GREAT PLACES

SW Corridor

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Beaverton • Durham • King City • Lake Oswego
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Community Technical Workshop

April 15, 2015

www.swcorridorplan.org

swcorridorplan.blog.com

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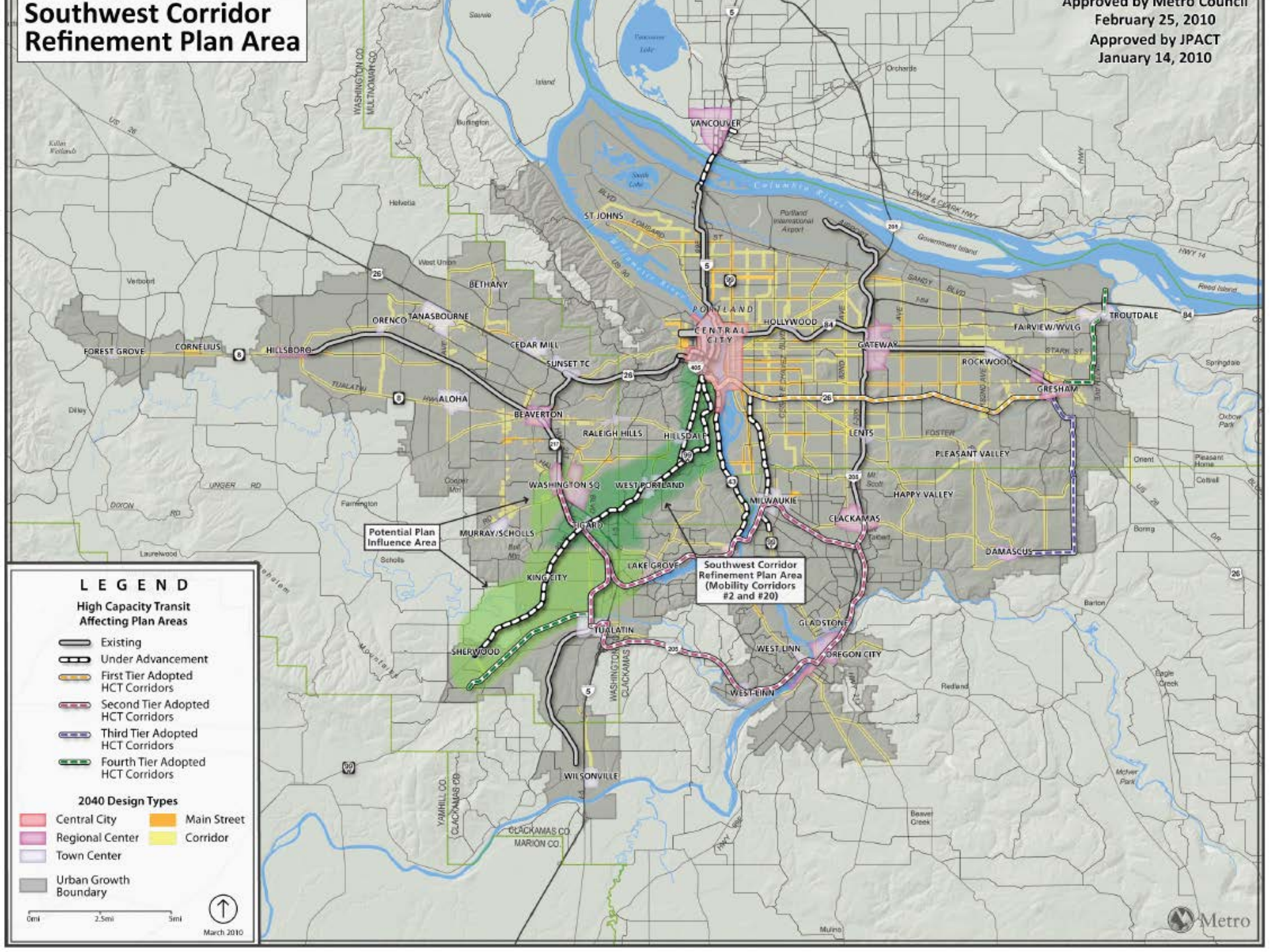
Agenda Items

- Welcome/Review desired outcomes
- Timeline and Decision Making
- Overview of alignments
- Transit Performance
- Tunnel Impacts
- Cost
- Traffic
- Local Transit

