

# L Project Update

*New Design Recommendations*

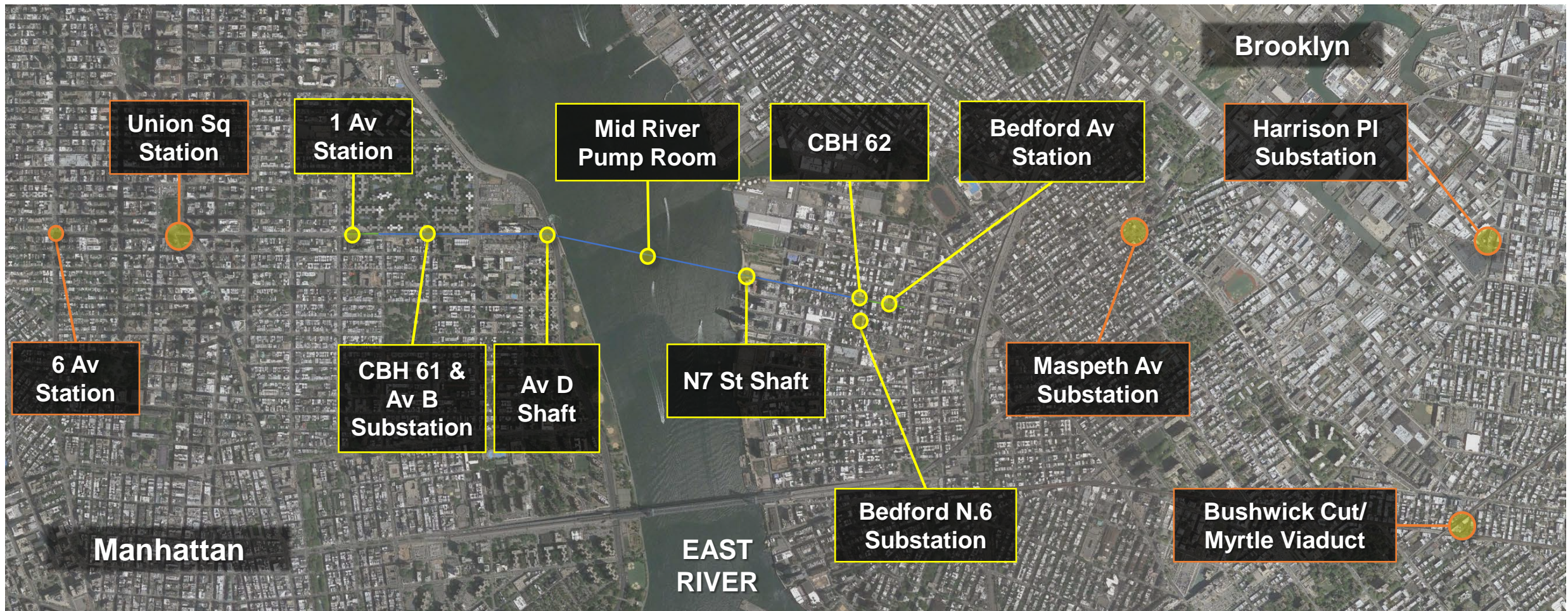
*Overall Project Update*

**January 15, 2019**



# Project Overview

*Sandy Rehabilitation, Core Capacity Improvement, Additional Projects*



Canarsie Tunnel contract work

Additional projects planned to support / coincide with L work



# Project Overview

*Canarsie Tunnel a critical link in system and severely damaged in Sandy*

- **Canarsie Tunnel:**

- Built in 1924
- 2 one-track tubes in cast iron with concrete liner
- 40 trains per hour in peak with 225,000 riders each weekday

- **Impact of Sandy:**

- Flooded with 7 million gallons of saltwater
- Damage to track, signal and other electrical equipment



