



**Massachusetts Bay
Transportation Authority**

Green Line Capacity Improvements

Fiscal and Management Control Board

April 24, 2017



Overview

- Facts and Figures
- The Existing Infrastructure and Vehicles
- The Strategy for Increasing Capacity on the Green Line
- Short Term Improvements
- Mid Term Improvements
- Future Improvements
- In Summary



Green Line
Facts and Figures



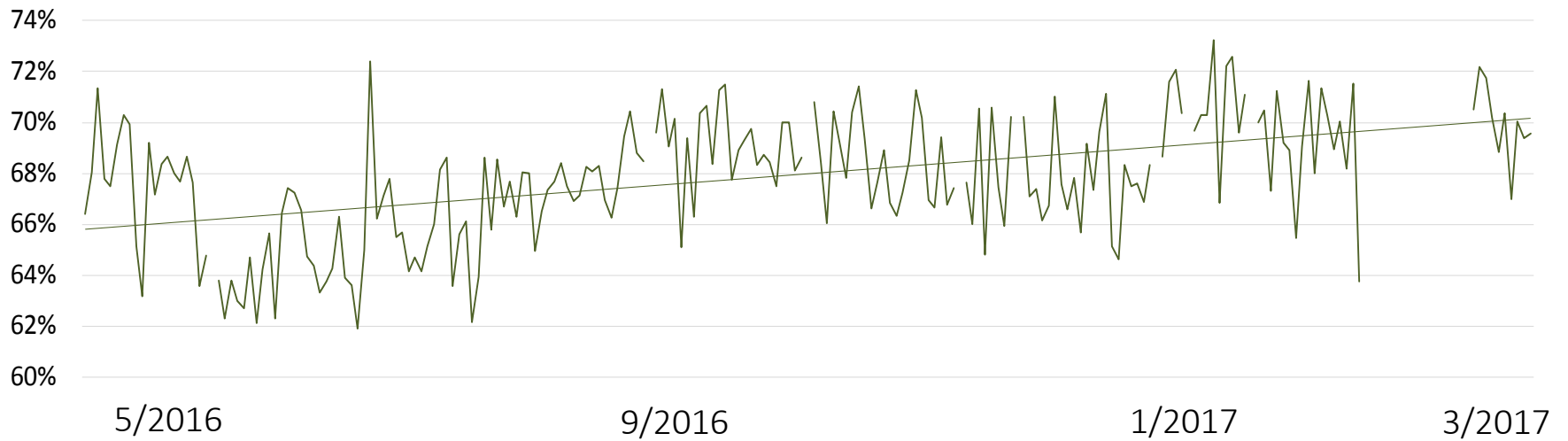
Key Facts



- Over 200,000 trips each weekday—the nation’s busiest light rail line
- 66 Stations
- 200 Fleet Cars
- Allocated fare revenue of \$73,950,058
- Right of Way
 - 31 track miles (yard + revenue)
 - 82 switches
 - 5 miles of tunnel section
 - 51 traffic signalized intersections



