



**Massachusetts Bay
Transportation Authority**

Red/Orange Line Headway Attainment & Maintenance Plan

Fiscal and Management Control Board

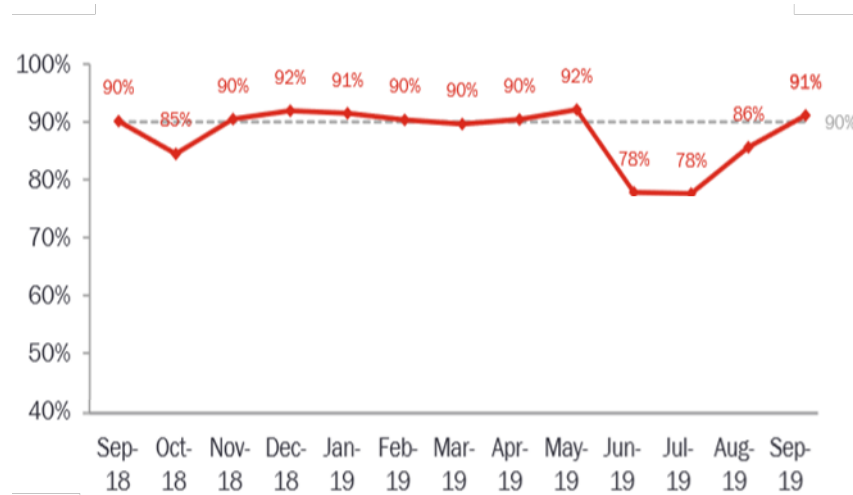
December 16, 2019

Michael Fitzgerald

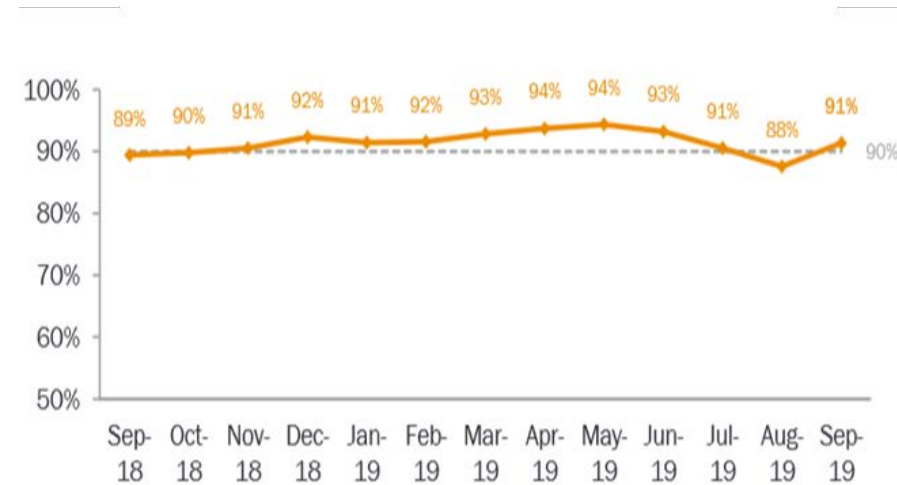
Customer Commitments

At the August 13, 2018 FMCB, we made the following commitments to our customers:

Red Line
95% Reliability
@ 3 Minute headways



Orange Line
96% Reliability
@ 4 ½ minute headways



Red/Orange Line Task Force Progress

- Started Summer 2019
- Collaboration – MBTA, Red/Orange Line Transformation and Network Rail
- Coordination – Reviewed system capacity, traction power, capital projects through 2025
- Definition – New critical track and power investments by 2025 and beyond
- Identification – Enabling actions across the MBTA
- Policy recommendations supporting Red/Orange Line service outcomes

