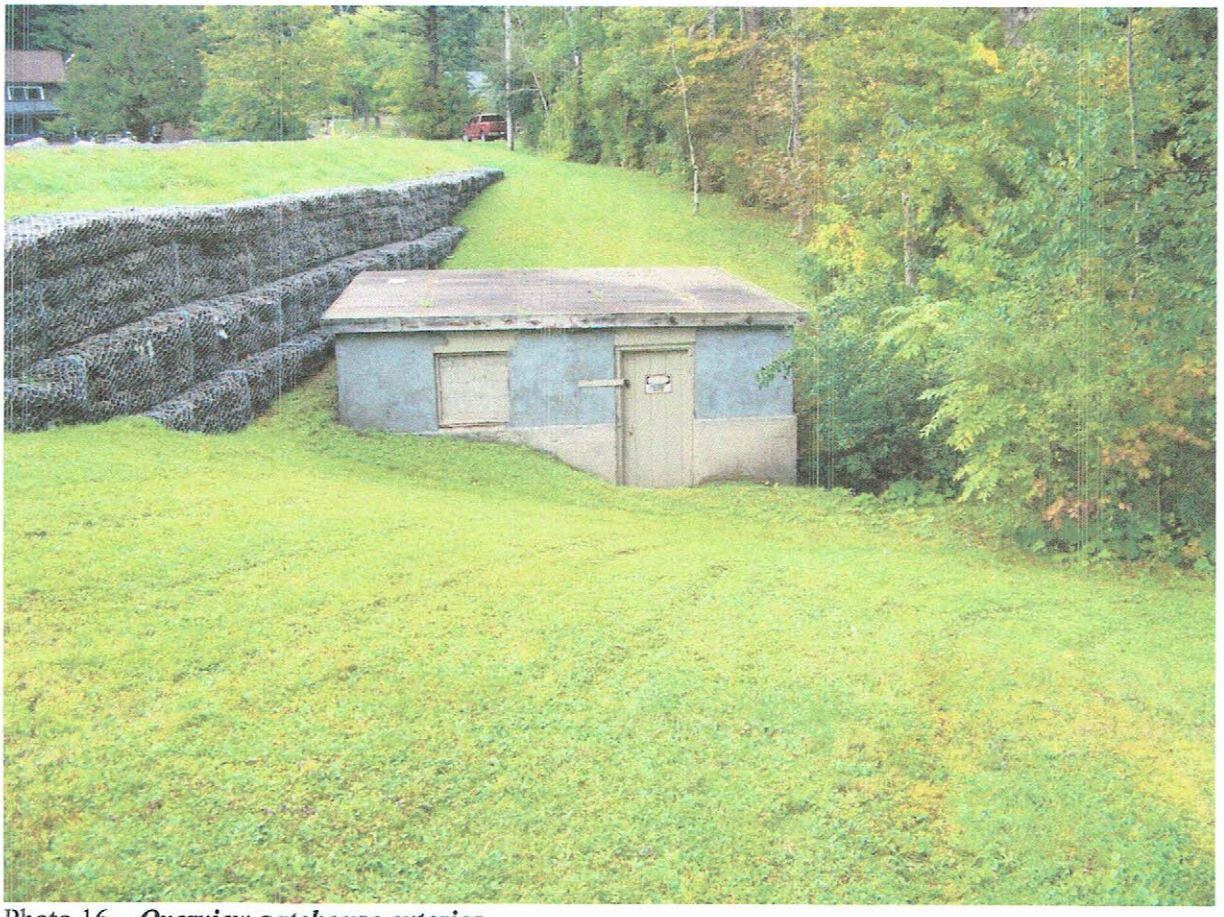


Photo 16 – ***Overview gatehouse exterior***

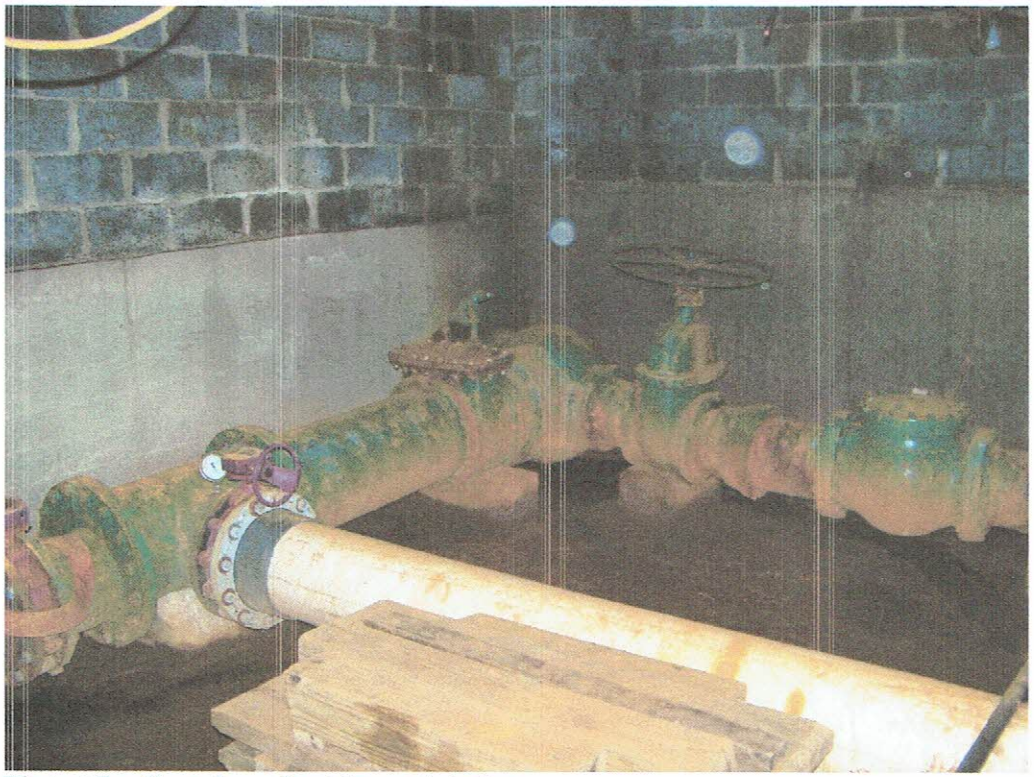


Photo 17 – ***Overview of gatehouse interior***

Photo 18 – ***Overview of old operators***

Photo 19 – ***Gatehouse outlet drains***

Photo 20 – ***Overview of reservoir***

APPENDIX B

CHECKLIST

DAM SAFETY INSPECTION CHECKLIST INSTRUCTION PAGE

The checklist (Excel file) includes sections applicable to a variety of dam structure types. Carefully follow the instructions on the first tab of the checklist. Complete those pages pertaining to each structure and omit pages that are not relevant or mark them "Not Applicable." The Checklist must be signed by the inspecting engineer and a clean, neat copy included in the final inspection report. Use the checklist to generate the Dam Evaluation Summary Detail Sheet (should immediately follow the Executive Summary) and Table 1.1 (should immediately follow Section 1.0).

E1: DESIGN METHODOLOGY
1. Unknown Design – no design records available
2. No design or post-design analyses
3. No analyses, but dam features appear suitable
4. Design or post-design analyses show dam meets most criteria
5. State of the art design – design records available & dam meets all criteria

E2: LEVEL OF MAINTENANCE
1. Dam in disrepair, no evidence of maintenance, no O&M manual
2. Dam in poor level of upkeep, very little maintenance, no O&M manual
3. Dam in fair level of upkeep, some maintenance and standard procedures
