Enhanced Transit Corridors

Draft Recommended Plan

PUBLIC REVIEW DRAFT – 2/19/2018

PBOT
PORTLAND BUREAU OF TRANSPORTATION

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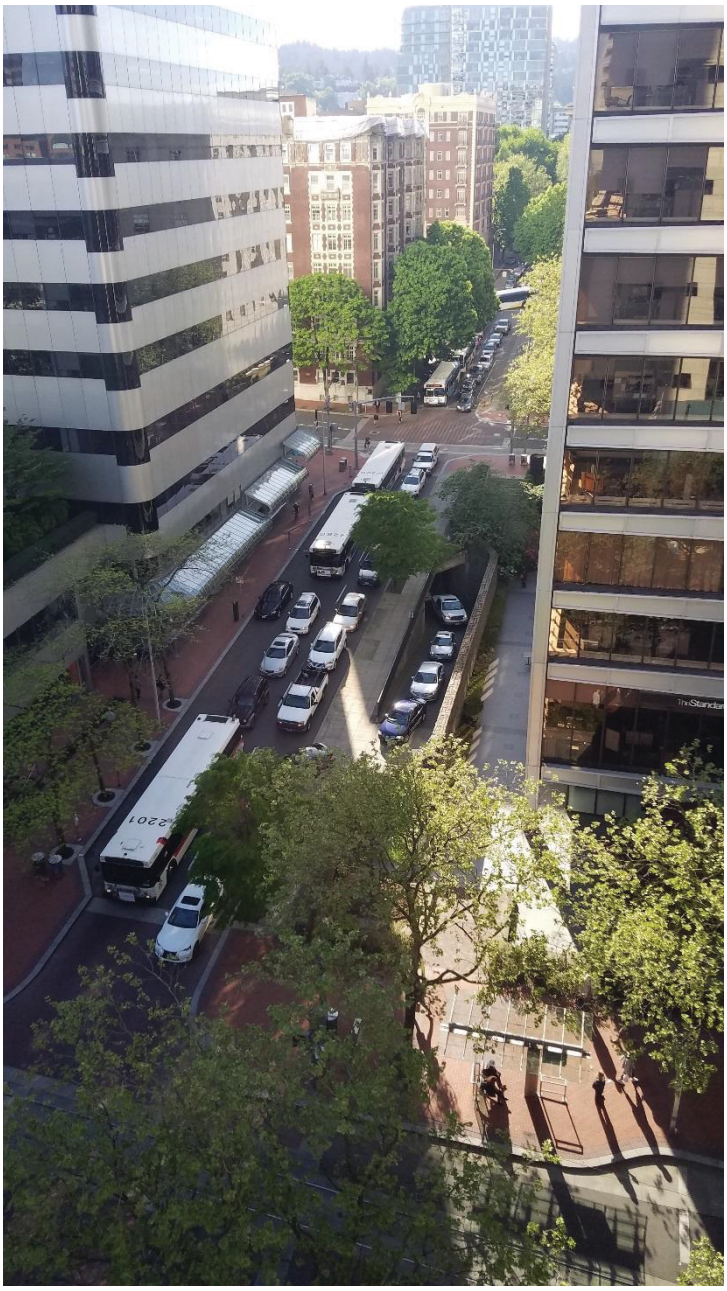

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1. Introduction

Between 2016 and early 2018, the Portland Bureau of Transportation (PBOT) led a planning process in coordination with TriMet to develop the Enhanced Transit Corridors (ETC) Plan. PBOT and TriMet define Enhanced Transit as capital and operational treatments of moderate cost that improve transit capacity, reliability, and travel time. These improvements can help make transit more attractive and reliable for people to get to work, school, and to meet their daily needs, especially for people who depend on transit. This plan identifies where transit priority, streamlining, and access treatments could be most beneficial on the planned TriMet Frequent Service network within the City of Portland, including buses and streetcar. This plan was developed to help support and implement the Portland Comprehensive Plan 2035 and Climate Action Plan.

The goals and outcomes established at the beginning of the planning process:

- Increase transit ridership and improve the experience for current riders by improving transit capacity, reliability, and travel time
- Support planned growth in centers and along corridors consistent with the City's Comprehensive Plan update.
- Define and identify "Enhanced Transit Corridors" in Portland.
- Establish clear and objective operational performance measures and thresholds to define what success looks like for the most heavily used Frequent Service lines.
- Guide the prioritization of capital and operational investments in Enhanced Transit Corridors

This is not intended to just be a static plan. This plan, and the planning process that led to it, is the start of a conversation about Enhanced Transit in Portland, establishing what it is, where it is most needed based on current conditions, and why we need to take action and invest locally and regionally. This plan identifies a new vision for transit in Portland and how we can advance implementation. It also provides a programmatic framework for on-going monitoring and investment to improve transit speed and reliability in partnership with TriMet. More of this is described in the recommendations in Chapter 2.

TriMet Frequent Service Lines

Frequent Service lines connect the regional hubs where many riders live and work. In addition to providing more frequency most of the day on weekdays, some lines have a number of features designed to make your trips easier, faster and more comfortable.

To learn more about TriMet's Frequent Service Lines, please visit: **https://trimet.org/schedules/frequentservice.htm**

How these recommendations were reached is described in *Chapter 4: Planning Process.* Through the planning process, PBOT developed an evaluation framework for identifying those bus lines on TriMet's planned Frequent Transit Network, as identified in the recent TriMet Service Enhancement Plans, where it is most important to explore improvements that increase transit reliability, speed, and capacity. The plan draws on proven strategies from other cities across the country that have successfully implemented Enhanced Transit treatments. Stakeholder and public engagement were essential to understanding transit problems and evaluating potential improvements. Stakeholders and the general public provided feedback at key junctures to shape the plan, and will continue to play an integral part to the implementation of this plan's recommendations.

Since the initiation of this planning process, a few new developments occurred to help advance Enhanced Transit locally and regionally.

Midway through development of this plan, on July 13, 2017, City Council adopted a resolution to recommend PBOT develop new and expanded strategies to improve transit service and increase transit ridership throughout the City by developing an Enhanced Transit Program. Council directed PBOT to pursue bold strategies and transit treatments in the Enhanced Transit Corridors Plan, in addition to recommending projects, performance measures, and guidelines that will serve ongoing implementation. This direction from the City Council strongly influenced the recommendations included in this plan.

A new community advocacy organization called the Portland Bus Lane Project formed in mid-2017. They are working to improve the state of transit in the Portland Metropolitan region.

PBOT began installing small spot improvement projects to improve transit travel time and reliability through the new Transit Priority Program established during the 2016 update to the Transportation System Plan. Portland Streetcar Inc and PBOT began implementing transit travel time and reliability treatments on the City's streetcar lines. These are described more in *Chapter 6: Early Implementation.*

The City's Enhanced Transit planning process helped initiate conversation of Enhanced Transit at the regional level. The Enhanced Transit concept was introduced into Metro's Regional Transit Strategy as part of the 2018 Metro Regional Transportation Plan (RTP) update. Concurrently, Metro and TriMet initiated a pilot program in 2018 to build understanding around where enhanced transit tools may be applicable throughout the greater Portland region. JPACT and Metro Council allocated up to $5M of Regional Flexible Funds to support the pilot workplan. The Regional Enhanced Transit Concept pilot program will be led by Metro and TriMet. This pilot program presents a great opportunity for the City of Portland to potentially advance project development and design for Enhanced Transit candidate segments. This is described in *Chapter 2: Recommendations*, under the section on the Regional Enhanced Transit Concept Pilot Program.

1.1 What is Enhanced Transit?

Enhanced Transit encompasses a range investments comprised of capital and operational treatments of moderate cost that improve transit capacity, reliability, and travel time. Enhanced Transit is intended to be flexible and context-sensitive during design and implementation. It can be deployed relatively quickly in comparison to larger High Capacity Transit (HCT) capital projects. Treatments can be applied systematically across a transit network to improve multiple lines or through a corridor approach to improve one or more transit lines. Enhanced Transit capital projects come in a variety of shapes and sizes; for example, the improvements might address bottlenecks, or a portion of a transit line experiencing delay, or in some cases, improvements to a full transit line. On the spectrum of types of transit, Enhanced Transit typically falls in the middle of the spectrum, with a combination of transit running in mixed traffic, targeted priority treatments and possibly some exclusive transit guideway or dedicated lanes, as illustrated in Exhibits 1 through 3.

Exhibit 1. Westbound BAT/pro-time bus lane on SE Madison Street, between SE 10th Avenue and the Morrison Bridgehead

As part of the planning process, the project team developed an Enhanced Transit Toolbox to identify effective transit priority improvements that could be achieved at various scales throughout the City.[1] The Toolbox contains a combination of capital and operational treatments that could be applied to improve transit performance and/or to create safer, more predictable interactions with other travel modes. Learn more about the toolbox in *Chapter 3: Capital and Operational Toolbox.*

Exhibit 2. Southbound BAT lane on SW 11th Avenue from SW Stark Street to SW Clay Street, shared with Portland Streetcar alignment. This is an example of how Enhanced Transit treatments can benefit both buses and streetcars.

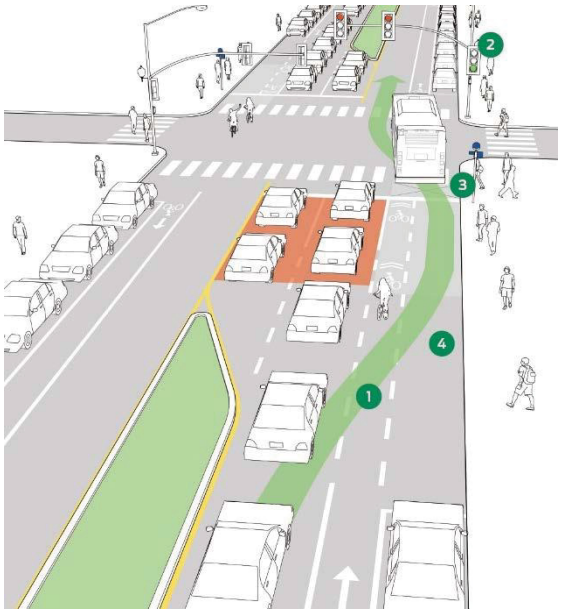


Exhibit 3. NACTO 'queue jump' diagram, which uses a combination of laneway treatments, stop improvements, and signal priority to allow transit to 'jump' in front of vehicle platoon at intersections. Source: NACTO Transit Street Design Guide

[1] Memo #4: ETC Capital and Operational Toolbox can be found at: https://www.portlandoregon.gov/transportation/article/640269

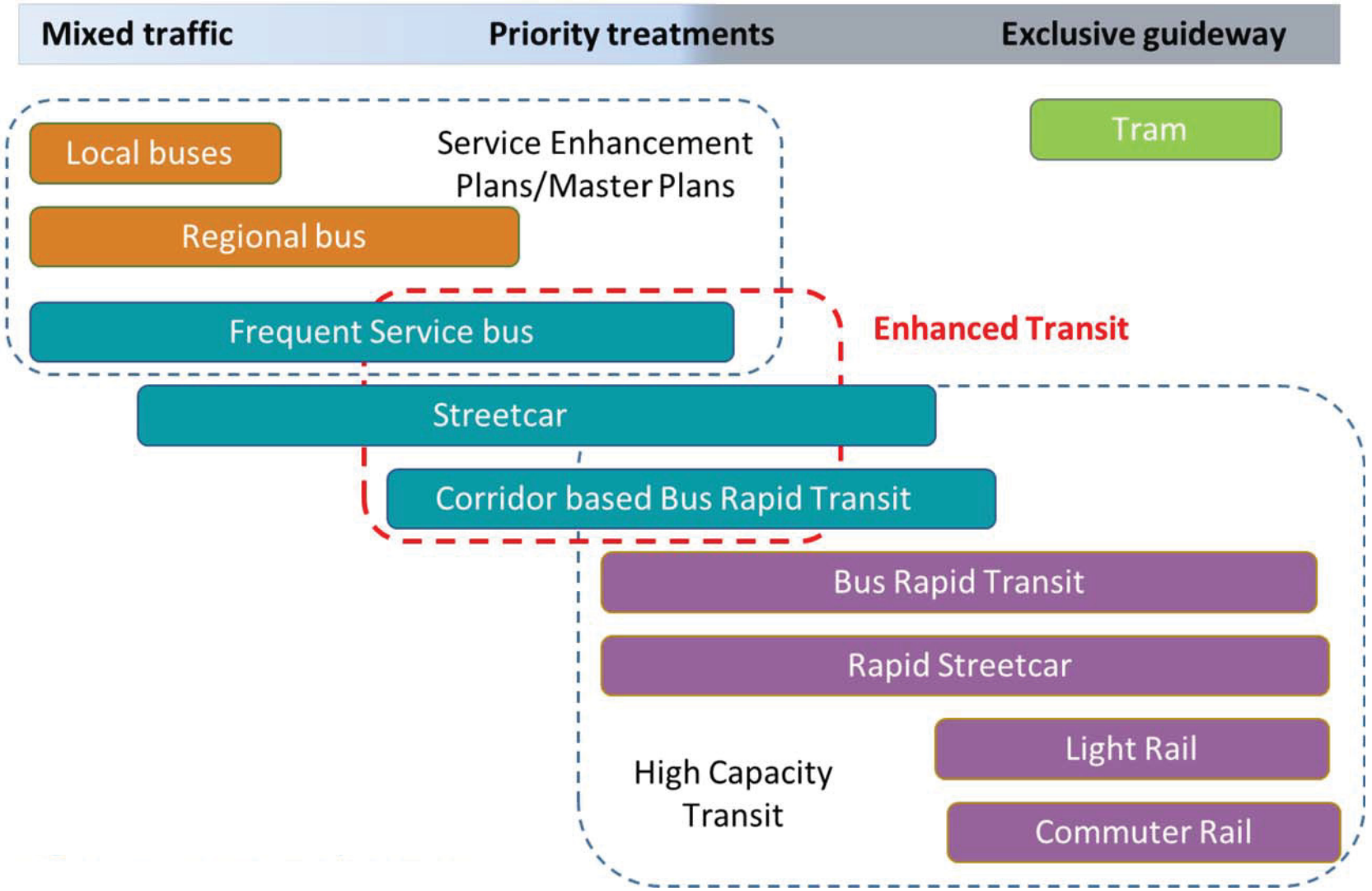


Exhibit 4. Regional Transits Spectrum

1.2 Why This Plan?

Enhanced Transit projects will strongly support the City's transportation and climate goals and policy, intended to shift transportation away from single occupant vehicles to transit in addition to other modes like cycling and walking. The City has adopted a transit mode share goal of 25% of all trips by 2035 in its Climate Action Plan, while Metro's Regional Transportation Plan (RTP) calls for a tripling of 2005 transit mode share by 2035. Though MAX light rail ridership has increased, ridership on local bus and streetcar lines has not increased enough to meet these goals. Since the year 2000, the citywide transit mode share has remained at 12%, short of these goals (Exhibit 5). Additionally, the 2035 Transportation System Plan Update, adopted by the City Council in December 2016, establishes an objective to reduce the number of miles Portlanders travel by car to 11 miles per day on average and for 70 percent of commuters to walk, bike, take transit, carpool, or work from home.

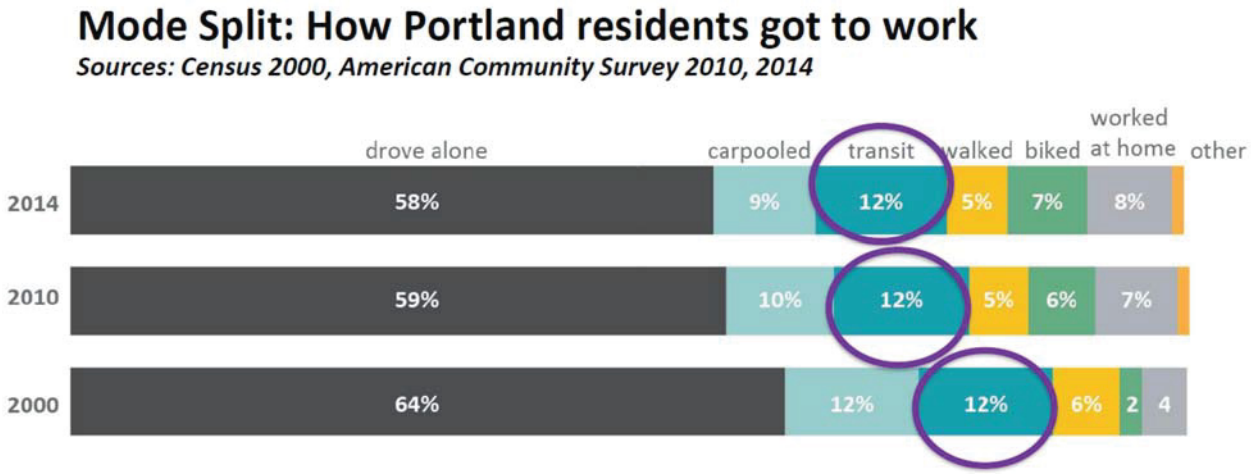


Exhibit 5. Portland Mode Split (2000 - 2014)

TriMet's Frequent Service bus network serves as the backbone of the transit system in the City of Portland. Buses are the work horse of the transit system, and some bus and Portland Streetcar lines carry as many riders as the region's MAX Light Rail Lines (Table 1). Meanwhile, buses and streetcars are increasingly stuck in traffic (Exhibit 6), leading to longer travel times (Exhibit 7) and less travel time reliability, making bus and streetcar transit less competitive with driving, bicycling, and other transit modes.

Table 1. Top 10 Transit Lines by Ridership (2015)

Top 10 Transit Lines (2015)			
Number of Boarding Rides			
1.	MAX Blue Line	6	MAX Yellow Line
2	MAX Green Line	7	Portland Streetcar
3	MAX Red Line	8	MAX Orange Line
4	Line 4 – Division/Fessenden	9	Line 20 – Burnside/Stark
5	Line 72 – Killingsworth/82nd Avenue	10	Line 75 – Cesar Chavez/Lombard

At the same time buses are increasing stuck in traffic, demand for transit service is only expected to increase - the City is projected to gain approximately 140,000 new jobs and 260,000 new residents by 2035. As of the writing of this plan, TriMet spends roughly $1-2 million per year to add more buses to routes just to keep up with published route schedules and account for greater variability and longer travel times to complete a route. Without substantial improvements to the bus and streetcar network, it is very likely that transit service speed and reliability will continue to deteriorate. These realities create a strong need for the City and TriMet to prioritize reliability and speed treatments for transit on key corridors throughout the City. The Enhanced Transit Corridors Plan is a significant first step toward implementing lower cost, flexible, and effective transit priority treatments that will in turn support more transit ridership throughout Portland.

