

Ten Year **Sewer and Drain** Infrastructure Plan

April 2019

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INTRODUCTION | OUR SYSTEM FAST FACTS

99

MILES OF SEPARATED STORMWATER MAINS

Transport stormwater to a receiving body of water such as a river, lake or ocean. Cambridge stormwater mains discharge to Alewife Brook, the Charles River, Fresh Pond or Jerry's Pond.

113

MILES OF SEPARATED SANITARY SEWER MAINS

Transport water carrying human and domestic wastes to the Massachusetts Water Resources Authority (MWRA) collection system for processing at the wastewater treatment facility at Deer Island.

40

MILES OF COMBINED SEWER MAINS

Transport water carrying human and domestic wastes during dry weather and a combination of wastewater and stormwater during wet weather to MWRA, or to the Alewife Brook or the Charles River through CSOs.

8,238

SEWER AND DRAIN MANHOLES

Provide an access point to inspect and perform maintenance.

5,932

CATCH BASINS

Collect and transport runoff through the drain system to Alewife Brook, the Charles River, Fresh Pond, or Jerry's Pond.

38

SEWER AND DRAIN PUMPING STATIONS

Collect and pump sewer or stormwater from a low to high area of the system or from a storage tank into the sewer or drain system. A structure consists of pumps, wetwell and control system.

47

STORMWATER AND CSO OUTFALLS

Discharge collected flows to Alewife Brook, the Charles River, Fresh Pond or Jerry's Pond through city-owned outfalls.

INTRODUCTION | OUR WATERSHEDS

Cambridge is part of the Charles River and Alewife Brook watersheds, and the community uses these water bodies for recreational use, such as boating and fishing. Untreated discharges of stormwater or combined sewer overflows (CSOs) can impact the watershed and water bodies.

The City works with the following to ensure projects address environmental objectives of multiple federal, state, and local agencies, and improve water quality of the Charles River and Alewife Brook:

- U.S. Department of Environmental Protection (EPA)
- Massachusetts Department of Environmental Protection (MassDEP)
- Massachusetts Water Resources Authority (MWRA)
- City departments and local community groups



PRIORITIES | OBJECTIVES

The objectives of the 10 Year Plan are to:

1. Address high-risk infrastructure conditions
2. Remove inflow/infiltration (I/I) from sewer systems
3. Eliminate sanitary sewer overflows (SSOs) and reduce CSOs
4. Manage stormwater quality and quantity
5. Reduce flooding and protect neighborhoods
6. Address fats, oils, and grease (FOG) in the sewer system
7. Conduct operation and maintenance activities

