# *- FORGE POND DAM & DIKE-*

# PHASE I

# INSPECTION / EVALUATION REPORT

| | |
|---|---|
| Dam Name: | Forge Dam & Dike |
| State Dam ID#: | 2-8-111-2 Dam & 2-8-111-3 Dike |
| NID#: | MA00488 Dam & MA00489 Dike |
| Owner: | Town of Granby |
| Owner Type: | Municipal |
| Town: | Granby |
| Consultant: | Lenart Consulting Service, LLC |
| Date of Inspection: | March 23, 2020 |

# Executive Summary

This Phase I Inspection/Evaluation Report details the inspection and evaluation of Forge Pond Dam and Forge Pond Dike, located in Granby, Massachusetts. The inspection was conducted on March 23, 2020 by Lenart Consulting Service, LLC. Forge Pond Dam and Forge Pond Dike are classified as an **Intermediate** sized, **Significant (Class II)** hazard potential dam structures.

The overall physical condition of Forge Pond Dam and Forge Pond Dike, collectively, were found to be **Poor** based on the Office of Dam Safety's September 2008 rating guidelines. The following deficiencies were noted during the inspection and evaluation:

**Dam Location:**

1. There is spalling, transverse structural cracks and missing pieces of concrete in the upstream training walls at both abutments.

2. The rubber tire retaining wall immediately downstream of the right end of the spillway is failing, jeopardizing the residence adjacent to the discharge channel and the right abutment.

3. Erosion of embankment soils has occurred behind the left spillway training wall at its downstream end. This condition has remained the same since the last inspection.

4. The hydraulic adequacy of the spillway to accommodate the SDF flows should be evaluated.

5. Maintenance is required including stump removal and control of woody vegetation

**6. Dike Location:**

1. The gate is not operable and materials of construction require replacement.

2. The stop-logs are deteriorated and materials of construction require replacement.

3. Stone masonry walls require repair.

It is recommended that the following actions be taken to address the deficiencies found at the dam and dike during this inspection and evaluation:

**General:**

- Perform an updated, detailed Hydraulic & Hydrologic analysis to determine the design storm discharge and hydraulic adequacy of spillway.

- Prepare a formal Operations & Maintenance Manual for the dam and the dike.

**Dam & Dike Location:**

- Remove tree stumps and root systems.

- Repair left concrete wall at the dam.

- Fill the depressed area behind the spillway training wall at the right abutment.
- Establish grass surface on dam crest where soils are exposed.
- Repair downstream stone masonry walls at dike.
- Remove Repair/replace the concrete wall on the right side of the spillway.
- Replace the tire retaining wall with a proper structure to provide stability.
- Repair eroded area behind the left spillway training wall.
- Extend left downstream concrete training wall or augment with rip rap.
- Repair gate and operator at dike.
- Replace the stop logs at dike

Some of the recommendations should be performed under the direction of a registered professional engineer familiar with the methods and materials used in the design, construction and repair of dams.

# Dam Evaluation Summary Detail Sheet

| | | | |
|---|---|---|---|
| 1. NID ID: | MA00488 | 4. Inspection Date: | March 23, 2020 |
| 2. Dam Name: | Forge Pond Dam | 5. Last Insp. Date: | July 10, 2014 |
| 3. Dam Location: | Granby, MA | 6. Next Inspection: | March 23, 2025 |
| 7. Inspector: | Cathleen A. Benben | | |
| 8. Consultant: | Lenart Consulting Services, LLC | | |
| 9. Hazard Code: | Significant | 9a. Is Hazard Code Change Requested?: | No |
| 10. Insp. Frequency: | 5 Years | 11. Overall Physical Condition of Dam: | POOR |
| 12. Spillway Capacity (% SDF) | 0-50% of the SDF or Unknown | | |

| | | | |
|---|---|---|---|
| E1. Design Methodology: | 3 | E7. Low-Level Discharge Capacity: | 1 |
| E2. Level of Maintenance: | 2 | E8. Low-Level Outlet Physical Condition: | 2 |
| E3. Emergency Action Plan: | 5 | E9. Spillway Design Flood Capacity: | 1 |
| E4. Embankment Seepage: | 4 | E10. Overall Physical Condition of the Dam: | 2 |
| E5. Embankment Condition: | 4 | E11. Estimated Repair Cost: | $375,000 |
| E6. Concrete Condition: | 3 | | |

## 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

# Dam Evaluation Summary Detail Sheet

| | | | |
|---|---|---|---|
| 1. NID ID: | MA00489 | 4. Inspection Date: | March 23, 2020 |
| 2. Dam Name: | Forge Pond Dike | 5. Last Insp. Date: | July 10, 2020 |
| 3. Dam Location: | Granby, MA | 6. Next Inspection: | March 23, 2025 |
| 7. Inspector: | Cathleen A. Benben | | |
| 8. Consultant: | Lenart Consulting Services, LLC | | |
| 9. Hazard Code: | Significant | 9a. Is Hazard Code Change Requested?: | No |
| 10. Insp. Frequency: | 5 Years | 11. Overall Physical Condition of Dam: | POOR |
| 12. Spillway Capacity (% SDF) | No spillway at dike | | |

| | | | |
|---|---|---|---|
| E1. Design Methodology: | 3 | E7. Low-Level Discharge Capacity: | 2 |
| E2. Level of Maintenance: | 2 | E8. Low-Level Outlet Physical Condition: | 2 |
| E3. Emergency Action Plan: | 5 | E9. Spillway Design Flood Capacity: | 1 |
| E4. Embankment Seepage: | 4 | E10. Overall Physical Condition of the Dam: | 2 |
| E5. Embankment Condition: | 2 | E11. Estimated Repair Cost: | $50,000 |
| E6. Concrete Condition: | 2 | | |

## Evaluation Description

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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

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1. 0 - 50% of the SDF or unknown
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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
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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

# Preface

The following three paragraphs were excerpted 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 is based upon available data and visual inspections. Detailed investigations 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 reported condition of the dam is based on observations of field conditions at the time of inspection, along with data available to the inspection team. In cases where an impoundment is lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions, which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is 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 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 would be detected.

David M. Lenart, P.E.
Massachusetts License No.:27995
Lenart Consulting Service

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## Section 3 Assessments and Recommendations



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## Figures



## Appendices

# Section 1
# Description of Project

## 1.1 General

### 1.1.1 Authority

The Town of Granby has retained Lenart Consulting Service, LLC to perform a visual inspection and develop a report of conditions for the Forge Pond Dam and Forge Pond Dike in Granby, 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 is 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 is 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.

### 1.1.4 Figures

Figures were created for this report to aid the reader in understanding the dam, its features, and the surrounding area. Figure 1 presents a topographic image showing the dam and dike location and surrounding area. Figure 2 presents an aerial overview of the dam and dike and surrounding area. Figure 3 presents a topographic image showing the watershed area associated with the dam. Site sketches of the dam and dike, which serve as photo location plans showing location and orientation of photos taken during the inspection, are also included in Appendix A.

## 1.2 Description of Project

### 1.2.1 Location

Forge Pond Dam and Forge Pond Dike are located on Forge Pond in the Town of Granby, Massachusetts in Hampshire County. The dam location is shown on the USGS quadrangle map at coordinates 42.274511, -72.470850. The dike is located at

coordinates 42.273763, -72.470885. Access to both structures is from School Street. See Figure 1 and 2, the USGS site locus map and an aerial photograph site locus appended to this report in the Figures section.

### 1.2.2 Owner/Operator

| | Dam and Dike Owner | Dam and Dike Caretaker |
|---|---|---|
| Name | Town of Granby thru its Board of Selectmen | Town of Granby thru its Board of Selectmen |
| Mailing Address | Senior Center Building<br>2nd Floor<br>10-B West State Street | Senior Center Building<br>2nd Floor<br>10-B West State Street |
| Town | Granby, MA | Granby, MA |
| Daytime Phone | (413) 467-7177 | (413) 467-7177 |
| Emergency Phone | 911 | 911 |
| Email Address | Not Available | Not Available |

Current owner and caretaker data is also included in Table 1.1.

### 1.2.3 Purpose of the Dam

Forge Pond Dam was constructed to enlarge the impoundment of Forge Pond. The pond was originally utilized for a forge operation during the Civil War but now is utilized for recreational and conservation purposes. The dike section was constructed to provide an outlet for the forge operation but now is a drain for lowering and controlling the pond level.

### 1.2.4 Description of the Dam and Appurtenances

The dam at Forge Pond consists of two (2) structures, the main dam where the spillway is located, and the dike, where the low-level outlet is located.

The dam is approximately 115 feet long and 13.5 feet high. The dam is an earthen embankment with a spillway that is a combination of dry-stone masonry and concrete construction. The embankment section of the dam is about 33 feet long with a crest width of 12 feet. The upstream face is a vertical concrete wall and the downstream slope is very flat. A sketch from an inspection report from 1975 indicated that the embankment was constructed with a stone masonry wall along its downstream face. If the wall still exists, it has been backfilled and is no longer visible. The downstream slope and crest are grass covered.

The spillway is an 82-foot long broad-crested weir located at the right abutment. Outflow from the pond passes over the spillway crest, dropping approximately 11.0 feet

to the brook bed discharge channel at the base of the dam. The dry-stone masonry section of the spillway is capped with concrete, beginning at the right abutment and is 24-feet in length. The remaining portion of the spillway structure is concrete and is offset from and parallel to the stone masonry section of the spillway. The concrete and stone portions of the spillway are connected by a concrete wall section which is perpendicular to both walls and is about 3-feet long. The downstream face of the main concrete spillway is battered. Ledge outcropping is located at the left end of the spillway.

The upstream apron of the spillway is rip rapped to the stone masonry section, and concrete paved to the concrete section. The apron has an approximate slope of 6:1 extending to the gravel bottom of the pond. There are concrete training walls on each side of the spillway. No provision for flashboards exists at the spillway.

The dike is an "L" shaped earth fill embankment located approximately 200-feet south of the main dam, with a reinforced concrete retaining wall and mortared stone fascia on the upstream face. The dike is about 90 feet long, 10.7 feet high, and 19 feet wide at the crest. The lowest 2.5 feet of the vertical face is actually exposed bedrock. The downstream slope on the right side is 2H:1V and is grass covered, as is the crest. The downstream slope to the left of the outlet control structure is stepped with a stone masonry retaining wall approximately 2.5 feet high beginning at the top of the embankment.

Near the bend in the "L", is a control structure with a 36-inch diameter outlet that functions as a drain for the pond. The control structure is constructed of reinforced concrete with a footing that sits on bedrock. The structure is 6 feet by 8 feet and the top of the structure extends 20-iches above the top of the embankment. There is a rack and pinion operated sluice gate on the upstream face of the structure and stop logs within the structure for controlling flow. The invert elevation of the 36-inch diameter outlet is 266.0. The outlet line terminates at the dry stone masonry headwall on the downstream face of the dike. The discharge channel is stone-lined and has a restricted cross-section before it crosses beneath School Street by means of a 36-inch diameter corrugated metal pipe culvert.

### 1.2.5 Operations and Maintenance

Forge Pond Dam and Dike are operated and maintained by the Town of Granby, with the assistance of the Granby Highway Department. Currently there are no formal operating procedures for these structures. The site is not checked on a regular basis, nor is regular maintenance carried out.

### 1.2.6 DCR Size Classification

Forge Pond Dam has a maximum structural height of 13.5 feet and Forge Pond Dike has a maximum structural height of 10.7 feet. The maximum storage capacities for the dam and the dike are 600 and 540 acre-feet, respectively. In accordance with Department of Conservation and Recreation classification, under Commonwealth of Massachusetts Regulations 302 CMR Dam Safety revised November 4, 2005, both the dam and dike at Forge Pond are **Intermediate** size structures.

### 1.2.7 DCR Hazard Potential Classification

Forge Pond Dam is located 300 feet upstream of School Street and a residence is situated at the downstream side of the right abutment. It is estimated that failure of

Forge Pond Dam at maximum pool could impact the house with possible loss of life, and possibly overtop School Street. Therefore, in accordance with Department of Conservation and Recreation Dam Safety classification procedures, under the Commonwealth of Massachusetts Regulations 302 CMR 10.00 as revised November 4, 2005, Forge Pond Dam is classified as a **Significant** (Class II) hazard potential dam. The outflow from Forge Pond Dike would not impact the residence adjacent to the dam, however, flow past School Street is restricted by an undersized culvert. Therefore, Forge Pond Dike is also classified as a **Significant** (Class II) hazard due to the potential impacts to School Street.

# 1.3 Engineering Data

The following sections are based on field measurements, review of USGS and MassGIS mapping and available design and construction information from previously submitted reports listed in Appendix C. The information presented in this section is intended to provide an overview of the dam and impoundment.

The water surface elevation of 271.0 at Forge Pond, as shown on the USGS Belchertown Quadrangle, Massachusetts, was adopted as the spillway crest elevation. All other elevations given in this report were estimated from the assumed spillway crest elevation. Elevations refer to National Geodetic Vertical Datum (NGVD).

## 1.3.1 Drainage Area

The total drainage area contributing to Forge Pond is approximately 14.2 square miles. The pond is surrounded by hilly terrain and development within the watershed is light with undeveloped areas being heavily wooded. The drainage area includes outflow from Metacomet Lake. About 5.6 percent of the drainage area is made up of ponds and swamps. Figure 3, included in the Figures section of the report, outlines the drainage area boundary for Forge Pond.

## 1.3.2 Reservoir

| | Impoundment Elevation (feet) | Surface Area (acres) | Storage Volume (acre-feet) |
|---|---|---|---|
| Normal Pool | 271.0 | 72 | 380 (dam)<br>320 (dike) |
| Maximum Pool | 273.5 | 85 | 600 (dam)<br>540 (dike) |
| SDF Pool (100-yr storm) | Unknown | Unknown | Unknown |
| Max Pool ½ PMF (from 1981 H&H analysis) | 276.0 | 113 | 820 (dam)*<br>760 (dike)* |

* Estimated storage volume adjusted based on field observed elevations.

### 1.3.3 Discharges at the Dam Site

The normal discharge past Forge Pond Dam is over the stone masonry and concrete spillway at elevation 271.0 with a weir length of 82 feet. Downstream of the spillway, the discharge channel averages 35 feet in width and flows through three (3) 8 x 6-foot corrugated metal pipe arch culverts under School Street.

