Combined Sewer Overflow Updated Long Term Control Plan Progress & Related Efforts

File ID 25-0966 Officer's Communication to City Council

Infrastructure & Asset Management

22 May 2025

Presenter's Preamble

- This presentation contains numerous slides, most borrowed from other presentations, and any one of which could be a topic of prolonged discussion
- It is the presenter’s intention to move very quickly through the slides and only provide the highest-level overview on each topic
- The presentation includes pause points to answer questions and/or provide additional detail on any concept of interest (slides are numbered for reference)

Presentation Overview

- Part One – Combined Sewer Overflow (CSO) Long Term Control Plan (LTCP) Update
  - What is a CSO & what is the MWRA?
  - Original LTCP
  - Updated LTCP
  - Example alternatives
  - Overall Capital Investment Plan
  - Financial Capability Analysis
  - Next steps / schedule
- Part Two – Billing for Stormwater
  - Why should we do it?
  - How will it work?
  - What are the benefits?

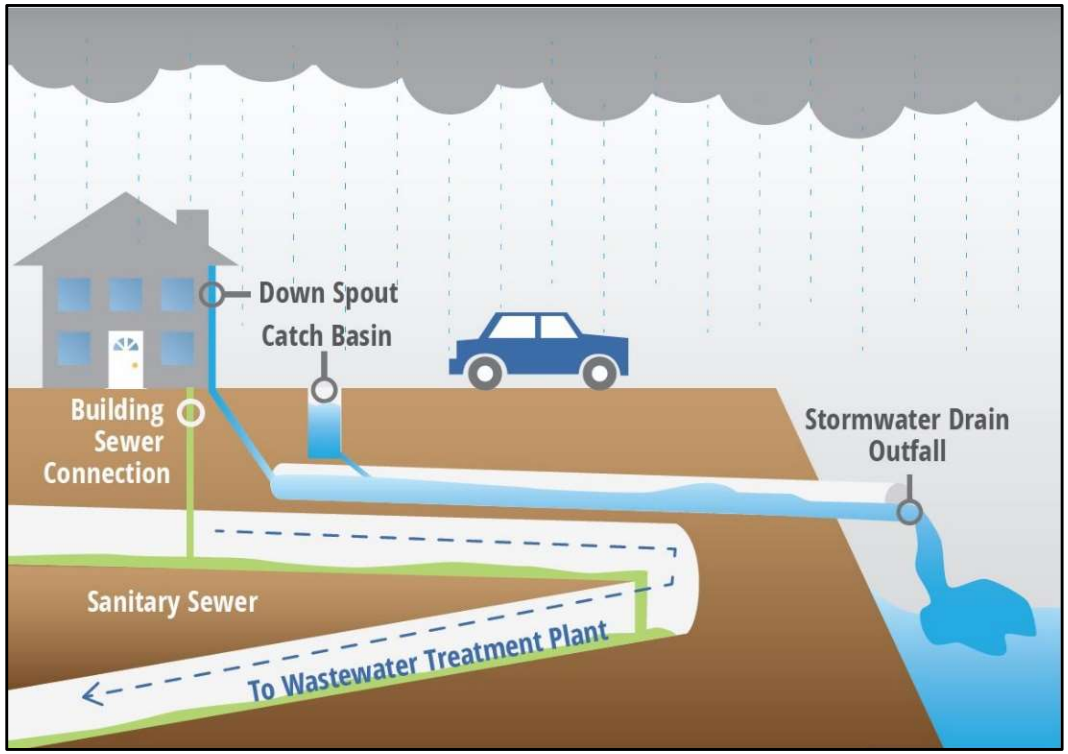
Combined Sewer Overflows

What is a Separate Sewer System?

Two dedicated networks of pipes: one for sanitary flows, and one for stormwater flows.

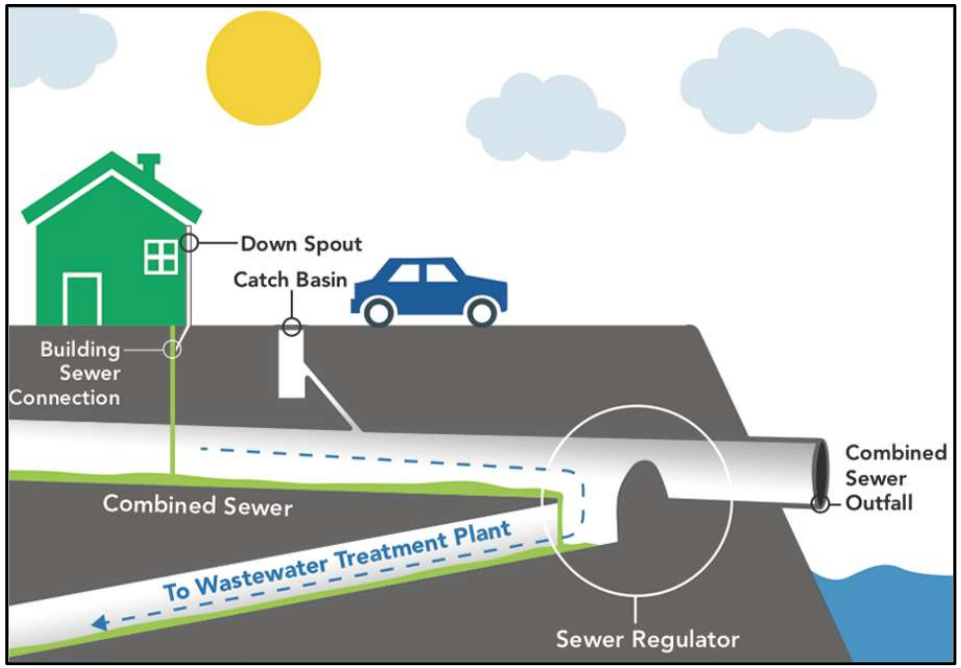
Residential sewage and industrial wastewater is conveyed to the Deer Island facility for treatment.

All stormwater runoff is discharged to the Alewife, Charles and Mystic Rivers.

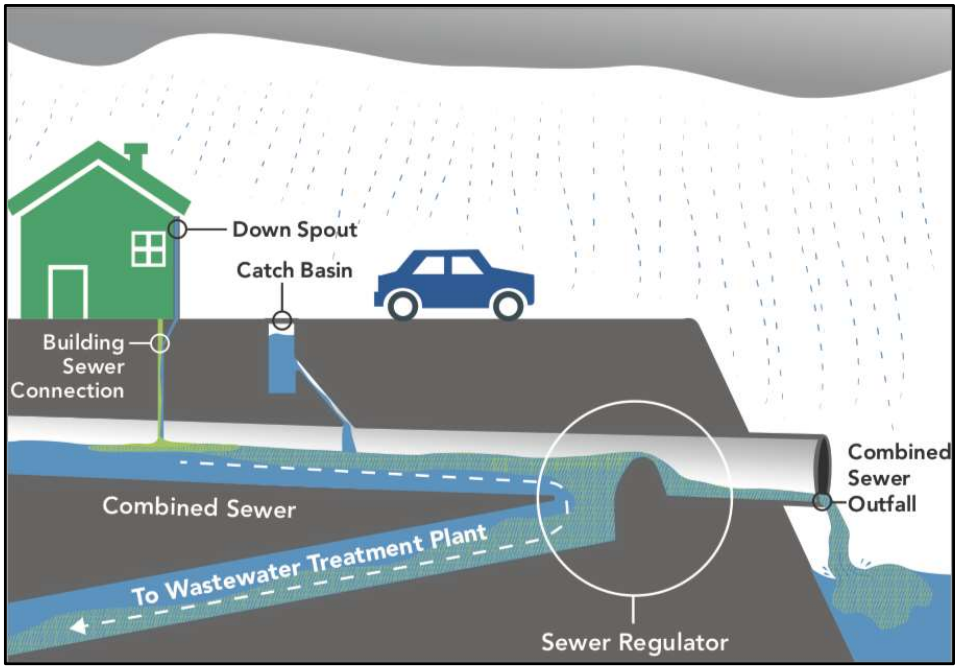


What is a Combined Sewer System?

One network of pipes for both sanitary and stormwater flow.



All sanitary flow and stormwater from most storms is moved to the Deer Island Wastewater Treatment Facility.



Occasionally, **excess flow during heavy rain** can cause a combined sewer overflow (CSO) into rivers.

MWRA Regional System Timeline

1889 – Regional sewer construction begins under Metropolitan Sewerage District

1995 – New Deer Island Treatment Facility begins operation

1972 – Clean Water Act

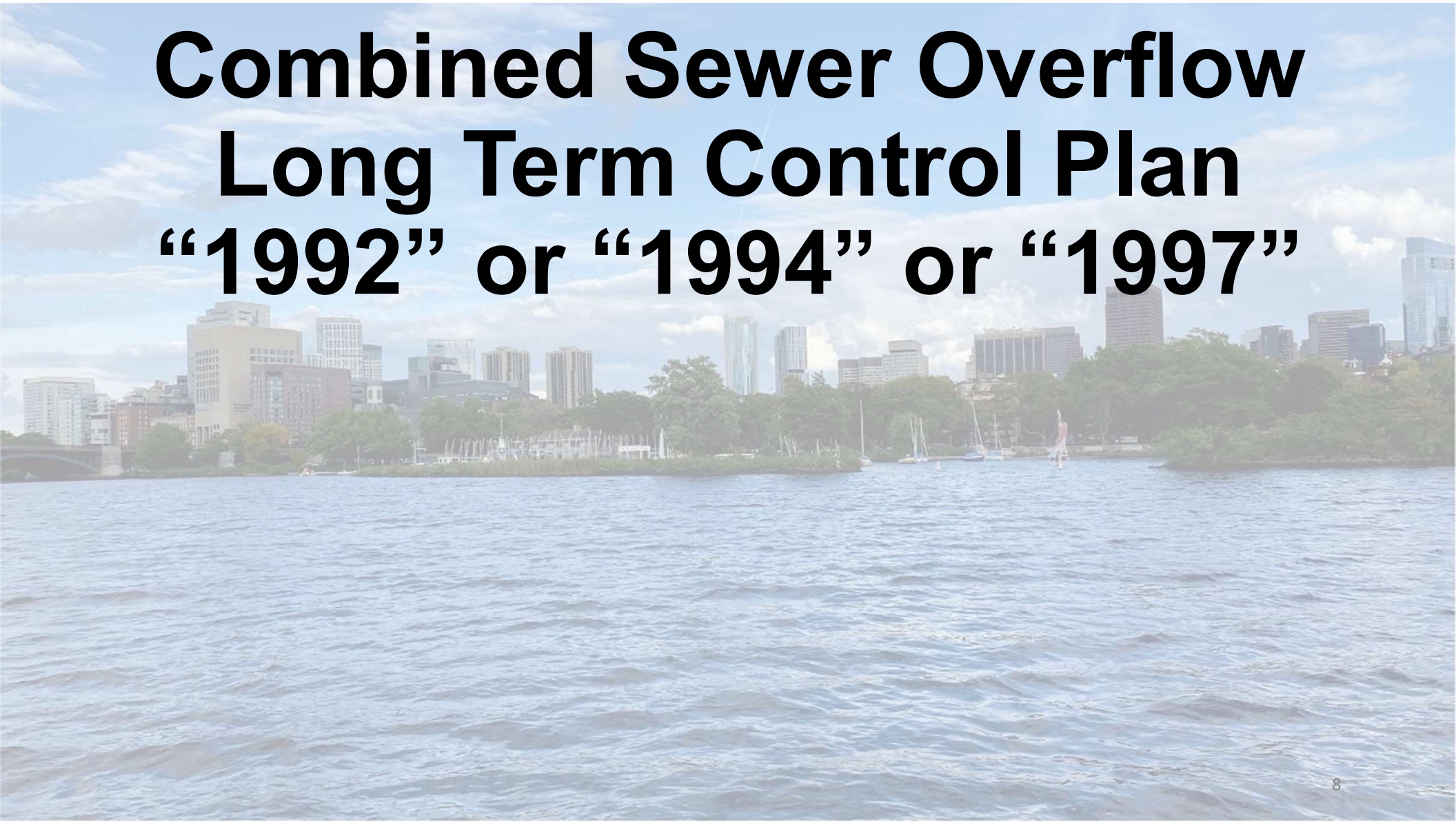
1876 – Boston sewer interceptor construction begins

1952 – First regional sewage treatment plant

1985 – MWRA assumes control of sewer system

1988-1992 – Early upgrades
1994-2015 – Capital Improvement Projects completed as part of original Long Term Control Plan

2022 – Planning for updated CSO Control Plans



Combined Sewer Overflow Long Term Control Plan "1992" or "1994" or "1997"

Original MWRA System Wide CSO Long Term Control Plan Near Completion

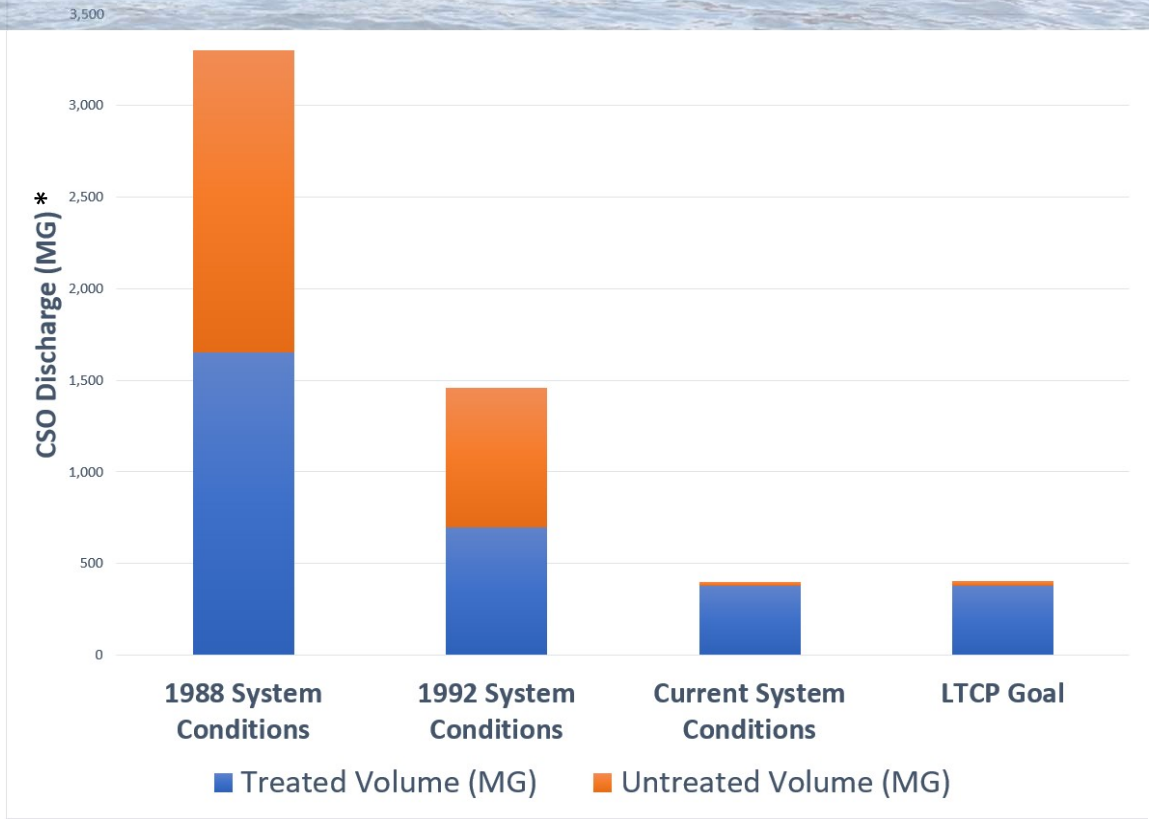
25 Years of Major Investment in sewer and stormwater infrastructure and maintenance overall resulting in:

- CSO volume reduction of 2.9 billion gallons / year
  - 87% reduction in overall CSO volume
  - 93% of remaining CSO volume is treated
- Closure of 40 / 86 CSO outfall points (5 effectively closed along South Boston beaches)
- $911 million spent on 35 projects to reduce CSOs
- Boston's beaches are now considered the cleanest urban beaches in the country
- CSOs now only contribute to bacterial water quality standard being exceeded ***a very small percentage*** of an average year (8hrs and 35hrs, in the Charles and Alewife/Mystic respectively).