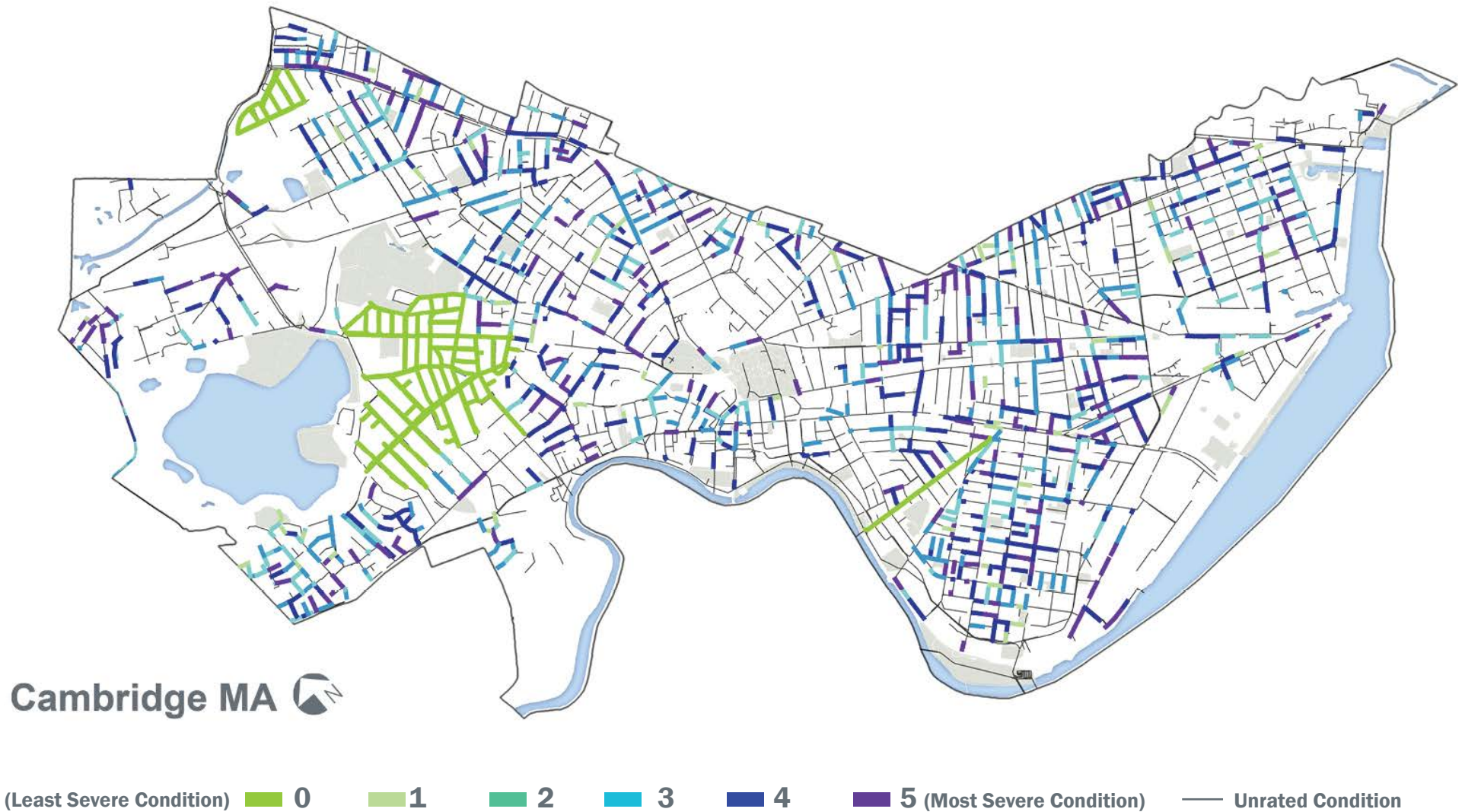


PRIORITIES | SCHEDULING & CONSTRAINTS

Infrastructure projects in the 10 Year Plan are influenced by:

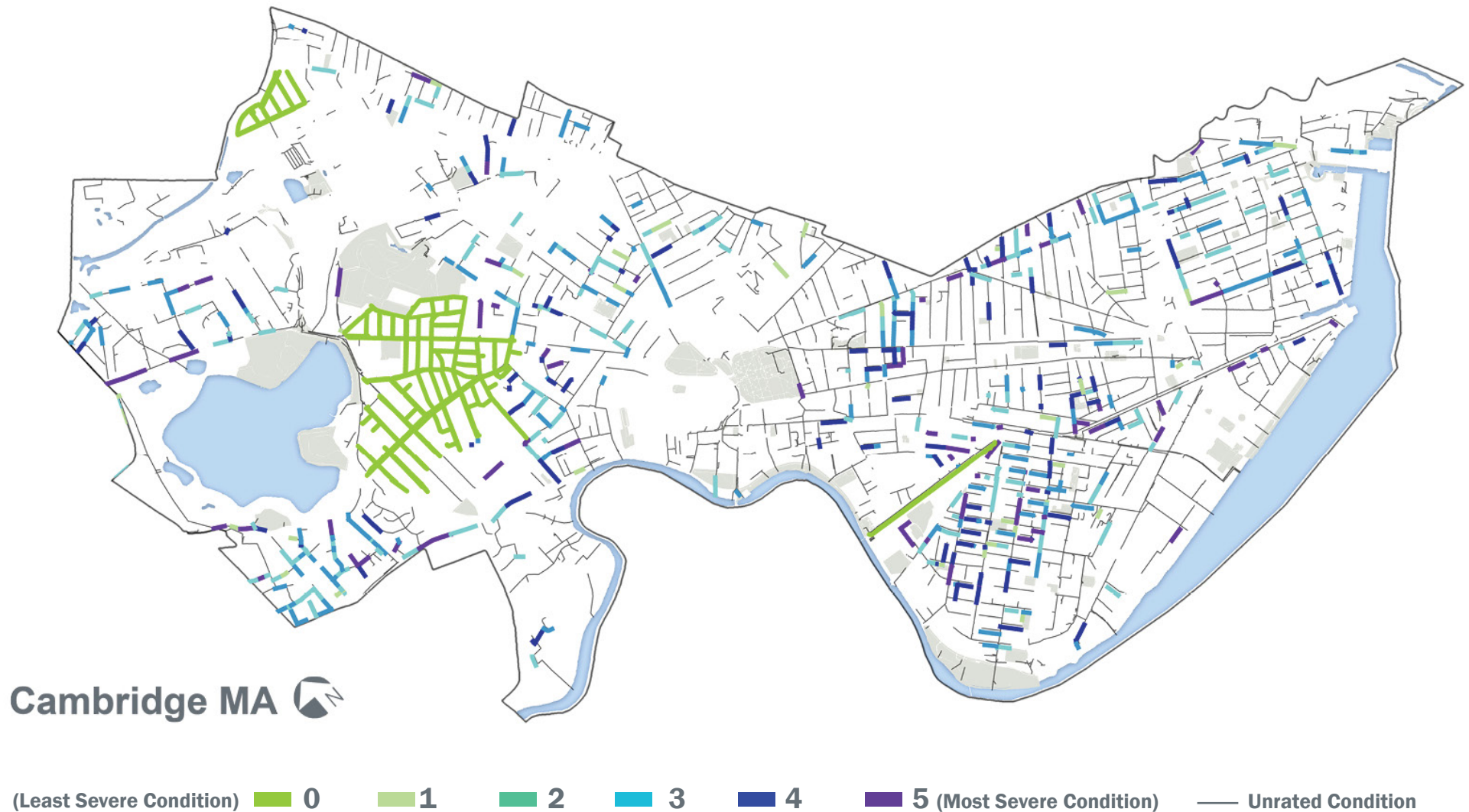
- Aging infrastructure reaching the end of its service life and needs replacement or rehabilitation
- Planned private development projects
- Climate change impacts
- Public health impacts
- Available budget/funding
- Projects planned as part of the 5 Year Sidewalk and Street Reconstruction Plan
- Regulatory initiatives and enforcement actions or permit requirements that change