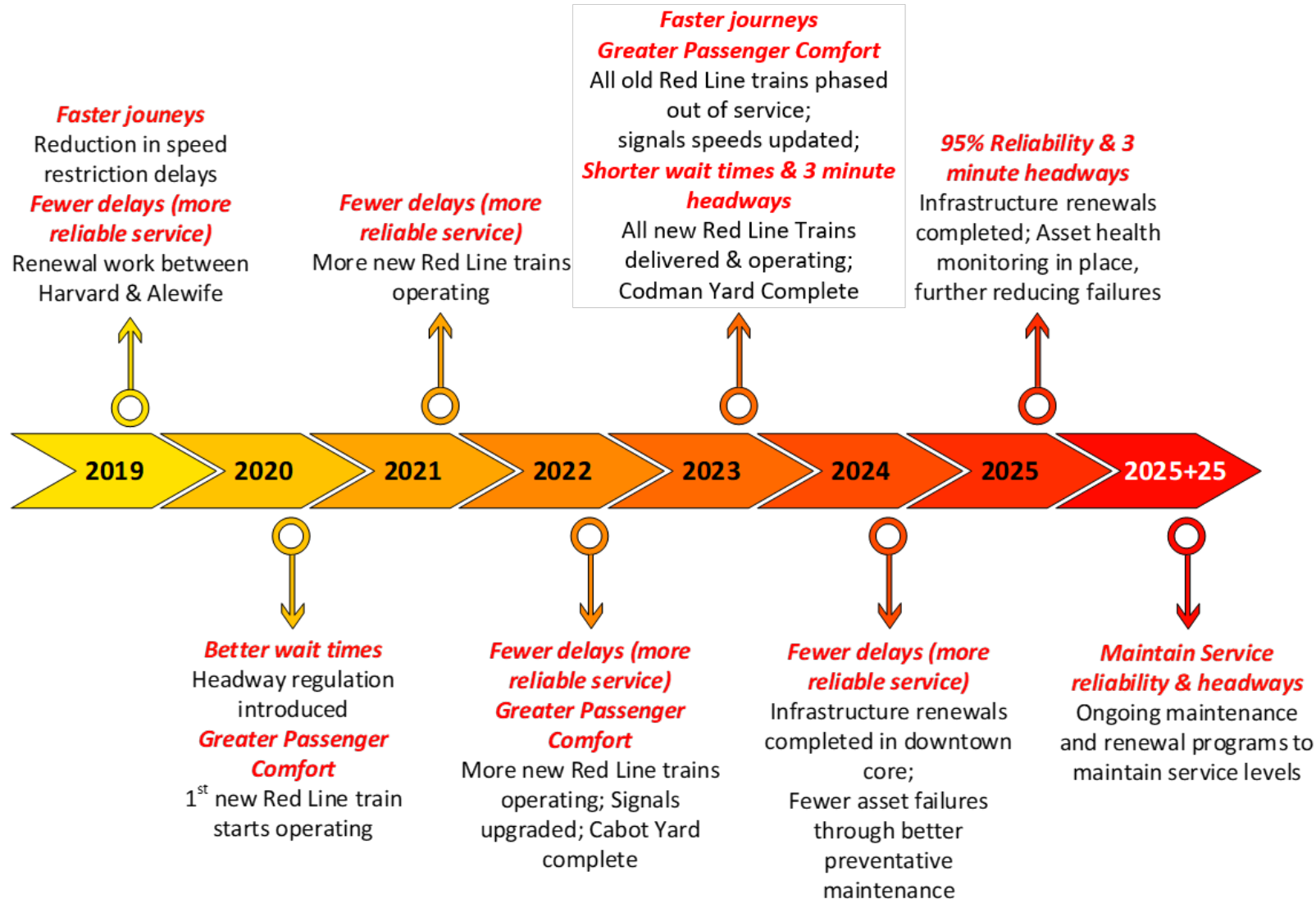


Red/Orange Task Force Approach

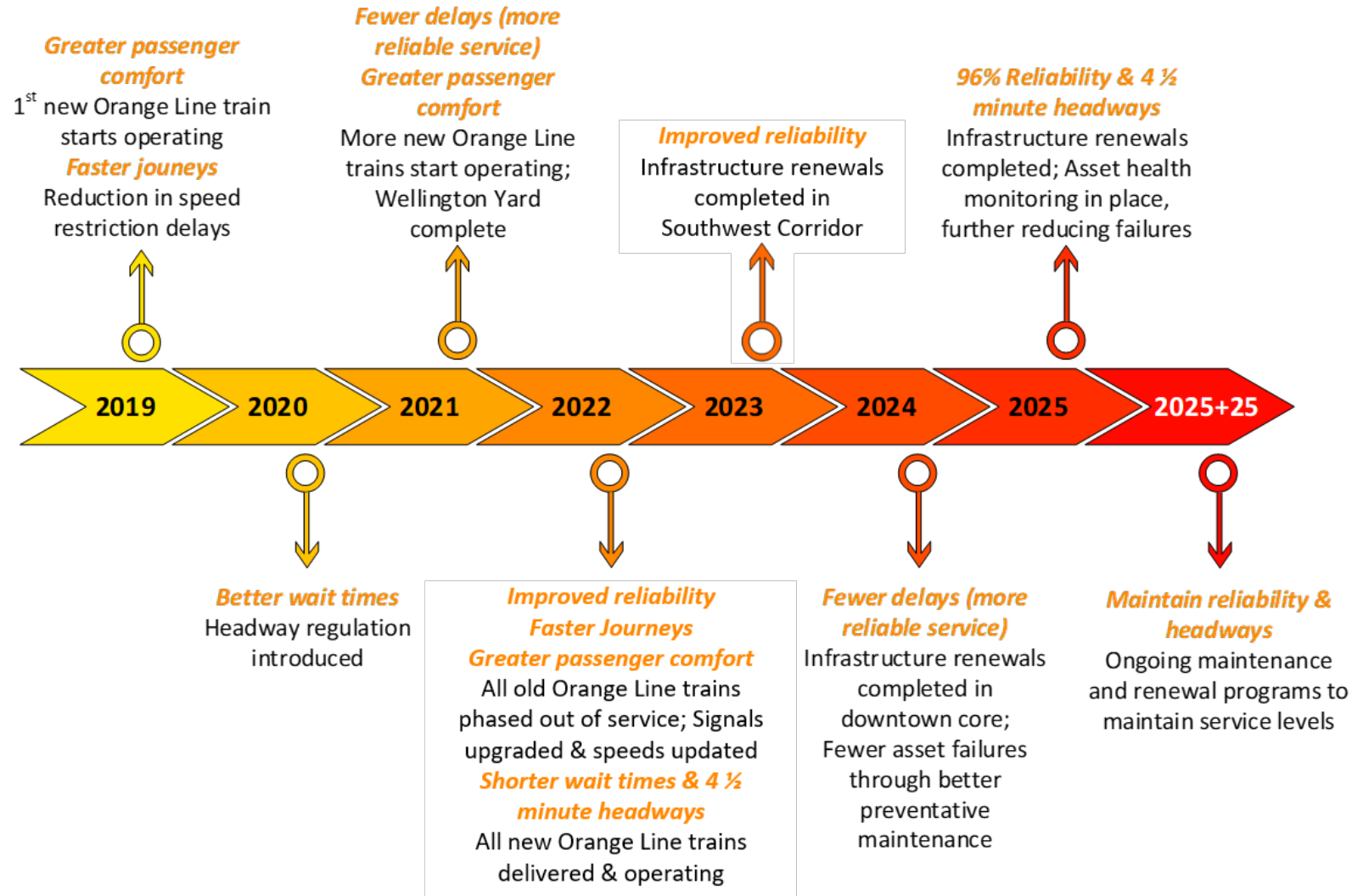
- Developing a transformation plan for one part of an incredibly complex system is an inherently difficult task
- We made a few major assumptions to help focus our efforts
 - Considered Red/Orange Lines as a stand alone system
 - Time constraint of 2025 headway and reliability targets
 - Adopt an asset management driven lifecycle cadence for asset renewal & maintenance
- The outcome of this approach will be tangible recommendations for the Board to consider as they weigh against other needs of the Authority



