



department of Conservation and Recreation

Rehabilitation of Upper Mystic Lake Dam Medford and Arlington, MA

PUBLIC MEETING

Thursday, September 24, 2009

6:30 p.m. – 8:00 p.m.

Winchester Town Hall, Winchester Room
71 Mt. Vernon Street, Winchester



GZA
GeoEnvironmental,
Inc.



Commonwealth of Massachusetts

Governor

Deval L. Patrick

Lieutenant Governor

Timothy Murray

Energy and Environmental Secretary

Ian A. Bowles

Department of Conservation and Recreation

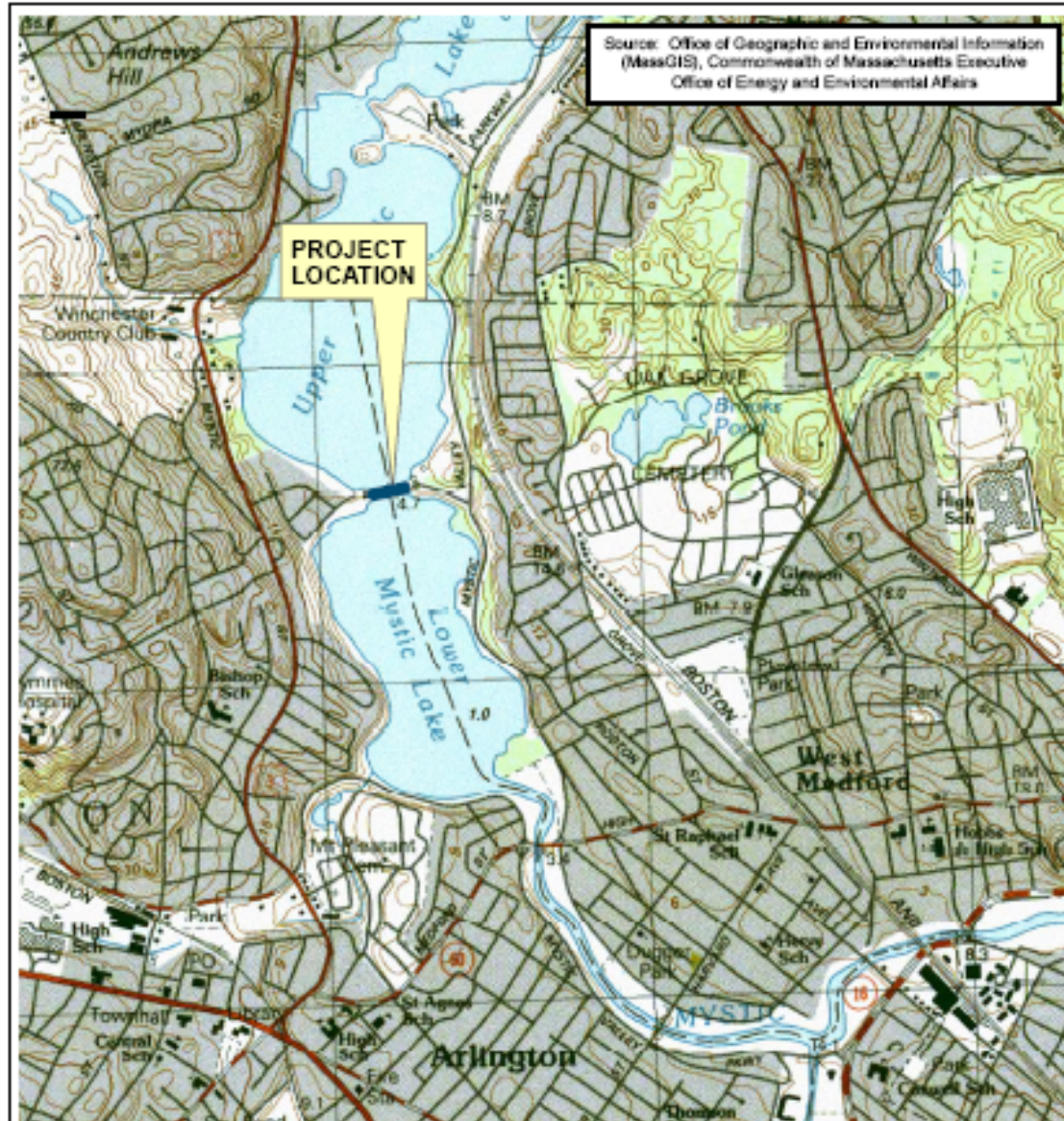
Commissioner

Richard K. Sullivan, Jr.

