

# SQUANNACOOK RIVER DAM PHASE I INSPECTION / EVALUATION



<b>Dam Name:</b>	Squannacook River Dam
<b>State ID #:</b>	4-9-115-1
<b>NID ID#:</b>	MA00442
<b>Owner:</b>	Town of Groton
<b>Owner Type:</b>	Municipal
<b>Town:</b>	Groton
<b>Consultant:</b>	Haley & Aldrich, Inc.
<b>Date of Inspection:</b>	May 5, 2023

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## EXECUTIVE SUMMARY

The Squannacook River Dam is a run-of-the-river concrete structure with stone masonry training walls, approximately 150 ft long and 18 ft high. The dam includes a concrete spillway, which extends from a 10 ft-high masonry training wall on the right abutment to a concrete outlet works structure at the left abutment. A stone masonry training wall extends from the grassed embankment slope at the upstream West Groton Road bridge abutment to the outlet works structure. The dam is located immediately upstream of the River Court Residences, senior housing. Due to the downstream development, the dam is classified as a High hazard dam.

The size and hazard classifications for the Squannacook River Dam were determined in accordance with 302 CMR 10.06. Squannacook River Dam has a maximum height of approximately 18 ft and a maximum storage capacity of 110 acre-feet. The dam is classified as an **Intermediate** size dam. Failure of the dam could lead to property damage and potential loss of life; accordingly, the dam is classified as a **High Hazard** dam.

A Phase I inspection was last completed at the site in September 2020 and concluded that the dam was in fair condition due to the Shirley side of the Dam. In 2013, repairs to the Groton side (East, or Left, side) of the dam were completed; however, repairs to the Shirley (West, or Right) side are still needed to maintain the structure. The overall physical condition of the dam is judged to be in FAIR condition due to the needed repairs in the Shirley side of the dam.

## Dam Evaluation Summary Detail Sheet

<b>1. NID ID:</b> MA00442	<b>2. Dam Name:</b> Squannacook River Dam	<b>3. Dam Location:</b> Groton
<b>4. Inspection Date:</b> 5 May 2023	<b>5. Last Insp. Date:</b> 19 September 2020	<b>6. Next Inspection:</b> 2025
<b>7. Inspector:</b> Denis J. Bell	<b>8. Consultant:</b> Haley & Aldrich, Inc.	
<b>9. Hazard Code:</b> High	<b>10. Insp. Frequency:</b> High 2-Yrs.	<b>11. Insp. Condition:</b> Fair
<b>E1. Design Methodology:</b>	1	<b>E7. Low-Level Discharge Capacity:</b> 3
<b>E2. Level of Maintenance:</b>	3	<b>E8. Low-Level Outlet Physical Condition:</b> 3
<b>E3. Emergency Action Plan:</b>	5	<b>E9. Spillway Design Flood Capacity:</b> 5
<b>E4. Embankment Seepage:</b>	4	<b>E10. Overall Physical Condition of the Dam:</b> 3
<b>E5. Embankment Condition:</b>	3	<b>E11. Estimated Repair Cost (in thousand\$):</b> 306
<b>E6. Concrete Condition:</b>	3	

### Evaluation Description

#### E1: DESIGN METHODOLOGY

1. Unknown Design – no design records available
3. Some standard design features
5. State of the art design – design records available

#### E2: LEVEL OF MAINTENANCE

1. No evidence of maintenance, no O&M manual
2. Very little maintenance, no O&M manual
3. Some level of maintenance and standard procedures
4. Adequate level of maintenance and standard procedures
5. 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

#### E4: EMBANKMENT SEEPAGE

1. Severe piping and/or seepage with no monitoring
2. Evidence of monitored piping and seepage
3. No piping but uncontrolled seepage
4. Controlled seepage
5. No seepage or piping

#### E5: EMBANKMENT CONDITION

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

1. Major cracks, misalignment, discontinuities causing leaks, seepage or stability concerns
2. Cracks with misalignment inclusive of transverse cracks with no misalignment
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
2. Outlet with insufficient drawdown capacity
3. Inoperable gate with potentially sufficient drawdown capacity
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 - 20% of the SDF
2. 21- 40% of the SDF
3. 41- 60% of the SDF
4. 61- 80% of the SDF
5. 81- 100% of the SDF

#### 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 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

The dam was repaired in 2013. The Shirley, MA (west) side of the dam still requires attention.

## PREFACE

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 this report.

In reviewing this report, it should be realized that the described condition of the dam is based on observations of field conditions at the time of inspection, along with other 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 that might otherwise be detectable if inspected under 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 will be detected.

Signed:

Denis J. Bell  
Consulting Engineer

Print Name: Denis J. Bell

Massachusetts License No.: 46241

Title: Senior Engineer

Company: Haley & Aldrich, Inc.

Professional Engineer's Seal:



## TABLE OF CONTENTS

	Page No.
<b>EXECUTIVE SUMMARY</b>	<b>i</b>
<b>DAM EVALUATION SUMMARY DETAIL SHEET</b>	<b>ii</b>
<b>PREFACE</b>	<b>iii</b>
<b>1.0 DESCRIPTION OF PROJECT</b>	<b>1</b>
1.1 General	1
1.1.1 Authority	1
1.1.2 Purpose of Work	1
1.1.3 Definitions	1
1.2 Description of Project	1
1.2.1 Location	1
1.2.2 Owner/Operator	2
1.2.3 Purpose of Dam	2
1.2.4 Description of the Dam and Appurtenances	2
1.2.5 Operation and Maintenance	2
1.2.6 DCR Size Classification	3
1.2.7 DCR Hazard Classification	3
1.3 Engineering Dam	3
1.3.1 Drainage Area	3
1.3.2 Reservoir	3
1.3.3 Discharges at the Dam Site	4
1.3.4 General Elevations	4
1.3.5 Overflow Spillway	4
1.3.6 Outlet Structure	4
1.3.7 Design and Construction Records	4
1.3.8 Operating Records	4
<b>2.0 INSPECTION</b>	<b>6</b>
2.1 Visual Inspection	6
2.1.1 General Findings	6
2.1.2 Dam	6
2.1.3 Appurtenant Structures	6
2.1.4 Downstream Area	7
2.1.5 Reservoir Area	7
2.2 Caretaker Interview	7
2.3 Operation and Maintenance Procedures	7
2.3.1 Operational Procedures	7
2.3.2 Maintenance of Dam and Operating Facilities	7
2.4 Emergency Warning System	7
2.5 Hydraulic/Hydrologic Data	7
2.6 Structural Stability/Overtopping Potential	8
2.6.1 Structural Stability	8

## TABLE OF CONTENTS

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	Page No.
2.6.2 Overtopping Potential	8
<b>3.0 ASSESSMENT AND RECOMMENDATIONS</b>	<b>9</b>
3.1 Assessments	9
3.2 Studies and Analyses	9
3.3 Yearly Recommendations	9
3.4 Recommendations, Maintenance, and Minor Repairs	9
3.5 Remedial Measures	9
3.6 Alternatives	10
3.7 Opinion of Probable Construction Cost	10

### FIGURES

- Figure 1: Locus Plan
- Figure 2: Existing Conditions Plan
- Figure 3: Aerial Photograph
- Figure 4: Drainage Area

**APPENDIX A – Photographs**

**APPENDIX B – Inspection Checklist**

**APPENDIX C – Definitions**

## 1 DESCRIPTION OF PROJECT

### 1.1 General

#### 1.1.1 Authority

Haley & Aldrich, Inc. has been retained by the Town of Groton to perform a visual inspection and develop a report of conditions for the Squannacook River Dam in Groton, Massachusetts. This inspection and report were performed in accordance with Chapter 253, Sections 44-50 of the Massachusetts General Laws.