PRIORITIES | SEWER CONDITION



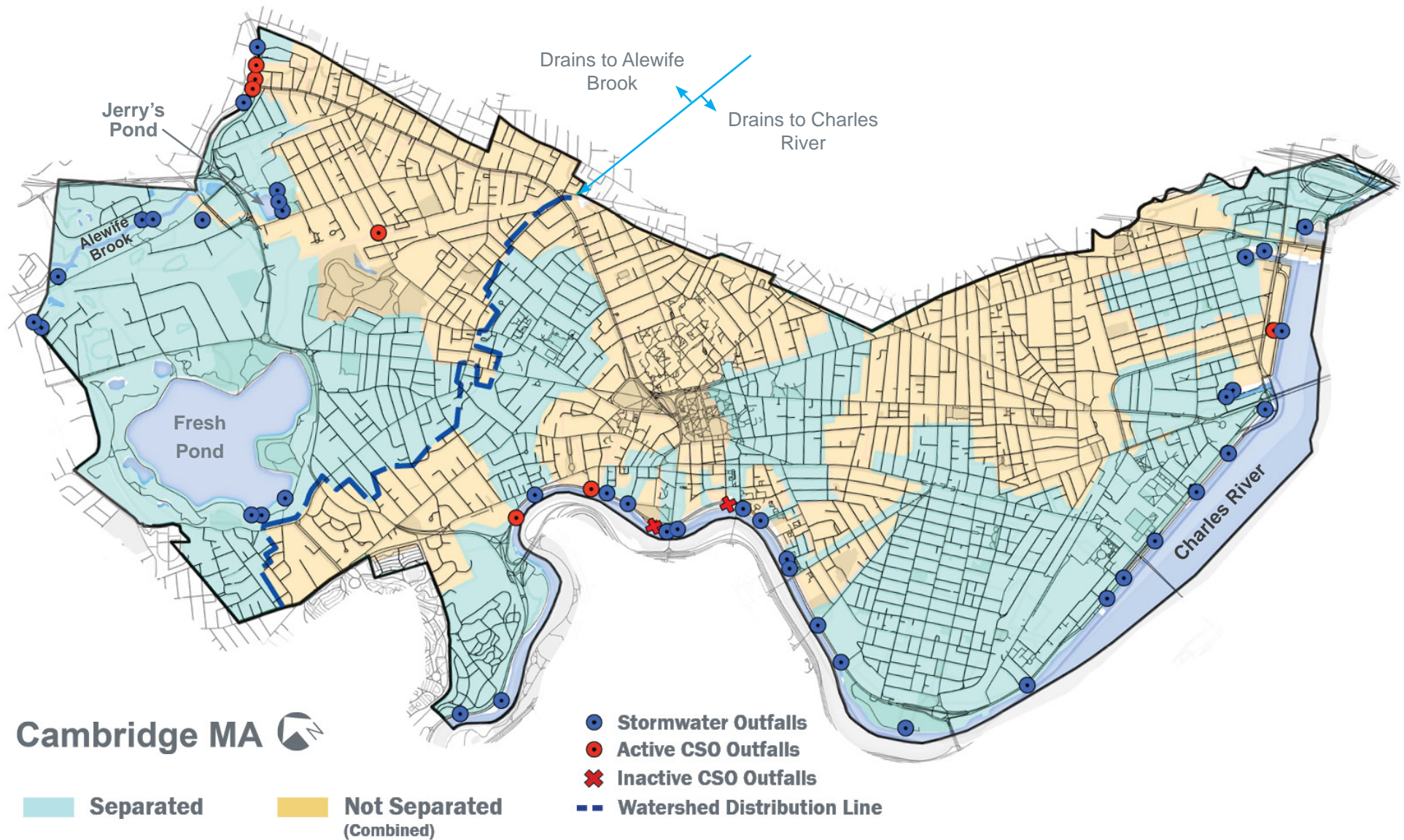
These maps on pages 6 and 7 show areas of major pipe replacement or rehabilitation (0 rating), the condition (1-5 rating) of pipes inspected since 2005, and pipes that have not yet been inspected (unrated). The City continues to inspect its infrastructure through a dedicated program and as part of public and private projects.

