Southwest Corridor Plan

Key Issues: PCC - Sylvania Area

Discussion Draft, April 13, 2015

GREAT PLACES
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Key Issues: PCC-Sylvania Area

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Southwest Corridor Plan overview

The Southwest Corridor Plan is a comprehensive approach to achieving community visions through integrated land use and transportation planning. The Southwest Corridor Plan incorporates high capacity transit (HCT) alternatives, roadway, bicycle and pedestrian projects and adopted local land use visions, including the Barbur Concept Plan, the Tigard High Capacity Transit Land Use Plan, Linking Tualatin and the Sherwood Town Center Plan. The Plan is exploring Bus Rapid Transit (BRT) and Light Rail Transit (LRT) alternatives for several alignments that connect the Portland Central City, Southwest Portland, Tigard, and Tualatin.

In July 2013, the Southwest Corridor Plan Steering Committee recommended a Shared Investment Strategy that includes key investments in transit, roadways, active transportation, parks, trails and natural areas. A refinement study was initiated in August 2013 to narrow HCT options, identify a preferred alternative and create a subset of road and active transportation projects. In June 2014, the Steering Committee accepted the recommendation of a narrowed set of HCT design options and requested additional refinement work from staff.

In December 2014, the Steering Committee directed project staff to use these findings and further community input to develop a Preferred Package of transportation investments to support community land use goals. The Preferred Package is anticipated to be defined in spring 2016.

After the Steering Committee approves the Preferred Package, the identified HCT mode, alignment options, roadway, bicycle and pedestrian projects will receive full environmental review in a Draft Environmental Impact Statement (DEIS) under the National Environmental Policy Act (NEPA). It is anticipated that additional roadway, transit, bicycle and pedestrian projects will be further studied, funded and implemented through other collective federal, state, regional and local efforts.

Desired outcome: Preferred Package

Project partners will work 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:

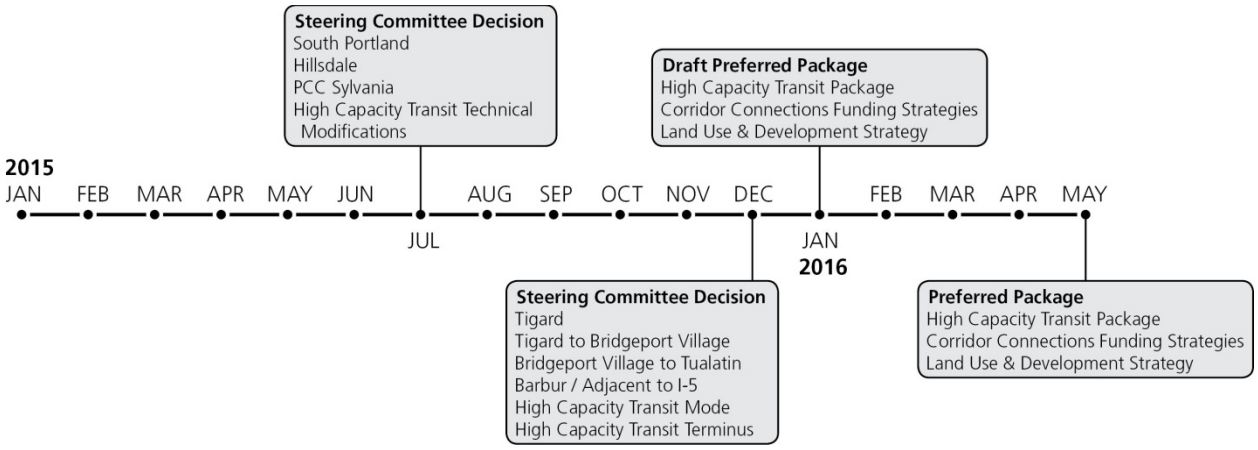
- ***HCT Preferred Alternative:*** Preferred HCT alignments to study further in a DEIS, including mode, alignments, terminus, and associated roadway, bicycle, and pedestrian projects
- ***Corridor Connections:*** Potential funding source and timeframe for each of the roadway, bicycle, and pedestrian 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 of 2016, two key Steering Committee decision-making points have been identified in 2015: July and December. Technical analysis, place-based public outreach, and partner conversations will precede each Steering Committee decision. A draft recommendation report will be presented at community forums before each decision-making point, including public comment gathered during the place-based outreach period and any additional technical analysis compiled.

The July Steering Committee decision will focus on surface versus tunnel access to key destinations in the corridor including Marquam Hill, Hillsdale, and the Portland Community College (PCC) Sylvania Campus, as well as technical modifications to other HCT alignments. The December Steering Committee decision will focus on the remaining HCT alignments and terminus options as well as an HCT mode decision between LRT and BRT. In January 2016, the Steering Committee will identify a Draft Preferred Package, including HCT mode, alignment options, terminus options, and associated roadway and active transportation projects for further study in a DEIS, a funding strategy for additional priority roadway, bicycle, and pedestrian projects throughout the corridor, and integrated land use and development strategies.



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. The place-based key issues will be reviewed by the public and the Steering Committee in the context of their implications for achieving the multifaceted goals for the corridor as a whole. Decision makers and the public will have several months to discuss this report through public meetings and online engagement. A staff recommendation report focusing on HCT options in the South Portland, Hillsdale, and PCC-Sylvania areas will be available prior to the July 2015 Steering Committee

meeting and will include a summary of stakeholder feedback. The remaining place-based evaluation and recommendation reports will be available before the December 2015 Steering Committee decision.

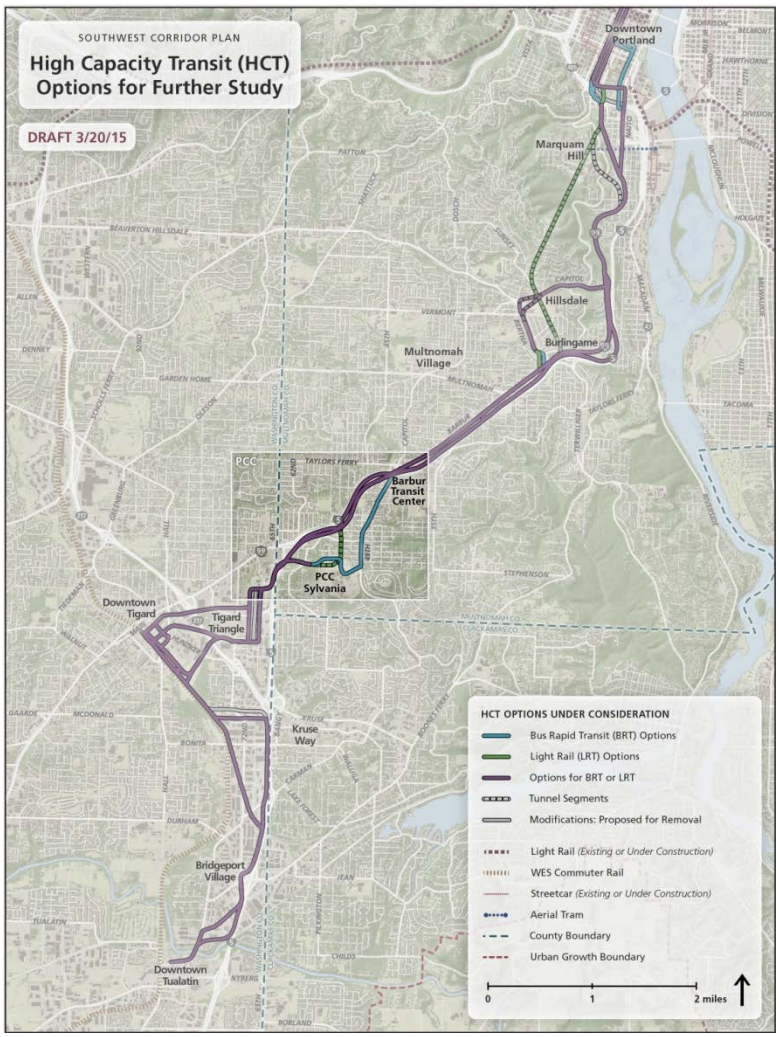
This document fits into a broader array of technical information that supports Steering Committee decision making during this phase of the Southwest Corridor Plan. **Appendix A** lists the anticipated major project documents and their estimated dates of completion.

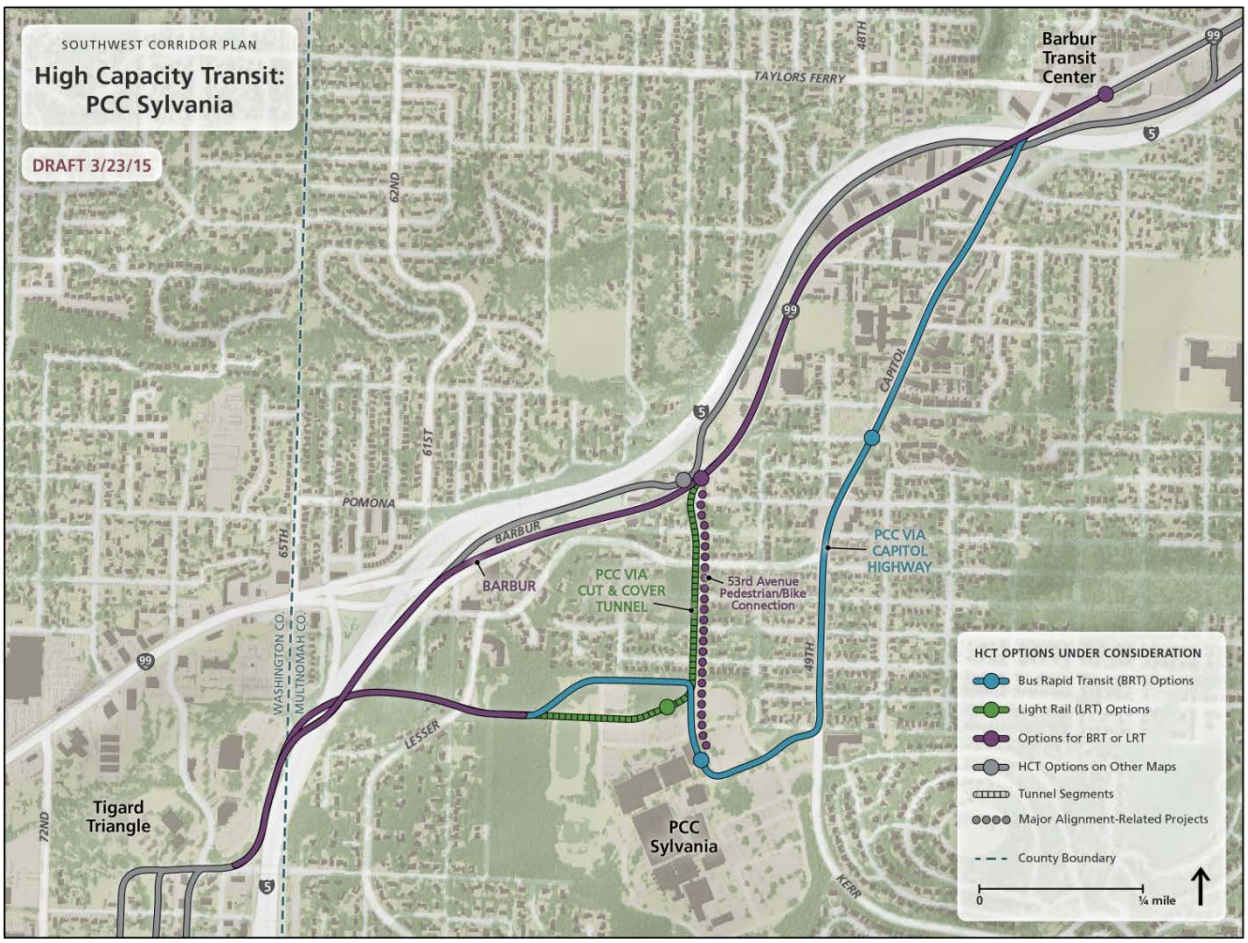
This document includes an overview of the decision making process as it relates to the key issues in the PCC-Sylvania area, a description of the three proposed high capacity transit alignments to serve the campus, a summary of technical information and a description of key issues for decision makers and the public to consider. Appendices contain supplemental information including maps and project lists of Shared Investment Strategy road, bicycle and pedestrian projects being considered for the PCC-Sylvania area, a discussion of general transit mode considerations, and maps highlighting demographic factors in the study area.

PCC-Sylvania Area Key Issues summary

The PCC-Sylvania area encompasses the project area between the Crossroads intersection (SW Barbur Boulevard, SW Capitol Highway, and I-5 ramps just south of the Barbur Transit Center) to the northeast and the Tigard Triangle to the southwest and includes three HCT options under consideration:

1. Barbur Boulevard between Crossroads and the Tigard Triangle (BRT or LRT)
2. PCC campus via Capitol Highway (BRT only)
3. PCC cut-and-cover tunnel (LRT only)





Major decisions in the PCC-Sylvania area

In July 2015 the Southwest Corridor Plan Steering Committee will be asked to make a recommendation on which of the proposed HCT alignment choices for serving the PCC-Sylvania area will advance to further environmental review through a DEIS that could begin as early as late 2016. This document focuses on the substantial tradeoffs between options so that the public and decision makers can be confident that all options that will enter the DEIS are viable and aligned with project goals.

Major decisions in the PCC-Sylvania area

July 2015:

- Should the DEIS include study of a direct access BRT option along Capitol Highway to PCC-Sylvania?
    - What are the travel time and ridership tradeoffs of a lengthier direct BRT route to campus?
- Should the DEIS include study of a direct access LRT option with a cut-and-cover tunnel to PCC-Sylvania?

    - What are the construction impacts and cost tradeoffs of this option? Are future campus plans commensurate with such an investment?
- Should the DEIS include study of a Barbur option with a surface pedestrian/bike connection between a Barbur station and the PCC-Sylvania campus? How viable would such a connection be for providing campus access and how would it impact the neighborhood?

- Will the local transit service improvements proposed in TriMet's Southwest Service Enhancement Plan provide the necessary connections and service frequency to the campus, with or without an HCT investment?

December 2015:

- 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 PCC-Sylvania to connect to the HCT project?
- What is the best implementation approach for roadway, bicycle and pedestrian Corridor Connections projects defined in the Shared Investment Strategy for the PCC-Sylvania area?

Deliberation and decision making will be driven by how well each element of the proposed project meets the Southwest Corridor Plan overarching 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.

