WALTHAM RESILIENT STORMWATER ACTION AND IMPLEMENTATION PLAN

EXECUTIVE SUMMARY - JUNE 2021

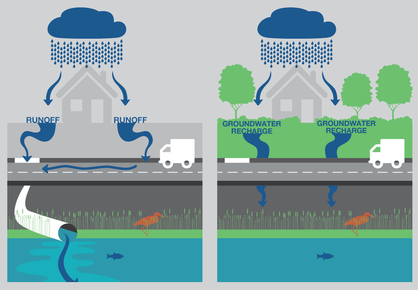
The Resilient Stormwater Action and Implementation Plan was supported by the City Engineer's Office, Planning and Development Department, and Consolidated Public Works.

The Resilient Stormwater Action and Implementation Plan was funded in part by the Massachusett's Executive Office of Energy and Environmental Affairs' Municipal Vulnerability Preparedness (MVP) Action Grant.

INTRODUCTION

The City of Waltham's 2019 Hazard Mitigation Plan – Municipal Vulnerability Preparedness Plan (HMP-MVP Plan) found flooding is the most prevalent and serious natural hazard. Flooding in Waltham occurs as both riverine and as urban stormwater flooding. Both types of flooding are expected to worsen with more intense precipitation projected to occur under climate change. To address this vulnerability, the City of Waltham applied for and was awarded grant funding from the Executive Office of Environmental Affairs' Municipal Vulnerability Preparedness Action Grant Program to create a Resilient Stormwater Action and Implementation Plan (RSAIP) to address flooding and water quality in Waltham.

- The average annual precipitation across the Northeastern states has increased by approximately 10 percent in the last fifty years.
- More total rainfall can have an impact on the frequency of minor but disruptive flooding events, especially in areas where stormwater infrastructure has not been adequately sized to accommodate higher levels.



Waltham is also anticipated to have:

- hotter temperatures
- more intense and frequent storms
- more flooding

PROJECT OBJECTIVES

- Develop a comprehensive and resilient management and implementation plan for the stormwater system to reduce flooding and urban heat island
- Identify priority stormwater projects and key areas to equitably incorporate green infrastructure
- Evaluate projects to more efficiently direct future resources
- Better maintain, protect, and improve the assets and natural resources of the City through proactive stormwater management

FLOODING IN BEAVER BROOK

METHODS

1. Review historic stormwater and flooding data and information
2. Field conditions and stream assessment
3. Hydraulic & hydrologic model of current and future flood conditions
4. Identification and prioritization of green and grey infrastructure opportunities
5. Complete an urban heat island assessment
6. Create a stormwater infrastructure maintenance tracking form
7. Virtual community and and stakeholder engagement
8. Review regulations to incorporate climate resiliency
9. Develop a capital improvement plan
10. Apply for a grants to implement solutions

The compiliation of all of the deliverables can be found online at www.city.waltham.ma.us/engineering/pages/waltham-resilient-storm-water-action-implementation-plan

PROJECT TYPES

STREAM IMPROVEMENTS

Outcomes:

- Inspected **26 miles** within the Lower Beaver Brook, Clematis Brook, Chester Brook, West Chester Brook, Master Brook, and Stoney Brook
- Documented over **140 outfalls**, the condition of **68 culverts**, and numerous other possible stream improvements
- Beaver Brook, West Chester, and Chester Brook had the greatest amount of projects identified for stream and culvert improvements
- The most prominent project needs across subbasins are stream and culvert cleaning of debris and sedimentation and culvert replacements
- **Twenty-four culverts** do not require any action