PRIORITIES | DRAIN CONDITION



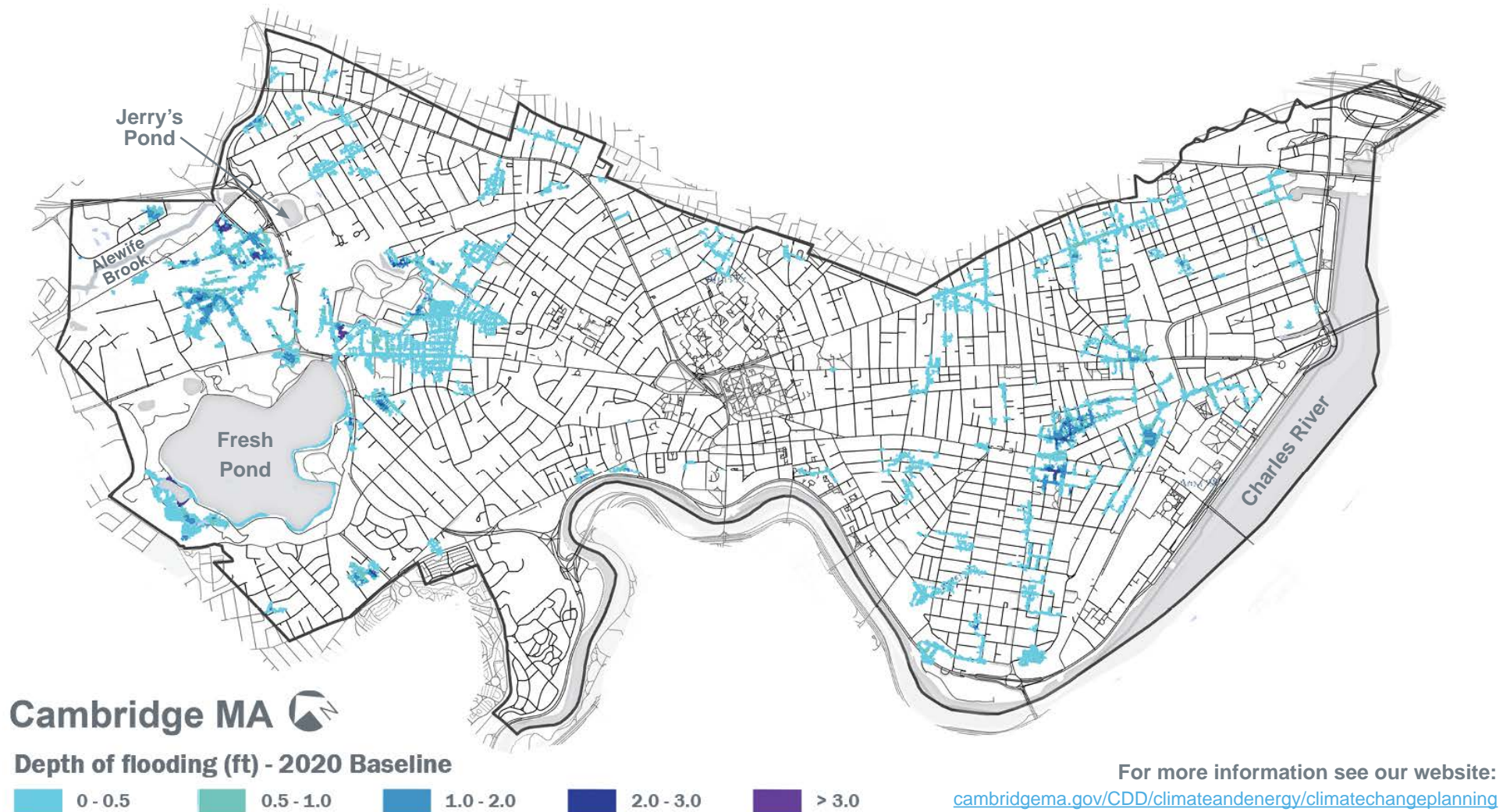
In 2009, the City adopted the Pipeline Assessment Certification Program (PACP) as the standard method for inspecting, identifying, and assessing pipes. This program provides the City with a consistent method to evaluate its infrastructure condition and identify high-risk assets to be addressed.