Key Considerations

This PCC-Sylvania Area Key Issues memo outlines data collected through technical analysis, local knowledge and partner discussions that will influence this decision including:

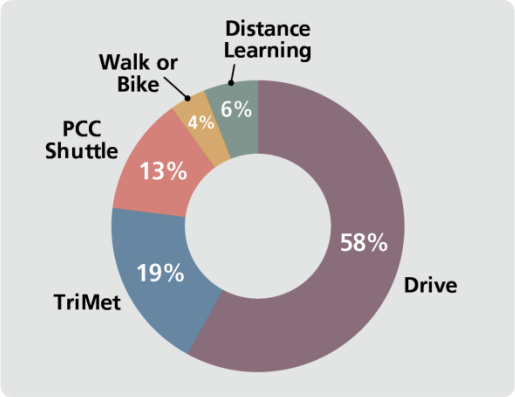
- Transit performance
- Community development
- Mobility
- Capital cost estimates
- Engineering complexity and risk
- Community impacts

Portland Community College: Sylvania Campus

Sylvania campus in context

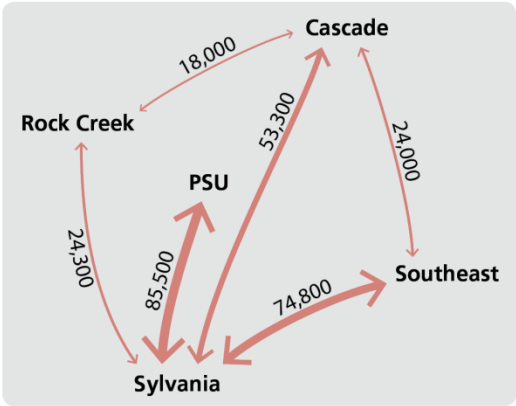
- First PCC campus, opened in 1968
- 120 acres with 900,000 developed square feet
- Campus facilities were upgraded through a 2000 bond, and are continuing to be upgraded through a 2008 bond
- Largest enrollment of the four campuses: 31,868 students in the 2012-2013 academic year, or a full-time equivalent of 12,137 students
- Permitted under a conditional use master plan, but now at the limits of the plan, so future development would require a new campus master plan

How do students get to the Sylvania campus?



DATA FROM 2012 STUDENT COMMUTE SURVEY

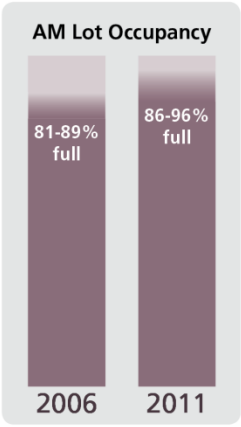
PCC shuttle ridership (2012-2013 Academic Year)



DATA FROM WWW.PCC.EDU/RESOURCES/PARKING/SHUTTLE

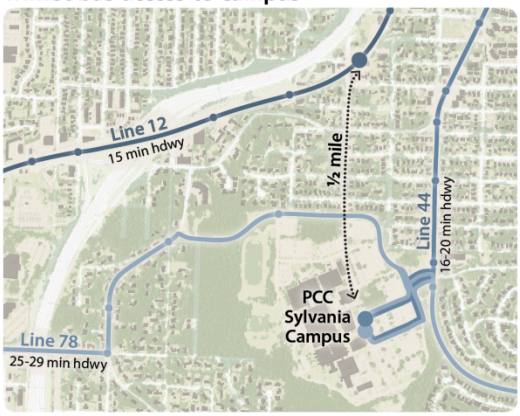
Parking at Sylvania

- Capacity: 2,421 vehicles
- Parking permits cost $5 per day, $50 per term for students, or $37.50 per term for faculty and staff
- Parking permit fees cover cost of street maintenance

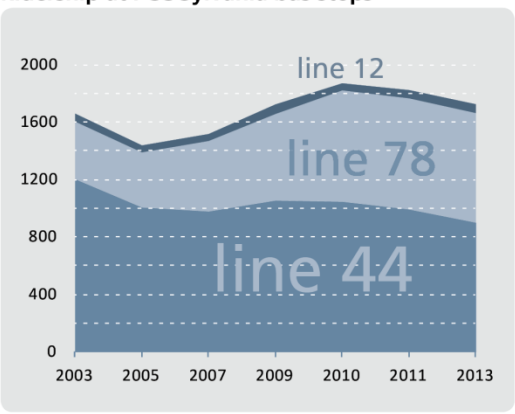


DATA FROM 2012 TDM REPORT

TriMet bus access to campus



Ridership at PCC Sylvania bus stops



ONS AND OFFS FOR #12 AT BARBUR & 53RD (UNIMPROVED WALK CONNECTION TO PCC)
DATA FROM TRIMET PASSENGER CENSUS

PCC-Sylvania area summary

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

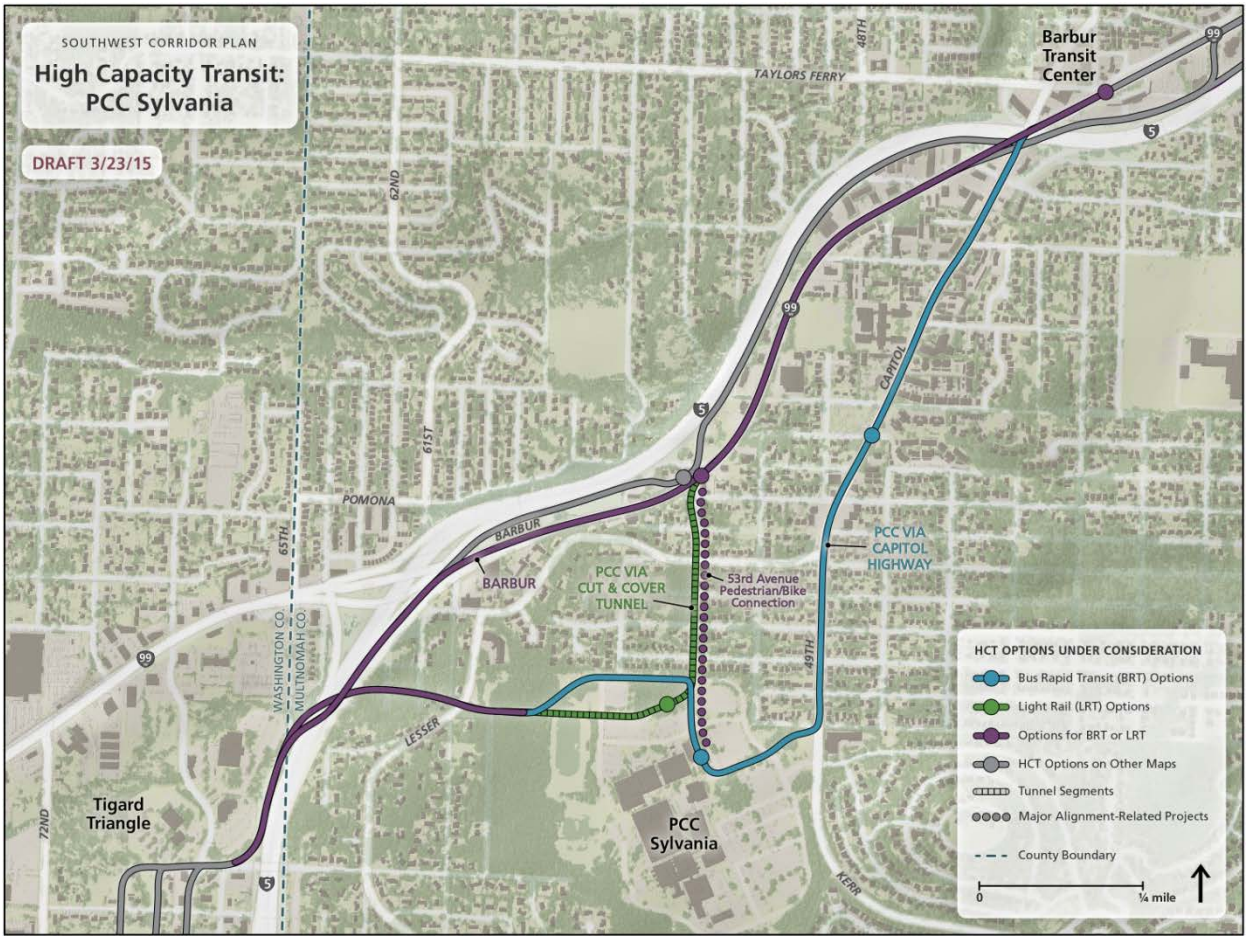
Key considerations	Evaluation factors	Barbur – (BRT or LRT)	PCC via Capitol (BRT)	PCC via cut-and-cover tunnel (LRT)
Transit Performance • How should the tradeoffs in transit performance be weighed between alignments that serve PCC directly and those that stay on Barbur, including travel time, cost, construction complexity and risk, and community development impacts?	*2035 new transit trips*	New transit trips: 8,400 (BRT) 15,700 (LRT)	New transit trips: 9,700	New transit trips: 17,800
	2035 line riders	Line riders: 30,800 (BRT) 43,500 (LRT)	Line riders: 32,900	Line riders: 46,200
	Travel time (PSU to Tualatin)	Travel time: 34.1 minutes (BRT) 31.1 minutes (LRT)	Travel time: 35.7 minutes	Travel time: 31.9 minutes
Community Development • Can local transit and an improved bike and pedestrian connection on or near 53rd Ave effectively connect the PCC Campus to an HCT alignment on Barbur? • Are there land use changes that could occur on the PCC-Sylvania campus in the next 15-20 years that would support a high-cost tunnel investment required for a direct LRT connection?	*Access*	• Station at Barbur and 53rd Ave with improved walk/bike connection to campus (1/3- to ½- mile)	• PCC campus station	• PCC campus station
	Redevelopment potential	• Some redevelopment potential at Barbur and SW 53rd Ave	• Opportunity for significant campus redevelopment • Current PCC master plan would require changes to allow redevelopment	• Opportunity for significant campus redevelopment • Current PCC master plan would require changes to allow redevelopment
Mobility • How do alignment choices affect cars, bikes and pedestrians? • How do alignment choices impact road, bike and pedestrian improvement projects that could serve PCC and the neighborhood?	*Accessibility*	• Includes sidewalk/bike improvements along Barbur • Includes sidewalk/bike improvements along 53rd to link PCC to Barbur station	• Includes sidewalk/bike improvements along Capitol and to access station • Could consider converting lanes on Capitol to HCT-only	• Includes sidewalk/bike improvements to access station and along Barbur east of 53rd

Key considerations	Evaluation factors	Barbur – (BRT or LRT)	PCC via Capitol (BRT)	PCC via cut-and-cover tunnel (LRT)
Mobility • How do alignment choices affect cars, bikes and pedestrians? • How do alignment choices impact road, bike and pedestrian improvement projects that could serve PCC and the neighborhood?	*Accessibility*	• Could consider converting lanes on Barbur to HCT-only		• Could consider converting lanes on Barbur to HCT-only
	Mode considerations	• 20 BRT vehicles per hour in the peak • 8 LRT vehicles per hour in the peak	• Same as Barbur alignment option	• Same as Barbur alignment option
Capital Costs • 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?	*Cost estimates in 2014 dollars*	• LRT: $1.9B - $2.4B line, $225M PCC area segment • BRT: $750M - $1.2B line, PCC segment under development	• $750M - PCC segment cost under development (expected May 2015)	• $469M segment cost ($244M more than LRT on Barbur)
Engineering complexity/risk • What are the benefits and risks associated with construction of a deep-bored tunnel or a cut-and-cover tunnel? • What aspects of each alignment option present noteworthy risk?	*Risk*	• At-grade option with station on Barbur • Requires major improvements to 53rd Avenue to provide walk access from station	• At-grade option with dedicated transitway on PCC campus	• Requires cut-and-cover tunnel along length of 53rd Avenue • Potential geotechnical and construction risks involved with mining operation
Community impacts • How would construction of a cut-and-cover tunnel impact the neighborhood? • How would the Barbur to PCC campus bicycle and pedestrian connection along 53rd Ave impact the neighborhood?	*Access* *Property Impacts*	• Shortest in-vehicle travel time but longest walk between station and campus • Opportunity for station area and park and ride along Barbur near 53rd Avenue	• Provides more direct service to Capitol Highway neighborhoods • Provides front door service to PCC Sylvania staff and students	• Substantial construction impacts and potential displacement of neighborhood residents along cut-and-cover tunnel alignment • Provides station at edge of campus

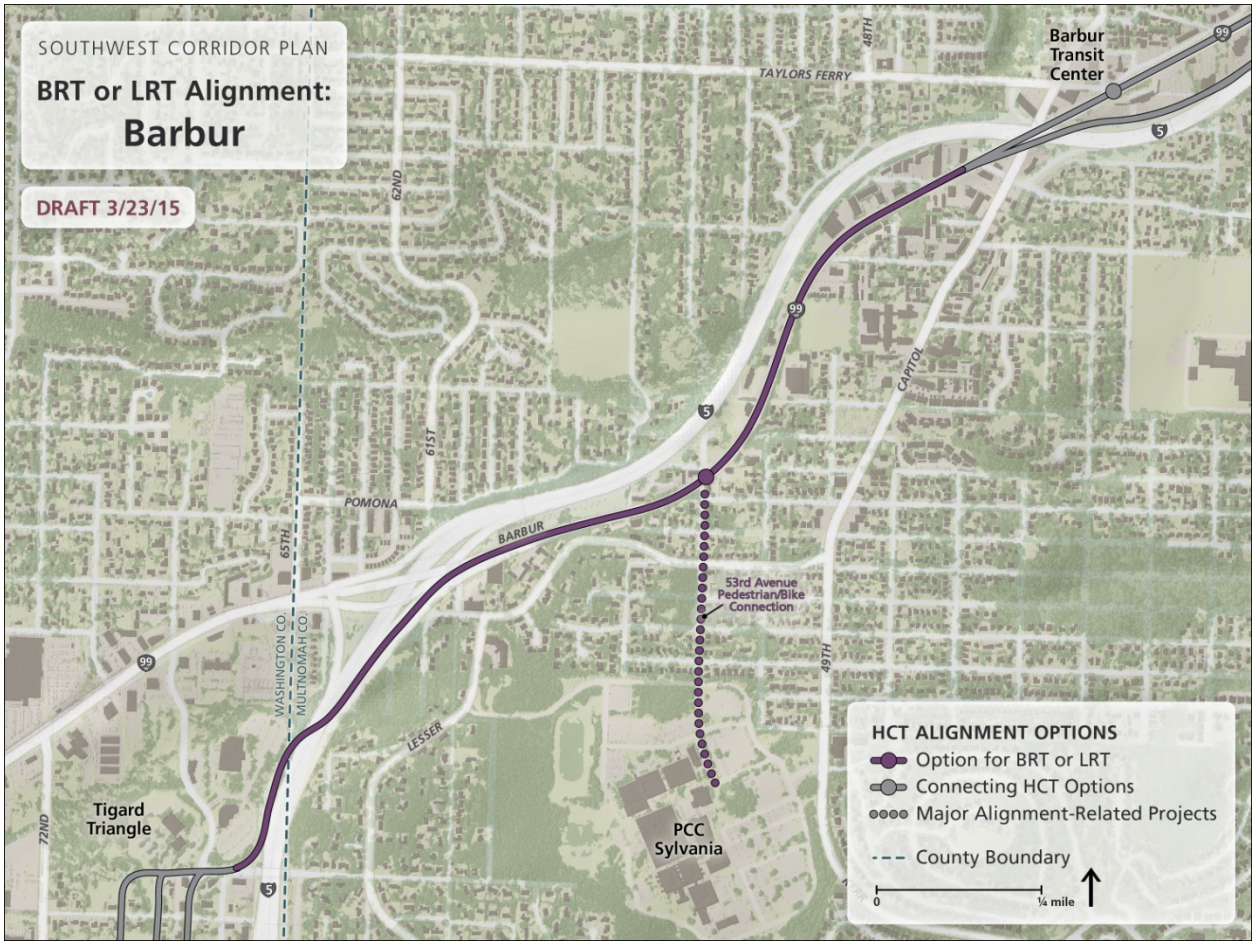
PCC-Sylvania Area Key Issues

There are three HCT alignments in the vicinity of PCC-Sylvania: one that would remain on or parallel to Barbur Boulevard and would serve the campus with an improved pedestrian and bike connection from a station in the vicinity of Barbur and SW 53rd Avenue (BRT or LRT), and two that would diverge from Barbur to serve the campus directly (one with a BRT surface alignment and one an LRT tunnel alignment). A number of other HCT alignment options were removed from further consideration by the Steering Committee in April and June 2014. More information on these options may be found on the Southwest Corridor Plan website: http://www.oregonmetro.gov/public-projects/southwest-corridor-plan/project-library.

