



*Mural at Tigard WES station
Photo credit: City of Tigard*

Southwest Corridor Plan Key Issues: Tigard

Final Review Draft – September 4, 2015

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Tigard Key Issues – September 4, 2015

Key Issues: Tigard

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Tigard Key Issues: introduction and summary

Southwest Corridor Plan overview

The Southwest Corridor Plan is a package of transit, roadway, bicycle and pedestrian solutions that can help reduce congestion, improve circulation and enhance quality of life in this corridor. The Southwest Corridor Plan defines investments to help realize the local land use visions adopted by each community in the area. These visions include the City of Portland's *Barbur Concept Plan*, the *Tigard High Capacity Transit Land Use Plan*, *Linking Tualatin* and the *Sherwood Town Center Plan*. A major component of the Southwest Corridor Plan is the analysis and evaluation of both Bus Rapid Transit (BRT) and Light Rail Transit (LRT) travel modes for several potential route alignments to link Central Portland, Southwest Portland, Tigard and Tualatin.

The Plan is being researched and developed by a group of partners including agencies involved in funding, constructing and operating the transportation investments chosen and the jurisdictions in the project area. A steering committee consisting of elected leaders and appointees from these partners is leading the planning process. Past decisions of the Southwest Corridor Steering Committee include:

- In 2013, the committee recommended a Shared Investment Strategy that prioritizes key investments in transit, roadways, active transportation, parks, trails and natural areas.
- In 2014, the committee recommended a narrowed set of high capacity transit design options being considered and directed staff to develop a Preferred Package of transportation investments to support community land use goals.

Desired outcome: Preferred Package

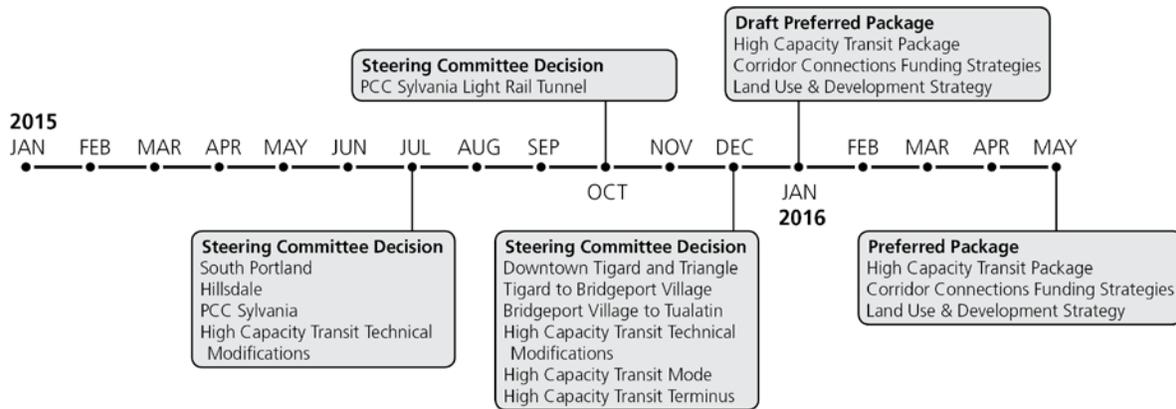
The project partners are working together to develop a Preferred Package by spring 2016 that addresses the needs and aspirations of Southwest Corridor residents and businesses. The Preferred Package will include the following components:

- **HCT Preferred Alternatives:** Preferred HCT alignments to study further in a Draft Environmental Impact Statement, including travel mode, alignments, terminus, and associated roadway, bicycle, and pedestrian projects
- **Corridor Connections:** Potential funding source and timeframe for each of the roadway, bicycle and pedestrian projects identified in the Shared Investment Strategy
- **Land use and development strategy:** Partnership agreements and other pre-development work to activate land use and place-making strategies identified in local land use visions.

Identifying the Preferred Package: 2015-2016 timeline overview

To reach a Preferred Package by spring 2016, three key steering committee decision-making points have been identified for July, October and December 2015. Technical analysis, place-based public outreach, and partner conversations will precede each steering committee decision. A draft recommendation

report will be available to the public before each decision-making point that will include public comment gathered during the place-based outreach period and any additional technical analysis compiled.



In July 2015, the steering committee took action on HCT alignment options in the South Portland, Hillsdale and Portland Community College (PCC) Sylvania areas of the corridor. The committee recommended continued study of a direct bus rapid transit connection to PCC Sylvania via SW Capitol Highway and removal of the Marquam Hill-Hillsdale tunnel and the Hillsdale Loop cut-and-cover tunnel from further consideration. The committee recommended rescheduling the decision regarding continued study of the PCC Sylvania direct cut-and-cover light rail tunnel decision to October 2015. The October 2015 decision will focus on whether to continue study of either a cut-and-cover or bored tunnel under the PCC Sylvania campus, which could include an exit portal in the Tigard Triangle.

In December 2015, the steering committee will make recommendations for public review on continued study of HCT alignment options in Tigard and Tualatin, the preferred HCT terminus, and whether bus rapid transit or light rail is the preferred HCT travel mode.

Steering committee members and the public will have several months in early 2016 to discuss the draft Preferred Package resulting from these 2015 decisions. The final Preferred Package is anticipated to be adopted in spring 2016. Comprehensive environmental review of the Preferred Package would likely begin in 2017; design and construction of the HCT line could begin as early as 2021.

How to use this Key Issues memo

The Southwest Corridor project partners are taking a place-based approach to understanding the key issues related to potential HCT and transportation investments as they relate to local concerns and community aspirations. This Tigard Key Issues memo is part of a series of memos and technical information on key places throughout the corridor that the public and steering committee can review before giving input and making recommendations on major project decisions.

This document fits into a broader array of technical information that supports Steering Committee decision making during this phase of the Southwest Corridor Plan. **Appendix A** lists the anticipated major project documents and their estimated dates of completion.

In addition to this report, in fall 2015 project staff will release a key issues memo on Tualatin, a draft Evaluation Report with technical evaluation of HCT alignment options in Tigard and Tualatin, a technical modifications memo on alignment options in Portland’s Central Barbur area, and reports on travel mode and terminus. A staff recommendation report on these alignment options, terminus and travel mode will be available prior to the December 2015 Steering Committee meeting and will include a summary of stakeholder feedback.

The remainder of this document is divided into two sections for improved readability. The first section addresses key issues in downtown Tigard and the Tigard Triangle, while the second section addresses key issues in Southeast Tigard (the area between downtown and Bridgeport Village).

Both sections include:

- an overview of the decision making process as it relates to the key issues in Tigard,
- a description of the proposed high capacity transit alignments to serve Tigard,
- a summary of technical information, and
- a description of key issues for decision makers and the public to consider.

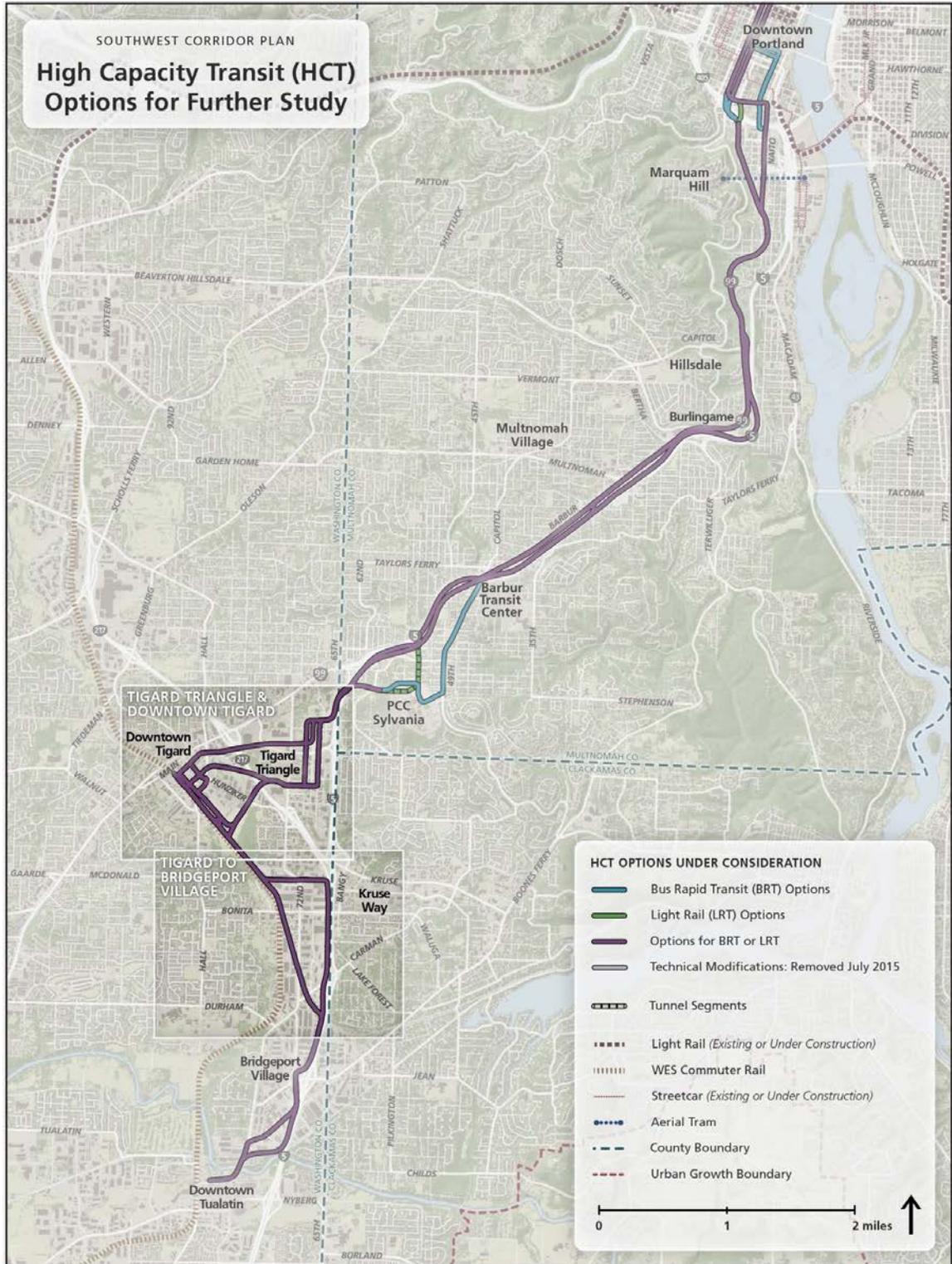
Appendices contain supplemental information including maps and project lists of Shared Investment Strategy projects involving roadway, bicycle and pedestrian investments being considered for Tigard, a discussion of general transit mode considerations, and maps highlighting demographic factors in the study area.

Additional options and alternative refinements are expected to materialize as the analysis, environmental and engineering efforts advance.

Evaluation factors

This Key Issues memo outlines data collected through technical analysis, local knowledge and partners discussions that will influence this decision including:

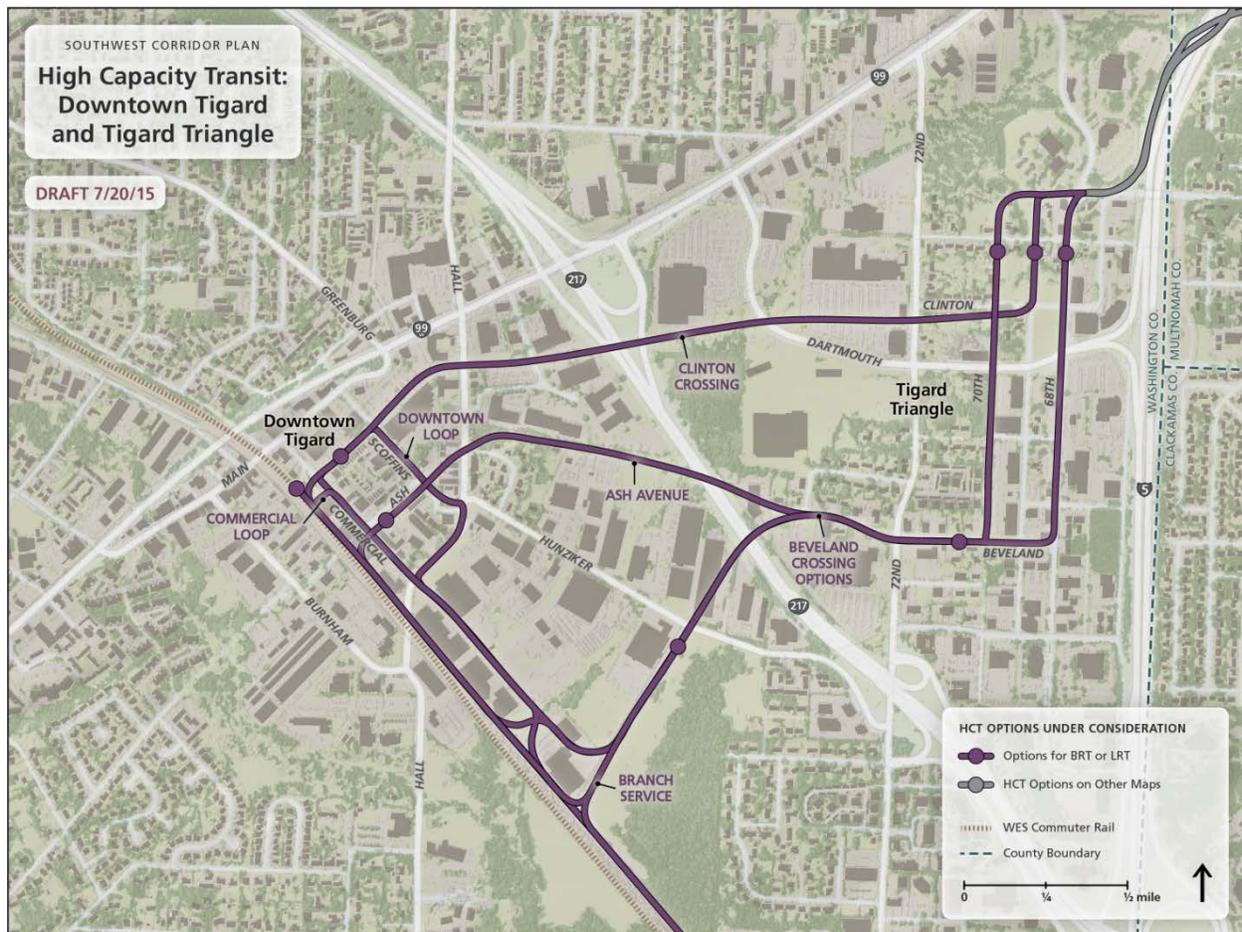
- Transit performance
- Community development
- Mobility
- Capital cost estimates
- Engineering complexity and risk
- Community impacts



Downtown Tigard Key Issues

Downtown Tigard encompasses the project area between OR-99W to the east and north and Fanno Creek to the southwest. The Tigard Triangle is located between three major roadways: I-5, OR-99W and OR-217. Five options are under consideration to serve this area, all for both BRT and LRT:

- Downtown Loop
- Commercial Loop
- Clinton Crossing
- Ash Avenue
- Branch Service



Major decisions in the downtown Tigard area

The HCT alignments in the Tigard Triangle were largely established in the document *HCT alignment modifications based on technical analysis* released on April 15, 2015. That memo proposed that the HCT alignment in the Tigard Triangle follow a 68th/70th Avenue couplet design. The Southwest Corridor Steering Committee adopted this recommendation for public review in July 2015.

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In October 2015 the Southwest Corridor Steering Committee will be asked whether to continue study of either a cut-and-cover or bored tunnel to serve the PCC Sylvania campus.

In December 2015 the steering committee will be asked to make a recommendation on which of the proposed HCT alignment choices for serving downtown Tigard will advance to further environmental review through a Draft Environmental Impact Statement (DEIS), which could begin in late 2016. This Key Issues memo focuses on the tradeoffs between the five options currently under consideration so that the public and decision makers can refine the options to be considered in the DEIS based on project goals.

Major decisions in October 2015:

- Will a high capacity transit tunnel to serve PCC Sylvania continue to be studied, which could include a tunnel exit portal in the Tigard Triangle?

Major decisions in December 2015:

- Which HCT alignment options in downtown Tigard should be advanced for further study?
- Is BRT or LRT the preferred mode for the corridor to study in the DEIS?
- What is the timeframe for designing and implementing local transit service improvements to enhance connections to and through downtown Tigard to link to the HCT project?
- What is the best implementation approach for corridor connection projects defined in the Shared Investment Strategy for downtown Tigard?