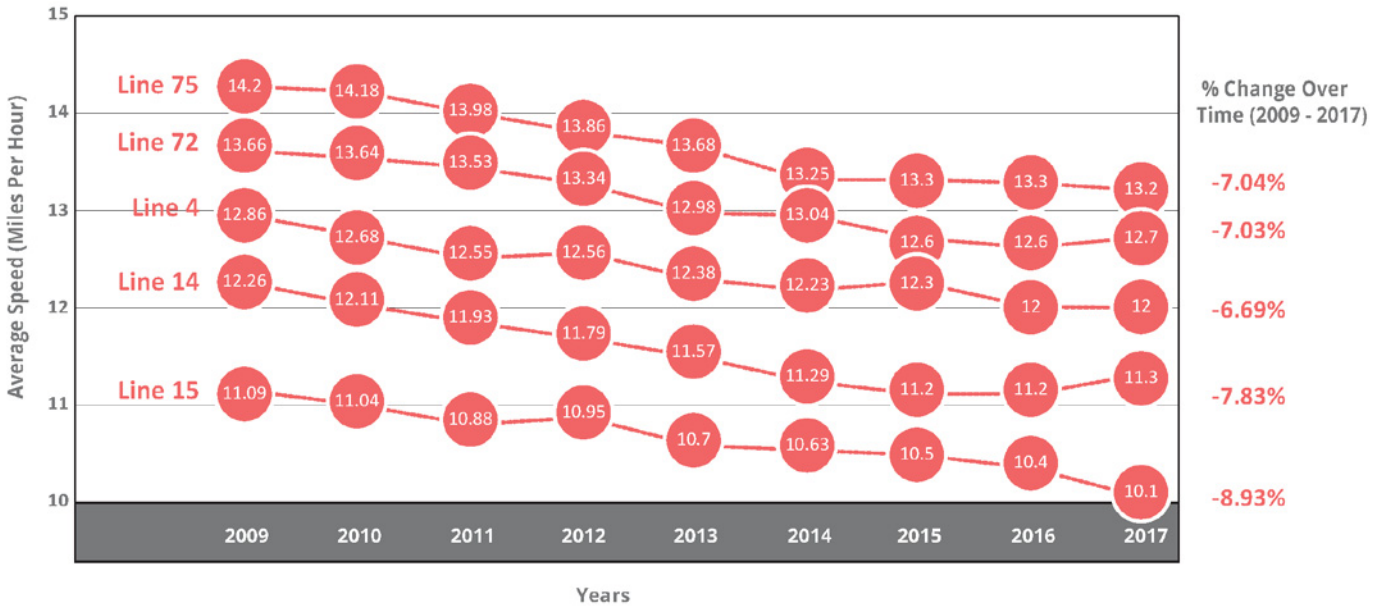


Exhibit 6. Average Transit Speed (2009 - 2017)

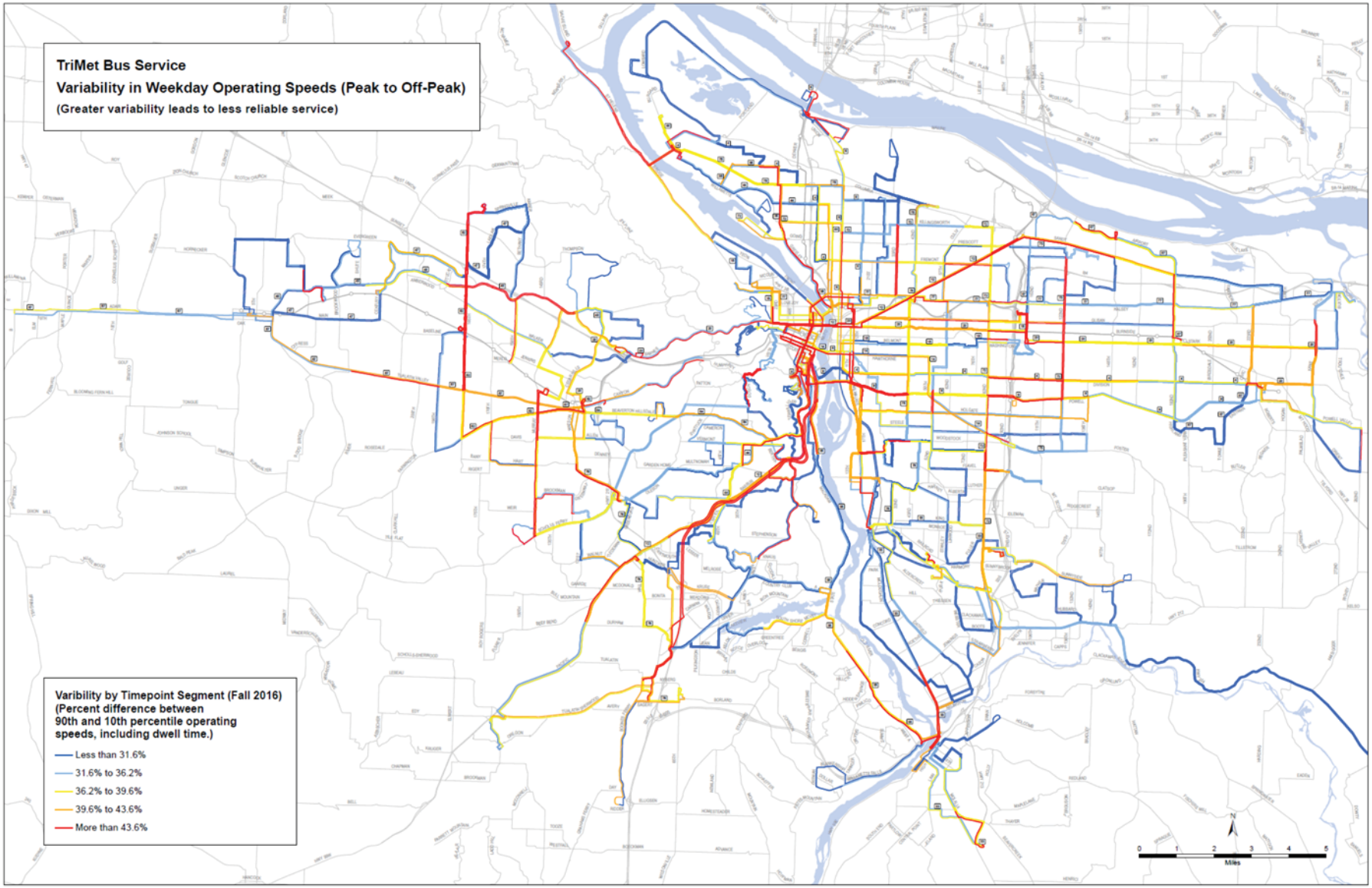


Exhibit 7. Regional Transit Reliability, by Timepoint Segment

1.3 Policy Background

The need for the Enhanced Transit Corridors Plan was identified as a part of the Portland Comprehensive Plan update process. It was then included as a future planning need in the Portland 2035 Transportation System Plan, Section 12 Refinement Plans and Studies, in the TSP update adopted by City Council in December 2016.

Implementing the Enhanced Transit Corridors Plan will help to achieve multiple adopted City goals and policies and accommodate future growth. The Portland Plan and the Climate Action Plan established a mode split goal of 25% of all trips on transit by 2035, and the 2035 Regional Transportation Plan includes a goal of tripling transit mode share over 2005 levels. Increasing transit reliability, travel times and capacity are ways to increase transit ridership and help meet these mode split goals.

The Enhanced Transit Corridors Plan supports multiple goals and policies in the Portland Comprehensive Plan 2035, including:

- Goal 9B, that Portland's transportation system is funded and maintained to achieve multiple goals and measurable outcomes for people and the environment. The transportation system is safe, complete, interconnected, multimodal, and fulfills daily needs for people and businesses.
- Policy 9.5, to increase the share of trips made using active and low-carbon transportation modes. Reduce Vehicle Miles Traveled (VMT) to achieve targets set in the most current Climate Action Plan and Transportation System Plan, and meet or exceed Metro's mode share and VMT targets.
- Policy 9.6, regarding the transportation strategy for people movement. Implement a prioritization of modes for people movement by making transportation system decisions according to the following ordered list:

    1. Walking
    2. Bicycling
    3. Transit
    4. Taxi / commercial transit / shared vehicles
    5. Zero emission vehicles
    6. Other single-occupant vehicles

    When implementing this prioritization, ensure that:

    - The needs and safety of each group of users are considered, and changes do not make existing conditions worse for the most vulnerable users higher on the ordered list.
    - All users' needs are balanced with the intent of optimizing the right of way for multiple modes on the same street.
    - When necessary to ensure safety, accommodate some users on parallel streets as part of a multi-street corridor.
    - Land use and system plans, network functionality for all modes, other street functions, and complete street policies, are maintained.
    - Policy-based rationale is provided if modes lower in the ordered list are prioritized.

- Policy 9.22, regarding public transportation, to coordinate with public transit agencies to create conditions that make transit the preferred mode of travel for trips that are not made by walking or bicycling.
- Policy 9.24, regarding transit service, in partnership with TriMet, to develop a public transportation system that conveniently, safely, comfortably, and equitably serves residents and workers 24 hours a day, 7 days a week.
- Policy 9.25, regarding transit equity, in partnership with TriMet, to maintain and expand high-quality frequent transit service to all Town Centers, Civic Corridors, Neighborhood Centers, Neighborhood Corridors, and other major concentrations of employment, and improve service to areas with high concentrations of poverty and historically under-served and under-represented communities.

The Enhanced Transit Corridors Plan helps to achieve policy elements in the Portland 2035 Transportation System Plan update adopted by City Council in December 2016. This includes:

- TSP Objective 9.26.h; by 2035, to reduce the number of miles Portlanders travel by car to 11 miles per day on average and 70 percent of commuters walk, bike, take transit, carpool, or work from home.
- TSP Policy 6.6 Transit Classification Description for Major Transit Streets:

  Improvements. Employ transit-preferential measures, such as signal priority and bypass lanes. Provide transit signal priority at major intersections, prioritize transit stops or transit lanes over on-street parking, and provide enough lane width to accommodate standard transit vehicles. Consider the use of exclusive or semi-exclusive transit lanes where needed to reduce congestion-related transit delay. Design intersections of Major Transit Priority Streets with other Major Transit Priority Streets or Transit Access Streets to allow turning movements of a standard transit vehicle. Where compatible with adjacent land use designations, right-of-way acquisition or parking removal may occur to accommodate transit-preferential measures or improve access to transit. The use of access management should be considered where needed to reduce conflicts between transit vehicles and other vehicles. Carefully consider any street design changes to Major Transit Priority Streets that impact travel time in light of the potential costs and benefits to transit riders, while also taking into account other adopted goals and policies.

Implementing the Enhanced Transit Corridors Plan will help to achieve regional policy and actions in the Regional Climate Smart Strategy, adopted by the Metro Council in December 2014 and approved by the state in May 2015. This includes:

- Policy: Make transit convenient, frequent, accessible and affordable. The Strategy identifies four key ways to make transit service convenient, frequent, accessible and affordable. The first one is most relevant to Portland's ETC Plan:
  - Frequency. Increasing the frequency of transit service in combination with transit signal priority and bus lanes makes transit faster and more convenient.

- Near-term (2017-20) Action Item: Expand partnerships with transit agencies to implement capital improvements in frequent bus corridors (including dedicated bus lanes, stop/shelter improvements, and intersection priority treatments) to increase service performance.

1.4 Learning from Other Cities

Other cities across the country have proven strategies to improve transit travel times and reliability that Portland could use in our city.

Enhanced Transit solutions are not new – they have been applied in metropolitan areas across the country to improve bus service reliability, reduce transit travel times, and make transit more attractive to prospective riders. Cities like Seattle, for example, have seen great success in deploying Enhanced Transit solutions on its RapidRide bus routes. RapidRide routes have seen **ridership increase 87%** over previous service in each corridor. Minneapolis and San Francisco have similarly implemented Enhanced Transit treatments on their most heavily used corridors, resulting in substantial speed, reliability, and safety improvements.

Seattle's Transit Master Plan, partly the inspiration for Portland's Enhanced Transit Corridors Plan, articulated a strong commitment to developing bus rapid transit and priority bus corridors within the city. In fact, this is the highest priority strategy in the Master Plan. With a rapidly increasing population and limited street space (similar to Portland) Seattle and King County Metro have aggressively funded and implemented Enhanced Transit projects like the RapidRide program to increase the utility of transit and serve more riders.

Metro RapidRide, King County, WA

Metro's RapidRide program provides frequent, high capacity bus service on some of the most heavily used transit corridors in metropolitan Seattle. RapidRide corridors make strategic use of Enhanced Transit treatments including bus only lanes, BAT lanes, and transit signal priority to improve transit travel time reliability at the most congested locations. RapidRide implementation has included substantial stop consolidation to reduce transit travel times. The system also features amenities typical of bus rapid transit, including off-board fare collection and level boarding to reduce dwell time at bus stops and increase overall route efficiency.[2]

[2] King County Metro. 2017. Seattle RapidRide Expansion Program Report. Retrieved from: https://www.seattle.gov/Documents/Departments/SDOT/TransitProgram/RapidRide/RREP_Plan_FINAL_062217_WEB.PDF

Metro Transit, Minneapolis, MN

Metro Transit initiated a study in 2011 to look at improving transit travel times on its eleven highest-uses bus routes in metropolitan Minneapolis. The study found that traffic lights and rider boarding were two of the most significant transit delay factors in the corridor. The agency has since implemented improvements on many of these corridors, including intersection queue jumps, all-door boarding, and curb bulbouts to facilitate in-lane stops.[3]

San Francisco Municipal Transportation Agency, San Francisco, CA

The San Francisco Municipal Transportation Agency (SFMTA) has implemented Enhanced Transit treatments on several heavily trafficked corridors, including Mission and Market Streets. SFMTA was one of the first agencies to apply red-painted bus only lanes through a special project with CalTrans and FHWA. Not only have the red bus-only lanes improved transit reliability, they've increased safety – SFMTA found that the new red lanes, which provide a clear demarcation between transit and general purpose lanes, have reduced speeding and bus-car conflicts.[4] The agency has also added curb bulbouts to allow in-lane stops and upgraded their operations to accommodate all-door boarding on buses, reducing delay on the system.

[3] Metro Transit. 2018. Arterial Transitway Corridors Study website. Retrieved from: https://www.metrotransit.org/abrt-study

[4] San Francisco Municipal Transit Authority. 2017. Red Transit-Only Lanes Work: Two New Studies Show Their Benefits. Retrieved from: https://www.sfmta.com/blog/red-transit-only-lanes-work-two-new-studies-show-their-benefits

2. Recommendations

The recommendations in this section support the development of an Enhanced Transit Program in the City of Portland. Plan recommendations are organized into four distinct categories. The first category is comprised of a new vision for transit. It includes a network of corridors and corridor segments that will form an initial bundle of Enhanced Transit capital projects in areas throughout the City with the greatest need for improved transit service. These projects are recommended to be included in the Portland Transportation System Plan and the 2018 – 2040 Project list of the Metro 2018 Regional Transportation Plan (RTP).[5]

The second category of recommendations includes additional policy recommendations, actions, and next steps to be taken by the City to advance the implementation of enhanced transit in Portland.

The third category of recommendations describes a starting basis for a City-wide Enhanced Transit Program and on-going performance monitoring framework. This program will set City-wide Enhanced Transit performance standards, help identify future Enhanced Transit projects, and track the performance of funded Enhanced Transit projects on an on-going basis. Potential Enhanced Transit project locations were selected for their applicability to other corridors across the City, and to inform the future application of Enhanced Transit tools on streets experiencing similar transit performance issues.

This chapter concludes with the fourth category of recommendations, describing the development of a Regional Enhanced Transit Concept pilot program, led by TriMet, Metro, and regional partners including the City of Portland, and recommending candidate segments for the City of Portland to submit to the regional ETC pilot program.

2.1 A New Vision for Transit: Initial Enhanced Transit Corridors and Recommended Transit Capital Projects

This planning process began focused on Enhanced Transit. It became apparent that a broader look was needed to address future transit needs. Therefore, we expanded our look to other elements of the transit system. This led to a new vision for transit in Portland and how Enhanced Transit fits into it.

Portland and the region is at a critical point in the evolution of our transit network. Our buses are increasingly stuck in traffic, and each year resources for transit hours are spent just trying to keep up schedules due to congestion, reducing the potential funding to increase transit service. This critical point calls for redoubling our efforts to improve transit. This calls for a three-pronged strategy:

[5] As of the writing of this section, the inclusion of these projects is contingent on discussion and approval from other regional partners.

1. **More aggressively invest in transit service and local infrastructure.** This includes adding new service lines in areas not served by transit, increasing service on less frequent transit lines to become Frequent Service, and increasing service on existing Frequent Service transit lines where ridership demand and growth is increasing. The TriMet Service Enhancement Plans provide a vision for where to increase service. The City's Growing Transit Communities Plan provides a model for how the City can coordinate investments and partner with TriMet to improve access to transit where TriMet increases service frequency on new lines and on less frequent transit lines with transportation barriers.

2. **Rebalance the relationship between transit accessibility and mobility in the next 20 years.** Refocus from the original MAX Blue line that used light rail as a local, free circulator for the downtown retail core, streetcar and closely spaced stops in inner Portland. In past decades, Portland emphasized local accessibility with the intention to increase transit ridership by providing convenient access to transit stations and by using these stations as ways to encourage transit-oriented development. At the time, this made sense and to a large degree we succeeded, particularly in inner Portland.

   Over time, as Portland and the region keep growing, we have slowly moved towards emphasizing transit mobility (travel speed and reliability) more. Examples of this includes the newly designed Transit Mall (with stations further apart than the "cross Mall" alignment on Yamhill and Morrison), and the recent work by Portland Streetcar to eliminate some stops. Recent PBOT capital projects have come with some bus stop consolidation. The result has been greater transit reliability, faster travel times and increased ridership—especially evident for streetcar. This new emphasis makes sense as the region has grown, increasing travel distances, multiplying destinations, and increasing travel times. A common criticism of the existing transit network is that it takes too long to cross downtown Portland or to get to any destination compared to driving. We are losing the attractiveness of transit every year as buses are stuck in traffic, not taking people where they want to go at a competitive travel time.

   Enhanced Transit plus a number of new transit concepts emanating from Metro's Regional Transportation Plan (RTP), including a potential transit tunnel under the Central City in the next 20-40 years, can make transit more attractive and competitive while maintaining the basic accessibility that transit needs to attract riders. This new generation of transit projects will "supercharge" the move toward a faster and more reliable transit system. Enhanced Transit, improvements addressing the Steel Bridge/Rose Quarter bottleneck, the MAX red line extension and a potential future Central City tunnel are primarily proposed to increase the reliability and travel time of the network by improving the in-vehicle travel time, which, when multiplied by the personal time of the numerous transit riders traveling long distances from the region and from East Portland, lead to benefits that outweigh the cost of some people having to walk a little longer in inner Portland to get to their stop, particularly if these stops include better shelters and other improvements.

3. **A closer relationship and active cooperation between transit operators and PBOT**. For us, this means developing the City's Transit Program. More about this in the following three sections of this chapter.

During the first phase of developing the Enhanced Transit Corridor Plan, the project team identified an initial network of Enhanced Transit Corridors along bus lines in the TriMet Planned Frequent Service Network (Exhibit 3). Based on the initial methodology developed during the planning process, the project team evaluated the segments of this initial network to assess where there was greatest need and was most important to focus capital investments to improve transit reliability, travel time and capacity. The results of this evaluation informed the development of a list of Enhanced Transit capital projects to improve this initial network of Enhanced Transit Corridor bus lines.

The initial network of Enhanced Transit Corridors along bus lines identified during this planning process were combined with several streetcar projects and other major transit capital projects to form a New Vision for Transit in Portland. This Vision includes projects to address key bottlenecks and expansions to the MAX system, as well as an emerging concept for a potential transit tunnel under the Central City, which requires further study before it can become a project.

This Vision has a corresponding list of transit-related capital projects and studies that were submitted by the City of Portland and TriMet for the draft 2018 Regional Transportation Plan (RTP) update first round call for projects in July 2017. Exhibit 9 below organizes the RTP projects by mode, while Exhibit 10 organizes those same projects by RTP funding timeframes. Included in the list Table 2, 3 and 4 describe the Enhanced Transit projects. Table 5 describes other transit projects reflected in the Vision. They are organized into three priority tiers based on the RTP 2018 Update funding timeframes (1 – 10 years Financially Constrained, 11 – 20 years Financially Constrained, and Strategic TBD).

This plan recommends that these transit capital projects be added to the Portland Transportation System Plan (TSP) during the next update or future amendments to the plan.

All the transit projects submitted by the City of Portland have been identified in coordination with TriMet. The recent Portland Streetcar Expansion Study informed streetcar project selection, and all streetcar projects were identified in coordination with Portland Streetcar, Inc. The recommendations include a set of initial Enhanced Transit Corridors to be included in the RTP Transit Vision, and a corresponding list of Enhanced Transit capital projects to improve existing bus lines identified through the development of this Plan. This planning process is described in *Chapter 4: Planning Process.* Future Enhanced Transit corridors and hot spots will be identified through the City's on-going Enhanced Transit Program or the Regional Enhanced Transit Concept pilot program described in the following sections.

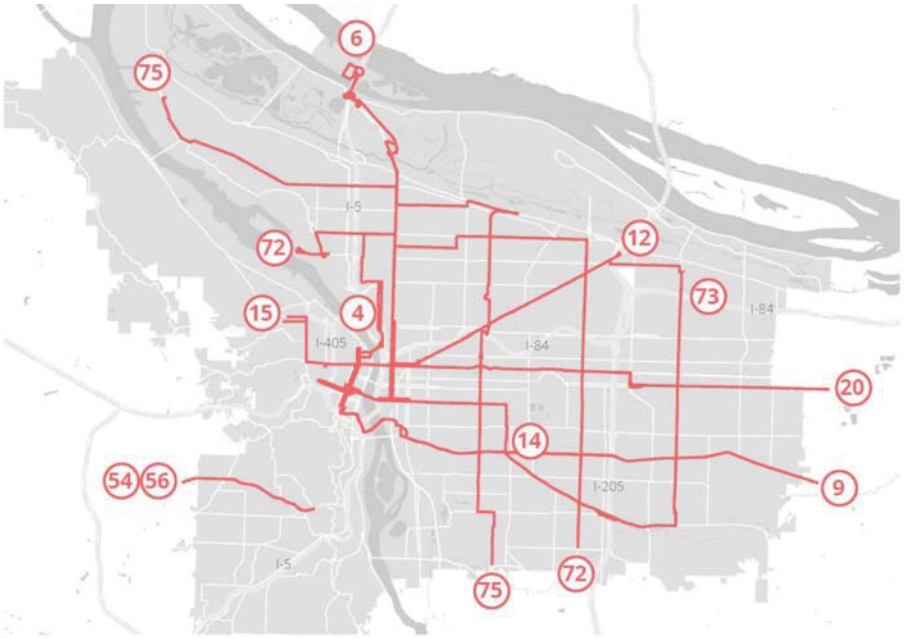


Exhibit 8. Initial Network of Enhanced Transit Corridors along Bus Lines

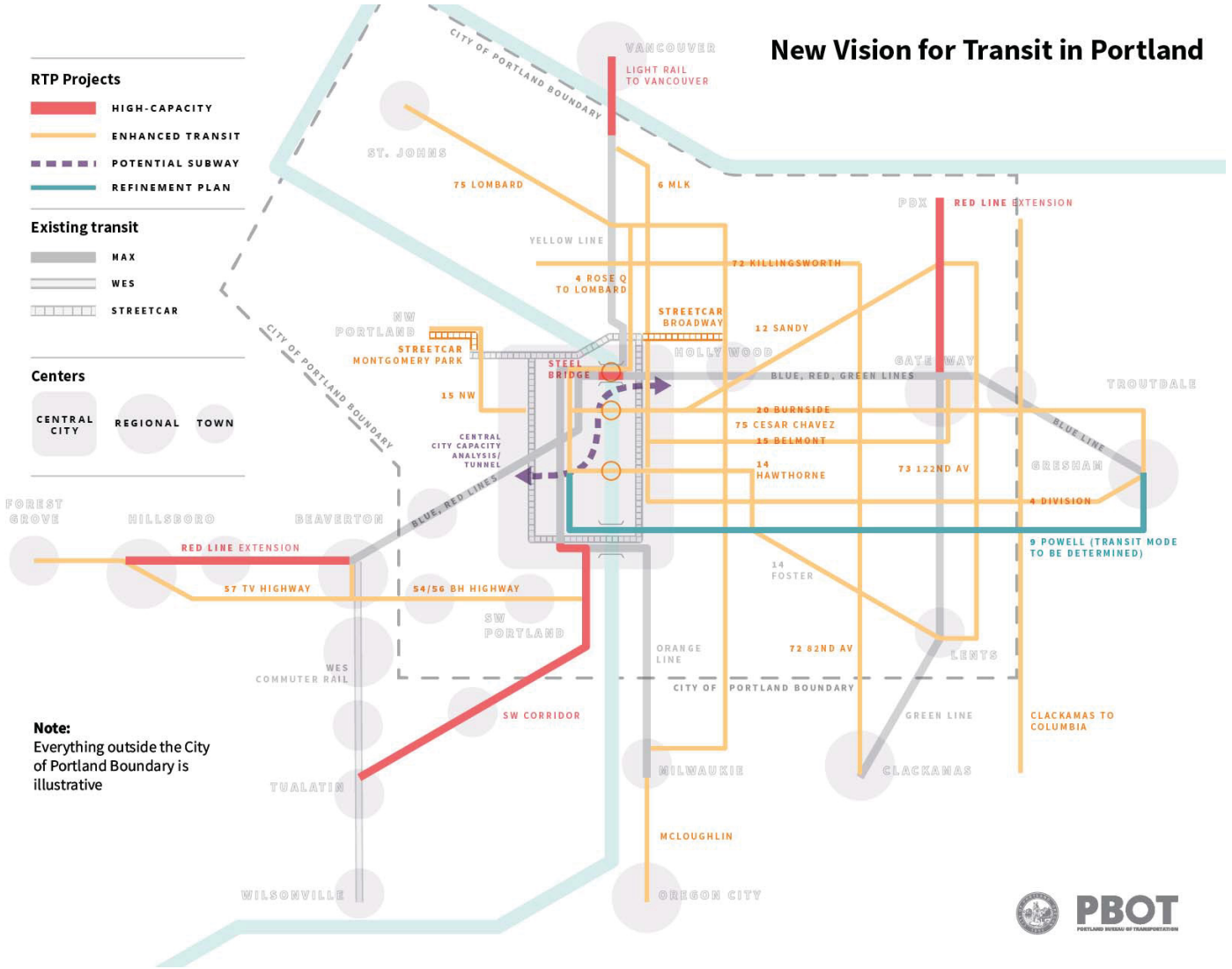


Exhibit 9. Recommended Transit Vision (by transit mode) for inclusion in the next Portland Transportation System Plan update and 2018 Metro RTP Update