Southwest Corridor Refinement Plan Area

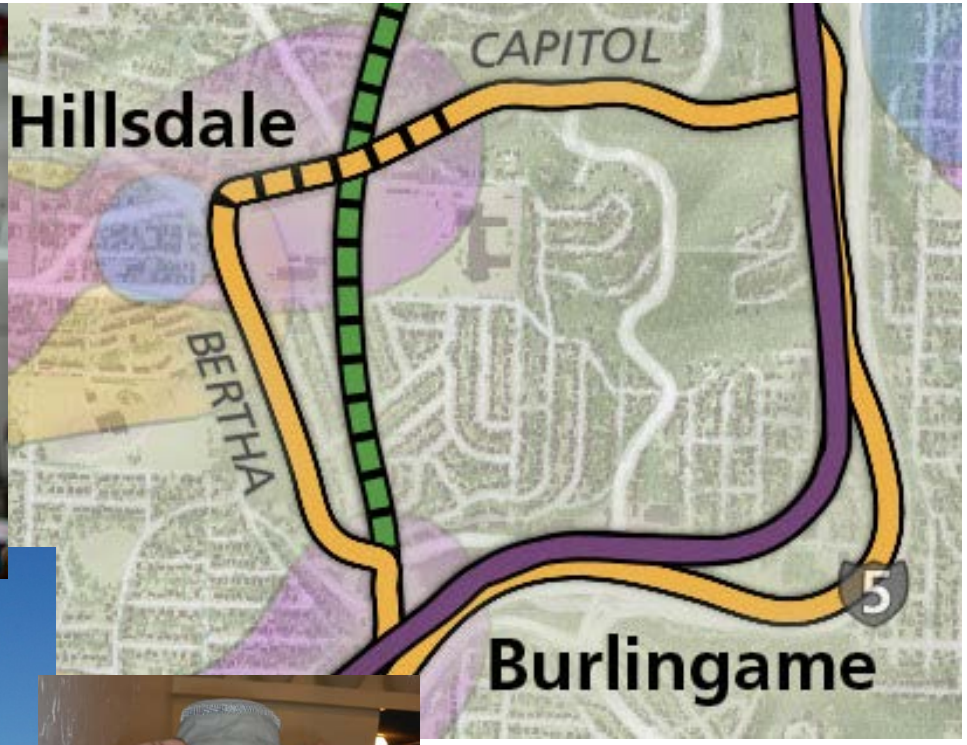
Approved by Metro Council
February 25, 2010
Approved by JPACT
January 14, 2010



Places and People: South Portland

NCNM's location has made transportation a key issue for the college and the SW Corridor Plan is important to the college's future.

Places and People: Hillsdale

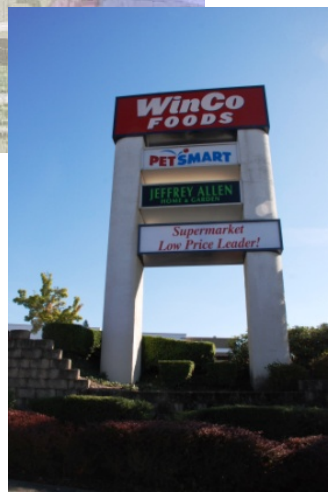


Hillsdale resident Don Baack's work is pedestrian...but in a good way. So good in fact that in 2014 Portland honored him with a Spirit of Portland Award for founding and leading SW Trails.

Places and People: PCC Sylvania; Barbur Blvd

Maddie Allen…commutes five miles by bicycle from her home in inner SE Portland to her job on SW 26 and Barbur, despite the harrowing nature of the ride. "I've gotten used to it now, so it's less awful, but I remember the first time being so terrified. The cars are going so fast, and when it's rainy, you get splashed… The bike lane is often covered by sticks and rocks and debris, especially when it's been raining for a bit."