#### 1.1.2 Purpose of Work

The purpose of this investigation is to inspect and evaluate the present condition of the dam and appurtenant structures. More specifically, it is to compare the existing structural and hydraulic conditions of the dam to the conditions reported during previous inspections, and to re-evaluate hazard and size classifications as they relate to present Massachusetts 302 CMR 10.00 Dam Safety Rules and Regulations.

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

#### 1.1.3 Definitions

To provide the reader 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: orientation; 2) dam components; 3) size classification; 4) hazard classification; and 5) miscellaneous.

### 1.2 Description of Project

#### 1.2.1 Location

Squannacook River Dam is located on the Squannacook River in the Town of Groton in Middlesex County, Massachusetts. As shown on Figure 1, the coordinates of the dam are 42° 36' 09" north latitude and 71° 37' 41" west longitude.

#### 1.2.2 Owner/Operator

Squannacook River Dam is owned by the Town of Groton with Mr. Thomas Delaney, Highway Director as the primary caretaker of the dam.

	Dam Owner	Dam Caretaker
Name	Town of Groton	Thomas Delaney, Jr., Highway Director
Mailing Address	173 Main Street	600 Cow Pond Brook Road PO Box 1111
Town	Groton, MA 01450	Groton, MA 01450
Daytime Phone	978-448-1111	(978) 448-1162
Emergency Phone	911	911
Email Address	<a href="mailto:selectmen@ci.groton.ma.us">selectmen@ci.groton.ma.us</a>	<a href="mailto:highway@townofgroton.org">highway@townofgroton.org</a>

### 1.2.3 Purpose of Dam

Squannacook River Dam was formerly used to generate power for the mill located adjacent to the dam. The current use of the dam is for recreation (isolated canoeing upstream) and as a scenic area adjacent to the housing development and roadway. A 6-ft diameter pipe located downstream of the penstock area was plugged with concrete and is no longer in service.

### 1.2.4 Description of the Dam and Appurtenances

The dam is a run-of-the-river stone masonry and concrete structure, approximately 150 ft long and 18 ft high. The crest of the dam was submerged below about 2 inches of water at the time of the inspection and was not fully observable. The dam includes a cut stone masonry and concrete spillway, which extends from a 10-ft-high masonry training wall on the right abutment to concrete outlet works structure at the left abutment. A stone masonry training wall extends from the grassed embankment slope at the upstream West Groton Road bridge abutment to the outlet works structure.

A refurbished brick mill building is located downstream of the dam starting at the left abutment. The building has been converted into an assisted and independent living facility, and is currently occupied. A 6-ft diameter penstock starts at a concrete headwall at the outlet works structure and discharges within the mill building. The outlet pipe was plugged with concrete sometime between 1999 and 2006 and is no longer in service.

The general layout of the dam is shown on the plan view, Figure 2.

### 1.2.5 Operation and Maintenance

There are no formal operating procedures at the Squannacook River Dam. The outlet for the penstock consists of two outlets. The 6-ft diameter pipe downstream of the penstock area which leads into the mill building has been plugged with concrete and is no longer active. The active outlets consist of a notch in the concrete with stoplog grooves in the concrete which is able to be fitted with stoplogs. The other active outlet is a low level outlet from the penstock and is typically set open a few inches.

### 1.2.6 DCR Size Classification

Storage volume at the top of Squannacook River Dam is estimated to be about 110 acre-ft. The



dam has a maximum structural height of about 18 ft. Based on this information and according to the criteria in 302 CMR 10.00, the dam is classified as an INTERMEDIATE dam.

### **1.2.7 DCR Hazard Classification**

The downstream area consists of farmland and swamps with little development downstream of the dam, however the mill building adjacent to the left abutment is occupied. Accordingly, failure of the dam may cause loss of life and temporary flooding to the lowest level of the mill building. Based on the criteria in 302 CMR 10.00, the dam is classified as HIGH hazard.

## **1.3 Engineering Data**

Information on the dam is presented below in Table 1.1.

### **1.3.1 Drainage Area**

The dam is a run of the river dam and is in series with the privately owned Hollingsworth & Vose Co. dam upstream of the Squannacook River Dam, thus the drainage area was evaluated as the drainage area for the river below the upstream dam, approximately 780 acres (1.2 square miles). The normal surface area of the river impounded by the dam below the upstream dam is about 28 acres (0.04 square miles), about 4% of the drainage area. The topography of the area is mostly wooded with some hills. There are also residential areas within the drainage area.

### **1.3.2 Reservoir**

#### **1.3.2.1 Length**

Below the Hollingsworth & Vose Co. dam and above the Squannacook River Dam, the Squannacook River is approximately 0.8 miles long. In general, the banks of the river are wooded and gently sloped.

#### **1.3.2.2 Surface Area**

The normal surface area for the portion of the Squannacook River upstream of the Squannacook River Dam and downstream of the Hollingsworth & Vose Co. dam is about 28 acres.

#### **1.3.2.3 Storage Area**

Based on a review of existing data for the dam, the normal storage capacity of the Squannacook River Dam is about 75 acre-ft. Its maximum capacity is estimated to be about 110 acre-ft.

### **1.3.3 Discharges at the Dam Site**

The design flood for the Squannacook River Dam is the 100-year flood. The inflow to the dam is significantly governed by the upstream control (Hollingsworth & Vose Co. dam).

#### **1.3.4 General Elevations**

All elevations are based on the National Geodetic Vertical Datum (NGVD). Based on a review of topographic maps, the elevation of the top of the dam was approximately El. 242.75.

#### **1.3.5 Overflow Spillway**

The elevation of the top of the spillway was approximately 2.75 ft below the top of the dam (El. 240).

#### **1.3.6 Outlet Structure**

The low level outlet structure consists of a square wooded gate measuring about 40 inches square. The mechanism is exercised once each year or so and is typically left open a few inches.

#### **1.3.7 Design and Construction Records**

No construction records are available however the year 1926 was imprinted in the concrete of the dam prior to 2013. It is not known if this year is the original construction or a major reconstruction. In 2013, the wall was chipped and new concrete placed. The imprinted 1926 no longer exists.

In the Fall of 2013, the Groton side of the dam, the left side, was repaired and the design drawings are available.

#### **1.3.8 Operating Records**

No operational records are available and reportedly, no operation records are maintained.

