Presentation to

MWRA Advisory Board of Directors

Draft Updated CSO Control Plan Alternatives Recommendation

October 30, 2025

Agenda

- Background
- Water Quality
- Levels of Control
- CSO Reduction and Elimination Tools
- Alternatives Development and Evaluation
- Recommended Alternatives
- Cost Sharing and Financial Considerations
- Next Steps

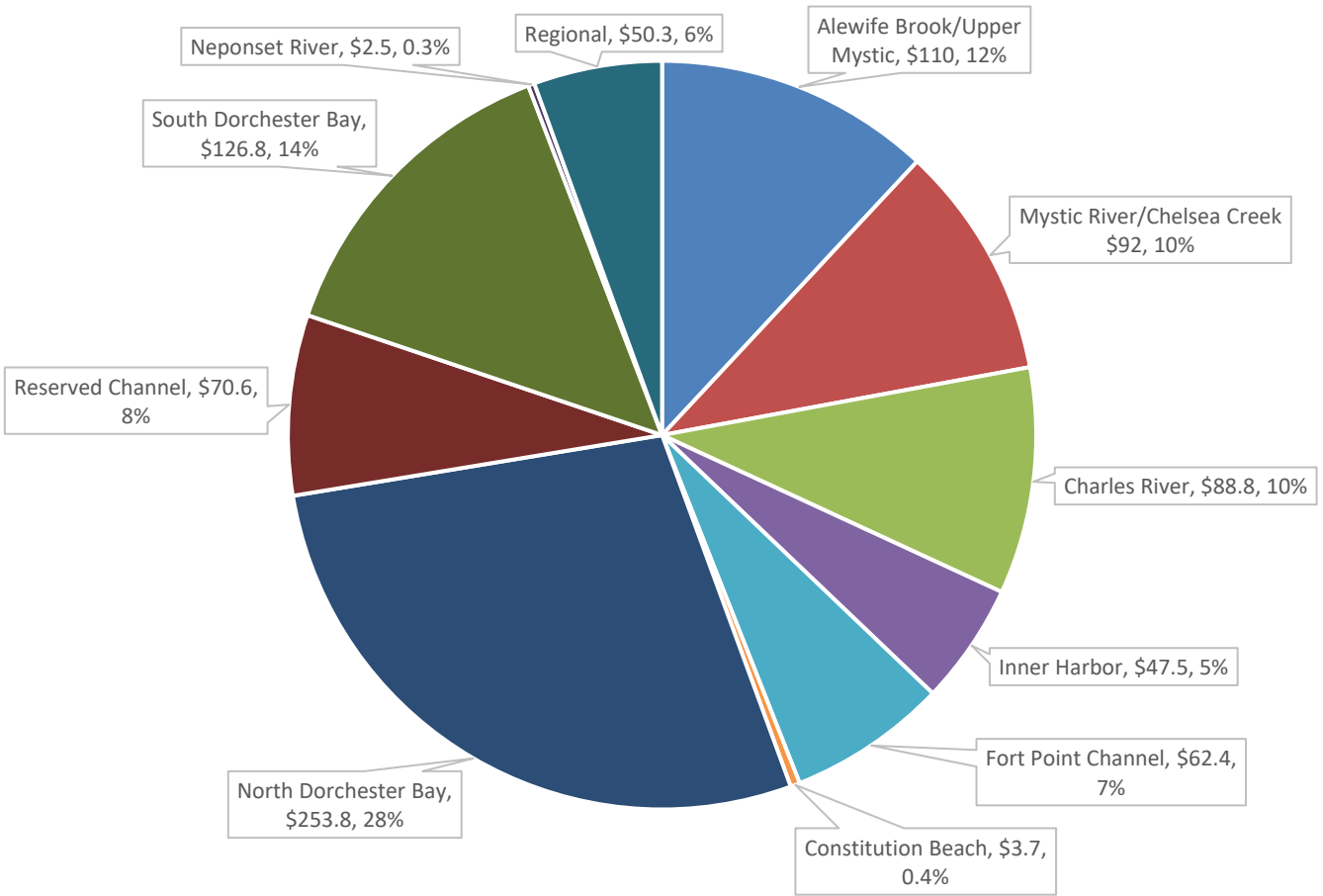
Background

Completed Long Term Control Plan

Types of CSO Control Projects

- Included a range of projects (35 total) targeted to site specific control including:
  - System optimization
  - Sewer separation
  - Interceptor relief
  - Detention treatment facilities
  - Storage facilities
  - Upgrades to existing CSO facilities
- **Total cost $911 million ($1.52 billion in today's dollars)**
- When combined with related local community projects, that investment is **over $1 billion**.

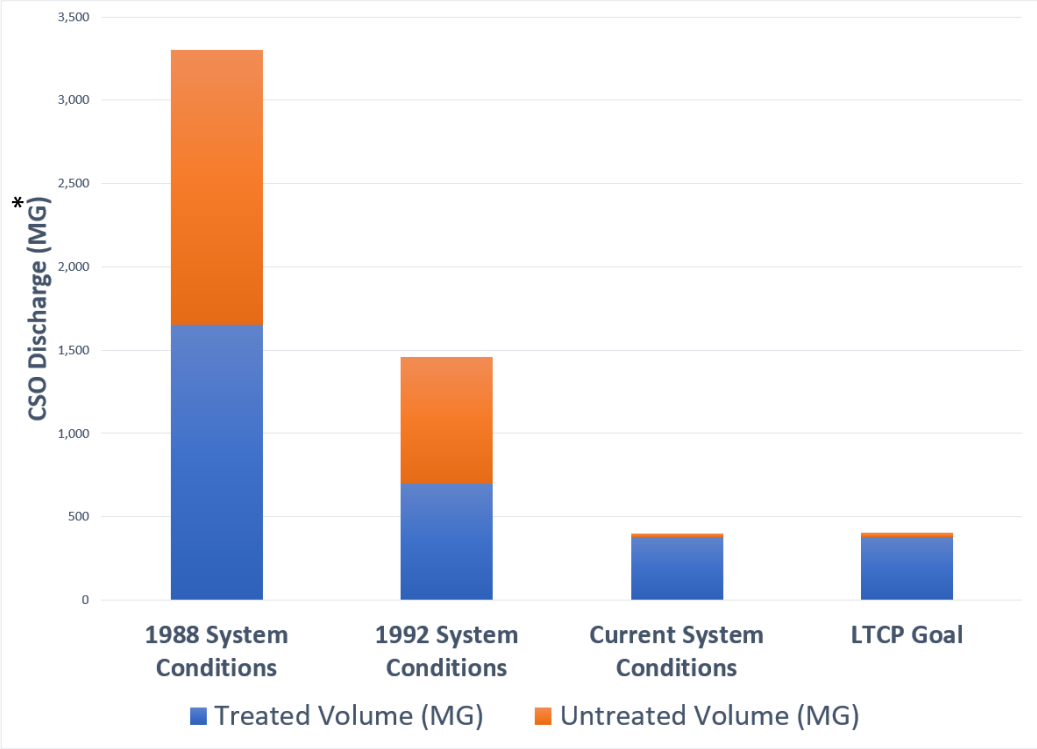
MWRA CSO Investments By Receiving Water



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

Prior Long Term Control Plan

- System wide improvements resulted in an 88% reduction in CSO discharge since 1980s.
- 94% of remaining CSO is Treated using Prior Typical Year.



System Wide CSO Reduction Since the 1980s

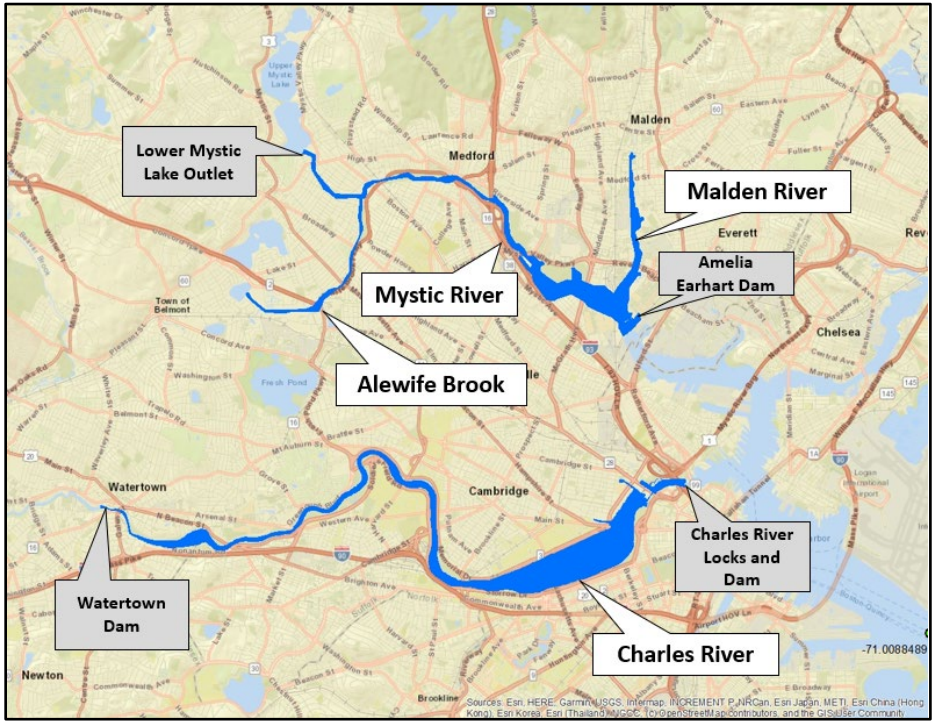
Annual discharge volume based on the prior **Typical Year*

Variance Water CSOs

Water Quality

Water Quality – Model Results

- Separate models run for the Charles River and Mystic/Alewife for the full 2050 Typical Year
- Following results are preliminary
- Compliance with WQ benchmarks as recommended by DEP
  - Use of 410 #/100mL *E. coli* as the benchmark
- Models show impacts of non-CSO sources such as stormwater and conditions upstream of the model area
- **Model results do not account for additional CSO control measures in the Updated CSO Control Plan**



Water Quality Modeling Results – Charles River

Percentage Time Entire Modeled River is in Compliance*				
Model Run	*E. coli* (410#/100mL)			
	All Sources	**Non-CSO Sources**	**CSO Only**	**Stormwater Only**
2050 Typical Year	51% (186 days)	51% (186 days)	99.7% (364 days)	64% (234 days)

*Based on guidance from DEP, model results were analyzed for a single sample maximum equivalent to the value of the Class B Statistical Threshold Value Criterion (STV) for bacteria. The Class B water quality criteria for bacteria at 314 CMR 4.05 (5)(f.1) do not identify a single sample max criterion but rather identify a geometric mean and a 90th percentile STV.

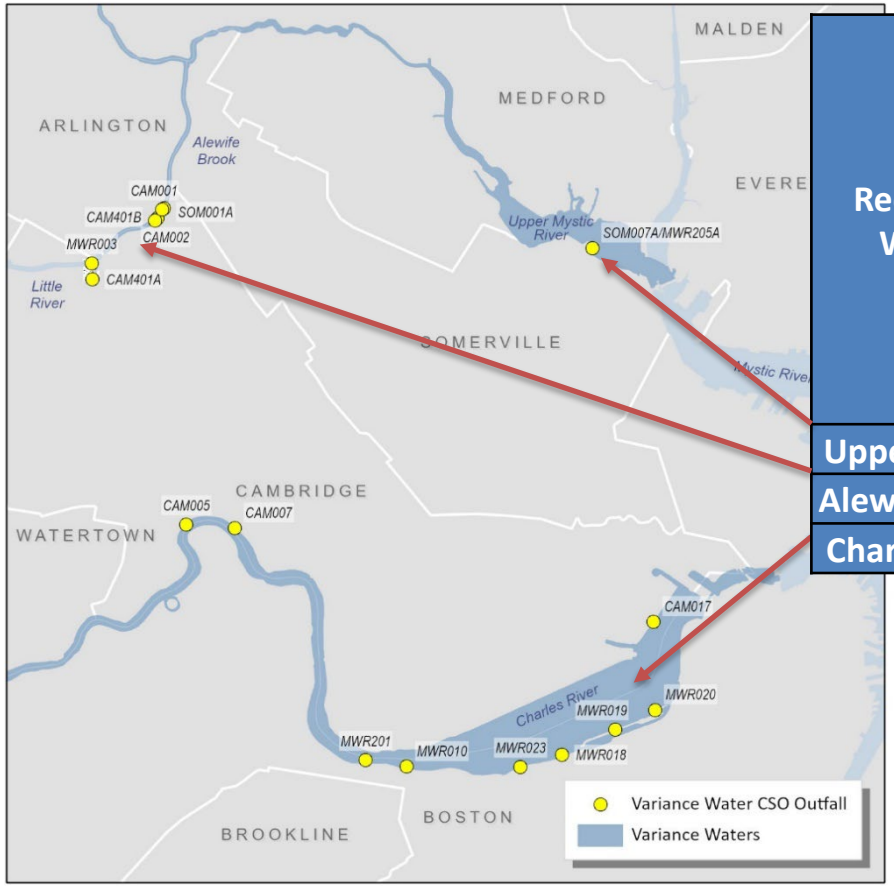
Water Quality Modeling Results – Alewife Brook / Mystic River

Percentage Time Entire Modeled River is in Compliance*				
Model Run	*E. coli* (410#/100mL)			
	All Sources	**Non-CSO Sources**	**CSO Only**	**Stormwater Only**
Alewife Brook				
2050 Typical Year	41% (150 days)	41% (150 days)	99% (361 days)	43% (157 days)
Mystic River				
2050 Typical Year	52% (190 days)	52% (190 days)	96% (350 days)	54% (197 days)

*Based on guidance from DEP, model results were analyzed for a single sample maximum equivalent to the value of the Class B Statistical Threshold Value Criterion (STV) for bacteria. The Class B water quality criteria for bacteria at 314 CMR 4.05 (5)(f.1) do not identify a single sample max criterion but rather identify a geometric mean and a 90th percentile STV.

Levels of Control

CSO Increases When Considering Climate Change



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

Considering Climate Change Impacts

- 2050 Planning Year
- Larger more intense storm events
- Larger CSO volumes expected

Four Levels of Control Being Evaluated

Receiving Water	Hydraulic Model Predictions				
	Activation Frequency	CSO Discharge Volume (MG)			
	2050 TY	2050 TY	2050 Largest Storm in TY	2050 5- year Storm	2050 25-year Storm
Upper Mystic	8	29.3	10.5	17.4	27.2
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Significantly reducing CSO discharges from those predicted to occur in a 2050 Typical Year ("**Limited CSO in 2050 Typical Year**")

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No CSO in a 2050 Typical Year ("**2050 Typical Year**")

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No CSO in a 2050 Typical Year ("**2050 Typical Year**")

No CSO in a 2050 5-year, 24-hour design storm ("**2050 5-year**")

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Significantly reducing CSO discharges from those predicted to occur in a 2050 Typical Year ("**Limited CSO in 2050 Typical Year**")

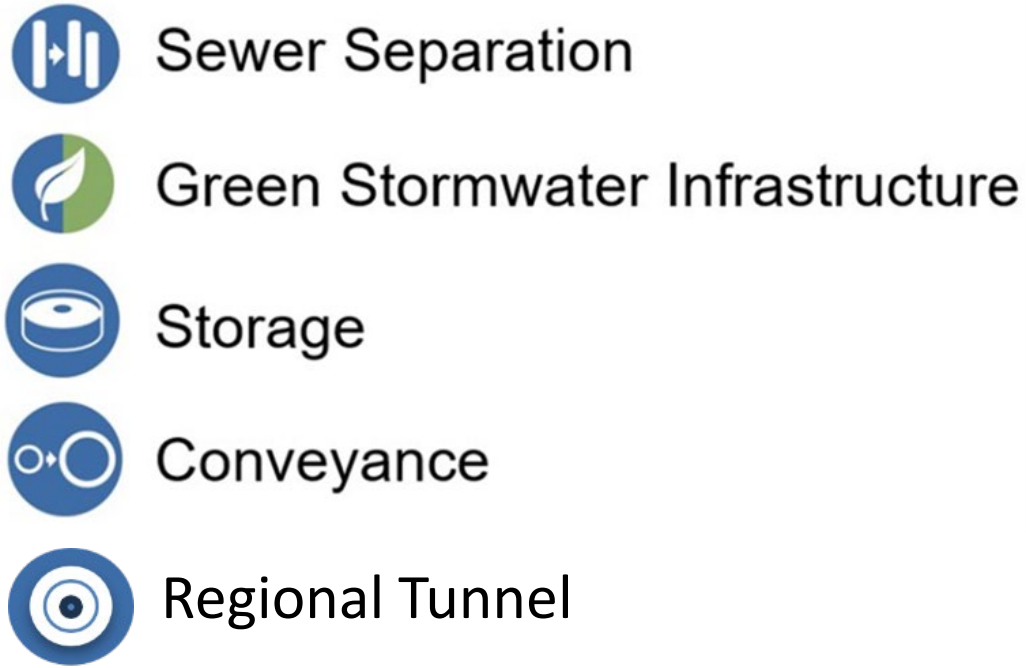
No CSO in a 2050 Typical Year ("**2050 Typical Year**")

No CSO in a 2050 5-year, 24-hour design storm ("**2050 5-year**")

No CSO in a 2050 25-year, 24-hour design storm ("**2050 25-year**")

CSO Reduction and Elimination Tools

General Components of an Alternative



Alternatives

Alternatives Development Process

- Two considerations before concepts developed:
  - Nutrient and bacteria loading
  - Potential for flooding impacts
- Initial development and screening of the technologies for individual outfalls;
- Assessment of opportunities to address two or more outfalls with a single control tool;
- Assessment of the impact of control tools on certain outfalls;
- Optimization of combinations of control tools; and
- Assessment of elimination of CSO discharges.

Alternatives Considered

- **39 total** alternatives evaluated across 4 levels of control
- Combination of CSO Control Tools
- Alewife Brook: 12 alternatives (sewer separation, storage tanks and microtunnels, large tunnels)
- Upper Mystic River: 14 alternatives (sewer separation, storage tanks)
- Charles River: 13 alternatives (sewer separation, storage tanks and microtunnels, large tunnels)

Alternative Evaluation/Selection Considerations

- Level of CSO control
- Permitting uncertainty
- Site acquisition risks
- Capital Cost and Life Cycle Cost
- Timeline to implementation/CSO benefits
- Impact on priority, vulnerable, and environmental justice populations
- Benefits criteria
- Stakeholder input

Benefits Criteria	
Criteria Category	**Evaluation Criterion**
CSO Performance	**Water quality impact; nutrient load reduction**
	Schedule: minimize duration to CSO reduction benefit
Construction	**Minimize construction impacts**
	• Impacts to public uses during construction
	• Neighborhood impacts during construction
	Minimize construction complexity/risk
	• Depth to excavation
	• Construction complexity
Operations, Maintenance & Resiliency	**Operation and maintenance/safety considerations**
	Resiliency and adaptability
	Opportunity to upgrade existing infrastructure
Community & Ancillary Benefits	**Flooding: reduce sewer/stormwater flood risk**
	Community co-benefits and long-term site impacts
	• Community co-benefits
	• Permanent impacts to public uses
	Impacts to non-variance CSOs

Alternative Evaluation/Selection Considerations

- Level of CSO control
- Permitting uncertainty
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- Capital Cost and Life Cycle Cost
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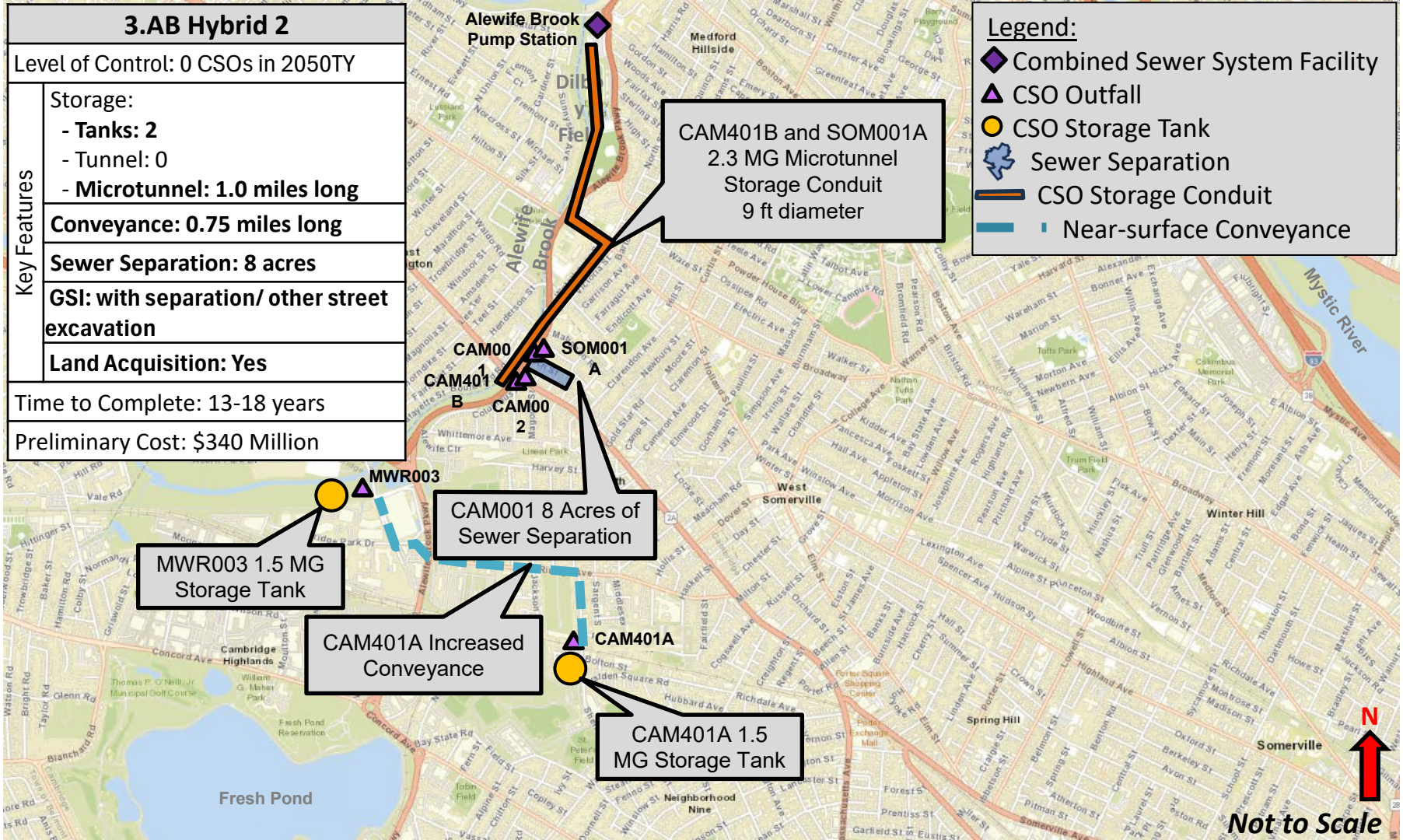
Recommended Alternatives

Alternatives Considered

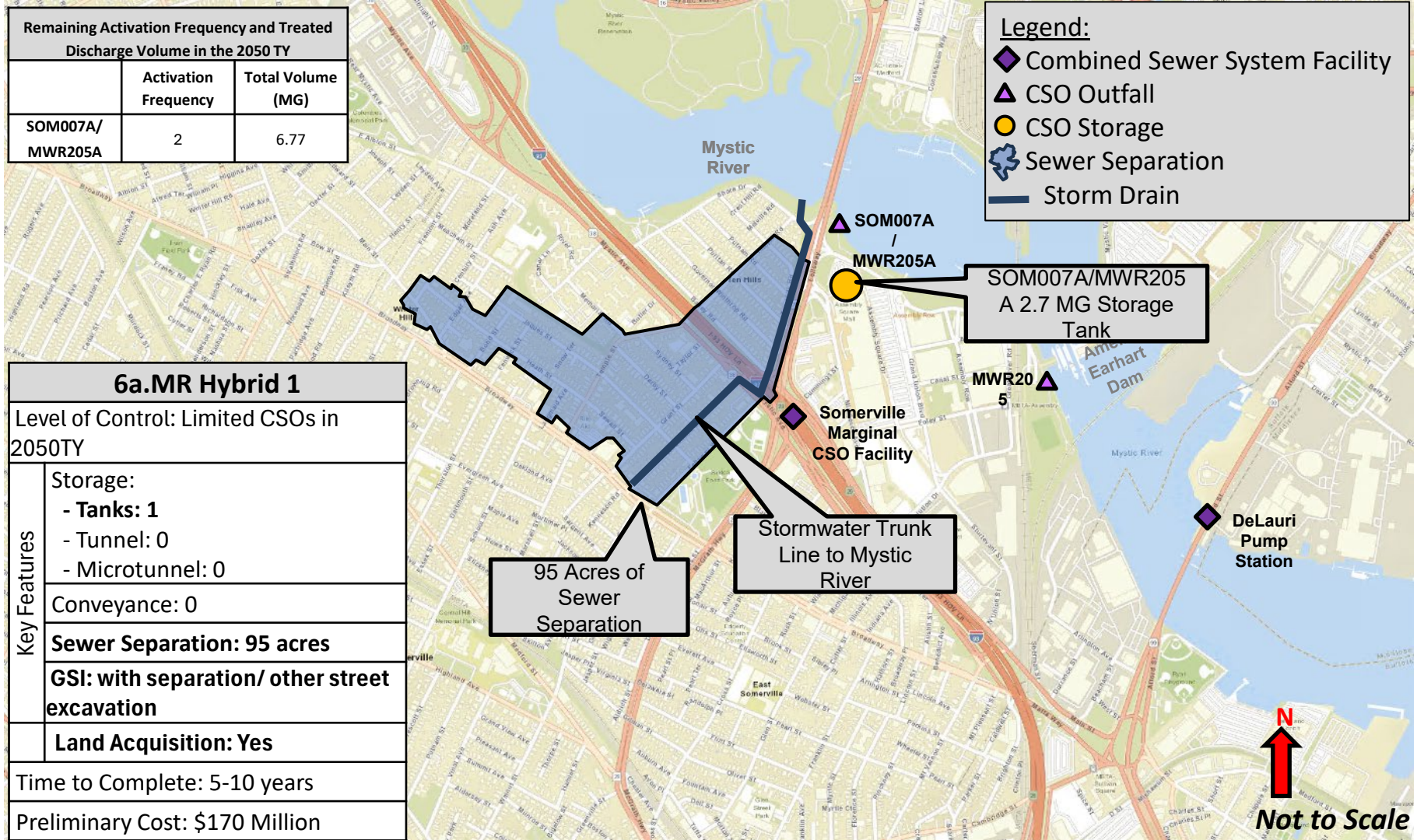
- **Alewife Brook: 12 alternatives (sewer separation, storage tanks and microtunnels, large tunnels)**
- Upper Mystic River: 14 alternatives (sewer separation, storage tanks)
- Charles River: 13 alternatives (sewer separation, storage tanks and microtunnels, large tunnels)


3.AB Hybrid 2
Level of Control: 0 CSOs in 2050TY
Key Features
Storage:
- Tanks: 2
- Tunnel: 0
- Microtunnel: 1.0 miles long
Conveyance: 0.75 miles long
Sewer Separation: 8 acres
GSI: with separation/ other street excavation
Land Acquisition: Yes
Time to Complete: 13-18 years
Preliminary Cost: $340 Million
Legend:
Combined Sewer System Facility
CSO Outfall
CSO Storage Tank
Sewer Separation
CSO Storage Conduit
Near-surface Conveyance
Alewife Brook Pump Station
CAM401B and SOM001A 2.3 MG Microtunnel Storage Conduit 9 ft diameter
CAM001
SOM001A
CAM401B
CAM002
MWR003
MWR003 1.5 MG Storage Tank
CAM001 8 Acres of Sewer Separation
CAM401A Increased Conveyance
CAM401A
CAM401A 1.5 MG Storage Tank
Alewife Brook
Mystic River
Fresh Pond
Medford Hillside
West Somerville
Winter Hill
Cambridge Highlands
Spring Hill
Somerville
Neighborhood Nine
N
Not to Scale

Alternatives Considered

- Alewife Brook: 12 alternatives (sewer separation, storage tanks and microtunnels, large tunnels)
- **Upper Mystic River: 14 alternatives (sewer separation, storage tanks)**
- Charles River: 13 alternatives (sewer separation, storage tanks and microtunnels, large tunnels)