PCC-Sylvania HCT alignment option descriptions



Barbur with improved connection to PCC



This alignment would run along Barbur Boulevard from the Crossroads intersection to approximately 60th Avenue, where it would turn south to cross over the freeway on a new bridge and descend into the Tigard Triangle area at Atlanta/Haines Street and 68th Avenue. The station near 53rd would serve both the PCC-Sylvania campus and a new park and ride lot to the southwest. The station would include an enhanced pedestrian and bike connection along 53rd Avenue to provide safe, comfortable access to the PCC campus. The alignment would include parallel bike and pedestrian facilities along its length, generally along the alignment, including on the new crossing over I-5 connecting Barbur Boulevard and the Tigard Triangle.

The analysis to date assumes the conversion of one auto lane in each direction for exclusive HCT use along this stretch of Barbur (southwest of the Crossroads intersection) in order to minimize impacts to adjacent properties compared to an alignment that maintains all auto lanes. Based on preliminary traffic analysis the lane conversion appears to function for both cars and HCT as this segment has fewer cars than the segments of Barbur/99W to both the north and south where travel lanes would not be converted for HCT use. The final design could include such a conversion or could maintain all current

auto lanes. Future work will include an analysis of the impact when traffic is diverted to Barbur Boulevard due to an incident on I-5.

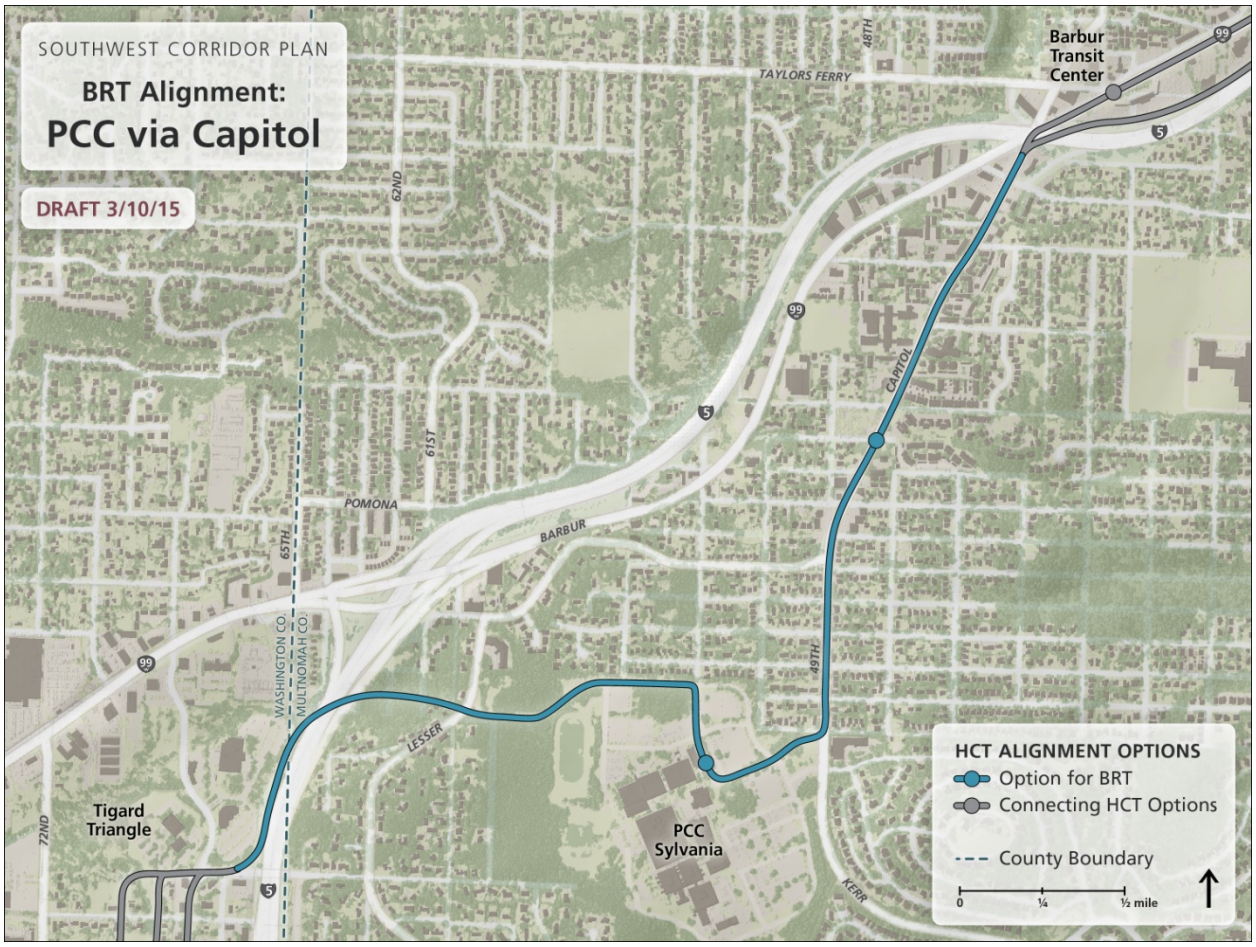
An option that would include HCT operating adjacent to I-5 instead of on Barbur is under development. This option would include the identical station, park and ride lot, and pedestrian connection to PCC-Sylvania as the Barbur option, but would not convert any travel lanes in this section. This option will be addressed in the Barbur/Adjacent to I-5 Key Issues Memo anticipated in October 2015. That memo will focus on options to operate adjacent to I-5 along Barbur Boulevard from the Burlingame area through the PCC-Sylvania area.

BRT in this area is currently designed to operate in exclusive transit right of way to avoid interaction with other traffic and maximize transit travel speeds. One of the benefits of BRT is that it can operate in mixed traffic where necessary to preserve auto and freight capacity or to minimize cost. Future design option could consider BRT in mixed traffic in this area to preserve auto travel lanes.

An additional option may be developed for BRT with transit vehicles running in mixed traffic in this segment to preserve vehicle lanes.

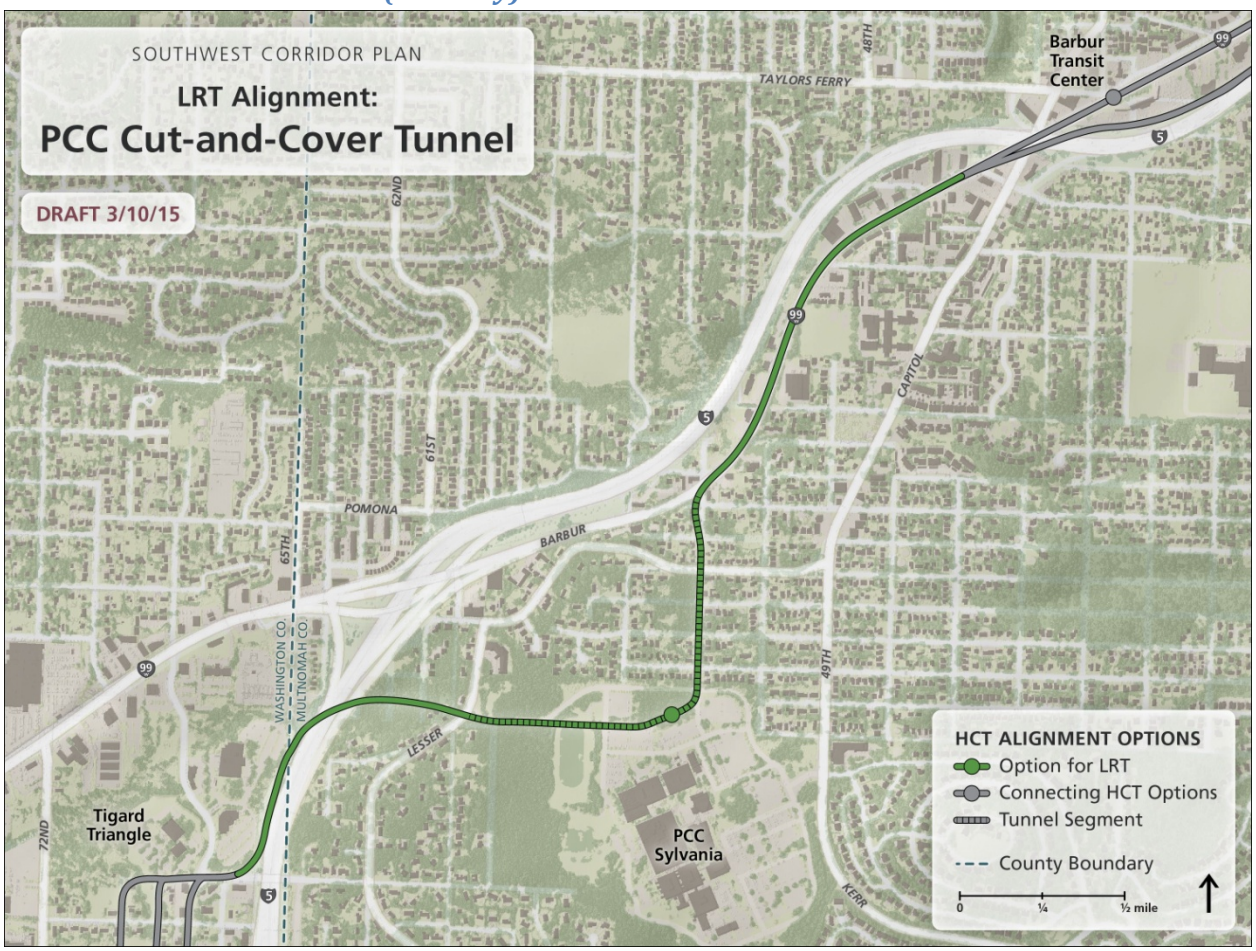
PCC Direct

PCC via Capitol Highway (BRT only)



This alignment is unique to BRT due to the steep slopes approaching and departing the PCC Campus which LRT cannot operate on. The option would depart Barbur Boulevard at the Crossroads intersection, and then run in the center of Capitol Highway and 49th Avenue to the PCC-Sylvania campus. The option assumes the conversion of one auto lane in each direction to HCT exclusive use to limit impacts to adjacent properties. The lane conversion appears to maintain adequate traffic flow for both cars and HCT, based on preliminary traffic analysis. Once at the PCC campus, BRT would head west through campus, and then run on a new structure stretching from Lesser Road across I-5 to the Tigard Triangle. This new bridge would include bike and pedestrian facilities to provide a safe and comfortable connection for those modes between PCC and the Tigard Triangle. This alignment would include a station at the "front door" of the PCC campus, as well as a station at Capitol Highway and Comus Street, near Holly Farm Park and the Capitol Hill Library. The alignment would include parallel bike and pedestrian facilities along its length, generally along the alignment, including on the new crossing over I-5 connecting Barbur Boulevard and the Tigard Triangle.

PCC via cut-and-cover tunnel (LRT only)



This alignment, which only serves LRT, would run along Barbur Boulevard from the Barbur Transit Center to 53rd Avenue, and then enter a cut-and-cover tunnel running underneath 53rd toward the PCC campus. An underground station would serve PCC near the northern edge of campus. LRT would emerge from the cut-and-cover tunnel near Lesser Road. As with the surface BRT alignment to PCC, LRT would travel through a wooded area and across I-5 into the Tigard Triangle on a new bridge for transit, bicyclists and pedestrians.

The option assumes the conversion of one auto lane in each direction to HCT exclusive use to limit impacts to adjacent properties. Based on preliminary traffic analysis the lane conversion appears to function for both cars and HCT as this segment has fewer cars than the segments of Barbur/99W to both the north and south. Another option that parallels I-5 and would not convert any travel lanes in this segment could serve as an alternative approach to the cut-and-cover tunnel. This option will be addressed in the Barbur - Adjacent to I-5 Key Issues Memo anticipated to be completed in October 2015.

This alignment would include bike and pedestrian facilities along Barbur Boulevard east of 53rd, and on the new bridge crossing over I-5 connecting Barbur Boulevard and the Tigard Triangle.

Roadway, pedestrian and bicycle projects

All alignment options include a range of roadway, pedestrian and bicycle improvements to better connect the HCT corridor to the surrounding neighborhoods. The specific improvements vary depending on the alignment and multimodal needs. Maps and lists of potential roadway, pedestrian and bicycle projects that would accompany HCT alignments in South Portland are included in Appendix B. One major project, the Barbur Boulevard-PCC Creative Connection, is described in more detail below.

Barbur-PCC Creative Connection

An HCT alignment that stays on Barbur Boulevard to the north of the PCC Sylvania Campus would require a walk or a bicycle ride to/from the station near Barbur and 53rd of up to a ½ mile to reach the PCC-Sylvania central campus area, or a transfer to a local bus or PCC shuttle bus at the Barbur Transit Center or other station. Several ideas for strengthening bicycle and walk connections between PCC and a station at 53rd will be the subject of a study to be conducted in late March and April. Ideas include: improvements to 53rd including new sidewalks or a multi-use path on one side with improved drainage, lighting and accessibility. Steep grades in several locations may require ramps, stairs and/or elevators. Another idea is to explore the opportunity for a partnership with PCC to establish a shuttle service between a 53rd station using Pomona and/or Capitol to connect to the campus directly.

PCC-Sylvania analysis and findings

Transit performance

Key considerations:

- For both BRT and LRT, how would an alignment with a direct connection to the PCC-Sylvania campus perform relative to a Barbur alignment with a station at SW 53rd Avenue that includes an improved pedestrian and bike connection to campus?
- For BRT, would the more direct connection with a campus station justify the longer travel times and higher cost required to reach PCC-Sylvania?
- For LRT, would the more direct connection with a campus station justify the community impacts and higher cost required to construct a cut-and-cover tunnel?