Red Line Customer Benefits Plan



Orange Line Customer Benefits Plan



Customer Benefit Initiatives

- Operational Policies and Practices
 - Dwell time reduction
 - Train headway adherence
 - Training for operators & maintainers
 - Rail system simulation
 - New public performance measures: headway adherence, excess trip time
 - Passenger demand forecasts and capacity planning for 2050



System Reliability Initiatives

- Implementation of Asset Management
 - Data-driven identification of age and condition
 - Automated collection of asset performance
 - Remote condition monitoring
- Investment in Capital Renewals and Upgrades
 - 5-year capital project implementation
 - New investment in infrastructure renewal identified by asset management
 - Future shift in both inspection and maintenance regimes
 - Long term capital program investments to achieve and maintain state-of-good repair including remote condition monitoring of new assets

Trapeze Asset Management Database

Asset Search					
Asset ID			...	Go	

Service Requests					
Zoom	Date Created	ID	Asset	Priority	Task
Q	12/11/2019 14:25	TK-GAY-RBP-LECH-T3-64798	TK-GAY-RBP-LECH-T3 - GLA YD - LECHMERE YARD TK3 BUMPER	3	TK-771 - DAJ
Q	12/11/2019 14:12	TK-OL-AXG-SUMMERST-64797	TK-OL-AXG-SUMMERST - OL - SUMMER ST ROW GATE	3	TK-006 - NO OTHERS
Q	12/11/2019 13:44	TK-OL-AXG-JERRYS-64770	TK-OL-AXG-JERRYS - OL - JERRYS ROW GATE	3	TK-720 - DAJ
Q	12/09/2019 08:35	TK-OL-SB-64452	TK-OL-SB - ORANGE LINE SOUTHBOUND TRACK	3	TK-601 - LOV
Q	08/27/2019 17:50	TK-OL-SB-63370	TK-OL-SB - ORANGE LINE SOUTHBOUND TRACK	3	TK-202 - DET
Q	08/23/2019 13:23	TK-OL-SB-63196	TK-OL-SB - ORANGE LINE SOUTHBOUND TRACK	3	TK-905 - CAT
Q	08/20/2019 10:14	TK-OL-NB-63029	TK-OL-NB - ORANGE LINE NORTHBOUND TRACK	3	TK-103 - HOI ALIGNMENT

Showing 12 records

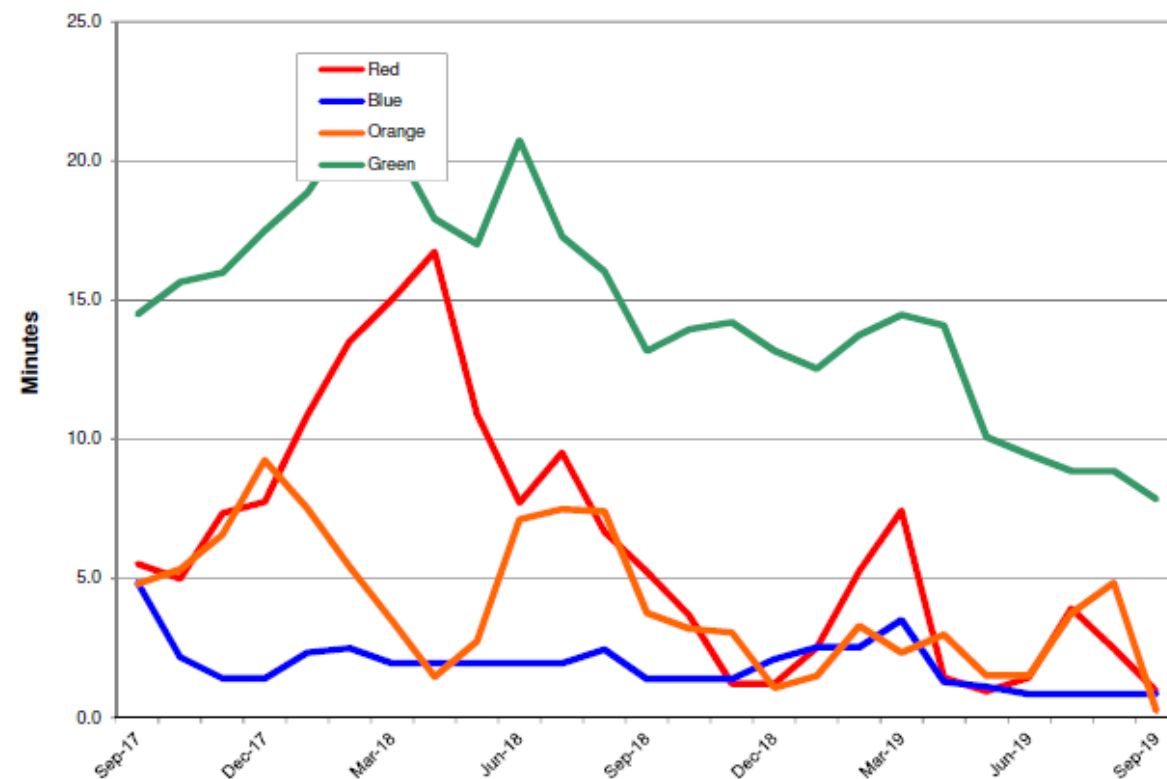
Work Orders					
ID	Assignment Status	Asset	Priority	Job Type	Sta
MOW-OL-2019-105	N/A	TK-OL-SB - ORANGE LINE SOUTHBOUND TRACK	3	REPAIR	WORK F