PRIORITIES | SEWER SEPARATION



This map shows the areas of Cambridge's sewer system that are separated and are not separated and the active city-owned outfall locations. The City is 55% separated and 45% not yet separated.

PRIORITIES | CLIMATE CHANGE



From the Climate Change Vulnerable Assessment, this map shows the precipitation flooding scenario under the 10-year 24-hour storm by 2070s (updated April 2019).

PRIORITIES | FUNDING

PROJECT TYPES:

- Sewer separation
- Repair or replacement of infrastructure
- Inflow/infiltration removal
- Pump stations, including storage tanks
- New stormwater outfalls
- Climate change and resiliency planning

MORE DEMAND THAN FUNDING OR ABILITY TO CONSTRUCT:

- Inspect and clean pipes to target localized infrastructure repairs and restore designed pipe capacity
- Utilize innovative measures, such as pipe lining and spot repairs, to extend the life of infrastructure
- Identify pipes in or around high priority locations that may impact the most people
- Identify streets that have overlapping needs/benefits



10 YEAR PLAN | SCOPE OF WORK

Our approach requires the effort of both the public and private sectors to achieve the regulatory, infrastructure, and water quality improvements to make Cambridge a **clean** and **healthy community**.

REGULATORY

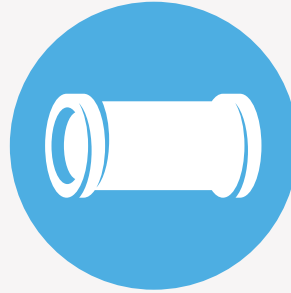
INFRASTRUCTURE

WATER QUALITY

PUBLIC



Reduce CSOs, Pollutants of Concern, and Total Suspended Solids (TSS) to surface waters



Address at risk or high risk infrastructure in high priority areas through rehabilitation or replacement



Use green infrastructure solutions where possible

PRIVATE



Comply with Stormwater Regulations to reduce erosion, nonpoint source pollution, and flooding



Design and build to the 2070 10-year and recover to the 2070 100-year storm climate projection



