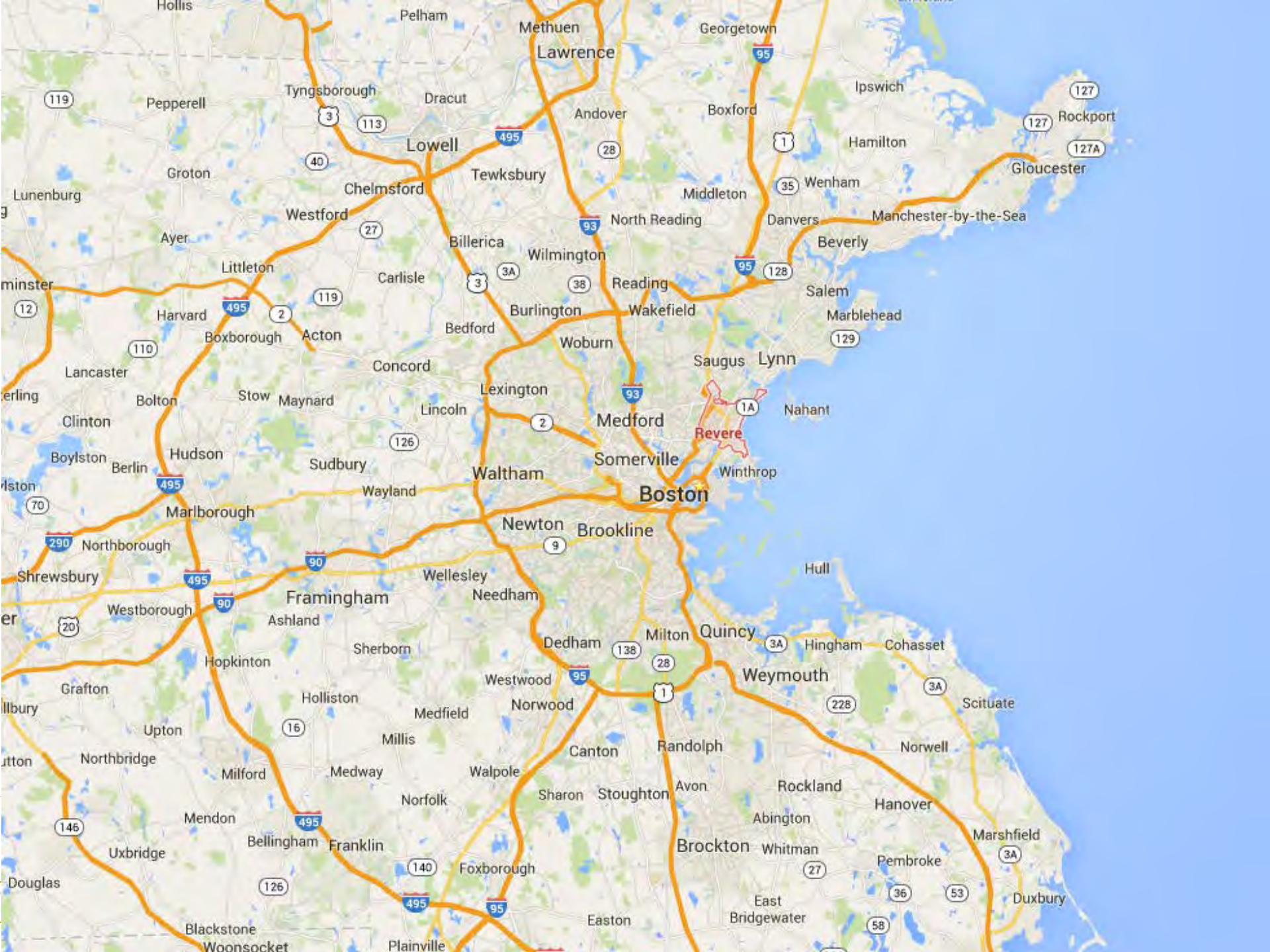
A Revolutionary City's Multi-Faceted Emergency Repair Under the Governor's Avenue

