Appendices (Part 3 of 3)

Appendix A Task 1-1 Recap Nemo and Task 1-2 Supporting Documentation

Appendix B Task 1-2 Model Updates and Piped Infrastructure

Appendix C Task 1-2 Updated Flood Model Outputs (Mapbook)

Appendix D GIS Mapbook of 3-acre Opportunity Sites by Land Use (January 2020 workshop)

Appendix E Land Use Codebook (Classifications for GIS Desktop Analysis)

Appendix F GIS-based Suitability Screening of Potential Wetland GI Sites

Appendix G Full List of Suitable Opportunity Sites for Regional Wetland GI

Appendix H Initial Scoring Methodology

Appendix I Revised Scoring Methodology

Appendix J Task 2-2 Maps and Tables of Additional GI Opportunities

Appendix K Ranking Tool Dashboard and Supporting Materials

Appendix L Task 3-2 Feedback on Top 35 watershed opportunities (One-Pager Summaries)

Appendix M Stakeholder Engagement and Outreach Materials

Appendix N Task 4 Site Investigations Recap Notes and Photos

Appendix O Conceptual Wetland GI - Supporting Documentation

Appendix P Active Reservoir Management - Supporting Documentation

Appendix Q Overview of Water Bodies, Piped Infrastructure Constrictions, and Control Structures (Summary Map)

Appendix M

Stakeholder Engagement and Outreach Materials

Image credit: MyRWA

Task 1.1

Outreach materials and sample community data request

PROJECT OVERVIEW 2-PAGER FLYER (COMMUNITY OUTREACH)

MVP Action Grant: Watershed-wide Analysis to Optimize & Coordinate Regional Stormwater Management in Mystic River Watershed

Mystic River WATERSHED ASSOCIATION

PROJECT OVERVIEW

The Resilient Mystic Collaborative's (RMC) Upper Mystic Stormwater Working Group, through the City of Cambridge, was awarded a $350,000 Municipal Vulnerability Preparedness (MVP) Action Grant to prioritize opportunities for regional stormwater retention with an emphasis on green infrastructure solutions. An associated $75,000 grant from the U.S. EPA will help communities incorporate the results of this work into their local Hazard Mitigation Plans.

The MVP Action Grant will be used to complete a comprehensive analysis of how to optimize and coordinate regional stormwater management in the Upper Mystic River Watershed. The goal of the analysis is to determine the effectiveness of new stormwater wetlands and active reservoir management in reducing river flooding at a regional scale.

WHY IS THIS PROJECT A PRIORITY? HOW DOES IT ADVANCE REGIONAL RESILIENCY EFFORTS?

"Climate impacts do not recognize town, county, or state borders."

"Extreme precipitation events, impacted by climate change, cause the Mystic River watershed to flood more frequently and severely due to changes in intensity and rainfall volume."

- Recent regional climate reports

A growing number of municipalities within the Upper Mystic River watershed have conducted climate change vulnerability assessments and determined that addressing flooding from extreme precipitation is of high priority within their municipality. This initiative aims to advance efforts to mitigate flooding from precipitation events within the watershed by aligning resources with intervention opportunities. Working together across municipal boundaries to prioritize the most cost-effective projects at the watershed scale, this project will serve as a model for other regional collaboratives across the state and country.

Through this MVP Action Grant, the project team will identify and pursue site-specific green infrastructure opportunities for regional stormwater management and evaluate additional flood management strategies to mitigate precipitation flooding from the 10-year storm event in 2070.

WHAT ARE THE KEY PROJECT OUTCOMES? HOW WILL THIS BENEFIT MY MUNICIPALITY?

The Consensus Building Institute (CBI) released a new report this month[1], funded by the Barr Foundation, that included an overview of climate resilience initiatives in the Greater Boston region.

A major takeaway from this report was that preparing for climate impacts requires municipalities to address areas of *shared vulnerability* in addition to their own unique needs. The project team is coordinating with 17 municipalities within the Upper Mystic watershed, DCR, and MWRA to identify and pursue site-specific green infrastructure opportunities to advance regional and local stormwater management with co-benefits for RMC stakeholders. The project will involve:

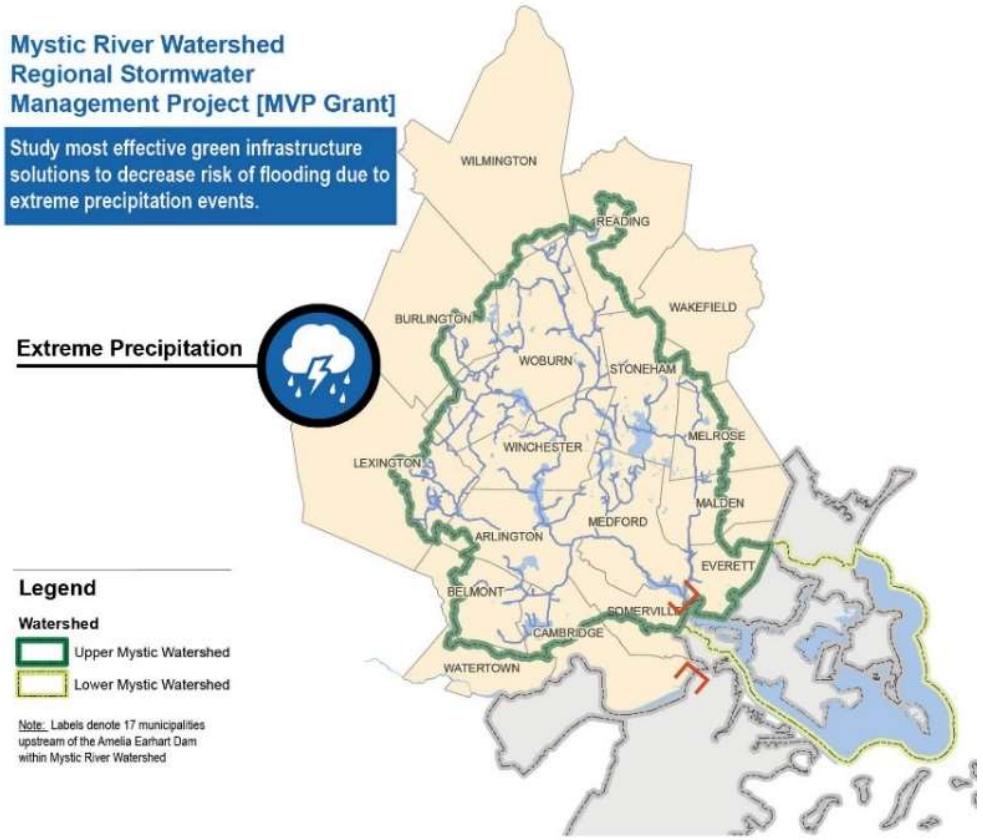
- Undertaking a watershed-wide analysis to optimize and coordinate regional stormwater management in the Mystic River Watershed.
- Refining the existing watershed model to become an inclusive, shared stormwater management model for Upper Mystic municipalities. This step will help improve planning efforts and assist in prioritization of projects that reduce watershed flood risk via improved stormwater management.
- Building out a portfolio of potential green infrastructure projects in each municipality. For each municipality in this project, at least one green infrastructure project opportunity will be identified. (A full list of these will be shared in this project's Final Report.)

[1] *Pathways to Climate Resilience: Strategies for the Greater Boston Area.* Barr Foundation & Consensus Building Institute. August 2019. https://barrfdn.issuelab.org/resource/pathways-to-climate-resilience-strategies-for-the-greater-boston-area.html

MVP Action Grant: Watershed-wide Analysis to Optimize & Coordinate Regional Stormwater Management in Mystic River Watershed

Mystic River WATERSHED ASSOCIATION

- Using a consensus-based prioritization approach, the project team – working in collaboration with the RMC Upper Mystic Stormwater Working Group - will rank the most cost-effective green infrastructure projects that contribute significantly to flood reduction at the watershed scale (during precipitation events) while also delivering significant co-benefits and enhancing local climate resilience:
- A select group of priority project opportunities will then be advanced to 10% concept design and modeled within the updated Mystic River Watershed model. (Note: Priority opportunities in this group will not include an opportunity in each of the municipalities). The intent of prioritization, as it applies to this effort, is to prioritize project opportunities that contribute significantly to flood reduction at the watershed scale and help position these potential projects for implementation via future MVP Action grants, or using other funding sources.



HOW CAN YOU BEST SUPPORT THIS PROJECT?

As municipal engineers, planners, first responders, and leaders within the watershed, your involvement is very important. Your input is being requested:

- **Review the projected flood maps** at the meeting that were developed through previous RMC and project team efforts to help calibrate the Upper Mystic Watershed model via feedback and data on actual observations;
- **Provide technical feedback on drainage system functions and first-hand observations from first response to flood events** at the meeting; also discuss and review any previous work done by specific communities to identify potential parcels for green infrastructure implementation.
- **Share existing community data**. See **ATTACHMENT: Data Request Table.** Within 2 weeks of the meeting, provide requested data (GIS data, reports, plans, etc.) to Jen Zoppo at Stantec.
- Meeting participants are also invited - and encouraged to **contribute to - the RMC Upper Mystic Stormwater Working Group's prioritization ranking workshops** (target date December 2019 or January 2020). As this date nears, meeting participants will receive an email with confirmed date and location.

PROJECT TIMELINE: September 2019 – June 2020

PROJECT CONTACTS:

Patrick Herron, Executive Director, Mystic River Watershed Association, Patrick.Herron@mysticriver.org 781-316-3438

Jen Zoppo, Project Manager, Stantec, Jennifer.Zoppo@stantec.com 617-314-7172

SAMPLE COMMUNITY DATA REQUEST

MVP Action Grant: Watershed-wide Analysis to Optimize & Coordinate Regional Stormwater Management in Mystic River Watershed

COMMUNITY DATA REQUEST

Data Request		Priority	Notes
1	Hydrologic and Hydraulic Model of Collection System (if available)	High	
2	Reservoirs and assets not in current model (Spot Pond, Central Falls Dam, North, Middle and South Reservoir, Wright's Pond, Spy pond) o Bathymetry for each reservoir (XYZ points, or Stage-Area Tables) o Operational Procedures (Weirs, gates, etc.)	High	Not applicable to all communities
3	Bridges: Deck, Piers, Opening in CAD, Drawings	High	DCR, DOT
4	Information about historical flood spots (associations with storm events, dates, photographs), and MVP implementation plans (if available)	Medium	
5	Existing, in-construction, near-future BMPs, LIDs (Plans, Reports)	Medium	
6	Site conditions (e.g., contamination fields, areas of ecological concern, and other habitat core areas)	Medium	
7	Capital improvement plans (5-year) including but not limited to roads, parks, and open spaces. Wide roads that could be narrowed and other opportunities (e.g., current TIGER or BUILD Transportation grant awards)	Medium	
8	GIS Layers (beyond MassGIS)		
	o Sewer, Drain and Combined Conduits, Outfalls	High	
	o Junctions, Catch Basins, Diversion Structures, Tide Gates	High	
	o In-line, Offline Storage units	High	
	o Shapefiles of berms, walls	High	
	o Building Footprints	High	
	o Parcel data, size, vacant lots, and ownership	High	Specifically of interest are GIS data for Municipal-owned properties (including parks, Town/County Land Bank properties (if any), other vacant parcels, and easements)
	o Culverts: size, length, shape, material, condition	Medium	
	o Roadway, Railroad layers	Medium	
	o Soils, Land use, impervious area	Medium	
	o LiDAR, Elevation spot checks, Survey Elevations	Low	
9	Groundwater table seasonal variability	Medium	Can be provided post alternatives site selection
10	Riverbank protection structures (e.g., spur dikes, riprap sections, retention walls, etc.) where applicable	Low	
11	Rain Gauge data	Low	
12	Boring logs	Low	Can be provided post alternatives site selection

Task 1.2
Supporting Documentation
Regional model feedback
(sign-in sheets and map markups)
from municipalities

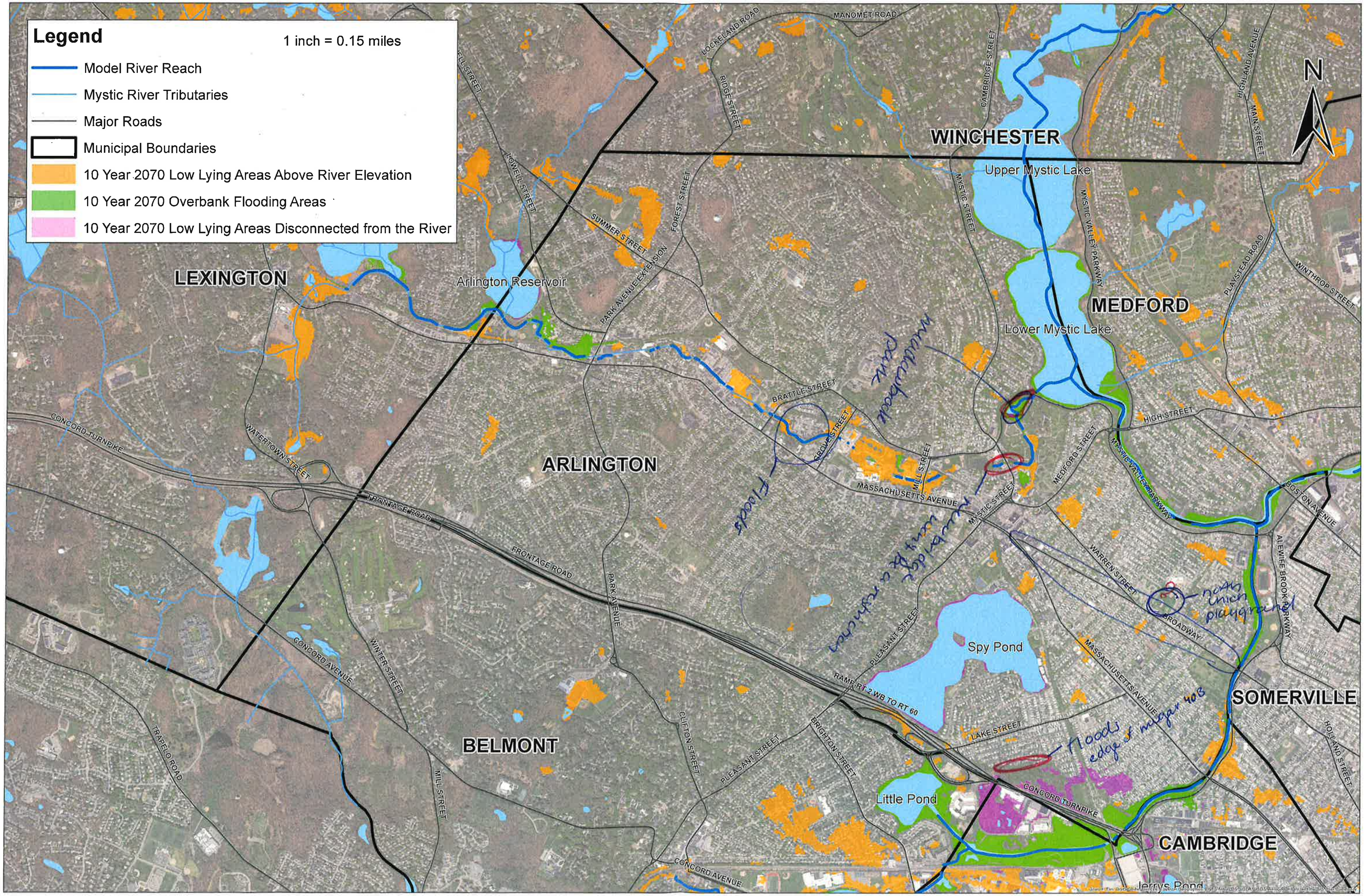
Meeting Sign-In Sheet

MVP Action Grant: Watershed-wide Analysis to Optimize & Coordinate Regional Stormwater Management in the Mystic River Watershed

Date: 9/24/2019
Time: 3:00 pm
Location: Arlington DPW
51 Grove Street
Arlington, MA 02476

Sign-In Sheet

Name	Affiliation	Phone / E-Mail	Initials
Jen Zoppo	Stantec	jennifer.zoppo@stantec.com	JZ
Emily Sullivan	Arlington	esullivan@town.arlington-ma.us	EAS
WAYNE CHOUINARD	ARLINGTON	WCHOUINARD@TOWN.ARLINGTON.MA.US	WAC
Patrick Herron	MyRWA		


Legend
1 inch = 0.15 miles
Model River Reach
Mystic River Tributaries
Major Roads
Municipal Boundaries
10 Year 2070 Low Lying Areas Above River Elevation
10 Year 2070 Overbank Flooding Areas
10 Year 2070 Low Lying Areas Disconnected from the River
N
WINCHESTER
Upper Mystic Lake
Lower Mystic Lake
MEDFORD
LEXINGTON
Arlington Reservoir
ARLINGTON
Spy Pond
SOMERVILLE
BELMONT
Little Pond
CAMBRIDGE
Jerrys Pond
MANOMET ROAD
LOCKELAND ROAD
RIDGE STREET
CAMBRIDGE STREET
HIGHLAND AVENUE
MAIN STREET
LOWELL STREET
SUMMER STREET
FOREST STREET
PARK AVENUE EXTENSION
MYSTIC STREET
MYSTIC VALLEY PARKWAY
PLAYSTEAD ROAD
WINTHROP STREET
BRATTLE STREET
HIGH STREET
MEDFORD STREET
MILL STREET
MASSACHUSETTS AVENUE
CONCORD TURNPIKE
WATERTOWN STREET
FRONTAGE ROAD
PARK AVENUE
WARREN STREET
BOSTON AVENUE
ALEWIFE BROOK PARKWAY
BROADWAY
PLEASANT STREET
RAMP RT 2 WB TO RT 60
LAKE STREET
CONCORD AVENUE
WINTER STREET
CLIFTON STREET
BRIGHTON STREET
TRAPELO ROAD
HOLLAND STREET

Meeting Sign-In Sheet

MVP Action Grant: Watershed-wide Analysis to Optimize & Coordinate Regional Stormwater Management in the Mystic River Watershed

Date: 9/17/2019
Time: 3:00 - 4:00 PM
Location: Town Hall Annex
Burlington, MA

Sign-In Sheet

Name	Affiliation	Phone / E-Mail	Initials
Eileen Cdeman	Bur Conservation	ecdeman@burlington.org	EC
THOMAS HAYES	DPW	THAYES@BURLINGTON.ORG	TH
John Keeley	Burl Con Com	jkeeley@burlington.org	JK
Matt Hemler	Burl con Com	hemler.matt@gmail.com	MSH
Liz Bonventre	Burl Planning	ebonventre@burlington.com	EAB
Jennifer Zoppo	Stantec	jennifer.zoppo@stantec.com	JZ
Patrick Herron	MyRWA	patrick@mysticriver.org	

Legend

1 inch = 0.25 miles

- Model River Reach
- Mystic River Tributaries
- Major Roads
- Municipal Boundaries
- 10 Year 2070 Low Lying Areas Above River Elevation
- 10 Year 2070 Overbank Flooding Areas
- 10 Year 2070 Low Lying Areas Disconnected from the River

WILMINGTON
BURLINGTON
LEXINGTON
WOBURN
WINCHESTER
Fawn Lake: Farm Lake
Mill Pond
Upper Woburn Street Pond
Lower Woburn Street Pond
Butterfield Pond
Horn Pond
LOWELL STREET
WEST STREET
INTERSTATE 93
MAIN STREET
EAMES STREET
WOBURN STREET
BOSTON ROAD
WILMINGTON ROAD
CAMBRIDGE STREET
FRANKLIN TYMAN ROAD
MIDDLESEX TURNPIKE
ROUTE 3
CROSBY DRIVE
RAMP RT 3 NB TO RT 128
NORTH ROAD
CARLISLE ROAD
BURLINGTON ROAD
BEDFORD STREET
TERRACE HALL AVENUE
CENTER STREET
WINN STREET
YANKEE DIVISION HIGHWAY
OLYMPIA AVENUE
MISHAWUM ROAD
CONCORD ROAD
GREAT ROAD
BROOKSBIE ROAD
SOUTH ROAD
SHAWSHEEN ROAD
PAGE ROAD
BURLINGTON MALL ROAD
WAYSIDE ROAD
BLANCHARD ROAD
HARTWELL ROAD
RT 3 - INTERSTATE 95 SB CD ROAD
WHEELER ROAD
HARTWELL AVENUE
GROVE STREET
CAMBRIDGE ROAD
LEXINGTON STREET
PLEASANT STREET
MONTVALE AVENUE
MERRIMAC STREET
NEW BOSTON STREET

no known flooding here

wetland

detention ponds

Littles brook

skating rink

Meeting Sign-In Sheet

MVP Action Grant: Watershed-wide Analysis to Optimize & Coordinate Regional Stormwater Management in the Mystic River Watershed

Date:
Time:
Location:

Cambridge

Sign-In Sheet

Name	Affiliation	Phone / E-Mail	Initials
Jen Zoppo	Stantec	jennifer.zoppa@stantec.com	JZ
Kathy Watkins	DPW	Kwatkins@cambridgema.gov	
Catherine Daly Woodbury	DPW	CWoodbury@cambridgema.gov	CDW
Jim Wilcox	DPW	jwilcox@cambridgema.gov	JW
Chris Balerna	KLF	Cbalerna@Kleinfelder.com	CB

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No map markup from Cambridge

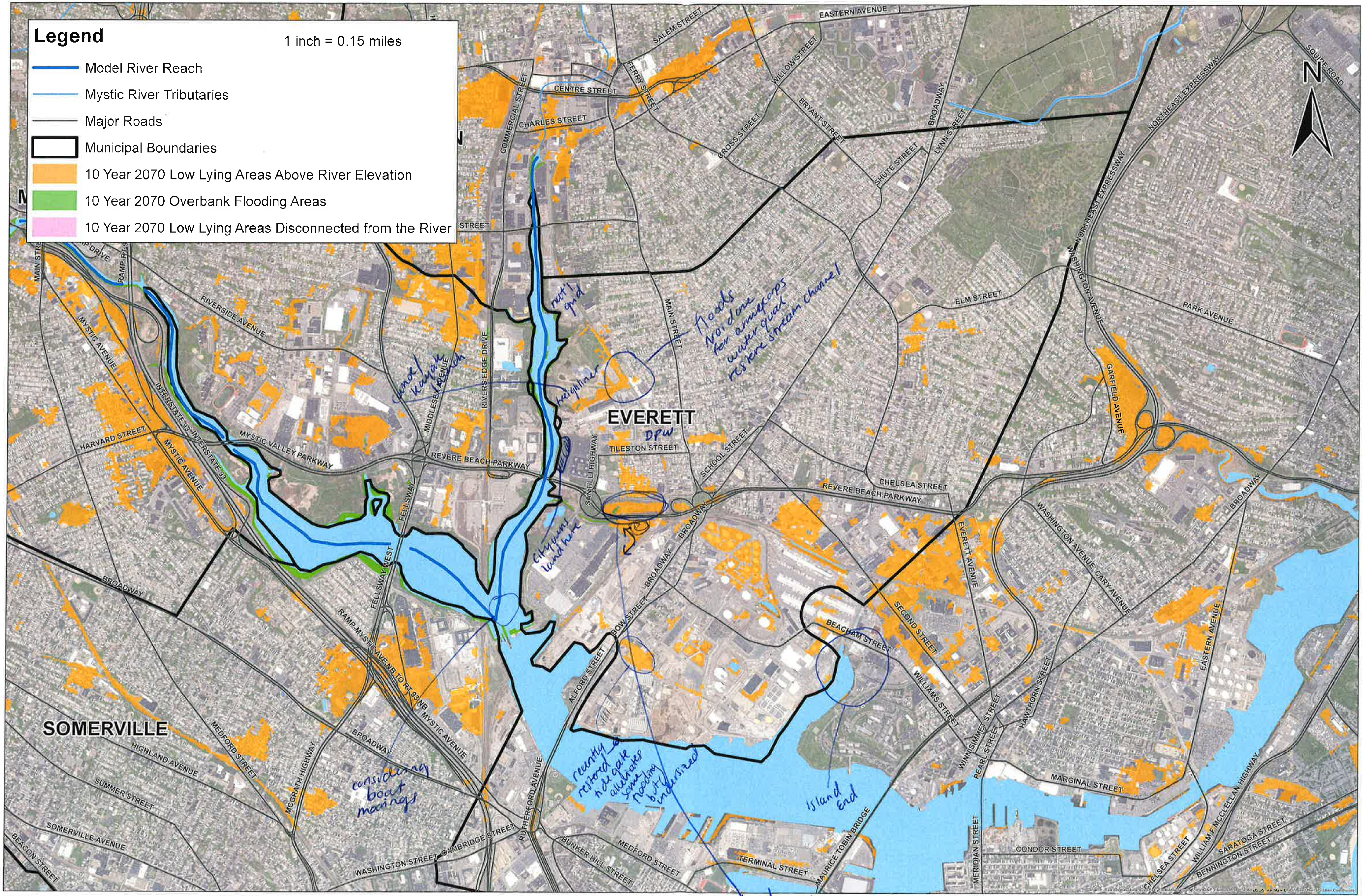
Meeting Sign-In Sheet

MVP Action Grant: Watershed-wide Analysis to Optimize & Coordinate Regional Stormwater Management in the Mystic River Watershed

Date: 9/23/2019
Time: 8:45 am
Location: myRWA
20 Academy St #306
Arlington, MA 02476

Everett
Sign-In Sheet

Name	Affiliation	Phone / E-Mail	Initials
Jen Zoppo	Stantec		JZ
Greg St. Louis	Everett DPW/ENG	617.512.9027 greg.stlouis@ci.everett.ma.us	
Patrick Herron	MyRWA		PH



opp. area wetland area. talked about making it a park acts as a trash bin, no one clean it.

Legend

1 inch = 0.15 miles

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- 10 Year 2070 Low Lying Areas Disconnected from the River

N

EVERETT

SOMERVILLE

N. Creek

S. Creek

T.G.

DPW

EASTERN AVENUE
SALEM STREET
CENTRE STREET
FERRY STREET
WILLOW STREET
CHARLES STREET
COMMERCIAL STREET
CROSS STREET
BRYANT STREET
BROADWAY
LYNN STREET
SHUTE STREET
SQUIRE ROAD
NORTHEAST EXPRESSWAY
WASHINGTON AVENUE
ELM STREET
PARK AVENUE
GARFIELD AVENUE
MAIN STREET
RIVERSIDE AVENUE
MYSTIC AVENUE
HARVARD STREET
INTERSTATE 93
MYSTIC VALLEY PARKWAY
MIDDLESEX AVENUE
RIVERS EDGE DRIVE
REVERE BEACH PARKWAY
TILESTON STREET
SCHOOL STREET
SAMILLI HIGHWAY
CHELSEA STREET
FELLSWAY
FELLSWAY WEST
RAMP-MYSTIC AVENUE TO RT 93 NB
BOW STREET
BROADWAY
ALFORD STREET
BEACHAM STREET
SECOND STREET
EVERETT AVENUE
WASHINGTON AVENUE-CARY AVENUE
WINNISIMMET STREET
WILLIAMS STREET
HAWTHORN STREET
BEARL STREET
EASTERN AVENUE
MARGINAL STREET
MAURICE TOBIN BRIDGE
MERIDIAN STREET
CONDOR STREET
WILLIAM F. MCCLELLAN HIGHWAY
SARATOGA STREET
BENNINGTON STREET
BEACON STREET
SOMERVILLE AVENUE
SUMMER STREET
HIGHLAND AVENUE
MEDFORD STREET
MCGRATH HIGHWAY
WASHINGTON STREET
CAMBRIDGE STREET
RUTHERFORD AVENUE
BUNKER HILL STREET
TERMINAL STREET

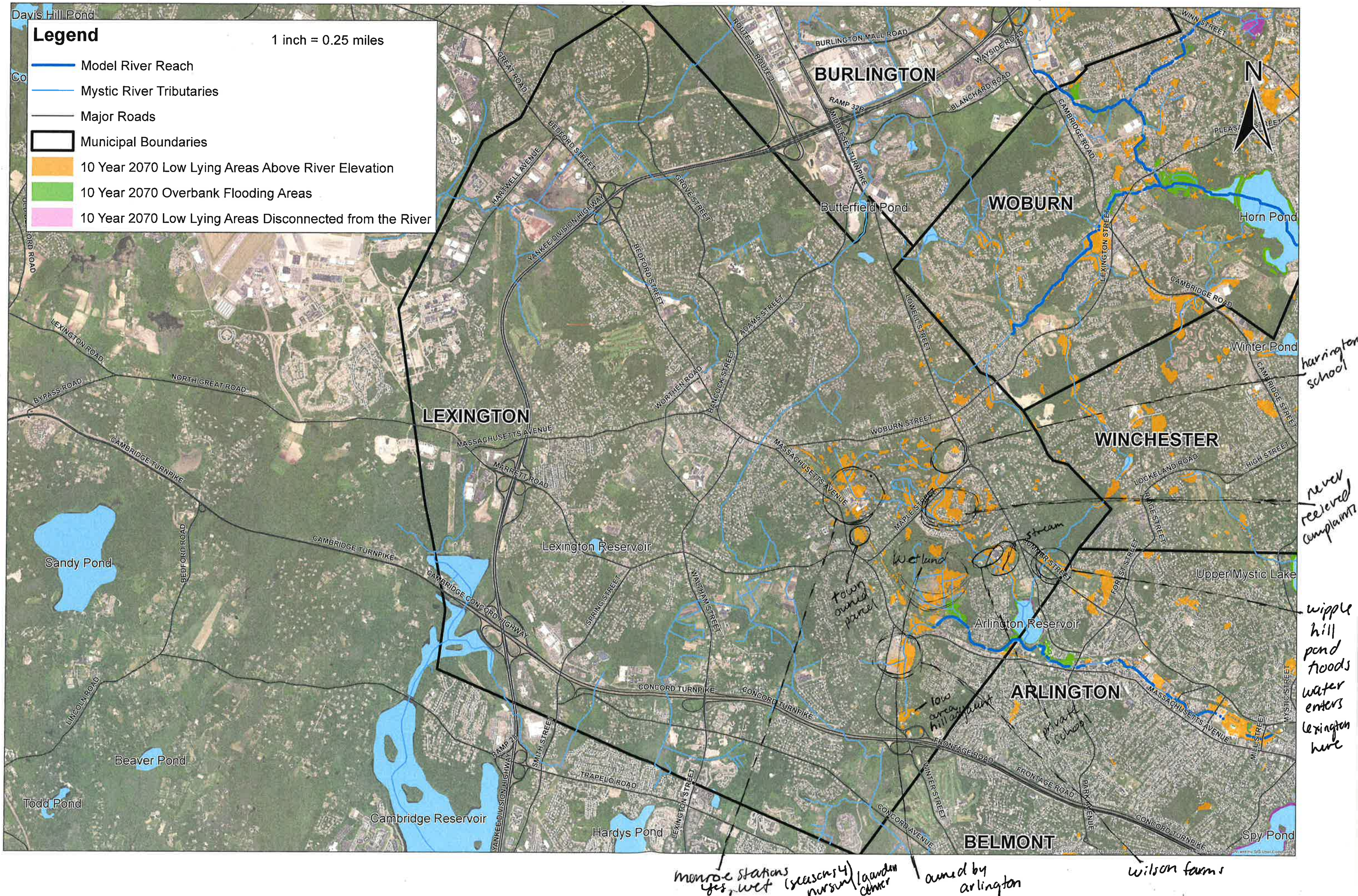
Meeting Sign-In Sheet

MVP Action Grant: Watershed-wide Analysis to Optimize & Coordinate Regional Stormwater Management in the Mystic River Watershed

Date: 10/3/2019
Time: 1 PM
Location: Lexington Public Works Dept
201 Bedford Street
Lexington, MA 02420

Sign-In Sheet

Name	Affiliation	Phone / E-Mail	Initials
Jen Zappo	Stantec	339-832-0128	JZ
JOHN LIVSEY	LEXINGTON	781-274-8311	JL
Patrick Herron	MyRWA	781 316 3438	PH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N
BURLINGTON
WOBURN
LEXINGTON
WINCHESTER
ARLINGTON
BELMONT
Davis Hill Pond
Butterfield Pond
Horn Pond
Winter Pond
Upper Mystic Lake
Lexington Reservoir
Arlington Reservoir
Sandy Pond
Beaver Pond
Todd Pond
Cambridge Reservoir
Hardys Pond
Spy Pond
BURLINGTON MALL ROAD
WINN STREET
WAYSIDE ROAD
BLANCHARD ROAD
CAMBRIDGE ROAD
MIDDLESEX TURNPIKE
RAMP 32B
GREAT ROAD
BEDFORD STREET
HARTWELL AVENUE
YANKEE DIVISION HIGHWAY
GROVE STREET
LEXINGTON STREET
LOWELL STREET
ADAMS STREET
HANCOCK STREET
WORTHEN ROAD
WOBURN STREET
MASSACHUSETTS AVENUE
MARRETT ROAD
MAPLE STREET
SUMMER STREET
FOREST STREET
RIDGE STREET
LOCKELAND ROAD
HIGH STREET
CAMBRIDGE STREET
MYSTIC STREET
MILL STREET
LEXINGTON ROAD
NORTH GREAT ROAD
BYPASS ROAD
CAMBRIDGE TURNPIKE
BEDFORD ROAD
LINCOLN ROAD
CAMBRIDGE CONCORD HIGHWAY
SPRING STREET
WALTHAM STREET
CONCORD TURNPIKE
SMITH STREET
TRAPELO ROAD
RAMP 2S
FRONTAGE ROAD
WINTER STREET
PARK AVENUE
CONCORD AVENUE
harrington school
never recieved complaints
wipple hill pond floods water enters lexington here
stream
wetland
town owned parcel
low area hill and plant
private school
monroe stations yes, wet
(seasonal) nursing/garden center
owned by arlington
wilson farms

Meeting Sign-In Sheet

MVP Action Grant: Watershed-wide Analysis to Optimize & Coordinate Regional Stormwater Management in the Mystic River Watershed

Date: 9/17/2019
Time: 1:00 - 2:15 pm
Location: Malden City Hall
110 Pleasant St
Malden, MA 02148

Sign-In Sheet

Name	Affiliation	Phone / E-Mail	Initials
Jennifer Zoppo	Stantec	339-832-0128 / jennifer.zoppo@stantec.com	JZ
Jem LIP	MALDEN		
Patrick Herron	MyRWA	781 316 3438 patrick@mystcrrier.org	
Steve Fama	Malden	781 397 7150 SFama@CityofMalden.org	

Legend

1 inch = 0.15 miles

- Model River Reach
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MELROSE
MALDEN
MEDFORD
EVERETT
Boojum Rock Pond
Wrights Pond
Fellsmere Pond
Long Pond
Towners Pond
Swains Pond
Seaplane Basin
WEST WYOMING AVENUE
UPHAM STREET
LEBANON STREET
WASHINGTON STREET
PLEASANT STREET
MAIN STREET
FELLSWAY EAST
BENNETT HIGHWAY
ESSEX ST
WINTER STREET
ELM STREET
FELLSWAY WEST
RAMP-RT 93-SB-TO-RT 28
SOUTH BORDER ROAD
RAMP-RT 93-NB-TO-RT 28
RAMP-RT 60 TO RT 93 NB
HIGHLAND AVENUE
FELLSWAY
PLEASANT STREET
FELLSWAY WEST
CENTRE STREET
CHARLES STREET
COMMERCIAL STREET
SALEM STREET
HIGH STREET
MEDFORD STREET
MIDDLESEX AVENUE
INTERSTATE 93
MYSTIC VALLEY PARKWAY
MYSTIC AVENUE
RIVERSIDE AVENUE
MAIN STREET
FERRY STREET
WILLOW STREET
GROSS STREET
BRYANT STREET
SHUTE STREET
BROADWAY
EASTERN AVENUE
HUNTING STREET
BEACH STREET
SQUIRE ROAD
LYNN STREET
NORTHEAST EXPRESSWAY
WASHINGTON AVENUE
PARK AVENUE
ELM STREET

never seen this flood (stew)

Meeting Sign-In Sheet

MVP Action Grant: Watershed-wide Analysis to Optimize & Coordinate Regional Stormwater Management in the Mystic River Watershed

Date: 9/23/2019
Time: 3:00 pm
Location: Medford City Hall
85 George P Hassett Drive
Medford, MA 02155

Sign-In Sheet

Name	Affiliation	Phone / E-Mail	Initials
Jen Zoppo	Stantec	339-832-0128/jennifer.zeppo@stantec.com	JZ
Penny Antonoglou	City of Medford	781-475-5979/PAntonoglou@medford-ma.gov	PA
Alicia Hunt	Medford E+F	ahunt@medfordma.gov	AH
Tim McGovern	MEDFORD	tmcgovern@medford-ma.gov	TM
Patrick Herron	MyRWA		

WINCHESTER
STONEHAM
MELROSE
MALDEN
MEDFORD
ARLINGTON
EVERETT
SOMERVILLE

Winter Pond
Wedge Pond
Judkins Pond
North Reservoir
Middle Reservoir
Spot Pond
South Reservoir
Quarter Mile Pond
Fells Reservoir
Boojum Rock Pond
Wrights Pond
Towners Pond
Swains Pond
Upper Mystic Lake
Lower Mystic Lake
Fellsmere Pond
Clay Pit Pond

CAMBRIDGE STREET
CHURCH STREET
HIGH STREET
MANOMET ROAD
LOCKELAND ROAD
RIDGE STREET
BACON STREET
MAIN STREET
HIGHLAND AVENUE
INTERSTATE 93
POND STREET
WEST WYOMING AVENUE
WASHINGTON STREET
PLEASANT STREET
MAIN STREET
LEBANON STREET
UPHAM STREET
FELLSWAY WEST
FELLSWAY EAST
RAMP RT 93 SB TO RT 28
SOUTH BORDER ROAD
WINTER STREET
MYSTIC STREET
FOREST STREET
PLAISTEAD ROAD
WINTHROP STREET
HIGH STREET
SALEM STREET
PLEASANT STREET
HIGHLAND AVENUE
COMMERCIAL STREET
CENTRE STREET
EASTERN AVENUE
SALEM STREET
WILLOW STREET
BRYANT STREET
CROSS STREET
FERRY STREET
SPLITE STREET
LYNN STREET
BROADWAY
SUMMER STREET
GROVE STREET
MASSACHUSETTS AVENUE
PLEASANT STREET
WARREN STREET
BROADWAY
BOSTON AVENUE
CONNECTOR
MYSTIC VALLEY PARKWAY
RIVERSIDE AVENUE
MEDFORD STREET
ELM STREET
MYSTIC AVENUE
MAIN STREET
HARVARD STREET
INTERSTATE 93
MIDDLESEX AVENUE
RIVERS EDGE DRIVE
REVERE BEACH PARKWAY
TILESTON STREET
SCHOOL STREET
CHELSEA STREET
BROWDER HOUSE BOULEVARD
COLLEGE AVENUE
HOLLAND STREET
DAY STREET
ELM STREET
HIGHLAND AVENUE
MEDFORD STREET
BROADWAY
FELLSWAY WEST
MYSTIC AVENUE
BOW STREET
BROADWAY
SECOND STREET
BEACHAM STREET