Implementation of Asset Management

- Early stages of data collection, classification, and condition assessment of assets. This enables us to begin applying asset management practices that will achieve customer benefits.
- This organization-wide initiative began over 3 years ago with significant progress on vehicle maintenance and track to date.
- Ultimate transition from reactive to preventative maintenance practices

Reduction in Speed Restrictions (minutes delay)



Speed Restriction Impact is measured as the difference between the round trip travel time at the speed limit with track speed restrictions in place and at the regular speed limit.

This chart sums the speed restriction impacts for all branches of each line.

Existing Capital Programs: Red Line Projects

Current Program Projects

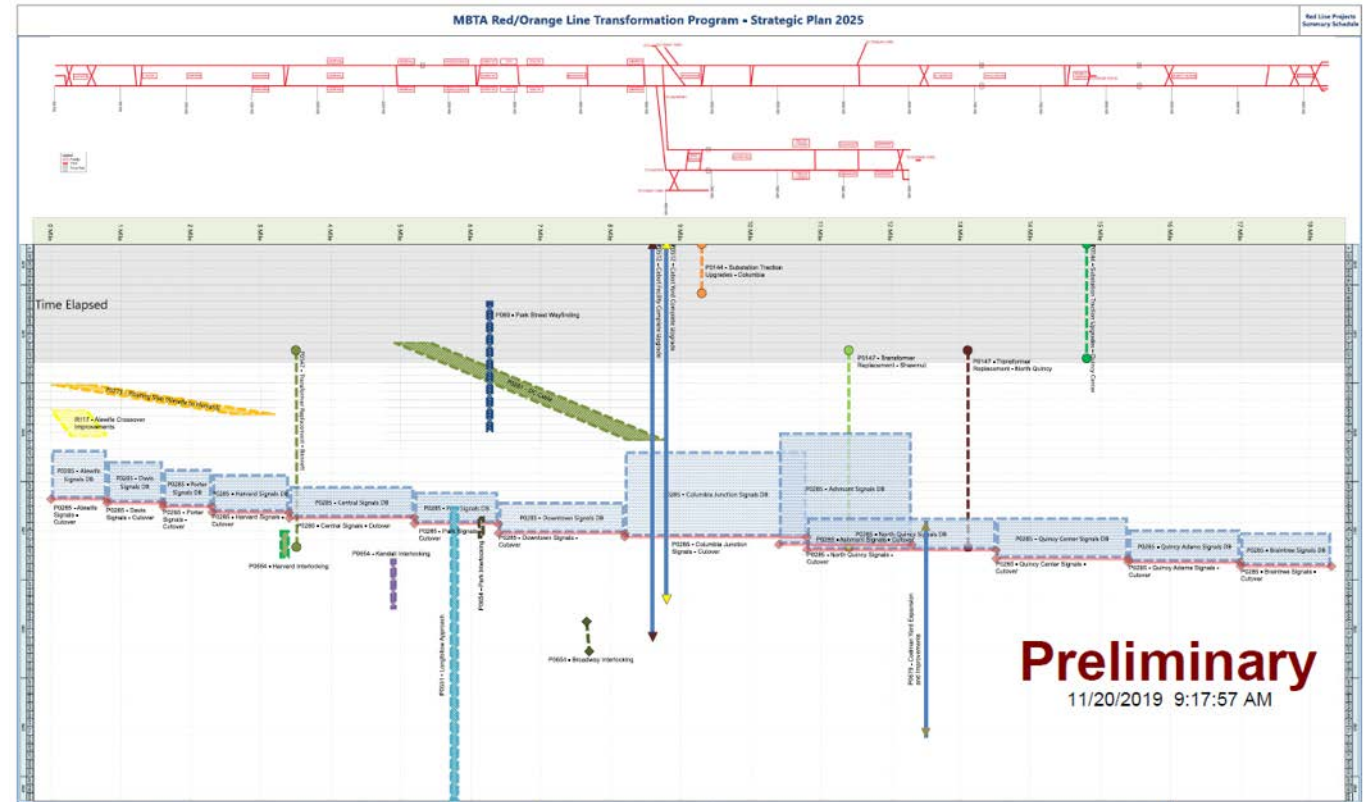
Total Value: **\$622,643,711**
(fully funded)

Construction Phase Projects

- Red Line Test Track
- Cabot Yard & Maintenance Facility Improvements
- Signals Upgrade Project (Design-Build)

