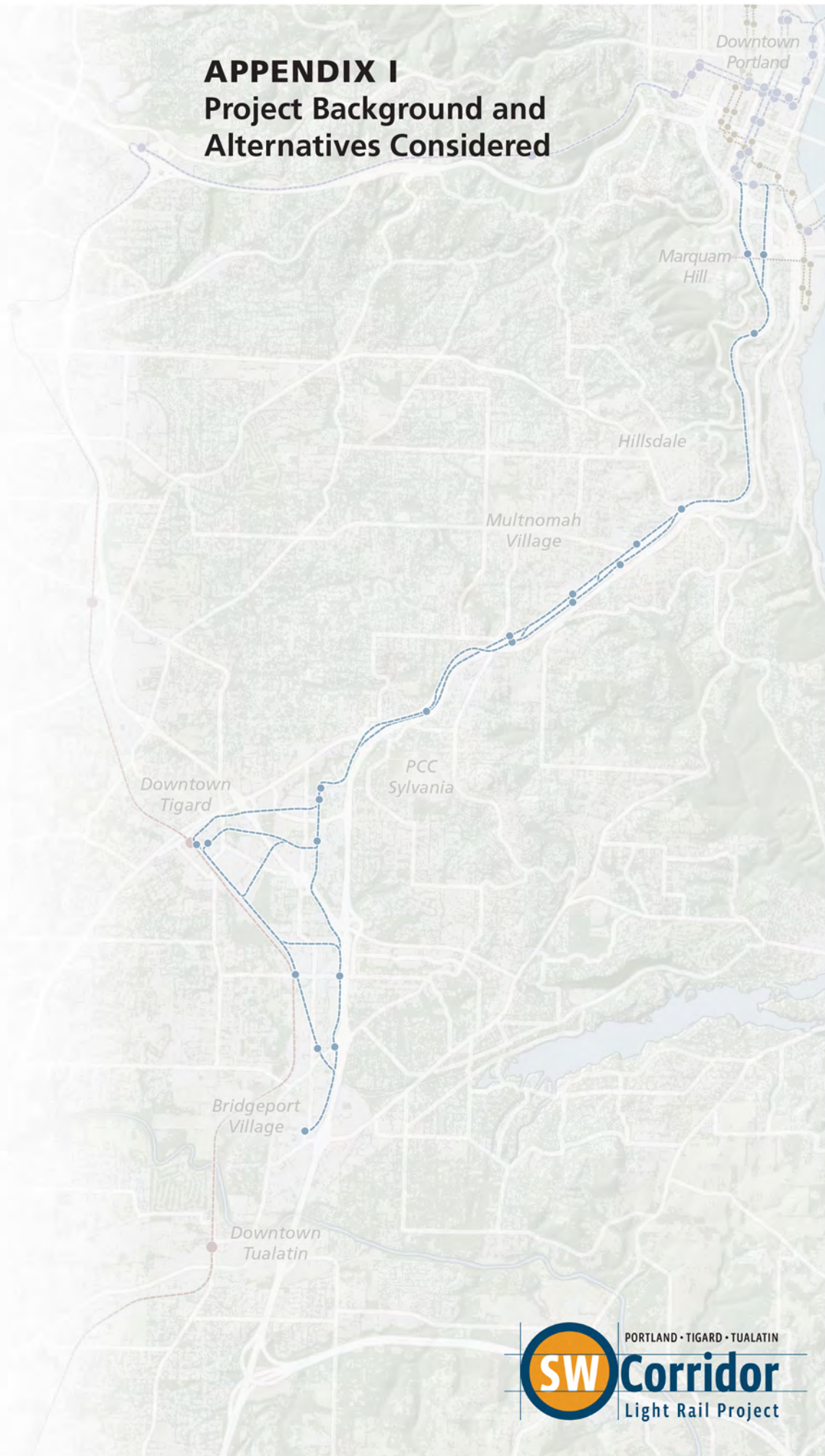


APPENDIX I

Project Background and Alternatives Considered



APPENDIX I – PROJECT BACKGROUND AND ALTERNATIVES CONSIDERED

This appendix summarizes the planning process that led to the identification of the proposed alternatives included in this Draft Environmental Impact Statement (EIS),

Overview

The Southwest Corridor of the Portland metropolitan region is made up of diverse cities and neighborhoods, natural areas and landmarks that contribute to its identity and regional significance. Spanning Southwest Portland to Sherwood and Washington Square to Tualatin, the corridor has 11 percent of the region's population and 26 percent of the region's employment. The corridor's job centers and educational institutions attract people from both within the area and across the Metro region.

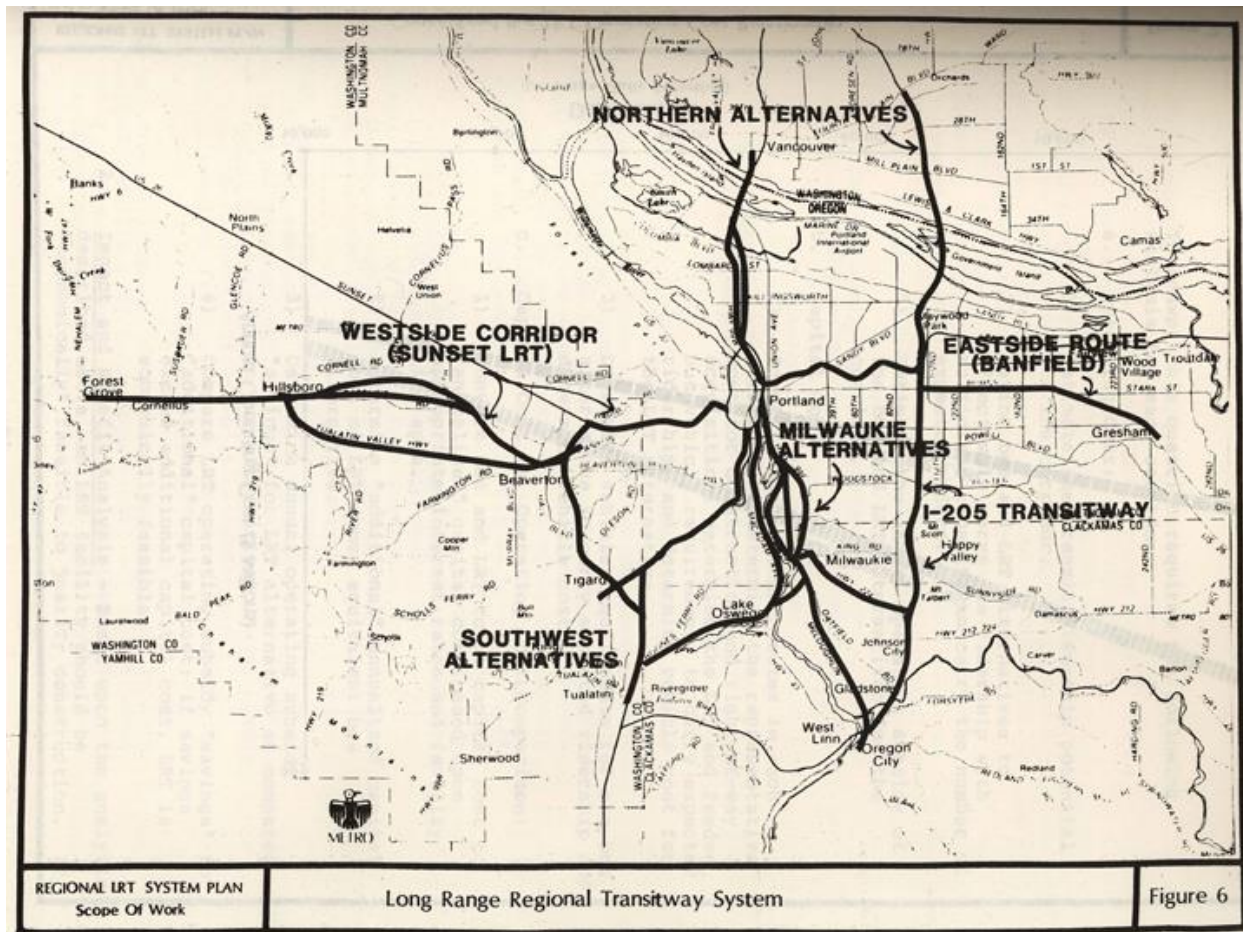
The corridor is experiencing worsening traffic congestion driven by regional and local growth. From 2010 to 2035, the Southwest Corridor is projected to add around 41,000 households, an increase of 48 percent, and 77,000 jobs, an increase of 38 percent. Travel options are constrained by the geography and development patterns in the corridor, and roads in much of the corridor are winding and discontinuous. These conditions limit mobility within the corridor.