Nicholas J. Rystrom, P.E. – City of Revere

Jonathan E. Kunay, P.E. – CDM Smith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Pelham
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Lowell
Tewksbury
Chelmsford
Groton
Lunenburg
Middleton
Wenham
Westford
North Reading
Danvers
Manchester-by-the-Sea
Ayer
Billerica
Wilmington
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Littleton
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Lynn
Lancaster
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Wayland
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Newton
Brookline
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Westborough
Ashland
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Hingham
Cohasset
Sherborn
Hopkinton
Weymouth
Grafton
Westwood
Holliston
Norwood
Scituate
Medfield
Upton
Millis
Randolph
Norwell
Northbridge
Canton
Milford
Medway
Walpole
Avon
Rockland
Norfolk
Sharon
Stoughton
Hanover
Mendon
Abington
Marshfield
Bellingham
Franklin
Brockton
Whitman
Uxbridge
Foxborough
Pembroke
Douglas
East
Bridgewater
Duxbury
Easton
Blackstone
Woonsocket
Plainville

The City of REVERE, MASSACHUSETTS

Consent Decree (CD)

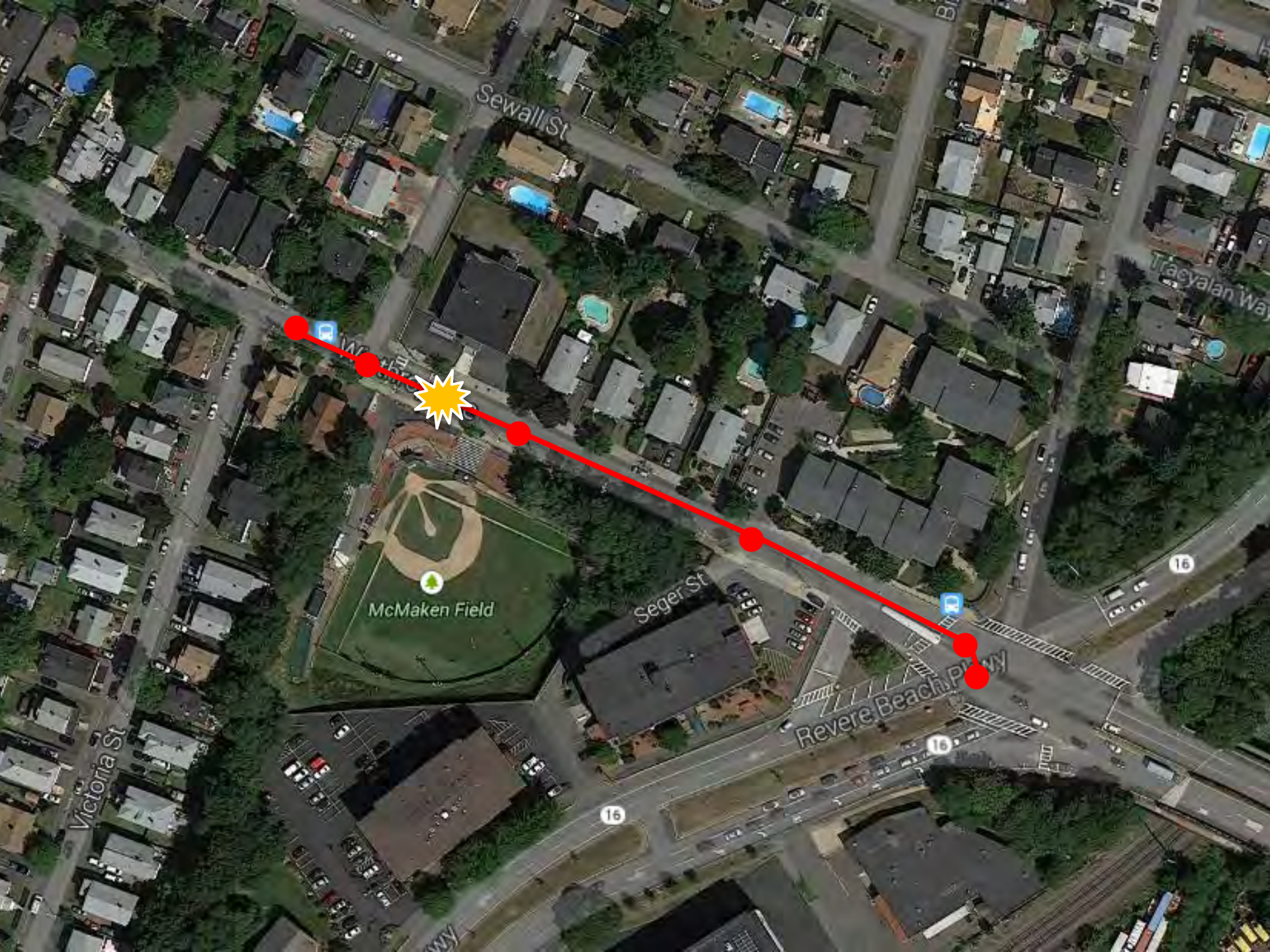
Civil Action No.
1:10-cv-11460

- Entered into in 2010 with MassDEP & USEPA
- Violations of Clean Water Act
- Compliance Requirements
  - Eliminate sanitary sewer overflows (SSOs)
    - Evaluate system conditions
      - Clean & CCTV inspect system
    - Remove inflow & infiltration (I/I)
      - Sewer system rehabilitation

Experienced catastrophic collapse on Winthrop Avenue during cleaning and CCTV inspection

Winthrop Avenue Sewer
The “Governors Avenue”

- 100 years old
- 18”Ø VCP
- 20’ deep
- Carries 30% of City flow
  - 2.3 MGD
- Very busy street