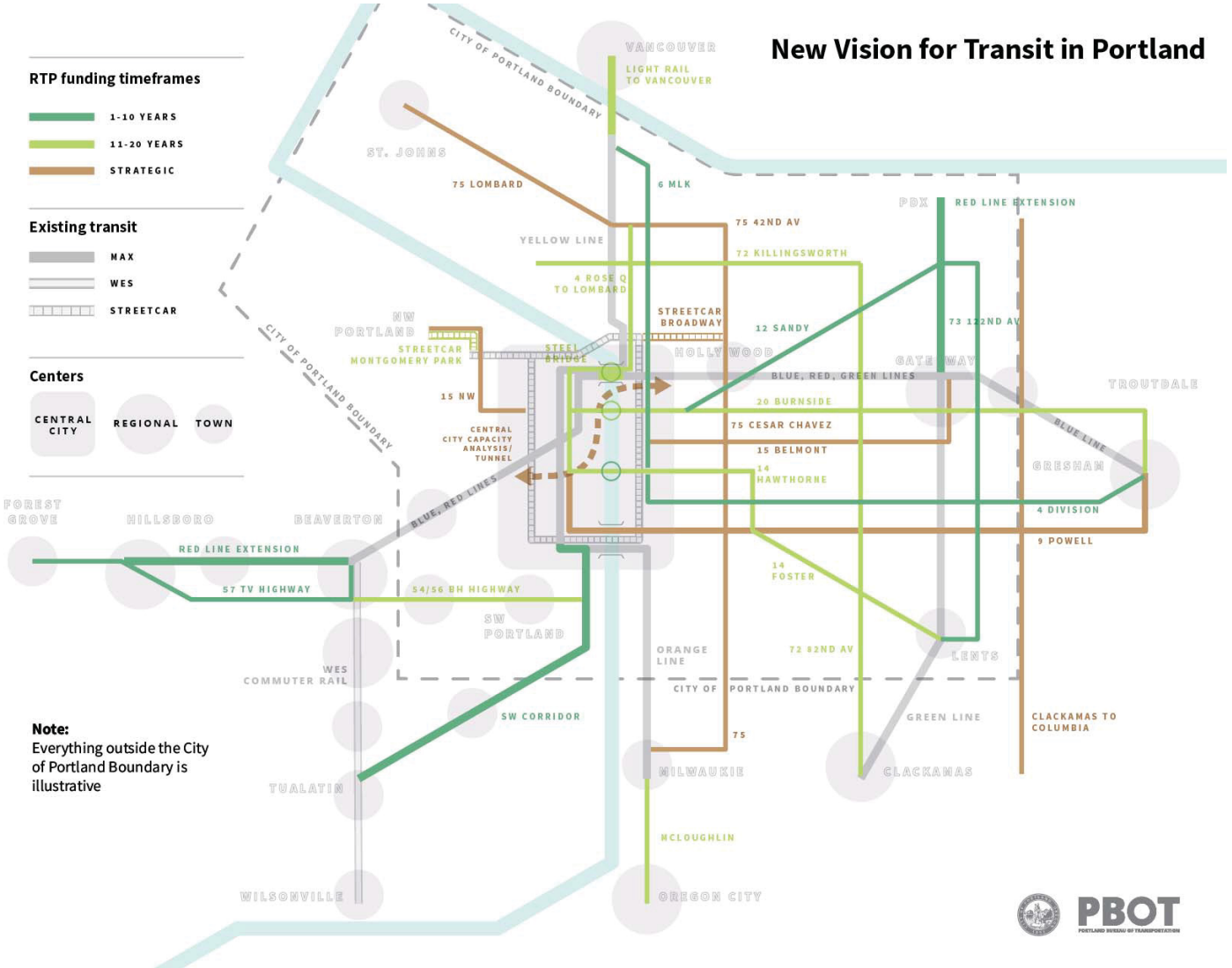


Exhibit 10. Recommended Transit Vision (by RTP Funding Timeframe) for inclusion in the next Portland Transportation System Plan update and 2018 Metro RTP Update

Table 2. Recommended Enhanced Transit Capital Projects, Tier 1 (1 - 10 Years)

Recommended Enhanced Transit Capital Projects for Portland TSP Update and Metro 2018 RTP Update								
TSP-ID	RTP ID	Lead Agency	Project/ Program Name	Project Start Location	Project End Location	Time Period	Cost Range	Constrained or Strategic
New	New	Portland	82nd Ave Transit Enhancements	NE Killingsworth St	SE Clatsop St	Years 1 - 10	$1 - 10 million	Constrained
New	New	Portland	SE Powell Blvd Transit Enhancements	SE Milwaukie Ave	SE 122nd Ave	Years 1 - 10	$1 - 10 million	Constrained
New	New	Portland	122nd Ave Transit Enhancements	Lents Town Center	Parkrose / Sumner Transit Center	Years 1 - 10	$11 - $49 million	Constrained
New	New	Portland	Central City Portals Transit Enhancement	Portland Central City	Portland Central City	Years 1 - 10	$1 - 10 million	Constrained
20125	New	Portland	Portland Streetcar Operational Improvements	Portland Central City	Portland Central City	Years 1 - 10	$1 – 10 million	Constrained
60035	11319	Portland	Streetcar Extension: Montgomery Park	NW Lovejoy / Northrup	Montgomery Park	Years 1 - 10	$11 - $49 million	Constrained
30042	New	TriMet	NE MLK Jr Blvd Enhanced Transit Project	Central City	Jantzen Beach	Years 1 - 10	$11 - $49 million	Constrained
New	New	TriMet	NE Sandy Blvd Enhanced Transit Project	Central City	Parkrose/Sumner Transit Center	Years 1 - 10	$11 - $49 million	Constrained

Note: This document is for planning and agency coordination purposes in preparation for recommending candidate projects for the Metro RTP 2018 Update and the Portland Transportation System Plan (TSP) Update. The final project list and projects details may change.
Note: Other transit service enhancements identified in TriMet's Service Enhancement Plans will also be included in the RTP but are not included on this list.

Table 3. Recommended Enhanced Transit Capital Projects, Tier 2 (11 - 20 Years)

Recommended Enhanced Transit Capital Projects for Portland TSP Update and Metro 2018 RTP Update								
TSP-ID	RTP ID	Lead Agency	Project/ Program Name	Project Start Location	Project End Location	Time Period	Cost Range	Constrained or Strategic
40131	1102	Portland	Streetcar Extension: Broadway-Weidler to Hollywood	NE Grand Ave	Hollywood Town Center	Years 11 - 20	$50 - $100 million	Constrained
New	New	Portland	N Vancouver/Williams & Mississippi/Albina Transit Enhancements	Portland Central City	N Lombard	Years 11 - 20	$1 - 10 million	Constrained
New	New	Portland	SE Hawthorne/50th Ave Transit Enhancements	Central City	SE Powell Blvd	Years 11 - 20	$1 - 10 million	Constrained
New	New	Portland	Cesar Chavez Blvd Transit Enhancements	Hollywood Town Center	SE Powell Blvd	Years 11 - 20	$1 - 10 million	Constrained
New	New	Portland	N/NE Lombard St Transit Enhancements	St Johns Town Center	NE MLK Jr Blvd	Years 11 - 20	$1 - 10 million	Constrained
New	New	TriMet	82nd Ave/Killingsworth Enhanced Transit Project	Swan Island	Clackamas Town Center	Years 11 - 20	$50 - $100 million	Constrained
New	New	TriMet	E Burnside/SE Stark Enhanced Transit Project	Central City	Gresham Town Center	Years 11 - 20	$50 - $100 million	Constrained
New	New	TriMet	SE Hawthorne/Foster Enhanced Transit Project	Central City	Lents Town Center	Years 11 - 20	$11 - $49 million	Constrained
New	New	TriMet	SW Beaverton-Hillsdale Hwy Enhanced Transit Project	Central City	Washington County	Years 11 - 20	$11 - $49 million	Constrained

Note: This document is for planning and agency coordination purposes in preparation for recommending candidate projects for the Metro RTP 2018 Update and the Portland Transportation System Plan (TSP) Update. The final project list and projects details may change.
Note: Other transit service enhancements identified in TriMet's Service Enhancement Plans will also be included in the RTP but are not included on this list.

Table 4. Recommended Enhanced Transit Capital Projects, Tier 3 (Funding Timeframe TBD)

Recommended Enhanced Transit Capital Projects for Portland TSP Update and Metro 2018 RTP Update								
TSP-ID	RTP ID	Lead Agency	Project/ Program Name	Project Start Location	Project End Location	Time Period	Cost Range	Constrained or Strategic
New	New	TriMet	SE Belmont Enhanced Transit Project	Central City	Gateway Transit Center	N/A	$11 - $49 million	Strategic
New	New	TriMet	Lombard/Cesar Chavez Enhanced Transit Project	St Johns Town Center	Milwaukie Town Center	N/A	$50 - $100 million	Strategic
40130	11318	Portland	MLK Streetcar Extension	Broadway	Killingsworth	N/A	TBD	Strategic
90102	11639	Portland	Johns Landing Streetcar	SW Lowell	Willamette Park	N/A	TBD	Strategic

Note: This document is for planning and agency coordination purposes in preparation for recommending candidate projects for the Metro RTP 2018 Update and the Portland Transportation System Plan (TSP) Update. The final project list and projects details may change.
Note: Other transit service enhancements identified in TriMet's Service Enhancement Plans will also be included in the RTP but are not included on this list.

Table 5. Other Recommended Transit Capital Projects, All Timeframes

Recommended Enhanced Transit Capital Projects for Portland TSP Update and Metro 2018 RTP Update								
TSP-ID	RTP ID	Lead Agency	Project/ Program Name	Project Start Location	Project End Location	Time Period	Cost Range	Constrained or Strategic
80040	11590	TriMet	Division Transit Project	Central City	Gresham	Years 1 - 10	$175 million	Constrained
80040	11590	TriMet	SW Corridor Project	Central City	Tigard	Years 1 - 10	$2.4 billion	Constrained
30033	10902	TriMet	Portland to Vancouver Light Rail	Expo Center	Downtown Vancouver	Years 11 - 20	$500 million - $1 billion	Constrained
New	New	TriMet	Steel Bridge Transit Bottleneck	Central City - Old Town	Rose Quarter/ Lloyd District	Years 11 - 20	$500 million - $1 billion	Constrained
New	New	TriMet	SE Powell Blvd Transit Project	Central City	TBD	N/A	TBD	Strategic
New	New	TriMet	Central City Capacity Analysis A study to analyze Central City transit capacity and identify preferred options to address transit bottlenecks, delays, layover needs and improve transit	Central City	Central City	N/A	$50 million	Strategic

Recommended Enhanced Transit Capital Projects for Portland TSP Update and Metro 2018 RTP Update								
TSP-ID	RTP ID	Lead Agency	Project/ Program Name	Project Start Location	Project End Location	Time Period	Cost Range	Constrained or Strategic
			reliability, travel times and regional mobility. Include analysis of a potential tunnel option.					

Note: This document is for planning and agency coordination purposes in preparation for recommending candidate projects for the Metro RTP 2018 Update and the Portland Transportation System Plan (TSP) Update. The final project list and projects details may change.
Note: Other transit service enhancements identified in TriMet's Service Enhancement Plans will also be included in the RTP but are not included on this list.

2.3 Additional Policy Recommendations, Actions, and Next Steps

The following sections describe additional policy recommendations, actions, and next steps to be taken by the City of Portland to advance the implementation of Enhanced Transit in the Portland metro region and beyond. Policy recommendations are organized into local, regional, state, and federal policy actions.

Local

1. **Amend the Portland Transportation System Plan (TSP) to add major projects recommended in Chapter 2 of the ETC Plan. See Tables 2-5.**
2. **Continue to seek opportunities to integrate Enhanced Transit, or transit priority treatments, into PBOT plans and projects that are proposed along transit lines. Current opportunities already identified during this planning process include:**
    a. Line 73 through the 122nd Ave Plan and Project
    b. Line 20 through an Outer SE Stark Safety and Access planning process and Project
    c. Key bottlenecks in the Central City through the Central City in Motion Project
3. **Continue implementing small capital projects to improve transit reliability and travel time through PBOT Transit Priority Spot Improvement Program. Develop guidance for this program that is informed by the framework for on-going transit performance developed during the ETC Plan.**
4. **Seek increased annual on-going funding for the PBOT Transit Priority Spot Improvement Program, with the goal of increasing funding to at least the recommended level in the TSP of $500,000 annually. The current budget in Fiscal Year 17/18 is $75,000 annually.**
5. **Add various transit priority treatment design guidance to future PBOT Complete Street Design Guide.**
6. **Add policy to the Portland Transportation System Plan (TSP) supporting bus priority design as a part of capital projects. Consider policy language as follows:**
    a. "Direct Portland Bureau of Transportation staff to consider and incorporate transit priority treatments, such as those in the PBOT Enhanced Transit Corridors Plan, to improve transit speed and reliability during the planning and design phase of capital projects along streets served by transit lines."
7. **Add policy to the Portland TSP supporting use of transit as the preferred mode for trips longer than 3 miles.**
    a. Consider amending: Policy 9.22 Public transportation as follows: Coordinate with public transit agencies to create conditions that make transit the preferred mode of travel for trips that are <u>longer than 3 miles or shorter trips</u> not made by walking or bicycling (additions underlined).
    b. Or amending: Policy 9.23 Transportation to job centers. Promote and enhance transit to be more convenient and economical than the automobile for people travelling more than three miles to and from the Central City and Gateway. Enhance

regional access to the Central City and access from Portland to other regional job centers.

8. **Develop further design guidance for application of treatments in the ETC Toolbox, particularly Shared Bus/Bike Zones.**
9. **Develop future MOUs and IGAs to further forge TriMet and PBOT partnerships on funding, design and construction of Enhanced Transit capital projects and improved transit service.** This includes projects built programmatically and individual major capital projects.

Regional

1. **Recommend Enhanced Transit and other elements of the New Vision for Transit in Portland be incorporated into the Regional Transit Strategy and 2018 RTP Update, through supportive policy and projects.**

State

1. **Seek to amend State OAR 734-020-0300 to remove current limitations on the use of Bus Signal Priority.**

Federal

1. **Explore and pursue a formal request to be added to the FHWA experimental study of red lane markings for dedicated bus lanes. Request funding and staff resources to incorporate this into the future PBOT staff work plan and budget.**

   In order to use red treatment in transit lanes, PBOT would need to formally submit a request to the FHWA to be added to the Red Transit Lane request to experiment, since they are not currently in the MUTCD. San Francisco is part of a formal experiment with the FHWA. Other cities have requested to be added to the experiment. This would be similar to the request to experiment the City previously made for the use of green painted "bike boxes." As PBOT learned from participating in that previous study, there are data collecting and reporting requirements. When a formal approval is issued, there are likely to be additional considerations and conditions that the City would need to abide by.

   PBOT is interested to participate in the FHWA study. As of this writing, the agency is exploring what that would involve. The City is considering a formal request to be added to the study and how t staff resources could be allocated towards this effort.

   Before submitting a request to FHWA to join the request to experiment, PBOT would be required to perform the following:

   a. Consider how to apply red lane treatments and experiment through the study;
   b. Assess what resources this would take, including staff time and costs;
   c. Secure any additional funding, if needed.

2.4 Portland Enhanced Transit Program and On-going Monitoring

This section of the ETC Plan contains the recommendations for a City-wide Enhanced Transit Program and on-going performance monitoring framework. This program will set City-wide Enhanced Transit performance measures, track the performance of buses and streetcar lines in the current and planned TriMet Frequent Service Network on an on-going basis and help identify future Enhanced Transit projects. The program recommendations include an on-going framework and process to identify, evaluate and manage transit improvements to improve overall transit operations within the City of Portland.

The evaluation conducted during the ETC planning process that resulted in an initial network of Enhanced Transit Corridors and recommended projects in Section 2.1 was based on initial criteria and current conditions. This is a starting point. The initial criteria, evaluation and public feedback also informed the following recommendations for performance measures to use in on-going monitoring. In the future, additional Enhanced Transit hot spots, segments or lines may be added to the Enhanced Transit network and lead to new projects based on this on-going performance monitoring.

The recommended Enhanced Transit Program and on-going performance monitoring framework is summarized in Exhibit 11 and described in more detail on the following pages.

The recommended framework:

1. Identify the **Universe to Monitor** that includes a subset of bus and streetcar lines for on-going monitoring. In concept, this will include buses and streetcar lines in the current and planned TriMet Frequent Service Network within the City of Portland. The exact subset of lines may change over time to reflect changes to this network by TriMet or Portland Streetcar Inc.
2. Establish a small set of **Tier 1 performance measures to monitor** the above Universe on a regular basis; ideally quarterly or at a minimum annually. Recommended performance measures:
    a. Passenger Delay: This measure helps capture the accumulative delay to all the people on buses. Measure how much time each bus is slowed down during peak travel and congested times (Transit Delay) multiplied by the number of passengers per bus (passenger load). Measure at the time point segment level.
    b. Transit Run Time Variability: This measure helps identify deficiencies in reliability that impact transit riders and the transit agency's ability to efficiently maintain a dependable schedule. Measure the variability of bus run time for each individual scheduled bus run. Measure compares optimal scheduled cycle time (run time plus layover) and identifies when and how much the run time exceeds scheduled time. It may indicate potential need to add additional resources (operators/vehicles) to maintain schedule. Measure at the route level.