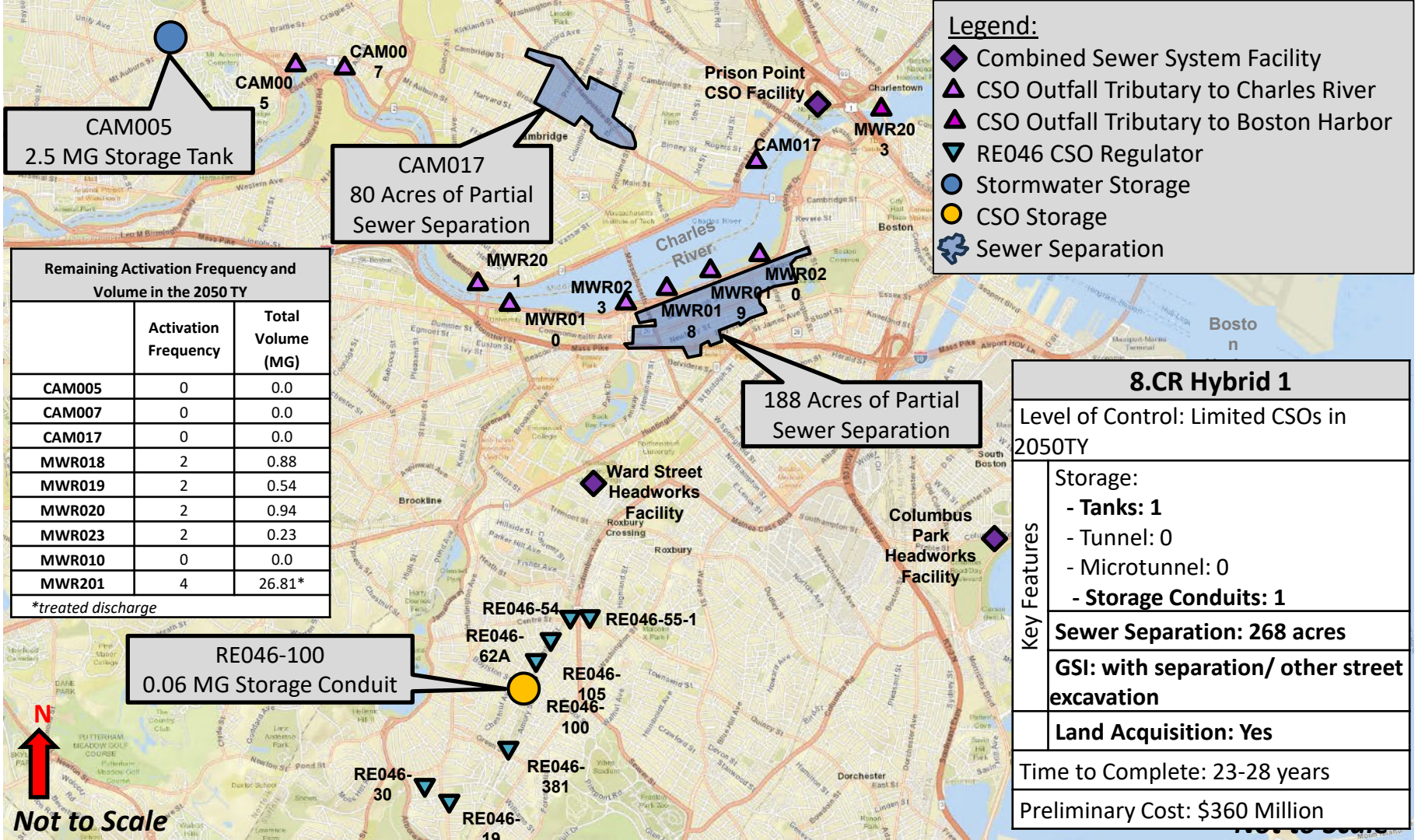
Remaining Activation Frequency and Treated Discharge Volume in the 2050 TY		
	Activation Frequency	Total Volume (MG)
SOM007A/ MWR205A	2	6.77



6a.MR Hybrid 1	
Level of Control: Limited CSOs in 2050TY	
Key Features	Storage: **- Tanks: 1** - Tunnel: 0 - Microtunnel: 0
	Conveyance: 0
	Sewer Separation: 95 acres
	GSI: with separation/ other street excavation
	Land Acquisition: Yes
Time to Complete: 5-10 years	
Preliminary Cost: $170 Million	

Alternatives Considered

- Alewife Brook: 12 alternatives (sewer separation, storage tanks and microtunnels, large tunnels)
- Upper Mystic River: 14 alternatives (sewer separation, storage tanks)
- **Charles River: 13 alternatives (sewer separation, storage tanks and microtunnels, large tunnels)**



Remaining Activation Frequency and Volume in the 2050 TY		
	Activation Frequency	Total Volume (MG)
CAM005	0	0.0
CAM007	0	0.0
CAM017	0	0.0
MWR018	2	0.88
MWR019	2	0.54
MWR020	2	0.94
MWR023	2	0.23
MWR010	0	0.0
MWR201	4	26.81*
*treated discharge		

8.CR Hybrid 1

Level of Control: Limited CSOs in 2050TY

Key Features

Storage:
- **Tanks: 1**
- Tunnel: 0
- Microtunnel: 0
- **Storage Conduits: 1**

Sewer Separation: 268 acres

GSI: with separation/ other street excavation

Land Acquisition: Yes

Time to Complete: 23-28 years

Preliminary Cost: $360 Million

Summary of Recommended Alternatives

Receiving Waterbody	Alternative Name	Level of Control	Cost	Duration
Alewife Brook	3.AB Hybrid 2	0 CSOs in 2050 TY	$340M	13-18 years
Upper Mystic	6a.MR Hybrid 1	Limited CSOs in 2050 TY	$170M	5-10 years
Charles River	8.CR Hybrid 1	Limited CSOs in 2050 TY	$360M	23-28 years
		Total Cost	**$870M**	

Cost Sharing and Financial Considerations

Cost Sharing Methodologies

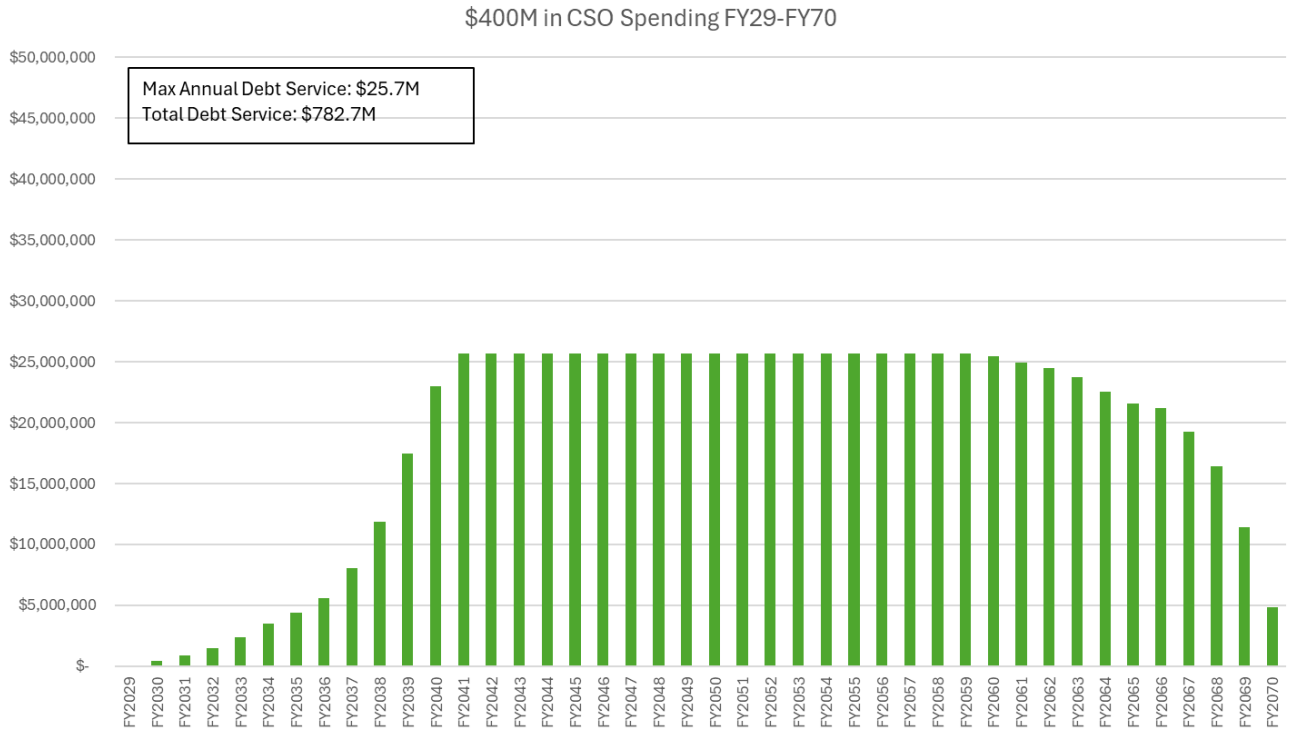
- CSO Ownership:
  - Owner of outfall would pay for the solution
  - Regional projects, costs would be allocated between multiple owners by CSO volume

- Project Type and Location:
  - Separation or green infrastructure projects would be paid by the community being separated or where projects are located
  - Local storage projects within a community collection system would be paid for by the community whose flow is being captured.
  - Regional storage would be allocated by contributing flow.

- CSO Volume Reduction:
  - Costs would be apportioned for each receiving water based on the reduction in CSO volume by each outfall owner.

Projected $400 Million in CSO Project Debt Service

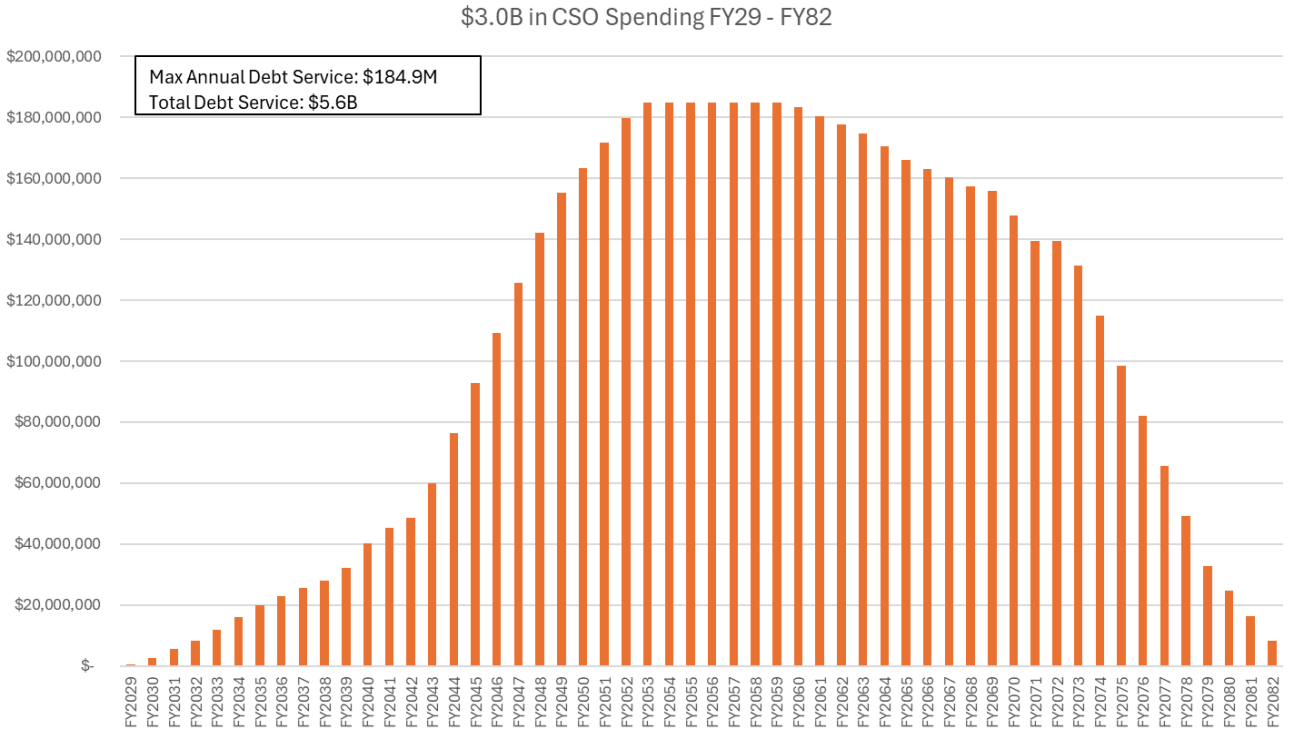
- Projected Design and Construction Spending between 2028 and 2039.
- Total Debt Service Cost **$782.7 million** in debt service costs.



- All bonds issued as level debt service for 30 years at 5.0% interest. Preliminary projected project costs are in today's dollars.

Projected $3.0 Billion in CSO Project Debt Service

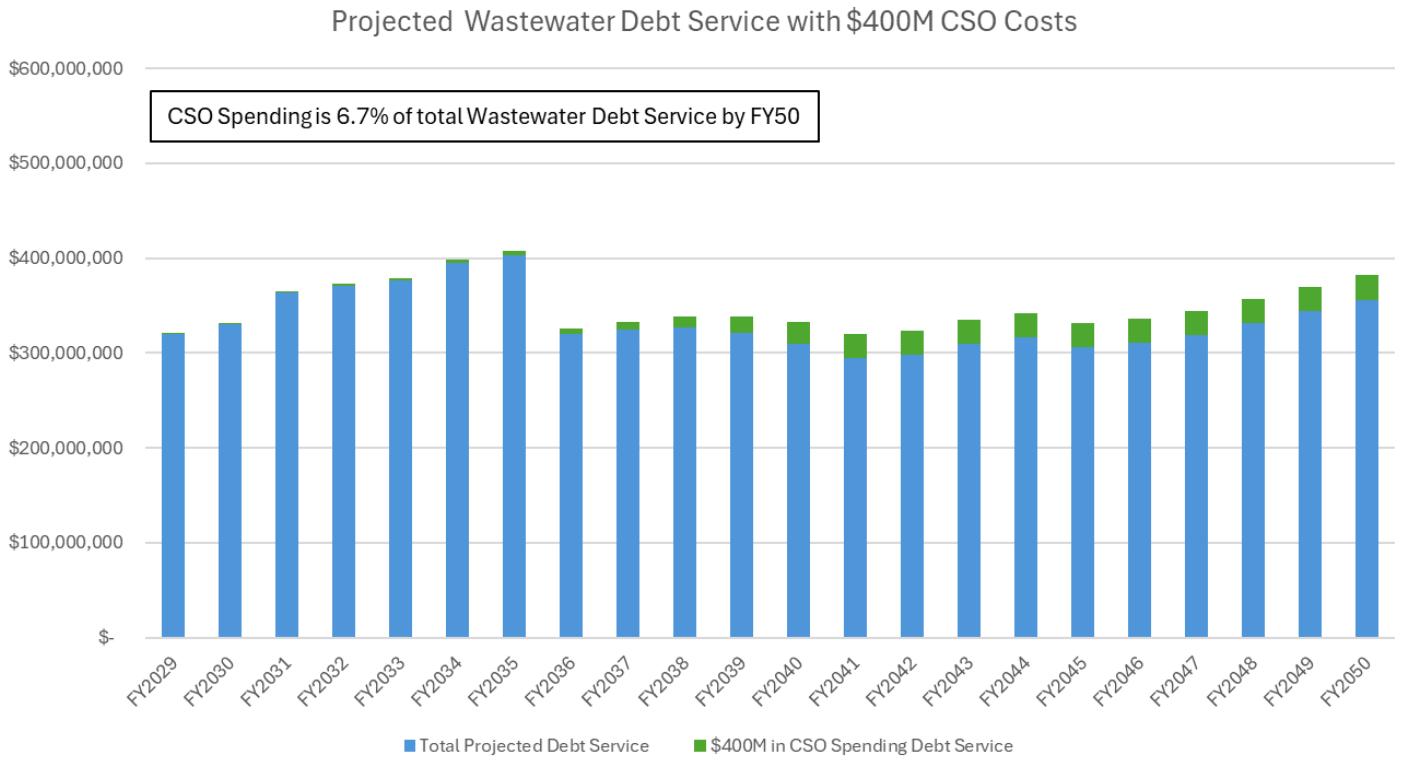
- Design and construction spending between 2028 and 2053.
- Results in **$5.6 billion** in debt service costs.



- All bonds issued as level debt service for 30 years at 5.0% interest. Preliminary projected project costs are in today's dollars.

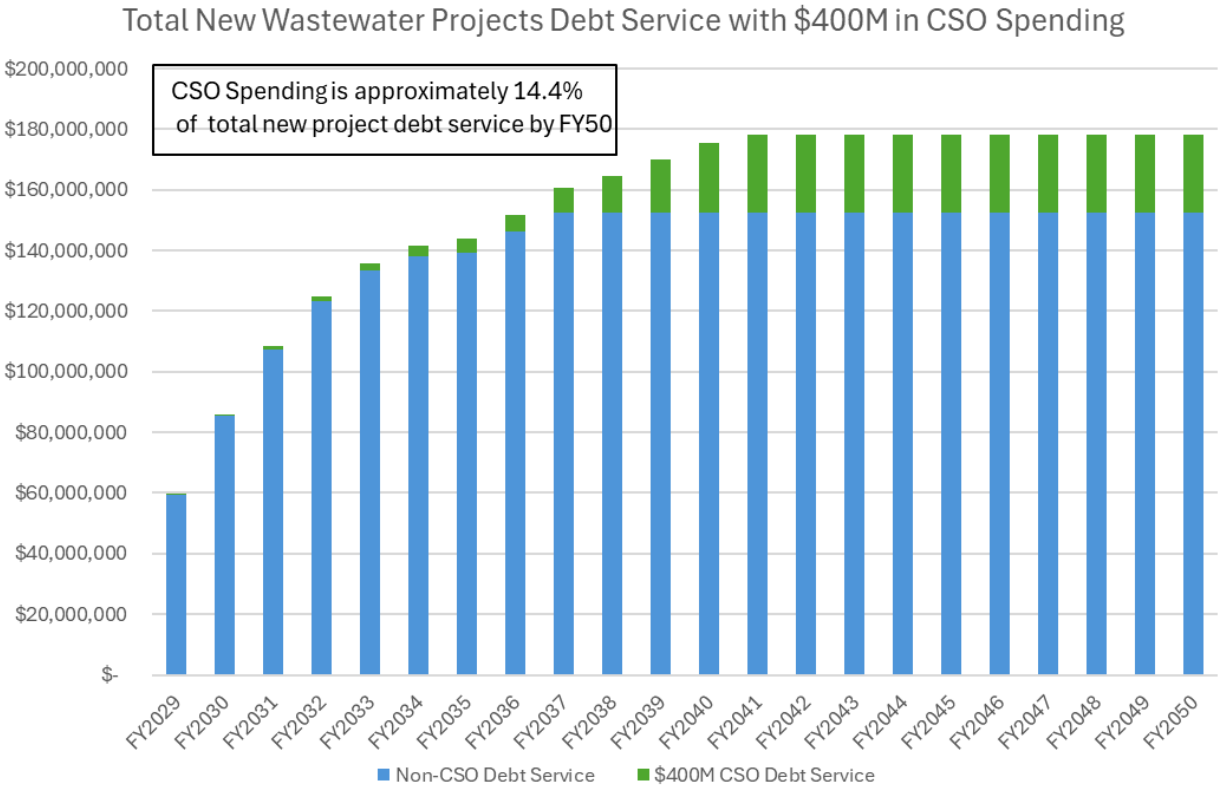
Projected Wastewater Debt Service with $400 million in CSO Costs

- $400 million in CSO spending results in **$335.8 million** in additional debt service costs between FY29 and FY50.



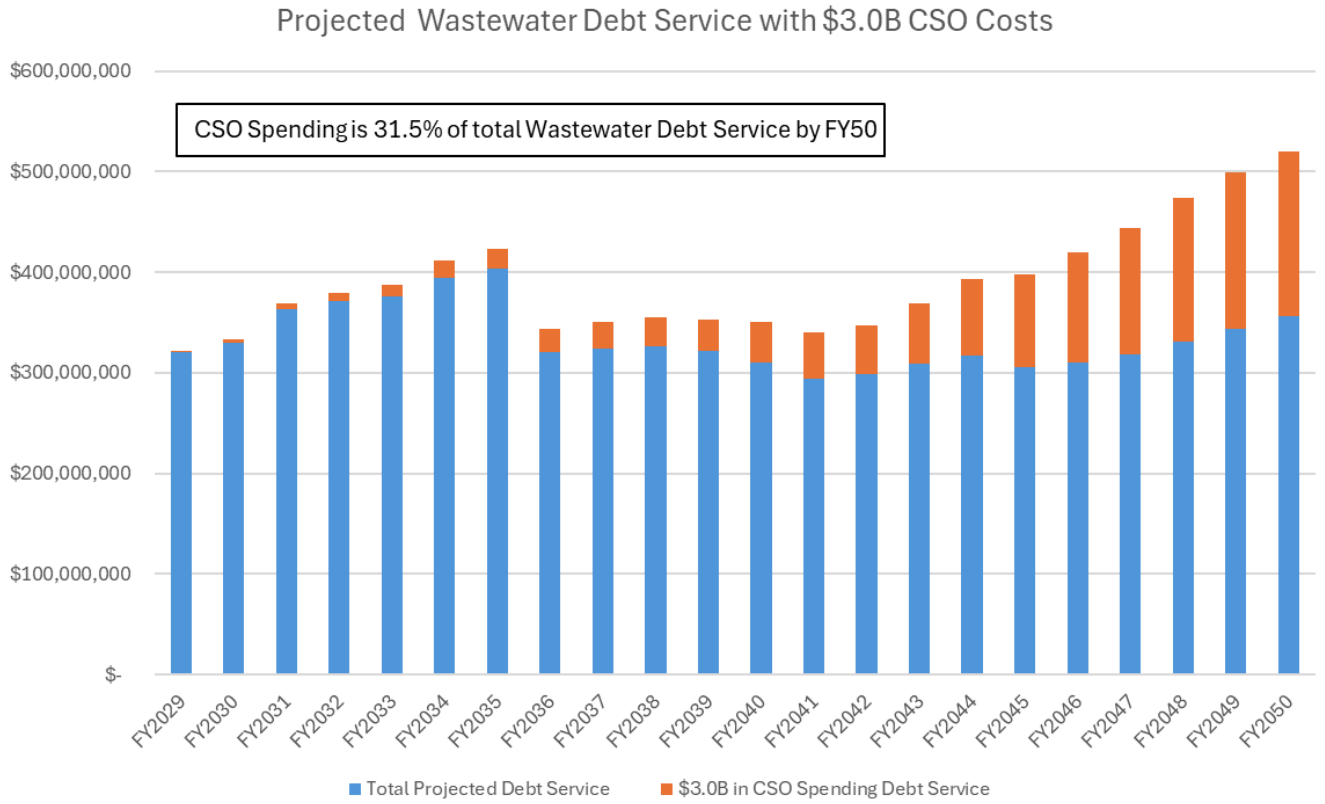
Projected Wastewater Debt Service with $400 million in CSO Costs

- $400 million in CSO spending would comprise **14.4%** of total wastewater debt service costs in FY50.



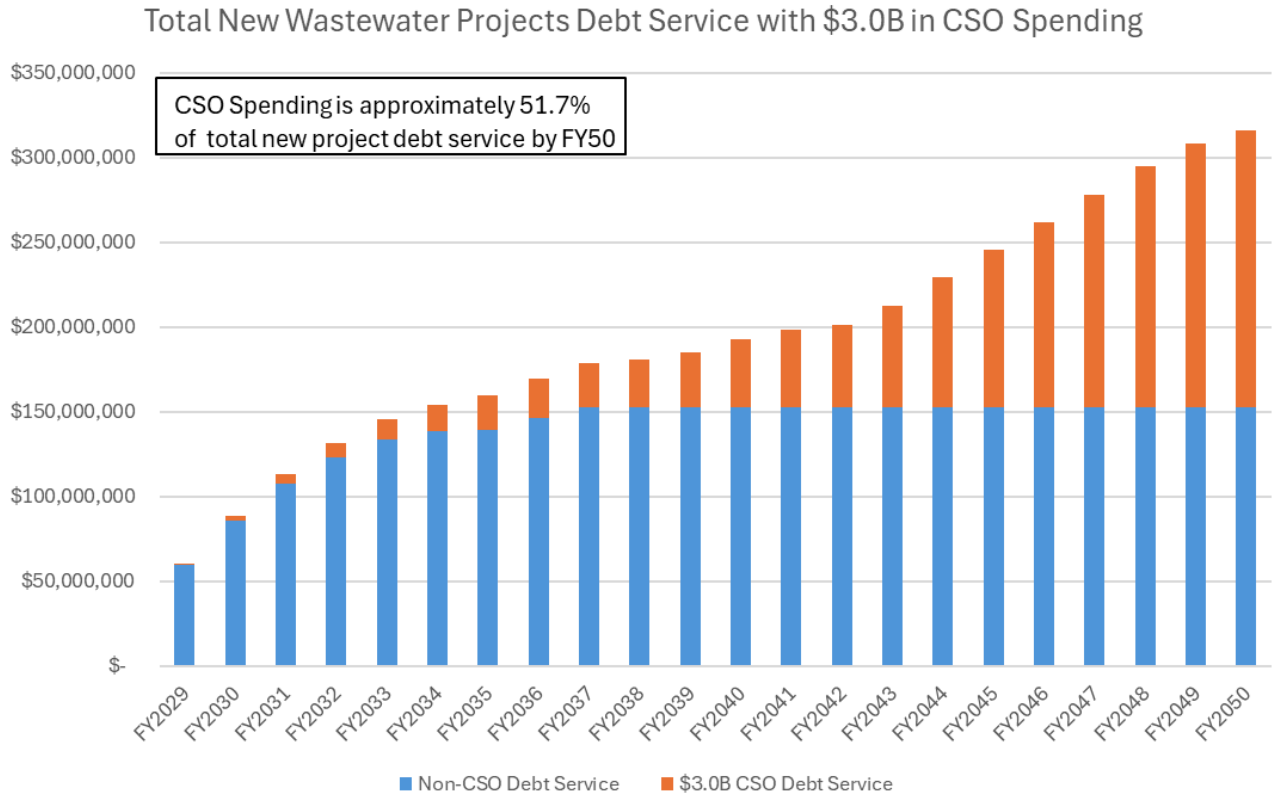
Projected Wastewater Debt Service with $3.0 billion in CSO Costs

- $3.0 billion in CSO spending results in **$1.2 billion** in additional debt service costs between FY29 and FY50.



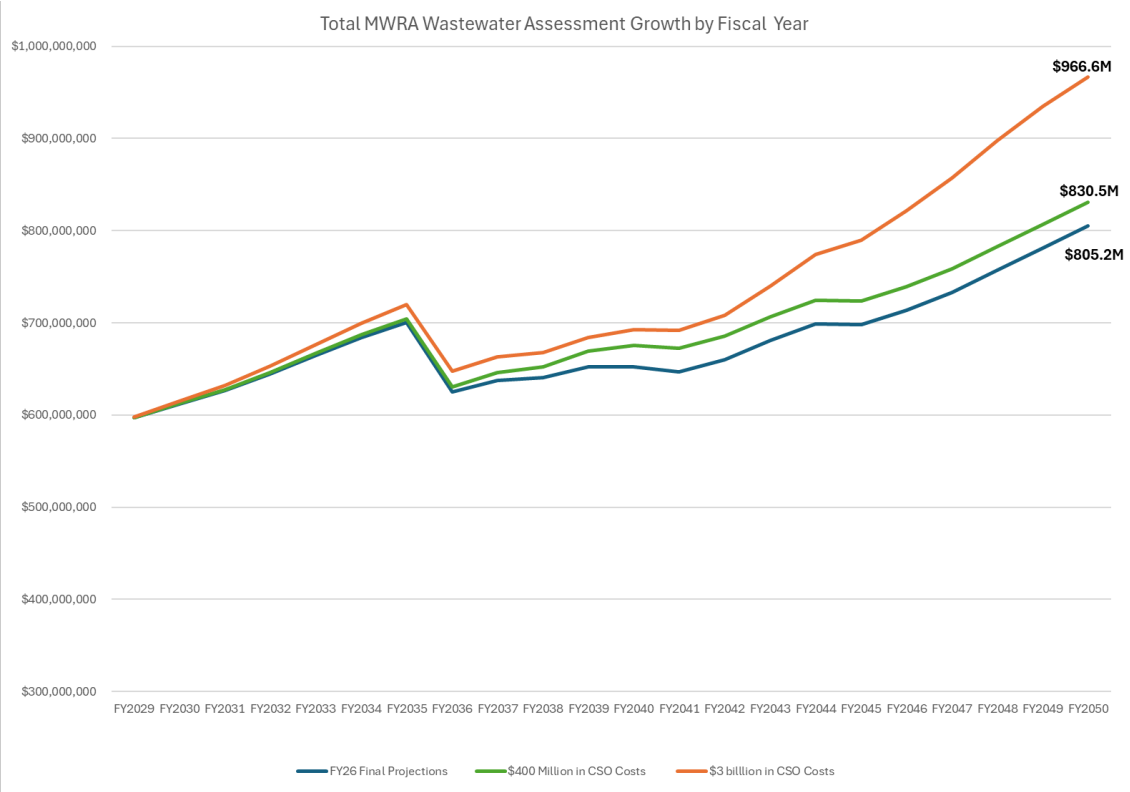
Projected Wastewater Debt Service with $3.0 billion in CSO Costs

- $3.0 billion in CSO spending would comprise **51.7%** of total wastewater debt service costs in FY50.