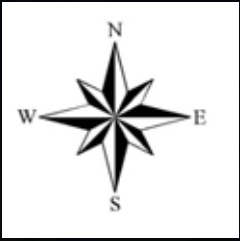


DCR Mission Statement

***To protect, promote, and
enhance our common wealth of
natural, cultural, and recreational
resources***



Upper Mystic Lake Dam Rehabilitation Project



DCR Public
Parking Area

Main Dam

Overflow Location

Spillway

Medford Boat Club

Parker Rd

Robin Hood Rd

Intervale Rd

Cheviot Rd

Lake Shore Dr

Pine Ridge Rd

Road Aerial **Bird's eye** ▼



Upper Mystic Lake Dam Rehabilitation Project

Description of Upper Mystic Lake Dam

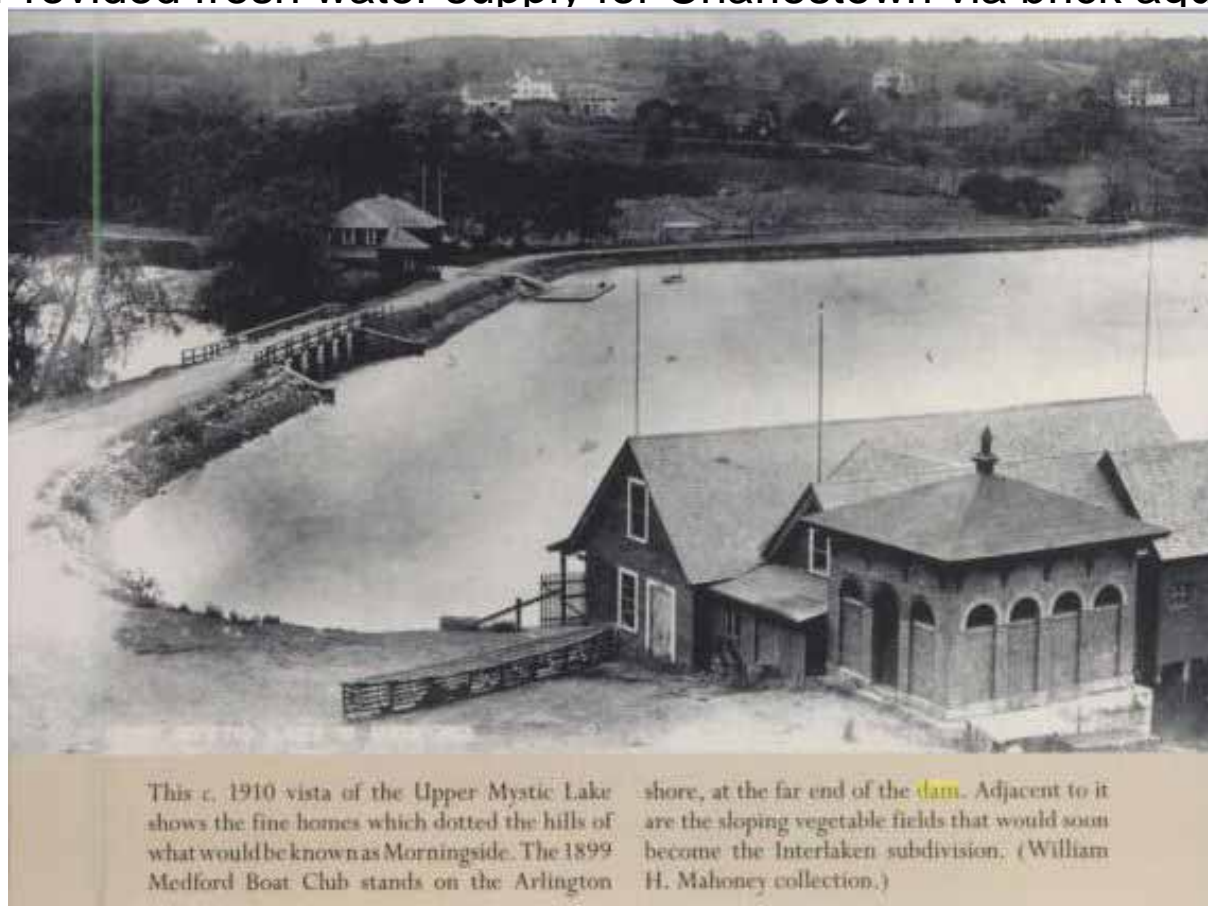
(NID No. MA00769, State ID No. 4-9-10-1)

- Earthfill Embankment Dam
 - Sandy fill with timber and “puddle” core wall
- Main Dam Length = 550 ft. (total embankment = 1,560 ft.)
- Structural Height = 16 ft.
- Upper Lake Surface Area = 185 acres
- Upper Lake Normal Water Elevation = 114.2' (MDC Datum)

Upper Mystic Lake Dam Rehabilitation Project

History of Upper Mystic Lake Dam

- Constructed 1865 by Charlestown Water Commission
- Divided Upper Lake from Lower Lake at “the Narrows”
- Provided fresh water supply for Charlestown via brick aqueduct



This c. 1910 vista of the Upper Mystic Lake shore, at the far end of the dam. Adjacent to it shows the fine homes which dotted the hills of what would be known as Morningside. The 1899 Medford Boat Club stands on the Arlington shore, at the far end of the dam. Adjacent to it are the sloping vegetable fields that would soon become the Interlaken subdivision. (William H. Mahoney collection.)

