



Metropolitan Water Tunnel Program

Town of Wellesley

Board of Public Works

Program Update

November 15, 2022



Topics

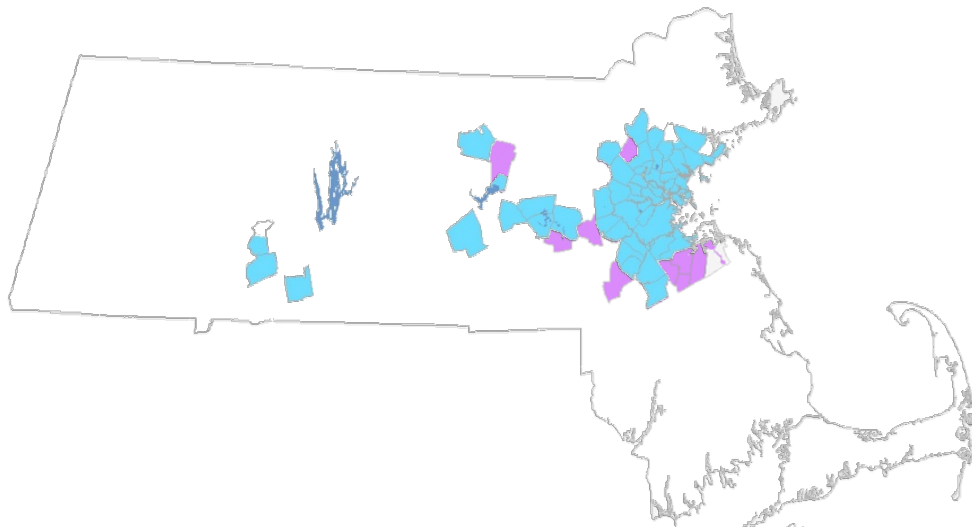
- MWRA – who we are and what we do
- Need for Redundancy and the Metropolitan Water Tunnel Program
- Tunnel Program – overview
- Considerations for Selection of the Preferred Alternative
- Proposed Hegarty Pump Station Connection Shaft Site
- Conceptual Construction Schedule
- Land Acquisition
- Where to Find Information / How to Contact Us
- Questions



MWRA - What We Do ...

The MWRA ...

- provides wholesale water and wastewater services to over 3.1 million customers in 61 communities
- delivers an average of 200 million gallons per day to its water customers
- collects and treats an average of 350 million gallons of wastewater per day, with a peak capacity of 1.2 billion gallons



We have ...

- 102 miles of active transmission mains and tunnels (plus 43 miles on standby), including a number of deep rock pressure tunnels
- 284 miles of distribution mains with over 4,700 valves
- 5 years of storage for water supply
- 12 pump stations
- ~ 85% of our water is delivered by gravity

We Must...

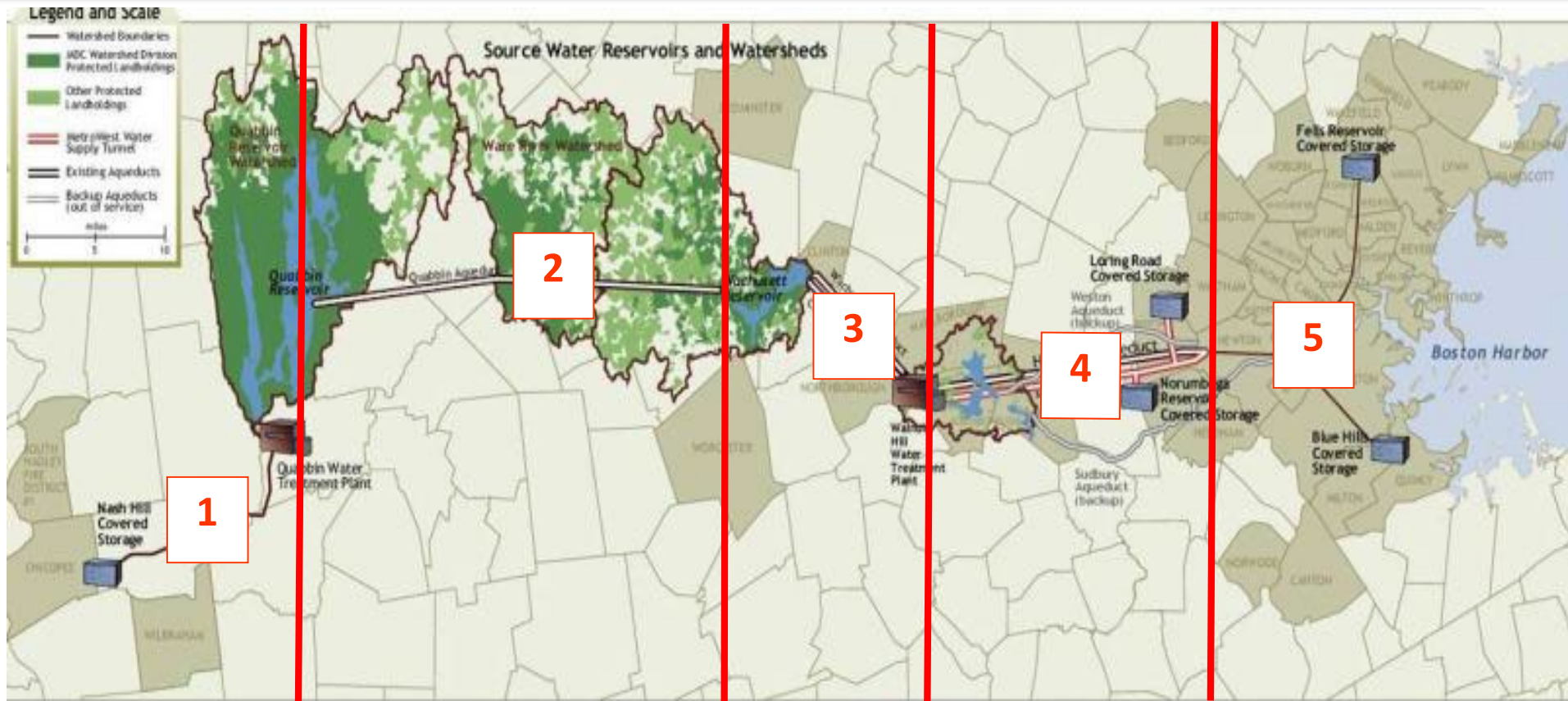
- Deliver water to protect public health, provide sanitation, and fire protection

We Need to....

- Have the ability to swiftly respond to a disruption in service
- Maintain and rehabilitate surface piping, key valves and tunnels on a periodic basis