Key findings:

- A direct connection to PCC-Sylvania would result in slightly slower travel compared to alignments on Barbur.
- A campus station would attract more daily ons and offs compared to a 53rd Avenue station with the Barbur alignment.
- With a direct connection to campus, the longer travel time compared to options on Barbur would result in slightly lower ridership at stations outside of the PCC-Sylvania area. The combination of higher ridership on campus and lower ridership elsewhere would still result in increases in line and system ridership.

Transit performance analysis in the PCC-Sylvania area focuses on differences between direct HCT access to the campus and HCT service on Barbur Boulevard with an improved walk connection. Since direct access requires different routing for BRT than for LRT, both direct access options were modeled and compared to separate Barbur options differentiated by mode (BRT an LRT). As a result, four travel demand model runs were completed for this analysis:

1. BRT on Barbur Boulevard
2. BRT to PCC via Capitol Highway
3. LRT on Barbur Boulevard
4. LRT to PCC via a cut-and-cover tunnel

A future Key Issues memo will compare the corridor performance of BRT to LRT. This memo compares the direct to PCC BRT option to the Barbur Boulevard BRT option, and the direct to PCC LRT option to the Barbur Boulevard LRT option. All model results are preliminary. Refinements of HCT options, traffic analyses and local bus service assumptions will result in updated modeling assumptions and new model runs during the DEIS process.

Travel time and reliability

Compared to a BRT option on Barbur, a BRT routed directly to the campus would add 1.6 minutes of travel time, or five percent of the line time between Tualatin and Portland State University. The longer travel time would result from the slightly longer alignment (0.3 miles) and also from stopping at an additional station on Capitol Highway near SW Comus Street. Both options assume BRT operating in exclusive right of way along the entire alignment in this section, but with less grade change and fewer curves, the Barbur alignment can be assumed to be slightly more reliable in staying on schedule than the alignment directly serving campus.

LRT in a cut-and-cover tunnel would add approximately 48 seconds of travel time compared to a Barbur LRT option due to a slightly longer alignment and slower speeds through the curve in the tunnel. Since both options assume LRT operating in exclusive right of way and because the Barbur option would not cross major intersections, both options can be assumed to be similarly reliable.

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.

For both modes, direct service with a station on the campus would add transit riders in the PCC-Sylvania area, but the additional travel time required to reach the campus would negatively impact ridership elsewhere along the line.

For PCC via Capitol alignment for BRT, the direct connection via Capitol Highway would attract 4,300 daily ons and offs at a campus station. This represents an increase of over 1,900 ons and offs compared with a 53rd Avenue station with the Barbur BRT route, including patrons of the assumed new park and ride lot near the station. The alignment would result in 1,300 new system transit trips and 2,100 additional line riders compared to the Barbur option, or increases of 15 percent and seven percent, respectively. The PCC via Capitol alignment would also include an additional station near SW Comus Street, which would provide access to the neighborhood and is projected to attract an additional 1,140 daily ons and offs.

For the PCC via Capitol alignment for LRT, the direct connection via a cut-and-cover tunnel would attract 6,800 daily ons and offs at a campus station, an increase of 3,200 daily ons and offs compared to a 53rd

Avenue LRT station with the Barbur option, including park and ride patrons. System ridership would increase by 2,100 new transit trips and line ridership would increase by 2,700 riders, or by 13 percent and six percent, respectively, with a campus station.

PCC-Sylvania 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 PCC-Sylvania area.

Consideration should be made for the number of transit vehicles travelling along Barbur Boulevard and through the campus in this area. Today three local bus routes (lines 12, 64, and 96) operate along Barbur below the campus with up to 17 buses an hour in peak periods, and two routes (lines 44 and 78) operate on or through the campus, with up to 5 buses an hour in peak periods. PCC also operates a shuttle bus system between campuses.

TriMet's Southwest Service Enhancement Plan envisions new all-day frequent service between downtown Portland, Hillsdale, Multnomah Village, and the Portland Community College Sylvania campus using the current line 44, with plans for every other Line 44 trip to Mountain Park, Lake Grove, Bridgeport Village, Durham, and Downtown Tualatin via Kerr Pkwy, McNary Pkwy, Monroe Pkwy, Boones Ferry, Bridgeport, Upper Boones Ferry, Boones Ferry, and the Tualatin WES Station. This expanded local service, or introduction of HCT, regardless of mode, could reduce the number of PCC shuttles needed to serve the campus

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 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.

Community development

Key considerations:

- Can local transit, and an improved surface bike and pedestrian connection effectively connect the PCC Campus to an indirect surface alignment on Barbur?
- Are there potential land use changes that could occur on the PCC-Sylvania campus in the next 15-20 years that would be commensurate with a tunnel investment?
- Would construction of a cut-and-cover tunnel cause significant disruption to traffic flow and neighborhood access?

Key findings:

- Future redevelopment on the PCC campus could offer enhanced ridership opportunities via a direct HCT connection.

- Current transit service needs to be assessed to determine what changes/additions would optimize service.

The Barbur Boulevard surface alignment in this section would include a station at Barbur Boulevard and 53rd Avenue. The direct PCC via Capitol BRT option would have a station located on the PCC campus, while the PCC cut-and-cover LRT tunnel option would have an underground station that would surface on the southern edge of the campus. The information presented in this section is meant to highlight the trade-offs between serving PCC-Sylvania directly with the PCC cut-and-cover LRT tunnel alignment or the PCC via Capitol surface BRT alignment, or less directly via a surface alignment on Barbur Boulevard. PCC-Sylvania is currently served by two bus lines, the 44 and the 78, neither of which offers all-day frequent service. Work to optimize current and future service is underway as part of the Service Enhancement Planning process lead by TriMet. Potential upgrades to the line 44 bus include all-day frequent service and routing further south to Lake Oswego and Tualatin.

Access

There are a significant number of student trips, up to 17,500, to the PCC campus each day. The majority of those trips are occurring in cars. There are several factors that may contribute to the high auto mode share in the area. First, the campus has a large amount of inexpensive surface parking available to students. Second, there are not enough transit lines offering direct, frequent service to the campus. Although PCC runs an intra-campus shuttle system, it only carries a small percentage of the daily trips to the Sylvania campus. A 2012 Travel Demand Study conducted on all PCC campuses showed that the mode split for PCC-Sylvania is 58 percent auto, 19 percent transit, 13 percent PCC shuttle, and four percent bike/walk.

Direct access to the campus, either through the PCC cut-and-cover tunnel or through the PCC via Capitol surface BRT station would likely influence future mode splits on the campus. This, in turn, would likely free up some of the existing surface parking for other uses. Without more detailed knowledge of future land use changes that may be explored on the campus, it is difficult to predict the impact direct service would have on land use patterns. Trade-offs associated with either direct service option (such as travel time impacts from a BRT connection or neighborhood impacts from tunnel construction) are explored further in the Transit Performance and Community Impacts section of this memo.

A surface HCT alignment on Barbur would not directly serve the PCC-Sylvania campus, but enhanced local bus service, along with improved bike and pedestrian facilities, and a continued shuttle system could be improved to ensure efficient connections to this regional education campus. Upgrading the line 44 to all-day frequent service with routing to Tualatin would increase cross-corridor connections and allow for more frequent access to the PCC campus from areas that currently do not have that opportunity. The project is also exploring a re-design of 53rd Avenue, with the idea to provide a direct bike and pedestrian route to the campus from a stop along Barbur Boulevard. The street would remain open to local vehicle access but would retain the auto barrier at the south end of the street to prevent auto through traffic in the neighborhood. This walk/bike connection exists within the ½ mile boundary

that is typically considered viable for transit access, but it would have to address the significant grade change between Barbur and the campus. Staff anticipates design concepts for a potential bicycle/pedestrian connection to be available for discussion in May 2015.

Redevelopment potential

Although no specific redevelopment plans have been defined, PCC staff has mentioned the need to re-examine the current land use assumptions on campus. Until PCC takes a more comprehensive look at its land use goals for the campus and its master plan, it will be hard to accurately determine what redevelopment opportunities exist. As previously stated, a direct HCT connection to the campus would likely influence mode splits in a way that would reduce the need for the amount of surface parking that exists today. This could allow PCC to explore redevelopment opportunities on the campus. Redevelopment analysis done during the 2014 Station Area Planning phase of this project did not consider any of the property on-campus, however the existing parking lots provide opportunity for the university to add on-site housing for students and retail and service amenities with more development toward the center of campus and the transit stop with minimal impact to the surrounding residential neighborhoods. The amenities could be oriented to serve both the students and the neighborhood residents particularly on sites near the entrance to the campus.

The station proposed on Barbur and 53rd does show some redevelopment potential on properties immediately adjacent to Barbur. The vast majority of properties identified in 2014 Station Area Planning work as possible redevelopment sites are found closer to the Barbur Transit Center further north. Consideration of a park and ride facility at this location may also play a factor in influencing redevelopment opportunities that would serve commuters that utilize the station, but it is likely that redevelopment at this location would be limited, mainly due to geographic constraints along Barbur Boulevard.

Support of local land use plans

The Barbur Concept Plan identifies a potential transit node along Barbur as the SW 53rd Focus Area. The area is identified as being somewhat isolated from other retail areas and has lower market potential for retail opportunities. The plan also calls for increased investment in sidewalk and bike lanes along Barbur in this location, which would be addressed through the construction of an HCT project along Barbur. The Barbur Concept Plan identifies the importance of this focus area as:

" *its connection with the PCC campus and potential for additional housing on the campus to accommodate students, as well as leasing opportunities as a potential revenue stream for the campus. It is understood that vehicle access to the campus will primarily continue to be served by Capitol Highway and Lesser Road, but improved pedestrian and bike connections to Barbur can position this node for a future High Capacity Transit station area serving this major growing institution."*

PCC started working on a Framework Plan for the Sylvania campus in 2010 that focused on analyzing the campus at a macro level. Among the topics explored were campus entry and circulation for motorists, bicyclists and pedestrians, stormwater management, and site design to support campus wayfinding and

signage for pedestrian navigation and learning lab opportunities. Although these issues are of importance to the ongoing maintenance and success of the campus, they do not address the potential for future development on the campus that could support, and be supported by, a regional HCT investment. There has been talk in recent months of PCC re-examining their long term vision for the campus, with a focus on future campus development, but no work has yet started on that effort.

Mobility

Key considerations:

- Can high capacity transit be designed to minimize negative impacts to auto, freight, bicycle and pedestrian mobility and access?
- How do alignment choices impact road, bike and pedestrian improvement projects that could serve PCC and the neighborhood?

Key findings:

- None of the alignments options overlap with regional or statewide freight routes, but do overlap local (city) freight routes on Barbur and Bertha.
- The Barbur Boulevard surface alignment would include design treatments that could improve pedestrian and bicycle facilities and road safety for all users on Barbur. These design treatments would likely include improved bicycle treatments, sidewalks, and crossings.
- The PCC-via-Capitol BRT alignment would include design treatments that could improve pedestrian and bicycle facilities and road safety for all users on Capitol Highway.
- Each alignment could consider the conversion of travel lanes on Barbur for exclusive transit use.

Motor vehicle and freight mobility

Both Barbur Boulevard and Capitol Highway south of Crossroads have lower traffic volumes than the segment of Barbur to the north of Crossroads. As a result, traffic impacts in this segment would be less significant and could largely be managed with minor geometric or operational solutions, such as signal timing. This also could provide opportunities for converting travel lanes for transit use without unacceptable impact to motor vehicle traffic.

Barbur and Bertha are both designated Major Truck Streets by the City, while Capitol is designated a Truck Access Street. Freight stakeholders have expressed interest in avoiding overlap between HCT and freight routes, and in ensuring that freight is appropriately accommodated on all streets. None of the alignment options overlap with regional or statewide freight routes. Transit designs would be required to accommodate freight trucks including vertical and horizontal clearances for all alignment options.

Initial traffic analysis considered traffic operations on the Barbur and PCC via Capitol surface alignments. The following table summarizes the intersections analyzed and the initial findings.

Intersection	Meets motor vehicle performance target?*	
	2035 No-Build	2035 Build
SW 49th Ave. (Capitol) & Hidalgo St. (PCC Access)	Yes	Yes
SW Barbur Blvd. & 53rd Ave.	Yes	Yes

* Within permitted margin of accuracy

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

During the DEIS phase, more detailed traffic analysis will be performed including queuing analysis, and mitigation would be developed for intersections not expected to meet the 2035 motor vehicle performance target. This could include changes in lane configurations, traffic signals, or other mitigation options.

Pedestrians and bicycles

The Barbur surface alignment and Capitol surface alignment could both improve pedestrian and bicycle facilities along their respective routes. The Barbur route would address the lack of continuous sidewalks between Crossroads and SW 60th. The Capitol route already has continuous sidewalks and bike lanes, and opportunities for improving these would be explored. Both would explore adding additional crossings for pedestrians and bicyclists. The cut-and-cover tunnel option would improve pedestrian and bicycle facilities along Barbur east of 53rd where the transit would run in-street.

All options would include a new bicycle and pedestrian connection between Barbur Boulevard and the Tigard Triangle with a new HCT, bicycle and pedestrian bridge.

Safety

Neither Barbur nor Capitol along these alignment options has a history of high-severity crashes, although the intersection of Barbur, Capitol, and I-5 (“Crossroads”) does. As part of any project, design treatments to address observed crash types and improve pedestrian and bicycle facilities could improve safety.

Access

Presuming use of center-running transit for the in-street segments, the Barbur and Capitol alignment options would both result in changes to motor vehicle access. On Barbur, there are relatively few destination and access points, resulting in relatively minor impacts to access. On Capitol, there are more frequent access points, resulting in moderate access impacts. Both options would likely involve elimination of some left-turn accesses, but changes to circulation patterns to continue to provide access would be evaluated.

Lane conversions

The only places in the corridor that are being considered for lane conversion are sections of roadways that currently appear to have excess capacity based on early traffic analysis. Two of these locations occur in this segment: Barbur Boulevard between the Barbur Transit Center and the Tigard Triangle; and Capitol Highway between Barbur Boulevard and PCC. Both of these segments currently have two northbound and two southbound travel lanes but have relatively little traffic for a four-lane facility, so the project team is studying the potential to convert one travel lane in each direction for HCT use in order to reduce cost and minimize impacts to adjacent properties. If needed, designs can be modified to maintain existing lane configurations, with the tradeoff of more property impacts. For BRT, the project team is studying options for both exclusive BRT lanes and running the BRT vehicles in mixed traffic in both of these segments.

As the project progresses, further traffic analysis will look in detail at traffic flows at intersections as well as in the broader network to confirm whether lane conversions could work and whether additional mitigations might be needed to allow conversion, such as new turn lanes or signals. Additionally, more detailed consideration of the property impacts of different lane configurations will allow for a discussion about the trade-offs between minimizing impacts and maintaining existing auto capacity. A sensitivity analysis will be conducted to determine the effects on Barbur with lane conversions when an incident occurs on I-5.