Green Line Reliability Performance

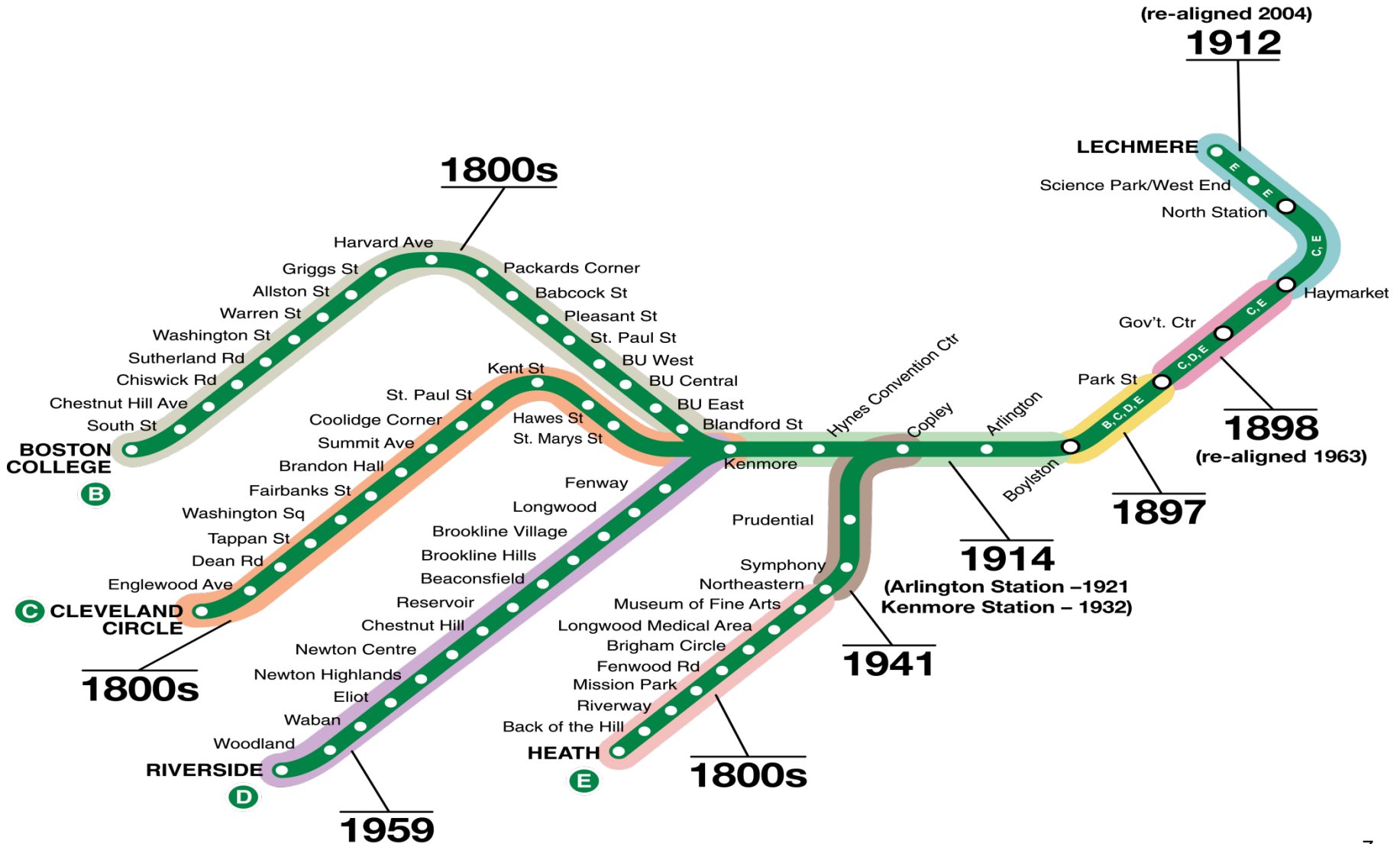




The Existing Green Line Infrastructure
and Vehicles



Infrastructure is Varying in Age and Installation Date





Assets Overview

18 ventilation shafts

38 ventilation fans

235 miles of power cable;