The outlet for the pond is a 36-inch diameter reinforced concrete pipe with a sluice gate and stop log control structure located at Forge Pond Dike. The outlet pipe discharges to a small stone-lined channel which passes under School Street through a 36-inch diameter corrugated metal pipe.

The discharges past the dam for various pool elevations are summarized below:

Discharges are in cubic feet per second (cfs):

| | | |
|---|---|---|
| A. | Maximum Known Flood at the Dam Site | Unknown |
| B. | Spillway Capacity With Water Level at the Top of the Dam | 1,005 |
| C. | Design Flood Outflow (100-year flood) | Unknown |
| D. | Low Level Outlet Capacity With Water Level at the Top of the Dam | 86 |

### 1.3.4 General Elevations (feet)

Elevations presented below are based on an assumed spillway crest elevation and field measurements presented in the previous inspection report.

| | | |
|---|---|---|
| A. | Top Of Dam | 273.5 |
| B. | Top of Dike | 273.5 |
| C. | Spillway Design Flood Pool | Unknown |
| D. | Normal Pool | 271.0 |
| E. | Spillway Crest | 271.0 |
| F. | Upstream Water At Time Of The Inspection | 271.1 |
| G. | Streambed At Toe Of The Dam | 260.0 |
| H. | Low Point Along Toe Of The Dam | 260.0 |

### 1.3.5 Main Spillway

| | | |
|---|---|---|
| A. | Type | Concrete and stone masonry weir |
| B. | Length | 82.0 |
| C. | Crest Elevation | 271.0 |
| D. | Upstream Channel | Forge Pond |
| E. | Downstream Channel | Bachelor Brook |
| F. | Channel Bottom Elevation | 260.0 |
| G. | Downstream Water Elevation | 261.0± |

### 1.3.6 Additional Information

Control Structure at Forge Pond Dike

| | | |
|---|---|---|
| A. | Top of Concrete structure (grating cover) | 275.3 |
| B. | Bottom of Concrete Structure | 266.0 |
| C. | Top of Stop Logs Inside Structure | 271.0 |
| E. | Downstream Channel | 262.8 |

### 1.3.7 Design and Construction Records

Design and construction records are not available. The dam was originally constructed around 1800. The original main dam structure included a wooden plank apron and spillway crest at the stone masonry section at the right side. In 1977, the present dike, an earthfill dam with a concrete retaining wall and stone fascia, was designed by MGS, Michael G. Suprenant, Consulting Engineer, to replace an existing concrete dam. Improvement plans for the dike and outlet structure are on file at the office of the Granby Conservation Commission. Reconstruction of the dike and outlet structure was completed in 1978. It is also assumed that in 1978 the wooden plank apron was replaced with riprap and a concrete cap was added to the stone masonry section of the main dam.

### 1.3.8 Operating Records

There are no operating records available for review. There is no formal operating procedure for this dam or the dike. The structures are not checked on a regularly, and no records of operation are kept.

## 1.4 Summary Data Table

Table 1.1 and 1.2, summarizing the required Phase I Report data collected as part of this inspection, are presented on the following pages.

## 1.1 Summary Data Table

| Required Phase I Report Data | Data Provided by the Inspecting Engineer | |
|---|---|---|
| National ID # | MA00488 | |
| Dam Name | Forge Pond Dam | |
| Dam Name (Alternate) | Forge Pond Main Dam | |
| River Name | Bachelor Brook | |
| Impoundment Name | Forge Pond | |
| Hazard Class | Significant | |
| Size Class | Intermediate | |
| Dam Type | Earthen Embankment w/ concrete/masonry spillway | |
| Dam Purpose | Recreation | |
| Structural Height of Dam (feet) | 13.5 | |
| Hydraulic Height of Dam (feet) | 11 | |
| Drainage Area (sq. mi.) | 14.2 | |
| Reservoir Surface Area (acres) | 70 | **Input** |
| Normal Impoundment Volume (acre-feet) | 380 | |
| Max Impoundment Volume ((top of dam) acre-feet) | 600 | |
| SDF Impoundment Volume* (acre-feet) | Unknown - No H&H | **Input** |
| Spillway Type | Broad-crested weir, concrete and stone masonry | |
| Spillway Length (feet) | 82 | |
| Freeboard at Normal Pool (feet) | 2.5 | |
| Principal Spillway Capacity* (cfs) | 1005 | |
| Auxiliary Spillway Capacity* (cfs) | N/A | |
| Low-Level Outlet Capacity* (cfs) | see dike | |
| Spillway Design Flood* (flow rate - cfs) | 100-year/no H&H | |
| Winter Drawdown (feet below normal pool) | N/A | **Input** |
| Drawdown Impoundment Vol. (acre-feet) | N/A | **Input** |
| Latitude | 42.274511 | |
| Longitude | -72.47085 | |
| City/Town | Granby | |
| County Name | Hampshire | |
| Public Road on Crest | No | **Input** |
| Public Bridge over Spillway | No | **Input** |
| EAP Date (if applicable) | No EAP | |
| Owner Name | Town of Granby | |
| Owner Address | 10B West State Street | |
| Owner Town | Granby, MA 01033 | |
| Owner Phone | (413) 467-7177 | |
| Owner Emergency Phone | 911 | |
| Owner Type | Municipality or Political subdivision | |
| Caretaker Name | Board of Selectmen | |
| Caretaker Address | 10B West State Street | |
| Caretaker Town | Granby, MA 01033 | |
| Caretaker Phone | (413) 467-7177 | |
| Caretaker Emergency Phone | 911 | |
| Date of Field Inspection | 3/23/2020 | |
| Consultant Firm Name | Lenart Consulting Services, LLC | |
| Inspecting Engineer | Cathleen A. Benben | |
| Engineer Phone Number | (413) 535-5754 | **Input** |

*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.

## 1.1 Summary Data Table

| Required Phase I Report Data | Data Provided by the Inspecting Engineer | |
|---|---|---|
| National ID # | MA00489 | |
| Dam Name | Forge Pond Dike | |
| Dam Name (Alternate) | Forge Pond Small Dam | |
| River Name | Bachelor Brook | |
| Impoundment Name | Forge Pond | |
| Hazard Class | Significant | |
| Size Class | Intermediate | |
| Dam Type | Earthen Embankment/stone masonry upstream face | |
| Dam Purpose | Recreation | |
| Structural Height of Dam (feet) | 10.7 | |
| Hydraulic Height of Dam (feet) | 8.2 | |
| Drainage Area (sq. mi.) | 14.2 | |
| Reservoir Surface Area (acres) | 70 | **Input** |
| Normal Impoundment Volume (acre-feet) | 320 | |
| Max Impoundment Volume ((top of dam) acre-feet) | 540 | |
| SDF Impoundment Volume* (acre-feet) | Unknown - no H&H | **Input** |
| Spillway Type | located at dam | |
| Spillway Length (feet) | see dam | |
| Freeboard at Normal Pool (feet) | 2.5 | |
| Principal Spillway Capacity* (cfs) | see dam data | |
| Auxiliary Spillway Capacity* (cfs) | N/A | |
| Low-Level Outlet Capacity* (cfs) | 86 | |
| Spillway Design Flood* (flow rate - cfs) | 100-yr/unknown | |
| Winter Drawdown (feet below normal pool) | N/A | **Input** |
| Drawdown Impoundment Vol. (acre-feet) | N/A | **Input** |
| Latitude | 42.273763 | |
| Longitude | -72.470885 | |
| City/Town | Granby | |
| County Name | Hampshire | |
| Public Road on Crest | No | **Input** |
| Public Bridge over Spillway | No | **Input** |
| EAP Date (if applicable) | 2019 | |
| Owner Name | Town of Granby | |
| Owner Address | 10B West State Street | |
| Owner Town | Granby, MA 01033 | |
| Owner Phone | (413) 467-7177 | |
| Owner Emergency Phone | 911 | |
| Owner Type | Municipality or Political subdivision | |
| Caretaker Name | Board of Selectmen | |
| Caretaker Address | 10B West State Street | |
| Caretaker Town | Granby, MA 01033 | |
| Caretaker Phone | (413) 467-7177 | |
| Caretaker Emergency Phone | 911 | |
| Date of Field Inspection | 3/23/2020 | |
| Consultant Firm Name | Lenart Consulting Services, LLC | |
| Inspecting Engineer | Cathleen A. Benben | |
| Engineer Phone Number | (413) 535-5754 | **Input** |

*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.

# Section 2
# Inspection

## 2.1 Visual Inspection

Forge Pond Dam and Forge Pond Dike were inspected on March 23, 2020 by Lenart Consulting Service. Following is a summary of the findings from that inspection. At the time of the inspection, the weather was mostly cloudy with a temperature in the mid 40's° F. Photographs to document the current condition of the dam were taken during the inspection and are included in Appendix A. The level of the impoundment at the time of the inspection was 0.2 feet over the spillway crest. No inspection of underwater areas was made. Copies of the inspection checklists are included in Appendix B.

### 2.1.1 General Findings

In general, Forge Pond Dam and Forge Pond Dike collectively were found to be in **Poor** condition. All trees and vegetation have been cleared from the dam and dike since the 2014 inspection. Stumps have not been removed. The specific concerns are identified in more detail in the sections below.

### 2.1.2 Dam

- Abutments

    - The right abutment of the main dam consists of a low concrete gravity wall on the upstream side, a portion of which was rebuilt in 1978. The settled area approximately 3 feet square and 1 foot deep noted in the 2014 inspection, located behind the right training wall of the spillway appears unchanged. This settled area was also noted during the 2009 and 1981 inspections.

    - There are horizontal and vertical cracks at several locations along the concrete wall on the upstream side at the right abutment. The condition of the wall has not changed significantly since the last inspection. The exposed footing underneath this wall is not cracked.

    - On the downstream side at the right abutment of the dam there is a fill area forming the side slope of the downstream channel. The slope is reinforced with rubber tires stacked on top of each other. The 2014 inspection report made note of a sketch of the dam showing an 8-foot long, 2 foot wide stone retaining wall at the downstream face of the right abutment. However, a concrete wall section was not observed. The tires appear to be placed on a stone foundation. Failure of this slope will impact the right abutment and jeopardize the house located at the right abutment.

    - The stumps from the large trees that were growing at the top of the slope remain and are near the downstream end of the right concrete training wall.

    - Trees and woody vegetation has been cleared, but stumps and root systems of trees and woody vegetation growing near both abutments and the training walls remain.

- Contact at the left abutment appears good. Outcroppings of bedrock are visible upstream at the abutment.

- Upstream slope
  - There is a concrete wall at the upstream face of the embankment to the left of the spillway. This wall appears to be in fair condition with horizontal and vertical cracks and spalled areas on the vertical face.
  - The small trees and other woody vegetation growing behind and in front of the wall has been cleared, but root systems remain.

- Crest
  - There is a large area adjacent to the spillway on the upstream left side with minor erosion from foot traffic and sparse grass cover.
  - The crest adjacent to the right side of the spillway is private property with various surface conditions, as a result of the homeowner's activity.

- Downstream Slope
  - The downstream slope is grass covered and slopes gradually towards School Street. The grass was cut short before winter and there are some bare areas where woody vegetation has been removed.
  - Erosion of the gravelly soils has occurred behind the left spillway training wall at its downstream end. The undermining of the backfill material at this location was noted in the previous report where there are large gaps between the end of the wall and the boulders placed at the end of the wall has not changed significantly.

- Drains
  - No drains were observed at the dam.

- Instrumentation
  - No instrumentation exists at Dam.

- Access Roads and Gates
  - The dam has unrestricted foot access from School Street.
  - There is a chain link fence along School Street preventing vehicular access when the gates are closed.

### 2.1.3 Dike

- Abutments
  - Trees and brush previously present at the left and right abutments has been cleared.

- No seepage or unusual movement was observed at the dike abutments.

- Upstream Face
  - The stone masonry along the upstream face is in good condition.

- Crest
  - The crest is grass covered along the section to the right of the outlet control structure, with good overall horizontal and vertical alignment. The grass is not maintained.
  - There is a worn foot path where soils are exposed, approximately 25 feet long, on the crest to the right of the low-level outlet.
  - The small trees and woody vegetation growing on the crest of the dike to the left of the outlet structure and along the top of the stone masonry wall on the downstream edge have been cleared, with stumps and root systems remaining.

- Downstream Slope
  - The downstream slope to the right of the outlet control structure appears stable with no signs of sliding. The slope is approximately 2H:1V and is grass covered. Bedrock is exposed on the slope.
  - Below the short retaining walls at the top of the downstream slope to the left of the low-level structure, the slope has several stumps from trees and brush that were cleared. There is a collapsed section in the wall approximately 2 feet wide.
  - Downstream of the outlet control structure there is a dry-stone masonry wall with the discharge of the 36-inch RCP low level outlet centered in the wall. A small amount of water is leaking past the gate and stop logs in the structure and discharging through the pipe.
  - There are large tree stumps behind the stone masonry walls on both the left and right sides of the low-level outlet.
  - The structure is located on a bedrock foundation, which appears to be stable, but there is a pool of water below the low level outlet that appears to be seepage through the structure at the interface of the stone wall with the bedrock foundation.

- Drains
  - No drains were observed.

- Instrumentation
  - No instrumentation exists at the dike.

- Access Roads and Gates

    - The dike is accessed from the dam location. It cannot be accessed directly from School Street without opening a locked gate. The gate was open at the time of the inspection.

### 2.1.4 Appurtenant Structures

- Primary Spillway (at Dam)

    - Water was flowing over the spillway at the time of the inspection, which prevented visual inspection of the downstream face of the spillway. Previous reports indicated minor seepage at various locations of the stone masonry structure and that the 15-inch thick concrete cap had minor surface erosion.

    - The right upstream training wall, also the upstream face at the right abutment, has horizontal and vertical transverse cracks in the wall. Pieces of concrete have fallen loose from the wall in two areas. There are no cracks in the footing.

    - The left concrete training wall has a vertical crack where a tree was growing at its base on the upstream side and spalling was observed near the top of the wall close to the spillway and along the normal pool waterline.

    - The downstream extension of the left training wall consists of boulders. These boulders are founded on bedrock. Large gaps where the boulders meet the concrete wall are allowing water to erode the embankment materials behind the wall.