### 1.1 Summary Data Table

Required Phase I Report Data	Data Provided by the Inspecting Engineer
National ID #	MA00442
Dam Name	Squannacook River Dam
Dam Name (Alternate)	NA
River Name	Squannacook River
Impoundment Name	Squannacook River
Hazard Class	High
Size Class	Intermediate
Dam Type	Concrete; Run of the River
Dam Purpose	Former Mill Dam; Recreational
Structural Height of Dam (feet)	18
Hydraulic Height of Dam (feet)	18
Drainage Area (sq. mi.)	1.2
Reservoir Surface Area (acres)	20
Normal Impoundment Volume (acre-feet)	75
Max Impoundment Volume ((top of dam) acre-feet)	110
SDF Impoundment Volume* (acre-feet)	110
Spillway Type	Concrete; Run of the River
Spillway Length (feet)	150
Freeboard at Normal Pool (feet)	5
Principal Spillway Capacity* (cfs)	1400
Auxiliary Spillway Capacity* (cfs)	50
Low-Level Outlet Capacity* (cfs)	50
Spillway Design Flood* (flow rate - cfs)	100yr/ 720 cfs
Winter Drawdown (feet below normal pool)	None
Drawdown Impoundment Vol. (acre-feet)	Not Applicable
Latitude	42o 36.1'
Longitude	71o 37.4'
City/Town	Groton
County Name	Middlesex
Public Road on Crest	No
Public Bridge over Spillway	Upstream
EAP Date (if applicable)	None
Owner Name	Town of Groton
Owner Address	173 Main Street
Owner Town	Groton, MA 01450
Owner Phone	978-448-1111
Owner Emergency Phone	(978) 852-6545
Owner Type	Municipality or Political subdivision
Caretaker Name	Thomas Delaney
Caretaker Address	600 Cow Pond Brook Road
Caretaker Town	Groton, MA 01450
Caretaker Phone	978-448-1162
Caretaker Emergency Phone	(978) 852-6545
Date of Field Inspection	9/17/2020
Consultant Firm Name	Haley & Aldrich, Inc.
Inspecting Engineer	Denis J. Bell, P.E.
Engineer Phone Number	617-886-7343

## **2 INSPECTION**

### **2.1 Visual Inspection**

#### **2.1.1 General Findings**

On 5 May 2023, Haley & Aldrich, Inc. completed a visual inspection of the Squannacook River Dam. The reservoir level at the time of the site visit was at the top of spillway. Based on that inspection, the dam and spillway were found to be in FAIR condition. Previously, the dam was found to be in Fair condition. The following paragraphs describe the condition of the dam observed during the inspection. Refer to the photographs included as Appendix A and checklist forms included in Appendix B for additional comments.

#### **2.1.2 Dam**

The Squannacook River Dam is a run of the river, concrete structure approximately 150 ft long and 18 ft high. The dam spillway could not be directly observed since the spillway was submerged. Bedrock was exposed below the dam in the central portion of the spillway and is abutted on both sides with an inclined concrete spillway slab where bedrock outcrops are not present.

The overall crest alignment appeared satisfactory, however, mortar was observed missing at some of the joints. The concrete spillway on the Groton side of the dam is in good condition.

During the site visit, a log/tree was present on the spillway and should be removed.

Repairs the Shirley side of the dam, the right side, are needed.

#### **2.1.3 Appurtenant Structures**

Along the left side of the dam, a stone masonry training wall extends from the bridge abutment upstream to the concrete outlet works structure. Downstream of the dam the abandoned mill building extends along the vegetated river bank. A cut stone masonry wall extends from the dam downstream along the right abutment.

The 6-ft-diameter above ground pipe that exits the concrete headwall structure and runs along the side of the mill building for approximately 100 to 150 ft was reportedly plugged with concrete sometime between 1999 and 2006.

The mill building immediately downstream of the left end of the spillway is occupied by an assisted living facility.

#### **2.1.4 Downstream Area**

Slope protection consisting of large stones was observed below the dam along the riverbanks. Brush and trees were observed growing in the slope protection. At the time of the inspection, water was flowing over the spillway and much of the discharge channel was underwater.

### **2.1.5 Reservoir Area**

The banks of the river are wooded with mild slopes. Immediately upstream of the spillway, the reservoir is silted up to about 1 in. below the top of the spillway. Vegetation including grasses and light bushes was observed growing immediately upstream of the spillway.

## **2.2 Caretaker Interview**

Mr. Tom Delaney, Groton Highway Department was interviewed concerning the operation and maintenance of the dam and the information has been incorporated into this report.

## **2.3 Operation and Maintenance Procedures**

### **2.3.1 Operational Procedures**

There are no formal operation or maintenance procedures, nor operating records for the dam.

### **2.3.2 Maintenance of Dam and Operating Facilities**

The Town of Groton monitors the dam periodically and controls the access to the dam by locking the gate at the outlet works structure. The low level outlet is reportedly kept open a few inches and is exercised about once each year or two.

## **2.4 Emergency Warning System**

There is no emergency warning system for the Squannacook River Dam. An Emergency Action Plan was developed for the dam, dated 14 April 2023 and is on file with the Groton Highway Department.

## **2.5 Hydraulic/Hydrologic Data**

Based on the DCR size and hazard classification system, the selected test flood for Squannacook River Dam is the 100 year flood. Upstream of the dam is the privately owned dam Hollingsworth & Vose Co. dam. Due to the proximity of the dams, the dams are considered in series. Since the Squannacook River Dam is the lower dam in a series, hydraulic/hydrologic calculations are based on only the flow from the drainage area between the upstream dam and the Squannacook River Dam. Accordingly, the calculated 100 year flood inflow is 720 cfs. Based on a review of the existing information, the spillway capacity is 1400 cfs, which is greater than the 100 year flood overflow. The height of water passing the spillway would be about 2 ft.

## **2.6 Structural Stability/Overtopping Potential**

### **2.6.1 Structural Stability**

The concrete spillway was dewatered during the 2013 construction and found to be in fair condition. Previously cracked and spalling concrete locations on the Groton side of the dam were chipped and repaired with reinforced concrete.

The Shirley side of the dam was not repaired during the recent work and this area of the dam is in need of repairs to maintain the structure.

#### **2.6.2 Overtopping Potential**

Assuming no upstream control, during the 100 year flood the water level on the dam should not overtop the dam during the design storm event. The height of water passing the spillway would be about 2.0 ft.

### **3 ASSESSMENT AND RECOMMENDATIONS**

#### **3.1 Assessments**

The condition of the Squannacook River Dam observed during the most recent site inspection is judged to be FAIR. Repairs to the Shirley side of the dam are needed to maintain the structure.

#### **3.2 Studies and Analyses**

- A detailed hydrologic/ hydraulic study should be completed for the dam taking into account the series of dams including the Hollingsworth & Vose Co. dam upstream of the Squannacook River Dam.

#### **3.3 Yearly Recommendations**

The condition of the spillway and dam should be monitored several times per year. The low level outlet gate should be exercised several times per year.

#### **3.4 Recommendations, Maintenance, and Minor Repairs**

The following recommendations for improvement at the dam include

- Implement remedial measures developed for the Shirley Side of the dam.
- Conduct a hydraulic/hydrologic study, including the effect of the upstream dam on the flow over the Squannacook River Dam, for the dam configuration after implementation of the remedial measures
- Repair the training wall on the Shirley side of the dam.
- Remove vegetation and debris from downstream areas, auxiliary spillway, and along crest.
- Remove debris on the spillway including the log/tree present on the spillway during the site visit.

#### **3.5 Remedial Measures**

In order for Squannacook Dam to be in compliance with Massachusetts General Law 253, Section 44, Chapter 302 CMR 10.00, the owner must upgrade the condition of the dam by performing the remedial measures shown below. These remedial measures require the owner to hire a qualified engineer to prepare documents prior to implementing the remedial measures. This work may require state, local or government permits that should be investigated prior to starting work.

Remedial measures requiring assistance from a qualified engineer:

- Implement remedial measures developed for the Shirley side of the dam.
- Conduct a hydraulic/hydrologic study, including the effect of the upstream dam on the flow over the Squannacook River Dam, for the dam configuration after implementation of the remedial

measures.

- Repair the training wall on the Shirley side of the dam.
- Remove vegetation and debris from downstream areas, auxiliary spillway, and along crest.

### 3.6 Alternatives

An alternative to repairing the dam is to take the dam out of service and remove the structure.