N

1 inch = 0.2 miles

Legend

- Model River Reach
- Mystic River Tributaries
- Major Roads
- Municipal Boundaries
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- 10 Year 2070 Overbank Flooding Areas
- 10 Year 2070 Low Lying Areas Disconnected from the River

High school
Compliant here sometimes
Gilis Park
Pump dot basin Brosnahan
barry park
pump station
tufts park
tufts field
IMG storage
private prop
wetland
centam.
old radio tower
weei
parking
bldg.
undeveloped

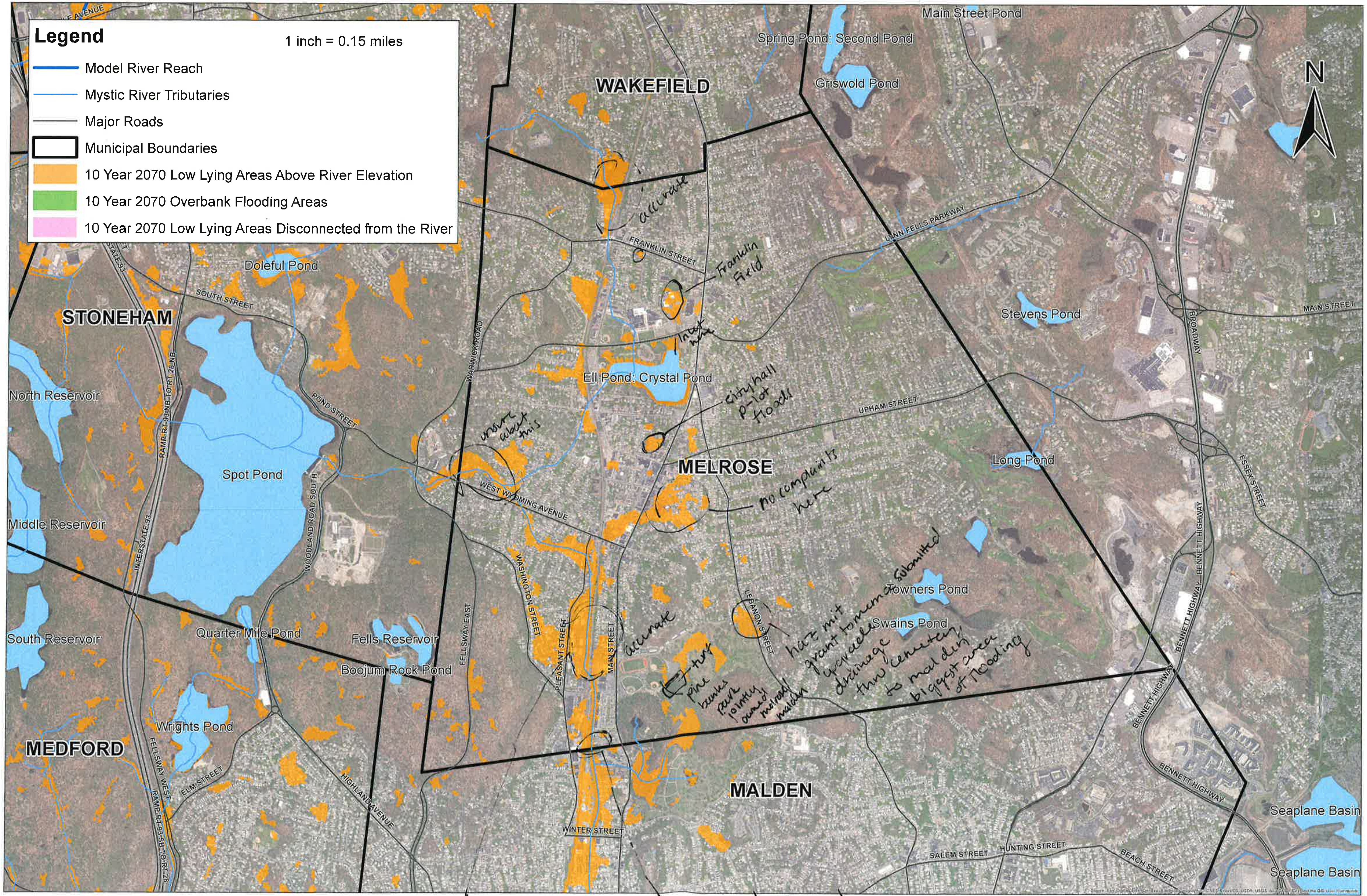
Meeting Sign-In Sheet

MVP Action Grant: Watershed-wide Analysis to Optimize & Coordinate Regional Stormwater Management in the Mystic River Watershed

Date: 10/4/2019
Time: 9Am
Location: Melrose City Hall
562 Main Street
Melrose, MA 02176

Sign-In Sheet

Name	Affiliation	Phone / E-Mail	Initials
Jen Zoppo	Stantec	339-832-0128	JZ
Elena Proakis Ellis	City of Melrose	781-979-4171	EPE
Patrick Herron	MyRWA	781 316 3638	PH



get calls from this area

trash grate DCR owned doesn't get cleaned enough

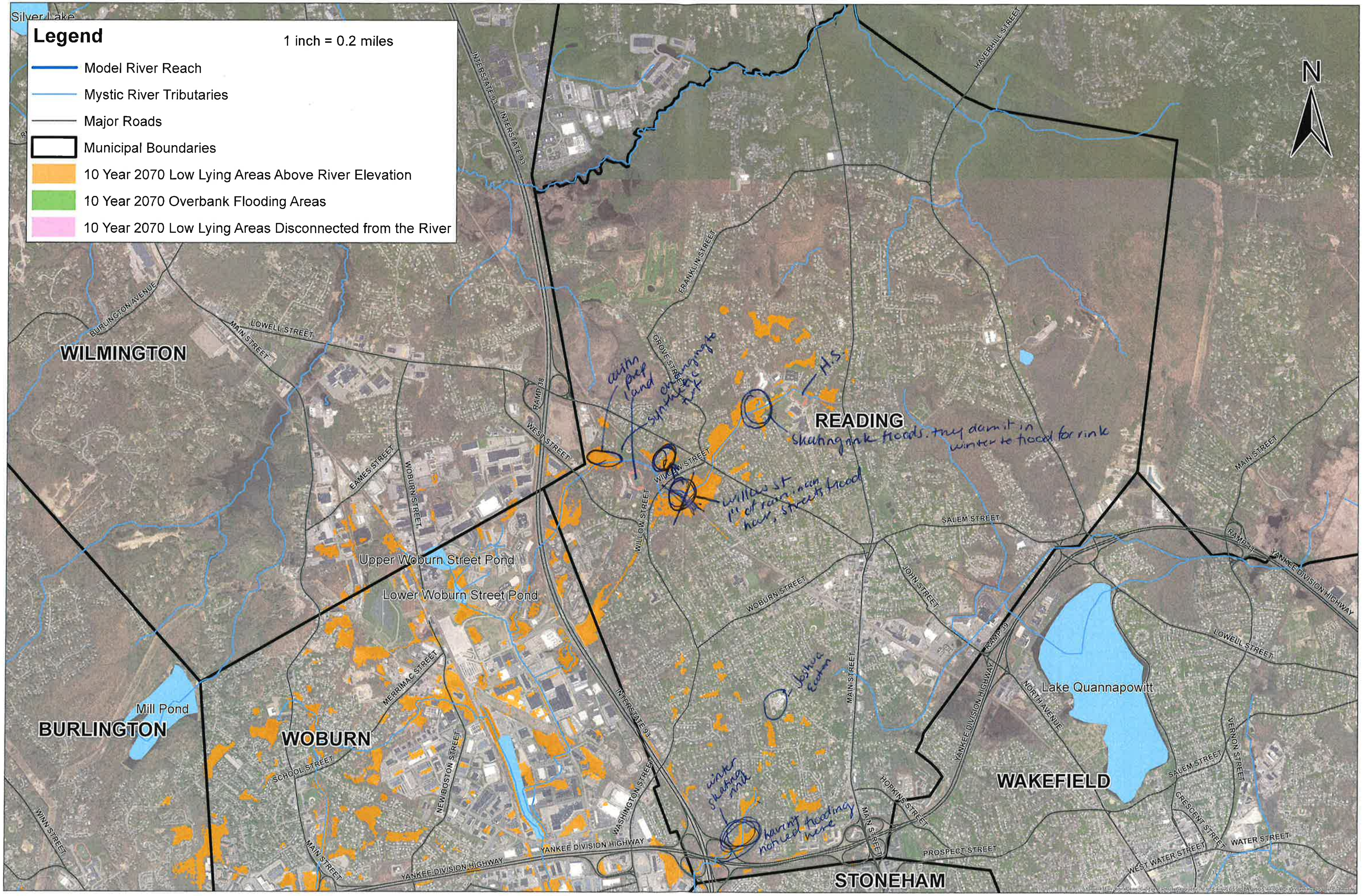
Meeting Sign-In Sheet

MVP Action Grant: Watershed-wide Analysis to Optimize & Coordinate Regional Stormwater Management in the Mystic River Watershed

Date: 9/24/2019
Time: ~~10:00~~ 10:30am
Location: ~~Addington Road~~ Reading Town Hall
~~Edgelawn Street~~
~~Arlington, MA 02476~~

~~Arlington~~ Reading
Sign-In Sheet

Name	Affiliation	Phone / E-Mail	Initials
Jen Zoppo	Stantec	339-832-0128/jennifer.zoppo@stantec.com	JZ
Alex Rozycki	Town of Reading	781-942-9082/arozycki@ci.reading.MA.us	AR
Patrick Herron	My Reed	781-316-3438	PH
Ryan Percival	Reading	781-942-9082 rpercival@ci.reading.MA.us	RP



Legend
1 inch = 0.2 miles
Model River Reach
Mystic River Tributaries
Major Roads
Municipal Boundaries
10 Year 2070 Low Lying Areas Above River Elevation
10 Year 2070 Overbank Flooding Areas
10 Year 2070 Low Lying Areas Disconnected from the River
N
Silver Lake
WILMINGTON
READING
BURLINGTON
WOBURN
WAKEFIELD
STONEHAM
Upper Woburn Street Pond
Lower Woburn Street Pond
Mill Pond
Lake Quannapowitt
INTERSTATE 93
HAVERHILL STREET
FRANKLIN STREET
GROVE STREET
BURLINGTON AVENUE
LOWELL STREET
MAIN STREET
RAMP 38
WEST STREET
EAMES STREET
WOBURN STREET
WILLOW STREET
SALEM STREET
JOHN STREET
RAMP 39
YANKEE DIVISION HIGHWAY
NORTH AVENUE
VERNON STREET
CRESCENT STREET
WATER STREET
WEST WATER STREET
PROSPECT STREET
HOPKINS STREET
WASHINGTON STREET
NEW BOSTON STREET
MERRIMAC STREET
SCHOOL STREET
WINN STREET
H.S.
skating rink floods. they dam it in winter to flood for rink
willow st
1" of rain in an hour, streets flood
Joshua Eaton
winter skating rink
having noticed flooding here

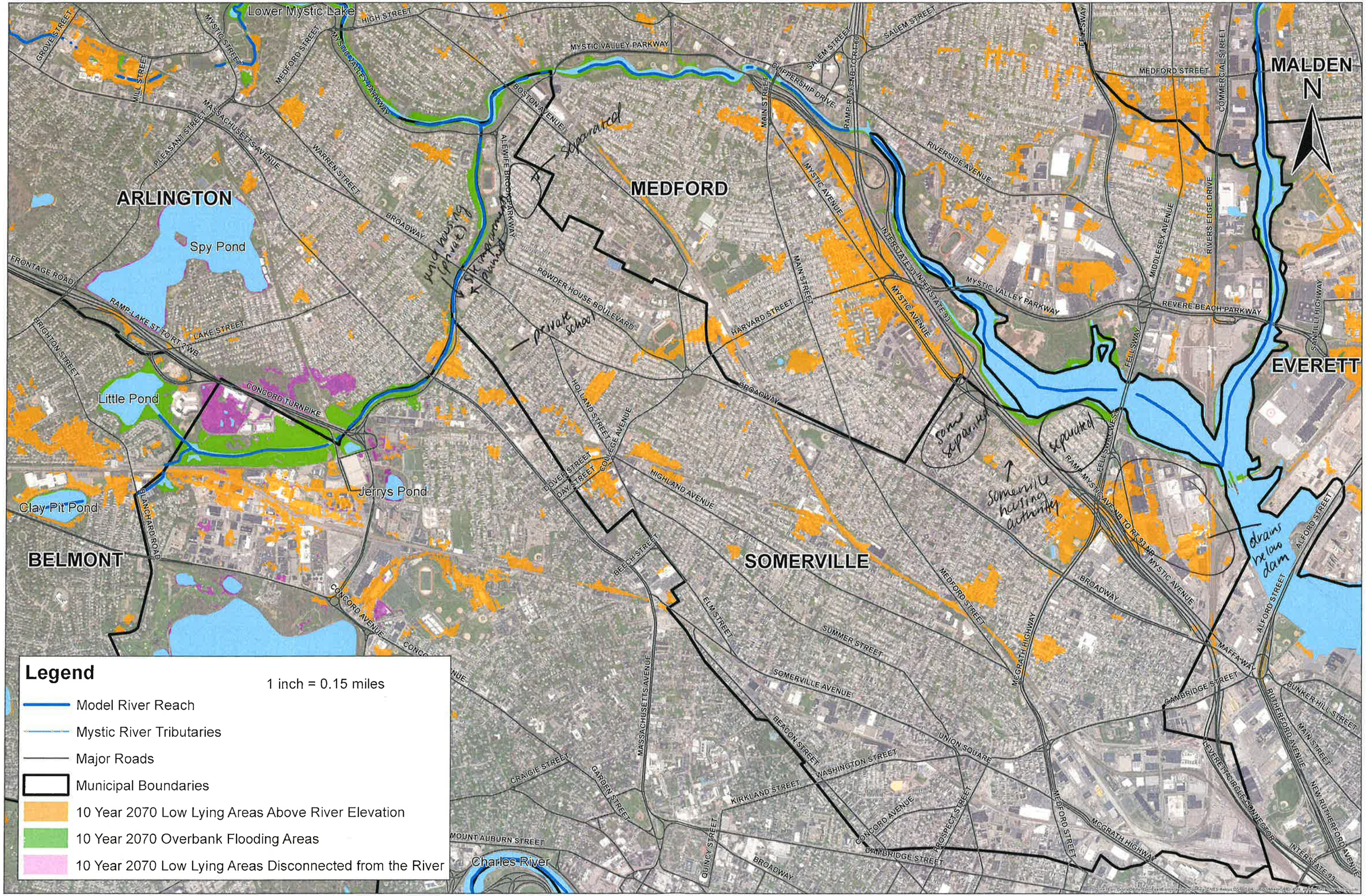
Meeting Sign-In Sheet

MVP Action Grant: Watershed-wide Analysis to Optimize & Coordinate Regional Stormwater Management in the Mystic River Watershed

Date: 9/25/2019
Time: 1:00 pm
Location: Somerville DPW
15 Franey Road
Somerville, MA 02145

Sign-In Sheet

Name	Affiliation	Phone / E-Mail	Initials
Jess Fossbrook	City of Somerville	617 625 6600 x 5416	JF
Jen Zoppo	Stantec	jennifer.zoppo@stantec.com	JZ
Hannah Payne	City of Somerville-OSE	hpayne@somervillema.gov ext. 2422	HP
Patrick Herron	MyRWA	—	PH



Focus on areas draining to Alewife

Meeting Sign-In Sheet

MVP Action Grant: Watershed-wide Analysis to Optimize & Coordinate Regional Stormwater Management in the Mystic River Watershed

Date: 9/20/2019
Time: 8:30 - 9:45am
Location: Stoneham DPW
16 Pine Street
Stoneham, MA 02180

Sign-In Sheet

Name	Affiliation	Phone / E-Mail	Initials
Jennifer Zoppo	Stantec	339-832-0128 / jennifer.zoppo@stantec.com	JZ
Brett Goldwes	Stoneham	781 507-4052 / bgoldwes@stoneham-ma.gov	BKG
Patrick Herron	MyRWA	—	PH

Legend

1 inch = 0.2 miles

- Model River Reach
- Mystic River Tributaries
- Major Roads
- Municipal Boundaries
- 10 Year 2070 Low Lying Areas Above River Elevation
- 10 Year 2070 Overbank Flooding Areas
- 10 Year 2070 Low Lying Areas Disconnected from the River

READING
WAKEFIELD
WOBURN
STONEHAM
MEDFORD
WINCHESTER
MELROSE
Lake Quannapowitt
Crystal Lake
Whittemore Pond
Horn Pond
Winter Pond
Wedge Pond
Judkins Pond
Upper Mystic Lake
North Reservoir
Middle Reservoir
South Reservoir
Doleful Pond
Spot Pond
Quarter Mile Pond
Fells Reservoir
Boojum Rock Pond
Wrights Pond
Ell Pond: Crystal Pond
Lower Pond
Lower Pond
Main Street Pond
Spring Pond: Second Pond
Griswold Pond
Stevens Pond
Long Pond
Towners Pond
Swains Pond
YANKEE DIVISION HIGHWAY
HOPKINS STREET
NORTH STREET
PROSPECT STREET
NORTH AVENUE
VERNON STREET
ALBION STREET
WATER STREET
NAHANT STREET
MAIN STREET
BROADWAY
INTERSTATE 93
SALEM STREET
WILLIAM STREET
ELM STREET
FARM STREET
WINN STREET
MONTVALE AVENUE
PLEASANT STREET
LEXINGTON STREET
SPRING STREET
EAST STREET
FOREST STREET
FRANKLIN STREET
WASHINGTON STREET
MARBLE STREET
SUMMER STREET
PARK STREET
LYNN FELLS PARKWAY
SOUTH STREET
POND STREET
WARWICK ROAD
UPHAM STREET
WEST WYOMING AVENUE
CAMBRIDGE ROAD
CAMBRIDGE STREET
CHURCH STREET
HIGH STREET
LOCKELAND ROAD
BACON STREET
HIGHLAND AVENUE
SOUTH BORDER ROAD
FELLSWAY WEST
LEBANON STREET
N

Floods, 5-6' on Montvale

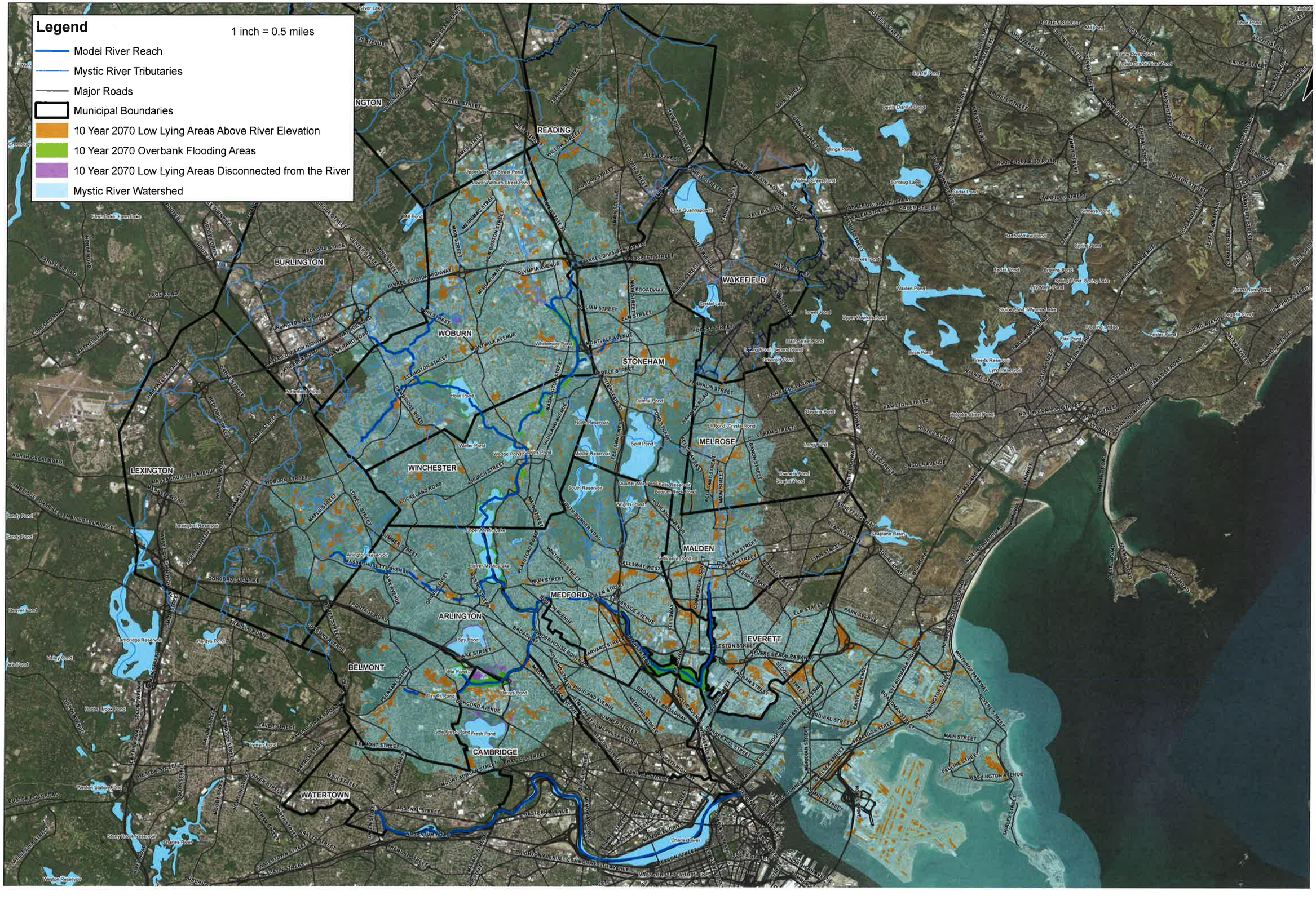
Meeting Sign-In Sheet

MVP Action Grant: Watershed-wide Analysis to Optimize & Coordinate Regional Stormwater Management in the Mystic River Watershed

Date: 10/9/2019
Time: 1:00 PM
Location: Wakefield Town Hall

Sign-In Sheet

Name	Affiliation	Phone / E-Mail	Initials
Jen Zoppo	Stantec	jennifer.zoppo@stantec.com	JZ
Claire Moss	Wakefield DPW	cmoss@wakefield.ma.us	CM
Bill Renault	" "	wrenault@ " " "	WR


Legend
1 inch = 0.5 miles
Model River Reach
Mystic River Tributaries
Major Roads
Municipal Boundaries
10 Year 2070 Low Lying Areas Above River Elevation
10 Year 2070 Overbank Flooding Areas
10 Year 2070 Low Lying Areas Disconnected from the River
Mystic River Watershed
READING
BURLINGTON
WOBURN
STONEHAM
WAKEFIELD
MELROSE
WINCHESTER
LEXINGTON
MALDEN
MEDFORD
ARLINGTON
BELMONT
EVERETT
CAMBRIDGE
WATERTOWN

Meeting Sign-In Sheet

MVP Action Grant: Watershed-wide Analysis to Optimize & Coordinate Regional Stormwater Management in the Mystic River Watershed

Date: 9/23/19
Time: 1:00 pm
Location: Watertown DPW
124 Orchard Street
Watertown, MA 02472

Watertown
Sign-In Sheet

Name	Affiliation	Phone / E-Mail	Initials
Jen Zoppo	Stantec		JZ
Laurel Ehrlich	Watertown		
Steve Magoon	" "	smagoon@watertown-ma.gov	SM
Matt Shuman	DPW		
Patrick Herron	myRWA		

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No map markup from Watertown

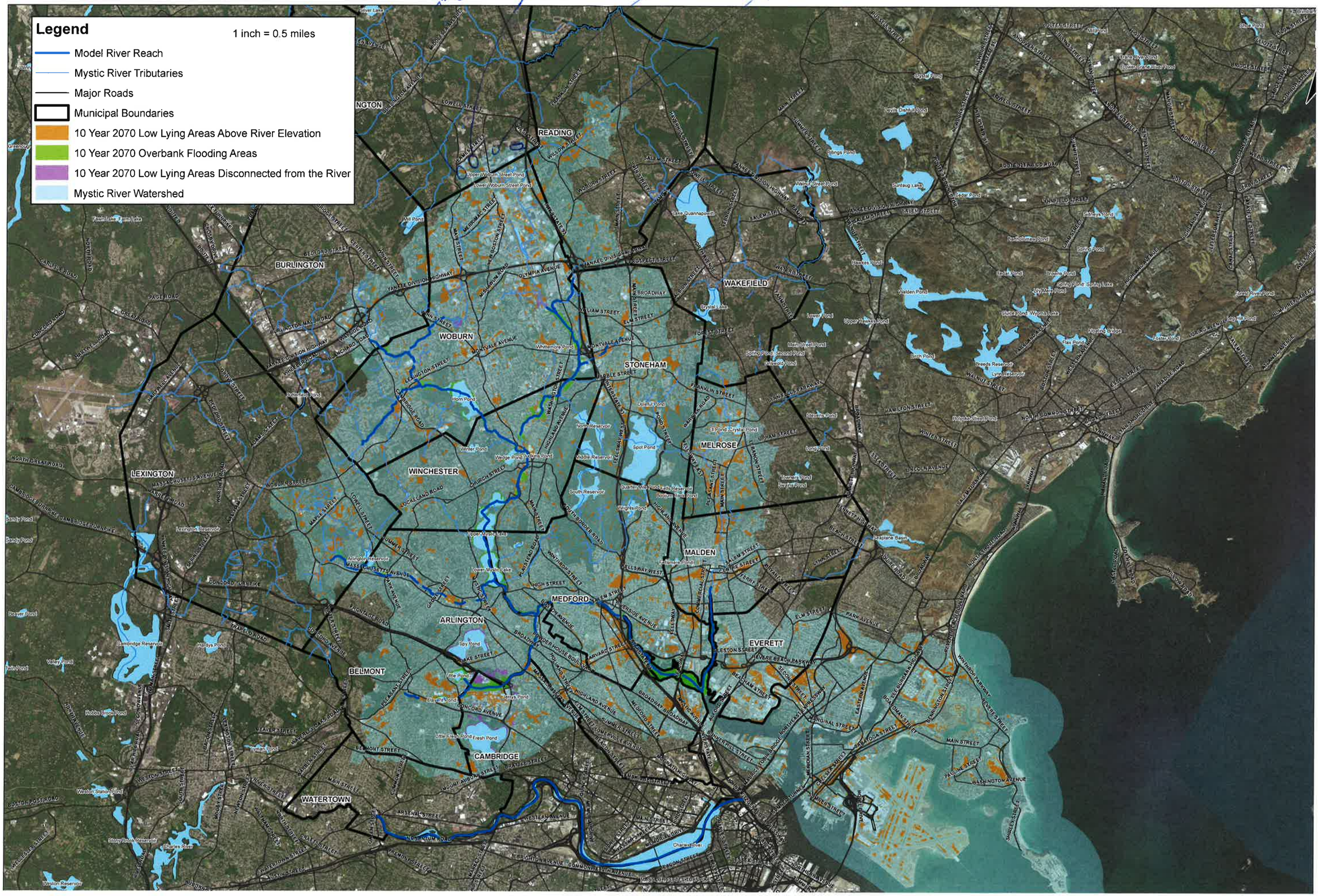
Meeting Sign-In Sheet

MVP Action Grant: Watershed-wide Analysis to Optimize & Coordinate Regional Stormwater Management in the Mystic River Watershed

Date: 9/27/2019
Time: 10:00 am
Location: Wilmington Town Hall

Wilmington
Sign-In Sheet

Name	Affiliation	Phone / E-Mail	Initials
Jen Zoppo	Stantec	jennifer.zoppo@stantec.com	JZ
Valerie Gingrich	WILMINGTON	vgingrich@wilmingtonma.gov	VG
Paul Alunni	"	palunni@wilmingtonma.gov	PAA


Legend
1 inch = 0.5 miles
Model River Reach
Mystic River Tributaries
Major Roads
Municipal Boundaries
10 Year 2070 Low Lying Areas Above River Elevation
10 Year 2070 Overbank Flooding Areas
10 Year 2070 Low Lying Areas Disconnected from the River
Mystic River Watershed
READING
BURLINGTON
WOBURN
WAKEFIELD
STONEHAM
MELROSE
WINCHESTER
LEXINGTON
MALDEN
MEDFORD
ARLINGTON
BELMONT
EVERETT
CAMBRIDGE
WATERTOWN

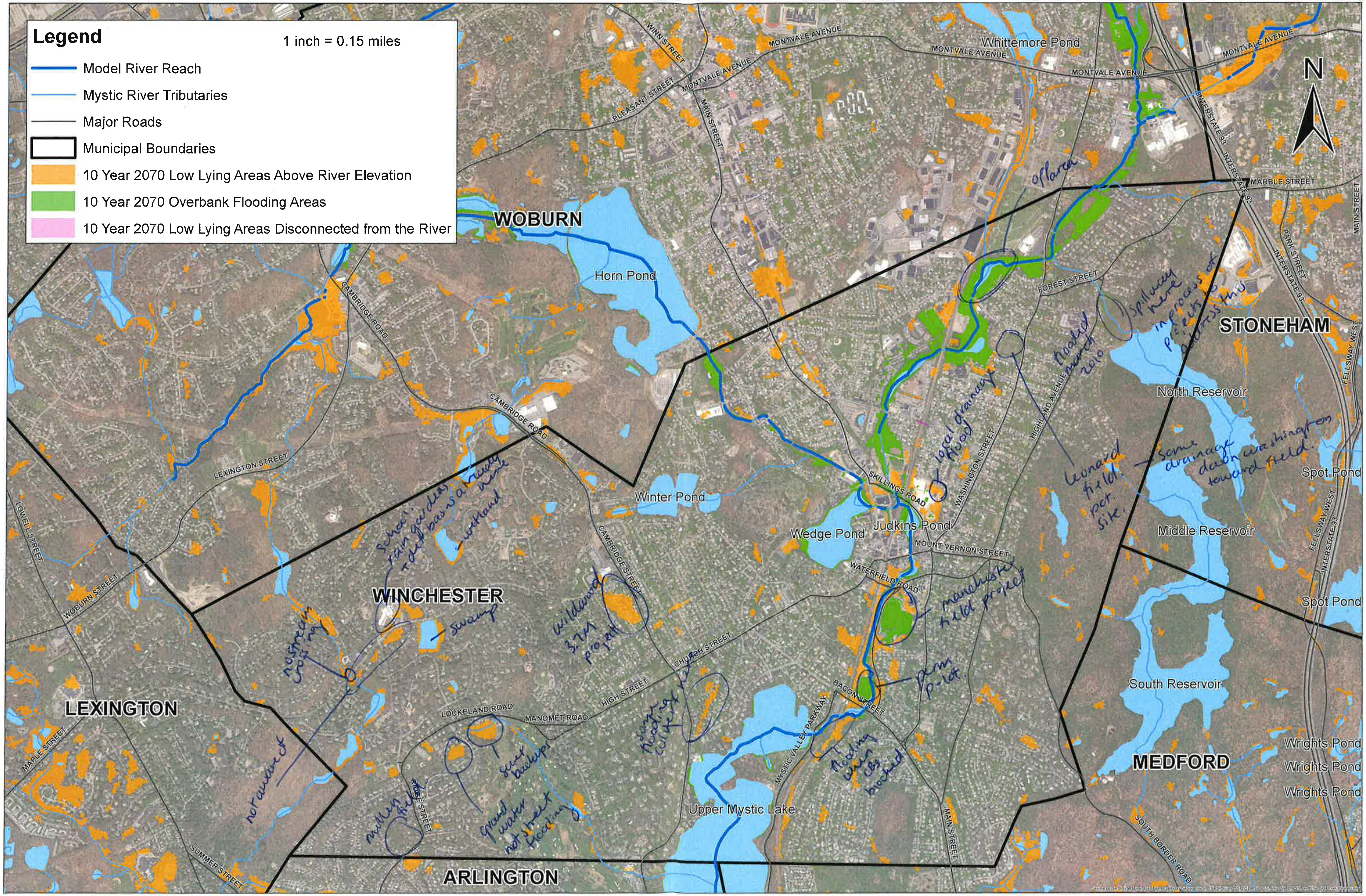
Meeting Sign-In Sheet

MVP Action Grant: Watershed-wide Analysis to Optimize & Coordinate Regional Stormwater Management in the Mystic River Watershed

Date: 9/23/2019
Time: 10:30 am
Location: Winchester Town Hall
71 Mt Vernon St
Winchester, MA 01890

Sign-In Sheet

Name	Affiliation	Phone / E-Mail	Initials
Jen Zoppo	Stantec		JZ
Beth Rudolph	Town Engineer	brudolph@winchester.us	BER
Bryan Carignan	Assistant Town Eng.	bcarignan@winchester.us	BAC
Patrick Herron	MyRWA		


Legend
1 inch = 0.15 miles
Model River Reach
Mystic River Tributaries
Major Roads
Municipal Boundaries
10 Year 2070 Low Lying Areas Above River Elevation
10 Year 2070 Overbank Flooding Areas
10 Year 2070 Low Lying Areas Disconnected from the River
N
WOBURN
WINCHESTER
LEXINGTON
ARLINGTON
MEDFORD
STONEHAM
Horn Pond
Winter Pond
Wedge Pond
Judkins Pond
Upper Mystic Lake
Whittemore Pond
North Reservoir
Middle Reservoir
South Reservoir
Spot Pond
Wrights Pond
MONTVALE AVENUE
MAIN STREET
WINN STREET
PLEASANT STREET
CAMBRIDGE ROAD
CAMBRIDGE STREET
LEXINGTON STREET
WOBURN STREET
LOWELL STREET
MAPLE STREET
SUMMER STREET
FOREST STREET
HIGHLAND AVENUE
WASHINGTON STREET
SKILLINGS ROAD
MOUNT VERNON STREET
WATERFIELD ROAD
CHURCH STREET
HIGH STREET
MANOMET ROAD
LOCKELAND ROAD
BACON STREET
MYSTIC VALLEY PARKWAY
SOUTH BORDER ROAD
MARBLE STREET
PARK STREET
INTERSTATE 93
FELLSWAY WEST

Meeting Sign-In Sheet

MVP Action Grant: Watershed-wide Analysis to Optimize & Coordinate Regional Stormwater Management in the Mystic River Watershed

Date: 9/17/2019
Time: 10:30 - 11:45 am
Location: Woburn City Hall
10 Common St
Woburn, MA 01801

Sign-In Sheet

Name	Affiliation	Phone / E-Mail	Initials
Jennifer Zoppo	Stantec	339-832-0128 / jennifer.zoppo@stantec.com	JZ
Patrick Herron	MyRWA	781-316-3438 / patrick@mysticriver.org	PH
Len Burnham	DPW	78-897-5917	
Jay Corey	Wob Engineering	781-384-7860 - jcorey@cityofwoburn.com	JEC
Matt Barrett	Engineering	781-897-5883 mbarrett@cityofwoburn.com	MB

operable unit 2 (EPA) Joe Lemay superfund site.

Legend

1 inch = 0.25 miles

- Model River Reach
- Mystic River Tributaries
- Major Roads
- Municipal Boundaries
- 10 Year 2070 Low Lying Areas Above River Elevation
- 10 Year 2070 Overbank Flooding Areas
- 10 Year 2070 Low Lying Areas Disconnected from the River

WILMINGTON
READING
BURLINGTON
WOBURN
STONEHAM
LEXINGTON
WINCHESTER
Upper Woburn Street Pond
Lower Woburn Street Pond
Mill Pond
Lake Quannapowitt
Whittemore Pond
Butterfield Pond
Horn Pond
Winter Pond
Wedge Pond
Judkins Pond
North Reservoir
Middle Reservoir
South Reservoir
Spot Pond
Doleful Pond
MAIN STREET
EAMES STREET
WOBURN STREET
LOWELL STREET
WILLOW STREET
WEST STREET
SALEM STREET
JOHN STREET
MERRIMAC STREET
NEW BOSTON STREET
INTERSTATE 93
YANKEE DIVISION HIGHWAY
HOPKINS STREET
NORTH STREET
OLYMPIA AVENUE
MISHAWUM ROAD
BROADWAY
ROUTE 3
ROSBY DRIVE
BURLINGTON ROAD
BEDFORD STREET
TERRACE HALL AVENUE
CENTER STREET
WINN STREET
PAGE ROAD
BURLINGTON MALL ROAD
WAYSIDE ROAD
BLANCHARD ROAD
RT 3 - INTERSTATE 95 SB CD ROAD
WHEELER ROAD
CAMBRIDGE ROAD
MONTVALE AVENUE
PLEASANT STREET
WILLIAM STREET
ELM STREET
SPRING STREET
FRANKLIN STREET
WASHINGTON STREET
FOREST STREET
SUMMER STREET
MARBLE STREET
PARK STREET
SOUTH STREET
POND STREET
HIGHLAND AVENUE
CHURCH STREET
GROVE STREET
LEXINGTON STREET
ADAMS STREET
LOWELL STREET
WORTHEN ROAD
HANCOCK STREET
FELLSMAY WEST

N

crunberry bog

congested culvert 4 corners

Task 2
Supporting Documentation

Upper Mystic Stormwater Working Group January workshop Moderator Guide

Moderator guide

Overall goals

1. **Assess + confirm whether the criteria selected for prioritization are aligned with MVP goals and facilitate the selection of most compatible parcels for addressing flooding.**
2. **Confirm whether the preliminary identification of top-ranking parcels using the proposed criteria and ranking make sense based on the unique knowledge of the municipalities.**
3. **Discuss/assess if parcels that ranked highly across multiple criteria best represent most compatible sites. (See printed large 11"x 17" table)**
4. **As informed by the analyses, what is your group's recommendation for weighting criteria to select the final 20 parcels to be investigated further.**

Leading questions (prioritization):

- How should the final 20 Opportunities considered for this MVP project be selected, i.e. should all 20 be selected using the same criteria, or diversify (e.g. select 10 Opportunities based on 'X', select other 10 based on 'Y')?