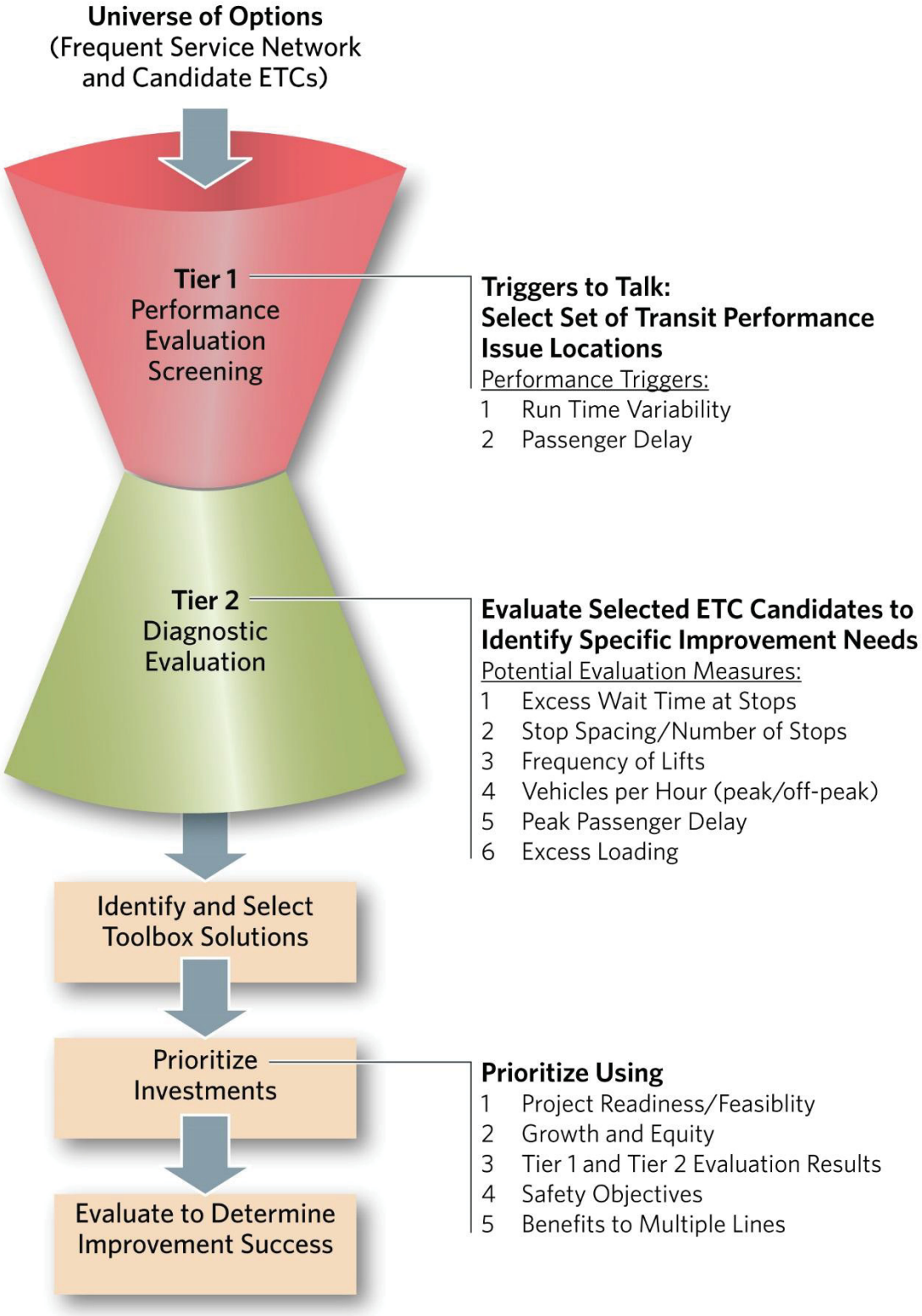


Exhibit 11. Framework for the Portland Transit Program and On-going Performance Assessment

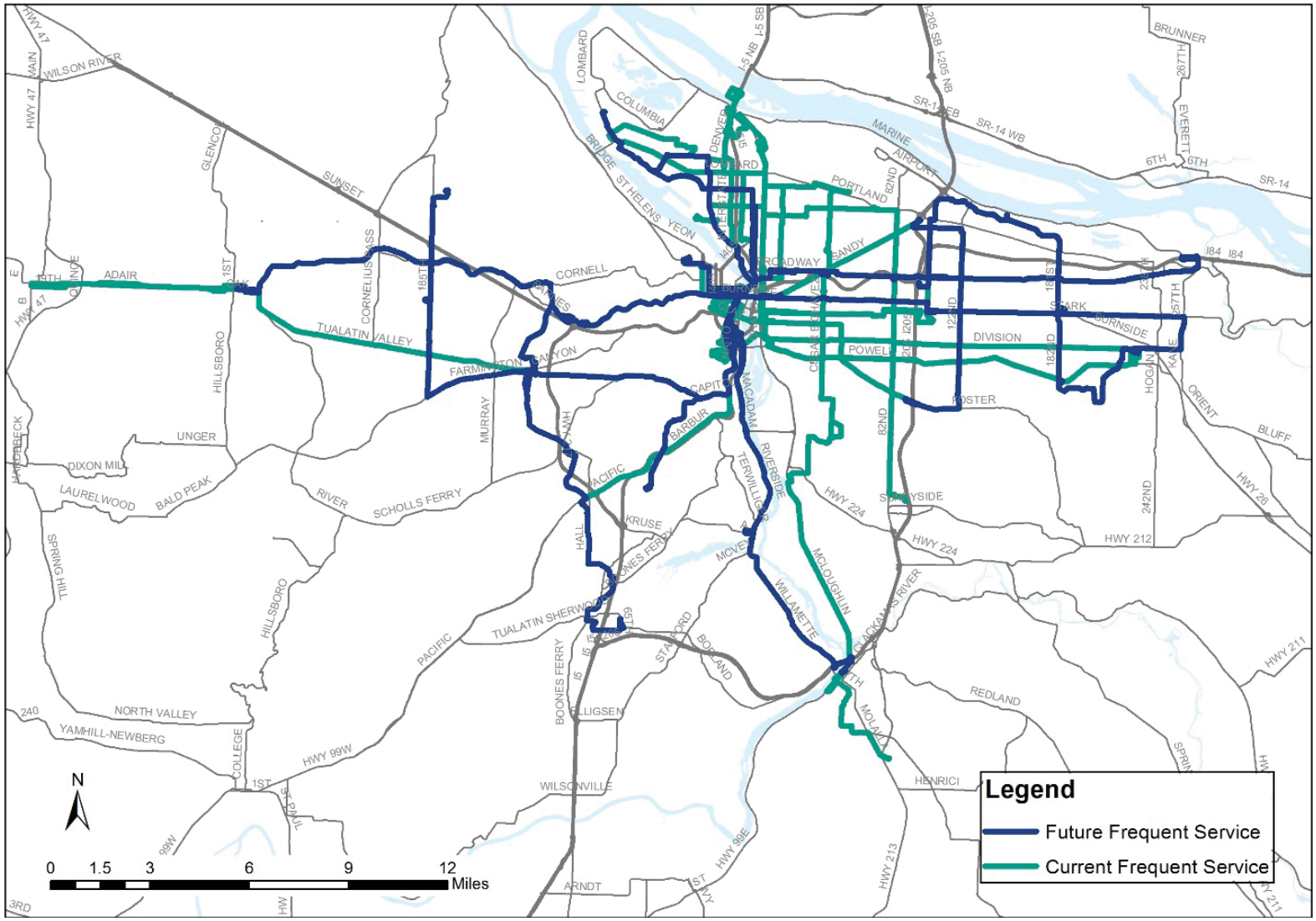


Exhibit 12. TriMet Current and Future Frequent Service Lines.

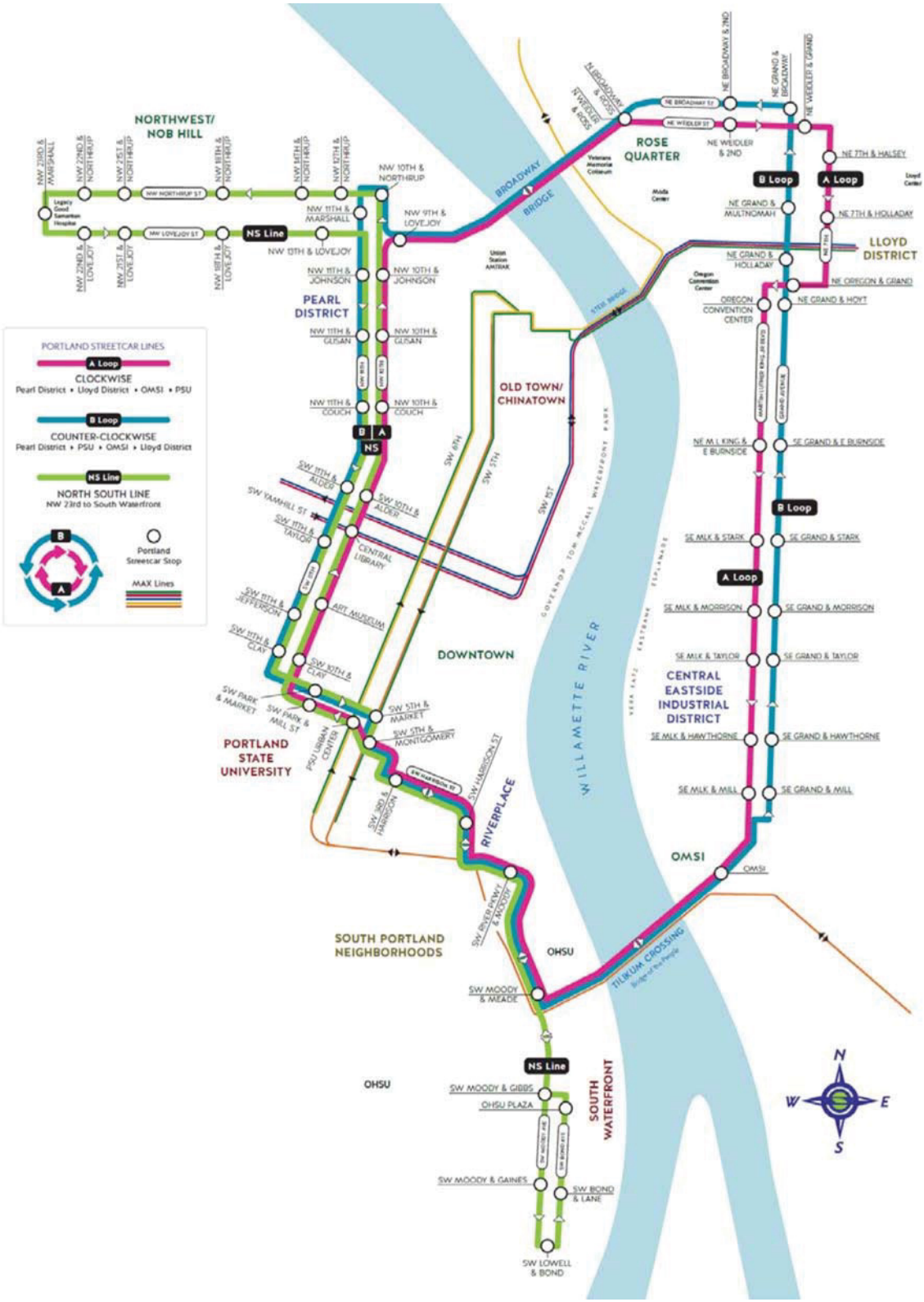
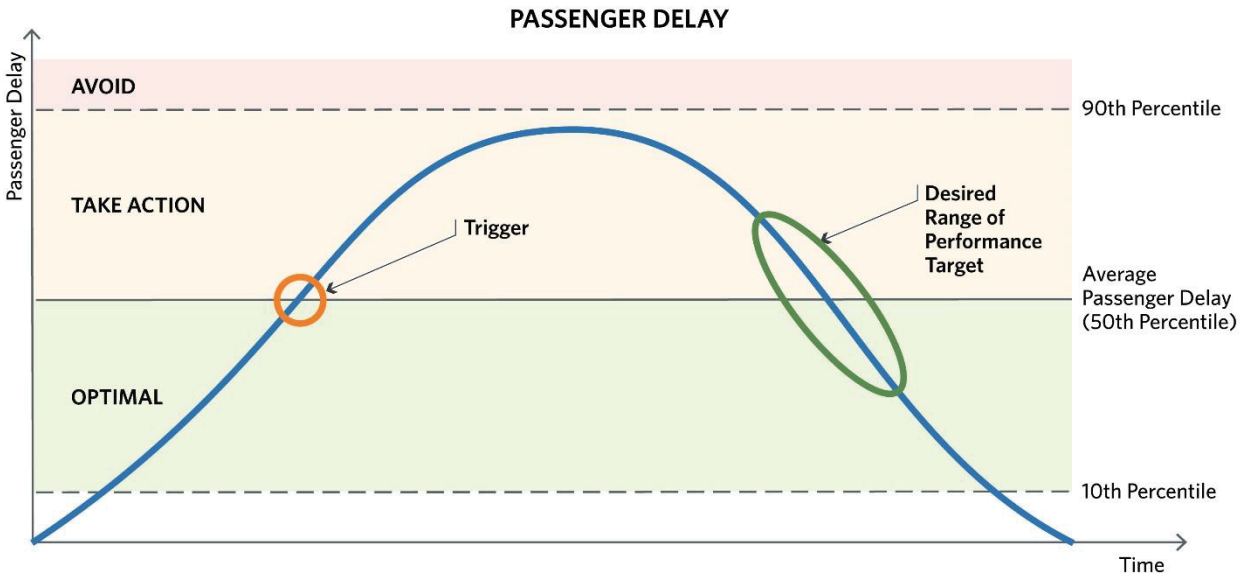
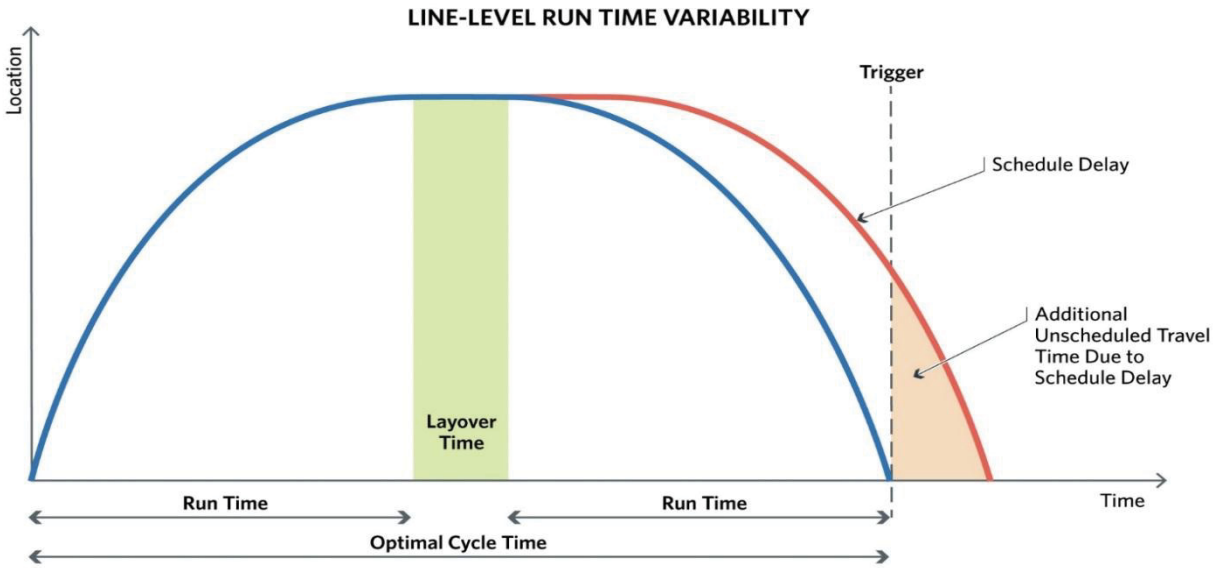


Exhibit 13. Current Portland Streetcar Network

3. Establish **Tier 1 performance threshold levels** for evaluating when to initiate a closer look evaluation and discussion with TriMet and/or Streetcar Inc. These would be the **"Triggers to Talk"** and **"Take a Closer Look."** The result of the Tier 1 evaluation would be a sub-set of bus and streetcar lines that exceed the performance threshold levels and become **Enhanced Transit Candidates** to be further evaluated in the following process steps.
    a. More study of the data, research and discussion is needed to recommend threshold levels.





4. Establish **Tier 2 diagnostic performance measures** for the closer look evaluation of the Enhanced Transit Candidates to help identify the types of delay occurring, more geographically specific locations of the delay and causes of delay to better diagnose the operational performance deficiencies and needs. These measures will help identify potential applicable treatments (Enhanced Transit tools) to address the nature of the delay and inform the prioritization of improvements. All or a subset of these diagnostic evaluation measures may be considered. Additional measures may be reviewed on a case by case basis depending on what may be causing an operational deficiency:

   Examples of recommended diagnostic performance measures (list is not exhaustive or exclusive):

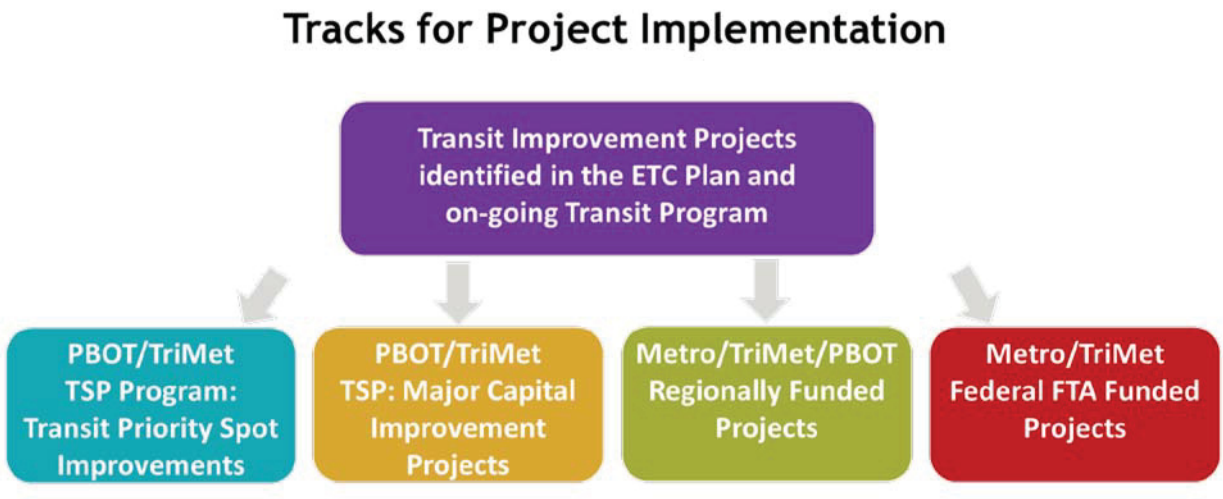
   a. Transit Speed:
      i. Median speeds: 50th percentile operating speeds, exclusive of dwell time. Ideally, proportional to the posted speed limit by segment.
      ii. 90th and 10th percentile operating speeds
      iii. Peak delay: difference between 90th and 10th percentile operating speeds. (This criterion was formerly called 'Reliability' in the initial methodology)
      iv. Yearly trend (percentage difference from previous years).
   b. Transit Travel Time: same measures as above.
   c. Peak Passenger Delay: measured at the timepoint segment level and sub-timepoint segment level, to better pinpoint delay location. Helps quantify the influence service delay has on passengers.
   d. Transit Dwell Time: Measures open door time spent at stops. Dwell time can be defined as the 50th percentile dwell time proportional to the 50th percentile overall running time.
   e. Excess Passenger Wait Time at Stops
   f. Stop Spacing/Number of Stops
   g. Frequency of ramp deployments, which will indicate importance of locations with greater use by people with disabilities and one cause of increased dwell time.
   h. Number of Buses per Hour (Peak/Off-Peak)
   i. Excess Passenger Loading, which identifies trips with vehicle capacity deficiencies

5. **Identify Enhanced Transit Toolbox Solutions and Develop Projects.** Take a Closer Look to evaluate transit operations using the Tier 2 diagnostic performance measures above, apply the Enhanced Transit Toolbox, and evaluate benefits and impacts/trade-offs. The process to identify investment needs on candidate corridors will consider specific tools at specific locations and/or corridor-wide (both at a policy and capital improvement level). Determining the applicability of specific tools will require an evaluation of potential trade-offs and impacts, coordination with other projects, considering interaction with other modes and

design constraints within existing corridor right-of-way. Future study may be required along certain corridors and/or at specific locations.

a. Identify recommended capital and operational improvements and develop projects.

b. Determine the scale of the project and identify the appropriate track for project implementation. This could range from a small project appropriate for the PBOT Transit Priority Spot Improvement Program to a medium or large stand-alone capital project comprised of focused hot spot improvements, a series of improvements in a corridor segment or a full line improvement. It could also entail integrating Enhanced Transit improvements into an already existing capital project. New projects that exceed the threshold for the TSP program and are not already on the Portland Transportation System Plan Major Capital Improvements List should be recommended for addition to the TSP through a plan amendment or future update.



6. **Prioritize Investments.** Establish a framework for prioritizing projects for implementation within the context of local and regional decision making and leveraging other planned projects. Recommended prioritization criteria (list is not exhaustive or exclusive):

a. Transit Operational Performance Need: Based on Tier 1 and Tier 2 performance measures evaluation results from the above-mentioned step 3 and 4.

b. Project Readiness and Feasibility: Considerations for political support, design, impacts, scale, complexity, concurrent project(s), funding, and additional planning requirements.

c. Growth: Aggregate household and job growth between base year and horizon year within a quarter mile of each corridor, which may dictate timeline for potential improvements

d. Equity: Measured as the percentage of people of color, low income (households below 200% federal poverty level), limited English proficiency (LEP) households within a ¼ mile buffer compared to the City-wide average. Include a measure for People with Disabilities; either the percentage of People with Disabilities within a ¼ mile buffer or number of ramp deployments at stops.

e. Safety Objectives: Higher considerations for projects on the Vision Zero High Crash Network.

f. Benefits to Multiple Lines: Considerations to improve multiple lines using shared locations which have been identified for toolbox improvements.

7. **Evaluate.** Establish performance targets using different performance metrics to track success in improving transit performance. Identify guidelines for the desired range of transit operational performance. Recommended performance metrics (list is not exhaustive or exclusive):

    a. Transit Ridership Growth and Transit Mode Share, with the ultimate target being to achieve the City's mode split goal of 25% of all trips on transit by 2035, established in the Portland Plan and the Climate Action Plan.

    b. Measures from the Tier 1 and 2 transit performance measures included above.

    c. More study of the data, research and discussion is needed to recommend additional performance targets and guidelines for the desired range of transit operational performance. This could include improving performance above existing year 2017 levels by a desired percentage, such as a 10% - 20% improvement for individual measures. It could also include a range of fixed target values with desired percentage improvements used to inform the targeted fixed values.

8. Establish **roles, responsibilities, and agreements for partnering agencies** to guide decision making, implementation and maintenance for a successful ETC program. Establishing clear roles and responsibilities will provide direction for all partnering agencies involved in the evaluation and implementation of an Enhanced Transit program. The program requires collaboration and decision making by PBOT, TriMet, ODOT (on State-owned Highway facilities), and other partnering agency staff and decision makers. The proposed roles and responsibilities are intended to be flexible to include additional agencies, different categories, and adjusted timelines as necessary. The Table below details the specific recommended roles and responsibilities for the partnering agencies for different stages of the Enhanced Transit program performance evaluation and implementation.

