Improving System Hydraulics in the Dorchester Interceptor through Off-Line Storage and Inflow Reduction

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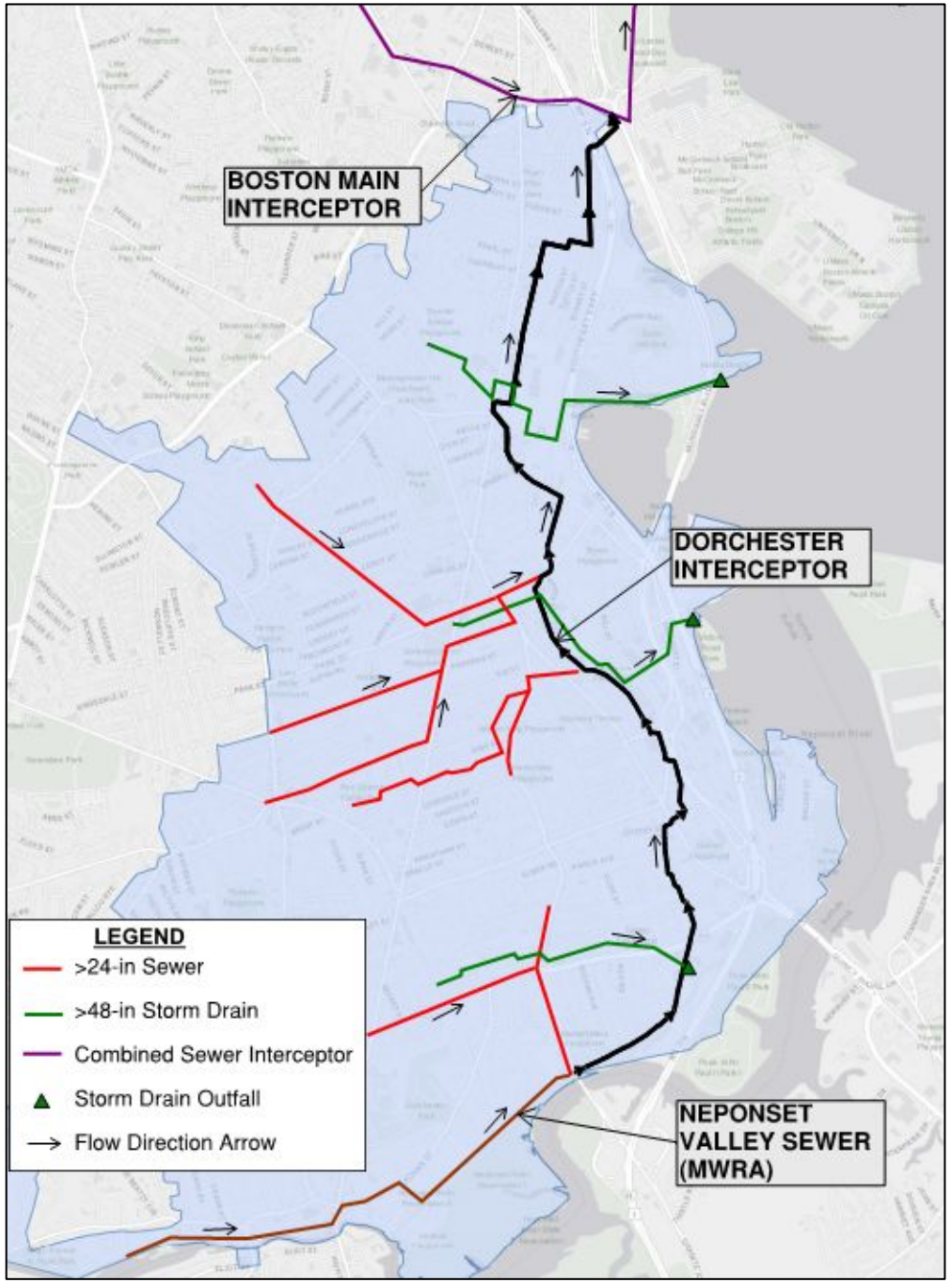
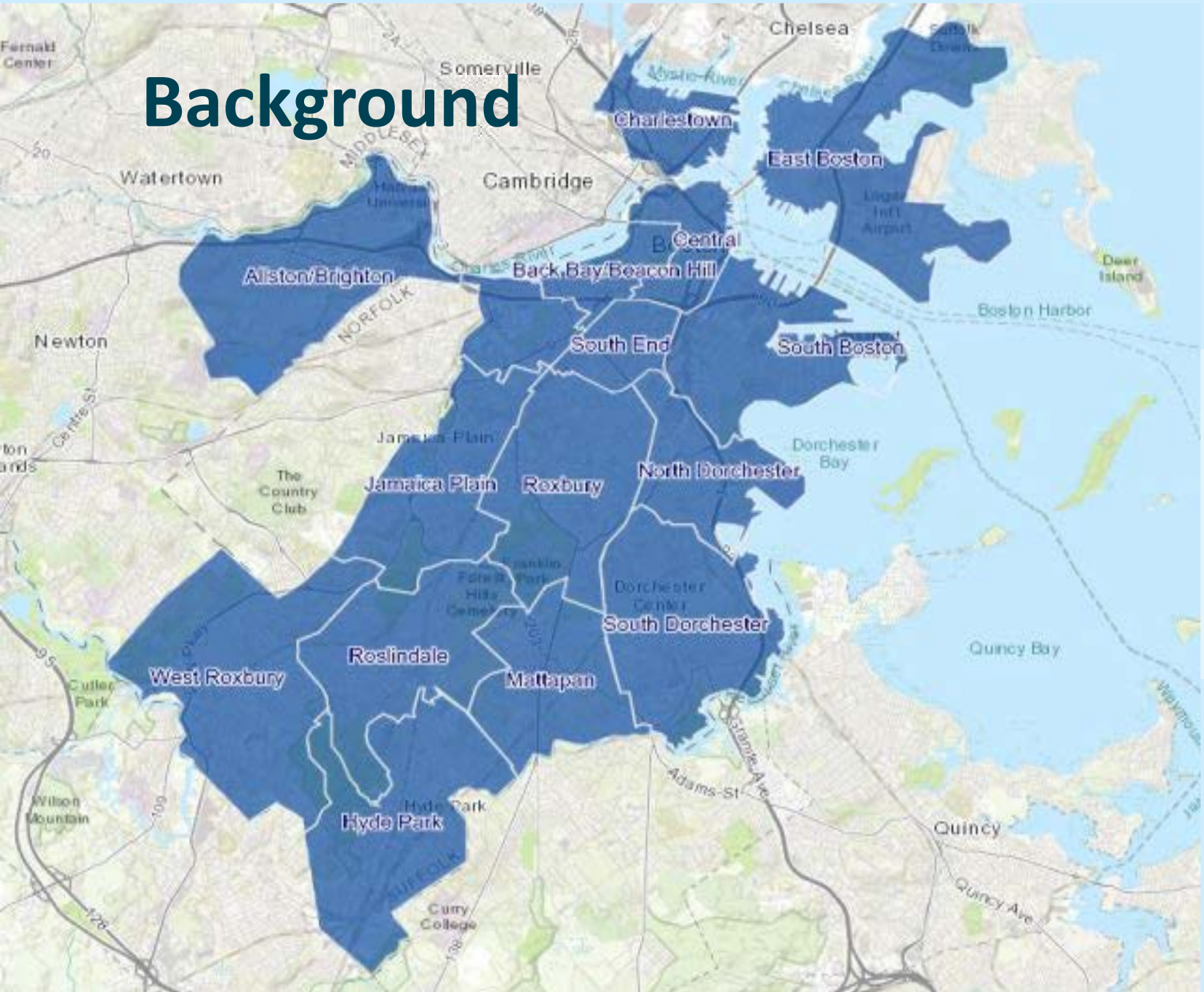
Agenda

- Background
- Dorchester Interceptor (DI) Study Summary
- Design Storm and Modeled Results
- Alternatives Evaluation
- Overview of Selected Alternatives
- Recommendations and Conclusion



Background



Boston Water and Sewer Commission (BWSC) est. 1977

- Water System ~1,018 miles
- Sewer system (sanitary and combined) ~870 miles
- Stormwater System ~670 miles