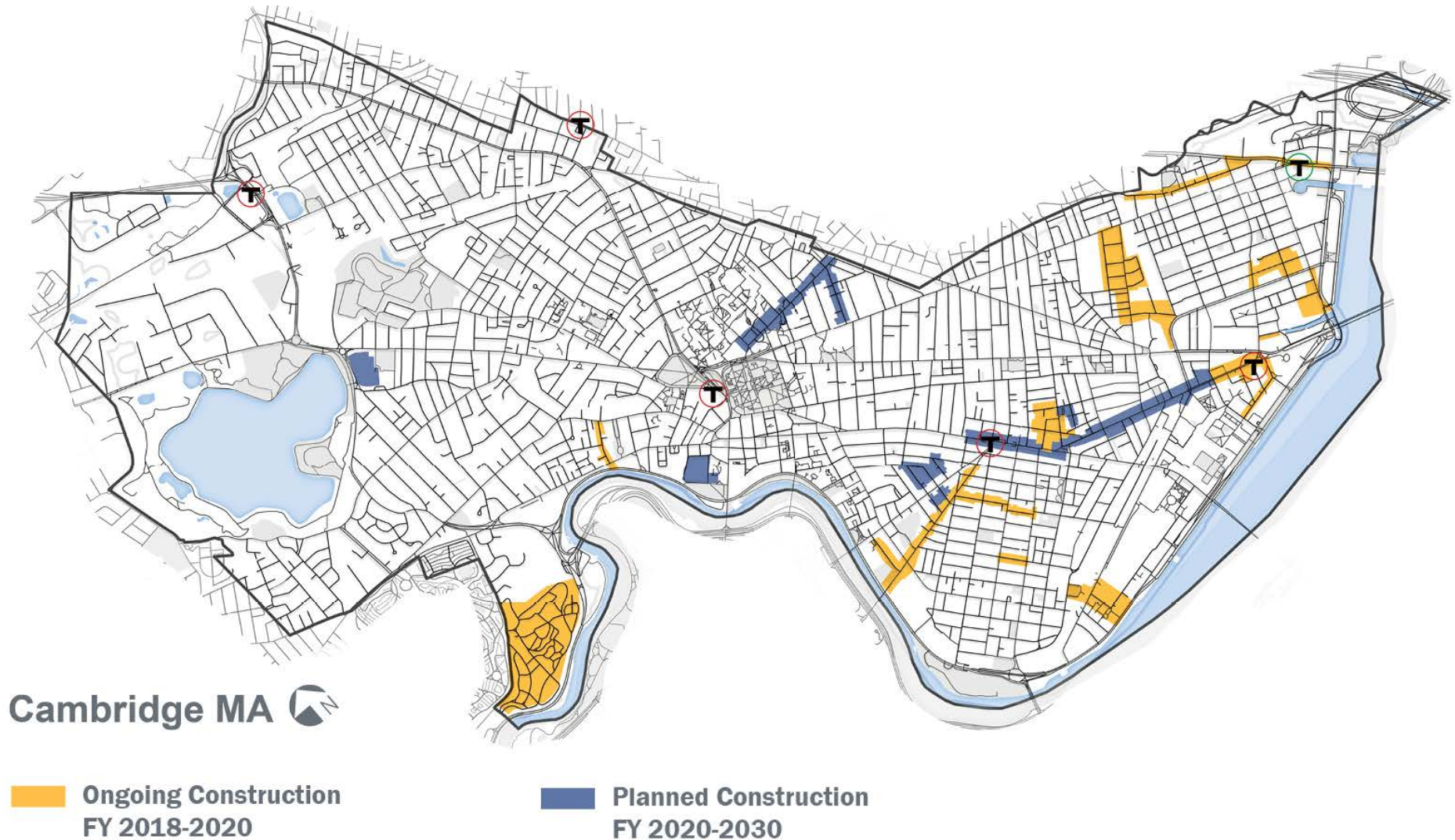
Implement Best Management Practices (BMPs)

10 YEAR PLAN | COMPLETED PROJECTS



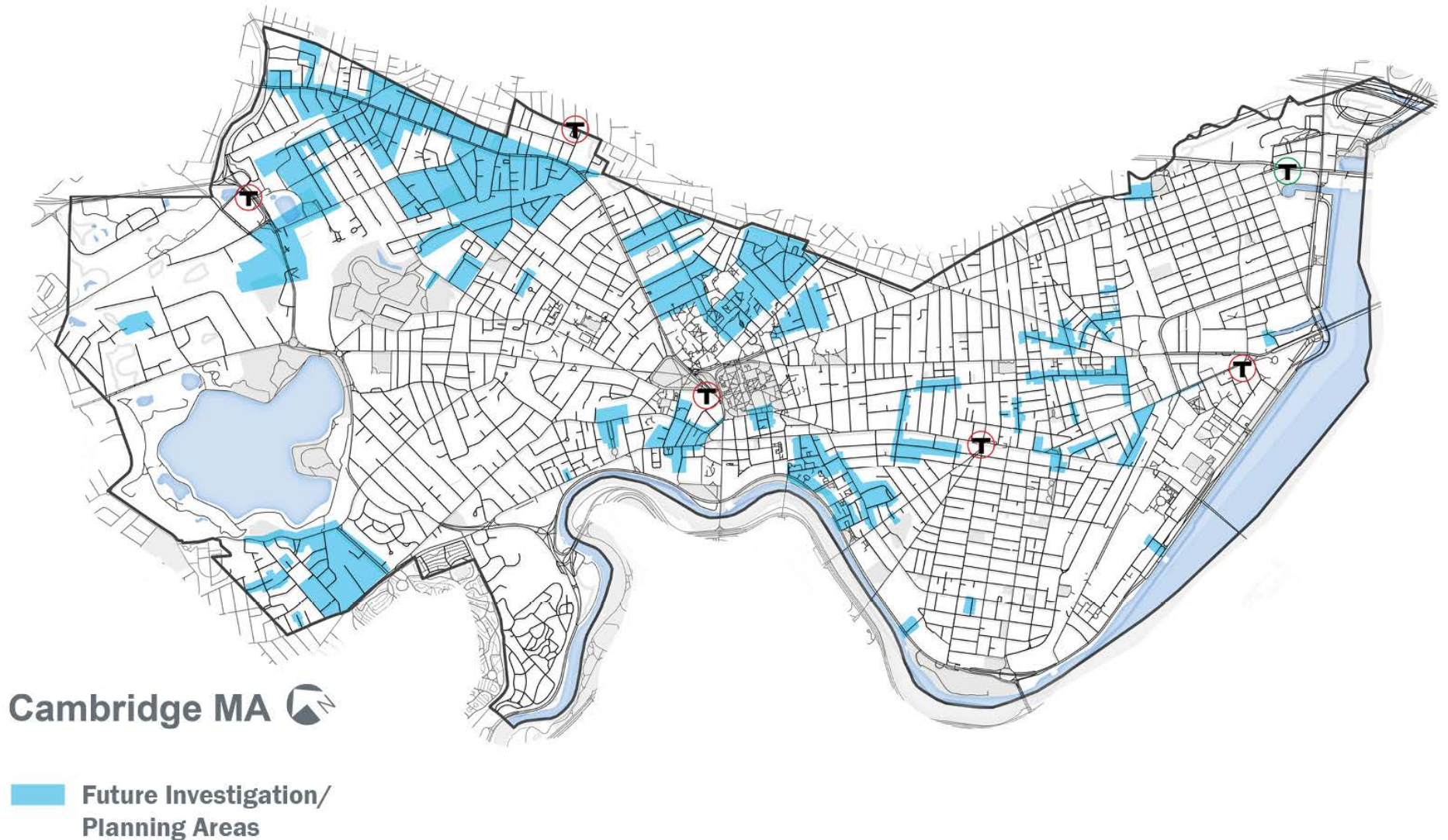
Completed projects include Alewife Sewer Separation, Whittemore Area Sewer Separation, Fresh Pond Parkway Sewer Separation, Alewife Stormwater Wetland, Western Avenue, Binney Street, and the separation of common manholes throughout the City.