4. Adequate level of maintenance and standard procedures
5. Dam well maintained, detailed maintenance plan that is executed

E3: EMERGENCY ACTION PLAN
1. No plan or idea of what to do in the event of an emergency
2. Some idea but no written plan
3. No formal plan but well thought out
4. Available written plan that needs updating
5. Detailed, updated written plan available, filed with MADCR, annual training

E4: EMBANKMENT SEEPAGE (Embankment, Foundation & Abutments)
1. Severe piping and/or seepage with no monitoring
2. Evidence of monitored piping and seepage
3. No piping but monitored seepage
4. Minor seepage or high volumes of seepage with filtered collection
5. No seepage or minor seepage with filtered collection

E5: EMBANKMENT CONDITION (see Note 1)
1. Severe erosion and/or large trees
2. Significant erosion or significant woody vegetation
3. Brush and exposed embankment soils, or moderate erosion
4. Unmaintained grass, rodent activity and maintainable erosion
5. Well maintained, healthy uniform grass cover

E6: CONCRETE CONDITION (see Note 2)
1. Major cracks, misalignment, discontinuities causing leaks, seepage or stability concerns
2. Cracks with misalignment inclusive of transverse cracks with no mis-alignment but with potential for significant structural degradation
3. Significant longitudinal cracking and minor transverse cracking
4. Spalling and minor surface cracking
5. No apparent deficiencies