# Project Overview

- **Prior plan:**

- The original L Train Project would have called for a 15-month closure from Bedford Ave. to 8<sup>th</sup> Ave
- Alternative service plan prepared with bus shuttles, ferries, HOV lanes and more

# Project Overview

- **Academic team review:**

- Before the Plan went into effect, Cornell & Columbia Engineering School professors performed a peer review to examine the tunnel, rehabilitation needs and project goals in collaboration with MTA & WSP
- That expert panel developed key project design alternatives to accomplish all **project objectives with less customer impact**
- **WSP and the MTA collaborated to develop the design recommendations and determined all the goals of the initial plan will be met with the new plan**

# New Recommendations

*Executive summary of recommendations & overall project scope*

WHAT'S NEW	WHAT DOESN'T CHANGE
<ul style="list-style-type: none"><li>• Reduced amount of demolition required for benchwalls<ul style="list-style-type: none"><li>• Stabilize or leave alone</li></ul></li><li>• Cables placed on racks along tunnel wall, instead of within benchwall</li><li>• Smart sensor systems to monitor benchwall and tunnel conditions</li><li>• Additional independent environmental monitoring</li></ul>	<ul style="list-style-type: none"><li>• New continuous welded rail and replacement of track elements (i.e. ties, third rail)</li><li>• Horizontal alignment of tracks</li><li>• Replacing all electrical &amp; communication cables</li><li>• Tunnel resilience investments</li><li>• ADA &amp; station improvements</li><li>• Substations and Circuit Breaker Houses</li><li>• New tunnel lighting</li></ul>

# New Recommendations

*Expert academic team focused on four key areas of opportunity*

- **Cables**

- Implement a new power and control system design
- Implement “racking” system design for cables
- Decouple cable system housing from benchwall
- Jacket cables with low smoke, zero halogen fireproof material
- Abandon all old cables in benchwall

- **Bench Walls**

- Leave benchwall unless structurally compromised and fortify using fiber reinforced polymer. Remove unstable benchwall
- Install “smart” sensor systems to monitor benchwall integrity
- Install walkway where benchwall removed