19 power substations

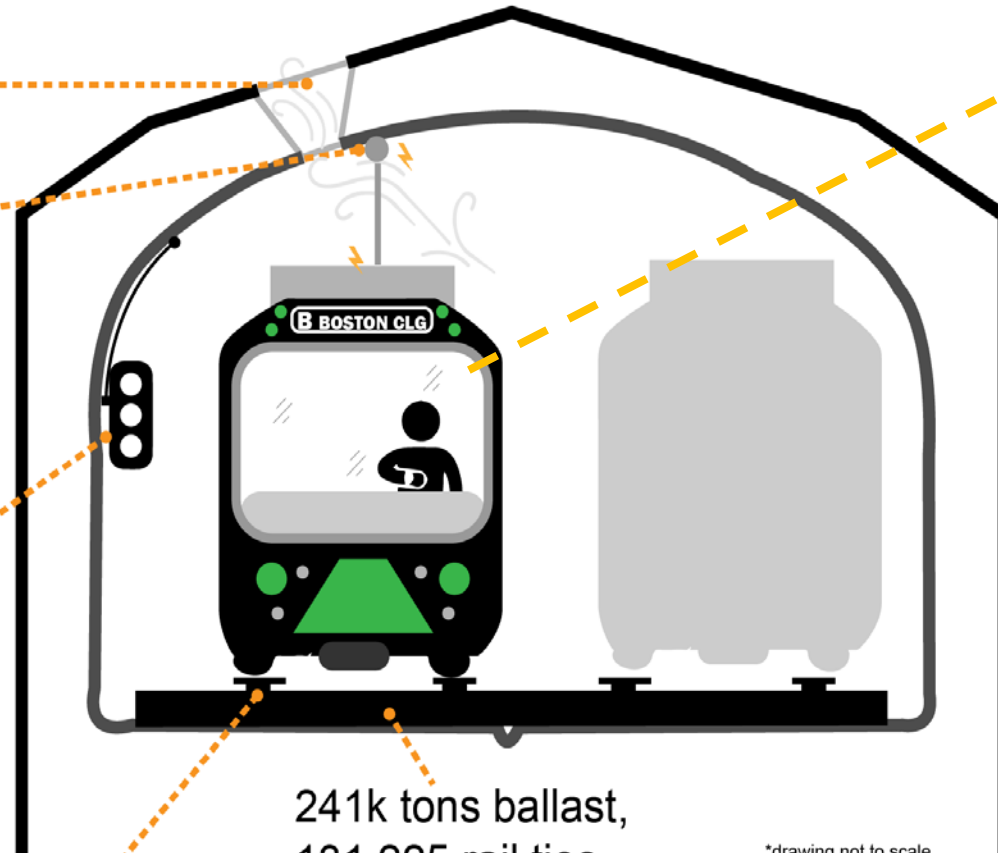
165 wayside signal equipment cases

26 (revenue) track miles

241k tons ballast,
131,225 rail ties,
and 5.2 miles of tunnel;
82 switches

94 accessible Type 8 cars

102 Type 7 cars (require a mobile lift to board)



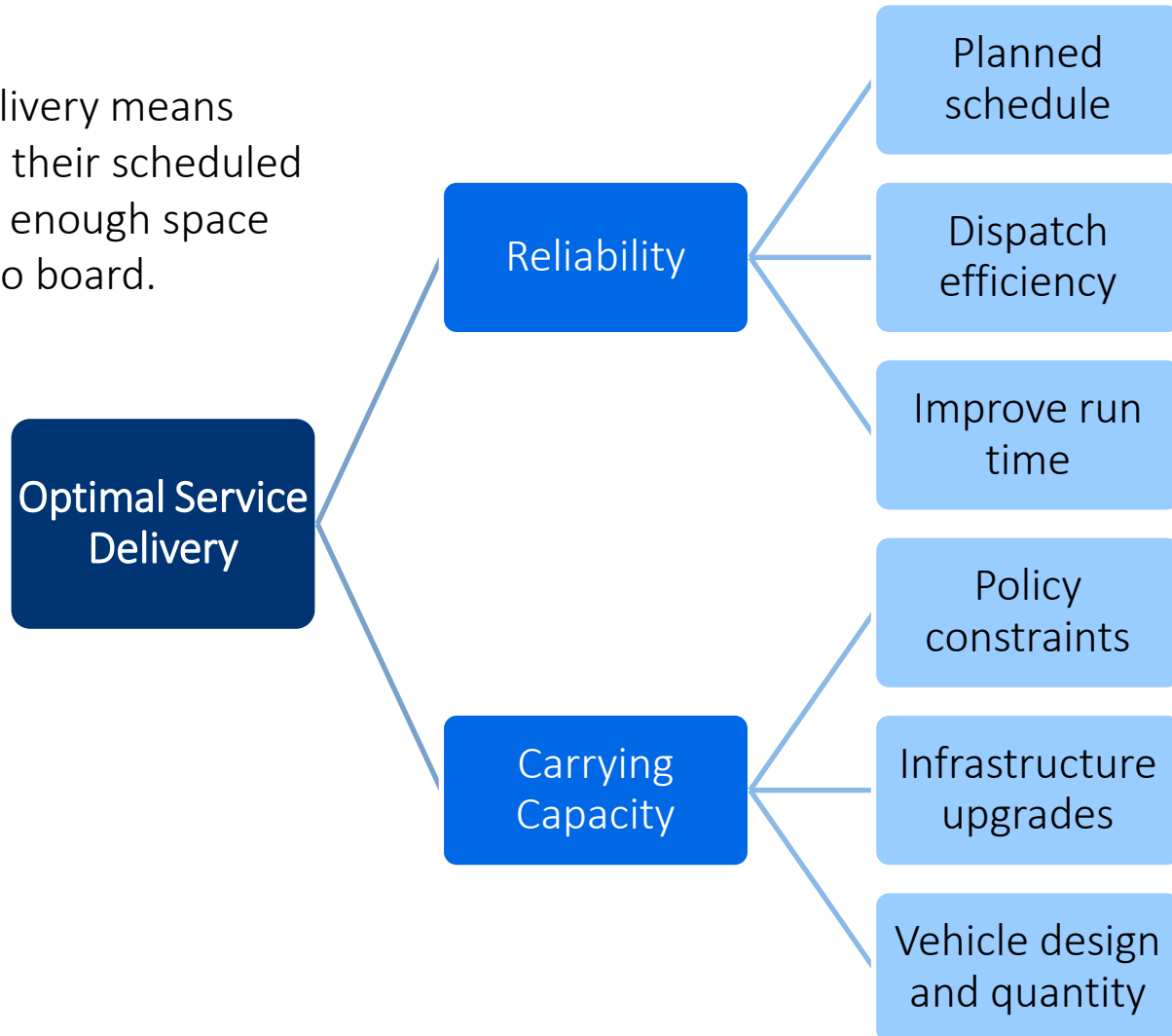


The Strategy for Increasing Capacity
on the Green Line



Capacity and Optimal Service Delivery

Optimal service delivery means trains arrive within their scheduled headway, and with enough space for all passengers to board.





Tactical Toolbox



Service Changes

- Run time and reliability changes
- Frequency and span changes

Operational Changes

- Improved dispatching tools and procedures

Capital Investments

- Additional vehicles
- Infrastructure investment

Partnerships with municipalities

- Signal Prioritization
- Signal Phase Optimization

Private sector partnerships

- Technical Analyses



Short Term Improvements



Service Planning Improvements

Goal

Increase reliability and capacity along the Green Line.

Solution

Investment to the Government Center and updated service planning.

Status

Government Center opened in March 2016. Run time and reliability analyses are completed at each service change.

Result

Spring Rating (March 2016) opening of Government Center. A concurrent run time and reliability analysis was completed and service changes were implemented late March 2016. A second run time and reliability analysis was completed and changes were implemented.

Next Steps

Continued service changes.



Transit Signal Prioritization

Goal

Improve run time for passengers.

Solution

Extend green light for Green Line as it approaches intersections.

Status

Active at 4 intersections on B and E branches. C branch active testing underway.

Partners

Boston and Brookline.



Transit Signal Prioritization

Expected Result

Travel time savings of 0:30/trip for B branch customers. C and E branch time savings estimates under review.

Next Steps

Completed testing in Boston and Brookline in June 2017.

Roll out to all applicable intersections as server space allows through Fall 2017.



Signal Phase Optimization

Goal

Improve run time for passengers.

Solution

Change signal timing to give priority for left-turning cars.

Status

Analysis underway for 6 Commonwealth Avenue intersections.

Partners

Boston, Brookline and MassDOT.