MWRA Water System

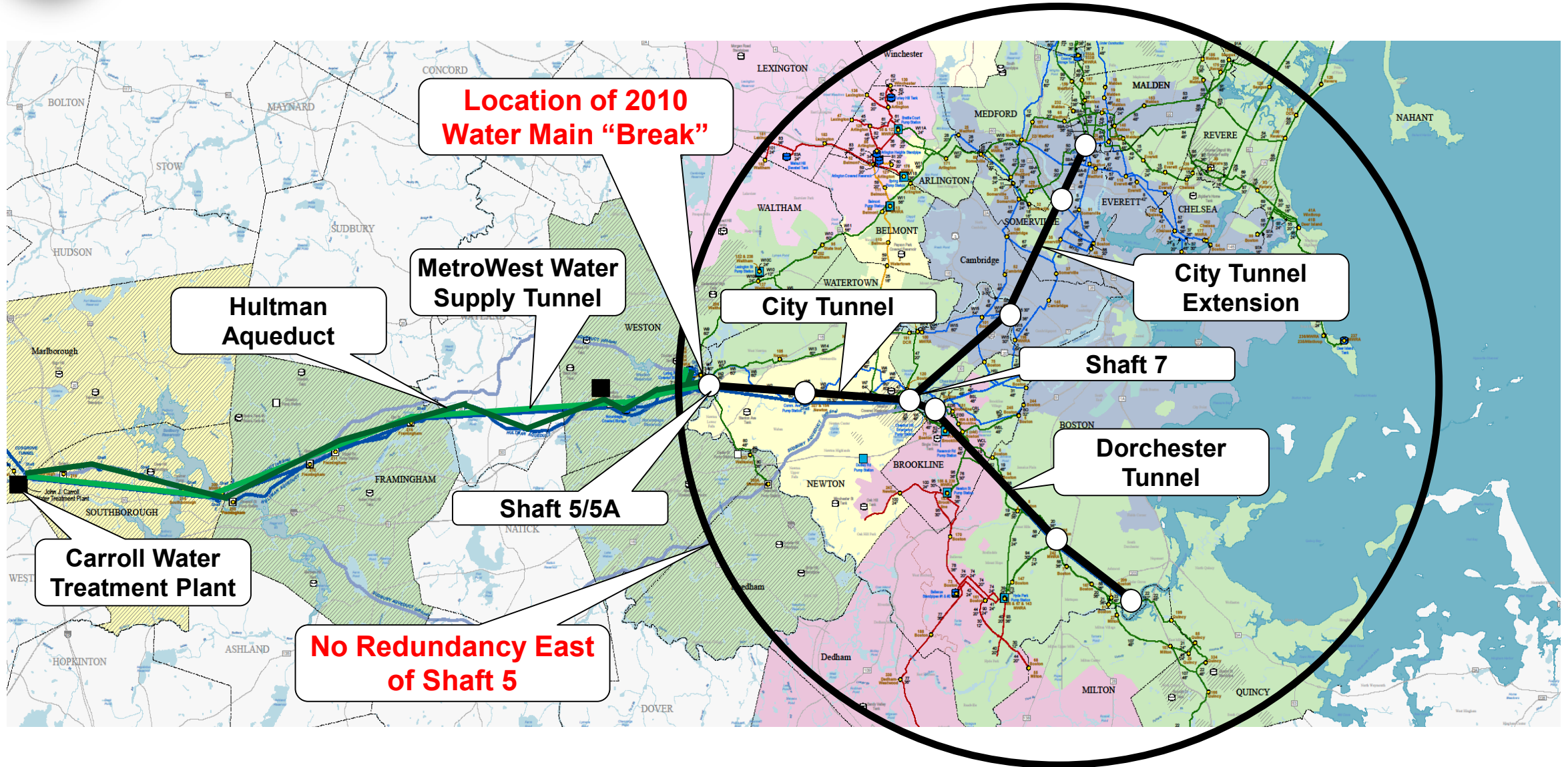


1. Chicopee Valley Aqueduct
2. Quabbin Aqueduct
3. Cosgrove Tunnel / Wachusett Aqueduct
4. MetroWest Tunnel / Hultman Aqueduct
5. Metropolitan Tunnels

- 2007 Improvements ✓
- Inspection planned ✓
- 2019 Improvements ✓
- 2003/2013 Improvements ✓
- Significant Needs ← Next!



Metropolitan Tunnel System Serves About 60 Percent of Water Demand in Metropolitan Area





Condition of the Existing Metropolitan Tunnel System

- Tunnel system:
 - Concrete-lined deep rock pressure tunnels
 - Steel and concrete lined vertical shafts
 - Surface pipe, valves and appurtenances
- Little maintenance required for tunnels and shafts. Little risk of failure
- Pipe, valves and appurtenances need maintenance, rehabilitation, replacement
- Currently we cannot maintain the tunnel system east of Shaft 5 because a shutdown of the entire Metropolitan Tunnel System would be required





Pipe, Valves and Appurtenances Concerns

Valve Reliability

- Can't operate or maintain



Shaft 8 PRV Chamber

Difficult Access

- High ground water/Infiltration
- Corrosion



Shaft 7C connection to Section 58

Appurtenance Liabilities

- Small pipe failures can lead to shutdowns



Air valve at Shaft 9A

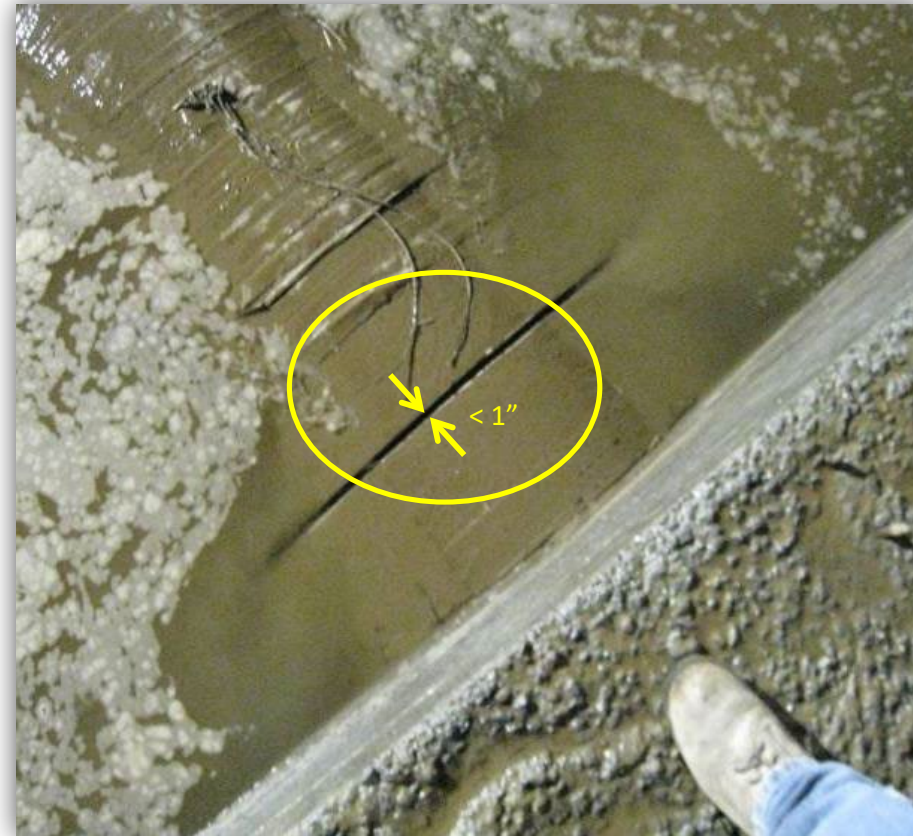


The Great Water Main Break of May 2010

Small pipe failures can lead to big problems



250 MGD flow at Shaft 5 break....



...came from a small gap in the pipe



We Need Redundancy!

- Why do we need a redundant water distribution system?
 - Valve reliability for the Metropolitan Tunnels is a concern
 - Without the ability to close (and then reopen) valves, there is no way to isolate a portion of the Metropolitan Tunnel System
 - Many valves have reached the end of their useful life but can't be replaced because shutdown of the City Tunnel would be required...which we cannot do
 - A failure anywhere within the Metropolitan Tunnel System requires shut down at Shaft 5, which is the limit of current distribution redundancy
 - Water main break at Shaft 5 in 2010 put a “sharp point” on the need to operate these valves and have full redundancy
- If we do nothing, another **failure** will eventually occur



Metropolitan Water Tunnel Program = Redundancy

- The planned Tunnel Program provides redundancy to the existing tunnel system which needs repair
- The new tunnel system is not intended to provide new connections between existing water distribution systems to the MWRA's main water supply distribution system, it provides a 2nd (redundant) connection where one already exists
- Hegarty PS is current supplied by Section 80 (which also needs repair)
- A 2nd connection between MWRA's system and the Hegarty PS limits the potential for future service interruption due to maintenance, emergency, etc.



