EBC Climate Change Leadership Webinar Series:
Resilient Mystic Collaborative

21 communities.
One watershed.
We partner on climate challenges no single municipality can solve alone
Welcome

Daniel K. Moon

President & Executive Director
Environmental Business Council
Introduction – How and Why Resilience Mystic Collaborative was Created

Julie Wormser

Deputy Director
Mystic River Watershed Association
Increasing Flood Resilience of the Amelia Earhart Dam

Kathy Watkins

City Engineer
City of Cambridge, MA
Amelia Earhart Dam

Building regional collaboration for flood risk reduction
Resilient Mystic Collaborative

Katherine F. Watkins
Assistant Commissioner / City Engineer
City of Cambridge
kwatkins@cambridgema.gov
Climate Projections & Key Impacts

**Temperature**

[Map showing temperature projections with higher-emission and lower-emission scenarios.

**Precipitation**

[Image depicting a flooded wooded area.

Friends of Alewife Reservation (FAR)

More extreme events

**Sea Level Rise (SLR)**

[Images of the Amelia Earhart Dam and Charles River Dam.

Amelia Earhart Dam (Source: MaUSHarbors.com)


Source: NECIA 2007
At 1% (100-yr):
• Flanked in 2045-2050
• Overtopped in 2055-2060

At 0.2% (500-yr):
• Flanked in 2030-2035
• Overtopped in 2040
State contracted with Woods Hole Group to update the BH-FRM Model. MC-FRM model results expected soon.

Increasing projected SLR from 3.4 to 4.2 in 2070.

Probability of flooding and extent of flooding will be worse.
Note: All elevations are in ft-Cambridge City Base (CCB) datum.

ft-NAVD88 = ft-CCB - 11.66     ft-MDC = ft-CCB + 94.78
2070 Precipitation Flooding – 100-Year, 24-Hour Storm

Amelia Earhart Dam
Resiliency and redundancy at Amelia Earhart Dam is critical.

AED operates with 3 pumps, but has space for a 4th pump.

Model results show increase in flooding impacts (extent and depth) under 2 pumps vs 3 pumps, based on 2018 Model Run and best available information at that time.
We are grateful for the Environmental Bond you signed this summer that authorizes over $2.4 billion over five years. The investments in safeguarding residents, municipalities and businesses from the impacts of climate change, protecting environmental resources, and improving recreational opportunities.” The final legislation includes the evaluation, purchase and installation of a fourth pump at the Amelia Earhart Dam.

2660 NPS: For the design, construction, reconstruction, rehabilitation, retrofitting, repair or removal of state-aided dams for which emergency action or inadequate hazard mitigation is required, provided further, that not less than $2,000,000 shall be expended to complete a pumping capacity evaluation and purchase and install a fourth pump at the Amelia Earhart Dam in the city of Somerville, and provided further, that the secretary of energy and environmental affairs may provide guidance for planning, prioritizing, selecting and implementing projects in furtherance of the goals of climate change mitigation and adaptation and consistent with the integrated state hazard mitigation needs climate change adaptation plan... $2,000,000

Including a fourth pump involves purchasing a new engine, gearbox, and pump, as well as upgrading the control system to support the new all four pumps. The $5 million from the Environmental Bond will cover the cost of the engineering study ($250,000) and make a significant down payment on the capital expenses for the capital improvements (expected to total $15-20 million).

We ask that you evaluate the full $5 million in your capital investment plan. We are committed to working with the Commonwealth to identify additional sources of funding and financing in order to complete this critical project.

Thank you for the opportunity to provide feedback on this vital project. We look forward to hearing from you.

Sincerely,

C C: Secretary Matthew Beaton
Commissioner Tim Roy

The dam was built in 1966 to prevent coastal flooding from extending far into low-lying inland communities built on filled marshlands. According to Cambridge’s Climate Change Vulnerability Assessment, the dam could be flanked as early as 2045 or overtopped as early as 2055 by storms similar in strength to the 2018 Nor’easters (which themselves came within two feet of overtopping the dam, see photo). During and following major rainstorms DCR operates all three existing pumps to prevent flooding upstream of the dam. The dam is outfitted with a bay for a fourth pump. The three existing pumps were refurbished in the mid-2000s and are expected to last for decades.

The New Charles River Dam, also managed by DCR, includes six pumps. Three are used at a time during storms with three in reserve as backup. The Amelia Earhart Dam has no backup pump. Cambridge’s vulnerability assessment indicates that flooding extent and depth would be substantial in upstream Mystic River communities if one or more of the Amelia Earhart Dam pumps were to fail.

We understand that a fourth pump could significantly accelerate recovery from both stormwater and coastal flooding, reducing the duration of peak flooding at critical infrastructure locations (e.g. subway stations, electrical substations, hospitals, tunnel entrances, key roadway intersections) in upstream communities and mitigating flood damages incurred during extreme storm events. For these reasons, adding a fourth pump to the dam is a top regional climate resilience priority for our communities.