The Southwest Corridor Plan is a broad array of transit, roadway, bicycle and pedestrian investments meant to reduce congestion, improve circulation and improve quality of life in this corridor. These investments are aligned with the local land use visions adopted by each community in the area. The Southwest Corridor Light Rail Project, the focus of this Draft EIS, is a major component of the Southwest Corridor Plan. Four years of project refinement have culminated in the package of light rail transit (LRT) alignments and associated roadway, bicycle and pedestrian projects studied in this document.

Project Background

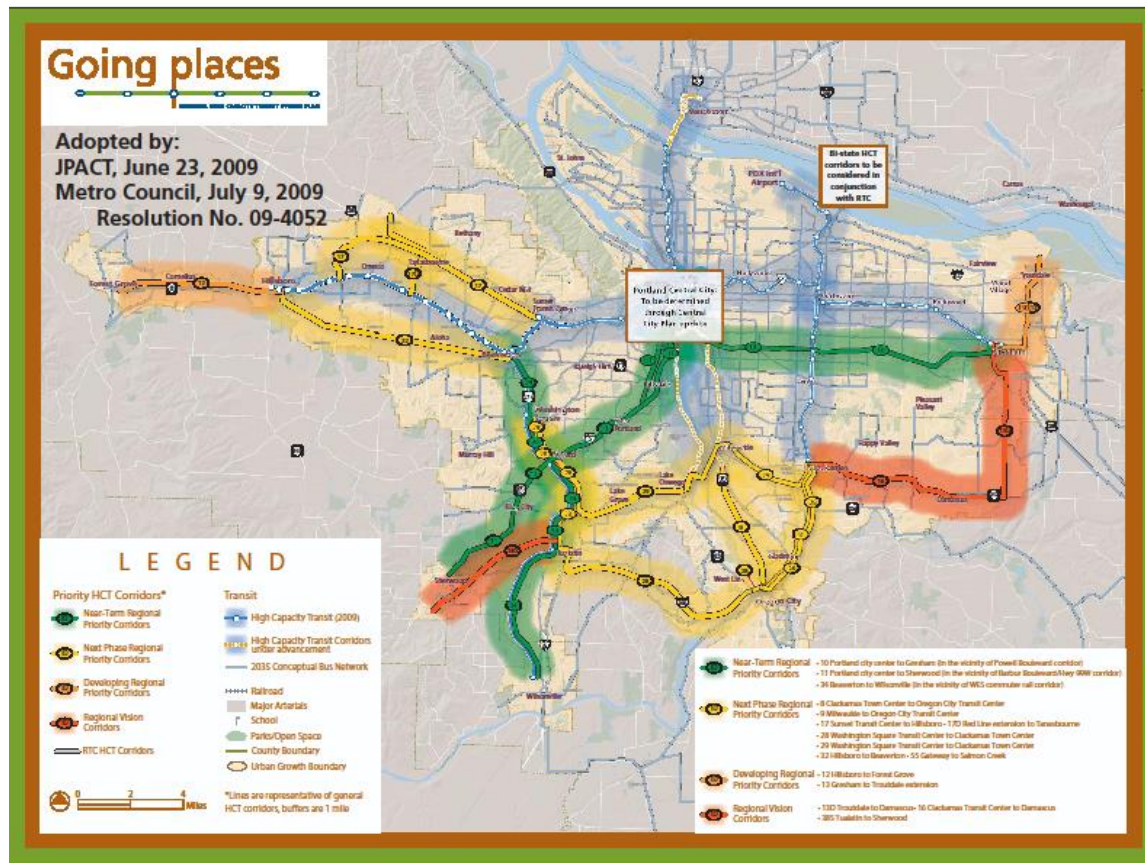
The Southwest Corridor project truly originated in Metro's 1982 Light Rail System Plan, which at a conceptual level envisioned possible regional transit extending between downtown Portland, Tigard and Tualatin (Figure I-1).

Figure I-1. Metro's 1982 Light Rail System Plan Map



In 2009, the project was highlighted as a “near-term regional priority corridor” in Metro’s Regional High Capacity Transit System Plan, which guided investments in light rail, commuter rail, bus rapid transit and rapid streetcar in the Portland metropolitan area (Figure I-2).

Figure I-2. Metro's 2009 Regional High Capacity Transit System Plan Map



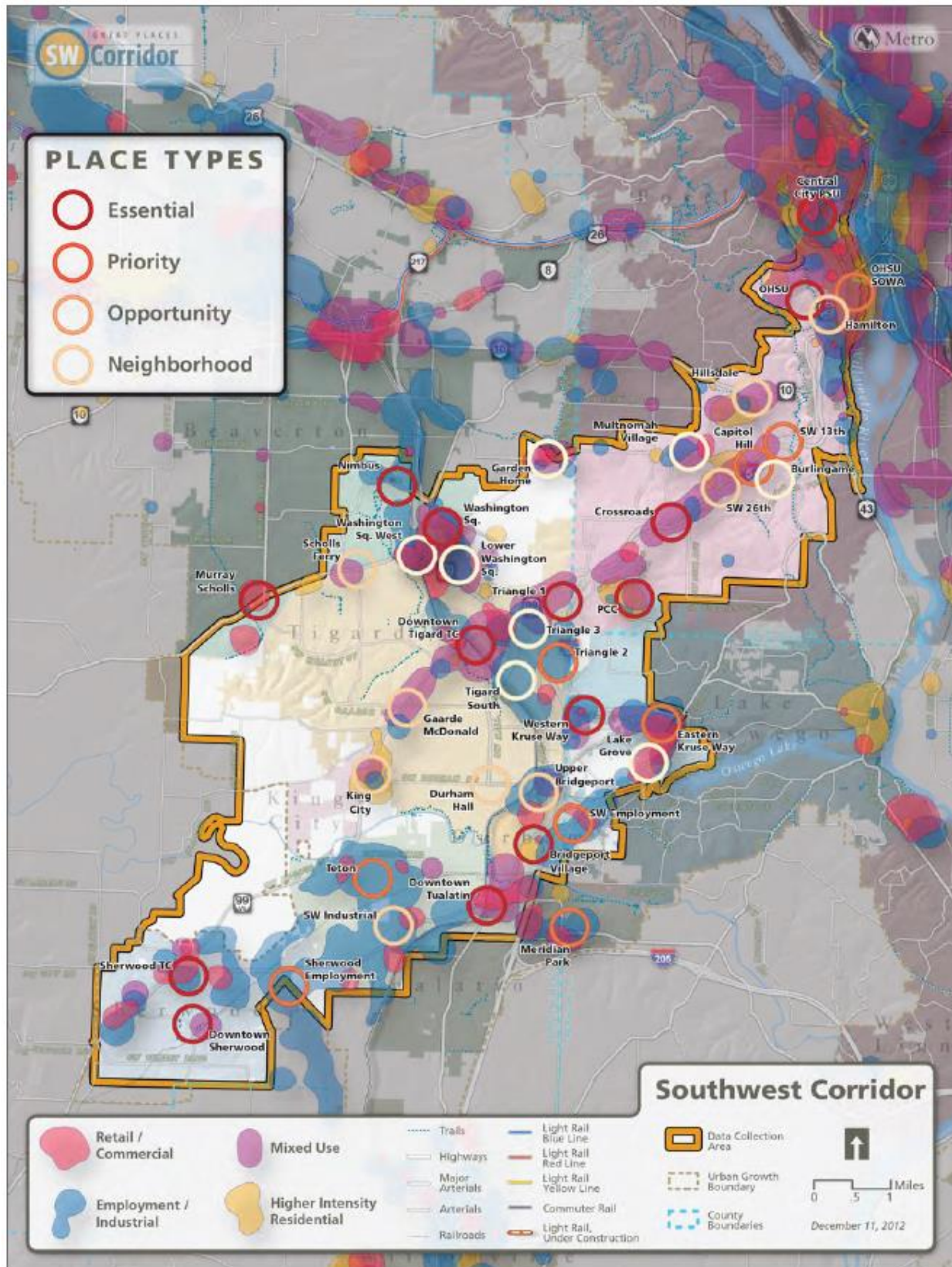
2009-2011: Shared Goals, Current Conditions

Initial study of high capacity transit (HCT) in the Southwest Corridor began in 2009, shortly after the Regional HCT System Plan was adopted, with potential destinations, routes and travel modes evaluated at a high level. Early steps in the project focused on assessing both existing conditions and possible future HCT conditions in the corridor. The Southwest Corridor Plan steering committee began its work by identifying the goals that the communities in this region share for living, working and getting around. In September 2011, FTA and Metro issued an early scoping notice and held related events to gather input on potential transit alternatives between downtown Portland and Sherwood.