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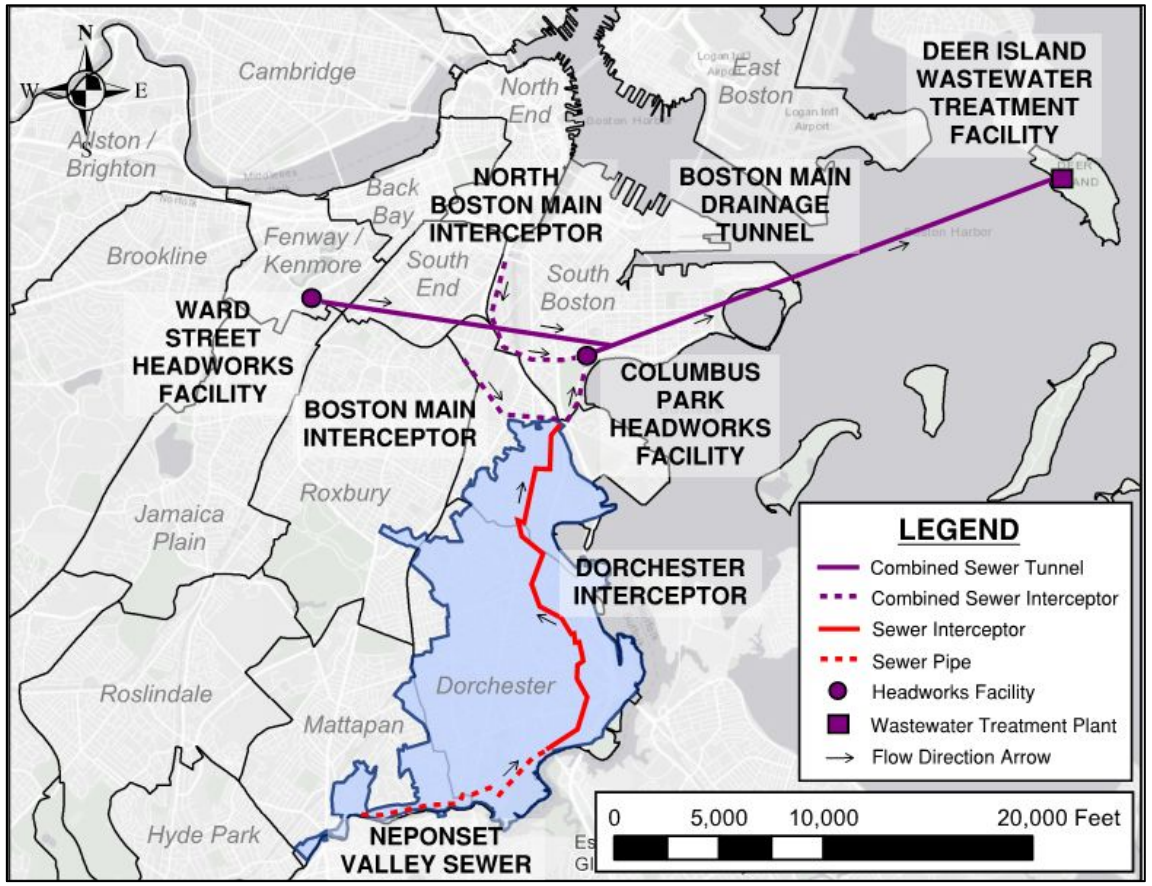
Background – Dorchester Interceptor (DI)

- Serves ~3,300 acres (Dorchester, Mattapan and a portion of Milton)
- ~20,000 linear feet from Massachusetts Water Resource Authority (MWRA) Neponset Valley Sewer to the Boston Main Interceptor (BMI)
- Flow from both the DI and BMI => MWRA's Columbus Park Headworks => MWRA's Deer Island Wastewater Treatment Facility



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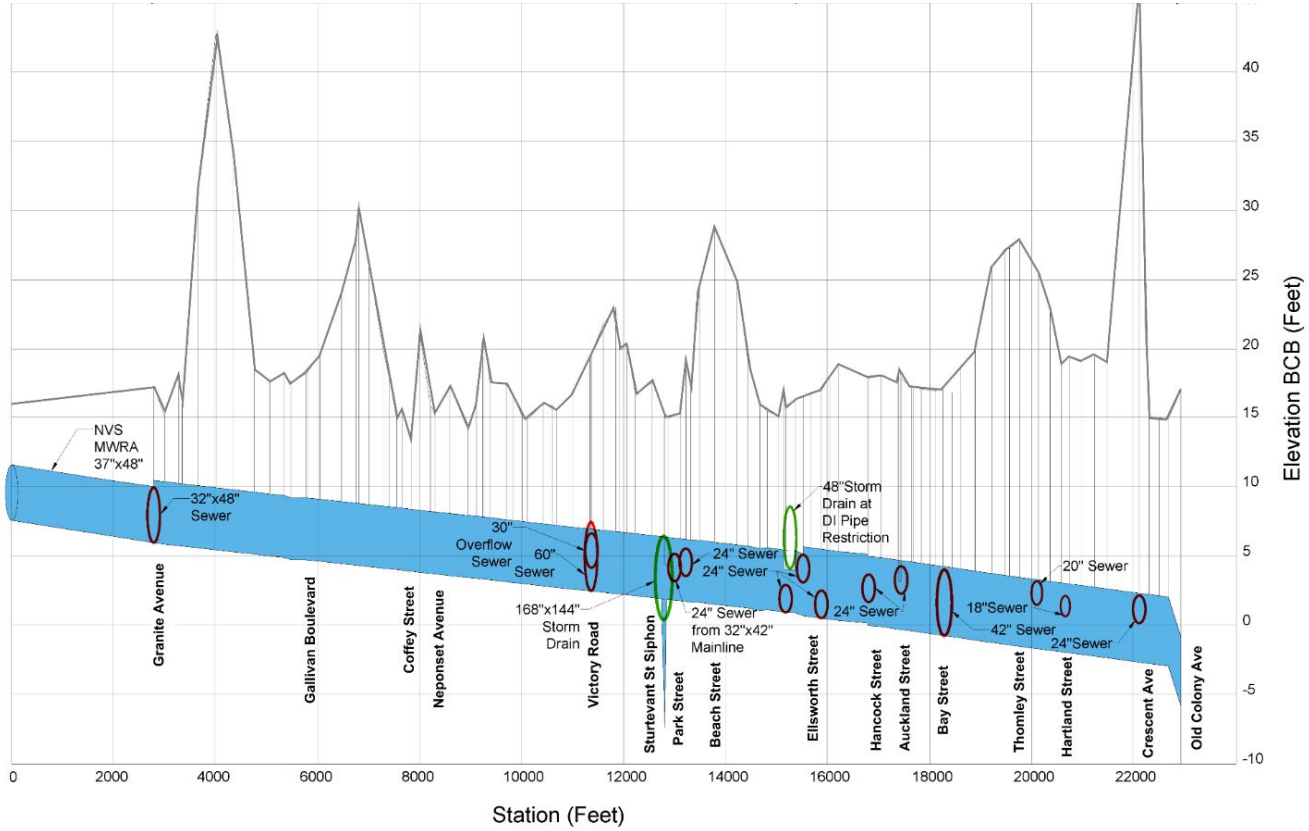
Background – DI Characteristics

- DI: 54-inch and 60-inch brick pipe with minimal slope on upper portion. Pipe is in good condition.
- DI unable to carry flow during some large or intense rain events
- No redundancy to inspect or maintain the DI



Dorchester Interceptor 54"
Circular Brick Pipe

Dorchester Interceptor SSO
July 9, 2021

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Background – BWSC Dorchester Interceptor History

Commission Activities

- Completed sewer separation of the DI tributary area in 2008, achieving over 95% separation as part of MWRA Combined Sewer Overflow (CSO) Reduction Program
- Closed all CSO outfalls
- Remaining inflow contributions include connections from flat roofed buildings with complex plumbing and internal downspouts
- Completed other studies of the DI
- Proactive in removing infiltration/inflow (I/I) through
  - Sewer system evaluation surveys (SSES)
  - CMOM Program
  - Site plan requirements requiring on-site drainage storage