- It is assumed (based on size of Opportunity and other GIS attributes) that "Suitable" parcels can produce a regional flood benefit experienced by downstream communities, however this cannot be modeled at this stage for each individual Opportunity. Does it make sense to prioritize projects in the upper watershed municipalities (via weighting methods, or other)? I.e. "upper watershed communities benefit locally from the project, downstream communities benefit via regional flood benefit"

- Similarly, should larger Opportunities (i.e. based on acreage) be prioritized – assuming a larger regional benefit can be achieved?

- Should more priority be given to parcels (potential projects) that can be proposed/designed in the immediate next MVP Action Grant (spring 2020) cycle? Or also include project opportunities that may have greater benefit but require more coordination (e.g., consider Article 97 protected sites, contiguous parcels, land acquisition, or other).

Leading questions (methodology/criteria):

- Does the suitability analysis and draft scoring accurately reflect conditions across parcels of different sizes – or is additional analysis required for large parcels (i.e., are portions of large parcels suitable but not considered by current scoring)? Which ones?

- Are any co-benefits, or criteria missing at this stage (across all 'Suitable' parcels)?
    - Ease of Implementation - Degraded lands, hazardous or contaminated sites, or low-quality habitat that could be restored that can make good candidate sites (good data source for Upper Mystic?)
    - Connectivity –should MyRWA existing/proposed greenway data also be considered explicitly in scoring?

- Are there any land uses or existing conditions types that should be removed from analysis altogether as Non-Suitable (e.g. cemeteries, utility easements, dumps, other?)

Supporting Documentation

Upper Mystic Stormwater Working Group meeting minutes

Resilient Mystic Collaborative
Upper Mystic Working Group
October 30, 2019 | 10:00am - 12:00pm
Arlington Town Hall
730 Massachusetts Ave, Arlington, MA 02476
Meeting Minutes

MEETING OBJECTIVES

- Determine criteria for ranking potential green infrastructure projects and confirm timeline
- Discuss goals, scope, timeline for concurrent EPA-funded project to incorporate green infrastructure into hazard mitigation plans and capital improvement plans

ATTENDEES:
Matt Barrett (Woburn), Melissa Surette (FEMA), Myra Schwartz (EPA), Claire Moss (Wakefield), Bryan Carignan (Winchester), John Keeley (Burlington), Mike Sprague (Lexington), Alicia Hunt (Medford), Patrick Herron (MyRWA), Sarah White (MEMA), Ray Cody (EPA), Andy Hrycyna (MyRWA), Darya Mattes (Groundworks Somerville), Jennifer Relstab (Horsley Witten), Arleen O'Donnell (ERG), Suzanne Warner (EPA), Francesca DeBenedictis (Boston Water & Sewer), Charlie Jewell (Boston Water & Sewer), Indrani Ghosh (Weston & Sampson), Kyle Johnson (Kleinfelder), Emily Sullivan (Arlington), Carri Hulet (CBI)

10:00	**Overview of MVP and EPA projects** ▪ MVP project objectives include: update stormwater model, create a methodology for selecting sites for large GI projects, identify 20 GI project locations, select ~6 GI project locations for 10% conceptual design ▪ EPA project objectives include: incorporate GI into the capital planning and hazard mitigation planning efforts
10:10	**MVP project** ▪ In Fall 2019, there were 16 community check-ins to ground truth model, updating model based on community check-ins and data provided by municipalities ▪ In addition to model, identifying parcels in Upper Mystic (above dam) for large GI o Parcels selected are: publicly owned (local, state, etc.), open space or vacant, larger than 3 acres or are contiguous with other open/vacant parcels that total to 3 acres o MEMA recommended looking into private parcels as well o List of ~300 parcels with these characteristics, need to finalize the categories/criteria to shorten list to 20 parcels o Categories include: Technical, Social Resiliency, Environmental, Governance, and Economic o Group will discuss and finalize categories at 1/22/2020 meeting ▪ GI projects will prioritize retention, but may have infiltration, water quality, and urban heat island mitigation co-benefits
10:50	**EPA project** ▪ EPA project is coordinating with the MVP project to use identified GI sites for capital and hazard mitigation planning

	▪ Will ask municipalities if they are interested in technical assistance to include GI in capital planning/capital improvement plans ▪ Will use the list of 20 GI sites to identify which municipalities are eligible for technical assistance to include these GI sites in their hazard mitigation planning o Technical assistance may also include tips for applying for FEMA grants to design/construct GI
11:40	**Action Items/Next Steps** ▪ Meeting on Tuesday, 1/22/2020 in the Arlington Health and Human Services Conference Room, located on the 2nd floor of the Arlington Senior Center, 27 Maple Street (the meeting room is one floor below MyRWA's office)
11:45	**Adjourn**

Resilient Mystic Collaborative
Upper Mystic Working Group
November 19, 2020 | 9:30-11am
Virtual Meeting through Zoom
Meeting Minutes

MEETING OBJECTIVES:

- Review Phase 1 Top 6 sites and select Top 3
- Review draft Phase 1 Model

ATTENDEES:

Matt Barrett (Woburn), Michael Sprague (Lexington), John Livsey (Lexington), Tim McGivern (Medford), Emily Sullivan (Arlington), Alex Rozycki (Reading), Charlie Jewell (Boston Water & Sewer), Tom Philbin (Everett), Catherine Woodbury (Cambridge), Patrick Herron (MyRWA), Catherine Pedemonti (MyRWA), Julie Wormser (MyRWA), Kyle Johnson (Kleinfelder), Chris Balerna (Kleinfelder), Hilary Holmes (Hatch), Indrani Ghosh (Weston & Sampson), Mike DuPont (Stantec), David Van Hoven (Stantec), Stefani Harrison (Stantec).

9:30	**Welcome**
9:35	**Select Top 3 Sites** ● Municipalities presented the site concepts for the top 6 sites. E. Sullivan presented for Arlington and stated that Arlington should be in sites #4-6 because additional design work was needed to resolve the site constraints of an MWRA sewer line through the site. M. Sprague presented for Lexington and stated that Lexington should be in sites #1-3 because the Town was ready to proceed with the project and there was community support. A. Rozycki presented for Reading and stated that Reading should be in sites #1-3 because Town stakeholders were supportive and the site is located upstream in the upper watershed. T. McGivern presented for Medford and stated that Medford should be in sites #4-6 because the private property owner was unresponsive to recent outreach from the City. T. Philbin presented for Everett and stated that Everett should be in sites #1-3 because City stakeholders were supportive, the private property owner was supportive, and the adjacent area is in the process of designing restoration efforts and shoreline improvements. M. Barrett presented for Woburn and stated that Woburn should be in sites #1-3 because City stakeholders were supportive and Woburn has experience in managing similar projects.

	● Municipal representatives present voted three times for their top three sites. Only one municipal representative from each municipality voted. The vote results were as follows: **Lexington** — **6** **Reading** — **5** **Woburn** — **5** Everett — 2 Based on the voting results, the top 3 sites were identified as Lexington, Reading, and Woburn. ● M. Sprague and E. Sullivan summarized the final steps for Phase 1, and the next steps for Phase 2 of the project. The final steps for Phase 1 include today's presentation by the Consultant Team on the modeling results of the top 6 sites and active reservoir management. Phase 1 draft deliverables will be circulated to municipal representatives in early December, and Phase 1 will wrap up on December 15, 2020. Phase 2 is underway, and the top 6 sites are currently being surveyed and delineated. These surveys and delineations will be used for the sites #1-3 design and permitting which will occur in Phase 2, and for sites #4-6 design which will occur in Phase 3 (future MVP funding needs to be pursued). An RFP for the design and permitting of sites #1-3 will be released on 11/27/2020 to hire a consultant for Phase 2.
10:10	**Phase 1 Modeling Results** ● M. DuPont presented the initial modeling results of the top 6 sites and active reservoir management. Overall, the model did not show tremendous impact with the construction of the top 6 constructed wetlands. The model did not estimate stormwater quality benefits, which are a significant co-benefit. Ultimately, the model showed that stormwater flooding could be mitigated more successfully by reducing directly connected impervious areas (DCIAs) by 30% across the watershed. DCIA reduction can be achieved by constructing wetlands and routing stormwater to the wetlands through drainage improvements, and by de-paving areas (using porous pavement options, vegetating, etc.). ● C. Jewell commented that bringing down flooding (e.g. from 2 feet to 6 inches) should be considered successful even if flooding is not completely mitigated. K. Johnson added that where flooding occurs also matters, and that "not all flooding is created equal". The Working Group agreed that this model was successful in guiding the watershed to explore best ways to manage flooding. More work will

	need to be done to determine how and where exactly flooding can be best managed to do the least harm.
11:00	**Adjourn**

Resilient Mystic Collaborative
Upper Mystic Working Group
January 22, 2020 | 9:30am - 12:00pm
Arlington Senior Center, Health and Human Services Conference Room, Second Floor
27 Maple Street, Arlington, MA 02476
Meeting Minutes

MEETING OBJECTIVES:

- Confirm clarity on project goals and schedule
- Finalize the methodology
    - Confirm scoring criteria and changes to land use categories
    - Finalize approach for selecting final sites

ATTENDEES:

Matt Barrett (Woburn), Bryan Carignan (Winchester), Michael Sprague (Lexington), Tim McGivern (Medford), Emily Sullivan (Arlington), Francesca DeBenedictis (Boston Water & Sewer), Charlie Jewell (Boston Water & Sewer), Cathy Watkins (Cambridge), Catherine Woodbury (Cambridge), Patrick Herron (MyRWA), Andy Hrycyna (MyRWA), Julie Wormser (MyRWA), Nathalie Beauvais (Kleinfelder), Kyle Johnson (Kleinfelder), Chris Balerna (Kleinfelder), Bella Purdy (Kleinfelder), Jen Zoppo (Stantec), Hilary Holmes (Hatch), Kalila Barnett (Barr Foundation), Nina Mascarenhas (MIT).

9:30	**Intros, welcome new participants**
9:45	**Overview of MVP project** ▪ MVP project objectives include: update stormwater model, create a methodology for selecting sites for large GI projects (i.e. constructed wetlands), identify 20 GI project locations, select ~6 GI project locations for 10% conceptual design and impact modeling ▪ Next MVP grant cycles: April/May 2020 and April 2021 ▪ **Task 1:** calibrate watershed-scale model stormwater model through community check-ins and municipal GIS infrastructure data ▪ **Task 2:** GIS analysis of potential GI sites ▪ **Task 3:** identification and consensus prioritization of sites (purpose of this meeting) ▪ **Task 4:** Field assessments of potential sites ▪ **Task 5:** 10% concept design for select sites ▪ **Task 6:** active reservoir management assessment ▪ **Task 7**: final report
10:50	**Suitable Sites for Green Infrastructure [Pre-sorting]** ▪ Changes made to criteria discussed during 10/30/2019 meeting include: using local Assessor's data to supplement MassGIS land use codes, inclusion of private parcels with consent of municipalities, other parcels identified by municipalities ▪ Approximately 465 parcels identified with new criteria, list cut down to 114 parcels for this meeting based on four criteria: 1) within/adjacent to FEMA

	100-year floodplain, 2)within/adjacent to watershed model's 2070 10-year overbank flood area, 3) shallow bedrock depth (<1ft), and 4) flatter sites (slopes <6%) ▪ Participants thought the four criteria might be too restrictive if a large parcel was sorted out due to slope/bedrock and only part of the site had deep bedrock or steep slopes ▪ The 4 categories of criteria identified to prioritize sites are: hydrology, environmental justice & equity, connectivity, and cost/feasibility of implementation ▪ These 4 categories contain a total of 14 unique criteria, which can be weighted differently to prioritize site list
	Refined Scoring Criteria for Prioritizing Sites ▪ Meeting broke out into three groups to review 14 criteria and list of project sites: Group #1, Group #2, Group #3 ▪ Group #1 (Nathalie Beauvais, Catherine Woodbury, Michael Sprague, Charlie Jewell, Emily Sullivan, Jen Zoppo) o Group #1 agreed that the hierarchy of categories should be: hydrology, cost/feasibility of implementation, and political & public acceptance o The 2 co-benefit categories environmental justice/equity and connectivity are less important than 3 categories above o The group asked if sub-watersheds could be modeled to determine which sub-watershed is most impactful and look particularly at projects in that area ▪ Group #2 (Bryan Carignan, Matt Barrett, Bella Purdy, Andy Hrycyna, Hilary Holmes) o Group #2 thought that the slope and bedrock criteria may be too restrictive, and that large parcels shouldn't be ruled out based on an average slope/depth o Floodplain proximity may also be restrictive especially if only part of a parcel is in the floodplain o The GI site list requires more sorting based on use (parking lot, playing field, cemetery, etc.) o Group #2 agreed that the hierarchy of categories should be: hydrology, cost/feasibility of implementation, public acceptance, co-benefits o The group asked if there is any information on existing wetlands and current function/quality of habitat ▪ Group #3 (Patrick Herron, Francesca DeBenedictis, Cathy Watkins, Chris Balerna, Tim McGivern) o Group #3 thought that the bedrock criterion may be too restrictive o Parking lots at schools are unrealistic for GI sites

	○ Adjacency to open space may be important for private parcels ▪ Kleinfelder reminded the group that this site identification is focused on finding large parcels for 3 acre constructed wetlands, though the list includes sites that are good opportunities for green/grey infrastructure. Communities will get the list of these opportunities so that they can pursue these smaller scale projects with high local impact independently ▪ Participants were interested in the proximity of opportunities and abutting parcels ▪ Participants were interested in seeing an environmental justice map of the watershed for context ▪ Participants were interested in understanding which sites have direct discharge to the Mystic River versus sites with remote storage capacity but not direct discharge. Connectivity to the Mystic Channel is not an existing site selection criterion, but wondered if it should be considered ▪ Next steps include refining criteria based on feedback and culling list to ~40 sites ▪ The next MVP grant application will be due sometime in April/May, the Working Group has to decide how to move forward with funding the projects identified
	Update on Task 6: Active Reservoir Management Assessment ▪ Opti (subcontractor) is identifying the 10 most suitable reservoirs for active management ▪ Opti is still determining the scope of a feasible model (e.g. depth lowered, how far in advance, etc.)
11:40	**Action Items/Next Steps** ▪ Next steps include refining criteria based on feedback and culling list to ~40 sites ▪ The next Working Group meeting will be in March to review the list of ~40 sites and select the top 6 ▪ At the March meeting the Working Groups will also determine next steps for funding (i.e. the next MVP grant)
11:45	**Adjourn**

Resilient Mystic Collaborative
Upper Mystic Working Group
May 4, 2020 | 2:30-4pm
Virtual Meeting through Zoom
Meeting Minutes

MEETING OBJECTIVES:

- Select the final 6-10 sites for 10 % concept design
- Discuss next steps for prioritized sites, additional grant opportunities, and active reservoir management

ATTENDEES:

Jay Corey (Woburn), Matt Barrett (Woburn), Tim McGivern (Medford), Beth Rudolph (Winchester), Bryan Carignan (Winchester), Catherine Woodbury (Cambridge), John Bolduc (Cambridge), John Livsey (Lexington), Michael Sprague (Lexington), Emily Sullivan (Arlington), Alex Rozycki (Reading), Yem Lip (Malden), Elena Proakis Ellis (Melrose), Julie Wormer (MyRWA), Patrick Herron (MyRWA), Ona Ferguson (CBI), Carri Hulet (CBI), Chris Balerna (Kleinfelder), Kyle Johnson (Kleinfelder), Nathalie Beauvais (Kleinfelder), Indrani Ghosh (Weston & Sampson), Stef Harrison (Stantec), Sara Burns (The Nature Conservancy)

2:30	**Welcome and Introductions**
2:40	**Project Overview** ● Quick overview of grant goals and project context
2:45	**Selection of Top 6-10 Sites** ● Participants narrowed the 18 potential sites to 6-10 through discussion of criteria and joint deliberation ● Folks on board with suggestion to think of these 18 projects as a pipeline (regional capital improvement program) and to frame that in the MVP proposal (see end of raw notes below with lots of bullets for MVP team to review) ● Next step: Technical team assess results of breakout group conversations as captured in this document. Choose top 6 to evaluate in the model. Some considerations: ○ Probably pick no more than one per municipality, but exceptions would be if the community has signaled they might have capacity/interest to move forward more than one and the project is likely to provide meaningful regional benefit

	○ Think about/assess total impact from the set of selected projects getting done (i.e. is the whole greater than the sum of its parts, depending on how you group and sequence the projects?) Feedback from Breakout Group #1: ● No more than two sites per municipality. More than one could advance, if muni has capacity ● Folks on board to move forward all the projects as a pipeline ● Some good feedback on readiness: The Woburn project has superfund issues, so might not be as ready. ● Davidson park is moving forward ● All the Lexington ones are clustered, so one of these might tackle the same drainage as others. ● Melrose: Franklin field. Feedback from Breakout Group #2: ● Good discussion on the weighting of the criteria ● Experimented with criteria weighting ● Got feedback from Woburn, Reading, and Medford. ● Designing more than two in a single municipality would be a hurdle for a community ● West Street and the other Reading site both are article 97 sites. ● Medford: Mystic Valley Parkway, possible issue would be how to get local benefit. Building infrastructure there would be a challenge. ● How we could grant them by year of implementation. ● Two qualities: intrinsic quality and readiness. If we tried to do all of them - six per year - we could say what's ready now, what's ready next year, and in two years. Need to work on a pipeline. How easy will it be to implement. Feedback from Breakout Group #3: ● Challenge for technical team. As we looked through top-ranked sites, we got concerned that Woburn's top site, connected to Horn Pond, which is storage already. If already connected to something that stores would be more beneficial than something that stores farther downstream. Might change the ranking a bit. ● One thing that's unknowable now is that, when you get to the modeling, you'll see how much actual regional benefit it brings. Need to think a little differently about the hydrology ranking.

3:40	**Updates and Next Steps** For group to discuss/sort out: ● Articulate the pipeline. Show that these first six (or so) are just the first steps. Show how others follow. ● Regional capital improvement program: Name how the whole set of projects might move the needle over time (based on all criteria) through big projects, then small projects, then zoning, etc. ● Understand what we'll know by the end of the current grant (total volume decrease for the first six projects) ● Build out an understanding of the funding pool to fund the pipeline? ● One per community? ● Regional benefits. ● Show that equity is big part of analysis. ● Readiness big part of sequencing ● Try to get 6 to [XX%] design by June 2022 (lots of discussion about how far you might get...consultants saying no way 100% design even for a 2-year grant, maybe 50-75%, requires more discussion) ● Articulate what will be needed by the municipalities. ● Ask MVP if they would allow multiple municipalities to match with labor (to avoid budget/town meeting issues)
4:00	**Adjourn**

Appendix N

Task 4 Site Investigations Recap Notes and Photos

Image credit: Kleinfelder

Mystic River Watershed Association

Cambridge Department of Public Works

cbi Consensus Building Institute

KLEINFELDER Bright People. Right Solutions.

Stantec

Weston & Sampson

HATCH

Watershed-wide Analysis to
Optimize & Coordinate Regional Stormwater Management in the Upper Mystic River

Project Update:

Results of candidate green infrastructure site investigations & next steps

7 OCT 2020

Image source:
Boston Globe
(June 2018: "Gearing up for climate change along the Mystic River")

Field investigations (15 sites visited):

Arlington – Meadowbrook Park

Lexington – Butterfield/Maple St (Harrington School), Orchard Ln

Everett – 1-2 Mystic View Rd 'Gateway' (private parcel)

Melrose – Franklin Field

Medford – former radio tower site along Mystic Valley Pkwy (private)

Reading – West St/Xavier-Aberjona parcels, Maillet Sommes land, Linneca Thelin bird sanctuary, conservation parcels at end of Longwood Rd/Arnold Ave

Winchester – Davidson Park

Woburn – 75 Bedford Rd (former Hurld Elementary), Commerce Way Lot 2, Cranberry Bog Conservation Area

Top 6 sites (August 2020)
& pilot concept development (ongoing)

Lexington - Butterfield/Maple St (Harrington School)

- **Pros**
  - watershed location (Pheasant Brook, upstream reach of Mill Brook draining to Arlington Reservoir)
  - 5+ acres of opportunity space
  - potential to alleviate local flooding near Solomon Pierce Rd
  - good opportunity for community education opportunity (Harrington School)

- **Cons**
  - Size of wetland opportunity may be limited by upstream drainage area
    - Maple and Lowell Streets are MassDOT alignments (potential headache if re-routing drainage from these streets)


FLOODING
Waverley
Square Daycare
Shattuck Ace Hardware
Woburn St
Town—owned parcel
(not Article 97 Open Space)
Harrington
Elementary School
Temporarily closed
Maple St
Lowell St
Winchester Dr
Google
Map
2D

Lexington - Butterfield/Maple St (Harrington School)

Lexington - Butterfield/Maple St (Harrington School)

Reading – Maillet Sommes land

- **Pros**
  - Localized flooding along Willow St / near Austin Prep School, Bond St and other local roads
  - large opportunity space
  - Town is actively looking to add trails, improve connectivity between school and downtown
  - good opportunity for community education opportunity
  - may be able to partner with Austin Prep future drainage improvements
- **Cons**
  - Article 97 protected open space
  - Some 12” utilities may need to be protected or rerouted

Reading – pocket headwater wetlands

Woburn - 75 Bedford Rd (former Hurld Elementary)

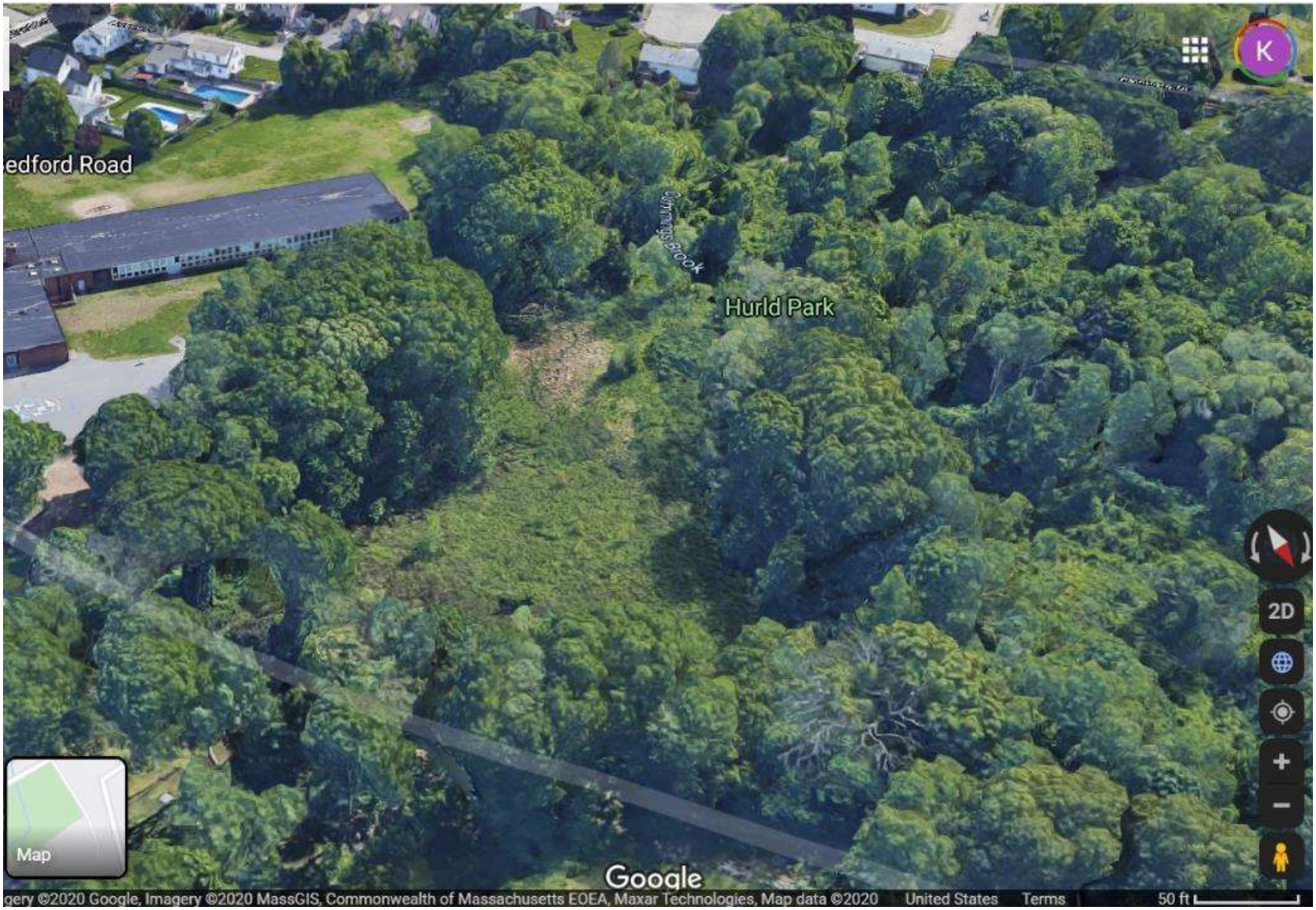
- **Pros**
  - flooding occurs both downstream and upstream of this site (along Horn Pond Brook and along historic former canal)
  - 3+ acres of opportunity space
  - limited accessible walkable trails in immediate area
  - site overall has negative community perception, Town wants building demolished and residents want green open space

- **Cons**
  - some Article 97 protections (pertaining to future open space/park)
  - pockets of existing wetland and mature vegetation communities


N
Quimby Avenue
Sheridan Street
Cummings Brook
AP-717
Bamberg Drive
Bamberg Drive
CASSIDY DRIVE
Ellison Street
Bedford Road
Woburn: 75 Bedford Rd
0 125 250 500 Feet

Woburn - 75 Bedford Rd (former Hurld Elementary)

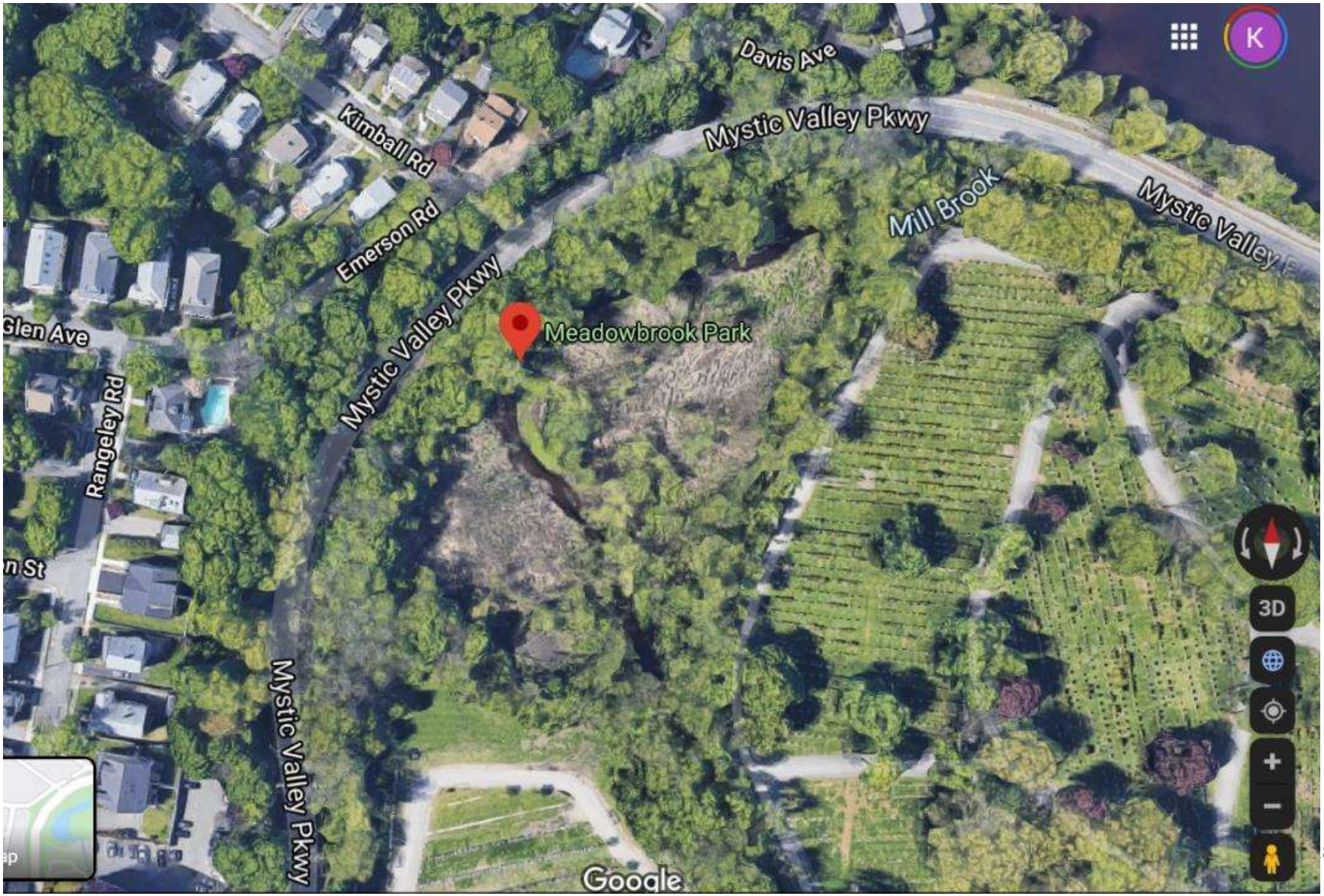
Woburn - 75 Bedford Rd (former Hurld Elementary)


edford Road
Hurld Park
Google
Map
2D
gery ©2020 Google, Imagery ©2020 MassGIS, Commonwealth of Massachusetts EOEA, Maxar Technologies, Map data ©2020
United States
Terms
50 ft

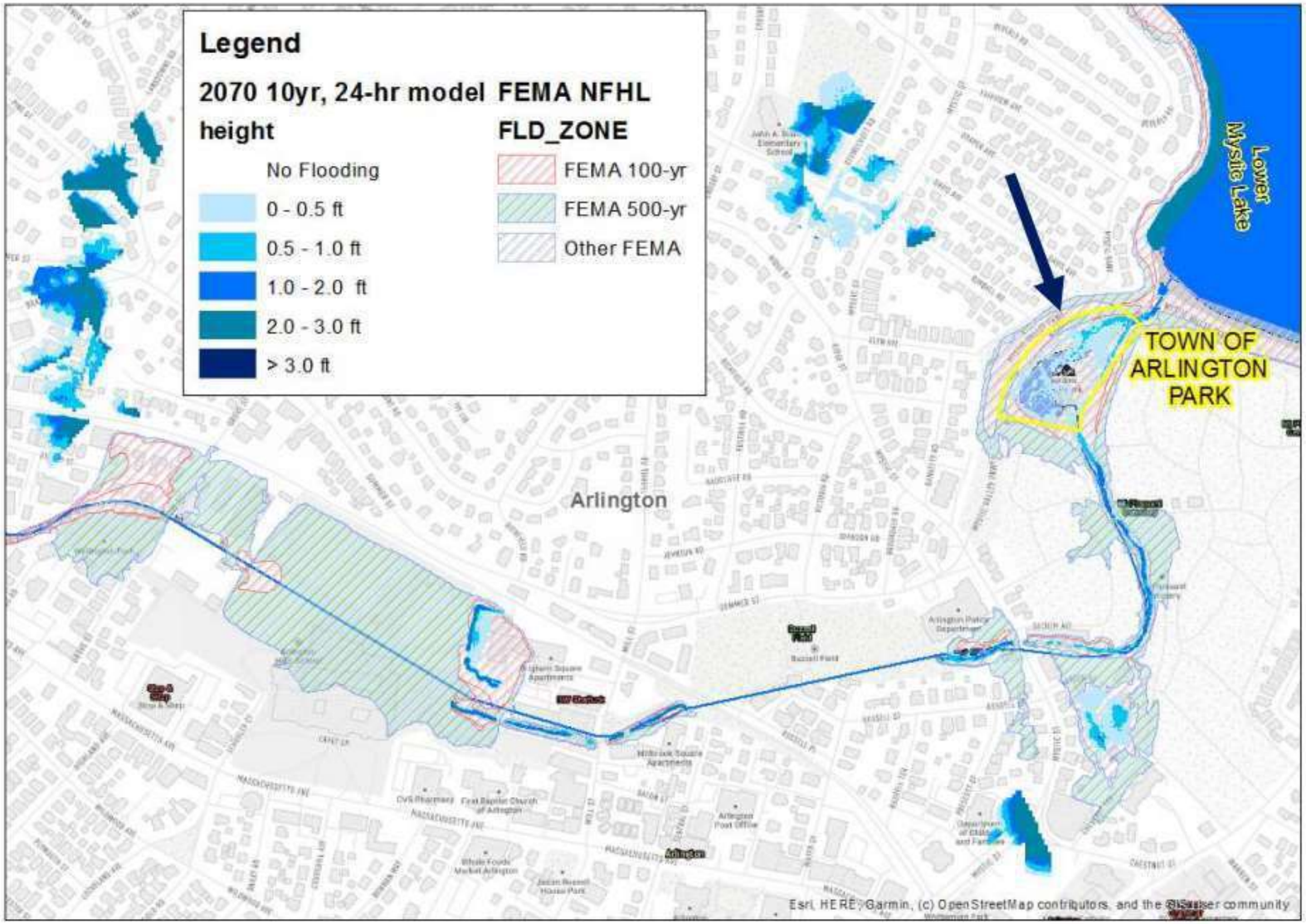
Arlington – Meadowbrook Park

- **Pros**
  - location could have immediate d/s benefit (at junction with Lower Mystic Lake)
  - Town Park could be more accessible from (most users today access through cemetery)
  - ~3 acres of storage space, if island bar can be dredged (wetland restoration)
  - would add better trail access to longest daylit portion of Mill Brook

- **Cons**
  - downstream of Arlington's worst flooding areas in channelized Mill Brook


Davis Ave
Kimball Rd
Mystic Valley Pkwy
Mill Brook
Emerson Rd
Mystic Valley Pkwy
Meadowbrook Park
Glen Ave
Rangeley Rd
Mystic Valley Pkwy
3D
Google

Site Opportunity map:



Arlington – Meadowbrook Park

public access points (via cemetery)