Sewall St
McMaken Field
Seger St
Revere Beach Pkwy
Victoria St
16
16
16


Winthrop Ave

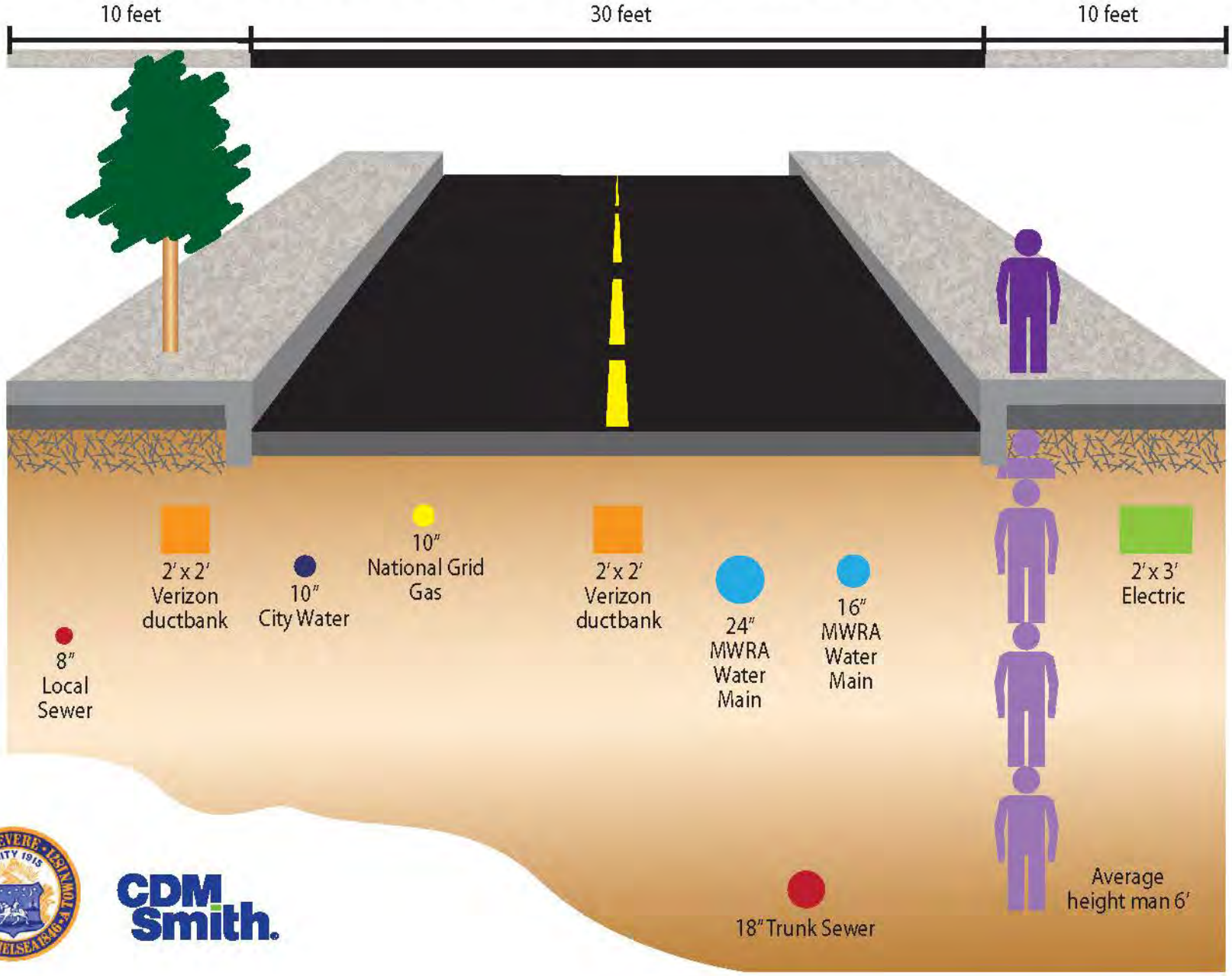
Goals of the Project

- Aiming for quick & easy repair with minimal disruptions to community
- Address long-term infrastructure upgrades while simultaneously executing the repair
- Alleviate ongoing O&M issues upstream
  - Grease and backups

Challenges Faced

- Existence of many other utilities within roadway
  - MWRA water mains
  - National Grid gas main
  - Local City water main (100 yrs old)
  - Local City sewers
  - Local City drains

Winthrop Avenue Looking East Toward Revere Beach Parkway



MWRA Water Mains

- High pressure & large diameter
  - 16” & 24” directly over collapse
  - 10” on other side of the street
- Provides 4.6 MGD to 100,000 people
  - 50% of the City of Revere (1.91 MGD)
  - The Town of Winthrop (1.23 MGD)
  - East Boston High Service Area (0.21 MGD)
  - Deer Island WWTP (1.25 MGD)
- Required permits and special design considerations

Additional Challenges

- MassDOT Jurisdiction on Revere Beach Parkway
  - Permits
  - Special police details
  - Restricted work hours
  - Heavy traffic
- Extreme winter weather
- Funding

Evaluation of Alternatives

Pipe Bursting (existing pipe)

- Pros
  - Increase capacity
  - Repair collapse
- Cons
  - Vibration (other utilities)

Pipe Jacking/Micro Tunneling (new parallel pipe)

- Pros
  - Increase capacity
  - Eliminate collapse
- Cons
  - Large access pits
  - Cost

Evaluation of Alternatives

CIPP Lining (existing pipe to prevent further collapse)

- Pros
  - Trenchless
  - No open cuts
- Cons
  - Inability to address capacity
  - Inability to line through collapse

Open Cutting (existing pipe or new parallel pipe)

- Pros
  - Increase capacity
  - Eliminate collapse
- Cons
  - Very deep
  - Relocation of exisiting utilities