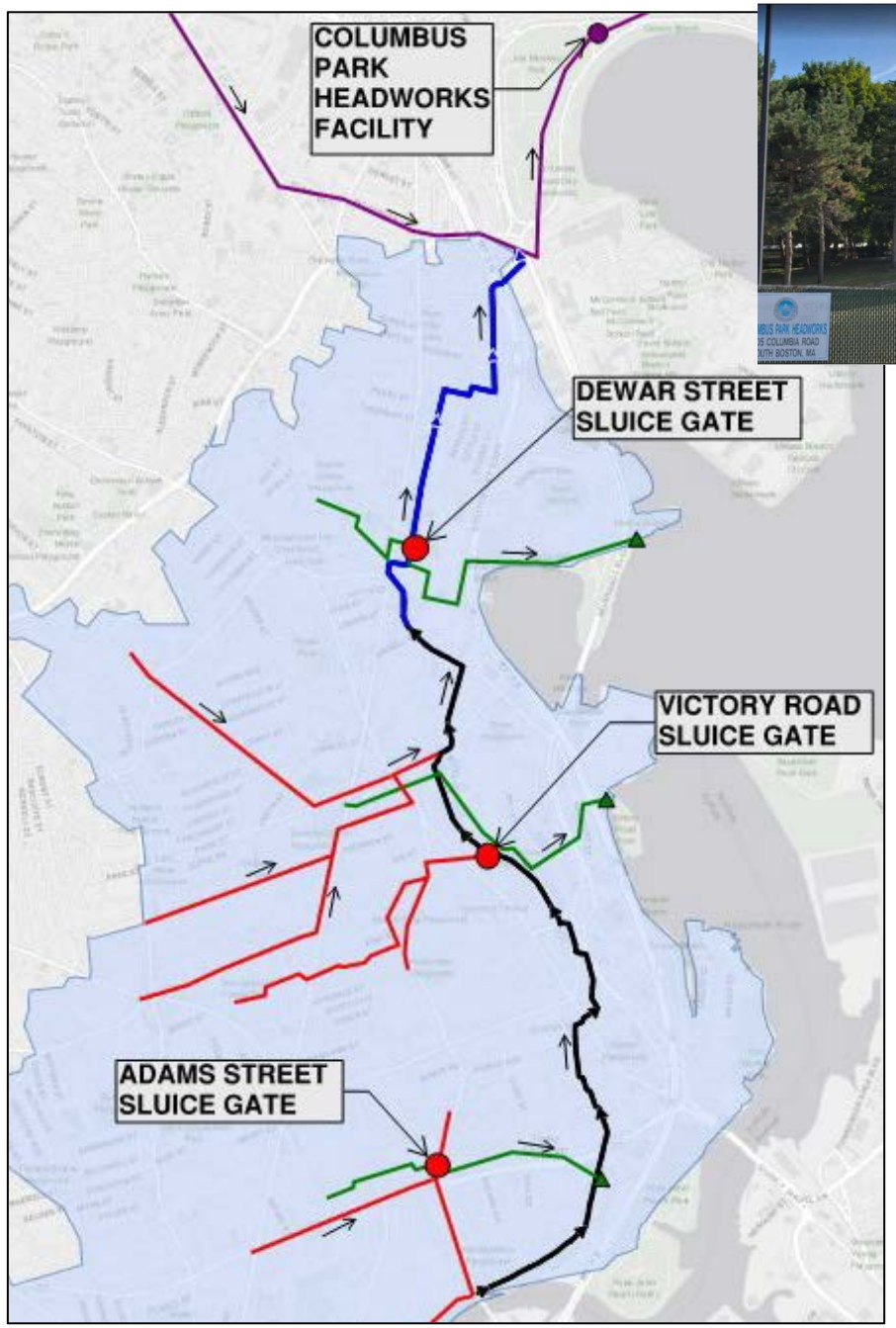
Eliminate Combined Sewer Overflows

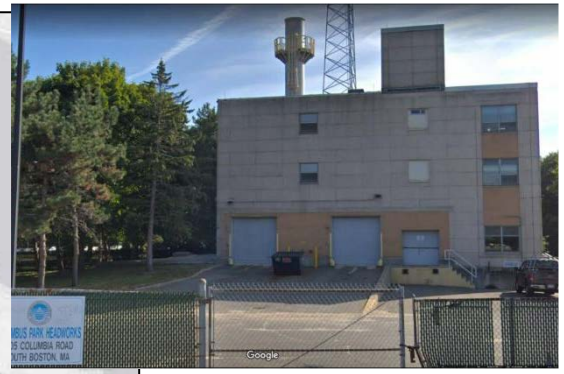
Reduce Pipe Infiltration

Remove Connections from Large Flat Roof Buildings

Background – CPH and Sluice Gates

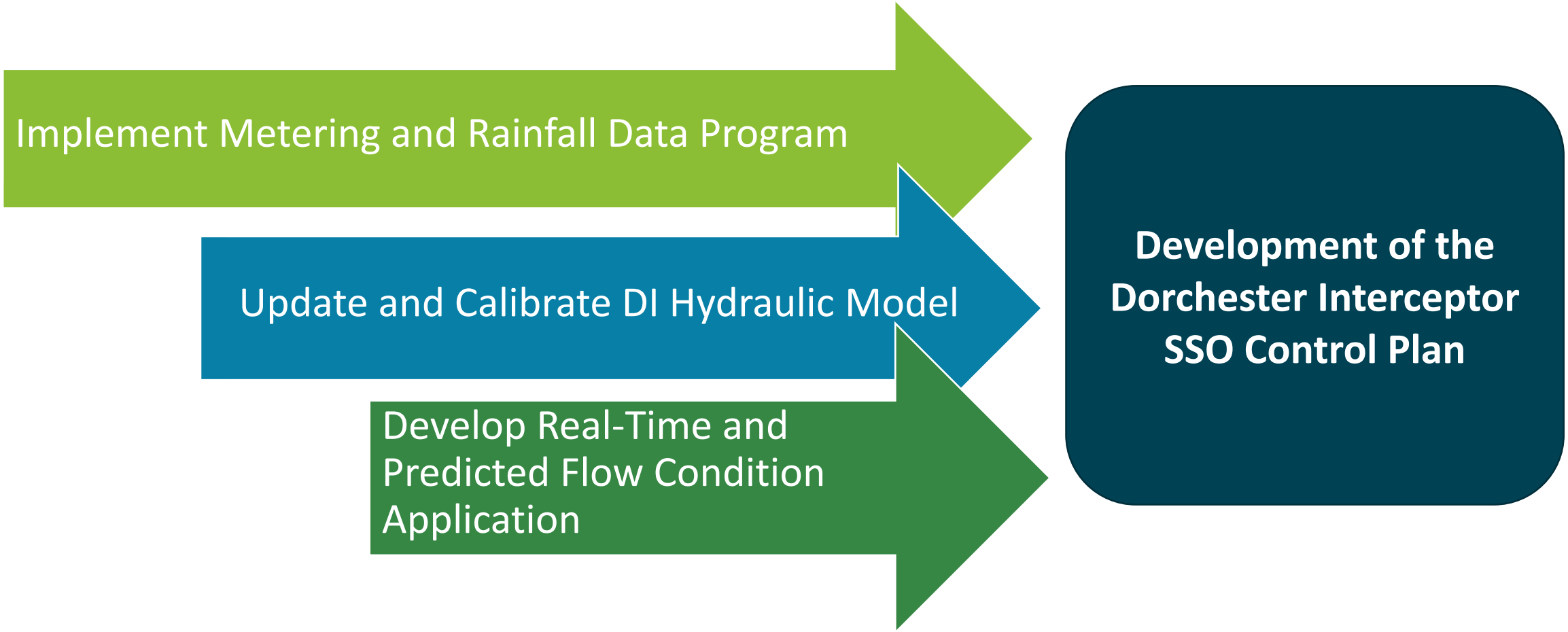
- During wet weather event, flow can be throttled at the MWRA's Columbus Park Headworks creating a backwater effect, which can impact the DI and BMI
- Three emergency relief sluice gates along the DI can be used to prevent inland flooding and protect public health as needed





Columbus Park Headworks Facility (MWRA)

DI Study Summary



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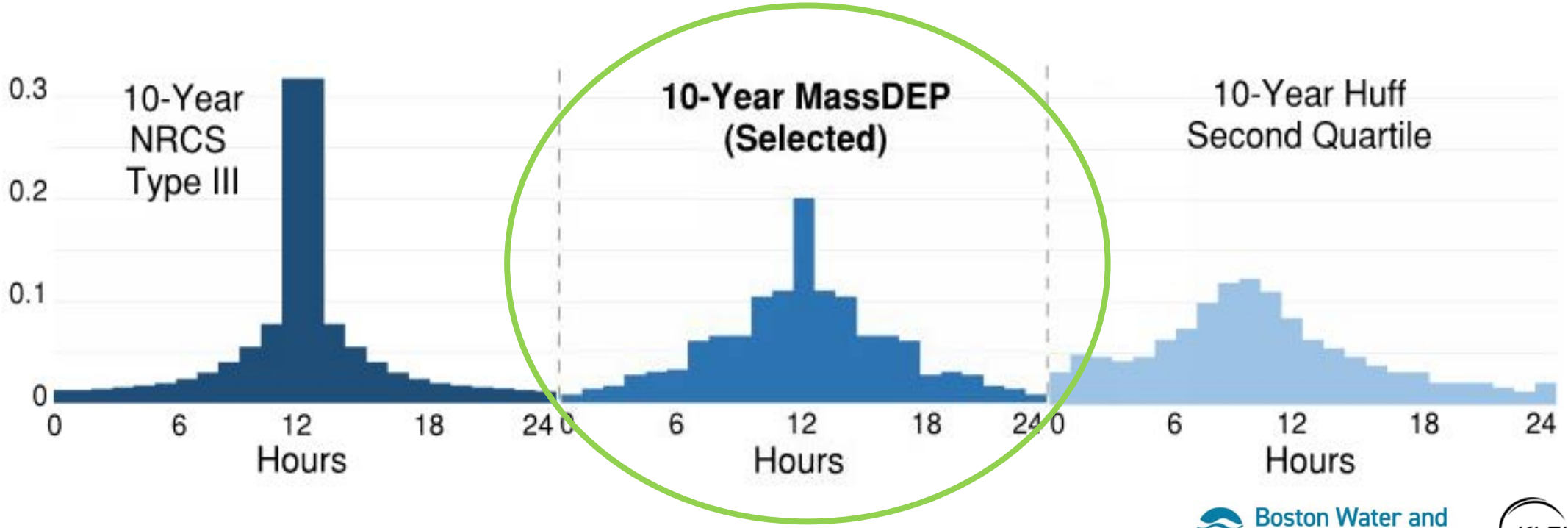
Design Storm Selection

- Utilized the calibrated DI sewer model
- Selected the 10-Year 24-Hour MassDEP design storm (5.1 inches [NOAA Atlas 14])
  - The peak intensity for this distribution falls between the SCS/NRCS Type III and the Huff Second Quartile