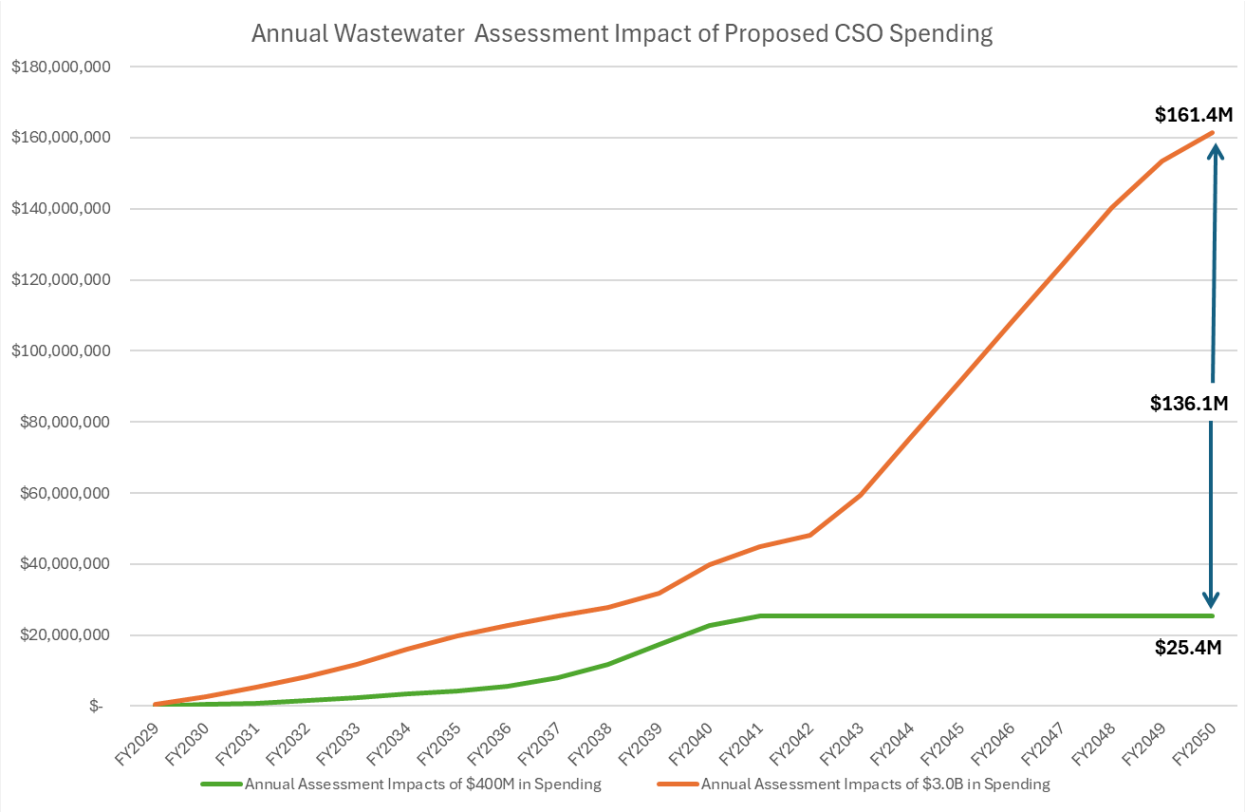
Projected Wastewater Assessment

- $400 million in spending increases assessment by **$25.4 million** and $3.0 billion increases assessment by **$161.4 million** by FY50.



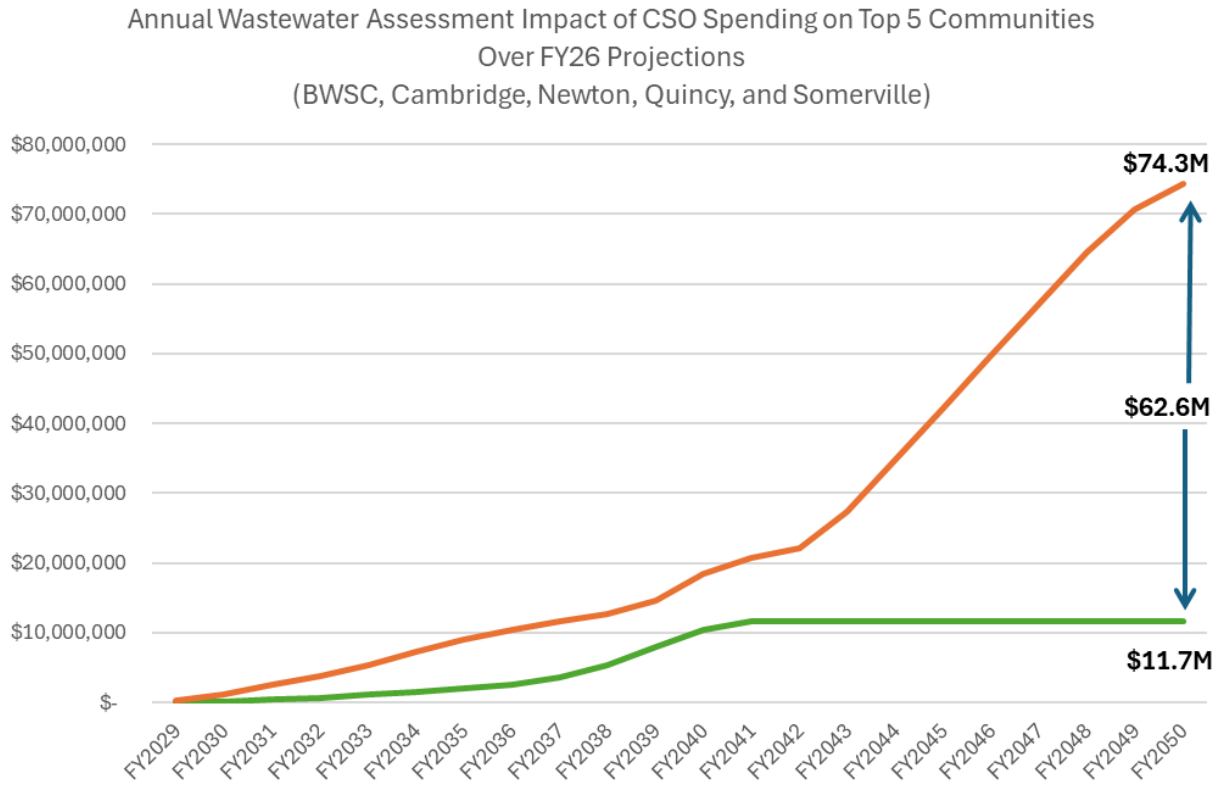
Projected Wastewater Assessment Impacts

- $400 million in CSO spending increases the total community charges by **$331.8 million** between FY29 and FY50.
- $3.0 billion in CSO spending increases the total community charges by **$1.2 billion** between FY29 and FY50.



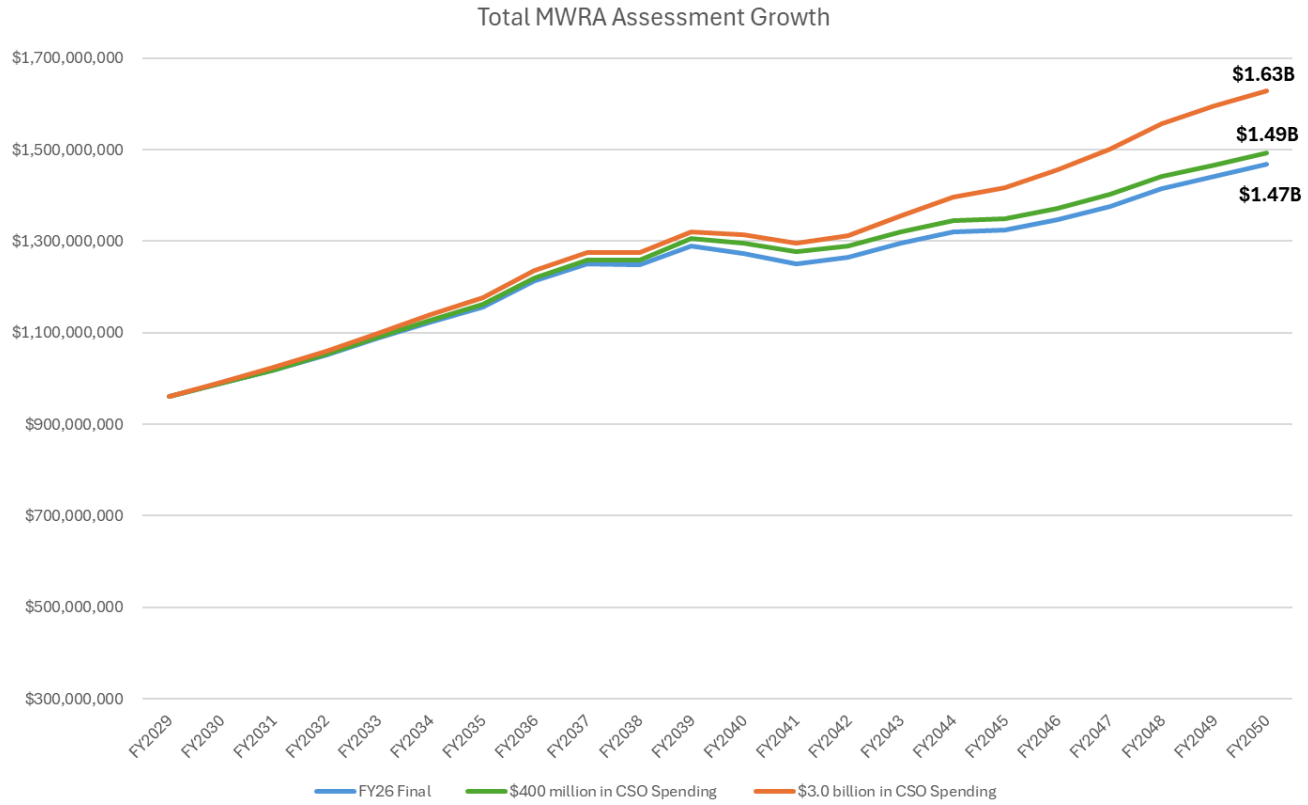
Projected Wastewater Assessment on Top 5 Users

- $400 million in CSO spending increases the total assessed by **$152.7 million** between FY29 and FY50.
- $3.0 billion in CSO spending increases the total assessed by **$560.7 million** between FY29 and FY50.



Projected Total Assessments

- 35 of the 43 wastewater communities receive all or a portion of their drinking water from MWRA.



Next Steps

Next Steps

2025 Activities

- Scoring alternatives and recommending one per waterbody
- Affordability of recommended alternatives
- Water quality impacts of recommended alternatives
- Draft recommended plan due to EPA and DEP December 31, 2025

2026 Activities

- Public mtg #6 on draft recommended plan
- Public hearing and public comment period
- Additional outreach in affected communities
- Team reviews comments and modifies plan

2027 and Beyond

- Final plan submitted January 2027
- EPA and DEP review the plan for further CSO control
- Design of projects
- Construction!

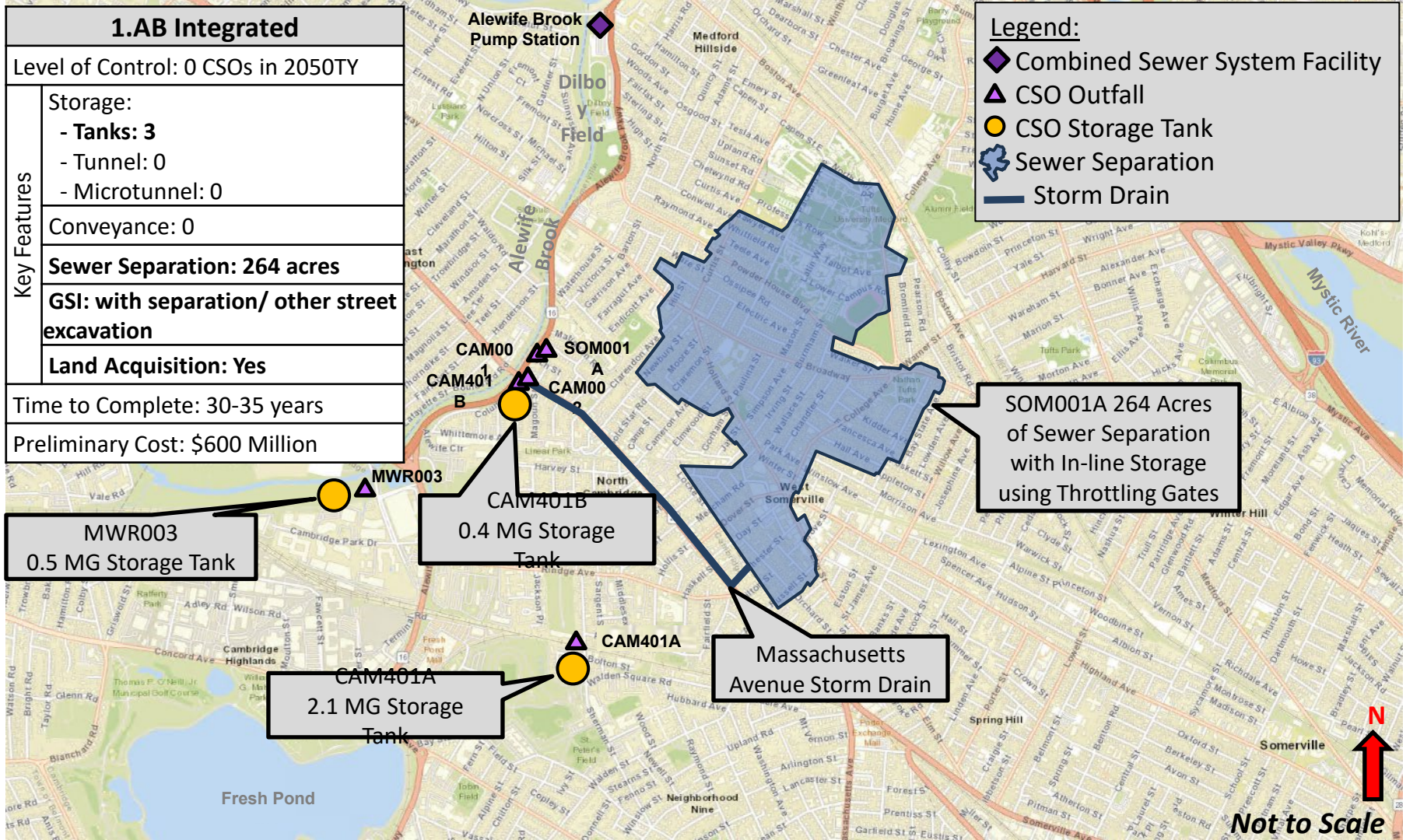
Questions

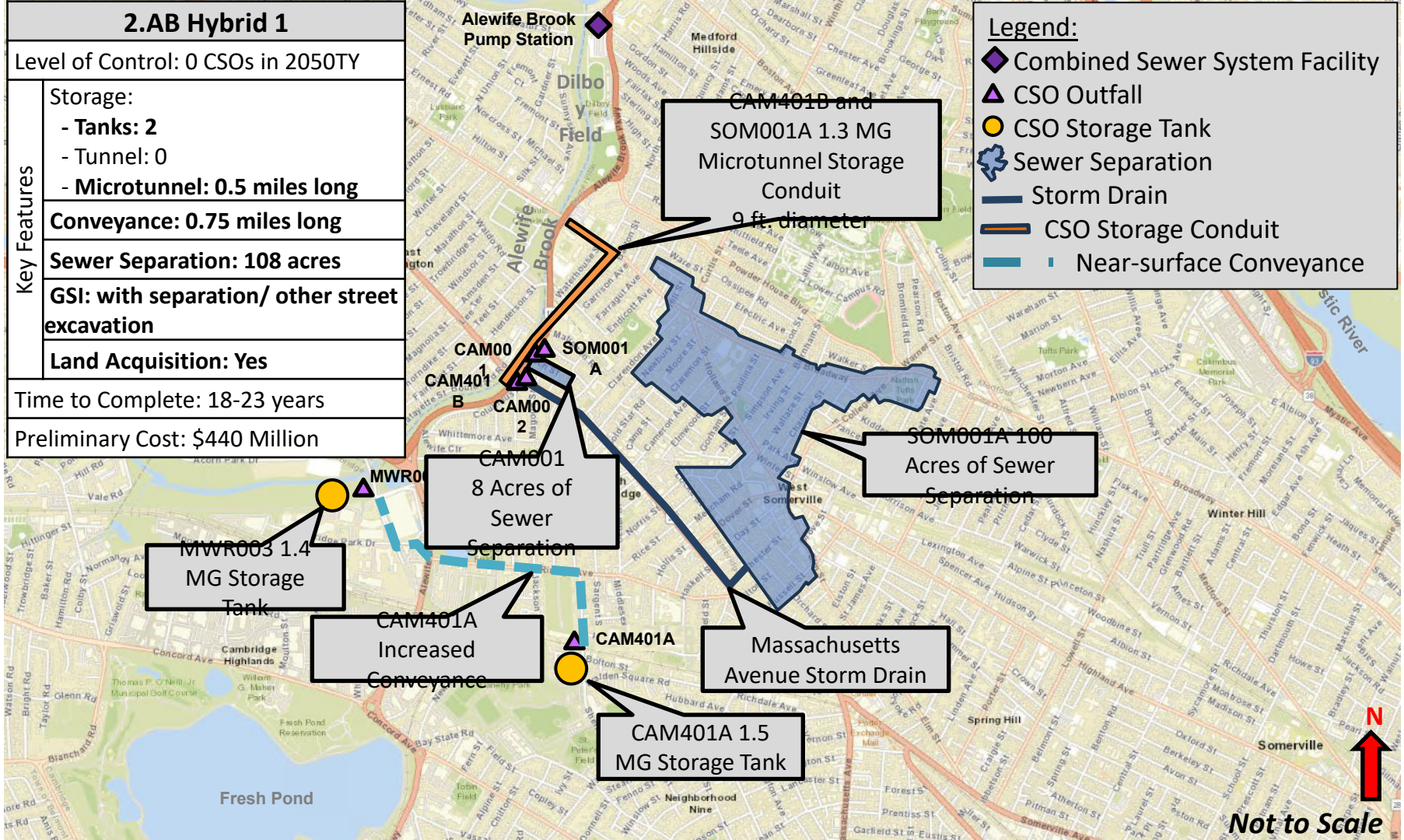

WATER RESOURCES AUTHORITY
MASSACHUSETTS

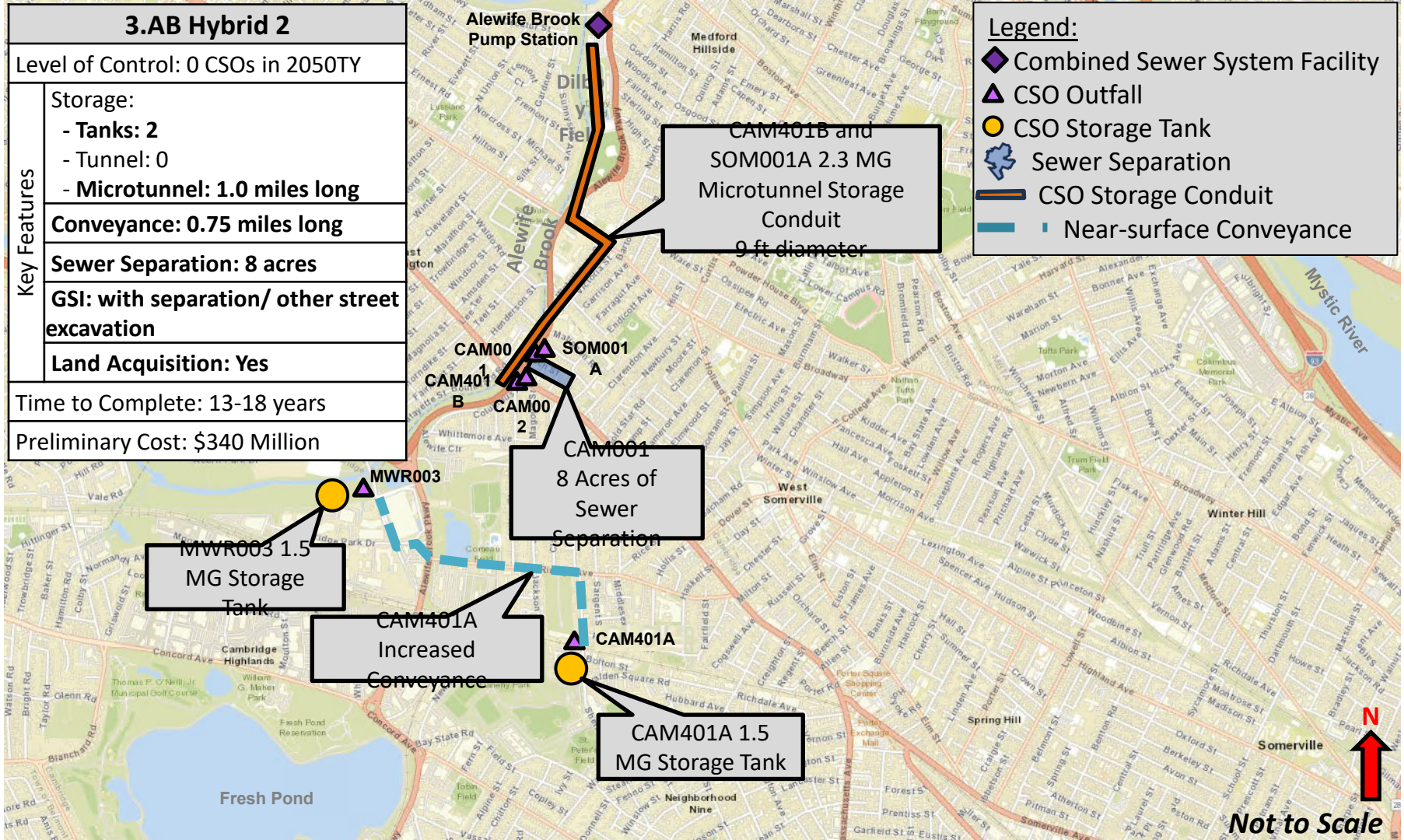
Alewife Brook Alternatives

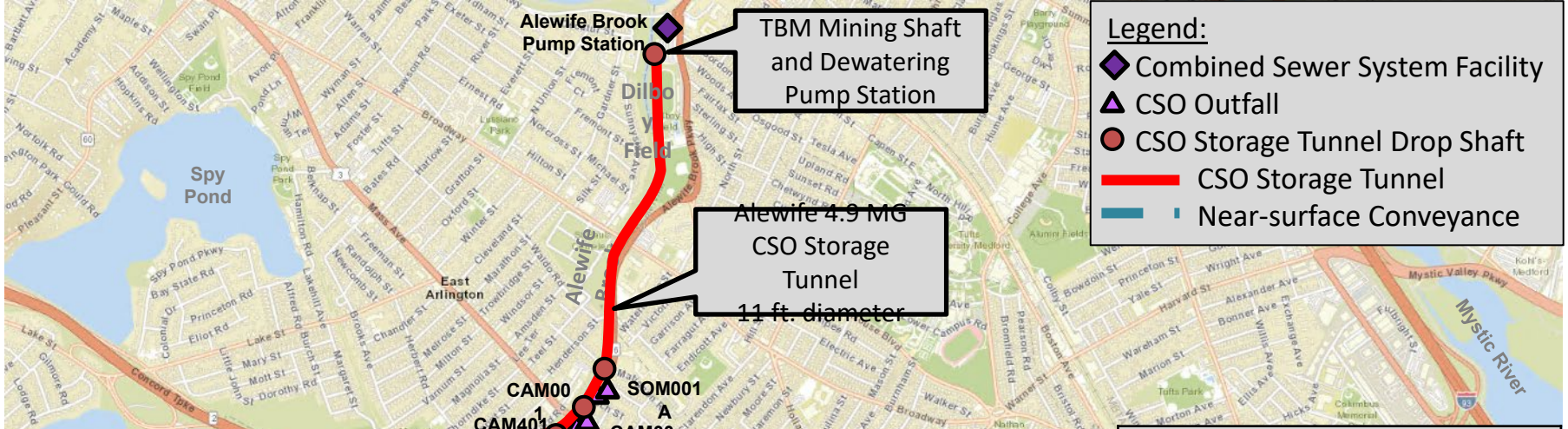
Alewife Brook: Summary of Alternatives Under Consideration

0 CSOs in 2050 Typical Year	Limited CSOs in 2050 Typical Year	0 CSOs in 2050 5-year Storm	0 CSOs in 2050 25-year Storm
1.AB Integrated 3 tanks (3 MG) + 264 acres of sewer separation	7.AB Hybrid 1 3 tanks (2.5 MG) + 108 acres of sewer separation + 0.75-mile-long conveyance pipe	9.AB Tunnel 1.5-mile-long deep tunnel (22 ft. diameter)	11.AB Tunnel 1.5-mile-long deep tunnel (32 ft. diameter)
2.AB Hybrid 1 2 tanks (2.9 MG) + 108 acres of sewer separation + 0.75-mile-long conveyance pipe + 0.5 mile-long microtunnel	8.AB Hybrid 2 3 tanks (2.5 MG) + 8 acres of sewer separation + 0.75-mile-long conveyance pipe + 0.5 mile-long microtunnel	10.AB Tunnel + GSI 1.5-mile-long deep tunnel (same tunnel as 9.AB) + GSI to capture and treat 1 inch from 36 acres of impervious area	12.AB Tunnel + GSI 1.5-mile-long deep tunnel (same tunnel as 11.AB) + GSI to capture and treat 1 inch from 36 acres of impervious area
3.AB Hybrid 2 2 tanks (3 MG) + 8 acres of sewer separation + 0.75-mile-long conveyance pipe + 1 mile-long microtunnel			
4.AB Tunnel 1.5-mile-long deep tunnel (11 ft. diameter)			
5.AB Tunnel + GSI 1.5-mile-long deep tunnel (same tunnel as 4.AB) + GSI to capture and treat 1 inch from 36 acres of impervious area			
6.AB Full Sewer Separation			

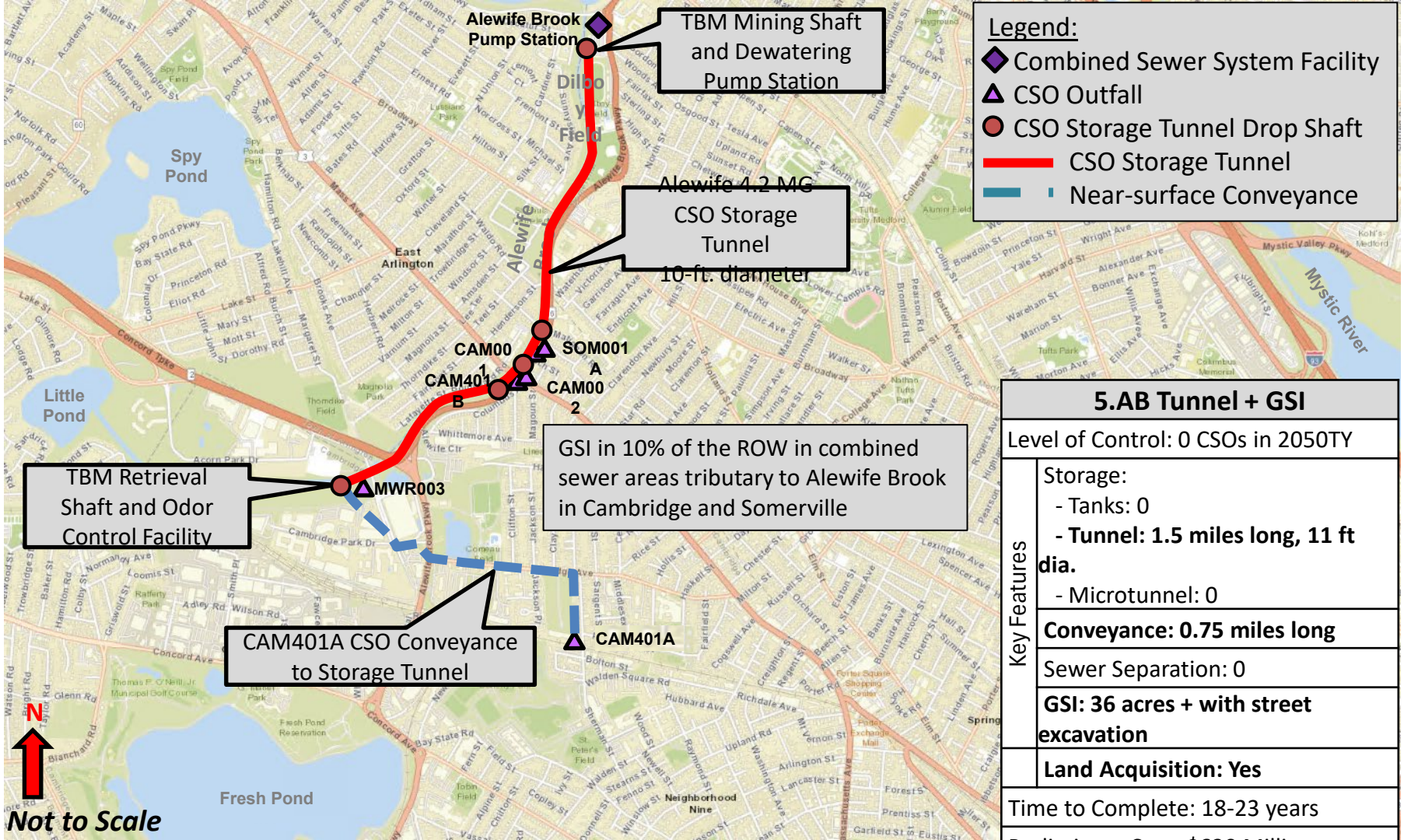

1.AB Integrated
Level of Control: 0 CSOs in 2050TY
Key Features
Storage:
- Tanks: 3
- Tunnel: 0
- Microtunnel: 0
Conveyance: 0
Sewer Separation: 264 acres
GSI: with separation/ other street excavation
Land Acquisition: Yes
Time to Complete: 30-35 years
Preliminary Cost: $600 Million
Legend:
Combined Sewer System Facility
CSO Outfall
CSO Storage Tank
Sewer Separation
Storm Drain
Alewife Brook Pump Station
CAM001
SOM001A
CAM401B
MWR003
CAM401A
MWR003
0.5 MG Storage Tank
CAM401B
0.4 MG Storage Tank
CAM401A
2.1 MG Storage Tank
SOM001A 264 Acres of Sewer Separation with In-line Storage using Throttling Gates
Massachusetts Avenue Storm Drain
Alewife Brook
Dilboy Field
Medford Hillside
Mystic River
Fresh Pond
Cambridge Highlands
North Cambridge
West Somerville
Spring Hill
Somerville
Neighborhood Nine
N
Not to Scale


