

# **Massachusetts Bay Transportation Authority**

## Blue Line Update

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Fiscal and Management Control Board

January 25, 2021

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# Agenda

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- Goals and Timeframe Expectations
- Achievements to Date
- Asset Investment Planning Look Ahead
  - Fleet
  - Infrastructure
  - Stations
  - Resiliency
  - Regional Connectivity
- Next Steps



# Goals for Future Investments

## Goal: Enhance service and service reliability through asset investment

### Reliability:

- Address service delays due to antiquated signal system (trip-stop) with modern technology
- Address water infiltration to mitigate track, signals, and power infrastructure degradation
- Mixed power infrastructure (OCS and 3<sup>rd</sup> Rail)
- Plan for new fleet readiness

### Resiliency:

- Susceptible to storm surge flooding
- Upgrade infrastructure with event recovery considered
- Participate in regional sea-level rise mitigation measures

### Service:

- Signal system modernization
- Suffolk Downs residential development
- Beachmont multi-modal consideration
- Expansion to Charles Circle for Red and Blue Connection

### **Timeframe:**

- **Much of the Investments over next decade are planning efforts**
- **Construction and procurement investments to occur post Green Line Transformation: Late 2020s and 2030s**
- **Resiliency investments will be advanced in-line with funding availability and increasing risk**

# Achievements to Date

## Program Achievements:

- Assessment of Boston Harbor Tunnel was completed in 2019. Results informed immediate, mid-term, and long-term improvements. Immediate improvements were completed in May 2020 and 3 weekend diversions in August 2020 with a two-week Construction Surge, which accomplished:
  - Approximately 2,200 feet of full-depth Track replacement between Maverick to Aquarium, eliminating a long standing speed restriction resulting in improved travel time of 51 seconds
  - 4,500 feet of new standpipe between Airport to Maverick
  - 1,000+ feet of leak repairs between Airport to Aquarium
  - New tactile safety edging installation at Bowdoin
- Vehicle Maintenance has a robust, reliability-centered maintenance program to support the existing Blue Line vehicle fleet.



Blue Line Transformation: Program Achievements								
Investment Type	2016	2017	2018	2019	2020	2021	Spend to Date (November 2020)	
Vehicles	Ongoing Reliability Centered Maintenance for the BL Vehicle Fleet							~\$12M
Track				Accelerated Infrastructure Work in Harbor Tunnel		Planning and Design – Partially Programmed	\$11M	
Infrastructure								

# Fleet

## Current – Blue Line #5 Vehicles

94-car fleet

Configured as 15 train sets + 4 spare cars

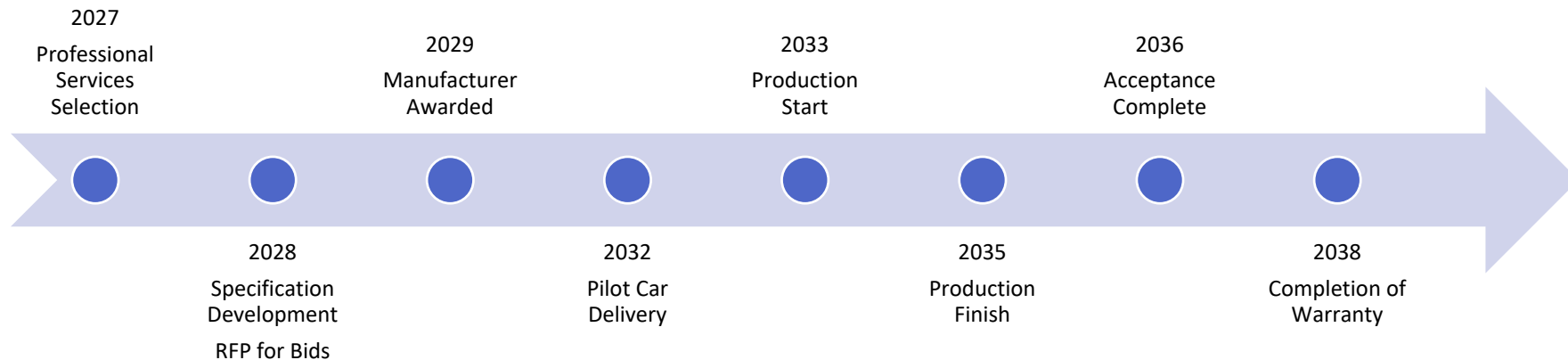
Entered service between 2007 and 2009

- Manufactured by Siemens
- 25-year lifecycle
- Due for replacement in mid/end-2030s