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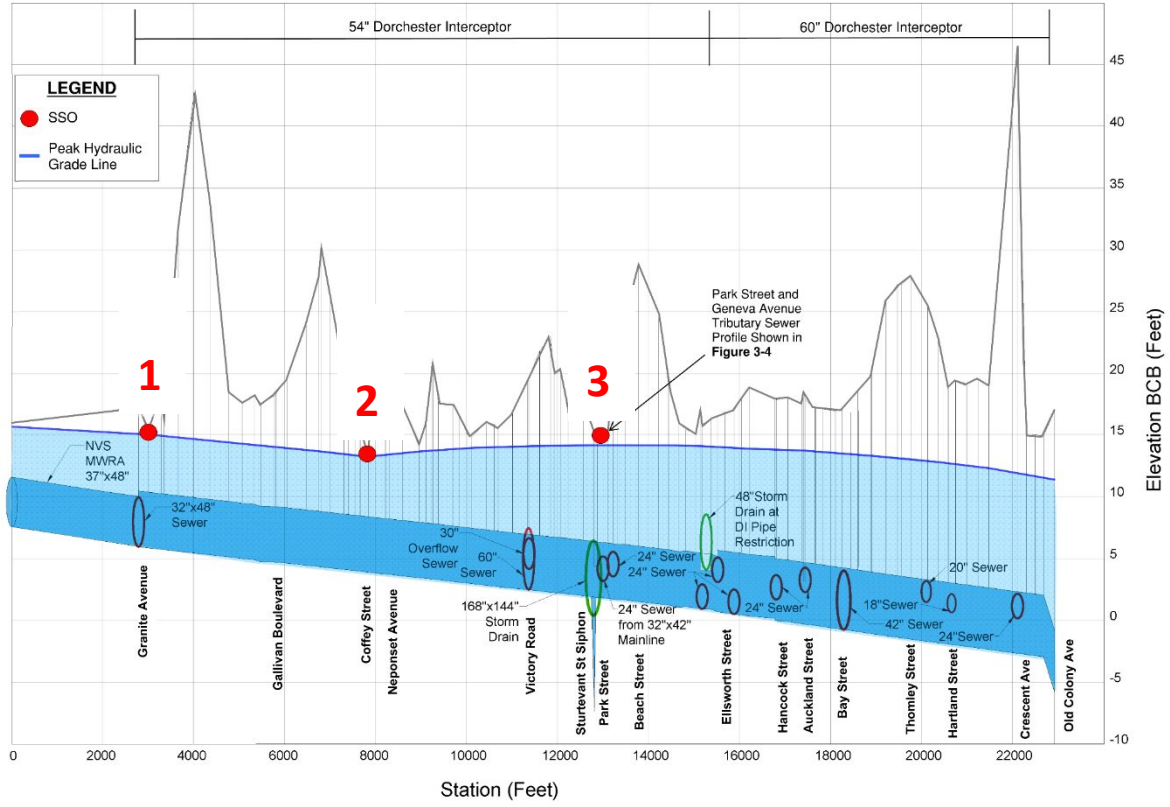
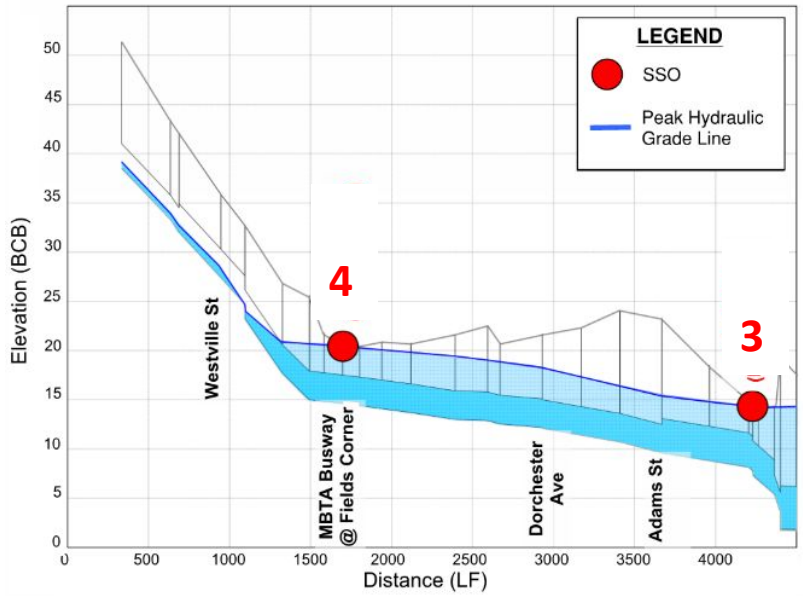
Design Storm Model Results

- Model results indicated **4 primary** SSO locations and **5 MG** total SSO volume
- Historical and observed events verified modeled SSO locations

1. Neponset Park
2. Coffey Street
3. Park Street
4. Geneva Avenue





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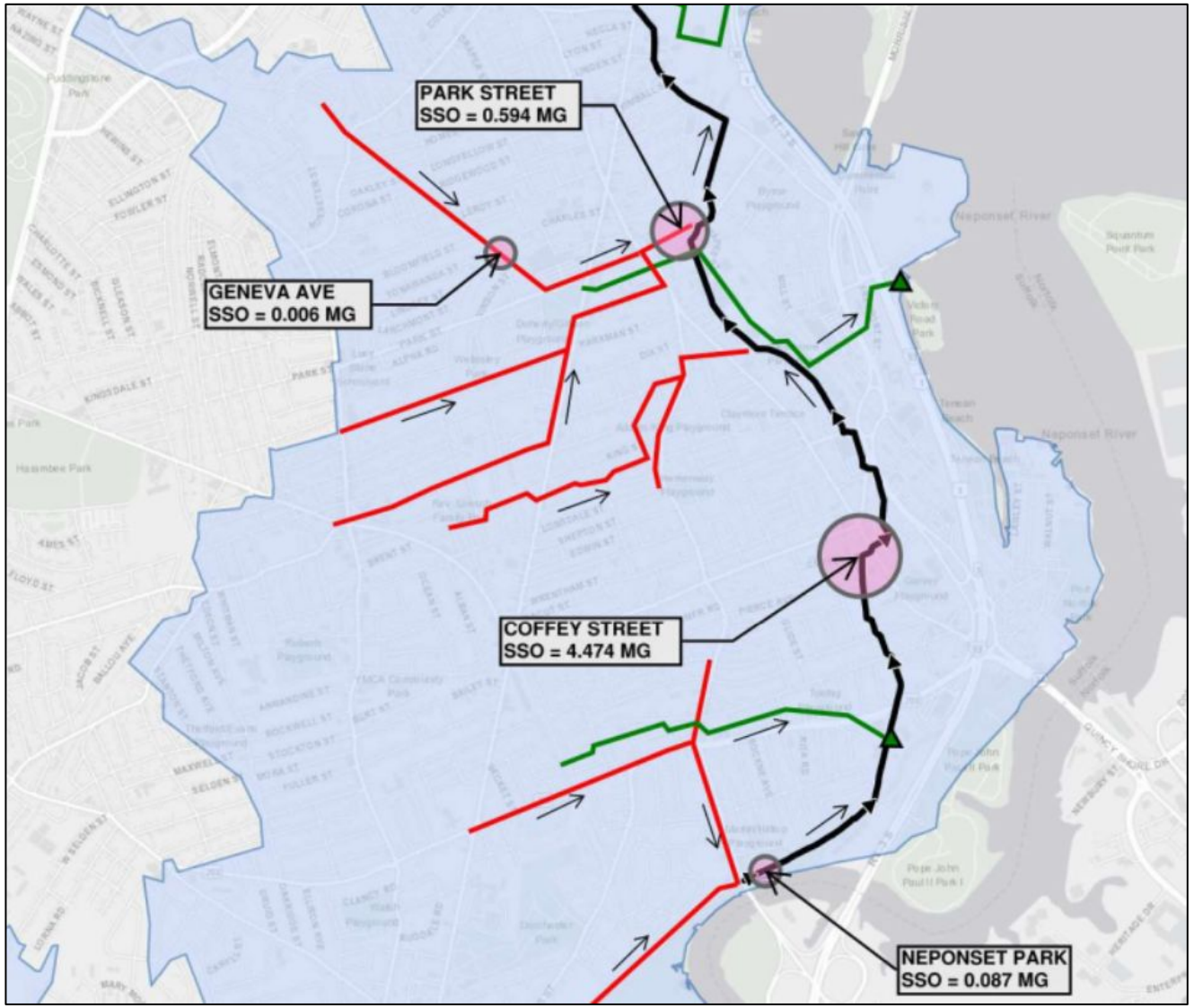
Design Storm Model Results

SSO locations and modeled volume

Neponset Park:	87,000 gal
Coffey Street:	4,500,000 gal
Park Street:	590,000 gal
Geneva Avenue:	6,000 gal
TOTAL	5,183,000 gal



Alternatives Overview

24 Initial Alternatives for SSO Control Identified under 3 Categories:

1. ***Storage and Flow Diversion*** – Alternatives typically requiring construction of new infrastructure to store or divert flows during wet weather events until there is capacity in the DI and its tributary sewers

   Ex: Underground storage tank, storage conduits, new diversion pipeline

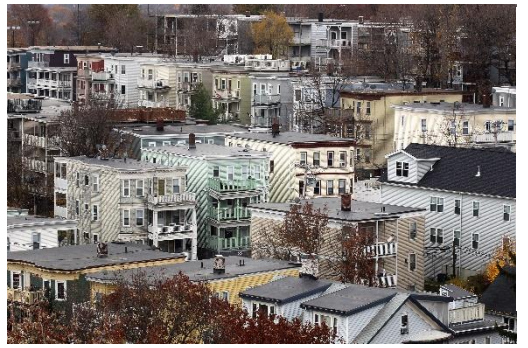
2. ***Inflow Removal*** – Alternatives that identify and remove inflow sources from the DI and its tributary sewers.