Upper Mystic Lake Dam Rehabilitation Project

May 2006 Flood



DCR's Key Project Goals

- Prepare for Possible Interim Dam Failure
 - Inundation Map to define limits of dam failure
- Prevent Failure
- Do not exacerbate flooding in watershed
 - Do not push problem downstream
- Maximize dam's benefits to flooding
 - Provide flood storage in advance of storm
- Include Fish Passage Project

Project Scope

- Initial Investigation
 - Flood Inundation Map
 - No plans for existing dam
 - Survey, Bathymetry, Borings, Ground penetrating radar
 - Review past reports
 - Review Historical information
 - Failure Mode Analysis
- Project Design and Permitting
 - Including Hydraulic Analysis
- Engineering Services during Construction



DESIGN CONSULTANT
GZA GeoEnvironmental, Inc.

One Edgewater Drive
Norwood, MA 02062

Structural Sub-Consultant:
Fisheries Sub-Consultant:

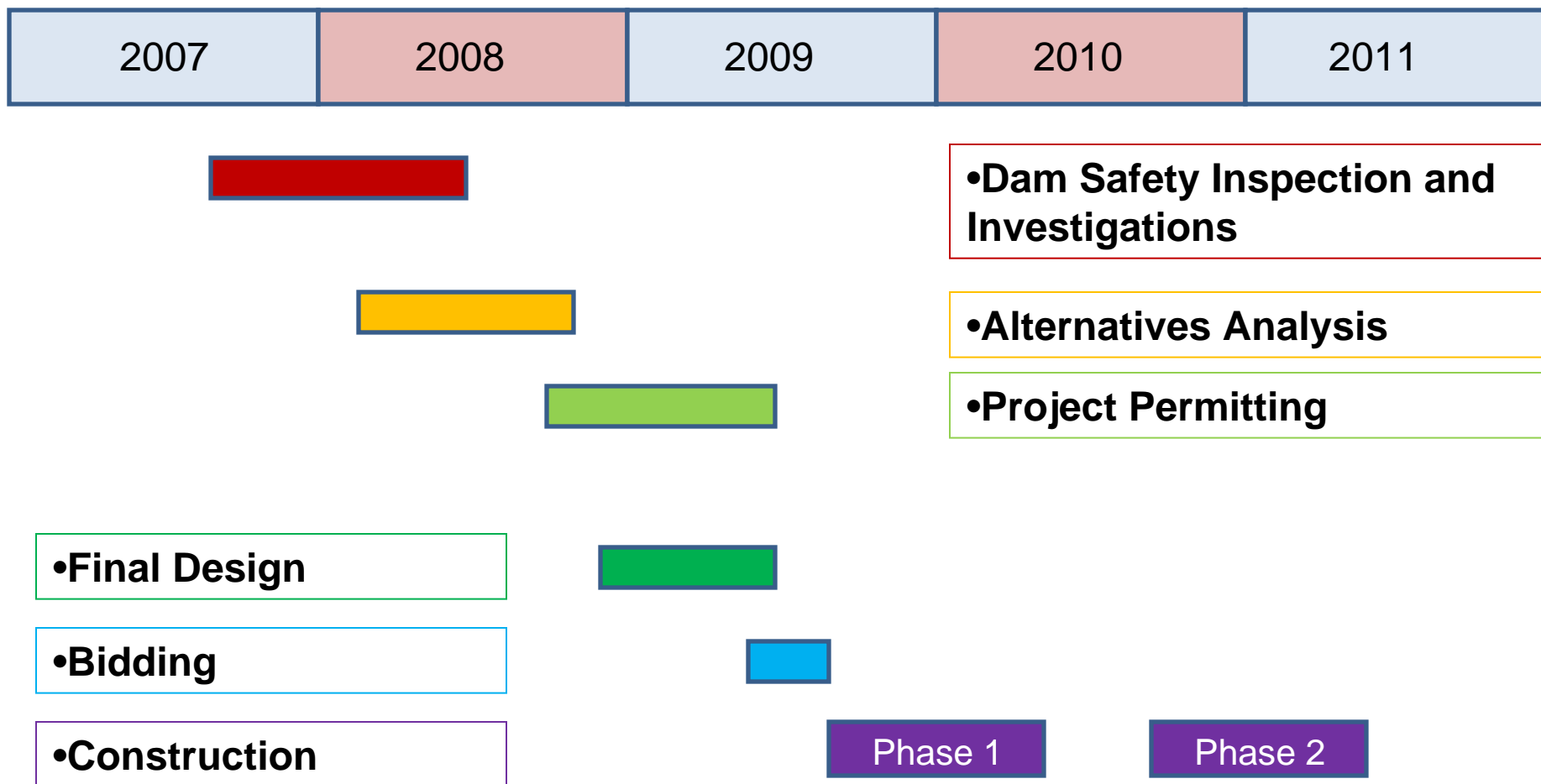
Stantec, Inc.
Louis-Berger, Inc.