Deliberation and decision making regarding the alignment options will be driven by how well they meet the Southwest Corridor Plan's stated Purpose and Need, including improved mobility and safety for all users and modes of transportation, efficient and reliable transportation choices, wise use of public resources, improved access to key places, and equitable distribution of the benefits and burdens of transportation and land use development. The alignments currently under consideration could adjust in the future as a result of refinements that materialize as the analysis, environmental and engineering efforts advance.

Downtown Tigard summary

The following table summarizes evaluation factors, key considerations, and analysis results for the downtown Tigard area.

Key considerations	<i>Evaluation factors</i>	DOWNTOWN LOOP	COMMERCIAL LOOP	CLINTON CROSSING	ASH AVENUE	BRANCH SERVICE
Transit Performance What are the tradeoffs to consider between transit performance of the downtown Tigard alignments and other factors such as cost, travel time, property impacts, auto access impacts and connectivity?	<i>2035 new transit trips</i>	– 14,500 (LRT) – 7,800* (BRT)	– 14,500* (LRT) – 7,800* (BRT)	– 15,600 (LRT) – 8,400* (BRT)	– 15,700 (LRT) – 8,400 (BRT)	– 16,700 (LRT) – 9,000* (BRT)
	<i>2035 line riders</i>	– 41,800 (LRT) – 29,600* (BRT)	– 41,800 (LRT) – 29,600* (BRT)	– 43,600 (LRT) – 30,900* (BRT)	– 43,500 (LRT) – 30,800 (BRT)	– 44,400 (LRT) – 31,400* (BRT)
	<i>Travel time in minutes (from PSU)</i>	LRT: – 24 to Tigard – 34 to Tualatin BRT: – TBD – TBD	LRT: – 24 to Tigard – 34 to Tualatin BRT: – TBD – TBD	LRT: – 21 to Tigard – 30 to Tualatin BRT: – TBD – TBD	LRT: – 22 to Tigard – 31 to Tualatin BRT: – 25 to Tigard – 34 to Tualatin	LRT: – 24 to Tigard – 30 to Tualatin BRT: – TBD – TBD
Community Development Do any of the alignment choices offer significantly different redevelopment opportunities? Are local plans supportive of an HCT investment?	<i>Access</i>	– 2 stations in Tigard Triangle – 1 or 2 stations west of OR-217	– 2 stations in Tigard Triangle – 1 or 2 stations west of OR-217	– Only 1 station in Tigard Triangle (north) – 1 station west of OR-217	– 2 stations in Tigard Triangle – 1 or 2 stations west of OR-217	– 2 stations in Tigard Triangle – 2 stations west of OR-217
		Downtown access comparable across alignment choices. All options access the Tigard TC and WES.				
	<i>Redevelopment potential</i>			Least redevelopment potential for the Tigard Triangle		
	Downtown redevelopment potential similar across all alignments					

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Key considerations	Evaluation factors	DOWNTOWN LOOP	COMMERCIAL LOOP	CLINTON CROSSING	ASH AVENUE	BRANCH SERVICE
<p>Mobility</p> <p>Can high capacity transit be designed to minimize negative impacts to auto, freight, bicycle and pedestrian mobility and access?</p> <p>Do the alignments that including a roadway crossing of OR-217 provide a traffic benefit?</p> <p>Do the alignment options result in noteworthy differences for pedestrians, bicyclists, freight, or safety?</p>	<p><i>Accessibility</i></p>	<p>Transit bridge over OR-217 could accommodate all modes.</p> <p>Business access impacts along Commercial, Hall, and Scoffins.</p>	<p>Transit bridge over OR-217 could accommodate all modes.</p> <p>Business access impacts along Commercial, Hall, and Scoffins.</p>	<p>Transit bridge over OR-217 could accommodate bikes and pedestrians, but not autos.</p> <p>Would not alter lanes on 68th Ave. Would not develop 70th Ave.</p>	<p>Transit bridge over OR-217 could accommodate bikes and pedestrians, but not autos.</p>	<p>Transit bridge over OR-217 could accommodate all modes.</p>
	<p><i>Mode considerations</i></p>	<p>In one-way loop through downtown Tigard:</p> <ul style="list-style-type: none"> - Up to 52 BRT vehicles per hour in the peak* - Up to 20 LRT vehicles per hour in the peak 	<p>In one-way loop along Commercial Street and WES:</p> <ul style="list-style-type: none"> - Up to 52 BRT vehicles per hour in the peak* - Up to 20 LRT vehicles per hour in the peak* 	<p>In each direction:</p> <ul style="list-style-type: none"> - Up to 26 BRT vehicles per hour in the peak* - Up to 10 LRT vehicles per hour in the peak 	<p>In each direction:</p> <ul style="list-style-type: none"> - Up to 26 BRT vehicles per hour in the peak - Up to 10 LRT vehicles per hour in the peak 	<p>At Tigard TC station:</p> <ul style="list-style-type: none"> - Up to 13 BRT vehicles per hour in the peak* - Up to 5 LRT vehicles per hour in the peak
<p>Costs</p> <p>Are the trade-offs clear between cost and other factors such as reliability, safety, access and community development opportunities?</p> <p>How does cost impact the length of the final HCT alignment?</p> <p>How do operating costs compare between options?</p>	<p><i>Segment capital cost estimates in 2014 dollars</i></p>	<p>LRT: – \$442 million</p> <p>BRT: – TBD</p>	<p>LRT: – \$442 million</p> <p>BRT: – TBD</p>	<p>LRT: – \$353 million</p> <p>BRT: – TBD</p>	<p>LRT: – \$399 million</p> <p>BRT: – TBD</p>	<p>LRT: – \$388 million</p> <p>BRT: – TBD</p>
	<p><i>Operating cost</i></p>	<p>Slightly higher operating cost than Clinton and Ash options due to slower travel time</p>	<p>Slightly higher operating cost than Clinton and Ash options due to slower travel time</p>	<p>Lowest operating cost due to shortest travel time</p>	<p>Slightly higher operating cost than Clinton option due to slower travel time</p>	<p>Highest operating cost due to increased service north of Tigard; up to 50% more vehicle operating hours than other options</p>

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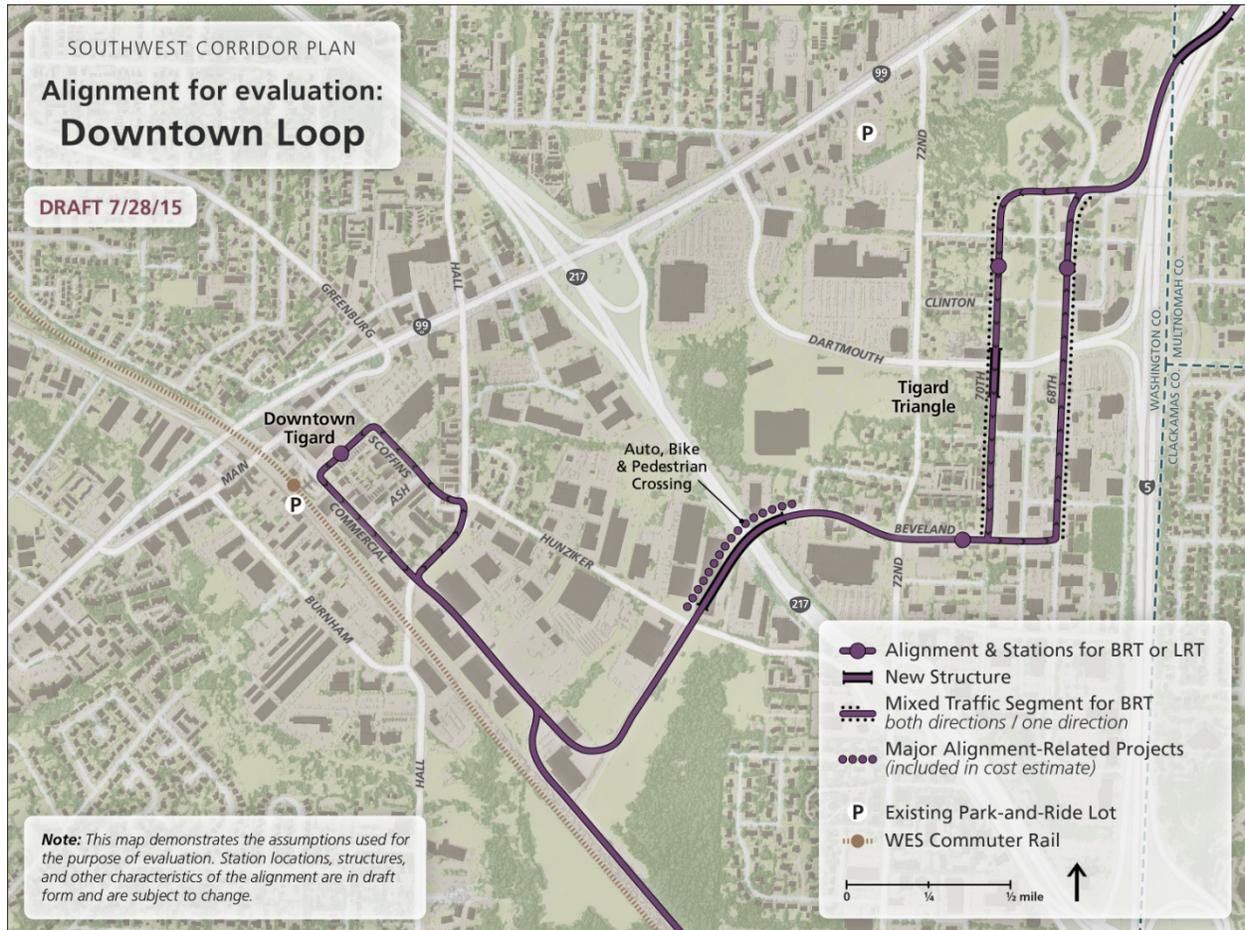
Key considerations	Evaluation factors	DOWNTOWN LOOP	COMMERCIAL LOOP	CLINTON CROSSING	ASH AVENUE	BRANCH SERVICE
<p>Engineering complexity/risk Complexity and risk add cost to the project and could result in the cost and schedule overruns.</p> <p>What aspects of each alignment add complexity to the project?</p> <p>What aspects of each alignment option present noteworthy risk?</p>	<i>Risk</i>	<ul style="list-style-type: none"> – Restricts left turn access to commercial businesses – Requires reconstruction of Tigard Transit Center 	<ul style="list-style-type: none"> – Restricts left turn access to commercial businesses – Requires reconstruction of Tigard Transit Center – Assumed setback from freight rail could be problematic 	<ul style="list-style-type: none"> – Long ¾-mile structure to cross OR-217 – OR-217 bridge would not accommodate autos – Could impact a wetland area 	<ul style="list-style-type: none"> – Beveland Crossing would not accommodate autos – New adjacent auto bridge might not be eligible for New Starts funding 	<ul style="list-style-type: none"> – Requires reconstruction of Tigard Transit Center – Challenges in including bike/ped facilities along most of HCT alignment in Tigard.
<p>Community impacts Can the benefits and burdens of a high capacity transit alignment be equally distributed among all population groups in the corridor?</p>	<i>Distribution of impacts</i>	<ul style="list-style-type: none"> – Bisects large tracts in industrial area – Commercial property impacts in downtown – Restricts turning movements of vehicles in downtown 	<ul style="list-style-type: none"> – Bisects large tracts in industrial area – Restricts turning movements of vehicles in downtown 	<ul style="list-style-type: none"> – Visual impact of long structure flying over properties and roadways – Commercial property impacts in downtown 	Considerable impacts to residential and commercial properties	Some access impacts and commercial property impacts, but less than other options

**estimated based on related model runs*

Downtown Tigard HCT alignment option descriptions

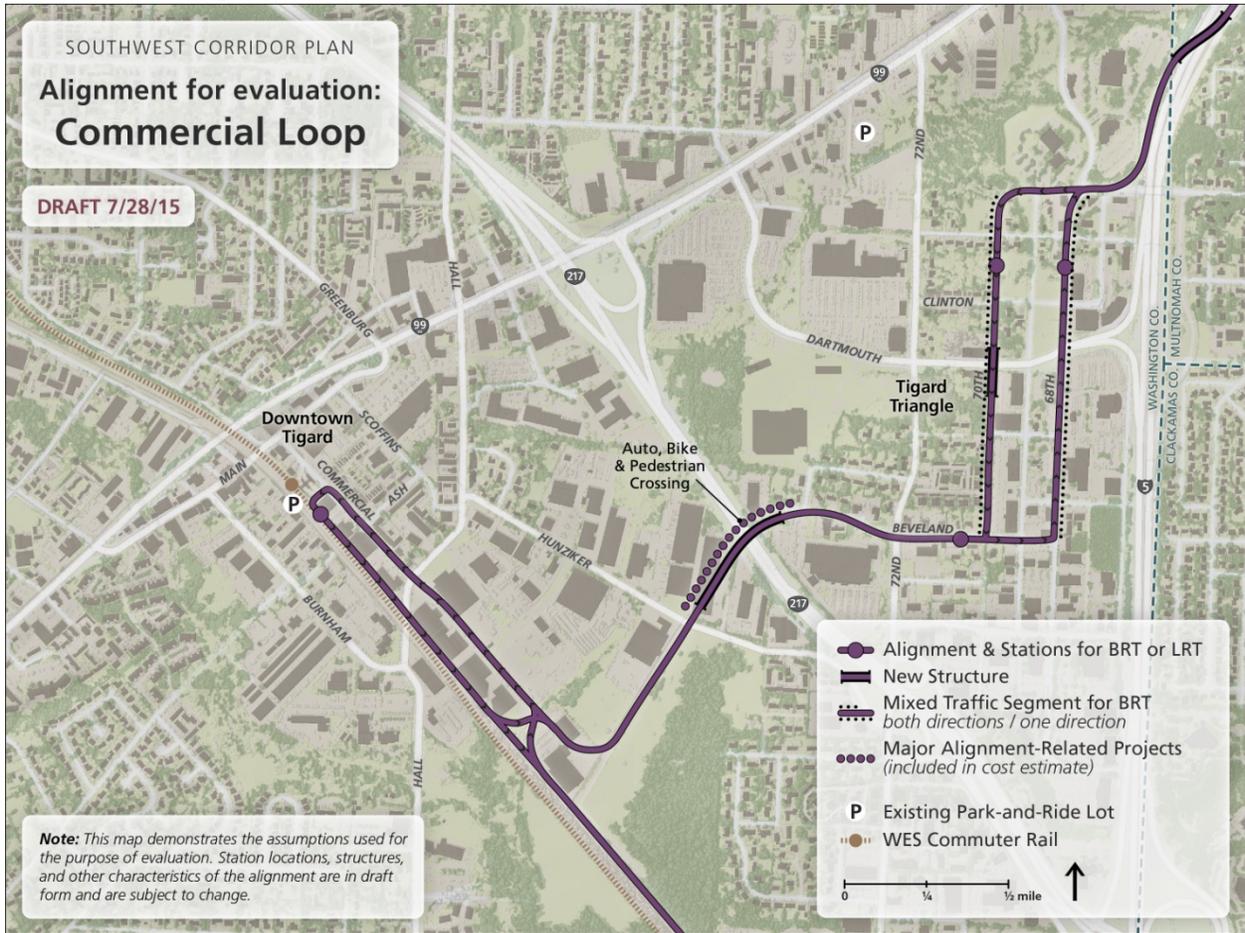
There are five HCT alignments in the downtown Tigard area. A number of other HCT alignment options were removed from further consideration by the Steering Committee in April and June 2014. More information on the options removed may be found on the Southwest Corridor Plan website: <http://www.oregonmetro.gov/public-projects/southwest-corridor-plan/project-library>.

Downtown Loop via Beveland Street crossing (BRT or LRT)



HCT would cross OR-217 at a new bridge curving from Beveland Street to Wall Street, which would also include facilities for cars, bikes, and pedestrians. HCT would continue southwest on Wall Street, then turn towards downtown Tigard along a new street extending southeast from Commercial Street. In downtown Tigard, HCT vehicles would run in a one-way counter-clockwise transit loop (in two-way streets) from the new alignment along Hall Boulevard, Scoffins Street and a new road south of Main Street, then return on Commercial Street Southbound vehicles would then shift over to parallel the WES tracks near Wall Street to head toward the Bonita station. This option would include a station near the Tigard Transit Center, and could include a station on Wall Street near Hunziker Street as well.