Metropolitan Water Tunnel Program

Key Locations

Construction Shaft Sites

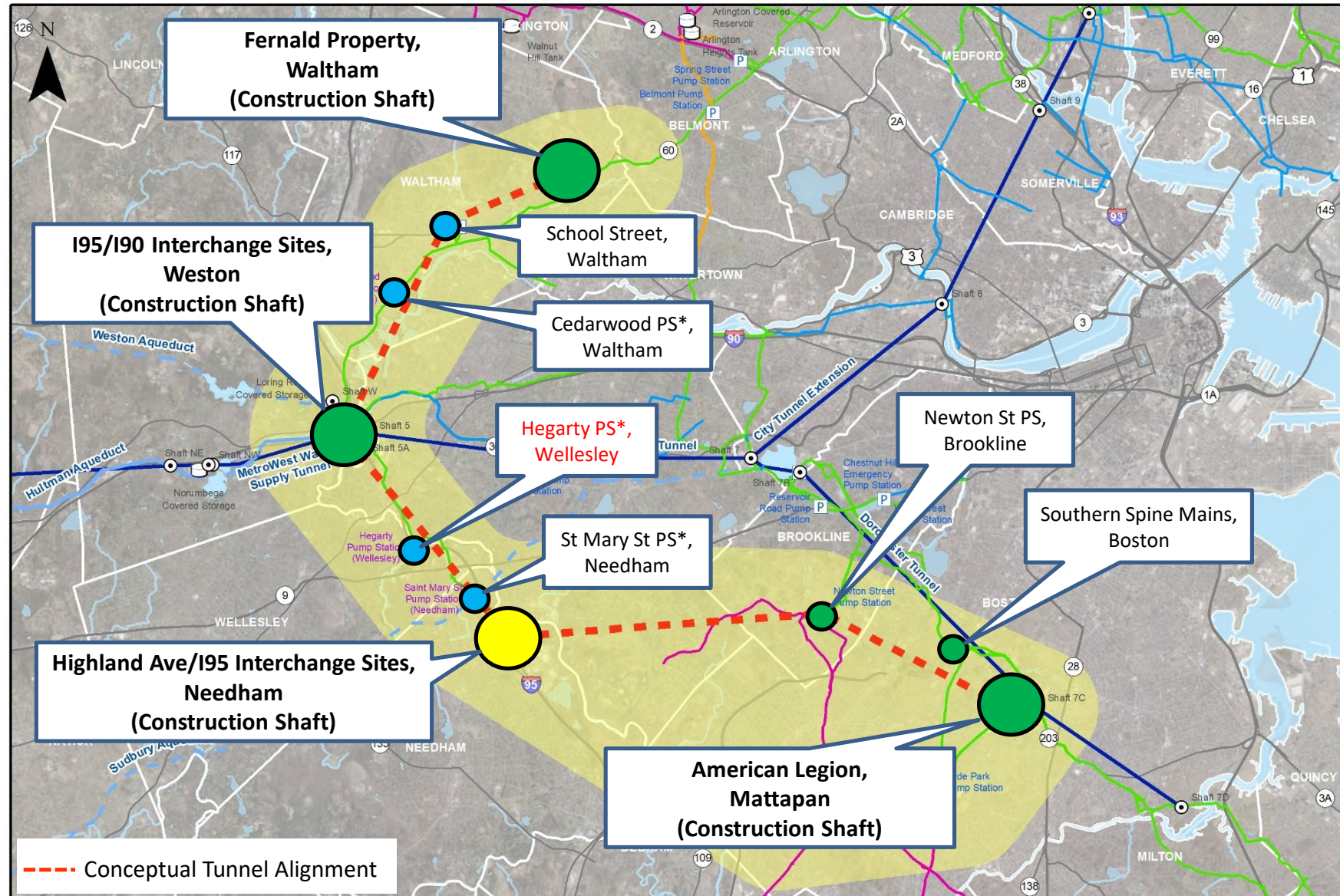
- Fernald Property, Waltham
- I90/I95 Interchange, Weston
- Highland Ave/I95 Interchange, Needham
- American Legion, Mattapan

Connection Shaft Sites

- Lexington St Pump Station, Waltham
- Cedarwood Pump Station, Waltham
- **Hegarty Pump Station, Wellesley**
- St. Mary Street Pump Station, Needham
- Newton Street Pump Station, Brookline
- Southern Spine Mains, Boston

Final shaft locations subject to permits and real estate acquisition

- * Non MWRA Pump Station
- Required Connection (required for system redundancy)
- Secondary Connection (provides local benefit)
- Construction Shaft (no connection)



--- Conceptual Tunnel Alignment

For discussion only



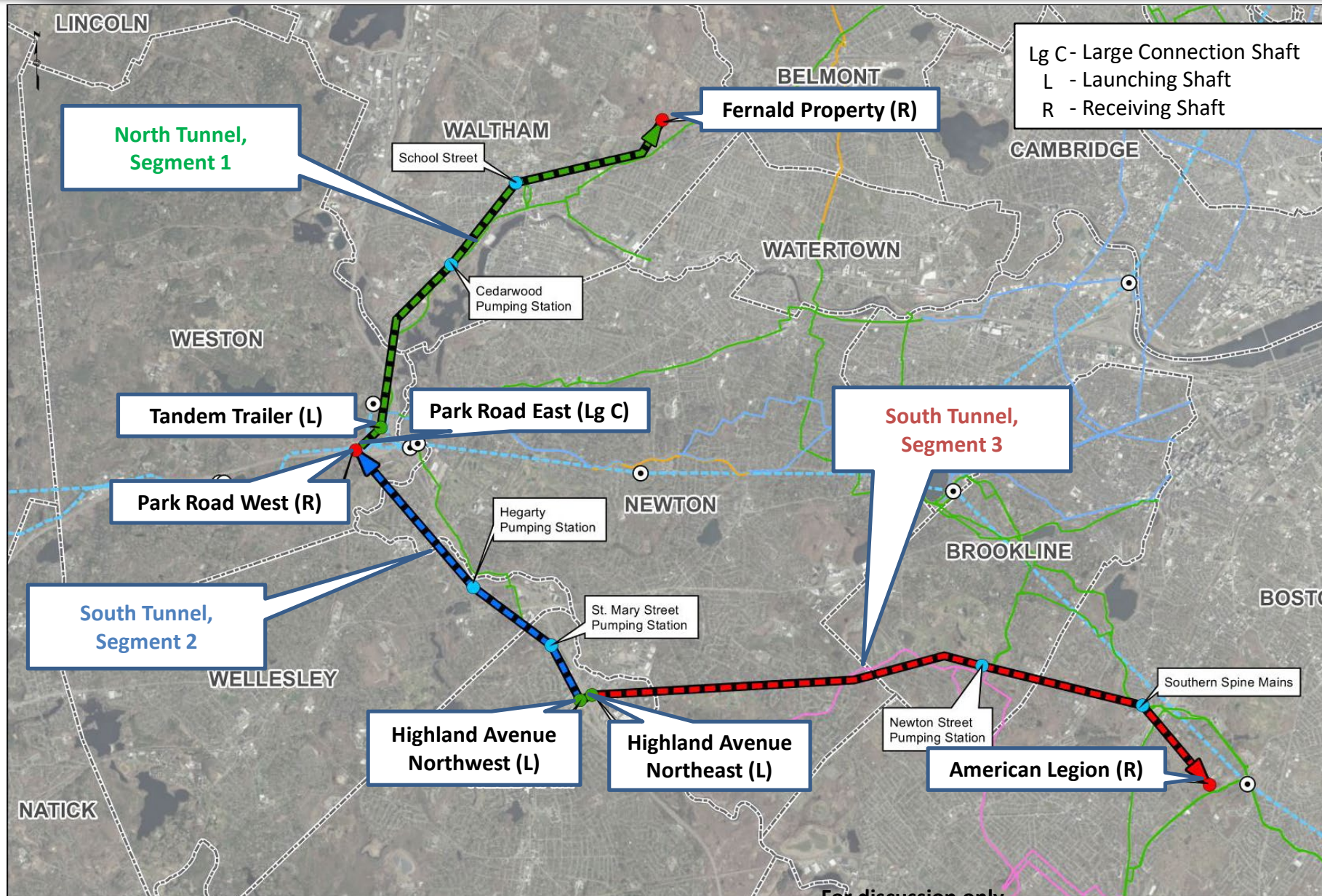
Considerations for Selection of the Preferred Alternative