System Wide CSO Reduction Since the Start of the CSO Program in the 1980s

Prior Long Term Control Plan

- System wide improvements including the Charles, Alewife, Mystic resulted in significant reductions in CSO discharge since 1980s.

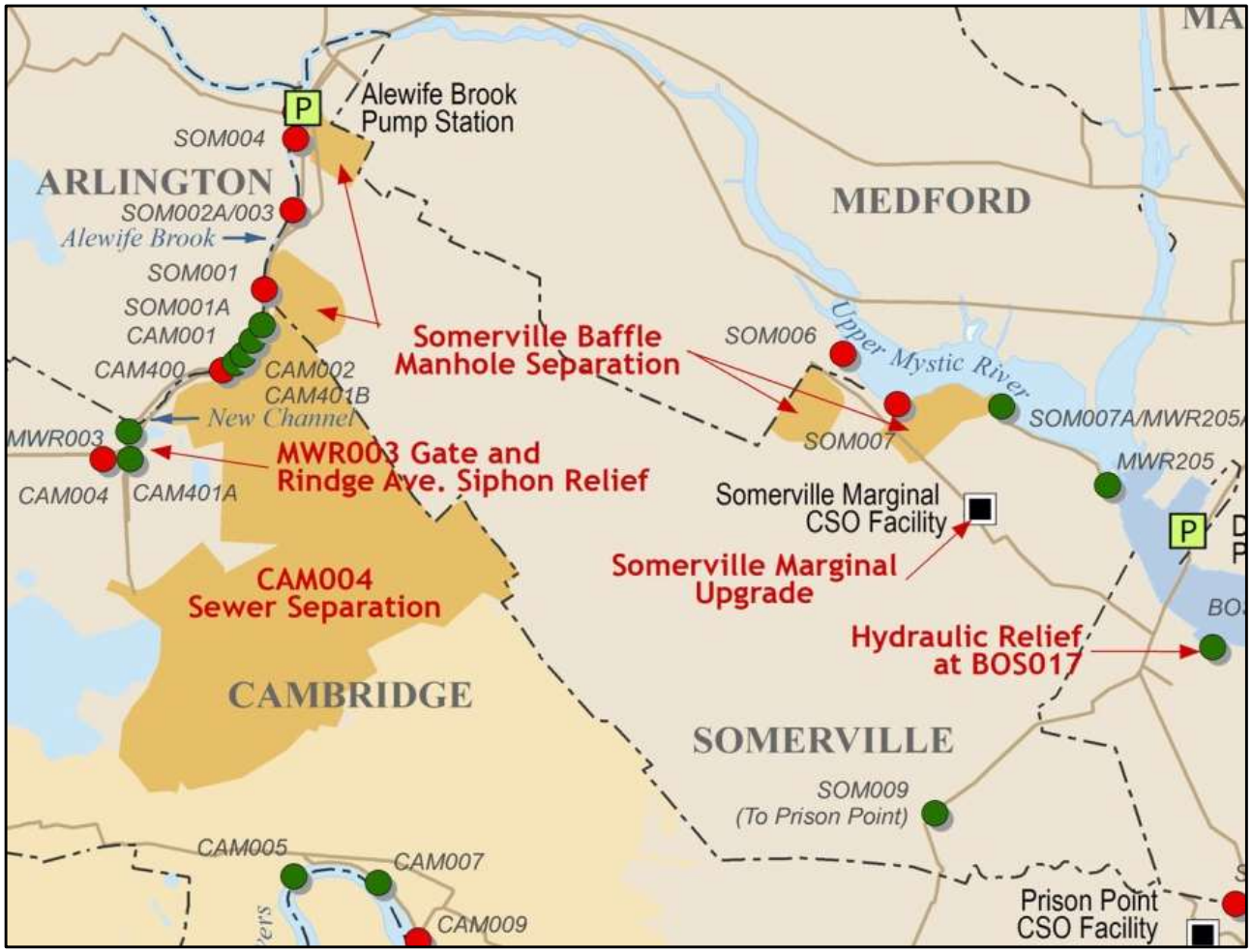


System Wide CSO Reduction Since the 1980s

**Annual discharge volume based on the prior Typical Year*

Alewife Brook & Upper Mystic Projects

Alewife Brook
Somerville
Closed:
SOM001,
SOM002A,
SOM003 &
SOM004
Remain:
SOM001A
Cambridge
Closed:
CAM0004,
CAM400
Remain:
CAM001
CAM002
MWR003
CAM401A
CAM401B



Upper Mystic
Closed:
SOM006,
SOM007
Remain:
SOM007A (100% Treated by MWRA Somerville Marginal Facility)

Alewife & Upper Mystic Projects
Over $215M spent
Additional Project underway design to further reduce SOM007A

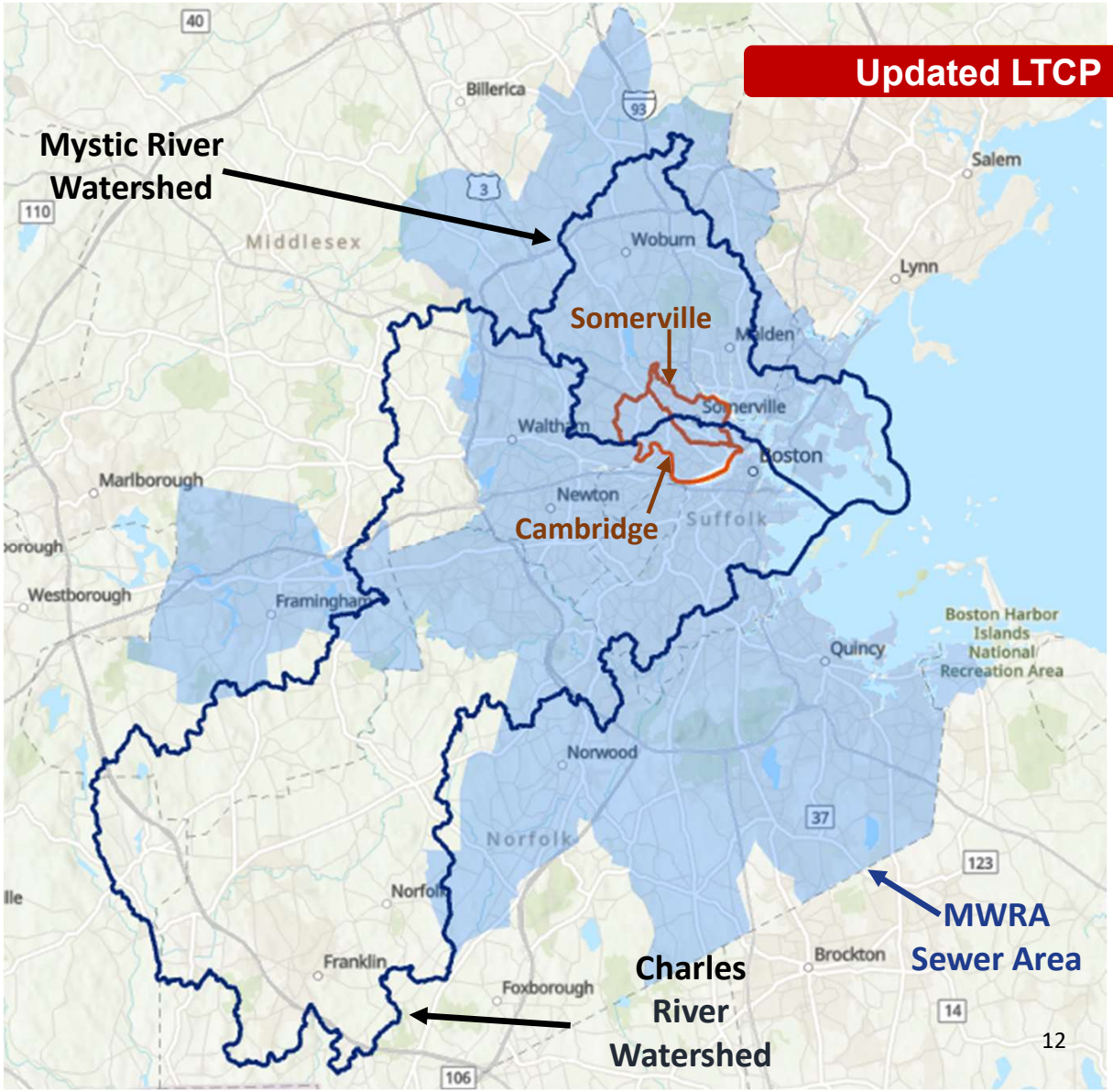
Charles & Mystic Variance

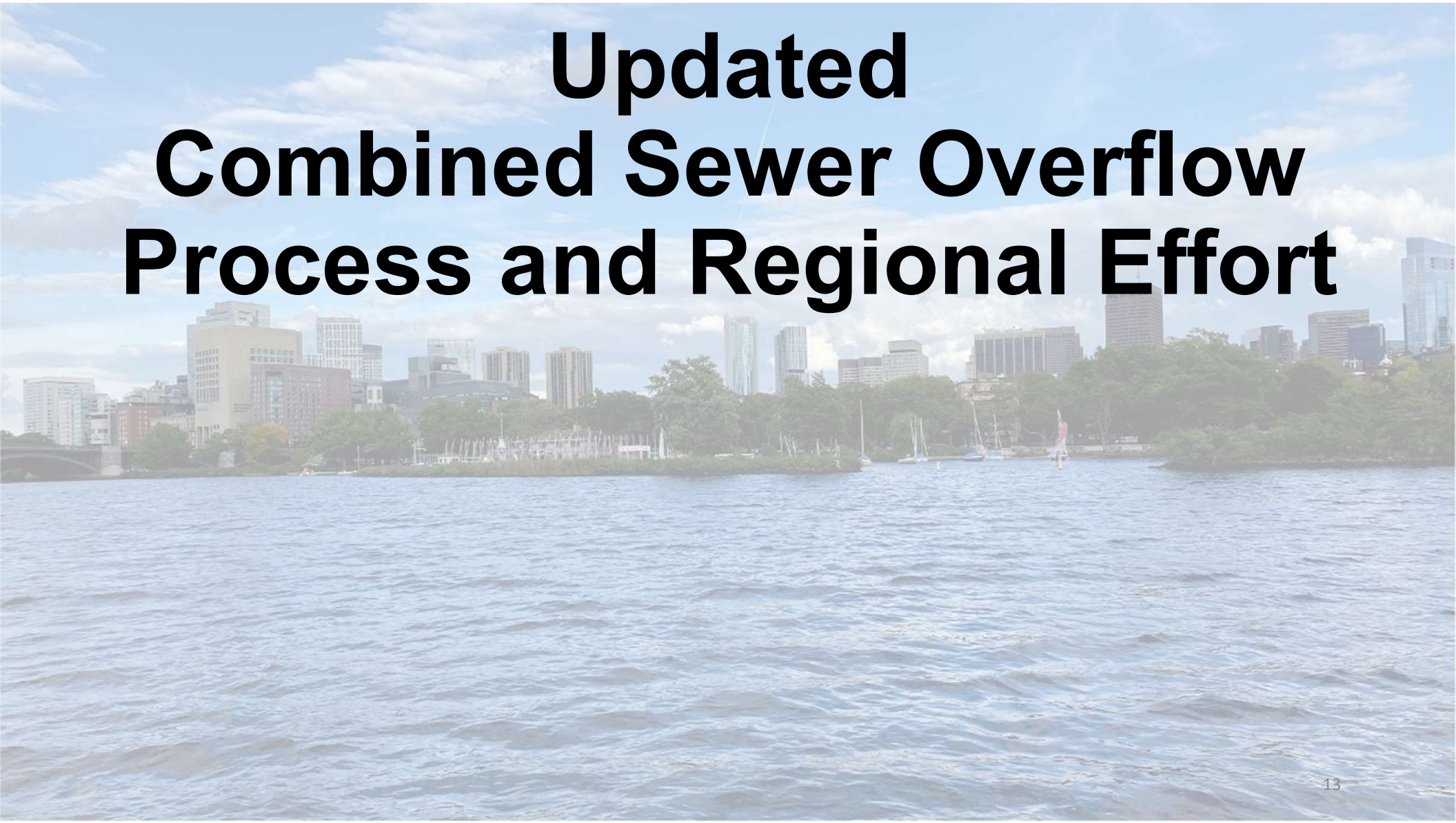
2016 – 2021: Monitor water quality
2022: Start Updated LTCP