Signal Phase Optimization

Expected Result

Travel time savings of 0:10/trip average for B branch customers.

Next Steps

Develop implementation plan with Boston and MassDOT Highway Division.

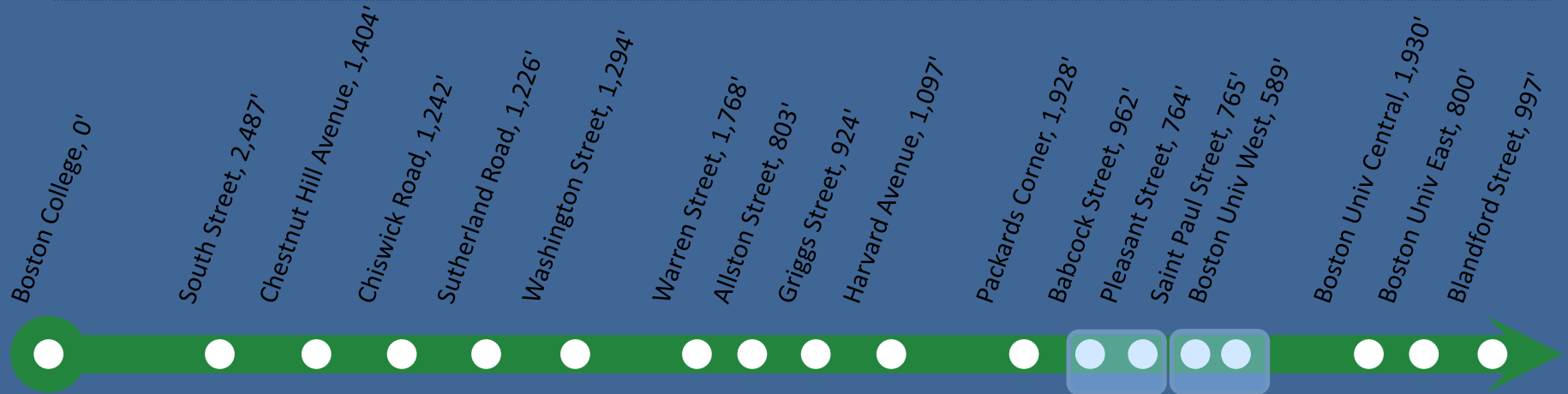
Complete analysis for Beacon Street and Huntington Avenue.



Mid Term Improvements



Surface Station Consolidation



Goal

To enhance reliability and run times.

Solution

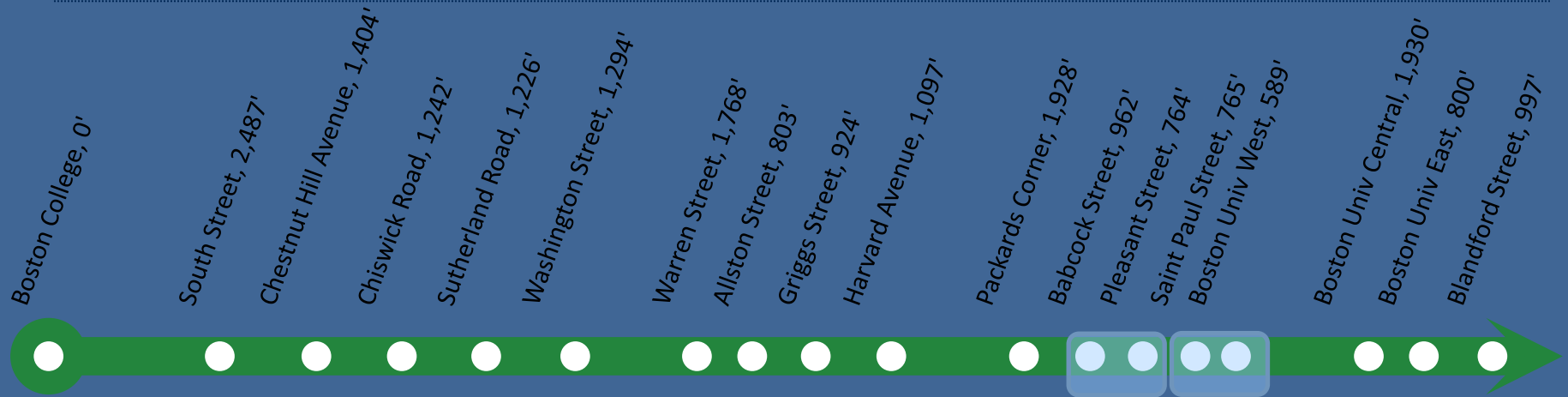
Consolidate stations that are within a close proximity. Consolidate four stations into two stations along the B Green Line corridor.

Status

Station consolidation is to be completed in 2019.



Surface Station Consolidation



Partners

Boston and Brookline.

Expected Result

Travel time savings of 0:20/trip average for B branch customers.

Next Step

Work with Boston and Brookline to identify additional surface station consolidation candidates.



Real-Time Tablet Application Pilot

Goal

To dispatch trains more evenly, thus improving reliability.

Solution

Empower officials with real-time information and up-to-the-second departure recommendations.

Status

Successful pilot completed at Riverside Terminal in March 2017.