Arlington – Meadowbrook Park

Downstream condition

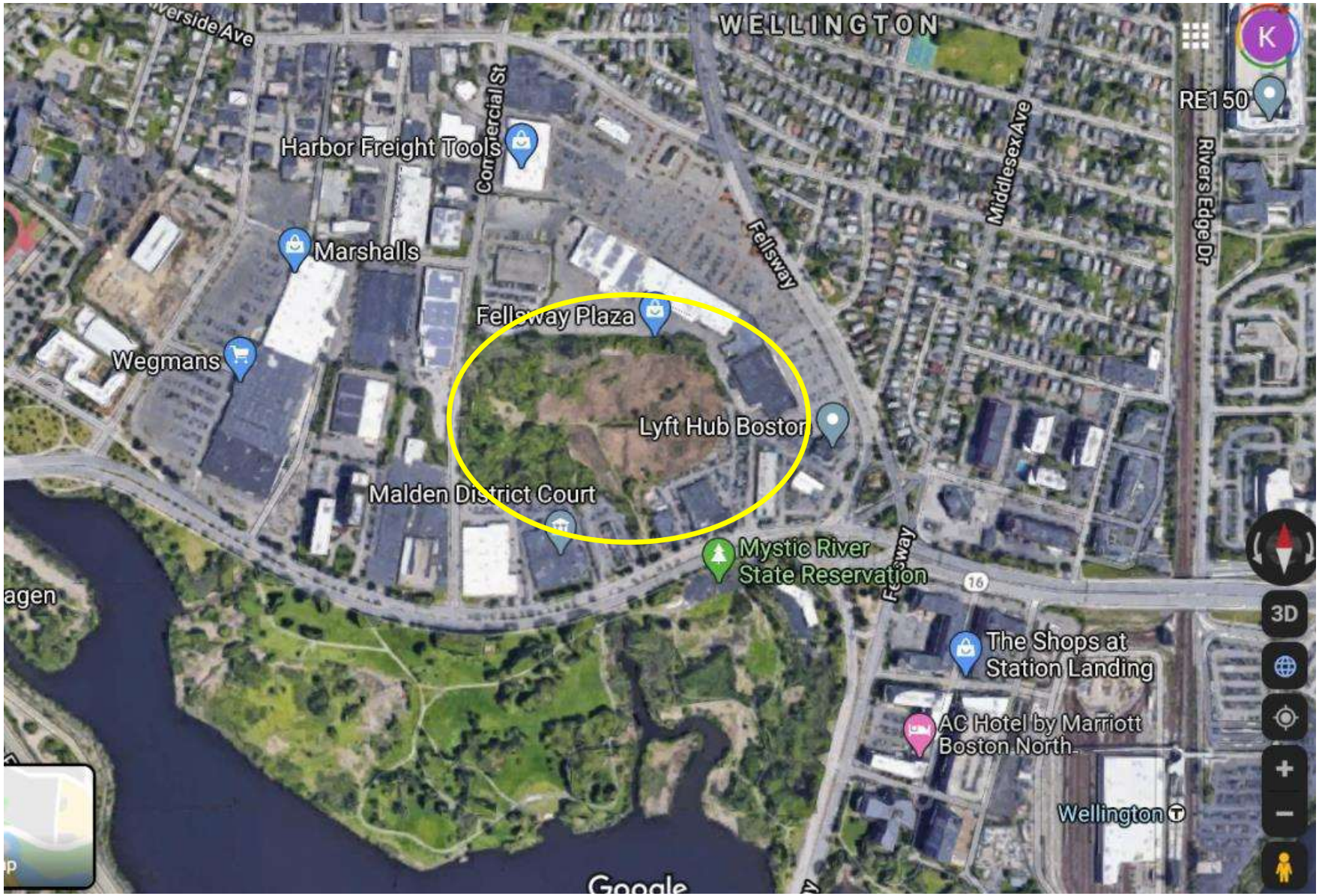
Arlington – Meadowbrook Park

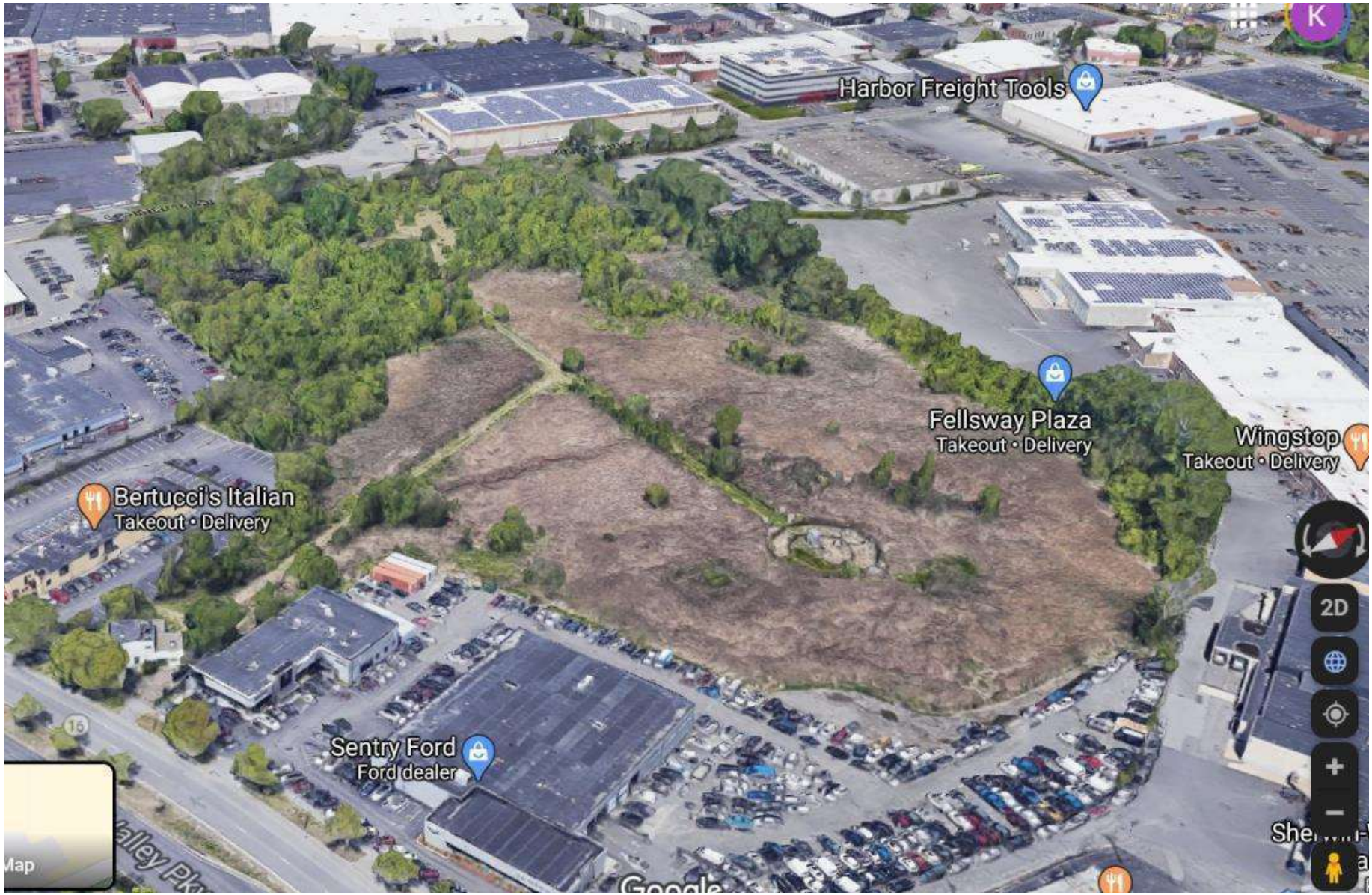
Downstream condition

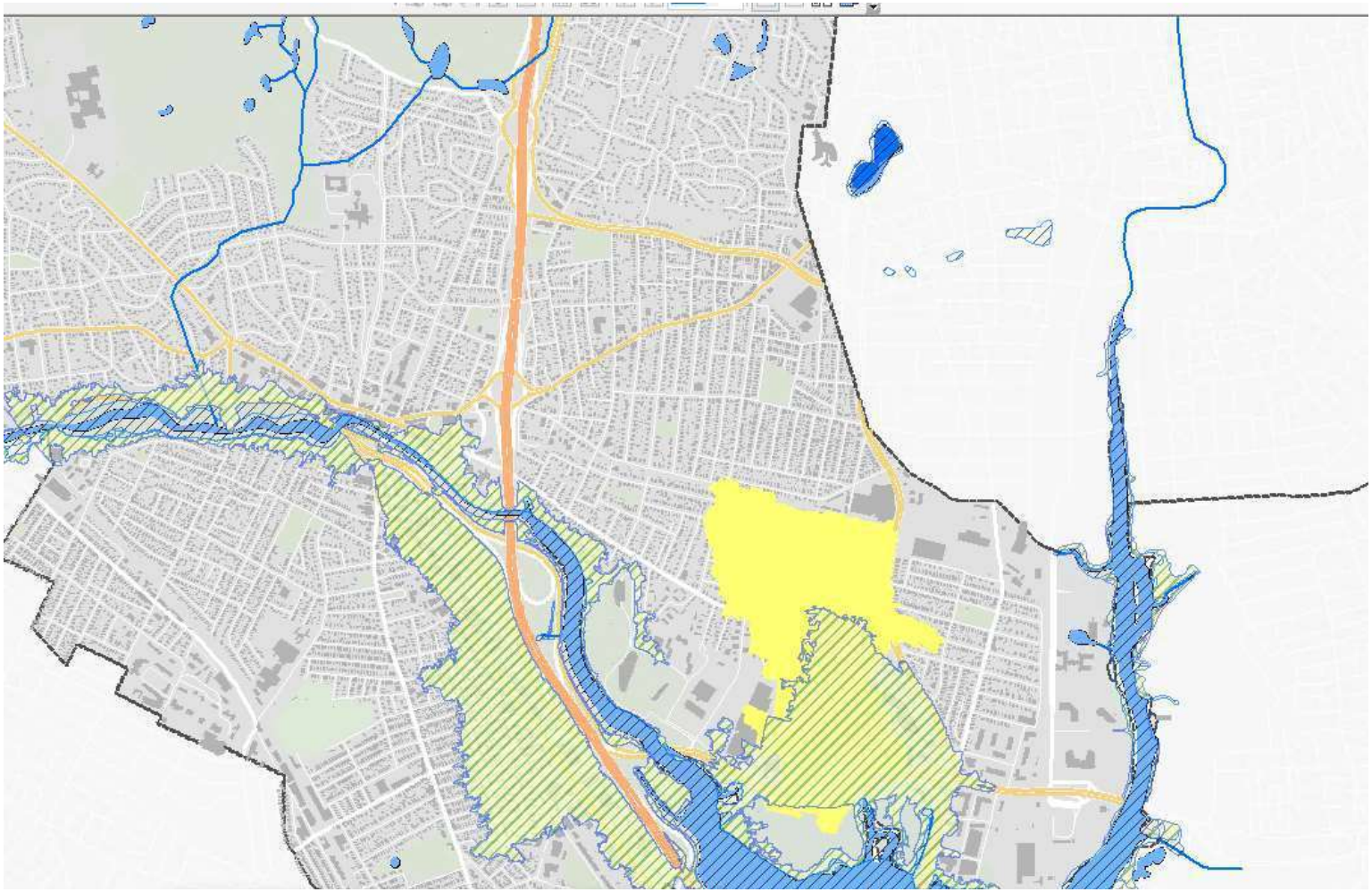
Medford – former radio tower site at 4068 Mystic Valley Pkwy, (private)

- **Pros**
  - Adjacent to lower reach of Mystic River (i.e., few flow constrictions)
  - Some places may be good for additional stormwater storage
    - existing phragmites wetlands (but dependent on elevation and drainage)
  - Potential for localized flood mitigation in upstream catchments

- **Cons**
  - Much of this site is within existing floodplain
  - The owners are looking at developing the site on existing uplands.


WELLINGTON
Harbor Freight Tools
Marshalls
Wegmans
Fellsway Plaza
Lyft Hub Boston
Malden District Court
Mystic River State Reservation
Commercial St
Fellsway
Middlesex Ave
Rivers Edge Dr
RE150
The Shops at Station Landing
AC Hotel by Marriott Boston North
Wellington
3D
Google

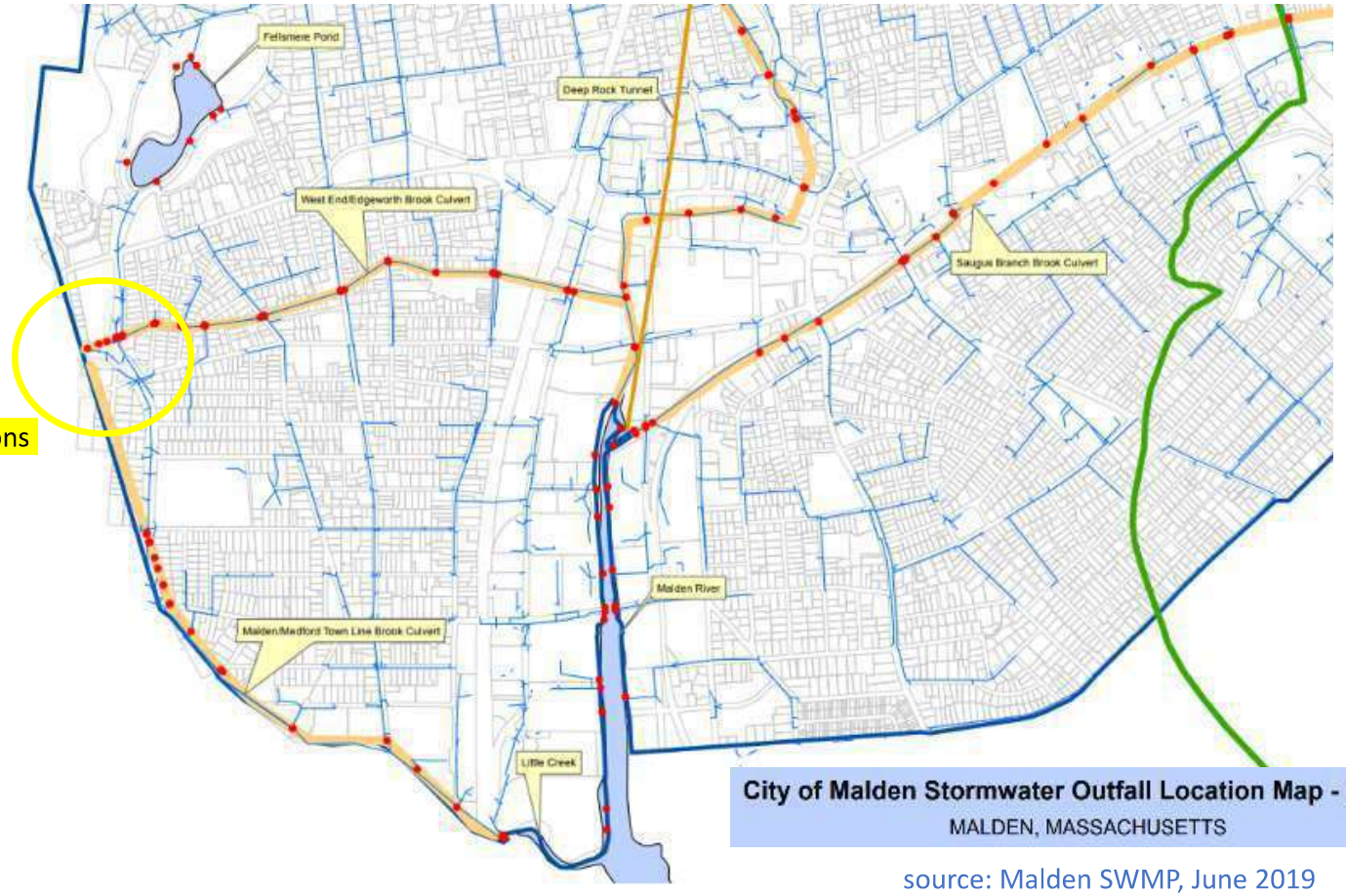

Harbor Freight Tools
Fellsway Plaza
Takeout • Delivery
Wingstop
Takeout • Delivery
Bertucci's Italian
Takeout • Delivery
Sentry Ford
Ford dealer
2D
Google



- Existing upstream drainage area is ~190-195 acres
- The site is manmade wetland area (poor condition) that is entirely within FEMA 500-year floodplain. However, it is not in the 100-year floodplain (disconnected from riverine storage by the Parkway)

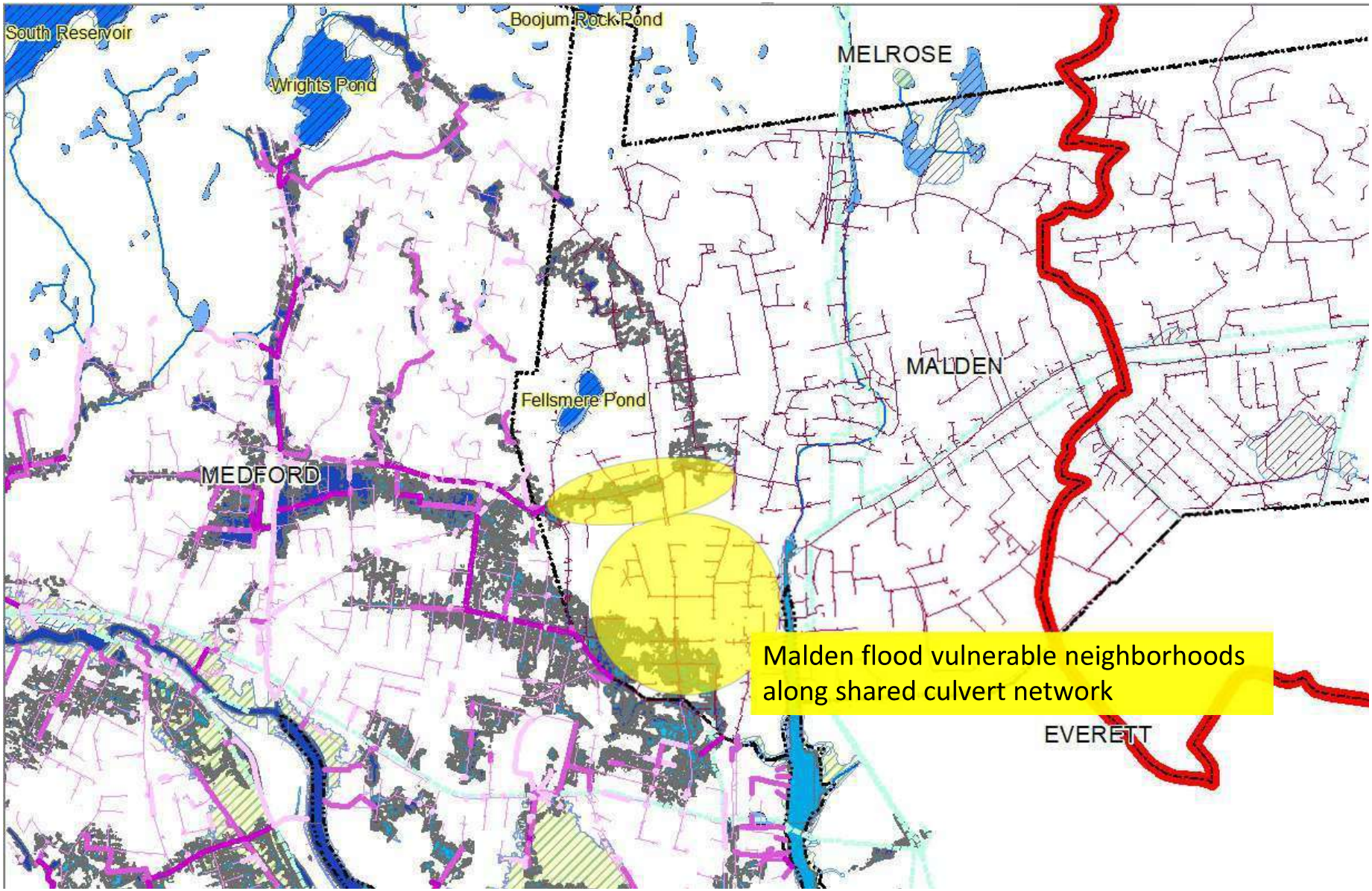
Downstream condition

Medford-Malden interconnections



Interconnections between two culverts?

source: Malden SWMP, June 2019

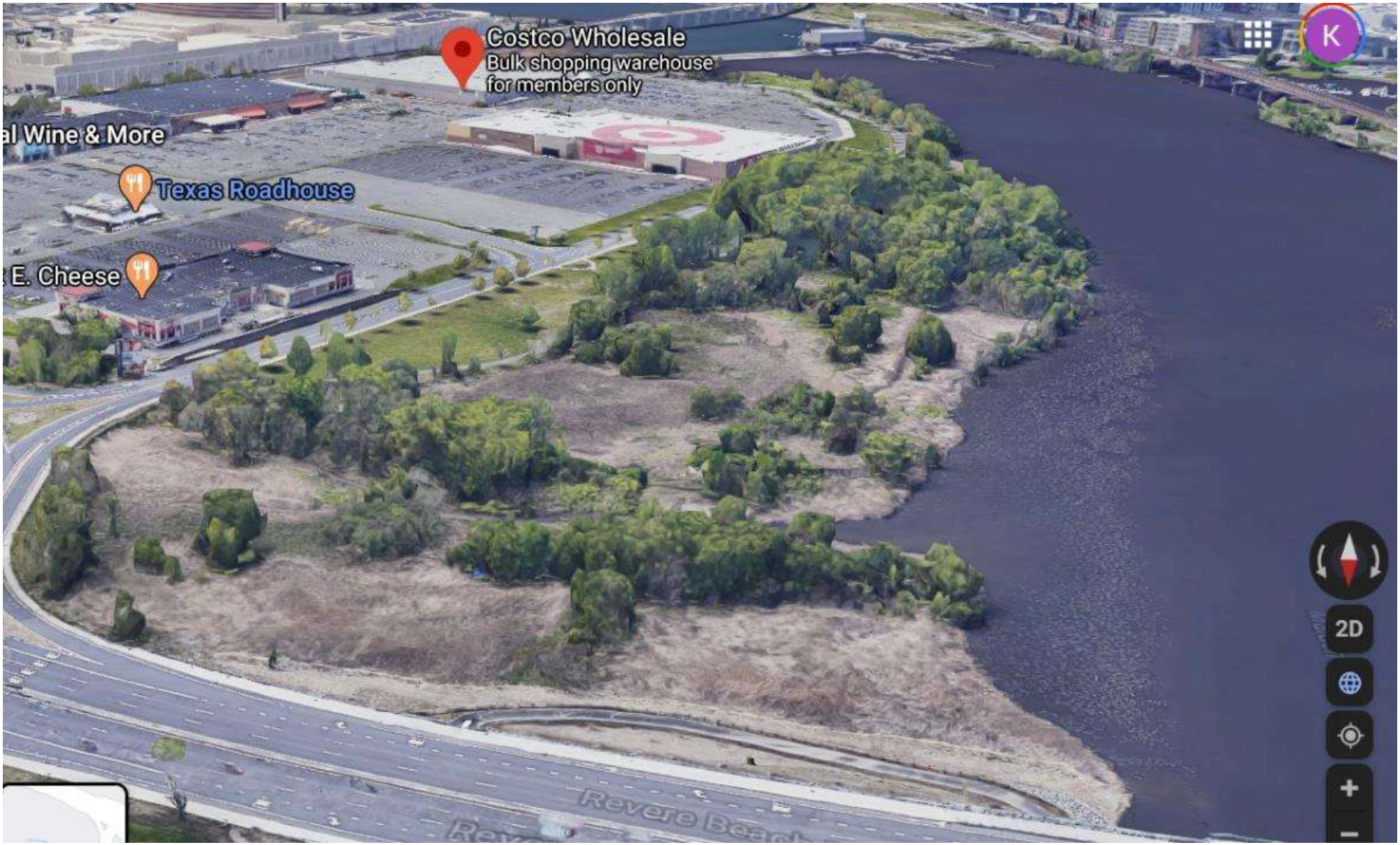

South Reservoir
Wrights Pond
Boojum Rock Pond
MELROSE
MALDEN
Fellsmere Pond
MEDFORD
Malden flood vulnerable neighborhoods along shared culvert network
EVERETT

Everett - 1-2 Mystic View Rd (private)

- **Pros**
  - non-maintained wetland fringe is almost all phragmites
    - private owner maintains pathways, occasional vegetation cutback for view of river only
  - City's Integrated Plan includes alternative
    - reroute additional 100+ acres of upstream drainage area from Spring St catchment
  - potential to improve connectivity from Amelia Earhart Dam to Malden Center/Everett Main St
  - multiple potential benefits (coastal storm protection and mitigated inland flooding, water quality)

- **Cons**
  - private owner (DDRC Gateway-Costco)
  - soil conditions (urban fill can be contaminated), would need to consider potential reuse on-site

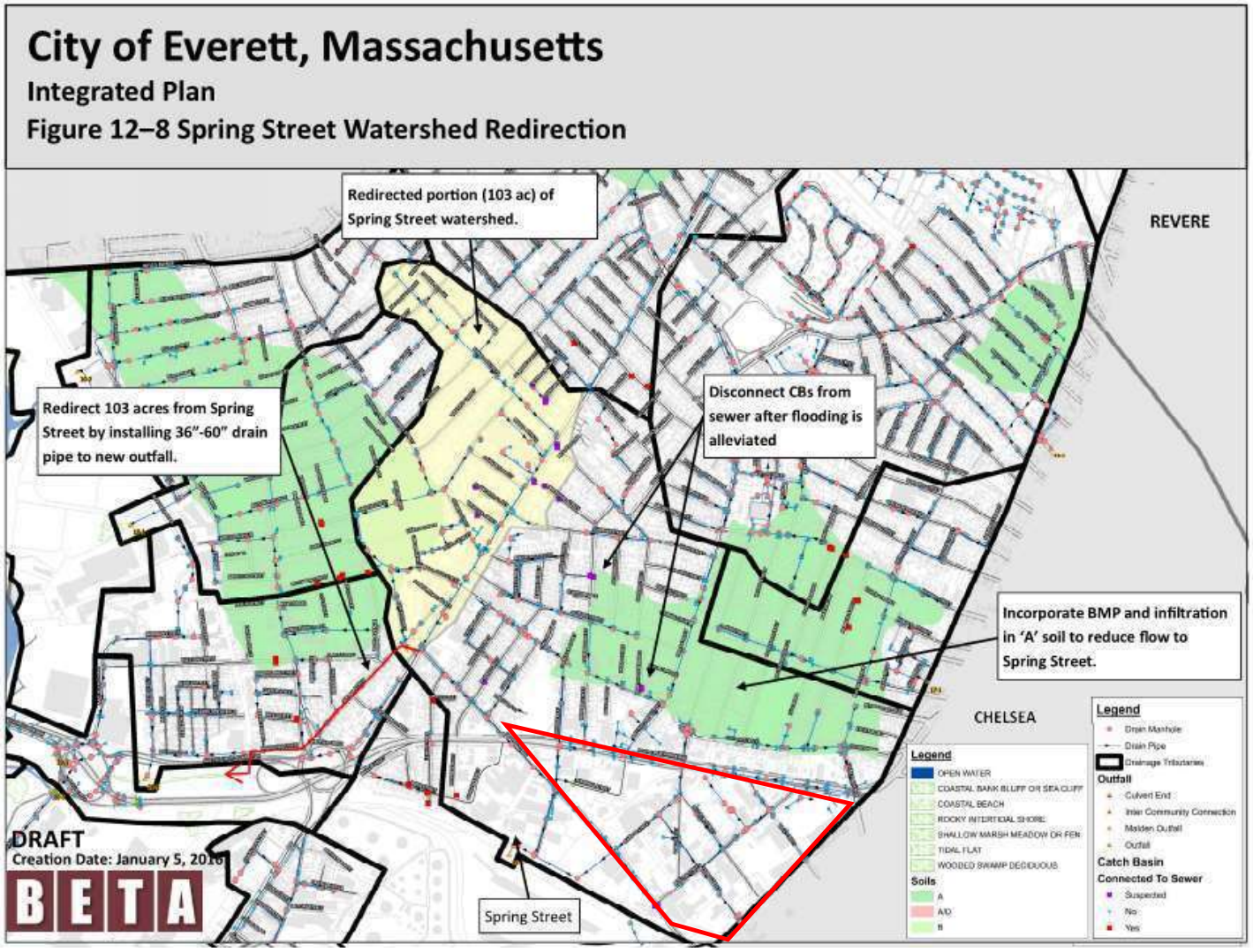
Everett - 1-2 Mystic View Rd (private)


Costco Wholesale
Bulk shopping warehouse
for members only
al Wine & More
Texas Roadhouse
E. Cheese
K
2D
Revere Beach


LARGE HILL IN PARK. CONSIDER RIVERFRONT WALKWAY ON STRUCTURE WEST OF HILL
SANTILLI CIRCLE
ENCORE BOSTON HARBOR
BNY MELLON
POSSIBLE BOARDWALK THROUGH MARSH
EXISTING PEDESTRIAN ROUTE IS NARROW AND ADJACENT TO A BUSY TRAFFIC ZONE
THIN VEGETATION FOR VIEWS AND SAFETY. OVERLOOK OPPORTUNITY
VILLAGE LANDING PARK
(CITY OF EVERETT)
GATEWAY CENTER
(DDRC)
GATEWAY PARK
(DDRC / DCR)
MYSTIC VIEW ROAD
(DCR)
PROJECT LIMIT
OVERLOOK OPPORTUNITY
REVERE BEACH PARKWAY (MA-16)
PEDESTRIAN / BICYCLE UNDERPASS
MALDEN RIVER
POSSIBLE BOAT LAUNCH LOCATION WITH AMENDMENT TO AUL
OVERLOOK OPPORTUNITY
MBTA WELLINGTON
CONSIDER WIDENING WALKWAY TO 10' FOR PEDESTRIAN & BICYCLE USE
POSSIBLE FISHING PIER LOCATION
AMELIA EARHART DAM
MBTA

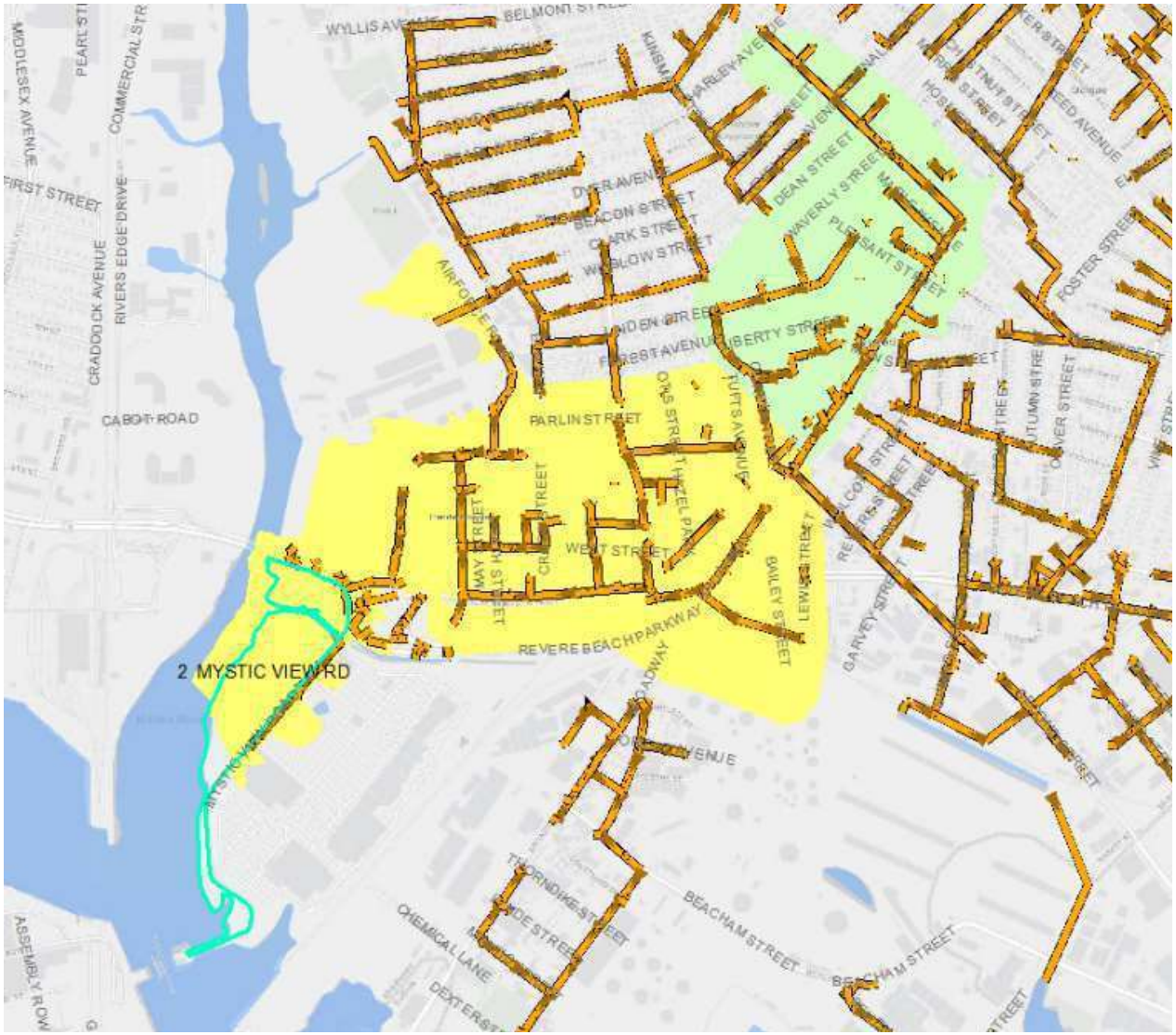
Everett - 1-2 Mystic View Rd (private)

- Private owner (DDRC Gateway; associated with shopping center) maintains footpaths through site, but does not maintain wetland areas
- Occasional cutback of fringe phragmites (along walking path) has taken place to maintain viewpoint of Malden River, but this does not last long



- Draft IP discusses an alternative (Spring Street Watershed Redirection) aims to alleviate flooding in Everett and Chelsea (Lower Mystic) near Commercial Triangle
- Flood mitigation benefits are low for Everett wetland GI candidate sit when considering only existing Upper Mystic drainage piping
- Need to balance WQ objectives (Upper/Lower Mystic)

source: City of Everett Draft Integrated Plan (BETA Group)



- Existing contributing drainage area to site (via MassDOT parcel) is ~225 acres
- Potential diversion (from Spring St catchment) is additional 103 acres

Additional site visit photos/notes

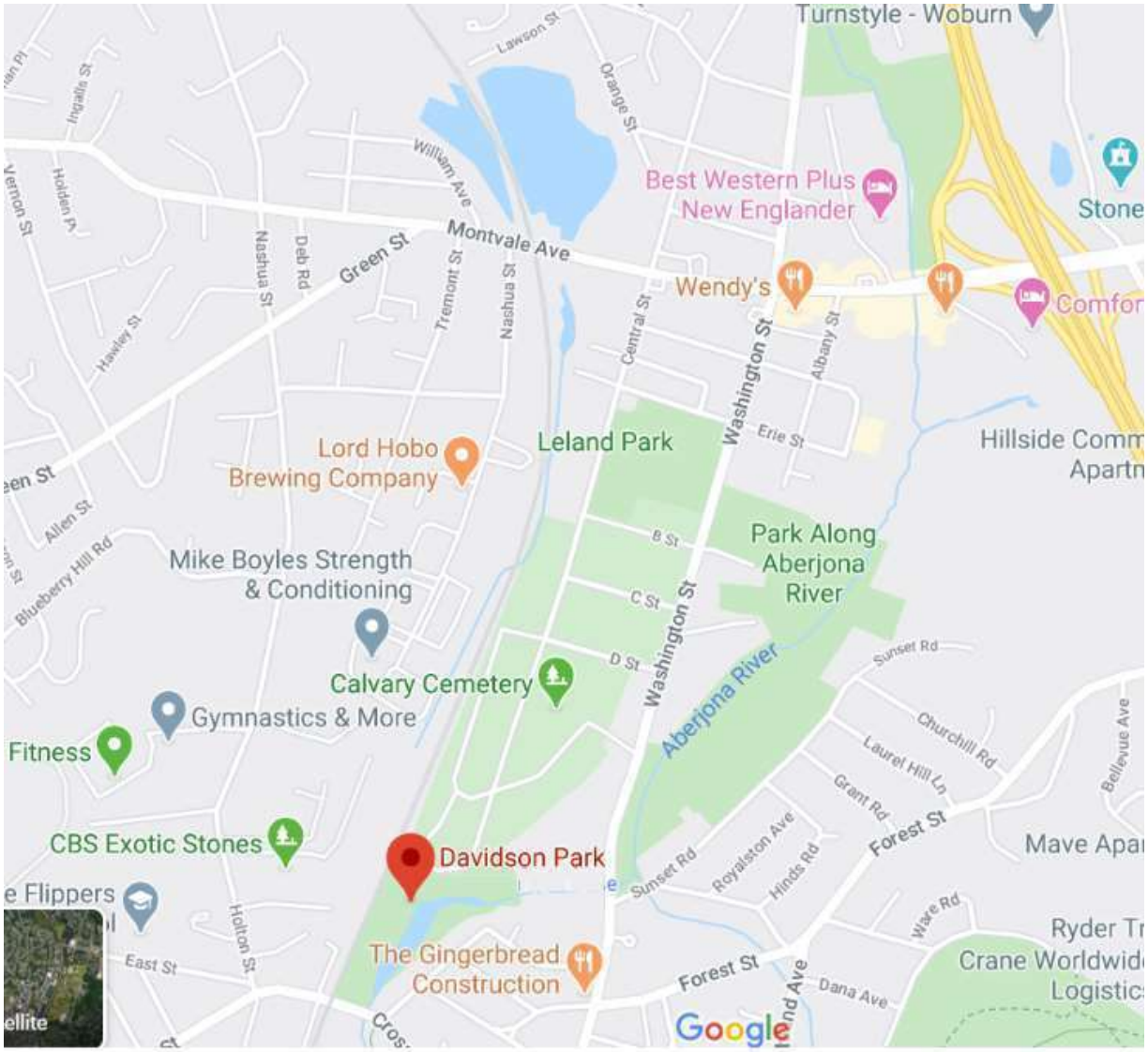
July 2020 notes for sites in next grouping within project pipeline

Winchester – Davidson Park

- **Pros**
  - **Already in process of river restoration project**
    - **3 concepts were already developed by Horsley & Witten**
  - Town owns parcel across Washington St (may be additional opportunity space)
    - Town applied for MVP Action Grant for small water quality project at north end of parcel

- **Cons**
  - Awaiting feedback from Industri-Plex NRDAR Trustee Council on river restoration concept
  - Already low-lying (in floodplain), not much new storage space could be created
  - Town wants to maintain surface condition of turf areas (not many lawn areas in Winchester for public open space)