2012-2013: The Elements of Great Places

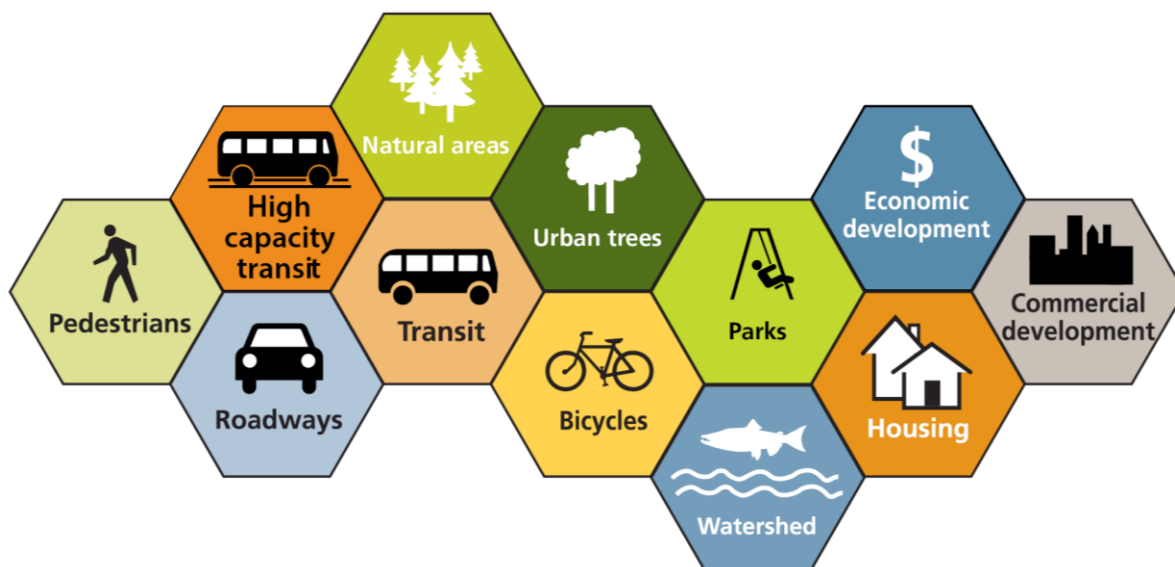
The Southwest Corridor partners agreed that the foundation of the Southwest Corridor Plan would be the Southwest Corridor Land Use Vision, which reflects each community's unique characteristics and aspirations and identifies areas to focus new development (Figure I-3). Beginning in 2012, the partners worked to identify a set of collective investments that would help achieve these local visions and link the corridor communities with a more effective, reliable and safe regional transportation network. The project partners engaged the public on which investments would make it easier, safer and more enjoyable to get around in their communities and studied the viability of different options for new transit to serve the whole corridor.

Figure I-3. Southwest Corridor Land Use Vision Map



In 2013, the steering committee adopted a comprehensive Shared Investment Strategy (Figure I-4) that established a vision of investments in parks, trails, sidewalks, transit and roadways from Portland to Sherwood, Beaverton to Lake Oswego to support community goals.

Figure I-4. Southwest Corridor Shared Investment Strategy Elements



As part of the Shared Investment Strategy recommendation, the steering committee proposed further study of a high capacity transit line between Portland and Tualatin via Tigard, using either LRT or bus rapid transit (BRT) running mostly in an exclusive transitway.

2013-2016: Project Refinement

The project refinement phase of the Southwest Corridor planning process aimed to identify a reasonable range of proposed HCT alternatives and other supporting investments to best meet the project's preliminary Purpose & Need, which was adopted in January 2014. During this period, HCT alignment options were analyzed and evaluated for both LRT and BRT, with the steering committee recommending some alignments for study in an environmental review process and others to be removed from further consideration; see the section on *Alternatives Considered and Removed* later in this document for more details. The analysis and refinement process included extensive outreach to the public through open houses and forums; meetings with affected and interested organizations, such as neighborhood associations and business groups; and online surveys and an interactive map tool. The public input received is documented on the project website (www.swcorridorplan.org). The refinement phase culminated in the steering committee's selection of light rail as the preferred high capacity transit mode for the corridor, with several alignment options remaining for further study during the environmental review phase.

Alternatives Considered and Removed

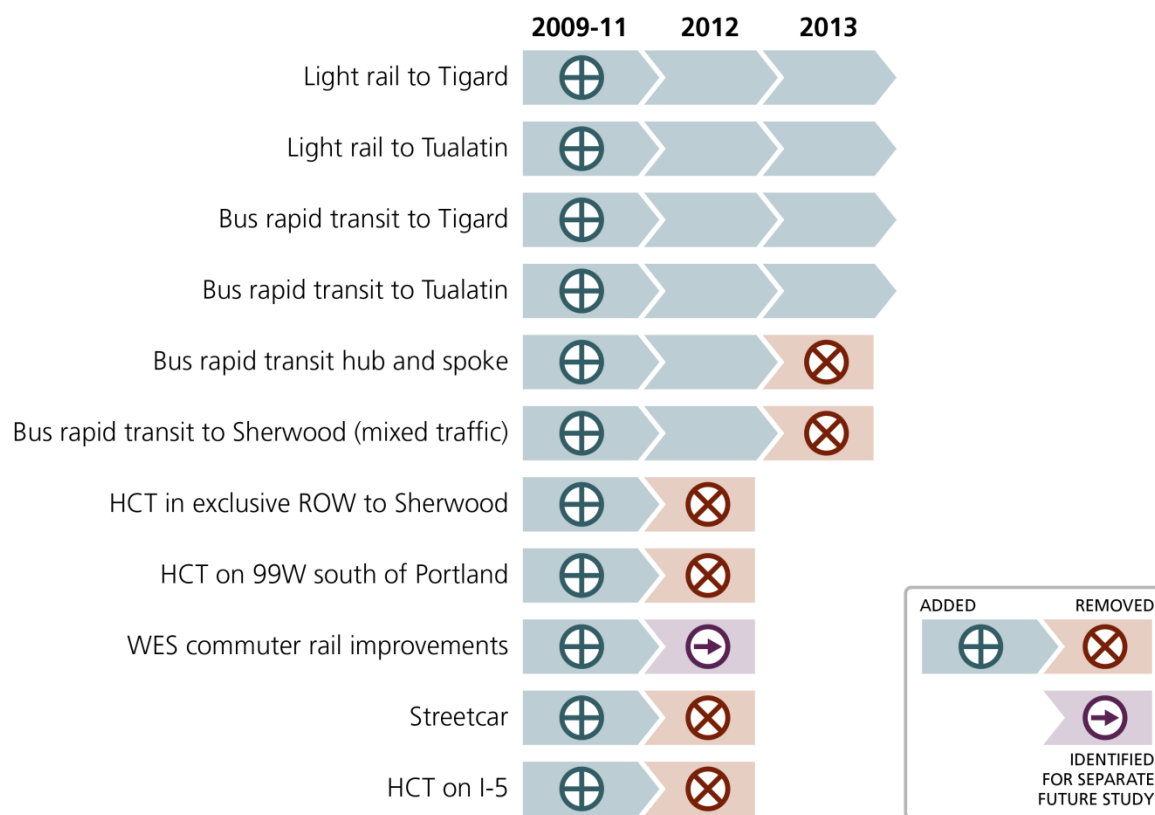
Development of Alternatives

In September 2011, FTA and Metro issued an early scoping notice to advise other agencies, tribal governments and the public that they intended to explore alternatives for improving transit service between downtown Portland and Sherwood. Six events were held to provide opportunity for the public to comment on potential transit alternatives.