    - On the right side, there is a short section of a stone masonry training wall on the downstream side. The discharge channel side slope is constructed using rubber tires to reinforce the slope for a length of approximately 80 feet. A section of the tire wall adjacent to the stone masonry appears to be sliding. A considerable number of trees that were growing on the slope within the tires have been cut but stumps remain.

- Low Level Outlet (at Dike)

    - The sluice gate is operated with a rack and pinion system and is currently inoperable. The gate is in the closed position and materials of construction are deteriated.

    - The stop-logs within the structure were visible through the grating and show significant deterioration.

    - The structure was designed so that when the sluice gate was left in the open position, the stop logs within the outlet structure are utilized to control the impoundment level.

    - The outlet consists of a 36-inch diameter reinforced concrete pipe exiting the concrete structure.

- Metal grating exists on top of the outlet structure. The grating is secured with a keyed locking mechanism.

- The headwall at the outlet end of the 36-inch conduit consists of dry-stone masonry which is in good condition.

- The outlet channel consists of a combination of dry-stone masonry walls and stone revetment. In some locations the stones have become displaced from the walls.

- The trees that were growing downstream of the stone wall headwall and behind the outlet channel wall on both the left and right side have been cleared. The stumps remain.

- Auxiliary/Emergency Spillway

  - There is no auxiliary spillway at Forge Pond Dam.

### 2.1.5 Downstream Area

- Discharge from the main dam spillway flows to a natural channel and passes under School Street through three 8 x 6-foot corrugated metal pipe arch culverts.

- Discharge from the 36-inch outlet at the dike flows to a narrow, rock-lined channel and passes through a 36-inch corrugated metal pipe culvert under School Street.

- Discharge flows past the dam and dike and converges on the opposite side of School Street and continues down Bachelor Brook.

- Bachelor Brook meanders through an undeveloped area before reaching Aldrich Lake, a distance of about 21,000 feet downstream of the dam.

### 2.1.6 Reservoir Area

- The pond has some moderate residential development on the southerly shoreline and light residential development on the westerly shoreline. The remainder of the surrounding area is wooded hills and wetlands.

## 2.2 Caretaker Interview

A representative for the owner of Forge Pond Dam and Dike, was not available at the time of the inspection to provide information for this report. Lenart Consulting Service worked with the Granby DPW for permitting the recent tree removal with the Conservation Commission and Office of Dam Safety

# 2.3 Operation and Maintenance Procedures

## 2.3.1 Operational Procedures

The Town of Granby operates the dam with assistance from the Granby DPW. There are currently no formal operating procedures that are followed at Forge Pond Dam or Forge Pond Dike.

## 2.3.2 Maintenance of Dam and Dike

In 2019 all trees and woody vegetation on the structures and within 15 feet of any part of the structures was cleared and the grassy areas were mowed. The stumps and root systems were left in place.

There are no formal maintenance procedures for these structures. The dam is not checked on a regularly, and no records of operation are kept.

## 2.3.3 Emergency Warning System

A formal Emergency Action Plan has been developed for Forge Pond Dam and Dike in 2019.

# 2.4 Hydrologic/Hydraulic Data

Forge Pond Dam and Dike are both intermediate size, significant (Class II) hazard structures and in accordance with Massachusetts Dam Safety Regulation the spillway design flood (SDF) for the site is a 100-year flood. A Hydrologic/Hydraulic (H&H) Analysis was performed as part of the Army Corps of Engineers Phase I Inspection Report for Forge Pond Dam and Dike in 1981 and indicates that the inflow to Forge Pond during ½ PMF event is 13,230 cfs, and concluded that the spillway was inadequate without determining the design outflow from the impoundment.

The following values apply to Forge Pond Dam and Dike.

| | | |
|---|---|---|
| A. | Spillway Design Flood (SDF) | 100-year |
| B. | SDF Outflow (cfs) Estimated By StreamStats | 1000 |
| C. | Spillway Capacity (cfs) | 1005 |
| D. | Depth of Overtopping | Unknown |

# 2.5 Structural Stability/Overtopping Potential

## 2.5.1 Embankment Structural Stability

An embankment stability analysis for Forge Pond Dam and Dike was not within the scope of this report and there were no records of a previous stability analysis for the dam available for review. Based on visual observations at the time of the inspection, the dam and dike appear stable

### 2.5.2 Structural Stability of Non-Embankment Structures

A structural stability analysis of non-embankment structures for Forge Pond Dam and Dike was not within the scope of this report. At the time of the inspection, there was no indication of any concerns for structural stability of non-embankment areas

### 2.5.3 Seepage Stability

The 2014 visual inspection and the most recent inspection did identify minor seepage in areas along the downstream side of the dike. However, there was no indication for concerns for seepage issues observed at the structures.

### 2.5.4 Overtopping Potential

Based upon the Army Corps of Engineers Phase I Inspection Report for Forge Pond Dam and Dike dated 1981, it was assumed that the dam would overtop during a ½ PMF storm event. However, the design storm for the dam and dike is the 100-year storm, which is significantly smaller than a ½ PMF storm. An updated H&H Analysis should be performed to re-evaluate the overtopping potential at Forge Pond Dam and Dike.

# Section 3
# Assessments and Recommendations

## 3.1 Assessments

On the basis of the visual inspection and a review of available information, Forge Pond Dam and Forge Pond Dike are, collectively, generally in **Poor** condition. The structures were found to have the following deficiencies resulting in the condition stated:

**Dam Location:**

1. There is spalling, transverse structural cracks and missing pieces of concrete in the upstream training walls at both abutments.

2. The rubber tire retaining wall immediately downstream of the right end of the spillway is failing, jeopardizing the residence adjacent to the discharge channel and the right abutment.

3. Erosion of embankment soils has occurred behind the left spillway training wall at its downstream end. This condition has remained the same since the last inspection.

4. The hydraulic adequacy of the spillway to accommodate the SDF flows should be evaluated.

5. Maintenance is required including stump removal and control of woody vegetation

**Dike Location:**

1. The gate is not operable and materials of construction require replacement.

2. The stop-logs are deteriorated and materials of construction require replacement.

| Previously Identified Deficiency | Resolution or Current Condition |
|---|---|
| Woody vegetation growing on dam abutment and on dike crest and downstream embankment | Trees and woody vegetation have been cleared. Stumps remain. |
| Trees growing in spillway discharge channel on left side | Trees and woody vegetation have been cleared. Stumps remain. |
| Concrete wall at right abutment has cracks | Cracks are slightly worse. There are also cracks in the upstream wall on the left side near spillway. |
| Settlement 3 feet square by 1 foot deep at right abutment | Same |
| During low flow, seepage was observed at stone mortar section of spillway | Unable to inspect because of flow over spillway |

| | |
|---|---|
| Seepage was observed coming through joints in bedrock at left side of spillway and from under left training wall | Unable to inspect because of flow over spillway |
| Some leakage past stop logs in outlet control structure | Minor leakage observed |
| Seepage at stone masonry/bedrock interface at downstream toe of dike | Same |
| Operating mechanism for low level outlet gate removed | Operating system present but inoperable and materials of construction deteriorated. |
| Rubber tire revetment on slope becoming undermined at toe | Soils eroded from around tires and wall leaning near spillway. |

The recommendations and remedial measures that follow generally describe the recommended approach to address current deficiencies at the dam. The applicability of environmental permits should be determined prior to undertaking 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 following analyses should be initiated by the Granby Conservation Commission:

1. Perform an updated, detailed Hydraulic & Hydrologic analysis to determine the design storm discharge and hydraulic adequacy of spillway.

2. Prepare a formal Operations & Maintenance Manual for the dam and the dike.

## 3.3 Yearly Recommendations

This section presents recommended activities that are routine maintenance.

1. Regularly mow the embankment crest and slopes to establish and maintain a good quality grass cover and to control vegetative growth.

2. Regularly remove debris from the spillway, downstream culverts and downstream channels.

## 3.4 Recommendations, Maintenance, and Minor Repairs

This section presents recommended activities to improve the overall condition of the dam that do not alter the current design of the dam:

1. Remove tree stumps and root systems.

2. Repair left concrete walls at the dam.

3. Fill the depressed area behind the spillway training wall at the right abutment.

4. Plant an erosion resistant surface on dam crest where soils are exposed.

The following repairs and maintenance items are recommended to improve the overall condition of the dike:

1. Remove tree stumps and root systems.
2. Repair downstream stone masonry walls
3. Monitor the leakage through the control structure. Inspect stop logs and replace when necessary.
4. Monitor seepage through the bedrock foundation under the dike.

## 3.5 Remedial Measures

This section presents recommended modifications to the dam that alter the current configuration or design of the structure. No remedial measures are needed at the dike at this time.

1. Repair/replace the concrete wall on the right side of the spillway.
2. Replace the tire retaining wall with a proper structure to provide stability.
3. Repair eroded area behind the left spillway training wall. Extend concrete wall or augment with rip rap.
4. Replace the materials of construction of the low-level outlet gate.
5. Replace the materials of construction of the stop logs.

## 3.6 Alternatives

No alternatives have been developed at this time. Design studies may provide practical alternatives to the recommendations listed above.

## 3.7 Opinion of Probable Costs

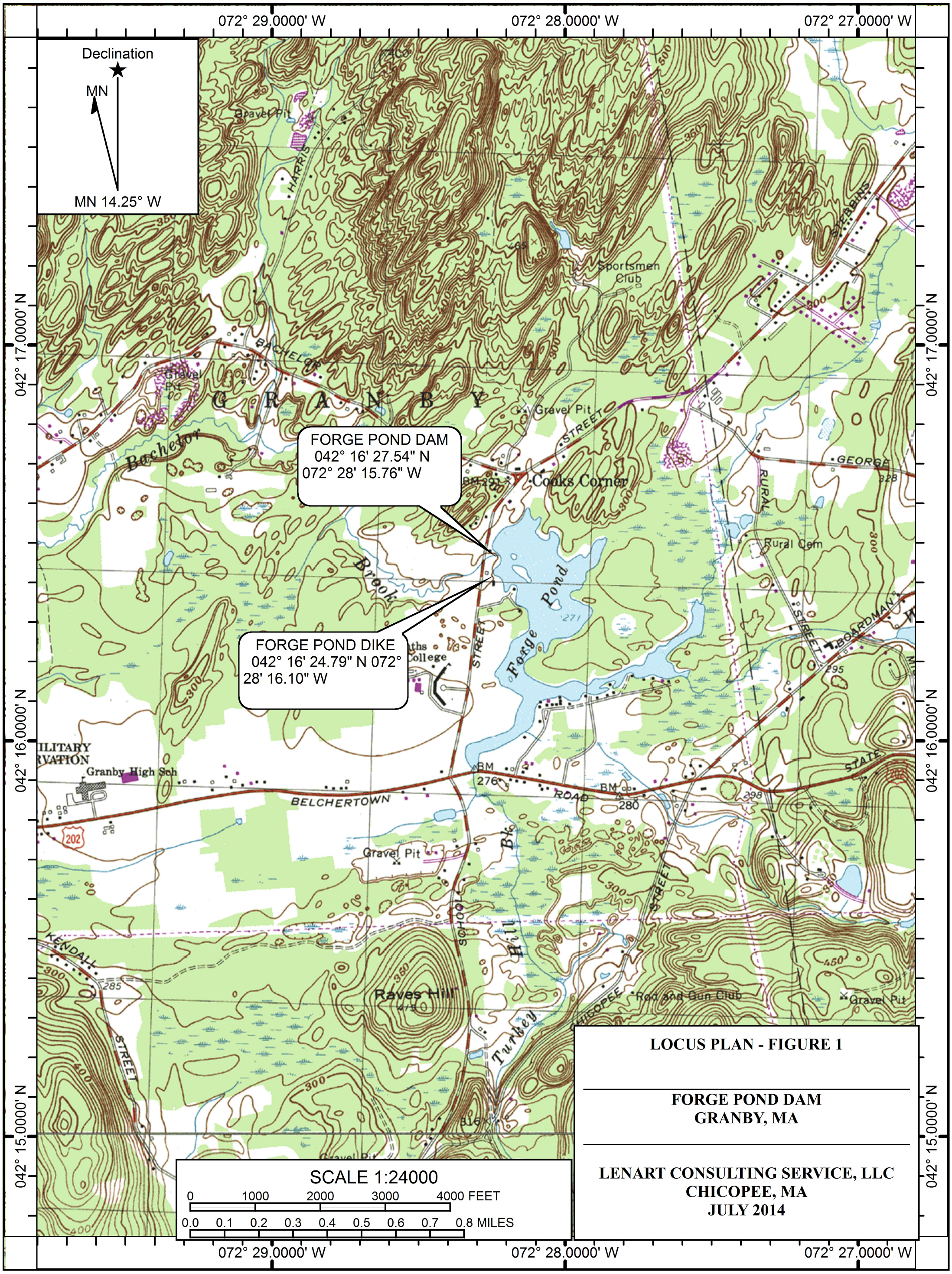
The following opinion of probable costs has been developed for the studies, analyses, recommendations and remedial measures noted above. Routine maintenance items that can be accomplished by Town forces are not included. The probable construction costs are based on very limited investigations. Once further detailed investigations are performed, the scope of work may change, affecting the actual construction costs. The estimates include engineering, permits and contingencies where applicable.

| | **Recommendation** | **Probable Cost** |
|---|---|---|
| 1 | Prepare updated Hydraulic & Hydrologic Analysis | $10,000 |
| 2 | Develop Operations and Maintenance Manual | $4,000 |
| 3 | Remove tree stumps and root systems from embankments | $50,000 |