Table 5. Recommended Agency Roles and Responsibilities

Categories	Agency Responsibilities			Timeline
	PBOT	TriMet	ODOT	
Overall Performance Evaluation Process	Lead Agency	Partner Agency The TriMet Data Analysis Group can provide initial data analysis, run reports and provide data in Excel.	Partner Agency	Quarterly or Annual; depending on funding availability
Candidate Corridor Selection	Collaborate to select corridors			Annual or depending on funding availability
Performance Data Production and Evaluation	Conduct evaluation using TriMet's performance data; provide projected growth and equity data	Produce performance data for each measure	N/A	Quarterly performance reporting in conjunction with corridor selection
Prioritization	Lead prioritization using result of evaluation	Coordination on corridor and segment prioritization		Annual in conjunction with corridor selection
Establish Triggers and Targets	Lead agency to consider adjustments to performance triggers and targets	Partnering agency to agree on adjustments to performance triggers and targets	N/A	Varies; Adjust periodically only if needed
Toolbox Application	Agencies collaborate on investment tool selection using TriMet breadcrumb data and investment tool triggers		Coordinate with partnering agencies if tools are identified on ODOT facility	Varies depending on identification of corridor deficiencies and need
Test for Readiness	Agency collaboration and coordination on project readiness			Assess readiness after projects have been identified for corridor improvement

Implementation	May lead capital project implementation on City owned facilities. Or approve through permit if led by others.	May lead or support project implementation. Lead service related implementation (vehicles, technology, procedures, etc.)	May lead project implementation on ODOT owned facilities. Or review for approval if led by others.	Varies depending on project
Policy Changes	Include identified projects in City's TSP	Include identified projects in TriMet's budget	Consider and evaluate state funding availability for selected projects	Varies; HCT Projects will require RTP adoption, with Metro coordination
Evaluate Improvement Effectiveness	Lead agency to evaluate investment effectiveness on ETC corridors	Provide needed data to evaluate investment effectiveness on ETC corridors	N/A	In conjunction with project implementation
Maintenance	Maintain PBOT facilities	Maintain TriMet facilities	Maintain ODOT facilities	As needed

2.5 Regional Enhanced Transit Concept Pilot Program

An outcome of this planning effort has been the creation and development of a regional pilot program to advance Enhanced Transit in the Portland Metro region. Portland City Council has directed the Portland Bureau of Transportation (PBOT) to coordinate with TriMet and Metro to advance a strong transit vision that includes Enhanced Transit as a centerpiece in the 2040 Regional Transit Vision and 2018-2040 Project list element of the Metro Regional Transportation Plan.

In late 2017 and early 2018, TriMet and Metro formalized discussions to pursue new opportunities to support emerging Enhanced Transit concepts. TriMet and Metro will support capital and operating partnerships with jurisdictions around the region to increase bus transit capacity and reliability where needed, and to identify relatively low-cost, context-sensitive, and readily-deployable enhanced transit solutions. The methodology for implementing the pilot program is based on the analysis methods and capital/operational tools developed as part of the Portland ETC Plan.

As of the writing of this plan, the region is conducting a series of workshops with regional jurisdictions to test the feasibility of Enhanced Transit solutions on bus lines experiencing transit performance issues throughout the region. The purpose of the workshops is to select candidate Enhanced Transit projects to advance to 15%, 30%, and eventually final design. These projects are also proposed for inclusion in the Metro 2018 Regional Transportation Plan (RTP) project list.

The City of Portland segments that are planned to be studied in the Regional ETC Pilot Program Workshops are displayed in **Error! Reference source not found.**Exhibit 14 below. Additional candidate segments that were previously studied are also eligible for the Regional ETC Pilot program. These include the three segments studied during the Closer Look workshops conducted through the City's ETC Plan planning process and summarized in *Chapter 4*: *Planning Process* and segments studied through other recent planning processes.

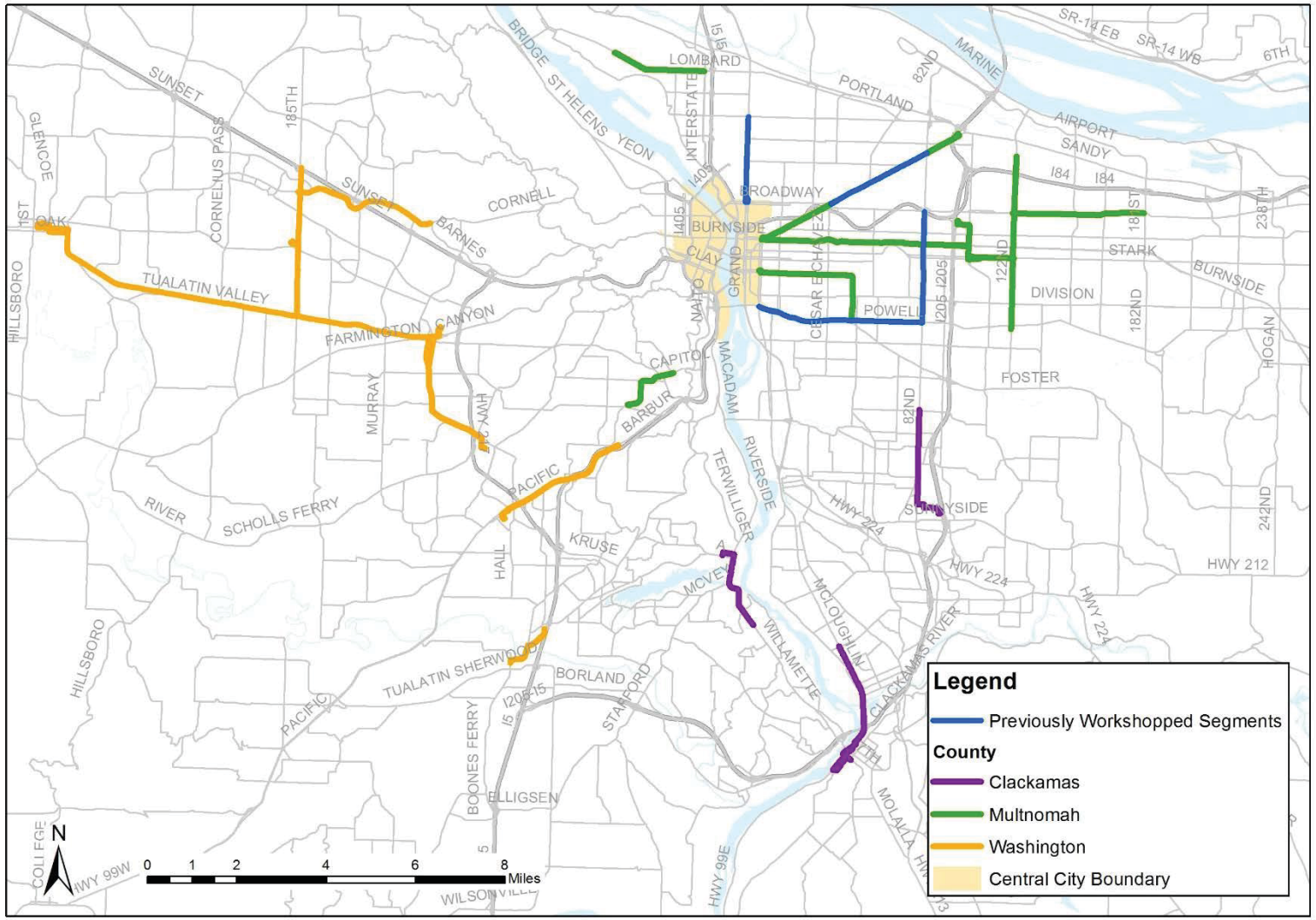


Exhibit 14. Candidate Segments to be studied in Regional ETC Pilot Program Workshops (outside Portland Central City)

For a complete discussion of the Regional Enhanced Transit Concept Pilot Program, please refer to *Chapter 7: Looking Ahead.*

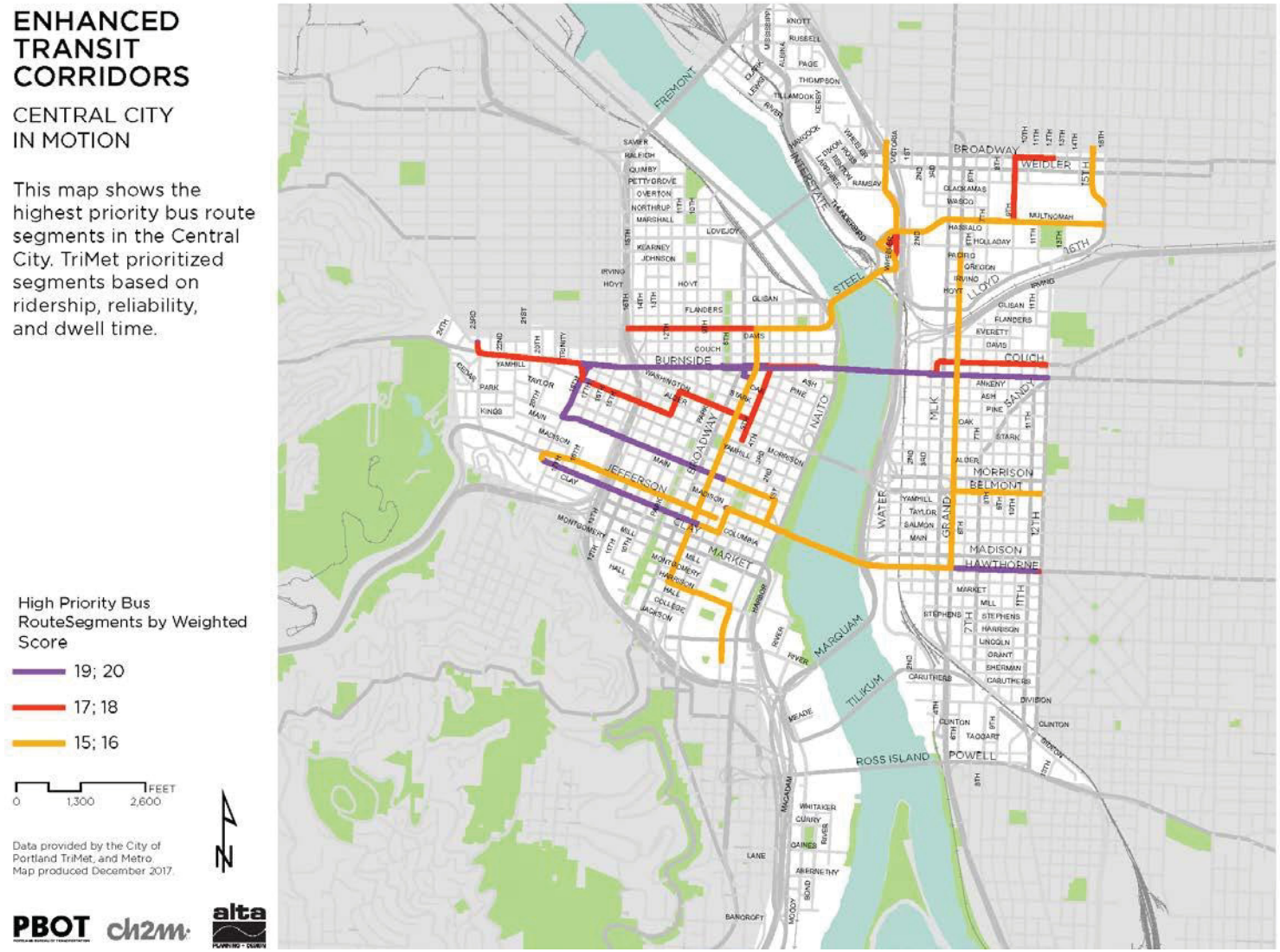


Exhibit 15. Frequent Service segments to be studied in the Regional ETC Pilot Program Workshops (within Central City)

3. Capital and Operational Toolbox

The ETC Capital and Operational Toolbox provides a concept-level overview of 19 capital and operational treatments that can be applied to improve transit performance that also results in safer, more predictable interactions between travel modes. The Toolbox was developed with the intent to help the City of Portland, TriMet, and other regional partners define a set of context-sensitive solutions to address performance problems within TriMet's Frequent Service bus network that also respond to trends in growth and transportation funding policy.

The Toolbox consistently communicates contextual information to help inform decisions about the potential applicability and effectiveness of each treatment. Tools are organized into categories that reflect the purpose and function of specific tools. Within the categories, treatments are organized in descending order from most to least capital intensive. Individual Toolbox sheets provide an overview of each tool, including the type of problem it seeks to solve, key features, and typical context for application. The relative cost of implementing a given tool is visually represented using one to four dollar signs in the upper right-hand corner of each page, which allows for a quick visual comparison of treatments.

Although this set of tools was developed to address transit performance within TriMet's Frequent Service bus network, these tools are applicable in other regional and national contexts where strategic, localized improvements to existing bus lines can substantially address performance issues without needing to resort to corridor-wide investments in bus rapid transit systems or other capital-intensive approaches.

3.1 Toolbox Categories

The Toolbox is organized into four categories that reflect the purpose and function of specific tools. The categories also communicate the tactical "scale" of improvements, ranging from improvements

that are only appropriate and/or feasible at the regional or corridor-wide scale, to improvements that are appropriate at stops, stations, and intersections.

Laneways and Intersection Treatments

The category refers to Enhanced Transit improvements that are deployed along a line, corridor, or intersection "hot spot" experiencing significant levels of transit delay. Examples include Dedicated Bus Lanes, Business Access and Transit (BAT) Lanes, and Pro-Time (Peak Period Only) Transit Lanes. Laneway and intersection solutions typically imply impacts to the road right-of-way, whether the specific improvement involves lane repurposing, roadway widening, or the potential acquisition of buildings and property. Solutions in this category are generally the most capital-intensive class of Enhanced Transit tools, but offer the highest level of bus transit priority via partially or fully dedicated roadway spaces for buses.

Dedicated Bus Lane on SW 5th Avenue, southbound approaching I-405 (Credit: CH2M)

Multi-Modal Interaction

This category of Enhanced Transit tools seeks to minimize transit delay in multi-modal environments while maximizing bicycle and pedestrian safety and comfort. Examples include curb-tight bike lane running behind stations, left-side bike lanes, dedicated bike signals, and shared bus/bike zones. These tools seek to clarify the interaction among bicycle riders, pedestrians, and transit vehicles to improve multi-modal integration and to reduce modal safety conflicts. The individual tools in this category range from laneway improvements to create shared or exclusive bus/bike spaces, to tactical improvements that can be done at stations to reduce multi-modal friction for both transit and other active transportation users.

Traffic island and bikes behind station at SW Moody and Gaines (Credit: TriMet)

Stops and Stations

Tools in this category aim to improve bus travel time by reducing delay associated with deceleration to, acceleration from, and dwell time at bus stops and stations. Examples include curb extensions at stops/stations, level or near-level boarding, and far-side bus stop placement. Some of these improvements can be deployed in a relatively tactical scale, such as curb extensions at near-side stops that allow buses to stop for passengers in-lane, while simultaneously reducing the need to merge in and out of the traffic lane. Other stop and station improvements, such as level or near-level boarding, are only feasible at the corridor or regional scale, and would require additional policy guidance and interagency discussion before project development and multi-phase implementation.

Level boarding on Portland Streetcar (Credit: Railroadforums.com)

Operations/Other

The tools in this category range considerably in terms of purpose, function, and scale. Examples include headway management, transit signal priority (TSP) improvements, and rolling stock modifications. Given that most of these tools are only feasible and/or appropriate at the regional or corridor level, implementing these improvements requires additional policy guidance, design analysis, and interagency discussion before any specific application of the tools can be implemented.

Toolbox Applicability

It is important to note that not all Toolbox treatments are possible in every street context. Some treatments can only be applied under specific conditions or with significant changes to the street and cross-section, which may not be feasible or practical. Toolbox treatments are also likely to involve trade-offs in the public right-of-way, or require acquisition of additional private property to widen the right-of way. For example, widening can impact adjacent properties and buildings. Trade-offs could also impact vehicle access and space for parking or other modes. Where such trade-offs arise, additional stakeholder and public engagement is often necessary.

Appropriate application of individual tools requires additional corridor-level analysis regarding the specific existing conditions and context – as well as the needs of other travel modes to assess which Toolbox treatments are likely to be feasible and effective in particular corridors. This level of analysis is beyond the scope of this plan, but initial steps were taken to understand which tools

could be applied in which contexts, and what kinds of transit benefits could be anticipated.

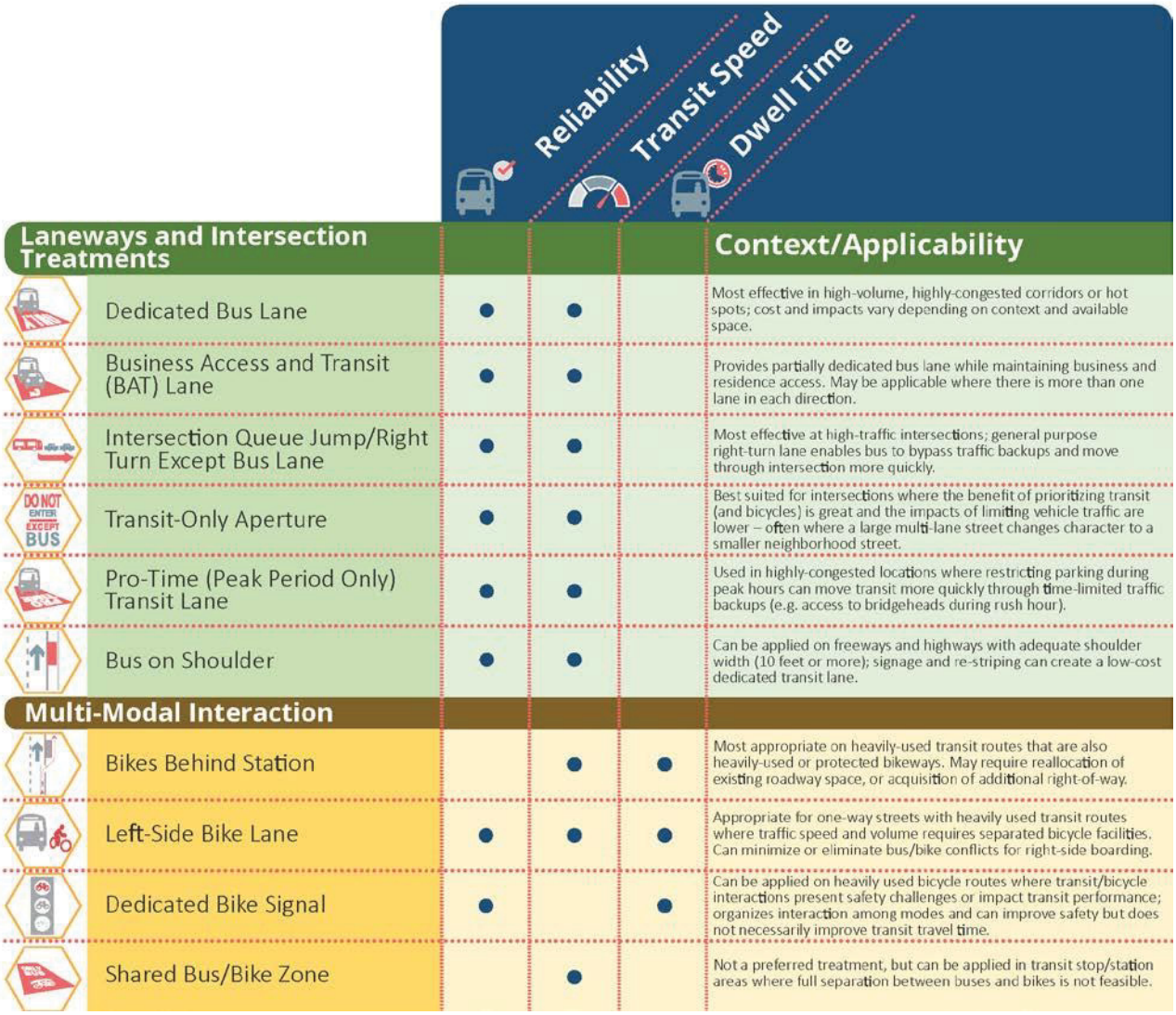


Exhibit 16 describes which tools are most appropriate for different types of corridors and problems.[6]

[6] The full ETC Capital and Operational Toolbox can be found on the City's project website: https://www.portlandoregon.gov/transportation/article/640269