## Future – Blue Line Vehicles

Plan for an increased fleet size of approximately 130 cars

Budget: Assume \$630M to \$750M



# Infrastructure

Investments into the Blue Line Infrastructure must consider the following:

## Track

- Average age of ballast, ties and rail (95% wooden ties, 5% concrete ties) is approximately 35 years
- Expected service life: wood ties (30 years), concrete ties (40 years), straight rail (40 years), curved rail (varies), and ballast (25 years)

## Communications

- Communications Investment Needs = \$10M
- Modernization of Communication and AFC rooms and equipment
- Upgrade to fiber optics between stations
- State of Good Repair improvements:
- Flood resilience, Pest control

## Bridges

- Two bridge structures, both in FAIR condition
- Beachmont Station Viaduct last reconstructed in 1993

## Tunnels

- East Boston Tunnel; Bowdoin to Maverick – 2300 ft., constructed between 1904 and 1916
- Prescott Tube, 475 ft., constructed in 1954

## Power

- Power assets range in age from 1918 power transmission to 1990s-era substation infrastructure
- Traction power is dual-mode third rail within tunnel infrastructure and Overhead Contact System (OCS) above-ground
- Convert traction power to single system for easier maintenance and operation and more efficient future vehicle procurement
- Significant investment in power infrastructure to address SGR
- Initiative Study
  - Power Investment Needs = \$250M+
  - OCS to 3<sup>rd</sup> Rail conversion evaluation



# Infrastructure

## Future Signal System – Options Study

Study considered many technology options:

- Electro-Mechanical Trip Stops
- Inductive Trip Stops
- Intermittent Train Protection System
- Ultra-Wideband Train Protection System
- Cab-Signal Train Control
- Distance-to-Go (DTG)
- Communication Based Train Control (CBTC)

Principle Requirements:

- Improve safety conditions
- Improve service capacity
- Improve operation service flexibility
- Minimize way-side maintenance – include remote diagnostic capability
- Future-proof design
- Maximize potential for automated train operations

Criteria \ Signal Technology	Mechanical Trip Stop	Inductive Trip Stop	Intermittent Train Protection	Ultra Wideband	Cab Signal	Distance to Go	CBTC
Improve Safety Conditions	✓	✓	✓	⊕	✓	✓	✓
Improved Operations	✗	✗	✗	⊕	✓	✓	✓
Service Flexibility	✗	✗	✗	⊕	✓	✓	✓
Service Capacity	✗	✗	✗	⊕	✓	✓	✓
Future-Proof Design	✗	✗	✗	⊕	✗	✗	✓
Maximize ATO Operations	✗	✗	✗	⊕	✗	✓	✓
Remote Diagnostic Capabilities	✗	✗	✗	⊕	✓	✓	✓
Minimize Way-side Maintenance	✗	✗	✗	⊕	✗	✓	✓



# Stations

Overall, MBTA Blue Line stations are in an “Adequate to Good” State of Good Repair (SGR) with the exception of Suffolk Downs

## Planning for the needs of Stations:

- Investment in State of Good Repair at all our stations
- Improve accessibility through wayfinding improvements, station lighting improvements, and vertical transportation (elevator) access
- Flood resiliency of Aquarium, State, and Maverick stations
- Coordinate Track, Signals, and Power investments through all stations
- Partner investments with an eventual evolution of Logan Airport
- Reconstruct Suffolk Downs station
- Beachmont Station study as a future multi-modal Bus Terminal funded by transportation mitigation funds from the Suffolk Downs Racetrack development project
- Possible consolidation of Bowdoin Station with the Red-Blue Connector Project at Charles/MGH

Station	Score
Bowdoin*	3
Government Center	4
State Street	3
Aquarium	4
Maverick	4
Airport	3
Wood Island	3
Orient Heights	4
Suffolk Downs	2
Beachmont	3
Revere Beach	4
Wonderland	4

\* Bowdoin is not an accessible station

An asset is in **SGR** if it has a rating over **3** on the TERM scale.