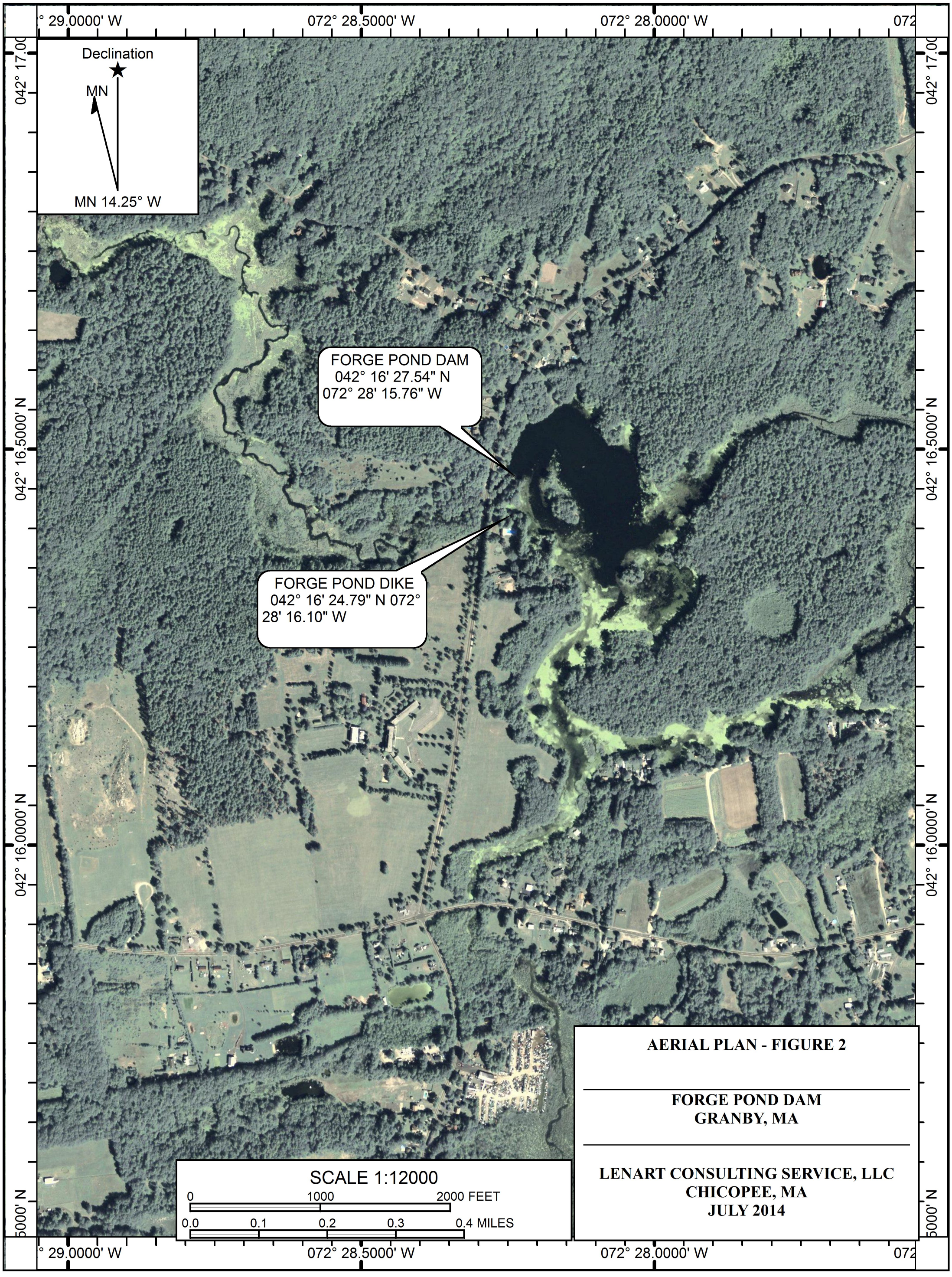
| | | |
|---|---|---|
| 4 | Repair/replace concrete walls at the dam | $60,000 |
| 5 | Replace rubber tire wall with a more stable retaining wall | $250,000 |
| 6 | Repair eroded area behind the left spillway training wall. Augment with rip rap | $10,000 |
| 7 | Replace the materials of construction of the low-level gate and stoplogs | $25,000 |
| 8 | Repair stone masonry wall on downstream side of dike | $10,000 |
| | **Total** | **$424,000**<br>**Say $425,000** |

C:\G-006\ Granbyl DCR Phase 1 Report 4/1/20\Report text.doc

**Figures**




USGS Quadrangle: BELCHERTOWN




USGS Quadrangle: SW BELCHERTOWN, MA

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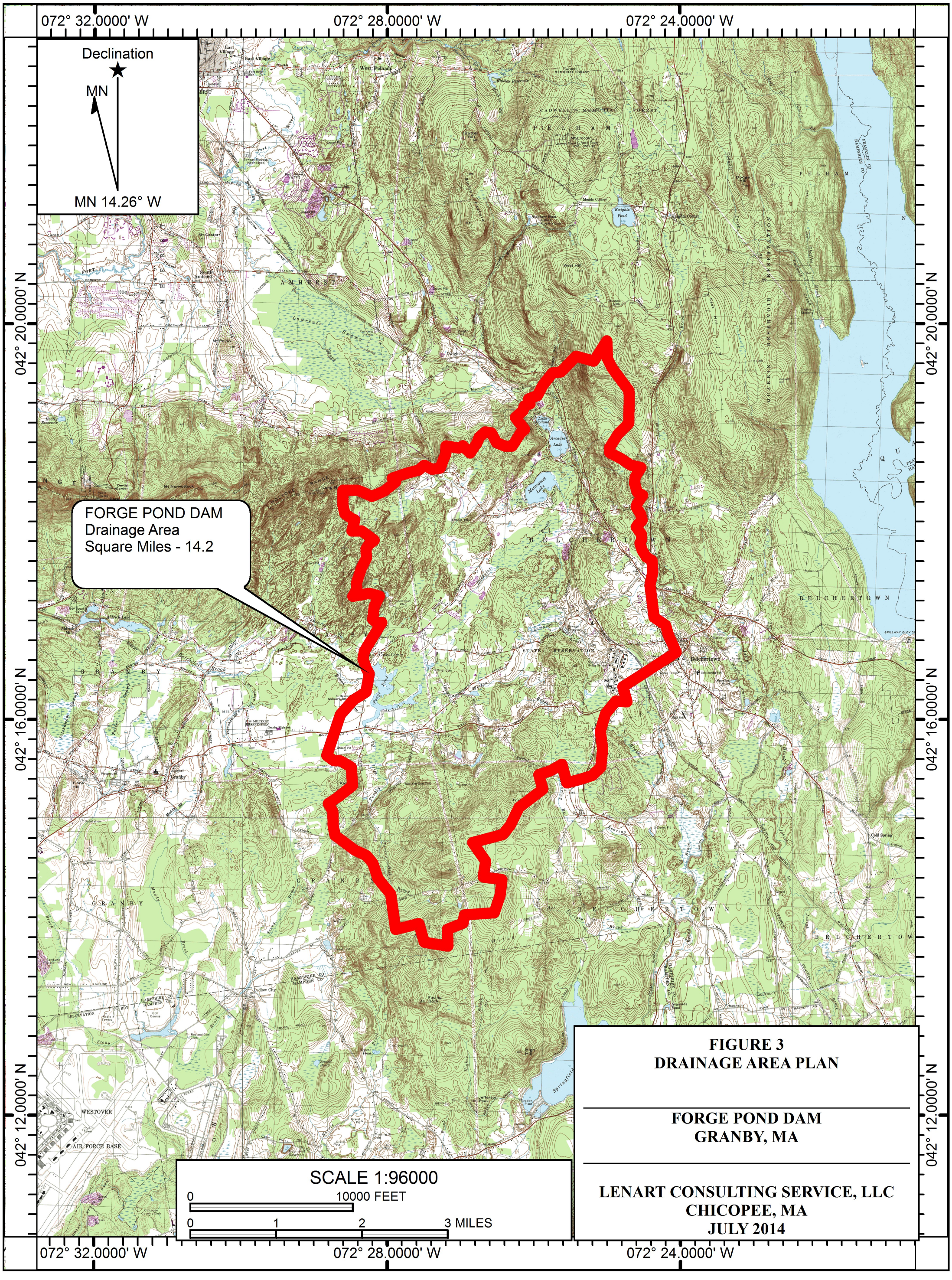
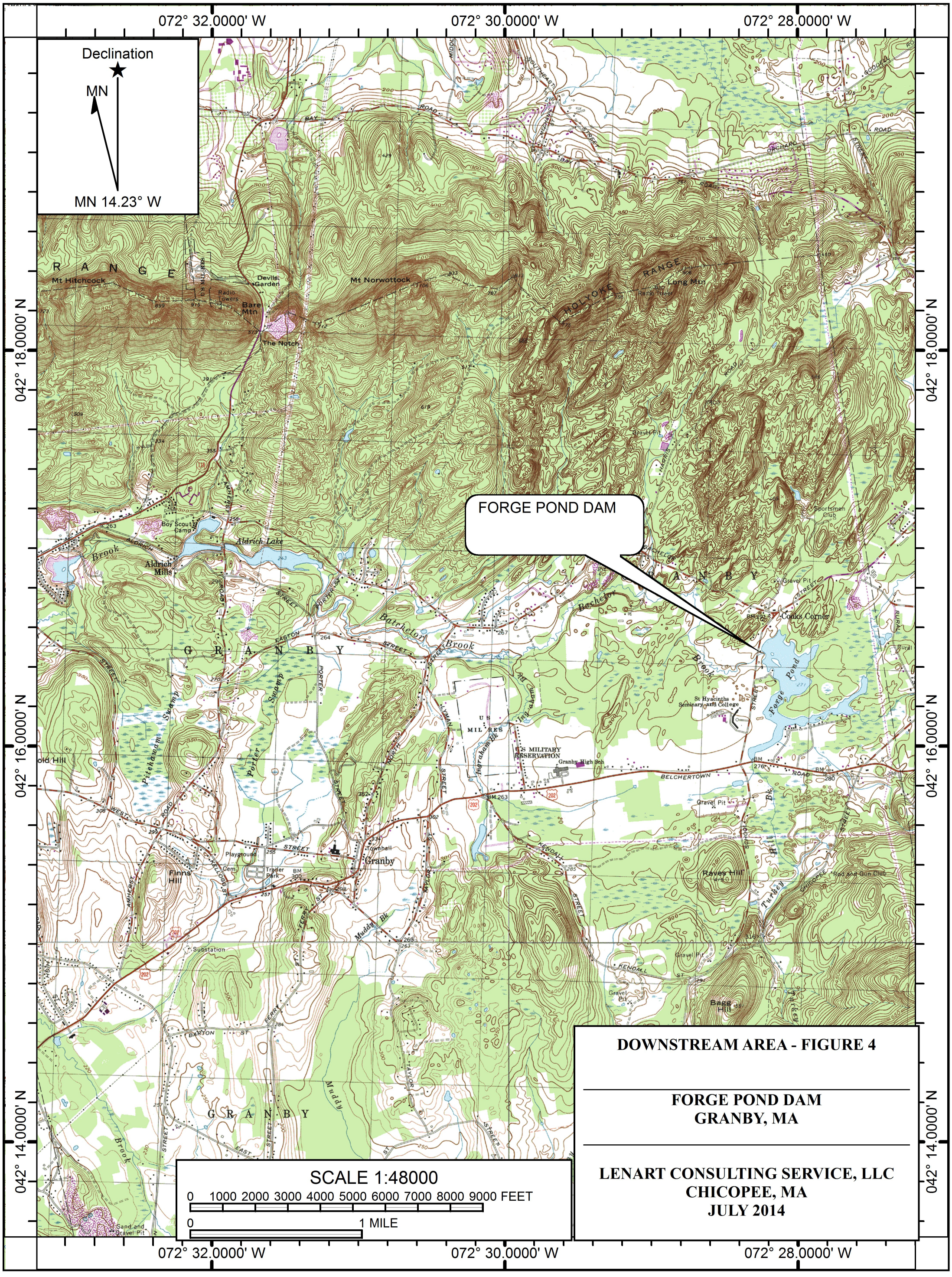



USGS Quadrangle: BELCHERTOWN




USGS Quadrangle: MT HOLYOKE

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APPENDIX A
**Photographs**

Forge Pond Dam
Forge Pond Dike

**Forge Pond Dam**

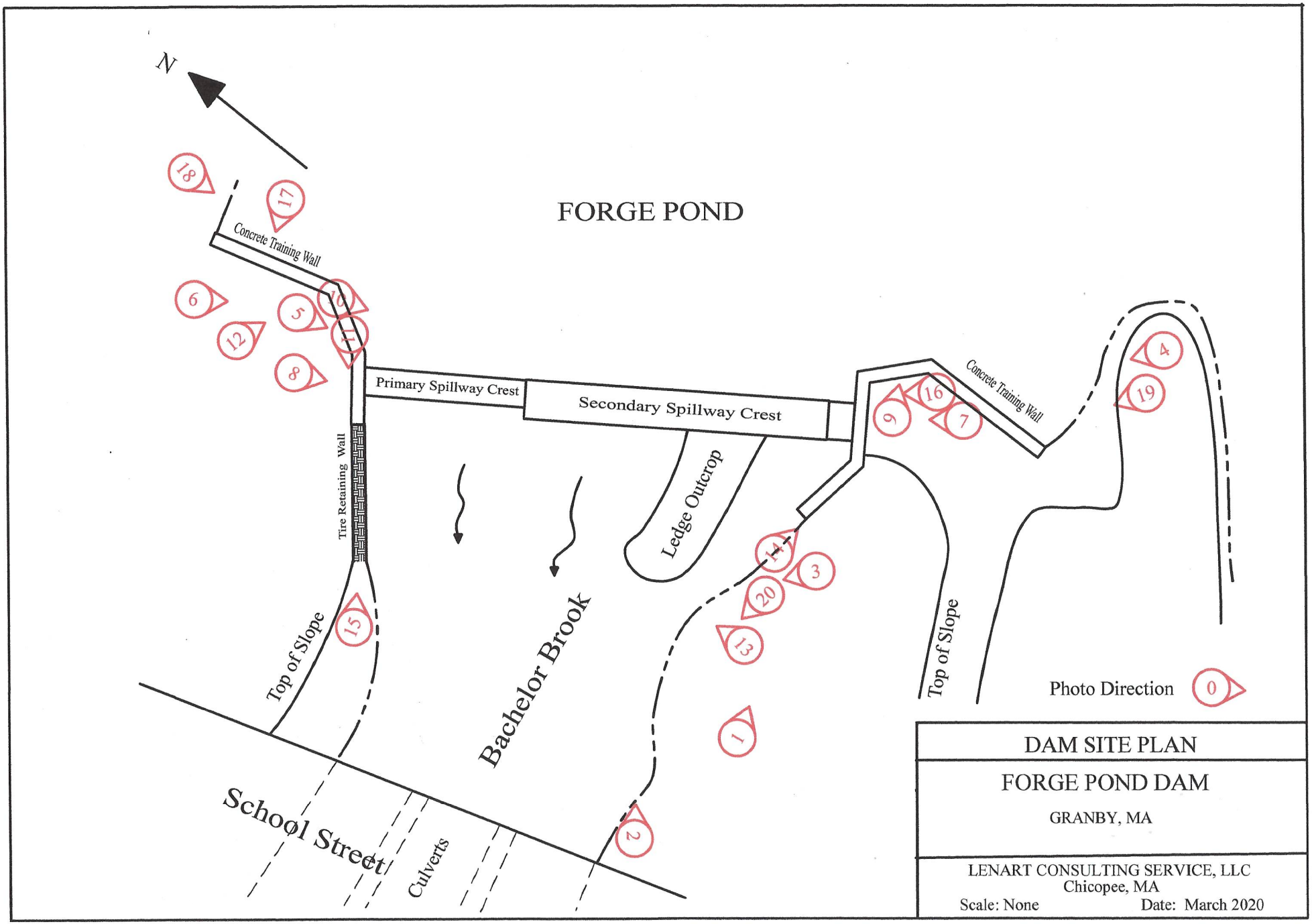

N
FORGE POND
Concrete Training Wall
Primary Spillway Crest
Secondary Spillway Crest
Concrete Training Wall
Tire Retaining Wall
Ledge Outcrop
Top of Slope
Bachelor Brook
Top of Slope
School Street
Culverts
Photo Direction
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
DAM SITE PLAN
FORGE POND DAM
GRANBY, MA
LENART CONSULTING SERVICE, LLC
Chicopee, MA
Scale: None
Date: March 2020