sediment build-up

vegetation overgrowth

debris in stream

retaining wall condition

culvert conditions

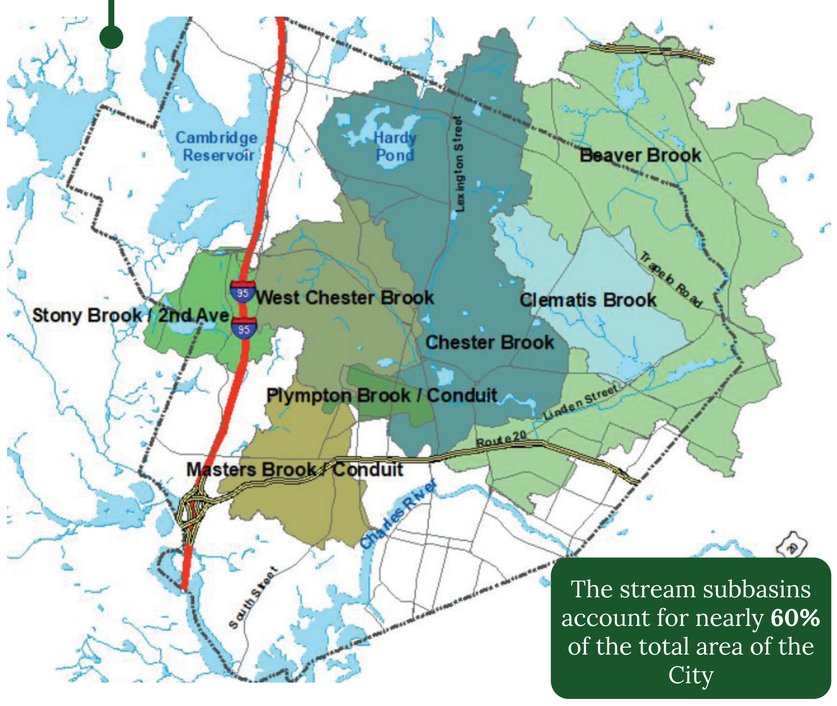
channel cross section

outfall conditions

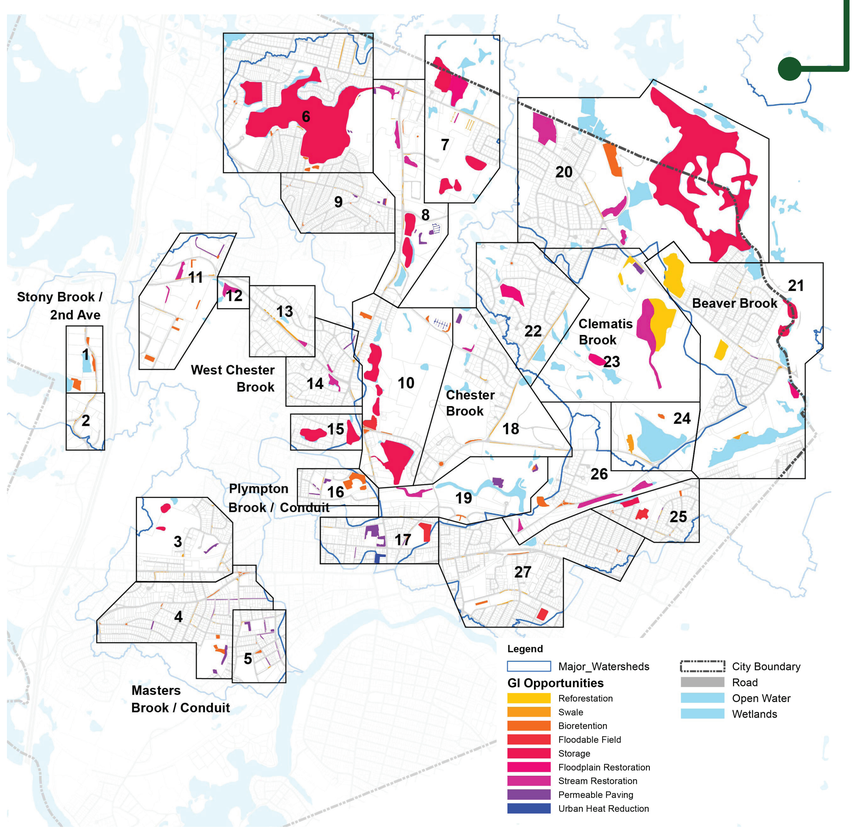
bank erosion

	Bank Stabilization	Culvert Maintenance[1] or Replacement	Debris Removal	Overgrowth Removal	Retaining Wall Repair	Sediment Removal
Beaver Brook	1,233 linear feet	Maintenance required on six culverts	34 tree dams, 17 piles of garbage/other debris, 3 locations of rock, brick, or concrete dumped	1,902 linear feet	-	14,167 cubic yards
Clematis Brook	-	Maintenance required on three culverts	4 fallen trees	808 linear feet		2,833 cubic yards
Chester Brook	188 linear feet	Maintenance required on ten culverts, replace one culvert	47 debris points: 41 fallen trees, 6 piles of garbage/other debris	1,980 linear feet	Repairs required on one section of retaining wall	16,331 cubic yards
West Chester Brook	1,053 linear feet	Maintenance required on sixteen culverts, replace three culverts	49 fallen trees	1,458 linear feet	Repairs required on one section of retaining wall	4,167 cubic feet
Masters Brook	-	-	-	-	-	-
Stoney Brook	-	Maintenance required on two culvert	3 fallen trees, 3 piles of garbage/other debris	76 linear feet	-	3,250 cubic feet

[1]Maintenance includes structural maintenance on the culvert and/or headwall[1]Maintenance includes structural maintenance on the culvert and/or headwall



The stream subbasins account for nearly **60%** of the total area of the City



NATURE BASED SOLUTIONS AND GREY INFRASTRUCTURE FOR FLOOD MITIGATION

Outcomes:

- **Over 300** green infrastructure projects and their co-benefits were identified
- Several grey infrastructure upgrades, such as upsizing culverts, were assessed for flood mitigation potential reduce

Benefits:

- Stormwater volume reduction
- Water quality improvements