Winchester – Davidson Park



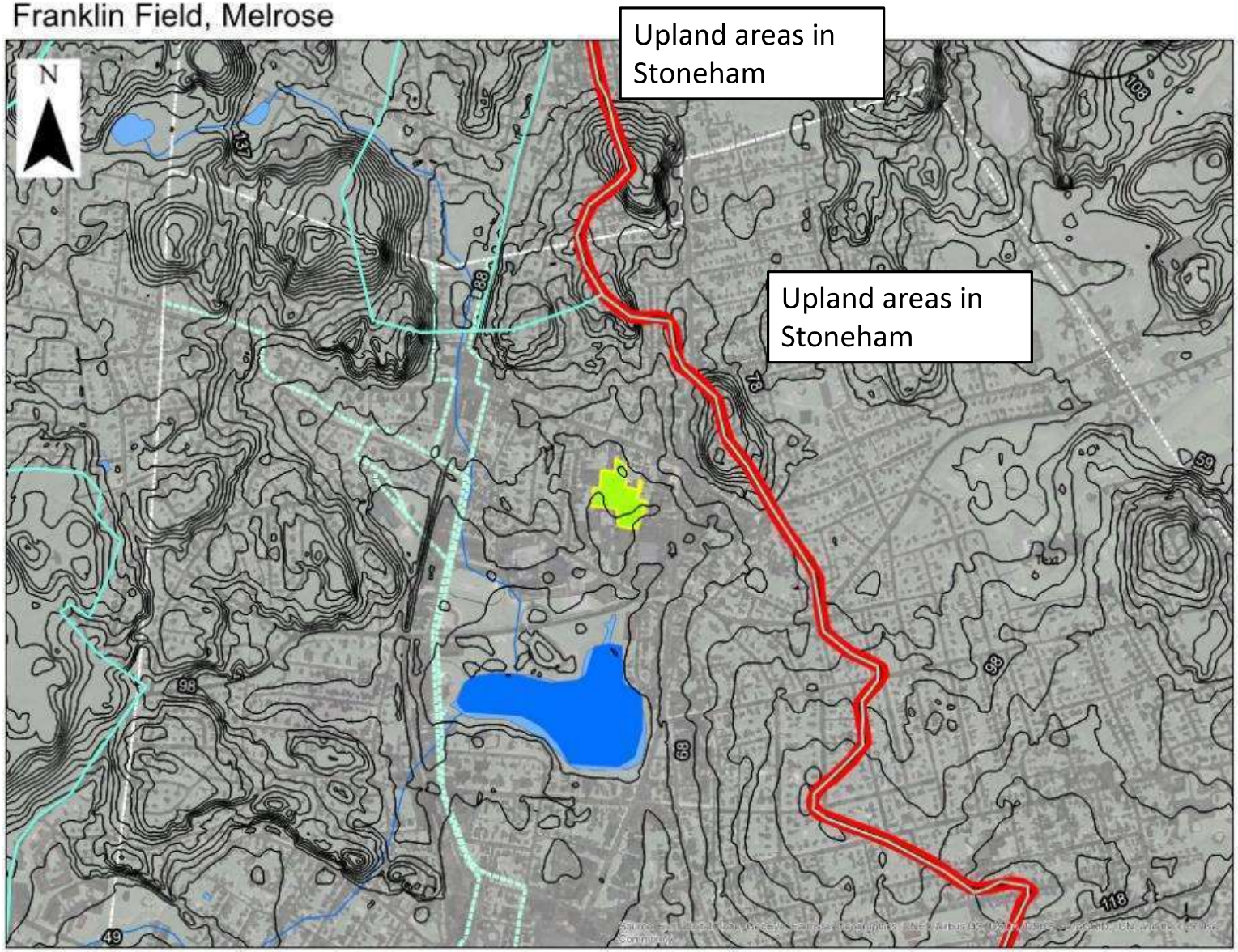
Winchester – Davidson Park

Melrose – Franklin Field

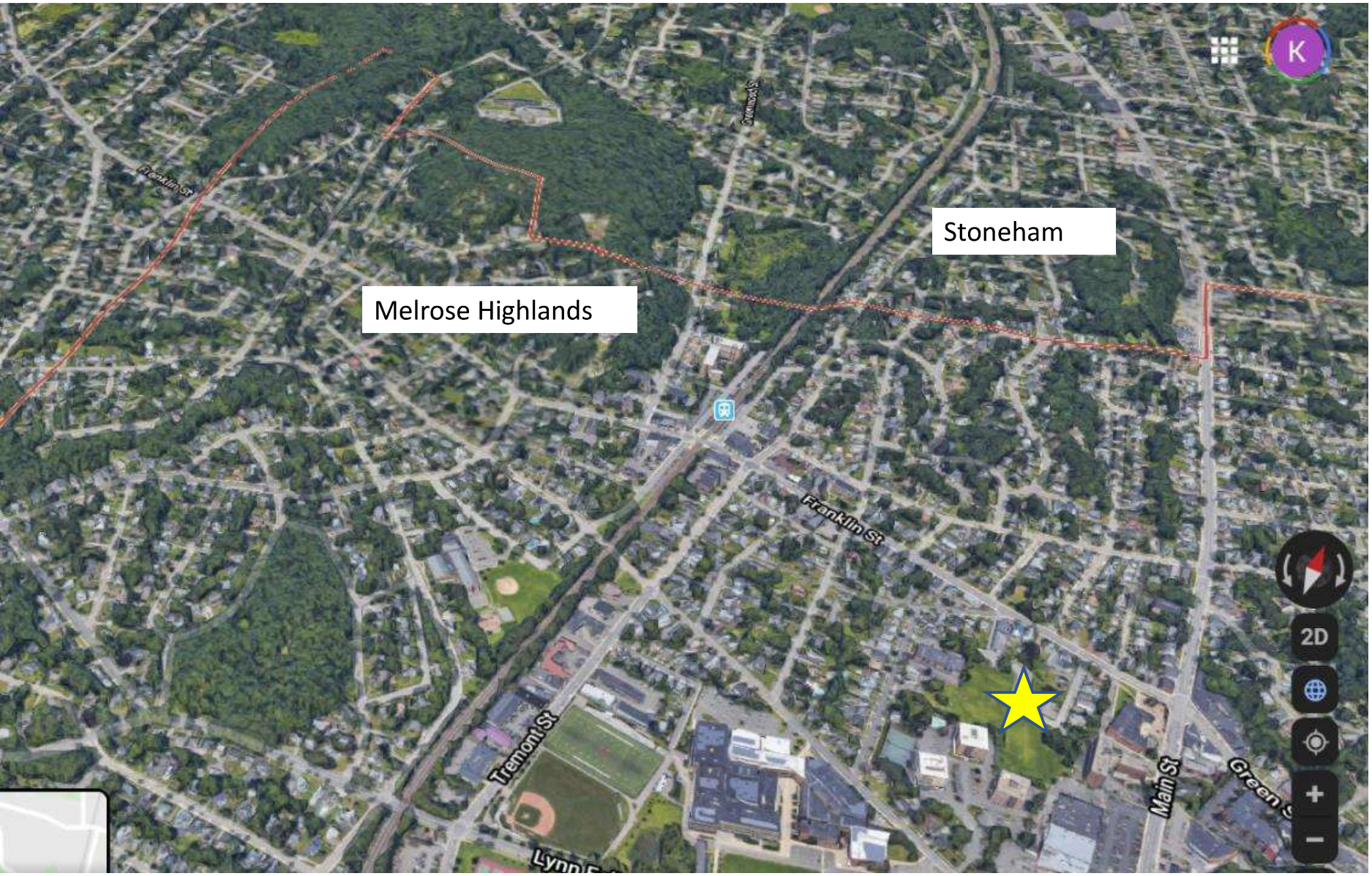
- **Pros**
  - large storm piping at southeast edge of parcel currently bypasses field, but could be easily re-directed
  - upstream drainage includes portions of Stoneham

- **Cons**
  - not much space for any surface GI
    - Subsurface infiltration/detention BMP would be better
  - already functions as a public open space (athletic fields)

Franklin Field, Melrose



Melrose- Franklin Field



Melrose-Franklin Field

Melrose- Franklin Field

Melrose- Franklin Field

Melrose- Franklin Field

Reading – West St & Xavier-Aberjona parcels

- **Pros**
  - A large amount of secondary Aberjona reach (large upstream drainage area) comes through this location
  - West St. parcel is Town owned (without Art. 97 protection)
  - Some pockets (1-2 acres each) of potential upland area could be converted to storage

- **Cons**
  - Mature hardwood trees: 150+ year old oak trees make this a significant ecological tradeoff for flood mitigation
  - Floodplain delineation (extents of skunk cabbage) and succession of forest community is evident

Reading – West St & Xavier-Aberjona parcels

Reading – West St & Xavier-Aberjona parcels

Reading – alternate "pocket headwater wetland" sites

(Linneca Thelin bird sanctuary, conservation parcels at end of Longwood Rd/Arnold Ave, Reading Land Trust parcels)

- **Pros**
  - watershed location (headwaters of Aberjona River draining to Woburn)
  - limited recreation access along river edge (priority for Town to improve)
  - several local flood mitigation opportunities

- **Cons**
  - Limited opportunity size
    - Storage space < 2 acres (without significantly impacting habitat or existing wetlands)
    - Hard to divert large amounts of upstream drainage area due to headwater location
  - Article 97 protections at each site (Conservation parcels)

Reading – pocket headwater wetlands

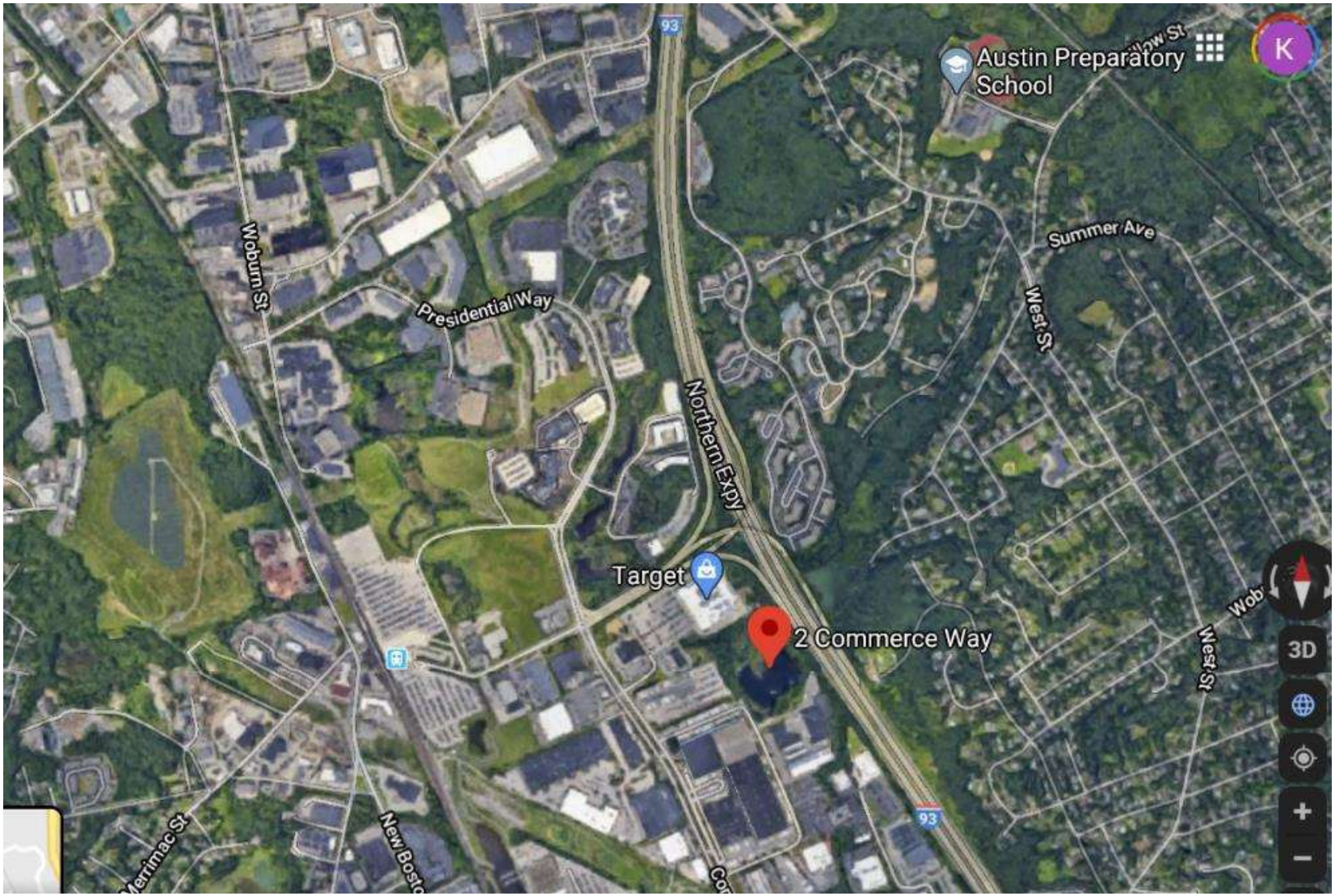
Reading – pocket headwater wetlands

Reading – pocket headwater wetlands

Woburn – Commerce Way Lot 2

- **Pros**
  - Close proximity to large impervious industrial center
  - Immediately downstream of Reading (1 of 2 river reaches of Aberjona River into Woburn)

- **Cons**
  - Site is already mostly existing wetland (>70% of total site area)
  - Not located in location that immediately helps either Woburn or Reading local flooding
  - Offline location from Aberjona, but topography makes this site not an ideal location for additional Woburn drainage

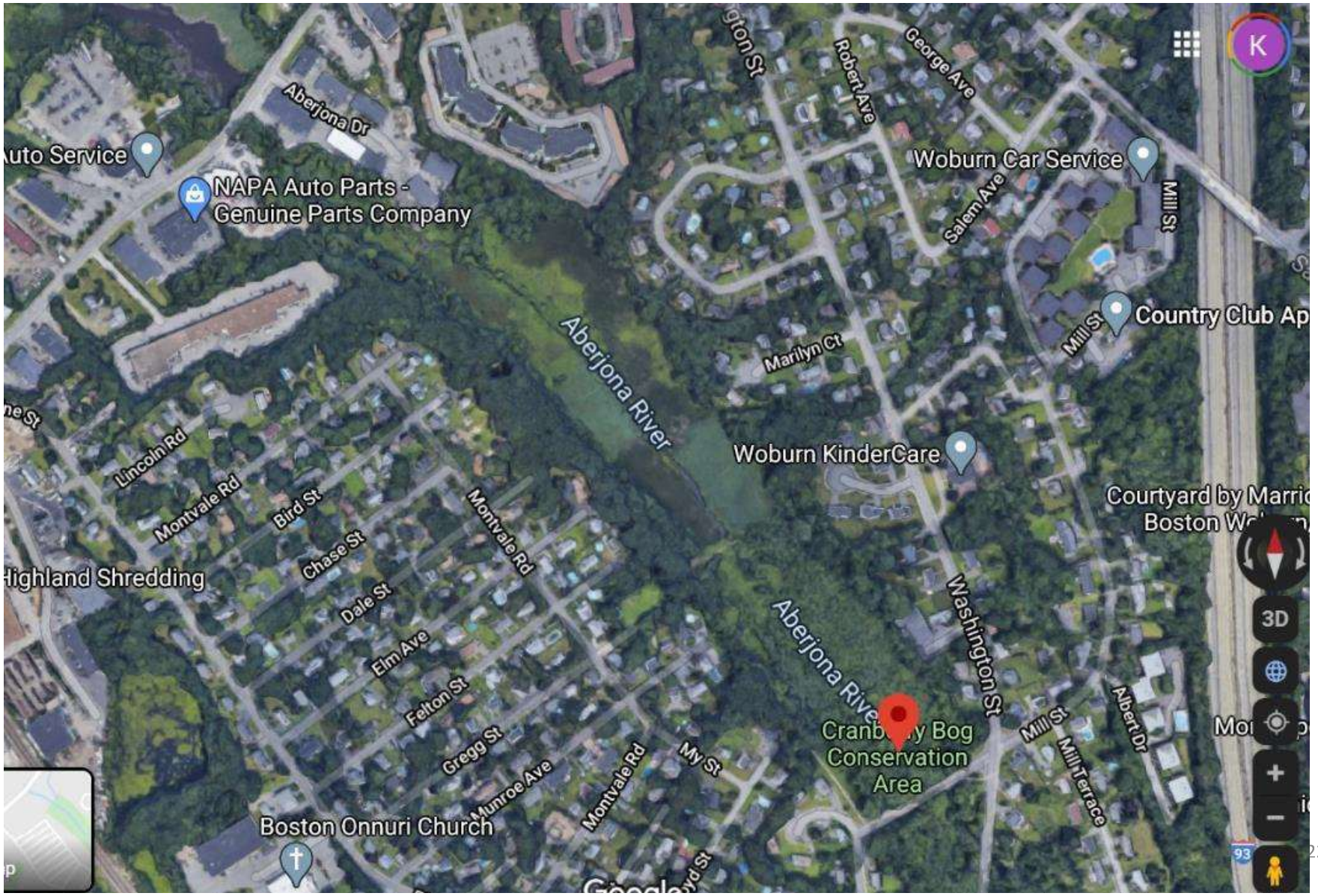

Austin Preparatory School
Summer Ave
Woburn St
Presidential Way
Northern Expy
West St
Target
2 Commerce Way
93
3D

- Site is already mostly existing wetland (>70% of total site area)
- Not located in location that immediately helps either Woburn or Reading local flooding
- Offline location from Aberjona
- Topography makes this site not an ideal location for additional Woburn drainage

Woburn – Cranberry Bog Conservation Area

- **Pros**
  - A large amount of secondary Aberjona reach (large upstream drainage area) comes through this location
  - Some pockets (1-2 acres each) of potential upland area could be converted to storage

- **Cons**
  - Article 97 protection of historic cranberry bogs
  - Ecological tradeoff for flood mitigation
  - Private property holdout may require re-location


Aberjona Dr
NAPA Auto Parts -
Genuine Parts Company
Woburn Car Service
George Ave
Robert Ave
Salem Ave
Mill St
Country Club Ap
Aberjona River
Marilyn Ct
Woburn KinderCare
Courtyard by Marri
Lincoln Rd
Montvale Rd
Bird St
Chase St
Dale St
Elm Ave
Felton St
Gregg St
Munroe Ave
Highland Shredding
Washington St
Cranb y Bog
Conservation
Area
Albert Dr
Mill Terrace
My St
Boston Onnuri Church
3D
93

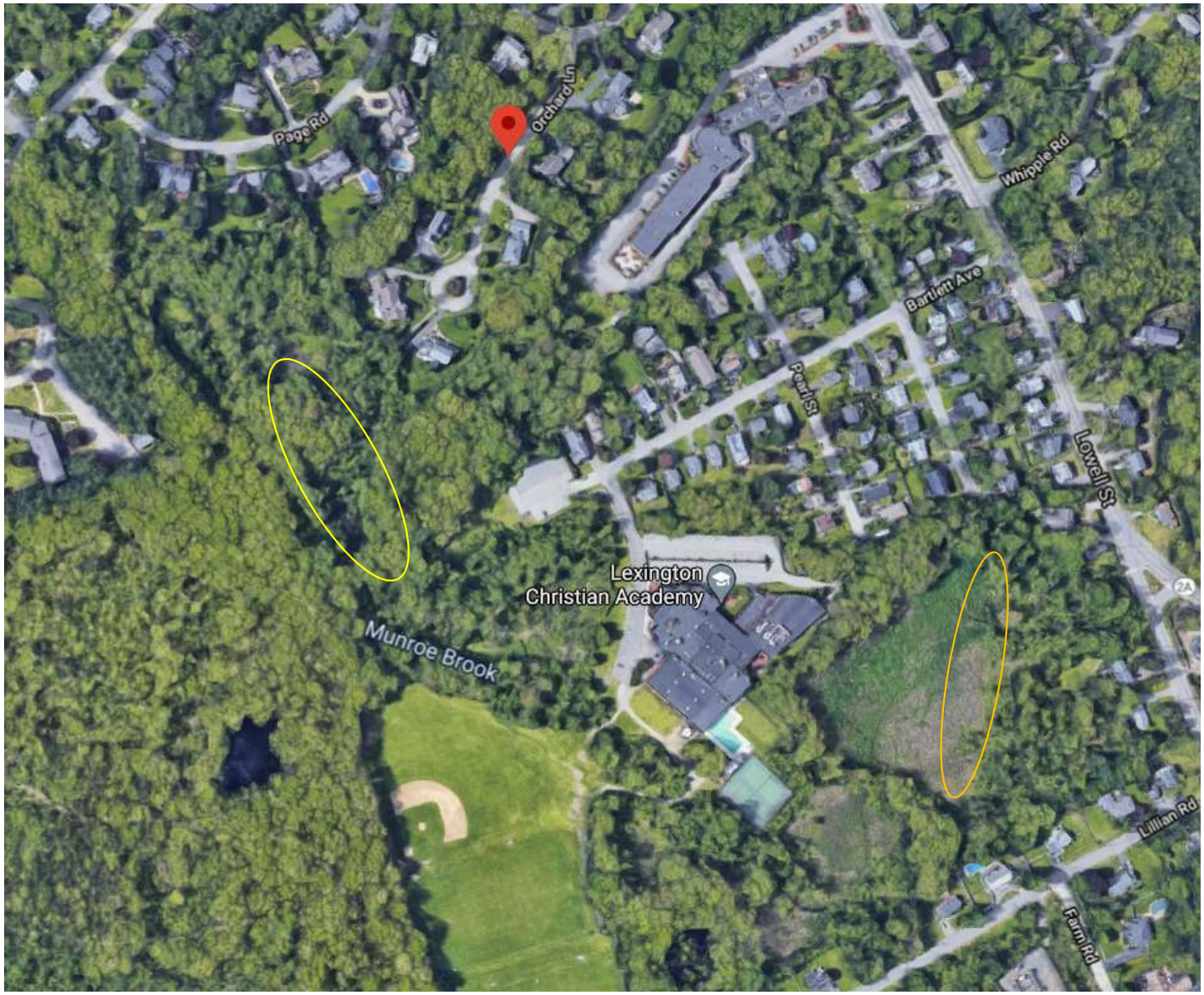
Woburn – Cranberry Bog Conservation Area

Woburn – Cranberry Bog Conservation Area

Lexington – Orchard Ln

- **Pros**
  - Good secondary site for Lexington
    - Low-quality habitat
    - Catchments upstream experience localized flooding
    - Small trail access already exists from end of cul-de-sac

- **Cons**
  - Coordination required with private abutters and Lexington Christian Academy
  - Existing sewer easement runs along length of site and may limit opportunity size
  - Maintenance access could be a challenge



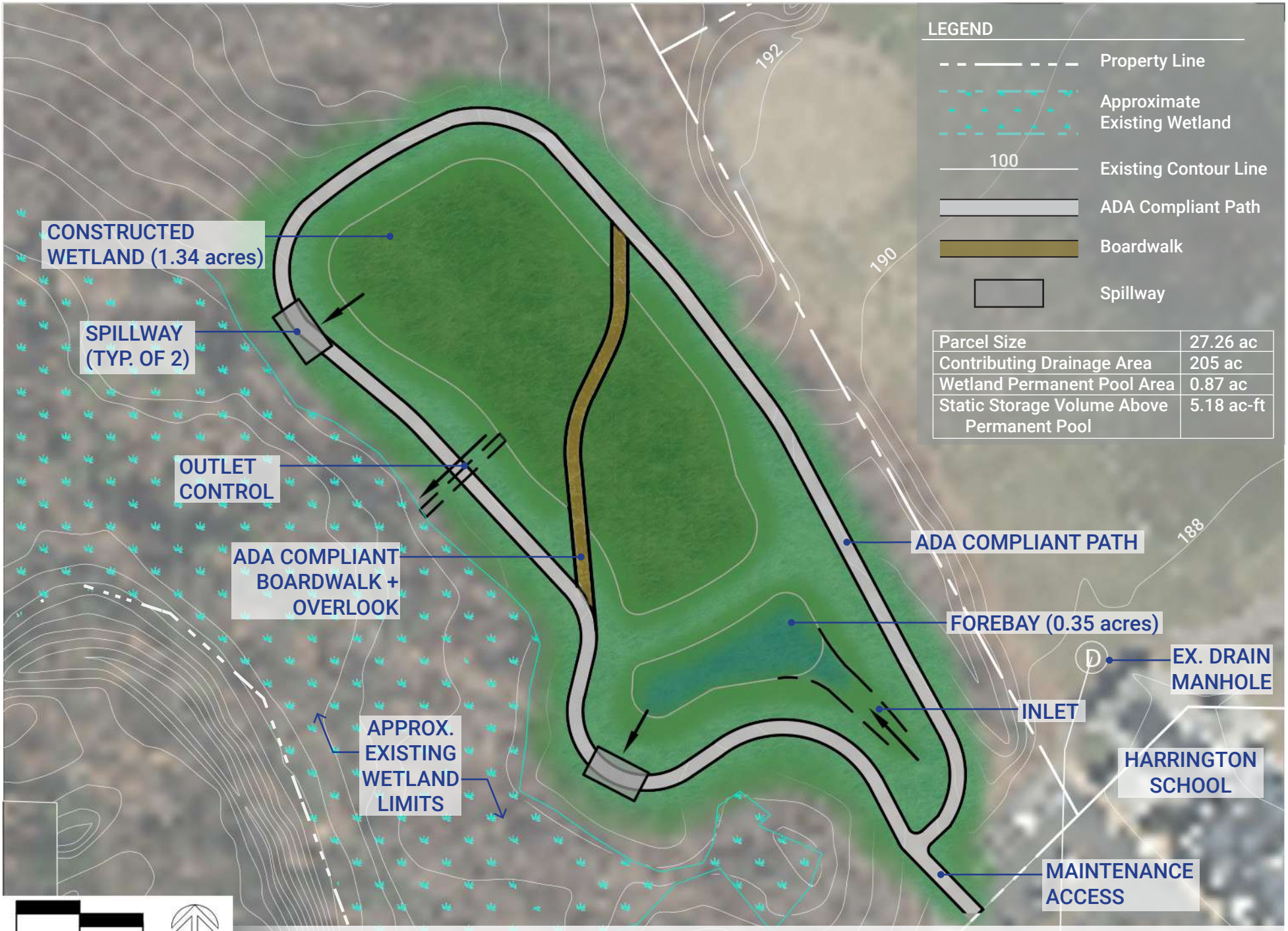
Lexington–Orchard Ln (Town of Lexington parcel)

upland portions of Lexington Christian Academy wetland (500-year flood zone)

Appendix O

Conceptual Wetland GI - Supporting Documentation

Image credit: Hatch



STORMWATER WETLAND CONCEPT - MAPLE ST, LEXINGTON, MA

Watershed-Wide Analysis to Optimize & Coordinate Regional Stormwater Management in the Mystic River Watershed

Mystic River Watershed Association

Prepared for Resilient Mystic Collaborative (RMC)

Watershed-wide Analysis to Optimize & Coordinate Regional Stormwater Management in the Mystic River Watershed

Prepared for the Resilient Mystic Collaborative (RMC)

Maple St. (behind Harrington School) - Lexington, MA

Owner

Town of Lexington

Parcel Size

27.26 acres

Conceptual Constructed Wetland Information

Contributing Drainage Area: 205 acres
Forebay Area: 0.35 acres
Wetland Area: 1.34 acres
Wetland Permanent Pool Area: 0.87 acres
Static Storage Volume Above Permanent Pool: 5.18 acre-ft

Conceptual Estimated Cost: $2,702,000*

Constructed Wetland: $1,880,000
Paths/Signage/Boardwalk: $85,000
Wetland Mitigation: $0
**Includes 10% Mobilization and 25% Contingency Cost*,
**Excludes Cost for Upstream Stormwater/Grey Infrastructure and Design/Permitting*

Potential Pollutant Removal Estimates

~127 lbs/year TP removal, ~663 lbs/year TN removal

Site-Specific Opportunities & Co-Benefits

- Wetland opportunity is contained on Town-owned land; less coordination and site access issues for construction or O&M.
- The larger upland site areas (away from the existing wetland) offers best opportunity for the constructed wetland. Constructed wetland concept can be kept separate, so as not to encroach on any existing wetland.
- Opportunity for local flood mitigation opportunity (flow can be routed from north (Woburn St). Some flooding also observed to northwest near Solomon Pierce Road.
- Site is adjacent to future (active) recreational facilities, with environmental education/Big Backyard opportunity (for Harrington Elementary School); pathways along edge of wooded area have grown in over time.

Lexington GIS Map – Maple Street Property

Site Photo – Maple Street Property

Design Considerations & Challenges

- Confirm Exxon Oil Easement (through the site per Lexington GIS) is abandoned.
- Consider coordination with MassDOT, MWRA for adjacent drainage opportunities off of Lowell St. and Maple St. to wetland to wetland (or distributed green infrastructure).

Table 1. Project Summary Credit for Cambridge MVP Action Grant - Lexington

	Removed Phosphorus Load (lb/yr)	Removed Nitrogen Load (lb/yr)	Removed Sediment Load (lb/yr)
Structural	127.40	663.34	62,516.08
Non-Structural	0	0	0
Land Use Conversion	0	0	0
Total	127.40	663.34	62,516.08

Table 2. Structural Project Summary for Lexington

Project ID	BMP Type	BMP Storage Capacity (ft^3)/ Filter Depth (in.)	Phosphorus BMP Efficiency (%)	Nitrogen BMP Efficiency (%)	Sediment BMP Efficiency (%)	Removed Phosphorus Load (lb/yr)	Removed Nitrogen Load (lb/yr)	Removed Sediment Load (lb/yr)	Impervious Area Treated (ac)	Runoff Depth (in.)
LexingtonBMP	WET POND/CREATED WETLAND	292100	39.62	24.87	62.99	127.4	663.34	62516.08	161.5	0.44

Table 3. Non-Structural Project Summary for LEXINGTON

There are no non-structural BMPs.

Table 4. Land Use Conversion Project Summary for LEXINGTON

There are no land use conversion projects.

Town of Lexington - Site Adjacent to Harrington School

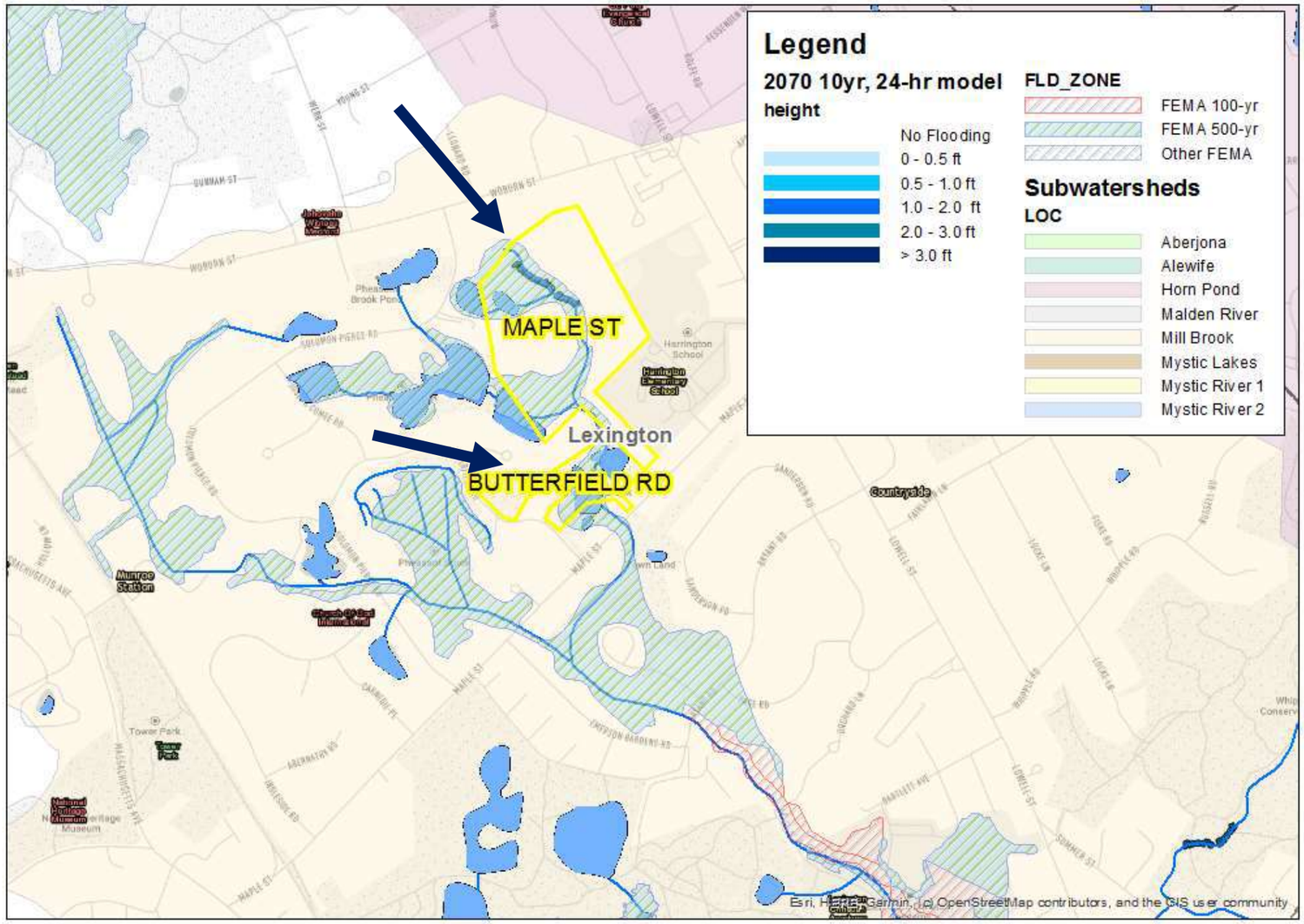
Concept-Level 10% Cost Estimate - December 2020

Item Description	Included Items	Cost
Excavation and Earthwork	Site prep, earthwork, planting soils, stabilization, forebay.	$1,600,000
Site Grey Infrastructure	All connections to stormwater wetland inlet.	
Paths and Boardwalks	ADA-compliant boardwalk and stonedust trail	$70,000
Site Improvements	Signage	$15,000
Planting	Wetland planting, buffer planting and seeding.	$280,000
Wetland Mitigation		$0
	Subtotal	$1,965,000
	10% Mobilization	$196,500
	25% Contingency	$540,375
	Total	**$2,702,000**
Exclusions: Design and Permitting Costs, upstream drainage retrofits		

SITE L3

Site Address / Name	Property Owner	Size estimate of suitable opportunity space:	Town Notes / Feedback:
MAPLE ST, BUTTERFIELD RD KLF_ID: AP-201, AP-205	TOWN OF LEXINGTON, TOWN OF LEXINGTON CONSERVATION	~26 acres (AP-201), ~7-acre (AP-205)	AP-205 is Con Comm owned

Site Opportunity map:



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

FEMA	2070 10-yr 24hr (riverine/overbank flooding)	2070-10-yr 24hr (subcatchment/piped infrastructure flooding)	Regional (subcatchment) weight
3	1	1	3

Existing Slope, Soils	Article 97 protection status	Public Acceptance
5, 3 (AP-205)	5,1 (AP-205)	4

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

Land Cover & Habitat (Restoration Potential)	Socially Vulnerable Populations (Equitable Access & Flood Risk)	Proximity to existing park space, or Mystic waterfront (Connectivity)
1, 5 (AP-205)	2	5

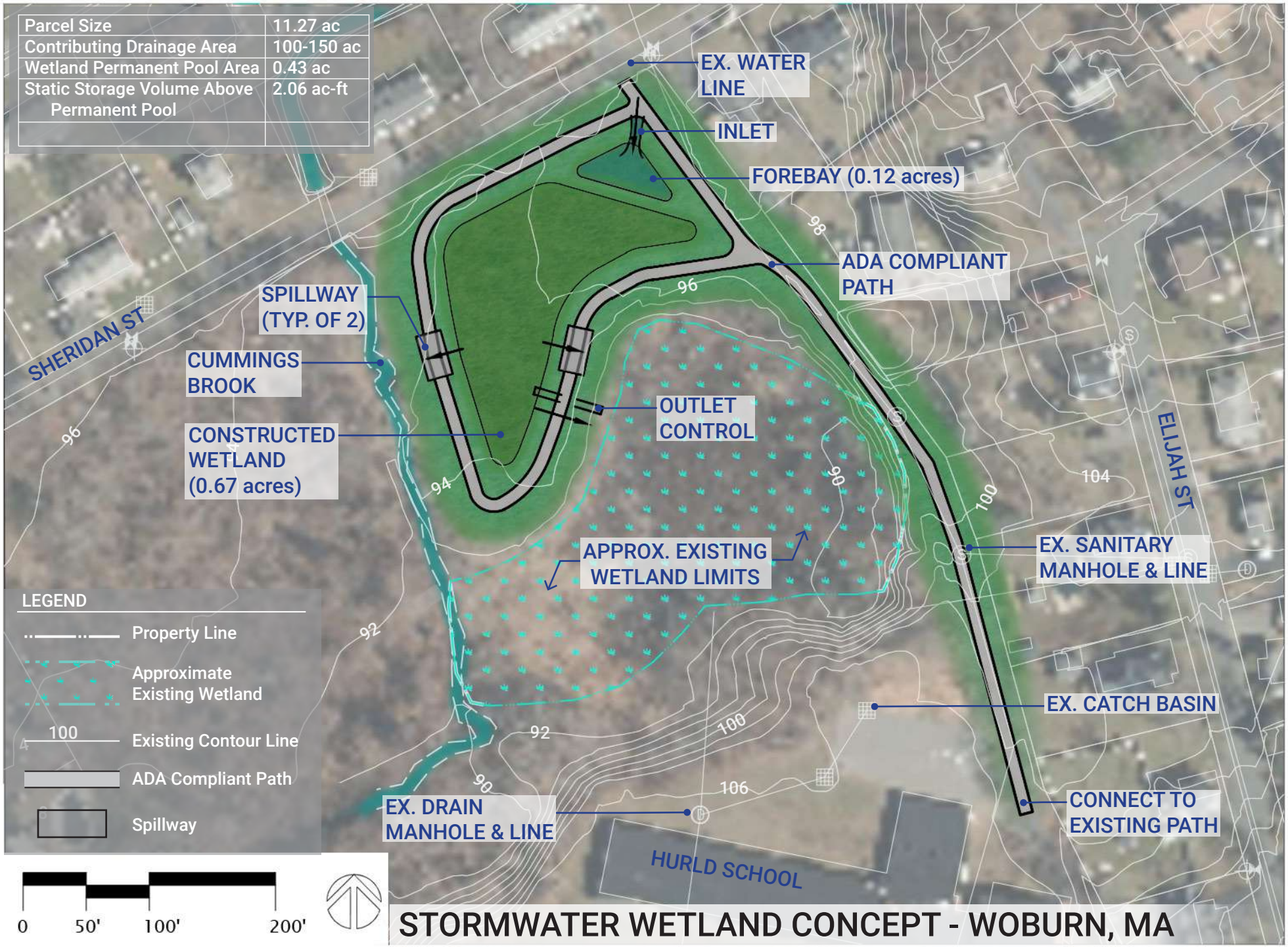
Scoring Notes

- Sites are mostly within the FEMA 500-yr zone. Modeled 2070 10-year flooding was not present in this location, however modeled piped infrastructure was limited in this area. Located in upper reaches of Mill Brook subcatchment. Routing >300 acres of drainage to this location may be a challenge (see Footnote).
- These sites contain some slopes 3-6% and are not protected site use under Article 97 (per MassGIS Open Space layer).
- Butterfield Rd site (AP-205) scored high for land cover/habitat restoration potential.
- The site is in a census tract that scores in the low-middle range per CDC's Social Vulnerability Index (0.25 < x 0.5, out of 1.0).
- The opportunity is along a primary tributary to Mystic River, with potential for increased connectivity/public open space.