### 3.7 Opinion of Probable Construction Cost

The opinion of probable costs is given below. These design and construction costs, including estimated labor and material costs, are based on limited investigations and are provided only for general information and relative cost of individual items. No detailed quantity measurements; nor time and equipment calculations were completed. Estimates were based on engineering judgment, interpretation of site conditions, and general comparison with other similar repair work where appropriate. Actual construction costs can vary significantly from these estimates; budgeting requests or other financial decisions should not be submitted based on these estimates. A detailed project specific estimate should be completed for those purposes.

<u>RECOMMENDATIONS/REMEDIAL MEASURES</u>	<u>ESTIMATED COST</u>
Repair Shirley training wall	\$120,000
Conduct hydraulic/hydrologic evaluation	\$35,000
Repair Splashpad on Shirley side	\$50,000
Remove vegetation at downstream area and crest	\$20,000
Re-Point Upstream Walls (w/ water diversion)	\$30,000
Subtotal	\$255,000
Engineering and Construction Contingencies (20%)	\$51,000
Total	\$306,000

Total estimated repair cost for Squannacook River Dam is approximately \$306,000.



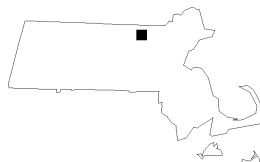


MAP SOURCE: ESRI

SITE COORDINATES: 42°36'10"N, 71°37'39"W

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ALDRICH**

SQUANNAHOOK RIVER DAM  
NID MA00442  
GROTON, MASSACHUSETTS



## PROJECT LOCUS

APPROXIMATE SCALE: 1 IN = 2000 FT  
OCTOBER 2015

**FIGURE 1**

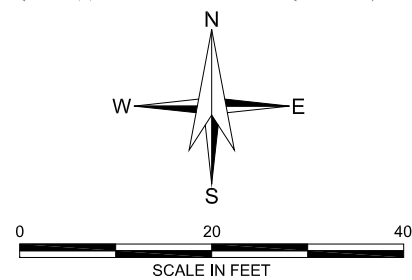
G:\350761002-2011-PH\ISQUANACOOK-01.DWG

NOTES:

1. BASE PLAN TAKEN FROM PLAN TITLED "EXISTING CONDITIONS" PREPARED BY DUCHARME AND DILLIS CIVIL DESIGN GROUP, INC. DATED 1 FEBRUARY 2008.
2. ELEVATIONS ARE IN FEET AND REFERENCE THE NATIONAL GEODETIC VERTICAL DATUM (NGVD) OF 1929

LEGEND:

APPROXIMATE DESIGNATION AND  
ORIENTATION OF PHOTOGRAPH



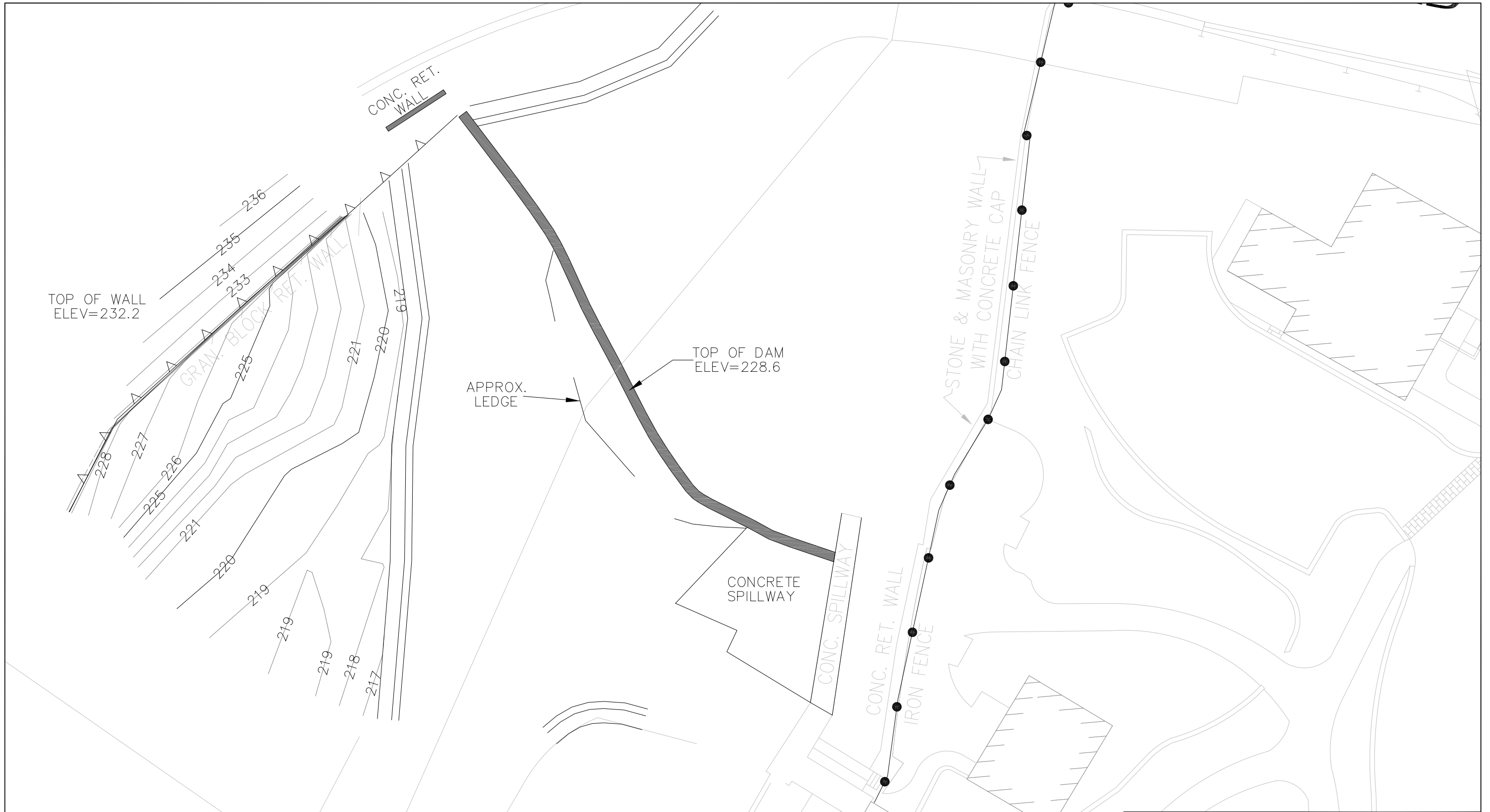
**HALEY &  
ALDRICH**

SQUANNAHOOK RIVER DAM  
GROTON, MASSACHUSETTS

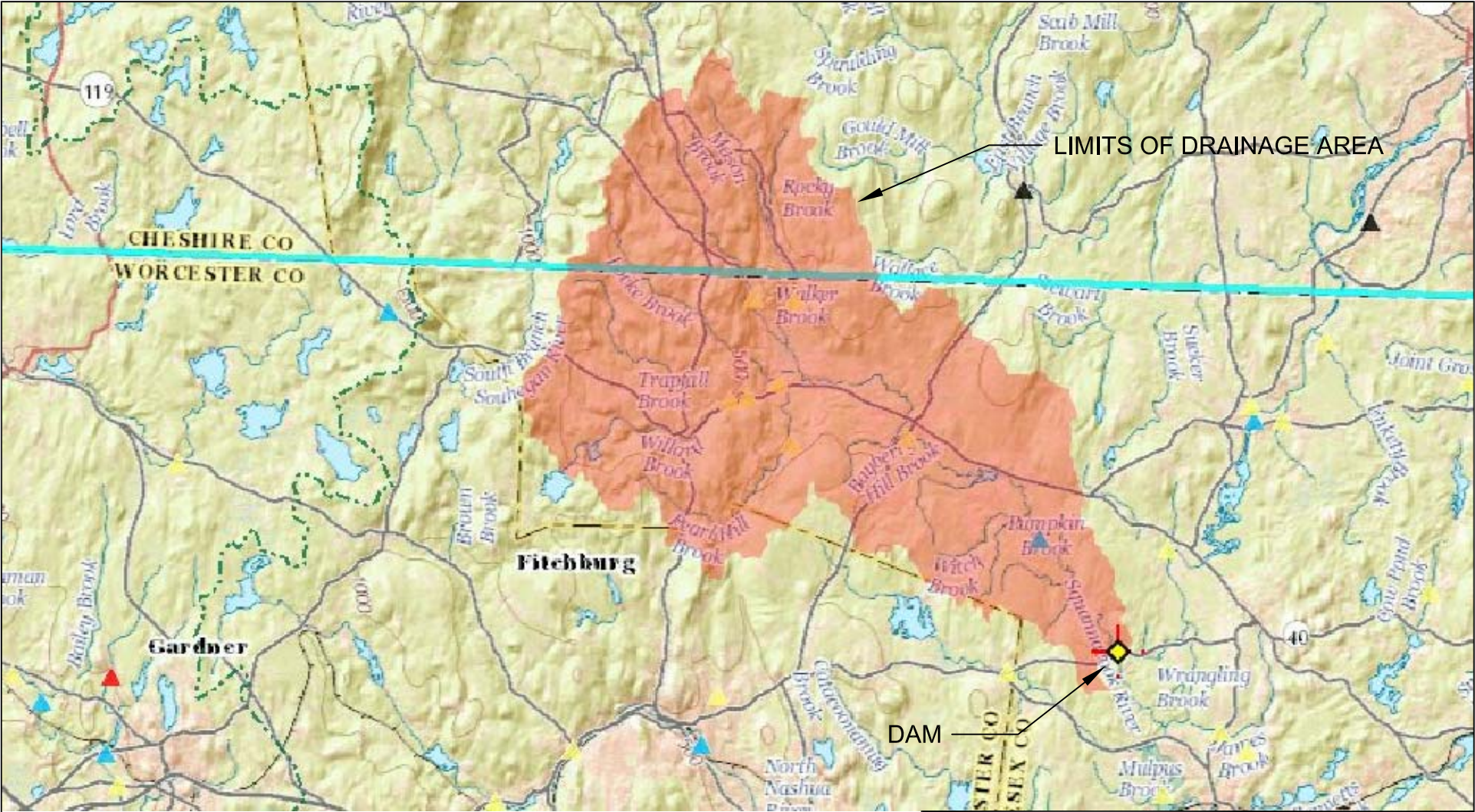
EXISTING CONDITIONS PLAN

SCALE: AS SHOWN  
AUGUST 2011

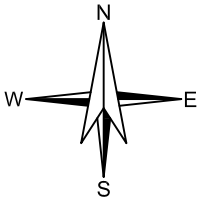
FIGURE 2







NOTE: FIGURE BASEPLAN AND INFORMATION OBTAINED FROM USGS DATABASE



**HALEY  
ALDRICH**

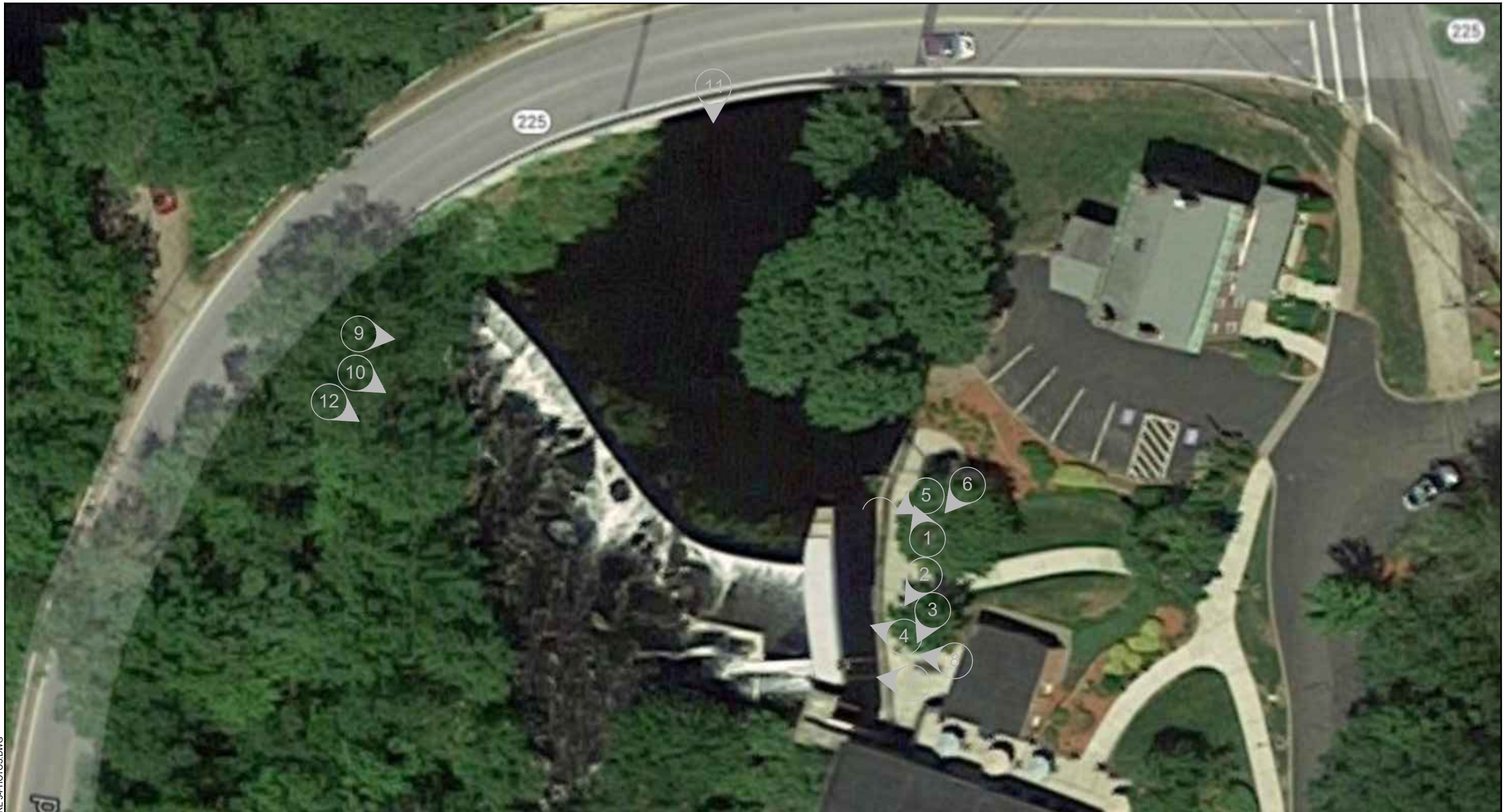
PHASE I DAM SAFETY INSPECTION  
FILE NO. 35078-012  
GROTON, MASSACHUSETTS

**SQUANNACOOK RIVER DAM  
DRAINAGE AREA MAP**

SCALE: AS SHOWN  
OCTOBER 2015

**FIGURE 4**





NOTES

1. AERIAL PHOTOGRAPH FROM GOOGLE EARTH PRO REGISTERED TO HALEY & ALDRICH, INC.



LEGEND:

LOCATION AND ORIENTATION  
OF PHOTOGRAPH



**HALEY  
ALDRICH**

SQUANNA COOK RIVER DAM  
NID MA00442

AERIAL PHOTOGRAPH

SCALE: AS SHOWN  
MAY 2023

FIGURE 4

## **APPENDIX A**

### **Photographs**





Photo 1  
Squannacook River  
Looking Upstream



Photo 2  
Sluiceway with Debris





Photo 3  
Debris on Spillway



Photo 4  
Sluiceway



Photo 5  
High Level Spillway



Photo 6  
Spillway





Photo 7  
High Level Spillway



Photo 8  
Squannacook River Dam





Photo 9  
Shirley Side of Dam



Photo 10  
Spillway





Photo 11  
Squannacook River



Photo 12  
Downstream Area

## **APPENDIX B**

### **INSPECTION CHECKLISTS**

### DAM SAFETY INSPECTION CHECKLIST

NAME OF DAM: <u>Squannacook River Dam</u>		STATE ID #: <u>4-9-115-1</u>	
REGISTERED: <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO		NID ID #: <u>MA00442</u>	
STATE SIZE CLASSIFICATION: <u>Intermediate</u>		STATE HAZARD CLASSIFICATION: <u>High</u>	
		CHANGE IN HAZARD CLASSIFICATION REQUESTED?: <u>No</u>	
<u><b>DAM LOCATION INFORMATION</b></u>			
CITY/TOWN: <u>Groton</u>		COUNTY: <u>Middlesex</u>	
DAM LOCATION: <u>West Main Street (Route 225)</u> (street address if known)		ALTERNATE DAM NAME: <u>NA</u>	
USGS QUAD.: <u>Shirley, MA</u>		LAT.: <u>42° 36.1'</u>	LONG.: <u>71° 37.4'</u>
DRAINAGE BASIN: <u>Merrimack</u>		RIVER: <u>Squannacook River</u>	
IMPOUNDMENT NAME(S): <u>Squannacook River</u>			
<u><b>GENERAL DAM INFORMATION</b></u>			
TYPE OF DAM: <u>Concrete; Run of the River</u>		OVERALL LENGTH (FT): <u>150</u>	
PURPOSE OF DAM: <u>Former Mill Dam; Recreational</u>		NORMAL POOL STORAGE (ACRE-FT): <u>75</u>	
YEAR BUILT: <u>Concrete Imprint indictaes 1926; Repairs 2013</u>		MAXIMUM POOL STORAGE (ACRE-FT): <u>110</u>	
STRUCTURAL HEIGHT (FT): <u>18</u>		EL. NORMAL POOL (FT): <u>240.0</u>	
HYDRAULIC HEIGHT (FT): <u>18</u>		EL. MAXIMUM POOL (FT): <u>242.0</u>	
<u><b>FOR INTERNAL MADCR USE ONLY</b></u>			
FOLLOW-UP INSPECTION REQUIRED: <input type="checkbox"/> YES <input type="checkbox"/> NO		CONDITIONAL LETTER: <input type="checkbox"/> YES <input type="checkbox"/> NO	

NAME OF DAM: <u>Squannacook River Dam</u>		STATE ID #: <u>4-9-115-1</u>	
INSPECTION DATE: <u>May 5, 2023</u>		NID ID #: <u>MA00442</u>	
<u>INSPECTION SUMMARY</u>			
DATE OF INSPECTION: <u>May 5, 2023</u>		DATE OF PREVIOUS INSPECTION: <u>September 17, 2020</u>	
TEMPERATURE/WEATHER: <u>Clouds, 60s</u>		ARMY CORPS PHASE I: <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO If YES, date _____	
CONSULTANT: <u>Haley &amp; Aldrich, Inc.</u>		PREVIOUS DCR PHASE I: <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO If YES, date <u>17-Oct-17</u>	
BENCHMARK/DATUM: <u>NGVD 1929</u>			
OVERALL PHYSICAL CONDITION OF DAM: <u>FAIR</u>		DATE OF LAST REHABILITATION: <u>2013</u>	
SPILLWAY CAPACITY: <u>&gt;100% SDF w/ no actions by Caretaker</u>			
EL. POOL DURING INSP.: <u>240</u>		EL. TAILWATER DURING INSP.: <u>222</u>	
<u>PERSONS PRESENT AT INSPECTION</u>			
<u>NAME</u>	<u>TITLE/POSITION</u>	<u>REPRESENTING</u>	
Denis J. Bell, P.E.	Senior Engineer	Haley & Aldrich, Inc.	
<u>EVALUATION INFORMATION</u>			
Click on box to select E-code		Click on box to select E-code	
E1) TYPE OF DESIGN	<div style="border: 1px solid black; padding: 2px;">1</div>	E8) LOW-LEVEL OUTLET CONDITION	<div style="border: 1px solid black; padding: 2px;">3</div>
E2) LEVEL OF MAINTENANCE	<div style="border: 1px solid black; padding: 2px;">3</div>	E9) SPILLWAY DESIGN FLOOD CAPACITY	<div style="border: 1px solid black; padding: 2px;">5</div>
E3) EMERGENCY ACTION PLAN	<div style="border: 1px solid black; padding: 2px;">5</div>	E10) OVERALL PHYSICAL CONDITION	<div style="border: 1px solid black; padding: 2px;">3</div>
E4) EMBANKMENT SEEPAGE	<div style="border: 1px solid black; padding: 2px;">4</div>	E11) ESTIMATED REPAIR COST	<div style="border: 1px solid black; padding: 2px;">\$306,000</div>
E5) EMBANKMENT CONDITION	<div style="border: 1px solid black; padding: 2px;">3</div>	ROADWAY OVER CREST	<div style="border: 1px solid black; padding: 2px;">NO</div>
E6) CONCRETE CONDITION	<div style="border: 1px solid black; padding: 2px;">3</div>	BRIDGE NEAR DAM	<div style="border: 1px solid black; padding: 2px;">YES</div>
E7) LOW-LEVEL OUTLET CAPACITY	<div style="border: 1px solid black; padding: 2px;">3</div>		
NAME OF INSPECTING ENGINEER: Denis J. Bell, P.E.		SIGNATURE: <i>Denis J Bell</i>	