City of Cambridge

City of Somerville

Massachusetts Water Resources Authority (MWRA)

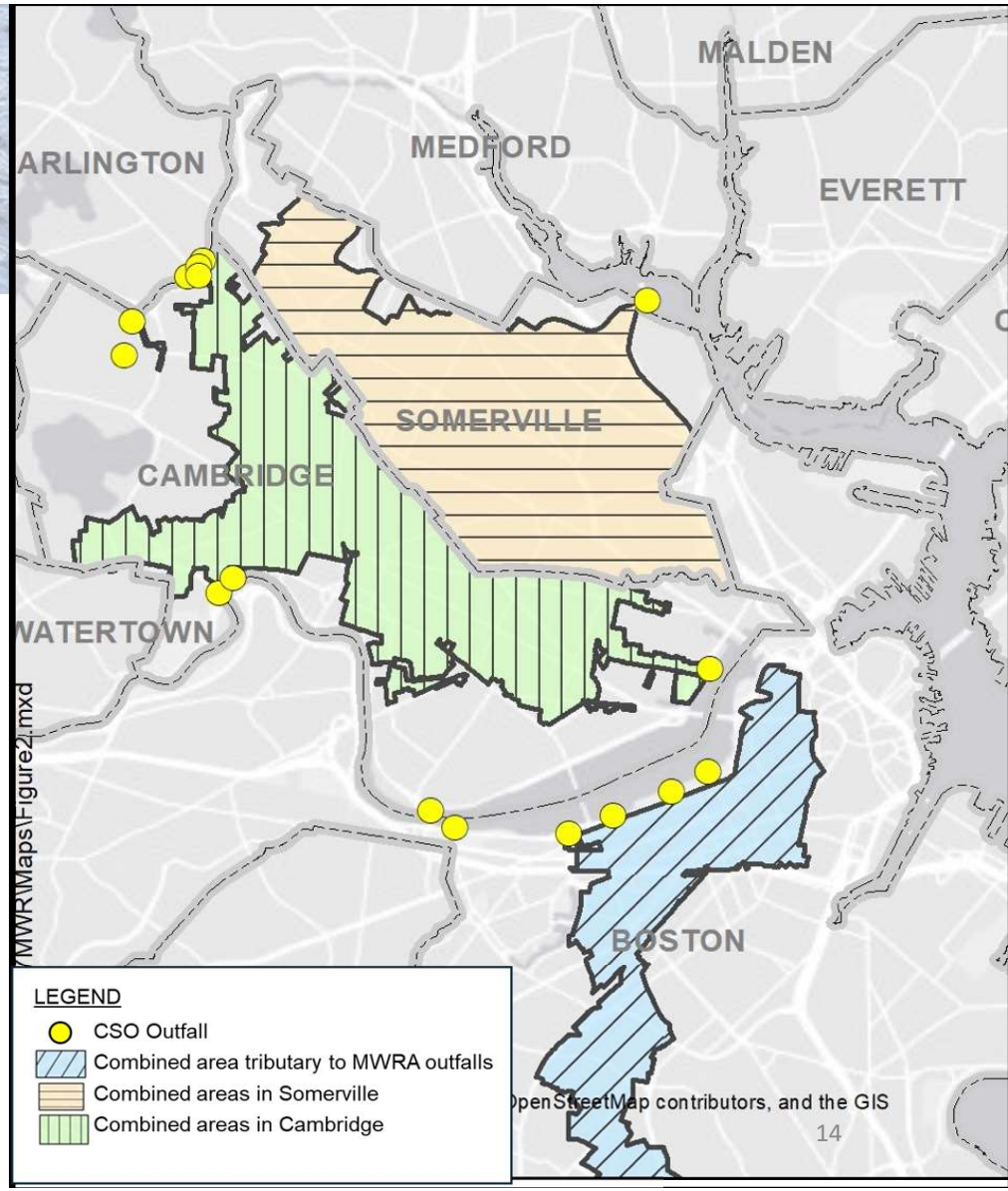




Updated Combined Sewer Overflow Process and Regional Effort

What Are We Doing **Now** About CSOs?

- Cambridge, Somerville, and MWRA are developing Updated CSO Control Plans with the overall goal to reduce or eliminate CSOs.
- The new plans focus on the Charles River, Alewife Brook, and Upper Mystic River (the variance waters).
- New plans incorporate the impacts of climate change.



Updated CSO Control Plan Steps:

1) 2050 Typical Year & 2050 Design Storms

2) Unify Hydrologic & Hydraulic models

3) **Create alternatives:**
   a) Identify scenarios to evaluate CSOs
      - 2050 Typical Year
      - 2050 5-yr
      - 2050 25-yr
   b) Combine CSO tools to develop various alternatives
   c) Optimize regionally for each variance water

Step 3b Zoom In: CSO Reduction Tools


Sewer Separation


Green Stormwater Infrastructure


Inflow/infiltration reduction


Storage


Conveyance

2050 Design Storm CSO Activations and Discharge Volumes by Receiving Water

2050 Typical Year Reflective of Climate Change Conditions

- A full year of rain data that best represents rain over time
- A representative "average" year for planning, as rain changes from year to year

Design Storms Reflective of Climate Change Conditions

- 2050 5-Year 24-hour and 25-year 24-hour design storms

Receiving Water	Future Baseline Condition Model Results						
	Activation Frequency		CSO Discharge Volume (MG)				
	Prior Typical Year	2050 Typical Year	Prior Typical Year	2050 Typical Year	2050 Largest Storm in the Typical Year (3.3 inches)	2050 5-year Storm (5.3 inches)	2050 25-year Storm (7.8 inches)
Charles River	3	6	7.9	38.4	16.6	65.5	120.6
Alewife Brook	8	13	9.9	20.9	4.84	20.9	40.1
Mystic River	2	8	1.3	29.3	10.5	17.4	27.2

Pause for questions

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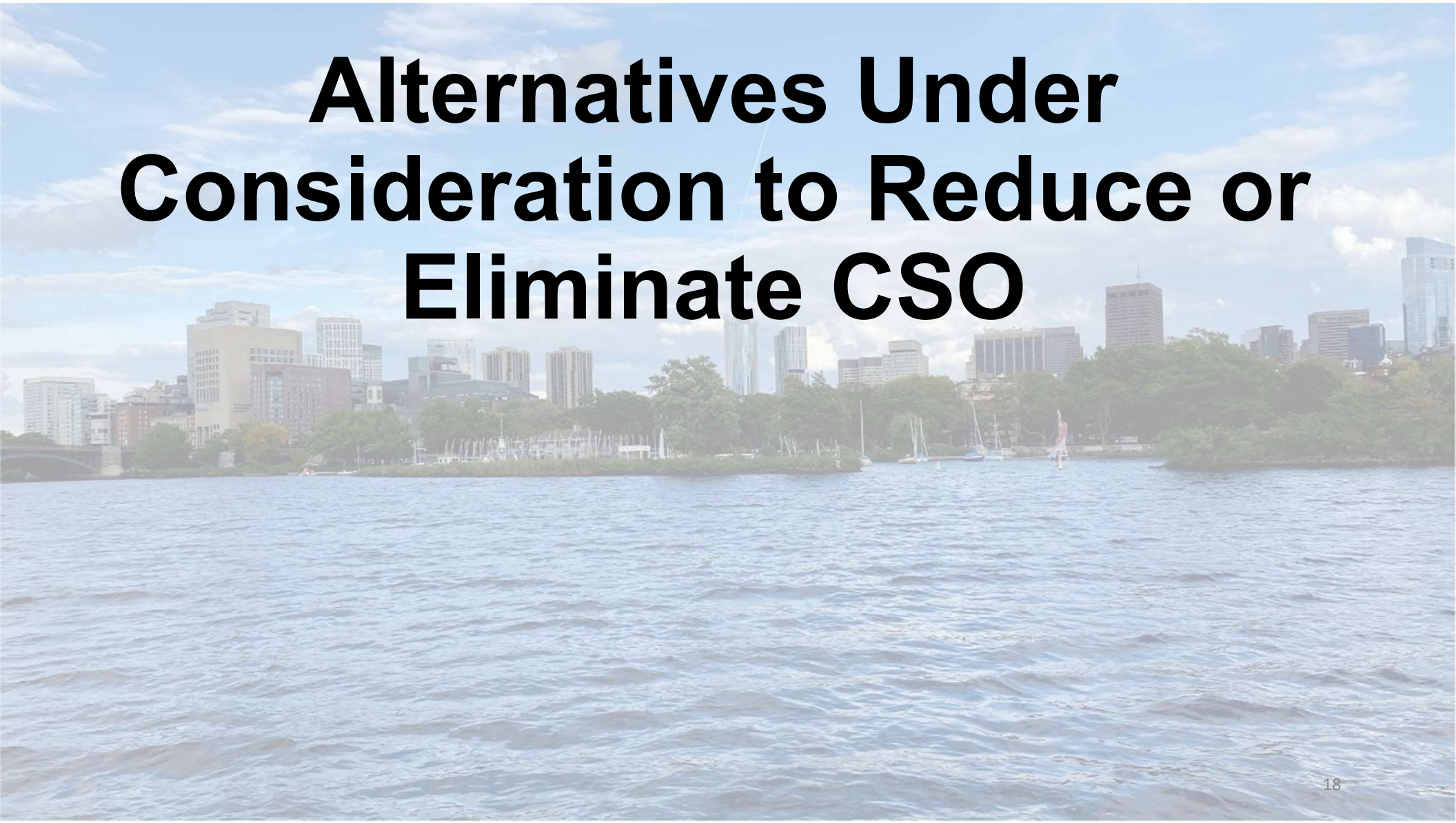


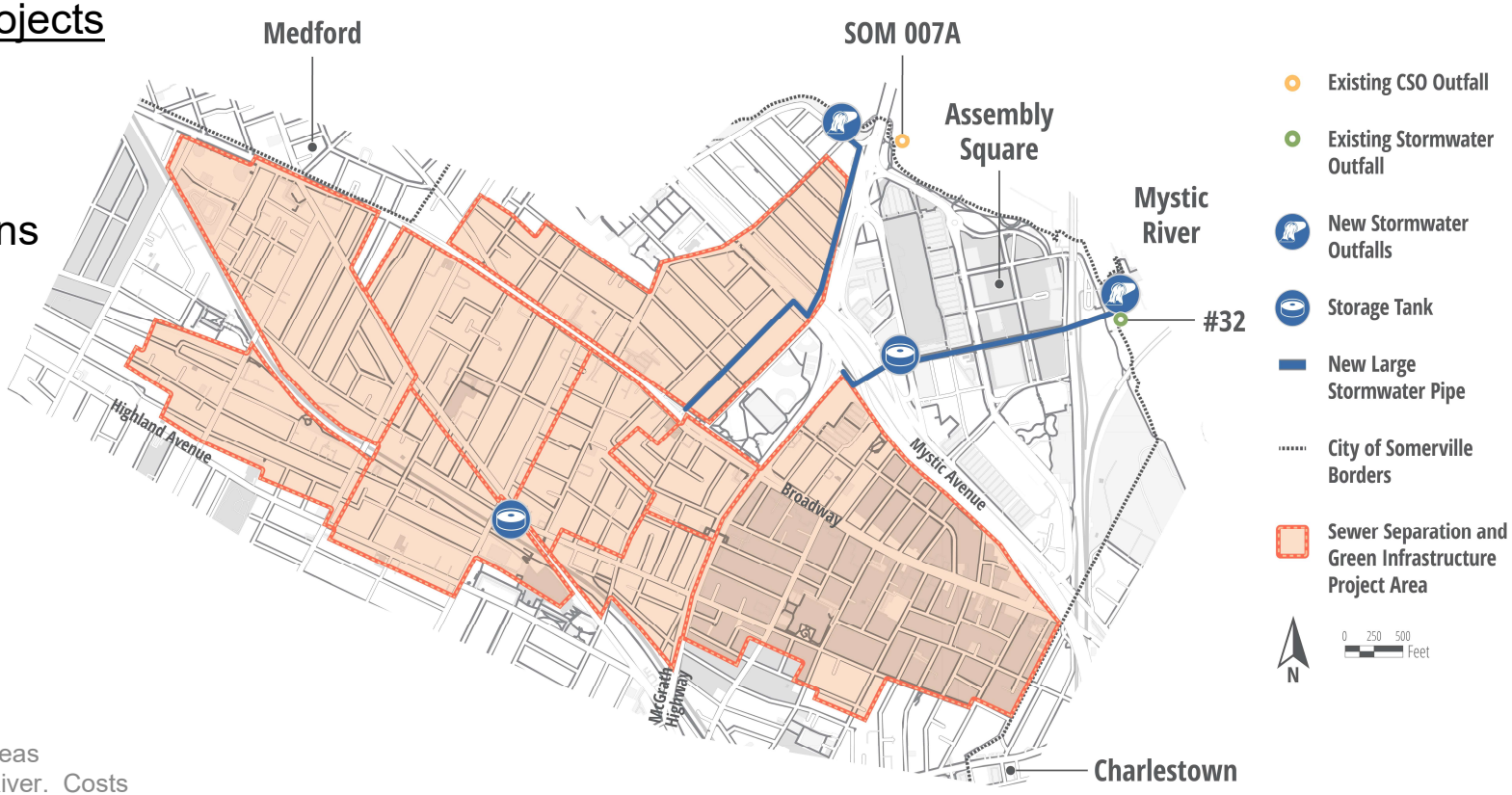
Alternatives Under Consideration to Reduce or Eliminate CSO

Mystic River Sewer Separation

City of Somerville - 2050 Typical Year CSO Control

Potential Mystic River Projects

- 560 acres of localized sewer separation
- 2 Storm drain outfalls
- Large trunk storm drains
- 5.5MG storage tank
- 0.5 MG storage tank
-