AP-205 is conservation land w/Art. 97

Does the Town envision that implementation of a wetland-scale GI project in this location could also mitigate or solve a <u>local</u> flooding issue: Definitely [X] Potentially [ ] No [ ]

For all wetland opportunities, it is worth considering that baseflow drainage conditions (i.e., inter-storm event) would require ~1:100 loading ratio to maintain wetland function and ecology.
For example, 3-acre wetland opportunity, a 300-acre (or larger) drainageshed would be re-routed towards the wetland, resulting in a local opportunity for flood storage and/or water quality treatment.
When considering the size of upstream drainage that could be routed to the wetland GI, we recommend considering any localized flood issues that could potentially be addressed or mitigated as a result of this opportunity



STORMWATER WETLAND CONCEPT - WOBURN, MA

Watershed-Wide Analysis to Optimize & Coordinate Regional Stormwater Management in the Mystic River Watershed

Mystic River Watershed Association

Prepared for Resilient Mystic Collaborative (RMC)

Watershed-wide Analysis to Optimize & Coordinate Regional Stormwater Management in the Mystic River Watershed

Prepared for the Resilient Mystic Collaborative (RMC)

75 Bedford Road (former Hurld School)- Woburn, MA

Owner

City of Woburn

Parcel Size

- 11.27 acres (site has protected site use under Article 97)

Conceptual Constructed Wetland Information

Contributing Drainage Area: 100-150 acres
Forebay Area: 0.12 acres
Wetland Area: 0.67 acres
Wetland Permanent Pool Area: 0.43 acres
Static Storage Volume Above Permanent Pool: 2.06 acre-ft

Conceptual Estimated Cost: $1,464,000*

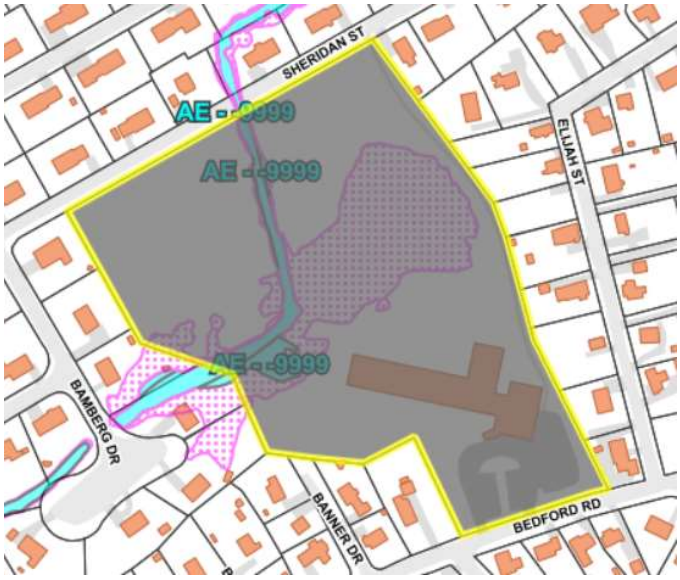
Constructed Wetland: $997,000
Paths/Signage/Boardwalk: $68,000
Wetland Mitigation: $0
**Includes 10% Mobilization and 25% Contingency Cost,*
**Excludes Cost for Upstream Stormwater/Grey Infrastructure and Design/Permitting*

Potential Pollutant Removal Estimates

~46 lbs/year TP removal, ~217 lbs/year TN removal

Site-Specific Opportunities & Co-Benefits

- Passive recreational opportunity with increased connectivity to the former Hurld School (building to be demolished and used for future public open space), improving site perception.
- Opportunity to connect to existing trail on east side of property connects Bedford Road and Sheridan Street. Recreation/trail opportunities are limited in this area of the City (Horn Pond areas are closest).
- The larger upland site area away from the existing wetland and Cummings Brook offer best opportunity for the constructed wetland.
- Existing upland parts of site is early successional woodland dominated by invasive tree, shrub, groundcover and vine species.



Woburn GIS Map – 75 Bedford Road Property

Site Photo – 75 Bedford Road Property

Design Considerations & Challenges

- Advantageously re-routing upstream stormwater for multiple benefits (such as Cummings Brook and Middlesex Canal low-lying areas) which have both low-flow, stagnant water issues and downstream flooding
- Other upstream drainage (near Rag Rock Hill on Bedford Rd side) may be more advantageous based on alternative siting layouts

Table 1. Project Summary Credit for Cambridge MVP Action Grant - Woburn

	Removed Phosphorus Load (lb/yr)	Removed Nitrogen Load (lb/yr)	Removed Sediment Load (lb/yr)
Structural	46.1	217.9	34,191.4
Non-Structural	0	0	0
Land Use Conversion	0	0	0
Total	46.1	217.9	34,191.4

Table 2. Structural Project Summary for Woburn

Project ID	BMP Type	BMP Storage Capacity (ft^3)/ Filter Depth (in.)	Phosphorus BMP Efficiency (%)	Nitrogen BMP Efficiency (%)	Sediment BMP Efficiency (%)	Removed Phosphorus Load (lb/yr)	Removed Nitrogen Load (lb/yr)	Removed Sediment Load (lb/yr)	Impervious Area Treated (ac)	Runoff Depth (in.)
WoburnBMP	WET POND/CREATED WETLAND	406,300	55.7	34.7	80.3	83.7	388.6	57677.5	88.1	1.1

Table 3. Non-Structural Project Summary for WOBURN

There are no non-structural BMPs.

Table 4. Land Use Conversion Project Summary for WOBURN

There are no land use conversion projects.

Town of Woburn - 75 Bedford Rd. site

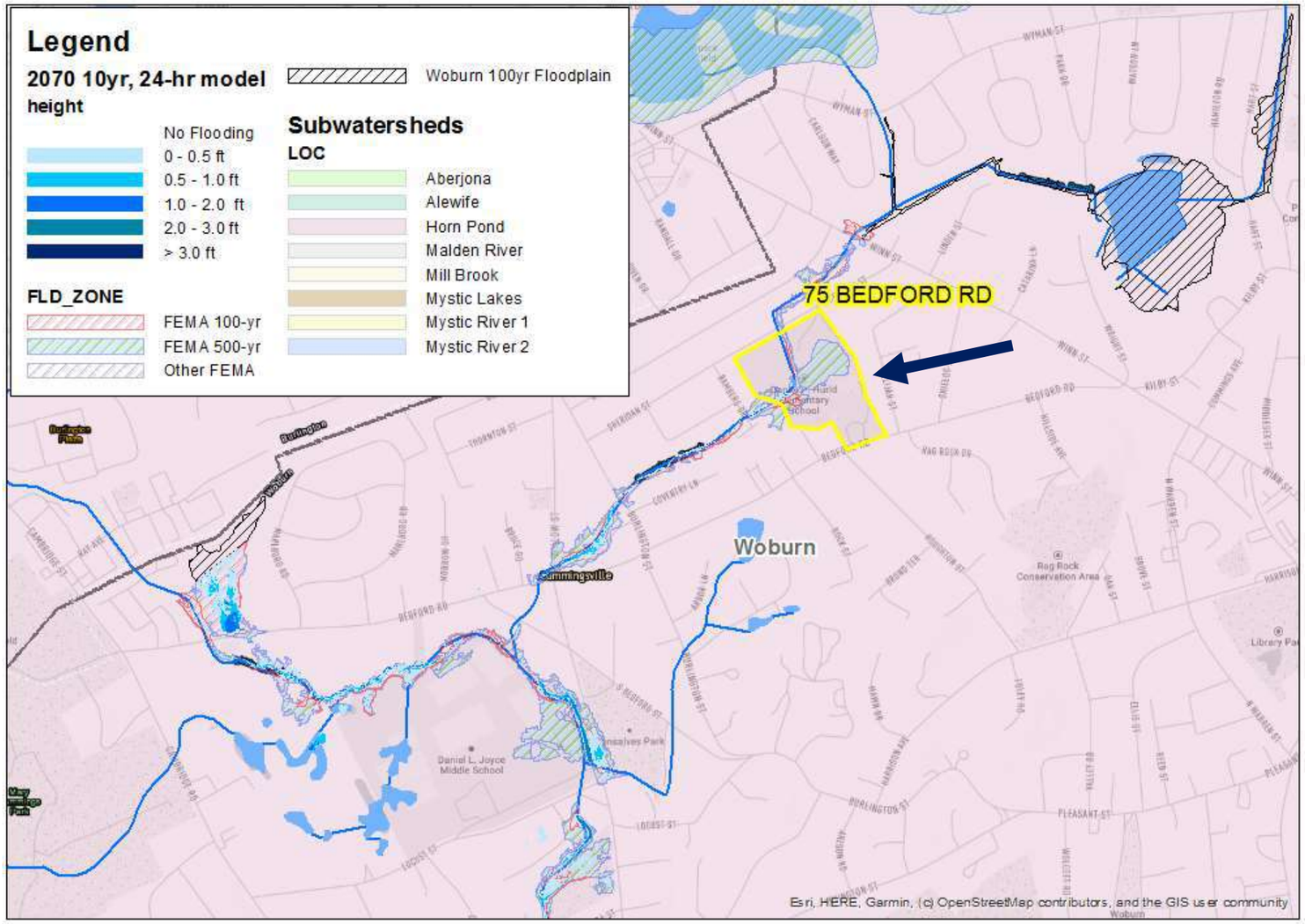
Concept-Level 10% Cost Estimate - December 2020

Item Description	Included Items	Cost
Excavation and Earthwork	Site prep, earthwork, planting soils, stabilization, forebay.	$800,000
Site Grey Infrastructure	All connections to stormwater wetland inlet.	
Paths and Boardwalks	ADA-compliant boardwalk and stonedust trail	$53,000
Site Improvements	Signage	$15,000
Planting	Wetland planting, buffer planting and seeding.	$197,000
Wetland Mitigation		$0
	Subtotal	$1,065,000
	10% Mobilization	$106,500
	25% Contingency	$292,875
	Total	**$1,464,000**
Exclusions: Design and Permitting Costs, upstream drainage retrofits		

SITE WOB1

Site Address / Name	Property Owner	Size estimate of suitable opportunity space:	Town Notes / Feedback:
75 BEDFORD RD (former Hurld Elementary School) KLF_ID: AP-717	City of Woburn	>6 acres (of 11.4 acre parcel)	

Site Opportunity map:



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

FEMA	2070 10-yr 24hr (riverine/overbank flooding)	2070-10-yr 24hr (subcatchment/piped infrastructure flooding)	Regional (subcatchment) weight
4	4	5	5

Existing Slope, Soils	Article 97 protection status	Public Acceptance
5	5	5

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

Land Cover & Habitat (Restoration Potential)	Socially Vulnerable Populations (Equitable Access & Flood Risk)	Proximity to existing park space, or Mystic waterfront (Connectivity)
2	5	5

Scoring Notes

- Site contains both FEMA 100-yr and FEMA 500-yr flood zone areas. Modeled 2070 10-year flooding is present downstream but not on-site (however model resolution and piped infrastructure was limited in this area). The site is along Cummings Brook, upstream of confluence with Little Brook, and Horn Pond.
- The site contains flat slopes <3% and is not protected site use under Article 97 (per MassGIS Open Space layer).
- The site is in a census tract that scores in the most vulnerable quartile per CDC's Social Vulnerability Index (x > 0.75, out of 1.0) that also has modeled piped infrastructure flooding.
- The opportunity is located along Cummings Brook with potential for public open space or greenway connectivity potential.

Does the Town envision that implementation of a wetland-scale GI project in this location could also mitigate or solve a <u>local</u> flooding issue: Definitely [X] Potentially [ ] No [ ]

For all wetland opportunities, it is worth considering that baseflow drainage conditions (i.e., inter-storm event) would require ~1:100 loading ratio to maintain wetland function and ecology.
For example, 3-acre wetland opportunity, a 300-acre (or larger) drainageshed would be re-routed towards the wetland, resulting in a local opportunity for flood storage and/or water quality treatment.
When considering the size of upstream drainage that could be routed to the wetland GI, we recommend considering any localized flood issues that could potentially be addressed or mitigated as a result of this opportunity

STORMWATER WETLAND CONCEPT - MEADOWBROOK PARK, ARLINGTON, MA

Watershed-Wide Analysis to Optimize & Coordinate Regional Stormwater Management in the Mystic River Watershed

Prepared for Resilient Mystic Collaborative (RMC)

Mystic River Watershed Association

Watershed-wide Analysis to Optimize & Coordinate Regional Stormwater Management in the Mystic River Watershed

Prepared for the Resilient Mystic Collaborative (RMC)

0 Mystic Valley Parkway (Meadowbrook Park) - Arlington, MA

Owner
Town of Arlington Park

Parcel Size

9.1 acres (site has protected site use under Article 97)

Conceptual Constructed Wetland Information

Contributing Drainage Area: 125 acres
Forebay Area: 0.36 acres
Wetland Area: 1.87 acres
Wetland Permanent Pool Area: 1.32 acres
Static Storage Volume Above Permanent Pool: 7.69 acre-ft
Existing Wetland Impacted Area: 2.62 acres

Conceptual Estimated Cost: $4,015,000*

Constructed Wetland: $2,345,000
Paths/Signage/Boardwalk: $100,000
Wetland Mitigation and Stream Restoration: $475,000
**Includes 10% Mobilization and 25% Contingency Cost,*
**Excludes Cost for Upstream Stormwater/Grey Infrastructure and Design/Permitting*

Potential Pollutant Removal Estimates

~76 lbs/year TP removal, ~365 lbs/year TN removal

Site-Specific Opportunities & Co-Benefits

- Mill Brook, an urban stream passing through the site, offers opportunity for stream restoration, flood mitigation, and ecological enhancement.
- Existing site is dominated by invasive phragmites grasses and Japanese knotweed.
- Opportunity for improved passive recreation accessibility (park has limited site access via cemetery).
- Opportunity to reduce erosion and pre-treat stormwater runoff from Town Cemetery and other upstream areas (water quality cobenefit).

Arlington GIS Map – Meadowbrook Park Property

Site Photo – Meadowbrook Park Property

Design Considerations & Challenges

- Constructed stormwater wetland could operate as a stormwater improvement separate from Mill Brook, assuming upstream runoff could be conveyed from west of site. However, MWRA sewer crossing is barrier to implementation.
- Alternative flood storage concept could utilize existing wetland area, adding active controls at downstream outlet to better detain and treat flows prior to discharging to Lower Mystic Lake.

Table 1. Project Summary Credit for Cambridge MVP Action Grant - Arlington

	Removed Phosphorus Load (lb/yr)	Removed Nitrogen Load (lb/yr)	Removed Sediment Load (lb/yr)
Structural	76.8	365.94	49,083.67
Non-Structural	0	0	0
Land Use Conversion	0	0	0
Total	76.8	365.94	49,083.67

Table 2. Structural Project Summary for Arlington

Project ID	BMP Type	BMP Storage Capacity (ft^3)/ Filter Depth (in.)	Phosphorus BMP Efficiency (%)	Nitrogen BMP Efficiency (%)	Sediment BMP Efficiency (%)	Removed Phosphorus Load (lb/yr)	Removed Nitrogen Load (lb/yr)	Removed Sediment Load (lb/yr)	Impervious Area Treated (ac)	Runoff Depth (in.)
ArlingtonBMP	WET POND/CREATED WETLAND	406,300	57.08	36.08	81.9	76.8	365.94	49,083.67	74.29	1.27

Table 3. Non-Structural Project Summary for ARLINGTON

There are no non-structural BMPs.

Table 4. Land Use Conversion Project Summary for ARLINGTON

There are no land use conversion projects.

Town of Arlington - Meadowbrook Park

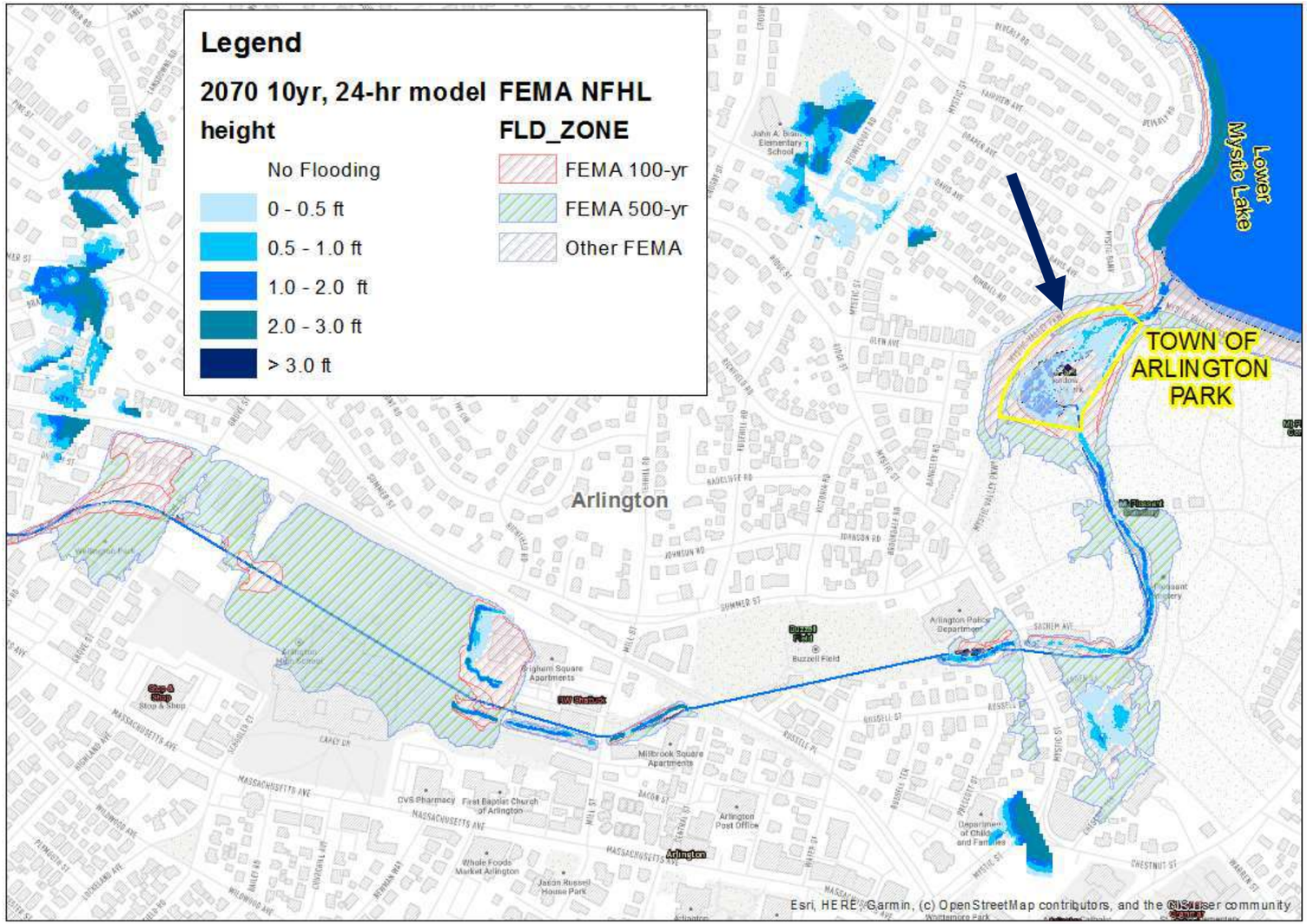
Concept-Level 10% Cost Estimate - December 2020

Item Description	Included Items	Cost
Excavation and Earthwork	Site prep, earthwork, planting soils, stabilization, forebay.	$2,000,000
Site Grey Infrastructure	All connections to stormwater wetland inlet.	
Paths and Boardwalks	ADA-compliant boardwalk and stonedust trail	$85,000
Site Improvements	Signage	$15,000
Planting	Wetland planting, buffer planting and seeding.	$345,000
Wetland Mitigation and Stream Restoration	Mitigation of lost wetland & Mill Brook stabilization	$475,000
	Subtotal	$2,920,000
	10% Mobilization	$292,000
	25% Contingency	$803,000
	Total	**$4,015,000**
Exclusions: Design and Permitting Costs, upstream drainage retrofits		

SITE A1

Site Address / Name	Property Owner	Size estimate of suitable opportunity space:	Town Notes / Feedback:
Meadowbrook Park KLF_ID: AP-027	Town of Arlington	~3.75 acres	Potential for flood storage. If there is benefit w/o loss of usable space, public may be amenable.

Site Opportunity map:



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

FEMA	2070 10-yr 24hr (riverine/overbank flooding)	2070-10-yr 24hr (subcatchment/piped infrastructure flooding)	Regional (subcatchment) weight
4	4	5	3

Existing Slope, Soils	Article 97 protection status	Public Acceptance
1	~~5~~ 1	5

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

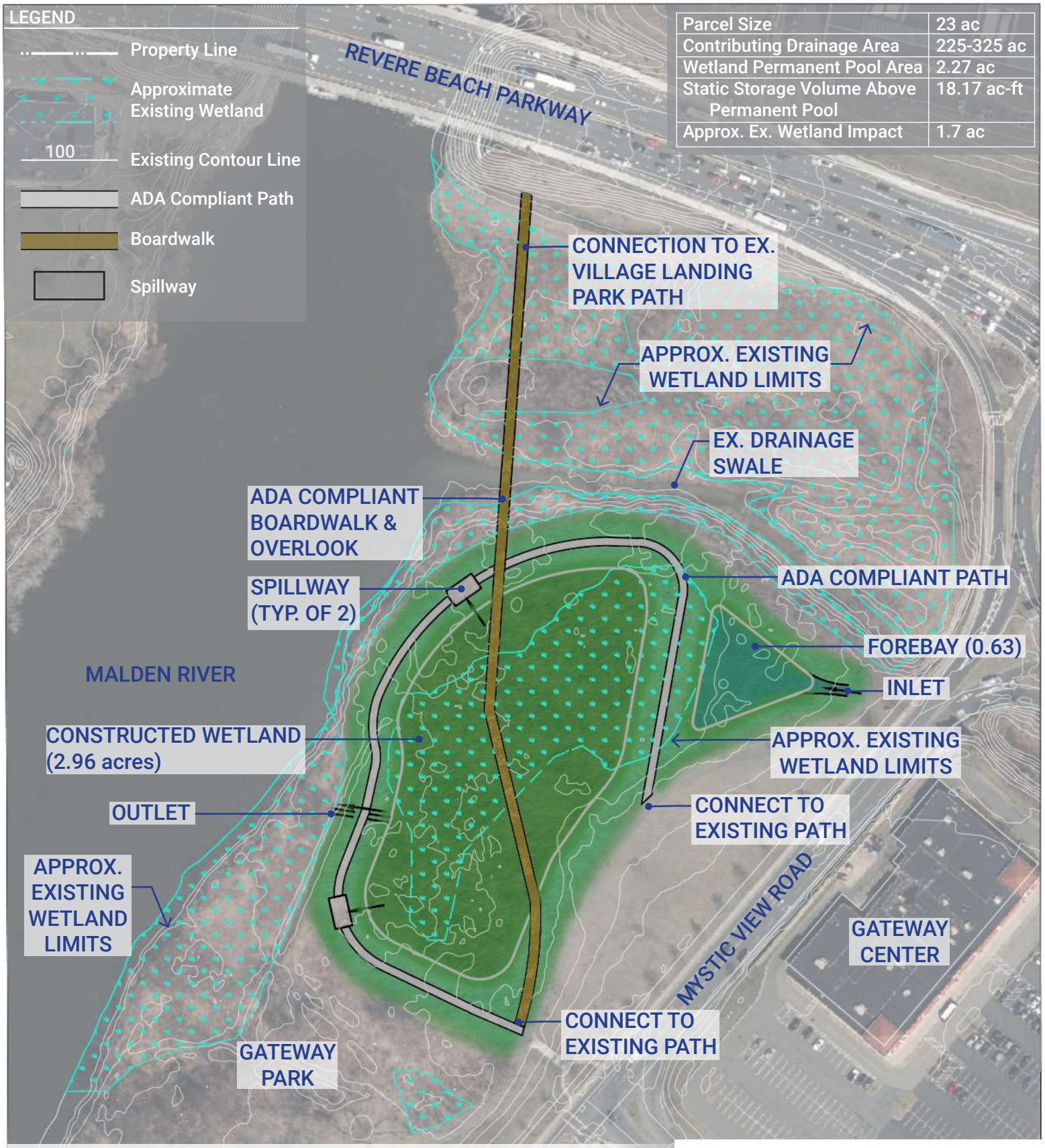
Land Cover & Habitat (Restoration Potential)	Socially Vulnerable Populations (Equitable Access & Flood Risk)	Proximity to existing park space, or Mystic waterfront (Connectivity)
2	1	5

Scoring Notes

- Site is mostly within FEMA 100-yr flood zone, with portions in FEMA 500-yr zone, and modeled 2070 10-year flooding on-site. The site downstream of flood areas in the Mill Brook subcatchment, and the site discharges to Lower Mystic Lake.
- The site contains some slopes >6% and is ~~not~~ protected site use under Article 97 (per MassGIS Open Space layer).
- The site is in a census tract that scores in the least vulnerable quartile per CDC's Social Vulnerability Index (x < 0.25, out of 1.0).
- The opportunity is located within an existing park (public open space) with greater connectivity or greenway potential.

Does the Town envision that implementation of a wetland-scale GI project in this location could also mitigate or solve a <u>local</u> flooding issue: Definitely ☒ Potentially ☐ No ☐

For all wetland opportunities, it is worth considering that baseflow drainage conditions (i.e., inter-storm event) would require ~1:100 loading ratio to maintain wetland function and ecology.
For example, 3-acre wetland opportunity, a 300-acre (or larger) drainageshed would be re-routed towards the wetland, resulting in a local opportunity for flood storage and/or water quality treatment.
When considering the size of upstream drainage that could be routed to the wetland GI, we recommend considering any localized flood issues that could potentially be addressed or mitigated as a result of this opportunity



STORMWATER WETLAND CONCEPT - GATEWAY PARK, EVERETT, MA

Watershed-Wide Analysis to Optimize & Coordinate Regional Stormwater Management in the Mystic River Watershed

Prepared for Resilient Mystic Collaborative (RMC)

Mystic River WATERSHED ASSOCIATION

Watershed-wide Analysis to Optimize & Coordinate Regional Stormwater Management in the Mystic River Watershed

Prepared for the Resilient Mystic Collaborative (RMC)

2 Mystic View Road (Gateway Park) - Everett, MA

Owner

DDRC Gateway LLC

Parcel Size

~23 acres

Conceptual Constructed Wetland Information

Contributing Drainage Area: 225-325 acres
Forebay Area: 0.63 acres
Wetland Area: 2.96 acres
Wetland Permanent Pool Area: 2.27 acres
Static Storage Volume Above Permanent Pool: 18.17 acre-ft
Existing Wetland Impacted Area: 1.7 acres

Conceptual Estimated Cost: $4,653,000*

Constructed Wetland: $2,850,000
Paths/Signage/Boardwalk: $159,000
Wetland Mitigation: $375,000
**Includes 10% Mobilization and 25% Contingency Cost*,
**Excludes Cost for Upstream Stormwater/Grey Infrastructure and Design/Permitting*

Potential Pollutant Removal Estimates

~166 lbs/year TP removal, ~769 lbs/year TN removal

Site-Specific Opportunities & Co-Benefits

- The location of proposed wetland park is strategically aligned with the long-term visions for the City of Everett waterfront and Malden River Greenway plans. Concept would improved passive recreation and pedestrian accessibility between the Amelia Earhart Dam and Village Landing Park up to Malden Center and (proposed) Spot Pond Brook Greenway.
- Existing site vegetation is dominated by invasive phragmites grasses, which are contracted to be removed every few years by private owner to preserve viewpoints.
- Concept builds off previous site visioning process with Shadley Associates, and has potential tie-in to proposed Spring Street Diversion Alternative in the City's Integrated (Water) Plan.

Everett MuniMapper – 2 Mystic View Rd Property


Site Photo – 2 Mystic View Rd Property

Design Considerations & Challenges

- Property is privately owned by DDRC Gateway LLC with activity and use limitations (AULs). Although proposed concept site uses are in line with AULs, further analysis of to determine if any required soil remediation is required.

Table 1. Project Summary Credit for Cambridge MVP Action Grant - Everett

	Removed Phosphorus Load (lb/yr)	Removed Nitrogen Load (lb/yr)	Removed Sediment Load (lb/yr)
Structural	166.29	768.93	95,624.25
Non-Structural	0	0	0
Land Use Conversion	0	0	0
Total	166.29	768.93	95,624.25

Table 2. Structural Project Summary for Everett

Project ID	BMP Type	BMP Storage Capacity (ft^3)/ Filter Depth (in.)	Phosphorus BMP Efficiency (%)	Nitrogen BMP Efficiency (%)	Sediment BMP Efficiency (%)	Removed Phosphorus Load (lb/yr)	Removed Nitrogen Load (lb/yr)	Removed Sediment Load (lb/yr)	Impervious Area Treated (ac)	Runoff Depth (in.)
EverettBMP	WET POND/CREATED WETLAND	901,180	59.31	37.79	83.79	166.29	768.93	95,624.25	152.17	1.51

Table 3. Non-Structural Project Summary for EVERETT

There are no non-structural BMPs.

Table 4. Land Use Conversion Project Summary for EVERETT

There are no land use conversion projects.

City of Everett - Gateway Park

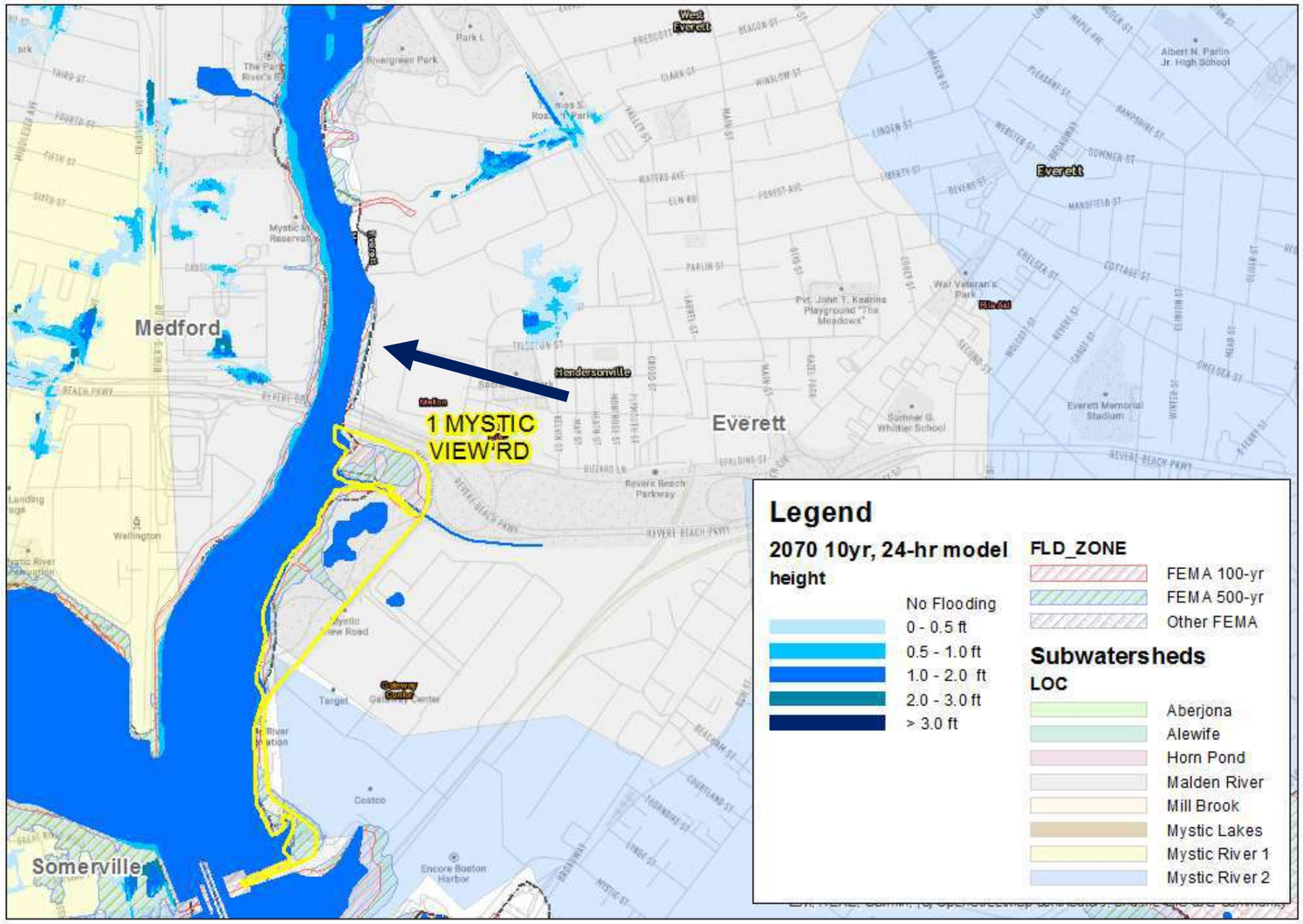
Concept-Level 10% Cost Estimate - December 2020

Item Description	Included Items	Cost
Excavation and Earthwork	Site prep, earthwork, planting soils, stabilization, forebay.	$2,400,000
Site Grey Infrastructure	All connections to stormwater wetland inlet.	
Paths and Boardwalks	ADA-compliant boardwalk and stonedust trail	$144,000
Site Improvements	Signage	$15,000
Planting	Wetland planting, buffer planting and seeding.	$450,000
Wetland Mitigation	Mitigation of lost wetland - 2.5 acres	$375,000
	Subtotal	$3,384,000
	10% Mobilization	$338,400
	25% Contingency	$930,600
	Total	**$4,653,000**
Exclusions: Design and Permitting Costs, upstream drainage retrofits		

SITE E1

Site Address / Name	Property Owner	Size estimate of suitable opportunity space:	Town Notes / Feedback:
2 MYSTIC VIEW RD KLF_ID: AP-157	Private parcel (DDRC GATEWAY LLC)	23+ acre parcel	DCR-controlled site. Adjacent to former contaminated site status unknown. Preferred site to the City.

Site Opportunity map:



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

FEMA	2070 10-yr 24hr (riverine/overbank flooding)	2070-10-yr 24hr (subcatchment/piped infrastructure flooding)	Regional (subcatchment) weight
4	4	5	1

Existing Slope, Soils	Article 97 protection status	Public Acceptance
3	5	5

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

Land Cover & Habitat (Restoration Potential)	Socially Vulnerable Populations (Equitable Access & Flood Risk)	Proximity to existing park space, or Mystic waterfront (Connectivity)
2	5	5

Scoring Notes

- Site contains areas within FEMA 100-yr and FEMA 500-yr flood zones. The site is at downstream end of Malden River subcatchment, adjacent to the Amelia Earhart Dam.
- The site is undeveloped and contains slopes between 3- 6% and is not protected site use under Article 97 (per MassGIS Open Space layer).
- The site is in a census tract that scores in the most vulnerable quartile per CDC's Social Vulnerability Index (x > 0.75, out of 1.0) that also has modeled piped infrastructure flooding.
- The opportunity is located immediately adjacent to waterfront with greater connectivity or greenway potential as public open space.

Does the Town envision that implementation of a wetland-scale GI project in this location could also mitigate or solve a <u>local</u> flooding issue: Definitely ☐ Potentially ☒ No ☐

For all wetland opportunities, it is worth considering that baseflow drainage conditions (i.e., inter-storm event) would require ~1:100 loading ratio to maintain wetland function and ecology.
For example, 3-acre wetland opportunity, a 300-acre (or larger) drainageshed would be re-routed towards the wetland, resulting in a local opportunity for flood storage and/or water quality treatment.
When considering the size of upstream drainage that could be routed to the wetland GI, we recommend considering any localized flood issues that could potentially be addressed or mitigated as a result of this opportunity

STORMWATER WETLAND CONCEPT - MAILLET, SOMMES & MORGAN, READING, MA

Watershed-Wide Analysis to Optimize & Coordinate Regional Stormwater Management in the Mystic River Watershed

Prepared for Resilient Mystic Collaborative (RMC)

Mystic River Watershed Association

Watershed-wide Analysis to Optimize & Coordinate Regional Stormwater Management in the Mystic River Watershed

Prepared for the Resilient Mystic Collaborative (RMC)

0 Willow Street (Maillet, Sommes & Morgan Land) - Reading, MA

Owner
Town of Reading (conservation parcel)

Parcel Size

5.48 acres; protected site use under Article 97

Conceptual Constructed Wetland Information

Contributing Drainage Area: 100-150 acres
Forebay Area: 0.29 acres
Wetland Area: 1.72 acres
Wetland Permanent Pool Area: 0.96 acres
Static Storage Volume Above Permanent Pool: 5.96 acre-ft
Existing Wetland Impacted Area: 1 acre

Conceptual Estimated Cost: $2,828,000*

Constructed Wetland: $1,880,000
Paths/Signage/Boardwalk: $97,000
Wetland Mitigation: $80,000
**Includes 10% Mobilization and 25% Contingency Cost,*
**Excludes Cost for Upstream Stormwater/Grey Infrastructure and Design/Permitting*

Potential Pollutant Removal Estimates

~79 lbs/year TP removal, ~364 lbs/year TN removal

Site-Specific Opportunities & Co-Benefits

- Concept compliments existing recreational and trail use; proposed ADA-compliant trail and boardwalk connects to existing open space circulation.
- It is envisioned that recreation/trail improvements can improve access linkage between Willow Street/Austin Preparatory School and depot/Town center (via Hunt & Vine Street).
- Wetland environmental education (co-benefit) and collaboration opportunity with Austin Preparatory School drainage improvements.
- Existing upland space at site comprised of low-quality lawn, Japanese knotweed, and oriental bittersweet invasives.
- Relocates existing sanitary sewer outside of the existing wetland.

Reading GIS Map – 0 Willow St Property

Site Photo – 0 Willow St Property

Design Considerations & Challenges

- Opportunities to mitigate flooding at Willow St, Lowell and Bond Streets, and washout sheet flow from Lee and Hunt Streets.
- Existing 12” sewer alignment cuts below advantageous areas for wetland space; may need to work around or relocate towards private parcels at north edge of site.

Table 1. Project Summary Credit for Cambridge MVP Action Grant - Reading

	Removed Phosphorus Load (lb/yr)	Removed Nitrogen Load (lb/yr)	Removed Sediment Load (lb/yr)
Structural	79.54	364.36	56,172.53
Non-Structural	0	0	0
Land Use Conversion	0	0	0
Total	79.54	364.36	56,172.53

Table 2. Structural Project Summary for Reading

Project ID	BMP Type	BMP Storage Capacity (ft^3)/ Filter Depth (in.)	Phosphorus BMP Efficiency (%)	Nitrogen BMP Efficiency (%)	Sediment BMP Efficiency (%)	Removed Phosphorus Load (lb/yr)	Removed Nitrogen Load (lb/yr)	Removed Sediment Load (lb/yr)	Impervious Area Treated (ac)	Runoff Depth (in.)
ReadingBMP	WET POND/CREATED WETLAND	374,350	55.91	34.91	80.5	79.54	364.36	56,172.53	74.83	1.06

Table 3. Non-Structural Project Summary for READING

There are no non-structural BMPs.

Table 4. Land Use Conversion Project Summary for READING

There are no land use conversion projects.