E7: LOW-LEVEL OUTLET DISCHARGE CAPACITY
1. No low-level outlet, no provisions (e.g., pumps, siphons) for emptying pond
2. No operable outlet, plans for emptying pond, but no equipment
3. Outlet with insufficient drawdown capacity, pumping equipment available
4. Operable gate with sufficient drawdown capacity
5. Operable gate with capacity greater than necessary

E8: LOW-LEVEL OUTLET PHYSICAL CONDITION
1. Outlet inoperative needs replacement, non-existent or inaccessible
2. Outlet inoperative needs repair
3. Outlet operable but needs repair
4. Outlet operable but needs maintenance
5. Outlet and operator operable and well maintained

E9: SPILLWAY DESIGN FLOOD CAPACITY
1. 0 - 50% of the SDF or unknown
2. 51- 90% of the SDF
3. 91- 100% of the SDF
4. >100% of the SDF with actions required by caretaker (e.g., open outlet)
5. >100% of the SDF with no actions required by caretaker

E10: OVERALL PHYSICAL CONDITION OF THE DAM
1. *UNSAFE* – Major structural, operational, and maintenance deficiencies exist under normal operating conditions
2. *POOR* - Significant structural, operation and maintenance deficiencies are clearly recognized for normal loading conditions
3. *FAIR* - Significant operational and maintenance deficiencies, no structural deficiencies. Potential deficiencies exist under unusual loading conditions that may realistically occur. Can be used when uncertainties exist as to critical parameters
4. *SATISFACTORY* - Minor operational and maintenance deficiencies. Infrequent hydrologic events would probably result in deficiencies.
5. *GOOD* - No existing or potential deficiencies recognized. Safe performance is expected under all loading including SDF

E11: ESTIMATED REPAIR COST

Estimation of the total cost to address all identified structural, operational, maintenance deficiencies. Cost shall be developed utilizing standard estimating guides and procedures

Guidelines and Notes for Evaluations

Each of the evaluation categories has 5 rating levels. In general, the rating levels in each category are intended to reflect the following conditions:

1. Unsafe
2. Poor
3. Fair
4. Satisfactory
5. Good

E10-Overall Safety Rating Guideline

Unless the inspecting engineer presents compelling data, analyses, and observations that justify a higher rating, E10-Overall Safety Rating of the Dam shall not be higher than the lowest ranking in these high importance categories:
-E4-Seepage,
-E5-Embankment Condition (for embankment dams), and
-E6-Concrete Condition (for dams where concrete structures retain water).

Note 1 - Embankment Condition Factor of Safety Criteria

In addition to the inspection conditions listed, the embankment condition rating should consider the slope stability Factor of Safety (FS) according to the following guidelines for downstream (D/S) and upstream slopes (U/S).

	Normal Pool	SDF	Seismic	Rapid Drawdown
Rating	**D/S & U/S FS**	**D/S FS**	**D/S & U/S FS**	**U/S FS**
1	<1.3	<1.1	<1.0	<1.0
2	<1.5	<1.4	<1.0	<1.1
3	>1.5	<1.5	<1.1	<1.2
4	>1.5	>1.5	>1.1	>1.2
5	>1.5	>1.5	>1.1	>1.2

In the absence of stability analyses, use the following factors to evaluate the stability component of the embankment rating. The inspecting engineer will need to consider all factors in combination as the exact combination of conditions listed will rarely occur. For slopes, > indicates "steeper than."

Rating	Slopes	Seepage	Material	Compaction
1	>2H:1V	>5' above toe	SP, ML*, SM*	Loose or unknown
2	>2.5H:1V	>2' above toe	ML**, MH	Loose or unknown
3	>3H:1V	at toe	SM**, SW, CH	Likely compacted
4	<3H:1V	DS of toe	SC, CL	Compacted
5	<3H:1V	None	Suitably Zoned	Compacted

ML* - Non-plastic silt or any silt or clay susceptible to dispersion
ML** - Silt with some plasticity (non-dispersive)
SM* - Uniform silty fine sand
SM** - Widely graded silty sand

Note 2 - Concrete Condition Factor of Safety Criteria

In addition to the inspection conditions listed, ratings should consider the sliding stability Factors of Safety (FS) for any concrete structures that retain water according to the following guidelines.