Recommended Alternatives

- CIPP Lining (existing pipe to prevent further collapse)
- Setup water main bypass
- Temporarily remove water mains above collapse
- Open cut removal and replacement of sewer collapse
- Replace water mains

Funding

- Capital funds not available in City budget
- City engaged MassDEP to help acquire funding
- Creative solutions were implemented
  - $2 million acquired through CWSRF emergency funding
  - Funds utilized from contingencies of on-going sewer rehabilitation projects

Design – Part I

- Mitigate disruption and insure integrity of MWRA transmission lines
  - Redundancy Required
    - 2 of 3 mains in service at all times
  - Install insulated 16”Ø by-pass above ground
  - Temporarily remove (cut & cap) 16”Ø & 24”Ø water mains
  - Excavate collapsed sewer
  - Install new 16”Ø & 24”Ø water mains

Design – Part II

- Mitigate further damage to existing sewer infrastructure immediately up & down stream
  - By-pass related flows
  - Clean & CCTV inspection
  - CIPP line
    - 18”Ø sewer
    - 8”Ø local
    - Related services
    - Related MH structures

Design – Part III

- Perform open cut replacement of sewer collapse
  - Excavate & support 20’ deep trench
  - Remove collapsed and aging VC pipe
  - Replace with 165‘ of new 18”Ø PVC

Construction: Bypass pumping

- Install sewer bypass
  - Trench across Revere Beach Parkway
  - Insulate and protect pumps
  - Monitor 24/7
- Restrict traffic on Winthrop Avenue
  - Reroute MBTA bus traffic
  - Close street to 2-way traffic

Construction: CIPP lining

- Extreme weather (polar vortex)
  - 40°F to 7°F
    - Curing water temperature
    - Equipment failure
    - Installation deficiencies
  - Lined approx. 800’ of 8”Ø and 18”Ø pipe