Town of Reading - Maillet Sommes & Morgan Land

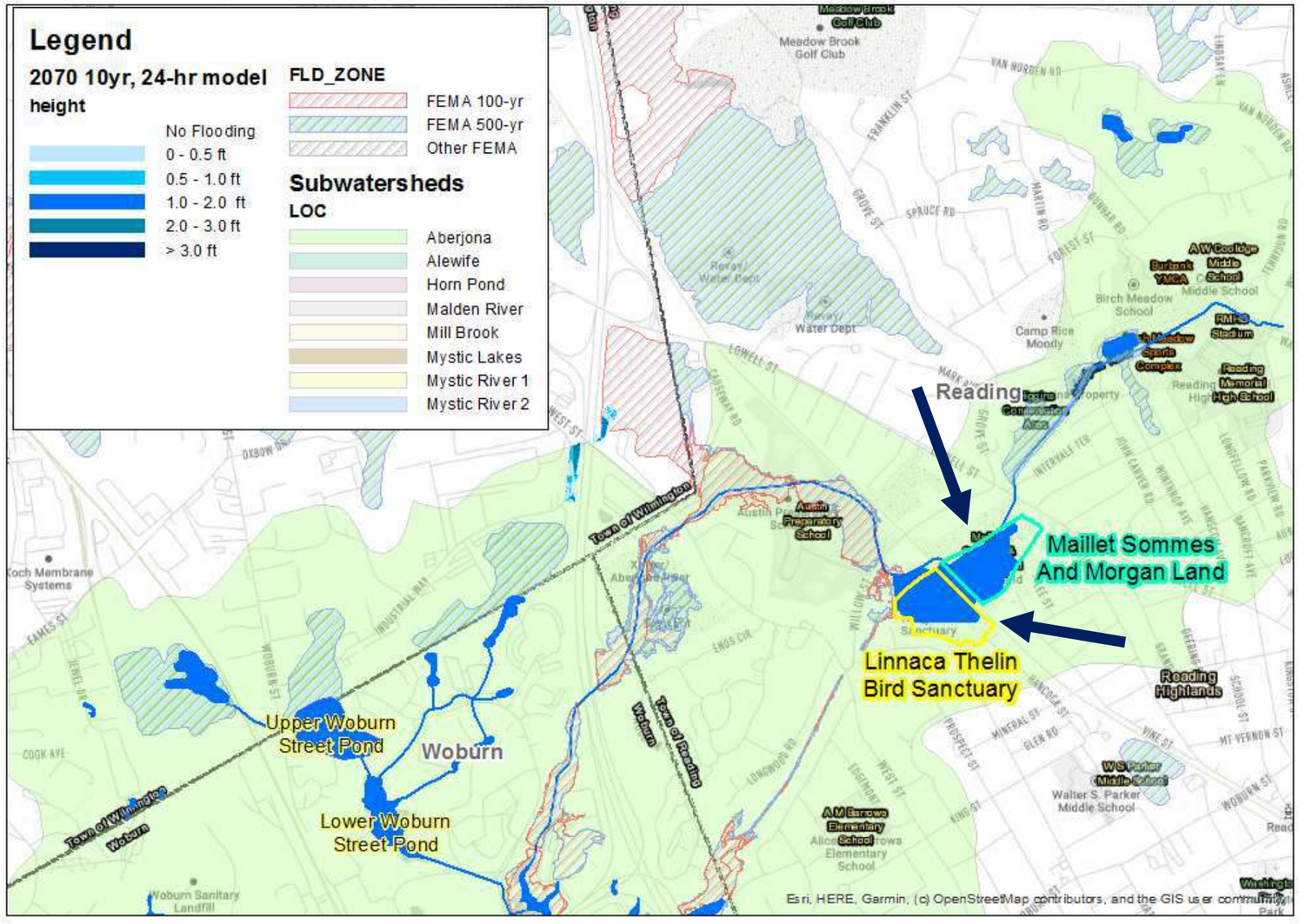
Concept-Level 10% Cost Estimate - December 2020

Item Description	Included Items	Cost
Excavation and Earthwork	Site prep, earthwork, planting soils, stabilization, forebay.	$1,600,000
Site Grey Infrastructure	All connections to stormwater wetland inlet.	
Paths and Boardwalks	ADA-compliant boardwalk and stonedust trail	$82,000
Site Improvements	Signage	$15,000
Planting	Wetland planting, buffer planting and seeding.	$280,000
Wetland Mitigation	Mitigation of lost wetland - 0.6 acres	$80,000
	Subtotal	$2,057,000
	10% Mobilization	$205,700
	25% Contingency	$565,675
	Total	**$2,828,000**
Exclusions: Design and Permitting Costs, upstream drainage retrofits		

SITE R2

Site Address / Name	Property Owner	Size estimate of suitable opportunity space:	Town Notes / Feedback:
Maillet Sommes and Morgan Land, Linnaca Thelin Bird Sanctuary KLF_ID: OS-056, OS-050	Town of Reading	~11 acres (OS-056) ~11.8 acres (OS-050)	Potential opportunity and second most likely, upstream of localized flooding at Austin Prep. Could expand recreation opportunities following work.

Site Opportunity map:



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

FEMA	2070 10-yr 24hr (riverine/overbank flooding)	2070-10-yr 24hr (subcatchment/piped infrastructure flooding)	Regional (subcatchment) weight
5, 4	1	1	5

Existing Slope, Soils	Article 97 protection status	Public Acceptance
5	1	4

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

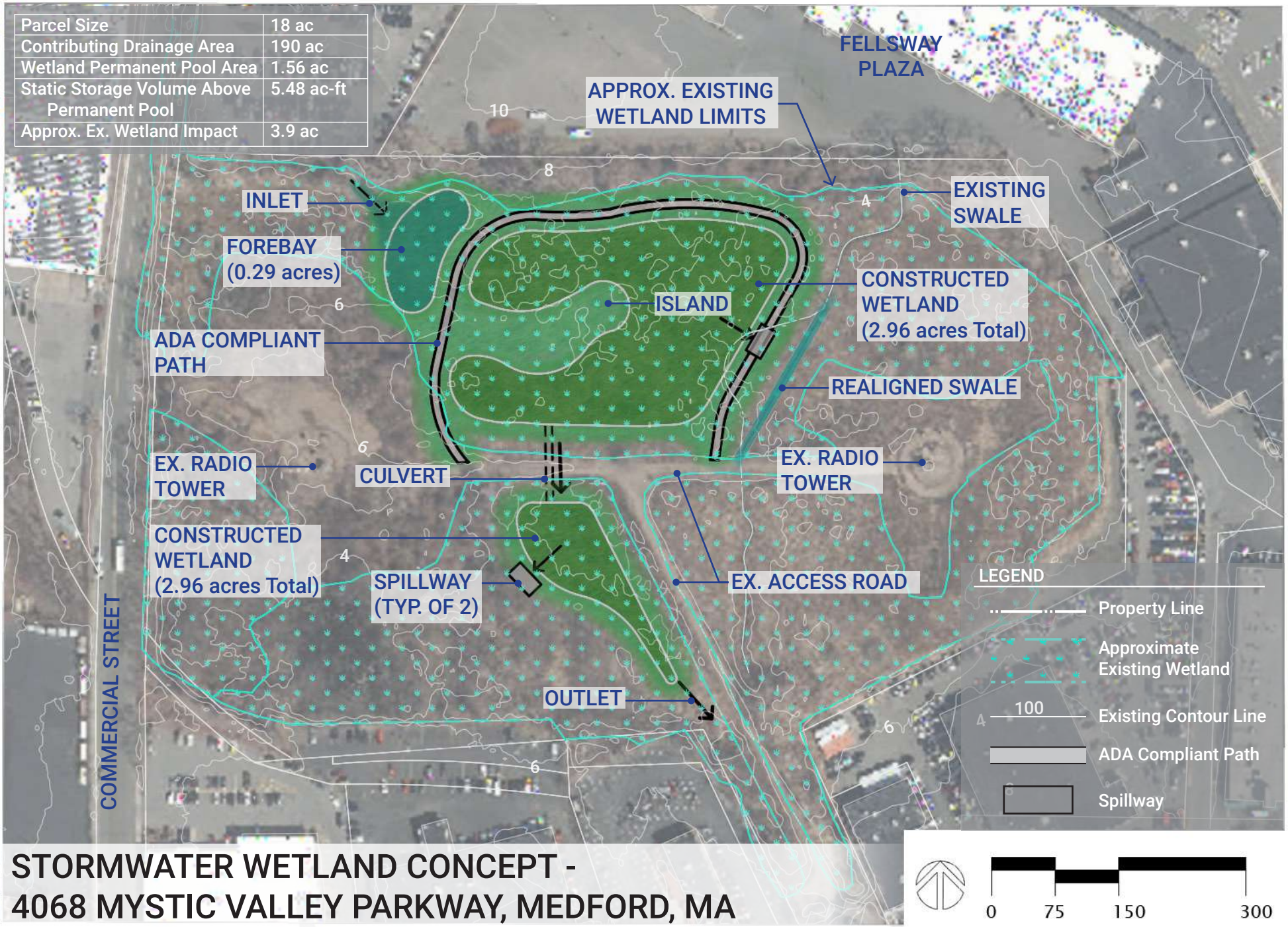
Land Cover & Habitat (Restoration Potential)	Socially Vulnerable Populations (Equitable Access & Flood Risk)	Proximity to existing park space, or Mystic waterfront (Connectivity)
1	1	5

Scoring Notes

- Site OS-050 contains portions in FEMA 500-yr zone. Modeled 2070 10-year flooding was not modeled in this location, however model resolution and piped infrastructure was limited in this area. The site is located in the upper reaches of the Aberjona sub-basin.
- Both sites' existing conditions contain mostly flat slopes <3% and are mostly HD wetland/woodland cover.
- Both sites have uses protected under Article 97 (per MassGIS Open Space layer). Locally designated for future green Open Space
- Both sites are in a census tract that scores in the least vulnerable quartile per CDC's Social Vulnerability Index (x < 0.25, out of 1.0).
- The opportunity is located within 500 feet the Aberjona River

Does the Town envision that implementation of a wetland-scale GI project in this location could also mitigate or solve a <u>local</u> flooding issue: Definitely ☐ Potentially ☒ No ☐

For all wetland opportunities, it is worth considering that baseflow drainage conditions (i.e., inter-storm event) would require ~1:100 loading ratio to maintain wetland function and ecology.
For example, 3-acre wetland opportunity, a 300-acre (or larger) drainageshed would be re-routed towards the wetland, resulting in a local opportunity for flood storage and/or water quality treatment.
When considering the size of upstream drainage that could be routed to the wetland GI, we recommend considering any localized flood issues that could potentially be addressed or mitigated as a result of this opportunity



STORMWATER WETLAND CONCEPT - 4068 MYSTIC VALLEY PARKWAY, MEDFORD, MA

Watershed-Wide Analysis to Optimize & Coordinate Regional Stormwater Management in the Mystic River Watershed

Prepared for Resilient Mystic Collaborative (RMC)

Mystic River WATERSHED ASSOCIATION

Watershed-wide Analysis to Optimize & Coordinate Regional Stormwater Management in the Mystic River Watershed

Prepared for the Resilient Mystic Collaborative (RMC)

4068 Mystic Valley Parkway - Medford, MA

Owner

Fellsway Associates LLC

Parcel Size

18 acres

Conceptual Constructed Wetland Information

Contributing Drainage Area: 190 acres
Forebay Area: 0.29 acres
Wetland Area: 2.52 acres
Wetland Permanent Pool Area: 1.56 acres
Static Storage Volume Above Permanent Pool: 5.48 acre-ft
Existing Wetland Impacted Area: 3.9 acres

Conceptual Estimated Cost: $3,944,000*

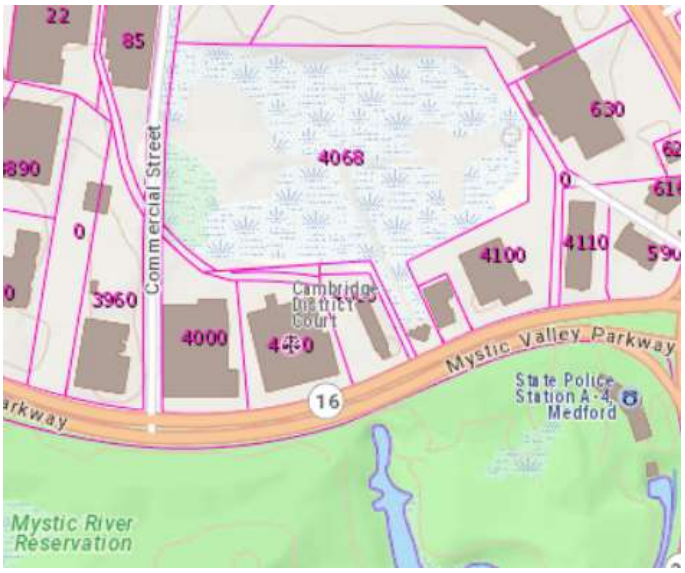
Constructed Wetland: $2,442,000
Paths/Signage/Boardwalk: $81,000
Wetland Mitigation: $345,000
**Includes 10% Mobilization and 25% Contingency Cost,*
**Excludes Cost for Upstream Stormwater/Grey Infrastructure and Design/Permitting*

Potential Pollutant Removal Estimates

~109 lbs/year TP removal, ~547 lbs/year TN removal

Site-Specific Opportunities & Co-Benefits

- Property is privately owned by Fellsway Associates LLC with development planned in the northwest upland portion of the site.
- Site has close proximity to Mystic River Reservation with potential for increased connectivity and public open space.
- Existing wetlands appear man-made. Low-quality habitat comprised almost entirely of invasive phragmites grasses.
- Existing radio tower, building, and access roads would not be impacted by concept.
- Opportunity for water quality improvement of adjacent largely-impervious commercial areas



MuniMapper – 4068 Mystic Valley Parkway Property

Site Photo – 4068 Mystic Valley Parkway Property

Design Considerations & Challenges

- Extent of existing upstream drainage site needs to be confirmed. Past wet weather observation (anecdotal by MyRWA) has noted that outlet by Mystic Valley Parkway has positive flow, but not substantial.
- Site outlet elevation is not much higher than Mystic River; active outlet controls may be needed to improve performance during low- to mid-size storm events.

Table 1. Project Summary Credit for Cambridge MVP Action Grant - Reading

	Removed Phosphorus Load (lb/yr)	Removed Nitrogen Load (lb/yr)	Removed Sediment Load (lb/yr)
Structural	79.54	364.36	56,172.53
Non-Structural	0	0	0
Land Use Conversion	0	0	0
Total	79.54	364.36	56,172.53

Table 2. Structural Project Summary for Reading

Project ID	BMP Type	BMP Storage Capacity (ft^3)/ Filter Depth (in.)	Phosphorus BMP Efficiency (%)	Nitrogen BMP Efficiency (%)	Sediment BMP Efficiency (%)	Removed Phosphorus Load (lb/yr)	Removed Nitrogen Load (lb/yr)	Removed Sediment Load (lb/yr)	Impervious Area Treated (ac)	Runoff Depth (in.)
ReadingBMP	WET POND/CREATED WETLAND	374,350	55.91	34.91	80.5	79.54	364.36	56,172.53	74.83	1.06

Table 3. Non-Structural Project Summary for READING

There are no non-structural BMPs.

Table 4. Land Use Conversion Project Summary for READING

There are no land use conversion projects.

City of Medford - Mystic Valley Parkway (Radio Tower site)

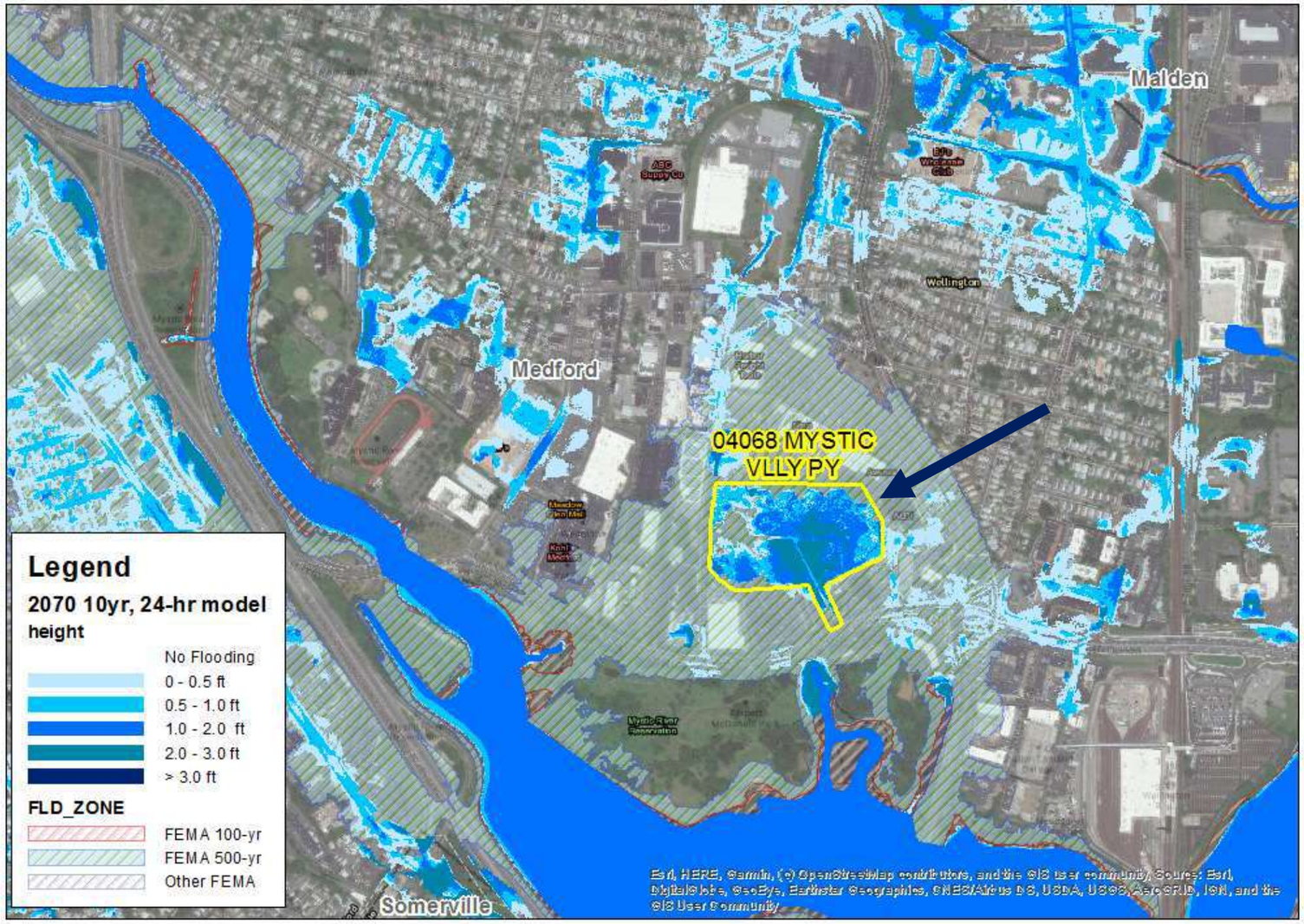
Concept-Level 10% Cost Estimate - December 2020

Item Description	Included Items	Cost
Excavation and Earthwork	Site prep, earthwork, planting soils, stabilization, forebay.	$2,400,000
Site Grey Infrastructure	All connections to stormwater wetland inlet.	
Paths and Boardwalks	ADA-compliant boardwalk and stonedust trail	$66,000
Site Improvements	Signage	$15,000
Planting	Wetland planting, buffer planting and seeding.	$42,000
Wetland Mitigation	Mitigation of lost wetland - 2.3 acres	$345,000
	Subtotal	$2,868,000
	10% Mobilization	$286,800
	25% Contingency	$788,700
	Total	**$3,944,000**
Exclusions: Design and Permitting Costs, upstream drainage retrofits		

SITE MED2

Site Address / Name	Property Owner	Size estimate of suitable opportunity space:	Town Notes / Feedback:
04068 MYSTIC VLLY PY KLF_ID: AP-265	FELLSWAY ASSOCIATES LLC private	~18 acres	previous radio tower/contaminated site

Site Opportunity map:



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

FEMA	2070 10-yr 24hr (riverine/overbank flooding)	2070-10-yr 24hr (subcatchment/piped infrastructure flooding)	Regional (subcatchment) weight
3	4	5	1

Existing Slope, Soils	Article 97 protection status	Public Acceptance
3	5	4

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

Land Cover & Habitat (Restoration Potential)	Socially Vulnerable Populations (Equitable Access & Flood Risk)	Proximity to existing park space, or Mystic waterfront (Connectivity)
1	5	3

Scoring Notes

- Site is located entirely within the FEMA 500-yr flood zone, and has modeled 2070 10-year flooding on-site. The site is near the confluence of the Mystic River channelized section and Amelia Earhart Dam basin.
- The site contains slopes between 3-6%, and is not protected site use under Article 97 (per MassGIS Open Space layer), but is privately owned.
- The site is in a census tract that scores in the most vulnerable quartile per CDC's Social Vulnerability Index (x < 0.25, out of 1.0) that also has modeled piped infrastructure flooding.
- The opportunity is located in close proximity to the Mystic River main channel with greater connectivity or greenway potential.

Does the Town envision that implementation of a wetland-scale GI project in this location could also mitigate or solve a <u>local</u> flooding issue: Definitely [ ] Potentially [x] No [ ]

For all wetland opportunities, it is worth considering that baseflow drainage conditions (i.e., inter-storm event) would require ~1:100 loading ratio to maintain wetland function and ecology.
For example, 3-acre wetland opportunity, a 300-acre (or larger) drainageshed would be re-routed towards the wetland, resulting in a local opportunity for flood storage and/or water quality treatment.
When considering the size of upstream drainage that could be routed to the wetland GI, we recommend considering any localized flood issues that could potentially be addressed or mitigated as a result of this opportunity

Mystic MVP Grant
Top 6 Site Key Quantity Estimates

Maple Street, Lexington	
Parcel Size (acres)	27.26
Contributing Drainage Area (acres)	205
Forebay Area (sf)	15,110
Wetland Area (sf)	58,420
Permanent Pool Area (sf)	38,080
Assumed elevation of wetland outlet, El. NAVD88	*179.0*
Assumed elevation of top of permanent pool, El. NAVD88	*174.0*
Static Storage Volume Above Permanent Pool (acre-ft)	5.18
Existing Wetland Area Impacted (sf)	0

75 Bedford Street, Woburn	
Parcel Size (acres)	11.27
Contributing Drainage Area (acres)	100-150
Forebay Area (sf)	5,285
Wetland Area (sf)	29,320
Wetland Permanent Pool Area (sf)	18,900
Assumed elevation of wetland outlet, El. NAVD88	*94.0*
Assumed elevation of top of permanent pool, El. NAVD88	*90.0*
Static Storage Volume Above Permanent Pool (acre-ft)	2.06
Existing Wetland Area Impacted (sf)	0

0 Mystic Valley Parkway (Meadowbrook Park), Arlington	
Parcel Size (acres)	9.1
Contributing Drainage Area (acres)	125
Forebay Area (sf)	15,750
Wetland Area (sf)	81,260
Wetland Permanent Pool Area (sf)	57,420
Assumed elevation of wetland outlet, El. NAVD88	*7.0*
Assumed elevation of top of permanent pool, El. NAVD88	*2.0*
Static Storage Volume Above Permanent Pool (acre-ft)	7.69
Existing Wetland Area Impacted (sf)	113,940

note: includes area impacted for paths

2 Mystic View Road (Gateway Park), Everett	
Parcel Size (acres)	23
Contributing Drainage Area (acres)	225-325
Forebay Area (sf)	27,500
Wetland Area (sf)	128,740
Wetland Permanent Pool Area (sf)	99,040
Assumed elevation of wetland outlet, El. NAVD88	*7.0*
Assumed elevation of top of permanent pool, El. NAVD88	*0.0*
Static Storage Volume Above Permanent Pool (acre-ft)	18.17
Existing Wetland Area Impacted (sf)	72,980

0 Willow Street (Maillet, Sommes & Morgan Land), Reading	
Parcel Size (ac)	5.48
Contributing Drainage Area (acres)	100-150
Forebay Area (sf)	12,740
Wetland Area (sf)	74,870
Wetland Permanent Pool Area (sf)	41,770
Assumed elevation of wetland outlet, El. NAVD88	*91.0*
Assumed elevation of top of permanent pool, El. NAVD88	*86.0*
Static Storage Volume Above Permanent Pool (acre-ft)	5.96
Existing Wetland Area Impacted (sf)	42,580

4068 Mystic Valley Parkway, Medford	
Parcel Size (acres)	18
Contributing Drainage Area (acres)	190
Forebay Area (sf)	12,730
Wetland Area (sf)	109,880
Wetland Permanent Pool Area (sf)	67,740
Assumed elevation of wetland outlet, El. NAVD88	*5.0*
Assumed elevation of top of permanent pool, El. NAVD88	*2.0*
Static Storage Volume Above Permanent Pool (acre-ft)	5.48
Existing Wetland Area Impacted (sf)	168,430

note: includes area impacted for paths

Appendix P

Active Reservoir Management - Supporting Documentation

Image credit: MyRWA

Screening assessment of large water bodies, reservoirs, and ponds with potential for Active Reservoir Management (ARM)

BASIN NAME	SURFACE AREA (Acres)	Priority	Explicity modeled in ICM-2D regional model?	ARM Opportunity status; outreach + prioritization notes	FEMA NFHL notes; site use notes from MS4 NOI's and published web content	Owner or Operator	Flow Control at Outlet (to confirm)
Spot Pond	**282.19**	**3**	**bathymetry only; no outflow**	**Represented in model w/bathymetry but simplified runoff-storage relationship in model; outfall structure (discharge goes through open channel ditch Melrose, then Malden, and buried connection to Malden River)**	**minimal flood hazard - recreation - fishing**	**DCR / received back from MWRA**	**Spot Pond earthen dam**
Upper Mystic Lake*	**158.35**	2	yes	updated stop log portion and ogee overflow weir based on call/email with DCR; scematic shared by Mike Galvin/Bill Gode	recreation - floodway	DCR	Mystic Dam
Fresh Pond	**151.67**			not an opportunity per existing use / separate from Mystic watershed drainage	recreation - 0.2% annual chance flood hazard	City of Cambridge	n/a; disconnected from watershed
Horn Pond*	**98.73**		yes	moeled in VHB updated HEC-RAS model; *model data shared via Sharepoint, but simulation of controlled released (active controls) not yet integrated in ICM-2D model*	recreation - regulatory floodway	City of Woburn	Scalley Dam (Horn Pond Dam)
Spy Pond	**93.92**	**1**	**yes**	**assumption made about length of weir; 36" pipe is likely limiting factor; bathymetry in ICM2D is an improvement over what is included in Jeff Walker study**	**recreation - arsenic pollution - without base flood elevation Zone A**	**Arlington land trust**	**rectangular standpipe; culvert to Little Pond**
Lower Mystic Lake*	**85.22**		yes	not an opportunity per DCR	recreation - regulatory floodway Zone AE	DCR	n/a; begins Mystic River at southeast end
South Reservoir	**72.12**		no	The City of Medford's model already accounts for the hydrologic response from the Middle/South Reservoir through its calibration. South and Middle Reservoirs are connected.	minimal flood hazard	Town of Winchester DPW	South Reservoir Dam (S) and East Dike (in Medford)
Middle Reservoir	**52.96**		no	The City of Medford's model already accounts for the hydrologic response from the Middle/South Reservoir through its calibration. South and Middle Reservoirs are connected.	minimal flood hazard	Town of Winchester DPW	Middle Reservoir Dike (in Medford)
North Reservoir	**51.98**		yes	North Reservoir is separate, but has a pumped connection from the Middle Reservoir. The regional model does does not have available data on the sub-surface or open channel network between the Aberjona River and the North Reservoir. The available HydroCAD model provided by the Town would have been prohibitively time-intensive to import to ICM and would have required major assumptions on the conveyance features downstream of the outlet structure.	minimal flood hazard	Town of Winchester DPW	North Reservoir Dam (in Winchester)
Arlington Reservoir*	24.9		yes	An emergency spillway, built in 2006, was added to the Arlington Reservoir model element. The emergency spillway geometry was based on 2018 Arlington Reservoir Master Plan.	beach recreation - without base flood elevation - some regulatory floodway	Inhabitants of Arlington - Public	Dam (earthen embankment)
Wright's Pond	**24.22**	4	yes	was added into ICM-2D model update using outlet/stop log data from AECOM dam safety report	recreation - without base flood elevation	MDC	Wrights Pond Dam
Wedge Pond*	**22.73**		yes	topogprahically challenging; pond sits too low for flood mitigation ARM (may be good water quality ARM opportunity)	recreation / minimal flood hazard; low flow typical, can dry up in summer months	Town of Winchester	outlet flows under Main St to Judkins Pond
Ell Pond: Crystal Pond, Melrose	**20.71**		no	opportunity may be limited; discharges to Spot Pond Brook conduit (controlling impact)	without base flood elevation	City of Melrose	crest gate (flood control; added 2008)
MISHAWUM LAKE	**18.05**			ICM-2D model is cut at Highway	polluted - floodway Zone AE	MARK-PHILLIP TRUST	flows under Mishawum Rd to Aberjona River
Little Pond, Belmont	**16.12**		yes	downstream of Spy Pond, upstream of Alewife Brook	recreation- significant wetlands - regulatory floodway Zone AE	DCR/ Commonwealth of Massachusetts	n/a, flows to Little River
Winter Pond	**14.74**			removed from model; refer to ENSR 2000 report -- limited opportunity for flood mitigation ARM (may be good water quality ARM opportunity)	minimal flood hazard; eutrophication some issues maintaining water level	Town of Winchester	flows to Little Winter Pond
Fells Reservoir	**11.27**		no	not an opportunity per existing use	recreation - potential for drinking water use in emergency cases	MWRA	earthen embankment
Clay Pit Pond	**10.54**	5	yes	opportunity may be limited; some flooding has occurred in adjacent areas in recent past	man-made pond; impaired - flooding issues - floodway Zone AE	Inhabitants of Belmont	buried connection to Blair Pond / Little River
Upper Woburn Street Pond	**9.04**			ICM-2D model is cut at Highway	area of minimal flood hazard	JAMITKOWSKI WALTER J JR, TRUSTEE	earthen dam?
FOWLE BROOK/HORN POND	**8.74**			updates are likely included in VHB's latest HEC-RAS update	recreation - regulatory floodway	City of Woburn	-
BROOKS POND	**6.97**			to Lower Mystic Lake; not an opportunity	recreation - without base flood elevation	City of Medford	-
Doleful Pond	**6.74**			DCR has no info to provide	minimal flood hazard - recreation	DCR	piped flow to Spot Pond
Quarter Mile Pond	**5.47**			DCR has no info to provide	recreational fishing - without base flood elevation	DCR	-
Fellsmere Pond	**4.71**	tied to 4	yes	was added into ICM-2D model update	recreation - fishing - without base flood elevation; backup water supply Malden	Comm of Mass	Fellsmere Pond Dam
Whittemore Pond + Walker pond / adjacent Woburn parcels	**4.32**	6		*not yet integrated in ICM-2D model; 2D detailed zone is east of railway*	impaired - recreation fishing	KRAFT GENERAL FOODS INC	n/a; small impoundment before joining Aberjona
Boojum Rock Pond	**3.62**			opportunity may be limited due to size	recreation - potential for drinking water use in emergency cases (Fells Reservoir MWRA)	DCR	-
Little Fresh Pond	**3.39**			not an opportunity per existing use / separate from Mystic watershed drainage	recreation - 0.2% annual chance flood hazard	City of Cambridge	n/a; disconnected from watershed
Lower Woburn Street Pond	**3.29**			*not yet integrated in ICM-2D model; 2D detailed zone is south of highway*	area of minimal flood hazard	RESOURCES FOR RESPONSIBLE SITE MGMT TR.	n/a; culvert at Congress St
LITTLE WINTER POND	**2.87**			removed from model; refer to ENSR 2000 report --- limited opportunity for flood mitigation ARM (may be good water quality ARM opportunity)	minimal flood hazard	Town of Winchester	flows to Wedge Pond
Jerrys Pond	**2.57**			may be opportunity as part of future site redevelopment	polluted private water - without base flood elevation Zone A	GCP Applied Technologies INC	n/a; mad-made
SMITH POND	**2.51**			opportunity may be limited due to size	recreation - toxic algal bloom	Town of Winchester	-
Judkins Pond	**2.08**			opportunity may be limited due to size and elevation	impaired - minimal flood hazard	Town of Winchester	n/a; flow to Aberjona

Draft Control Logic for ARM at two case study locations - Spy Pond (Arlington) and Wright's Pond (Medford)

Draft Control Logic for Mystic River MVP

The proposed control logic for both Spy Pond and Wright's Pond would rely on real-time calculations that compare forecast conditions to current measured conditions, determining if a drawdown is required to create storage capacity. For both sites the logic will determine a binary Release / Don't Release decision which would be used to control a pump to draw down the ponds. An overview of the control structure is shown in Figure 1. The control logic relies on site specific thresholds and maximum / minimum bounds on desired water level. Proposed control settings are shown in Tables 2 and 3 for the two sites.

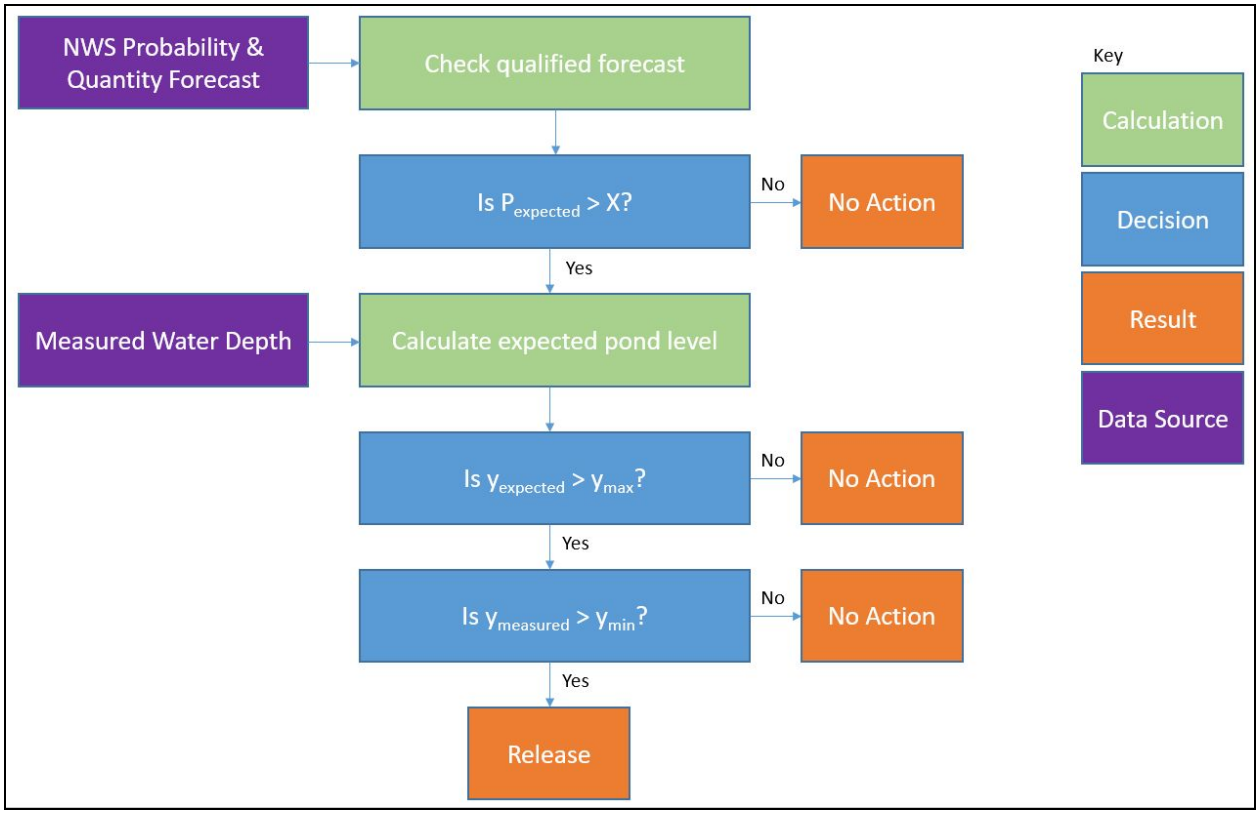


Figure 1: Logic Flow Diagram for Spy Pond and Wright's Pond

Table 1: Forecast Parameters

	Spy Pond	Wright's Pond
Probability Trust Threshold *(%)*	60	60
Quantity Trust Threshold *(in)*	0.05	0.05
Forecast Window *(hrs)*	48	48
Drainage Area *(acres)*	706	264

Table 2: Control Parameters

	Spy Pond	Wright's Pond
Minimum Drawdown Elevation *(ft)*	2.0 *ft NGVD 29*	132.2 *ft NAVD88*
Maximum Target Elevation *(ft)*	4.0 *ft NGVD29*	135.2 *ft NAVD88*
Downstream Release Defeat Threshold *(in)*	N/A	48

Calculation 1: Check qualified forecast

Data Sources:

- NWS Probability of Precipitation (POP) model
- NWS Quantitative Precipitation Forecast (QPF) model

Specified Parameters:

- Forecast window
- Probability Trust Threshold
- Quantity Trust Threshold

For each time step, the POP and QPF forecasts will be compared against the specified thresholds. If both forecast models exceed their respective threshold for a time step in the forecast window, the predicted rainfall volume (QPF) will be added to the total expected rainfall. National Weather Service forecasts are available up to 48 hours in advance, however if a longer forecast duration is required a proprietary forecast model from DarkSky can be used instead with a maximum duration of one week. An overview of the forecast calculations is shown in Figure 2.