Commercial Loop via Beveland Street crossing (BRT or LRT)



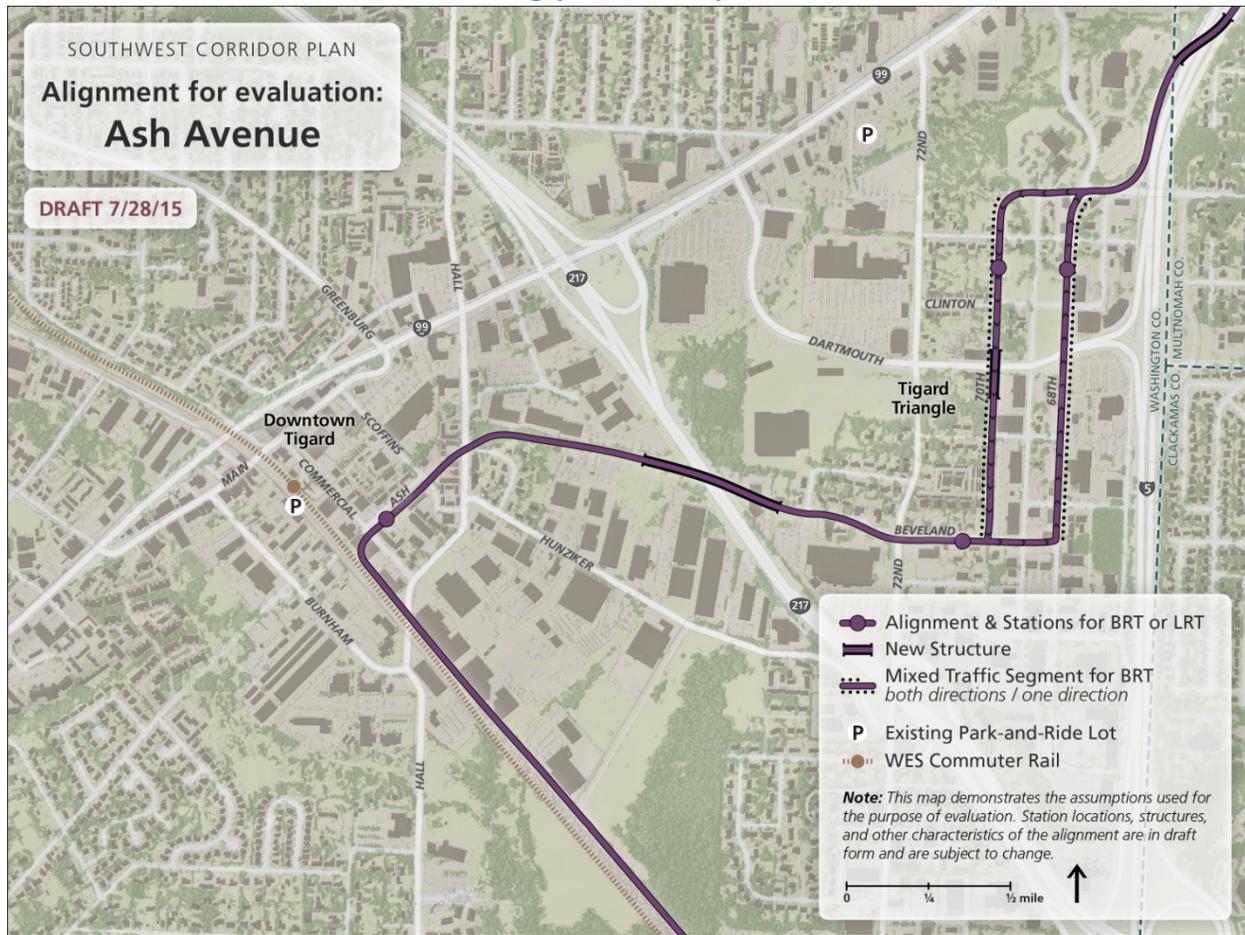
As with the Downtown Loop option, HCT would cross OR-217 at a new bridge between Beveland Street and Wall Street, which would include facilities for cars, bikes, and pedestrians. HCT would continue south on Wall Street, then turn towards downtown Tigard in a one-way transit loop along a new two-way street extending from Commercial Street. This alignment would run in a one-way counter-clockwise loop along Commercial and parallel to the WES tracks, with a sharp turn near the existing Tigard Transit Center. The downtown Tigard station would be located near this turn. This option could include a station on Wall Street near Hunziker Street as well.

Clinton Street Crossing (BRT or LRT)



HCT would run three quarters of a mile on a transit-only elevated structure from 70th Avenue and Clinton Street across OR-217 to Hall Boulevard. At Hall Boulevard, the alignment would transition to center running in a new street connecting Hall Boulevard to Commercial Street. The alignment would then turn southeast to parallel the WES alignment heading toward Tualatin. A station would be located near the existing Tigard Transit Center on the new street. Unlike the other options, this alignment would not include a station in the southern portion of the Tigard Triangle (the Beveland station).

Ash Avenue via Beveland Street crossing (BRT or LRT)



HCT would cross OR-217 on a new bridge extending westward from Beveland Street, passing behind the industrial properties fronting Hunziker Street and crossing Hall Boulevard at Knoll Drive. This new OR-217 crossing would be open to bicyclists and pedestrians in addition to transit. From Hall Boulevard, the alignment would connect to Ash Avenue, with a station between Scoffins and Commercial, and then turn southeast to parallel the WES tracks. This alignment would not include a Hunziker station.

A new auto, bike, and pedestrian bridge (not shown on the map above) could connect Beveland Street to Hunziker Street near its intersection with Wall Street, similar to the link in the Downtown Loop and Commercial Loop alignments.

This alignment may also provide an opportunity to extend Ash Avenue across the WES and freight rail tracks with a new roadway crossing, pending negotiations with the regulating authorities of the rail corridor.

Branch Service via Beveland Street crossing (BRT or LRT)



As with the Downtown Loop option, HCT would cross OR-217 on a new bridge between Beveland Street and Wall Street, which would include facilities for cars, bikes, and pedestrians. The alignment would include a station near Hunziker Street and Wall Street. From there, transit vehicles would continue along Wall Street, connecting to the WES corridor; Wall Street would continue to be a dead end street for other modes.

At the Hunziker station, every other HCT vehicle would continue to a terminus in Tualatin while the other HCT vehicles would continue to a downtown Tigard terminus. Tigard-bound vehicles would reverse direction at the downtown Tigard station, and then return to the Hunziker station heading northbound to Portland. Tualatin-bound vehicles would turn southeast to parallel the WES tracks, bypassing the downtown Tigard station and continue to Tualatin. This arrangement would mean a transfer at the Hunziker Station to travel between Tigard Transit Center and Tualatin via HCT.

Roadway, pedestrian and bicycle projects

All options include a range of roadway, pedestrian and bicycle improvements to better connect the corridor to the surrounding neighborhoods. The specific improvements vary depending on the alignment and multi-modal needs. Maps and lists of potential roadway, pedestrian and bicycle projects that would accompany HCT alignments in downtown Tigard are included in **Appendix B**. One major project, the OR-217 crossing, is described in more detail below.

OR-217 Crossing

This project is a new auto, bicycle and pedestrian crossing over Highway 217 between Beveland Street and Hunziker Street. The bridge would provide a new connection between the Tigard Triangle area and downtown Tigard to supplement the two existing crossing opportunities at OR-99W and 72nd Avenue.

For some of the HCT alignment options under consideration, the OR-217 crossing could be included within the HCT project design. The Downtown Loop, Commercial Loop and Branch Service options all include a transit crossing from Beveland Street to Wall Street, which is the preferred location for an auto crossing as well. For these three alignments, an auto crossing is assumed to be included in the design of the bridge. For the Clinton Crossing and Ash Avenue alignment options, however, it would be challenging to incorporate an auto crossing into the transit bridge due to the proximity to OR-99W. For these alignments, bicyclists and pedestrians could be accommodated on the transit crossing, but a new auto crossing would require a separate bridge farther south.

Downtown Tigard analysis and findings

Transit performance

Key considerations:

- What are the tradeoffs to consider between travel time, access, ridership, cost and impacts?

Key findings:

- The Branch Service option would have the highest ridership overall, but also the least stations and stops in downtown Tigard.
- The Clinton to Tigard Transit Center option would provide the fastest travel time to Tualatin while connecting through downtown Tigard, but would have ridership comparable to the Ash Avenue option due to the lack of a station in the southern portion of the Tigard Triangle.
- The two loop options would have the lowest ridership due to their slower travel times compared to the other three options.

All travel demand model results at this time should be considered preliminary. Refinements of HCT options, traffic analyses and local bus service assumptions will necessitate updated modeling throughout the DEIS process. Model runs were completed for four of the five downtown Tigard options. The Commercial Loop option was not modeled because it is very similar to the Downtown Loop option and would perform comparably. Model runs for the loop options assume a single station in downtown Tigard, without a Hunziker station. BRT design options are identical to LRT options in downtown Tigard; relative differences in travel times and ridership between these options for BRT would be similar to LRT,

so some options were modeled for LRT only for the purpose of comparison. Estimated BRT ridership for these options has been calculated by applying the relative differences between the LRT options to the ridership for the one BRT option that has been modeled, Ash Avenue.

Travel time and reliability

The Downtown Loop option was the first concept developed for downtown Tigard. Due to the looping in downtown it would be the slowest option, resulting in a 24-minute trip from downtown Portland to downtown Tigard and 34 minutes to downtown Tualatin. Because of the loop, northbound travel would be slightly slower. The Commercial Loop option would have similar travel times. Inclusion of a Hunziker station would increase travel times on these options.

The two loop options could provide unreliable travel times with BRT because up to 26 vehicles would be required in each direction in order to meet 2035 ridership demand. For the two loop options, both directions would run in a one-way loop to access the downtown Tigard station, resulting in up to 52 vehicles per hour running along the one-way busway through multiple intersections downtown. More detailed traffic analysis would be necessary to assess the feasibility of a loop alignment with BRT.

The Clinton Crossing option was developed in an effort to improve on travel times. It would provide a 21-minute trip from downtown Portland to downtown Tigard and a 30-minute trip to downtown Tualatin, an improvement of several minutes over the original design. Part of the time saving is a result of not serving the southern portion of the Tigard Triangle and not including a Hunziker station, however.

The Ash Avenue option would be only one minute slower than the Clinton Crossing option, at 22 minutes to downtown Tigard and 31 minutes to downtown Tualatin, while retaining the Beveland station in the Tigard Triangle.

The Branch Service option would provide a 24-minute trip to downtown Tigard and a 30-minute trip to downtown Tualatin. The travel time to downtown Tigard would be slightly slower compared to the Ash Avenue option because it would include the Hunziker station. The travel time to downtown Tualatin would be faster than the Ash Avenue option because the Tualatin branch would skip the downtown Tigard station. As a result, however, a trip between Tigard and Tualatin would require a transfer at the Hunziker station, adding transfer wait time to that trip.

Corridor line ridership, system transit ridership, and station activity

Future HCT ridership projections are largely determined by the speed of the service relative to competing modes and by the numbers of people and jobs the HCT line serves. Ridership is expressed in three ways:

- **Line ridership** measures the number of daily riders on the specific HCT line between the terminus and downtown Portland—this includes both new transit riders and those who would ride local buses in a no-build scenario (without the HCT project).
- **Change in system transit trips** measures the growth of total transit system ridership in the entire transit service area with implementation of the proposed project compared to a no-build alternative—this isolates new transit riders only. While shifts of modeled riders from local buses

to HCT service indicate benefits from improved accessibility gained with a project, new riders represent shifts in mode, usually from autos to transit, that are more likely to benefit the transportation system as a whole.

- **Station ons and offs** measures daily activity at specific transit stops.

All measures are for forecast year 2035.

The Branch Service option would have the highest ridership overall, with 44,400 daily line riders and 16,700 new transit trips for LRT. This high ridership, though, is a result of the higher off-peak frequencies assumed for the line because of the branched service. The other alignment options assumed service frequencies of every 7.5 minutes in the peak, and 15 minutes in the off-peak. Since each branch is served by every alternating vehicle, the service frequencies between Tigard and the Hunziker station and between Tualatin and the Hunziker station would be 15 minutes in the peak and 30 minutes in the off-peak. TriMet's service policy does not allow such infrequent service in the off-peak, so both branches were assumed to have 15-minute all-day service. As a result, the combined frequency north of Tigard would be 7.5 minutes, not 15 minutes, during the off-peak. While the Branch Service option would generate higher ridership, it would also result in much higher operating costs—vehicle revenue hours would be nearly 50% greater than the other options.

Although the Branch Service option has the highest overall ridership, it also has the lowest number of station ons and offs in downtown Tigard because only every other vehicle would serve the downtown station. The Branch Service would have 5,500 ons and offs at the downtown Tigard station for LRT, which is a drop of 40 to 47 percent compared to the other alignment options. While some of these lost riders may be choosing to board the HCT line at a different station in the branch service scenario, others may be choosing a different mode of transportation due to the reduction in HCT service downtown compared to other alignment options.

The Ash Avenue and Clinton Crossing options would perform similarly to one another, with around 43,500 line riders and 15,600 new transit riders for LRT. While the Clinton Crossing option would be slightly faster, and thereby attract more riders throughout its alignment, it would not include the Beveland station, which results in effectively the same ridership as the Ash Avenue option. The Clinton Crossing option would have 10,300 daily ons and offs at the downtown Tigard station, compared to 9,900 for the Ash Avenue option.

The Downtown Loop and Commercial Loop options, which are the slowest alignments, would attract approximately 41,800 line riders, 14,500 new transit trips and 9,200 downtown Tigard station ons and offs for LRT.

Downtown Tigard mode considerations

Appendix C includes a general discussion of differences between BRT and LRT modes and their corridor-wide impacts. This section addresses issues particular to the downtown Tigard area.

Because of differences in carrying capacities, more BRT vehicles than LRT vehicles would be needed to carry an equivalent passenger load (see Appendix C). The projected 2035 demand in the northern

section of the alignment would require up to 26 BRT vehicles per hour in the peak, while LRT would require up to 10 vehicles per hour. This difference in frequencies could affect the amount of signal priority permitted to the HCT service, and result in slower travel times for BRT than initially assumed. Impacts to local traffic would also be more likely with BRT, as BRT vehicles would be traveling through downtown Tigard at least every 3 minutes in each direction in peak periods compared to every 6 minutes for LRT. The high frequency of BRT vehicles would be particularly concerning for the two loop options because the vehicles from both directions would run in a one-way loop to access the downtown Tigard station, resulting in up to 52 vehicles per hour on the busway in the one-way portions.

Community development

Key considerations:

- Do any of the alignment choices offer significantly different redevelopment opportunities?
- Are local plans supportive of an HCT investment?

Key findings:

- Based on the location of each alignment and their associated downtown stations, there does not appear to be a significant difference in redevelopment opportunities for downtown Tigard.
- The absence of a station in the southern portion of the Tigard Triangle with the Clinton Crossing option will likely impact redevelopment opportunities.
- The Tigard Triangle Strategic Plan builds off of the work done on the Tigard HCT Land Use plan to actively support the investment of HCT in the area.

Access

The Tigard Triangle has historically had limited access opportunities, due to the confluence of the major roadways that surround and define the area (I-5, OR-99W and OR-217). There are no access points to the west, one to the south (72nd Avenue) and one across I-5 to the east (Haines Street). Of the four access points to the north, only two extend beyond Highway 99W. The area is also limited in terms of bicycle and pedestrian accessibility, mainly due to limited street connectivity and lack of sidewalks.

The opportunity for HCT two stations within the Triangle offers the most direct transit access to the area while also assisting in the closing of several gaps in the bike/pedestrian network. There are two distinct sub-districts within the Triangle, with the northern area focusing on retail and possible future housing/office, while the southern portion focuses on employment, institutional, and educational land uses. Having two stations in the Triangle will offer the ability to access and grow those existing and future uses to the benefit of the area. Additionally, the southern station will offer a possible connection for bikes and pedestrians seeking to access employment lands southeast of the Triangle in the Kruse Way area.

Access to downtown Tigard is not as constrained as the Tigard Triangle, but it faces some similar challenges. Highway 99W acts as a barrier to access from the north, as this high-traffic facility discourages walking or biking to the downtown. This barrier will pose challenges to getting potential HCT riders from northern Tigard to downtown except by car. Enhancing pedestrian and bike crossing opportunities along OR-99W will be necessary to support access to a new HCT stop in downtown. Access

to downtown Tigard from the south is largely via Hall Boulevard, which features a bike lane and has a consistent sidewalk along its west side. Access from the west into downtown is limited by the heavy rail line. An additional crossing of the rail line is desirable, but may be difficult to secure. The City is interested in extending Ash Avenue across the rail line in particular.