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:

- Corridor-wide BRT estimates range from $750M to $1.2B in 2014 dollars.
- Corridor-wide LRT estimates that include a cut-and-cover tunnel in Hillsdale and PCC-Sylvania range from $1.9B to $2.4B in 2014 dollars. This does not include the cost of a Marquam Hill-Hillsdale bored Tunnel.

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 costs

Current estimates for a BRT alignment from downtown Portland to Tualatin range from $750M to $1.2B. The range reflects options for cut-and-cover tunneling and for infrastructure improvements to allow BRT to operate in dedicated transit lanes.

Costs for an LRT alignment extending from downtown Portland to Tualatin would range from $1.9B to $2.4B. The range is inclusive of surface and shallow cut-and-cover tunnel options in Hillsdale and at PCC but excludes the deep-bored tunnel option under Marquam Hill, which is estimated to add an additional $800-$900M to the overall project cost. More expensive HCT alignment options such as tunnels may impact the final length of the HCT project and the ability to serve more communities to the south.

PCC-Sylvania area costs

The PCC via cut-and-cover tunnel alignment for LRT would have considerably higher capital costs relative to the PCC via Capitol alignment for BRT or the Barbur alignment for either mode (costs for segment from Crossroads to Tigard Triangle below).

- BRT to PCC via Capitol - $ (under development)
- BRT on Barbur (with 53rd bike/ped improvements) - $ (under development)
- LRT to PCC via cut-and-cover tunnel $469M
- LRT on Barbur (with 53rd bike/ped improvements) - $225M

Engineering complexity and risk

Key considerations:

- What are the risks associated with construction of a cut-and cover tunnel?
- What aspects of each alignment option present noteworthy risk?

Key findings:

- There would be significant potential geotechnical and construction risks involved with a mining operation involved with cut-and-cover tunnel construction; details about impacts and risks are being developed in a separate tunneling technical report
- An Barbur option for either LRT or BRT with a station at SW 53rd would require major improvements to 53rd Avenue to provide walk access from the station to the PCC-Sylvania campus.
- All options include a new structure over I-5 connecting the PCC-Sylvania area to the Tigard Triangle for use by transit, bikes, and pedestrians.

Barbur

A number of different HCT configurations are possible on Barbur. LRT in Barbur would likely require a structure for LRT beyond a station at 53rd. The current slope of Barbur is approximately 5 percent. In order to create a level area for a station the alignment would be elevated. Anytime a significant structure is involved there is a risk that subsurface conditions will present unexpected challenges.

PCC via Capitol Highway (BRT only)

This alignment has fairly low engineering risk and complexity within the Capitol Highway right of way as a result of the flexibility offered by the BRT vehicle. Engineering risks exist insofar that lane conversion

on Capitol Hwy is or is not a possibility. However, the BRT could run in mixed traffic to avoid potential risk. Without lane conversion the necessary space for turn lanes and other traffic mitigation would not be available without potentially significant property impacts. This option would share a new structure that would extend straight from PCC G Street over I-5 and land at the top of the Tigard Triangle. This structure and the slope below could introduce unanticipated engineering challenges related to drainages and unstable slope or other subsurface conditions.

PCC via cut-and-cover tunnel (LRT only)

Tunnels are inherently risky given the variety of unanticipated subsurface conditions that might be encountered. Subsurface conditions of a cut-and-cover tunnel can be more effectively explored with borings, unlike the deeper bored tunnel under Marquam Hill and Hillsdale. While the tunnel under consideration would likely be no deeper than 60' to 70' the character of the materials to be encountered is currently unknown. A study which will broadly categorize the likely materials and challenges to be encountered is expected to be completed in early May 2015.

Community impacts

Key considerations:

- How would construction of a cut-and-cover tunnel impact the neighborhood?
- How would the Barbur-PCC pedestrian and bicycle Creative Connection impact the neighborhood?
- Can benefits and burdens of a high capacity transit alignment be equally distributed among all population groups in the corridor?
- Do surface or tunnel alignments offer the greatest access to key places such as education, employment, health care and retail centers?

Key findings:

- Construction of a cut-and-cover tunnel could require acquisition of properties along the tunnel route.
- The Barbur-PCC Creative Connection would improve right of way along SW 53rd for pedestrian and bike traffic, but would not create new access to campus for cars.
- Based on spatial analysis of demographic maps, there is no significant difference in how each alignment option runs through areas of non-white, non-English speaking, low-income or senior 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.

Property impacts

The options under consideration all have varying levels of impact to adjacent private properties. In many cases, property impacts are limited to only a narrow strip of area needed to widen the roadway and sidewalks. In other instances, temporary construction easements may be all that is needed to allow for construction of new roadway and sidewalks. In other cases, large or complete acquisitions may be necessary when impacts to buildings or other major infrastructure are unavoidable. The project team is currently quantifying the areas of potential impact on each of the options and will be presenting the level of impact of the various options relative to one another once the data is assembled. 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.

Of particular concern in this area is the impact of cut-and-cover tunnel construction. While the homes and other structures along the excavated street may not need to be disturbed during construction, access to those buildings can be expected to be precluded for two years or more. This impact would likely require full property acquisitions along much of the proposed tunnel alignment through the residential neighborhood.

The Barbur-PCC Creative Connection, the improved pedestrian and bicycle connection between a 53rd Avenue station and the campus, would be part of a Barbur option with BRT or LRT. The approximately 1/3- to 1/2 mile connection has not yet been designed, but would likely include street paving, sidewalks, and lighting to improve walk and bike access to campus. Foot traffic would increase along the street, but the connection would not include a new through route for autos. Property impacts will be determined through the design.

Demographics

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). Subsequent discussions with residents, employees and visitors to these areas will help us to further understand 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 the maps, the northern part of the alignment options would run through areas with higher than average non-white and non-English speaking populations. Disaggregation by ethnicity shows that the northern parts of the alignment options would run through areas with higher than average concentrations of Black populations.

Low-income and senior populations

Based on spatial analysis of the maps, none of the alignment options would run through areas with higher than average concentrations of low-income populations. The southern portion of the alignment options would run through areas with higher than average concentrations of senior populations.

Access to services

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

PCC Sylvania campus is only education center identified in this portion of the study area. A bus rapid transit option on Capitol Highway or a PCC cut-and-cover tunnel would provide more direct access to the PCC Sylvania campus.

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 the PCC-Sylvania area. Between March and July 2015, project staff will present information on PCC-Sylvania and other Southwest Corridor Plan issues and invite public comment at numerous public meetings, including a Community Planning Forum and a Community Technical workshop. An updated calendar can be found on our website:

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

May 2015: staff will produce a technical evaluation report that will include assessments of options accessing South Portland, Hillsdale, PCC-Sylvania, and Tigard followed by staff recommendations to the Steering Committee.

July 13, 2015: the Steering Committee will be asked to consider making decisions on what options in these four areas should continue to be studied in a DEIS.

December 2015: the Steering Committee will be asked to consider making a recommendation on the mode, terminus and remaining HCT alignments to be studied further in a DEIS, along with an implementation strategy for the corridor connection projects defined in the Shared Investment Strategy.

April 2016: the Steering Committee will consider recommending a final Preferred Package to JPACT and the Metro Council.

Appendices

Appendix A: Anticipated major project documents and estimated dates of completion
Appendix B: Shared Investment Strategy roadway and active transportation projects
Appendix C: Corridor-wide mode considerations
Appendix D: Demographic map

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

July Steering Committee decision: direct vs. indirect service to Marquam Hill, Hillsdale and PCC-Sylvania

- Key Issue Memos:
  - South Portland – March
  - Hillsdale – March
  - PCC-Sylvania – May
- Draft Evaluation Report – May
- Evaluation Report and Recommendation – June
- Supplementary documents:
  - Tunnel fact sheet – March
  - Modeling report – May
  - Cost estimate report – May
  - Tunnel technical memo – May

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

- Key Issue Memos:
  - Tigard – May
  - Tigard to Bridgeport Village – September
  - Bridgeport Village to Tualatin – September
  - Barbur / Adjacent to I-5 – October
  - HCT mode – October
  - HCT terminus – October
- Draft Evaluation Report – October
- Evaluation Report and Recommendation – November
- Supplementary documents:
  - Modeling report – October
  - Cost estimate report – October
  - Traffic report - October
- 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.

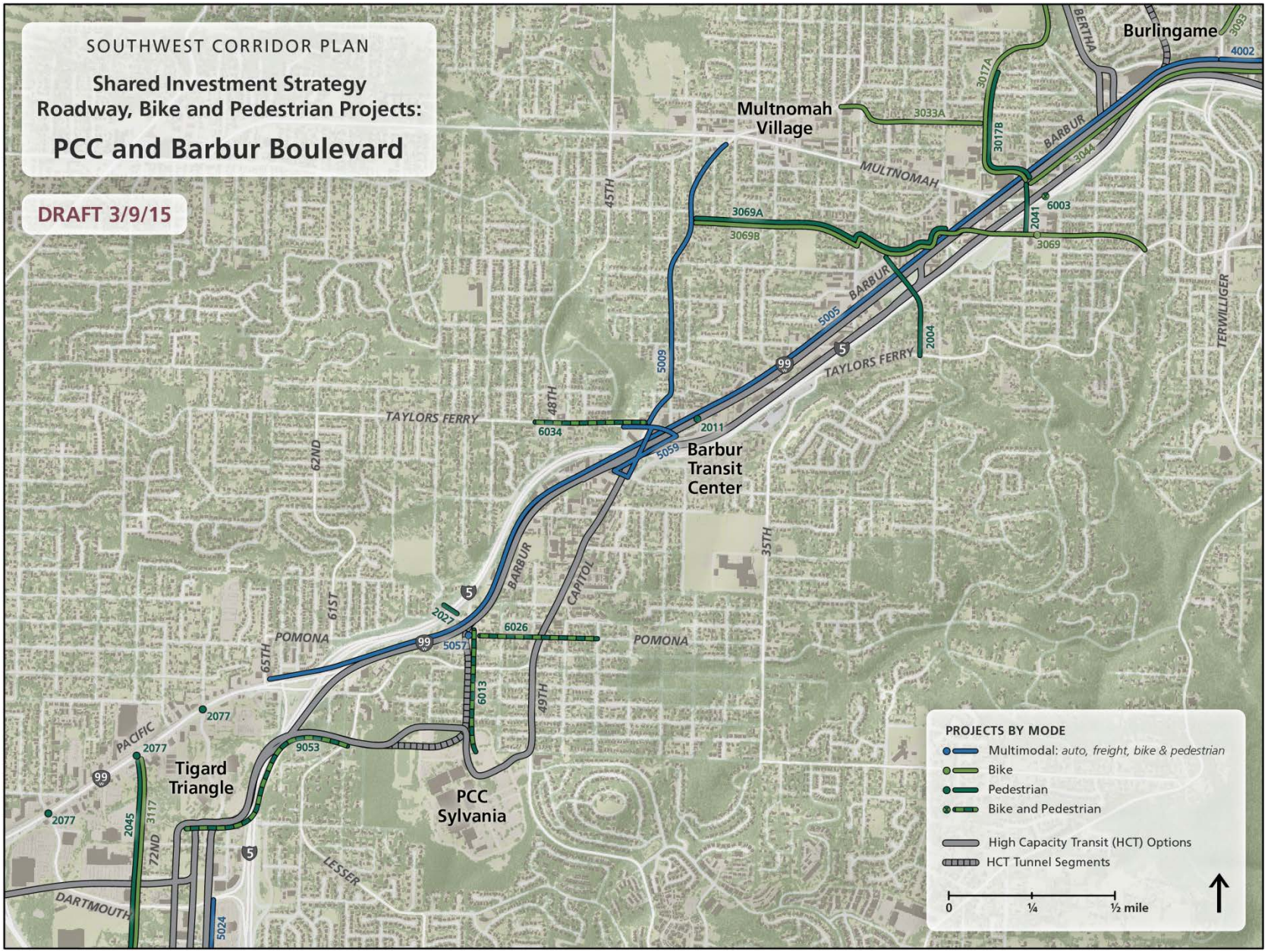
The Shared Investment Strategy (SIS) Roadway and Active Transportation Project List includes projects that improve access to both key places in the corridor and to the high capacity transit (HCT) alignments currently under consideration:

- ***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 list show both the HCT-supportive and corridor connections projects in the PCC and Barbur Boulevard area.


SOUTHWEST CORRIDOR PLAN
Shared Investment Strategy
Roadway, Bike and Pedestrian Projects:
PCC and Barbur Boulevard
DRAFT 3/9/15
Multnomah Village
Barbur Transit Center
Tigard Triangle
PCC Sylvania
Burlingame
TAYLORS FERRY
MULTNOMAH
BARBUR
POMONA
CAPITOL
PACIFIC
DARTMOUTH
LESSER
TERWILLIGER
45TH
48TH
49TH
61ST
62ND
65TH
72ND
35TH
BERTHA
3069A
3069B
3033A
3017A
3017B
3044
3069
6003
2041
2004
5005
5009
2011
5059
6034
2027
6026
5057
6013
2077
9053
3117
2045
5024
4002
3093
PROJECTS BY MODE
Multimodal: auto, freight, bike & pedestrian
Bike
Pedestrian
Bike and Pedestrian
High Capacity Transit (HCT) Options
HCT Tunnel Segments
0
¼
½ mile

Multimodal | Auto/Freight | Bicycle | Pedestrian | Bike/Ped

Cost: ¢ - up to $500,000; $ - up to $5 M; $$ - up to $10 M; $$$ - up to $20 M; $$$$ - More than $20 M

Project # Location/ Ownership	**Title** Description	**Cost**	**Primary Mode**	**Primary Project Type**	**Time-frame**	**Potential Funding Sources**	**Notes**
2004 Portland	**26th Ave, SW (Spring Garden - Taylors Ferry): Pedestrian Improvements** Construct a walkway for pedestrian travel and access to transit and install street lighting	¢	Pedestrian	HCT Supportive		HCT Package	With HCT station at Barbur & 26th: Include Include with station at Barbur & 30th?
2011 Portland ODOT	**Connections to Transit/Transit Improvements: Barbur & Taylors Ferry** New steps/ramp connecting SW Taylors Ferry frontage road to Barbur across from transit center at existing signalized crossing.	¢	Pedestrian	HCT Supportive		HCT Package ODOT	
2027 Portland ODOT	**Pedestrian Overpass near Markham School** Construct pedestrian path and bridge over Barbur Blvd. and I-5 to connect SW Alfred and SW 52nd to the rear of Markham School.	$$	Pedestrian	HCT Supportive		HCT Package	With HCT station at Barbur & 53rd: Include
2041 Portland	**SW 19th Ave sidewalks: Barbur - Spring Garden** Construct new sidewalks where none exist (DA)	¢	Pedestrian	HCT Supportive		HCT Package	With HCT station at Barbur & Capitol Hill/19th: Include
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		HCT Package	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%)