2.AB Hybrid 1
Level of Control: 0 CSOs in 2050TY
Key Features
Storage:
- Tanks: 2
- Tunnel: 0
- Microtunnel: 0.5 miles long
Conveyance: 0.75 miles long
Sewer Separation: 108 acres
GSI: with separation/ other street excavation
Land Acquisition: Yes
Time to Complete: 18-23 years
Preliminary Cost: $440 Million
Legend:
Combined Sewer System Facility
CSO Outfall
CSO Storage Tank
Sewer Separation
Storm Drain
CSO Storage Conduit
Near-surface Conveyance
Alewife Brook Pump Station
CAM401B and SOM001A 1.3 MG Microtunnel Storage Conduit 9 ft. diameter
CAM001
8 Acres of Sewer Separation
SOM001A 100 Acres of Sewer Separation
MWR003 1.4 MG Storage Tank
CAM401A Increased Conveyance
Massachusetts Avenue Storm Drain
CAM401A 1.5 MG Storage Tank
Alewife Brook
Dilboy Field
Medford Hillside
Fresh Pond
Cambridge Highlands
West Somerville
Winter Hill
Spring Hill
Somerville
Neighborhood Nine
Mystic River
N
Not to Scale


3.AB Hybrid 2
Level of Control: 0 CSOs in 2050TY
Key Features
Storage:
- Tanks: 2
- Tunnel: 0
- Microtunnel: 1.0 miles long
Conveyance: 0.75 miles long
Sewer Separation: 8 acres
GSI: with separation/ other street excavation
Land Acquisition: Yes
Time to Complete: 13-18 years
Preliminary Cost: $340 Million
Legend:
Combined Sewer System Facility
CSO Outfall
CSO Storage Tank
Sewer Separation
CSO Storage Conduit
Near-surface Conveyance
Alewife Brook Pump Station
CAM401B and SOM001A 2.3 MG Microtunnel Storage Conduit 9 ft diameter
CAM001
8 Acres of Sewer Separation
MWR003
MWR003 1.5 MG Storage Tank
CAM401A Increased Conveyance
CAM401A
CAM401A 1.5 MG Storage Tank
CAM001
CAM401B
CAM002
SOM001A
Alewife Brook
Mystic River
Fresh Pond
Medford Hillside
West Somerville
Winter Hill
Somerville
Spring Hill
Cambridge Highlands
Neighborhood Nine
N
Not to Scale

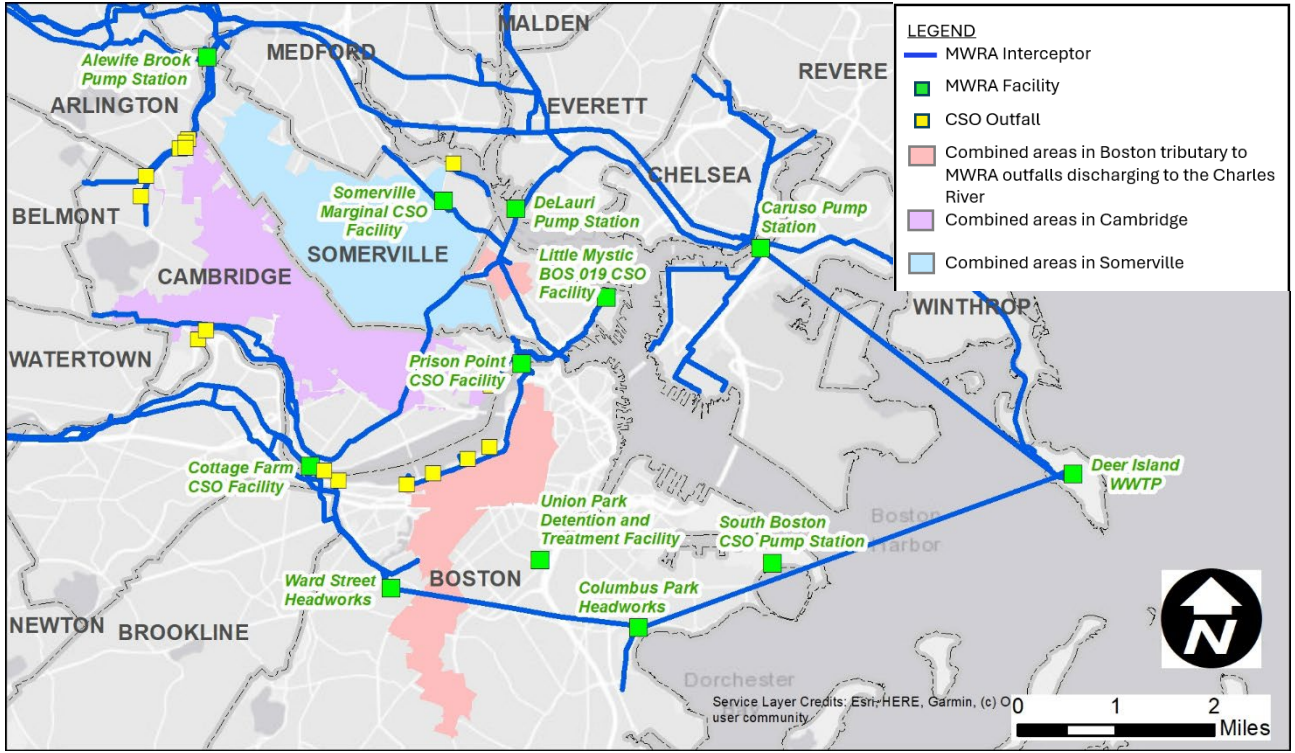


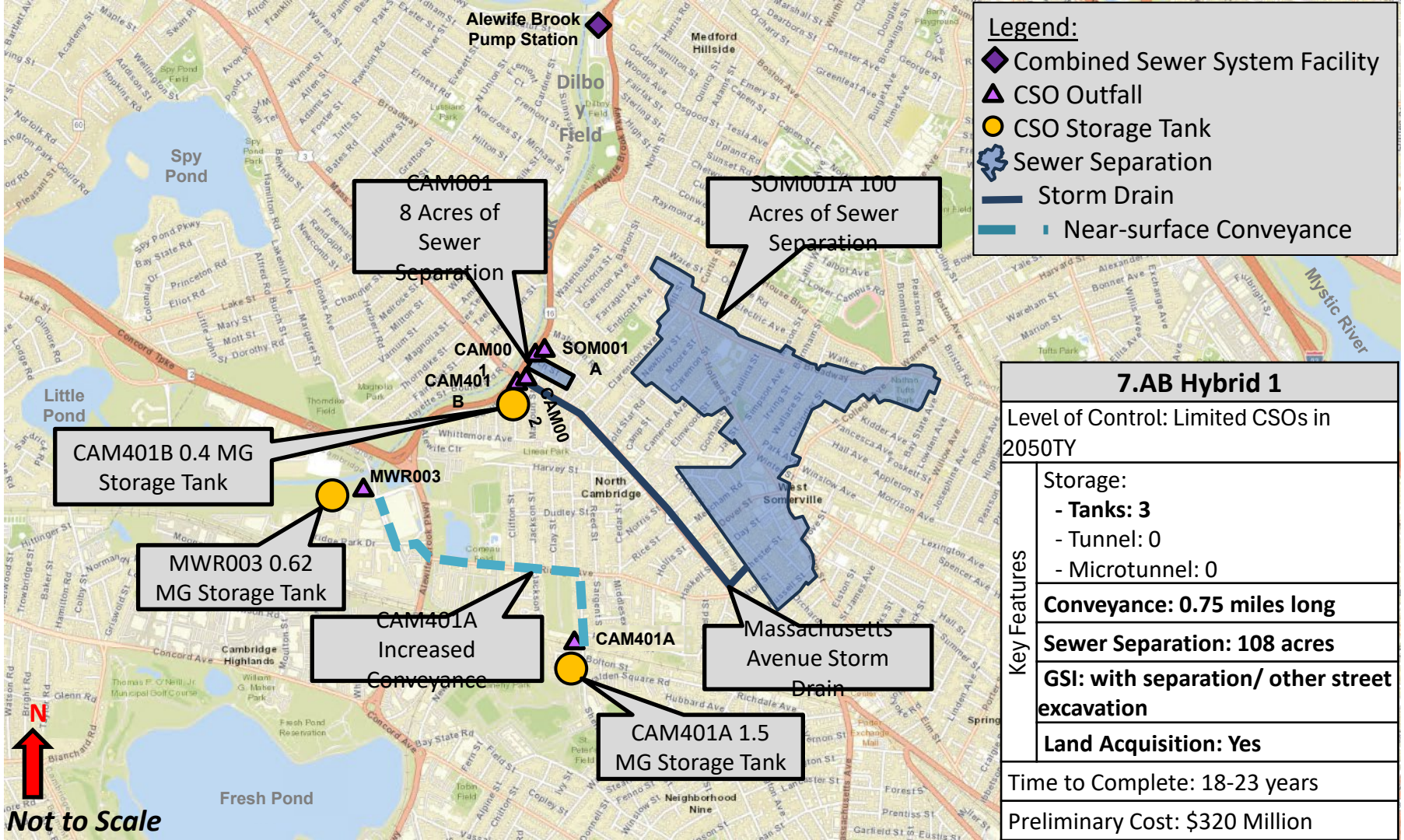
4.AB Tunnel	
Level of Control: 0 CSOs in 2050TY	
Key Features	Storage: - Tanks: 0 **- Tunnel: 1.5 miles long, 11 ft dia.** - Microtunnel: 0
	Conveyance: 0.75 miles long
	Sewer Separation: 0
	GSI: with street excavation
	Land Acquisition: Yes
Time to Complete: 15-20 years	
Preliminary Cost: $600 Million	



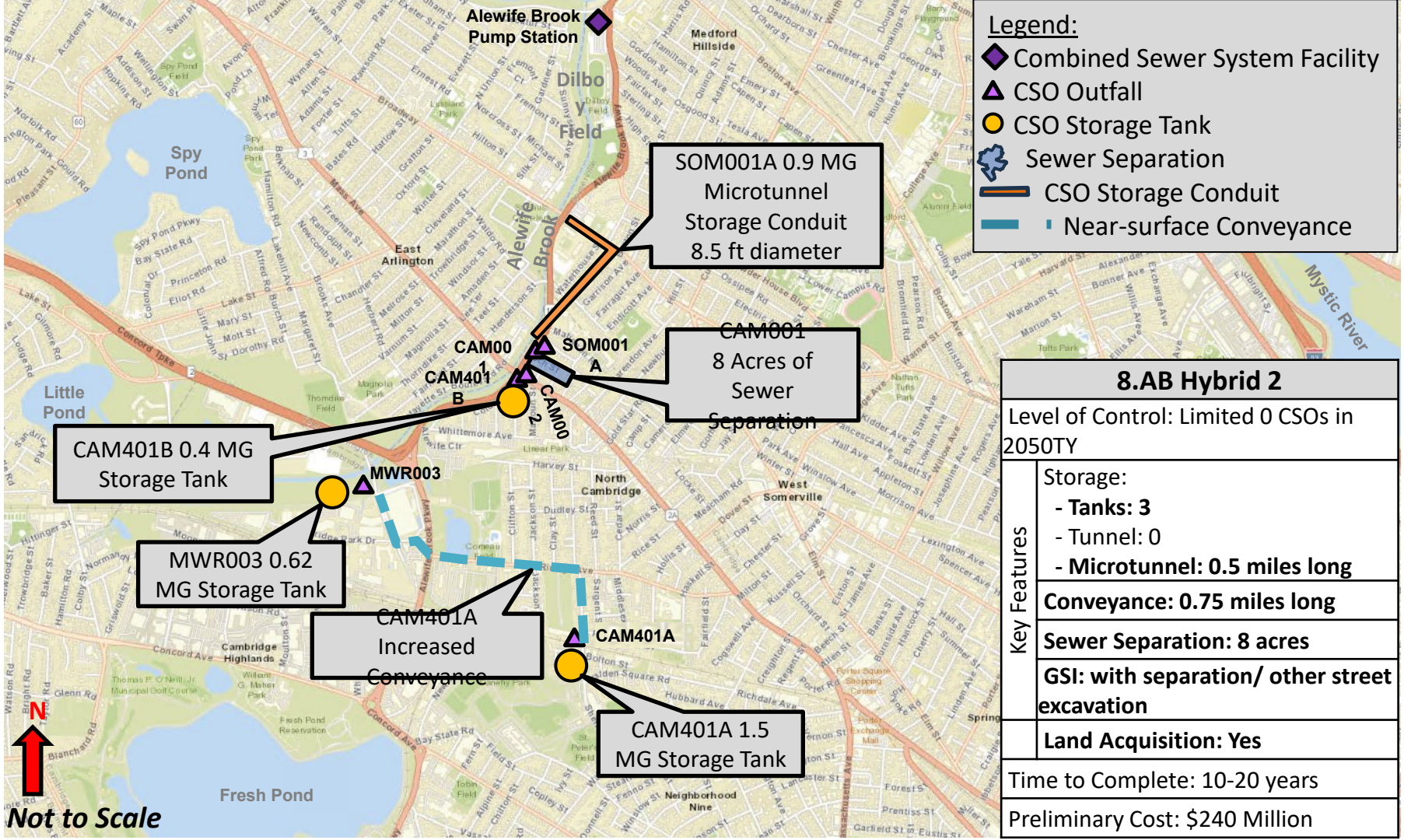
5.AB Tunnel + GSI	
Level of Control: 0 CSOs in 2050TY	
Key Features	Storage: - Tanks: 0 **- Tunnel: 1.5 miles long, 11 ft dia.** - Microtunnel: 0
	Conveyance: 0.75 miles long
	Sewer Separation: 0
	GSI: 36 acres + with street excavation
	Land Acquisition: Yes
Time to Complete: 18-23 years	

6.AB Sewer Separation	
Level of Control: 0 CSOs in 2050TY	
Key Features	Storage: - Tanks: 0 - Tunnel: 0 - Microtunnel: 0
	Conveyance: 0
	Sewer Separation: 900 acres
	GSI: with separation
	Land Acquisition: Yes
Time to Complete: 50+ years	
Preliminary Cost: $1,700 Million	

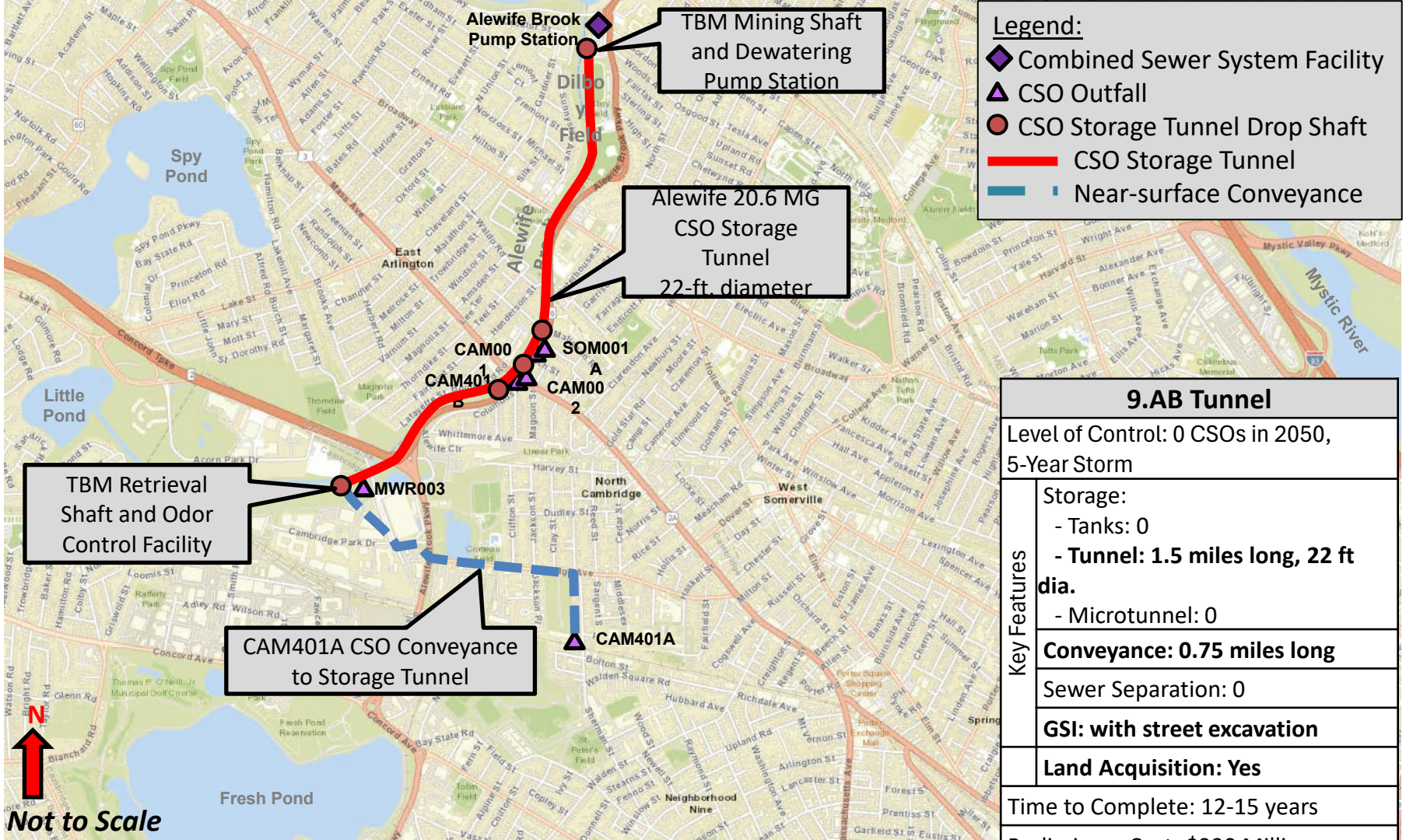




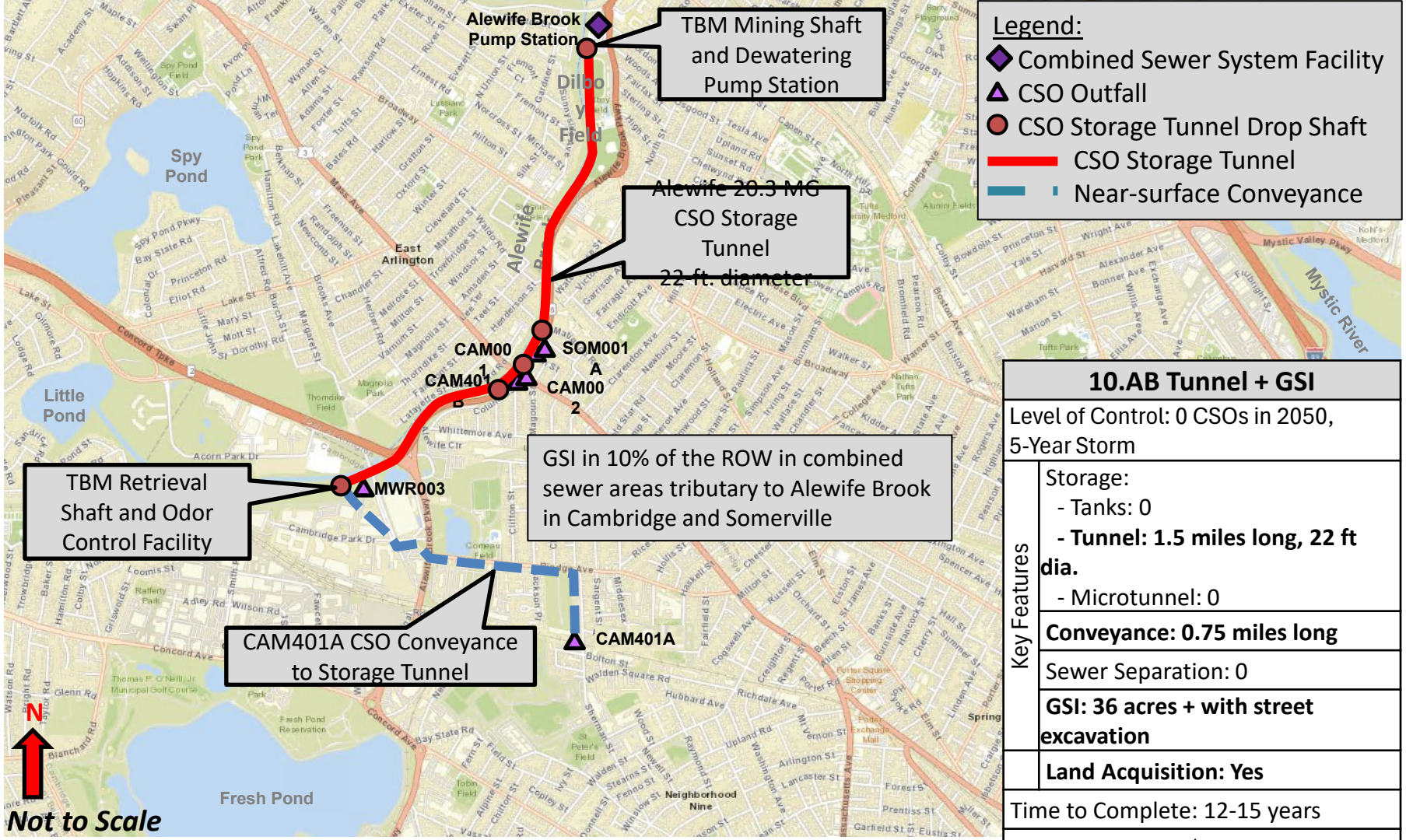
7.AB Hybrid 1	
Level of Control: Limited CSOs in 2050TY	
Key Features	Storage: **- Tanks: 3** - Tunnel: 0 - Microtunnel: 0
	Conveyance: 0.75 miles long
	Sewer Separation: 108 acres
	GSI: with separation/ other street excavation
	Land Acquisition: Yes
Time to Complete: 18-23 years	
Preliminary Cost: $320 Million	



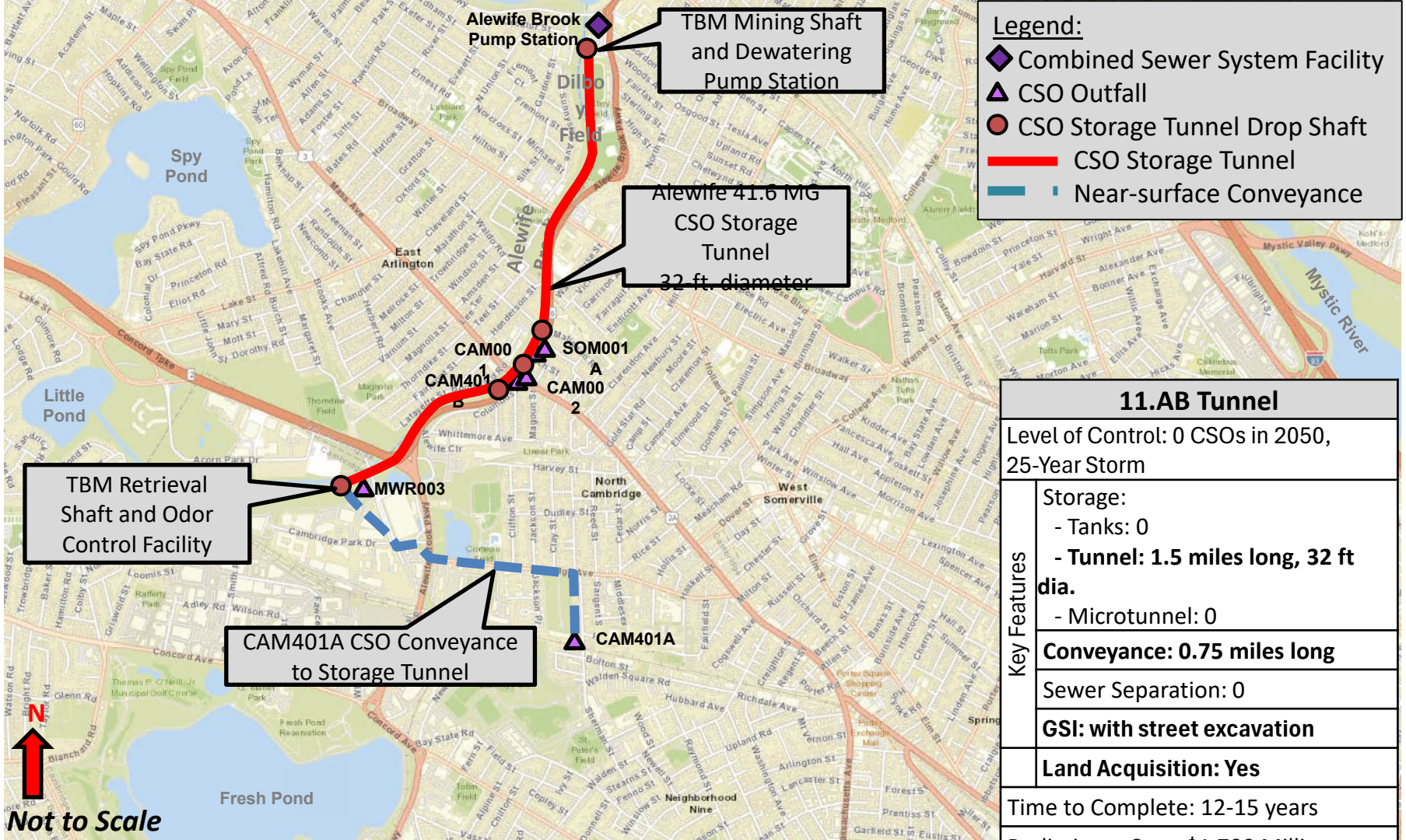
8.AB Hybrid 2	
Level of Control: Limited 0 CSOs in 2050TY	
Key Features	Storage: **- Tanks: 3** - Tunnel: 0 **- Microtunnel: 0.5 miles long**
	Conveyance: 0.75 miles long
	Sewer Separation: 8 acres
	GSI: with separation/ other street excavation
	Land Acquisition: Yes
Time to Complete: 10-20 years	
Preliminary Cost: $240 Million	



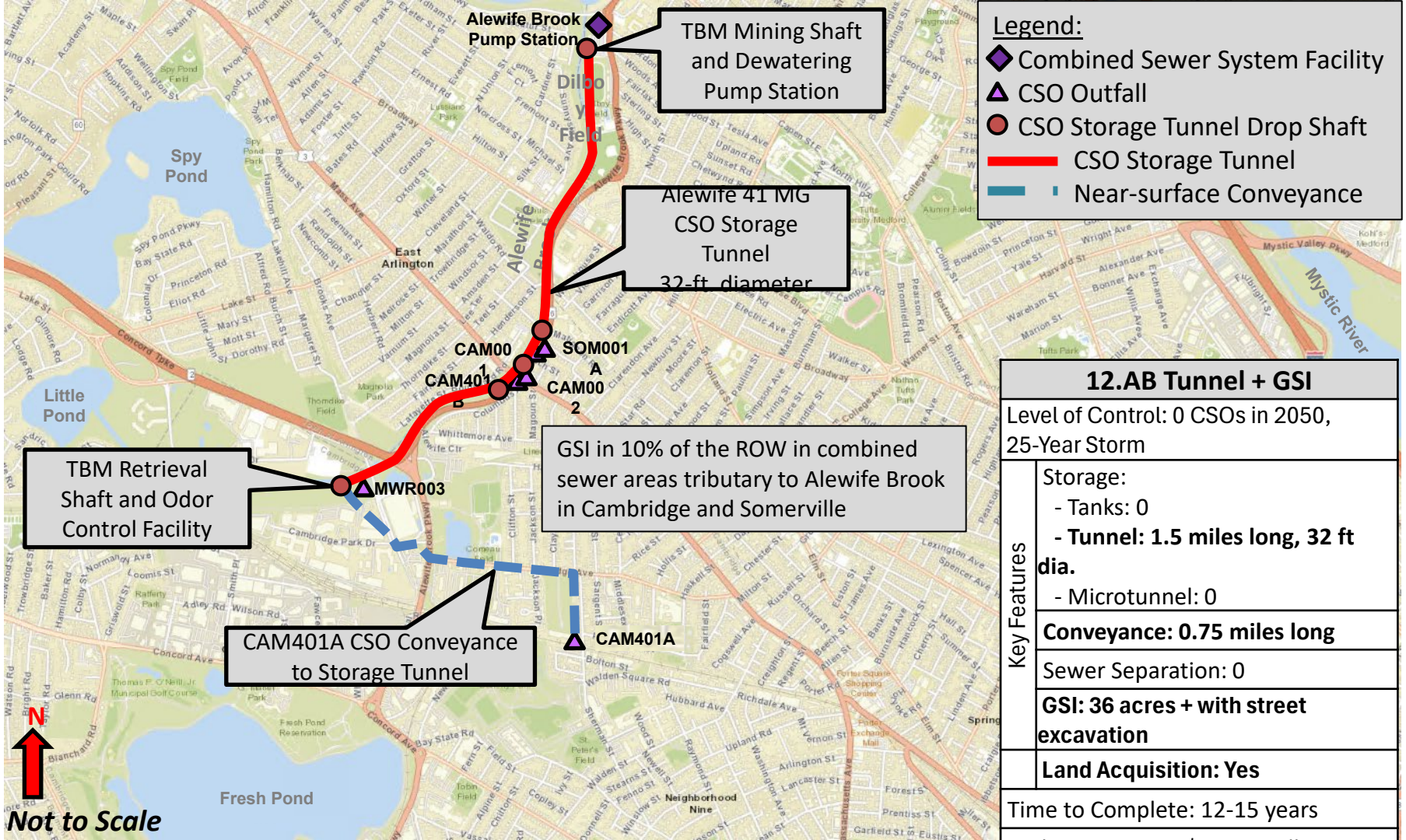
9.AB Tunnel	
Level of Control: 0 CSOs in 2050, 5-Year Storm	
Key Features	Storage: - Tanks: 0 **- Tunnel: 1.5 miles long, 22 ft dia.** - Microtunnel: 0
	Conveyance: 0.75 miles long
	Sewer Separation: 0
	GSI: with street excavation
	Land Acquisition: Yes
Time to Complete: 12-15 years	