- Reduction in impervious surfaces in Waltham by **1,716,680 sq.ft (39.4 acres)**
- And more! See the table below

GREEN INFRASTRUCTURE TOOLBOX


Permeable Paving


Biorention


Underground Storage


Reforestation


Floodable Field


Stream Restoration


Bioswales


Floodplain Restoration


Urban Heat Reduction Structures

GREEN INFRASTRUCTURE SCENARIOS AND CO-BENEFITS

The green infrastructure projects were grouped into scenarios because projects have the greatest impact when implemented togther.

Scenario	Community Resilience Factor	Environmental Justice Neighborhood	Reduction of Urban Heat	Placemaking	Pedestrian Improvements	Biodiversity
Scenario 1 – Northern Second Ave	2	5	2	2	3	2
Scenario 2 – Southern Second Ave	1	5	1	2	3	1
Scenario 3 – Upper Masters/Sibley Brook	1	5	2	2	2	2
Scenario 4 – Middle Masters/Sibley Brook	2	3	2	4	4	4
Scenario 5 – Lower Masters/Sibley Brook	3	3	2	2	3	2
Scenario 6 – Hardy Pond	4	4	1	2	1	3
Scenario 7 – Falzone Memorial Park and Shady's Pond Conservation Area	1	3	1	3	2	4
Scenario 8 – Upper Chester Brook	4	5	2	3	5	4
Scenario 9 – Lake Street Neighborhood	4	5	1	1	3	1
Scenario 10 – Middle Chester Brook	1	2	2	4	2	4
Scenario 11 – Upper West Chester Brook	2	5	3	3	4	4
Scenario 12 – Prospect Hill Park	3	1	3	5	4	5
Scenario 13 – Totten Pond Road	1	1	1	1	3	3
Scenario 14 – Pond End Road	1	1	2	2	1	3
Scenario 15 – Lexington and Bacon St	3	1	1	2	1	3
Scenario 16 – Plympton Brook	3	4	2	4	3	4
Scenario 17 – Lexington and Church St	1	5	4	3	3	2
Scenario 18 – North of Lyman Pond	1	2	2	2	5	3
Scenario 19 – Lower Chester Brook	3	5	2	2	1	3
Scenario 20 – Upper Beaver Brook	5	2	4	4	2	4
Scenario 21 – Middle Beaver Brook	3	1	5	5	4	4
Scenario 22 – Upper Clematis Brook	1	1	3	3	3	3
Scenario 23 – Fernald Campus	5	1	5	5	2	5
Scenario 24 – Lower Clematis Brook	1	1	1	2	2	2
Scenario 25 – Warrendale	1	1	2	4	3	4
Scenario 26 – Waverly Oaks and Linden	5	3	2	4	4	4
Scenario 27 – Lower Beaver Brook	3	3	3	2	4	2