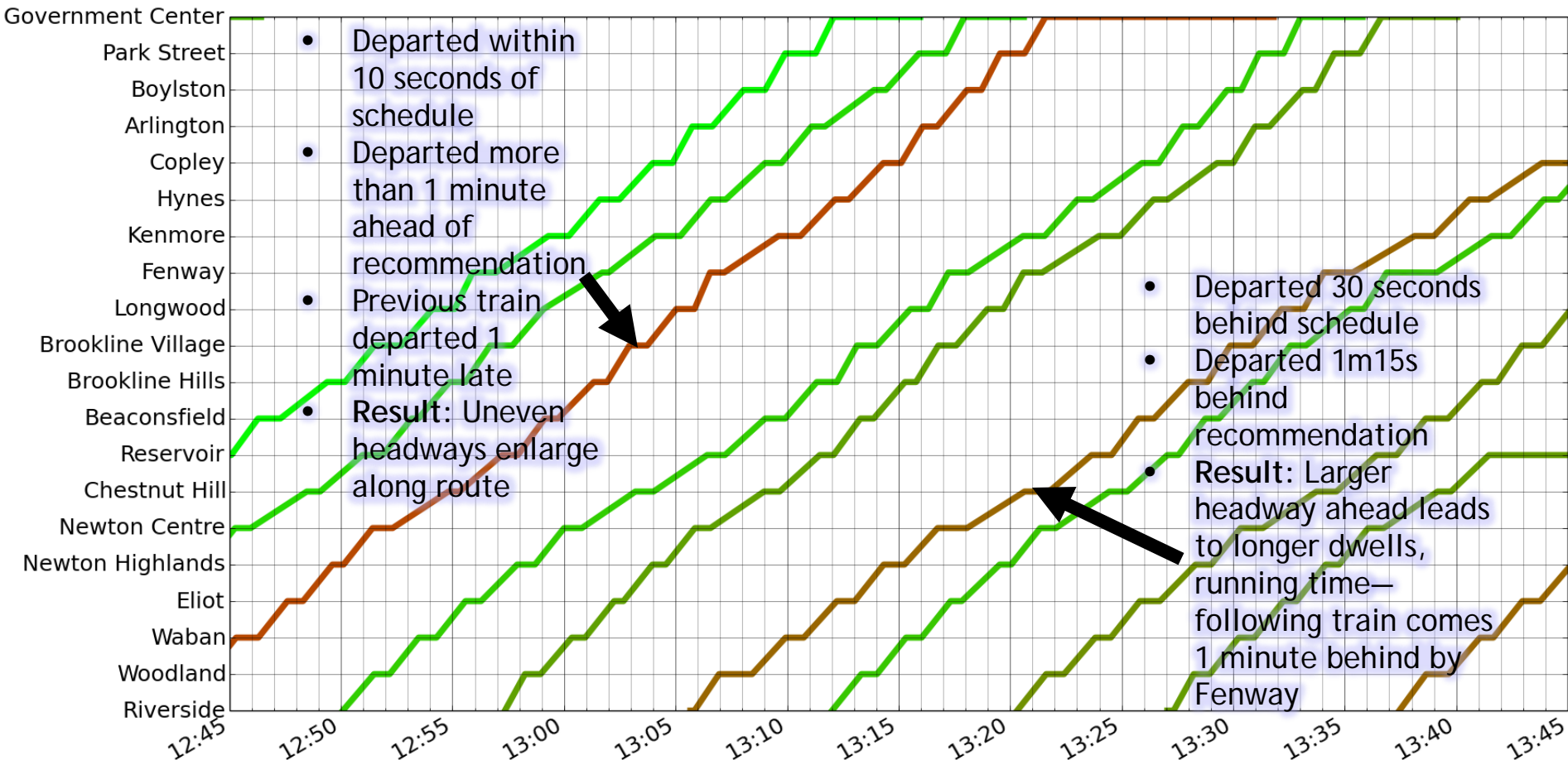
Partner

MIT



Real-Time Tablet Application Pilot

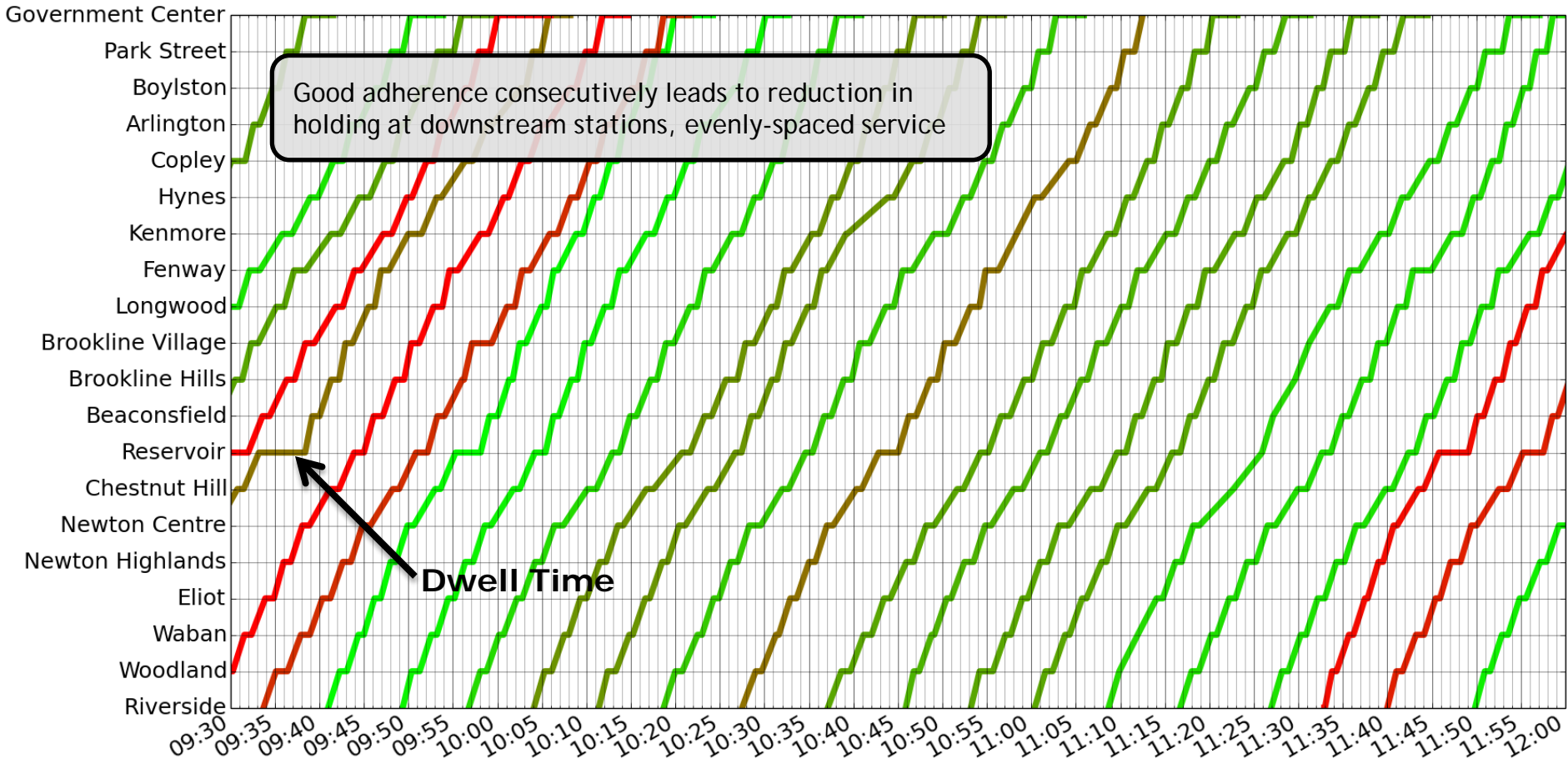
Poor Headway Control - Monday, March 6, 2017





Real-Time Tablet Application Pilot

Headway Control - Tuesday, March 7, 2017





Real-Time Tablet Application Pilot

Results

When the pilot was in full effect, headway variability decreased by 42% as experienced by passengers at surface stops.

Next Steps

Short Term:

Create a tablet application that will show real-time train arrivals at terminals, by June 2017.

Longer Term:

CIP request was approved for software/user interface component to roll out to all officials. MIT will continue to develop and test algorithms. Anticipated roll out in 2019.



Long Range Customer Demand Study

Goal

Explore initiatives for improving capacity beyond vehicle and infrastructure upgrades.

Solution

Understand opportunities to improve capacity through partnerships. Strengthen existing partnerships and identify action items to improve capacity.

Status

Complete by mid/late 2018.

Partner

MassDOT Planning



Long Range Customer Demand Study

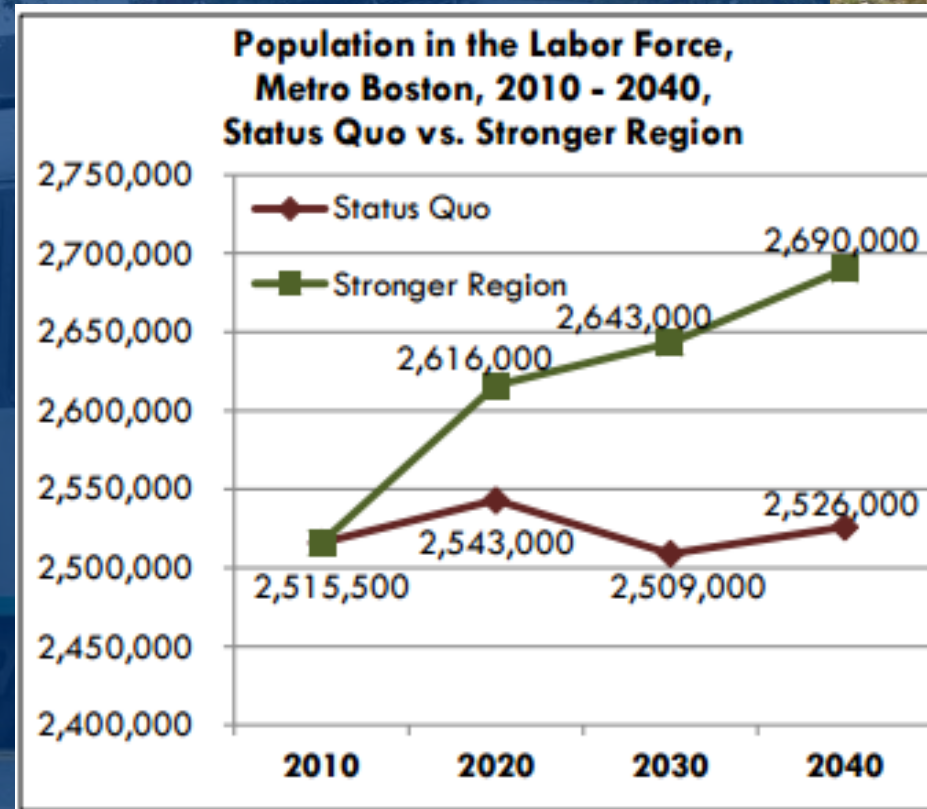
Expected Result

Future Green Line passenger demand baseline.