   Ex: Building drainage connections, parking lots, roof pumps, blue roofs

3. ***Miscellaneous*** – Alternatives that did not fall into either of the other two categories.

   Ex: Bolted manholes, raised manholes

Storage and Flow Diversion Example: Large Diameter Pipe Installation



Inflow Removal Example: Remove Connections from Large Flat Roof Buildings

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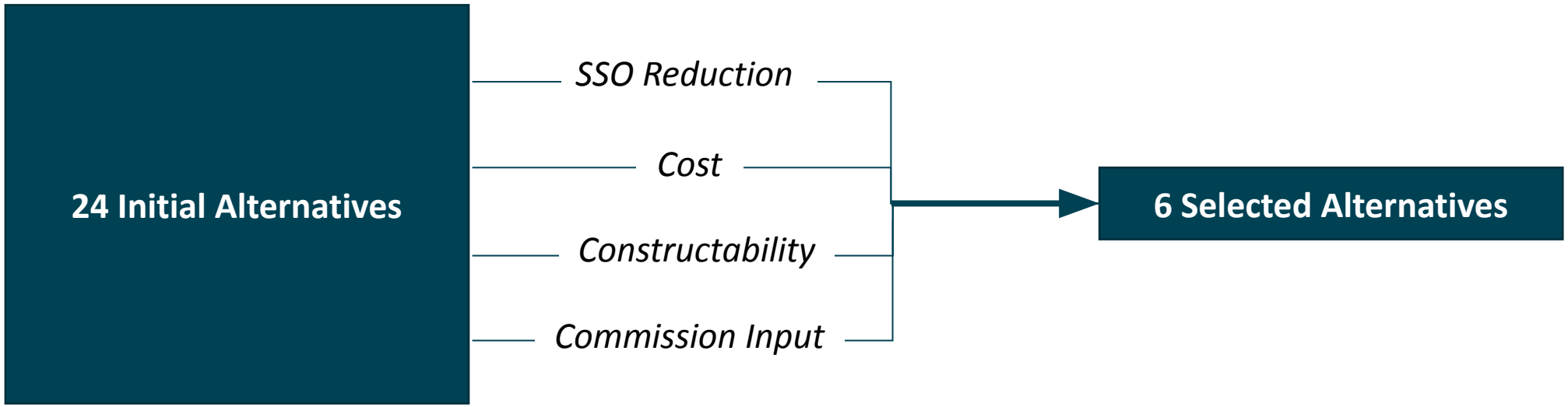
Screening of Alternatives



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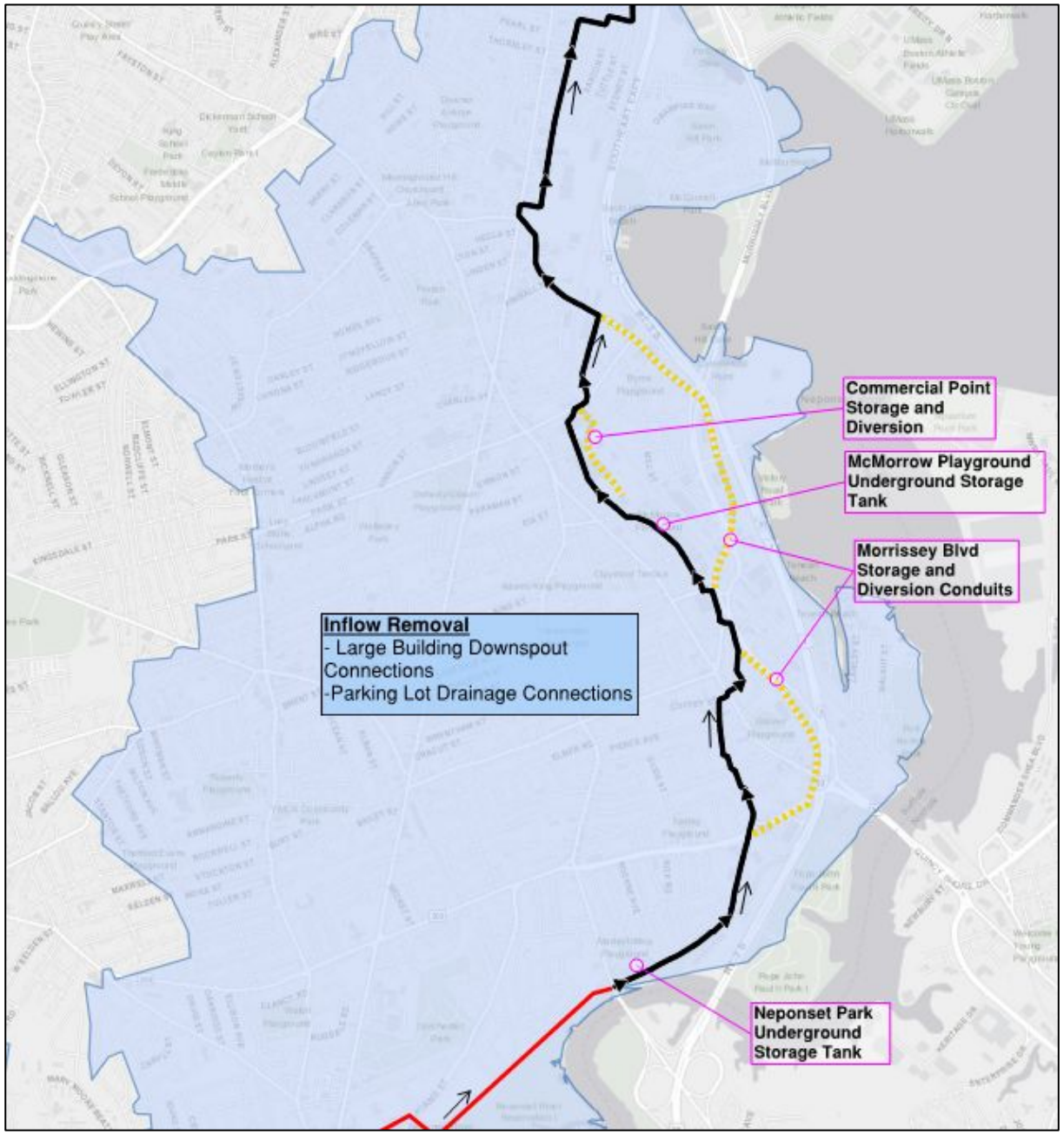
Selected Alternatives

6 Final Alternatives Selected

- ***Storage and Flow Diversion***
  - Neponset Park Underground Storage Tank
  - Commercial Point Storage and Diversion
  - Morrissey Boulevard Storage and Diversion Conduits
  - McMorrow Playground Underground Storage Tank
- ***Inflow Removal***
  - Large Building Roof Drainage Connections
  - Parking Lot Drainage Connections