Prelim. Estimated Cost:
~$700 million *
Prelim. Timeline: ~40 yrs

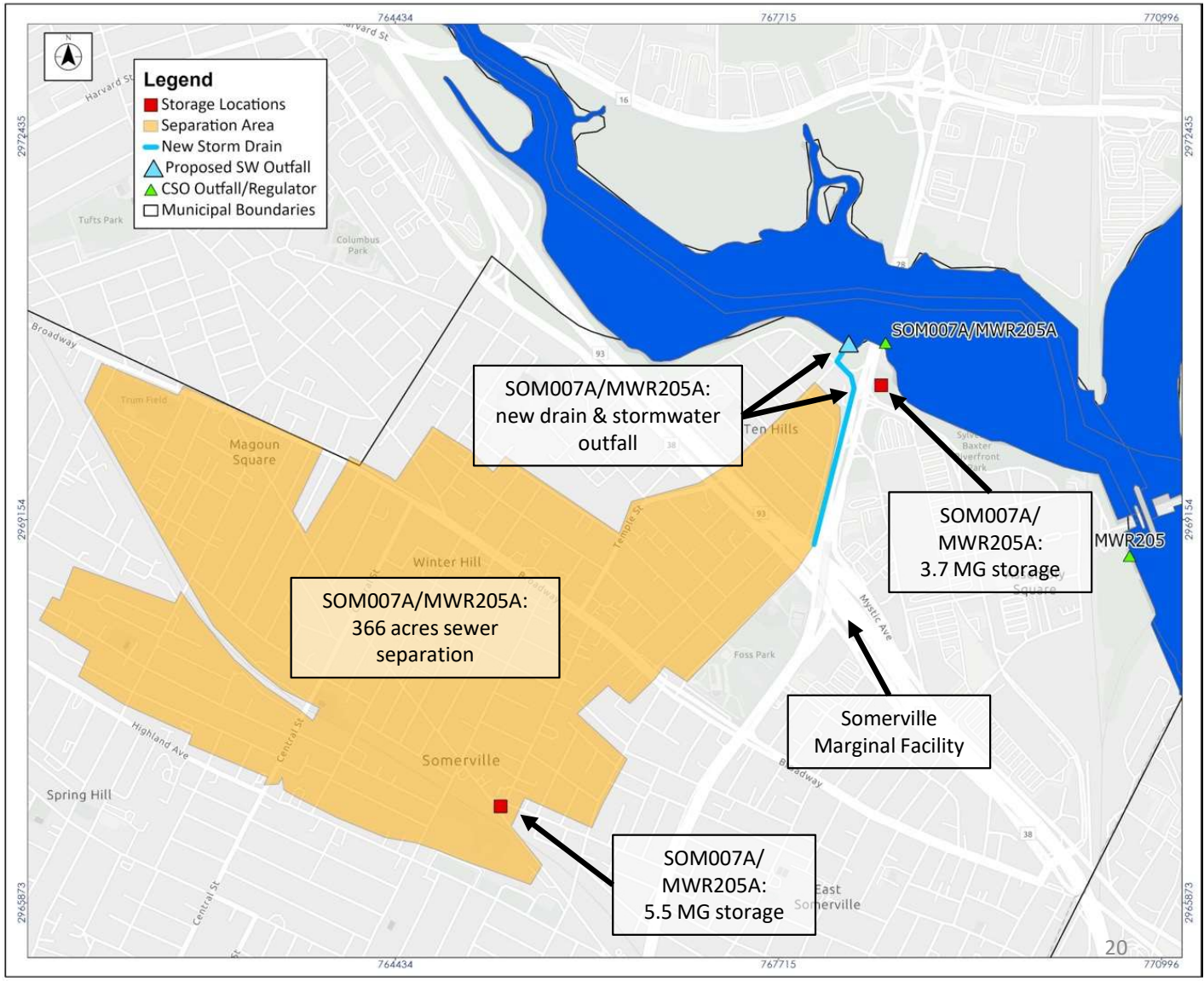
*Costs include sewer separation of some areas tributary to both Alewife Brook and Mystic River. Costs estimated using 2024-dollar amounts and not escalated to construction period. Costs subject to refinement.

Mystic Integrated Alternative: 2050 Typical Year CSO Control

SOM007A/MWR205A:

- 366 acres sewer separation
- 1 new outfall & large storm drain
- 5.5 MG stormwater storage
- 3.7 MG treated CSO storage

Prelim. Estimated Cost: ~$550 million



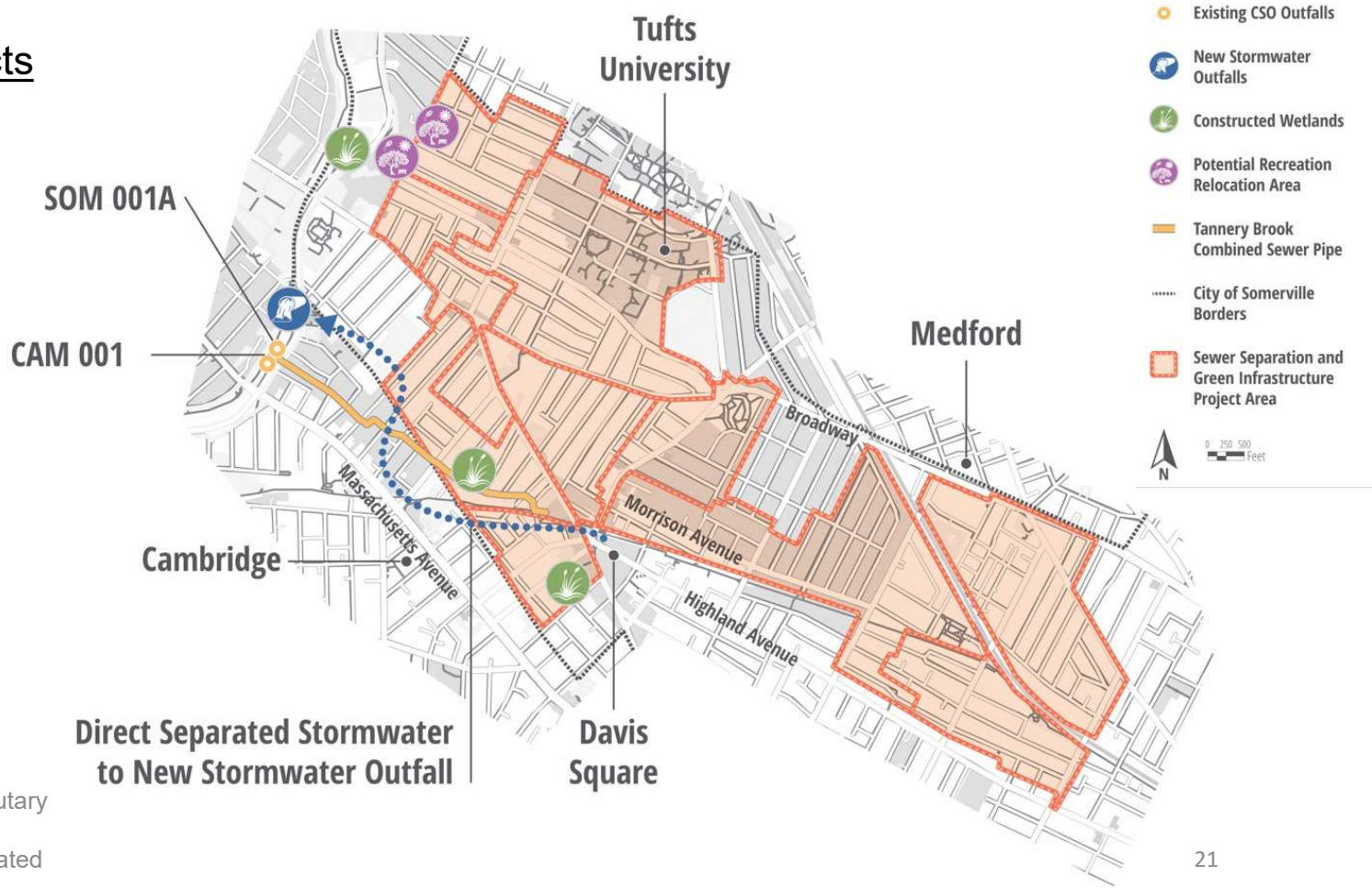
Alewife Brook Sewer Separation

City of Somerville - 2050 Typical Year CSO Control

Potential Alewife Brook Projects

- 560 acres of localized sewer separation
- New stormwater outfall on Alewife Brook
- Large trunk storm drain
- 3 constructed wetlands and land acquisition

Prelim. Estimated Cost:
~$850 million *
Prelim. Timeline: ~50 yrs

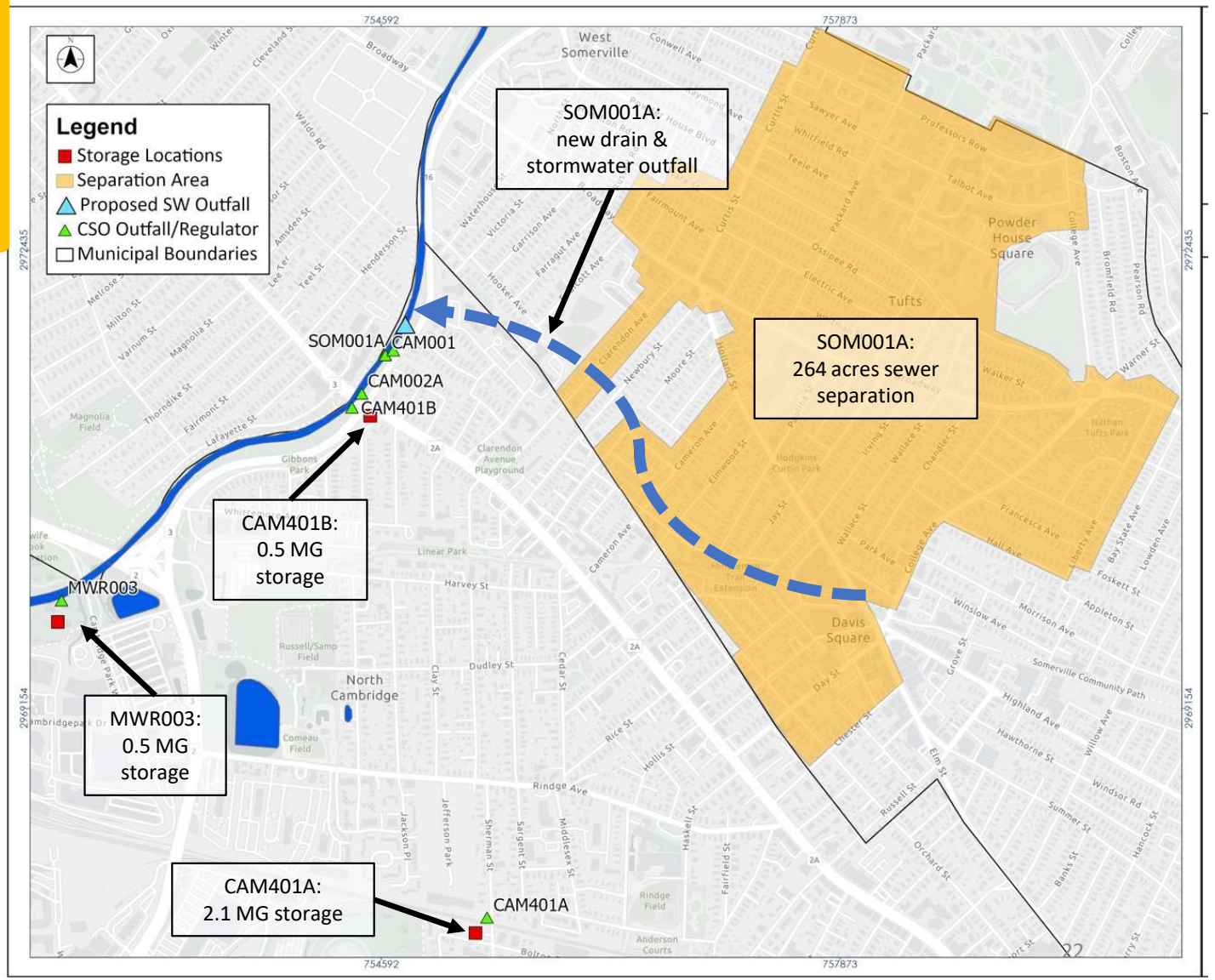


*Costs include sewer separation of some areas tributary to both Alewife Brook and Mystic River. Costs estimated using 2024-dollar amounts and not escalated to construction period. Costs subject to refinement.

Alewife Integrated Alternative: 2050 Typical Year CSO Control

- CAM401A: 2.1 MG storage
- CAM401B: 0.4 MG storage
- MWR003: 0.5 MG storage
- SOM001A: 264 acres separated + inline storage with throttles

Prelim. Estimated Cost: ~$600 million



Storage Tunnel to Control CSO Outfalls Tributary to Alewife Brook

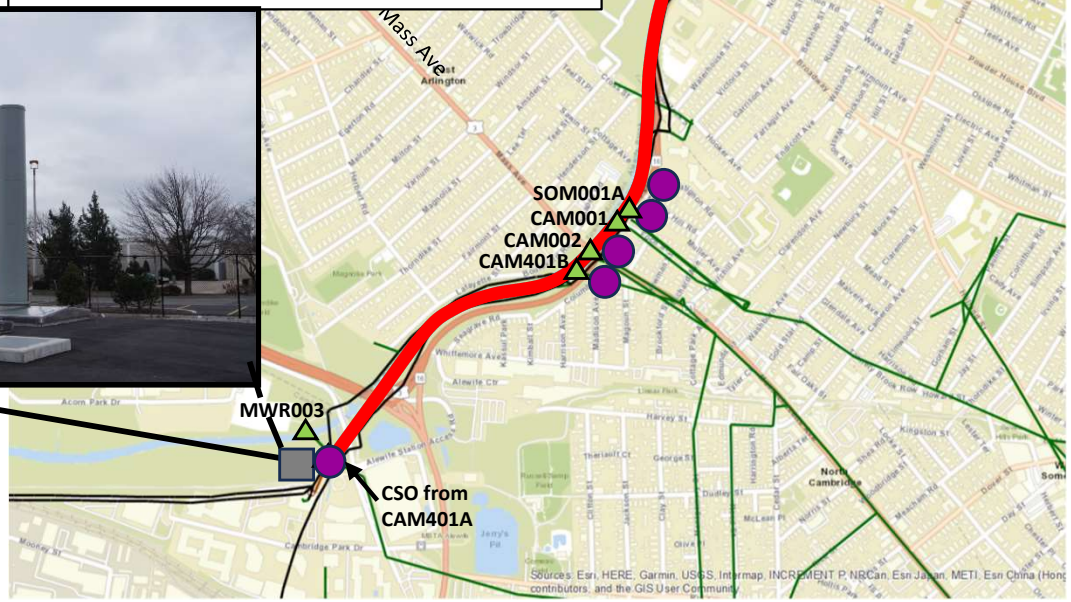
Legend:

- Potential Tunnel Alignment
- CSO Outfall
- Location where CSO drops into tunnel
- Pump station to pump stored flow to interceptor after storm
- Odor control/Ventilation Building
- Large Collection System Pipes

Note: Facility locations are approximate

North Dorchester Bay Dewatering Pump Station

North Dorchester Bay Odor Control/ Ventilation Facility



Alewife Brook Potential CSO Storage Tunnel Alternatives (Tunnel Length: 1.4 Miles)		
Level of CSO Control	**Storage Volume (MG)**	**Diameter (feet)**
2050 Typical Year	4.9	11
2050 5 Year	20.6	22
2050 25 Year	41.6	32

Preliminary Estimated Capital Costs Range from ~$700M to ~$1.7B*

*2024 dollars unescalated to construction period. Costs do not include land acquisition and may be further refined.