Identification of opportunities to improve capacity and reliability, working with partners.

Next Step

Continued partnership with MassDOT Planning and partners along the Green Line corridor.



Source: MAPC



Future Improvements



Green Line Extension and Type 9 Cars

Goal

Increase connectivity and capacity along the Green Line.

Solution

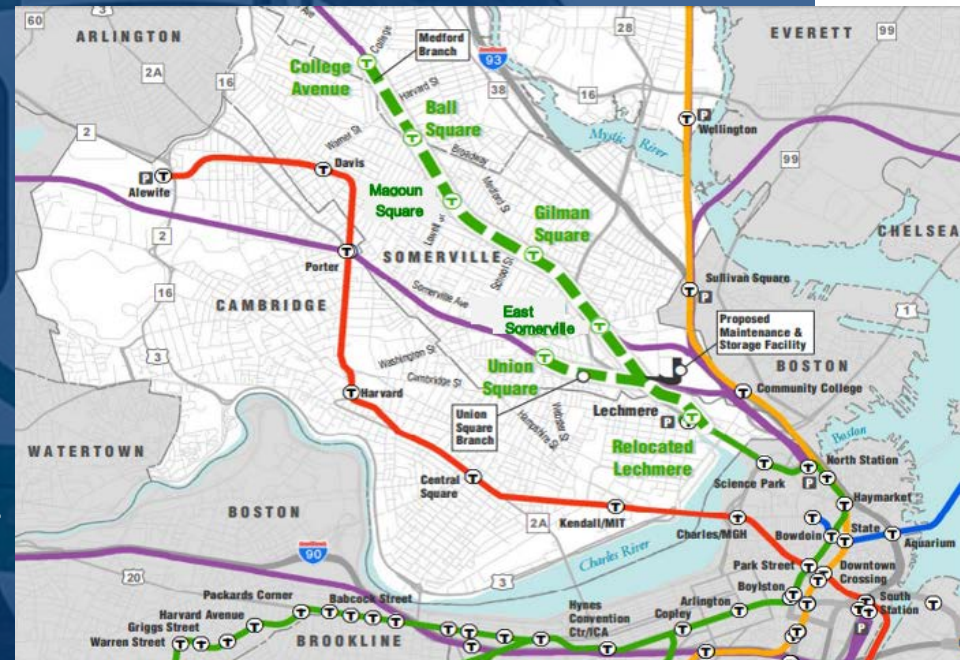
Extend the Green Line from Lechmere to College Avenue in Medford.

Status

Construction schedule is 43 months.

Partner

MassDOT, City of Somerville and Federal partners.





Green Line Extension and Type 9 Cars

Expected Result

Green Line is extended 4.5 miles, with 6 new transit oriented stations.

24 New Green Line vehicles and a new Green Line vehicle storage and maintenance facility.

20% of population of Somerville is within walking distance of rail transit today, and 80% is anticipated to be so with extension of the Green Line

Next Steps

Continued planning and construction based on schedules.

Service planning and scheduling in anticipation of new service delivery along the extended line.



Infrastructure and Future Vehicles

Goal

Model of service improvements possible under different Type 10 car types and infrastructure upgrade scenarios.

Solution

Analyze the Green Line, using simulation models to test operational approaches to enhanced service delivery.

Status

Project to begin in May 2017. Completion expected by April 2018.