Photo 1 – Downstream view of embankment left of spillway

Photo 2 – Downstream overview of dam

Photo 3 – Upstream view of embankment retaining wall cracks and spalling

Photo 4 – Upstream view of spillway from left abutment

Photo 5 – Upstream overview from right side

Photo 6 – Spillway and right training wall viewed from right side

Photo 7 – Back of left training wall and spillway crest viewed from left side

Photo 8 – Left training wall viewed from right side

Photo 9 – View of impoundment and left upstream spillway training wall

Photo 10 – View of jogged spillway crest and downstream area

Photo 11 – Right upstream training wall and tree stumps downstream of spillway at right abutment.

Photo 12 – Settlement and rotting stump behind right upstream spillway training wall

Photo 13 – Downstream side of spillway viewed from left side

Photo 14 – Left side of spillway with erosion behind left downstream  training wall

Photo 15 – Downstream view of spillway from right side

Photo 16 – Spillway crest, deteriorating concrete on right training wall and upstream retaining wall

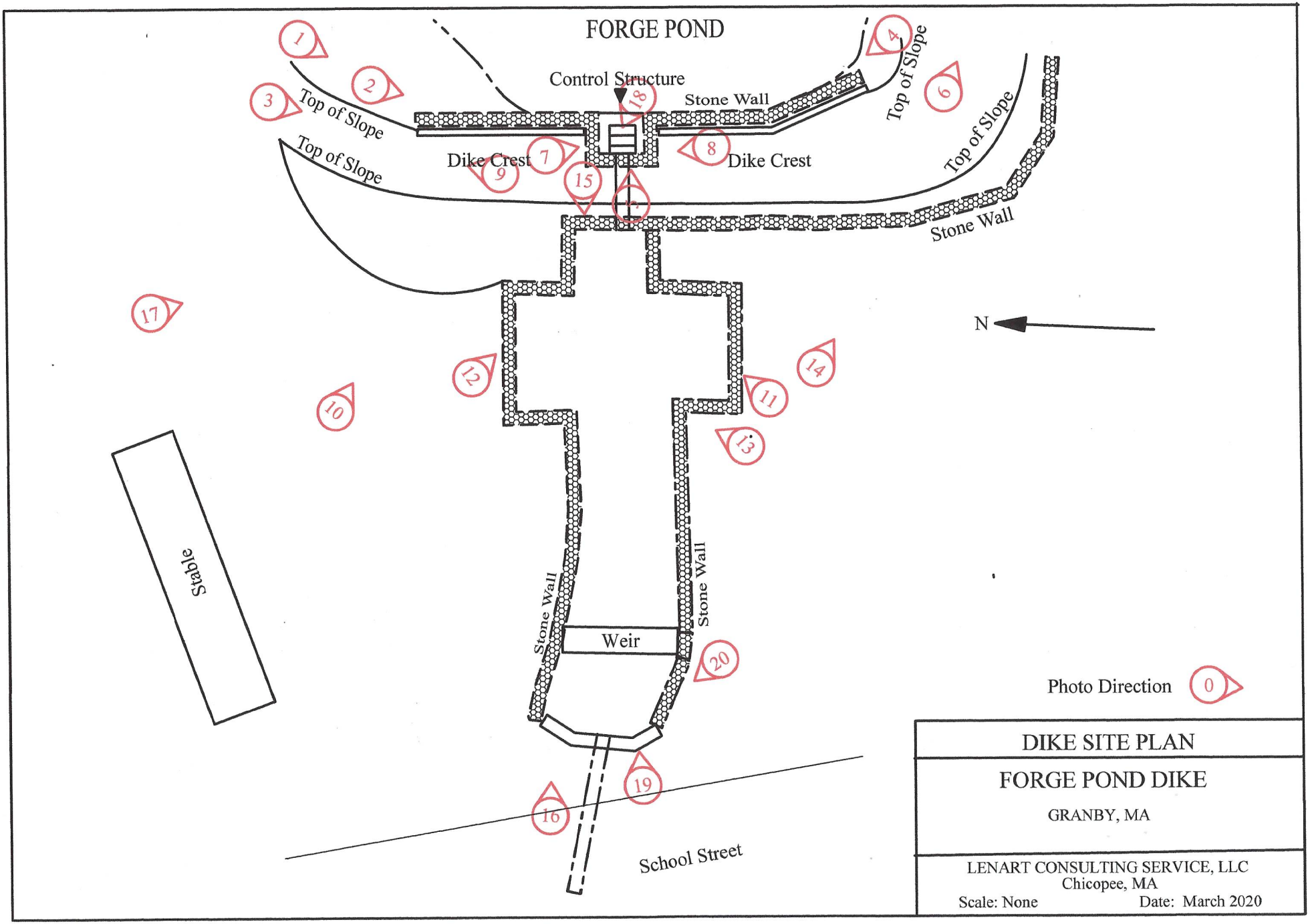
Photo 17 - Deteriorating concrete on upstream face of right spillway training wall

Photo 18 –Upstream face of right spillway training wall

Photo 19 – Upstream left retaining wall

Photo 20 – Upstream view of ACCMP culverts passing under School Street downstream

**Forge Pond Dike**




DIKE SITE PLAN

FORGE POND DIKE

GRANBY, MA

LENART CONSULTING SERVICE, LLC
Chicopee, MA

Scale: None Date: March 2020

Photo 1 – Overview of upstream face of dike from right abutment

Photo 2 – Upstream face viewed from right end of dike

Photo 3 – Dike crest viewed from right end

Photo 4 – Upstream face of dike from left abutment

Photo 5 – Control gate structure viewed from downstream side looking into impoundment

Photo 6 – Crest and view of left abutment

Photo 7 – Right side of rack and pinion level control gate structure

Photo 8 – Crest and low-level control structure viewed from the left side

Photo 9 – Embankment crest at right abutment

Photo 10 – Downstream slope at right side of dike

Photo 11 – Downstream stone masonry retaining wall at low level outlet

Photo 12 – Stone masonry  retaining wall at discharge channel to the left of low level outlet

Photo 13 – Downstream stone retaining wall at discharge channel to the right of low level outlet

Photo 14 – Stone masonry wall on downstream slope to the left of the low-level outlet

Photo 15 – Discharge channel viewed from the top of dike

Photo 16 – Downstream overview of the dike from School Street

Photo 17 – Downstream overview of the dike from the right side

Photo 18 – Interior of low-level outlet structure looking downstream

Photo 19 – Concrete weir in discharge channel downstream of the low-level outlet

Photo 20 – Upstream end of culvert passing under School Street downstream of low-level outlet

APPENDIX B
**Inspection Checklist**

Forge Pond Dam
Forge Pond Dike

**Forge Pond Dam**

# DAM SAFETY INSPECTION CHECKLIST

NAME OF DAM: Forge Pond Dam

STATE ID #: 2-8-111-2

REGISTERED: ☑ YES ☐ NO

NID ID #: MA00488

STATE SIZE CLASSIFICATION: Intermediate

STATE HAZARD CLASSIFICATION: Significant

CHANGE IN HAZARD CLASSIFICATION REQUESTED?: No

*DAM LOCATION INFORMATION*

CITY/TOWN: Granby

COUNTY: Hampshire

DAM LOCATION: School Street
(street address if known)

ALTERNATE DAM NAME: Forge Pond Main Dam

USGS QUAD.: Belchertown, MA

LAT.: 42.274511

LONG.: -72.47085

DRAINAGE BASIN: Connecticut

RIVER: Bachelor Brook

IMPOUNDMENT NAME(S): Forge Pond

*GENERAL DAM INFORMATION*

TYPE OF DAM: Earthen Embankment w/ concrete/masonry spillway

OVERALL LENGTH (FT): 115

PURPOSE OF DAM: Recreation

NORMAL POOL STORAGE (ACRE-FT): 380

YEAR BUILT: 1900

MAXIMUM POOL STORAGE (ACRE-FT): 600

STRUCTURAL HEIGHT (FT): 13.5

EL. NORMAL POOL (FT): 271.0

HYDRAULIC HEIGHT (FT): 11.0

EL. MAXIMUM POOL (FT): 273.5

*FOR INTERNAL MADCR USE ONLY*

FOLLOW-UP INSPECTION REQUIRED: ☐ YES ☐ NO

CONDITIONAL LETTER: ☐ YES ☐ NO

NAME OF DAM: Forge Pond Dam | STATE ID #: 2-8-111-2

INSPECTION DATE: March 23, 2020 | NID ID #: MA00488

*INSPECTION SUMMARY*

DATE OF INSPECTION: March 23, 2020 | DATE OF PREVIOUS INSPECTION: July 10, 2014

TEMPERATURE/WEATHER: low 40's° mostly sunny | ARMY CORPS PHASE I: ☑ YES ☐ NO | If YES, date March 1981

CONSULTANT: Lenart Consulting Services, LLC | PREVIOUS DCR PHASE I: ☐ YES ☑ NO | If YES, date

BENCHMARK/DATUM: USGS - 271 pond elevation set to normal pool elevation

OVERALL PHYSICAL CONDITION OF DAM: POOR | DATE OF LAST REHABILITATION: 1978

SPILLWAY CAPACITY: 0-50% of the SDF or Unknown

EL. POOL DURING INSP.: 271.2 | EL. TAILWATER DURING INSP.: 262 ±

*PERSONS PRESENT AT INSPECTION*

| NAME | TITLE/POSITION | REPRESENTING |
|---|---|---|
| Cathleen A. Benben | Engineer | Lenart Consulting Services, LLC |
| | | |
| | | |
| | | |

*EVALUATION INFORMATION*

| | Click on box to select E-code | | Click on box to select E-code |
|---|---|---|---|
| E1) TYPE OF DESIGN | 3 | E8) LOW-LEVEL OUTLET CONDITION | 2 |
| E2) LEVEL OF MAINTENANCE | 2 | E9) SPILLWAY DESIGN FLOOD CAPACITY | 1 |
| E3) EMERGENCY ACTION PLAN | 5 | E10) OVERALL PHYSICAL CONDITION | 2 |
| E4) EMBANKMENT SEEPAGE | 4 | E11) ESTIMATED REPAIR COST | $375,000 |
| E5) EMBANKMENT CONDITION | 4 | ROADWAY OVER CREST | NO |
| E6) CONCRETE CONDITION | 3 | BRIDGE NEAR DAM | NO |
| E7) LOW-LEVEL OUTLET CAPACITY | 1 | | |

NAME OF INSPECTING ENGINEER: Cathleen A. Benben | SIGNATURE: Cathleen A Benben

| | | | |
|---|---|---|---|
| NAME OF DAM: | Forge Pond Dam | STATE ID #: | 2-8-111-2 |
| INSPECTION DATE: | March 23, 2020 | NID ID #: | MA00488 |

| OWNER: | | CARETAKER: | |
|---|---|---|---|
| ORGANIZATION | Town of Granby | ORGANIZATION | Town of Granby |
| NAME/TITLE | Board of Selectmen | NAME/TITLE | Board of Selectmen |
| STREET | 10B West State Street | STREET | 10B West State Street |
| TOWN, STATE, ZIP | Granby, MA | TOWN, STATE, ZIP | Granby, MA |
| PHONE | (413) 467-7177 | PHONE | (413) 467-7177 |
| EMERGENCY PH. # | 911 | EMERGENCY PH. # | 911 |
| FAX | N/A | FAX | N/A |
| EMAIL | N/A | EMAIL | N/A |
| OWNER TYPE | Municipality or Political subdivision | | |

| | | | |
|---|---|---|---|
| PRIMARY SPILLWAY TYPE | Broad-crested weir, concrete and stone masonry | | |
| SPILLWAY LENGTH (FT) | 82 | SPILLWAY CAPACITY (CFS) | 1,005 |
| AUXILIARY SPILLWAY TYPE | N/A | AUX. SPILLWAY CAPACITY (CFS) | N/A |
| NUMBER OF OUTLETS | 1 at the dike location | OUTLET(S) CAPACITY (CFS) | see dike |
| TYPE OF OUTLETS | 36-in. diameter conduit at the dike | TOTAL DISCHARGE CAPACITY (CFS) | 1,091 (spillway and LLO) |
| DRAINAGE AREA (SQ MI) | 14.2 | SPILLWAY DESIGN FLOOD (PERIOD/CFS) | 100-year/no H&H |

HAS DAM BEEN BREACHED OR OVERTOPPED ☐ YES ☑ NO IF YES, PROVIDE DATE(S)

FISH LADDER (LIST TYPE IF PRESENT) N/A

DOES CREST SUPPORT PUBLIC ROAD? ☐ YES ☑ NO IF YES, ROAD NAME:

PUBLIC BRIDGE WITHIN 50' OF DAM? ☐ YES ☑ NO IF YES, ROAD/BRIDGE NAME:

MHD BRIDGE NO. (IF APPLICABLE)

NAME OF DAM: Forge Pond Dam STATE ID #: 2-8-111-2

INSPECTION DATE: March 23, 2020 NID ID #: MA00488

## EMBANKMENT (CREST)

| AREA INSPECTED | CONDITION | OBSERVATIONS | NO ACTION | MONITOR | REPAIR |
|---|---|---|---|---|---|
| CREST | 1. SURFACE TYPE | Grass | | | X |
| | 2. SURFACE CRACKING | None Observed | X | | |
| | 3. SINKHOLES, ANIMAL BURROWS | None Observed | X | | |
| | 4. VERTICAL ALIGNMENT (DEPRESSIONS | Depression behind right training wall at abutment contact | | | X |
| | 5. HORIZONTAL ALIGNMENT | Good | X | | |
| | 6. RUTS AND/OR PUDDLES | None Observed | X | | |
| | 7. VEGETATION (PRESENCE/CONDITION) | Grass with some exposed soils | | | X |
| | 8. ABUTMENT CONTACT | Good | X | | |
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ADDITIONAL COMMENTS:

NAME OF DAM: Forge Pond Dam STATE ID #: 2-8-111-2

INSPECTION DATE: March 23, 2020 NID ID #: MA00488

## EMBANKMENT (D/S SLOPE)

| AREA INSPECTED | CONDITION | OBSERVATIONS | NO ACTION | MONITOR | REPAIR |
|---|---|---|---|---|---|
| D/S SLOPE | 1. WET AREAS (NO FLOW) | None Observed | X | | |
| | 2. SEEPAGE | None Observed | X | | |
| | 3. SLIDE, SLOUGH, SCARP | None Observed | X | | |
| | 4. EMB.-ABUTMENT CONTACT | Good on left side; interface with tire retaining wall on right side showing erosion | | | X |
| | 5. SINKHOLE/ANIMAL BURROWS | None Observed | X | | |
| | 6. EROSION | Erosion behind the left spillway training wall at the downstream end | | | X |
| | 7. UNUSUAL MOVEMENT | None Observed | X | | |
| | 8. VEGETATION (PRESENCE/CONDITION) | Grass cover on downstream slope sparse in areas | | | X |
| | | Some areas with exposed soils where brush has been removed. | | | |
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ADDITIONAL COMMENTS:

NAME OF DAM: Forge Pond Dam STATE ID #: 2-8-111-2

INSPECTION DATE: March 23, 2020 NID ID #: MA00488

## EMBANKMENT (U/S SLOPE)

| AREA INSPECTED | CONDITION | OBSERVATIONS | NO ACTION | MONITOR | REPAIR |
|---|---|---|---|---|---|
| U/S SLOPE | 1. SLIDE, SLOUGH, SCARP | N/A - Upstream face is concrete wall | X | | |
| | 2. SLOPE PROTECTION TYPE AND COND. | Concrete wall and gravel slope under water; transverse cracks and spalling | | | X |
| | 3. SINKHOLE/ANIMAL BURROWS | N/A - Upstream face is concrete wall | X | | |
| | 4. EMB.-ABUTMENT CONTACT | Good | X | | |
| | 5. EROSION | N/A - Upstream face is concrete wall | X | | |
| | 6. UNUSUAL MOVEMENT | None Observed | X | | |
| | 7. VEGETATION (PRESENCE/CONDITION) | Upstream face is concrete wall, | | | X |
| | | Woody vegetation growing through cracks in walls has been cut; stumps and roots | | | X |
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ADDITIONAL COMMENTS:

NAME OF DAM: Forge Pond Dam STATE ID #: 2-8-111-2

INSPECTION DATE: March 23, 2020 NID ID #: MA00488

## INSTRUMENTATION

| AREA INSPECTED | CONDITION | OBSERVATIONS | NO ACTION | MONITOR | REPAIR |
|---|---|---|---|---|---|
| INSTR. | 1. PIEZOMETERS | N/A | | | |
| | 2. OBSERVATION WELLS | N/A | | | |
| | 3. STAFF GAGE AND RECORDER | N/A | | | |
| | 4. WEIRS | N/A | | | |
| | 5. INCLINOMETERS | N/A | | | |
| | 6. SURVEY MONUMENTS | N/A | | | |
| | 7. DRAINS | N/A | | | |
| | 8. FREQUENCY OF READINGS | N/A | | | |
| | 9. LOCATION OF READINGS | N/A | | | |
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ADDITIONAL COMMENTS:

NAME OF DAM: Forge Pond Dam STATE ID #: 2-8-111-2

INSPECTION DATE: March 23, 2020 NID ID #: MA00488

## DOWNSTREAM MASONRY WALLS

| AREA INSPECTED | CONDITION | OBSERVATIONS | NO ACTION | MONITOR | REPAIR |
|---|---|---|---|---|---|
| D/S WALLS | 1. WALL TYPE | N/A | | | |
| | 2. WALL ALIGNMENT | N/A | | | |
| | 3. WALL CONDITION | N/A | | | |
| | 4. HEIGHT: TOP OF WALL TO MUDLINE | min: max: avg: | | | |
| | 5. SEEPAGE OR LEAKAGE | N/A | | | |
| | 6. ABUTMENT CONTACT | N/A | | | |
| | 7. EROSION/SINKHOLES BEHIND WALL | N/A | | | |
| | 8. ANIMAL BURROWS | N/A | | | |
| | 9. UNUSUAL MOVEMENT | N/A | | | |
| | 10. WET AREAS AT TOE OF WALL | N/A | | | |
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ADDITIONAL COMMENTS:

NAME OF DAM: Forge Pond Dam STATE ID #: 2-8-111-2

INSPECTION DATE: March 23, 2020 NID ID #: MA00488

## UPSTREAM MASONRY WALLS

| AREA INSPECTED | CONDITION | OBSERVATIONS | NO ACTION | MONITOR | REPAIR |
|---|---|---|---|---|---|
| U/S WALLS | 1. WALL TYPE | N/A | | | |
| | 2. WALL ALIGNMENT | N/A | | | |
| | 3. WALL CONDITION | N/A | | | |
| | 4. HEIGHT: TOP OF WALL TO MUDLINE | min: max: avg: | | | |
| | 5. ABUTMENT CONTACT | N/A | | | |
| | 6. EROSION/SINKHOLES BEHIND WALL | N/A | | | |
| | 7. ANIMAL BURROWS | N/A | | | |
| | 8. UNUSUAL MOVEMENT | N/A | | | |
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ADDITIONAL COMMENTS:

NAME OF DAM: Forge Pond Dam STATE ID #: 2-8-111-2

INSPECTION DATE: March 23, 2020 NID ID #: MA00488

## DOWNSTREAM AREA

| AREA INSPECTED | CONDITION | OBSERVATIONS | NO ACTION | MONITOR | REPAIR |
|---|---|---|---|---|---|
| D/S AREA | 1. ABUTMENT LEAKAGE | None Observed | X | | |
| | 2. FOUNDATION SEEPAGE | None Observed, previous report indicated seepage at spillway foundation | | X | |
| | 3. SLIDE, SLOUGH, SCARP | Erosion behind downstream end of spillway training wall on left | | | X |
| | 4. WEIRS | None Observed | X | | |
| | 5. DRAINAGE SYSTEM | None Observed | X | | |
| | 6. INSTRUMENTATION | None Observed | X | | |
| | 7. VEGETATION | Grass cover at toe of slope. Tree stumps behind concrete training walls. | | | X |
| | 8. ACCESSIBILITY | Access from School Street | X | | |
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| | 9. DOWNSTREAM HAZARD DESCRIPTION | Significant - residence at right abutment, School Street 300 feet downstream | | | |
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| | 10. DATE OF LAST EAP UPDATE | EAP 2019 | | | |
| | | | | | |

ADDITIONAL COMMENTS:

NAME OF DAM: Forge Pond Dam STATE ID #: 2-8-111-2

INSPECTION DATE: March 23, 2020 NID ID #: MA00488

## MISCELLANEOUS

| AREA INSPECTED | CONDITION | OBSERVATIONS |
|---|---|---|
| MISC. | 1. RESERVOIR DEPTH (AVG) | Assume 5.5 |
| | 2. RESERVOIR SHORELINE | Some development, wooded hills and marshland |
| | 3. RESERVOIR SLOPES | Relatively flat surrounding pond |
| | 4. ACCESS ROADS | Access is from School Street in Granby |
| | 5. SECURITY DEVICES | Chain link fence along School Street, gated to prevent vehicular access |
| | 6. VANDALISM OR TRESPASS | ☑ YES ☐ NO WHAT: public recreational use |
| | 7. AVAILABILITY OF PLANS | ☑ YES ☐ NO DATE: 1977 proposed improvements |
| | 8. AVAILABILITY OF DESIGN CALCS | ☐ YES ☑ NO DATE: |
| | 9. AVAILABILITY OF EAP/LAST UPDATE | ☑ YES ☐ NO DATE: 2019 |
| | 10. AVAILABILITY OF O&M MANUAL | ☐ YES ☑ NO DATE: |
| | 11. CARETAKER/OWNER AVAILABLE | ☐ YES ☑ NO DATE: |
| | 12. CONFINED SPACE ENTRY REQUIRED | ☑ YES ☐ NO PURPOSE: low level control structure to access stop logs |
| | | |
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| | | |

ADDITIONAL COMMENTS: Confined space entry is required to enter low level control structure located at Forge Pond Dike

NAME OF DAM: Forge Pond Dam STATE ID #: 2-8-111-2

INSPECTION DATE: March 23, 2020 NID ID #: MA00488

## PRIMARY SPILLWAY

| AREA INSPECTED | CONDITION | OBSERVATIONS | NO ACTION | MONITOR | REPAIR |
|---|---|---|---|---|---|
| SPILLWAY | SPILLWAY TYPE | Stone masonry and concrete | X | | |
| | WEIR TYPE | Broad crested | X | | |
| | SPILLWAY CONDITION | Satisfactory - spalling observed on spillway crest | | X | |
| | TRAINING WALLS | Fair - cracks and spalling | | | X |
| | SPILLWAY CONTROLS AND CONDITION | No control | X | | |
| | UNUSUAL MOVEMENT | None Observed | X | | |
| | APPROACH AREA | Concrete and riprap apron | X | | |
| | DISCHARGE AREA | Natural stream channel, bedrock outcropping at left side. Trees have been cleared. | X | | |
| | DEBRIS | None observed | | | X |
| | WATER LEVEL AT TIME OF INSPECTION | 0.2 feet above spillway crest | X | | |
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ADDITIONAL COMMENTS:

NAME OF DAM: Forge Pond Dam STATE ID #: 2-8-111-2

INSPECTION DATE: March 23, 2020 NID ID #: MA00488

## AUXILIARY SPILLWAY

| AREA INSPECTED | CONDITION | OBSERVATIONS | NO ACTION | MONITOR | REPAIR |
|---|---|---|---|---|---|
| SPILLWAY | SPILLWAY TYPE | N/A | | | |
| | WEIR TYPE | N/A | | | |
| | SPILLWAY CONDITION | N/A | | | |
| | TRAINING WALLS | N/A | | | |
| | SPILLWAY CONTROLS AND CONDITION | N/A | | | |
| | UNUSUAL MOVEMENT | N/A | | | |
| | APPROACH AREA | N/A | | | |
| | DISCHARGE AREA | N/A | | | |
| | DEBRIS | N/A | | | |
| | WATER LEVEL AT TIME OF INSPECTION | N/A | | | |
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ADDITIONAL COMMENTS:

NAME OF DAM: Forge Pond Dam STATE ID #: 2-8-111-2

INSPECTION DATE: March 23, 2020 NID ID #: MA00488

## OUTLET WORKS

| AREA INSPECTED | CONDITION | OBSERVATIONS | NO ACTION | MONITOR | REPAIR |
|---|---|---|---|---|---|
| OUTLET WORKS | TYPE | Concrete intake structure; gated entrance, stop logs within structure, 36-inch outlet | | | X |
| | INTAKE STRUCTURE | 6 foot by 8 foot concrete structure | X | | |
| | TRASHRACK | None | X | | |
| | PRIMARY CLOSURE | Sluice gate upstream face | X | | |
| | SECONDARY CLOSURE | Stop logs within structure | X | | |
| | CONDUIT | 36-inch RCP outlet | X | | |
| | OUTLET STRUCTURE/HEADWALL | Stone masonry wall at discharge | X | | |
| | EROSION ALONG TOE OF DAM | None | X | | |
| | SEEPAGE/LEAKAGE | Minor leakage past gate and stop logs | | X | |
| | DEBRIS/BLOCKAGE | None observed | X | | |
| | UNUSUAL MOVEMENT | None observed | X | | |
| | DOWNSTREAM AREA | Stone lined channel independent of spillway discharge channel | X | | |
| | | | | | |
| | MISCELLANEOUS | 36-inch CMP conduit crosses under School Street before covergence with | | | |
| | | spillway discharge | | | |

ADDITIONAL COMMENTS: This structure is not located at the dam. It's location is approx. 200 feet south of the main dam at the dike.

Note: Use additional sheets for additional outlets.