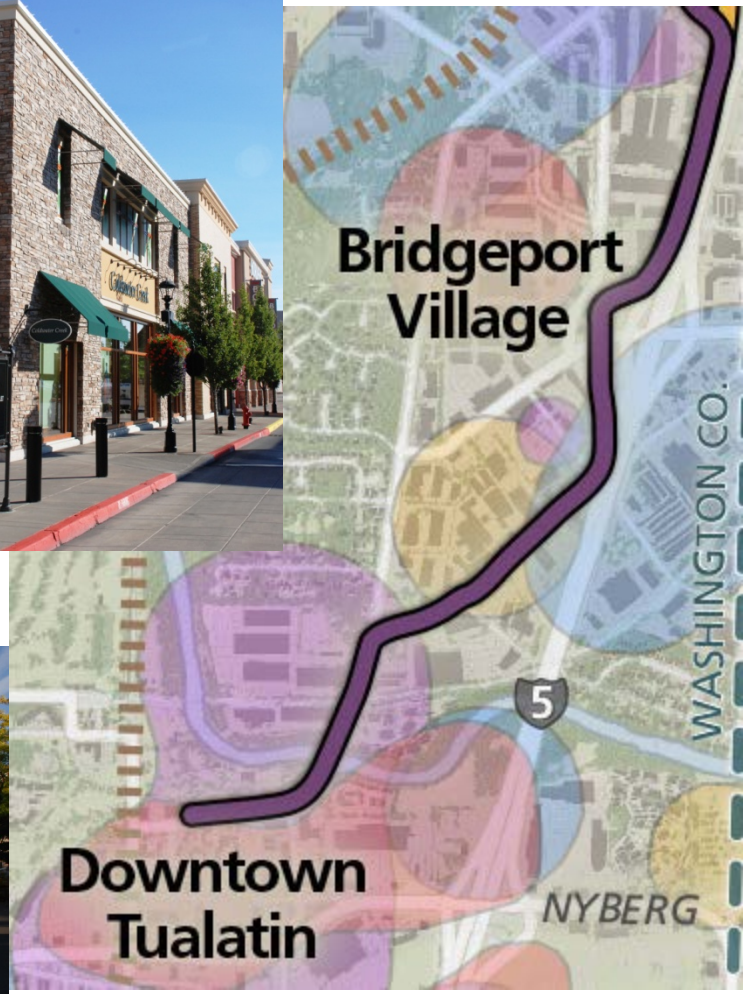
Places and People: Tigard & Kruse Way



Tigard resident Jennifer Dixon, who rides public transit everywhere and has never owned a car or had a drivers license, said people constantly mistake her for younger than her age. "It's all the bus-taking I do," Dixon joked. "I'm not stressed out from driving. Somebody else is driving for me."

Places and People: Tualatin, Durham, Bridgeport

Bill Beers is a father to two young girls and commutes 17 miles from his home in Tualatin to his job on Swan Island. In low traffic, it's a trip that takes about 25 minutes. During commuting hours, however, Beers said the drive takes him 45 to 55 minutes – sometimes longer.

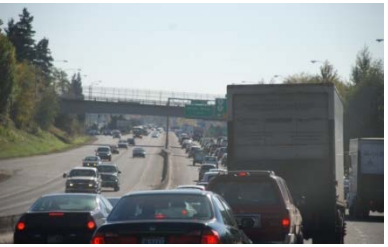


Places and People: Sherwood, Washington Square

In 2013 Sherwood was ranked the fifth best small town in America. When asked about the rankings, Sherwood Mayor Bill Middleton proudly stated "As residents of Sherwood we always knew it was one of the best places to live; now the secret is out."