Rating	Description	Condition
5	Excellent	New asset; no visible defects
4	Good	Some slightly defective/deteriorated component(s)
3	Adequate	Some moderately defective/deteriorated component(s)
2	Marginal	Increasing # of defective/deteriorated component(s) & maintenance needs
1	Poor	In need of immediate repair or replacement; may have critically damaged component(s)



# Resiliency


Design to elevate, harden and add redundancy to all critical infrastructure currently within the floodplain to protect against storm surge and flood events to accelerate recovery time and prevent permanent damage to vital systems


## Needs and Initiatives:

- Focus on Power, Signals, Communications, Security and Life Safety assets as well as material storage above at-risk elevations
- Implement deployable Flood Barriers at floodwater ingress locations
- Aquarium Station Floodproofing Improvements
- Resiliency design of Orient Heights Car House, primarily the traction power substation (pending NTP)
- Feasibility study for equipment and materials storage in the yard for Signals employees (pending NTP)
- Engineering solutions to harden tunnel flooding exposure and propose protection alternatives (anticipated FY22)
- Investigation of points of groundwater in-flow
- Benefits Analysis of raising the track elevation



*Legend*

2070 100 year depth approx. 

2030 100 year depth approx. 

# Service and Regional Connectivity

## Red-Blue Connector

- A proposed Blue Line extension to a new connection with the Red Line at Charles/MGH. Frequent coordination with the City of Boston, Mass General Hospital, and other stakeholders has helped confirm the envelope and the siting of vertical circulation elements for a new Charles/MGH Blue Line station.
- Current Status: Concept Design Report under internal MBTA review
- Next Steps: Preliminary design and state/federal environmental review (additional CIP funding required)
- Construction Cost Estimate: \$850M (no funding for construction in CIP)

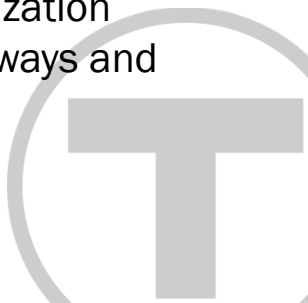
## Suffolk Downs Development

- Development predicts: 25K jobs and 10K housing units, and significant increases ridership (27K),
- Project funds approximately \$20 million for MBTA-related transportation mitigation:
  - Beachmont Bus Connection Study
  - Suffolk Downs Station Design

- Portions of Beachmont/Suffolk Downs Station Construction
- Blue Line Signal Design

## Beachmont Bus Transfer Facility:

- Provides an alternative for bus commuters from northern towns such as Lynn, Revere, Swampscott, Saugus, and others to access downtown Boston
- Mitigate the impact from significantly increased congestion for bus transit on Route 1A and in the Ted Williams, Sumner, and Callahan Tunnels
- Help to offset the Suffolk Downs Development increase in travel
- Provide a PPP or TOD opportunity to develop the surface parking parcel
- Upgrades include safety, resiliency, accessibility, egress, general state of good repair and station modernization
- Upgrades to surrounding roadway, including busways and station parking lot to be considered
- Provides potential for service redundancy



# Next Steps

- Develop program funding needs
  - Fleet
  - Infrastructure Reliability
  - Resiliency
  - Service enhancement and expansion
- Advance Preliminary Signal System Design
  - Alternatives Analysis Completed
- Procure Designer for Harbor Tunnel Infrastructure Improvements (Track, Signals, Power, Tunnel, Drainage, etc.)
  - 15% - 100% Design
- Complete Environmental Flood Resiliency Study which is underway
- Develop OCS to 3rd Rail Conversion Study
  - Perform a DC Load Flow Study Assessment
- Receive development funding for and procure a consultant for the design of Suffolk Downs Station
- Receive development funding for and procure a consultant for the Beachmont Station connectivity study and design
- Advance the Red-Blue Connector project into the preliminary engineering and environmental permitting phase