FS Criteria for Dams with Limited Structure and Foundation Information and Testing

Rating	Normal Pool FS	SDF FS	Ice Loading FS	Seismic FS
1	<2.0	<1.3	<1.3	<1.0
2	<3.0	<2.0	<2.0	<1.3
3	>3.0	>2.0	>2.0	<1.5
4	>3.0	>2.0	>2.0	>1.5
5	>3.0	>2.0	>2.0	>1.5

FS Criteria for Dams with Well Defined Structure and Foundation Information and Testing

Rating	Normal Pool FS	SDF FS	Ice Loading FS	Seismic FS
1	<1.5	<1.3	<1.3	<1.0
2	<2.0	<1.7	<1.7	<1.0
3	<3.0	<2.0	<2.0	<1.1
4	>3.0	>2.0	>2.0	<1.3
5	>3.0	>2.0	>2.0	>1.3

See Appendix D for a complete listing of dam orientation and terminology definitions.

Upstream – Shall mean the side of the dam that borders the impoundment.

Downstream – Shall mean the high side of the dam, the side opposite the upstream side.

Right – Shall mean the area to the right when looking in the downstream direction.

Left – Shall mean the area to the left when looking in the downstream direction.

Height of Dam – Shall mean the vertical distance from the lowest portion of the natural ground, including any stream channel, along the downstream toe of the dam to the crest of the dam.

Embankment – Shall mean the fill material, usually earth or rock, placed with sloping sides, such that it forms a permanent barrier that impounds water.

Crest – Shall mean the top of the dam, usually provides a road or path across the dam.

Abutment – Shall mean that part of a valley side against which a dam is constructed. An artificial abutment is sometimes constructed as a concrete gravity section, to take the thrust of an arch dam where there is no suitable natural abutment.

Appurtenant Works – Shall mean structures, either in dams or separate therefrom, including but not be limited to, spillways; reservoirs and their rims; low-level outlet works; and water conduits including tunnels, pipelines, or penstocks, either through the dams or their abutments.

Spillway – Shall mean a structure over or through which water flows are discharged. If the flow is controlled by gates or boards, it is a controlled spillway; if the fixed elevation of the spillway crest controls the level of the impoundment, it is an uncontrolled spillway.

APPENDIX C

PREVIOUS INSPECTION CHECKLIST

ACOE PHASE I INSPECTION REPORT dated August 14, 2020 prepared by Scheurer Consulting Engineers of Lee, Massachusetts

ACOE PHASE I INSPECTION REPORT dated June 21, 2018 prepared by Scheurer Consulting Engineers of Lee, Massachusetts

ACOE PHASE I INSPECTION REPORT dated June 2, 2016 prepared by Scheurer Consulting Engineers of Lee, Massachusetts

ACOE PHASE I INSPECTION REPORT dated August 16, 2014 prepared by Scheurer Consulting Engineers of Lee, Massachusetts

ACOE PHASE I INSPECTION REPORT dated August 9, 2012 prepared by Berkshire Engineering of Lee, Massachusetts

ACOE PHASE I INSPECTION REPORT dated August 20, 2010 prepared by Berkshire Engineering of Lee, Massachusetts

ACOE PHASE I INSPECTION REPORT dated September 2, 2008 prepared by Tighe & Bond of Westfield, Massachusetts

ACOE PHASE I INSPECTION REPORT dated September 6, 2006 prepared by Tighe & Bond of Westfield, Massachusetts

DEM – Division of Dam Safety Inspection Report dated May 11, 2001, prepared by Mark McClusky of DEM Office of Dam Safety

HYDROLOGICAL/HYDRAULIC ANALYSIS dated October 5, 2001, prepared by Tighe & Bond of Westfield, Massachusetts

ACOE PHASE I INSPECTION REPORT dated September 7, 1978, prepared by Camp Dresser & McKee of Boston, Massachusetts

APPENDIX D

DEFINITIONS

COMMON DAM SAFETY DEFINITIONS

For a comprehensive list of dam engineering terminology and definitions refer to 302 CMR10.00 Dam Safety, or other reference published by FERC, Dept. of the Interior Bureau of Reclamation, or FEMA. Please note should discrepancies between definitions exist, those definitions included within 302 CMR 10.00 govern for dams located within the Commonwealth of Massachusetts.

Orientation

Upstream – Shall mean the side of the dam that borders the impoundment.

Downstream – Shall mean the high side of the dam, the side opposite the upstream side.

Right – Shall mean the area to the right when looking in the downstream direction.

Left – Shall mean the area to the left when looking in the downstream direction.

Dam Components

Dam – Shall mean any artificial barrier, including appurtenant works, which impounds or diverts water.

Embankment – Shall mean the fill material, usually earth or rock, placed with sloping sides, such that it forms a permanent barrier that impounds water.