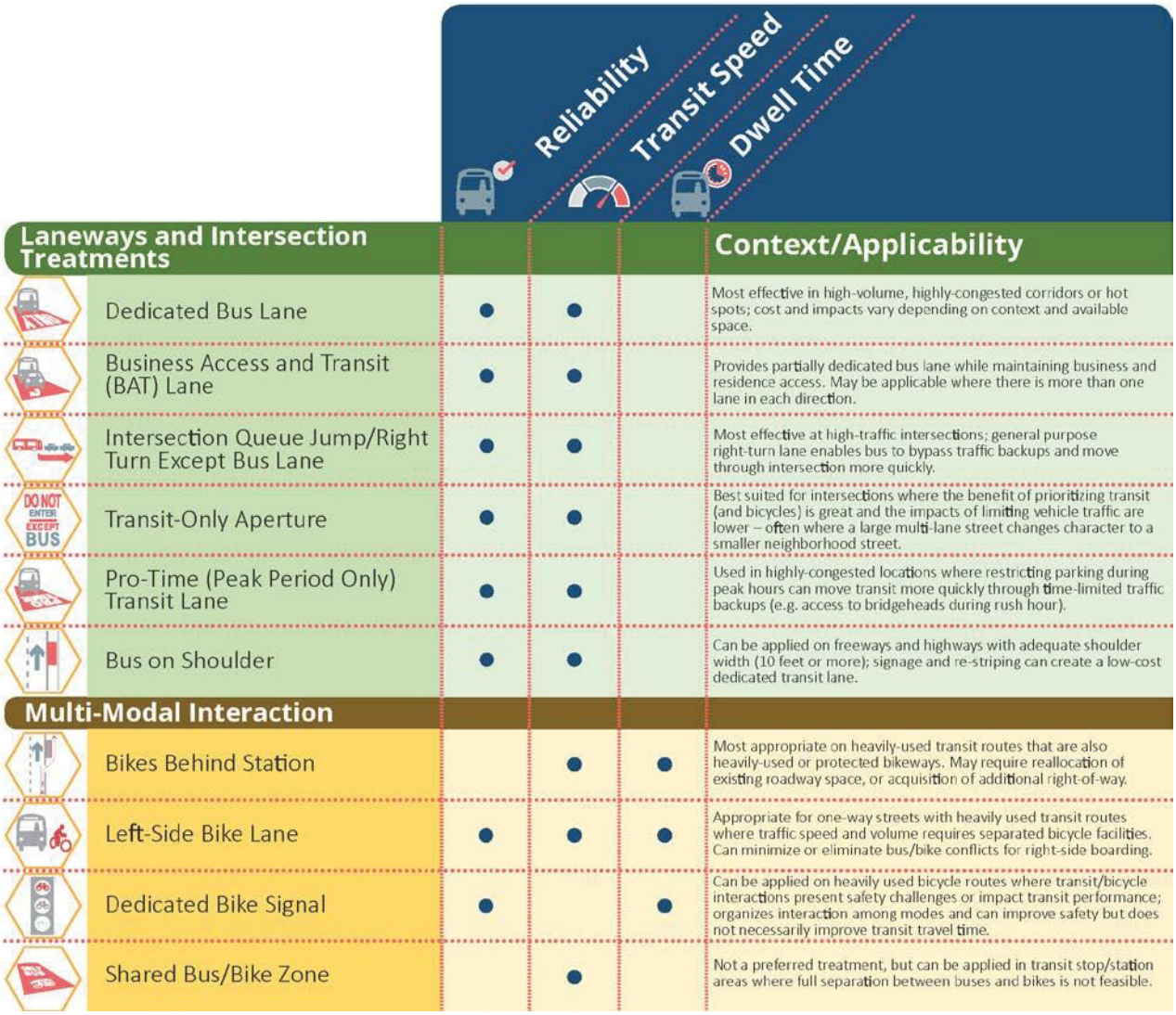


Exhibit 16. ETC Capital/Operational Toolbox Applicability Matrix

Laneways and Intersection Treatments	Reliability	Transit Speed	Dwell Time	Context/Applicability
Stops and Stations				
Curb Extensions for Stations/ Stops	●	●	●	Typically applied where there is on-street parking. Applicable in both mixed-flow and dedicated transit lane conditions; can be installed mid-block or at intersections.
Level Boarding	●	●	●	Application varies based on adjacent building entrance locations, right-of-way widths and availability, and integration with the sidewalk environment; cost varies widely depending on the need for new platforms or rolling stock.
All-Door Boarding	●	●	●	Can be combined with off-board fare collection and/or on-board electronic fare technology at each door to facilitate quick entry and compliant fare payment.
Far-Side Bus Stop Placement	●	●	●	Stop placement depends on corridor land use, street/intersection design, sidewalk availability, driveway locations, and other conditions; most effective when used in combination with transit signal priority (TSP).
Bus Stop Consolidation	●	●	●	May be appropriate in corridors with a large number of closely spaced stops where roadway and pedestrian conditions allow for safe access to consolidated stops.
Operations/Other				
Rolling Stock Modification			●	Longer vehicles can accommodate more passengers, and/or on-board amenities; this may help address crowding. Modern low-floor vehicles enable level boarding and all-door boarding. May require new or retrofitted maintenance facilities.
Street Design Traffic Flow Modifications	●	●		Applicability dependent on context and conditions.
Transit Signal Priority and Signal Improvements	●	●		Signal adaptations may include extending a green light, triggering a transit priority phase, and/or progression changes to improve conditions for all traffic.
Headway Management	●			Strategies may include monitoring/management for specific lines or groups of lines, or headway-based service that operates without published schedules. Often requires new software, hardware and staff.

Exhibit 17. ETC Capital/Operational Toolbox Applicability Matrix (Continued)

3.2 Avoiding Multi-modal Operational and Policy Conflicts

Portland's Comprehensive Plan Policy 9.6, "Transportation Strategy for People Movement," Plan policy 9.6, (mentioned above) directs the City to "not make existing conditions worse for the most vulnerable users higher on the ordered list" associated with the policy, which in this case refers to people bicycling and walking. For this reason, great care must be taken when implementing those toolbox treatments that can reduce the safety and comfort of people walking or bicycling, or preclude the future provision of appropriate bicycle facilities on streets classified for bicycle use.

Applying some ETC toolbox treatments can result in conflicts for pedestrians or cyclists. Such conflicts between modes should be avoided where possible and otherwise minimized.

This can be facilitated by taking a Complete Streets approach in the project scoping and design phase and considering a range of design options. Depending upon the context and trade-offs, this may include analyzing the removal of on-street parking, repurposing of a travel lane, widening the

sidewalk corridor in a manner that would create a sidewalk-level bicycle lane or other changes to the street cross-section.

During the development of this plan, the Shared Bus/Bike Zone treatment in the ETC Toolbox raised particular concern. The National Association of City Transportation Officials (NACTO) state in their "*Transit Street Design Guide*" that "bus-bike lanes are not high-comfort bicycle facilities, and are not a substitute for dedicated bikeways, particularly at peak periods and on high-volume bus routes. Special care must be taken not to require bicycle and bus traffic to mix at high speeds. As bus speeds and volumes increase, the number of passing events increases, eroding the comfort and, potentially, the safety of the facility for bicyclists." NACTO also suggests that these facilities are best applied on streets where there is no existing or planned bicycle facility. Indeed, the ETC Toolbox states that such facilities are "not ideal for either bicycle safety or bus operations."

4. Planning Process

This chapter summarizes the ETC planning process and provides a brief history of the work that went into the development of plan recommendations.

Key steps in the planning process included the development of methodology to screen and select ETC Candidate Corridors from TriMet's current and planned Frequent Service lines. The project team also used this methodology to evaluate the existing and projected conditions of Candidate Corridors, and to perform an initial ranking of Candidate Corridors based on level of transit need, projected future growth, and equity considerations. The initial ranking of Candidate Corridors also served as the first step developing an analysis framework for an on-going Enhanced Transit performance monitoring and implementation program. The lessons learned from this technical work formed the basis for how Enhanced Transit projects will be identified and prioritized in the future, not only within the City of Portland's new Enhanced Transit Program, but also within Metro's Regional Enhanced Transit Concept pilot program. Through this iterative planning process, the project team also identified ways to integrate Enhanced Transit opportunities into other City plans and projects, including the Central City in Motion project, the 122nd Avenue Area Safety Improvements project, and the Outer Stark Safety and Access project.

This chapter also includes a summary of the public and stakeholder outreach that was conducted in support of the development of this plan, with explanation of how the project team integrated public and stakeholder feedback into each step of the ETC planning process.

4.1 Initial Screening and Selection Process

The ETC planning process began in 2016, when staff from PBOT and TriMet worked together to develop an initial universe of ETC Candidate Corridors. The purpose of this screening process was to select less than a dozen bus corridors, segments, or hot spots from TriMet's existing and near-term planned Frequent Service network for further study and analysis as part of the ETC Plan ( ).

Screening and Selection Methodology

The screening and selection process to identify ETC Candidate Corridors began with an interagency effort to update the existing and planned-near term TriMet Frequent Service network map to reflect current or upcoming transit projects. As a result, the project team added two additional lines for consideration: Line 20 – E Burnside/SE Stark St and Line 73 – 122nd Ave. These lines were added to reflect TriMet's existing work plans to achieve Frequent Service on these routes. The project team also excluded some lines from consideration with transit improvement projects already in progress. Line 4 – SE Division (Division Transit Project) and Line 12 – SW Barbur Blvd (SW Corridor Project) were excluded from consideration to focus Plan resources in key corridors throughout the City that were not already being actively studied.

The project team then broke transit lines into proposed corridor segments to facilitate further analysis and interagency discussion. Some lines passing through downtown Portland were truncated at the edge of the downtown core, while others were truncated at Portland City limits based on discussions around jurisdictional ownership, relationships to other modes, and transit performance characteristics.

These analysis segments were then passed through a second screening process based on criteria and measures based on historic transit operations and reliability, ridership, and areas of forecasted future growth.

Criteria and Measures

The Project Team used the following **criteria and measures** to evaluate the universe of candidates. Criteria and measures were based on analysis of TriMet Automatic Vehicle Location (AVL) data.

- **Reliability Measure**: "Percentage difference between 90th and 10th percentile revenue speed." It was used to identify segments along bus routes where the difference between the transit travel speed (inclusive of all activity, such as picking up passengers, while in revenue service) varied greatly throughout the course of a day between more free flow traffic conditions and more congested/delayed time of day.

  Reliability was the primary measure the Team used in the screening process. Lines with two or more segments with the highest speed variability were recommended as Candidate Corridors. The following measures helped to tip the balance in deciding which of the candidates on the cusp to include.

TriMet Automatic Vehicle Location (AVL) Data

Like many transit agencies throughout the United States, TriMet has implemented AVL equipment to automatically determine and transmit the geographic location of a transit vehicle. AVL is beneficial to the agency in fleet management and asset management scenarios, and allows the agency to collect detailed transit performance and passenger census information. TriMet's AVL data formed the basis for the transit performance research conducted as part of the ETC Plan.

- **Ridership Passenger Loads Measure:** "90th percentile maximum load." This measure was used to identify segments where the passenger loads were greater.
- **Transit Speeds Measure:** "50th percentile revenue speed" divided by "posted speed limit." This measure was used to identify segments where buses were on average relatively slower than the posted speed, even off-peak.
- **Forecasted Future Growth** The following measures were used to help gauge corridors the City deems important in the Comprehensive Plan Update and forecasted for future higher densities.
  - Does the line serve a Center, Civic Corridor or Neighborhood Corridor?
  - Does it serve 2035 Forecasted Households Density or Employment Density?

The project team aggregated all TriMet data to the segments between time points. The segments were then ranked and displayed in quintiles. Generally, the project team selected corridors segments as ETC Candidate Corridors if they had multiple segments in the top/bottom two quintiles, as they were interpreted to be most reflective of poor performance relative to those scoring in the remaining quintiles.

Candidate Corridor Recommendations

The project team recommended the following list of eleven (11) candidate corridors for further evaluation based on the screening and selection process described above (

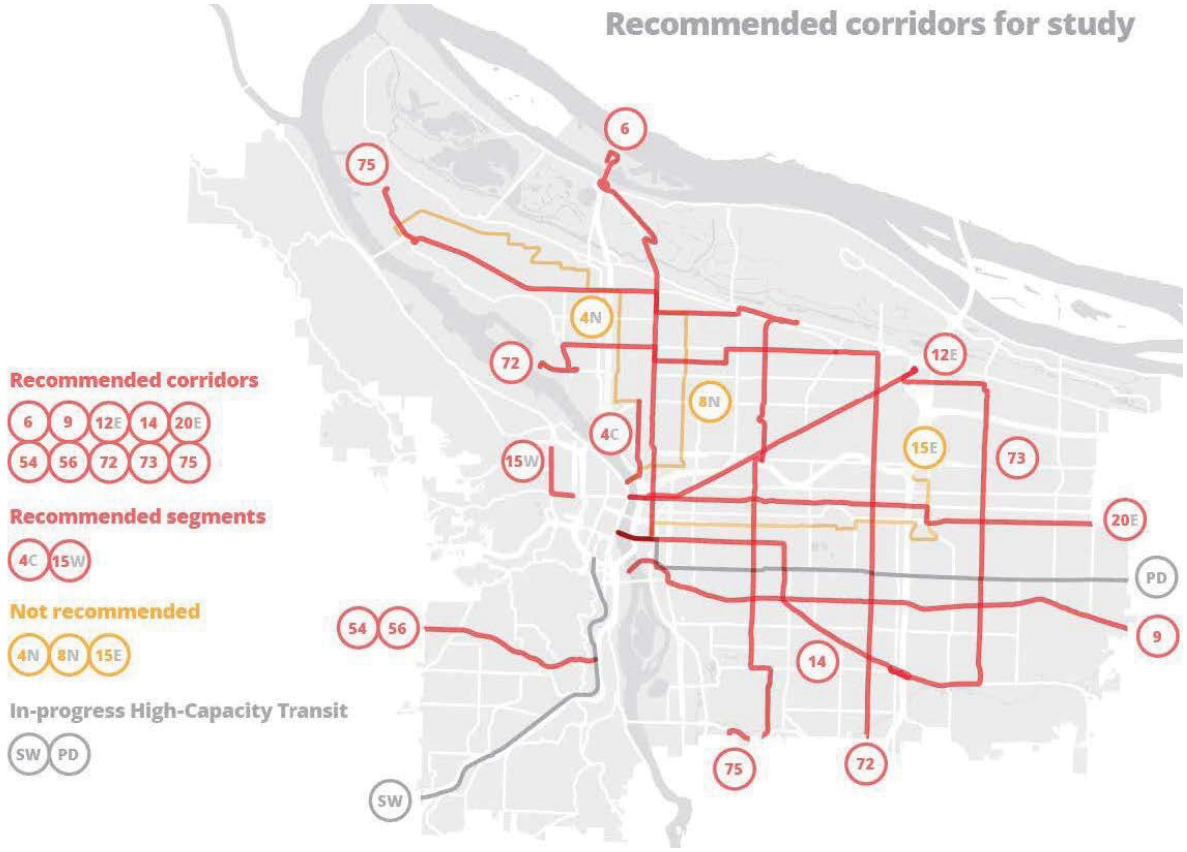


Exhibit 18).

- Line 4 – N Vancouver/Williams from Rose Quarter to N Fremont
- Line 6 – MLK Jr Blvd/Jantzen Beach
- Line 9 – SE Powell Blvd
- Line 12 – NE Sandy Blvd
- Line 14 – SE Hawthorne/Foster Rd
- Line 15 – West of downtown – W Burnside and NW 23rd up to Vaughn
- Line 20 – E Burnside/SE Stark St
- Line 54/56 – Beaverton-Hillsdale Hwy, both lines combine to provide Frequent Service
- Line 72 – Killingsworth/82nd Ave
- Line 73 – 122nd Ave
- Line 75 – Cesar Chavez/Lombard

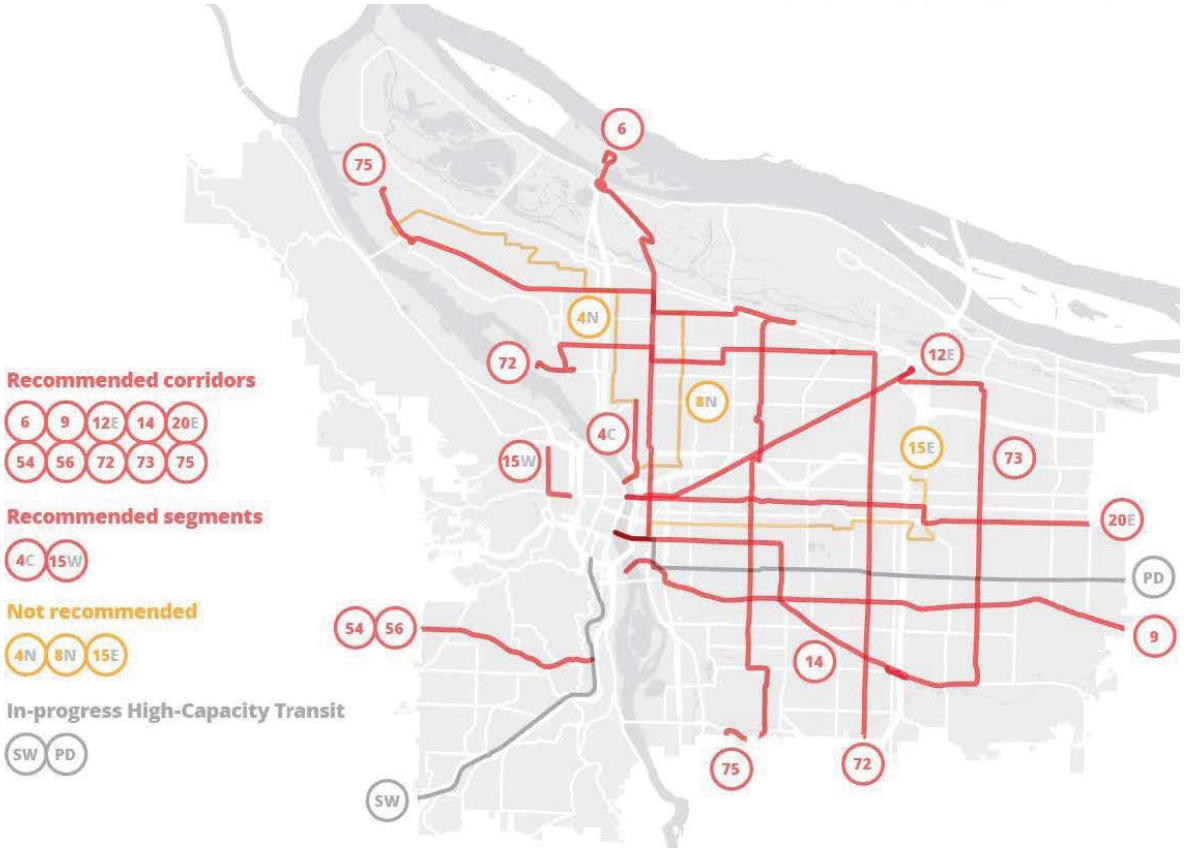


Exhibit 18. ETC Candidate Corridors – Recommended for further study as part of the ETC Plan

4.2 Existing and Projected Conditions

Building from the initial screening and selection process, the project team developed additional or revised criteria and performance measures to conduct a more detailed assessment of transit performance within selected ETC Candidate Corridors.

The existing and projected conditions analysis provided the basis for an initial corridor prioritization methodology, which helped support the final recommendations of this plan. The following section provides an overview of the corridor prioritization methodology, and how the prioritization of ETC segments fed into subsequent phases of the planning process.

Criteria and Performance Measures

The project team analyzed ETC Candidate Corridors in the context of future growth, equity, and relative transit performance. The analysis used TriMet AVL data at the **time point segment level**. The following measures were calculated for multiple segments along individual bus lines.[7]

Average Weekday Stop-Level Activity

Stop-level ridership describes passenger activity throughout the corridor. Activity is defined as the sum of boardings (riders getting onboard) and alightings (riders getting off) at stops. While this measure was not analyzed at the time point segment level or used to prioritize corridors, the information was included to give a better understanding of corridor conditions.

Average Existing Weekday Transit Trips

Average Existing Weekday Transit Trips is calculated using the Federal Transit Administration (FTA) Warrants ridership methodology used to rate projects. Trips are calculated by summing the average weekday passenger load entering the corridor and stop-level boardings along the line. This indicator provides information to determine rider impact as part of the prioritization process. A higher value indicates a greater need for improvement and higher likelihood of rider impact.

What is a time point segment?

The ETC Plan used "time point segments" as the geographic units of analysis for evaluating transit performance along a given bus line.

As a bus travels along a given route, TriMet's AVL equipment retrieves and transmits vehicle data in timed intervals. This data is geographically referenced and is reproducible as a geographic unit of analysis. The data can then be aggregated as needed for analysis.

Time point segments allowed the project team to evaluate bus performance at a more detailed level than what is possible using route or corridor-level information, and formed the basis for much of the analysis conducted as part of the ETC Plan.

Reliability

Reliability is defined as the percent difference between the 90th and 10th percentile operating speeds, including dwell time. This indicator describes travel speed variability over the course of the day and helps identify the influence of traffic congestion on delaying transit during typical peak periods. The greater the percentage is, the longer it takes the bus to travel the route segment during peak congested periods versus more free flow traffic conditions. A higher value indicates a higher deficiency – and therefore a greater need for improvement.

[7] The complete existing and projected conditions analysis, as well as detailed corridor profile sheets for each of the eleven (11) candidate corridors can be found in Existing Conditions and Methodology Memorandum and Appendix (May 2017): https://www.portlandoregon.gov/transportation/73694

Transit Speed

Transit speed is defined as the 50th percentile (average) operating speed (exclusive of dwell time) proportional to the posted speed limit along each segment. This indicator identifies the overall operating speed and reveals a number of operating deficiencies across all time periods. A lower value indicates a higher deficiency – and therefore a greater need for improvement.

Dwell Time

Dwell time is defined as the 50th percentile dwell time proportional to the 50th percentile overall running time. This indicator describes open door time spent at bus stops, and helps to identify the influence of bus stop delay. A higher value indicates a high deficiency – and therefore a greater need for improvement.

Equity

Equity measures the percentage of people of color, low income (households below 200% federal poverty level), and limited English proficiency (LEP) households. The equity score is a composite index of scores for these three demographic factors. Equity scores are based upon quartile point values for each block group within a quarter mile distance from the candidate corridor. Block groups received a higher composite score if they scored above the city-wide average for low-income, LEP, or people of color. The project team conducted scoring at the time point segment-level and then aggregated to arrive at corridor-level findings. This measure identifies locations where a concentration of equity populations suggests more need for transit improvements. A higher value indicates a greater need for improvement.