Project Manager:
Chad W. Cox, P.E.

Project Sequence

- Dam Safety Inspection and Investigations
- Alternatives Analysis
- Project Permitting
- Final Design
- Construction

Project Sequence



Upper Mystic Lake Dam Rehabilitation Project

Project Sequence

- **Dam Safety Inspection and Investigations**
- Alternatives Analysis
- Project Permitting
- Final Design
- Construction

Current Dam Safety Deficiencies

Inadequate Spillway Capacity



Upper Mystic Lake Dam Rehabilitation Project

Current Dam Safety Deficiencies Damaged Primary Spillway Apron and Masonry



Upper Mystic Lake Dam Rehabilitation Project

Current Dam Safety Deficiencies Leaking and Poorly Functioning Controls



Upper Mystic Lake Dam Rehabilitation Project

Current Dam Safety Deficiencies Slope Stability and Erosion Problems



Upper Mystic Lake Dam Rehabilitation Project

Current Dam Safety Deficiencies Trees on Embankment



Tree with roots displacing masonry

Upper Mystic Lake Dam Rehabilitation Project

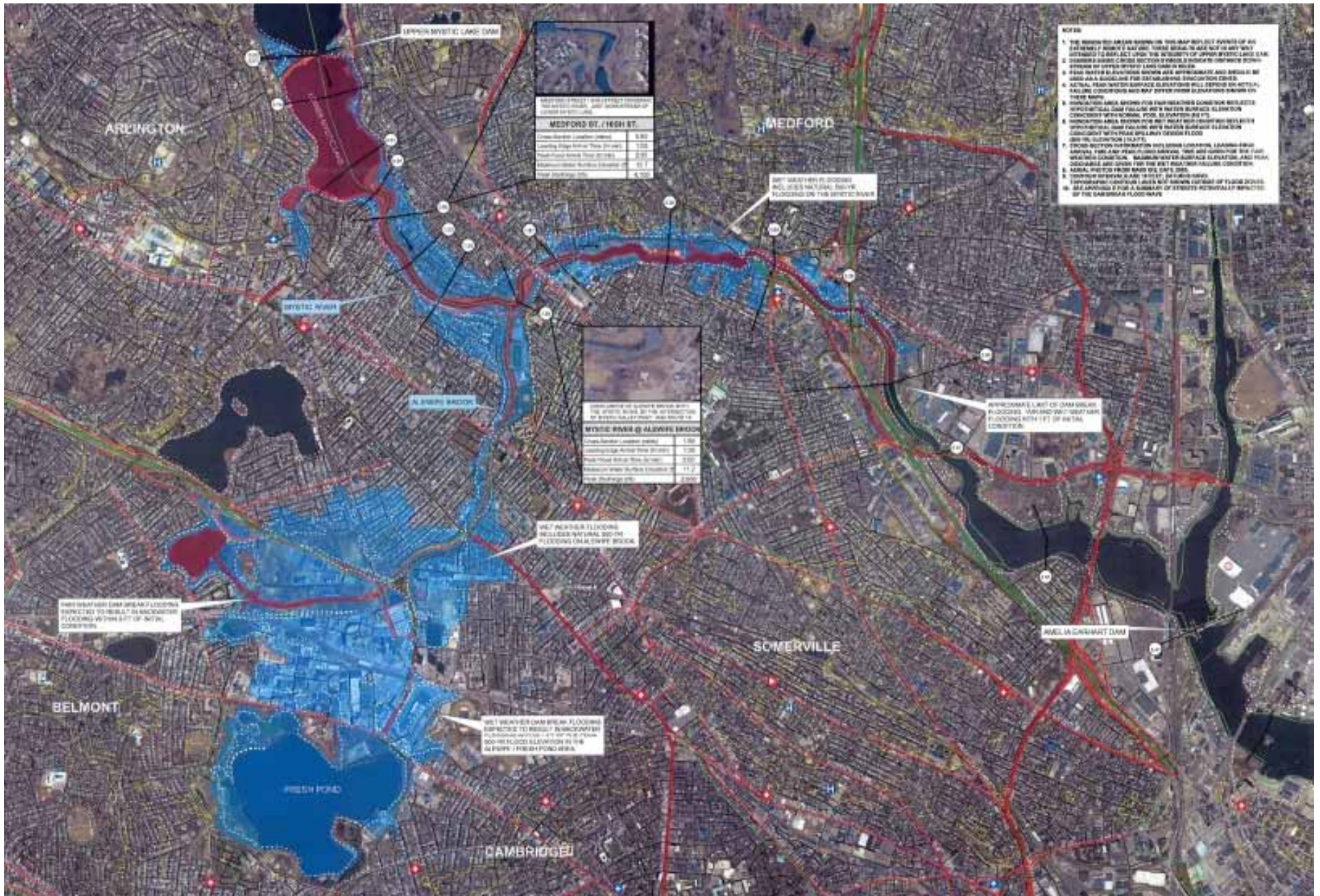
Current Dam Safety Deficiencies

- Other Deficiencies
 - Uncontrolled Seepage during high water
 - Low-Level Outlet Gate inoperable
 - Spillway Bridge unsafe during high flow
 - No facilities for fish passage