When selecting the preferred alternative, the MWRA considered:

- Hydraulic connection points to existing water infrastructure
 - Engineering and constructability
 - Operation of the permanent facilities
 - Availability of land
 - Environmental, social and community impacts
 - Contract packaging, contract interfaces, phasing and sequencing
 - Schedule
 - Cost
-
- The alternative evaluation and selection process are detailed in the DEIR www.mwra.com/mwtp/resources.html#docs



Preferred Alternative



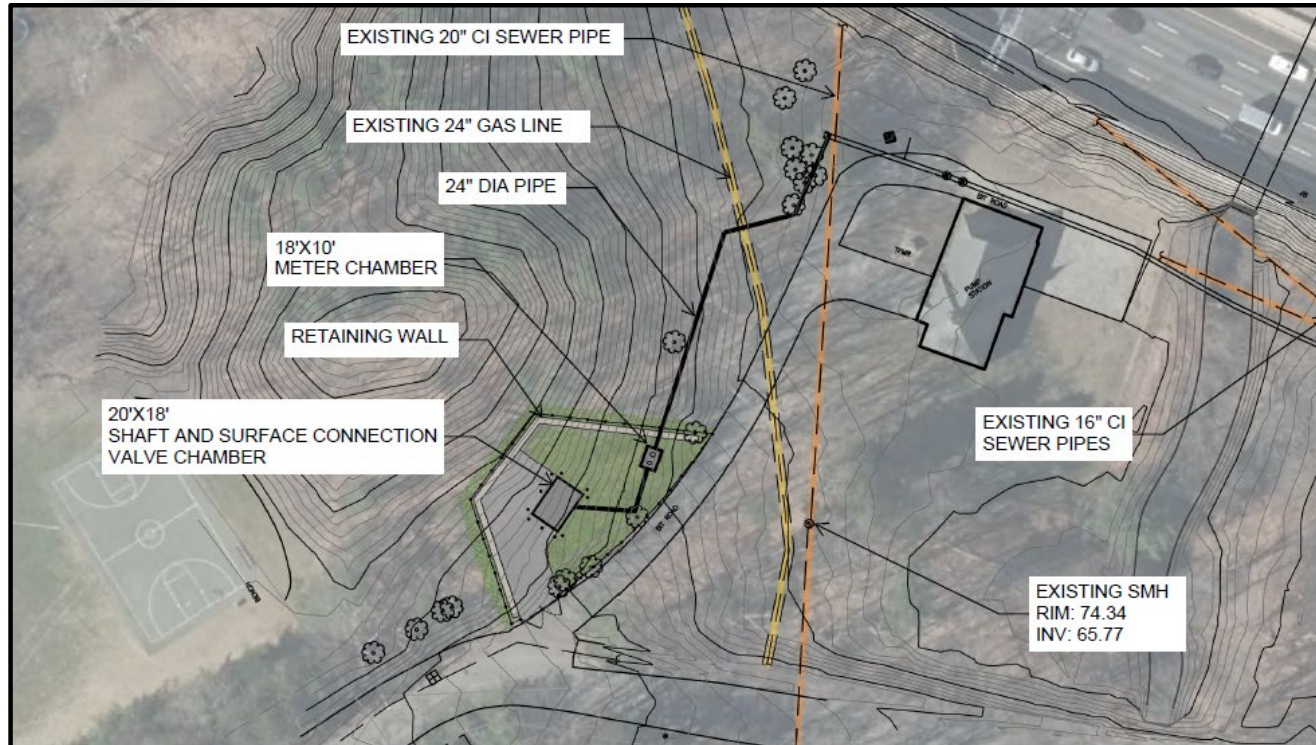
Lg C - Large Connection Shaft
L - Launching Shaft
R - Receiving Shaft

Preferred Alternative Includes:

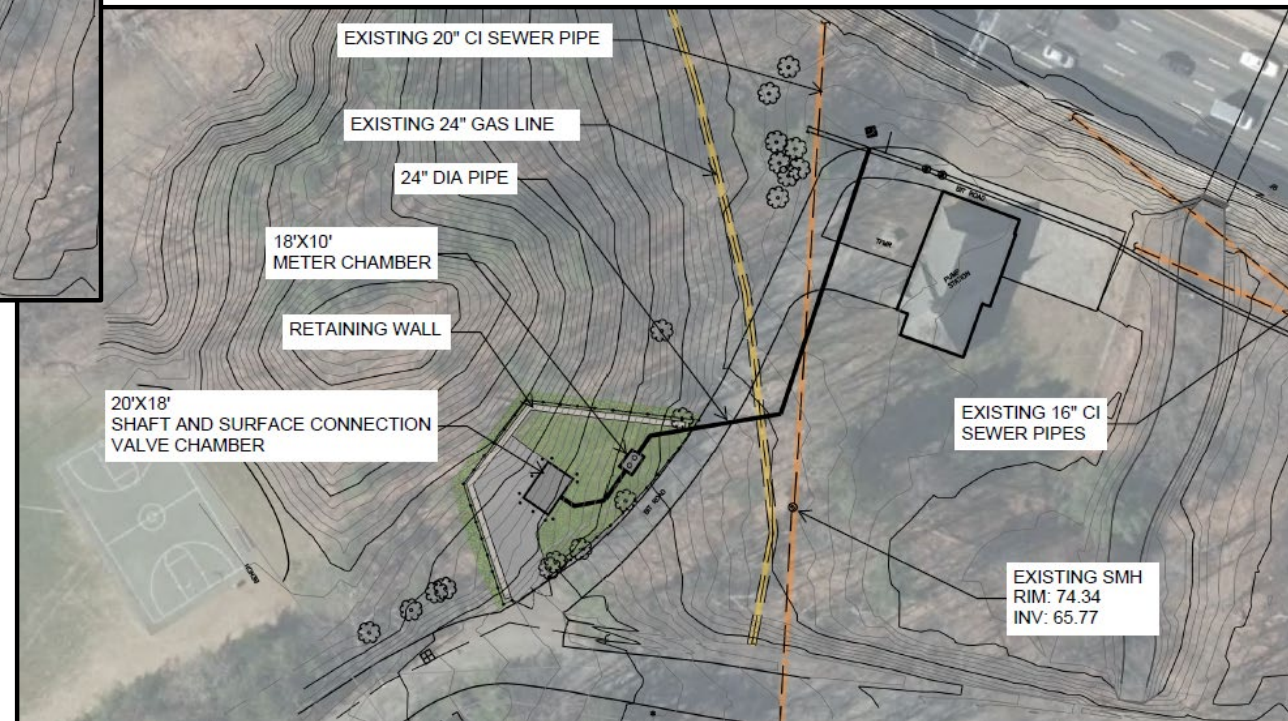
- 14.7 miles to deep rock tunnel
- 3 launching shaft sites
- 3 receiving shaft sites
- 1 large connection shaft site
- 6 connection shaft sites
- 3 tunnel segments
 - Segment 1 = tunnel from Weston (Tandem Trailer) ~4.5 miles to Waltham (Fernald Property)
 - Segment 2 = tunnel from Needham (Highland Ave NW) ~3.4 miles to Weston (Park Road W)
 - Segment 3 = tunnel from Needham (Highland Ave NE) ~6.8 miles to Mattapan (American Legion)
- Tunnel system will operate as 2 tunnels (North Tunnel & South Tunnel)