NAME OF DAM: <u>Squannacook River Dam</u>		STATE ID #: <u>4-9-115-1</u>																					
INSPECTION DATE: <u>May 5, 2023</u>		NID ID #: <u>MA00442</u>																					
<table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <b>OWNER:</b> ORGANIZATION <u>Town of Groton</u>  NAME/TITLE <u>Selectmen</u>  STREET <u>173 Main Street</u>  TOWN, STATE, ZIP <u>Groton, MA 01450</u>  PHONE <u>978-448-1111</u>  EMERGENCY PH. # <u>(978) 852-6545</u>  FAX _____  EMAIL <u><a href="mailto:highway@townofgroton.org">highway@townofgroton.org</a></u>  OWNER TYPE <u>Municipality or Political subdivision</u> </td> <td style="width: 50%; vertical-align: top;"> <b>CARETAKER:</b> ORGANIZATION <u>Groton Highway Department</u>  NAME/TITLE <u>Thomas Delaney</u>  STREET <u>600 Cow Pond Brook Road</u>  TOWN, STATE, ZIP <u>Groton, MA 01450</u>  PHONE <u>978-448-1162</u>  EMERGENCY PH. # <u>(978) 852-6545</u>  FAX _____  EMAIL <u><a href="mailto:highway@townofgroton.org">highway@townofgroton.org</a></u> </td> </tr> </table>				<b>OWNER:</b> ORGANIZATION <u>Town of Groton</u> NAME/TITLE <u>Selectmen</u> STREET <u>173 Main Street</u> TOWN, STATE, ZIP <u>Groton, MA 01450</u> PHONE <u>978-448-1111</u> EMERGENCY PH. # <u>(978) 852-6545</u> FAX _____ EMAIL <u><a href="mailto:highway@townofgroton.org">highway@townofgroton.org</a></u> OWNER TYPE <u>Municipality or Political subdivision</u>	<b>CARETAKER:</b> ORGANIZATION <u>Groton Highway Department</u> NAME/TITLE <u>Thomas Delaney</u> STREET <u>600 Cow Pond Brook Road</u> TOWN, STATE, ZIP <u>Groton, MA 01450</u> PHONE <u>978-448-1162</u> EMERGENCY PH. # <u>(978) 852-6545</u> FAX _____ EMAIL <u><a href="mailto:highway@townofgroton.org">highway@townofgroton.org</a></u>																		
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NAME OF DAM: <u>Squannacook River Dam</u>		STATE ID #: <u>4-9-115-1</u>			
INSPECTION DATE: <u>May 5, 2023</u>		NID ID #: <u>MA00442</u>			
<b>EMBANKMENT (CREST)</b>					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
CREST	1. SURFACE TYPE	Not Applicable			
	2. SURFACE CRACKING	Not Applicable			
	3. SINKHOLES, ANIMAL BURROWS	Not Applicable			
	4. VERTICAL ALIGNMENT (DEPRESSIONS)	Not Applicable			
	5. HORIZONTAL ALIGNMENT	Not Applicable			
	6. RUTS AND/OR PUDDLES	Not Applicable			
	7. VEGETATION (PRESENCE/CONDITION)	Not Applicable			
	8. ABUTMENT CONTACT	Not Applicable			
ADDITIONAL COMMENTS: _____ _____ _____ _____ _____					



NAME OF DAM: <u>Squannacook River Dam</u>		STATE ID #: <u>4-9-115-1</u>			
INSPECTION DATE: <u>May 5, 2023</u>		NID ID #: <u>MA00442</u>			
<b>EMBANKMENT (D/S SLOPE)</b>					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
D/S SLOPE	1. WET AREAS (NO FLOW)	Not Applicable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2. SEEPAGE	Not Applicable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3. SLIDE, SLOUGH, SCARP	Not Applicable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4. EMB.-ABUTMENT CONTACT	Not Applicable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5. SINKHOLE/ANIMAL BURROWS	Not Applicable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	6. EROSION	Not Applicable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	7. UNUSUAL MOVEMENT	Not Applicable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	8. VEGETATION (PRESENCE/CONDITION)	Not Applicable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ADDITIONAL COMMENTS: _____ _____ _____ _____					

NAME OF DAM: <u>Squannacook River Dam</u>		STATE ID #: <u>4-9-115-1</u>			
INSPECTION DATE: <u>May 5, 2023</u>		NID ID #: <u>MA00442</u>			
<b>EMBANKMENT (U/S SLOPE)</b>					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
U/S SLOPE	1. SLIDE, SLOUGH, SCARP	Not Applicable			
	2. SLOPE PROTECTION TYPE AND COND.	Not Applicable			
	3. SINKHOLE/ANIMAL BURROWS	Not Applicable			
	4. EMB.-ABUTMENT CONTACT	Not Applicable			
	5. EROSION	Not Applicable			
	6. UNUSUAL MOVEMENT	Not Applicable			
	7. VEGETATION (PRESENCE/CONDITION)	Not Applicable			
ADDITIONAL COMMENTS: _____ _____ _____ _____ _____ _____ _____ _____					

NAME OF DAM: <u>Squannacook River Dam</u>		STATE ID #: <u>4-9-115-1</u>			
INSPECTION DATE: <u>May 5, 2023</u>		NID ID #: <u>MA00442</u>			
<b>INSTRUMENTATION</b>					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
INSTR.	1. PIEZOMETERS	None			
	2. OBSERVATION WELLS	None			
	3. STAFF GAGE AND RECORDER	None			
	4. WEIRS	None for Instrumentation; inlet weir			
	5. INCLINOMETERS	None			
	6. SURVEY MONUMENTS	None			
	7. DRAINS	None			
	8. FREQUENCY OF READINGS	None			
	9. LOCATION OF READINGS	None			
ADDITIONAL COMMENTS: _____ _____ _____ _____ _____					

NAME OF DAM: Squannacook River DamSTATE ID #: 4-9-115-1INSPECTION DATE: May 5, 2023NID ID #: MA00442**DOWNSTREAM MASONRY WALLS**

AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
D/S WALLS	1. WALL TYPE	Stone Block with Mortar and Concrete			X
	2. WALL ALIGNMENT	Fair; Some Block Misalignment			X
	3. WALL CONDITION	Fiar to Poor; Mortar missing, block rotation and spauling of concrete			X
	4. HEIGHT: TOP OF WALL TO MUDLINE	min: max: avg: 10 ft			
	5. SEEPAGE OR LEAKAGE	Not Applicable			
	6. ABUTMENT CONTACT	Fair; Some Vegetation			X
	7. EROSION/SINKHOLES BEHIND WALL	Stone Blocks misaligned			X
	8. ANIMAL BURROWS	None Noted	X		
	9. UNUSUAL MOVEMENT	Stone wall in Fair to Poor Condition			X
	10. WET AREAS AT TOE OF WALL	Yes; bottom 3 ft			X

ADDITIONAL COMMENTS:

NAME OF DAM: <u>Squannacook River Dam</u>		STATE ID #: <u>4-9-115-1</u>			
INSPECTION DATE: <u>May 5, 2023</u>		NID ID #: <u>MA00442</u>			
<b>UPSTREAM MASONRY WALLS</b>					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
U/S WALLS	1. WALL TYPE	Stone Block Wall			X
	2. WALL ALIGNMENT	Some Misalignment			X
	3. WALL CONDITION	Fair			X
	4. HEIGHT: TOP OF WALL TO MUDLINE	min:                      max:                      avg: 10 ft		X	
	5. ABUTMENT CONTACT	Vegetation			X
	6. EROSION/SINKHOLES BEHIND WALL	None Noted		X	
	7. ANIMAL BURROWS	None Noted		X	
	8. UNUSUAL MOVEMENT	Block Misalignment			X
ADDITIONAL COMMENTS: _____ _____ _____ _____ _____					

NAME OF DAM: <u>Squannacook River Dam</u>		STATE ID #: <u>4-9-115-1</u>			
INSPECTION DATE: <u>May 5, 2023</u>		NID ID #: <u>MA00442</u>			
<b>DOWNSTREAM AREA</b>					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
D/S AREA	1. ABUTMENT LEAKAGE	None Observed	x		
	2. FOUNDATION SEEPAGE	None Observed	x		
	3. SLIDE, SLOUGH, SCARP	None Observed	x		
	4. WEIRS	None Observed	x		
	5. DRAINAGE SYSTEM	None	x		
	6. INSTRUMENTATION	None	x		
	7. VEGETATION	Grass; brush and small trees			x
	8. ACCESSIBILITY	Through Woods off Road	x		
	9. DOWNSTREAM HAZARD DESCRIPTION	Wooded River Banks; Senior Housing in Old Mill Complex			
	10. DATE OF LAST EAP UPDATE	2023			
ADDITIONAL COMMENTS: _____ _____ _____ _____					