Redevelopment potential

The City of Tigard has a unique opportunity to work with vacant parcels in the Triangle, unlike most other possible station locations along the HCT alignment. Redevelopment opportunities in the Tigard Triangle have been recently identified through the Tigard Triangle Strategic Plan process. Many early opportunity redevelopment sites are located within the northern portion of the Triangle, offering the uncommon chance for new development served by transit in a moderately urban setting. Vacant parcels exist on both northern corners of the Clinton Street/ 69th Avenue intersection and along Atlanta Street at 68th and 69th avenues. The proposed Beveland station in the southern portion of the Triangle would serve employment and commuter student populations and take advantage of development opportunities along Beveland Street and surrounding local streets.

These opportunity sites could be purchased or planned as a phased development by either the City or an individual developer. Policy changes and investment in pedestrian and bicycle infrastructure could enhance future development capacity of those parcels. The City plans and current activity will help support redevelopment potential by taking an active role in early Shared Investment Strategy projects and ensuring that near-term construction is designed to take advantage of future HCT.

The Clinton Crossing option would not include a Beveland station, which would likely limit the redevelopment potential in the southern portion of the Triangle. Although redevelopment will likely occur anyway due to increased land values associated with the HCT investment, those opportunities may happen further in the future. An HCT station in the southern portion of the Triangle would have a more immediate impact on land values there, thus promoting new development opportunities sooner.

Within downtown Tigard, previous station area planning has identified multiple parcels that are viable candidates for redevelopment. HCT investment in the area would likely have a positive market influence on early opportunity sites near the existing transit center. Although there are few vacant parcels in downtown, targeted acquisition and redevelopment of existing uses is a viable option already under way. This approach has already been taken with the upcoming Burnham/Ash Mixed-Use Housing Project. Additional housing projects in downtown are expected to spur the retail uses outlined in the City's local plans.

The downtown also includes a number of identified brownfield properties. Some of these brownfields may not require further cleanup for their current uses, but future redevelopment for residential purposes would likely require additional assessment and remediation efforts. The City has successfully acquired an EPA Assessment Grant and should continue to pursue funding efforts that will address the impact of contamination on redevelopment costs. This type of assistance to private developers and land owners will be key to catalyze early development opportunities in downtown.

Support of local land use plans

The *Tigard HCT Land Use Plan* laid the groundwork for supporting the investment of Light Rail or Bus Rapid Transit in the Triangle and throughout Tigard. The plan acknowledges that the Triangle offers the greatest opportunity in Tigard to build viable station communities, but also poses significant challenges. This planning effort led to the City's *Tigard Triangle Strategic Plan*. Although the Strategic Plan does not rely solely on HCT investment, the work was done with a future HCT alignment through the area in mind. The use of the 68th/70th Avenue couplet allows the City to focus on 69th Avenue as a pedestrian-oriented street, as envisioned in the strategic plan, supported by HCT one block away.

Although no local plans call for HCT service into downtown Tigard, the City's existing plans are supported by the Southwest Corridor Plan. The *City Center Urban Renewal Plan* focuses on implementing street improvements that will increase multimodal access and connectivity, reduce congestion at major intersections and increase safety for pedestrians, bicyclists and motor vehicles. The Shared Investment Strategy projects identified in the SW Corridor Plan are supportive of this effort. The *Tigard HCT Land Use Plan* ensures that downtown has the zoning in place to support a HCT investment, such as development standards that ensure active ground-floor uses, provide robust street connectivity, and orient buildings towards the street, promoting the vision described in the concept. The *HCT Land Use Plan* also encourages continued efforts to address off-street parking, as the City should be seeking to maximize development potential around the ultimate downtown station location.

Mobility

Key considerations:

- Can high capacity transit be designed to minimize negative impacts to auto, freight, bicycle and pedestrian mobility and access?
- Do the alignments that including a roadway crossing of OR-217 provide a traffic benefit?
- Do the alignment options result in noteworthy differences for pedestrians, bicyclists, freight, or safety?

Key findings:

- All of the options would improve connectivity of the circulation system for all modes within downtown Tigard and would improve bike and pedestrian safety.
- All of the options would likely provide a new bike and pedestrian connection over OR-217 between downtown and the Triangle. The loop options and Branch Service option could create a new auto connection over OR-217 as well, but the Ash Avenue and Clinton Crossing options would not.
- The loop options would impact business access in multiple locations.
- All options except the Clinton Crossing would run in a couplet in the Triangle, which would alter traffic flow but result in more north-south through lanes due to development of 70th Avenue.

Motor vehicle and freight mobility

The Downtown Loop option would follow a segment of Hall Boulevard, which is a local truck route although not a regional or state freight route. None of the other alignment options would follow

designated freight routes. All the options under consideration would include an at-grade crossing of either Hunziker Street, a regional freight connector, or Hall Boulevard, a local truck route. Potential impacts to freight mobility and mitigating actions will be evaluated in the DEIS.

The below table summarizes the intersections analyzed and the initial findings. All the alignments would result in minimal impacts to motor vehicle traffic at all study intersections with the exception of 72nd Avenue/Beveland Street. The proposed new overcrossing of OR-217 at Beveland would attract traffic from the congested OR-217 interchanges at Highway 99W and 72nd Avenue, increasing traffic at 72nd and Beveland. However, the City of Tigard has planned a future widening of 72nd Avenue to four lanes, which would address this potential issue under both Build and No-Build conditions.

<i>Intersection</i>	Meets motor vehicle performance target?*	
	<i>2035 No-Build</i>	<i>2035 Build</i>
68 th & Dartmouth (I-5 SB ramps)	Yes	Yes
72 nd & Beveland (links to new OR-217 crossing)	No	No
Hunziker & Hall	Yes	Yes
Hall & Scoffins	Yes	Yes
Hall & Commercial	Yes	Yes

* Within permitted margin of accuracy

Source: *Final SW Corridor Traffic Analysis and Operations Memorandum, DKS, July 29, 2014*

Pedestrians and bicyclists

All of the options would result in new street connections and complete gaps in pedestrian and bicycle facilities, including a new crossing of OR-217. The Downtown Loop option would result in the greatest connectivity improvement. The Commercial Loop, Clinton Crossing and Ash Avenue options would produce moderate improvements. The Branch Service option provides the relatively least (but still noteworthy) benefits to the walking and bicycling environment.

Safety

The primary improvement to safety is the proposed connection over OR-217, included in all of the options, which would include bicycle and pedestrian facilities, providing a safer route than currently exist. All existing connections between the Triangle and downtown require pedestrians and bicyclists to cross a freeway interchange.

The DEIS will evaluate if there are any queuing issues on the local system and exit ramps.

Access

The two loop options would both impact access to businesses along Commercial Street and the proposed extension of Commercial to Wall Street. The Downtown Loop could additionally have access impacts along Hall Boulevard and Scoffins Street, with left turns restricted to signalized intersections. The Clinton Crossing, Ash Avenue and Branch Service alignments would have fewer access impacts in the downtown area because they would run primarily in new right-of-way or adjacent to the WES tracks rather than within the existing street network.

Lane conversions

Within the Triangle, apart from the Clinton Crossing option, the options under consideration would include a couplet for transit and general purpose traffic in the Tigard Triangle along 68th and 70th Avenues. 68th is currently the primary north-south street in that area, with one through travel lane in each direction, left and right turn pockets at the intersection with Dartmouth and a continuous center turn lane to the north of Dartmouth. The couplet would convert the southbound travel lane on 68th to northbound transit use, changing 68th into a one-way northbound street for both transit and general traffic; the center turn lane would likely become a through travel lane, thereby maintaining two lanes for vehicle traffic. This approach would develop 70th, which is largely an undeveloped right-of-way today, into the southbound leg of the couplet, with one or two southbound through lanes for vehicle traffic.

Within the downtown Tigard area, none of the options currently under consideration would convert auto travel lanes to transit right-of-way. Rather, several of the options propose construction of new streets or bridges to improve connectivity in the area, including a crossing over OR-217 between downtown and the Tigard Triangle, an extension of Commercial Street and a new street connection parallel to Main Street.

Cost Estimates

Key considerations:

- Are the tradeoffs clear between cost and other factors such as reliability, safety, access and community development opportunities?
- How does cost impact the length of the final HCT alignment?
- How do operating costs compare between options?

Key findings:

- The Branch Service, Ash Avenue and Clinton Crossing alignments have the lowest capital cost.
- The segment cost is affected by which couplet is used in the Tigard Triangle.
- The Branch Service option would have the highest operating cost due to the increased service frequency required north of the Hunziker Street station, where the two branch lines would converge.

Current cost estimates for corridor HCT alignments are based on conceptual designs. Estimates will continue to be refined during the DEIS process as options are narrowed and designs progress, but are useful now in demonstrating the relative differences between current options. **All figures are in year 2014 dollars, and exclude escalation and finance costs.** Cost estimates are not yet complete for all modes, options, and segments; estimates will be updated and reported as the project progresses.

Corridor-wide capital costs

Current estimates for an LRT alignment from downtown Portland to downtown Tualatin range from \$1.7 billion to \$2.2 billion. BRT cost estimates are under development, and should be available in the Evaluation Report to be released in mid-autumn. The ranges reflect the lowest and highest cost

combination of alignment options for each mode. The region's funding capacity will impact the final HCT alignment choices and associated projects.

Downtown Tigard area costs

Currently for the downtown Tigard area, cost estimates are available for LRT options only. BRT cost estimates are under development, and should be available in the Evaluation Report to be released in mid-autumn.

The current estimated capital costs for LRT through the Tigard Triangle and downtown Tigard range from \$353 million to \$442 million. The major cost element for each option is the crossing over OR-217.

Despite having the longest structure to cross over 217, the Clinton Crossing option would have the lowest total capital cost, in part by avoiding construction of the couplet and a second station in the Triangle.¹ Of the options that include a couplet through the Triangle, the lowest cost is the Branch Service, followed by the Ash Avenue option. The Downtown Loop and Commercial Loop options would have the highest cost, largely due to their greater segment length—27% longer than the Ash Avenue option and 31% longer than the Branch Service Option. The cost estimates for the loop options assume inclusion of a Hunziker station.

Operating cost

Operating costs are influenced in large part by the total travel time along an alignment and the frequency of service provided. Within the Tigard area, the Branch Service option would have the highest operating cost because of the increased service frequency that would be provided north of the Hunziker Street station, where the two branch lines would converge, in order to provide adequate service along each individual branch line. The total daily vehicle operating hours for the branch service could be up to 50% higher than for the other Tigard options.

Among the other options, the Clinton Crossing would have the lowest operating costs because it has the fastest travel times, followed by the Ash Avenue option and then the two loop options. Compared to the Branch Service, however, the differences between these other options are relatively minor.

Engineering complexity and risk

Key considerations:

- Complexity and risk add cost to the project and could result in the cost and schedule overruns.
- What aspects of each alignment add complexity to the project?
- What aspects of each alignment option present noteworthy risk?

Key findings:

- The Branch Service option would add the least complexity and risk to the project.
- The Clinton Crossing option would add the most complexity.

¹ Building a couplet on 68th and 70th avenues in the Triangle would cost more than a couplet on 68th and 69th avenues.

Downtown Loop

The Downtown Loop option would introduce project risks by impacting access to industrial businesses along Commercial Street, which abut the WES/freight tracks to the southwest and would border the HCT alignment to the northeast.

Commercial Loop

The Commercial Loop option would impact access to businesses along Commercial Street as well, and also require reconstruction of the Tigard Transit Center in order to provide space for the HCT turnaround. The alignment design assumes a 25-foot setback from the existing freight rail, whereas the railroad may require a larger distance. Negotiations with the railroad over setback distances would introduce additional risk to the project.

Clinton Crossing

This option would include a ¼-mile structure to cross OR-217 and to negotiate the grade changes between the Tigard Triangle and downtown Tigard. The structure would be relatively high and would create visual impacts in addition to engineering complexity. Auto traffic would not be permitted on the crossing because that would exacerbate traffic congestion in the Hall Boulevard and OR-99W landing area. In addition, this option would cross over a wetland area to the east of OR-217 and could result in environmental impacts requiring mitigation.

Ash Avenue

This option would include a structure crossing OR-217 at Beveland Street, which would veer northwest away from Hunziker Street and toward Ash Avenue. A separate auto bridge could be constructed to connect to Hunziker, but funding for this connection would likely not be part of the federal funding for a transit project. Bicycle and pedestrian facilities could be included on the HCT structure. The structure would cross over wetlands and creeks.

There is a desire to add a new at-grade crossing of the existing WES/freight tracks at Ash Avenue that would provide a new link to downtown for autos and a good connection to the HCT station for all modes. Approval of this crossing ultimately lies with the Oregon Department of Transportation (ODOT).

Branch Service

This option would require the reconstruction of the Tigard Transit Center to allow for a third track for LRT or a turnaround location for BRT. West of the OR-217 crossing, the alignment would travel on Wall Street, which is a dead end street that does not intersect other roads, and adjacent to WES/freight rail tracks. This routing creates difficulties incorporating bike and pedestrian features into the HCT design because there would be no connection to a through roadway west of Hunziker Street. The need for quiet zones at the alignment's intersection with Hall Boulevard would be investigated.

Community impacts

Key considerations:

- Can the benefits and burdens of a high capacity transit alignment be equally distributed among all population groups in the corridor?

Key findings:

- Based on spatial analysis of demographic maps, there is no significant difference in how each alignment option runs through areas of non-white, low-income or senior populations.
- Based on spatial analysis of demographic maps, there are slight differences in how each alignment option runs through areas of non-English speaking populations.
- Subsequent analysis and conversations with residents, employees and visitors to the corridor will further detail the potential for unequal distribution of benefits and burdens of high capacity transit construction and service.

Demographic maps for non-white, non-English speaking, low-income and senior populations were overlaid with maps of the proposed HCT alignments (see **Appendix D**). Future discussions with residents, employees and visitors to these areas will help expand understanding of how different racial, ethnic and language groups may be impacted by the proposed alignments.

Non-white and non-English speaking populations

Based on spatial analysis of demographic maps, the majority of the alignment options would run through higher than average populations of non-white populations. Disaggregation by race shows that the Clinton Crossing and Ash Avenue options would run through higher concentrations of Native Hawaiian or Pacific Islander and Asian populations than the other alignment options.

Low-income and senior populations

Based on spatial analysis of demographic maps, all of the options would run through areas with higher than average concentrations of low-income populations. None of the options runs through areas with higher than average concentrations of senior populations, although the Commercial Loop and Branch Service options border upon areas of higher than average senior populations to the south.

Access to services

Investments in the transportation systems throughout the Southwest Corridor will aim to improve access to important community services such as education, health care, retail and employment centers for all residents.

Property impacts

The options under consideration have varying levels of impact to adjacent private properties. In many cases, property impacts are limited to a narrow strip needed to widen the roadway and sidewalks. In other cases, temporary construction easements may be necessary with no permanent impacts. In extreme cases, large or complete acquisitions may be necessary when impacts to buildings or other major infrastructure are unavoidable.