10.AB Tunnel + GSI	
Level of Control: 0 CSOs in 2050, 5-Year Storm	
Key Features	Storage: - Tanks: 0 **- Tunnel: 1.5 miles long, 22 ft dia.** - Microtunnel: 0
	Conveyance: 0.75 miles long
	Sewer Separation: 0
	GSI: 36 acres + with street excavation
	Land Acquisition: Yes
Time to Complete: 12-15 years	



11.AB Tunnel	
Level of Control: 0 CSOs in 2050, 25-Year Storm	
Key Features	Storage: - Tanks: 0 **- Tunnel: 1.5 miles long, 32 ft dia.** - Microtunnel: 0
	Conveyance: 0.75 miles long
	Sewer Separation: 0
	GSI: with street excavation
	Land Acquisition: Yes
Time to Complete: 12-15 years	

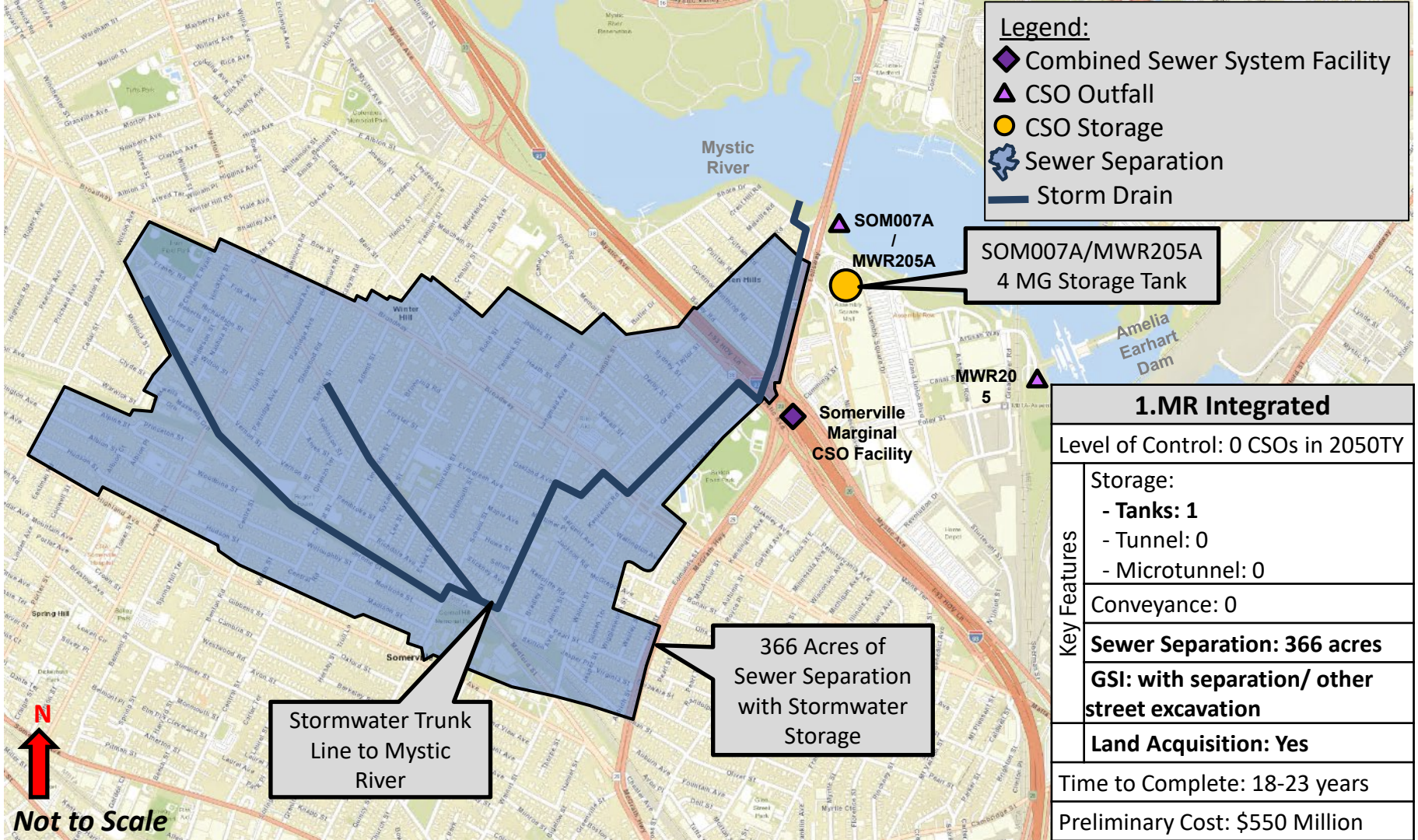


12.AB Tunnel + GSI	
Level of Control: 0 CSOs in 2050, 25-Year Storm	
Key Features	Storage: - Tanks: 0 **- Tunnel: 1.5 miles long, 32 ft dia.** - Microtunnel: 0
	Conveyance: 0.75 miles long
	Sewer Separation: 0
	GSI: 36 acres + with street excavation
	Land Acquisition: Yes
Time to Complete: 12-15 years	

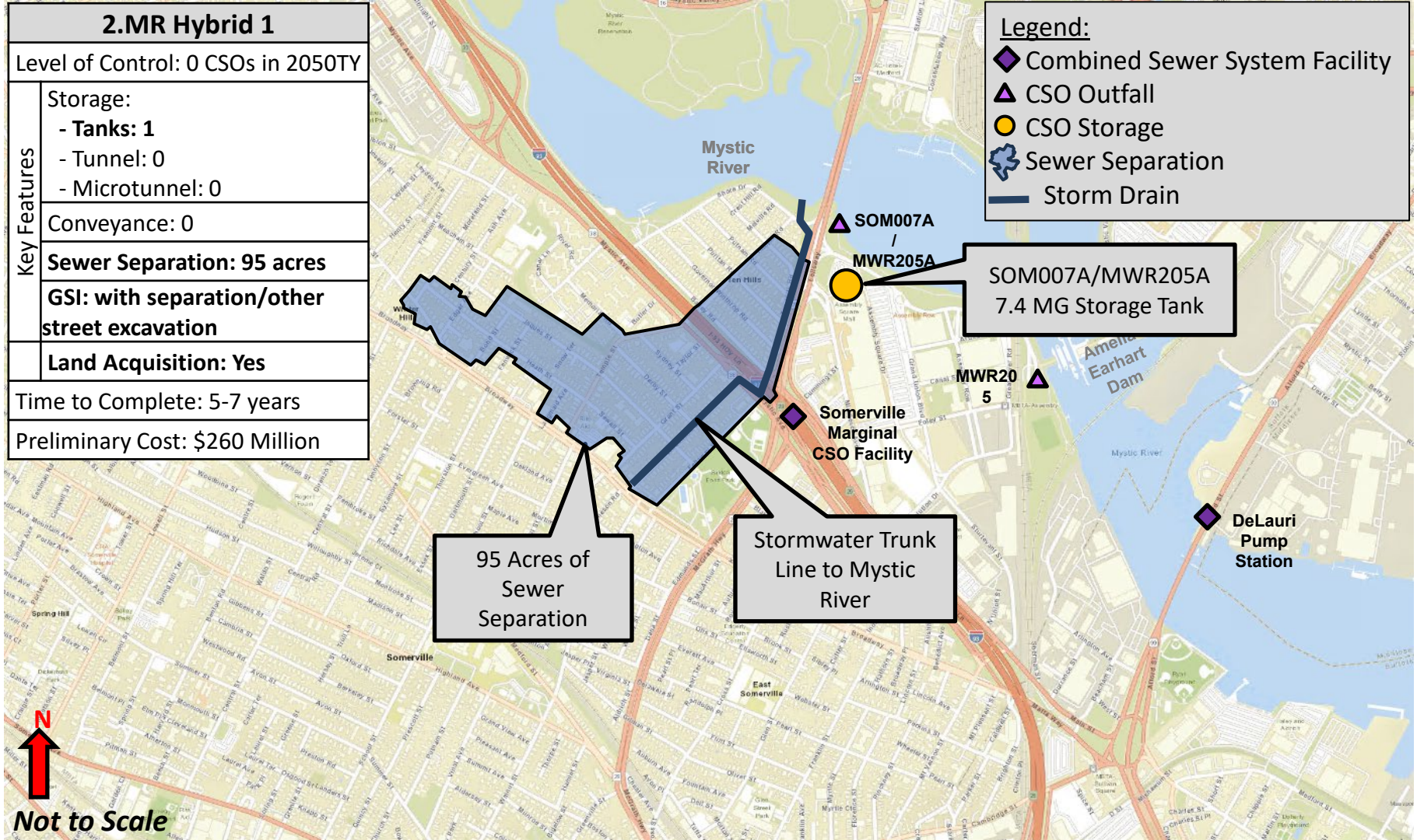
Mystic River Alternatives

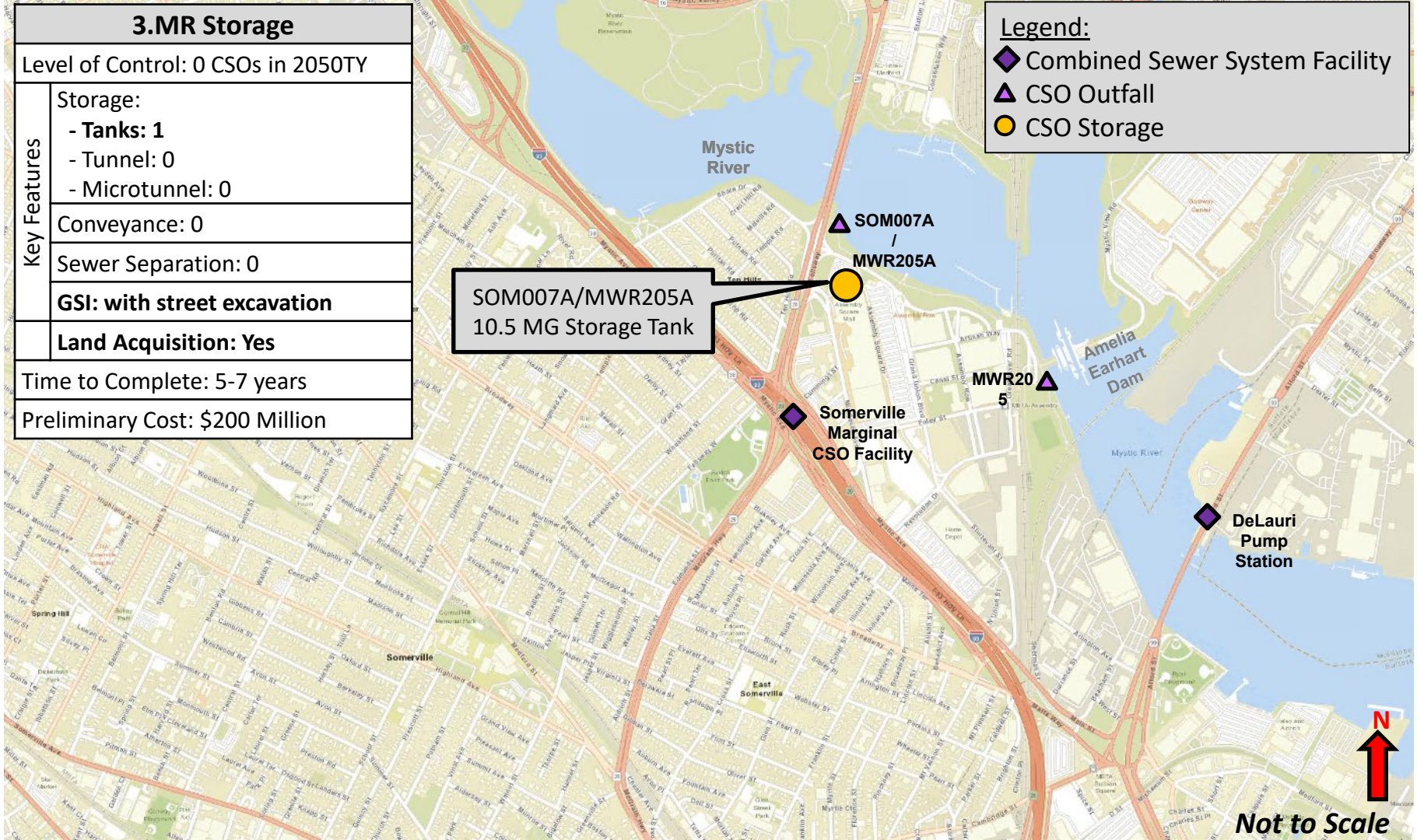
Mystic River: Summary of Alternatives Under Consideration

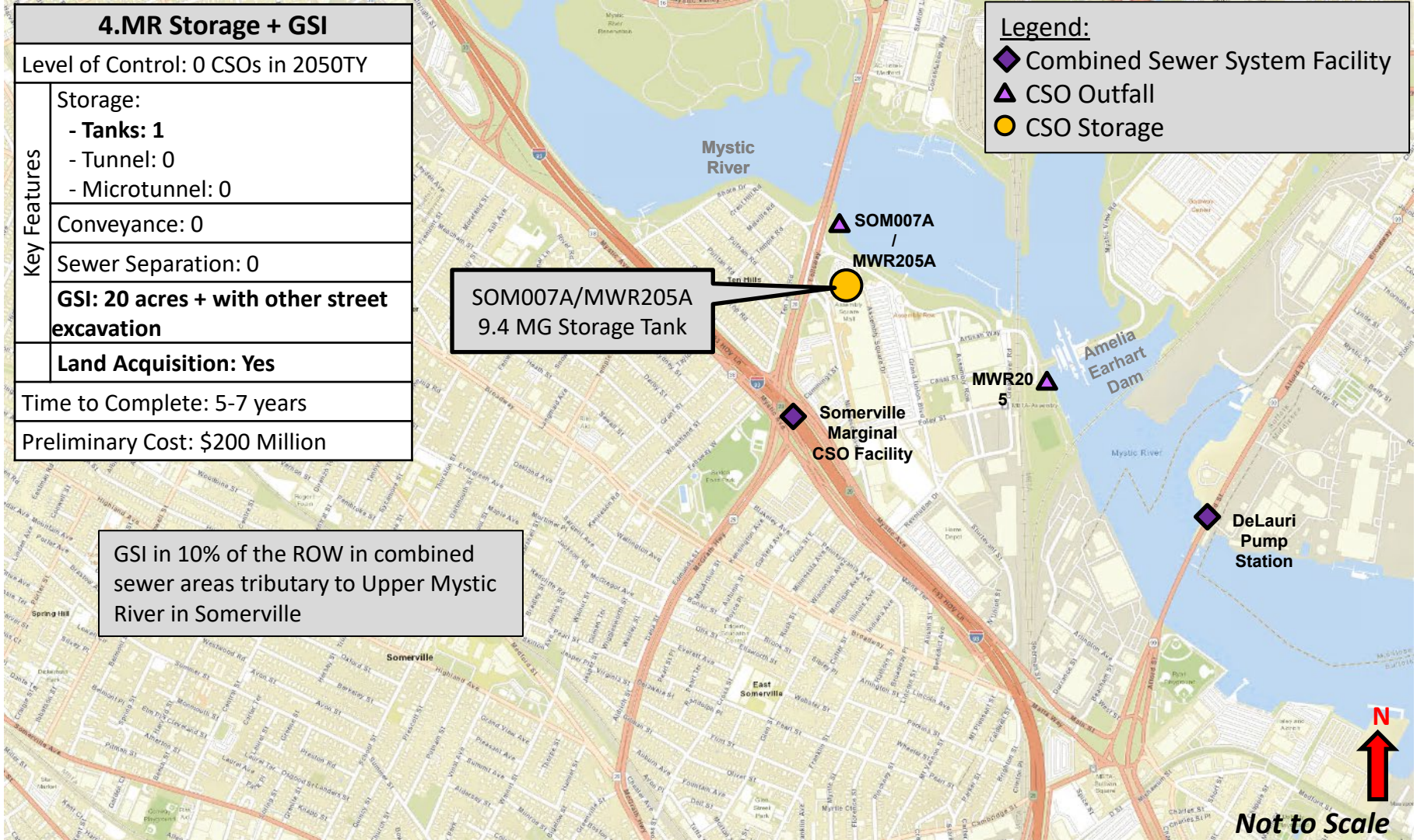
0 CSOs in 2050 Typical Year	Limited CSOs in 2050 Typical Year	0 CSOs in 2050 5-year Storm	0 CSOs in 2050 25-year Storm Mid-Tide
1.MR Integrated 1 tank (4 MG) + 366 acres of sewer separation	6a.MR Hybrid 1 1 tank (2.7 MG) + 95 acres of sewer separation	7.MR Storage 1 tank (10.5 MG)	10.MR Storage 1 tank (16.7 MG)
2.MR Hybrid 1 1 tank (7.4 MG) + 95 acres of sewer separation	6b.MR Hybrid 2 1 tank (5 MG)	8.MR Storage + GSI 1 tank (9.4 MG) + GSI to capture and treat 1 inch from 20 acres of impervious area	11.MR Storage + GSI 1 tank (15 MG) + GSI to capture and treat 1 inch from 20 acres of impervious area
3.MR Storage 1 tank (10.5 MG)	6c.MR Hybrid 3 95 acres of sewer separation	9.MR Hybrid 1 1 tank (7.4 MG) +95 acres of sewer separation	12.MR Hybrid 1 1 tank (14.2 MG) + 95 acres of sewer separation
4.MR Storage + GSI 1 tank (9.4 MG) + GSI to capture and treat 1 inch from 20 acres of impervious area			
5.MR Sewer Separation 690 acres of sewer separation			



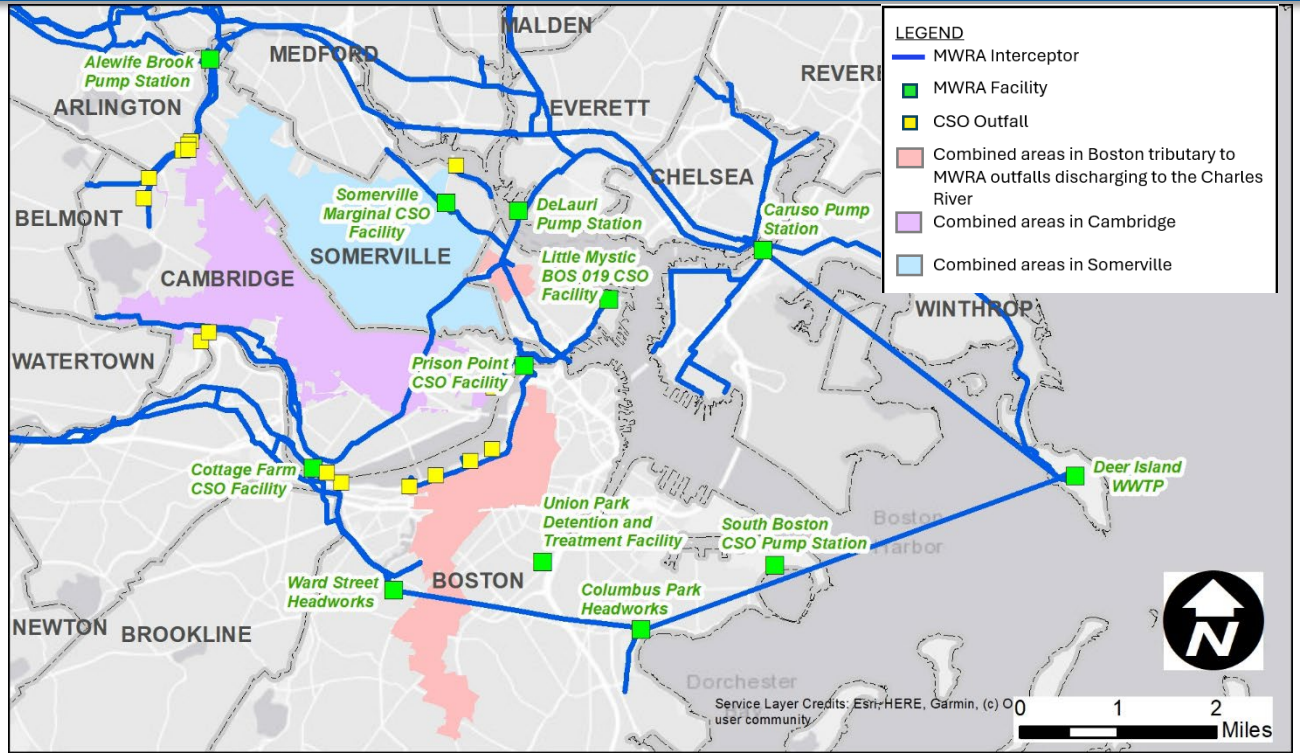
1.MR Integrated	
Level of Control: 0 CSOs in 2050TY	
Key Features	Storage: **- Tanks: 1** - Tunnel: 0 - Microtunnel: 0
	Conveyance: 0
	Sewer Separation: 366 acres
	GSI: with separation/ other street excavation
	Land Acquisition: Yes
Time to Complete: 18-23 years	
Preliminary Cost: $550 Million	


2.MR Hybrid 1
Level of Control: 0 CSOs in 2050TY
Key Features
Storage:
- Tanks: 1
- Tunnel: 0
- Microtunnel: 0
Conveyance: 0
Sewer Separation: 95 acres
GSI: with separation/other street excavation
Land Acquisition: Yes
Time to Complete: 5-7 years
Preliminary Cost: $260 Million
Legend:
Combined Sewer System Facility
CSO Outfall
CSO Storage
Sewer Separation
Storm Drain
Mystic River
SOM007A / MWR205A
SOM007A/MWR205A 7.4 MG Storage Tank
MWR205
Somerville Marginal CSO Facility
Amelia Earhart Dam
DeLauri Pump Station
95 Acres of Sewer Separation
Stormwater Trunk Line to Mystic River
Somerville
East Somerville
N
Not to Scale

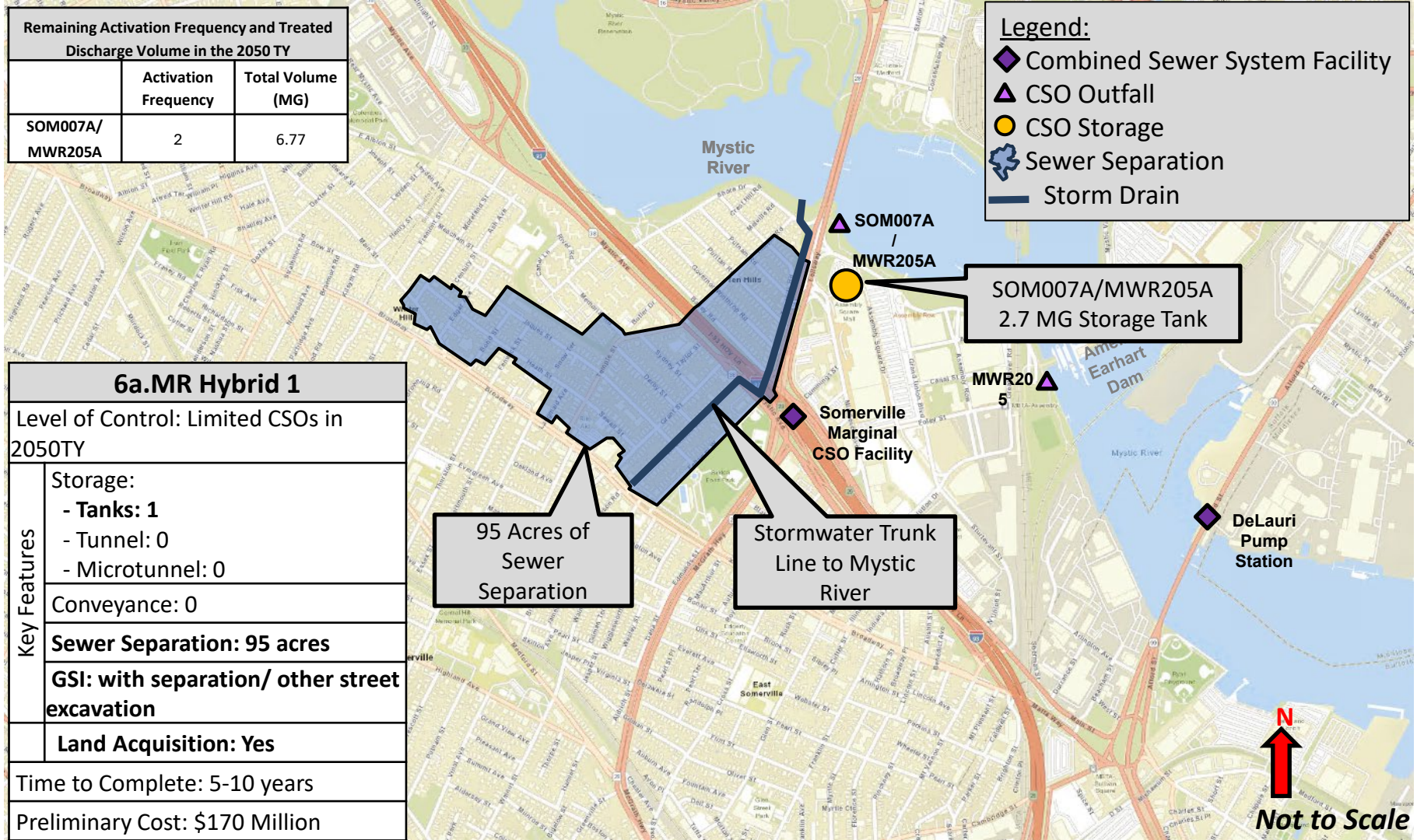

3.MR Storage
Level of Control: 0 CSOs in 2050TY
Key Features
Storage:
- Tanks: 1
- Tunnel: 0
- Microtunnel: 0
Conveyance: 0
Sewer Separation: 0
GSI: with street excavation
Land Acquisition: Yes
Time to Complete: 5-7 years
Preliminary Cost: $200 Million
Legend:
Combined Sewer System Facility
CSO Outfall
CSO Storage
Mystic River
SOM007A / MWR205A
SOM007A/MWR205A
10.5 MG Storage Tank
Amelia Earhart Dam
MWR205
Somerville Marginal CSO Facility
DeLauri Pump Station
Somerville
East Somerville
Spring Hill
N
Not to Scale


4.MR Storage + GSI
Level of Control: 0 CSOs in 2050TY
Key Features
Storage:
- Tanks: 1
- Tunnel: 0
- Microtunnel: 0
Conveyance: 0
Sewer Separation: 0
GSI: 20 acres + with other street excavation
Land Acquisition: Yes
Time to Complete: 5-7 years
Preliminary Cost: $200 Million
Legend:
Combined Sewer System Facility
CSO Outfall
CSO Storage
Mystic River
SOM007A / MWR205A
SOM007A/MWR205A
9.4 MG Storage Tank
Amelia Earhart Dam
MWR205
Somerville Marginal CSO Facility
DeLauri Pump Station
GSI in 10% of the ROW in combined sewer areas tributary to Upper Mystic River in Somerville
Somerville
East Somerville
N
Not to Scale

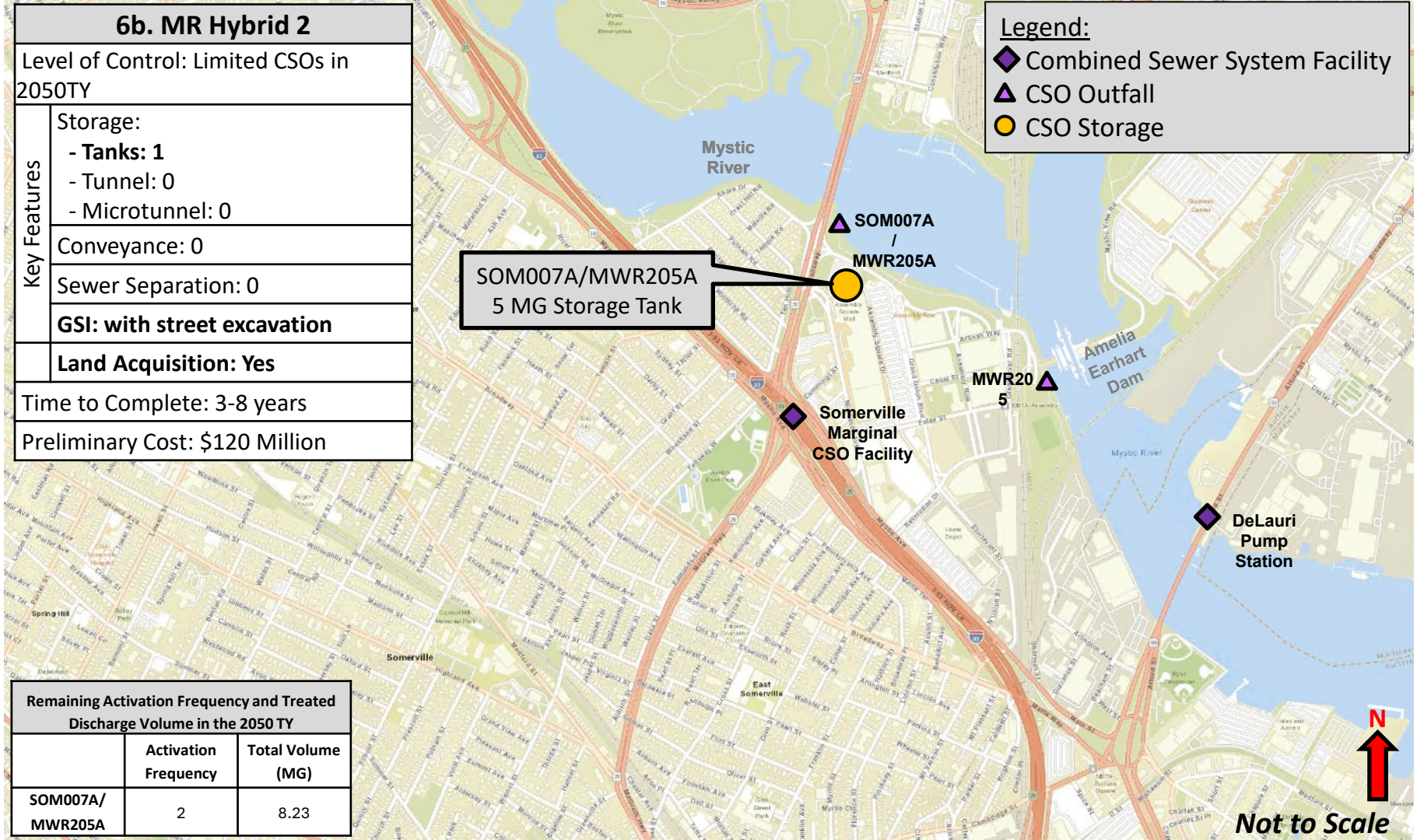
5.MR Sewer Separation	
Level of Control: 0 CSOs in 2050TY	
Key Features	Storage: - Tanks: 0 - Tunnel: 0 - Microtunnel: 0
	Conveyance: 0
	Sewer Separation: 690 acres
	GSI: with separation
	Land Acquisition: Yes
Time to Complete: 50+ years	
Preliminary Cost: $640 Million	