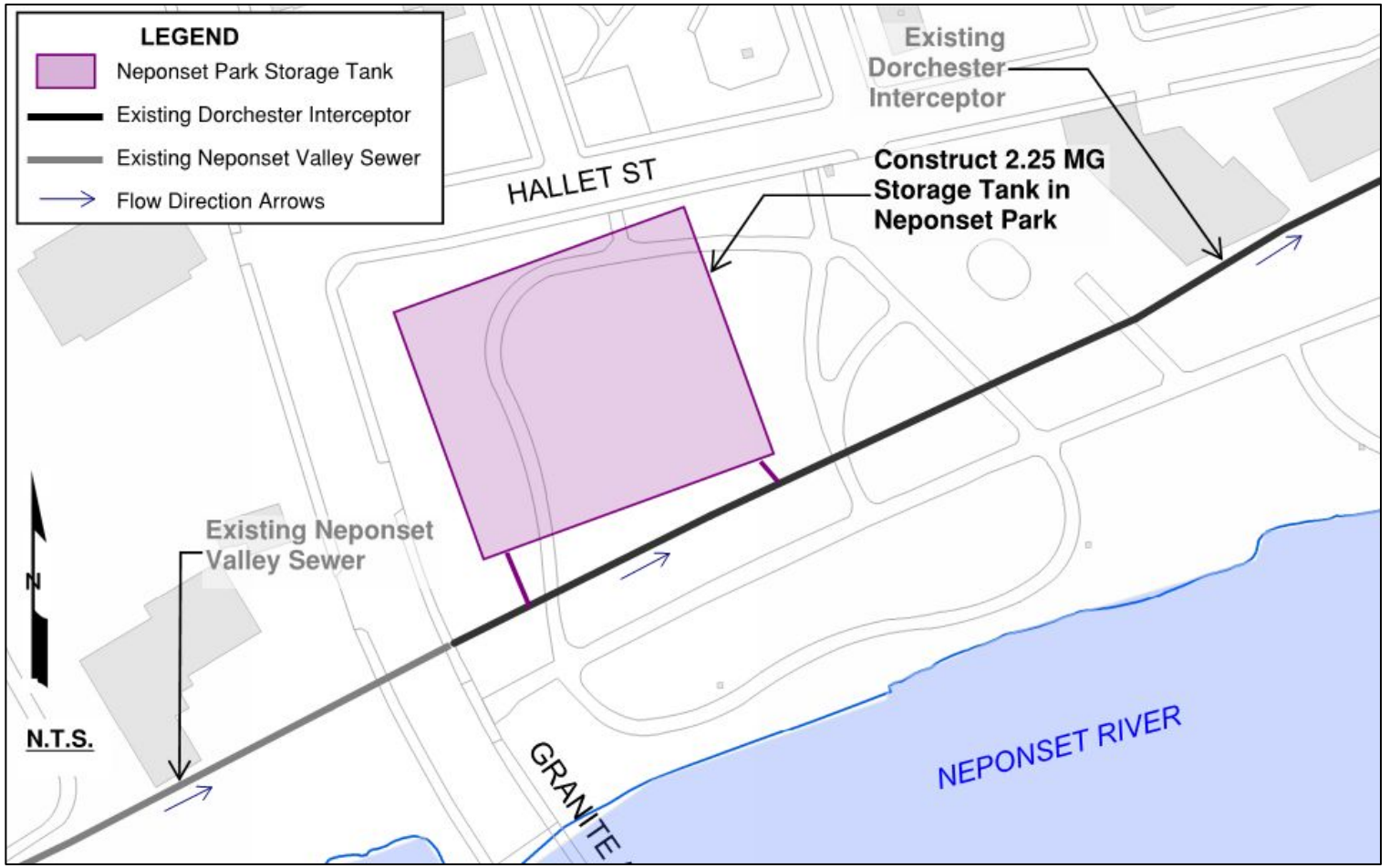
Neponset Park Underground Storage Tank

Details

- Storage: 2.25 MG
- Cost (Class 4): $31.2 Million

Benefits

- Eliminates SSOs at Neponset Park and reduces SSOs at other locations
- Site is open and lightly used. DI runs through Park
- Functions by gravity
- No utility conflicts



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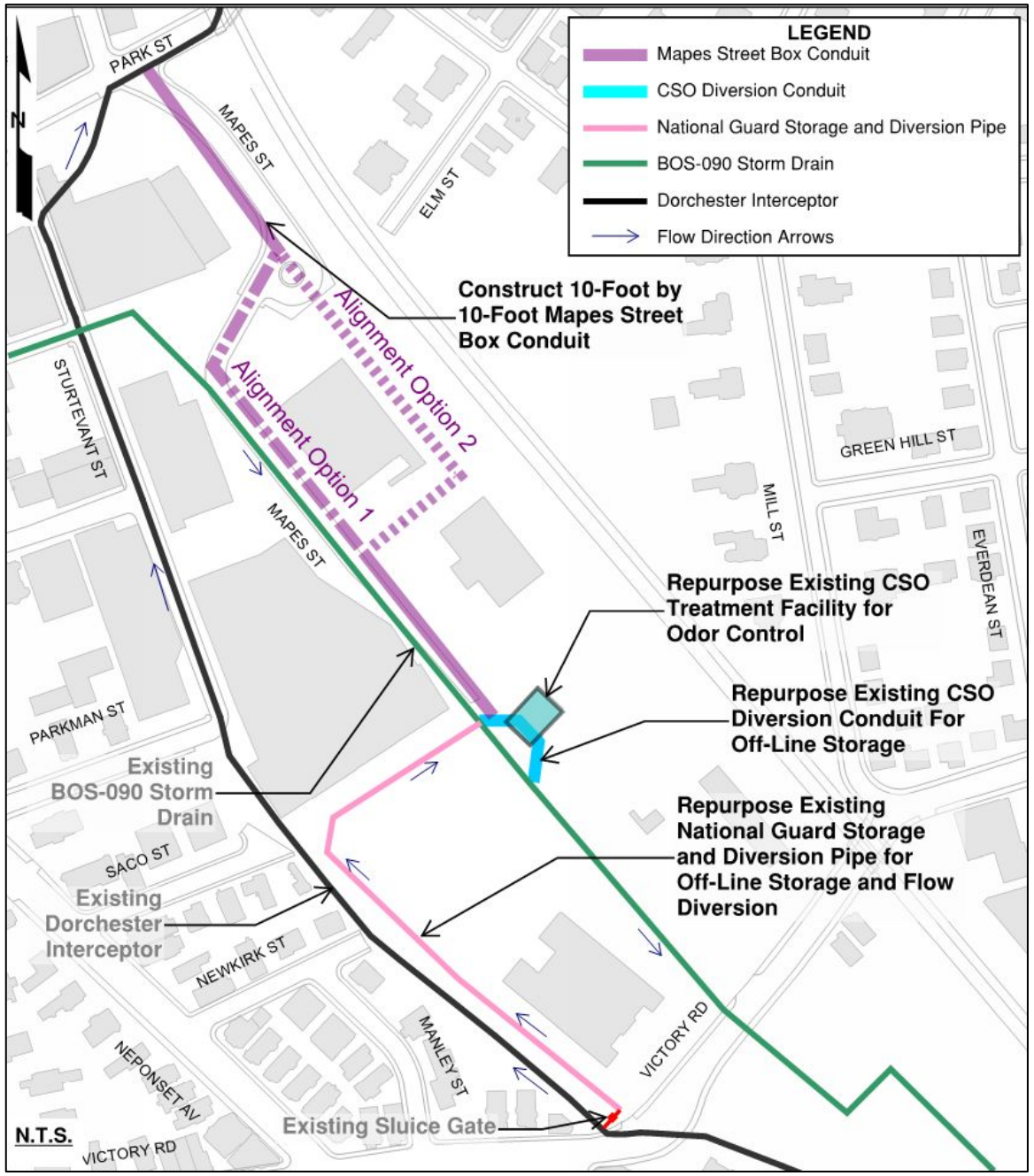
Commercial Point Storage and Diversion

Details

- Storage: 1.39 MG (Total)
- Cost (Class 4): $24 Million

Benefits

- Repurposes existing infrastructure that is inactive or underutilized
- Directly reduces SSOs in Park Street area more so than other alternatives
- Functions by gravity



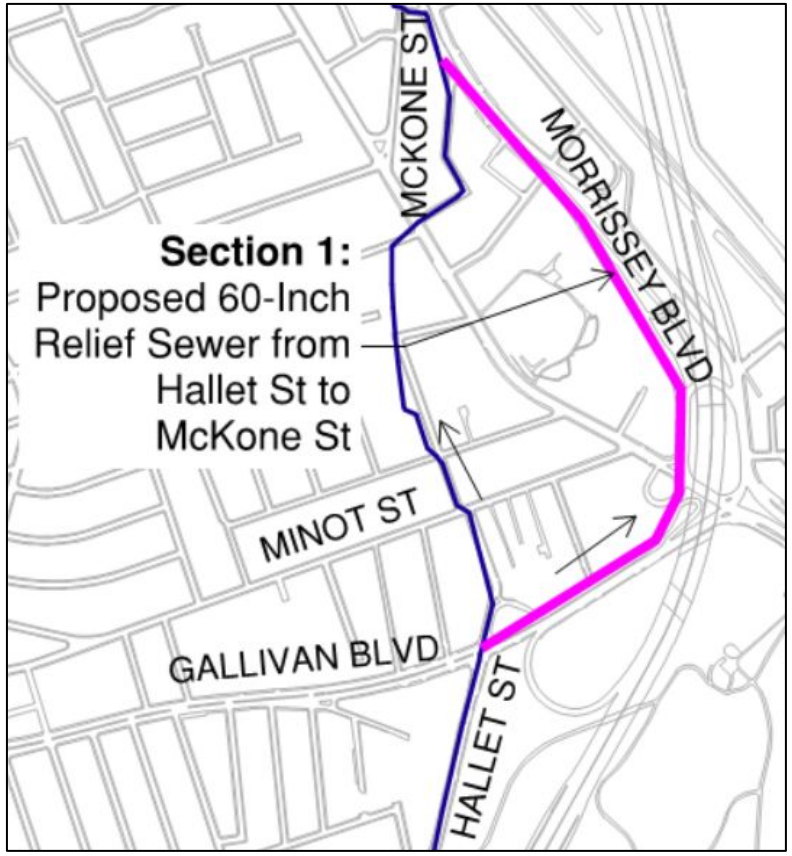
Morrissey Boulevard Storage and Diversion