Overall Condition Rating:

POOR

Dam Failure Inundation Map



Project Sequence

- Dam Safety Inspection and Investigations
- **Alternatives Analysis**
- Project Permitting
- Final Design
- Construction

Alternatives Analysis

1. No Action
2. Dam Removal
3. Dam Rehabilitation
 - 3.1 Complete Dam Replacement
 - 3.2 Rehabilitation of Existing Facilities
 - 3.3 Combined Rehabilitation and Modification of Existing Facilities

Project Sequence

- Dam Safety Inspection and Investigations
- Emergency Action Plan
- Alternatives Analysis
- **Project Permitting**
- Final Design
- Construction

Project Permits

1. Massachusetts Environmental Policy Act (MEPA) Environmental Notification Form
2. MA Office of Dam Safety Chapter 253 Permit
3. MADEP Section 401 Permit
4. USACE Section 404 Permit
5. MADEP Chapter 91 License
6. Massachusetts Historical Commission Notification
7. MA Wetlands Protection Act Order of Conditions from Medford and Arlington
8. USEPA NPDES Construction Storm Water Permit

Upper Mystic Lake Dam Rehabilitation Project

Project Sequence

- Dam Safety Inspection and Investigations
- Emergency Action Plan
- Alternatives Analysis
- Project Permitting
- **Final Design**
- Construction

Design Objectives

PROTECT:

- Public Safety
- Public and Private Property
- Upstream and Downstream Environmental Resources
- Upstream and Downstream Recreational Resources

MEET:

- Massachusetts Dam Safety Standards
- Modern Engineering Standard of Practice

Design Objectives

IMPROVE:

- Operability of Water Level Controls
 - Ability to create 330 acre-feet of pre-storm storage
- Operational Safety

PROVIDE:

- Upstream and Downstream Fish and Eel Passage

MAINTAIN:

- Historic Character of Site
- Existing Recreational Resources

SPECIAL CONSIDERATIONS - DESIGN

Mitigation Elements

- Construction of Fish Ladder / Eel-way
- Vegetation Restoration and Enhancements
 - Tree planting north of parking lot
 - Special grass seed near water
- Storm Water mitigations (porous pavement)
- Kayak / Canoe Landing
- Compensatory Flood Storage
- Historically-Sympathetic Design

Upper Mystic Lake Dam Rehabilitation Final Design Elements

Deficiency	Corrective Design Element
Inadequate Spillway Capacity	<ul style="list-style-type: none">•New secondary spillway•Close existing overflow area
Damage to Existing Spillway	<ul style="list-style-type: none">•Repair historic masonry structures•New concrete apron
Leaking / Inoperative Spillway Controls	<ul style="list-style-type: none">•Replace stop logs with concrete ogees•Install two bottom-hinged crest gates
Bridge Inadequate	<ul style="list-style-type: none">•New spillway bridge (test piers)
Inadequate Slope Stability	<ul style="list-style-type: none">•Flatten slopes
Inadequate Erosion Protection	<ul style="list-style-type: none">•Provide riprap and revetment stone
Trees on Embankment	<ul style="list-style-type: none">•Remove trees
Uncontrolled Seepage	<ul style="list-style-type: none">•New sheetpile cutoff•Downstream filter soils
Low-Level Outlet Malfunctioning	<ul style="list-style-type: none">•Replace existing slide gates•Modifications to aqueduct
No Fish Passage	<ul style="list-style-type: none">•New fish ladder / Eel-way