Hegarty Pumping Station – Connection Shaft Site Conceptual Site Layout (3 pipeline route options)



Conceptual Site Layout 1, Crosses PS Access Road



Conceptual Site Layout 1, X-Country Pipeline

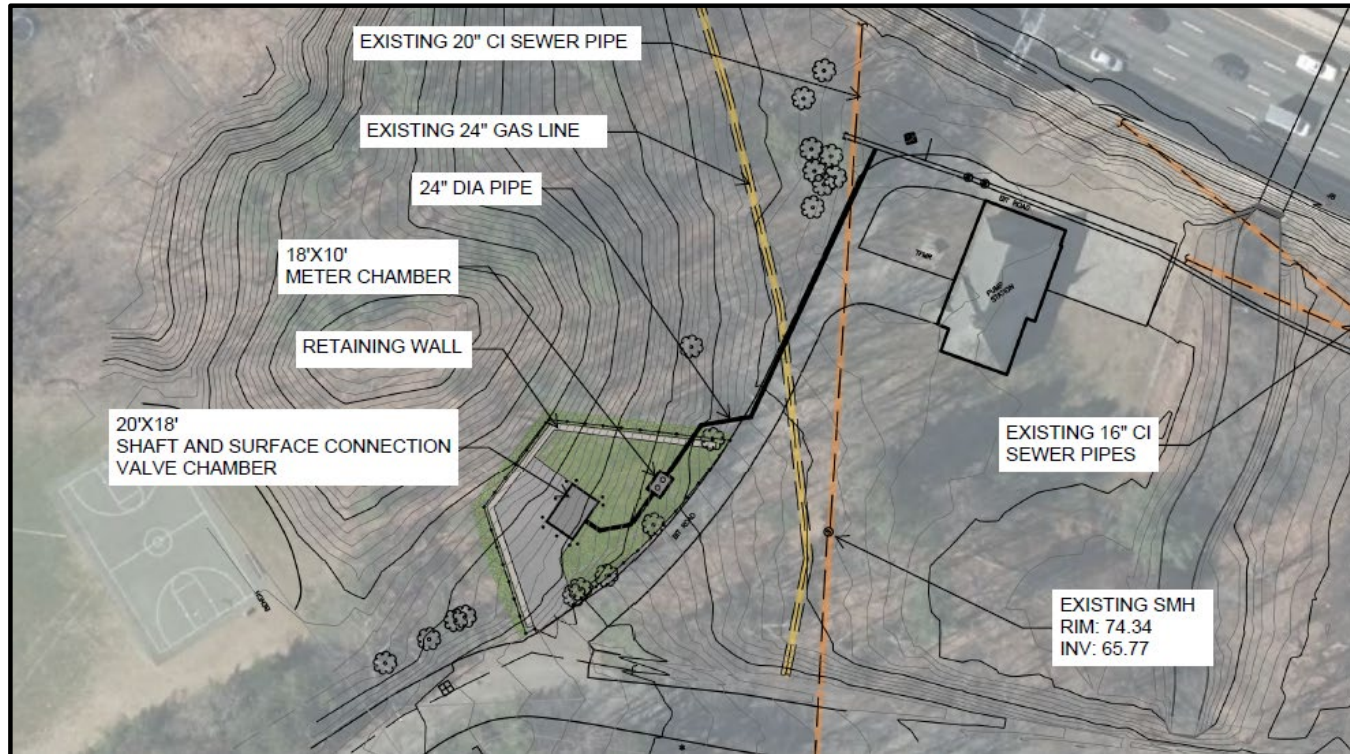
Notes:

1. Some tree removal will be needed. Amount depends on pipeline route.
2. MWRA will work with the Town to address tree replacement plan.

For discussion only



Conceptual Site Layout (3 pipeline route options)



Conceptual Site Layout 3, Along PS Access Road



Exiting and Conceptual Site Condition – Elevation View



Barton Road

Existing Site Condition



Barton Road

Conceptual Site Condition



What Happens at a Connection Shaft Site?

- General Construction Activities:
 - Mobilization
 - Excavate connection shaft – caisson thru soil and raise bore method thru rock
 - Utilize shaft for emergency egress and/or ventilation (possible)
 - Utilize shaft for tunnel concrete liner placement (possible)
 - Install shaft permanent lining
 - Construct valve vault over top of shaft
 - Use for sampling during disinfection and flushing
 - Site security, landscaping and restoration



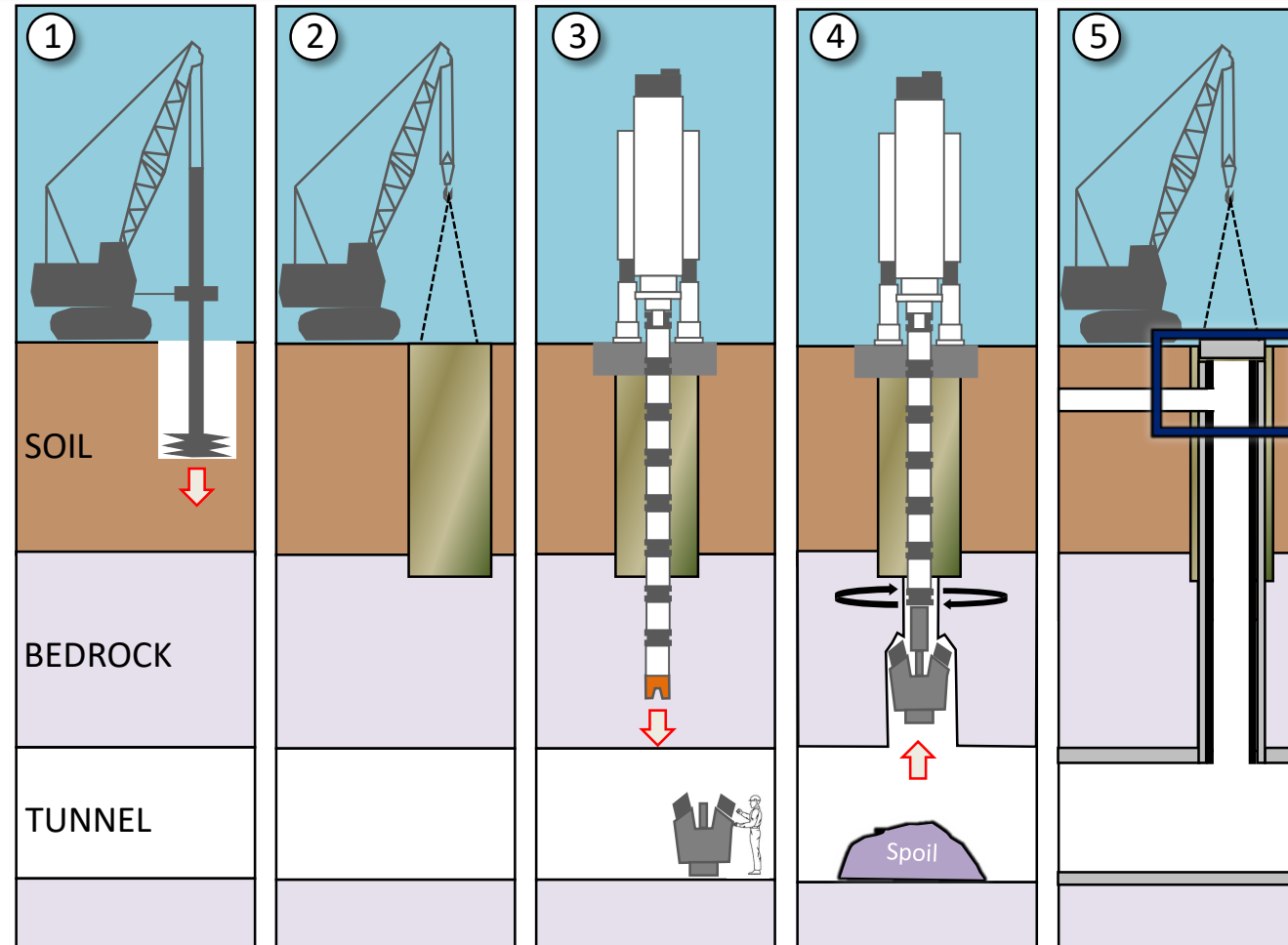
Shaft Construction – Caisson & Raised Bore Method