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Those dramatic floods in downtown and the Seaport last winter didn’t only serve as a wake-up call to business and civic leaders within the city of Boston.

They also added a new sense of urgency in neighboring cities, even ones without oceanfront properties — communities such as Cambridge, Somerville, and Medford. That’s why these and other Mystic River watershed cities just started lobbying the Baker administration for $5 million to help improve the Amelia Earhart Dam’s pumping capacity.

This is the Mystic communities’ biggest immediate priority in terms of resiliency: installing an additional pump at the dam. The 1960s-era barrier separates the saltwater, tidal Mystic from the freshwater portion. Its three pumps have largely proven sufficient, so far, in clearing water out of the basin above the dam during times of intense rainfall.

DCR – Cambridge model doesn’t represent operation of the AED – particularly the locks.

Concurrently, DCR undertaking study of hardening of the dam and Feasibility Analysis on Raising and Extending the Dam.
Collaboration with DCR to Improve Model at AED

Cambridge model focused on the existing 3 pumps.

 Didn’t incorporate operation of the locks.

3 pumps – 900 MGD (1,400cfs)

Lock #3 3,300 to 4,200 MGD
 with tide 3 to 4 feet below basin elevation
AED Operations: March 2010 Storm

25 year storm for 24hr rainfall
>50 year storm for 48 hr rainfall
< 25 year storm for peak intensity
Updated Modelling for Precipitation Flooding

• Incorporating locks into the model increased accuracy and reduced difference between 3 pump and 2 pump operation.

• Immediate benefit of 4th pump less clear.

• Sluicing through the locks less effective at maintaining desired river levels as sea level rises.

• Continued focus on resiliency at AED critical for both precipitation and SLR/SS.

• Regional coordination – improved collaboration with DCR and understanding of the AED operations.
Regional Partnerships – Advocate for funding and implementation of effective interventions

Individual projects AND collective protection. Model these regional interventions and estimating property value in impacted areas.

AED Interventions
1. Raising crest of AED and approaches 4’.
2. East of Encore Casino
3. Shrafts Center
4. Island End River
5. Draw 7 State Park
6. Route 1 Revere / Saugus / Malden

Modified the interventions to incorporate the work DCR did to include #6.
More optimistic than ever that there are valuable regional interventions to reduce the impact of SLR / SS.

RMC well poised to advocate for these regional projects and highlight the benefits of collective action.
Commitment to Continued Partnership with RMC and DCR

• Continue working together.

• RMC prioritizing and advocating for regional strategies. Cambridge sharing resources and modelling expertise. DCR sharing staff expertise and analysis.

• Improve understanding of vulnerabilities and strategies. Always using best available information.
Managing Regional Stormwater Flooding in the Upper Mystic

Emily Sullivan

Environmental Planner
Town of Arlington, MA
Managing Regional Stormwater Flooding in the Upper Mystic

Environmental Business Council
Climate Change Leadership Webinar Series

May 8, 2020

Emily Sullivan
Environmental Planner and Conservation Agent
Town of Arlington
Project Goals

Identify specific opportunities for green infrastructure and reservoir operations to reduce flooding from precipitation events
  • Large-scale constructed wetlands
  • Active reservoir management

Encourage municipal coordination to best align with watershed opportunities
  • Establishment of pipeline for projects across Upper Mystic River Watershed
  • Identify flood volumes, scale of benefits for specific projects

Establish shared understanding for ongoing regional efforts
  • Watershed-specific, future-oriented flood model data specific to Mystic River communities
Project Components

1. Regional stormwater model
2. Desktop analysis to identify large-scale green infrastructure sites
3. Development of site selection criteria
4. Selection of top sites and establishment of project pipeline
5. Assessment of active reservoir management
6. Ongoing municipal engagement to share local knowledge, data, and get feedback
Regional Stormwater Model – Basic

Mystic River Watershed Inundation Map (assumes 3 Pumps On at the Amelia Earhart Dam)

Stantec Web Mapping Application - BETA Product - Use for Calibration, not design or policy

Layers

Mystic River Model
- Mystic River Watershed
- Waterbodies (USGS 25k)

10-Year, 24-hour, 2070 Storm Event
- 10-Year, 2070 GCVA Peak Flood Extent

Mystic River Analysis Layers
- 10 Year-Model Points
- 10 Year-Riveline Overbank Flooding Areas
- 10 Year-Lowing Areas Disconnected from the River
- 10 Year-Lowing Areas above River Elevation

Identify

Draw

Measurement
Regional Stormwater Model – Updated
Desktop Analysis for Site Identification