Design Phase Projects

- Alewife Crossover Improvements
- Codman Yard Rebuild & Expansion



Mainline Projects in the 5 Year CIP – Time and Location

Existing Capital Programs: Orange Line Projects

Current Program Projects

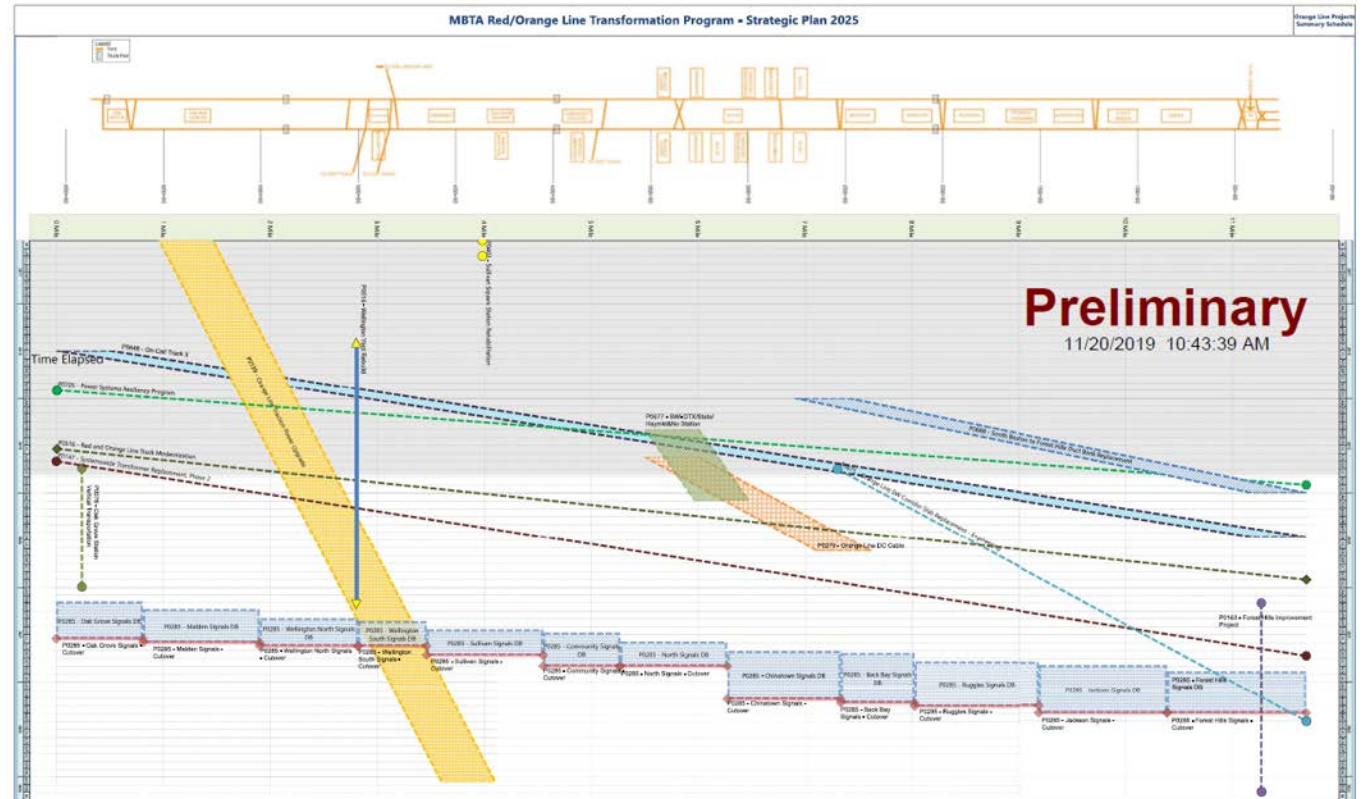
Total Value: **\$447,237,902**
(fully funded)

Construction Phase

- Wellington Maintenance Facility
- Wellington Yard Rebuild
- Signals Upgrade Project (Design-Build)

Completed

- *Wellington Yard Expansion (Tracks 33-38)*
- *Orange Line Test Track*



Mainline Projects in the 5 Year CIP – Time and Location

Identification of Additional Investments Through 2025

- We have confidence in delivery of existing and funded capital projects
- But our asset management information has identified additional investment needs for track and power through 2025 and beyond.
- The need to renew the infrastructure and sustain performance will result in a new cadence of capital project implementation for the future.
- We recognize that innovative ways to deliver those investments in addition to the current program will be critical.