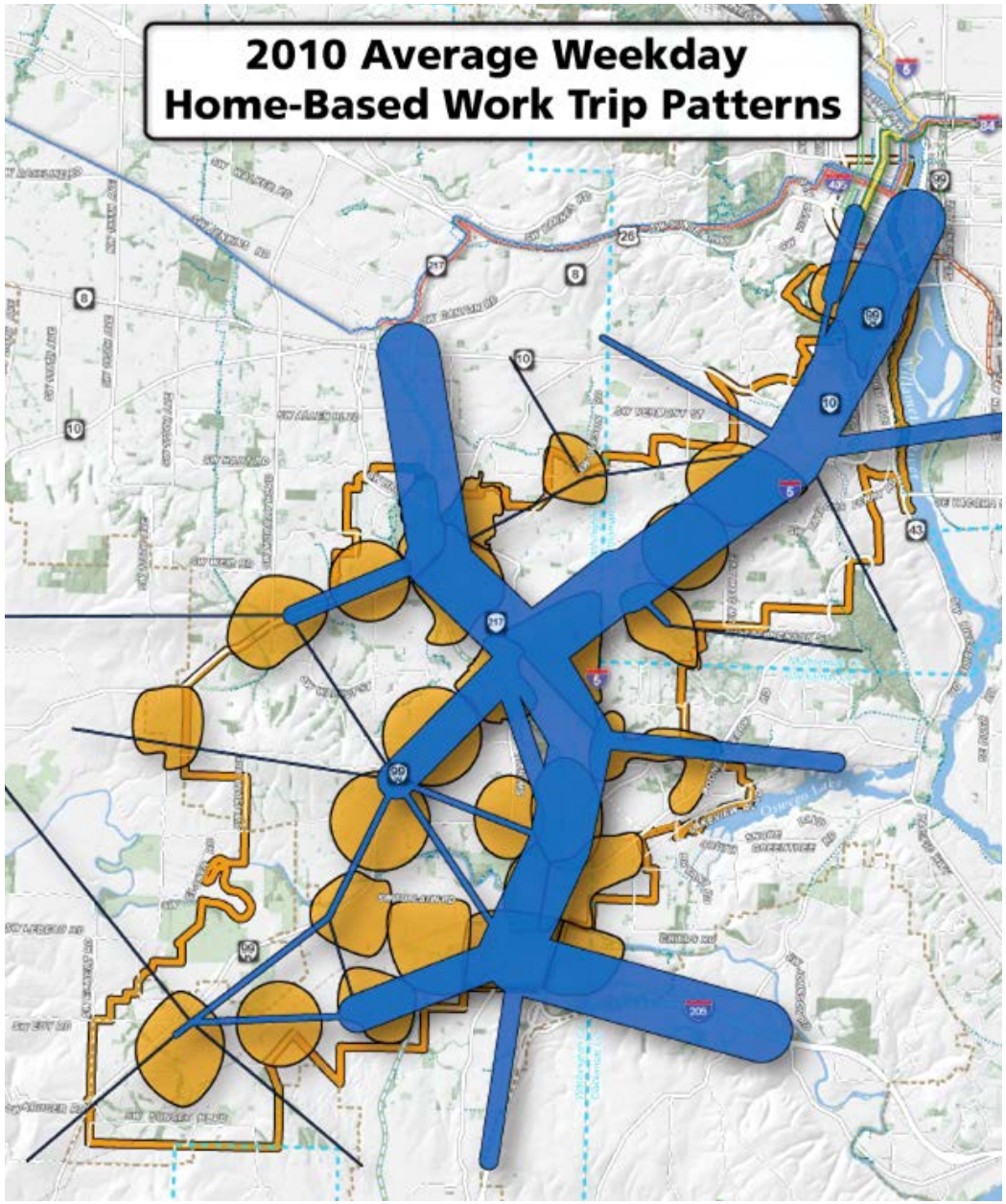
Collaborative effort

Opportunities & challenges



- High travel demand within and throughout the corridor with continued increases in residents and jobs
- Lack of safe infrastructure to provide connectivity & community for all modes
- Insufficient and unreliable transit
- Increased traffic congestion and unreliable travel times

Demand through and across the corridor



Timeline for major decisions

- July 2015: Recommendation Part 1
  - Preliminary connection of Shared Investment Strategy (SIS) projects with potential funding sources
  - Direct or indirect access to key places with HCT (Marquam Hill, Hillsdale, PCC)
- December 2015: Recommendation Part 2
  - Confirmation of HCT associated road, bike, ped projects
  - Draft strategy for funding SIS projects
  - Draft HCT mode, terminus, alignments for further study
- May 2016: Preferred Package
  - Defined HCT project, including complementary road, bike, ped improvements for DEIS
  - Strategy to fund SIS road, bike and ped improvements
  - Development strategy to support land use vision

July 2015 Steering Committee Questions

- LRT Marquam Hill-Hillsdale tunnel
- LRT Hillsdale Loop with cut-and-cover tunnel
- BRT Hillsdale Loop with cut-and-cover tunnel
- LRT direct to PCC with cut-and-cover tunnel
- BRT direct to PCC via Capitol Highway
- *Some options continued for in July may be removed from consideration when a mode is selected*

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May 5-19: Online comment period for July 2015 decision

May 11th SWCP Steering Committee: PCC Key Issues, Tunnels

May 12th Community Forum, Wilson High School

June 2-16: Second online comment period and community forum

July 13th SWCP Steering Committee Decision

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BRT and LRT alignments:

- Bored Tunnels
- South Portland
- Hillsdale
- PCC-Sylvania area

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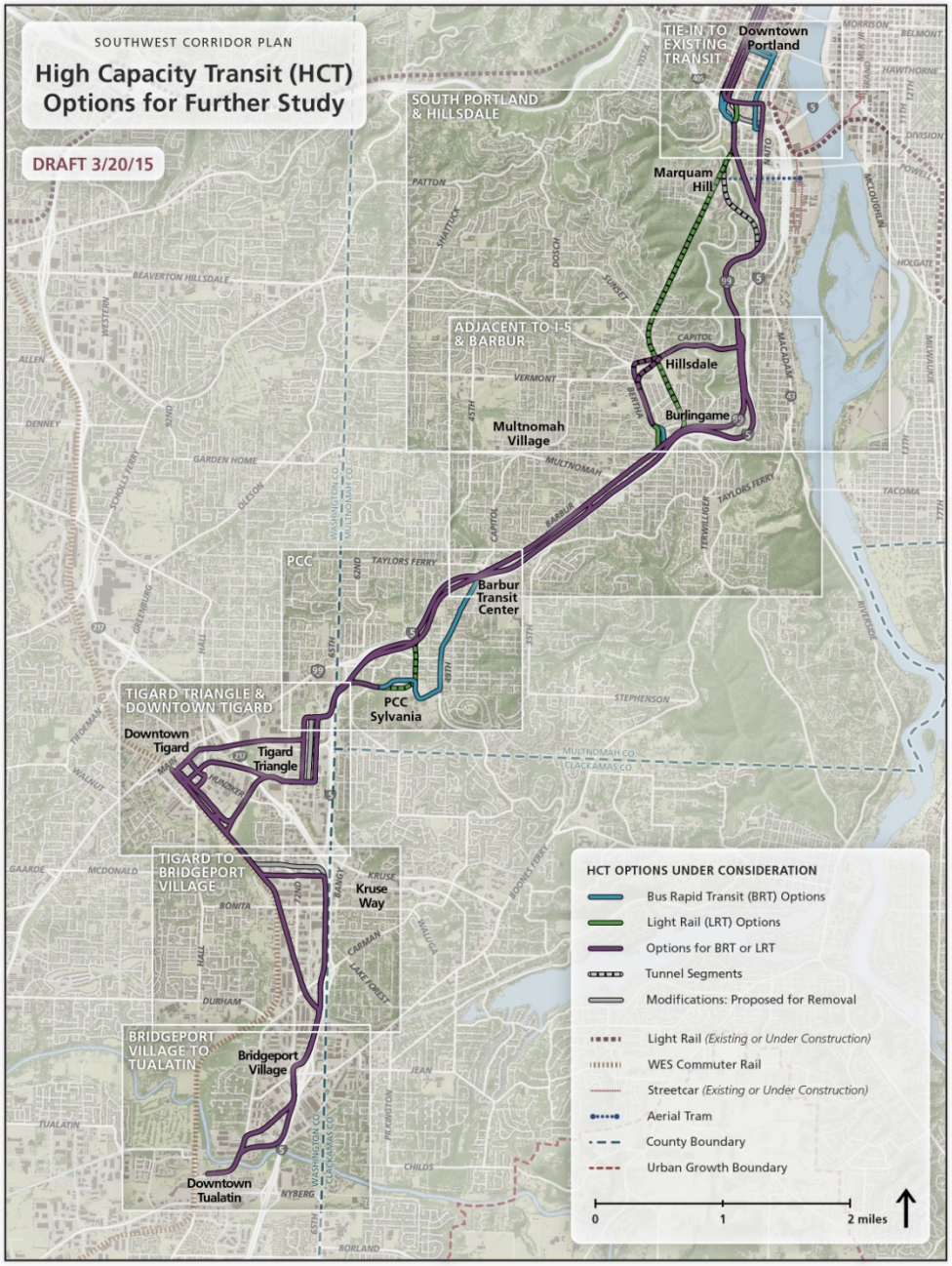


HCT alignment options under consideration

1. **Bored Tunnels (LRT only)**
   a. Marquam Hill-Hillsdale Tunnel
   b. Marquam Hill Tunnel (short tunnel)