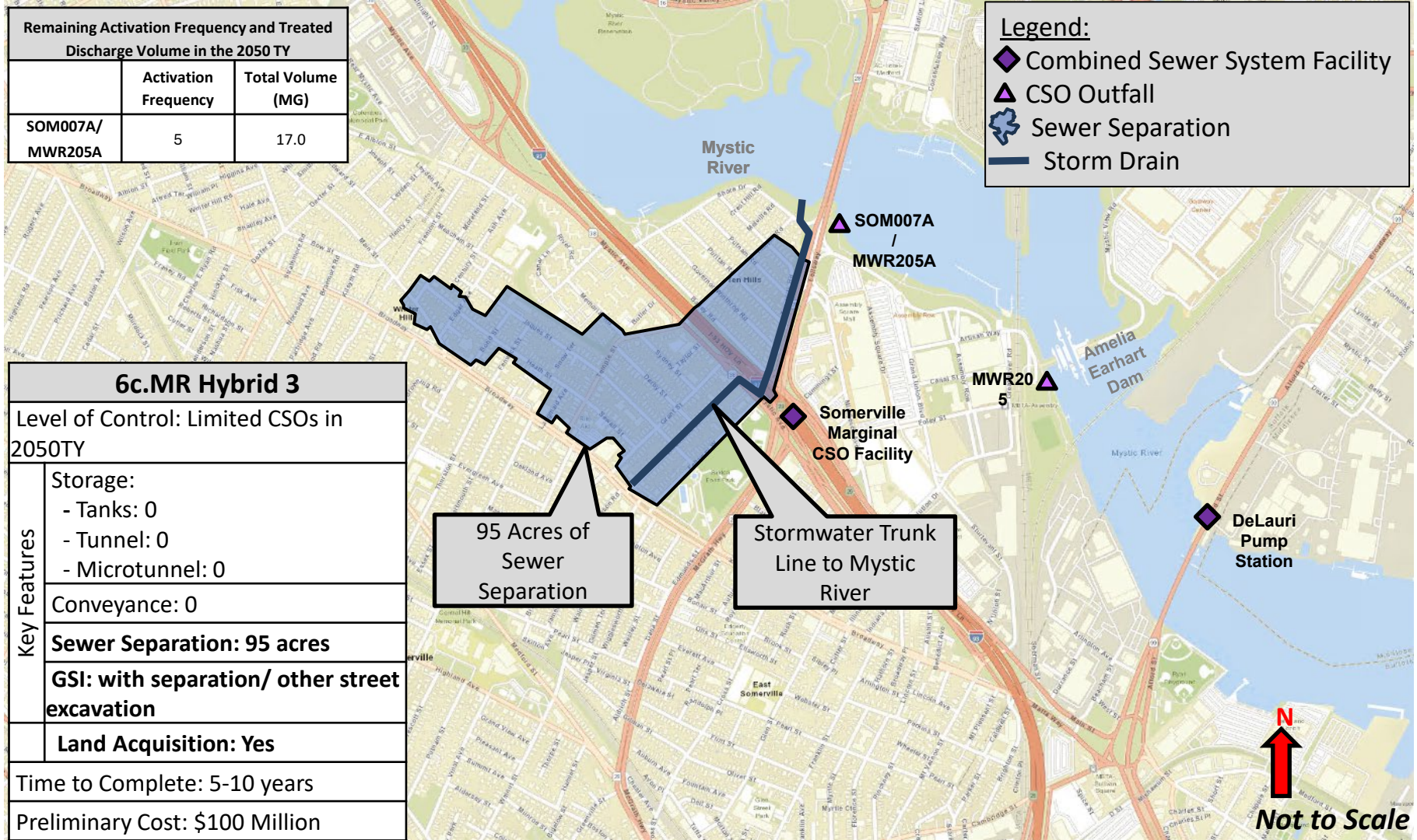
Remaining Activation Frequency and Treated Discharge Volume in the 2050 TY		
	Activation Frequency	Total Volume (MG)
SOM007A/ MWR205A	2	6.77



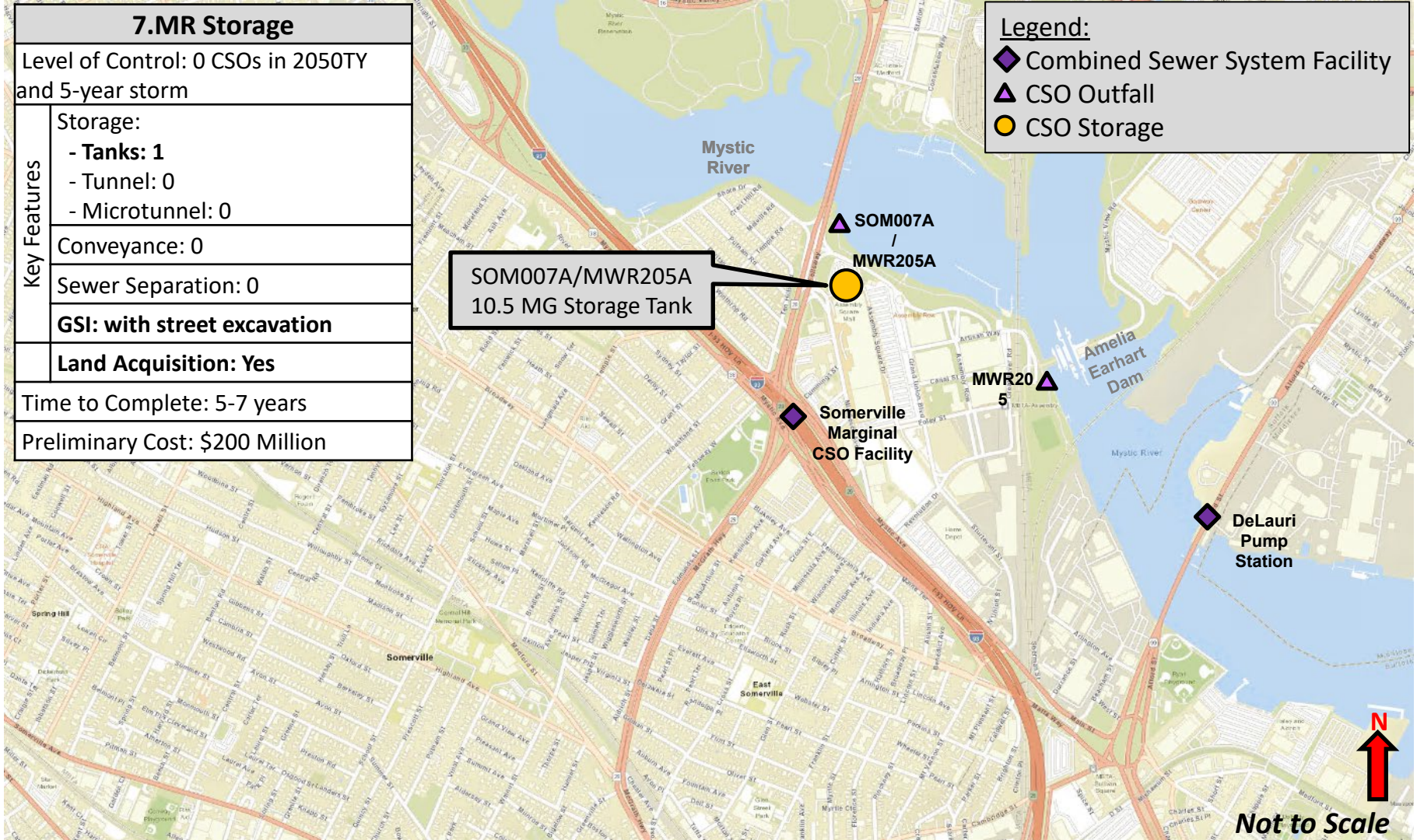
6a.MR Hybrid 1	
Level of Control: Limited CSOs in 2050TY	
Key Features	Storage: **- Tanks: 1** - Tunnel: 0 - Microtunnel: 0
	Conveyance: 0
	Sewer Separation: 95 acres
	GSI: with separation/ other street excavation
	Land Acquisition: Yes
Time to Complete: 5-10 years	
Preliminary Cost: $170 Million	

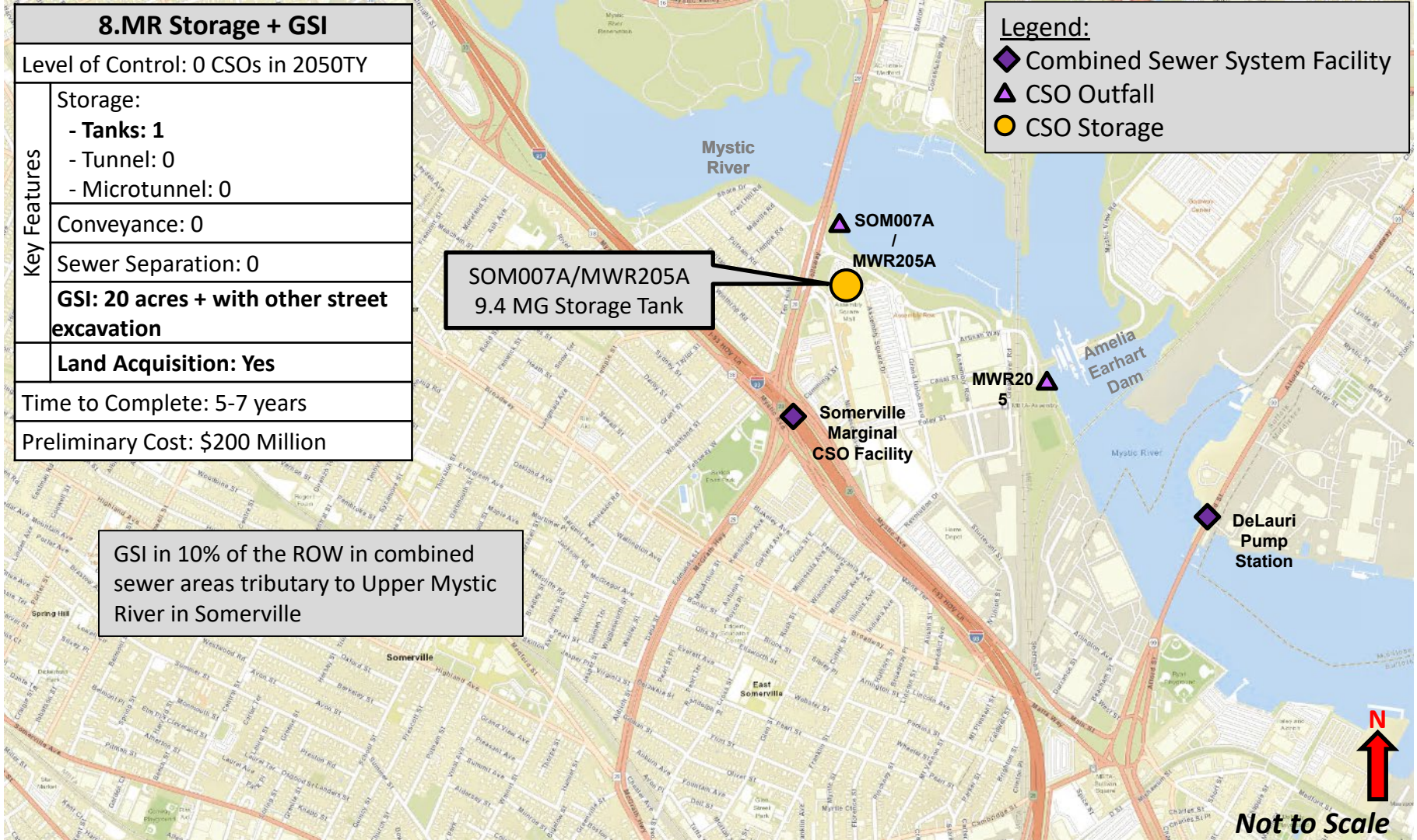

6b. MR Hybrid 2
Level of Control: Limited CSOs in 2050TY
Key Features
Storage:
- Tanks: 1
- Tunnel: 0
- Microtunnel: 0
Conveyance: 0
Sewer Separation: 0
GSI: with street excavation
Land Acquisition: Yes
Time to Complete: 3-8 years
Preliminary Cost: $120 Million
Legend:
Combined Sewer System Facility
CSO Outfall
CSO Storage
Mystic River
SOM007A / MWR205A
SOM007A/MWR205A 5 MG Storage Tank
MWR205
Somerville Marginal CSO Facility
Amelia Earhart Dam
DeLauri Pump Station
Somerville
East Somerville
Spring Hill
Remaining Activation Frequency and Treated Discharge Volume in the 2050 TY
Activation Frequency
Total Volume (MG)
SOM007A/ MWR205A
2
8.23
N
Not to Scale

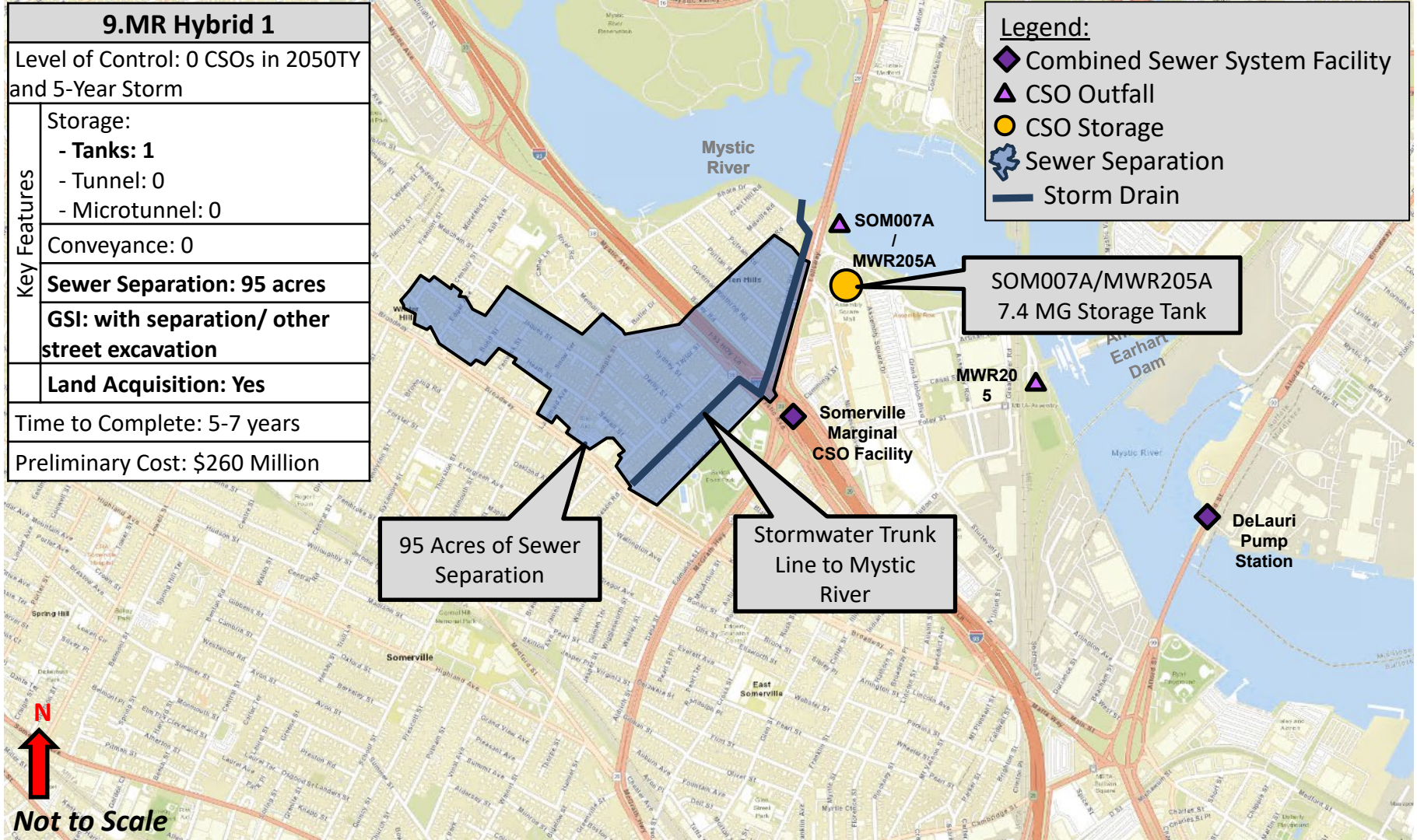
Remaining Activation Frequency and Treated Discharge Volume in the 2050 TY		
	Activation Frequency	Total Volume (MG)
SOM007A/ MWR205A	5	17.0

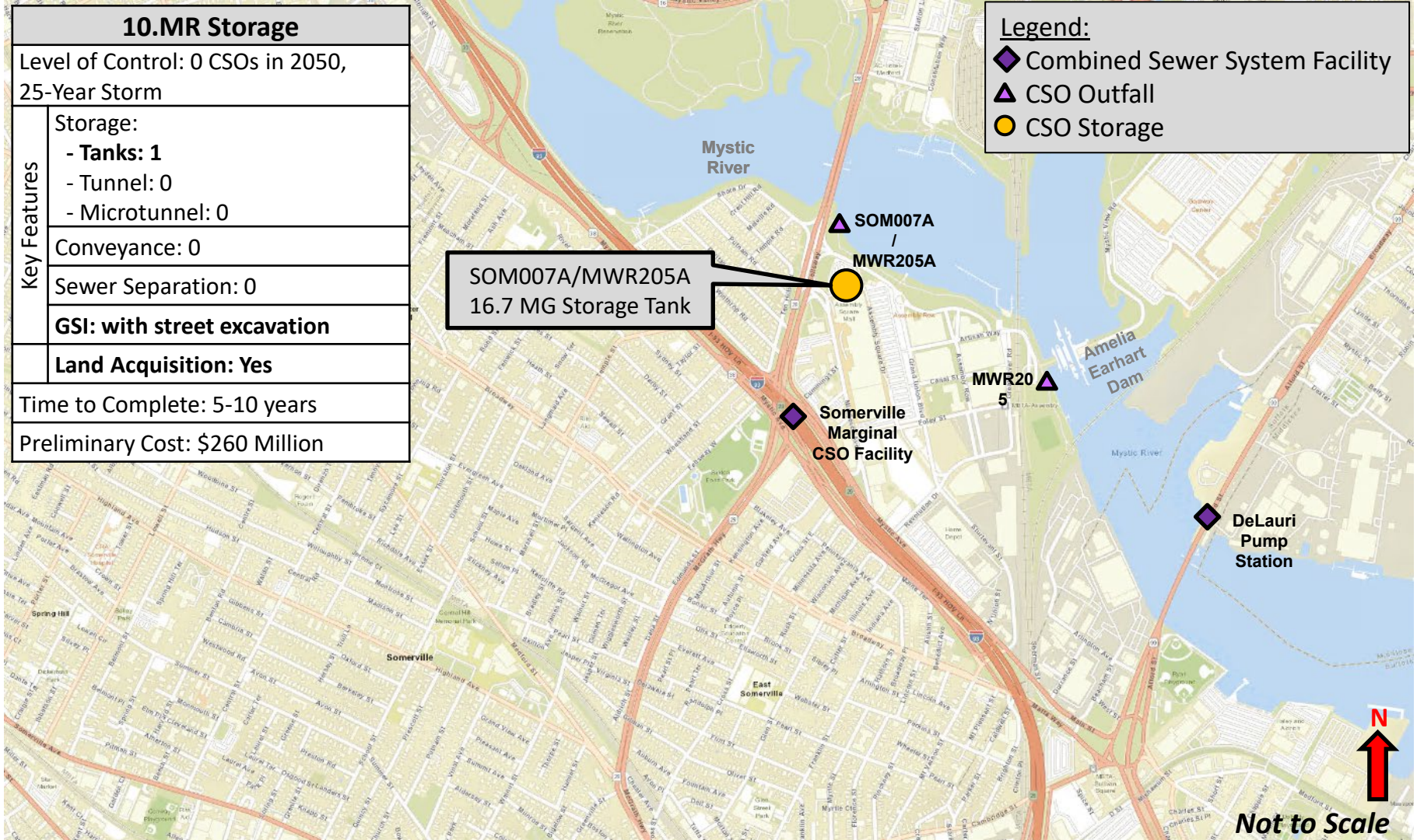


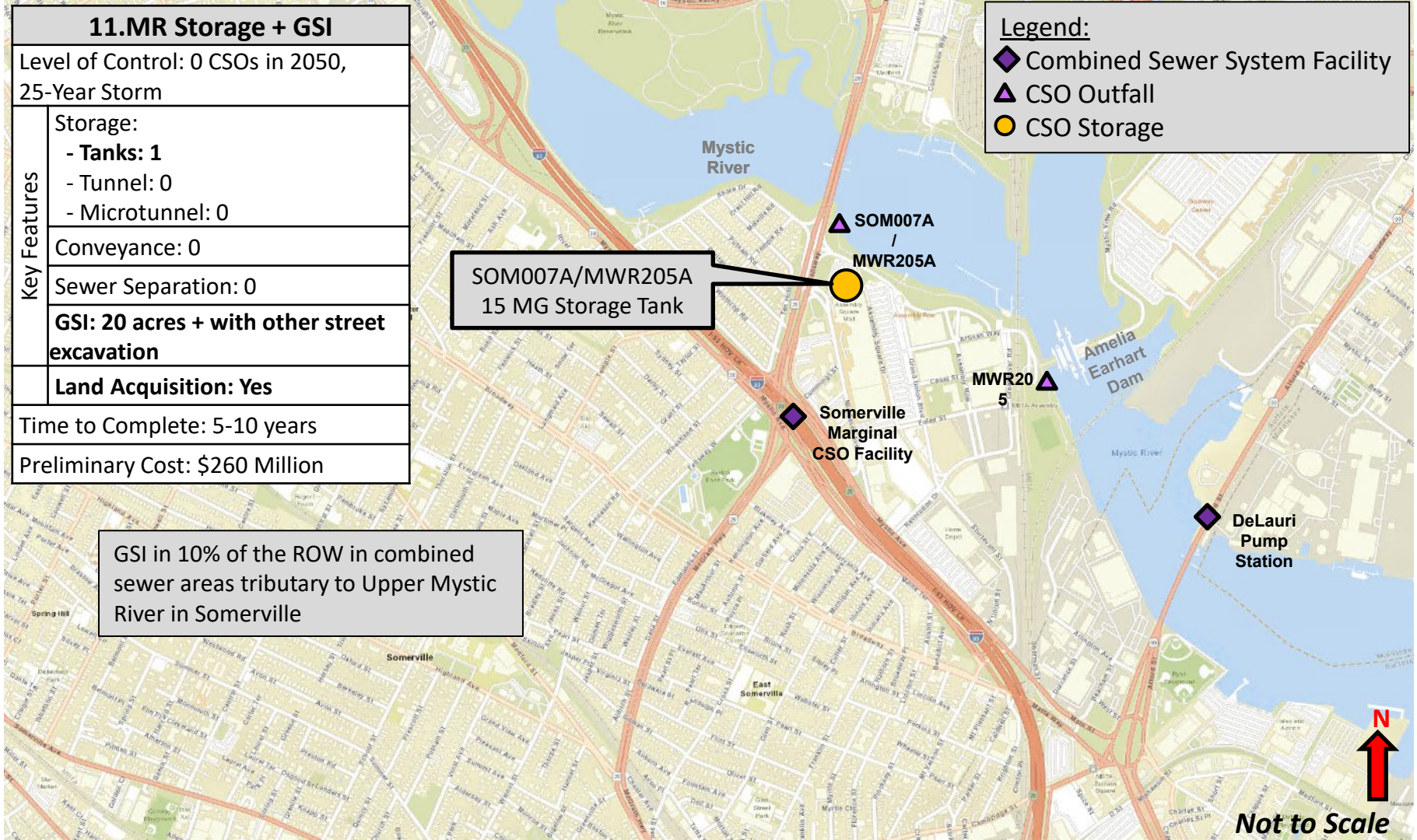
6c.MR Hybrid 3	
Level of Control: Limited CSOs in 2050TY	
Key Features	Storage: - Tanks: 0 - Tunnel: 0 - Microtunnel: 0
	Conveyance: 0
	Sewer Separation: 95 acres
	GSI: with separation/ other street excavation
	Land Acquisition: Yes
Time to Complete: 5-10 years	
Preliminary Cost: $100 Million	

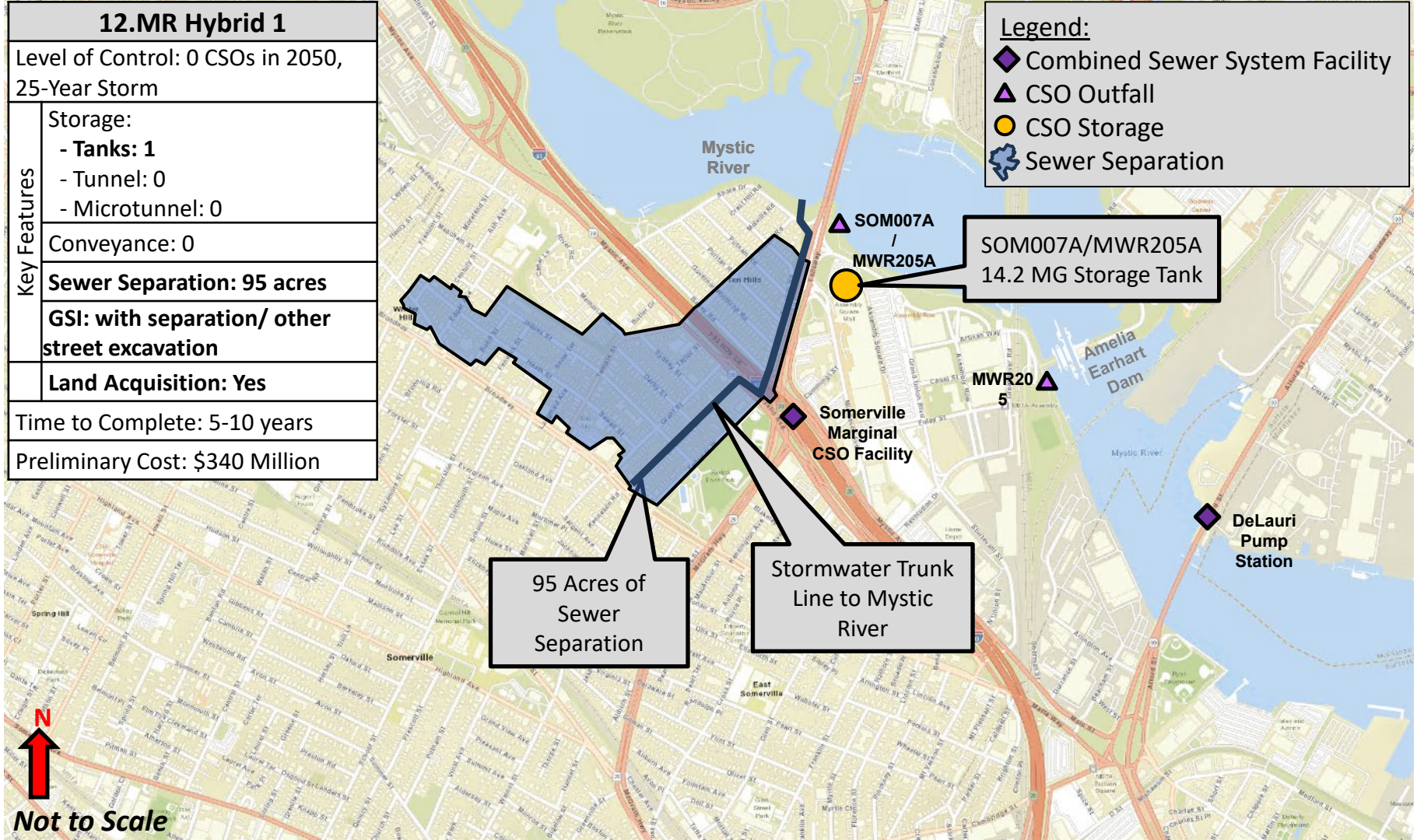

7.MR Storage
Level of Control: 0 CSOs in 2050TY and 5-year storm
Key Features
Storage:
- Tanks: 1
- Tunnel: 0
- Microtunnel: 0
Conveyance: 0
Sewer Separation: 0
GSI: with street excavation
Land Acquisition: Yes
Time to Complete: 5-7 years
Preliminary Cost: $200 Million
Legend:
Combined Sewer System Facility
CSO Outfall
CSO Storage
Mystic River
SOM007A / MWR205A
SOM007A/MWR205A
10.5 MG Storage Tank
Amelia Earhart Dam
MWR205
Somerville Marginal CSO Facility
DeLauri Pump Station
Somerville
East Somerville
Spring Hill
N
Not to Scale