department of Conservation and Recreation



PROJECT DESIGN FEATURES

Upper Mystic Lake Dam Rehabilitation Project

Upper Mystic Lake Dam Rehabilitation Right Abutment

Minor
Grading

Right Side
Lake Wall

Robin Hood Road



Upper Mystic Lake Dam Rehabilitation Central Embankment and Primary Spillway

3:1 Slope
and Riprap

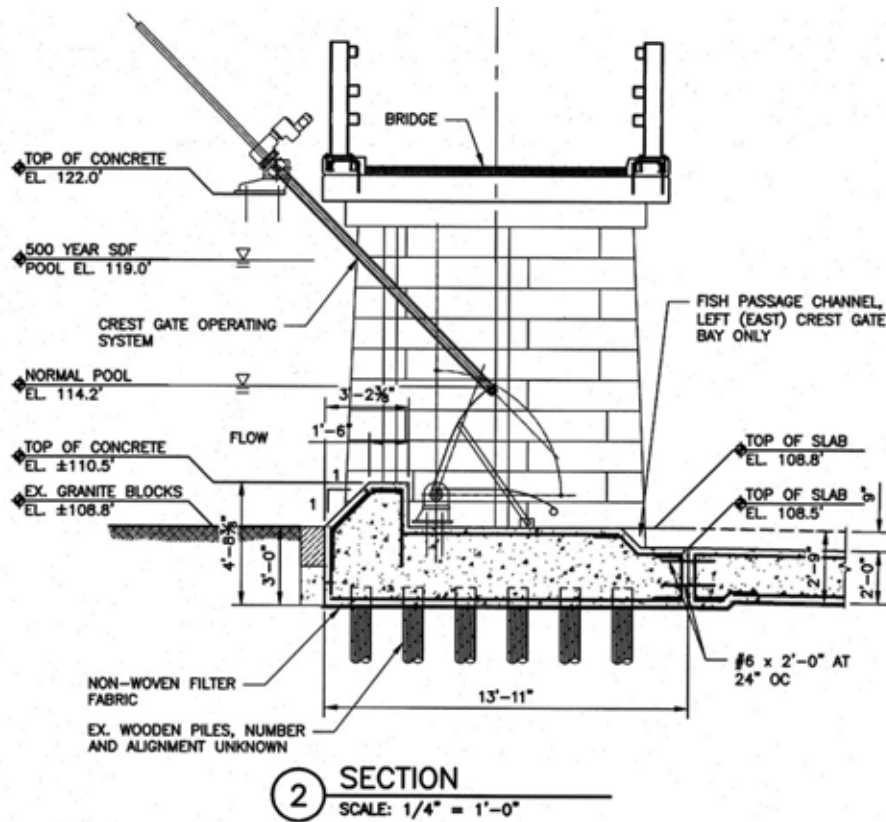
New
Sheetpile
Cutoff

3:1 Slope
and
Revetment
Stone

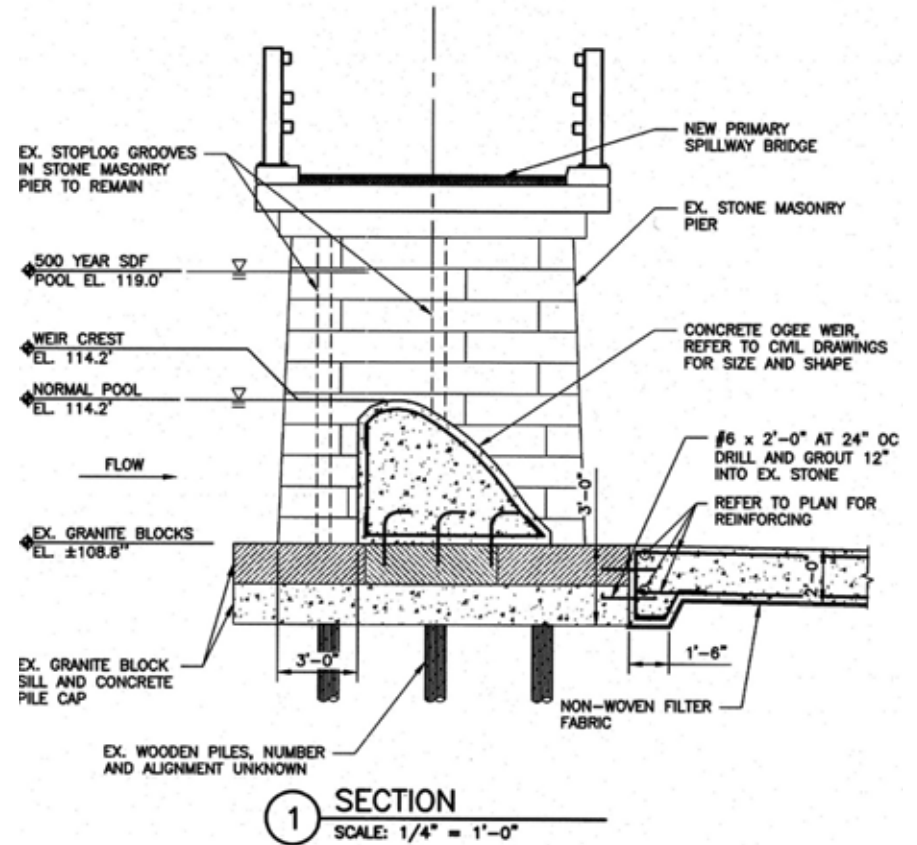
Rehabilitate
d Primary
Spillway
And Bridge