10 YEAR PLAN | ONGOING & PLANNED CONSTRUCTION



Ongoing and planned construction projects include The Port infrastructure projects and sewer separation of Willard Street, Talbot Street, River Street, and Kirkland Street.

A LOOK AHEAD | FUTURE INVESTIGATION/ PLANNING AREAS



Investigation/planning areas include evaluating the system to understand the areas for improvement. Future projects will be evaluated and incorporated into the 10 Year Plan as investigations proceed.

PROGRAMS | SEWER SEPARATION

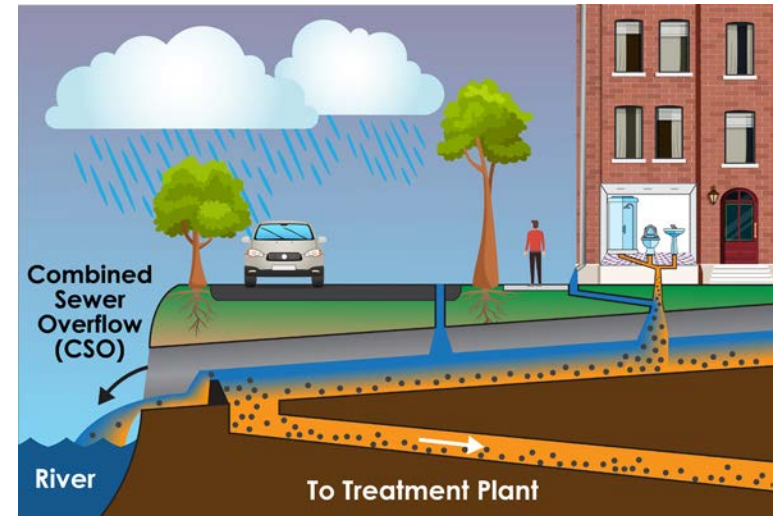
Cambridge's sewer system is approximately 55% separated, where sewage goes to the MWRA for treatment and the stormwater discharges directly to Alewife Brook or the Charles River.

The remaining system is combined sewer, where the sewer and stormwater share a common pipe and can be directed to the MWRA for treatment during dry and wet weather, and to the Alewife Brook or the Charles River during wet weather CSOs.