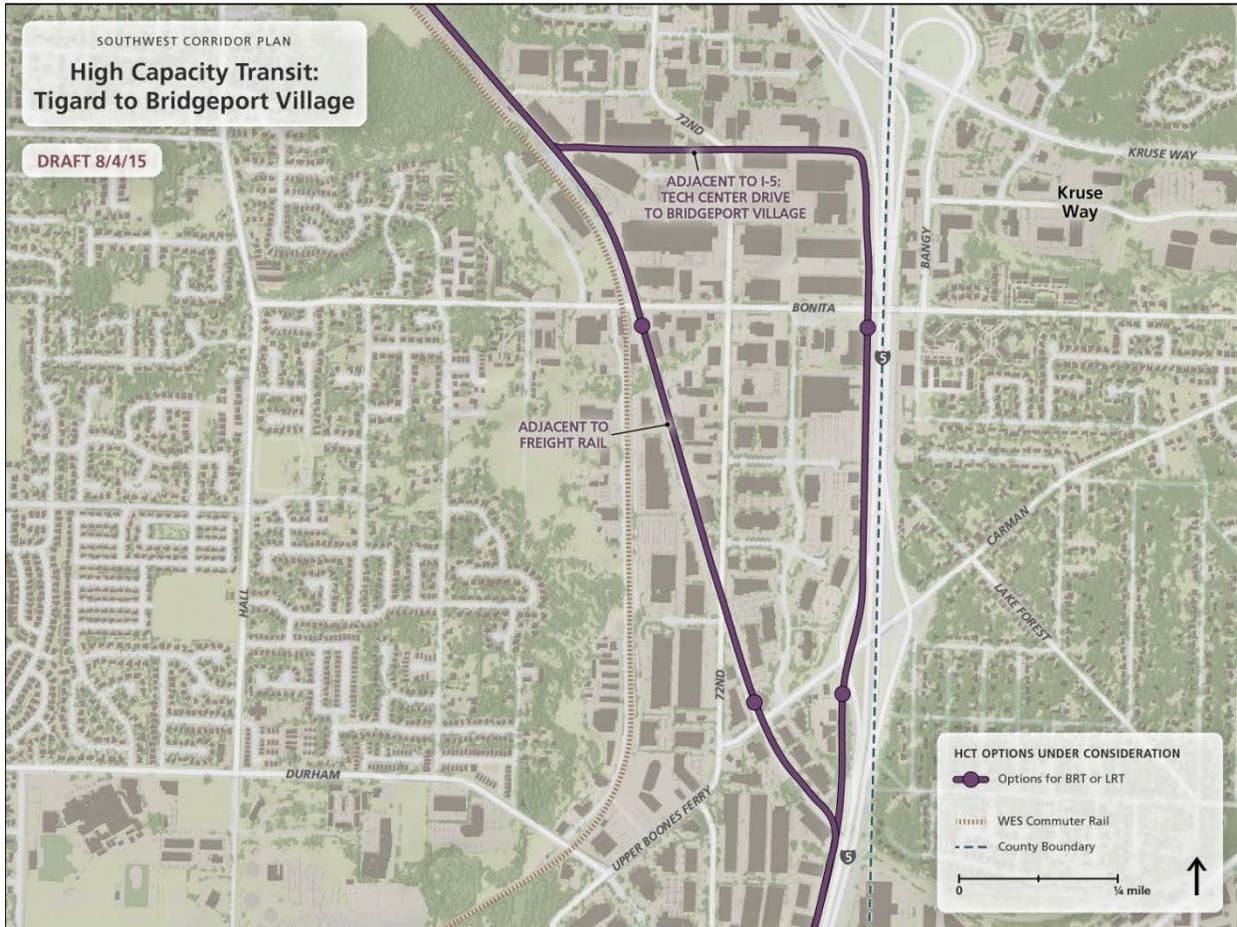
Project staff is currently quantifying the areas of potential impact for each option and will present this information in the future. In areas where converting an auto travel lane to a transit lane is under consideration, property impacts will be evaluated for scenarios both with and without the lane conversion in order to facilitate discussion about the trade-offs of minimizing impacts and maintaining auto capacity.

In general, the Ash Avenue option would result in the highest number of property impacts, some of which would occur in the central downtown area. The Branch Service option would result in the fewest impacts to developed properties, but would affect access to some businesses.

Southeast Tigard Key Issues

Between downtown Tigard and Bridgeport Village, two options are under consideration for both BRT and LRT modes:

- Adjacent to freight rail
- Adjacent to I-5: Tech Center Drive to Bridgeport Village



Major decisions in the Southeast Tigard area

In December 2015 the Southwest Corridor Plan Steering Committee will be asked to make a recommendation on which of the proposed HCT alignment choices between downtown Tigard and Bridgeport Village will advance to further environmental review through a DEIS.

Southeast Tigard summary

The following table summarizes evaluation factors, key considerations, and analysis results for consideration in the study area.

Key considerations	Evaluation factors	Adjacent to freight rail	Adjacent to I-5
Transit Performance What are the tradeoffs to consider between transit performance of the alignments and other factors such as cost, travel time, property impacts, auto access impacts and connectivity?	<i>2035 new transit trips</i>	– 15,700 (LRT) – 8,400 (BRT)	– 16,000 (LRT) – 8,600* (BRT)
	<i>2035 line riders</i>	– 43,500 (LRT) – 30,800 (BRT)	– 43,600 (LRT) – 30,900* (BRT)
	<i>Travel time (PSU to Tualatin)</i>	LRT: – 31 minutes BRT: – 34 minutes	LRT: – 34 minutes BRT: – 37 minutes*
Community Development What are the main access issues in the area? Are there significant land use implications between alignment choices?	<i>Access</i>	– Better access for neighborhoods – Need for improved connections – Better access to 72nd Avenue employment area	– Too far from existing neighborhoods for walk/bike access – Better access to Kruse Way employment area
	<i>Redevelopment potential</i>	No major difference between options	
Mobility Can high capacity transit be designed to minimize negative impacts to auto, freight, bicycle and pedestrian mobility and access? Do the alignment options result in noteworthy differences for pedestrians, bicyclists, freight, or safety?	<i>Accessibility</i>	No major difference between options or modes Future traffic operations in this area will perform better with the HCT project than without it	
	<i>Mode considerations</i>	In each direction: – Up to 26 BRT vehicles per hour in the peak – Up to 10 LRT vehicles per hour in the peak	
Capital Costs Are the trade-offs clear between cost and other factors such as reliability, safety, access and community development opportunities? How does cost impact the length of the final HCT alignment?	<i>Segment cost estimates in 2014 dollars</i>	LRT: – \$233 million BRT: – TBD	LRT: – \$238 million BRT: – TBD

Tigard Key Issues – September 4, 2015

Key considerations	<i>Evaluation factors</i>	Adjacent to freight rail	Adjacent to I-5
<p>Engineering complexity/risk Complexity and risk add cost to the project and could result in the cost and schedule overruns.</p> <p>What aspects of each alignment add complexity to the project?</p> <p>What aspects of each alignment option present noteworthy risk?</p>	<p><i>Risk</i></p>	<p>Both options require negotiations with right-of-way owners and comparable risks related to alignment adjustments to avoid impacts to I-5 access.</p>	
<p>Community impacts Can the benefits and burdens of a high capacity transit alignment be equally distributed among all population groups in the corridor?</p>	<p><i>Distribution of impacts</i></p>	<ul style="list-style-type: none"> – Few business access impacts – No residential property impacts – Fewer commercial property impacts 	<ul style="list-style-type: none"> – Few business access impacts – No residential property impacts – More commercial property impacts

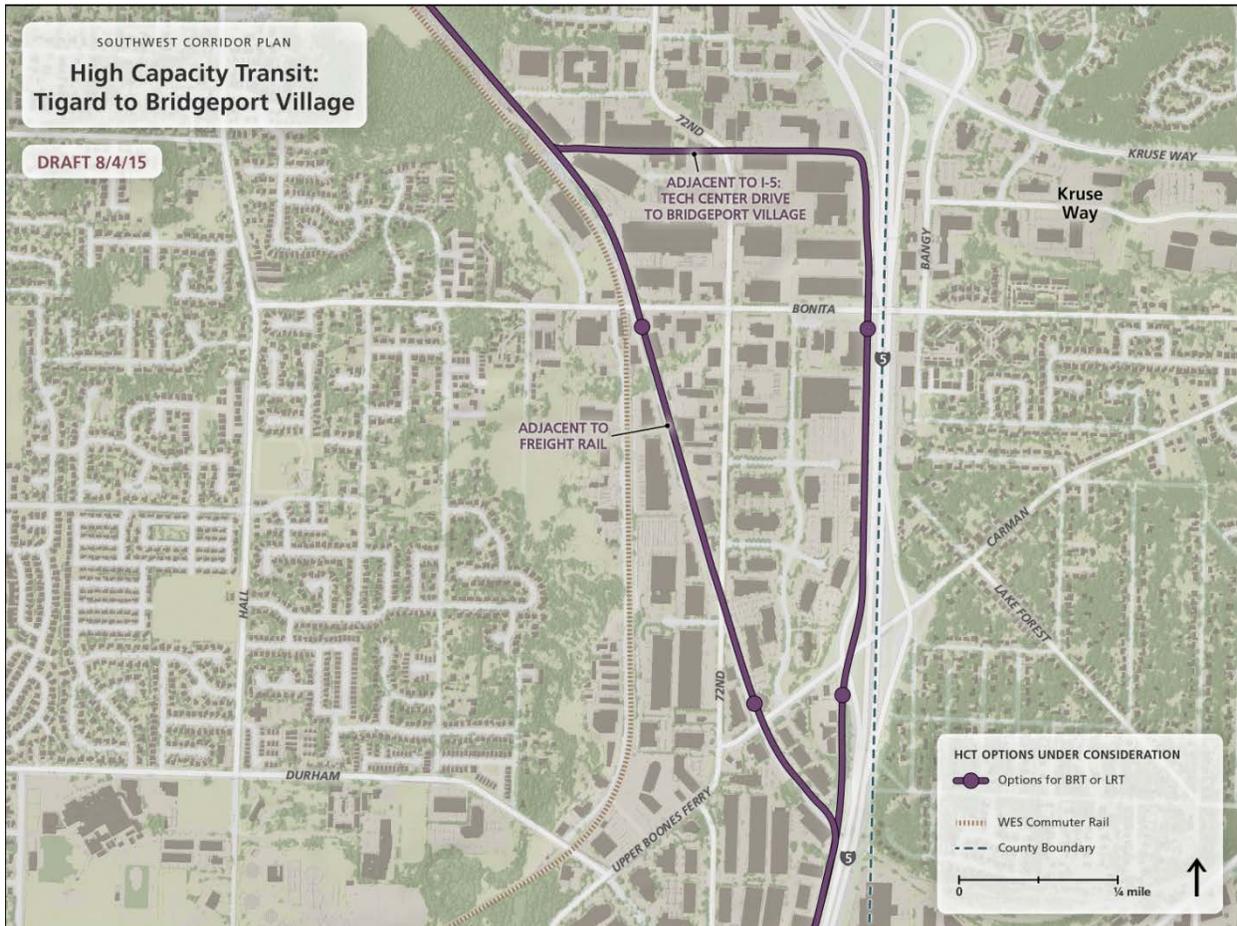
*estimated based on related model runs

Southeast Tigard alignment option descriptions

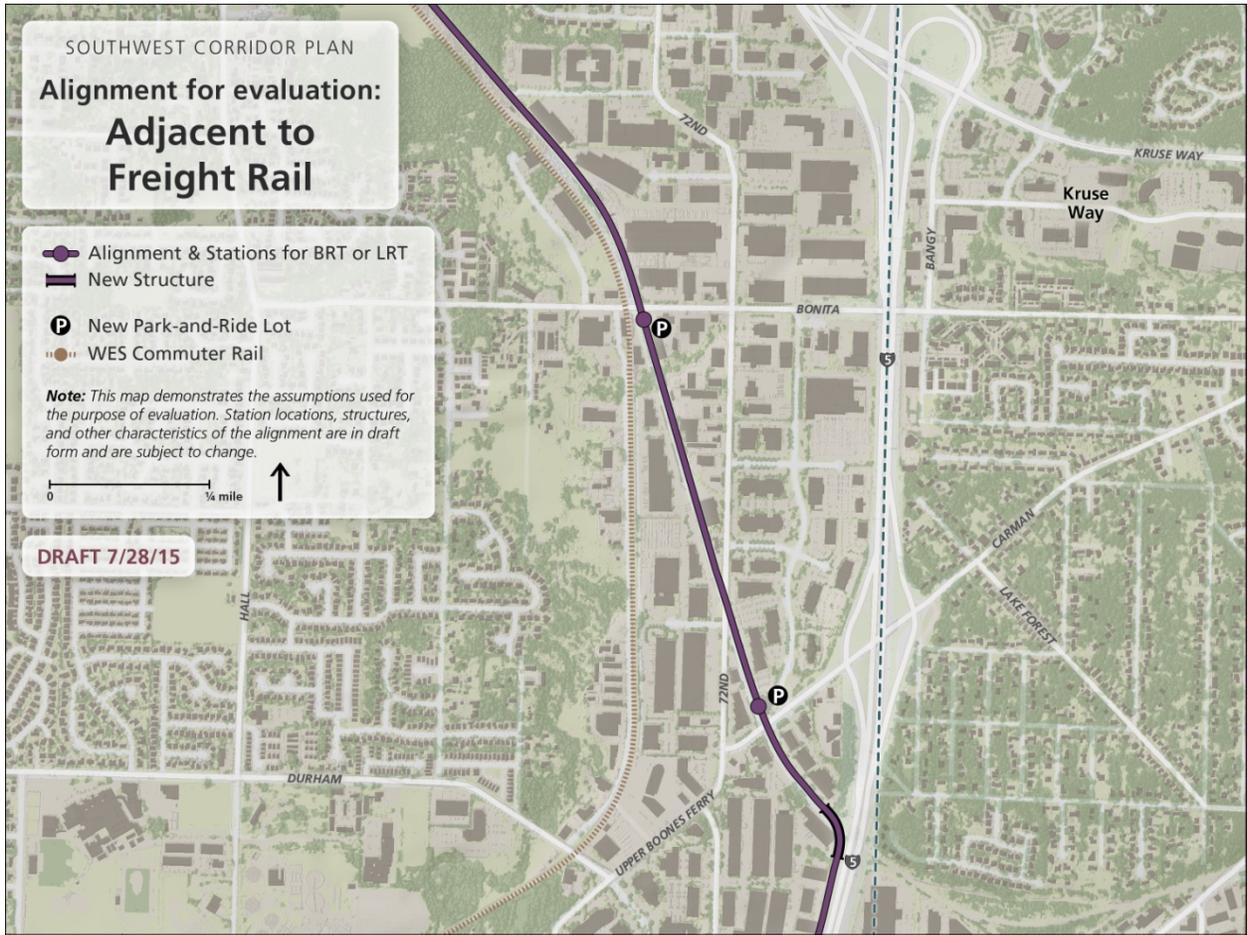
There are two HCT alignments in the Tigard to Bridgeport Village area. A number of other HCT alignment options were removed from further consideration by the Steering Committee in April and June 2014.

More information on the options removed may be found on the Southwest Corridor Plan website:

<http://www.oregonmetro.gov/public-projects/southwest-corridor-plan/project-library>.

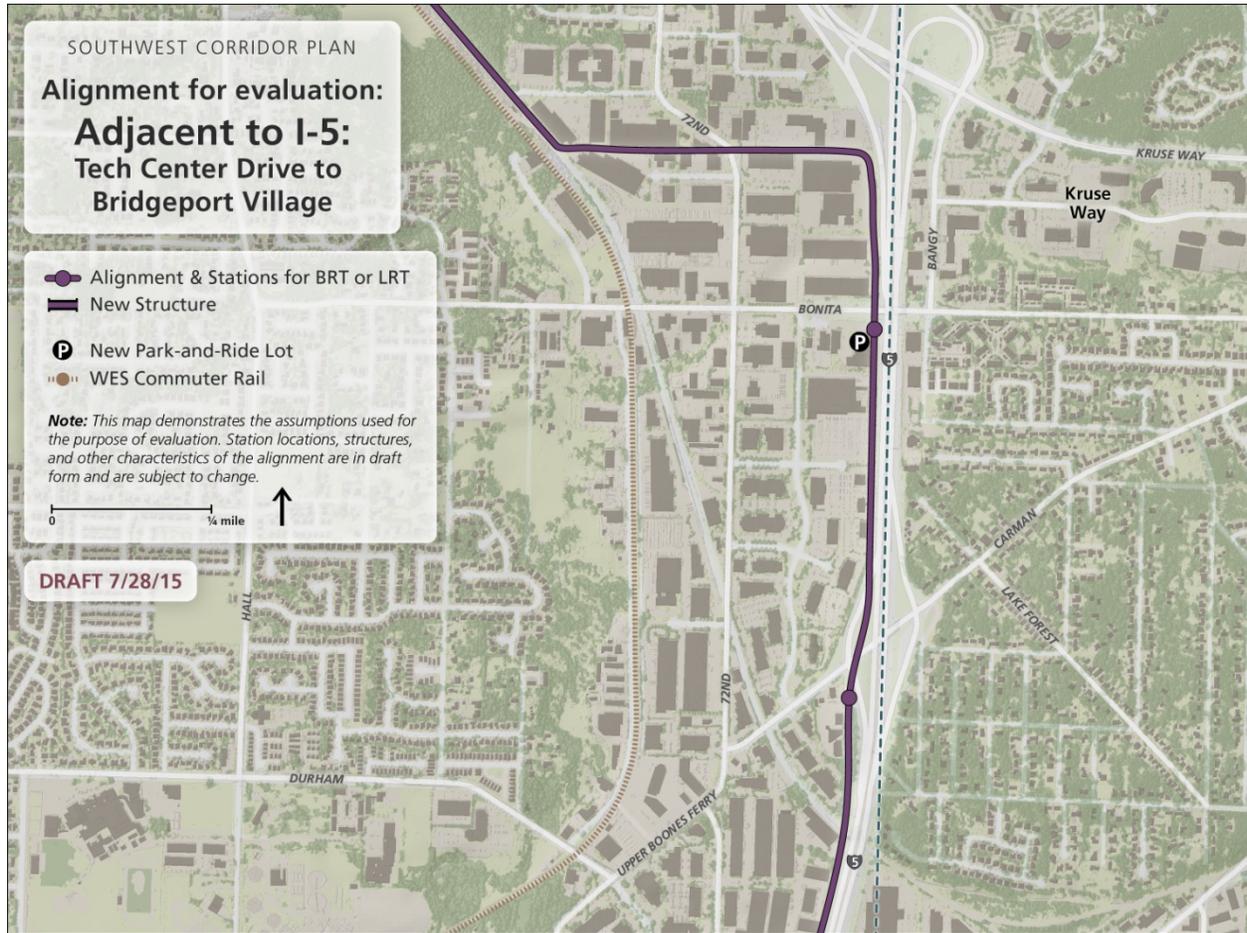


Adjacent to freight rail (BRT or LRT)



HCT would run alongside the WES commuter rail tracks between downtown Tigard and Bonita Road. South of Bonita Road, the alignment would split off from WES to run alongside the Union Pacific Railroad (UPRR) tracks. Where the UPRR tracks run under I-5, the HCT alignment would turn south to parallel the freeway approaching a Bridgeport Village station and park-and-ride lot. There would be two stations along the alignment between downtown Tigard and Bridgeport Village—one located near Bonita Road and the other near Upper Boones Ferry Road.