Upper Mystic Lake Dam Rehabilitation Primary Spillway Sections



Crest Gate Bays

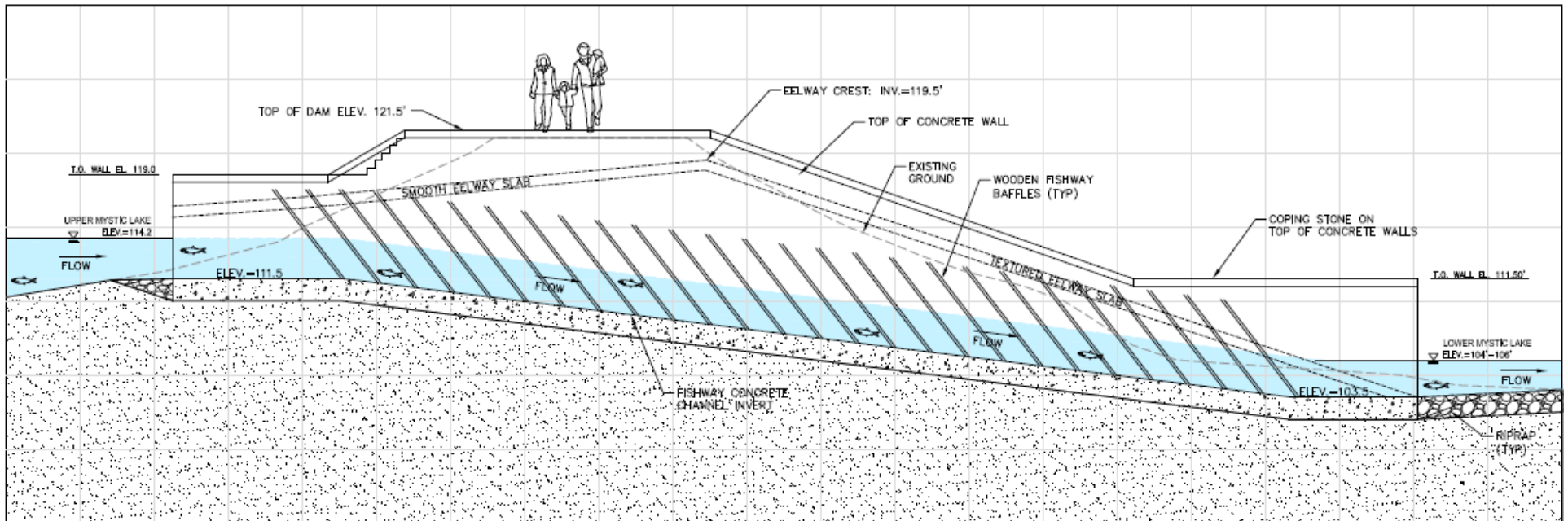


Ogee Bays

Upper Mystic Lake Dam Rehabilitation East Embankment, Fish Ladder and Secondary Spillway