2. **South Portland**
   a. Barbur
   b. Naito

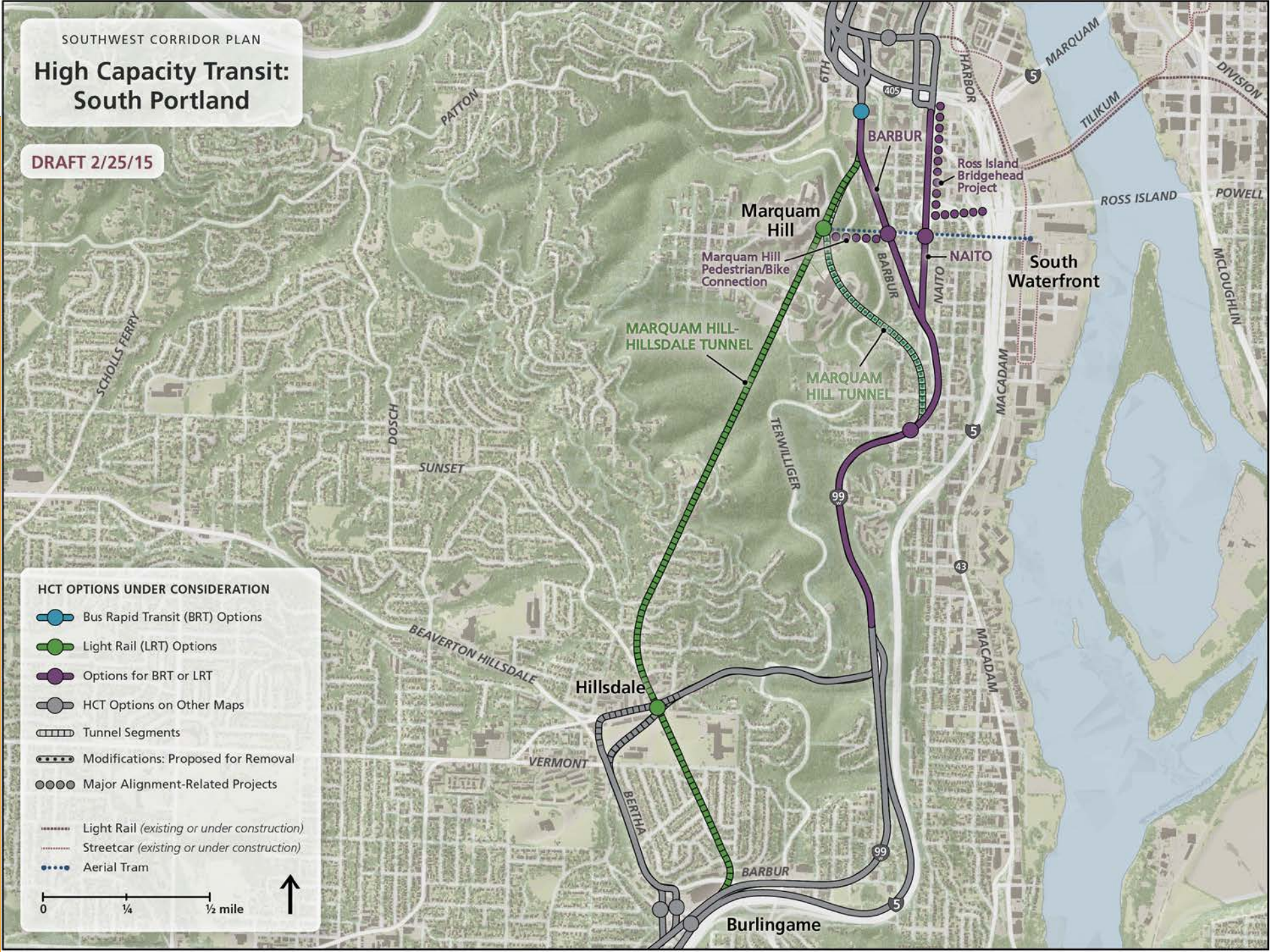
3. **Hillsdale**
   a. Barbur
   b. Hillsdale loop with cut-and-cover tunnel

4. **PCC-Sylvania Area**
   a. Barbur
   b. BRT to campus via Capitol Highway
   c. LRT to campus via cut-and-cover tunnel