Sewer separation provides benefits by:

- Improving the quality of waterways in and around Cambridge
- Reducing CSOs
- Eliminating sanitary sewer backups that cause SSOs
- Reducing flooding
- Maintaining compliance with regulations

Combined



Separated



PROGRAMS | ANNUAL CAPITAL REPAIRS & MAINTENANCE

The City actively maintains City-owned sewer and stormwater infrastructure and manages the following programs:

- **CCTV Inspection & Cleaning:** Clean and inspect infrastructure to evaluate structural condition
- **FOG Program:** Work with food establishments to limit fats, oils, and grease in sewer system preventing clogs/backups
- **Illicit Discharge Detection and Elimination (IDDE):** Search for illicit connections
- **Pipe Rehabilitation:** Improve longevity/useful life of existing infrastructure without excavation
- **Pump Maintenance:** Maintain infrastructure that controls flooding and SSOs
- **Routine System Maintenance & Cleaning:** Remove sediment and debris captured in catch basins and pipes to improve water quality and maintain capacity
- **Structure & Pipe Repairs:** Address point source problems, like pipe collapses



PROGRAMS | CLIMATE CHANGE PLANNING

The City is committed to **Climate Change Vulnerability and Preparedness Planning**, which:

- Identifies vulnerabilities to flooding due to increasing precipitation and sea level rise/storm surge
- Identifies adaptation and resiliency strategies, including strategies for sewer and drain infrastructure
- Informs changes to regulations
- Evaluates project impacts to climate change
- Coordinates federal, state, and regional efforts
- Prepares community through education and outreach



PROGRAMS | REGULATIONS & REQUIREMENTS

The City must ensure that the Infrastructure Plan meets or exceeds federal and state regulations, including:



Infrastructure Improvements and Maintenance:

- MassDEP (inflow and infiltration)
- EPA



Untreated discharges regulated through the NPDES Program:

- Municipal Separate Storm Sewer System (MS4)
- Combined Sewer Overflow (CSO)
- Total Maximum Daily Load (TMDL)



Activities related to floodplain areas:

- Federal Emergency Management Agency (FEMA) National Flood Insurance Program (NFIP)
- Wetlands Protection Act
- Zoning Flood Plane Overlay

DESIGN | SEWER

Considerations when the City undertakes design of the sewer system include:

Eliminate Sanitary Sewer Overflows

- Ensure pipe is properly sized (consider new development)
- Design greater than minimum pipe slopes
- Use of proper pipe materials
- Maintain adequate access for cleaning and maintenance
- Eliminate groundwater infiltration
- Redirect stormwater inflow



DESIGN | DRAIN

Considerations when the City undertakes design of the stormwater system include:

Reduce flooding

- System-wide modeling (consider climate change)
- Properly sized pipes
- Adequate detention and pumping

Water quality impact

- Sumped catch basins and drain manholes
- Increase pervious areas
- Consider first flush deflection or treatment where possible
- Removal of illicit connections
- Adequate access for cleaning and maintenance



DESIGN | GREEN INFRASTRUCTURE



Green infrastructure is an approach to stormwater management that protects, restores, and mimics the natural water cycle. Green infrastructure can address both quantity and quality of stormwater, reduce impervious surfaces, and increase plantings in a neighborhood.

Examples of green infrastructure include:

- Street trees and planter boxes
- Bio basins/rain gardens
- Rainwater harvesting (rain barrels)
- Infiltrating catch basins and other structures

CONSTRUCTION | SITE MANAGEMENT

All construction projects require implementation of:

Erosion & Sedimentation Control

- Reduce soil from entering the drain system and discharging to receiving waters by protecting catch basins and properly disposing construction materials
- Store construction materials properly on site
- Manage dust generated by construction activities



CONSTRUCTION | SITE MANAGEMENT

All construction projects require implementation of:

Traffic Management Plan

- Maintain pedestrian, bicycle, vehicular access where possible or provide an alternate route
- Coordinate with public transit temporary impacts to routes or stops
- Manage traffic using police details, signage, and traffic control devices



NEXT STEPS | CONCLUSION

The 10 Year Plan is a living document that will be updated regularly. As part of that process, the Department of Public Works will:

- Review the Plan annually based on the sewer and drain system assessments
- Update sewer and drain infrastructure condition data and corresponding maps
- Update 10 Year Plan to account for changing conditions and climate change impacts



GLOSSARY OF TERMS

BMP	best management practice
CCTV	closed-circuit television
CSOs	combined sewer overflows
EPA	U.S. Department of Environmental Protection
FEMA	Federal Emergency Management Agency
FOG	fats, oils, and grease
IDDE	illicit discharge detection and elimination
I/I	inflow/infiltration
MASSDEP	Massachusetts Department of Environmental Protection
MS4	Municipal Separate Storm Sewer System
MWRA	Massachusetts Water Resources Authority
NFIP	National Flood Insurance Program
NPDES	National Pollutant Discharge Elimination System
PACP	Pipeline Assessment Certification Program
SSOs	sanitary sewer overflows
TMDL	total maximum daily load
TMP	traffic management plan
TSS	total suspended solids



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