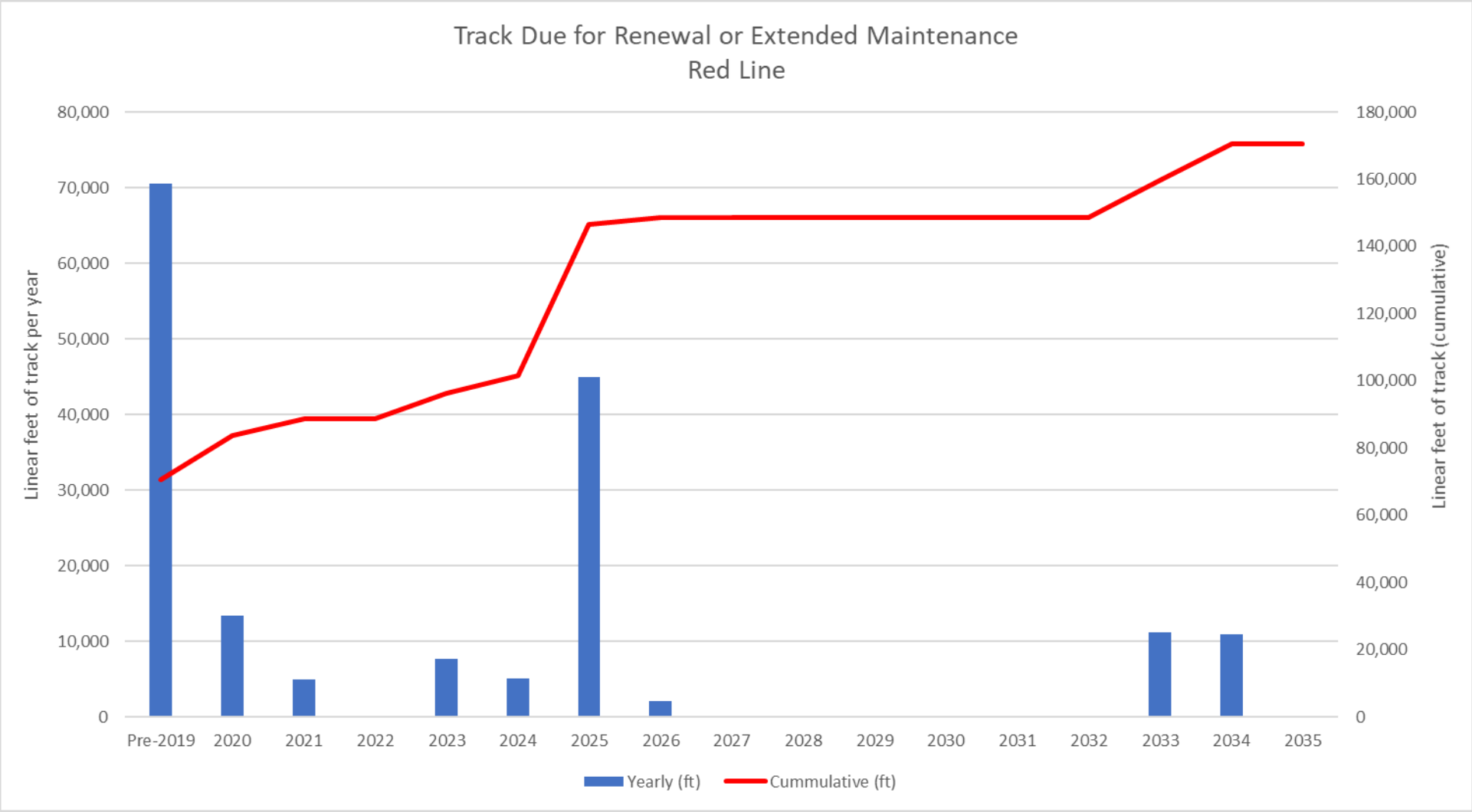


New Track Investment Needs

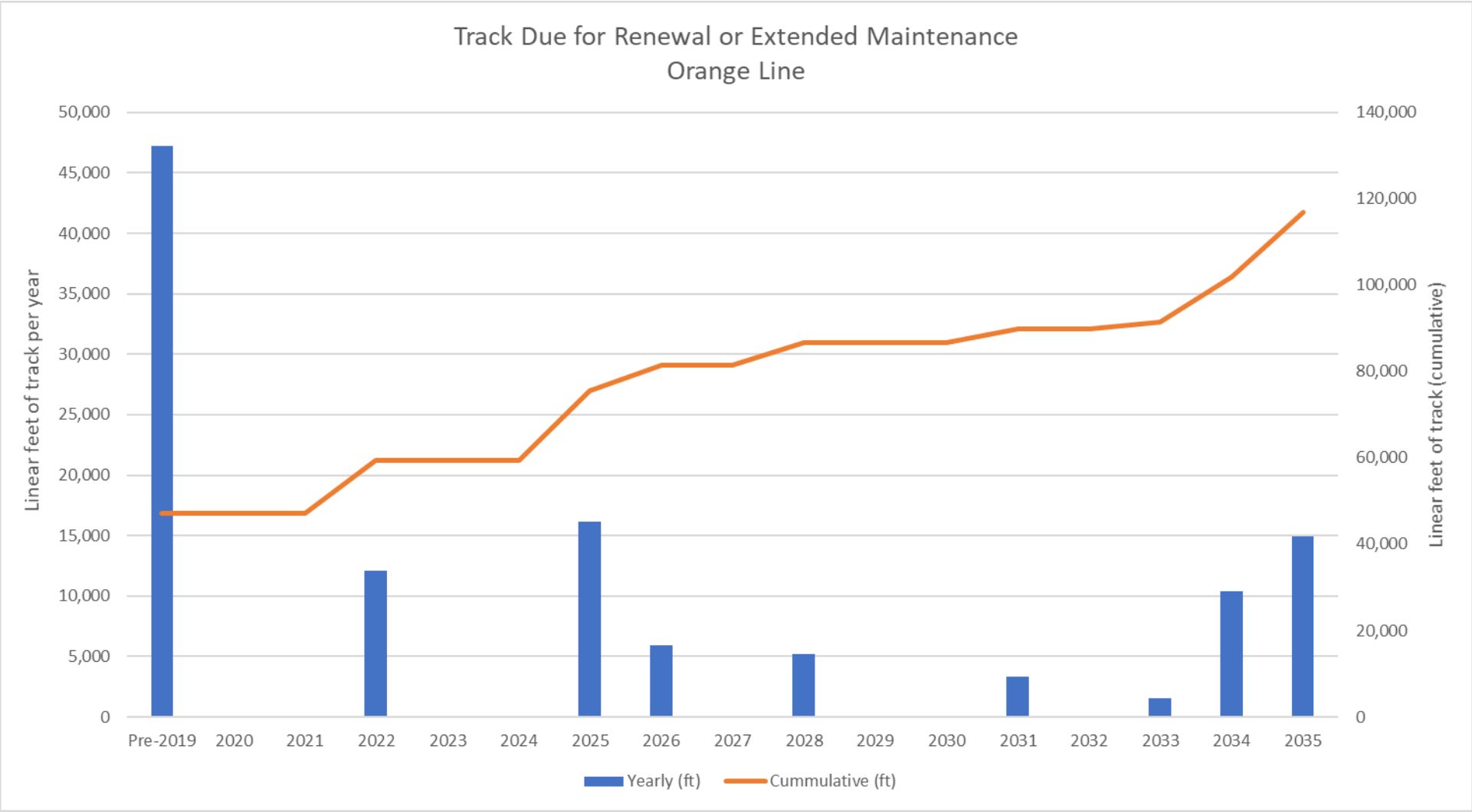
- Track asset management has collected age and condition data for the Red Line and Orange Line
- An analysis was performed for all track asset types indicating that on both lines there is a total of 220,000 feet of track that will require renewal or extended maintenance through 2025.