Project # Location/ Ownership	**Title** Description	**Cost**	**Primary Mode**	**Primary Project Type**	**Time-frame**	**Potential Funding Sources**	**Notes**
3017A Portland	**Capitol Hill Rd bikeway -from SW Barbur Blvd to SW Bertha Blvd.** Multiple bicycle facility types: bicycle boulevard or enhanced shared roadway (Barbur - Troy; 21st - Custer); bicycle boulevard or advisory bike lane (Troy - 21st); enhanced shared roadway (Custer - Bertha)	¢	Bicycle	HCT Supportive		HCT Package	With HCT station at Barbur & Capitol Hill/19th: Include
3017B Portland	**Capitol Hill Rd sidewalks -from SW Barbur Blvd to SW Bertha Blvd.** Install sidewalk on Capitol Hill Road from Barbur to Bertha.	$	Pedestrian	HCT Supportive		HCT Package	With HCT station at Barbur & Capitol Hill/19th: Include from Barbur to existing sidewalk at Custer Park (35%)
3033A Portland	**Inner Troy bikeway -from SW Capitol Hwy to SW Capitol Hill Rd.** Bike boulevard from SW Capitol Hwy to SW Capitol Hill Rd	¢	Bicycle	HCT Supportive		HCT Package	With HCT station at Barbur & Capitol Hill/19th: Include
3044 Portland ODOT	**Middle Barbur bikeway -from SW 23rd Ave to SW Capitol Hwy-Barbur Blvd Ramp.** Separated bicycle route in-roadway. Listed as a Regional Bicycle Parkway in the Regional Active Transportation Plan (5/9/13).	$	Bicycle	HCT Supportive		HCT Package	With HCT adjacent to I-5: Include within 1/2 mile of stations With HCT on Barbur: Include
3069A Portland	**Spring Garden, SW (Taylors Ferry - Capitol Hwy): Bikeway** Complete bicycle boulevard and bike lanes.	$	Bicycle	HCT Supportive		HCT Package	With HCT station at Barbur & 26th or Capitol Hill/19th: Include low-cost elements, such as striping or neighborhood greenway treatments (25%)
3069B Portland	**Spring Garden/Dolph Ct, SW (Capitol Hwy - Barbur): Sidewalks** Install sidewalk along Dolph Ct from Capitol Hwy to 26th Way and along Spring Garden from 26th Way to Barbur.	$	Pedestrian	HCT Supportive		HCT Package	With HCT station at Barbur & 26th or Capitol Hill/19th: Include from 27th Ave to intersection of 26th Way and Dolph Court (15%)
3093A Portland	**Terwilliger bikeway gaps** Separated bicycle route in-roadway. Eliminate key gaps in the Terwilliger Blvd bikeway	¢	Bicycle	HCT Supportive		HCT Package	With HCT station at Barbur & Terwilliger: Include lower section near Barbur (50%)

Project # Location/ Ownership	**Title** Description	**Cost**	**Primary Mode**	**Primary Project Type**	**Time-frame**	**Potential Funding Sources**	**Notes**
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		HCT Package	With all HCT options: Include if done through re-striping (conversion from 3-lane to 2-lane with bike lanes
4002 Portland ODOT	**Barbur Blvd, SW (3rd - Terwilliger): Multimodal Improvements** Construct Improvements for transit, bikes and pedestrians. Transit improvements include preferential signals, pullouts, shelters, left turn lanes, sidewalks, and crossing improvements.	$$	Multimodal	HCT Supportive		HCT Package	With HCT on Barbur Boulevard: Include
5005 Portland ODOT	**Barbur Blvd, SW (Terwilliger - City Limits): Multimodal Improvements** Complete boulevard design improvements including sidewalks and street trees, safe pedestrian crossings, enhance transit access and stop locations, and bike lanes (Terwilliger - SW 64th or Portland City Limits).	$$$$	Multimodal	HCT Supportive		HCT Package	With HCT adjacent to I-5: Include within 1/2 mile of stations (20%) With HCT on Barbur Boulevard: Include
5009 Portland	**Capitol Hwy Improvements (replace roadway and add sidewalks)** Improve SW Capitol Highway from SW Multnomah Boulevard to SW Taylors Ferry Road per the Capitol Highway Plan. Replace Existing Roadway and add sidewalks, bike lanes and green stormwater features.	$$$	Multimodal	HCT Supportive		HCT Package	
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		HCT Package	With all HCT options: Include sidewalk on one side from Atlanta to south of Baylor With HCT on 68th Avenue: Include
5057 Portland	**SW 53rd and Pomona (improves safety of ped/bike users)** Reconfigure and improve intersection to manage traffic turning speeds, and improve safety of ped/bike users between Barbur and Pomona.	¢	Multimodal	HCT Supportive		HCT Package	With HCT station at Barbur & 53rd: Include

Project # Location/ Ownership	**Title** Description	**Cost**	**Primary Mode**	**Primary Project Type**	**Time-frame**	**Potential Funding Sources**	**Notes**
5059 Portland ODOT	**SW Portland/ Crossroads Multimodal Project (roadway realignments and modifications to Barbur Blvd., Capitol Hwy., and the I-5 southbound on-ramp)** Implement Barbur Concept Plan walk audit recommendations in the SW Portland TC, including modifications to Barbur Blvd., Capitol Hwy., and the I-5 southbound on-ramp to support safer and more efficient operation for all modes. Project specifics include intersection types and roadway realignments to be refined.	$$$$	Multimodal	HCT Supportive		HCT Package	With all HCT options: Include multimodal investment at the Barbur/Capitol/Huber/Taylors Ferry intersections at this location (5%) Includes improved pedestrian crossings
6003 Portland	**Multmonah viaduct bicycle and pedestrian facilities** Construct new bicycle and pedestrian facilities at/parallel to Multnomah St. viaduct	$	Bike/Ped	HCT Supportive		HCT Package	With HCT on Barbur Boulevard: Include
6013 Portland	**Barbur/PCC ped/bike Connection** Neighborhood greenway connection between Barbur and PCC via SW 53rd.	¢	Bike/Ped	HCT Supportive		HCT Package	With HCT station at Barbur & 53rd: Include
6026 Portland	**Pomona St: Bicycle and Ped improvements (35th to Barbur)** provide bike lanes and sidewalks	$	Bike/Ped	HCT Supportive		HCT Package	With HCT station at Barbur & 53rd: Include from 53rd to 45th (50%)
6034 Portland	**Taylors Ferry, SW (Capitol Hwy - City Limits): Bicycle & Pedestrian Improvements** SW Taylors Ferry Rd: Provide bicycle lanes, including shoulder widening and drainage, and construct sidewalks for access to transit.	$	Bike/Ped	HCT Supportive		HCT Package	With all HCT options: Include from Capitol Highway to 49th (40%)
9053 Portland Tigard	**Ped/Bike Connection between Tigard Triangle and PCC-Sylvania** Provide pedestrian/bicycle connection between the Tigard Triangle area and PCC-Sylvania	$	Bike/Ped	HCT Supportive			

HCT-supportive projects in the PCC area

Corridor Connections projects in the PCC-Sylvania area

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.

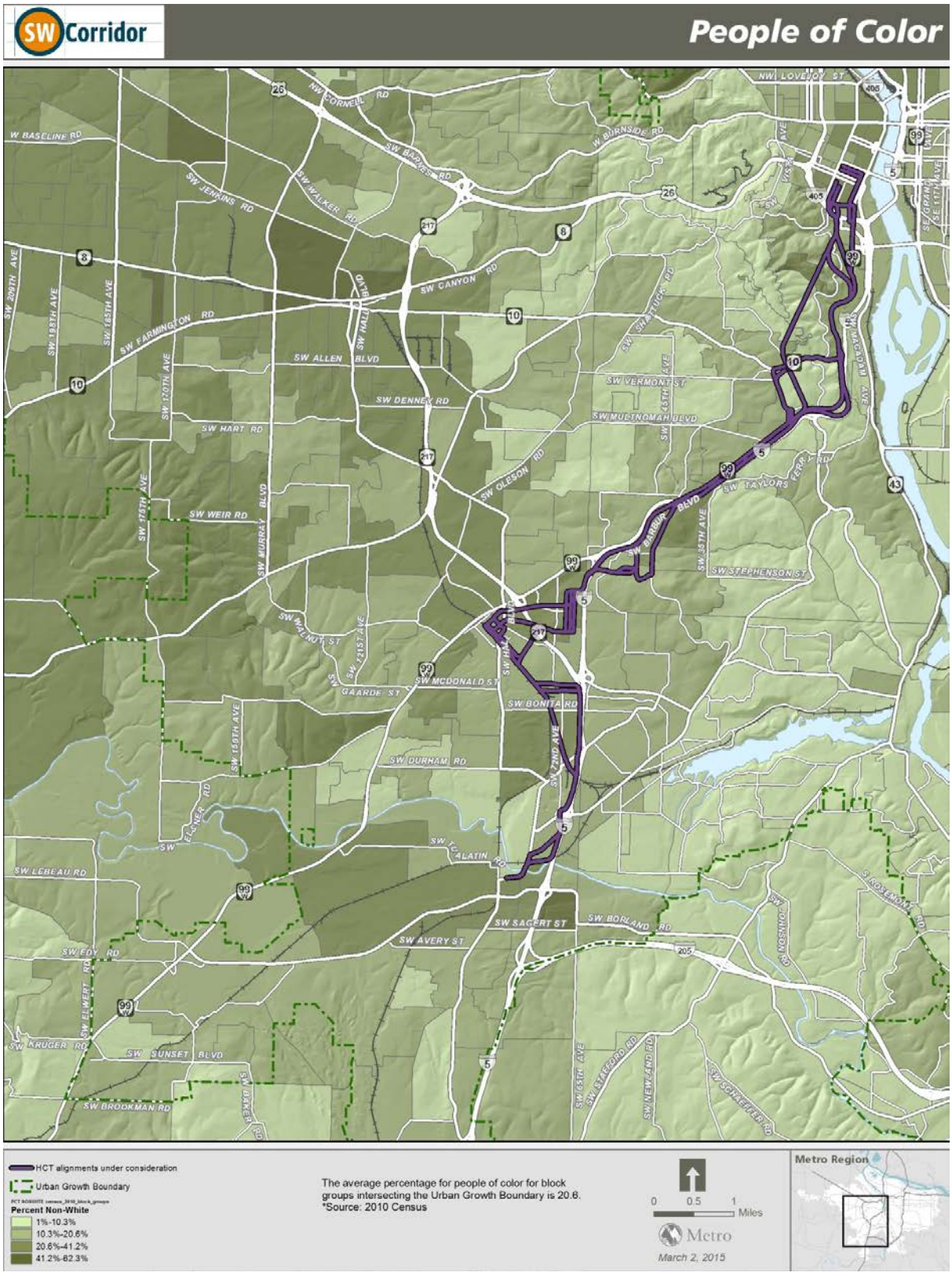
Models indicate that in 2035 the demand for HCT in the Southwest Corridor would require 20 BRT vehicles per hour in the peak, while LRT is assumed to operate with eight vehicles per hour in the peak with enough capacity still available to accommodate ridership growth beyond 2035. For BRT, growth above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

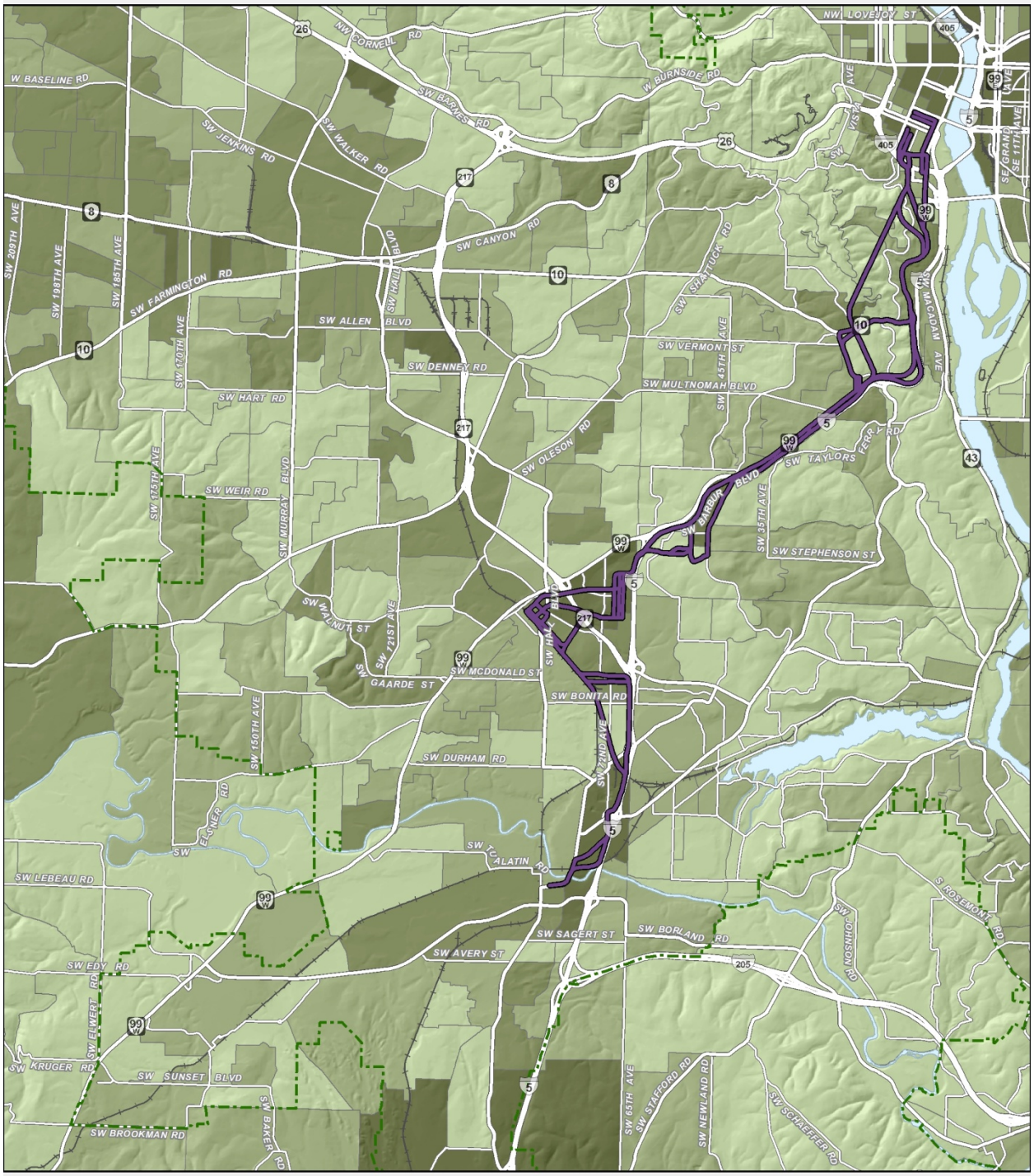
Both BRT and LRT would leverage private development investment at station areas. Available research assessing the difference in scale of development by mode is inconsistent and contradictory. Staff will address development by mode over the course of the next year.