Pause for questions

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Updated CSO Control Plan Steps:

4) Develop conceptual layouts and preliminary cost estimates

5) Compare alternatives using weighted criteria

6) Assess Initially Preferred Alternative(s) for:
- Financial Capability Assessment
  - Impact to rate payers
  - Implementation schedule
- Compliance with Water Quality standards
  - What is the highest attainable use without a widespread economic or social impact?

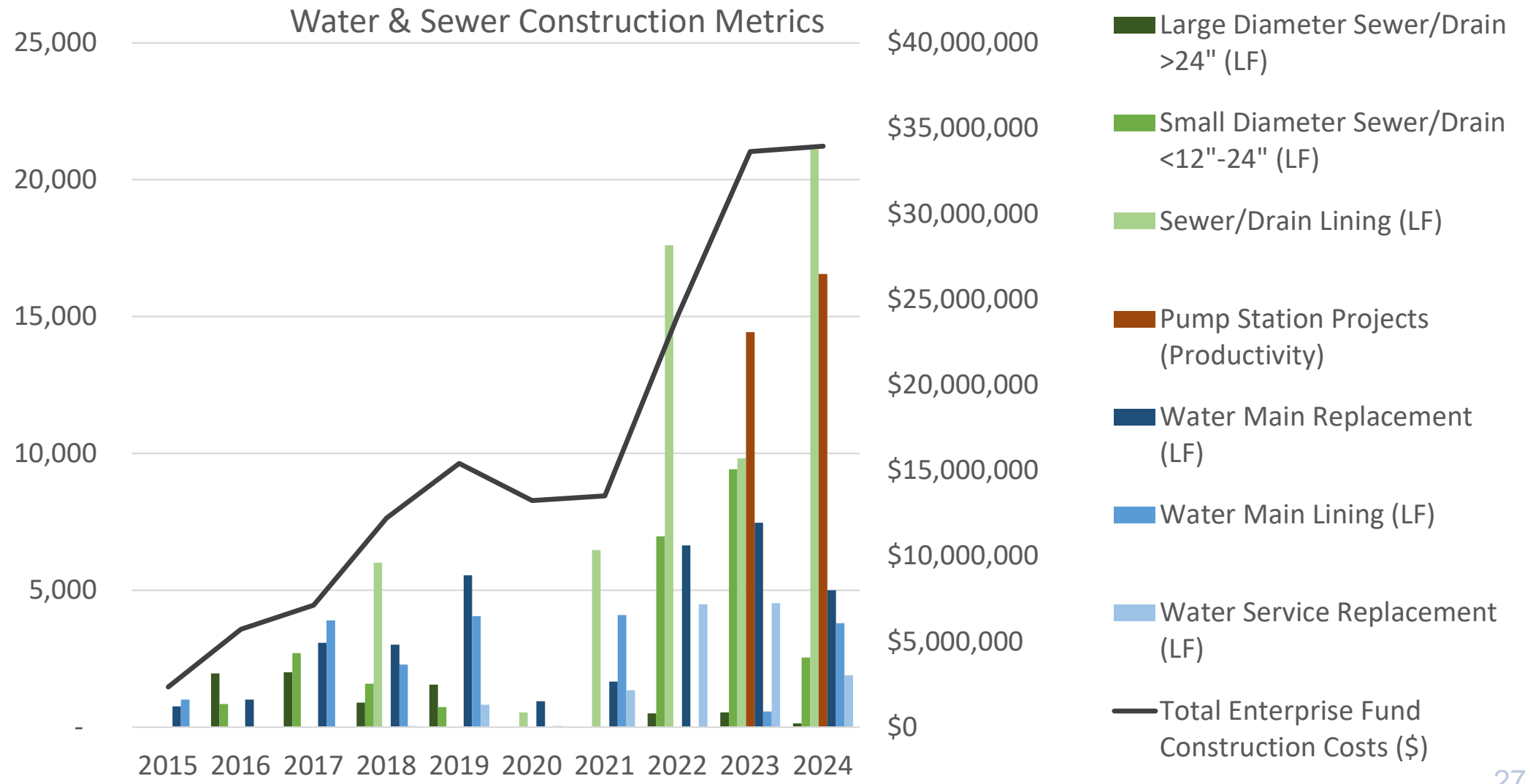
7) Develop Draft Updated CSO Control Plan(s)

Step 5 Zoom In: Alternatives Evaluation Preliminary Criteria

Reduce/eliminate combined sewer overflows
Reduce flooding and flooding impacts
Reduce sanitary sewer overflows
Improve water quality
Rehabilitate old infrastructure (pipes, facilities)
Improve resilience of our infrastructure to future climate conditions
Improve service to low income and minority communities
Offers community co-benefits (e.g., green space, gathering space, heat reduction)
Minimize neighborhood disruption during construction
Minimize costs to ratepayers / taxpayers
Other criteria based on public feedback

Overall Capital Investment Plan

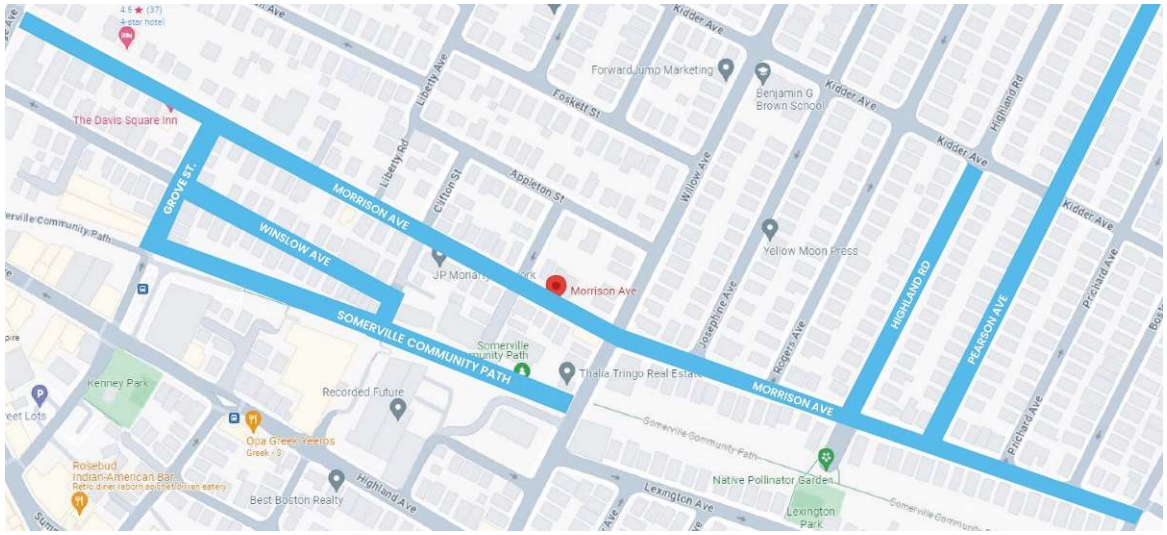
Integrating priorities

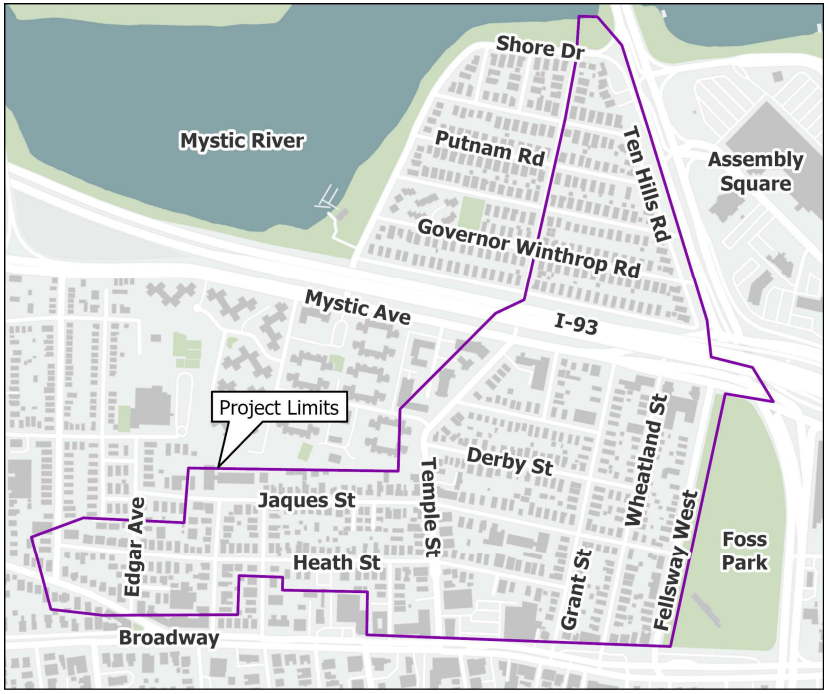

Water & Sewer Construction Metrics
25,000
20,000
15,000
10,000
5,000
-
$40,000,000
$35,000,000
$30,000,000
$25,000,000
$20,000,000
$15,000,000
$10,000,000
$5,000,000
$0
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
Large Diameter Sewer/Drain >24" (LF)
Small Diameter Sewer/Drain <12"-24" (LF)
Sewer/Drain Lining (LF)
Pump Station Projects (Productivity)
Water Main Replacement (LF)
Water Main Lining (LF)
Water Service Replacement (LF)
Total Enterprise Fund Construction Costs ($)

Guiding principles for CIP project selection

- Fulfill Regulatory Requirements
  - Comply with Administrative Orders and Permits
  - **Mitigate CSOs**
- Improve Level of Service
  - Increase capacity to deliver water
  - Decrease sewer system backups
- Mitigate Flooding
  - Add capacity and storage to reduce surface flooding
- Reduce Risk
  - Rehabilitate or replace pipes before they fail
  - Prioritize pipes with greatest impact
  - Add water valves and sewer manholes to improve operations & maintenance

Morrison Ave & MROSS Projects





- Preliminary designs complete
- Final design initiation awaiting W&S rate approval

Financial Capability Assessment Process

What is and what is not a Financial Capability Assessment (FCA)?

- ✓ Helps communities understand their ability to implement CSO long-term control plans as mandated by the Clean Water Act (CWA)
- ✓ Helps in developing the schedule for implementing CSO control plans and economic impact analysis for water quality standards decisions
- ✓ Shows the financial impacts of CSO controls
- ✗ Does not evaluate affordability for individual customers
- ✗ Does not consider other financial needs or priorities

Financial Capability Assessment (FCA) Process

EPA guidance prescribes methods to measure financial impact (low, medium, and high) associated with current and future sewer services within community using critical metrics such as:

- **Residential Indicator**
- **Financial Capability Indicators**
- Lowest Quintile Poverty Indicator Score
- Financial and Rate Models

Evaluate the financial impact of alternative CSO controls and schedule

Residential Indicator

Defined as a community's average cost per household for wastewater treatment and Clean Water Act controls needed to meet the requirements of the Clean Water Act.

$$\text{Residential Indicator (\%)} = \frac{\text{Cost per household}}{\text{Median Household Income (MHI)}}$$

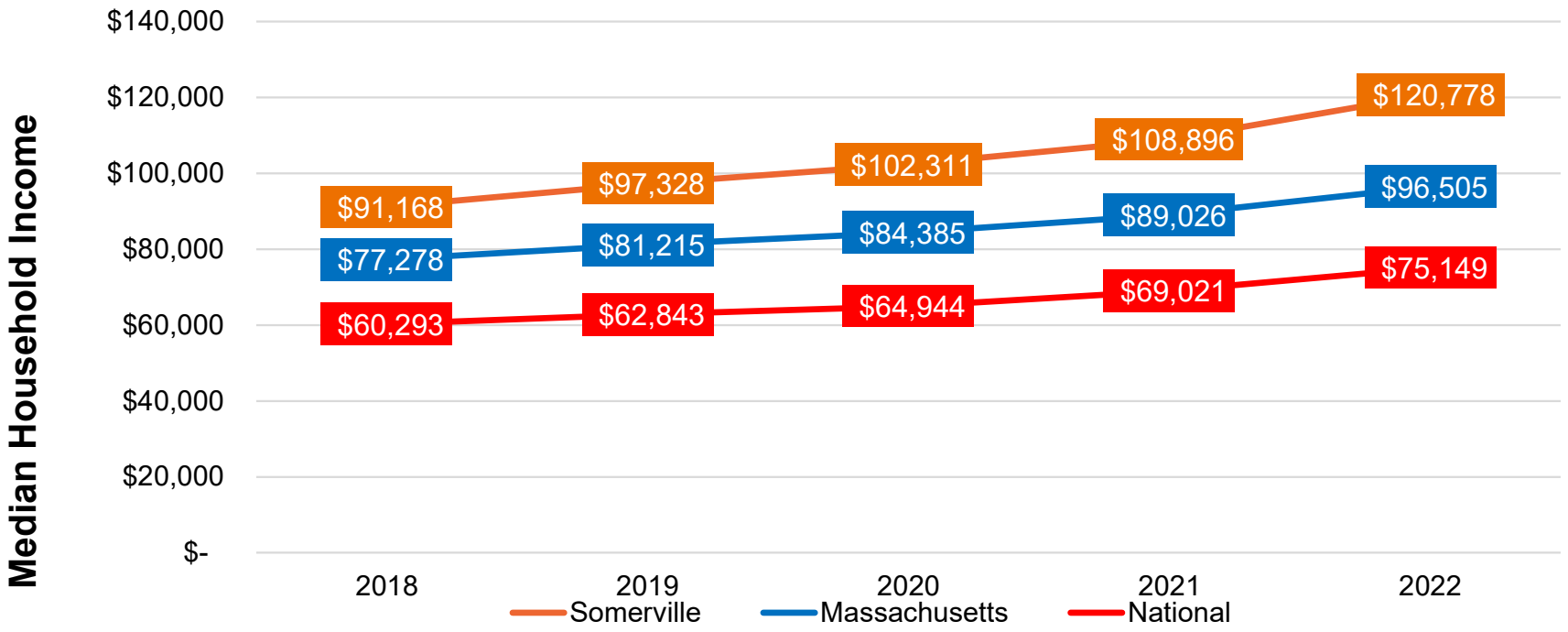
Residential Indicator	Financial Impact
< 1.0%	Low Impact
1.0% - 2.0%	Mid-Range Impact
> 2.0%	High Impact

Calculation of Cost per Household for Somerville Service Area

ITEM	BASELINE
Total Current and Projected Costs per Year (FY2030)	$ 50,268,027
Residential Share of Total Costs	$ 41,410,940
Total Number of Households in Somerville Service Area	35,035
COST PER HOUSEHOLD	**$ 1,182**

Income Levels

2018- 2022 Median Household Income



(1) MHI per US Census Data (2018 - 2022 ACS 5 Year Estimates).