GREY INFRASTRUCTURE IMPROVEMENTS

Watershed	Gray Infrastructure Project	Description / Justification	Near-term % Reduction Total Volume (MG)	Long-term % Reduction Total Volume MG)	H&H Performance 1: Minimal to 5: Very Significant
Stony Brook / 2nd Ave	None	NA	-	-	-
Masters / Sibley Brook	Prospect St at Highland / Felton St	The proposed change is to widen those conduits to 10 feet wide or otherwise create a comparable increase in cross-sectional flow area.	100.0%	100.0%	5
Chester Brook	None	Noted in the discussions of Scenarios 6, 8, and 10 in Appendix A, several green infrastructure scenarios included modifications to the culverts or other outlet structures that impound ponds or wetlands within the Chester Brook watershed	-	-	-
West Chester Brook	Craig Ln. & Totten Pond Road Storm Drain Improvements	Increase the capacity of the storm drains in Totten Pond Rd. and Craig Ln	100.0%	100.0%	4
	Culvert Improvements	Increase the discharge capacity at Worcester Ln., Bacon St., and Lexington St. , (3) 4-foot diameter culverts at all four road crossings	11450.0%	1473.0%	5
Beaver Brook & Clematis Brook	Culverts near Waverly Oaks Rd and Linden St	This concept incorporates widening of the channel in this trouble area (likely to the south) so that it is consistent with upstream and downstream reaches.	-	7.0%	3

CAPTIAL IMPROVEMENT PLAN

Outcomes:

- The Capital Improvement Plan is divided into 10 yearly segments
- Estimated individual project costs range from $200,000 to over $5.5 million
- Yearly costs range from approximately $3.1 million to $7.6 million

Funding Options:

- Current operational and capital funds
- Setting up a stormwater enterprise fund to secure a dedicated and reliable funding source
- Federal and state grants
- Federal and state revolving loans

Implementation:

- The City will continously reevaluate priorities and allocated budget amounts as new needs and circumstances arise
- Normal operation and maintenance costs have not been factored into this plan and will be evaluated through implementation

Updated June 29th, 2021

Base Year	Scenario 20 - Trapelo Road Beaver Brook Culvert Replacement	$1,000,000
	Scenario 23 - Fernald Wetland Pond and Stream Daylighting	$2,500,000
	Base Year Total	**$3,500,000**
Year 1	Scenario 4 - Rehabilition of Storm Drain - Cabot and Fiske Avenue	$450,000
	Scenario 5 - Floodable Field Design at Nipper Maher Park	$200,000
	Scenario 15 - Culvert Replacement under 260 Lexington Street	$950,000
	Improvements at Lower Chester Brook/Stanley Road to Beaver Brook	$900,000
	Green Infrastructure Projects from Relevant Scenarios	$250,000
	H/H Modeling Studies and Inspection of Infrastructure	$250,000
	Major Operation and Maintenance of the Collection System	$50,000
	Year 1 Total	**$3,050,000**
Year 2	Scenario 20 - Outlet Control Structure Mallard Way	$175,000
	Scenario 26 - Waverley Oaks and Linden Street Culverts	$5,500,000
	Improvements from Stony Brook - Second Avenue	$250,000
	Improvements at Lower Beaver Brook to Main Street	$325,000
	Green Infrastructure Projects from Relevant Scenarios	$250,000
	H/H Modeling Studies and Inspection of Infrastructure	$50,000
	Major Operation and Maintenance of the Collection System	$1,000,000
	Year 2 Total	**$7,550,000**

Contact the following people if you have questions or comments:
- Bob Winn, City Engineer, rwinn@city.waltham.ma.us
- Catherine Cagle, Director of Planning, ccagle@city.waltham.ma.us