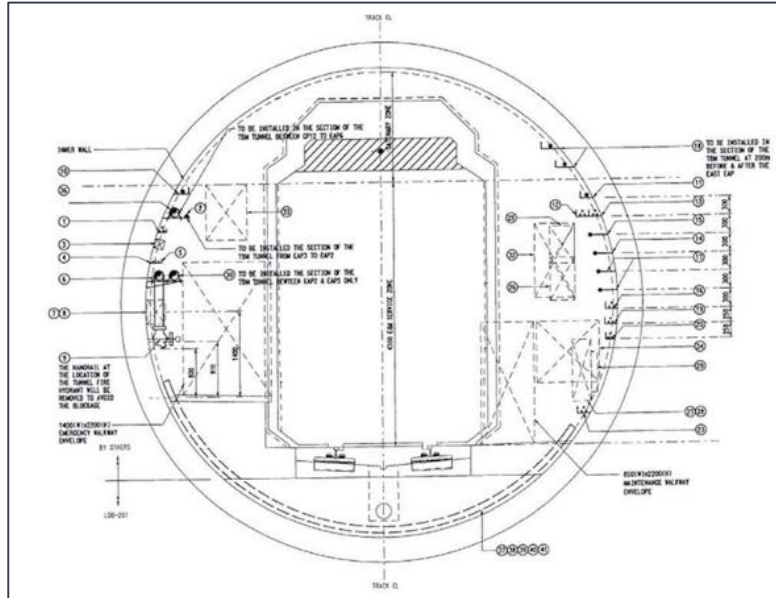
- **Resilience**

- Increase flood resilience measures

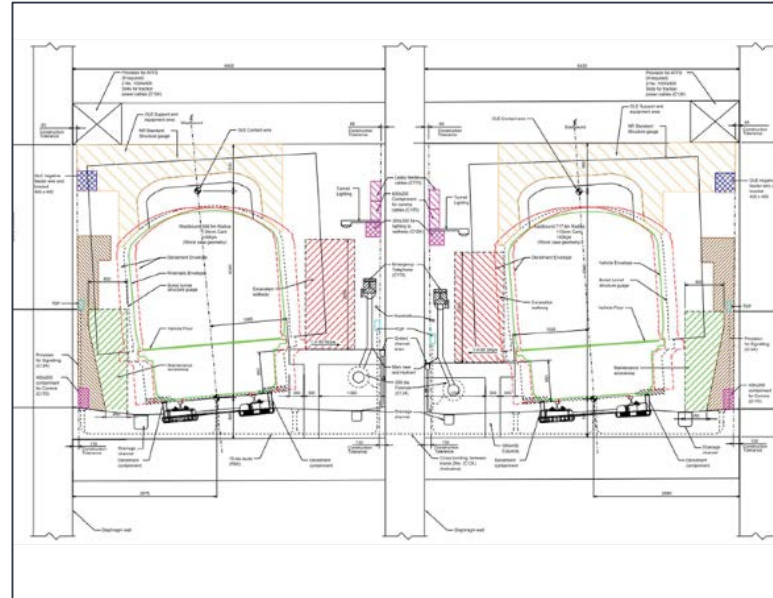
- **Enhance public safety**

# New Recommendations – Cables

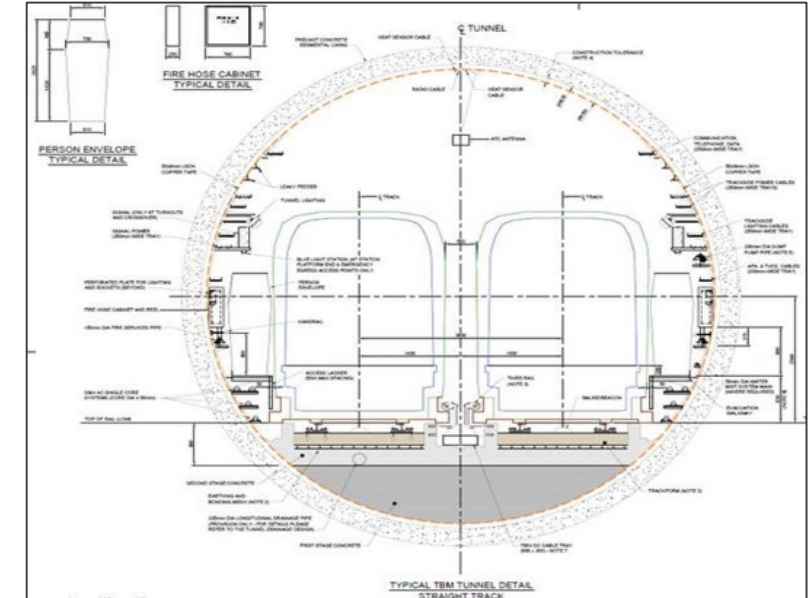
*Racking cables is common technology around the world*