Adjacent to I-5 (BRT or LRT)



HCT would run alongside the WES tracks between downtown Tigard and just south of SW Tech Center Drive, where it would turn east and run between industrial businesses. HCT would run along the west side of I-5 between the OR-217 interchange and a Bridgeport Village station and park-and-ride lot. There would be two stations along the alignment between downtown Tigard and Bridgeport Village—one located near Bonita Road and the other near Carman Drive/ Upper Boones Ferry Road.

Roadway, pedestrian and bicycle projects

Both options include a range of roadway, pedestrian and bicycle improvements to better connect the corridor to the surrounding neighborhoods. The specific improvements vary depending on the alignment and multi-modal needs. Maps and lists of potential roadway, pedestrian and bicycle projects that would accompany HCT alignments in the Southeast Tigard area are included in **Appendix B**.

Southeast Tigard analysis and findings

Transit performance

Key considerations:

- What are the tradeoffs to consider between transit performance of the alignments and other factors such as cost, travel time, property impacts, auto access impacts and connectivity?

Key findings:

- Adjacent to I-5 would add one minute of travel time compared to the Adjacent to Freight Rail option.
- Overall line and system ridership would be comparable between the two options.
- The Adjacent to I-5 option would have more ons and offs at the Bonita Road station, while the Adjacent to Freight Rail option would have more ons and offs at the Upper Boones Ferry Road station.

All model results at this time should be considered preliminary as refinements of HCT options, traffic analyses and local bus service assumptions will necessitate updated modeling throughout the DEIS process.

Travel time and reliability

Due to its added length, the Adjacent to I-5 option would be one minute slower than the Adjacent to Freight Rail option, with most of the extra time occurring between the Bonita Road station and the downtown Tigard station (or the Hunziker Street station in the Branch Service option).

Both options would provide highly reliable travel times. HCT would run in an exclusive guideway for both options for BRT and LRT, and both options would pass through relatively few signalized intersections. The Adjacent to Freight Rail option would traverse three intersections, while the Adjacent to I-5 option would pass through only one.

Corridor line ridership, system transit ridership, and station activity

Line ridership and system transit ridership would be comparable between the two options due to trade-offs in station location. While the Adjacent to I-5 option would have approximately 2,000 more ons and offs at a Bonita Road station compared to the equivalent Adjacent to Freight Rail station, it would have around 2,000 fewer ons and offs at an Upper Boones Ferry Road station. These differences are due to the high concentration of employment in the Kruse Way area, which would be better served by the Adjacent to I-5 Bonita Station, and in the 72nd/Upper Boones Ferry area, which would be better served by the Adjacent to Freight Rail option.

Southeast Tigard mode considerations

Please see the discussion related to downtown Tigard.

Community development

Key considerations:

- What are the main access issues in the area?
- Are there significant land use implications between alignment choices?

Key findings:

- Existing sidewalk gaps and a lack of bicycle infrastructure, coupled with the existence of a utilized rail corridor, limit access from the residential neighborhoods to the west.
- Future plans call for the land uses in this stretch of the alignment to change very little. The area will continue to focus on providing employment uses.

Access

The majority of existing employment uses between downtown Tigard and Bridgeport Village would have a high level of access to the HCT system under either alignment option and regardless of station locations. Sidewalk gaps and bicycle infrastructure would need to be addressed along 72nd Avenue and in the Carman Drive area to make that access consistent.

Existing residential uses in southeastern Tigard would have a modest level of access to the HCT system, due to the barriers posed by Fanno Creek and the WES/freight rail line. An alignment along the existing WES rail corridor with a station at 74th Avenue and Bonita Road would offer the best access for the residential neighborhoods, although the absence of a walkable street grid and the presence of the rail crossing create less-than-ideal access conditions at this location. Pedestrian and bike crossings over the rail line and additional connections between residential streets and collectors and arterials could substantially improve access.

An alignment adjacent to I-5 would move a Bonita station more than ½ mile from the residential neighborhoods. That distance, along with the existing creek and rail barriers, would likely limit use of the station by nearby residents, but the station would provide improved access to the Kruse Way employment area on the east side of I-5.

Redevelopment potential

Employment is expected to grow in this area, particularly within the 72nd Avenue corridor. Previous land use analysis done for the Southwest Corridor, under the guidance of City of Tigard staff, showed the 72nd Avenue Employment Corridor experiencing significant growth in the coming two decades. How that growth is managed and how access to the housing developments to the west occurs need to be explored further if multiple stations are being considered in this area.

Most of this growth will likely occur through expansions onsite with some coming through full site redevelopment. Surface parking is in good supply in the area, allowing for expansion in the near term that could incorporate transit-oriented design. As the area becomes more active, development within deep setbacks or parking lots along the frontage of major roads may provide another opportunity to increase investment and bring additional retail and services to the employees and residents of the area.

Several sites in the area are currently identified by the City as having mid-term redevelopment potential, with scattered infill lots available in the residential neighborhoods to the west.

Support of local land use plans

The *Tigard HCT Land Use Plan* largely focuses on locations within downtown, the Tigard Triangle, and further west along 99W, but also analyzes the intersection of Carman/ Upper Boones Ferry Road and SW 72nd Avenue. The plan calls for this intersection, which it names Upper Bridgeport Village, to develop predominantly with employment and retail. The area is already characterized by employment uses, made up of a mix of light industrial and office. Any future retail uses in the area would be meant to serve existing employees only, not regional shoppers.

Mobility

Key considerations:

- Can high capacity transit be designed to minimize negative impacts to auto, freight, bicycle and pedestrian mobility and access?
- Do the different alignment choices have differences in the level of benefit or impact?

Key findings:

- None of the alignment options overlap with regional or statewide freight routes between Bridgeport Village and downtown Tigard.
- Because the alignments are separated from motor vehicle traffic, there are minimal changes for motor vehicles, pedestrians, bicyclists, safety, or property access.

Motor vehicle and freight mobility

Neither alignment runs along a designated freight route, whether state, regional, or local. Both alignments cross 72nd Avenue—which is a regional freight connector and local truck route—at grade, resulting in minimal impact on operations.

Both alignments are completely separated from traffic except for at-grade street crossings. The DEIS will evaluate how the at-grade street crossings affect motor vehicle traffic. The following table summarizes the intersections analyzed and the initial findings. The results show that traffic operations in this area will perform better with the HCT project than without it.

<i>Intersection</i>	Meets motor vehicle performance target?*	
	<i>2035 No-Build</i>	<i>2035 Build</i>
72 nd & Bonita	Yes	Yes
72 nd & Upper Boones Ferry (North)	No	Yes
72 nd & Upper Boones Ferry (South)	Yes	Yes
Upper Boones Ferry & Durham	No	Yes
72 nd & Durham	Yes	Yes

* Within permitted margin of accuracy

Source: *Final SW Corridor Traffic Analysis and Operations Memorandum, DKS, July 29, 2014*

Pedestrians and bicyclists

Both alignments are completely separated from traffic except for at-grade street crossings, resulting in minimal impact to the walking and bicycling environment.

Safety

Both alignments are completely separated from traffic except for at-grade street crossings, resulting in minimal differences in roadway safety. The DEIS will evaluate if there are any queuing issues on the local system and exit ramps.

Access

Both alignments are completely separated from traffic except for at-grade street crossings, resulting in minimal impacts to property access.

Lane conversions

Neither alignment option would require travel in or along an existing roadway. No lane conversions would occur in this area.

Cost Estimates

Key considerations:

- Are the trade-offs between cost of a project and other factors such as reliability, safety, access and community development opportunities clear?
- How does cost impact the length of the final high capacity transit alignment?

Key findings:

- The Adjacent to I-5 option would cost \$5M more than the Adjacent to freight rail option.

Current cost estimates for corridor HCT alignments are based on conceptual designs. Estimates will continue to be refined during the DEIS process as options are narrowed and designs progress, but are useful now in demonstrating the relative differences between current options. **All figures are in year 2014 dollars, and exclude escalation and finance costs.** Cost estimates are not yet complete for all modes, options, and segments; estimates will be updated and reported as the project progresses.

Southeast Tigard segment costs

Cost estimates are available for LRT options only. BRT cost estimates are under development, and should be available in the Evaluation Report to be released in mid-autumn.

The Adjacent to I-5 option would cost \$5M more than the Adjacent to freight rail option. The higher cost is due to more property acquisitions and construction of underpasses to avoid I-5 ramp conflicts. The cost of the Adjacent to freight rail option could increase depending on the outcome of negotiations with UPRR over right of way considerations

Engineering complexity and risk

Key considerations:

- Complexity and risk add cost to the project and could result in the cost and schedule overruns.
- What aspects of each alignment add complexity to the project?
- What aspects of each alignment option present noteworthy risk?

Key findings:

- Both options require negotiations with right-of-way owners and comparable risks related to alignment adjustments to avoid impacts to I-5 access.

While the Adjacent to freight rail alignment would be the more direct and faster option, negotiations would be required with UPRR, which owns the right of way, to allow HCT operations. These negotiations could complicate the project timeline and result in additional expense. This option could require grade separation of the transit alignment at Upper Boones Ferry Road if the DEIS analysis shows queuing impacts of an at-grade crossing on nearby I-5 exit ramps.

The Adjacent to I-5 option would avoid the UPRR right of way and the need for negotiations with the railroad. This alignment would be more expensive to construct due to commercial property acquisitions and required underpasses of I-5 ramps. This option will also require conversations with ODOT and FHWA. There is a risk that these conversations may require the transit alignment to be located west of the interchange that may have some right-of-way impacts.

Community impacts

Key considerations:

- Can the benefits and burdens of a high capacity transit alignment be equally distributed among all population groups in the corridor?

Key findings:

- Based on spatial analysis of demographic maps, both alignment option runs through areas of non-white, low-income, senior, and non-English speaking populations.
- Subsequent analysis and conversations with residents, employees and visitors to the corridor will further detail the potential for unequal distribution of benefits and burdens of high capacity transit construction and service.

Demographic maps for non-white, non-English speaking, low-income and senior populations were overlaid with maps of the proposed HCT alignments (see **Appendix D**). Future discussions with residents, employees and visitors to these areas will help expand understanding of how different racial, ethnic and language groups may be impacted by the proposed alignments.

Based on spatial analysis of demographic maps, both alignment options would run through higher than average populations of non-white, low-income and senior populations. The Evaluation Report, which will be released in October 2015, will include a more detailed analysis to compare the number of new

transit trips in areas with higher than average low income, people of color, and limited English proficiency populations.

Access to services

Investments in the transportation systems throughout the Southwest Corridor will aim to improve access to important community services such as education, health care, retail and employment centers for all residents.

Property impacts

The options under consideration have varying levels of impact to adjacent private properties. In many cases, property impacts are limited to a narrow strip needed to widen the roadway and sidewalks. In other cases, temporary construction easements may be necessary with no permanent impacts. In extreme cases, large or complete acquisitions may be necessary when impacts to buildings or other major infrastructure are unavoidable. Project staff is currently quantifying the areas of potential impact for each option and will present this information in the future.

Based on current estimates, the Adjacent to I-5 option would have slightly more property impacts than the Adjacent to Freight Rail option. Neither option in the Southeast Tigard area would have residential property impacts.

Next steps

This Key Issues memo formally introduces to decision-makers and the public information relevant to a decision on high capacity transit alignments in Tigard. Between July and December 2015, project staff will present information on alignments in Tigard and other Southwest Corridor Plan issues and invite public comment at meetings and online. An updated calendar can be found on our website:

<http://www.oregonmetro.gov/public-projects/southwest-corridor-plan>

Upcoming staff reports and Steering Committee review of Southwest Corridor issues that affect Tigard include:

September 2015: This Key Issues memo will be presented to the Southwest Corridor Steering Committee for review and discussion. A technical evaluation report will be released in October with an in-depth assessment of options for accessing Tigard and Tualatin.

December 2015: The Steering Committee will make recommendations for public review on which HCT alignments in Tigard to continue studying, as well as the preferred travel mode and terminus. The Steering Committee will also review and discuss the list of Shared Investment Strategy projects and the funding strategy for those projects.

Appendix A: Anticipated major project documents and estimated dates of completion

December Steering Committee decision: remaining HCT alignments, mode, and terminus and SIS funding strategy

- Key Issue Memos:
 - Tigard – September
 - Bridgeport Village to Tualatin – September
 - HCT mode – October
 - HCT terminus – October
- Technical modifications memo: Central Barbur area – October
- Draft Evaluation Report, Part 2 – October
- Draft Recommendation Report – November
- Funding strategy for Shared Investment Strategy roadway, bike and pedestrian projects – December

Appendix B: Shared Investment Strategy roadway and active transportation projects

The information in this appendix will be further developed and presented as a stand-alone document.

The Shared Investment Strategy (SIS) Roadway and Active Transportation Project List includes projects that improve access to both key places in the corridor and to the high capacity transit (HCT) alignments currently under consideration:

- **HCT-aligned projects** are roadway, bikeway and pedestrian projects that were initially identified in the SIS in July 2013, and then were further refined in July 2014 as the HCT alignments were narrowed. These projects either run along the HCT alignment (and would be incorporated into HCT designs and cost estimates) or improve access to station areas.
- **Corridor Connections** are roadway, bikeway and pedestrian projects that improve connectivity and mobility across the corridor, beyond the immediate geographic area of a potential HCT line. These were identified in the SIS in July 2013 as critical for the support of land use goals in essential and priority places.

Some of the projects identified as HCT-supportive are also critical land use supportive projects, and will remain on the SIS Roadway and Active Transportation Project List as Corridor Connections projects if their associated HCT station or alignments are removed from consideration. Other HCT-supportive projects that do not support key land uses will be removed from the SIS project list as their associated HCT alignments or stations are removed from consideration.

For all projects on the SIS Roadway and Active Transportation Project List, potential funding sources will be identified. For HCT-supportive projects, one potential funding approach will be as part of the HCT package, but other potential funding sources will be identified for each project to support their implementation whether as part of a transit project or as a standalone project. Some of the projects will require traffic analysis and evaluation of other impacts prior to project partner support for implementation.

The following map and table show both the HCT-supportive and Corridor Connections projects in the downtown Tigard, Tigard Triangle and Kruse Way areas.

HCT-supportive projects in the downtown Tigard, Tigard Triangle and Kruse Way areas

The HCT-supportive projects in this area would focus on improving bike and pedestrian access to the potential HCT stations and along the HCT alignment.

Corridor Connections projects in the downtown Tigard, Tigard Triangle and Kruse Way areas

The Shared Investment Strategy includes several additional bike and pedestrian projects in this area that would not be directly linked to the HCT alignments.