Appendix D: Demographic maps



SW Corridor

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

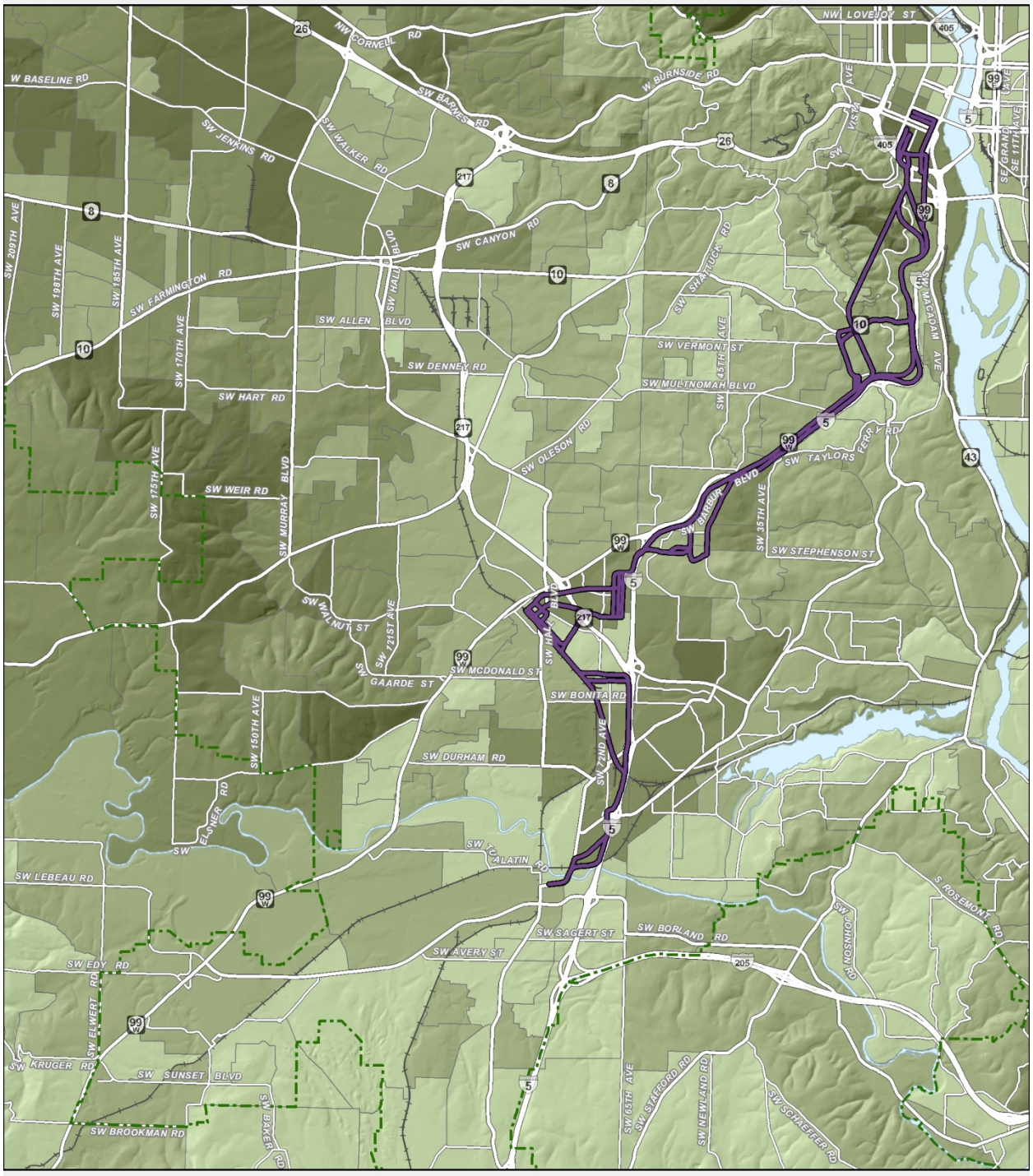
Metro

March 2, 2015

Metro Region

SW Corridor

Asian Population



HCT alignments under consideration

Urban Growth Boundary

PCT ASIAN census_2010_block_groups

Percent Asian

- 0% - 3.1%
- 3.1% - 6.2%
- 6.2% - 12.3%
- 12.3% - 45.1%

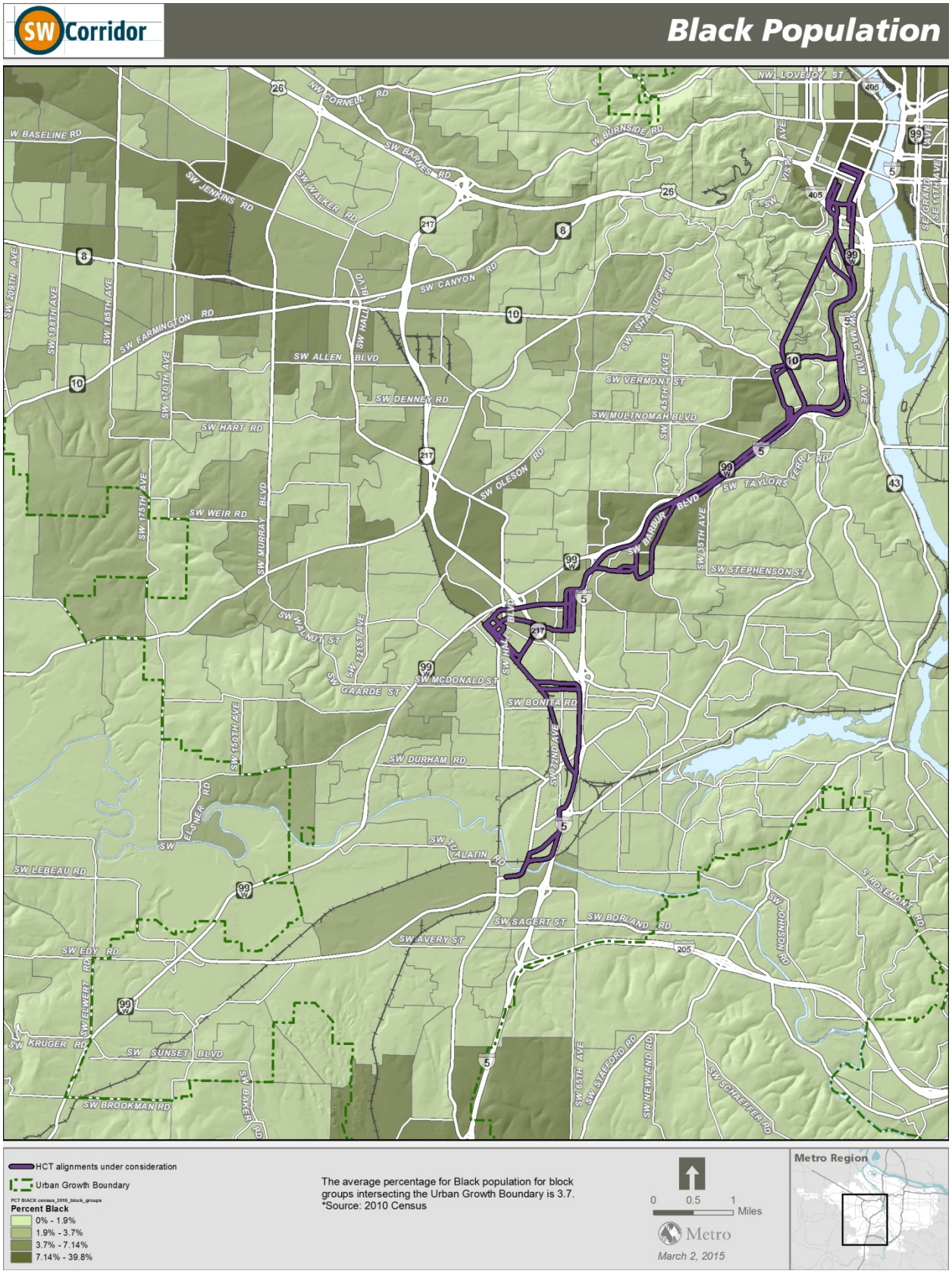
The average percentage for Asian population for block groups intersecting the Urban Growth Boundary is 6.17.
*Source: 2010 Census