Track Age and Condition: Red Line



Track Age and Condition: Orange Line



Track Service Life: Management Options

- Replacement of all identified track immediately is neither practical or essential
- Strategies for management of track condition:
 1. Reactive maintenance: higher costs, reliability reduces, least disruptive
 2. Life extension: higher short-term costs, improves reliability in short term
 3. Renewal: lowest whole life cost, significant reliability benefits.
- Our plan utilizes a blend of options, balancing current service quality and future reliability
- Plan also seeks to combine **power system renewal** at the same time as track renewal is undertaken



Identifying and Scoping New Red Line Projects

Track

62,000 ft. full-depth renewal

82,000 ft. extended maintenance

Power System Renewal

Kendall to Harvard

- Full-depth track renewal

Alewife to Beacon Portal

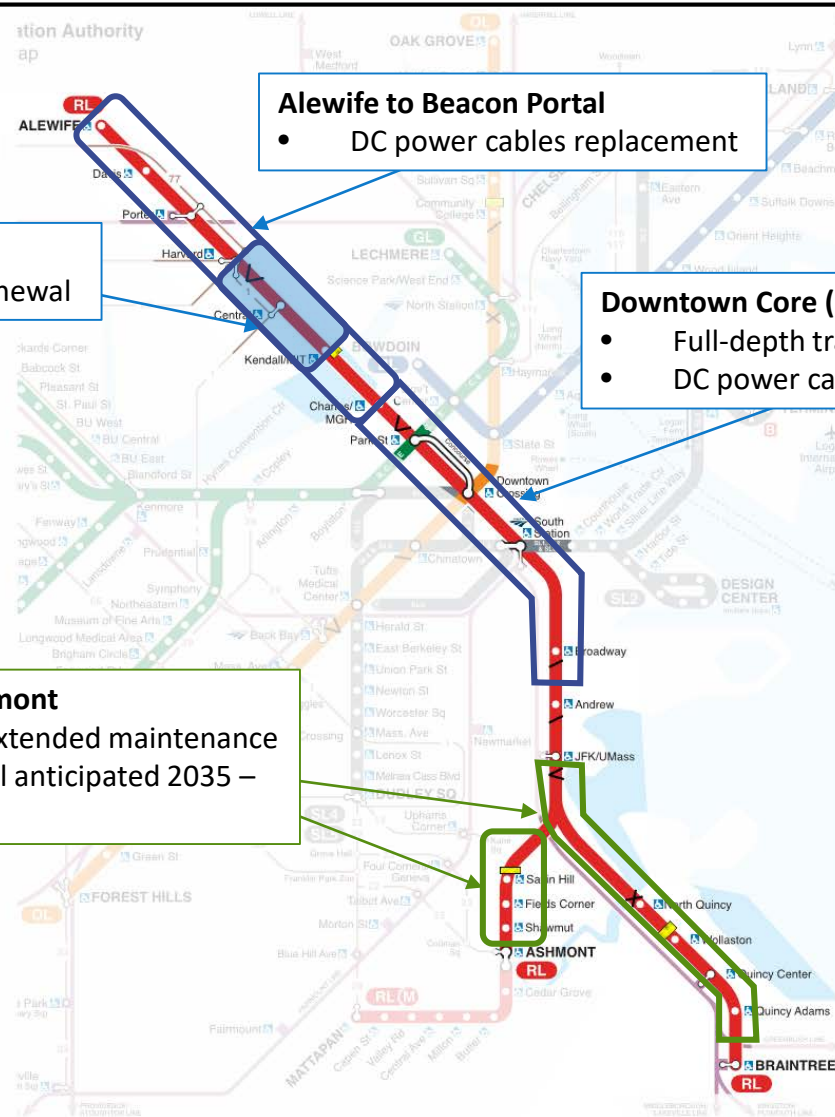
- DC power cables replacement

Downtown Core (Beacon Portal to Dorchester Ave Portal)