Forecasted Future Growth (2010 – 2035)

This criterion measures aggregated household and job growth between base year (2010) and future year (2035) within a quarter mile of the corridor. The growth forecast is based on the Portland Comprehensive Plan 2035 Growth Scenario. It identifies locations where future land use suggests more transit demand and the need for additional transit capacity. A higher value indicates a greater need for improvement.

4.3 Candidate Corridor Evaluation

The project team used the same criteria and performance measures above to develop a prioritization methodology to assess which Candidate Corridors, corridor segments, and/or "hot spots" warranted further study in subsequent phases of the plan. The evaluation approach was grounded in understanding transit operations and guided by transit policy and ridership demand. The Tier 1 corridors below had high aggregate "deficiency" scores based on the criteria; they also represented a diversity of corridor types and transit delay issues found throughout the City. Lessons learned from these corridors could apply across the City, informing future application of Enhanced Transit tools on streets experiencing similar transit performance issues.

Initial Evaluation Results

Given limited project resources, PBOT staff recommended three (3) corridors based on this prioritization methodology to be advanced for further analysis and conceptual application of Enhanced Transit tools as Tier 1 Enhanced Transit Corridors.[8] The results led to the development of the project list that was submitted for the Metro RTP Call for Projects in Summer 2017 and now recommended for the Portland Transportation System Plan (TSP) Update described in *Chapter 2: Recommendations.* The initial evaluation results also helped the project team identify segments to include in the Closer Look (See *Chapter 5: Conceptual Toolbox Application*).

Recommended for Initial Conceptual Toolbox Application or 'Closer Look'

- **Line 72** – 82nd Avenue between I-84 and SE Powell Boulevard
- **Line 12** – Sandy Boulevard between NE 47th and Parkrose Transit Center
- **Line 6** – Martin Luther King, Jr. Boulevard from NE Killingsworth to NE Holladay Street.

In addition, PBOT recommended that the following three corridors to be studied more closely as part of other planning efforts:

Corridors to be studied through other up-coming plans and projects:

- **Line 73** through the 122nd Avenue Safety and Access Improvement Project planning process
- **Line 20** through an Outer SE Start Safety and Access planning process
- **Key bottlenecks**, including in the Central City

[8] Detailed results maps for each of the evaluation criteria and performance measures, as well as a map of aggregated scores for all Candidate Corridors can be found on the City project website: https://www.portlandoregon.gov/transportation/73691

The complete evaluation process is documented in the Existing Conditions and Methodology Memorandum and Appendix (May 2017): https://www.portlandoregon.gov/transportation/73694

The complete corridor prioritization methodology is documented in detail in Existing Conditions and Methodology Memorandum and Appendix (May 2017): https://www.portlandoregon.gov/transportation/73694

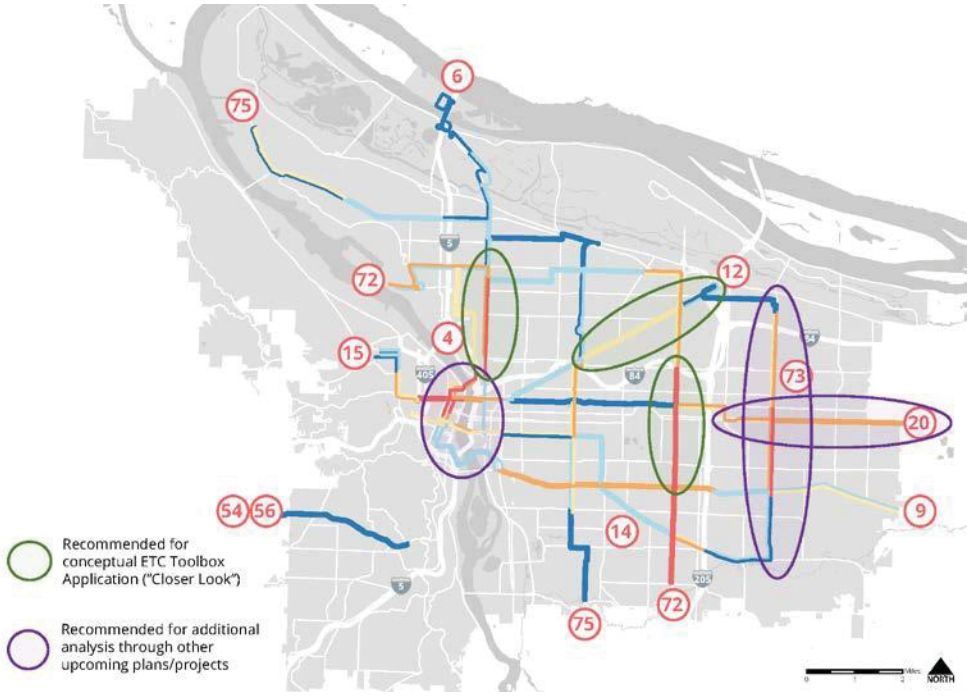


Exhibit 19. Initial Evaluation Results - Recommended for Conceptual Toolbox Application

5. Conceptual Toolbox Application (Closer Look)

As part of the ETC planning process, the project team performed a conceptual application of the ETC Toolbox (See *Chapter 5: Capital and Operational Toolbox*) in three segments from the initial Enhanced Transit Network. This exercise provided an opportunity to identify potential capital and operational treatments that could be applied to improve transit performance and/or to create safer, more predictable interactions with other travel modes within priority enhanced transit corridors. Through this exercise, the project team learned both general lessons that can be applied to the transit system in Portland, as well as specific information to the transit line segments evaluated. This chapter describes the outcomes of this process, referred to for convenience as the ETC "Closer Look."

The purpose was to explore design possibilities in context, identify potential tradeoffs and considerations for future study, and learn from the overall process. In summary, this effort led to the following high-level findings and outcomes:

- Identified some potential ETC tools in spot locations.
- Identified general considerations and potential impacts to traffic access, circulation, diversion, on-street parking, multi-modal environment, private property, etc.
- No formal project recommendations at this time.
- Additional project development and analysis is needed to understand the full potential benefits and trade-offs.
- The Regional ETC Pilot Program could provide an opportunity to further advance such project development and analysis for these three segments and other candidate segments eligible for the Regional ETC Pilot Program described in Chapter 7.

5.1 Closer Look Workshop Approach

The ETC Plan project team held three ETC "Closer Look" workshops in fall 2017 to test the application of Enhanced Transit tools in three selected segments of the transit network. Each workshop was attended by multiple agency partners and experts, including representatives from ODOT, PBOT, Portland Streetcar, and TriMet. The Closer Look process matched Enhanced Transit tools to locations where delay is harming transit performance within each transit segments. The Toolbox and workshops allowed exploration of design possibilities in context, identification of potential tradeoffs and considerations for future study, and "lessons learned" applicable to future Enhanced Transit applications.

5.2 Workshop Context and Limitations

Given the time and resource limitations of the ETC Plan, only three (3) segments of bus lines could be analyzed. PBOT and TriMet staff worked collaboratively to identify a set of corridor segments that exhibited a range of corridor types and transit delay. Community stakeholders had the opportunity

to provide input on which segments to look at during public engagement May through July 2017 and July 13 City Council hearing. The selected segments were:

- **Line 72** – 82nd Avenue between I-84 and SE Powell Boulevard
- **Line 12** – Sandy Boulevard between NE 47th and 82nd Ave
- **Line 6** – Martin Luther King, Jr. Boulevard from NE Killingsworth to NE Holladay St.

The project team selected corridor segments based on two main criteria: first, the team identified corridor segments that had high transit performance deficiency scores (*See Chapter 4: Planning Process)* and therefore had a high potential for improvement. The initial technical evaluation revealed both Lines 72 and 6 as having substantial transit delay issues, high ridership, and considerable implications for future growth and benefits to disadvantaged populations.

Second, the team sought to identify corridor segments that represented a broad range of street conditions and contexts, allowing for the findings to be broadly applicable to other corridors across the City. This approach also informed the future application of Enhanced Transit tools on streets experiencing similar transit performance issues.

In any given location, several different ETC capital/operational tools could address transit delay on these corridors. For purposes of the Closer Look, the project team explored the civil design tools most likely to yield benefits to transit at relatively low cost, given the information available.

5.3 Workshop Process

Problem Identification

Each workshop began with a detailed review of TriMet transit performance data for a particular bus line. This process built on previous work to develop existing conditions data and methodology, which provided an assessment of corridor-level performance for all ETC lines. The workshop approach expanded on this earlier work in two important ways. First, specific transit performance problems (such as transit delay during PM peak hours in a given direction) and their potential sources (e.g. bottlenecks at intersections and a high rate of intermodal transfers) were identified using more fine grain analysis of TriMet's CAD/AVL performance data, also known as "breadcrumb" data. Next, the team shared performance data to identify the time and place of particularly severe transit performance problems. The location, length, and duration of transit delay at specific locations were assessed using maps and charts displaying TriMet "breadcrumb" data. Then attendees agreed on a set of specific locations to focus on during the remainder of the workshop. The resulting study locations are displayed in Exhibits 20, 21, and 22.

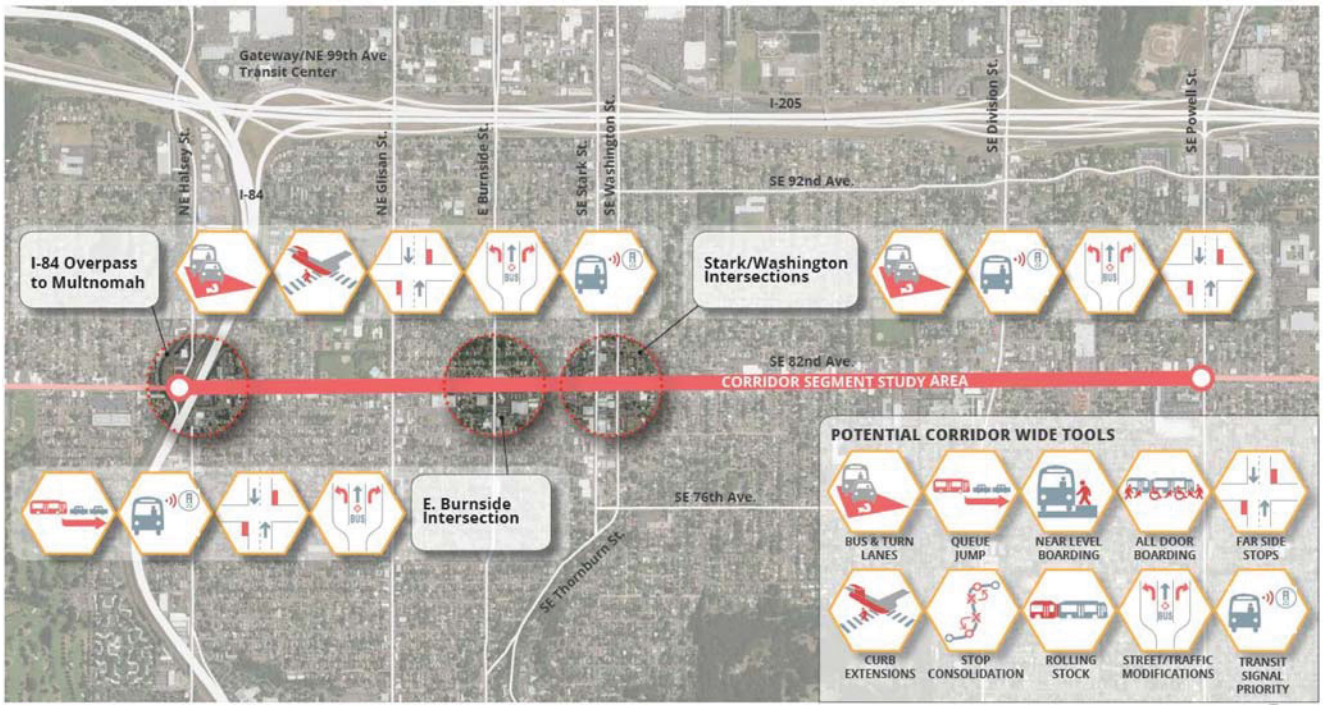


Exhibit 20. Line 72 - 82nd Avenue: Closer Look Study Locations and Potential Tools

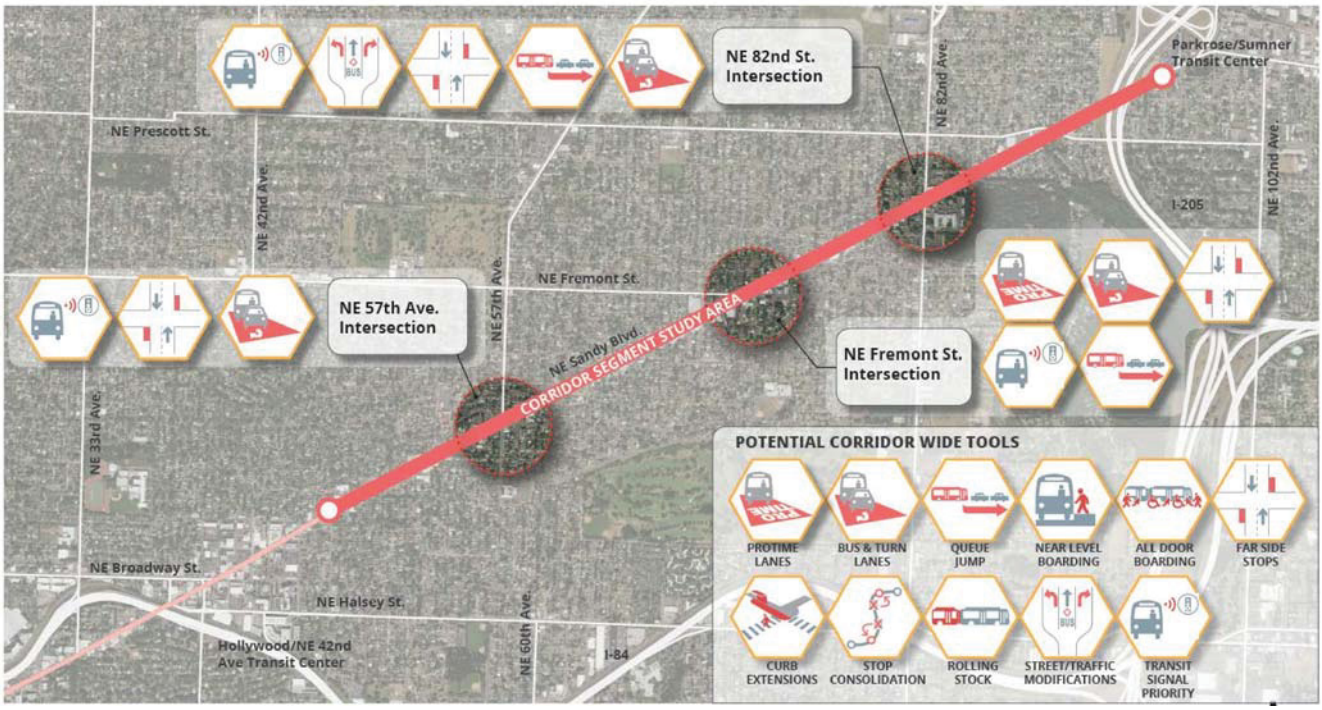


Exhibit 21. Line 12 - NE Sandy Boulevard: Closer Look Study Locations and Potential Tools

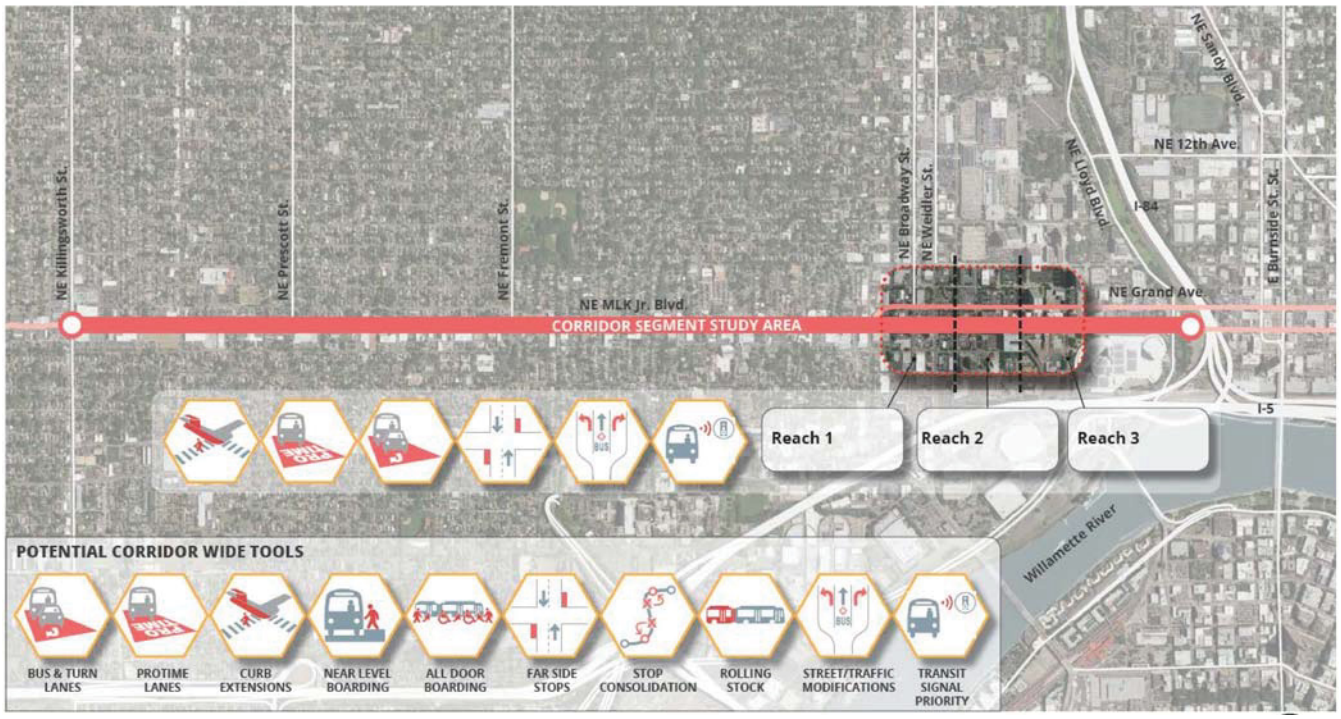


Exhibit 22. Line 6 - Martin Luther King, Jr. Boulevard: Closer Look Study Locations and Potential Tools

Toolbox Application

After workshop attendees agreed on problem locations, the group proceeded through a systematic review of the relevant ETC Capital and Operational Tools that could be deployed to reduce transit delay in each of the identified problem locations. The purpose was to leverage the expertise in the room to assess the applicability and feasibility of various Enhanced Transit tools in a specific context, faced with a specific transit performance problem. The workshop participants also discussed agency perspectives on the challenges and opportunities associated with implementing specific tools in each context. At the end of this process, the project design team identified nine (9) specific study locations where there was potential for applying geometric design ETC toolbox treatments. These conceptual design exercises set the stage for further investigation to identify potential impacts and tradeoffs of ETC Toolbox treatments at different location types.

The nine study locations serve as “case studies” to test the geometric feasibility of a range of Enhanced Transit tools. The selected locations and tools are listed in Table 6. In each case, more analysis is needed to determine transit performance, potential traffic and bicycle/pedestrian impacts, and impacts to specific properties. The case studies serve as a starting point to learn what it takes to implement Enhanced Transit tools in physically constrained locations. In addition, they highlight the local and regional policy issues that will ultimately guide development of a conceptual Enhanced Transit investment framework.

Table 6. Closer Look Case Study Locations and Tools Tested

Case Study Location	Tools Tested	
Line 72: 82nd Avenue		
I-84 Overpass to Multnomah	Bus and Turn Lanes Curb Extensions Far-side Bus Stops	Street/Traffic Modifications Transit Signal Priority
E Burnside Intersection	Queue Jump Far-side Bus Stops	Street/Traffic Modifications Transit Signal Priority
Stark/Washington Couplet	Bus and Turn Lanes Far-side Bus Stops	Street/Traffic Modifications Transit Signal Priority
Line 12: Sandy Boulevard		
NE 57th Avenue Intersection	Bus and Turn Lanes Far-side Bus Stops	Transit Signal Priority
NE 72nd/Fremont Street Intersection	Pro Time Lane Queue Jump	Far-side Bus Stops Transit Signal Priority
NE 82nd Avenue Intersection	Bus and Turn Lanes Queue Jump Far-side Bus Stops	Street/Traffic Modifications Transit Signal Priority
Line 6: Martin Luther King, Jr. Boulevard (Toolbox application on both MLK and Grand Avenue)		
Reach 1: NE Schuyler Street to NE Weidler Street	Bus and Turn Lanes Far-side Bus Stops	Street/Traffic Modifications Transit Signal Priority
Reach 2: NE Halsey Street to NE Wasco Street	Bus and Turn Lanes Far-side Bus Stops Curb Extensions	Street/Traffic Modifications Transit Signal Priority
Reach 3: NE Multnomah Street to NE Holladay Street	Bus and Turn Lanes Far-side Bus Stops	Street/Traffic Modifications Transit Signal Priority

5.4 Closer Look Findings

Table 7 summarizes the corridor-level findings from the conceptual application of ETC capital and operational tools to address specific hot spots and corridor segments. The major outcome of the Closer Look process was understanding that these findings require further study prior to becoming recommendations. These findings describe implementation considerations and a high-level assessment of potential benefits and trade-offs. Since traffic modeling and right-of-way safety analysis were not performed as part of the Closer Look process, most findings relate to the geometric and policy considerations associated with deploying Enhanced Transit tools in each case study location. The following considerations were key factors for all corridors in assessing whether a given corridor presented viable opportunities to implement Enhanced Transit treatments:

- Transit performance of given line(s)
- Multi-modal safety of the corridor
- Traffic performance
- Circulation and diversion impacts
- Right-of-way and property impacts
- Access to businesses, community destinations, and residences
- On-street parking impacts

Each case study considered multiple tools. Corridor wide or regionally-applicable tools – such as Transit Signal Priority – are visually represented as Enhanced Transit Toolbox icons in Exhibits 20, 21, and 22.[9]

Table 7. Corridor-Level Closer Look Findings

	General Considerations (Corridor-wide)
Line 72: 82 Avenue	• 82nd Avenue is a state highway facility owned by ODOT, which presents unique jurisdictional challenges for implementing Enhanced Transit solutions • Full-length dedicated transit lanes are not feasible for the length of 82nd Avenue due to the need for (and impacts of) taking general purpose and turn/travel lanes or acquiring property • Improvements that move curbs on 82nd will trigger bike, pedestrian, ADA, stormwater management improvements and more, increasing project cost and complexity • Strategic queue jumps may be feasible in some places; further analysis is needed to determine optimal locations

[9] The findings from this Closer Look effort are contained in ETC Memo #6 and appendices.