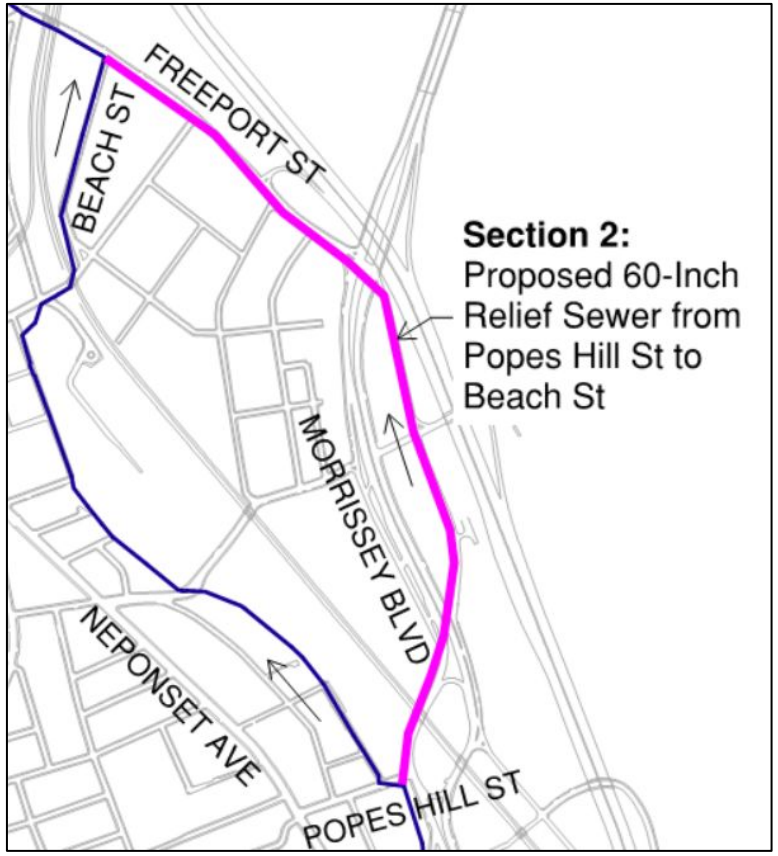
Details

- Storage: 2.15 MG
- Cost (Class 4): $45.2 Million

Benefits

- Reduces SSOs at all primary locations
- Provides redundancy to the DI for future maintenance and rehabilitation
- Can be installed separately or in sections based on scheduled roadway improvements
- Functions by gravity





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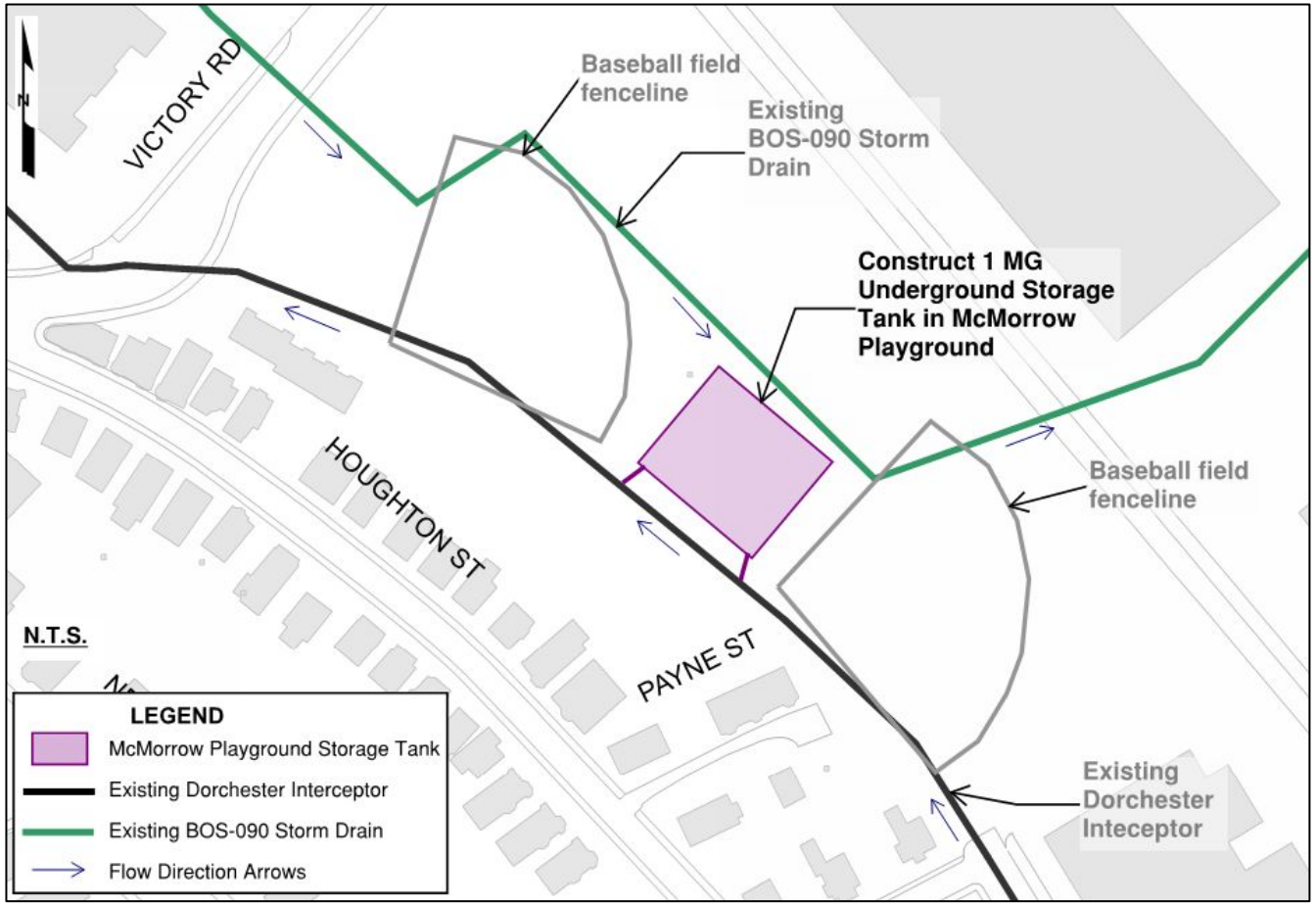
McMorrow Playground Underground Storage Tank

Details

- Storage: 1 MG
- Cost (Class 4): $14.9 Million

Benefits

- This portion of the park is open and lightly used. DI runs through Park.
- No utility conflicts
- Functions by gravity



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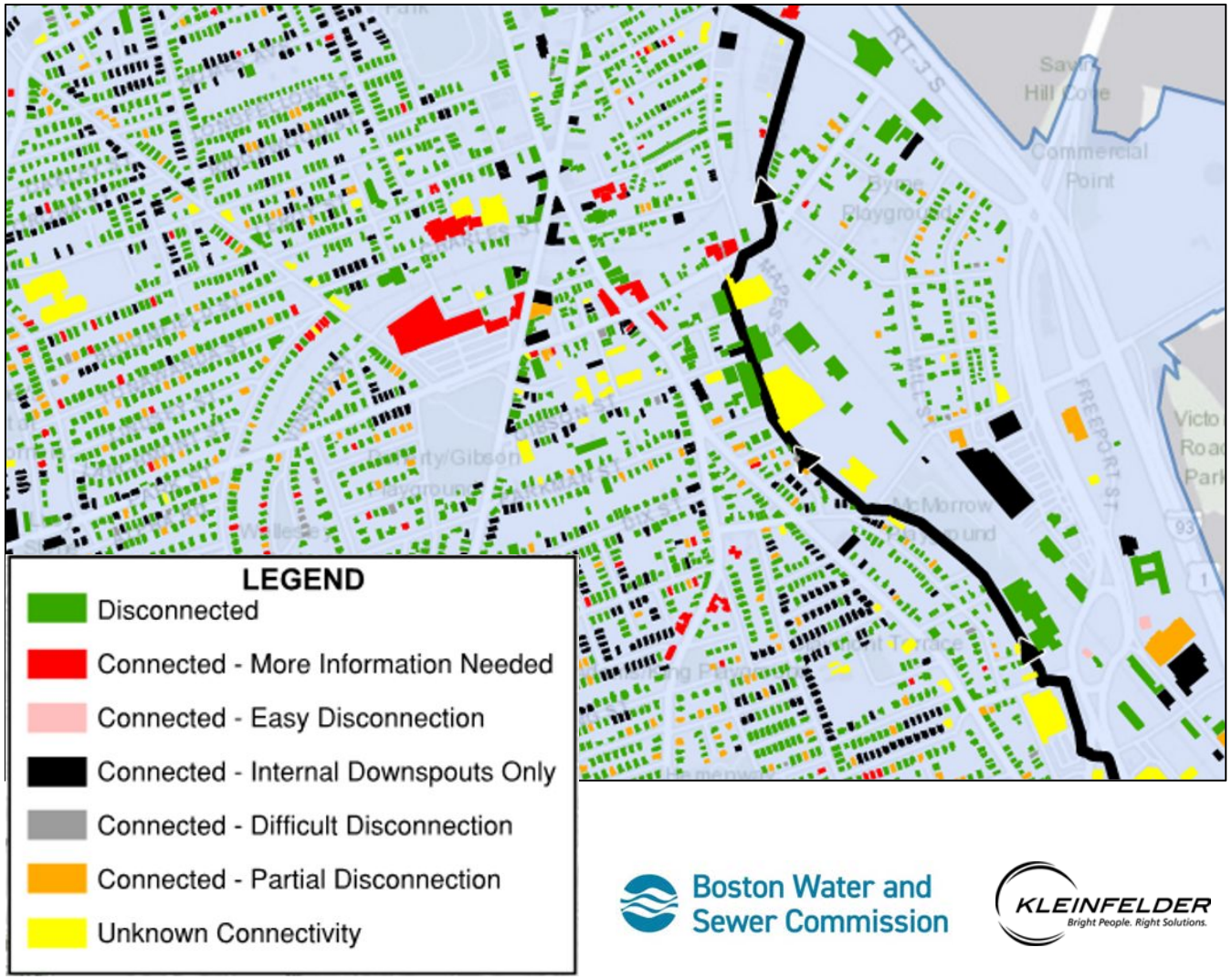
Building Roof Drainage Disconnections