NAME OF DAM: Forge Pond Dam STATE ID #: 2-8-111-2

INSPECTION DATE: March 23, 2020 NID ID #: MA00488

## CONCRETE/MASONRY DAMS

| AREA INSPECTED | CONDITION | OBSERVATIONS | NO ACTION | MONITOR | REPAIR |
|---|---|---|---|---|---|
| GENERAL | TYPE | N/A | | | |
| | AVAILABILITY OF PLANS | N/A | | | |
| | AVAILABILITY OF DESIGN CALCS | N/A | | | |
| | PIEZOMETERS | N/A | | | |
| | OBSERVATION WELLS | N/A | | | |
| | INCLINOMETERS | N/A | | | |
| | SEEPAGE GALLERY | N/A | | | |
| | UNUSUAL MOVEMENT | N/A | | | |
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ADDITIONAL COMMENTS:

NAME OF DAM: Forge Pond Dam STATE ID #: 2-8-111-2

INSPECTION DATE: March 23, 2020 NID ID #: MA00488

## CONCRETE/MASONRY DAMS (CREST)

| AREA INSPECTED | CONDITION | OBSERVATIONS | NO ACTION | MONITOR | REPAIR |
|---|---|---|---|---|---|
| CREST | TYPE | N/A | | | |
| | SURFACE CONDITIONS | N/A | | | |
| | CONDITIONS OF JOINTS | N/A | | | |
| | UNUSUAL MOVEMENT | N/A | | | |
| | HORIZONTAL ALIGNMENT | N/A | | | |
| | VERTICAL ALIGNMENT | N/A | | | |
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ADDITIONAL COMMENTS:

NAME OF DAM: Forge Pond Dam STATE ID #: 2-8-111-2

INSPECTION DATE: March 23, 2020 NID ID #: MA00488

## CONCRETE/MASONRY DAMS (DOWNSTREAM FACE)

| AREA INSPECTED | CONDITION | OBSERVATIONS | NO ACTION | MONITOR | REPAIR |
|---|---|---|---|---|---|
| D/S FACE | TYPE | N/A | | | |
| | SURFACE CONDITIONS | N/A | | | |
| | CONDITIONS OF JOINTS | N/A | | | |
| | UNUSUAL MOVEMENT | N/A | | | |
| | ABUTMENT CONTACT | N/A | | | |
| | LEAKAGE | N/A | | | |
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ADDITIONAL COMMENTS:

NAME OF DAM: Forge Pond Dam STATE ID #: 2-8-111-2

INSPECTION DATE: March 23, 2020 NID ID #: MA00488

## CONCRETE/MASONRY DAMS (UPSTREAM FACE)

| AREA INSPECTED | CONDITION | OBSERVATIONS | NO ACTION | MONITOR | REPAIR |
|---|---|---|---|---|---|
| U/S FACE | TYPE | N/A | | | |
| | SURFACE CONDITIONS | N/A | | | |
| | CONDITIONS OF JOINTS | N/A | | | |
| | UNUSUAL MOVEMENT | N/A | | | |
| | ABUTMENT CONTACTS | N/A | | | |
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ADDITIONAL COMMENTS:

**Forge Pond Dike**

# DAM SAFETY INSPECTION CHECKLIST

NAME OF DAM: Forge Pond Dike

STATE ID #: 2-8-111-3

REGISTERED: ☑ YES ☐ NO

NID ID #: MA00489

STATE SIZE CLASSIFICATION: Intermediate

STATE HAZARD CLASSIFICATION: Significant

CHANGE IN HAZARD CLASSIFICATION REQUESTED?: No

*DAM LOCATION INFORMATION*

CITY/TOWN: Granby

COUNTY: Hampshire

DAM LOCATION: School Street
(street address if known)

ALTERNATE DAM NAME: Forge Pond Small Dam

USGS QUAD.: Belchertown, MA

LAT.: 42.273763

LONG.: -72.470885

DRAINAGE BASIN: Connecticut

RIVER: Bachelor Brook

IMPOUNDMENT NAME(S): Forge Pond

*GENERAL DAM INFORMATION*

TYPE OF DAM: Earthen Embankment w/ stone masonry upstream face

OVERALL LENGTH (FT): 90

PURPOSE OF DAM: Recreation

NORMAL POOL STORAGE (ACRE-FT): 320

YEAR BUILT: 1800

MAXIMUM POOL STORAGE (ACRE-FT): 540

STRUCTURAL HEIGHT (FT): 10.7

EL. NORMAL POOL (FT): 271.0

HYDRAULIC HEIGHT (FT): 8.2

EL. MAXIMUM POOL (FT): 273.5

*FOR INTERNAL MADCR USE ONLY*

FOLLOW-UP INSPECTION REQUIRED: ☐ YES ☐ NO

CONDITIONAL LETTER: ☐ YES ☐ NO

NAME OF DAM: Forge Pond Dike | STATE ID #: 2-8-111-3

INSPECTION DATE: March 23, 2020 | NID ID #: MA00489

*INSPECTION SUMMARY*

DATE OF INSPECTION: March 23, 2020 | DATE OF PREVIOUS INSPECTION: July 10, 2020

TEMPERATURE/WEATHER: lower 50's and sxunny | ARMY CORPS PHASE I: ☑ YES ☐ NO | If YES, date March 1981

CONSULTANT: Lenart Consulting Services, LLC | PREVIOUS DCR PHASE I: ☐ YES ☑ NO | If YES, date

BENCHMARK/DATUM: USGS

OVERALL PHYSICAL CONDITION OF DAM: POOR | DATE OF LAST REHABILITATION: 1978

SPILLWAY CAPACITY: No spillway at dike

EL. POOL DURING INSP.: 271.2 | EL. TAILWATER DURING INSP.: 263.3 ±

*PERSONS PRESENT AT INSPECTION*

| NAME | TITLE/POSITION | REPRESENTING |
|---|---|---|
| Cathy Benben | Engineer | Lenart Consulting Services, LLC |
| | | |
| | | |
| | | |
| | | |

*EVALUATION INFORMATION*

| | Click on box to select E-code |
|---|---|
| E1) TYPE OF DESIGN | 3 |
| E2) LEVEL OF MAINTENANCE | 2 |
| E3) EMERGENCY ACTION PLAN | 5 |
| E4) EMBANKMENT SEEPAGE | 4 |
| E5) EMBANKMENT CONDITION | 3 |
| E6) CONCRETE CONDITION | 4 |
| E7) LOW-LEVEL OUTLET CAPACITY | 2 |

| | Click on box to select E-code |
|---|---|
| E8) LOW-LEVEL OUTLET CONDITION | 2 |
| E9) SPILLWAY DESIGN FLOOD CAPACITY | 1 |
| E10) OVERALL PHYSICAL CONDITION | 2 |
| E11) ESTIMATED REPAIR COST | $50,000 |
| ROADWAY OVER CREST | NO |
| BRIDGE NEAR DAM | NO |

NAME OF INSPECTING ENGINEER: Cathleen A. Benben | SIGNATURE: Cathleen A Benben

NAME OF DAM: Forge Pond Dike

STATE ID #: 2-8-111-3

INSPECTION DATE: March 23, 2020

NID ID #: MA00489

| OWNER: | | CARETAKER: | |
|---|---|---|---|
| ORGANIZATION | Town of Granby | ORGANIZATION | Town of Granby |
| NAME/TITLE | Board of Selectmen | NAME/TITLE | Board of Selectmen |
| STREET | 10B West Stae Street | STREET | 10B West State Street |
| TOWN, STATE, ZIP | Granby, MA | TOWN, STATE, ZIP | Granby, MA |
| PHONE | (413) 467-7177 | PHONE | (413) 467-7177 |
| EMERGENCY PH. # | 911 | EMERGENCY PH. # | 911 |
| FAX | | FAX | |
| EMAIL | | EMAIL | |
| OWNER TYPE | Municipality or Political subdivision | | |

PRIMARY SPILLWAY TYPE: located at dam

SPILLWAY LENGTH (FT): see dam

SPILLWAY CAPACITY (CFS): see dam data

AUXILIARY SPILLWAY TYPE: N/A

AUX. SPILLWAY CAPACITY (CFS): N/A

NUMBER OF OUTLETS: 1

OUTLET(S) CAPACITY (CFS): 86

TYPE OF OUTLETS: 36-inch RCP conduit

TOTAL DISCHARGE CAPACITY (CFS): 1,091 (spillway and LLO)

DRAINAGE AREA (SQ MI): 14.2

SPILLWAY DESIGN FLOOD (PERIOD/CFS): 100-yr/unknown

HAS DAM BEEN BREACHED OR OVERTOPPED ☐ YES ☑ NO IF YES, PROVIDE DATE(S)

FISH LADDER (LIST TYPE IF PRESENT): N/A

DOES CREST SUPPORT PUBLIC ROAD? ☐ YES ☑ NO IF YES, ROAD NAME:

PUBLIC BRIDGE WITHIN 50' OF DAM? ☐ YES ☑ NO IF YES, ROAD/BRIDGE NAME:

MHD BRIDGE NO. (IF APPLICABLE)

NAME OF DAM: Forge Pond Dike STATE ID #: 2-8-111-3

INSPECTION DATE: March 23, 2020 NID ID #: MA00489

## EMBANKMENT (CREST)

| AREA INSPECTED | CONDITION | OBSERVATIONS | NO ACTION | MONITOR | REPAIR |
|---|---|---|---|---|---|
| CREST | 1. SURFACE TYPE | Grass | X | | |
| | 2. SURFACE CRACKING | None observed | X | | |
| | 3. SINKHOLES, ANIMAL BURROWS | None observed | X | | |
| | 4. VERTICAL ALIGNMENT (DEPRESSIONS | Good, minor depression behind upstream wall from foot traffic wear | X | | |
| | 5. HORIZONTAL ALIGNMENT | Good | X | | |
| | 6. RUTS AND/OR PUDDLES | None observed | X | | |
| | 7. VEGETATION (PRESENCE/CONDITION) | Grass and woody vegetation recently cut | | X | |
| | 8. ABUTMENT CONTACT | Good | | X | |
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ADDITIONAL COMMENTS:

NAME OF DAM: Forge Pond Dike STATE ID #: 2-8-111-3

INSPECTION DATE: March 23, 2020 NID ID #: MA00489

## EMBANKMENT (D/S SLOPE)

| AREA INSPECTED | CONDITION | OBSERVATIONS | NO ACTION | MONITOR | REPAIR |
|---|---|---|---|---|---|
| D/S SLOPE | 1. WET AREAS (NO FLOW) | Shallow pool of water below LLO discharge | | X | |
| | 2. SEEPAGE | Some leakage below interface of stone masory wall and bedrock | | X | |
| | 3. SLIDE, SLOUGH, SCARP | None observed | X | | |
| | 4. EMB.-ABUTMENT CONTACT | Good | | X | |
| | 5. SINKHOLE/ANIMAL BURROWS | None observed | X | | |
| | 6. EROSION | None observed | | X | |
| | 7. UNUSUAL MOVEMENT | None observed | X | | |
| | 8. VEGETATION (PRESENCE/CONDITION) | Grass cover on right downstream slope | | | X |
| | | Trees that were growing adjacent to the stone masonry walls and along left embankment | | | X |
| | | have been cut. Stumps remain | | | |
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ADDITIONAL COMMENTS:

NAME OF DAM: Forge Pond Dike STATE ID #: 2-8-111-3

INSPECTION DATE: March 23, 2020 NID ID #: MA00489

## EMBANKMENT (U/S SLOPE)

| AREA INSPECTED | CONDITION | OBSERVATIONS | NO ACTION | MONITOR | REPAIR |
|---|---|---|---|---|---|
| U/S SLOPE | 1. SLIDE, SLOUGH, SCARP | Upstream face is concrete and stone masonry wall | | X | |
| | 2. SLOPE PROTECTION TYPE AND COND. | N/A-Upstream face is stone masonry | X | | |
| | 3. SINKHOLE/ANIMAL BURROWS | N/A-Upstream face is stone masonry | X | | |
| | 4. EMB.-ABUTMENT CONTACT | Good | X | | |
| | 5. EROSION | N/A-Upstream face is stone masonry | X | | |
| | 6. UNUSUAL MOVEMENT | None observed | | X | |
| | 7. VEGETATION (PRESENCE/CONDITION) | Upstream face is stone masonry | X | | |
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ADDITIONAL COMMENTS:

NAME OF DAM: Forge Pond Dike STATE ID #: 2-8-111-3

INSPECTION DATE: March 23, 2020 NID ID #: MA00489

## INSTRUMENTATION

| AREA INSPECTED | CONDITION | OBSERVATIONS | NO ACTION | MONITOR | REPAIR |
|---|---|---|---|---|---|
| INSTR. | 1. PIEZOMETERS | N/A | | | |
| | 2. OBSERVATION WELLS | N/A | | | |
| | 3. STAFF GAGE AND RECORDER | N/A | | | |
| | 4. WEIRS | N/A | | | |
| | 5. INCLINOMETERS | N/A | | | |
| | 6. SURVEY MONUMENTS | N/A | | | |
| | 7. DRAINS | N/A | | | |
| | 8. FREQUENCY OF READINGS | N/A | | | |
| | 9. LOCATION OF READINGS | N/A | | | |
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ADDITIONAL COMMENTS:

NAME OF DAM: Forge Pond Dike STATE ID #: 2-8-111-3

INSPECTION DATE: March 23, 2020 NID ID #: MA00489

## DOWNSTREAM MASONRY WALLS

| AREA INSPECTED | CONDITION | OBSERVATIONS | NO ACTION | MONITOR | REPAIR |
|---|---|---|---|---|---|
| D/S WALLS | 1. WALL TYPE | Stone masonry wall downstream of LLO and on left embankment | | X | |
| | 2. WALL ALIGNMENT | Good -Wall is curved left of outlet location | X | | |
| | 3. WALL CONDITION | 2-foot section collapsed, wall only 2 feet high | | | X |
| | 4. HEIGHT: TOP OF WALL TO MUDLINE | min: 1.5 ft max: 2.5 ft avg: 2 ft | X | | |
| | 5. SEEPAGE OR LEAKAGE | None observed-mostly above normal pool-near left abutment | X | | |
| | 6. ABUTMENT CONTACT | Good | X | | |
| | 7. EROSION/SINKHOLES BEHIND WALL | None observed | X | | |
| | 8. ANIMAL BURROWS | None observed | X | | |
| | 9. UNUSUAL MOVEMENT | 2-feet section collapsed, no embankment movement | | | X |
| | 10. WET AREAS AT TOE OF WALL | Minor seepage noted at base of wall near outlet | | X | |
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ADDITIONAL COMMENTS: Trees and woody vegetation that was growing adjacent to, and behind stone masonry walls has been cut. Stumps remain

NAME OF DAM: Forge Pond Dike STATE ID #: 2-8-111-3

INSPECTION DATE: March 23, 2020 NID ID #: MA00489

## UPSTREAM MASONRY WALLS

| AREA INSPECTED | CONDITION | OBSERVATIONS | | | NO ACTION | MONITOR | REPAIR |
|---|---|---|---|---|---|---|---|
| U/S WALLS | 1. WALL TYPE | Mortared stone masonry | | | X | | |
| | 2. WALL ALIGNMENT | Straight, good alignment | | | X | | |
| | 3. WALL CONDITION | Good | | | X | | |
| | 4. HEIGHT: TOP OF WALL TO MUDLINE | min: est. 4 | max: 7.5 | avg: est. 6.0 | X | | |
| | 5. ABUTMENT CONTACT | Good | | | X | | |
| | 6. EROSION/SINKHOLES BEHIND WALL | None observed | | | | X | |
| | 7. ANIMAL BURROWS | None observed | | | | X | |
| | 8. UNUSUAL MOVEMENT | None observed | | | | X | |
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ADDITIONAL COMMENTS:

NAME OF DAM: Forge Pond Dike STATE ID #: 2-8-111-3

INSPECTION DATE: March 23, 2020 NID ID #: MA00489

## DOWNSTREAM AREA

| AREA INSPECTED | CONDITION | OBSERVATIONS | NO ACTION | MONITOR | REPAIR |
|---|---|---|---|---|---|
| D/S AREA | 1. ABUTMENT LEAKAGE | None observed | X | | |
| | 2. FOUNDATION SEEPAGE | Some seepage at location of low level outlet below interface with bedrock | | X | |
| | 3. SLIDE, SLOUGH, SCARP | None observed | X | | |
| | 4. WEIRS | There is a concrete weir in the downstream channel - remove weir | | | X |
| | 5. DRAINAGE SYSTEM | None observed | X | | |
| | 6. INSTRUMENTATION | None observed | X | | |
| | 7. VEGETATION | Trees and brush that were lining the downstream channel have been cut | | | X |
| | 8. ACCESSIBILITY | The dike accessible by foot from the dam and through a locked gate off of School St. | X | | |
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| | 9. DOWNSTREAM HAZARD DESCRIPTION | Significant - If the dike were to fail, or overtop, flow would be restricted by the culvert crossing under School Street | | | |
| | 10. DATE OF LAST EAP UPDATE | 2019 | | | |

ADDITIONAL COMMENTS:

NAME OF DAM: Forge Pond Dike STATE ID #: 2-8-111-3

INSPECTION DATE: March 23, 2020 NID ID #: MA00489

## MISCELLANEOUS

| AREA INSPECTED | CONDITION | OBSERVATIONS |
|---|---|---|
| MISC. | 1. RESERVOIR DEPTH (AVG) | Assume 5.5 |
| | 2. RESERVOIR SHORELINE | Some development, wooded hills and marshland |
| | 3. RESERVOIR SLOPES | Relatively flat surrounding pond |
| | 4. ACCESS ROADS | Access is from School Street in Granby |
| | 5. SECURITY DEVICES | Chain link fence along School Street, gated to prevent vehicular access |
| | 6. VANDALISM OR TRESPASS | ☑ YES ☐ NO WHAT: public recreational use |
| | 7. AVAILABILITY OF PLANS | ☑ YES ☐ NO DATE: 1977 proposed improvements |
| | 8. AVAILABILITY OF DESIGN CALCS | ☐ YES ☑ NO DATE: |
| | 9. AVAILABILITY OF EAP/LAST UPDATE | ☑ YES ☐ NO DATE: 2019 |
| | 10. AVAILABILITY OF O&M MANUAL | ☐ YES ☑ NO DATE: |
| | 11. CARETAKER/OWNER AVAILABLE | ☐ YES ☑ NO DATE: |
| | 12. CONFINED SPACE ENTRY REQUIRED | ☑ YES ☐ NO PURPOSE: low level control structure to access stop logs |
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ADDITIONAL COMMENTS:

NAME OF DAM: Forge Pond Dike STATE ID #: 2-8-111-3

INSPECTION DATE: March 23, 2020 NID ID #: MA00489

## PRIMARY SPILLWAY

| AREA INSPECTED | CONDITION | OBSERVATIONS | NO ACTION | MONITOR | REPAIR |
|---|---|---|---|---|---|
| SPILLWAY | SPILLWAY TYPE | N/A | | | |
| | WEIR TYPE | N/A | | | |
| | SPILLWAY CONDITION | N/A | | | |
| | TRAINING WALLS | N/A **PRIMARY SPILLWAY LOCATED 200 FEET TO THE NORTH AT TH** | | | |
| | SPILLWAY CONTROLS AND CONDITION | N/A **MAIN DAM** | | | |
| | UNUSUAL MOVEMENT | N/A | | | |
| | APPROACH AREA | N/A | | | |
| | DISCHARGE AREA | N/A | | | |
| | DEBRIS | N/A | | | |
| | WATER LEVEL AT TIME OF INSPECTION | N/A | | | |
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ADDITIONAL COMMENTS:

NAME OF DAM: Forge Pond Dike STATE ID #: 2-8-111-3

INSPECTION DATE: March 23, 2020 NID ID #: MA00489

## AUXILIARY SPILLWAY

| AREA INSPECTED | CONDITION | OBSERVATIONS | NO ACTION | MONITOR | REPAIR |
|---|---|---|---|---|---|
| SPILLWAY | SPILLWAY TYPE | N/A | | | |
| | WEIR TYPE | N/A | | | |
| | SPILLWAY CONDITION | N/A | | | |
| | TRAINING WALLS | N/A | | | |
| | SPILLWAY CONTROLS AND CONDITION | N/A | | | |
| | UNUSUAL MOVEMENT | N/A | | | |
| | APPROACH AREA | N/A | | | |
| | DISCHARGE AREA | N/A | | | |
| | DEBRIS | N/A | | | |
| | WATER LEVEL AT TIME OF INSPECTION | N/A | | | |
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ADDITIONAL COMMENTS:

NAME OF DAM: Forge Pond Dike STATE ID #: 2-8-111-3

INSPECTION DATE: March 23, 2020 NID ID #: MA00489

## OUTLET WORKS

| AREA INSPECTED | CONDITION | OBSERVATIONS | NO ACTION | MONITOR | REPAIR |
|---|---|---|---|---|---|
| OUTLET WORKS | TYPE | Concrete intake structure, sluice gate, stop logs within structure, 36-in outlet | | | X |
| | INTAKE STRUCTURE | 6 foot by 8 foot concrete structure | X | | |
| | TRASHRACK | None | X | | |
| | PRIMARY CLOSURE | Sluice gate upstream face | | | X |
| | SECONDARY CLOSURE | Stop logs within structure | | | X |
| | CONDUIT | 36-inch RCP outlet | X | | |
| | OUTLET STRUCTURE/HEADWALL | Stone masory wall at discharge | X | | |
| | EROSION ALONG TOE OF DAM | None | X | | |
| | SEEPAGE/LEAKAGE | Minor leakage past gate and stop logs | X | | |
| | DEBRIS/BLOCKAGE | None observed | X | | |
| | UNUSUAL MOVEMENT | None observed | X | | |
| | DOWNSTREAM AREA | Stone lined channel independent of spillway discharge channel | X | | |
| | | | | | |
| | MISCELLANEOUS | 36-inch CMP conduit crosses under School Street before convergence with | X | | |
| | | spillway discharge | | | |

ADDITIONAL COMMENTS:

Note: Use additional sheets for additional outlets.

NAME OF DAM: Forge Pond Dike STATE ID #: 2-8-111-3

INSPECTION DATE: March 23, 2020 NID ID #: MA00489

## CONCRETE/MASONRY DAMS

| AREA INSPECTED | CONDITION | OBSERVATIONS | NO ACTION | MONITOR | REPAIR |
|---|---|---|---|---|---|
| GENERAL | TYPE | N/A | | | |
| | AVAILABILITY OF PLANS | N/A | | | |
| | AVAILABILITY OF DESIGN CALCS | N/A | | | |
| | PIEZOMETERS | N/A | | | |
| | OBSERVATION WELLS | N/A | | | |
| | INCLINOMETERS | N/A | | | |
| | SEEPAGE GALLERY | N/A | | | |
| | UNUSUAL MOVEMENT | N/A | | | |
| | | N/A | | | |
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ADDITIONAL COMMENTS:

NAME OF DAM: Forge Pond Dike STATE ID #: 2-8-111-3

INSPECTION DATE: March 23, 2020 NID ID #: MA00489

## CONCRETE/MASONRY DAMS (CREST)

| AREA INSPECTED | CONDITION | OBSERVATIONS | NO ACTION | MONITOR | REPAIR |
|---|---|---|---|---|---|
| CREST | TYPE | N/A | | | |
| | SURFACE CONDITIONS | N/A | | | |
| | CONDITIONS OF JOINTS | N/A | | | |
| | UNUSUAL MOVEMENT | N/A | | | |
| | HORIZONTAL ALIGNMENT | N/A | | | |
| | VERTICAL ALIGNMENT | N/A | | | |
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ADDITIONAL COMMENTS:

NAME OF DAM: Forge Pond Dike STATE ID #: 2-8-111-3

INSPECTION DATE: March 23, 2020 NID ID #: MA00489

## CONCRETE/MASONRY DAMS (DOWNSTREAM FACE)

| AREA INSPECTED | CONDITION | OBSERVATIONS | NO ACTION | MONITOR | REPAIR |
|---|---|---|---|---|---|
| D/S FACE | TYPE | Dry stone masonry wall at location of LLO | | X | |
| | SURFACE CONDITIONS | Wall surface not flat; tree stumps adjacent to wall | | | X |
| | CONDITIONS OF JOINTS | Dry stone masonry | | X | |
| | UNUSUAL MOVEMENT | Minor movement; wall surface not flat | | X | |
| | ABUTMENT CONTACT | N/A | | | |
| | LEAKAGE | Minor seepage at interface with bedrock | | X | |
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ADDITIONAL COMMENTS:

NAME OF DAM: Forge Pond Dike STATE ID #: 2-8-111-3

INSPECTION DATE: March 23, 2020 NID ID #: MA00489

## CONCRETE/MASONRY DAMS (UPSTREAM FACE)

| AREA INSPECTED | CONDITION | OBSERVATIONS | NO ACTION | MONITOR | REPAIR |
|---|---|---|---|---|---|
| U/S FACE | TYPE | Dike is earthen embankment with stone masonry on upstream face | X | | |
| | SURFACE CONDITIONS | Good above the water line | X | | |
| | CONDITIONS OF JOINTS | Good above the water line | X | | |
| | UNUSUAL MOVEMENT | None observed | X | | |
| | ABUTMENT CONTACTS | Good | | X | |
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ADDITIONAL COMMENTS:

APPENDIX C
**Previous Reports and References**

## PREVIOUS REPORTS AND REFERENCES

The following is a list of reports that were referenced in the previous report.

1. *Phase I Inspection/Evaluation Report for Forge Pond Dam and Dike, prepared by Lenart Consulting Service, LLC., dated July 10, 2014*

2. *Phase I Inspection/Evaluation Report for Forge Pond Dam and Dike, prepared by Tighe & Bond, Inc., dated April 17, 2009.*

3. *Phase I Inspection Report, National Dam Inspection Program, for Forge Pond Dam and Dike MA00488 and MA00489, prepared for the Department of the Army Corps of Engineers by Culligan Engineering Co. Inc., dated March 4, 1981.*

4. *Plans for Proposed Repairs and Restoration Work at Forge Pond Dam and Dike prepared by MGS Michael G. Suprenant, Consulting Engineer, dated October 1977.*

5. *Letter from DEQE, Division of Waterways to the Town of Granby ordering the Town to repair, or remove, the Forge Pond Dike, dated March 8, 1977.*

6. *Letter from DEQE, Division of Waterways to the Town of Granby declaring that the Forge Pond Dike was unsafe, dated September 26, 1977.*

7. *Inspection Report for Forge Pond Main Dam prepared by the Department of Public works, dated August 26, 1975.*

8. *Inspection Report for Forge Pond Main Dam prepared by the Department of Public works, dated July 23, 1973.*

APPENDIX D
**Definitions**

## COMMON DAM SAFETY DEFINITIONS

To provide a better understanding of this report, definitions of commonly used terms associated with dams are provided below. The terms are presented under the following common categories:

1) Orientation;
2) Dam components;
3) Size classification;
4) Hazard classification; and
5) General.

### 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/Dike – 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 barrier that impounds water.

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

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

Appurtenant Works – Shall mean any ancillary feature of a dam and shall include but not be limited to, such structures as training walls, spillways, either in the dam or separate there from and low level outlet works; also water conduits such as tunnels, channels, pipelines, or penstocks, either through the dam or its abutments.

Riprap – Shall mean a loose assemblage of broken stones erected in water or soft ground as erosion protection.

Toe – Shall mean the protruding base of the dam on the downstream side either natural or man-made.

Weir – Shall mean the top of the spillway where the water flows to the downstream side

### Size Classification

(as listed in Commonwealth of Massachusetts, 302 CMR *Dam Safety Rules and Regulations,* revised 11/04/05)

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

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

Small – Structure with a height between 6 and 15 feet and/or 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 *Dam Safety Rules and Regulations,* revised 11/04/05)

High Hazard (Class I) – Shall mean dams/dikes located where failure or misoperation will likely cause loss of life and/or serious damage to homes, industrial or commercial facilities, important public utilities, or major transportation arteries.

Significant Hazard (Class II) – Shall mean dams/dikes located where failure or misoperation may cause loss of life and/or damage to homes, industrial or commercial facilities, secondary highways or railroads, or cause the interruption of the use or service of important facilities.

Low Hazard (Class III) – Dams/dikes located where failure or misoperation may cause minimal property damage to others and loss of life is not expected.

**General**

DCR – Department of Conservation and Recreation, formerly the Department of Environmental Management (DEM).

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 volume equal to one foot of water over a one-acre area.

Height of Dam/Dike – 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/dike.

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.

APPENDIX D
**Definitions**

## COMMON DAM SAFETY DEFINITIONS

To provide a better understanding of this report, definitions of commonly used terms associated with dams are provided below. The terms are presented under the following common categories:

1) Orientation;
2) Dam components;
3) Size classification;
4) Hazard classification; and
5) General.

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Riprap – Shall mean a loose assemblage of broken stones erected in water or soft ground as erosion protection.

Toe – Shall mean the protruding base of the dam on the downstream side either natural or man-made.

Weir – Shall mean the top of the spillway where the water flows to the downstream side

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(as listed in Commonwealth of Massachusetts, 302 CMR *Dam Safety Rules and Regulations,* revised 11/04/05)

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Low Hazard (Class III) – Dams/dikes located where failure or misoperation may cause minimal property damage to others and loss of life is not expected.

**General**

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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.