Residential Indicator (2024 Data)

2018- 2022 Median Household Income

ITEM	BASELINE
Median Household Income in 2022 (1)	$ 120,778
CPI Adjustment Factor (2)	1.081
Adjusted Median Household Income for 2024	$ 130,561
Annual Cost per Household	$ 1,182
RESIDENTIAL INDICATOR	**0.91%**
	Low Impact

(1) MHI per US Census Data (2022 ACS 5 Year Estimate). Where jurisdictions bound more than one census tract, the average MHI (weighted by household count) is presented.
(2) MHI was adjusted using the 5 Year average CPI as outlined in EPA guidance.

Financial Capability Indicators

Debt Indicators
- Bond Rating
- Net Debt/Property Value

Socioeconomic Indicators
- Unemployment Rate
- Median Household Income

Financial Management Indicators
- Property Tax/Property Value
- Property Tax Collection Rate

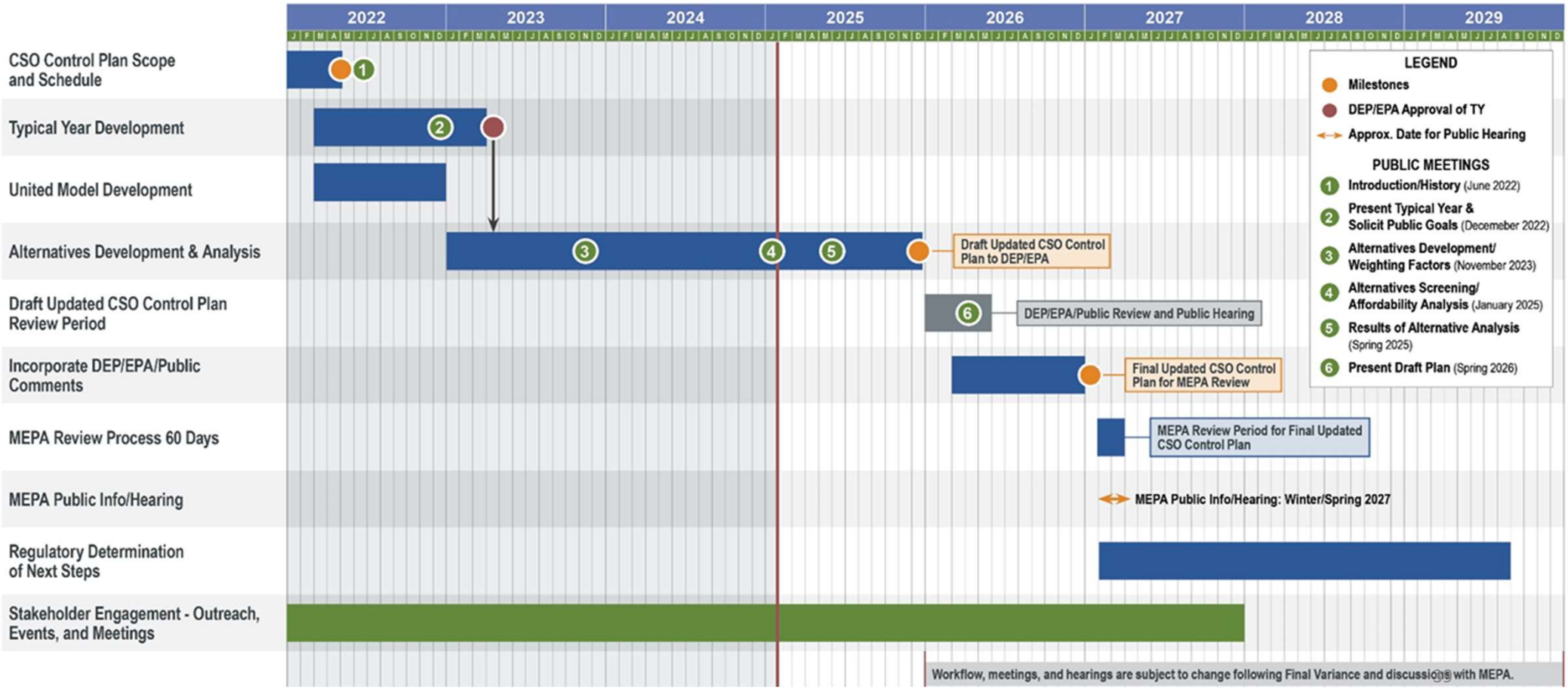
Each indicator is given a ranking of

Strong	Mid-Range	Weak

compared to other communities.

Next Steps

Updated CSO Control Plan Schedule



Updated 1/02/2025

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Part 2:
Billing for Stormwater Runoff

A fair and logical solution to Somerville's sewer problems

Infrastructure & Asset Management

22 May 2025

Somerville has a twofold stormwater runoff problem

Flooding

Constituent desire for system improvements especially in wet years


ONE WAY
DO NOT
ENTER


STOP

Combined Sewer Overflows (CSO)

Regulatory driver for system improvements

CSOs on Alewife combine with flood water

Photo by David Stoff / Save the Alewife Brook

Photo by Ann McDonald/ Save the Alewife Brook

- The Alewife Greenway Path is a heavily trafficked multi-use path on DCR land. It links Medford, Somerville, Arlington and Cambridge residents to the Alewife Red Line T stop.

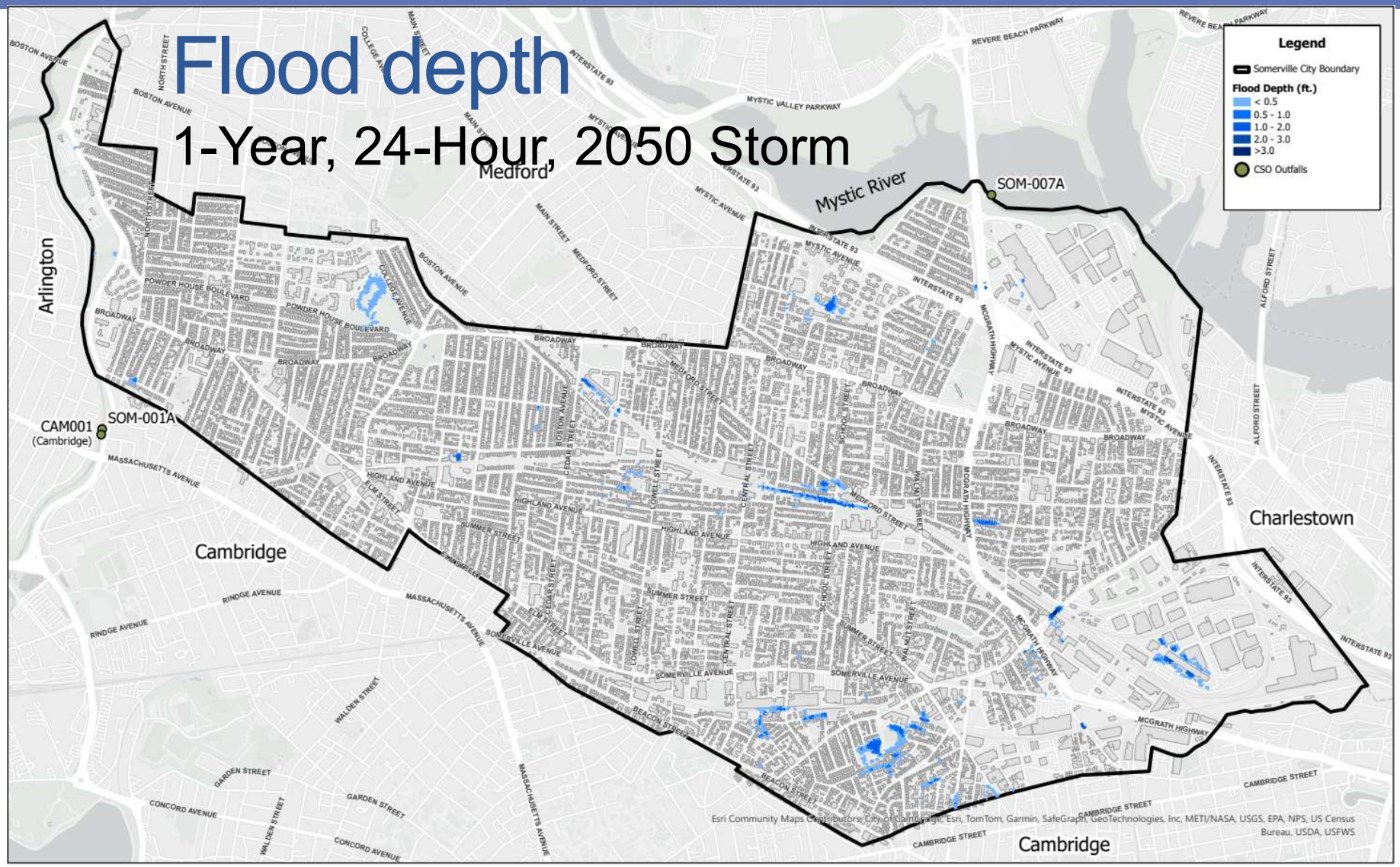
The bigger the storm, the bigger the problem