8.MR Storage + GSI
Level of Control: 0 CSOs in 2050TY
Key Features
Storage:
- Tanks: 1
- Tunnel: 0
- Microtunnel: 0
Conveyance: 0
Sewer Separation: 0
GSI: 20 acres + with other street excavation
Land Acquisition: Yes
Time to Complete: 5-7 years
Preliminary Cost: $200 Million
Legend:
Combined Sewer System Facility
CSO Outfall
CSO Storage
Mystic River
SOM007A / MWR205A
SOM007A/MWR205A
9.4 MG Storage Tank
Amelia Earhart Dam
MWR205
Somerville Marginal CSO Facility
DeLauri Pump Station
GSI in 10% of the ROW in combined sewer areas tributary to Upper Mystic River in Somerville
Somerville
East Somerville
Spring Hill
N
Not to Scale


9.MR Hybrid 1
Level of Control: 0 CSOs in 2050TY and 5-Year Storm
Key Features
Storage:
- Tanks: 1
- Tunnel: 0
- Microtunnel: 0
Conveyance: 0
Sewer Separation: 95 acres
GSI: with separation/ other street excavation
Land Acquisition: Yes
Time to Complete: 5-7 years
Preliminary Cost: $260 Million
Legend:
Combined Sewer System Facility
CSO Outfall
CSO Storage
Sewer Separation
Storm Drain
Mystic River
SOM007A / MWR205A
SOM007A/MWR205A 7.4 MG Storage Tank
MWR205
Somerville Marginal CSO Facility
Earhart Dam
DeLauri Pump Station
95 Acres of Sewer Separation
Stormwater Trunk Line to Mystic River
Somerville
East Somerville
N
Not to Scale


10.MR Storage
Level of Control: 0 CSOs in 2050, 25-Year Storm
Key Features
Storage:
- Tanks: 1
- Tunnel: 0
- Microtunnel: 0
Conveyance: 0
Sewer Separation: 0
GSI: with street excavation
Land Acquisition: Yes
Time to Complete: 5-10 years
Preliminary Cost: $260 Million
Legend:
Combined Sewer System Facility
CSO Outfall
CSO Storage
Mystic River
SOM007A / MWR205A
SOM007A/MWR205A
16.7 MG Storage Tank
Amelia Earhart Dam
MWR205
Somerville Marginal CSO Facility
DeLauri Pump Station
Somerville
East Somerville
Spring Hill
N
Not to Scale

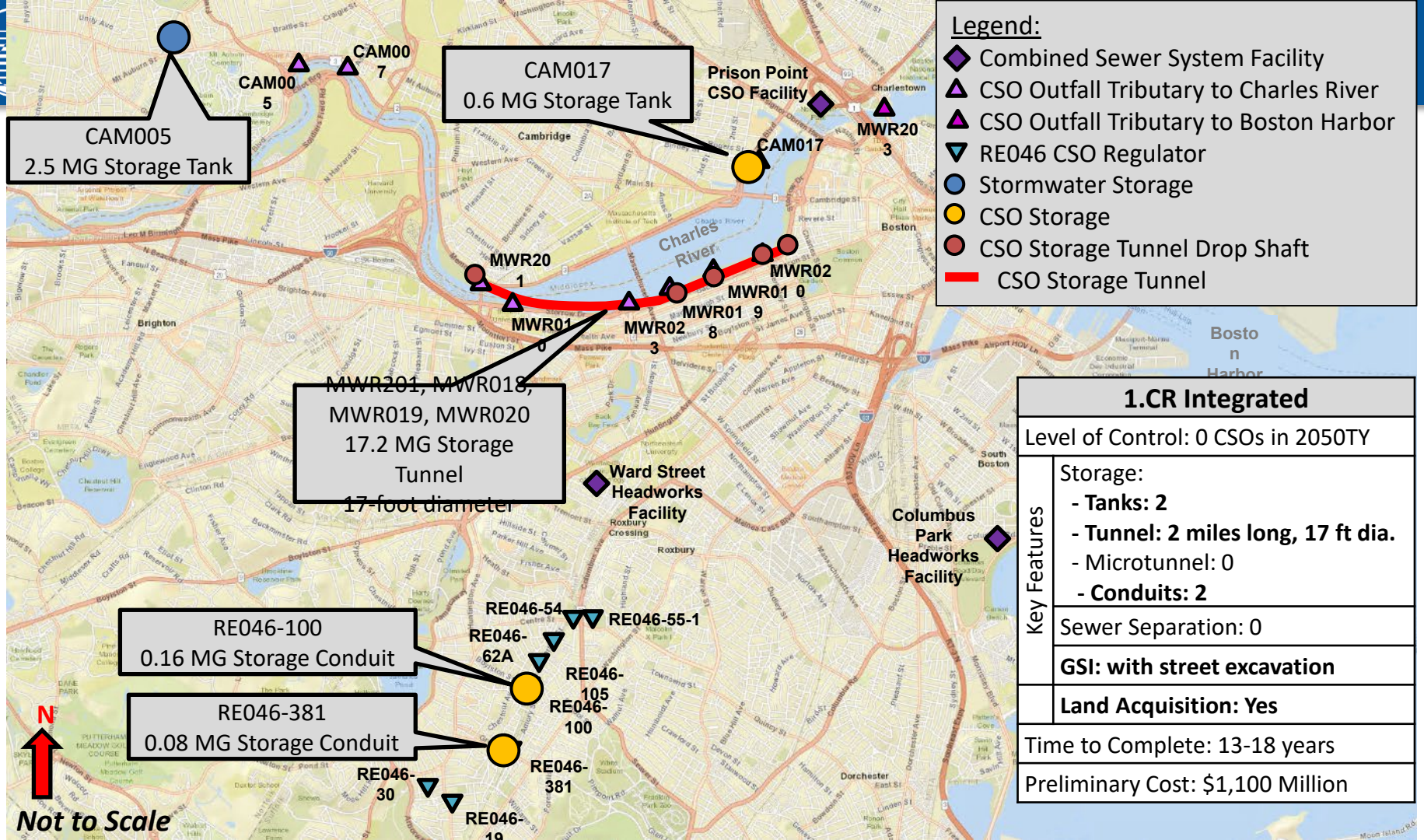

11.MR Storage + GSI
Level of Control: 0 CSOs in 2050, 25-Year Storm
Key Features
Storage:
- Tanks: 1
- Tunnel: 0
- Microtunnel: 0
Conveyance: 0
Sewer Separation: 0
GSI: 20 acres + with other street excavation
Land Acquisition: Yes
Time to Complete: 5-10 years
Preliminary Cost: $260 Million
GSI in 10% of the ROW in combined sewer areas tributary to Upper Mystic River in Somerville
Legend:
Combined Sewer System Facility
CSO Outfall
CSO Storage
SOM007A/MWR205A
15 MG Storage Tank
SOM007A / MWR205A
MWR205
Somerville Marginal CSO Facility
DeLauri Pump Station
Mystic River
Amelia Earhart Dam
Somerville
East Somerville
Spring Hill
N
Not to Scale


12.MR Hybrid 1
Level of Control: 0 CSOs in 2050, 25-Year Storm
Key Features
Storage:
- Tanks: 1
- Tunnel: 0
- Microtunnel: 0
Conveyance: 0
Sewer Separation: 95 acres
GSI: with separation/ other street excavation
Land Acquisition: Yes
Time to Complete: 5-10 years
Preliminary Cost: $340 Million
Legend:
Combined Sewer System Facility
CSO Outfall
CSO Storage
Sewer Separation
Mystic River
SOM007A / MWR205A
SOM007A/MWR205A 14.2 MG Storage Tank
Amelia Earhart Dam
MWR205
Somerville Marginal CSO Facility
DeLauri Pump Station
95 Acres of Sewer Separation
Stormwater Trunk Line to Mystic River
Somerville
East Somerville
Spring Hill
N
Not to Scale

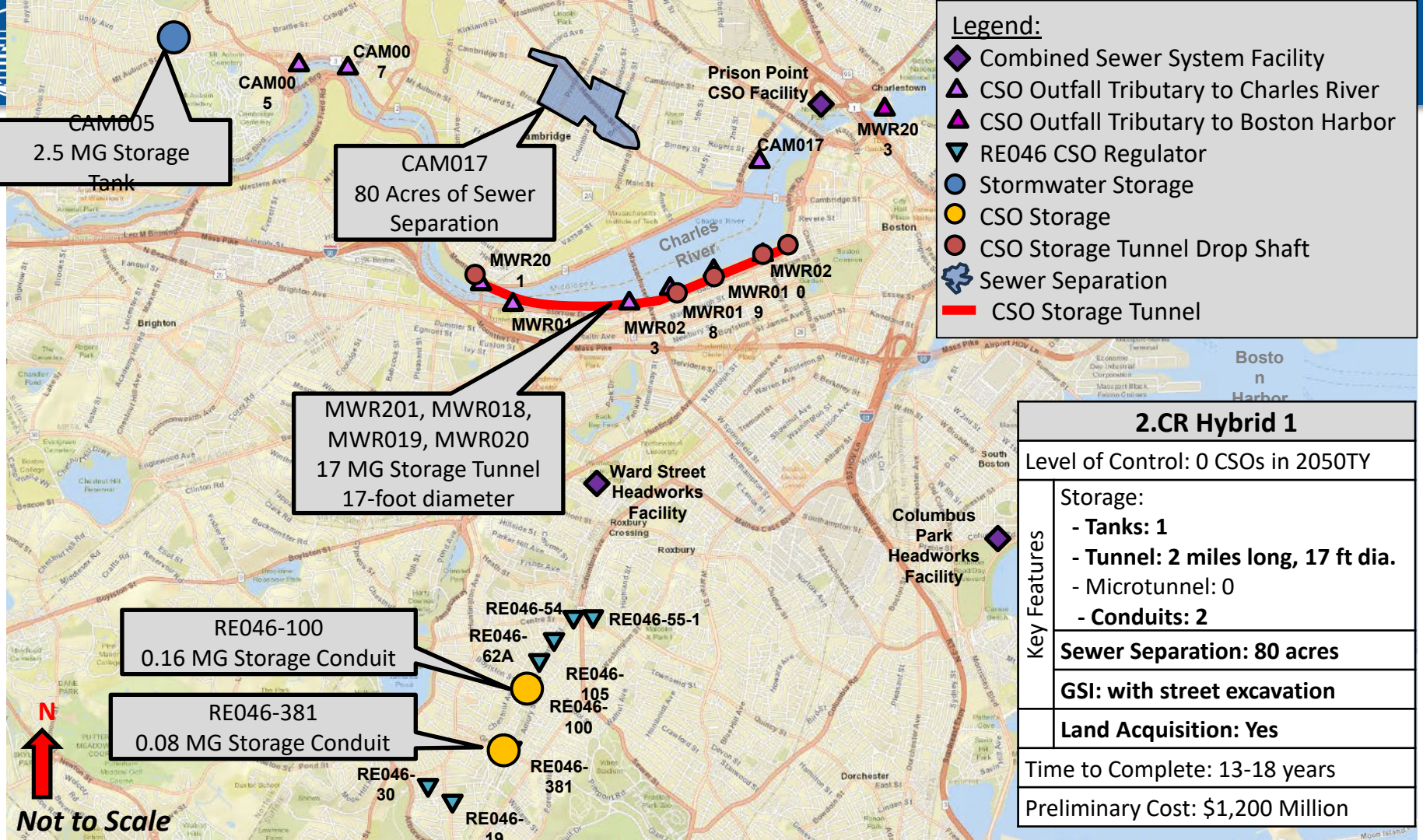
Charles River Alternatives

Charles River: Summary of Alternatives Under Consideration

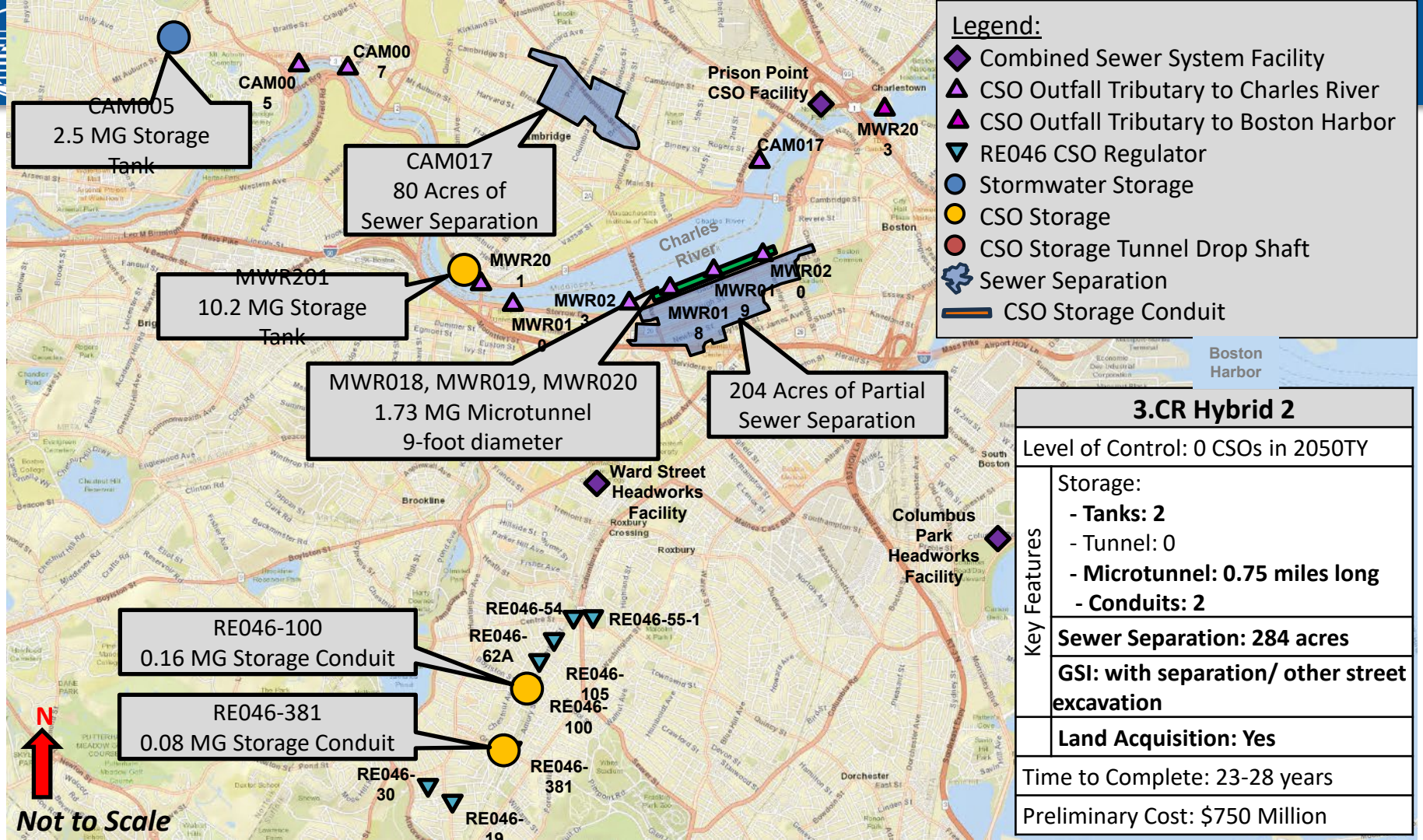
0 CSOs in 2050 Typical Year	Limited CSOs in 2050 Typical Year	0 CSOs in 2050 5-year Storm	0 CSOs in 2050 25-year Storm
1.CR Integrated 2 tanks (3.1 MG) + 2-mile-long deep tunnel (17 ft diameter) + 2 storage conduits	**8.CR Hybrid 1** 1 tank (2.5 MG) + 268 acres of sewer separation + 1 storage conduit	**10.CR Tunnel** 4.5-mile-long deep tunnel (24 ft diameter) +1-mile-long Microtunnel	**12.CR Tunnel** 4.5-mile-long deep tunnel (32 ft diameter)+ 1-mile-long Microtunnel + 1 storage conduit
2.CR Hybrid 1 1 tank (2.5 MG) + 80 acres of sewer separation +2-mile-long deep tunnel (17 ft diameter)			
3.CR Hybrid 2 2 tanks (12.7 MG) + 284 acres of sewer separation +0.75 mile-long Microtunnel + + 2 storage conduits			
4.CR Hybrid 3 2 tanks (12.6 MG) + 446 acres of sewer separation + 2 storage conduits	**9.CR Hybrid 2** 1 tank (2.5 MG) + 80 acres of sewer separation + 0.75 mile-long Microtunnel + storage conduit	**11.CR Tunnel + GSI** GSI to capture and treat 1 inch from 90 acres of impervious area + 4.5-mile-long deep tunnel + 1-mile-long Microtunnel (same tunnel as 10. CR)	**13.CR Tunnel + GSI** GSI to capture and treat 1 inch from 90 acres of impervious area +4.5-mile-long deep tunnel (same tunnel as 12. CR)+ 1-mile-long Microtunnel + 1 storage conduit
5.CR Tunnel 4.5-mile-deep tunnel (12 ft diameter) + 2 storage conduits			
6. CR Tunnel + GSI GSI to capture and treat 1 inch from 90 acres of impervious area + 4.5-mile-long deep tunnel (same tunnel as 5.CR) + 2 storage conduits			



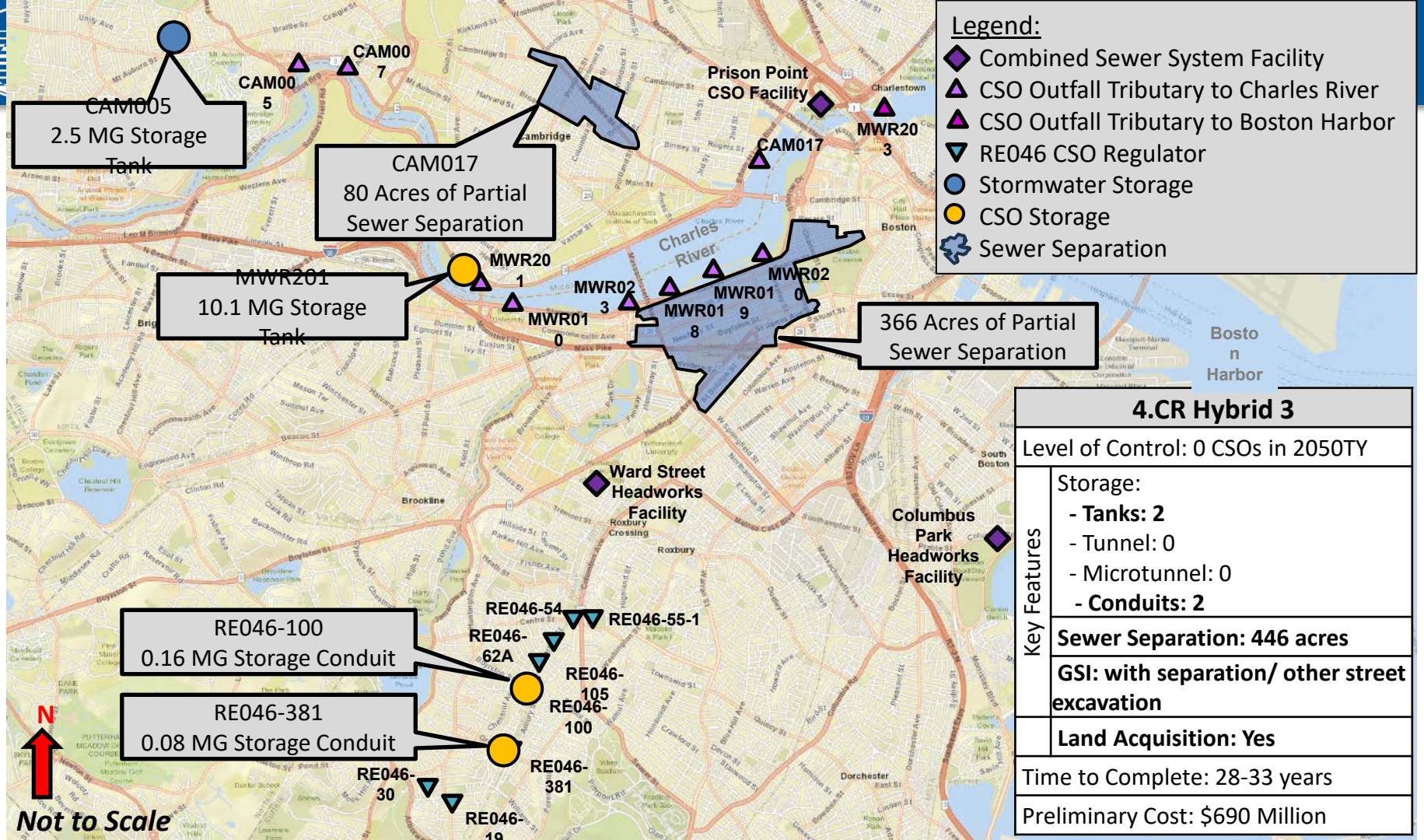
1.CR Integrated	
Level of Control: 0 CSOs in 2050TY	
Key Features	Storage: **- Tanks: 2** **- Tunnel: 2 miles long, 17 ft dia.** - Microtunnel: 0 **- Conduits: 2**
	Sewer Separation: 0
	GSI: with street excavation
	Land Acquisition: Yes
Time to Complete: 13-18 years	
Preliminary Cost: $1,100 Million	



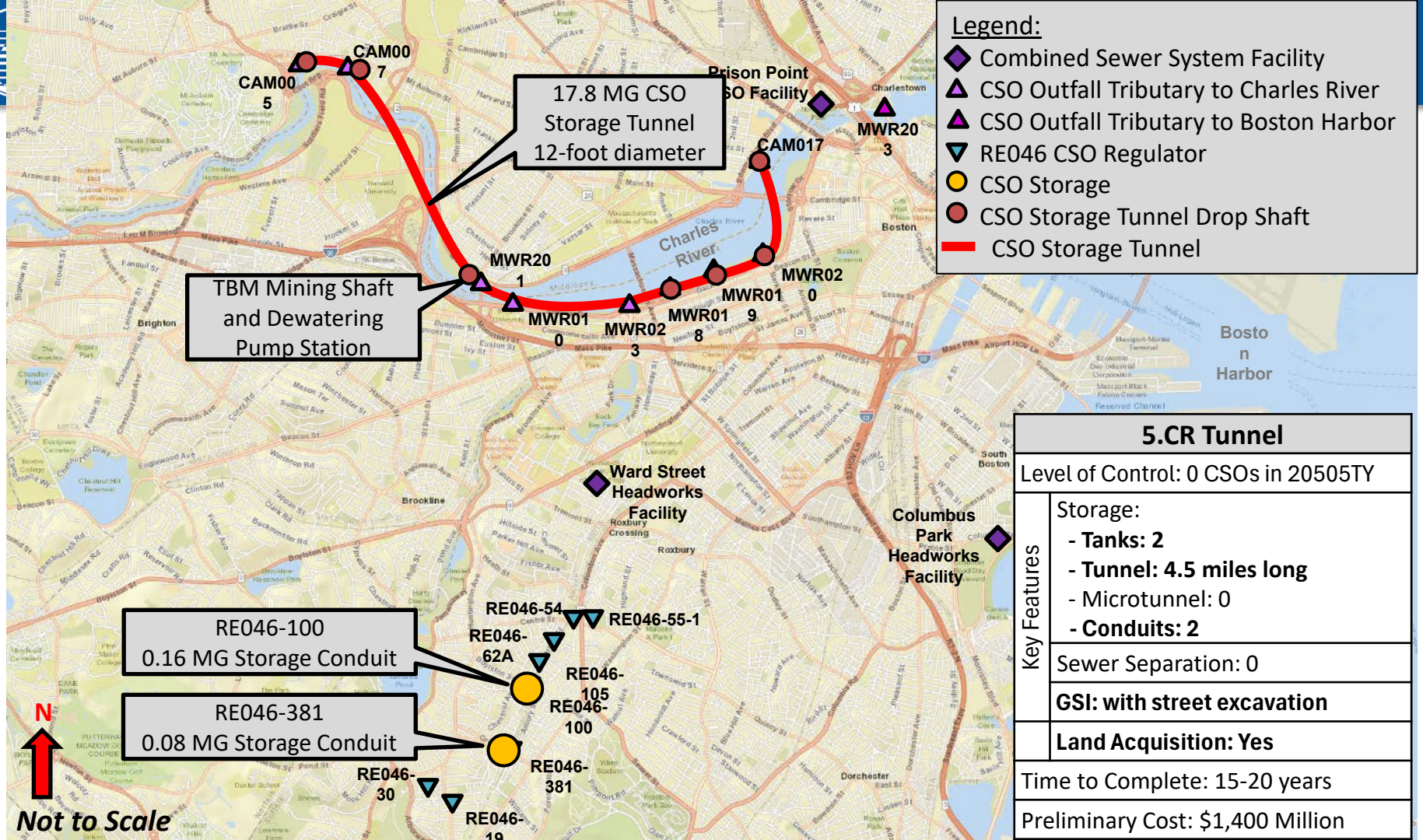
2.CR Hybrid 1	
Level of Control: 0 CSOs in 2050TY	
Key Features	Storage: **- Tanks: 1** **- Tunnel: 2 miles long, 17 ft dia.** - Microtunnel: 0 **- Conduits: 2**
	Sewer Separation: 80 acres
	GSI: with street excavation
	Land Acquisition: Yes
Time to Complete: 13-18 years	
Preliminary Cost: $1,200 Million	



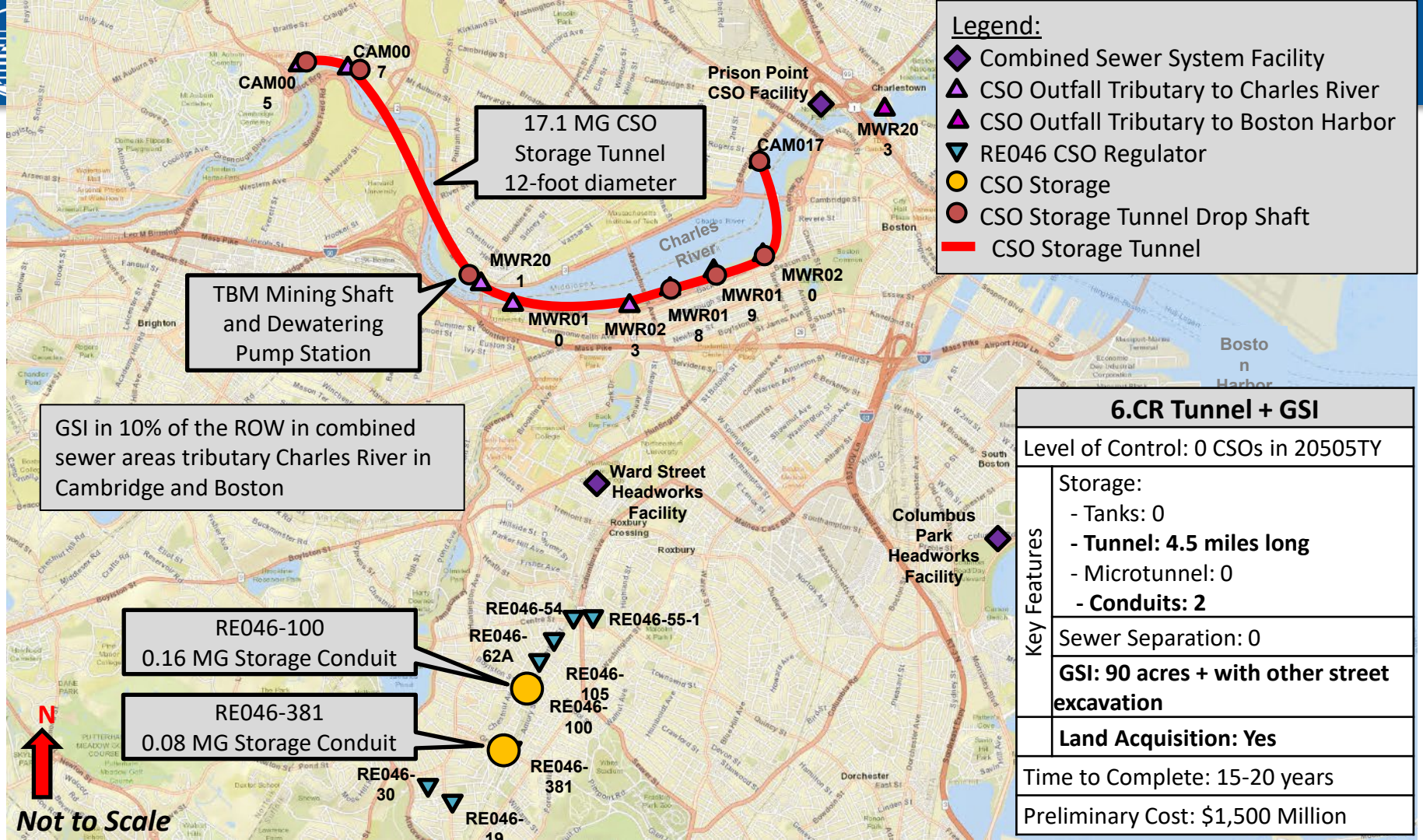
3.CR Hybrid 2	
Level of Control: 0 CSOs in 2050TY	
Key Features	Storage: **- Tanks: 2** - Tunnel: 0 **- Microtunnel: 0.75 miles long** **- Conduits: 2**
	Sewer Separation: 284 acres
	GSI: with separation/ other street excavation
	Land Acquisition: Yes
Time to Complete: 23-28 years	
Preliminary Cost: $750 Million	



4.CR Hybrid 3	
Level of Control: 0 CSOs in 2050TY	
Key Features	Storage: **- Tanks: 2** - Tunnel: 0 - Microtunnel: 0 **- Conduits: 2**
	Sewer Separation: 446 acres
	GSI: with separation/ other street excavation
	Land Acquisition: Yes
Time to Complete: 28-33 years	
Preliminary Cost: $690 Million	