Tigard Key Issues – September 4, 2015

Project # Location/ Ownership	Title Description	Cost	Primary Mode	Primary Project Type	Notes
1100 Tigard WashCo.	Hall/Hunziker/Scoffins Intersection Realignment Realign offset intersection to cross intersection to alleviate congestion and safety issues	\$	Auto/Freight	Corridor Connections	
2077 Tigard ODOT	Tigard Transit Center crossing improvements. Shorten crossing distances, make crosswalks more visible, and provide more time for pedestrians to cross at the intersections of 99W and SW Greenburg Rd., 99W & SW Hall Blvd., and 99W & SW Dartmouth St.	\$	Pedestrian	HCT Supportive	With all HCT options: Include crosswalk visibility and timing elements at Greenburg, Hall, Dartmouth, 72nd, and 68th (50%)
2079 Tigard	Tigard Transit Center pedestrian path Formalize the informal path running from Center Street Connection from SW Commercial St. to SW Hall Blvd., by paving it, making it ADA accessible, providing lighting, and wayfinding signage.	¢	Pedestrian	HCT Supportive	
2080 Tigard	Tigard Transit Center sidewalk infill. Build sidewalks, where there are none, along SW Scoffins St. & SW Ash St. These streets are near the Tigard Transit Center and provide access to it. Ensure there is a landscaped buffer between pedestrians and motor vehicles.	¢	Pedestrian	HCT Supportive	
1107 Tigard WashCo.	Hwy. 217 Over-crossing - Hunziker Hampton Connection Build new connection of Hunziker Road to 72nd Avenue at Hampton St., requires over-crossing over Hwy 217, removes or revises existing 72nd Avenue/Hunziker intersection/ connection.	\$\$\$\$	Auto/Freight	HCT Supportive	With HCT crossing from Beveland to Wall in Tigard: Include
5024 Tigard	68th Avenue (widen to 3 lanes) Widen to 3 lanes or for transitway including sidewalks and bike lanes between Dartmouth/I-5 Ramps and south end	\$\$\$	Multimodal	HCT Supportive	With all HCT options: Include sidewalk on one side from Atlanta to south of Baylor With HCT on 68th Avenue: Include
1078 Tigard	Atlanta Street Extension (new roadway) Extend Atlanta Street west to Dartmouth Street	\$	Auto/Freight	HCT Supportive	
5037 Tigard WashCo. ODOT	Hall Boulevard Widening, Oleson to 99W Widen to 3 lanes; build sidewalks and bike lanes; safety improvements	\$	Multimodal	Corridor Connections	

Tigard Key Issues – September 4, 2015

Project # Location/ Ownership	Title Description	Cost	Primary Mode	Primary Project Type	Notes
1077 Tigard	Ash Avenue railroad crossing (new roadway) Extend Ash Avenue across the railroad tracks from Burnham to Commercial Street.	\$	Auto/Freight	HCT Supportive	Requires closure of another crossing by the city of Tigard
5004 Lake Oswego	Boones Ferry Road Boulevard improvements (turn lanes with bike/ped. - Madrona to Kruse Way) Widen to include bike lanes, sidewalks, and turn lanes. This project is Phase 2, Oakridge/Reese to Kruse Way. Phase 1 (\$23 Million) is in Low Build.	\$\$	Multimodal	Corridor Connections	
6002 Lake Oswego	Carman Dr. sidewalks and bike lanes Add bike lanes and pedestrian pathway	\$	Bike/Ped	Corridor Connections	
3121 Tigard Lake Oswego	Bonita Road bike lanes: 72nd to I-5 Install bike lanes in eastbound direction from 72nd Avenue to I-5 Bridge	¢	Bicycle	HCT Supportive	With HCT station at Bonita & 74th: Include as re-striping only
3117 Tigard Tualatin	72nd Avenue bikeway: 99W to city limits Install bike facilities on both sides of the street from Highway 99W to South City Limits	\$	Bicycle	HCT Supportive	With all HCT options: Include if done through re-striping (conversion from 3-lane to 2-lane with bike lanes)
3129 Tigard	Tigard Transit Center Bicycle Hub Provide bicycle hub at Tigard Transit Center	¢	Bicycle	HCT Supportive	With all HCT options: Include as bike 'n ride
2058 Tigard	Hunziker Street Sidewalks: 72nd to Hall Install sidewalk on both sides of the street from 72nd Avenue to Hall Boulevard	\$	Pedestrian	HCT Supportive	With HCT station at Hunziker & Wall: Include one side from Wall/Beveland overcrossing to 72nd
2054 Tigard	Commercial Street sidewalks: Main to Lincoln Install sidewalks on both sides of the street from Main Street to Lincoln Street	¢	Pedestrian	HCT Supportive	Include on one side of street (50%)

Tigard Key Issues – September 4, 2015

Project # Location/ Ownership	Title Description	Cost	Primary Mode	Primary Project Type	Notes
2045 Tigard	72nd Avenue sidewalks: 99W to Bonita Complete gaps in sidewalk on both sides of street from Highway 99W to Bonita Road	\$	Pedestrian	HCT Supportive	With all HCT options: Include one side from 99W to Dartmouth (25%) With HCT station at Beveland: Include one side from Dartmouth to Hunziker (25%) With HCT station at 72nd & Tech Center Drive: Include west side from Tech Center Drive to south of Landmark Lane (20%) With HCT station at WES & Bonita: Include east side from Bonita to Landmark Lane (10%)
2046 Tigard	72nd Avenue sidewalks: Upper Boones Ferry to Durham Install sidewalk on both sides of street from Upper Boones Ferry Road to Durham Road	\$	Pedestrian	HCT Supportive	With HCT to Bridgeport Village: Include

Appendix C: Corridor-wide mode considerations

The information in this appendix will be further developed and presented as a stand-alone document.

Two high capacity transit (HCT) modes are under consideration for the corridor:

- Light rail transit (LRT)
- Bus rapid transit (BRT)

Bus Rapid Transit description

There are currently four operating LRT (or MAX) lines and one under construction in the Portland area. In 2014, BRT was selected as the preferred mode for the under-development Powell-Division Transit Development Project, but to date BRT does not operate in the region. Typically, BRT is differentiated from standard bus service by several characteristics:

- Fifty percent or more of the alignment operate in dedicated transitway lanes to increase speed and reliability.
- Portions of the alignment may have queue bypass lanes, signal priority, or other design elements to speed travel.
- Vehicles are larger capacity and have multiple doors for entry and exit.
- Fare payment is made off-board to reduce dwell times.
- Stations are similar to LRT or streetcar stations, and are spaced further apart than local service bus stops for faster service.

Capital costs

Depending on the percentage of dedicated transitway for a BRT alternative, capital costs to construct physical infrastructure are more expensive for LRT, which operates in fully dedicated transitway, in large part due to right-of-way acquisition of property required for construction. It is important that BRT planning consider the risks of “watering down” a project by deciding to operate BRT in congested roadways to avoid high capital costs or engineering complexity. This can diminish the effectiveness of BRT service as the most difficult places to attain exclusive right of way are often the places it is most needed.

Capital costs are a one-time cost shared by many partners including the federal government, which usually contributes 50% of a project’s capital cost, as well as state and local governments, municipal planning organizations, transit agencies, and other private partners.

Operating and maintenance costs

The vehicle operator accounts for the largest share of operating costs regardless of mode. Since an LRT vehicle has greater capacity compared to a BRT vehicle (266 versus approximately 86), fewer LRT vehicles are required to carry an equivalent passenger load, making LRT less expensive to operate than BRT. SW Corridor model runs indicate that in the year 2035 the 7.5 minutes assumed peak headway (number of minutes between vehicle arrivals) for LRT is sufficient to accommodate peak-hour, peak-

direction demand. For BRT, however, the peak frequencies would need to be increased to 3 minute headways to accommodate demand. This would result in higher operating costs for BRT for the lifetime of the service. On-going operating and maintenance costs are largely locally funded.

Speed, service and ridership

LRT attracts more riders than BRT. Because LRT always operates in exclusive transit lanes and because it is more likely to be granted signal priority at intersections, light rail is faster and more reliable than BRT. Stated preference surveys also show that LRT attracts more discretionary riders than BRT, due to speed advantages but also to better perceived ride quality compared to BRT.

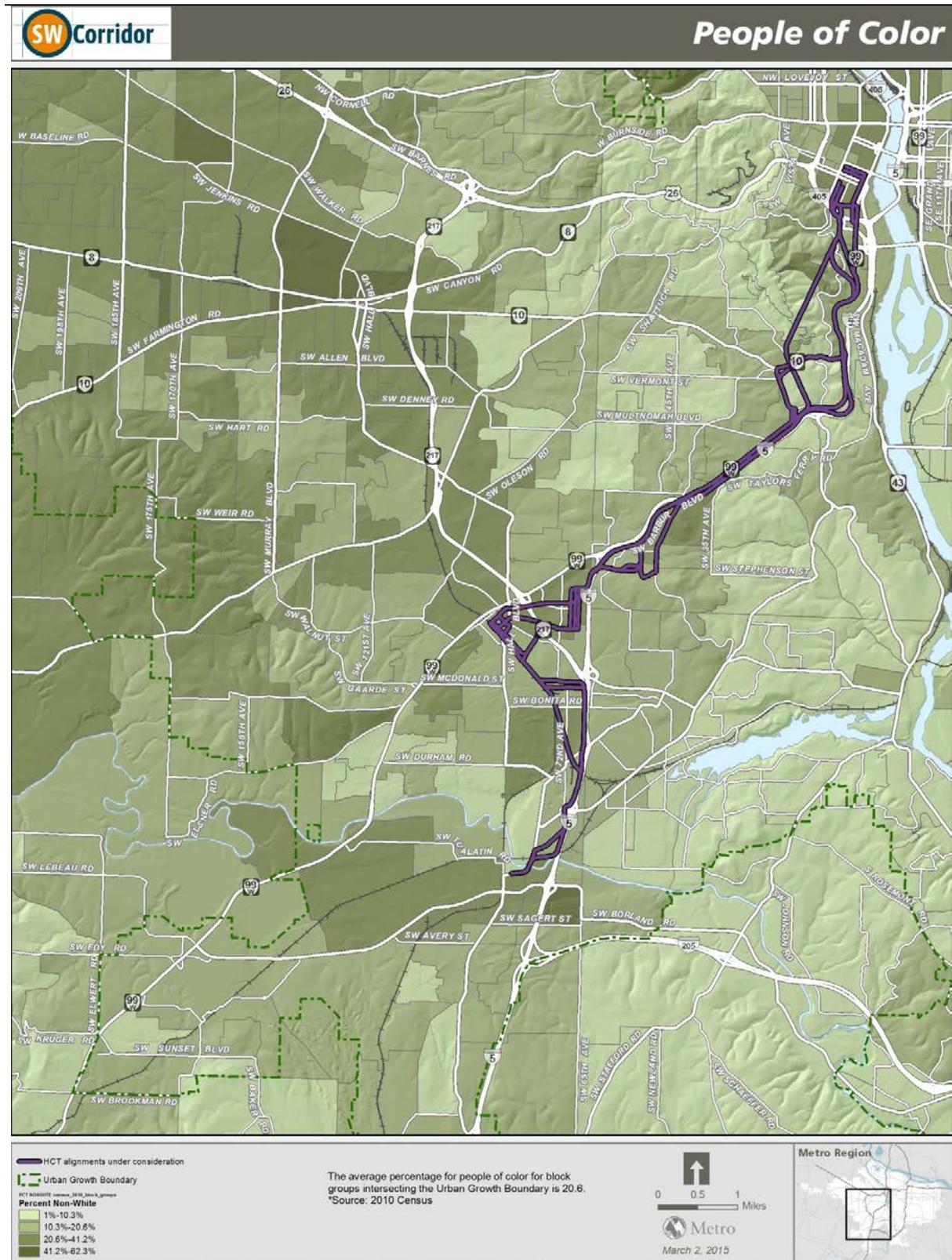
Models indicate that in 2035 the demand for HCT in the Southwest Corridor would require 20 BRT vehicles per hour in the peak, while LRT is assumed to operate with eight vehicles per hour in the peak with enough capacity still available to accommodate ridership growth beyond 2035. For BRT, growth above the projected 2035 demand would require yet more increases in service.

HCT service provides travel time advantages over local buses because of exclusive right of way but also because of longer distances between stations and signal priority at intersections. The high number of hourly vehicles required for BRT can be expected to diminish some of the travel time benefit from signal priority. The more frequently HCT vehicles pass through an intersection, the less likely signal priority can be given to the transit vehicles over autos. When the frequency of signal priority requests interferes with auto movement, priority for HCT vehicles is limited. It's expected that traffic would be largely unaffected by the eight LRT vehicles per hour assumed in the peak in 2035; however, the frequency required for BRT would likely prohibit full priority.

Development

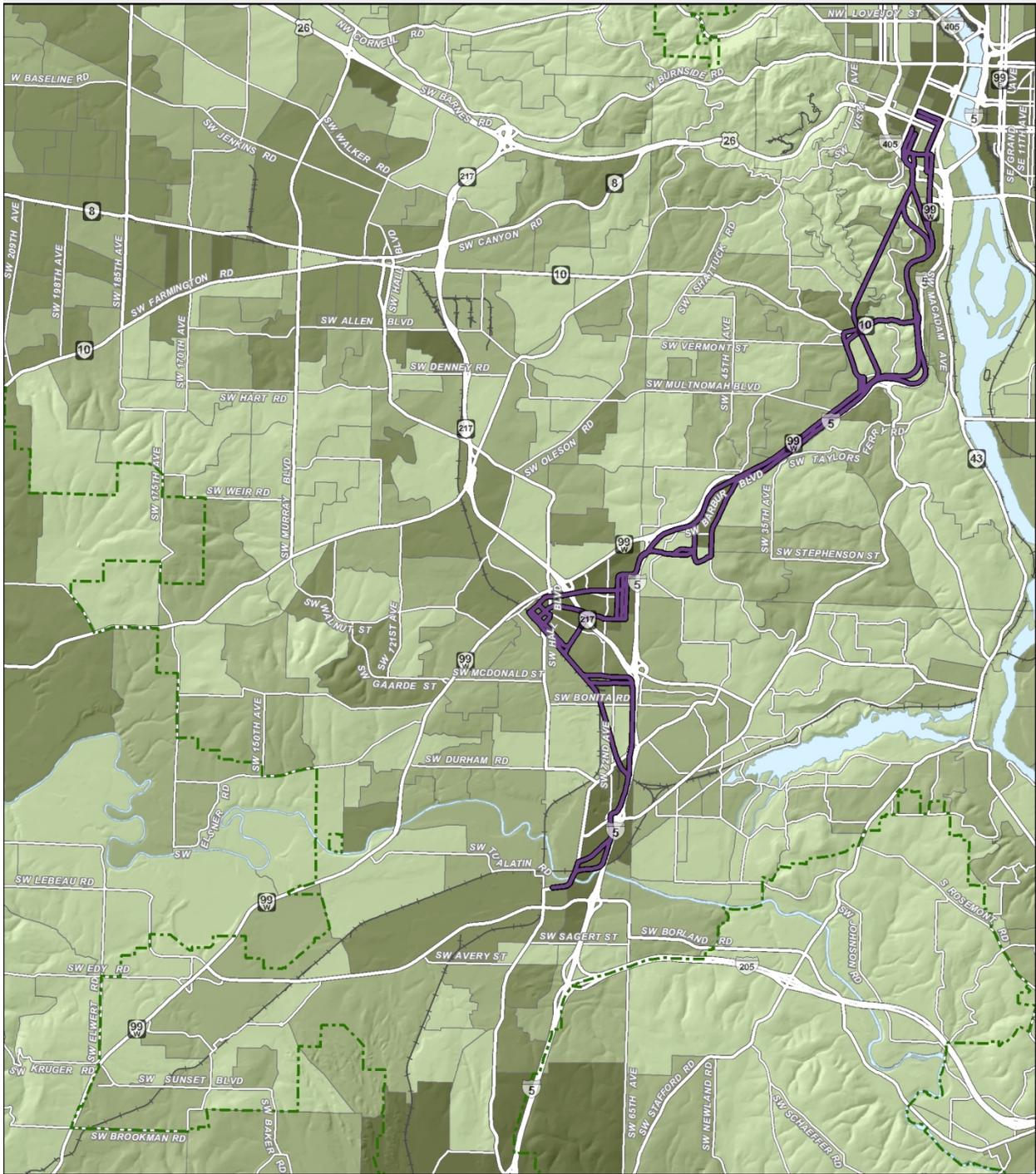
Both BRT and LRT would leverage private development investment at station areas. Available research assessing the difference in scale of development by mode is inconsistent and contradictory. Staff will address development by mode over the course of the next year.