- Full-depth track renewal
- DC power cables replacement

Braintree & Ashmont

- Rail & Tie extended maintenance
- Full renewal anticipated 2035 – 2045



Identifying and Scoping New Orange Line Projects

Track

58,000 ft. full-depth renewal

18,000 ft. extended maintenance

Power System Renewal

North Station to Oak Grove

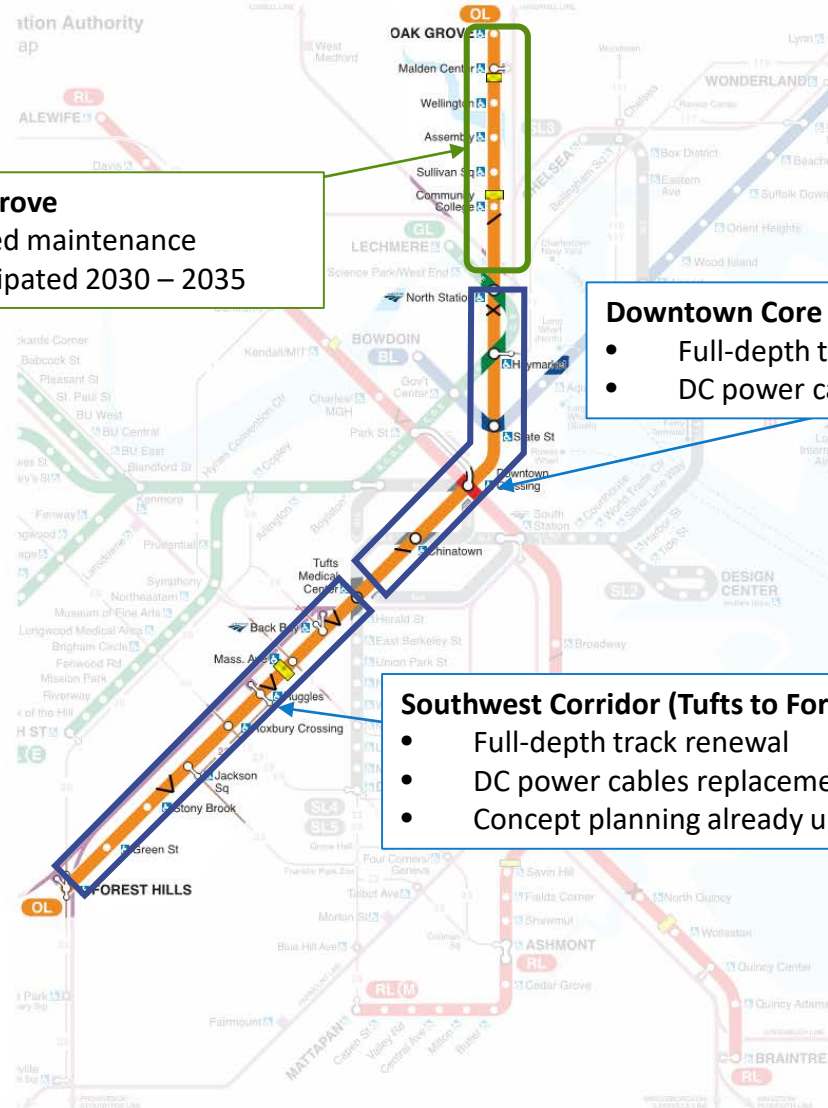
- Rail & Tie extended maintenance
- Full renewal anticipated 2030 – 2035

Downtown Core (North Station to Tufts)

- Full-depth track renewal
- DC power cables replacement

Southwest Corridor (Tufts to Forrest Hills)

- Full-depth track renewal
- DC power cables replacement
- Concept planning already underway



Significant Initiatives to Support Capital Program/Sustain Reliability

To reduce the time to complete this major renewal program and sustain system condition requires:

- Major new engineering, construction, and material vendor capacity
- Investment in people: new roles, new skills, new recruits, training
- System capacity, performance, and operations modelling
- Asset reliability policies for engineering, maintenance, and capital programs
- Remote Condition Monitoring of asset 'health' for infrastructure and vehicles
- Investment in systems: data management, analytics
- Procurement of new technologies and equipment



Risks

- Funding to achieve system performance commitments
- Infrastructure delivery
 - Industry capacity
 - Integrated access / substitute service program
- Sufficient Capital & Operations staffing with appropriate skills & training
- Succession planning
- ‘Whole Team’ understanding, acceptance, and engagement
- Future ridership growth and system capacity



Estimated Additional Investment Needs

2020 – 2025 (\$ in millions)

• Track and drainage	470
• Power	398
• Signals	10
• Facilities	5
• Program Delivery Costs*	409
<i>*Force Account, Design, Diversions, Admin, Escalation, Real Estate, etc.</i>	
• E&M	25
• IT, “smart” systems	15
• Business changes	30
TOTAL	\$1,362M

2025 – 2050

Under development

Operating Costs are NOT Included



Next Steps

- Whole organization participation in task force and steering Committee
- Establish Action Teams by March
- Perform traction power load flow study based on recommendation from 2019 power study
- *Orange Line Southwest Corridor*: develop procurement-ready design/build package
- Develop remaining construction packages for renewal of track and power for Red and Orange Line
- Develop additional transformational passenger and station customer benefit programs
- Reporting and updates to FMCB



Next Steps

Action Teams by March

- Stakeholder communications and engagement strategy
- Project delivery/procurement strategy
- Substitute service strategy
- Reliability metrics
- System modelling
- Passenger forecasting
- Operations trials for headway adherence and dwell times
- Update CIP/5-year operating projection for Red/Orange Line
- Further develop capital needs for 2025–2050