	General Considerations (Corridor-wide)
Line 12: NE Sandy Boulevard	• The diagonal orientation of NE Sandy Boulevard results in complex intersection geometry and street fragments that require special design consideration and treatments • Future investments in Enhanced Transit must acknowledge funded safety improvements on NE Sandy Boulevard. • Any future improvements on NE Sandy Boulevard that move the curbs to widen the roadway, will trigger bike, pedestrian, ADA, stormwater management improvements and more. This may potentially include reserving space for future protected bikeways. • Laneway solutions are feasible on the corridor, including bus and turn lanes, dedicated transit lanes, and intersection queue jumps. Stop consolidation and far-side stop placement is also feasible in the corridor.
	General Considerations (Corridor-wide)
Line 6: Martin Luther King, Jr. Boulevard	• The corridor is characterized by constrained right-of-way, a high frequency of mid-block crossings, and the presence of landscaped medians. • Planned improvements as part of the MLK Pedestrian Improvement Project include median modifications and refuge installations at Graham, Sumner, Failing, and Beech. The project also includes tree removal in some locations, lighting improvements, and an unfunded signal improvement at Going. • There is a need to coordinate HAWK signals and stops to achieve better movement for vehicles through the corridor while providing safe and accessible crossings for pedestrians. • Given high frequency of crossings and recent improvements in the corridor, there is a desire to create a “slow, but steady” travel environment for all users. • Constrained ROW and improved streetscape existing conditions north of NE Hancock Street influenced the selection of the study area to be consolidated south of Hancock on MLK and Grand couplet

Future Studies

The Closer Look process represented an important first step toward understanding the application of Enhanced Transit tools to transit lines in Portland. However, additional project development and analysis is needed to understand the full potential benefits and trade-offs resulting from Enhanced Transit tool applications on these segments. These would be important considerations for informing future recommendations. Due to resource constraints, the ETC Closer Look process did not include traffic modeling and safety analysis. As a result, the conceptual Toolbox applications provided

limited information about the potential benefits and trade-offs associated with selected Enhanced Transit improvements in specific locations. Still, the results provide valuable information about the conceptual application of Enhanced Transit tools, the Closer Look workshop process and what additional analysis is needed, including impacts on the following:

- Transit performance
- Multi-modal safety
- Traffic performance
- Circulation and diversion
- Right-of-way and property impacts
- Access
- On-street parking

There is an opportunity to potentially advance project development and analysis in these three study corridors and others through the newly emerging Enhanced Transit Concept Regional Pilot Program (See **Chapter 7: Looking Ahead)**. Further study will help guide the application of these tools, whether they are part of a City-led project or a regional investment strategy for Enhanced Transit. Table 6 briefly summarizes issues requiring additional analysis (beyond the scope of the ETC Plan). The future studies listed below only reflect those that were identified within the scope of the Closer Look process.

In the coming year, PBOT identified additional opportunities to focus on portions of other Enhanced Transit Corridors through other planning and projects. For example, the 122nd Avenue portion of Line 73 will be analyzed as part of the 122nd Avenue Plan, Line 20 will be analyzed as part of the Outer SE Stark Safety and Access planning process and various locations in the Central City will be looked at through the Central City in Motion project. These efforts provide an opportunity to apply the ETC Toolbox and develop recommendations for transit and the multi-modal safety and access needs together.

Table 8. Recommended Future Studies

General Studies
• Transit Signal Priority is applicable, but needs to be universally applied with a new regional architecture and technology backbone to be applied at the corridor and/or intersection level. Further study needs to consider TSP upgrades as a regional approach to developing an Enhanced Transit program. It is also important to consider that signal upgrades trigger ADA improvements, so future studies to identify deficient signals also need to understand cost implications of corridor-wide TSP upgrades. Potential signal upgrades also need to coordinate intelligent transportation system (ITS) projects previously identified in the City's Transportation System Plan (TSP), Oregon Statewide Transportation Improvement Program (STIP), and other relevant plans and programs.
• Headway management is potentially applicable as part of a regional approach, but it is currently difficult to document at a stop/corridor level. Further studies to implement an active headway management program are recommended.

- Strategic modification of traffic operations is implicit in all ETC Closer Look Case Studies, and will be a part of all future detailed designs for Enhanced Transit. Traffic modeling, safety, and transit performance studies are recommended to understand and manage trade-offs.

82nd Avenue Future Design Studies

- Future studies must be conducted in collaboration with ODOT.
- Additional safety studies are recommended to determine impacts associated with ETC Toolbox deployments along 82nd Ave.
- **82nd Avenue at Burnside Intersection:** Perform traffic modeling and detailed design analysis to determine the impacts of removing left-turn movements in lieu of queue jump implementation. Test application with fewer stops and far-side bus stop placement.
- **82nd Avenue MAX Station/Bridge SB (77 and 72):** Perform traffic modeling and detailed design analysis to determine the impacts resulting from the deployment of a northbound Bus and Turn Lane, with restricted left-turn movements from 82nd Ave southbound to Wasco eastbound. Explore southbound benefits and show fewer stops and far-side bus stop placement.
- **82nd Avenue from Powell to Division:** Perform a detailed design analysis to test Enhanced Transit solutions in this span. Implement bus stop consolidation and far-side bus stop placement.

NE Sandy Boulevard Future Design Studies

- Additional studies are needed to determine where bike/bus lanes are feasible along NE Sandy Boulevard based on street conditions, speeds, and volumes.
- Additional safety studies are recommended to determine impacts associated with ETC Toolbox deployments along NE Sandy Boulevard

NE Martin Luther King, Jr. Boulevard Future Design Studies

- Traffic modeling and detailed design analysis is recommended to assess the feasibility of continuous Bus and Turn Lanes along NE Martin Luther King, Jr. Boulevard and NE Grand Avenue. The study will need to acknowledge potential benefits or impacts to Streetcar performance along NE Grand Avenue.

6. Early Implementation

Although Enhanced Transit is still a relatively new concept in the City of Portland, the City has had some early success implementing Enhanced Transit treatments. The most notable example is the Portland Transit Mall, which repurposed travel lanes to give the MAX light rail lines priority through downtown Portland. Although the Enhanced Transit solutions being explored as part of this plan are much smaller in scale than the Portland Transit Mall, similar benefits have been realized by the City through smaller-scale investments in key locations throughout the City.

Many of the Enhanced Transit treatments that have been implemented in Portland to date seek to provide transit priority approaching bridgeheads for vehicles travelling to or from the City Center. Examples include the BAT (bus and right-turn only) lane on SE Belmont Street between SE 12th Avenue and the Morrison Bridgehead, the BAT/pro-time bus lane on SE Madison Street from SE 10th Avenue to the Hawthorne Bridgehead, and the W Burnside BAT lane/queue jump from NW 3rd Avenue to the Burnside Bridgehead. TriMet's Transit Priority Spot Improvements Program is planning to implement Enhanced Transit treatments in other contexts, such as on the Line 12: NE Sandy Boulevard approaching NE 72nd Avenue and Line 14: SE 50th approaching Powell. Other types of projects seek to benefit both buses and the Portland Streetcar, such as the planned BAT lane on NE Grand Avenue between SE Ash Street and NE Everette Street/I-84 (Spring 2018).

As City and regional planning efforts advance including the Metro Regional Transportation (RTP) 2018 Update, the Central City in Motion Plan, and emerging Regional Enhanced Transit Concept Pilot Program, project development will continue and more Enhanced Transit projects will be implemented City and region-wide. These already implemented ETC projects will lay the foundation for the future of Enhanced Transit in Portland.

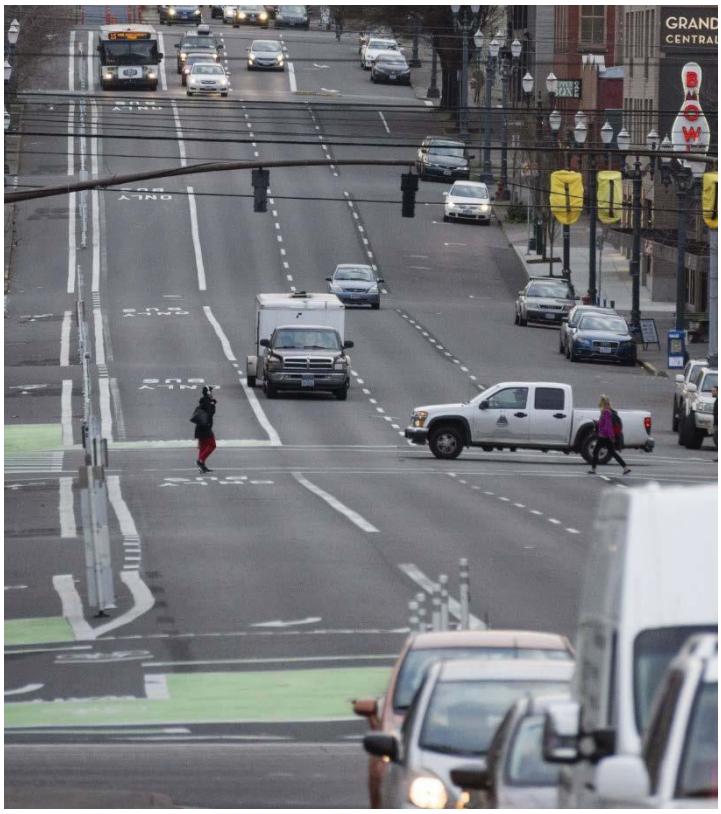


Exhibit 23. Westbound Pro-Time Bus Only/BAT Lane on SE Belmont Street from SE 12th Avenue to Morrison Bridgehead

Exhibit 24. Westbound BAT Lane/Queue jump on W Burnside at NW 3rd Avenue

Exhibit 25. Southbound BAT lane on SW 11th Avenue from SW Start Street to SW Clay Street, shared with Portland Streetcar alignment. This is an example of how Enhanced Transit treatments can benefit both buses and Streetcar.

7. Looking Ahead: Regional Enhanced Transit Concept Pilot Program

The Enhanced Transit concept is being introduced into Metro's Regional Transit Strategy as part of the current Metro Regional Transportation Plan (RTP) update. Concurrently, Metro and TriMet are initiating a year-long pilot program to build understanding around where enhanced transit tools may be applicable throughout the greater Portland region as of the writing on this memorandum. It is called the Regional Enhanced Transit (RETC) Corridors Concept Pilot program. The City of Portland's local ETC planning process has provided an initial framework for achieving these goals around the region, leading to the development of a Regional Enhanced Transit (RETC) Corridors Concept Pilot Program led by TriMet and Metro. Metro is leading the initial phase of the Pilot Program because the Pilot will leverage regional funds, and because the pilot is technically applicable to jurisdictions outside of TriMet's service district (e.g. SMART). The purpose of RETC Pilot Project is to develop a near and long-term investment framework for implementing Enhanced Transit projects throughout the region.

Goals of the RETC Pilot Program:

- Improve transit reliability, speed, and capacity
- Identify, design and build an initial set of Enhanced Transit projects
- Develop a pipeline of more Enhanced Transit projects

Metro Council and the Joint Policy Advisory Committee on Transportation (JPACT) policy took action to dedicate $5 million in federal Regional Flexible Funds to fund the pilot program, in fall 2017. TriMet and Metro staff worked with the Transit Working Group for Metro's 2018 Regional Transportation Plan update and the Transportation Policy Alternatives Committee (TPAC) to formalized policy and process, including prioritization criteria, for the Enhanced Transit Corridors Concept Pilot Program. With the allocated funding, TriMet and Metro will jointly manage a program to support capital and operating partnerships with jurisdictions around the region to identify relatively low-cost, context-sensitive, and readily-deployable Enhanced Transit solutions to increase transit capacity, service, and reliability where needed.

While the RETC Pilot Program is focusing on localized "Hotspot" improvements, the RETC policy framework is being developed to include regional, corridor and hotspot improvements. As the RETC is incorporated into Regional Transit Strategy and the 2018 RTP, the policy recommendation is anticipated to include two proposed levels of Enhanced Transit:

- **Level 1** consists of smaller scale enhanced transit improvements, most likely ranging from $10-$50 million.
- **Level 2** consists of medium to large scale enhanced transit improvements, likely to include FTA as a funding partner and range from $50 - $300 million (FTA Capital Investment Grant, Small Starts maximum funding levels).

As of the writing of this plan, the region is in the process of conducting a series of workshops with multiple jurisdictions to start exploring the feasibility of Enhanced Transit solutions around the

Portland Metro area. The following sections describe the work done to date to prepare for the workshops, and the Regional Transit Vision that the RETC Pilot Project will serve.

As of the writing of this plan, the region is in the process of conducting a series of workshops with multiple jurisdictions to start exploring the feasibility of Enhanced Transit solutions around the Portland Metro area. The following sections describe the work done to date to prepare for the workshops, and the Regional Transit Vision that the RETC Pilot Project will serve.

7.1 Initial Screening Phase

The first step in the development of the RETC Pilot Program was to perform a high-level analysis of all TriMet Frequent Service bus lines within the Metro area to determine those with the highest levels of need. This process was built from the City of Portland's local ETC planning process, and relied on some of the same key transit performance criteria and performance measures:

- **Reliability**, defined as the percent difference between 90th and 10th percentile runtime speeds
- **Dwell time**, defined as the percentage of runtime stopped at stations
- **Ridership per mile**, defined as the number of riders divided by operating mile

Like the City of Portland's local ETC Candidate Corridor evaluation process, composite scores were assigned to each Frequent Service bus line to assign "transit need" priority. Reliability was weighted (x2) to arrive at a composite transit deficiency score between 5 and 20. Segments that scored less than 10 were removed from consideration, which left 177 segments throughout the region that scored 10 or greater. Enhanced Transit solutions will be studied and reviewed by jurisdictional stakeholders in early 2018. The allocation of workshops to individual jurisdictions was based on the number of high-priority transit segments within their respective jurisdictions (Table 9). Eight workshops are planned for the City of Portland, organized into Central City and non-Central City Enhanced Transit solutions.

Table 9. RETC Pilot Program Segment Scoring and Workshop Allocation

Prioritized Universe (Score of 10 or higher)	Number of Segments*	Workshops Allocated (Total = 14)
Portland Central City	30	4
Portland Non-Central City	91	4
Multnomah County (Outside Portland)	1	1
Clackamas County	14	1
Washington County	27	3
ODOT	Varies	1

Already Studied (As part of ETC Plan or other effort)	14	N/A

Note: Not all segments will be reviewed in the workshops; some segments will be grouped based on relationship with Central City in Motion high priority bus routes, and other segments will be removed from consideration if feasible Enhanced Transit opportunities are not readily identified.

Based on this framework, each workshop will be focused on a single jurisdiction and associated time point segments.

7.2 Pilot Project Workshops

In early 2018, the Pilot program will fund a series of 14 staff workshops with regional jurisdictions to begin exploring the feasibility of Enhanced Transit solutions experiencing transit performance issues throughout the region.

The workshops have multiple stated purposes:

- Introduce partner jurisdictions to Regional Enhanced Transit Concepts program and engage them in potential solutions
- Evaluate a list of corridor segments and hot spots to explore potential design possibilities that achieve transit priority
- Reach a "go" or "no go" decision from the regional partners on which potential Enhanced Transit projects to advance for further consideration

Each workshop will assess Enhanced Transit tools in context to ascertain agency willingness to advance design and solution sets in specific locations. The level of design during these workshops will be pre-conceptual. "Fat-lines" on plan-view maps will be used to represent geometric/physical attributes of the Enhanced Transit solution (in the context of laneway and station solutions). Design options will identify key characteristics including potential right-of-way, access, turn movement, and parking impacts. In addition to these impacts, the workshop process will also identify the following issues and opportunities:

- **Ripeness:** testing the match between the ETC Toolkit and the problem set identified
- **Ownership:** Identification of ODOT-specific facilities/influence within the problem set
- **Scale:** Matching the problem areas to a network, corridor, or node scale and balancing the portfolio
- **Typology:** finding examples of similar problems across the geography to aggregate as a program

Enhanced Transit projects emerging from the workshop process will be eligible for further consideration via a Request for Interest (RFI) process led by Metro and TriMet. RFI responses will help the region determine which of time point segments and associated Enhanced Transit improvements should be advanced to 15% design and will help determine inclusion in the Metro Regional Transportation Plan (RTP) 2018 Update. Eventually, the region plans to advance these projects to 30% design, and eventually final design and construction as part of the Regional Transit Vision (Exhibit 26).

Key anticipated outcomes of the RETC workshops:

- Identify potential conceptual improvements in these corridors for future study and project development.
- Identify potential benefits, constraints, impacts, trade-offs and considerations.
- Determine which segments to advance to 15% design through the RETC pilot program and to potentially include in project list for the Metro RTP 2018 Update.
- Determine which potential ETC projects to place in an ETC project pipeline for additional study and refinement.

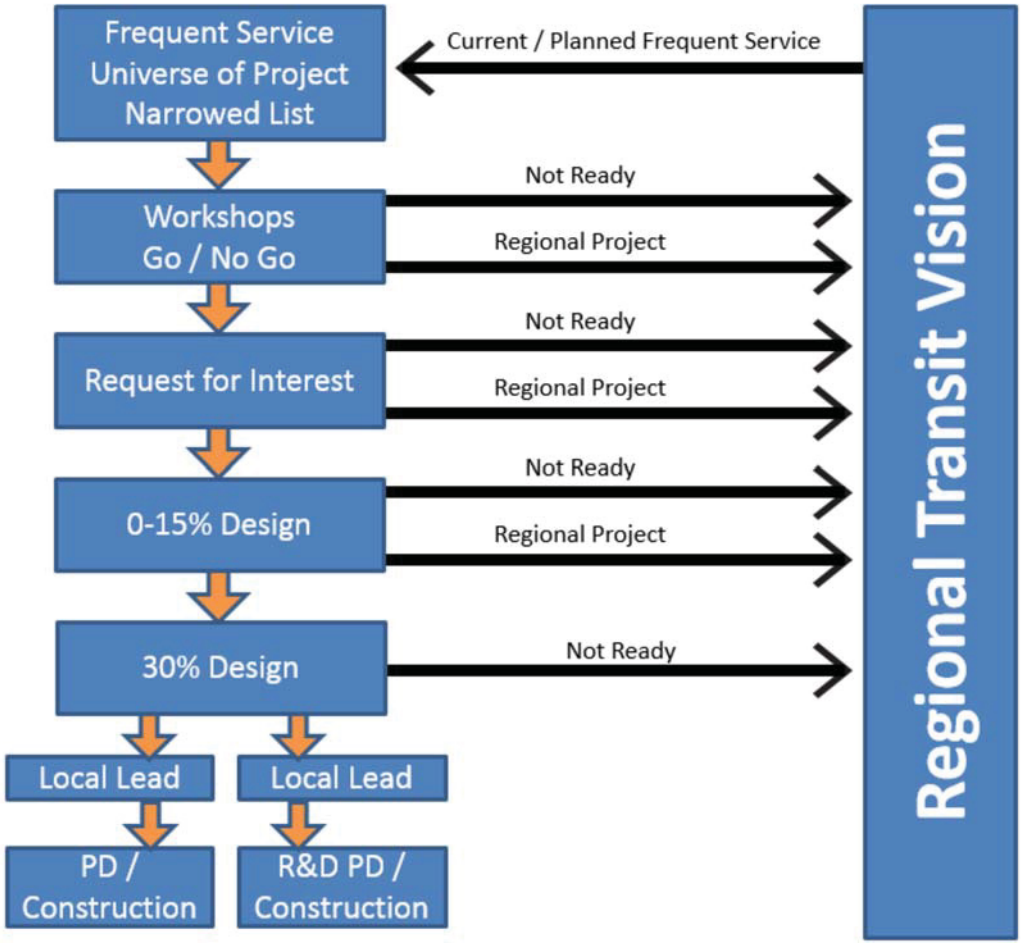


Exhibit 26. –Graphic to Explain How the Enhanced Transit Pilot Project Process can help advance Enhanced Transit projects and inform the Regional Transit Vision. Not all projects will advance to 0 – 15% or further, but that doesn't mean they shouldn't be constructed. Those projects not advancing can be included in the Regional Transit Vision, as part of the Regional Transit Strategy.

The City of Portland segments that are planned to be studied in the Pilot Project Workshops are included in Chapter 2 of this plan. These candidate segments may be eligible for the Request for Interest (RFI) submittal process led by Metro and TriMet in late spring/early summer 2018. Candidate segments that are accepted through the RFI may advance to project development, additional analysis and 15% Design.