Sequence of Construction:

- (1) Auger drill through soil
- (2) Install steel casing through soil
- (3) Drill pilot hole in rock
- (4) Ream larger hole in rock – spoil drops into and removed from the tunnel below
- (5) Install shaft and tunnel linings (concrete & steel) and construct valve vault

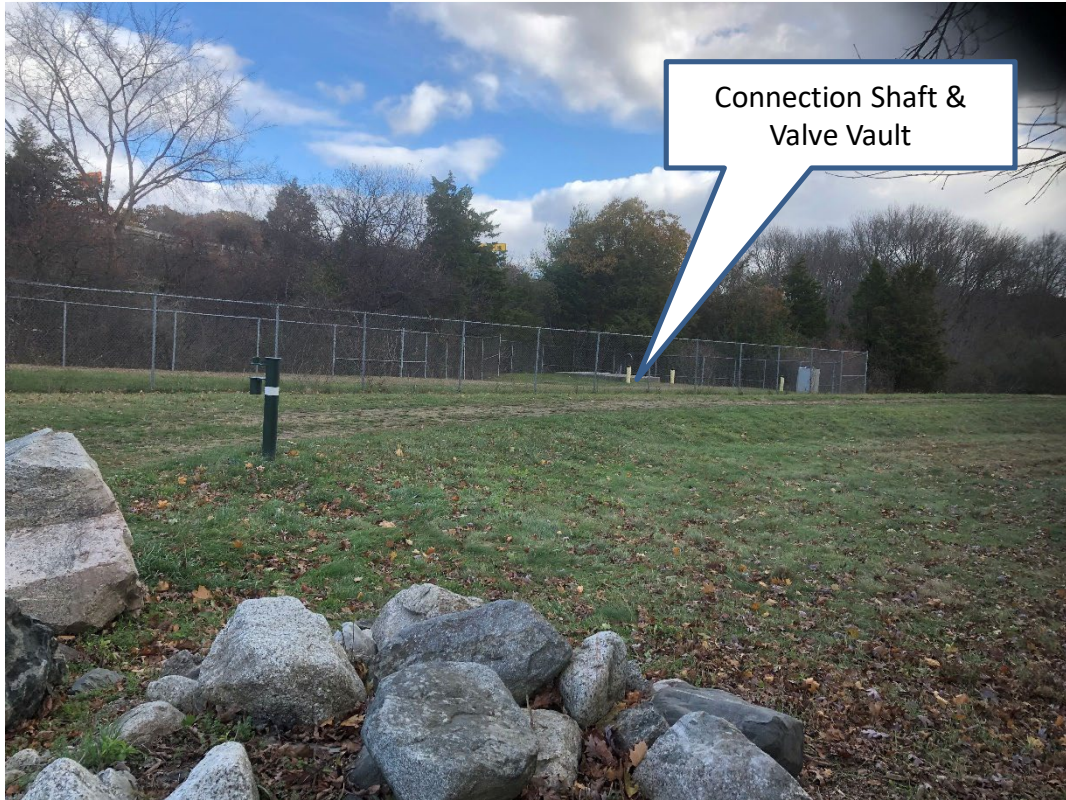
Benefits of Raise Bore Shaft Method:

- Usually the fastest, cheapest method, with the smallest working footprint at the surface
- Most excavate is removed from inside the tunnel – little trucking to/from site
- No blasting
- Not 24/7