Information from these public meetings, along with contributions from partner jurisdictions and consultation with state and federal transportation and environmental agencies, resulted in the initial wide range of transit alternatives for consideration in the project. These included the No-Build Alternative, as well as light rail, bus rapid transit, and streetcar alternatives, and options to improve the existing Westside Express Service (WES) commuter rail between Wilsonville and Beaverton. The alternatives included several alignment options to connect Portland to Tigard, Tualatin, or Sherwood, including BRT options on I-5 using high occupancy vehicle or high occupancy toll (HOV/HOT) lanes.

During the first phase of the project, these alternatives were narrowed at two decision points: an initial screening in October 2012 and as part of the July 2013 Shared Investment Strategy recommendation (Figure I-5).

Figure I-5. Southwest Corridor High Capacity Transit Alternative Narrowing from 2009 to 2013



Initial Screening of High Capacity Transit Alternatives

In October 2012, the project applied the following criteria to the initial range of alternatives:

- Is the alternative consistent with the project's vision, goals, and objectives?
- Does it address the transportation needs in the corridor?
- Does it support land use goals?
- Does it protect or enhance the existing facilities?
- When can we afford it?
- Are the impacts reasonable? Does the project avoid impacts to low-income neighborhoods, parks, and sensitive environmental and historic areas?

Based on the criteria, the following alternatives were removed from consideration:

- **Extension of LRT or extension of transit-exclusive right-of-way BRT to Sherwood:** Transportation needs analysis showed that the trip demand from Sherwood to the rest of the corridor is not at, nor forecast to, reach a level that would require HCT. Sherwood would be best served by local bus connections to nearby communities.
- **Westside Express Service (WES) improvements.** WES improvements would have the greatest property impacts and the highest operating costs per boarding of the initial alternatives. Improvements would not serve the spine of the corridor or sufficiently support land use goals within the corridor. The WES corridor (Beaverton to Wilsonville) ranks as a Near Term Regional Priority Corridor in Metro's High Capacity Transit System Plan. As such, WES merits further analysis as part of a corridor study separate from the Southwest Corridor Plan.
- **I-5 options to convert a lane or add a lane for HOV/HOT/BRT use.** I-5 options would not support the Southwest Corridor Land Use Vision. Few of the corridor's identified focus areas have adequate access for freeway-based transit to serve them effectively and physical barriers would make new accesses difficult.
- **Streetcar.** Streetcar is typically not effective serving a long corridor unless it has exclusive right-of-way. In the Southwest Corridor, acquiring exclusive right-of-way would be expensive and still could not meet demand without running significantly more frequently than LRT. Streetcar operating in mixed traffic over long distances would be significantly more expensive to construct than BRT without providing operational advantages over buses.

In addition to removing these alternatives, the steering committee agreed that HCT to or through Tigard should be routed through the Tigard Triangle, and not on Highway 99W southwest of the Interstate 5/ Highway 99W intersection. Instead, Highway 99W in this part of the corridor should continue to be served by local bus service. This decision was based on the following:

- The Tigard Triangle encompasses several important focus areas that would not be served by HCT on Highway 99W.

- Strong local concerns were expressed regarding potential traffic impacts on Highway 99W if auto lanes were converted for HCT, and about potential impacts to businesses along Highway 99W if right-of-way were acquired for HCT.
- Southwest of its intersection with Interstate 5, Highway 99W is designated as a Regional Freight Route, State Freight Route, and “Reduction Review” Route (ORS 366.215 route, in which adequate clearance is intended to be maintained for freight loads that are wider and taller than typical loads). Converting roadway capacity for transit uses here would be difficult.

Shared Investment Strategy Recommendation on High Capacity Transit Alternatives

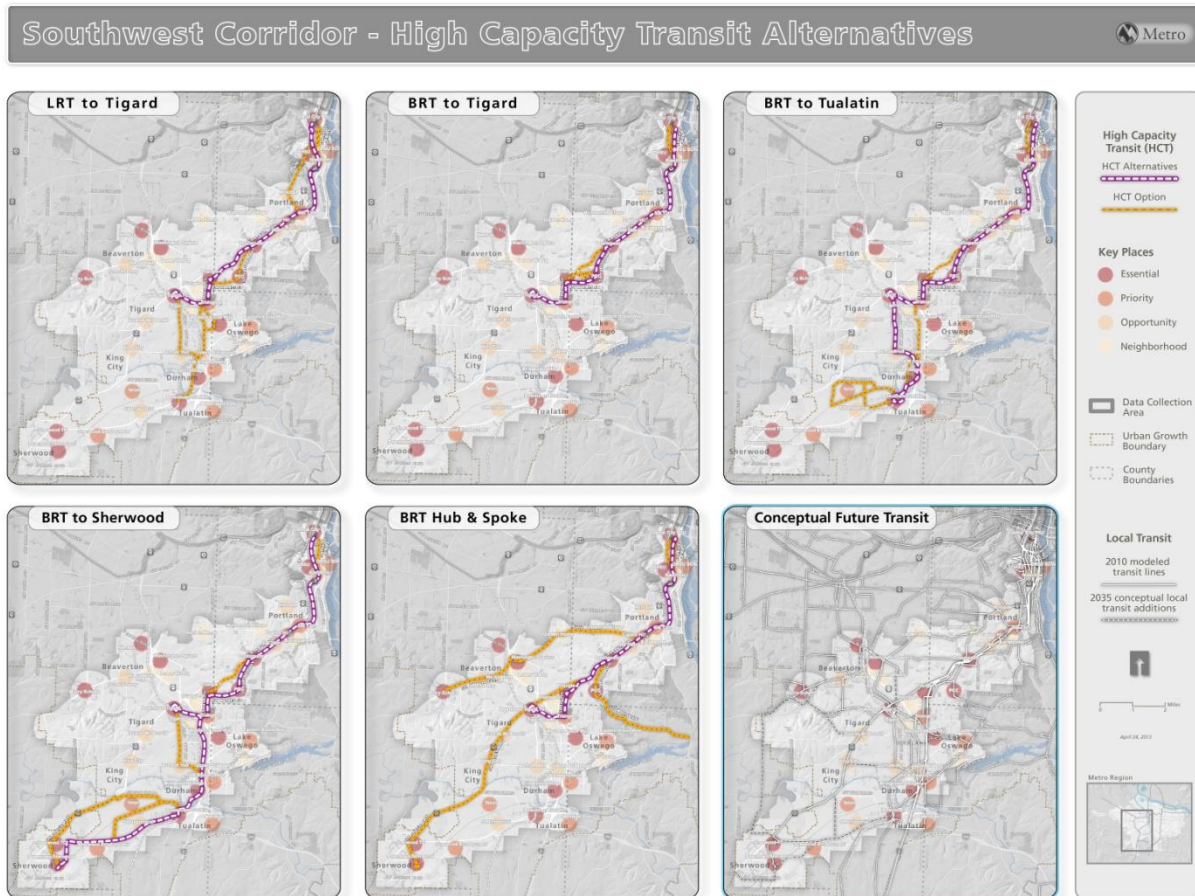
Five LRT and BRT alternatives were then developed for further analysis, each with several design options (Figure I-6):

- LRT to Tigard (with design options extending to Tualatin)
- BRT to Tigard
- BRT to Tualatin
- BRT to Sherwood
- BRT Hub & Spoke (BRT to Tigard with options for local bus routes from Sherwood, Murray Scholls and Lake Oswego to use the BRT business access and transit (BAT) lanes)

These alternatives were evaluated based on the following measures:

- capital costs
- transit operating costs
- operating efficiency
- ridership
- travel time

Figure I-6. Maps of LRT and BRT Alternatives and Options Evaluated in 2013



Based on this analysis, the steering committee recommended further study of HCT to Tualatin via Tigard, using either BRT operating in 50 to 100 percent exclusive right-of-way or light rail operating in 100 percent exclusive right of way, based on (1) the high ridership potential of both modes and (2) the need for additional design in order to produce more accurate capital cost estimates to clarify tradeoffs among cost, operating efficiency and ability to support the Southwest Corridor Land Use Vision. The steering committee specifically recommended that BRT operate mostly in exclusive right-of-way because FTA New Starts funding requires 50 percent or more of BRT projects in dedicated transitway, and experience around the U.S. and internationally suggests that the higher level of exclusive transitway would best support the Southwest Corridor Land Use Vision. The general HCT alignment recommendation of a line connecting Portland to Tualatin via Tigard was based on ridership potential, operating efficiency and plans for increased housing and employment in Tigard and Tualatin.