240 sites → 465 sites → 114 sites → 35 sites → 18 sites
Site Selection Criteria

**TIER 1**

**hydrology**
- 1 FEMA flood layer
- 2 modeled flood outputs
- 2 flood proxy layers for upland sub-catchment flooding

**cost and ease of implementation**
- soil
- bedrock
- slope
- site protection status

**public acceptance**
- public support
- public education

**TIER 2**

**environmental justice + equity**
- population demographics: speaks English less than well
- population demographics: minority
- population demographics: low-income
- population demographics: age, less than 6
- population demographics: age, greater than 64

**connectivity**
- proximity to the Mystic River
- proximity to existing Public Open Space
Top Site Selection and Project Pipeline

Summary of Tier I criteria (1- Lowest score, 5-Highest score)

<table>
<thead>
<tr>
<th>FEMA</th>
<th>2070 10-yr 24hr (riverine/overbank flooding)</th>
<th>2070-10-yr 24hr (subcatchment/piped infrastructure flooding)</th>
<th>Regional (subcatchment) weight</th>
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<th>Existing Slope, Soils</th>
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Summary of Tier II criteria (1- Lowest score, 5-Highest score)

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<tr>
<th>Land Cover &amp; Habitat (Restoration Potential)</th>
<th>Socially Vulnerable Populations (Equitable Access &amp; Flood Risk)</th>
<th>Proximity to existing park space, or Mystic waterfront (Connectivity)</th>
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Hydrological Impact

Feasibility of Implementation

Co-benefits
Municipal Engagement

Arlington, Belmont, Boston, Burlington, Cambridge, Everett, Lexington, Malden, Medford, Melrose, Reading, Stoneham, Wakefield, Wilmington, Winchester, Woburn
Thank you!

Emily Sullivan
Environmental Planner and Conservation Agent
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Storm Proofing Critical Regional Infrastructure in the Lower Mystic

Oliver Sellers-Garcia

Director

Office of Sustainability and the Environment

City of Somerville, MA
Regional Infrastructure in the Lower Mystic

Oliver Sellers-Garcia
Director, Office of Sustainability & Environment, City of Somerville
EBC Climate Change Luncheon Webinar Series, May 8, 2020
Outline

- Somerville’s climate planning
- Regional infrastructure
- Assessing regional vulnerability
Somerville’s climate change planning timeline

2014 - Carbon neutrality goal
2015 - SustainaVille
2016 - Greenhouse Gas Inventories
2017 - Vulnerability Assessment, Carbon Neutrality Pathway
2018 - Somerville Climate Forward
2050 - Carbon neutrality
Coastal flooding and sea level rise

2030 and 2070 coastal flooding probability
Schrafft Center Pathway

Image: Climate Ready Boston
Amelia Earhart Dam

Sea level rise and storm surge modeling for the area suggested that the Amelia Earhart Dam may be flanked during 1% annual storm events as early as 2035 and may be overtopped during the 1% annual storm event as early as 2055.

Courtesy of the MA Department of Conservation and Recreation
Climate Change Vulnerability Assessment: Top priorities for climate preparedness

- Citywide precipitation
- Amelia Earhart Dam failure
- Schrafft Center flooding pathway
- Police and Fire HQ
- Transportation system
- Economic growth areas
- Citywide temperature increase
- Public health impacts to vulnerable populations
- Open space and trees
Critical Infrastructure Facilities
MVP Regional Grant:
Critical Regional Infrastructure and Social Vulnerability in the Lower Mystic Watershed

- Identify the vulnerabilities and interdependencies among critical regional infrastructure during and after an extreme coastal storm
- Identify how the health, housing, and livelihoods of our most vulnerable residents and workers are affected if our critical infrastructure fails

Result: Prioritized punch list of operational and capital investments needed to prepare critical infrastructure for climate-enhanced storms.
Result: A social science-based approach to rethinking climate impacts and prioritizing action.

Boston, Chelsea, Everett, Revere, Somerville, Winthrop
Functional Exercise

- Regional infrastructure operators
- Facilitated by DHS
- Based on 100-year 2070 winter storm
- Support for operators with broad range of climate/planning

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The Storm of Today...is not the Storm of Tomorrow

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<tr>
<th>Exceedance Probability</th>
<th>Present Water Surface Elevation (ft-NAVD88)</th>
<th>2030 Water Surface Elevation (ft-NAVD88)</th>
<th>2050 Water Surface Elevation (ft-NAVD88)</th>
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How does social science understanding change prioritization?

- Using real estate value as a proxy for risk increases climate inequalities.
- Using social vulnerability as a proxy for risk decreases climate inequalities.
Thank you

Any questions?
Oliver Sellers-Garcia
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- Getting involved
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- Presentation template by SlidesCarnival
Closing Remarks

Daniel K. Moon

President & Executive Director

Environmental Business Council