- Target large, flat-roof buildings (>10,000 square feet) with complex internal roof drainage
- Remove internal plumbing roof drainage connections from buildings with known connection to sewers (Commission database)
  - 29 Buildings
  - $1.3 M (Class 5)
- Conduct investigations on buildings with unknown connections
  - 41 Buildings
  - $867,000 (Class 5)
- **Removes SSO volume at the source**



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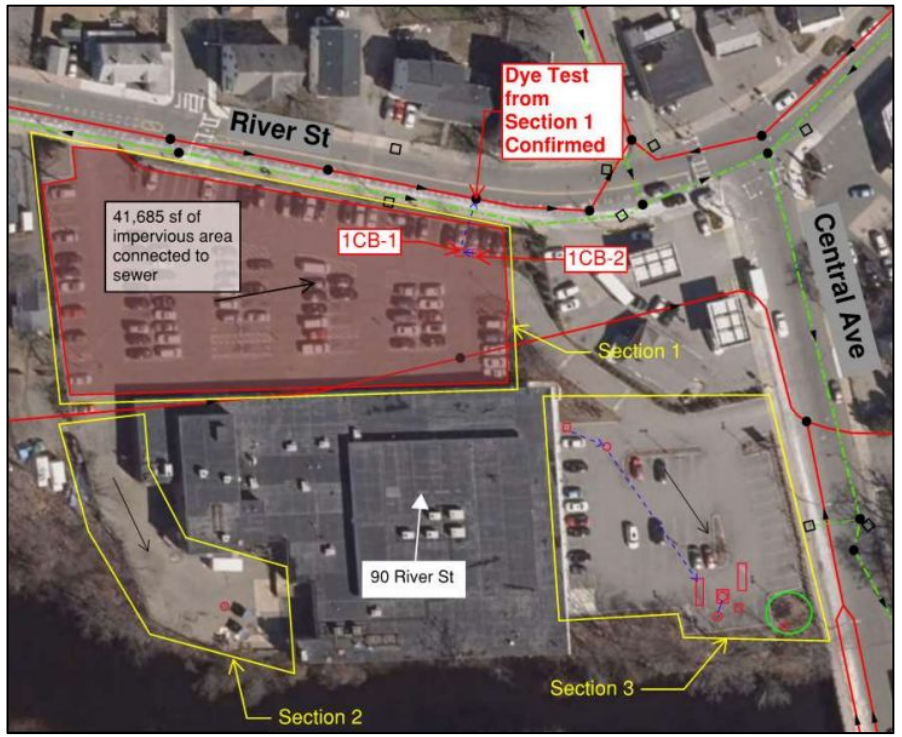
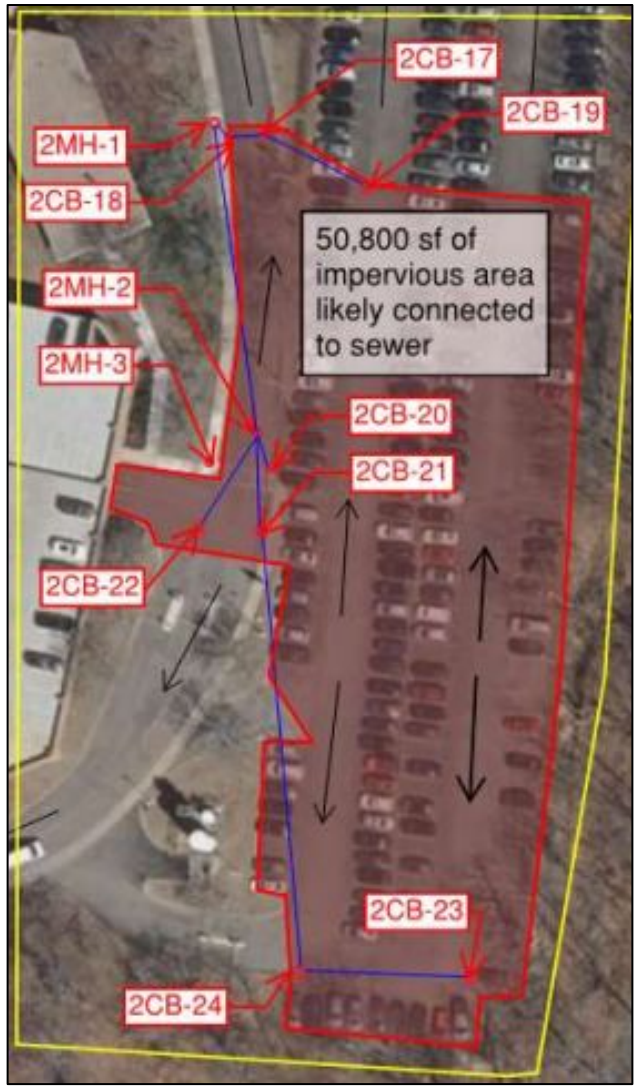
Parking Lot Drainage Disconnections

- Target large parking lots with identified drainage features or sheet flow
  - Coordinate redirection of drainage in 2 confirmed parking lots
  - $371,000 (Class 5)
- **Remove SSO volume at the source**





Recommended Plan

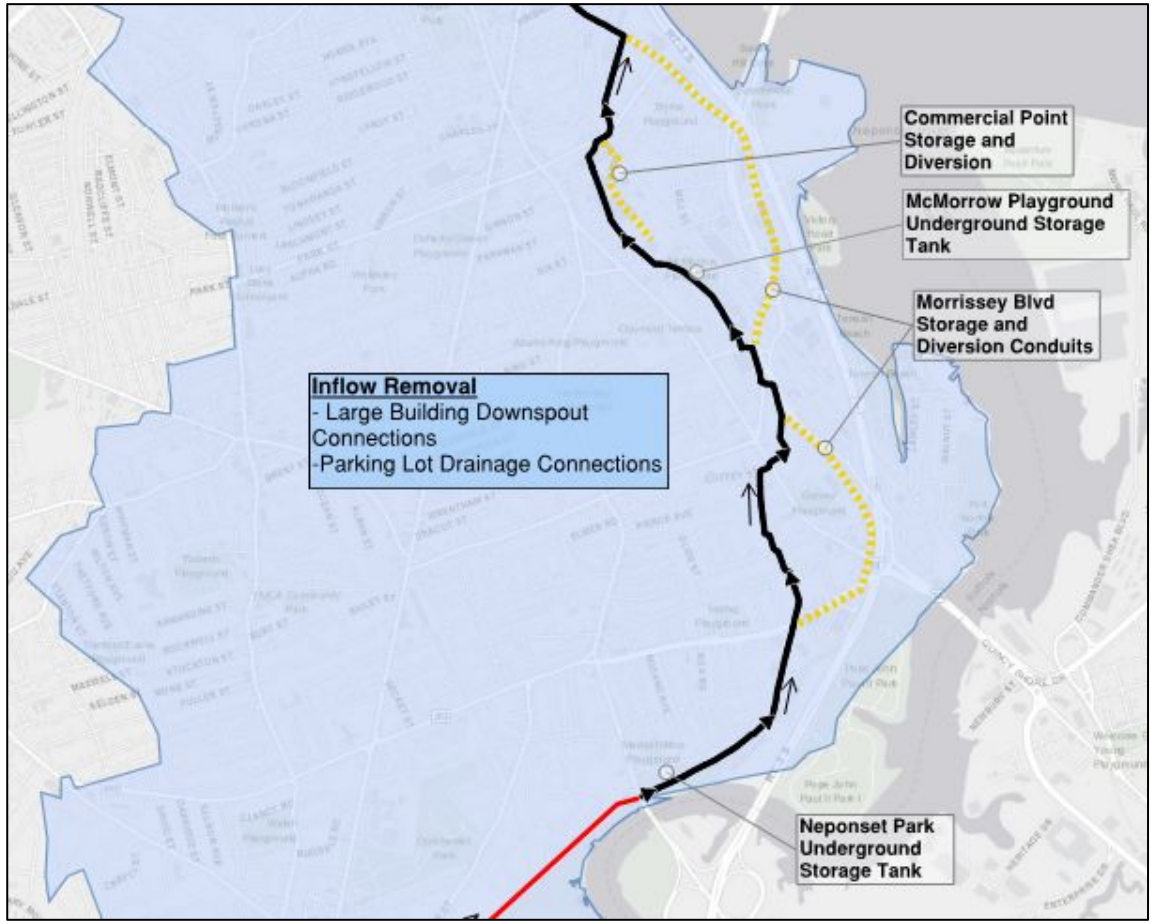
1. Focus on **Inflow Removal** (buildings, parking lots) – comparatively cost-effective alternative to reduce SSO and potentially decrease the size and cost of storage and flow diversion alternatives
2. Consider construction of **Storage and Flow Diversion** alternatives to further reduce SSOs (Neponset Park, Commercial Point, Morrissey Boulevard, and McMorrow Playground) – to be considered in coordination with other DCR, City and Park improvement projects
3. Perform a **System Re-evaluation** in the DI or specific areas of after every major project or program is implemented

Conclusions

1. Overall, all the selected alternatives are highly effective at reducing SSOs in the DI

2. While no one alternative results in elimination of SSOs for the selected design storm, the ***combination*** of inflow removal and storage and flow diversion alternatives does eliminate SSOs for the selected design storm

3. It is important that each improvement be tracked, and the hydraulic conditions re-evaluated, to maximize effectiveness while minimizing future costs



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Questions?

Thank You!

Contact Us!

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