The Southwest Corridor Shared Investment Strategy adopted in 2013 identified priority roadway and active-transportation projects. More than 500 potential projects were gathered from the Regional Transportation Plan and other regional plans, transportation system plans and other local plans, and suggestions from the public; 81 priority projects emerged that were highly supportive of improving connectivity to the potential HCT line or of the Southwest Corridor Land Use Vision.

The projects identified as highly supportive of high capacity transit will be included in further study of the high capacity transit project. Those projects that support the land use vision will move forward as

the local jurisdictions develop and fund them, either individually or in collaboration with other project partners.

Refinement of BRT and LRT Alternatives to Tualatin via Tigard

The July 2013 Shared Investment Strategy recommendation by the steering committee initiated the refinement period, which focused on the two alternative modes to Tualatin via Tigard. The steering committee considered nearly 60 alignment options for the two modes, narrowing them over a three-year period. The steering committee selected light rail as the preferred mode in May 2016.

Table I-1 below summarizes the refinement phase decisions by geographic segment. More detailed descriptions of the reasons for each alignment option removal follow the table, organized chronologically by the key steering committee decision points:

- April 2014: Early removal of least promising alignment options
- June 2014: Initial refinement phase decision
- July 2015: First focused refinement decision – focus on South Portland and Hillsdale
- January 2016: Second focused refinement decision – focus on Tigard and Tualatin
- May 2016: Third focused refinement decision – focus on mode and PCC Sylvania
- June 2016: Endorsement for environmental review

The following sections summarize the steering committee actions on proposed HCT alignments made during the project refinement period chronologically, with links provided for the relevant documentation.

Table I-1. LRT and BRT Alignment Refinement: 2013 to 2016





	Refinement											Associated Draft EIS Alignment Alternatives
	July 2013 and earlier	Aug. 2013 – Mar. 2014	Apr. 2014 decision	June 2014 decision	Aug. 2014 – June 2015	July 2015 decision	July-Sept. 2015	Jan. 2016 decision	Feb. – Apr. 2016	May 2016 decision	June 2016 decision	
 Proposed for consideration												
 Continued consideration/evaluation												
 Removed from further consideration												
 Endorsed for environmental review												
Tie-In - Via Barbur												
Barbur via 5th/6th - BRT		+								x		
Barbur via 5th/6th - LRT		+	x									
Barbur via 4th - BRT	+			x								
Barbur via 4th - LRT	+										✓	A1
Barbur to 4th/2nd - LRT		+		x								
Adjacent to I-405 via Barbur - LRT					+	x						
Tie-In - Via Naito												
Naito to Lincoln	+										✓	A2-BH, A2-LA
Naito to 1st - extended downtown - BRT	+									x		
Adjacent to I-405 via Naito - LRT					+	x						
Tie-In - Via South Waterfront												
South Waterfront - short		+		x								
South Waterfront - long		+	x									
Tunnel from South Waterfront		+		x								
South Portland and Hillsdale												
Naito	+										✓	A2-BH, A2-LA
Barbur	+										✓	All Segment A
Short tunnel - BRT		+		x								
Short tunnel - LRT		+				x						
Medium tunnel - BRT	+			x								
Medium tunnel - LRT	+					x						
Long tunnel		+		x								
Hillsdale surface loop - BRT		+		x								
Hillsdale cut-and-cover tunnel (Capitol) - BRT				+		x						
Hillsdale cut-and-cover tunnel (Capitol) - LRT		+				x						
Hillsdale cut-and-cover tunnel (fields)					+	x						
Barbur/Adjacent to I-5												
Barbur	+										✓	All Segment B
Adjacent to I-5: Capitol to 13th		+						x				
Adjacent to I-5: 13th to 26th		+									✓	B4
Adjacent to I-5: 26th to Crossroads		+									✓	B3, B4
Adjacent to I-5: Crossroads to 60th					+						✓	B2, B3, B4

Table I-1. LRT and BRT Alignment Refinement: 2013 to 2016

	Refinement											Associated Draft EIS Alignment Alternatives
	July 2013 and earlier	Aug. 2013 – Mar. 2014	Apr. 2014 decision	June 2014 decision	Aug. 2014 – June 2015	July 2015 decision	July-Sept. 2015	Jan. 2016 decision	Feb. – Apr. 2016	May 2016 decision	June 2016 decision	
Proposed for consideration												
Continued consideration/evaluation												
Removed from further consideration												
Endorsed for environmental review												
PCC-Sylvania Area												
Barbur	+										✓	B1
Capitol Highway north of campus - BRT	+									x		
Capitol Highway south of campus - BRT		+	x									
Lesser to Haines - BRT	+			x								
New bridge from PCC - BRT		+								x		
Cut-and-cover tunnel under 53rd - BRT		+		x								
Cut-and-cover tunnel under 53rd - LRT		+								x		
Bored tunnel under 51st		+		x								
Bored tunnel via Capitol Highway		+		x								
Bored tunnel under 53rd to bridge (short)							+			x		
Bored tunnel under 53rd to Tigard Triangle (long)							+			x		
Tigard Triangle												
68th 2-way	+			x								
68th/69th couplet		+				x						
68th/70th couplet		+		x	+					x		
70th 2-way									+		✓	All Segment C
Highway 217 Crossing												
Clinton to Tigard Transit Center		+									✓	C3, C4
Beveland to Wall		+									✓	C6
Beveland north		+		x								
Hampton	+			x								
Parallel to 72nd	+		x									
Irving to Hunziker	+		x									
Downtown Tigard												
Downtown loop via Hunziker - BRT	+			x								
Downtown loop via Hunziker - LRT	+		x									
Downtown loop via Wall		+						x				
Downtown loop Ash variation		+		x								
Commercial to WES		+						x				
Beveland to Ash					+						✓	C1, C2, C5
Branched Service												
Branch service - split at Wall Street					+					x		
Branch service - split in Tigard Triangle									+		✓	C5, C6