*Hong Kong*



*London*



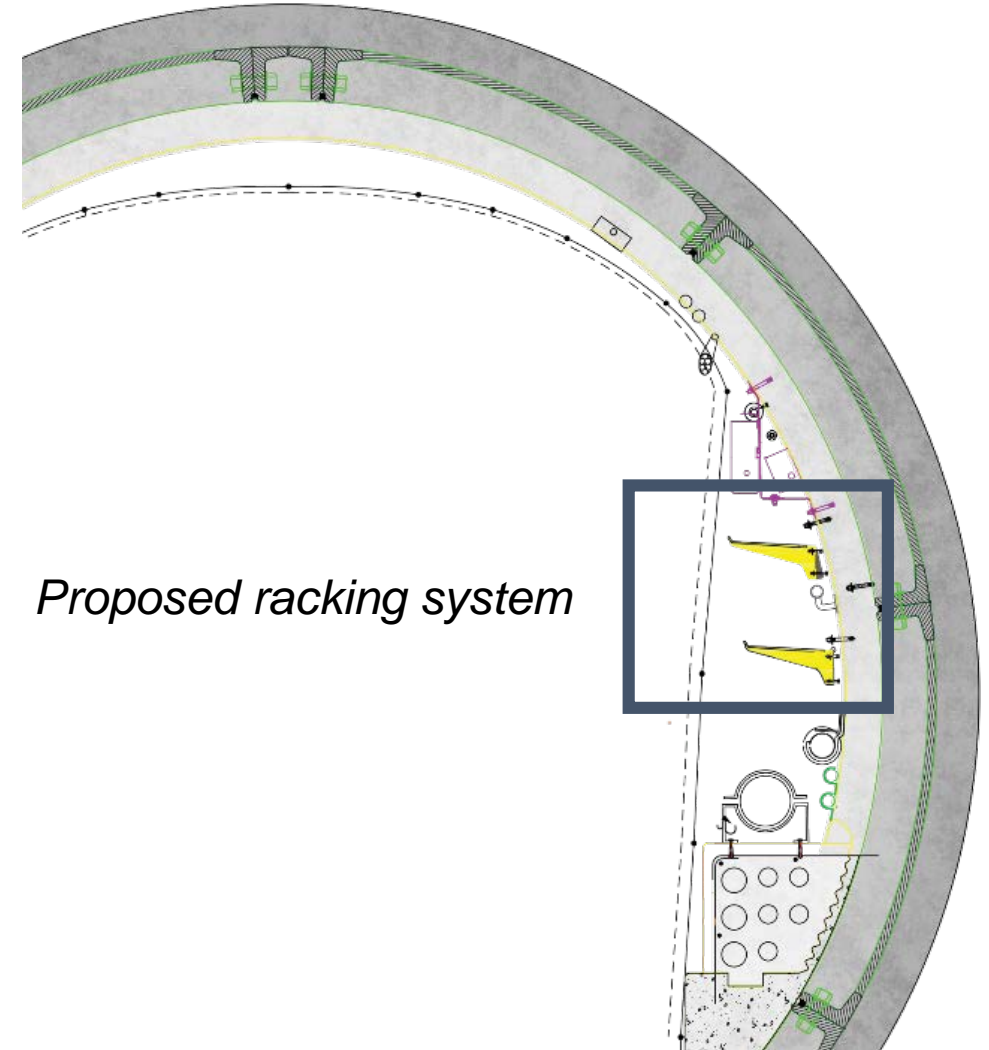
*Riyadh*



# New Recommendations – Cables

*New approach saves time while maintaining safety*

- All cables being replaced moved to wall and rack
  - Fully compliant with NFPA 130 standards
- Abandon old cables in place
- Frequency and depth of bolt penetration poses no risk to tunnel lining
- Racking system requires 60% fewer bolts than individually bolting cables to the tunnel lining



# New Recommendations – Benchwall

*Evaluating condition to best support structural integrity*

- **Three categories:**

- Leave in place – no action
- Leave in place – strengthen with FRP, cementitious or other material
- Remove
  - Poor condition
  - Repair tunnel liner

- **Ongoing review:**

- Step 1: Non-destructive testing – Complete
- Step 2: Field Review – This Week
- Step 3: Recommend approach – Next Week



*Benchwall in good condition*

# New Recommendations – Benchwall

*Industry-accepted approach for strengthening concrete*

- **Strengthen benchwall:**
  - Fiber reinforced polymer (FRP), cementitious or other material
- **FRP commonly used to strengthen concrete:**
  - Used internationally and across the US including in NYS
  - No. 7 Line Extension to Hudson Yards
  - Second Avenue Subway Phase 1
  - Culver Viaduct
  - NY Bridges, including Kosciuszko Bridge & RFK Bridge