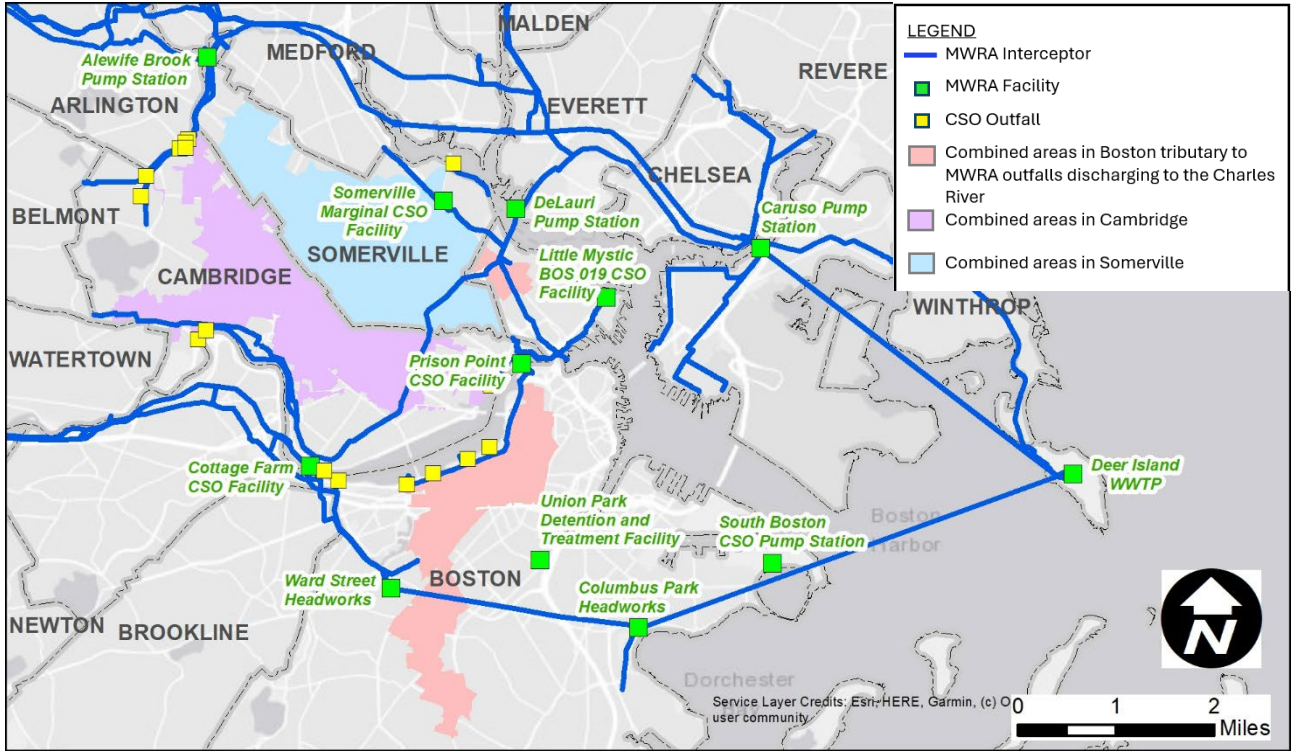


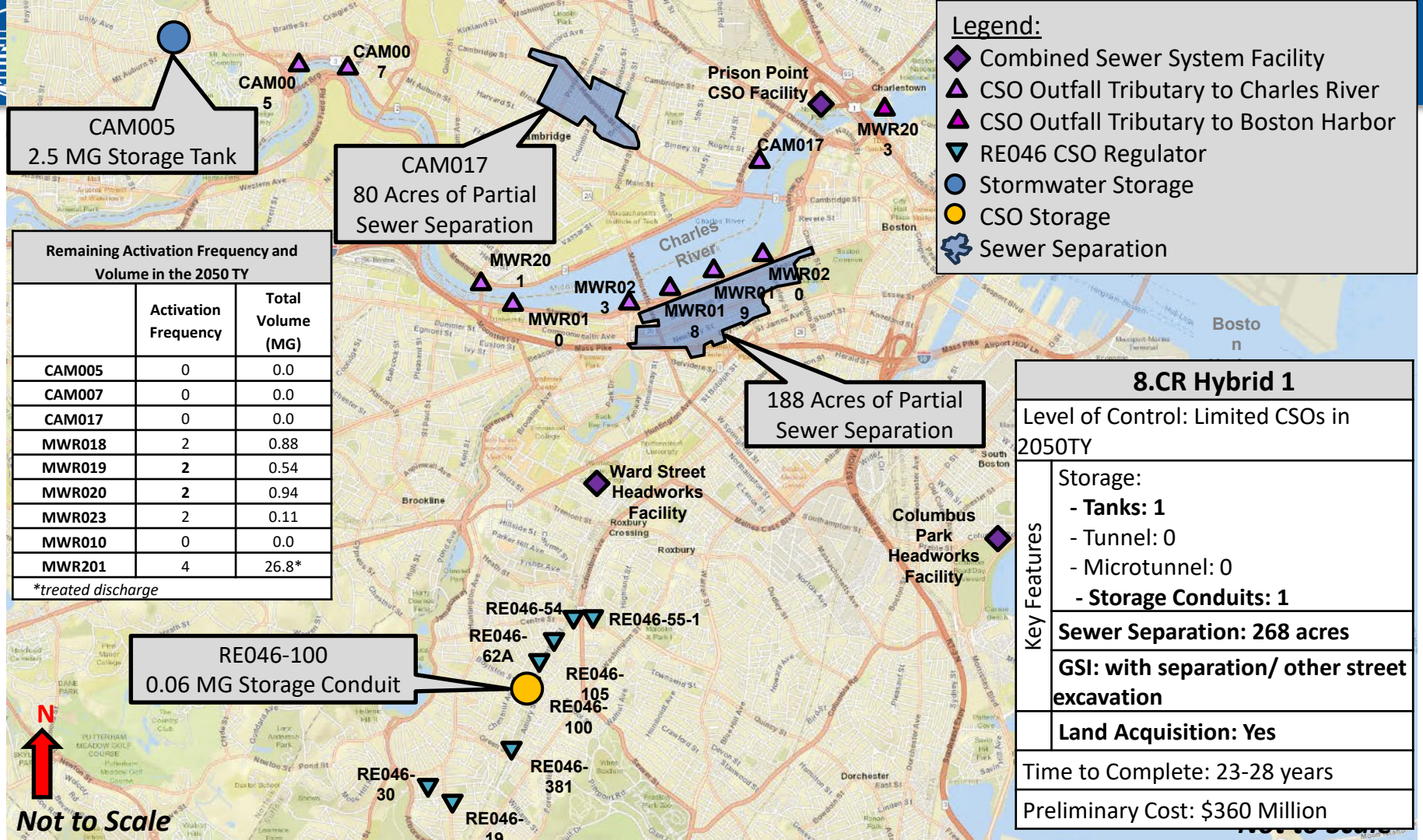
5.CR Tunnel	
Level of Control: 0 CSOs in 20505TY	
Key Features	Storage: **- Tanks: 2** **- Tunnel: 4.5 miles long** - Microtunnel: 0 **- Conduits: 2**
	Sewer Separation: 0
	GSI: with street excavation
	Land Acquisition: Yes
Time to Complete: 15-20 years	
Preliminary Cost: $1,400 Million	



6.CR Tunnel + GSI	
Level of Control: 0 CSOs in 20505TY	
Key Features	Storage: - Tanks: 0 **- Tunnel: 4.5 miles long** - Microtunnel: 0 **- Conduits: 2**
	Sewer Separation: 0
	GSI: 90 acres + with other street excavation
	Land Acquisition: Yes
Time to Complete: 15-20 years	
Preliminary Cost: $1,500 Million	

7.CR Sewer Separation	
Level of Control: 0 CSOs in 2050TY	
Key Features	Storage: - Tanks: 0 - Tunnel: 0 - Microtunnel: 0
	Conveyance: 0
	Sewer Separation: 4,400 acres
	GSI: with separation
	Land Acquisition: Yes
Time to Complete: 50+ years	
Preliminary Cost: $4,500 Million	





Remaining Activation Frequency and Volume in the 2050 TY		
	Activation Frequency	Total Volume (MG)
CAM005	0	0.0
CAM007	0	0.0
CAM017	0	0.0
MWR018	2	0.88
MWR019	**2**	0.54
MWR020	**2**	0.94
MWR023	2	0.11
MWR010	0	0.0
MWR201	4	26.8*
**treated discharge*		

8.CR Hybrid 1

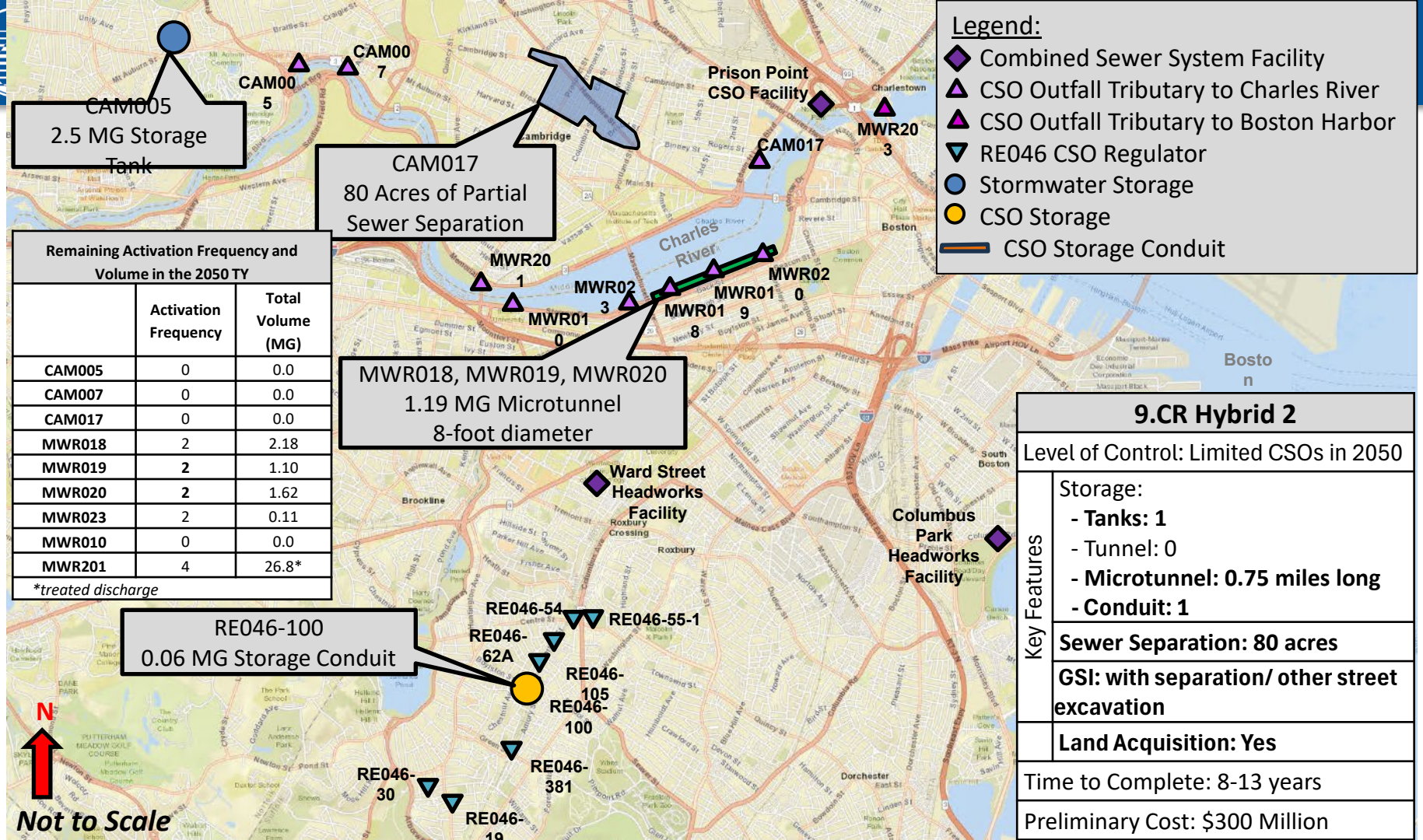
Level of Control: Limited CSOs in 2050TY

Key Features

- Storage:
  - **Tanks: 1**
  - Tunnel: 0
  - Microtunnel: 0
  - **Storage Conduits: 1**
- **Sewer Separation: 268 acres**
- **GSI: with separation/ other street excavation**
- **Land Acquisition: Yes**

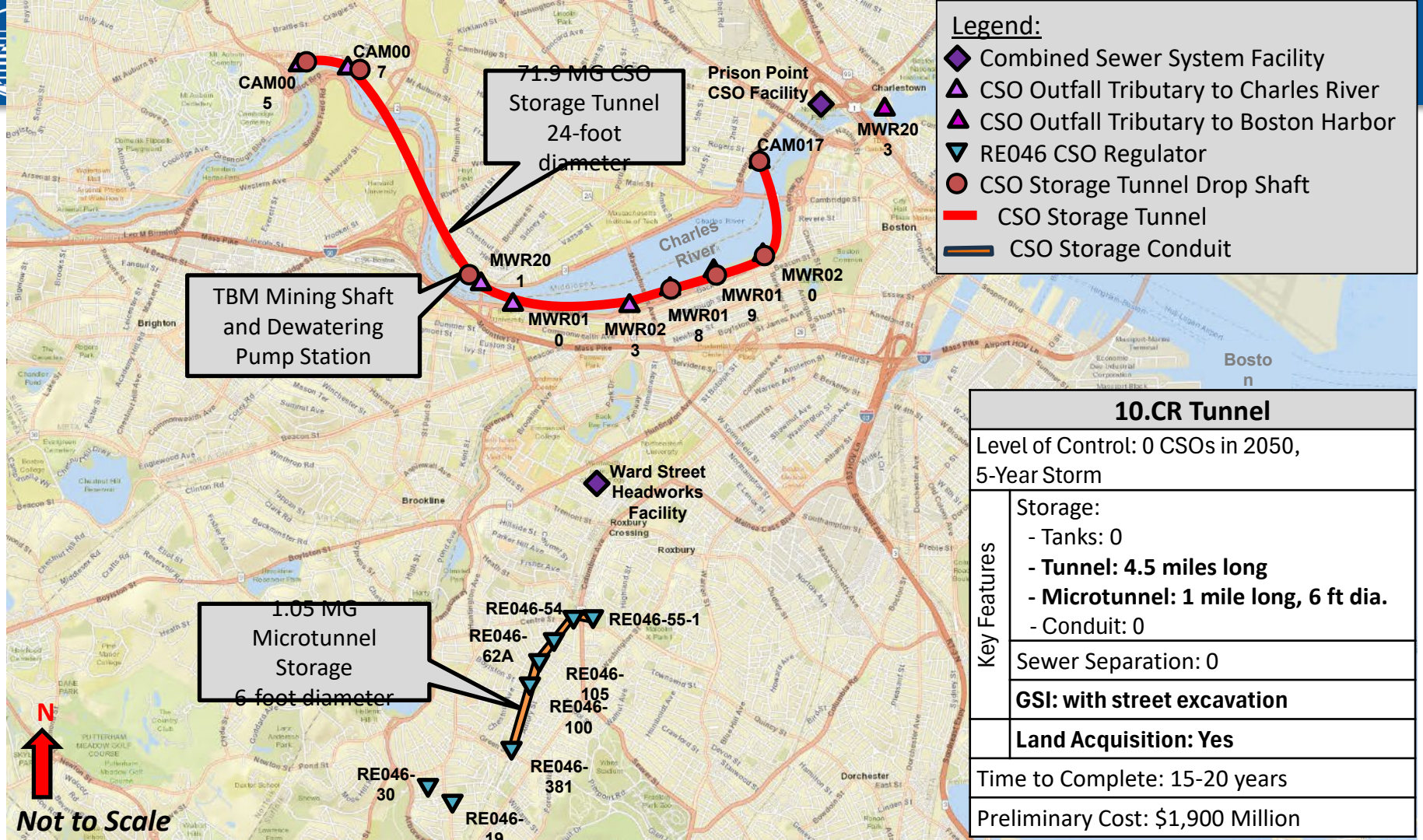
Time to Complete: 23-28 years

Preliminary Cost: $360 Million

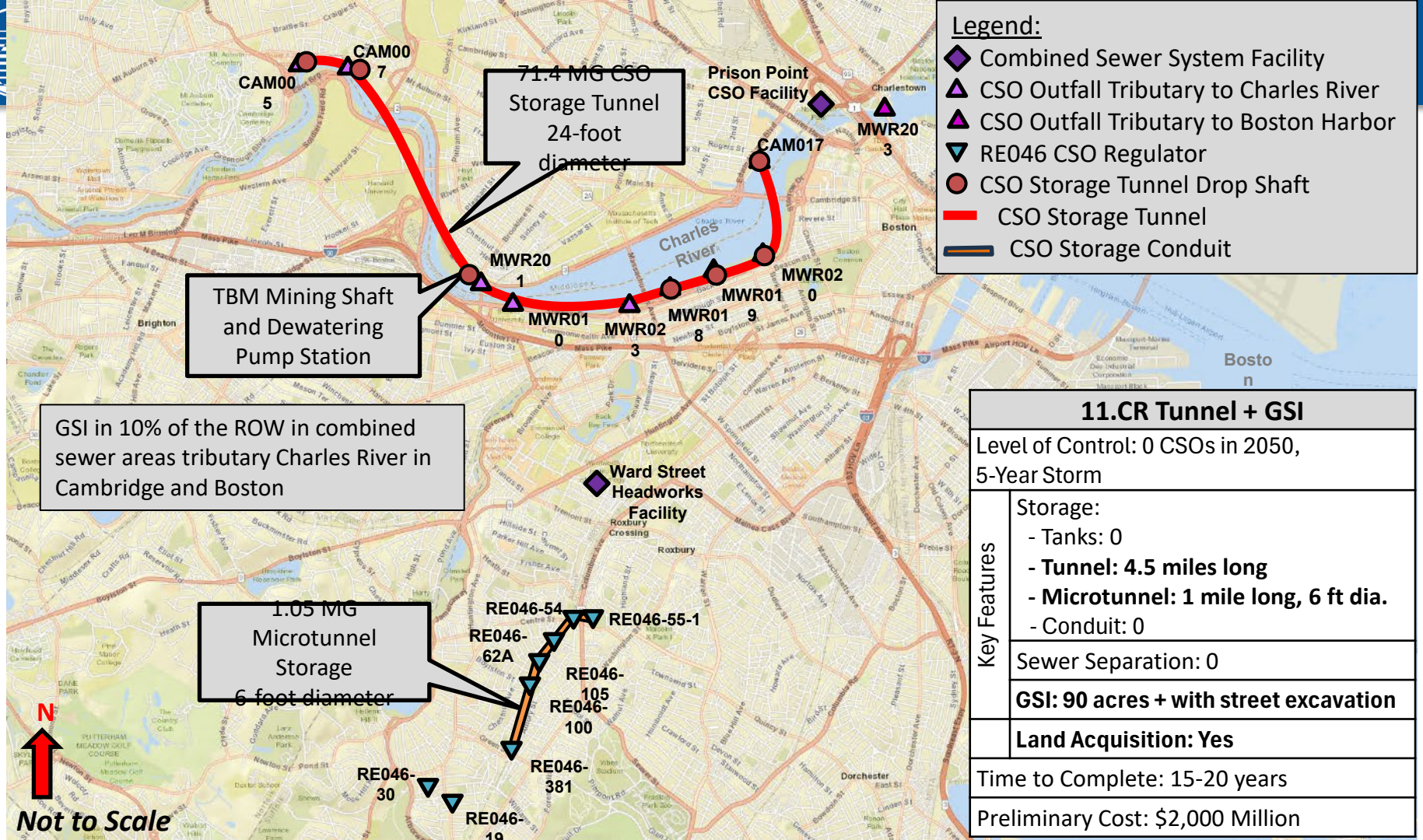


Remaining Activation Frequency and Volume in the 2050 TY		
	Activation Frequency	Total Volume (MG)
CAM005	0	0.0
CAM007	0	0.0
CAM017	0	0.0
MWR018	2	2.18
MWR019	**2**	1.10
MWR020	**2**	1.62
MWR023	2	0.11
MWR010	0	0.0
MWR201	4	26.8*
**treated discharge*		

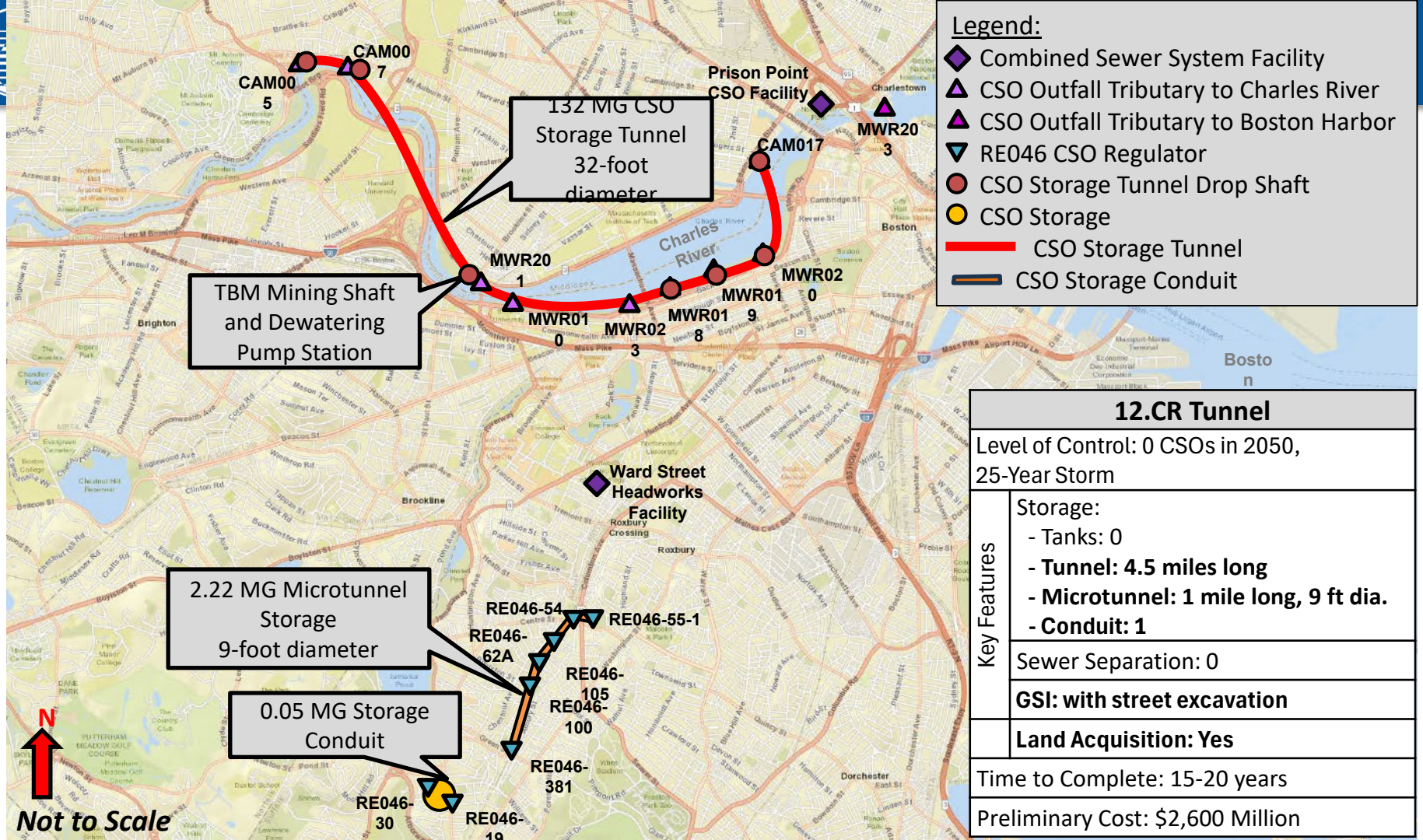
9.CR Hybrid 2	
Level of Control: Limited CSOs in 2050	
Key Features	Storage: **- Tanks: 1** - Tunnel: 0 **- Microtunnel: 0.75 miles long** **- Conduit: 1**
	Sewer Separation: 80 acres
	GSI: with separation/ other street excavation
	Land Acquisition: Yes
Time to Complete: 8-13 years	
Preliminary Cost: $300 Million	



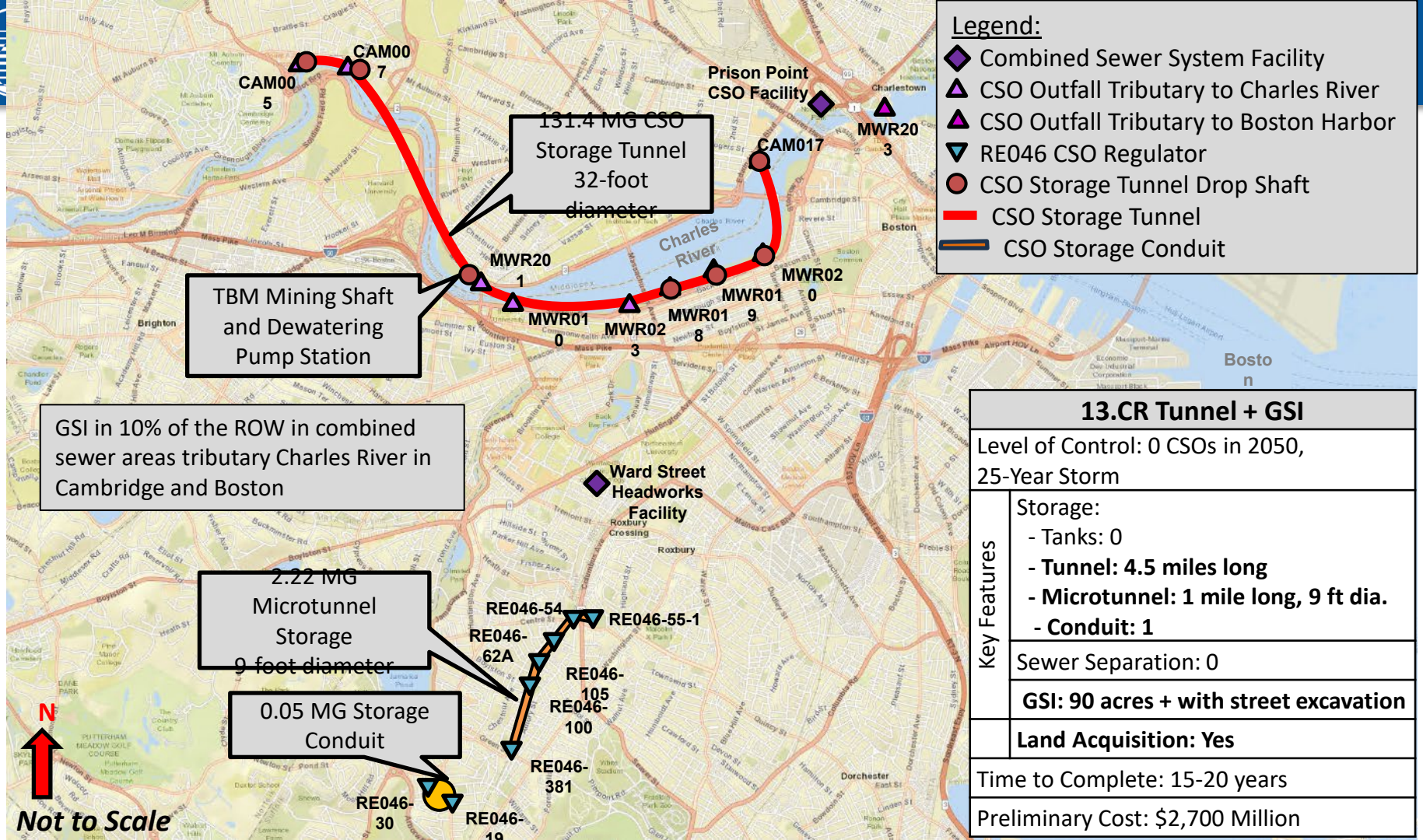
10.CR Tunnel	
Level of Control: 0 CSOs in 2050, 5-Year Storm	
Key Features	Storage: - Tanks: 0 **- Tunnel: 4.5 miles long** **- Microtunnel: 1 mile long, 6 ft dia.** - Conduit: 0
	Sewer Separation: 0
	GSI: with street excavation
	Land Acquisition: Yes
Time to Complete: 15-20 years	
Preliminary Cost: $1,900 Million	



11.CR Tunnel + GSI	
Level of Control: 0 CSOs in 2050, 5-Year Storm	
Key Features	Storage: - Tanks: 0 **- Tunnel: 4.5 miles long** **- Microtunnel: 1 mile long, 6 ft dia.** - Conduit: 0
	Sewer Separation: 0
	GSI: 90 acres + with street excavation
	Land Acquisition: Yes
Time to Complete: 15-20 years	
Preliminary Cost: $2,000 Million	



12.CR Tunnel	
Level of Control: 0 CSOs in 2050, 25-Year Storm	
Key Features	Storage: - Tanks: 0 **- Tunnel: 4.5 miles long** **- Microtunnel: 1 mile long, 9 ft dia.** **- Conduit: 1**
	Sewer Separation: 0
	GSI: with street excavation
	Land Acquisition: Yes
Time to Complete: 15-20 years	
Preliminary Cost: $2,600 Million	



13.CR Tunnel + GSI	
Level of Control: 0 CSOs in 2050, 25-Year Storm	
Key Features	Storage: - Tanks: 0 **- Tunnel: 4.5 miles long** **- Microtunnel: 1 mile long, 9 ft dia.** **- Conduit: 1**
	Sewer Separation: 0
	GSI: 90 acres + with street excavation
	Land Acquisition: Yes
Time to Complete: 15-20 years	
Preliminary Cost: $2,700 Million	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