Flooding

Evident in the neighborhoods

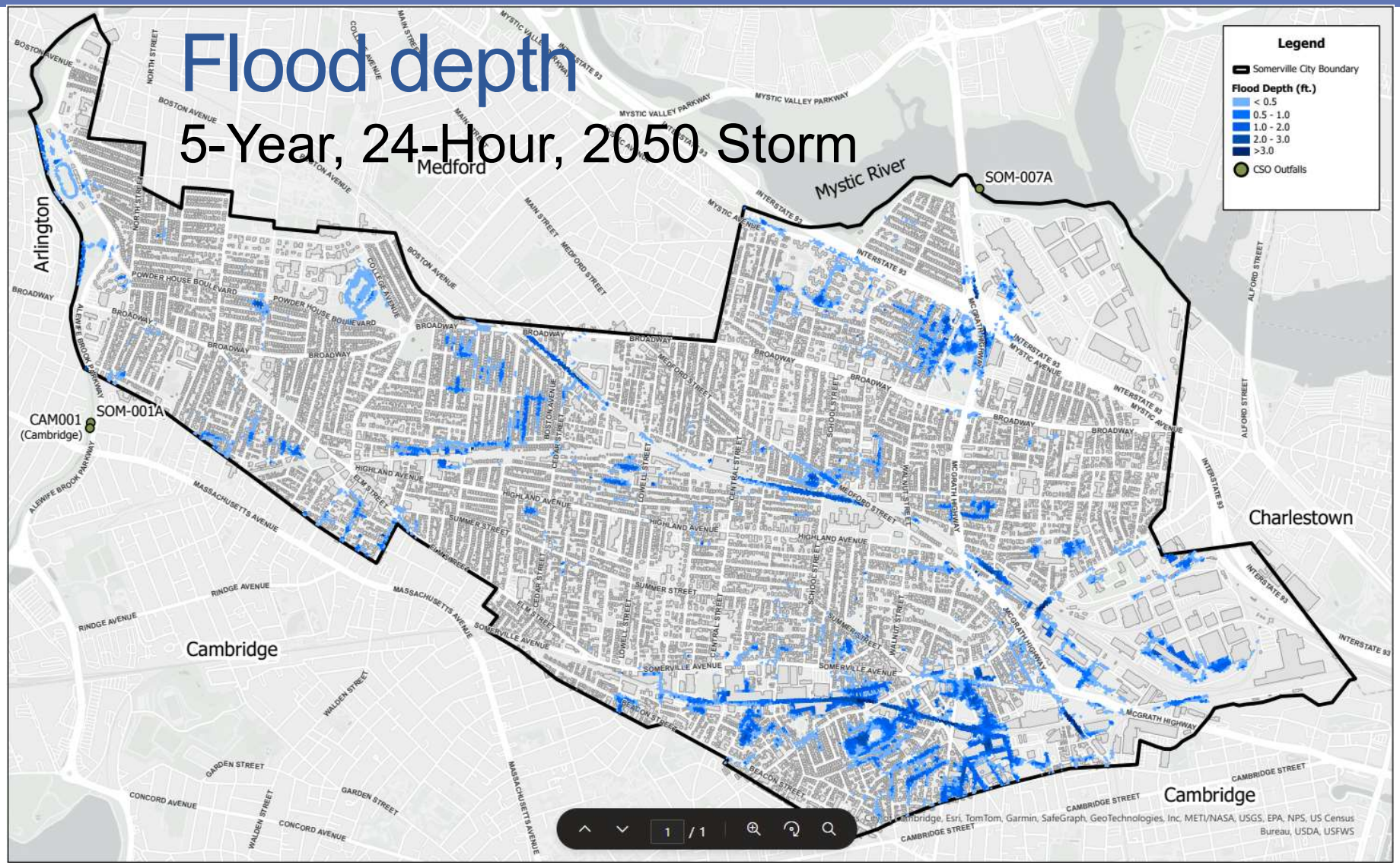
Flood depth

1-Year, 24-Hour, 2050 Storm



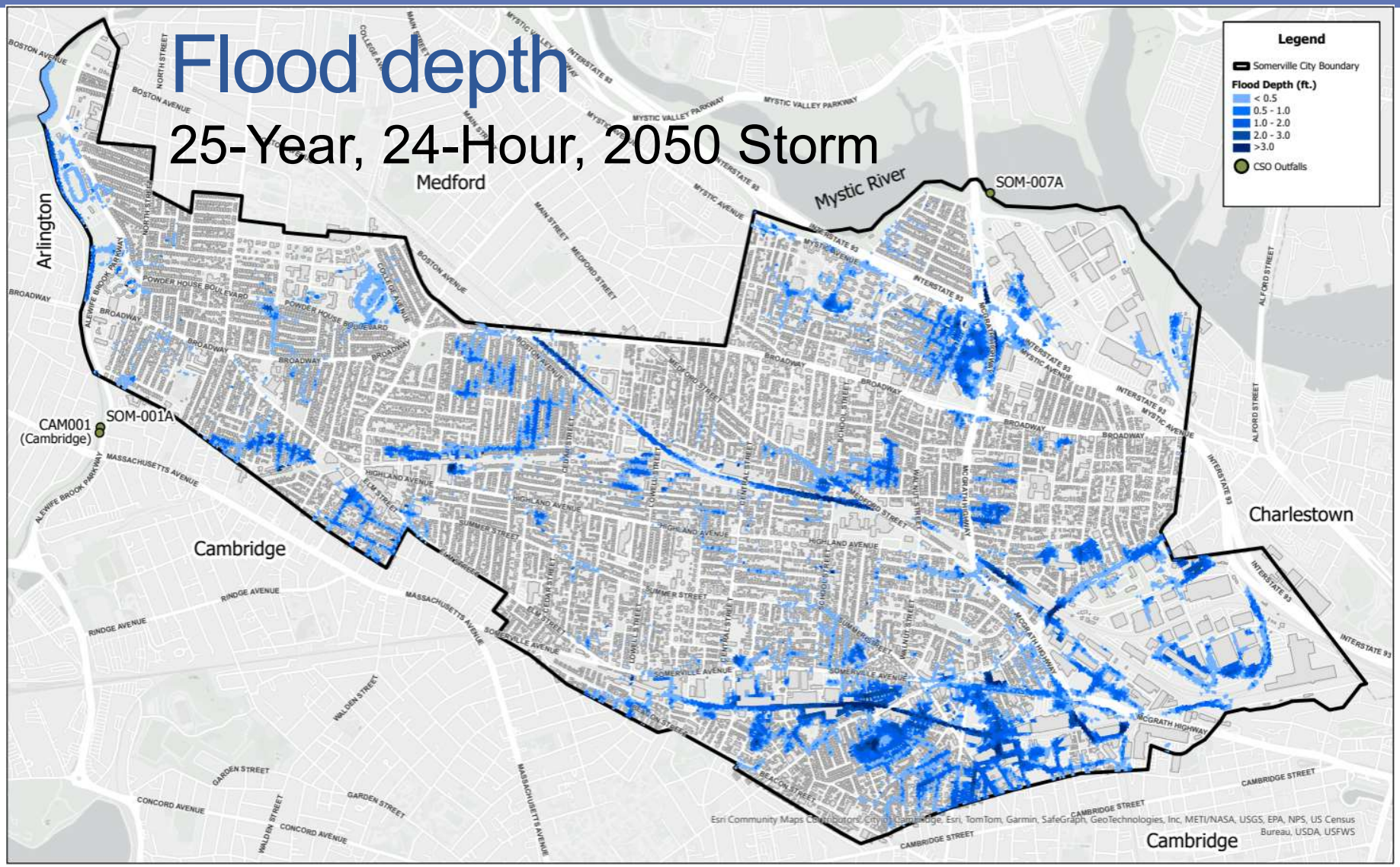
Flood depth

5-Year, 24-Hour, 2050 Storm



Flood depth

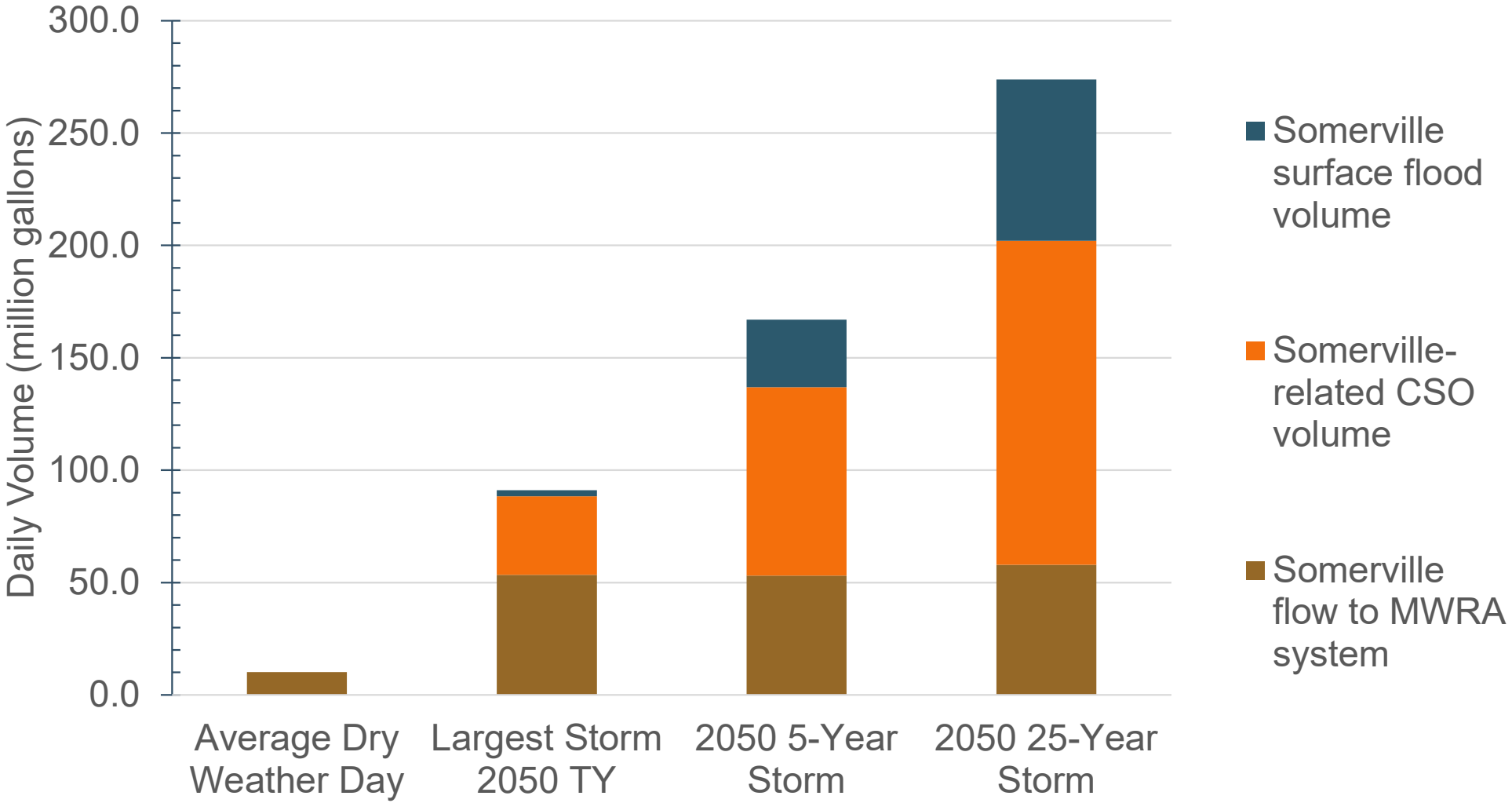
25-Year, 24-Hour, 2050 Storm



Pipes & CSOs

Underground & in the rivers

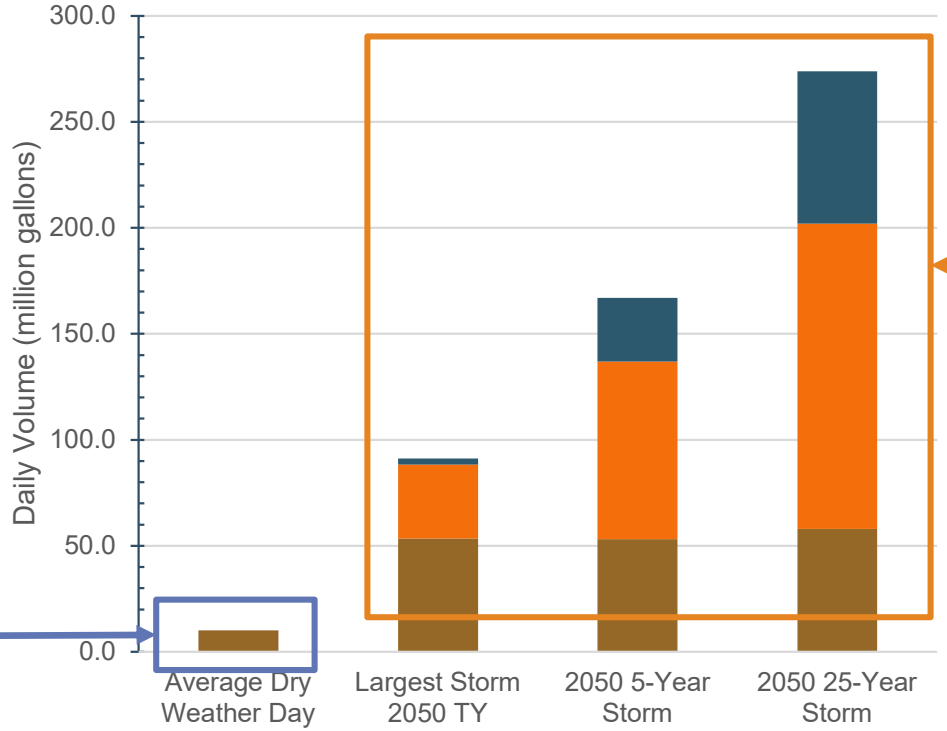
Limitations in both local and regional systems


300.0
250.0
200.0
150.0
100.0
50.0
0.0
Daily Volume (million gallons)
Average Dry Weather Day
Largest Storm 2050 TY
2050 5-Year Storm
2050 25-Year Storm
Somerville surface flood volume
Somerville-related CSO volume
Somerville flow to MWRA system

Revenue generation & expense problem

Currently, all operations & capital improvements to manage stormwater are paid from the Sewer Enterprise

Sewer Enterprise



Bills are based on water use

Majority of CIP & portion of CEB devoted to stormwater

Stormwater not related to water use

- Target water use
  - ~ five 2-family homes
- Targe impervious area
  - ~ 20 times that of those 5 properties combined

Related to area, particularly impervious

Increasing Impervious Surface = Increasing Runoff Generated

- Properties with more area contribute to the problem
- Property owners can control how much impervious surface they have and/or how the runoff from those areas are managed

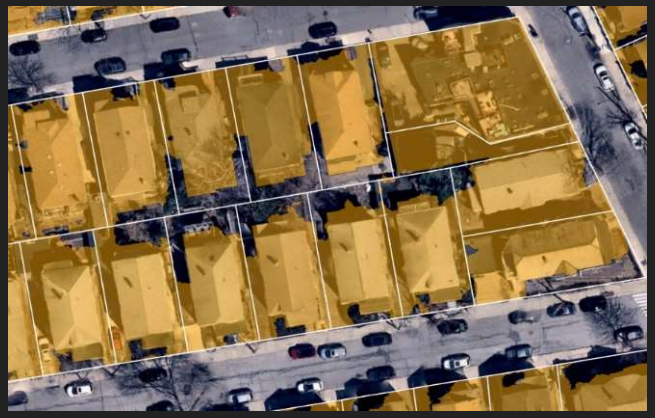
Proposal: Create 3rd enterprise fund & bill for impervious area in addition to water use

Water, Sewer & Stormwater Enterprises & bills

Impervious area by parcel

Detailed analysis

Detailed Impervious Area Development

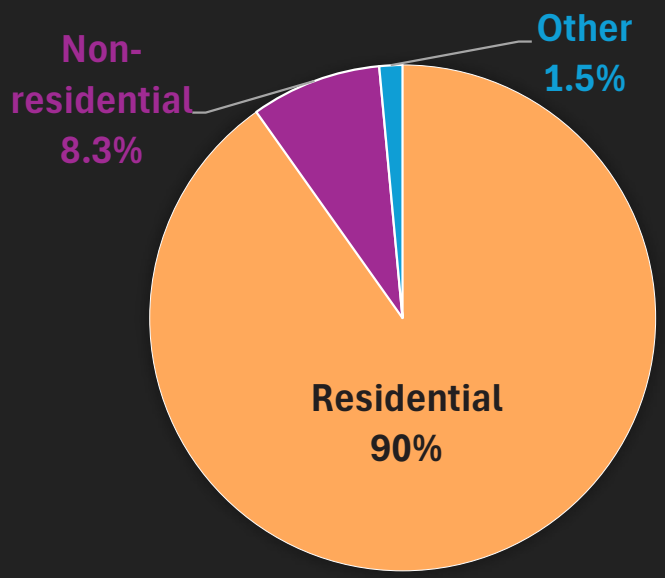


Measured Impervious Area*

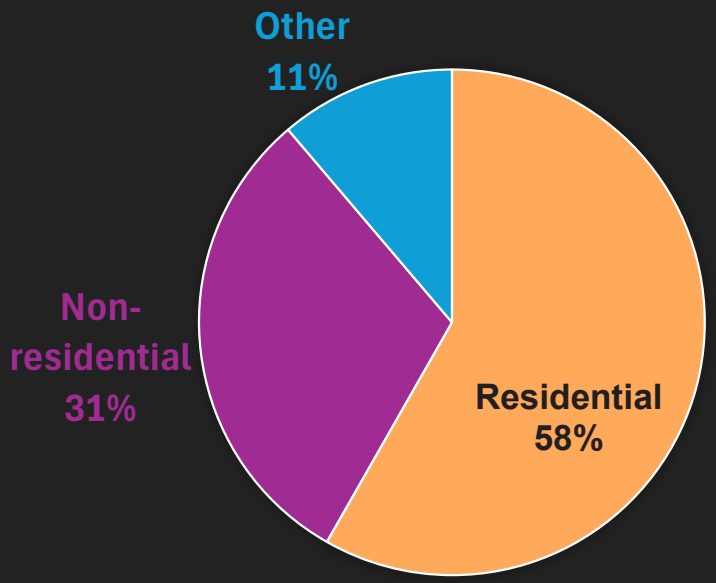
57M Square Feet of Impervious Area*

Parcel Type	Parcel Count	Impervious Area (Sq. Ft.)
Two Family	4,931	13,345,298
Single Family	2,310	4,856,230
Three Family	2,231	6,432,709
Condo	1,698	6,366,855
Apartments 4-8	529	2,125,127
Non-Residential	1,083	17,377,805
City-Owned	117	2,503,693
MTBA	51	3,109,853
Commonwealth of Mass	25	766,604