Vermont
RAMC 772
Green Mountain State

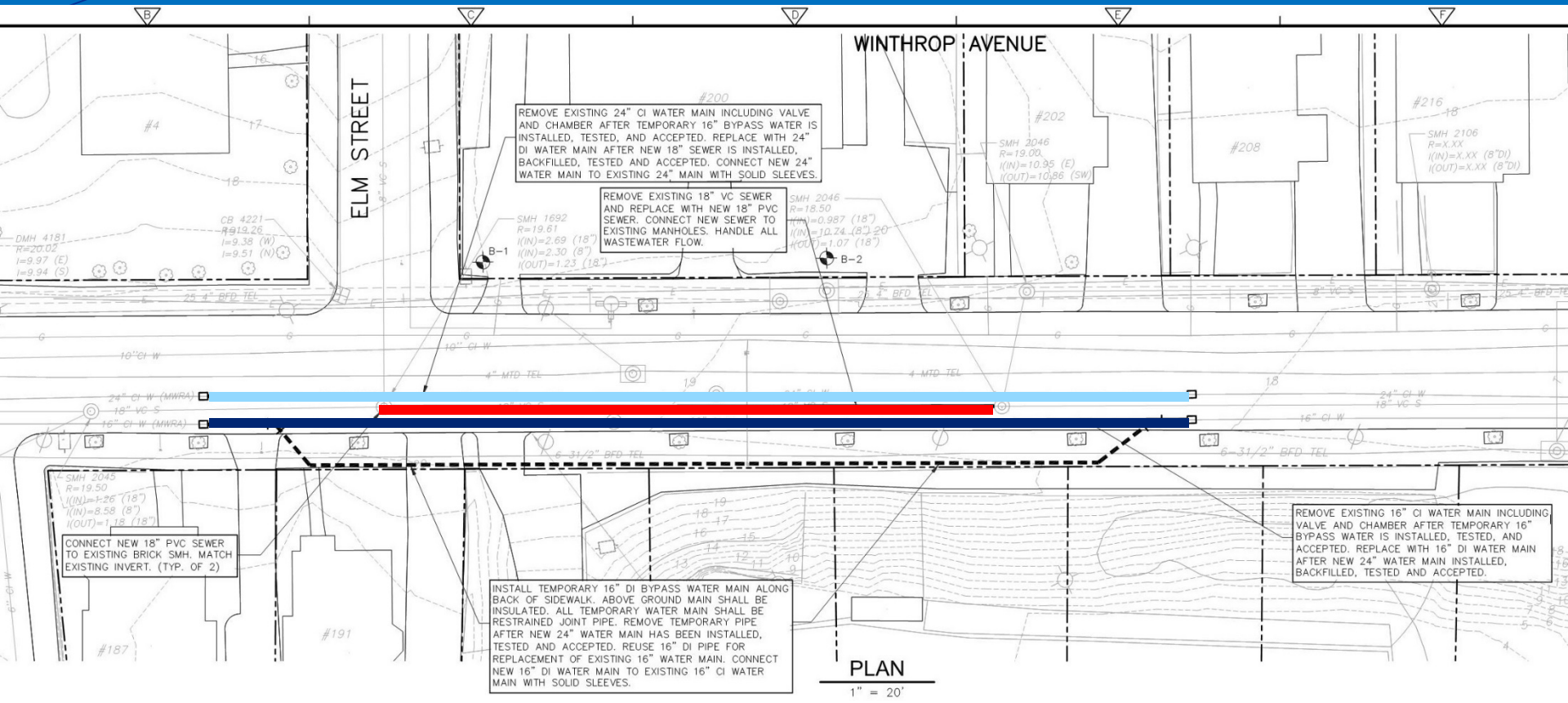
Construction: Service Laterals

- Service lateral lining & replacement
  - All but one lateral connection was lined with CIPP
  - One service tied to 18” sewer with gushing infiltration – 20’ deep
    - Rerouted to MH downstream at less depth
    - Difficulty navigating and relocating many existing utilities
    - Existing reinstated service eliminated with CIPP short liner

Construction:
Water Main Bypass & Removal

- MWRA required redundancy – 2 mains active
- Isolate 16”Ø main, tap and bypass above ground
- Cut and Cap 16”Ø and 24”Ø mains

Construction:
Water Main Bypass & Removal



16" Water
24" Water
18" Sewer

Construction:
Water Main Bypass & Removal

- MWRA required redundancy – 2 mains active
- Isolate 16”Ø main, tap and bypass above ground
- Cut and Cap 16”Ø and 24”Ø mains


LiuGONG

Construction:
18” Ø Sewer Collapse Repair

- Initial Emergency Repair
  - Support & excavate 20’ deep cut
  - Remove 18”Ø VC pipe & replace with 18”Ø PVC
  - Test and activate new line

No significant problems encountered due to proper planning and upfront work


DOOSAN


TRENCH SAFETY
800 UR-REN
United Rentals
TRENCH SAFETY
SOLUTIONS

Construction:
Water Main Reinstatement

- Install new 24”Ø water line in previous location
  - Test, disinfect and activate
- Install new 16”Ø water line in previous location
  - Test, disinfect and activate
- Remove temporary bypass


10"G

Construction: Manhole Rehabilitation

- Cementitious lining
  - Lined 4 manhole structures
- Interior drop connections installed
  - New service connection from #220

Summary of Project

- 7 months at a cost of $2.5M
- 2 Contractors and 1 Consultant
- Multiple funding sources
- Amalgam of several different design and construction techniques
- Work on 4 different infrastructure systems
- Collaboration of 10+ different entities

THANK YOU!

- MWRA
- City of Revere – DPW
- CDM Smith
- Mass DEP
- Albanese D & S
- Green Mountain Pipeline Services
- National Grid
- Revere Police Dept.
- Mass. State Police
- Local Residents

Questions?

- Nicholas J. Rystrom, P.E. – nrystrom@revere.org
- Jonathan E. Kunay, P.E. – kunayje@cdmsmith.com

Thank you for attending!