Partner

LTK Engineering



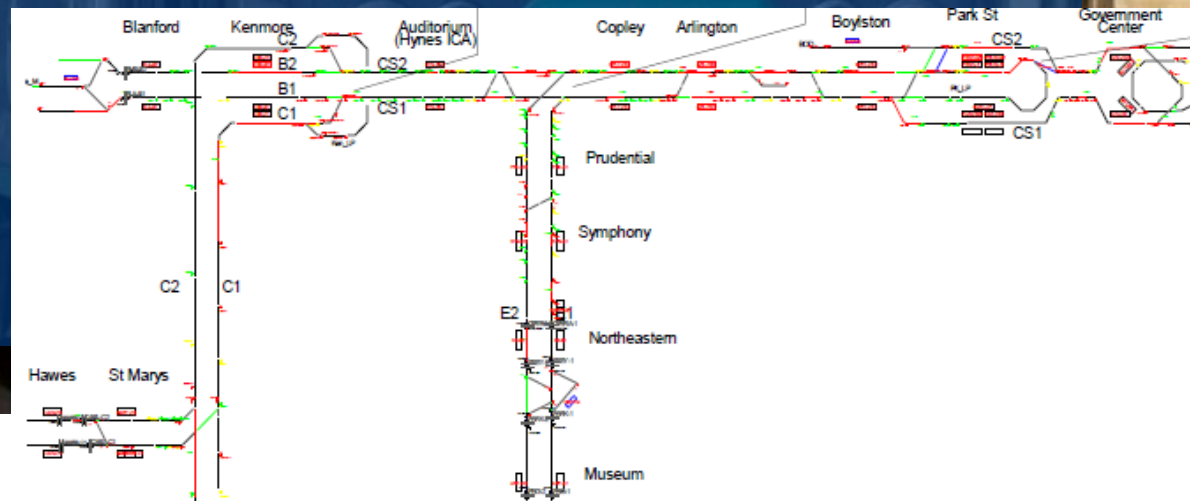
Infrastructure and Future Vehicles

Expected Result

Technical analysis of benefits based on the application of various operational scenarios for future light rail vehicle types and infrastructure upgrades.

Next Step

Work with LTK and partners to complete Green Line Study and develop a proposed project list based on operational scenarios.

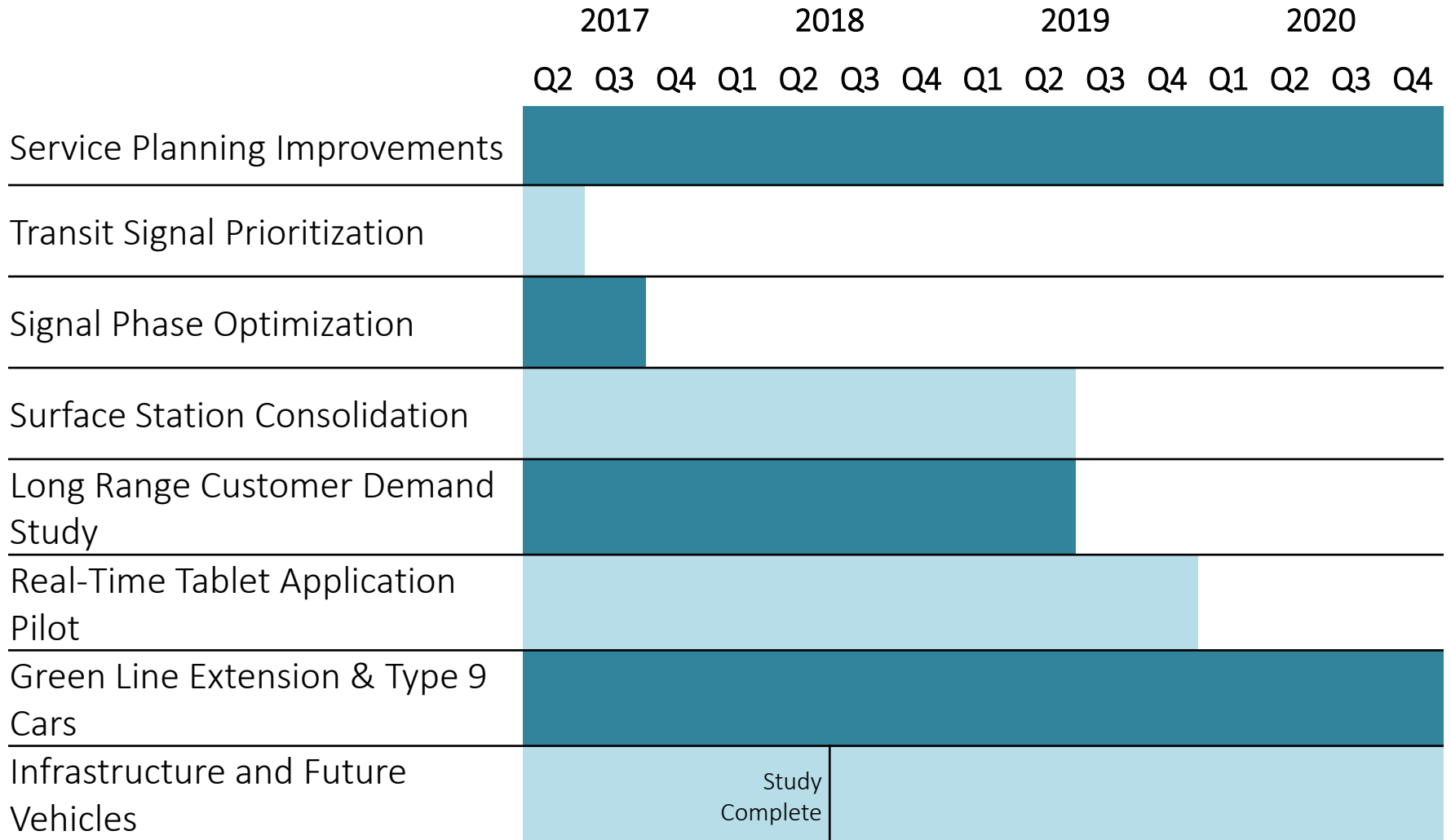




In Summary



Timeline for Improvements





In Summary

The Green Line is the nation's busiest light rail system.

The Green Line has unique characteristics and elements that require specific approaches for improvement.

We have a **strategy** to improve **infrastructure** and **vehicles** on the Green Line.

We are using our tactical toolkit to implement initiatives to support improvements.

- Service Changes

- Operational Changes

- Capital Investments

- Partnerships with Municipalities

- Private Partnerships