* Impervious area on streets and right-of-ways is equal to 28M Citywide



Parcel distribution



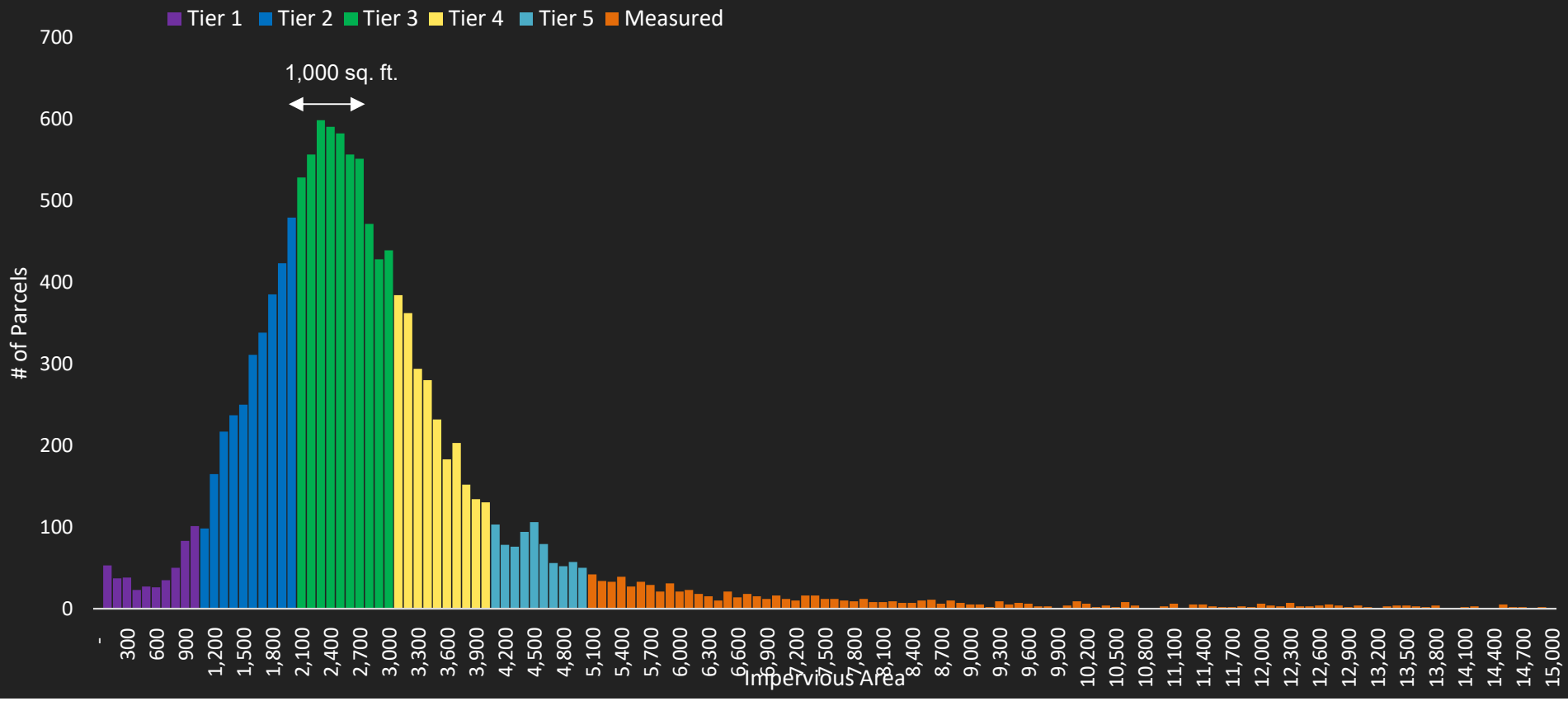
Impervious area distribution

How will bills work?

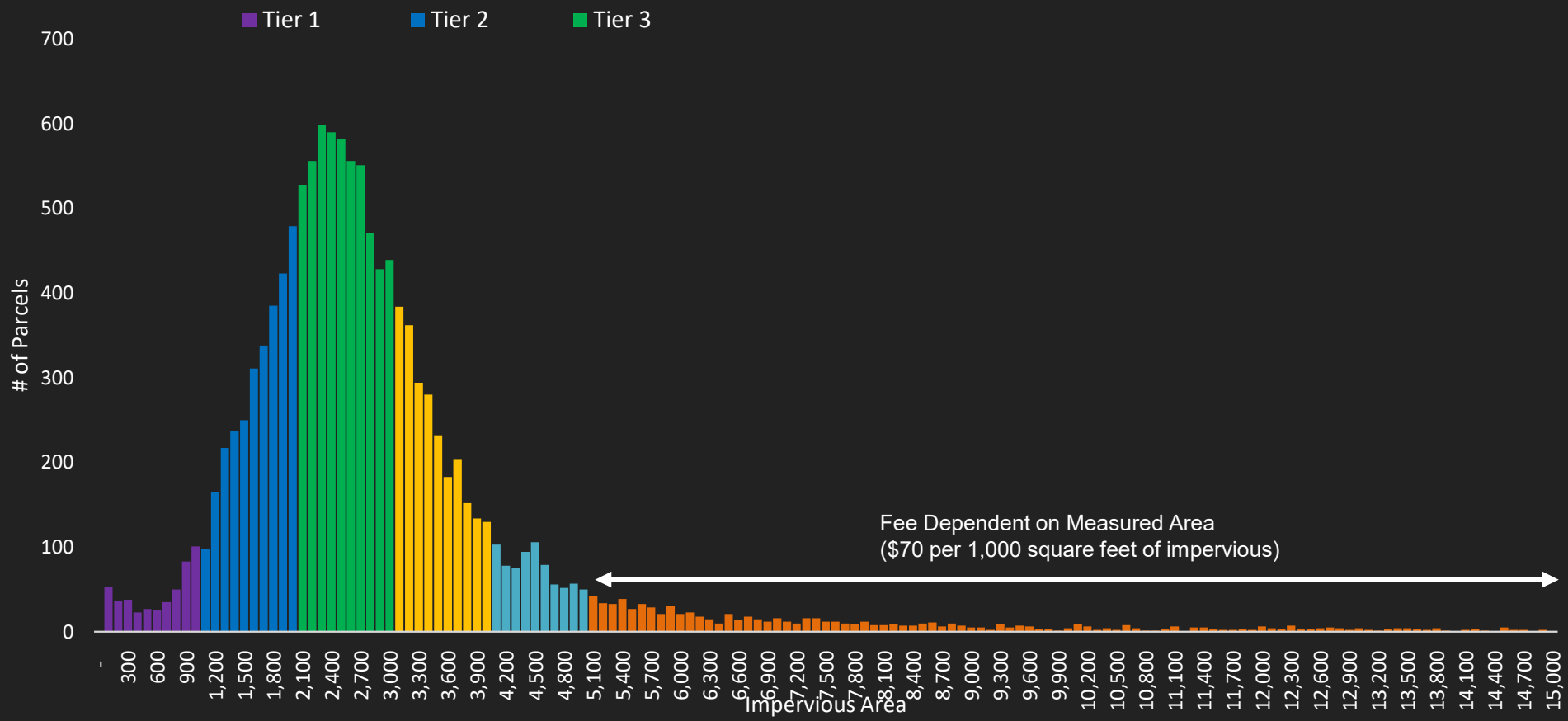
Balance of accuracy and simplicity

How to Structure the Stormwater Fee

- Recommend fee be based on impervious area contained on parcel
- Impervious area tiers used to simplify administration



Stormwater Fees



Monthly Fee:	$9	$28	$43	$59	$76
Tri-Annual Fee:	$34	$111	$173	$236	$304

Fees based on FY25 stormwater revenue requirements

Geospatial Tiers

Tri-Annual
Stormwater Fee

Tier 1 (100 - 1000 sq ft) $34
Tier 2 (1,001 - 2,000 sq ft) $111
Tier 3 (2,001 - 3,000 sq ft) $173
Tier 4 (3,001 - 4,000 sq ft) $236
Tier 5 (4,001 - 5,000 sq ft) $304
Measured Over 5,000 sq ft

Credit program will promote on-site control of stormwater

Billing fairness is only half of the intent. Private property comprises 90-percent of total area and 70-percent of impervious area in the City.

Stormwater Fee Credits

- Stormwater fee credit is an ongoing reduction in the fee charged to a qualifying property in return qualifying stormwater management
- Credit is recognition that onsite/offsite stormwater management reduces the City's stormwater expenditures
- Credits encourage property owners to proactively manage their stormwater impact

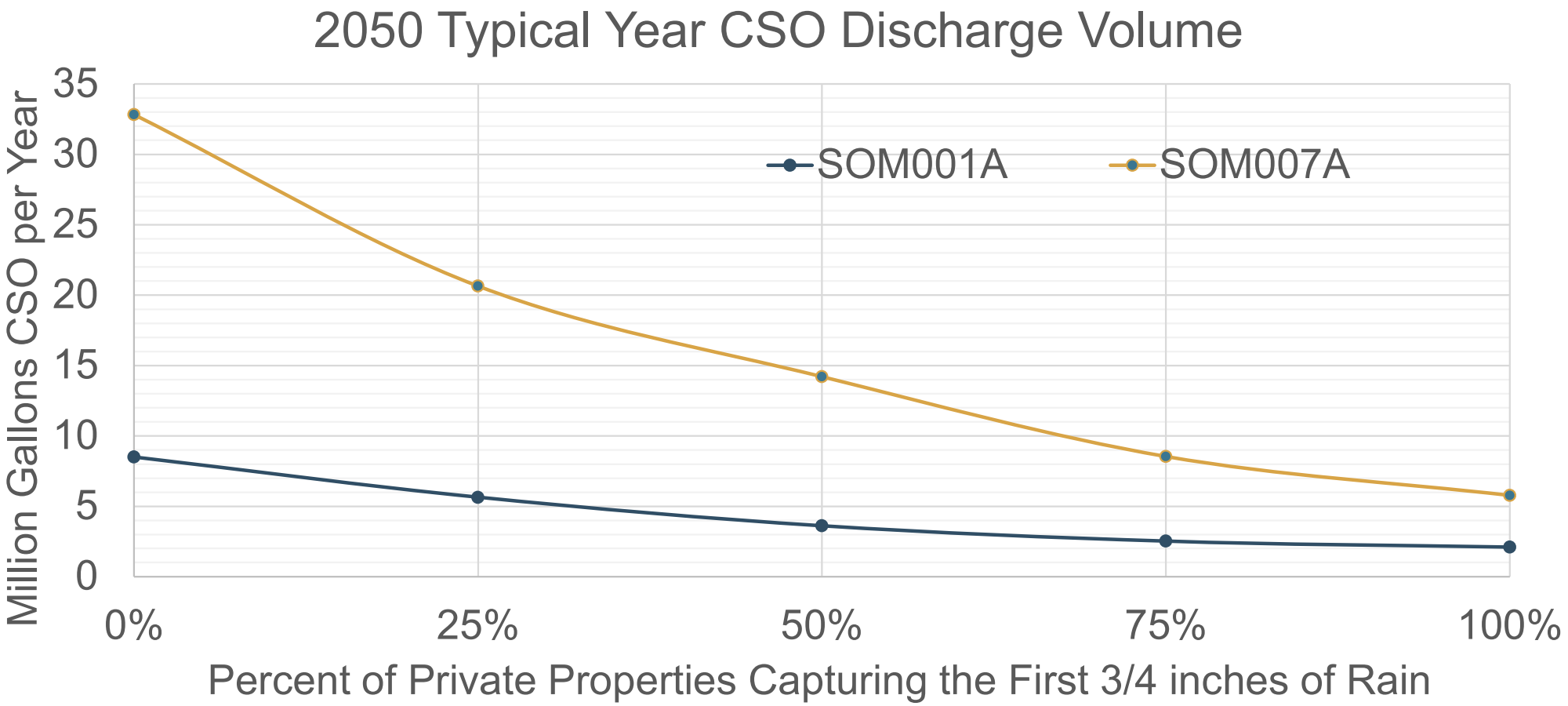
We know on-site management works

- Engineering Driveway & Paving Permit
  - https://s3.amazonaws.com/somervillema-live/s3fs-public/driveway-paving-permits-brochure.pdf
- Engineering Site Plan Permit
  - Infiltrate/detain first ¾-inch runoff
  - Reduce peak rate from 10-year storm to mimic 2-year storm
  - https://s3.amazonaws.com/somervillema-live/s3fs-public/engineering-site-permit-rules-regs.pdf
- Green Stormwater Infiltration Guidance
  - https://s3.amazonaws.com/somervillema-live/s3fs-public/gsi-planning-guidance.pdf

There are limits. It won't solve flooding or CSOs

But if we each do a little, we'll all do a lot.

CSO reduction from on-site management



Implementation

- Finalize FY2026 Water, Sewer & Stormwater Rate Proposal
- City Council authorization of change to City Ordinance to create Stormwater Enterprise and fee
- Public hearing on rates
- City Council approval of rates, budget
- Creation of FAQ's for 311 and Water Billing Department

Pause for questions

- Part One – Combined Sewer Overflow (CSO) Long Term Control Plan (LTCP) Update
  - What is a CSO & what is the MWRA?
  - Original LTCP
  - Updated LTCP
  - Example alternatives
  - Overall Capital Investment Plan
  - Financial Capability Analysis
  - Next steps / schedule
- Part Two – Billing for Stormwater
  - Why should we do it?
  - How will it work?
  - What are the benefits?

Combined Sewer Overflow Updated Long Term Control Plan Progress & Related Efforts

File ID 25-0966 Officer's Communication to City Council

Infrastructure & Asset Management

22 May 2025