Table I-1. LRT and BRT Alignment Refinement: 2013 to 2016

		Refinement											Associated Draft EIS Alignment Alternatives
		July 2013 and earlier	Aug. 2013 – Mar. 2014	Apr. 2014 decision	June 2014 decision	Aug. 2014 – June 2015	July 2015 decision	July-Sept. 2015	Jan. 2016 decision	Feb. – Apr. 2016	May 2016 decision	June 2016 decision	
<div><div></div><div>+</div></div>	Proposed for consideration												
<div><div></div><div></div></div>	Continued consideration/evaluation												
<div><div></div><div>x</div></div>	Removed from further consideration												
<div><div></div><div>✓</div></div>	Endorsed for environmental review												
Tigard to Bridgeport Village													
Hall Boulevard to Durham Road	<div><div></div><div>+</div></div>	<div><div></div><div></div></div>	<div><div></div><div></div></div>	<div><div></div><div>x</div></div>									
Hall to Bonita to 74th	<div><div></div><div>+</div></div>	<div><div></div><div></div></div>	<div><div></div><div>x</div></div>										
Hall to 85th	<div><div></div><div>+</div></div>	<div><div></div><div></div></div>	<div><div></div><div>x</div></div>										
72nd Avenue	<div><div></div><div>+</div></div>	<div><div></div><div></div></div>	<div><div></div><div>x</div></div>										
WES to 72nd		<div><div></div><div>+</div></div>	<div><div></div><div></div></div>	<div><div></div><div>x</div></div>									
Adjacent to WES and freight rail		<div><div></div><div>+</div></div>	<div><div></div><div></div></div>	<div><div></div><div></div></div>	<div><div></div><div></div></div>	<div><div></div><div></div></div>	<div><div></div><div></div></div>	<div><div></div><div></div></div>	<div><div></div><div></div></div>	<div><div></div><div></div></div>	<div><div></div><div>✓</div></div>	C2, C4	
Adjacent to WES and I-5		<div><div></div><div>+</div></div>	<div><div></div><div></div></div>	<div><div></div><div></div></div>	<div><div></div><div></div></div>	<div><div></div><div></div></div>	<div><div></div><div></div></div>	<div><div></div><div></div></div>	<div><div></div><div></div></div>	<div><div></div><div></div></div>	<div><div></div><div>✓</div></div>	C1, C3, C5, C6	
WES to 85th		<div><div></div><div>+</div></div>	<div><div></div><div>x</div></div>										
Bridgeport Village to Downtown Tualatin													
Upper Boones Ferry	<div><div></div><div>+</div></div>	<div><div></div><div></div></div>	<div><div></div><div></div></div>	<div><div></div><div>x</div></div>									
72nd to Bridgeport Road to Upper Boones Ferry		<div><div></div><div>+</div></div>	<div><div></div><div>x</div></div>										
Lower Boones Ferry	<div><div></div><div>+</div></div>	<div><div></div><div></div></div>	<div><div></div><div></div></div>	<div><div></div><div></div></div>	<div><div></div><div></div></div>	<div><div></div><div></div></div>	<div><div></div><div></div></div>	<div><div></div><div>x</div></div>					
Adjacent to I-5, freight rail, & Boones Ferry					<div><div></div><div>+</div></div>	<div><div></div><div></div></div>	<div><div></div><div></div></div>	<div><div></div><div>x</div></div>					
Downtown Tualatin													
Parallel to Boones Ferry		<div><div></div><div>+</div></div>	<div><div></div><div></div></div>	<div><div></div><div></div></div>	<div><div></div><div></div></div>	<div><div></div><div></div></div>	<div><div></div><div></div></div>	<div><div></div><div>x</div></div>					
Adjacent to I-5 & behind Nyberg Rivers		<div><div></div><div>+</div></div>	<div><div></div><div>x</div></div>										
Mohawk Park and Ride		<div><div></div><div>+</div></div>	<div><div></div><div>x</div></div>										
WES connection via Boones Ferry		<div><div></div><div>+</div></div>	<div><div></div><div></div></div>	<div><div></div><div>x</div></div>									

April 2014: Early Removal of Least Promising Alignment Options

The initial design process identified 13 options as clearly less viable than alternative options and removed them from further consideration, as shown in Table 1 and documented in a March 31, 2014 staff recommendation memo: <https://www.oregonmetro.gov/sites/default/files/2016/06/30/SWCP-PTLrecommendation-Removal-HCT-Design-Options-20140331.pdf>. In the Tie-In area, the **4th/5th Avenue couplet** for LRT and the **long bridge from South Waterfront** were removed largely due to the scale of construction and impacts to existing structures, including Orange Line MAX tracks.

At PCC Sylvania, a **BRT route around the south end of the campus and traveling on Haines Street** was removed due to impacts to properties, to private landscaping including old-growth trees, and to Lesser Park.

Two potential crossings of Highway 217, **parallel to 72nd Avenue** and **Irving Street to Hunziker Street**, were removed due to traffic impacts and slow transit travel times. In Tigard, **Hunziker Street** was removed from consideration for LRT operations due to impacts to business access.

Several options south of Tigard were removed. An option on **72nd Avenue with an out-and-back** design would impact traffic and would result in slow transit travel times. The **WES to 85th Avenue** and

Hall Boulevard to 85th Avenue alignments would not serve Bridgeport Village, and would require a crossing over the Tualatin River where a roadway bridge was strongly opposed by the community. The **Hall Boulevard to Bonita Road to 74th Avenue** option would serve areas with low ridership and redevelopment potential and would have impacted a park and private landscaping.

In Bridgeport Village, the **Bridgeport Road via 72nd Avenue** was removed due to extensive property impacts required to maintain the existing number of travel lanes on Bridgeport Road.

Two options were removed in Tualatin. The **adjacent to I-5 and behind Nyberg Rivers** would require tunneling and would interfere with the recently opened segment of the Tualatin Greenway Trail. An option with a **Mohawk park-and-ride terminus** would require a very long structure that would result in high capital costs and would impact the visual character of downtown Tualatin.

June 2014: Initial Refinement Phase Decision

At its June 2014 meeting, the steering committee accepted the staff recommendation to remove an additional 22 alignment options, as shown in Table 1 and documented in this recommendation memo (June 2, 2014): <https://www.oregonmetro.gov/sites/default/files/2016/06/30/SWCP-Summary-of-input-and-changes-to-draft-recommendation-HCT-20140602.pdf>. Remaining design options were illustrated and described in this June 9, 2014 recommendation summary document: <http://rim.metro-region.org/webdrawer/webdrawer.dll/webdrawer/rec/303590/view>.

Options were analyzed based on capital costs, transit performance, traffic/bike/pedestrian performance, impacts to the natural environment, and development/redevelopment potential. While the steering committee accepted the recommendations, public and jurisdictional comments resulted in reconsideration of recommendations regarding Marquam Hill tunnels after the meeting. Those changes are described below. The steering committee also decided to add time to the schedule to further engage the public and to conduct more technical analysis in order to further narrow the list of options to enter the Draft EIS.

The following documents summarize the public engagement efforts leading up to the June 2014 decision:

- Draft public involvement report: April 2014 activities (May 2014):
<http://rim.oregonmetro.gov/webdrawer/rec/273027/view>
- Draft public involvement report: March 2014 activities in the refinement phase (May 2014):
<http://rim.oregonmetro.gov/webdrawer/rec/296524/view>
- Appendix A: Public Involvement Report (June 2, 2014):
<http://rim.oregonmetro.gov/webdrawer/rec/296203/view>

Several options were removed in the tie-in area. **Naito Parkway extended downtown (BRT only)** would require BRT vehicles to operate in mixed traffic and would not provide convenient transfers to transit on the transit mall. A similar option for LRT, **Naito via First Avenue extended downtown**, would also miss the mall and interfere with auto traffic at bridgeheads. **Barbur Boulevard via Fourth Avenue / Second Avenue (LRT only)** would require high-cost tunneling and structures without adding benefit over other options. **South Waterfront – bridge/tunnel to Naito Parkway** and **South**

Waterfront – tunnel to OHSU would require tunneling and/or large structures and construction impacts to the OHSU South Waterfront campus, streetcar, and Orange line MAX.

Three tunnels under Marquam Hill in South Portland were considered and removed from further consideration for BRT because they would compromise BRT's major advantage of lower capital costs. For LRT, the **"medium tunnel" with southern portal at Bertha Boulevard** and the **"long tunnel" with southern portal at Barbur Transit Center** were removed due to high costs relative to projected ridership benefits and due to construction impacts to the OHSU Marquam Hill campus. The long tunnel would also not serve the historic highway portion of Barbur Boulevard in support of the land use vision. The **"short tunnel" with southern portal at Hamilton Street** was recommended for further study because it was the lowest cost option of the three tunnels. However, public and jurisdiction comments after the meeting persuaded staff to reconsider the medium tunnel in lieu of the short tunnel before the July 2015 steering committee meeting (described later).

In the PCC Sylvania area, tunnels for BRT were removed from consideration because a much less expensive at-grade option serving the campus directly was available via Capitol Highway. The **Lower Haines Road (BRT only)** option was removed due to property impacts from widening Lesser Road and sharp turning movements that would have slowed the BRT service. For LRT, the **tunnel via Barbur and 51st Avenue** and **tunnel via Capitol Highway** were removed because of higher costs compared to the shorter cut-and-cover tunnel via 53rd Avenue.

In the Tigard Triangle, a couplet option was recommended over the **68th Avenue two-way** option to minimize right-of-way requirements. The **68th/70th Avenue couplet** was removed in favor of the **68th/69th Avenue couplet** because of narrow widths and steep grades of 70th. However, this decision was reversed in July 2015, as detailed later.