Appendix D: Demographic maps





American Indian or Alaskan Native Population



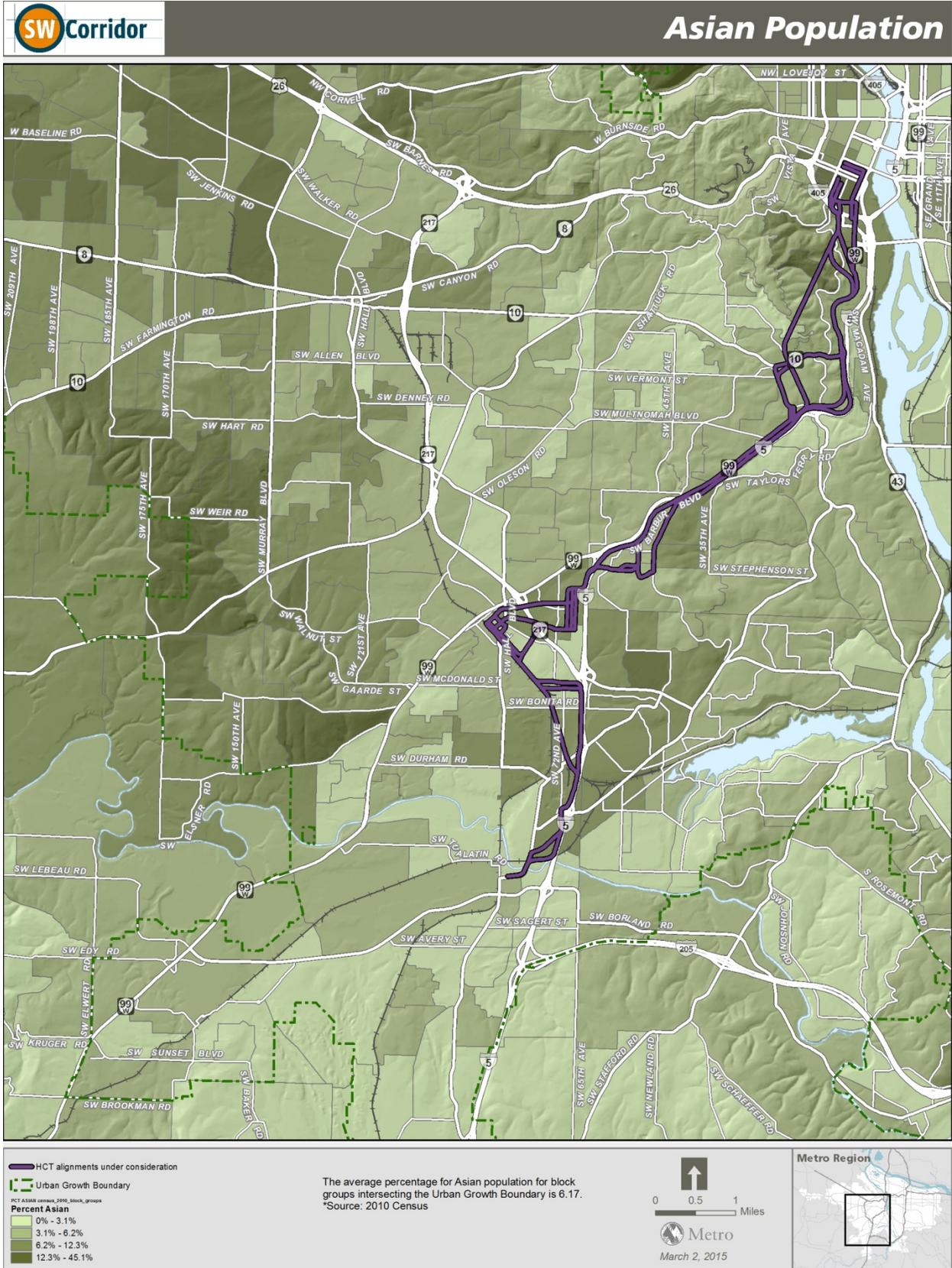
HCT alignments under consideration
 Urban Growth Boundary
PCT AIAN census_2010_block_groups
Percent AIAN
 0% - 46%
 46% - 91%
 91% - 1.8%
 1.8% - 5.3%

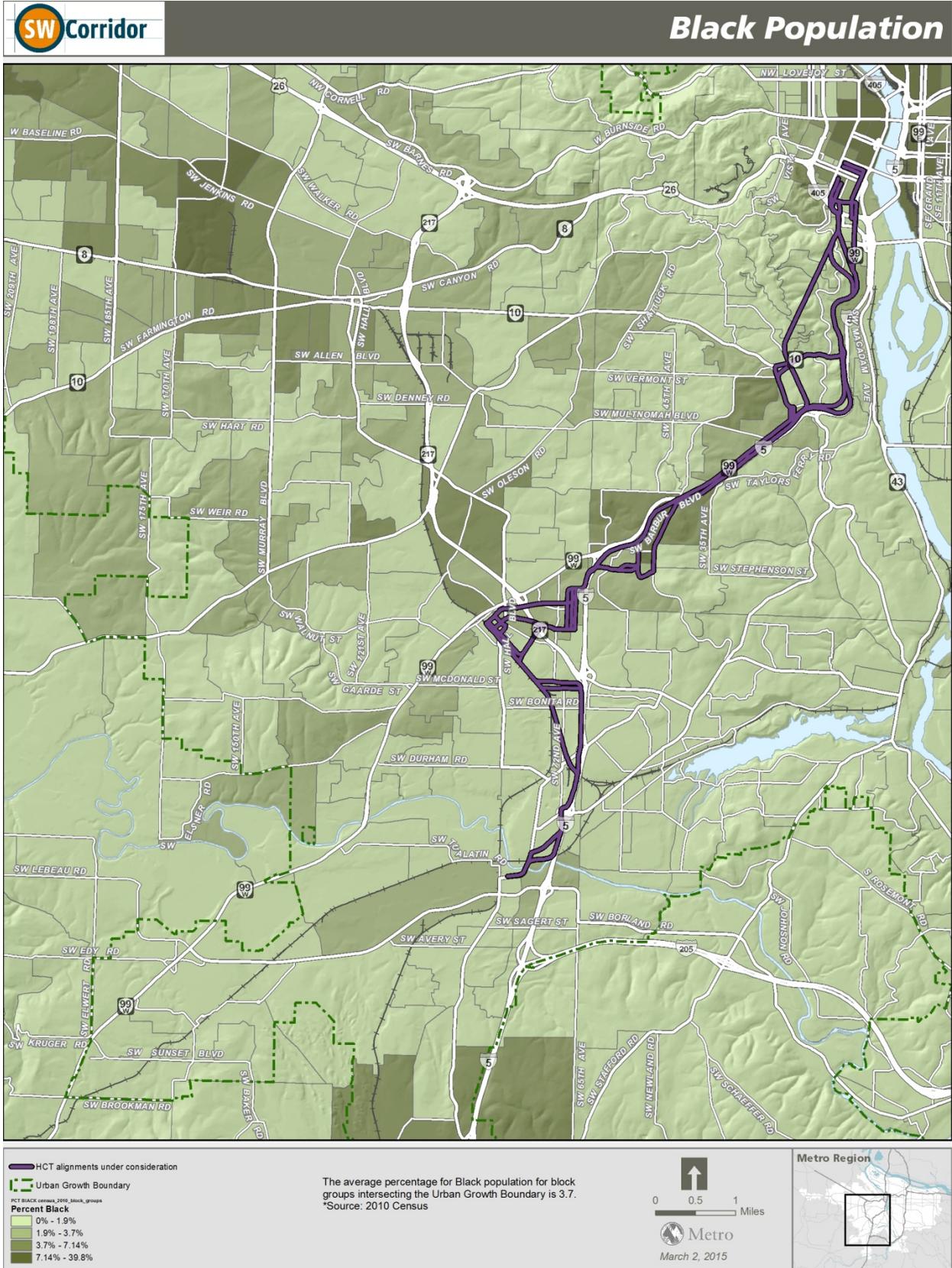
The average percentage for AIAN population for block groups intersecting the Urban Growth Boundary is 0.91.
 *Source: 2010 Census

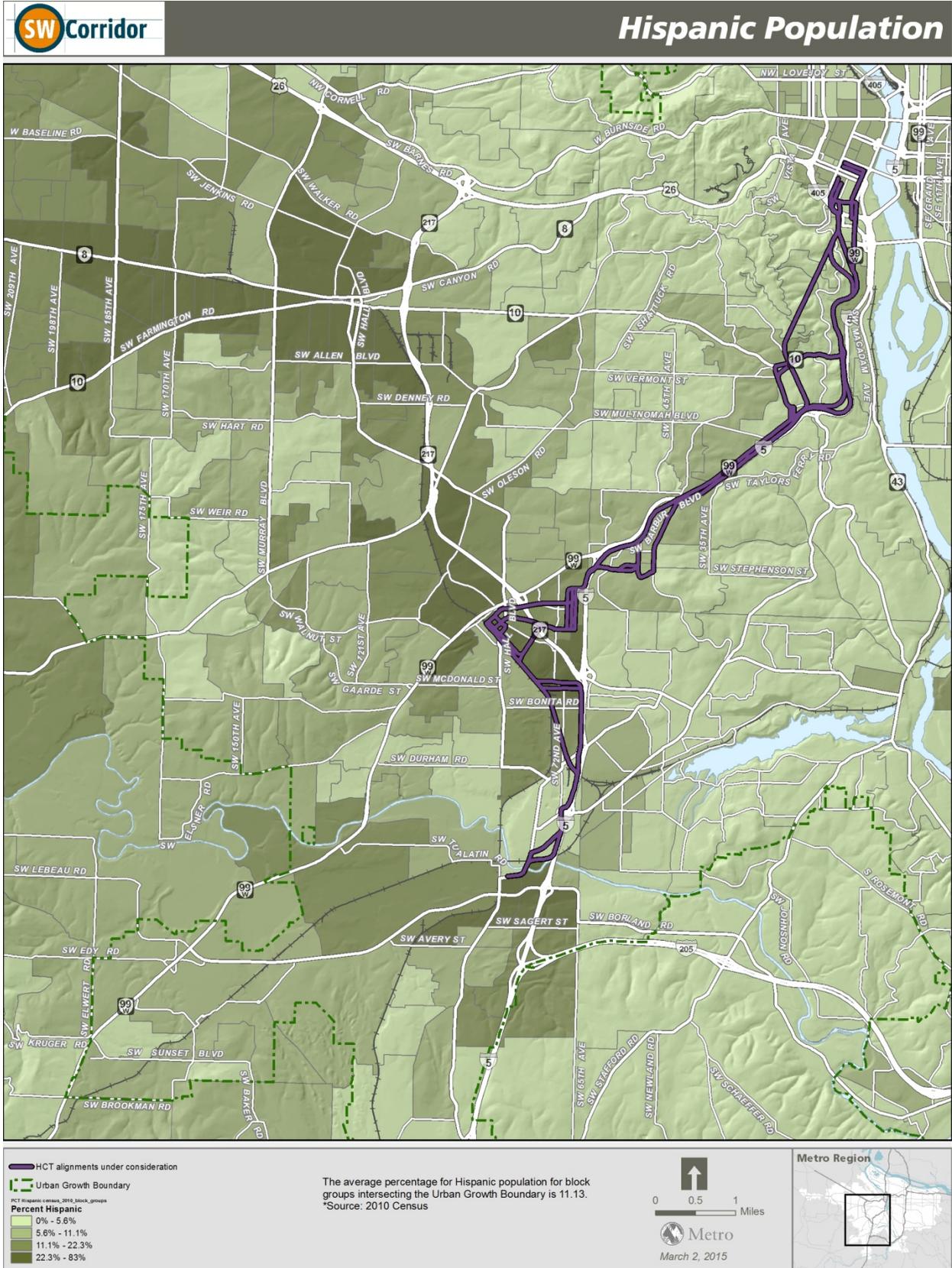
0 0.5 1 Miles

 Metro
 March 2, 2015



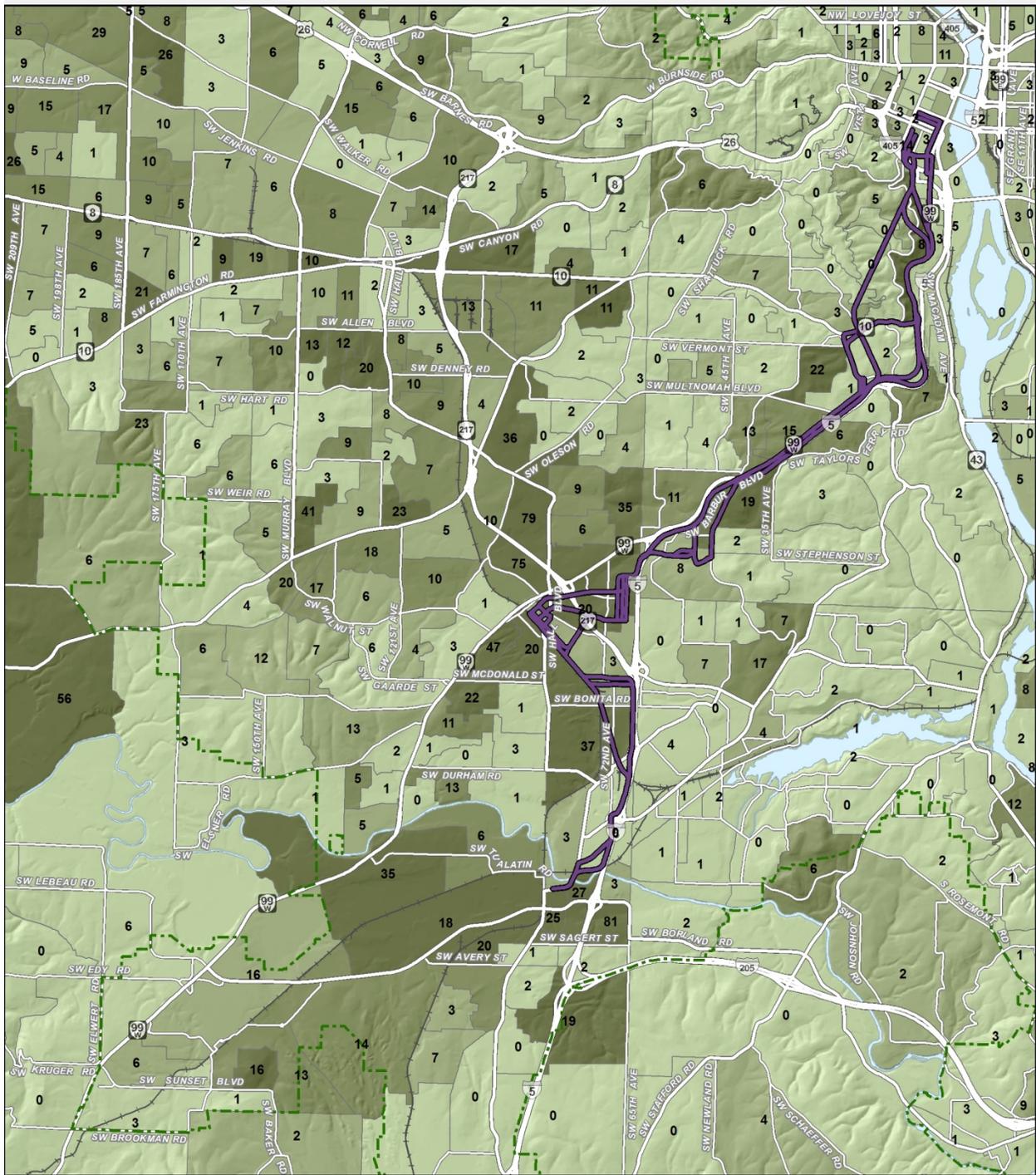








Native Hawaiian or Pacific Islander Population



HCT alignments under consideration
 Urban Growth Boundary
PCT 88199 census_2010_block_groups
Percent NHPI
 0% - 22.5%
 22.5% - 45%
 45% - 9%
 9% - 6.6%

The average percentage for NHPI population for block groups intersecting the Urban Growth Boundary is 0.45. Each block group is labeled with its total NHPI population.
 *Source: 2010 Census

March 2, 2015