*FRP on RFK Bridge*

# New Recommendations – Benchwall

*Less demolition required, less silica*

- **Project will comply with meet all environmental standards; including those set for silica mitigation**
- **Concrete demolition requires silica mitigation**
- **This is not unique to the L Train Project or to the MTA**
- **Recent MTA projects completed with environmental mitigation plans:**
  - Brooklyn Battery Tunnel (night closures)
  - Queens Midtown Tunnel (night closures)
  - Subway station work



# New Recommendations – Resiliency

*Ensure and strengthen tunnel resiliency for future flood events*

- **Increase pump capacity**
- Install permanent generator to power pumps
- Consider watertight submarine-type gates and sealing capability for openings, depending on critical elevation



*Watertight gate at Queens Midtown Tunnel*

# New Recommendations – Public Safety

- **Establish detailed evaluation** of control options for dust and airborne silica
- Third-party review of air quality
- Monitor structural conditions in real time with smart tunnel technology

# Improved Outcomes with the New Approach

- New plan will still address leaks in the tunnel lining with repairs



*Bench wall in poor condition*

# Improved Outcomes with the New Approach

- All necessary track repairs – from the ties to the rail – will be made



*Installation of stop arm*



# New Recommendations – Summary

*All goals of the initial plan will be met with this new plan*

- Integration of tested technologies applied to tunnel rehabilitation will lead to **a resilient, long-lasting infrastructure improvement in the form of a new tunnel**
- **New plan lessens impact on riders by avoiding total shutdown**

# Benefits

*Significant benefits to project, customers and agency*

- New system design **achieves all functional outcomes**
  - Upgrades to pump system and track occurs in tandem with cable and benchwall work
- Racking system allows **greater access** to cables for inspection or future upgrades
- Smart sensor system allows monitoring on **continuous**, rather than periodic, basis
- **Enhances** safety, functionality and flood resiliency

# New Recommendations – Review

*Cross-functional Work Groups moving recommendations forward*

- Work Groups implemented to **focus on design and implementation**
- Daily meetings with engineers and technical experts **aligned and working together**
- Collaborative, cross-functional groups across all project teams
  - MTACC
  - NYCT
  - WSP
  - Jacobs
  - Judlau-TC Electric

# L Train improvements as originally planned

*New proposal achieves same outcome*

- Station improvements / new entrances / elevators / mezzanines at Bedford Ave & 1<sup>st</sup> Ave Stations
- 3 new substations
- Reconstruction of two circuit breaker houses
- Replacement of all electrical & communication cabling in the tunnel
- Installation of new tunnel lighting
- Replacement of track and third rail
- Upgrade of pumping system
- Resiliency investments to protect the tunnel from future storms



# L Train improvements as originally planned

*Additional, planned capital projects to continue*

- Other projects planned to support and/or coincide with L work will continue, including:
  - **ADA** at 6<sup>th</sup> Ave L Station
  - **Station improvements** at Union Square L Station
  - **Structural Rehab** work in the subway between 1<sup>st</sup> Ave & 8<sup>th</sup> Ave L Stations
  - **Station improvement** at four L stations in Brooklyn
  - **Addition of new stairways** at Broadway-Junction JZ station
  - **Widening of stairways and platform** at Marcy Ave JMZ station
  - **Additional stairways** at Court Sq. & Metropolitan Ave G stations
  - **Reconstruction of stairway** at 14<sup>th</sup> St/7<sup>th</sup> Ave 1,2,3 station
  - **Opening of closed stairways** at Metropolitan Ave G station & Hewes St JMZ station
  - **Replacement of switches** at Bedford Ave

# Next Steps

- WSP recommends moving forward with the new and improved approach of the **rehabilitation of the tunnel** that meets the **original project goals** while avoiding a complete shutdown and **reducing customer impact**
- MTA will continue to provide **regular updates and ongoing dialogue** with Board and public