In the Highway 217 crossing area, the southernmost crossing option, at **Hampton Street**, was removed due to impacts to traffic and out-of-direction travel. The **Beveland Street north** option was removed in favor of the **Beveland Street to Wall Street** option because of concerns about wetland and traffic impacts. In Downtown Tigard, **Hunziker Street**, which had been removed for LRT in April 2014, was removed from consideration for BRT because the buses would operate in mixed traffic to avoid impacting accesses to businesses, while alternative options operated in exclusive right-of-way. **Downtown loop via Ash Street** was removed for both modes due to higher property impacts compared to other loop options. After the June 2014 decision, amid concerns about the slow travel times of the remaining loop options, a new option was developed that merged the Beveland Street north and downtown loop via Ash Street options to create a non-looped and non-branched option that would serve the southern part of the Tigard Triangle.

South of Tigard, **Hall Boulevard to Durham Road** was removed from consideration because a route on Hall would serve areas with limited ridership and development potential and would be slower than other options. **WES alignment and 72nd Avenue** was removed due to impacts to traffic and industrial business access along 72nd. In Bridgeport Village, **Upper Boones Ferry Road (from Durham Road or 72nd Avenue)** was removed because of impacts to recent streetscaping investments and to tree groves recently purchased for preservation, and because the route would not adequately serve the main entrance of Bridgeport Village or the park-and-ride lot.

In downtown Tualatin, the **WES connection via Boones Ferry Road** near Nyberg Road was removed due to impacts to auto lanes and to commercial properties in downtown Tualatin.

July 2015: First Focused Refinement Decision – Focus on Southwest Portland

Between June 2014 and July 2015 staff released several documents summarizing analysis and public input on the remaining options between downtown Portland and downtown Tigard:

- Key Issues: South Portland (March 2, 2015):
<https://www.oregonmetro.gov/sites/default/files/2015/05/05/SWCP-KeyIssues-SouthPortland-Updated-20150504.pdf>
- Key Issues: Hillsdale (March 2, 2015):
<https://www.oregonmetro.gov/sites/default/files/2015/05/05/SWCP-KeyIssues-Hillsdale-Revised-20150504.pdf>
- Key Issues: PCC Sylvania Area (April 13, 2015):
<https://www.oregonmetro.gov/sites/default/files/2016/01/08/SWCP-KeyIssues-PCC-Updated-20150504.pdf>
- High Capacity Technical Transit Evaluation: South Portland, Hillsdale, and PCC-Sylvania Areas (April 28, 2015):
<https://www.oregonmetro.gov/sites/default/files/2015/05/11/SWCP-HCT-TechnicalEvaluation-Results-20150511.pdf>
- Public engagement efforts leading up to the July 2015 decision included online surveys, an open house and other community dialogues, described in more detail in the October 2014 – July 2015 Public Engagement Summary (July 2015):
<https://www.oregonmetro.gov/sites/default/files/2015/07/06/July%202015%20PE%20summary%20final%20with%20appendices.pdf>

The factors that respondents found most important for decision makers to consider included:

- high construction cost (input was divided among those who felt the tunnel cost was too high and others who felt the cost was worth the benefit)
- desire for high ridership
- desire for fast travel times
- desire for direct connection to Marquam Hill
- need to include walk and bike improvements to Capitol Highway and Barbur Boulevard
- neighborhood construction impacts (input was divided among those with strong concern over neighborhood construction impacts and others who felt this should not be a major factor in decision making)

Two recommendation documents were released in preparation for the July 2015 steering committee meeting:

- HCT alignment modification based on technical analysis (April 15, 2015):
<https://www.oregonmetro.gov/sites/default/files/2015/04/16/SWCP-HCT-TechnicalModifications-20150415.pdf>
- Draft Staff Recommendation for July 2015 Decisions (June 12, 2015):
<https://www.oregonmetro.gov/sites/default/files/2016/06/30/SWCP-July2015-StaffRecommendations.pdf>

The steering committee accepted the recommendations at its July 2015 meeting, resulting in the removal of six options.

In the tie-in area, the **adjacent to I-405 via Barbur Boulevard** and **adjacent to I-405 via Naito Parkway** options were removed due to engineering challenges because of freeway ramps.

In South Portland, based on the April 15 modifications memo, the **Marquam Hill tunnel** (formerly “short tunnel”) was removed in favor of reconsidering the **Marquam Hill-Hillsdale tunnel** (formerly “medium tunnel”). The longer tunnel was favored because of high fixed cost of bored tunnels, greater travel times savings, the opportunity to provide direct access to the Hillsdale town center, and because of community preference. However, based on the June 12 recommendation, the **Marquam Hill-Hillsdale tunnel** was also removed due to the relatively small travel time and ridership gains compared to the high capital cost of the tunnel, the substantial construction impacts at portals and station areas, and the high engineering risk. Instead, a pedestrian and bike connection to Marquam Hill from the nearby surface HCT station on Barbur or Naito will be part of the project.

In Hillsdale, the **Hillsdale cut-and-cover tunnel** alignments were removed due to higher capital costs, added travel time, and lower ridership projections compared to a Barbur alignment.

In the Tigard Triangle, the committee replaced the **68th/69th Avenue couplet** with a **68th/70th Avenue couplet** due to impacts to access to properties between 68th and 69th, and to concerns about impacts to local land use planning in the Triangle.

January 2016: Second Focused Refinement Decision – Focus on Tigard and Tualatin

During the second half of 2015 analysis focused on alignment options between Tigard and Tualatin, and staff released the following documents:

- Key Issues: Tigard (September 4, 2015):
<https://www.oregonmetro.gov/sites/default/files/2015/09/10/SWCP-Tigard-KeyIssues-Memo-20150904.pdf>
- Key Issues: Tualatin (October 15, 2015):
https://www.oregonmetro.gov/sites/default/files/2015/11/13/SWCP-KeyIssuesMemo-Tualatin-20151015_0.pdf
- Central Barbur High Capacity Transit Options (October 15, 2015)
- High Capacity Transit Technical Evaluation: Downtown Tigard, Southeast Tigard and Tualatin (October 15, 2015):
<https://www.oregonmetro.gov/sites/default/files/2015/10/15/SWCP-HCT-TechEval-Part2-20151015.pdf>

- Terminus Options Memo (November 13, 2015):
<https://www.oregonmetro.gov/sites/default/files/2015/11/16/SWCP-TerminusOptions-Memo-20151113.pdf>
- Staff Recommendations (November 13, 2015):
<https://www.oregonmetro.gov/sites/default/files/2015/12/09/SWCP-StaffRecommendations-Dec2015-20151113.pdf>

Public engagement leading up to the January 2016 decision focused on an online survey and an interactive online map tool. When asked which factors were important to consider when selecting Tigard alignments for further study, respondents highlighted faster travel times and better connected streets, bicycle and pedestrian facilities between downtown Tigard and Tualatin. When asked which factors were most important for decision makers to consider when deciding where a future high capacity transit line should end, respondents highlighted ease of access by bikes and pedestrians, impact on travel times, potential for extending the line in the future and impact on ridership. People also highlighted additional issues including concerns about removing auto lanes for transit capacity, concerns about potential property impacts, support for creating viable alternatives to driving to reduce congestion and questions about how a high capacity transit line will interact with WES commuter rail. Public engagement during this time period is described in the following documents:

- October 2014 – July 2015 Public Engagement Summary (July 2015):
<https://www.oregonmetro.gov/sites/default/files/2015/07/06/July%202015%20PE%20summary%20final%20with%20appendices.pdf>
- October 2014 – May 2016 Public Engagement Summary (June 2016):
<https://www.oregonmetro.gov/sites/default/files/2016/06/06/SWCP-PublicEngagementSummary-Oct2014-May2016-20160606.pdf>

The staff recommendations were accepted by the steering committee at its January 11 meeting, resulting in further narrowing of HCT options.

In the Central Barbur area, the segment of **adjacent to I-5 north of 13th Avenue** was removed due to its slower travel time and increased capital cost, property impacts and engineering risk relative to the equivalent Barbur Boulevard segment, as well as its potential impacts to Fulton Park.

In Tigard, two options, the **Commercial Street loop** and **downtown loop** options were removed because they would result in slower travel times and lower ridership compared to the alternative branched or direct through-routed options, and because of their relatively large footprint in downtown Tigard that would impact access to businesses.