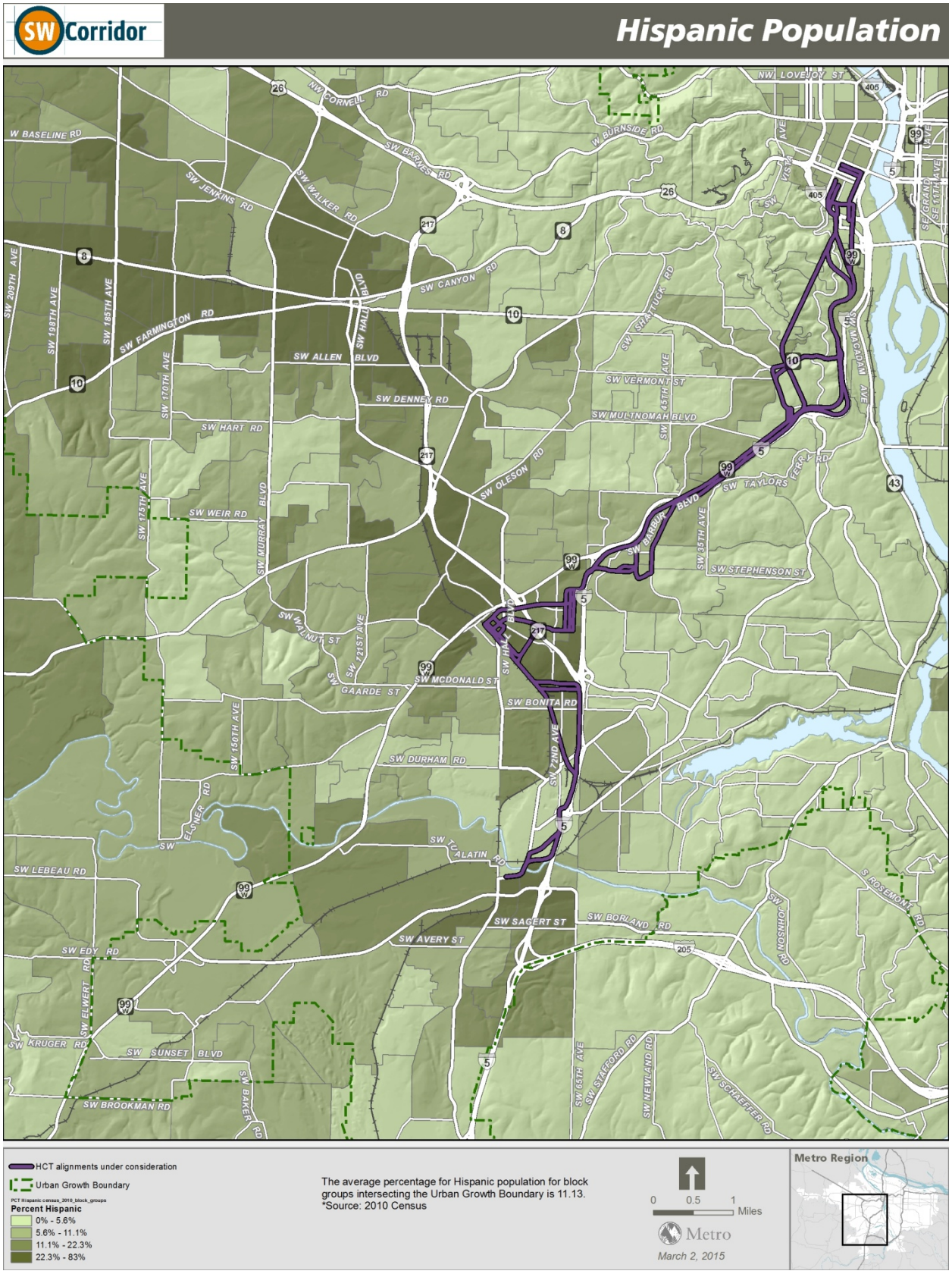
0 0.5 1 Miles

Metro

March 2, 2015

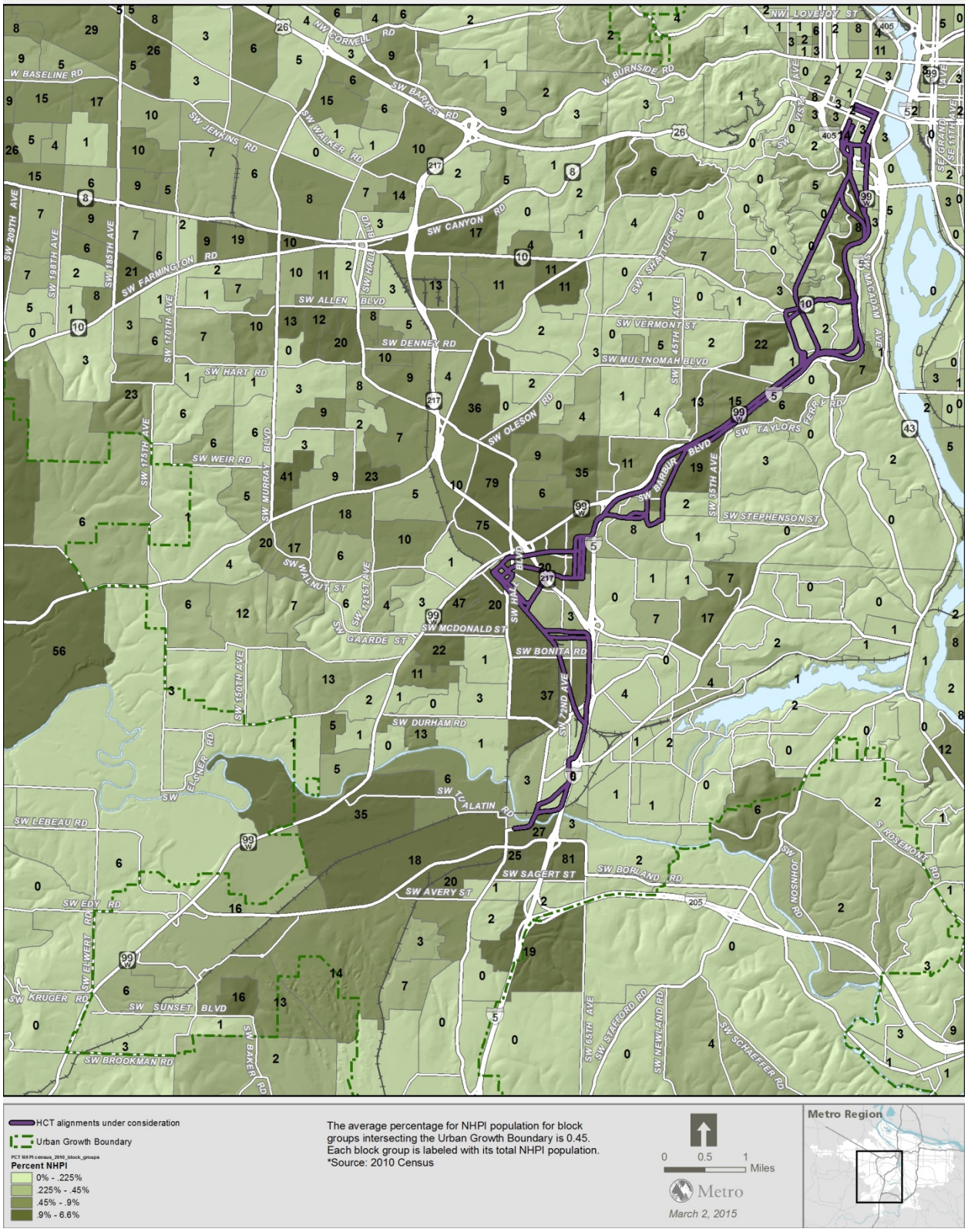
Metro Region

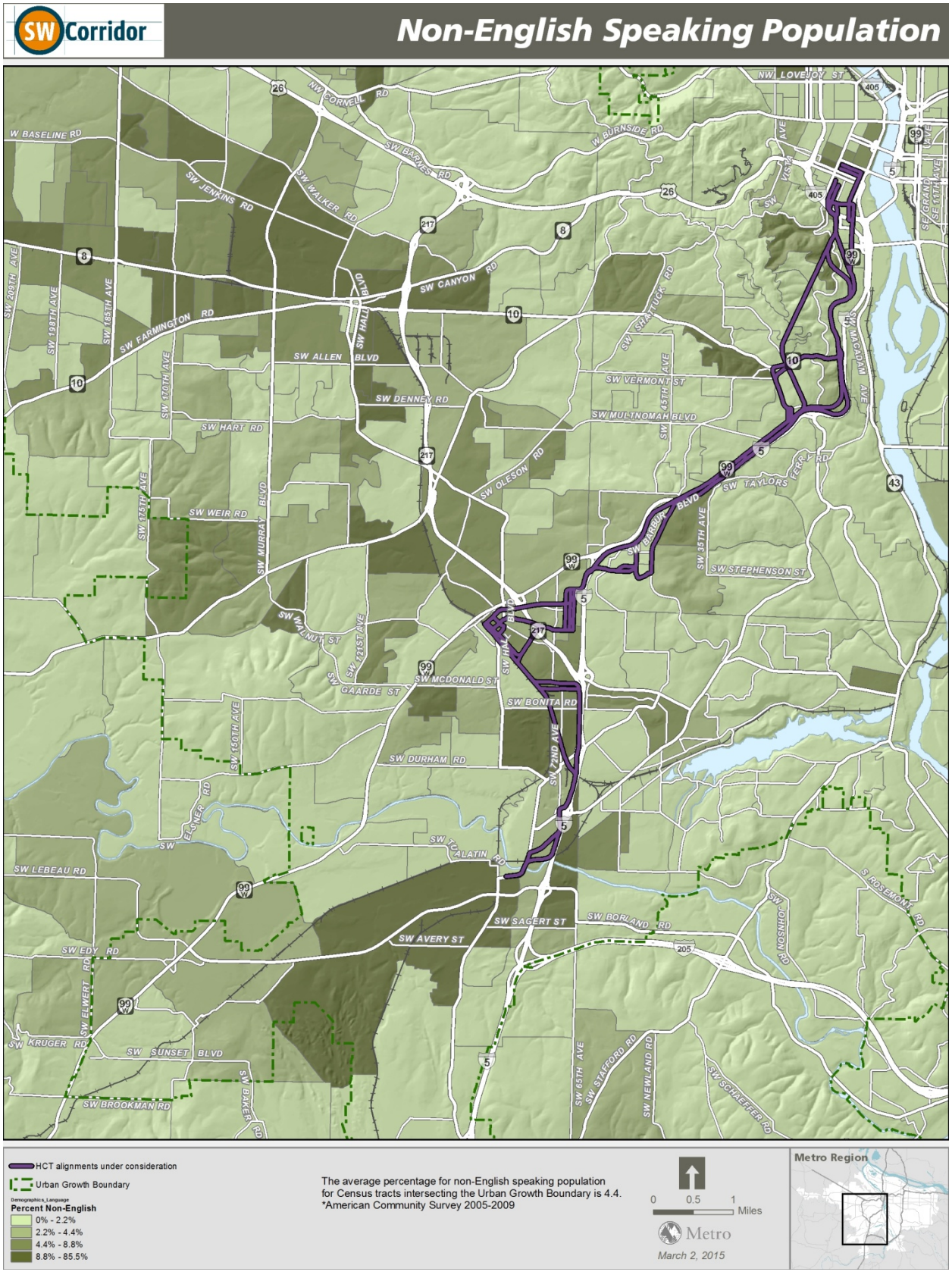

SW Corridor
Black Population
HCT alignments under consideration
Urban Growth Boundary
PCT BLACK census_2010_block_groups
Percent Black
0% - 1.9%
1.9% - 3.7%
3.7% - 7.14%
7.14% - 39.8%
The average percentage for Black population for block groups intersecting the Urban Growth Boundary is 3.7.
*Source: 2010 Census
0 0.5 1 Miles
Metro
March 2, 2015
Metro Region

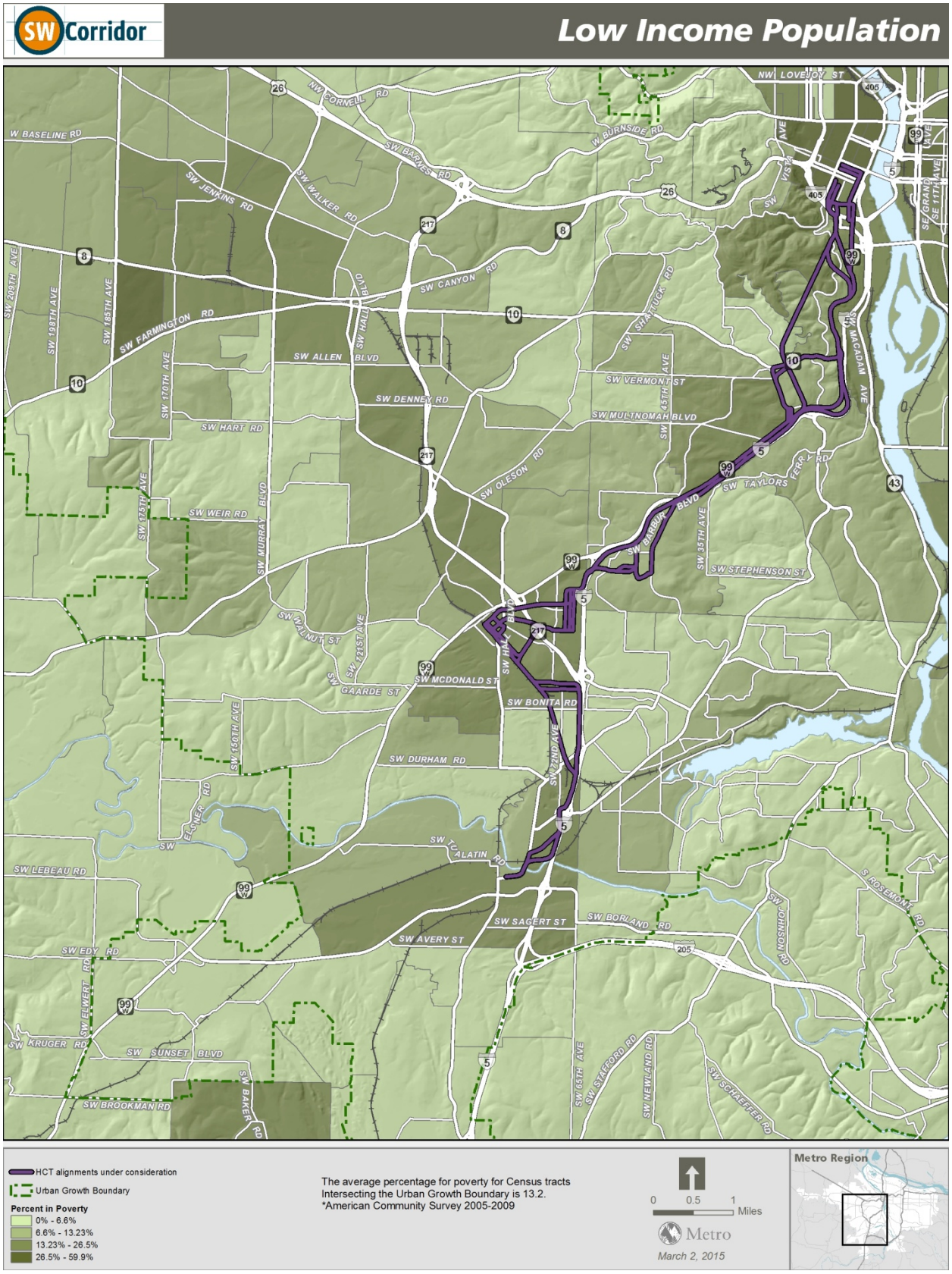

SW Corridor
Hispanic Population
HCT alignments under consideration
Urban Growth Boundary
PCT Hispanic census_2010_block_groups
Percent Hispanic
0% - 5.6%
5.6% - 11.1%
11.1% - 22.3%
22.3% - 83%
The average percentage for Hispanic population for block groups intersecting the Urban Growth Boundary is 11.13.
*Source: 2010 Census
0 0.5 1 Miles
Metro
March 2, 2015
Metro Region

SW Corridor

Native Hawaiian or Pacific Islander Population

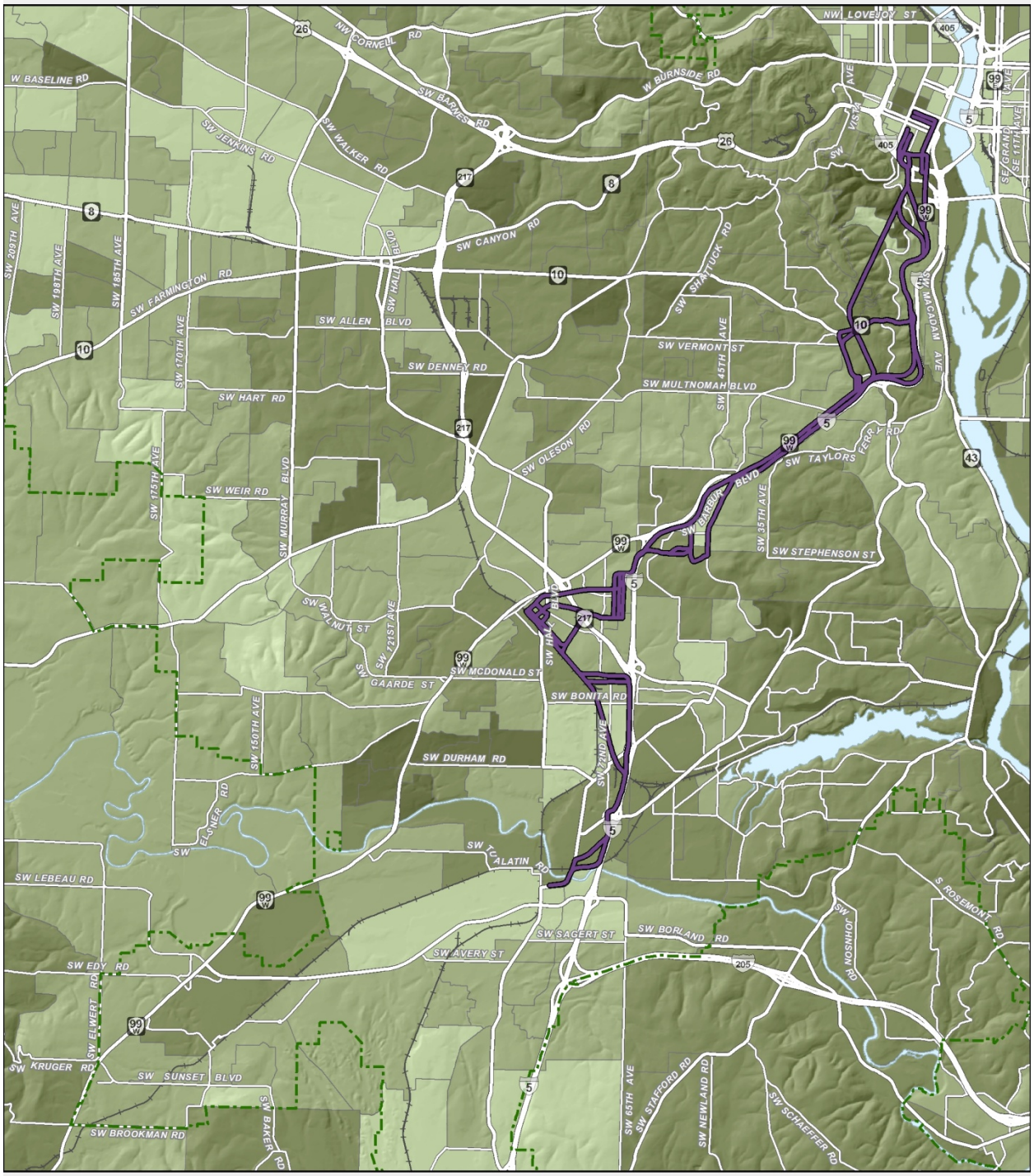



SW Corridor
Non-English Speaking Population
HCT alignments under consideration
Urban Growth Boundary
Demographics_Language
Percent Non-English
0% - 2.2%
2.2% - 4.4%
4.4% - 8.8%
8.8% - 85.5%
The average percentage for non-English speaking population for Census tracts intersecting the Urban Growth Boundary is 4.4.
*American Community Survey 2005-2009
0 0.5 1 Miles
Metro
March 2, 2015
Metro Region


SW Corridor
Low Income Population
HCT alignments under consideration
Urban Growth Boundary
Percent in Poverty
0% - 6.6%
6.6% - 13.23%
13.23% - 26.5%
26.5% - 59.9%
The average percentage for poverty for Census tracts Intersecting the Urban Growth Boundary is 13.2.
*American Community Survey 2005-2009
0 0.5 1 Miles
Metro
March 2, 2015
Metro Region

SW Corridor

Senior Population



HCT alignments under consideration

Urban Growth Boundary

tzk_grps_age

Percent 65 and greater

- 0% - 5.7%
- 5.7% - 11.33%
- 11.33% - 22.7%
- 22.7% - 80.5%

The average percentage for Senior population for block groups intersecting the Urban Growth Boundary is 11.33.
"Senior" is defined as age 65 or greater.
*Source: 2010 Census

0 0.5 1 Miles

Metro

March 2, 2015

Metro Region