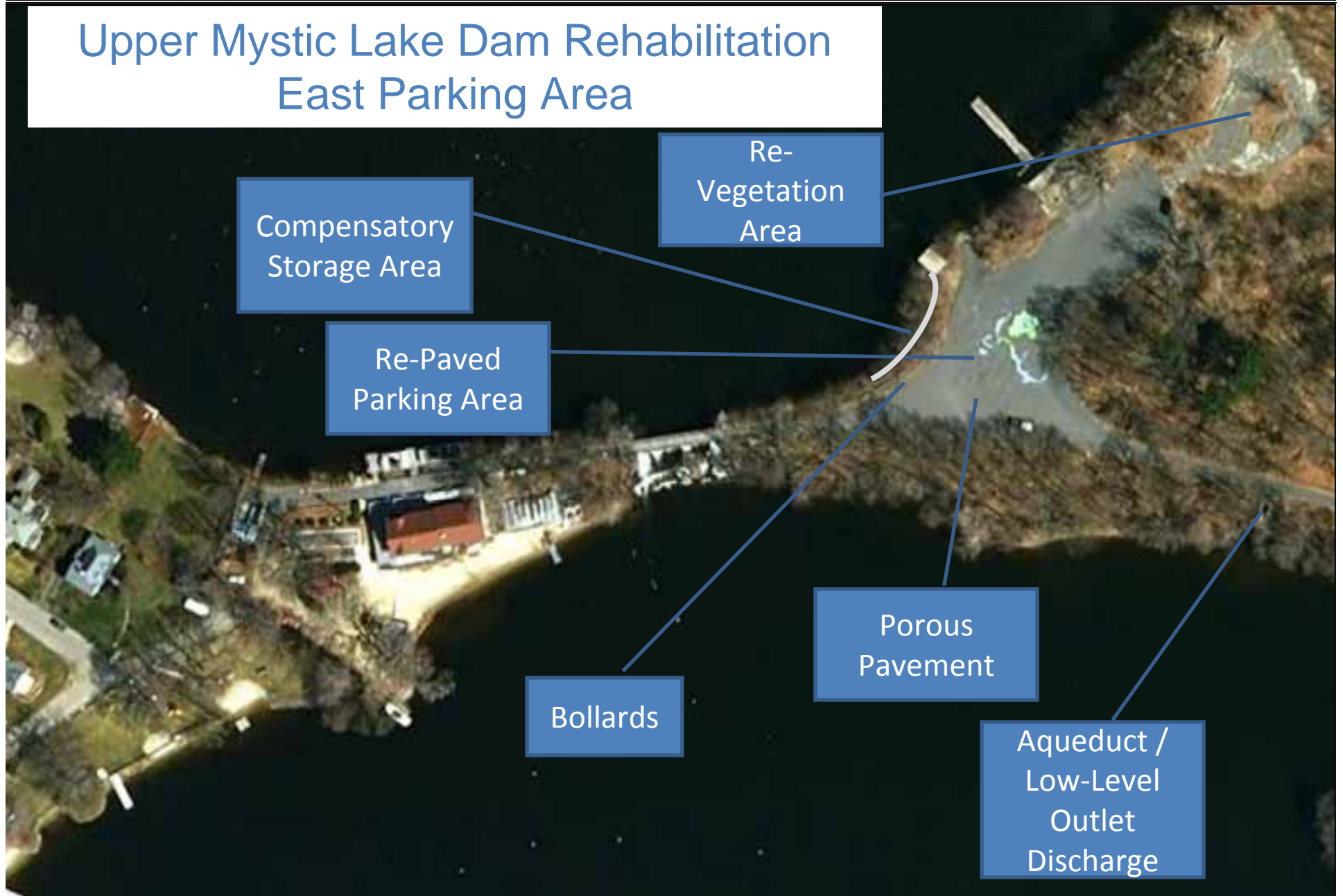


Upper Mystic Lake Dam Rehabilitation Fish Ladder / Eel-way



PROFILE: FISHWAY & EELWAY

Upper Mystic Lake Dam Rehabilitation East Parking Area



Project Sequence

- Dam Safety Inspection and Investigations
- Emergency Action Plan
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- **Construction**

Construction – Special Considerations & Mitigation Elements

- Construction phasing
 - Water control
 - Access and recreational use
- Sediment and erosion controls
- No lake drawdown

Construction –
Special Considerations & Mitigation Elements
Phasing - Water Control

- Phased Construction Required
- Temporary Steel Sheet Pile Cofferdams
- *Phase 1 (2009-10)*
 - Construct Secondary Spillway [water through primary spillway]
- *Phase 2 (2010-11)*
 - Rehabilitate Primary Spillway [water through secondary spillway notch]

Construction –
Special Considerations & Mitigation Elements
Phasing-Access & Recreational Use

- Project scheduled after heavy summer recreation-use season (**Labor Day to Memorial Day**)
- Medford-side Parking Lot closed during construction
- Restore access during Summer 2010
- Final completion before Summer 2011
- Special provision for access by Tufts Sailing Club
- No construction access from Arlington side during Phase 1

Upper Mystic Lake Dam Rehabilitation Project

Construction -
Special Considerations & Mitigation Elements

Sediment and Erosion Control

- Straw bales / Silt fence barriers
- In-Lake turbidity curtains
- Monitoring for potential sediment problems
- Minimize disturbance

Construction –
Special Considerations & Mitigation Elements

No Lake Drawdown

- Protects Upper Lake flora and fauna
- Maintains Upper Lake recreation

Construction

General Contractor

CRC Company, Inc.
77 FEDERAL AVE
QUINCY, MA 02169

President:

Carolyn Cashman

Site Superintendent:

Jim Skaves



77 FEDERAL AVE.
QUINCY, MA.

Upper Mystic Lake Dam Rehabilitation Project

Construction Schedule

Phase 1:

(Secondary Spillway & East Embankment)

September 2009 – Start of Construction

- Install Cofferdams
- Construct Secondary Spillway
- Construct Fish Ladder / Eel-way
- Rehabilitate East Embankment
- Remove Cofferdams

May 2010 – End of Phase 1 Work

Summer 2010 – No Active Construction Work

Construction Schedule

Summer 2010 – No Active Construction Work

Phase 2:

(Secondary Spillway & East Embankment)

September 2010 – Start of Phase 2 Construction

- Install Cofferdams
- Install Sheet Pile Cutoff
- Rehabilitate Primary Spillway
- Construct New Bridge
- Construct West Side Lake Wall

May 2011 – End of Construction

Funding

- Design and permitting costs approximately \$500,000
- Estimated cost for construction = \$5 M
- Project funding from statutory sources

Staying Informed

DCR is committed to working with stakeholders and being a good neighbor during the course of work on this important project.

For questions, concerns, or suggestions regarding the rehabilitation of the Upper Mystic Lake Dam, please:

email DCR.Updates@state.ma.us, noting Upper Mystic Dam in the subject line, or call 617-626-4974

This presentation will be available at the DCR website:
<http://www.mass.gov/dcr/news/publicmeetings/damsafetypast.htm>

Upper Mystic Lake Dam Rehabilitation Project

Preserving the Past – Building a Better Future



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