The downtown Tualatin terminus was removed from consideration in favor of a Bridgeport Village terminus because the segment to downtown Tualatin would increase construction costs proportionally more than it would increase ridership, because of property impacts to downtown Tualatin due to the larger footprint required for a terminus compared to a typical station, and because unlike the Bridgeport station, no park-and-ride lot would be available in downtown Tualatin. With Bridgeport Village chosen as the terminus, two options connecting Bridgeport to downtown Tualatin were removed: **Lower Boones Ferry Road to parallel to Boones Ferry Road** and **adjacent to I-5, freight rail and Boones Ferry Road**.

May 2016: Third Focused Refinement Decision – Focus on Mode and PCC-Sylvania

The final major decisions during the Refinement period addressed connections to PCC Sylvania and mode, as well as technical modifications to the alignment options in the Tigard Triangle area. The following documents contain the analysis supporting the steering committee decisions:

- High Capacity Transit Mode Comparison (December 31, 2015, updated January 13, 2016):
<https://www.oregonmetro.gov/sites/default/files/2016/02/09/SWCP-ModeComparisonMemo-20151231b.pdf>
- PCC Sylvania Enhanced Connection Options (December 31, 2015):
<https://www.oregonmetro.gov/sites/default/files/2016/01/14/SWCP-PCCConnections-TechnicalMemo-20151231.pdf>
- Direct and Indirect Connection Options to PCC Sylvania Campus (March 11, 2016):
<https://www.oregonmetro.gov/sites/default/files/2016/04/08/SWCP-PCC-connection-options-tech-evaluation-20160311.pdf>
- Recommendations for May 2016 Decisions (April 4, 2016):
<https://www.oregonmetro.gov/sites/default/files/2016/08/04/SWCP-May2016-StaffRecommendations-20160404.pdf>
- High Capacity Transit Alignment Technical Modifications: New Tigard Triangle and Branch Service Alignment Options (April 14, 2016):
<https://www.oregonmetro.gov/sites/default/files/2016/04/15/SWCP-HCT-Tigard-alignment-technical-modifications-20160414.pdf>

Public engagement leading up to the May 2016 decision included an online survey, an open house and other community dialogues. When asked about the choice between light rail and bus rapid transit, respondents echoed the desire for overall project benefits, including fast, reliable travel times, high ridership and access to key places. Other important factors regarding the mode decision included: capacity to serve future rush hour demand, capacity to extend the line in the future, lower ongoing operating cost per rider and flexibility under road blockages and extreme weather.

The public had a diverse set of opinions regarding the benefits and tradeoffs of a light rail tunnel to serve the PCC Sylvania campus. Overall themes included:

- Many felt that finding ways to improve transit service to campus is very important.
- Many felt the high cost of tunnels exceeded their benefit; others felt the cost was worth the long term benefit to the region.
- Some residents felt strongly that negative construction impacts to neighbors should be a major factor in deciding to build a tunnel.
- Improvement connections to the campus from communities in Washington County is important.

The following documents describe these public engagement efforts in more detail:

- October 2014 – July 2015 Public Engagement Summary (July 2015):
<https://www.oregonmetro.gov/sites/default/files/2015/07/06/July%202015%20PE%20summary%20final%20with%20appendices.pdf>

- October 2014 – May 2016 Public Engagement Summary (June 2016):
<https://www.oregonmetro.gov/sites/default/files/2016/06/06/SWCP-PublicEngagementSummary-Oct2014-May2016-20160606.pdf>
- Mt Sylvania outreach Summary (November 2015):
<https://www.oregonmetro.gov/sites/default/files/2016/01/08/SWCP-SylvaniaOutreachSummary-JulyOct2015-20151103.pdf>

In May 2016, the steering committee chose LRT as the preferred mode in the Southwest Corridor, removing **BRT and BRT-only design options** from consideration. The main reasons were the greater long-term carrying capacity and superior projected transit performance of LRT relative to BRT, its ability to integrate into the existing light rail system and its higher level of public support.

The committee also removed all LRT tunnel options serving PCC Sylvania, including **PCC via cut-and-cover tunnel under 53rd Avenue** and both the "**short**" and "**long**" **PCC bored tunnel options under 53rd Avenue**. The significant costs of constructing a tunnel would not be commensurate with the projected ridership gains and would negatively impact the project's overall cost-effectiveness. Further, funding limitations would jeopardize the ability of the alignment to reach Bridgeport Village, resulting in lower overall ridership compared to a surface alignment to Bridgeport Village, and would likely reduce the number of pedestrian, bike, and roadway projects associated with the project if an expensive tunnel were included. Finally, analysis shows there are viable other ways to link the Sylvania campus to LRT at a much lower cost than a tunnel.

In May the steering committee also accepted two recommended alignment modifications in the Tigard Triangle area. The **68th/70th Avenue couplet** was replaced with a **70th Avenue two-way** option. The new two-way option could be constructed on a mostly undeveloped right-of-way, providing additional connectivity by adding auto lanes where none exist, and avoiding impacts to developed streets. The **branch service option that split at Wall Street** was replaced by a **branch option splitting in the Tigard Triangle**. Under this new scenario, the Bridgeport Village leg would have faster travel times and reduced operating costs because it would continue due south on 70th Avenue to cross OR-217 and run adjacent to I-5 instead of detouring farther west along Wall Street and adjacent to WES.

June 2016: Endorsement for environmental review

At its June 2016 meeting, the steering committee reviewed the remaining LRT alignment options and potential station locations and endorsed them for environmental review. This "proposed range of alternatives" also identified a set of roadway, bicycle and pedestrian projects proposed for environment review, drawn largely from the list of priority projects in the 2013 Shared Investment Strategy along with other opportunities that emerged during the refinement process.

The proposed range of alternatives also identified which roadway, bicycle and pedestrian projects from the Shared Investment Strategy are not recommended for environmental review under NEPA, because they would not provide access to LRT stations, are not located along a LRT option, or are already advancing in the near term with other funding.

The proposed range of alternatives also lists additional roadway, bicycle and pedestrian priority projects under consideration for environmental review, including both projects from the Shared Investment Strategy and new station access projects suggested by project partners. Public and agency

comment on the potential impacts and benefits of these projects is specifically solicited during the scoping period, to help inform the decision on which to study under NEPA.

December 2016: Refinements before entering Draft EIS

At its December 2016 meeting, the steering committee refined the range of alternatives to be studied in the Draft EIS based on additional analysis and public input received during the project's scoping period, held from September 2 through October 3, 2016.

These refinements included a narrowing of connection options considered for Marquam Hill and PCC Sylvania. At Marquam Hill, an **escalator with inclined elevator** option was removed from consideration due to high impacts relative to other options. At PCC, **personal rapid transit, aerial tram, and gondola** options were removed due to high construction expense and property and visual impacts relative to remaining options. A stand-alone **electric bike share program** option was eliminated from consideration due to accessibility limitations and to anticipated complications in redistributing bikes. The program was recommended for consideration outside of the Draft EIS as a component of a larger bike-share program. Among bus options, a **bus hub** concept was removed from consideration because most of the benefit would come from bus routing changes that could be implemented without the capital improvements of the option. Such changes will be considered in the overall bus operations strategy and so were deemed unnecessary to include in the Draft EIS. A **shared transitway** between the Barbur Transit Center and downtown Portland was removed from consideration because of speed limitations for both buses and light rail when sharing trackway, because the buses would compete with light rail for riders and exclusive right of way space.

The steering committee also refined some light rail alignments and stations. The **Clinton** alignment was removed from consideration as part of the branched operating configuration due to high expense with only a single station benefiting from resulting travel time improvements. Near the Barbur Transit Center, a **transition between adjacent to I-5 north of the transit center to center-running in SW Barbur Boulevard** south of the transit center was removed from consideration, since that combination would require a long and tall retained-fill structure in the middle of Barbur due to the grade change. The **Hunziker Street station**, at one point the transfer location where branched configuration tracks would split, was eliminated as an option since the branch location was adjusted to occur at the Beveland station. Without transfers, the Hunziker location was not promising as a station due to its location in an industrial area, and due to concerns about accessibility to its proposed park and ride. Finally, the maximum capacity of the **Bridgeport park and ride** to be studied in the Draft EIS was increased to 1,000 spaces due to high projected demand.

The language of the purpose and need was also slightly modified to ensure that each stated purpose is supported by a defined need.

The final Proposed Range of Alternatives reflected the steering committee adjustments are included in Chapter 2, Alternatives Considered.