Crest – Shall mean the top of the dam, usually provides a road or path across the dam.

Abutment – Shall mean that part of a valley side against which a dam is constructed. An artificial abutment is sometimes constructed as a concrete gravity section, to take the thrust of an arch dam where there is no suitable natural abutment.

Appurtenant Works – Shall mean structures, either in dams or separate therefrom, including but not be limited to, spillways; reservoirs and their rims; low-level outlet works; and water conduits including tunnels, pipelines, or penstocks, either through the dams or their abutments.

Spillway – Shall mean a structure over or through which water flows are discharged. If the flow is controlled by gates or boards, it is a controlled spillway; if the fixed elevation of the spillway crest controls the level of the impoundment, it is an uncontrolled spillway.

Size Classification

(as listed in Commonwealth of Massachusetts, 302 CMR 10.00 *Dam Safety*)

Large – structure with a height greater than 40 feet or a storage capacity greater than 1,000 acre-feet.

Intermediate – structure with a height between 15 and 40 feet or a storage capacity of 50 to 1,000 acre-feet.

Small – structure with a height between 6 and 15 feet and a storage capacity of 15 to 50 acre-feet.

Non-Jurisdictional – structure less than 6 feet in height or having a storage capacity of less than 15 acre-feet.

Hazard Classification

(as listed in Commonwealth of Massachusetts, 302 CMR 10.00 *Dam Safety*)

High Hazard (Class I) – Shall mean dams located where failure will likely cause loss of life and serious damage to home(s), industrial or commercial facilities, important public utilities, main highway(s) or railroad(s).

Significant Hazard (Class II) – Shall mean dams located where failure may cause loss of life and damage to home(s), industrial or commercial facilities, secondary highway(s) or railroad(s), or cause the interruption of the use or service of relatively important facilities.

Low Hazard (Class III) – Dams located where failure may cause minimal property damage to others. Loss of life is not expected.

General

EAP – Emergency Action Plan – Shall mean a predetermined (and properly documented) plan of action to be taken to reduce the potential for property damage and/or loss of life in an area affected by an impending dam failure.

O&M Manual – Operations and Maintenance Manual; Document identifying routine maintenance and operational procedures under normal and storm conditions.

Normal Pool – Shall mean the elevation of the impoundment during normal operating conditions.

Acre-foot – Shall mean a unit of volumetric measure that would cover one acre to a depth of one foot. It is equal to 43,560 cubic feet. One million U.S. gallons = 3.068 acre feet.

Height of Dam (Structural Height) – Shall mean the vertical distance from the lowest portion of the natural ground, including any stream channel, along the downstream toe of the dam to the lowest point on the crest of the dam.

Hydraulic Height – means the height to which water rises behind a dam and the difference between the lowest point in the original streambed at the axis of the dam and the maximum controllable water surface.

Maximum Water Storage Elevation – means the maximum elevation of water surface which can be contained by the dam without overtopping the embankment section.

Spillway Design Flood (SDF) – Shall mean the flood used in the design of a dam and its appurtenant works particularly for sizing the spillway and outlet works, and for determining maximum temporary storage and height of dam requirements.

Maximum Storage Capacity – The volume of water contained in the impoundment at maximum water storage elevation.

Normal Storage Capacity – The volume of water contained in the impoundment at normal water storage elevation.

Condition Rating

Unsafe – Major structural*, operational, and maintenance deficiencies exist under normal operating conditions.

Poor – Significant structural*, operation and maintenance deficiencies are clearly recognized for normal loading conditions.

Fair – Significant operational and maintenance deficiencies, no structural deficiencies. Potential deficiencies exist under unusual loading conditions that may realistically occur. Can be used when uncertainties exist as to critical parameters.

Satisfactory – Minor operational and maintenance deficiencies. Infrequent hydrologic events would probably result in deficiencies.

Good – No existing or potential deficiencies recognized. Safe performance is expected under all loading including SDF.

* Structural deficiencies include but are not limited to the following:

- Excessive uncontrolled seepage (e.g., upwelling of water, evidence of fines movement, flowing water, erosion, etc.)
- Missing riprap with resulting erosion of slope
- Sinkholes, particularly behind retaining walls and above outlet pipes, possibly indicating loss of soil due to piping, rather than animal burrows
- Excessive vegetation and tree growth, particularly if it obscures features of the dam and the dam cannot be fully inspected
- Deterioration of concrete structures (e.g., exposed rebar, tilted walls, large cracks with or without seepage, excessive spalling, etc.)
- Inoperable outlets (gates and valves that have not been operated for many years or are broken)