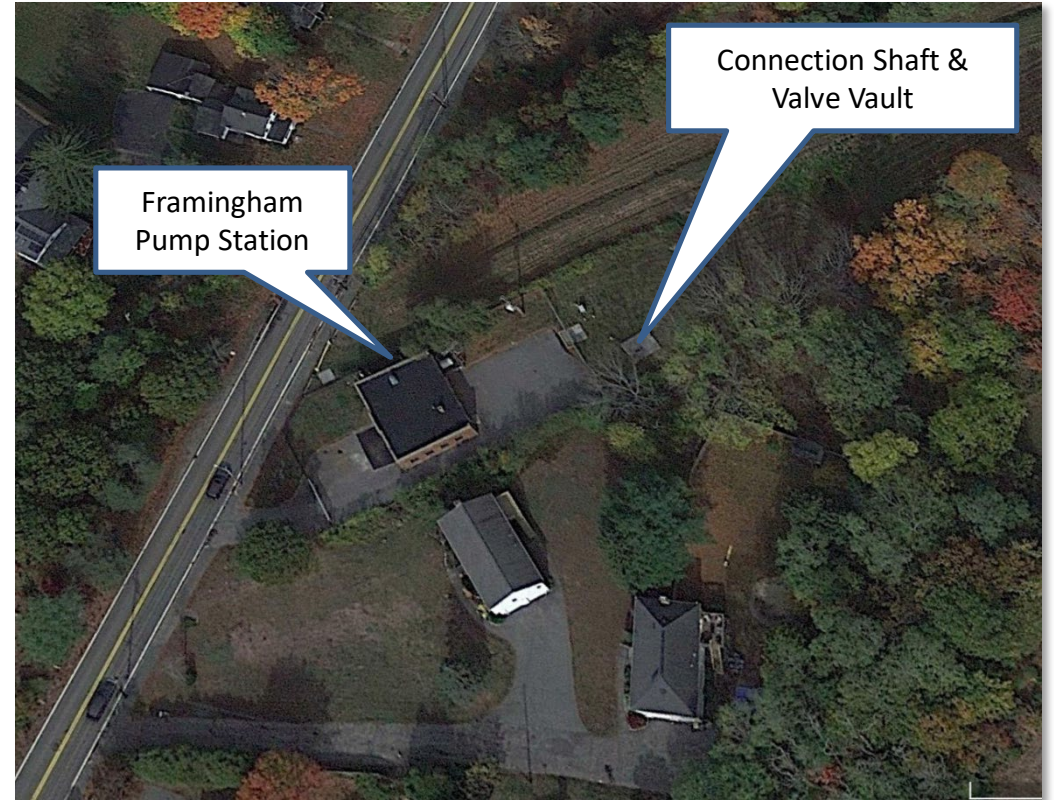




Similar MWRA Infrastructure – MWWST Weston and Framingham



Wellesley St Riser Shaft, Weston



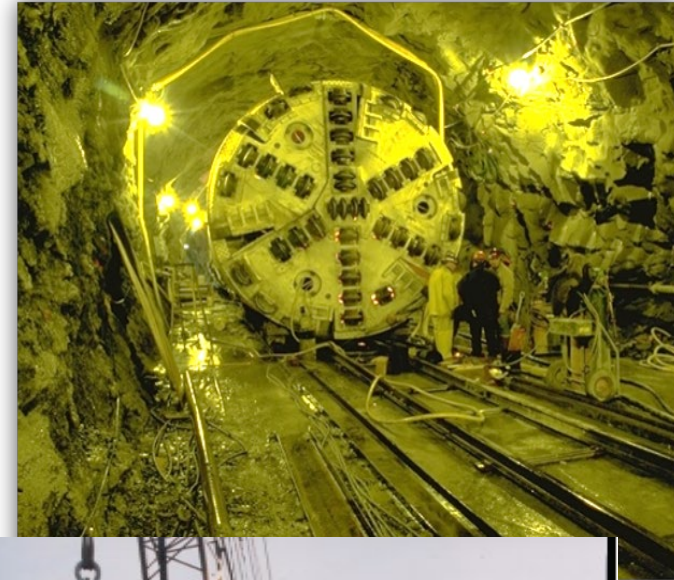
Edgell Rd Riser Shaft, Framingham



Metropolitan Water Tunnel Program – Overall Schedule

- Preliminary Design: July 2020 to Jan 2024
 - Evaluate tunnel alignment alternatives
 - Geotechnical investigations
 - Environmental Impact Report
 - Preliminary Design Report
 - Establish contract packages
 - Refine Program cost and schedule
- Final Design: begin in 2024
 - One or two final design contracts
 - Additional geotechnical investigation, survey, State and local permitting, land acquisition
- Construction: target 1st contract bid in 2027
 - Two or more tunnel construction packages
 - Each contract lasts 4-8 years+/-
 - All work is planned to be completed by 2040

We are Here





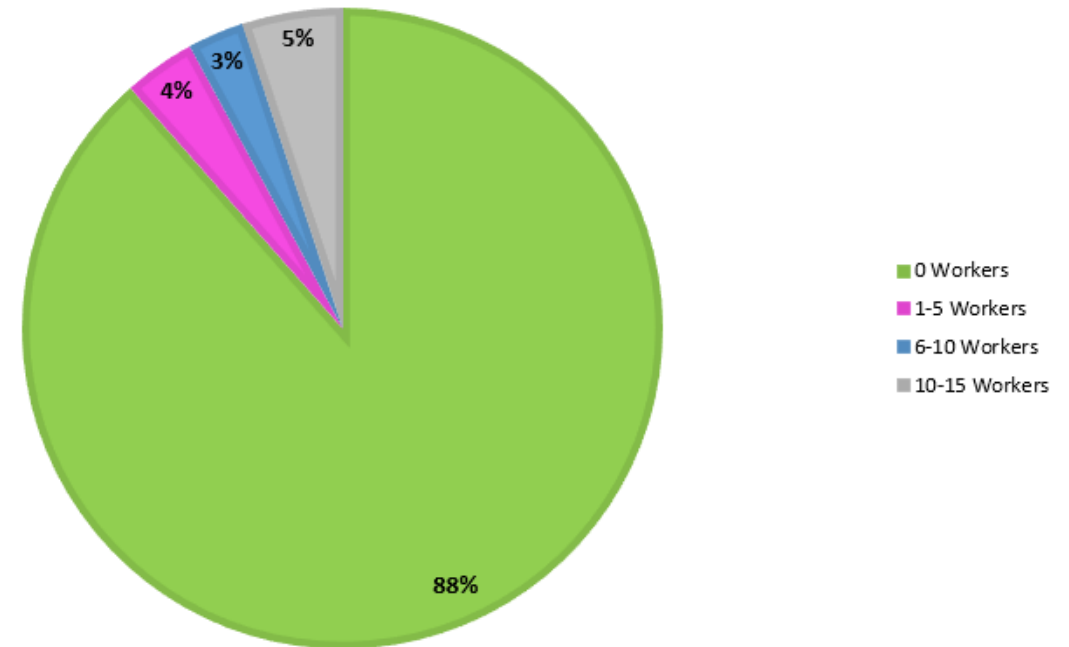
Conceptual Construction Schedule @ Hegarty PS Site

Hegarty Pumping Station Connection Shaft Site:

- Mobilization
 - ~1 to 2 months
- Excavate connection shaft
 - ~2 months
- Install shaft permanent lining
 - ~2 months
- Construct valve vault (over shaft) & pipeline connections
 - ~3-6 months
- Restoration & Demobilization

Note: Construction at Hegarty site will be discontinuous with gaps of little construction activity within the larger tunnel construction contract duration

METROWEST WATER SUPPLY TUNNEL CP-1 & CP-2
AVERAGE CONNECTION SHAFT CREW SIZES THROUGH CONSTRUCTION

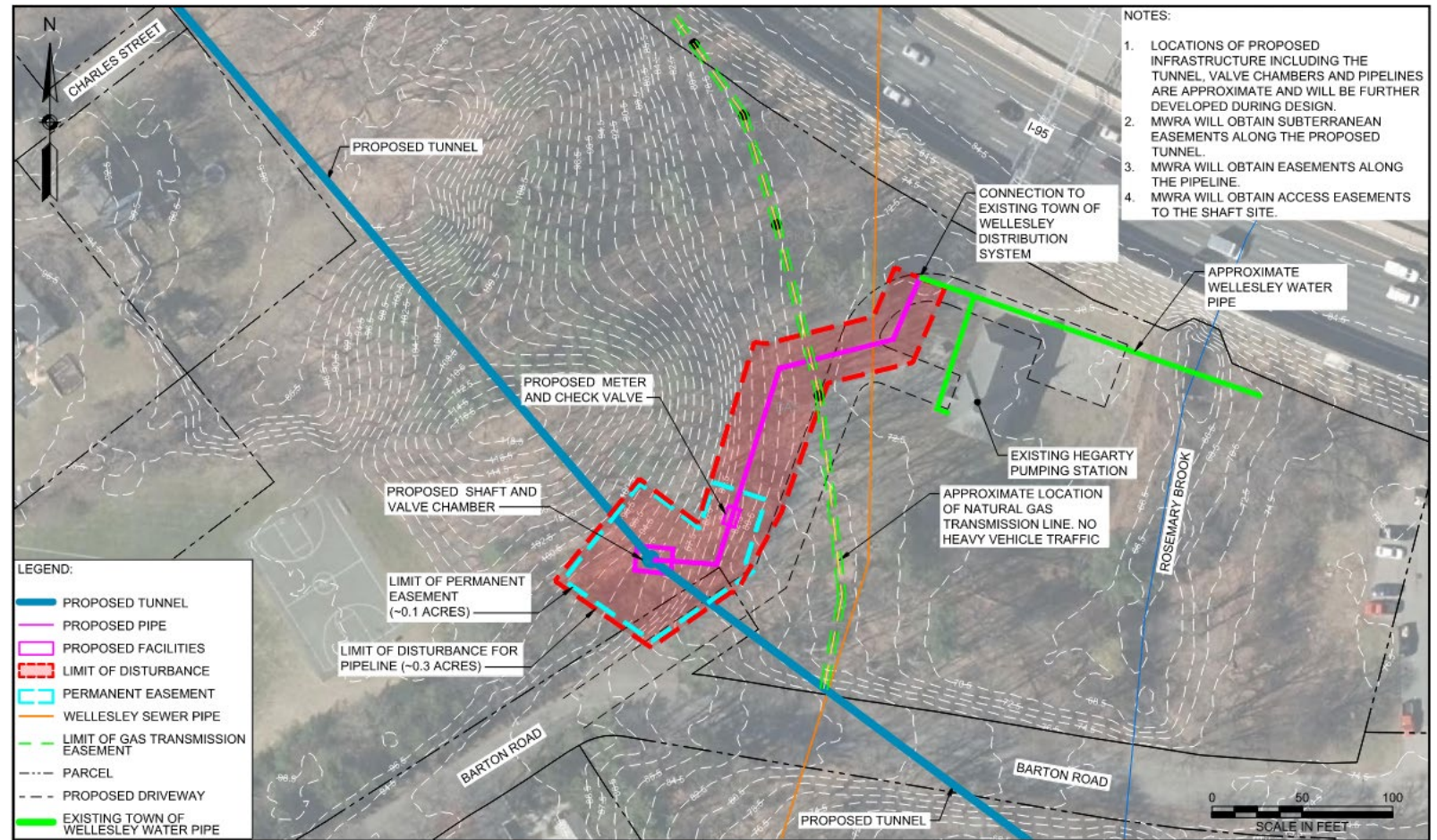


- % = # days with crews working at a connection shaft site / total construction package contract schedule
- % = average of 5 connections shaft sites for MWWST
- Total # working days at connection shaft site range = 185 – 296