NAME OF DAM: Squannacook River Dam

STATE ID #: 4-9-115-1

INSPECTION DATE: May 5, 2023

NID ID #: MA00442

### MISCELLANEOUS

AREA INSPECTED	CONDITION	OBSERVATIONS
MISC.	1. RESERVOIR DEPTH (AVG)	3 to 8 ft
	2. RESERVOIR SHORELINE	Mostly wooded riverbanks and residential building
	3. RESERVOIR SLOPES	Shallow slopes, mostly wooded
	4. ACCESS ROADS	None Observed
	5. SECURITY DEVICES	Closed gate at fenceline
	6. VANDALISM OR TRESPASS	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO WHAT:
	7. AVAILABILITY OF PLANS	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO DATE:
	8. AVAILABILITY OF DESIGN CALCS	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO DATE:
	9. AVAILABILITY OF EAP/LAST UPDATE	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO DATE: 2023
	10. AVAILABILITY OF O&M MANUAL	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO DATE:
	11. CARETAKER/OWNER AVAILABLE	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO DATE: May 5, 2023
	12. CONFINED SPACE ENTRY REQUIRED	<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO PURPOSE:

ADDITIONAL COMMENTS: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

NAME OF DAM: <u>Squannacook River Dam</u>		STATE ID #: <u>4-9-115-1</u>			
INSPECTION DATE: <u>May 5, 2023</u>		NID ID #: <u>MA00442</u>			
<b>PRIMARY SPILLWAY</b>					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
<b>SPILLWAY</b>	SPILLWAY TYPE	Concrete		x	
	WEIR TYPE	Uncontrolled		x	
	SPILLWAY CONDITION	Fair		x	
	TRAINING WALLS	Left Wall in Fair Condition; Right Wall in Poor Condition		x	
	SPILLWAY CONTROLS AND CONDITION	Fair		x	
	UNUSUAL MOVEMENT	None Observed		x	
	APPROACH AREA	Debris build up upstream of spillway		x	
	DISCHARGE AREA	Bedrock outcrop and clear; discharge channel is wooded		x	
	DEBRIS	Debris build up on upstream side of spillway		x	
	WATER LEVEL AT TIME OF INSPECTION	At Crest		x	
ADDITIONAL COMMENTS: _____ _____ _____ _____ _____					



NAME OF DAM: <u>Squannacook River Dam</u>		STATE ID #: <u>4-9-115-1</u>			
INSPECTION DATE: <u>May 5, 2023</u>		NID ID #: <u>MA00442</u>			
<b>AUXILIARY SPILLWAY</b>					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
<b>SPILLWAY</b>	SPILLWAY TYPE	Concrete with Stoplog grooves		X	
	WEIR TYPE	Stoplogs		X	
	SPILLWAY CONDITION	Satisfactory; reapiored concrete 2013		X	
	TRAINING WALLS	Concrete		X	
	SPILLWAY CONTROLS AND CONDITION	Stoplogs; Satisfactory		X	
	UNUSUAL MOVEMENT	None		X	
	APPROACH AREA	Penstock; Concrete		X	
	DISCHARGE AREA	Splashpad; fair		X	
	DEBRIS	None		X	
	WATER LEVEL AT TIME OF INSPECTION	At Crest		X	
ADDITIONAL COMMENTS: _____ _____ _____ _____ _____					

NAME OF DAM: <u>Squannacook River Dam</u>		STATE ID #: <u>4-9-115-1</u>			
INSPECTION DATE: <u>May 5, 2023</u>		NID ID #: <u>MA00442</u>			
<b>OUTLET WORKS</b>					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
<b>OUTLET WORKS</b>	TYPE	Low Level outlet consists of Concrete Culvert; Fair Condition		x	
	INTAKE STRUCTURE	Concrete Culvert		x	
	TRASHRACK	None		x	
	PRIMARY CLOSURE	Wooden Gate		x	
	SECONDARY CLOSURE	None		x	
	CONDUIT	Concrete Culvert		x	
	OUTLET STRUCTURE/HEADWALL	Stone and Concrete Culvert		x	
	EROSION ALONG TOE OF DAM	None		x	
	SEEPAGE/LEAKAGE	Gate remains 1 to 2 in. open for flow		x	
	DEBRIS/BLOCKAGE	None after Fall 2013 Construction		x	
	UNUSUAL MOVEMENT	None		x	
	DOWNSTREAM AREA	Splashpad		x	
	MISCELLANEOUS	Wooden Gate in Satisfactory condition; gate operator support in fair condition		x	
ADDITIONAL COMMENTS: _____ _____ _____ _____ _____					

NAME OF DAM: <u>Squannacook River Dam</u>		STATE ID #: <u>4-9-115-1</u>			
INSPECTION DATE: <u>May 5, 2023</u>		NID ID #: <u>MA00442</u>			
<b>CONCRETE/MASONRY DAMS</b>					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
GENERAL	TYPE	Uncontrolled Concrete/ Stone Masonry Run of the River Dam			
	AVAILABILITY OF PLANS	None; plans available for 2013 repair work			
	AVAILABILITY OF DESIGN CALCS	Not Available			
	PIEZOMETERS	None Observed			
	OBSERVATION WELLS	None Observed			
	INCLINOMETERS	None Observed			
	SEEPAGE GALLERY	None Observed			
	UNUSUAL MOVEMENT	None Observed			
ADDITIONAL COMMENTS: _____ _____ _____ _____ _____					

NAME OF DAM: <u>Squannacook River Dam</u>		STATE ID #: <u>4-9-115-1</u>			
INSPECTION DATE: <u>May 5, 2023</u>		NID ID #: <u>MA00442</u>			
<b>CONCRETE/MASONRY DAMS (CREST)</b>					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
CREST	TYPE	Concrete Uncontrolled Spillway		X	
	SURFACE CONDITIONS	Fair		X	
	CONDITIONS OF JOINTS	Fair		X	
	UNUSUAL MOVEMENT	None		X	
	HORIZONTAL ALIGNMENT	Satisfactory		X	
	VERTICAL ALIGNMENT	Satisfactory		X	
ADDITIONAL COMMENTS: _____					
_____					
_____					
_____					
_____					

NAME OF DAM: <u>Squannacook River Dam</u>		STATE ID #: <u>4-9-115-1</u>				
INSPECTION DATE: <u>May 5, 2023</u>		NID ID #: <u>MA00442</u>				
<b>CONCRETE/MASONRY DAMS (DOWNSTREAM FACE)</b>						
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR	
D/S FACE	TYPE	Concrete Face		X		
	SURFACE CONDITIONS	Fair		X		
	CONDITIONS OF JOINTS	Fair		X		
	UNUSUAL MOVEMENT	None Observed		X		
	ABUTMENT CONTACT	Fair		X		
	LEAKAGE	None Observed		X		
ADDITIONAL COMMENTS: _____						
_____						
_____						
_____						
_____						

NAME OF DAM: <u>Squannacook River Dam</u>		STATE ID #: <u>4-9-115-1</u>			
INSPECTION DATE: <u>May 5, 2023</u>		NID ID #: <u>MA00442</u>			
<b>CONCRETE/MASONRY DAMS (UPSTREAM FACE)</b>					
AREA INSPECTED	CONDITION	OBSERVATIONS	NO ACTION	MONITOR	REPAIR
U/S FACE	TYPE	Sloping Concrete		X	
	SURFACE CONDITIONS	Fair		X	
	CONDITIONS OF JOINTS	Fair		X	
	UNUSUAL MOVEMENT	None Observed		X	
	ABUTMENT CONTACTS	None Observed		X	
ADDITIONAL COMMENTS: _____ _____ _____ _____ _____					

## **APPENDIX C**

### **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 exists, 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 there from 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 and 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 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 break.

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 – 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.

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.

## **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.