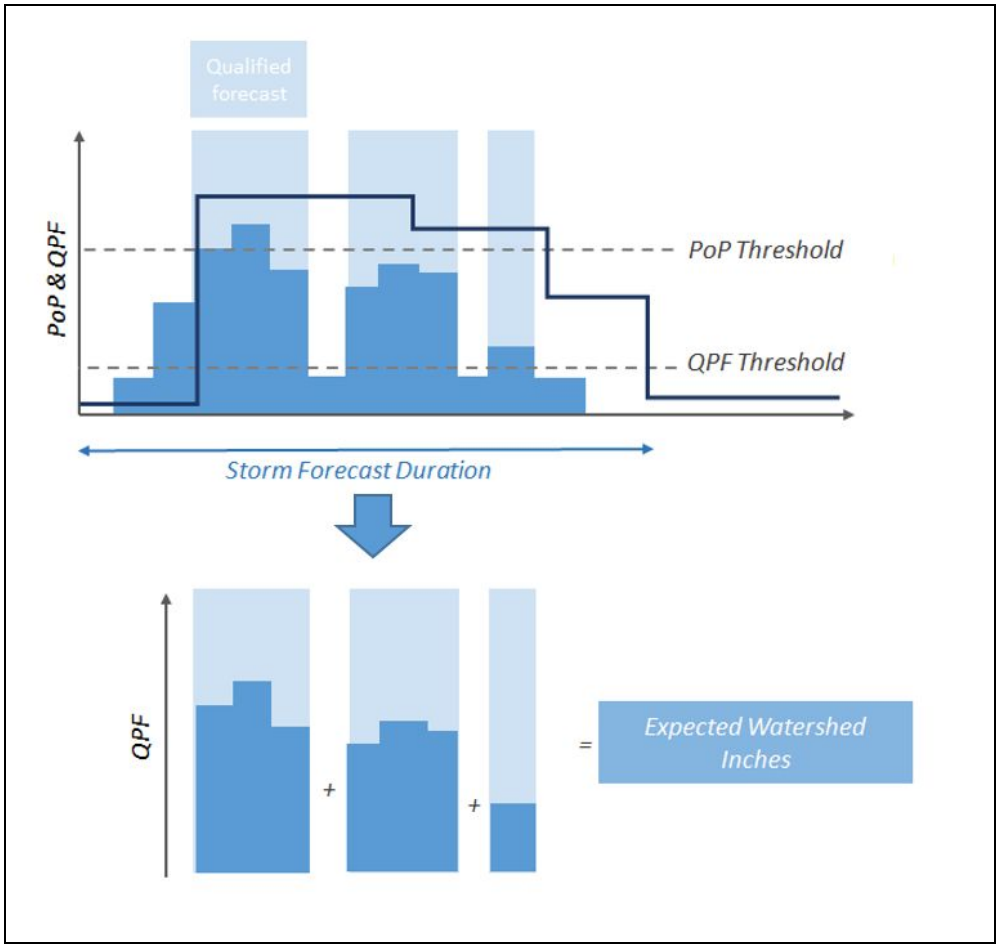


Figure 2: Overview of Forecast Qualification and Calculation

Calculation 2: Calculate expected pond level

Data Sources:

- Measured Water Level (from Opti gateway or approved alternative)
- Expected Watershed Inches (from Calculation 1)

Specified Parameters:

- Maximum Water Level
- Minimum Water Level

For each time step, the "Expected Watershed Inches" value calculated in step 1 is applied to a simple hydrologic model to translate expected rainfall to expected inflow volume. Using the measured water level in the pond, the current storage volume is calculated using a stage-storage relationship. The Expected Inflow Volume is added to the Current Storage Volume, and this new volume is used to back out the expected stage ($y_{expected}$) again using the stage-storage relationship. An overview of the different parameters and calculated values is shown in Figure 3.

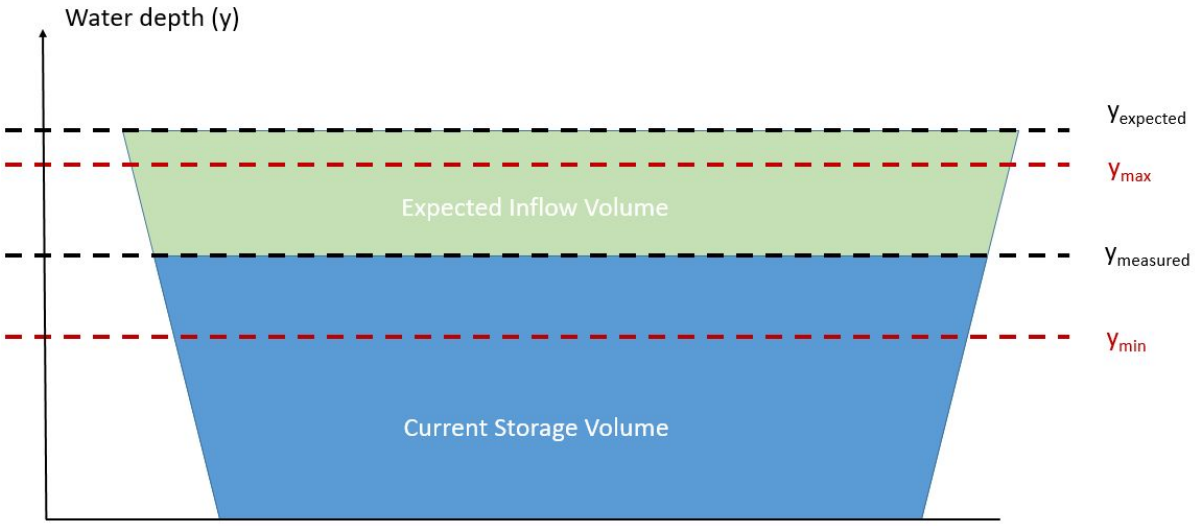


Figure 3: Calculated Levels and Volumes used in Spy Pond & Wright's Pond Control Logic

Once the expected stage is determined, the following logic is used to determine whether or not to initiate a release:

IF

$y_{expected} > y_{max}$ AND $y_{measured} > y_{min}$,

THEN:

Initiate Release

ELSE:

No Release

Release Defeat Logic:

Data Sources:

- Downstream water level (from Opti gateway or approved alternative)

Specified Parameters:

- Downstream Release Defeat Threshold

In addition to the predictive control logic, a release defeat is suggested for Wright's Pond that could limit releases based on a measured downstream condition. Because the downstream 48" culvert would likely constrain flow from the pond, an additional level sensor placed in the culvert could be used to

determine when outflow should be halted to avoid downstream flooding. When the measured downstream level exceeds the defined Downstream Release Defeat Threshold, all other control decisions will be overridden to a “No Release” decision.

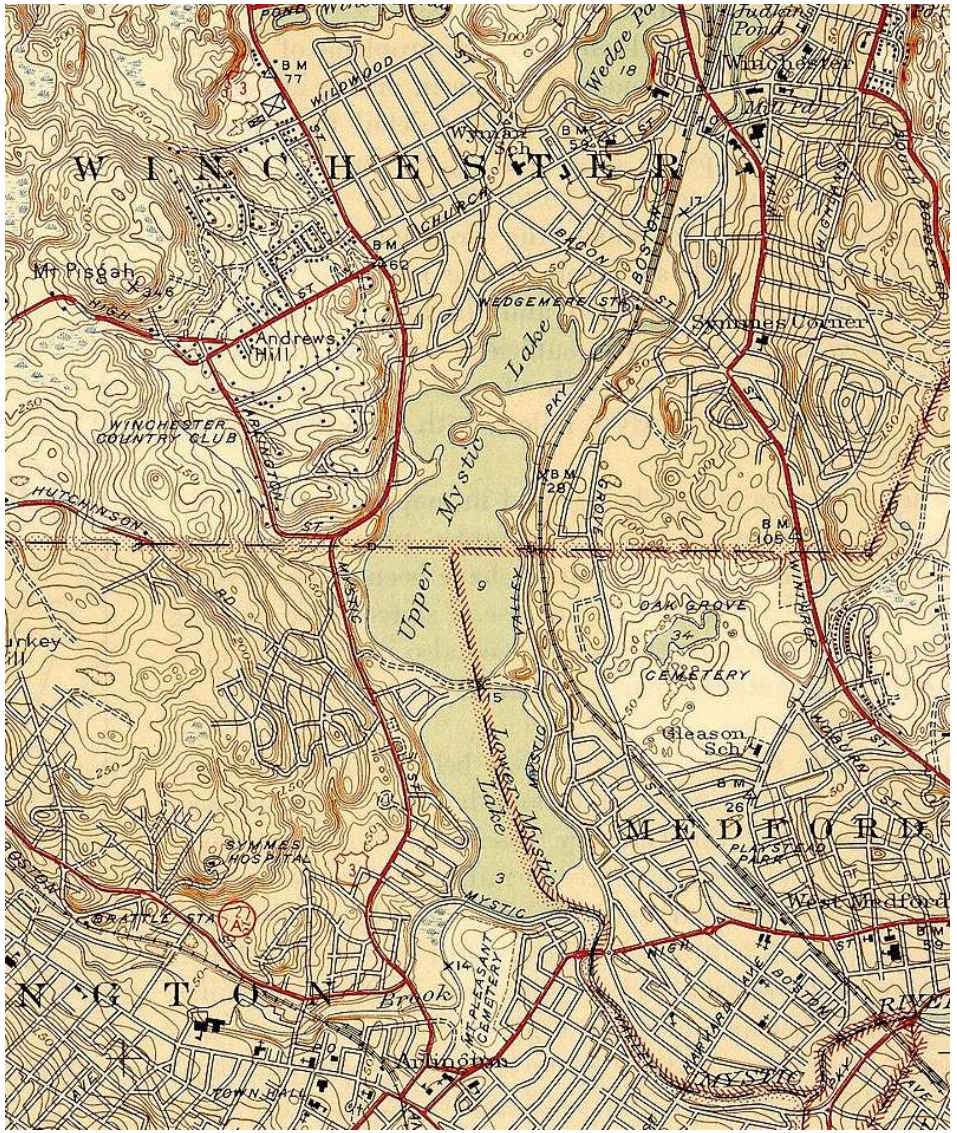
Notes from communications with staff from DCR, Town of Arlington, Town of Winchester, and City of Medford (April - August 2020)

Active Reservoir Management Update

April 2020

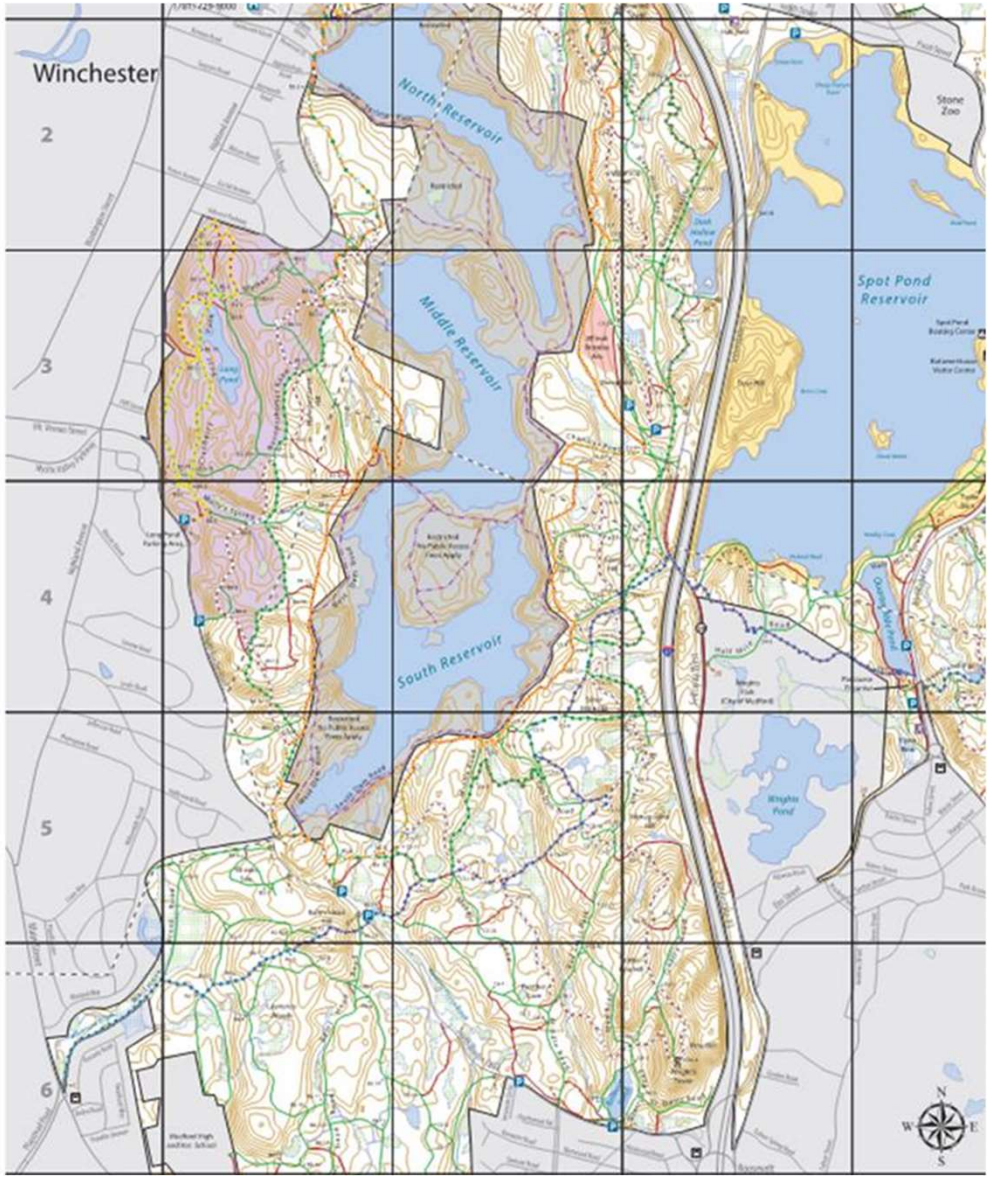
DCR Update

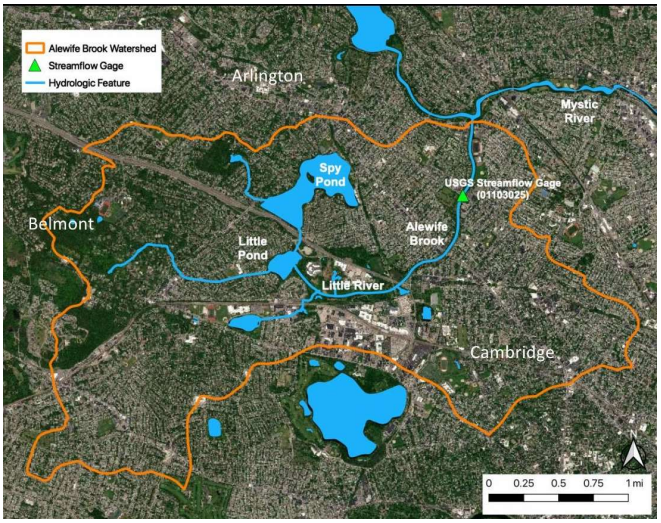
- Upper Mystic Lake:
  - Maximum Drawdown is 2ft
  - Gravity drained, so long lead time (~72 hours) to drawdown
  - A dam was added in 2010
    - Designed for extreme storms, has yet to be used
    - An anticipated storm with at least 4 inches of rainfall is needed to lower the water level, to prevent environmental damage.
    - The Upper Mystic Lake Dam crest gates:
      - are 7’ wide,
      - have a maximum crest gate elevation of 114.8’ MDC Base,
      - and have a minimum crest gate elevation of 110.5’ MDC Base ***although it is not reasonable to plan for the UML to be dropped as low as 110.5’***
- Lower Mystic Lake:
  - Water level controlled by Amelia Earhart Dam
- Spot Pond
  - ARM may be limited by drinking water uses
  - Continuing research on ARM options



Winchester Update

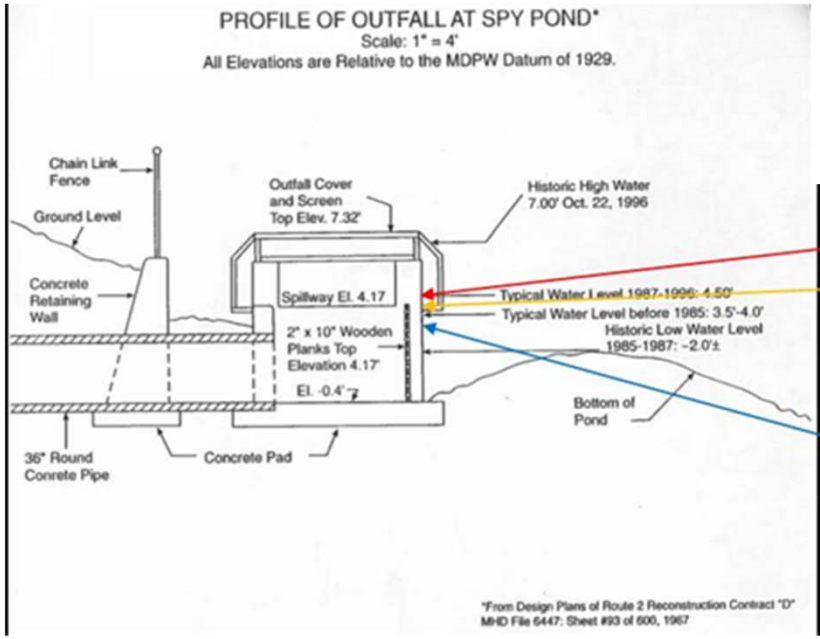
- Winchester has been working on a 20-year program to mitigate flooding, especially along the Aberjona
- Center Falls Dam & Horn Pond
  - Flow at Center Falls Dam is coordinated with Woburn based on Horn Pond levels and discharges
  - Winchester recently rebuilt Scully Dam at Horn Pond
  - Our team is working to capture the management between Center Falls Dam and Horn Pond in the regional model scenarios
- North, Middle and South Reservoirs
  - Provides about 1/3 of Winchester's drinking water (based on Summer)
  - South and Middle Reservoirs are connected. North Reservoir is separate, but has a pumped connection from the Middle Reservoir.
  - South and North Reservoirs are actively managed to prevent downstream flooding
  - Our team is working to incorporate operations at the reservoirs within regional model scenarios

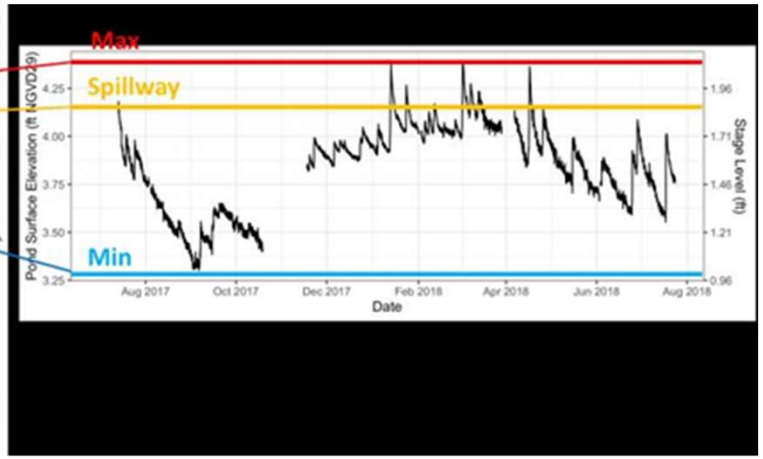




Spy Pond

- Using Jeffrey Walker's findings for model scenarios
  - **Gravity spillway elevation**: 4.17' MDW Datum of 1929
  - **Assumed water level at start of event** (48 hours prior to rainfall): 4.17'
  - **Max drawdown:** 1.5 feet
  - **Min water level:** (4.17' – 1.5'), or 2.67'

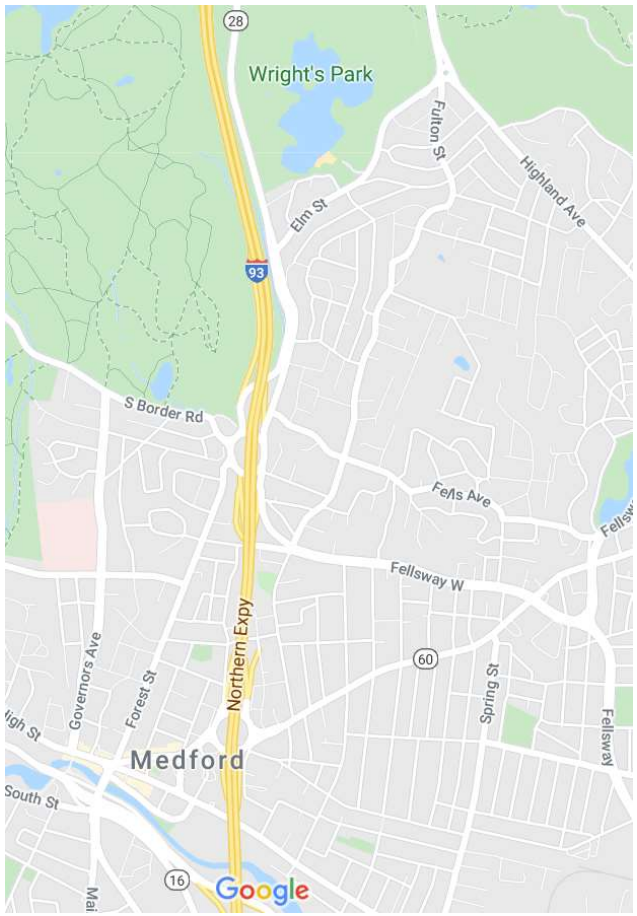




Additional Ponds in The Watershed

- Looking into adapting the approach from Walker's Spy Pond Study, at a high level, for other sites:
  - Spot Pond (DCR/Stoneham),
  - Clay Pit Pond (Belmont),
  - Wright's Pond (DCR/Medford),
  - Walker/Whittemore Pond (Woburn)
- Researching:
  - Downstream flow constrictions
  - Key Pond elevations, especially outfalls
  - Drawdown limitations

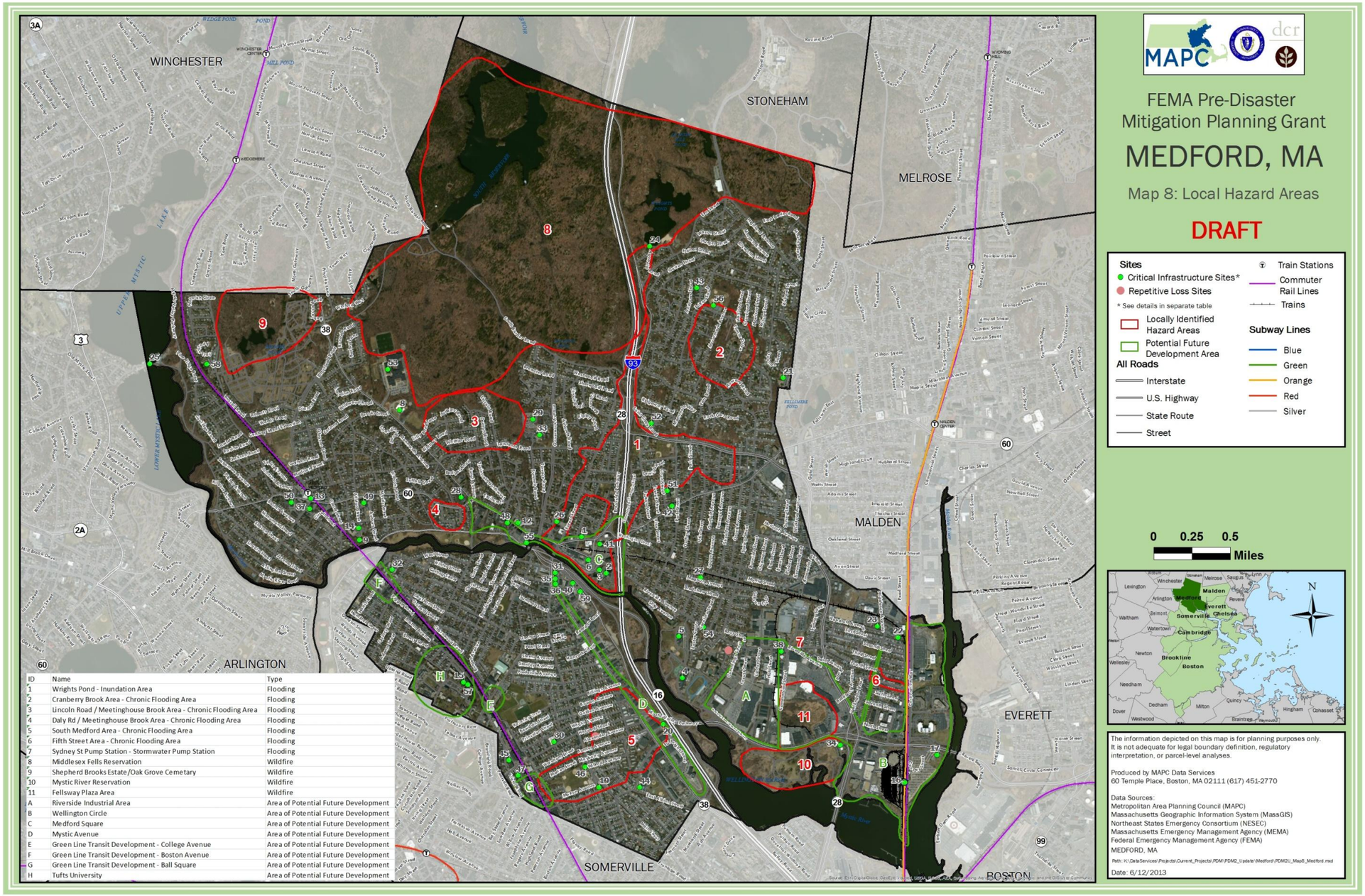
Wright’s Pond



e. Dams

Dams serve as critical infrastructure for Medford since their failure would result in significant damage within the city. There are three dams with the potential to cause such damage if they were to fail: the Mystic Lakes dam, the Wright's Pond Dam and the Amelia Earhart Dam.

(excerpt from Medford CCVA, January 2019)



ID	Name	Type
1	Wrights Pond - Inundation Area	Flooding
2	Cranberry Brook Area - Chronic Flooding Area	Flooding
3	Lincoln Road / Meetinghouse Brook Area - Chronic Flooding Area	Flooding
4	Daly Rd / Meetinghouse Brook Area - Chronic Flooding Area	Flooding
5	South Medford Area - Chronic Flooding Area	Flooding
6	Fifth Street Area - Chronic Flooding Area	Flooding
7	Sydney St Pump Station - Stormwater Pump Station	Flooding
8	Middlesex Fells Reservation	Wildfire
9	Shepherd Brooks Estate/Oak Grove Cemetary	Wildfire
10	Mystic River Reservation	Wildfire
11	Fellsway Plaza Area	Wildfire
A	Riverside Industrial Area	Area of Potential Future Development
B	Wellington Circle	Area of Potential Future Development
C	Medford Square	Area of Potential Future Development
D	Mystic Avenue	Area of Potential Future Development
E	Green Line Transit Development - College Avenue	Area of Potential Future Development
F	Green Line Transit Development - Boston Avenue	Area of Potential Future Development
G	Green Line Transit Development - Ball Square	Area of Potential Future Development
H	Tufts University	Area of Potential Future Development

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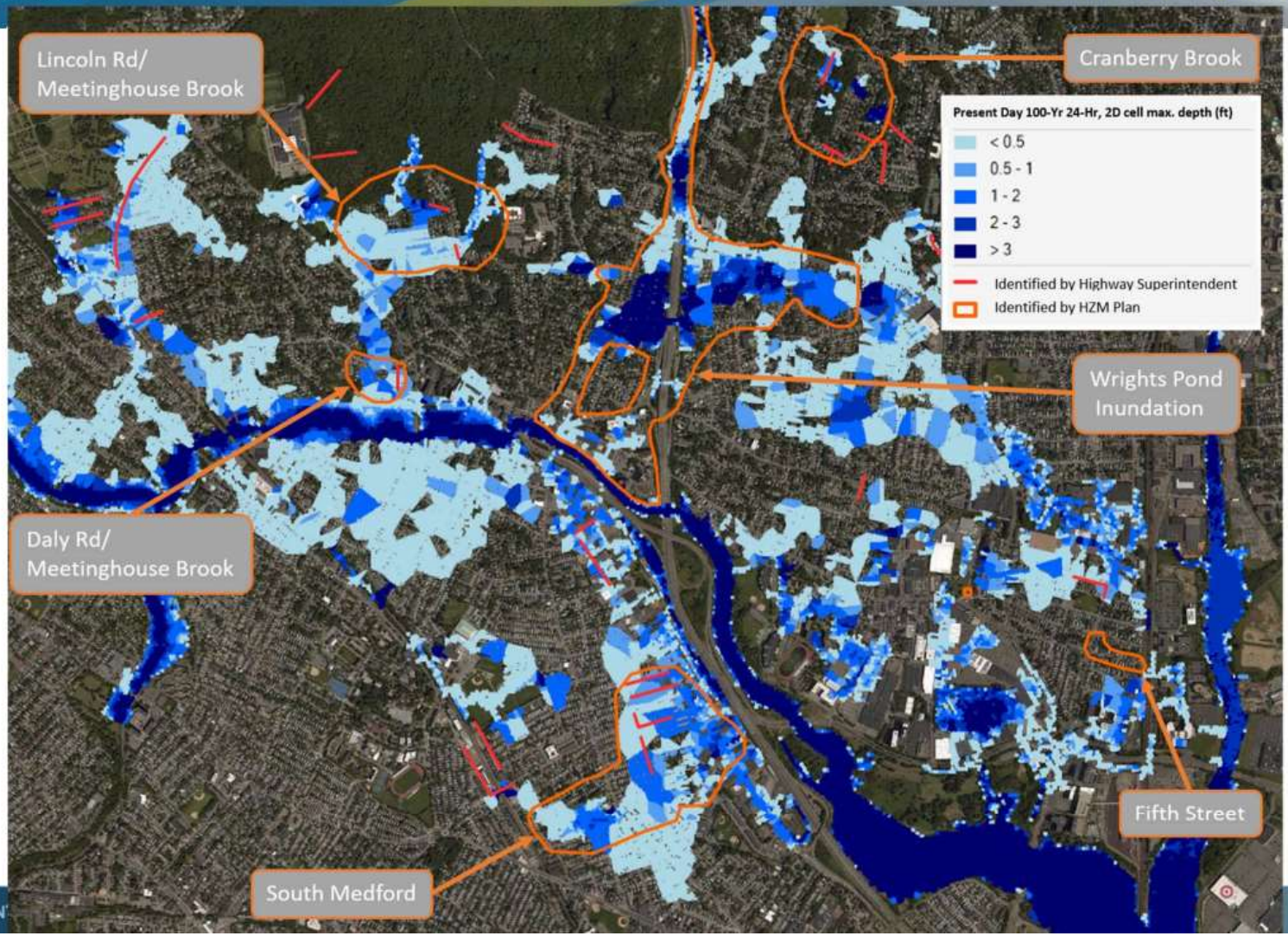
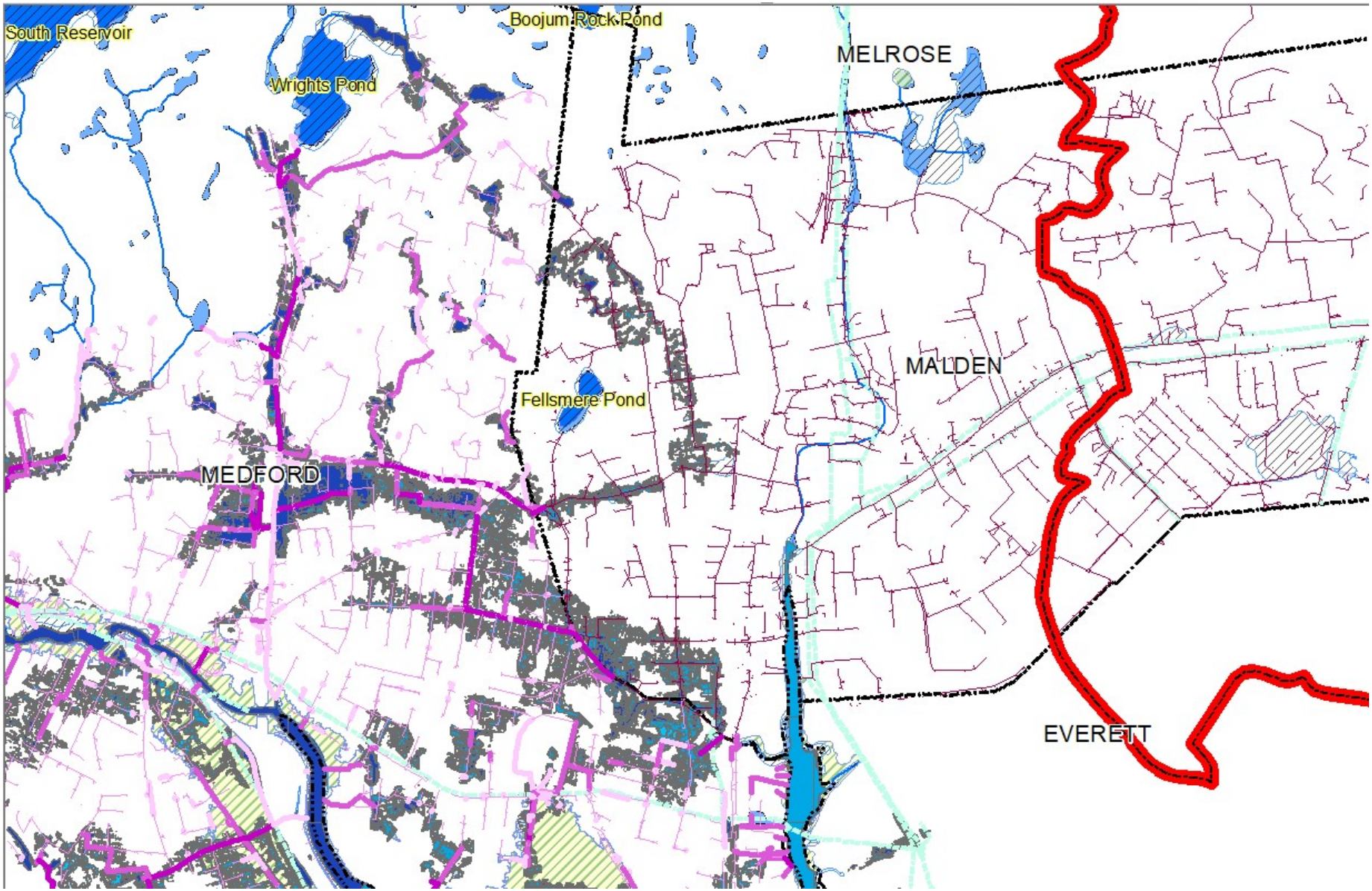
2D Model Validation/Verification



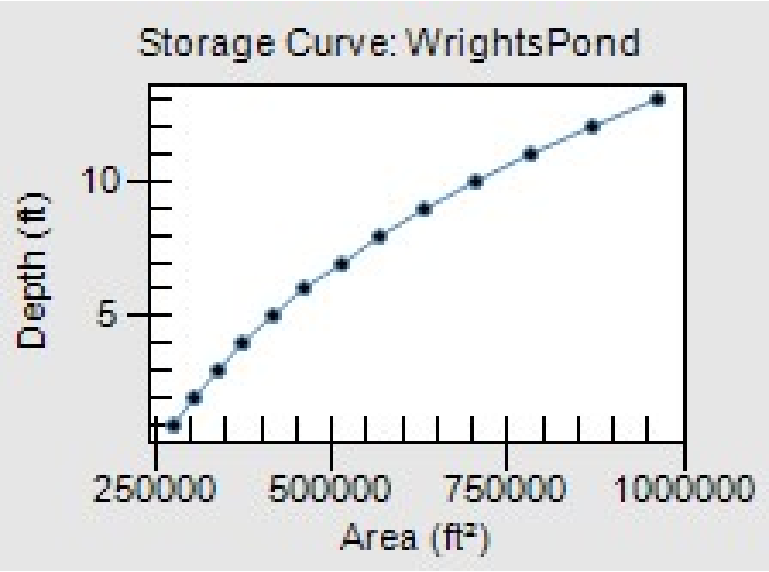

South Reservoir
Wrights Pond
Boojum Rock Pond
MELROSE
Fellsmere Pond
MALDEN
MEDFORD
EVERETT

Flow controls / Active Reservoir Management

Medford's other dam, the Wright's Pond Dam, is managed by the City, and is not currently in danger of breaching in the near future as a result of any identified climate change-related hazards. Water from Wright's Pond routinely flows out through a spillway and into a 48" culvert where it enters Medford's storm drain system and flows out to the Mystic River. The City has operational guidelines to follow to prevent downstream flooding, resulting from precipitation and overflow from Wright's Pond.

(excerpt from Medford CCVA, January 2019)

PC-SWMM modeling assumptions



- Simplified storage area in PCSWMM
- Assume outflow at 139’-NAVD
- Assumes storage curve from 129’ (bottom) to
  142’ (12 ft depth)
- No controlled discharge other than gravity drainage when at full capacity

Appendix Q

Overview of Water Bodies, Piped Infrastructure Constrictions, and Control Structures (Summary Map)

Image credit: Kleinfelder

Upper Mystic Watershed
Flow Control structures (dams, pond outlets)
Buried streams, bridge crossings, constrictions
Hydro_up_Mystic
Rivers
Water Bodies
Town Boundary
Adjacent Town Boundary

Roads

Administrative Type

Local Road (per MassDOT)
Major Road (per MassDOT)
Major Roads

1 inch = 0.39 miles

NORTH READING
LYNNFIELD
READING
Upper Woburn Street Pond
Lower Woburn Street Pond
outlet pipe
MISHAWUM LAKE
BURLINGTON
WAKEFIELD
WOBURN
Whittemore Pond
STONEHAM
FOWLE BROOK/HORN POND
Horn Pond
dam
outlet pipe
Doleful Pond
dam
North Reservoir
Ell Pond: Crystal Pond
crest gate
Winter Pond
outlet pipe
Wedge Pond
dam
Spot Pond
MELROSE
Middle Reservoir
WINCHESTER
dike
Quarter Mile Pond
South Reservoir
Fells Reservoir
dam
Boojum Rock Pond
SMITH POND
dike
dam
Wrights Pond
LEXINGTON
dam
Upper Mystic Lake
dam
BROOKS POND
Arlington Reservoir
dam
MEDFORD
Fellsmere Pond
dam
MALDEN
Lower Mystic Lake
ARLINGTON
locks
Spy Pond
outlet pipe
EVERETT
Little Pond
BELMONT
Clay Pit Pond
Jerrys Pond
WALTHAM
SOMERVILLE
Little Fresh Pond
Fresh Pond
CAMBRIDGE
BOSTON
WATERTOWN