Land Acquisition - Hegarty Pumping Station

- Up to ~0.3 acres required during construction (temporary easement)
- Permanent easement/acquisition of ~0.1 acres + pipeline subsurface easement
- Site is owned by Town of Wellesley and is identified as trails and recreation or water supply, Article 97
- MWRA is subject to Article 97 where applicable
- Chapter 30B does not apply to the MWRA
- Work with Town to determine appropriate land acquisition process





Land Acquisition – Permanent Subsurface Easement for Tunnel

- 10-ft diameter (ID) tunnel
- 200-500 ft below grade and in bedrock
- No surface access (except at shaft sites)
- Permanent subsurface easement that “encapsulates” the tunnel horizon (e.g. 50-ft centered on tunnel was used for MWWST)

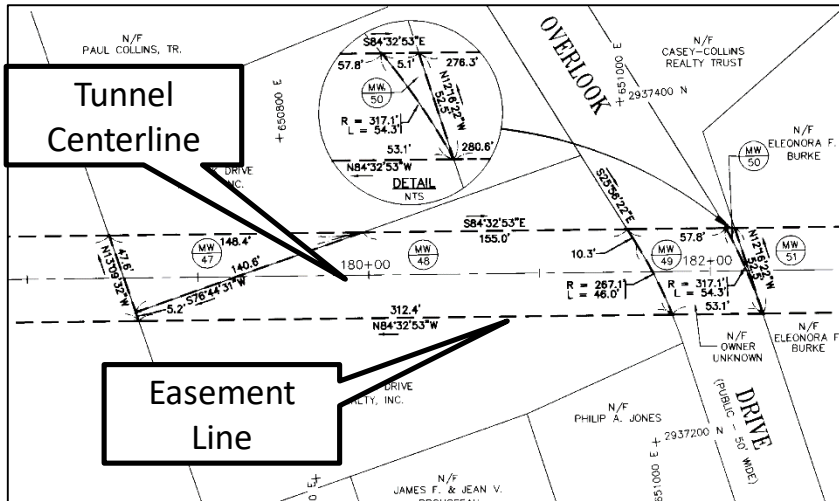
Early Initial estimate:

- 525 +/- parcels along the conceptual tunnel alignment
- Based on nominal 50' easement width
- Properties will be assessed for the impact of the tunnel easement and compensated accordingly

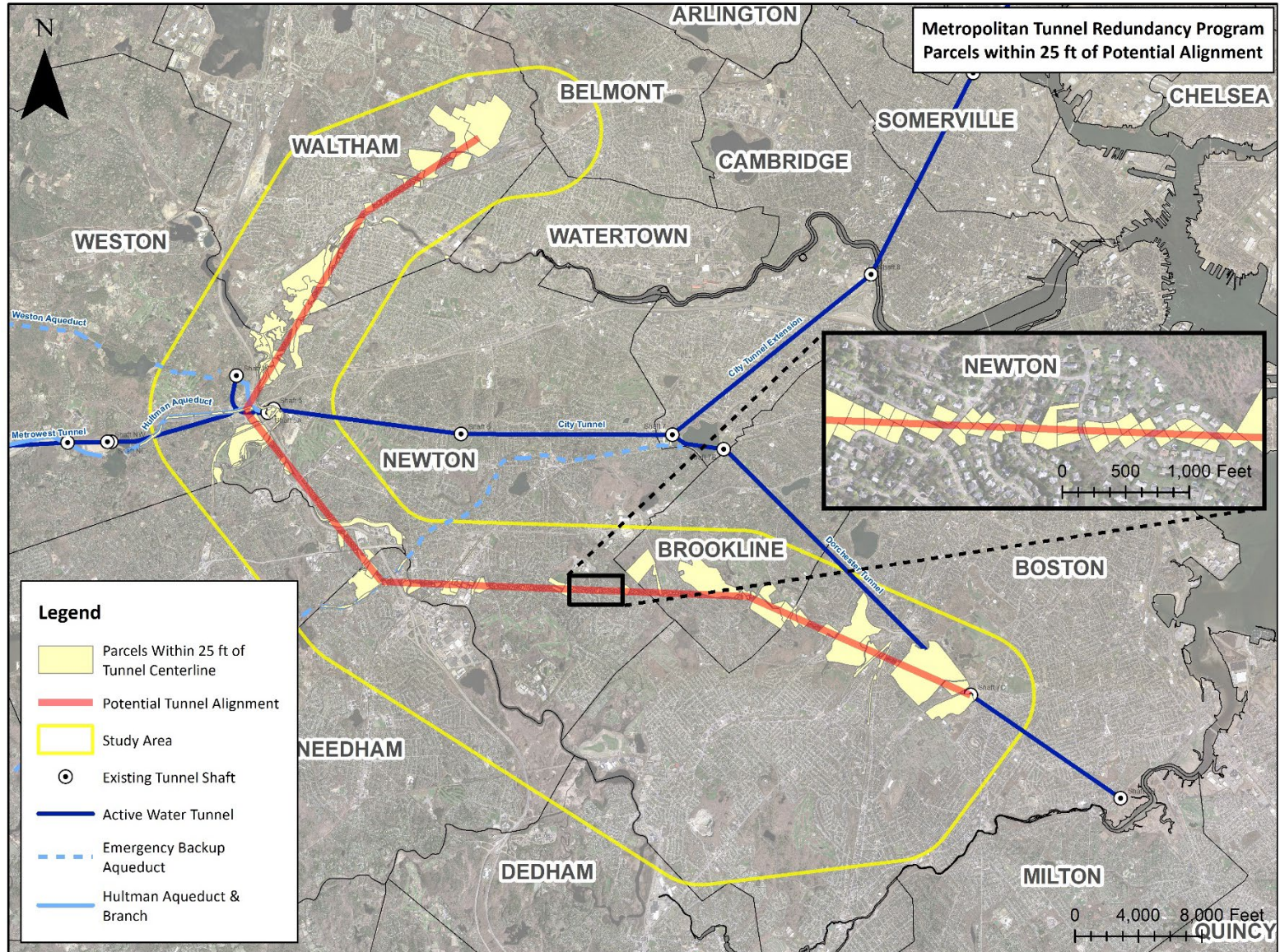


Tunnel Alignment – Permanent Subsurface Easements

Example of MWWST Subsurface Easement



Easement is both 50 ft in height and 50 ft in width at the depth shown on the plans



For discussion only



Where to Find Information / How to Contact Us

- <https://www.mwra.com/mwtp.html>
 - Program documents (ENF, DEIR)
 - Meeting notices, agendas, presentations, minutes
- Contact Us
 - Carmine DeMaria, Community Relations Coordinator
 - 617-305-5725
 - Carmine.DeMaria@mwra.com
 - Tunnels.info@mwra.com



Questions/Comments?



Thank you for your continued partnership!