SOUTHWEST CORRIDOR PLAN

High Capacity Transit: South Portland

DRAFT 2/25/15



SOUTHWEST CORRIDOR PLAN

LRT Alignment:
Marquam Hill-Hillsdale Tunnel

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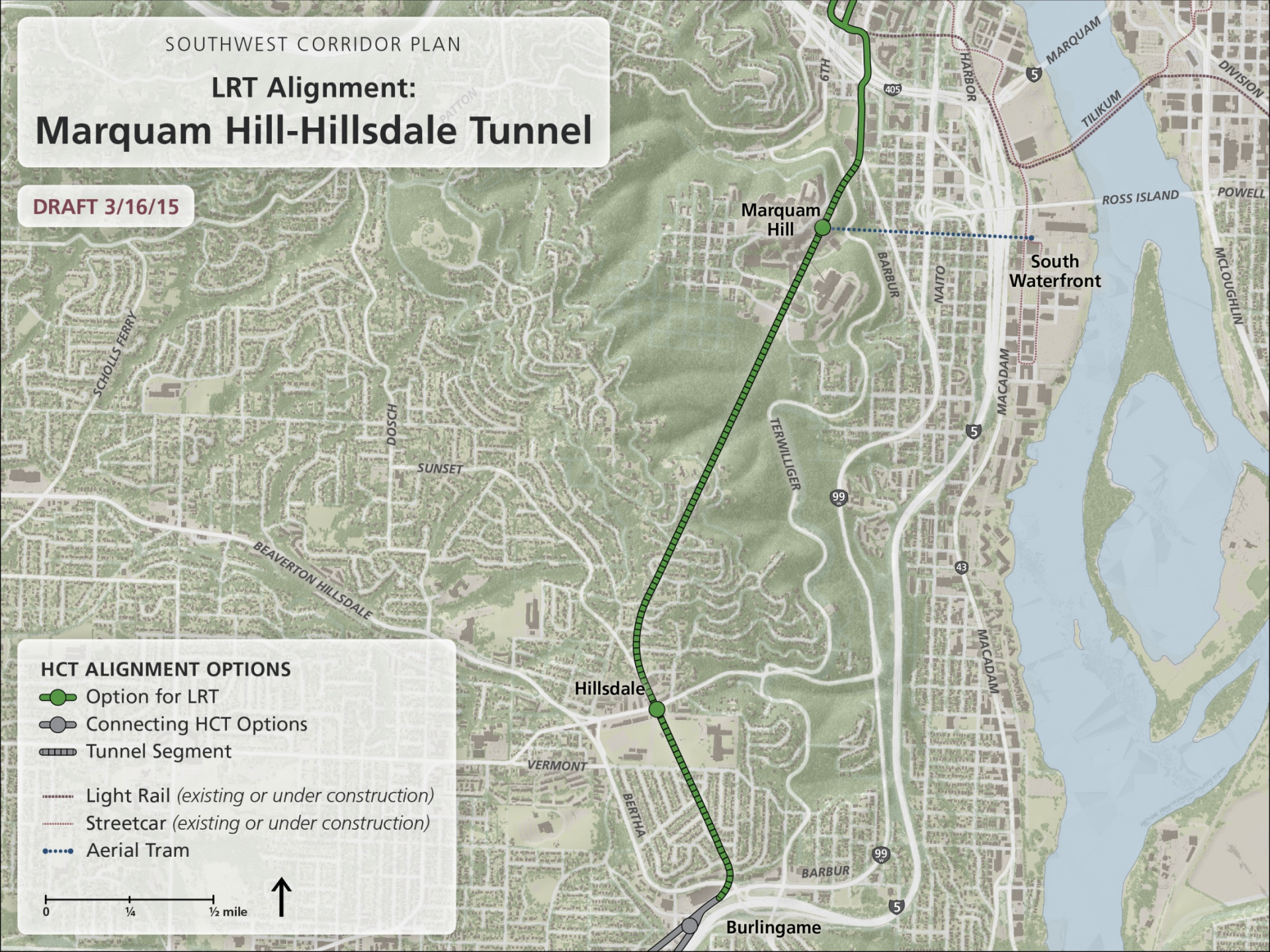

SOUTHWEST CORRIDOR PLAN

BRT or LRT Alignment: Barbur Boulevard

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SOUTHWEST CORRIDOR PLAN

BRT or LRT Alignment: Naito Parkway

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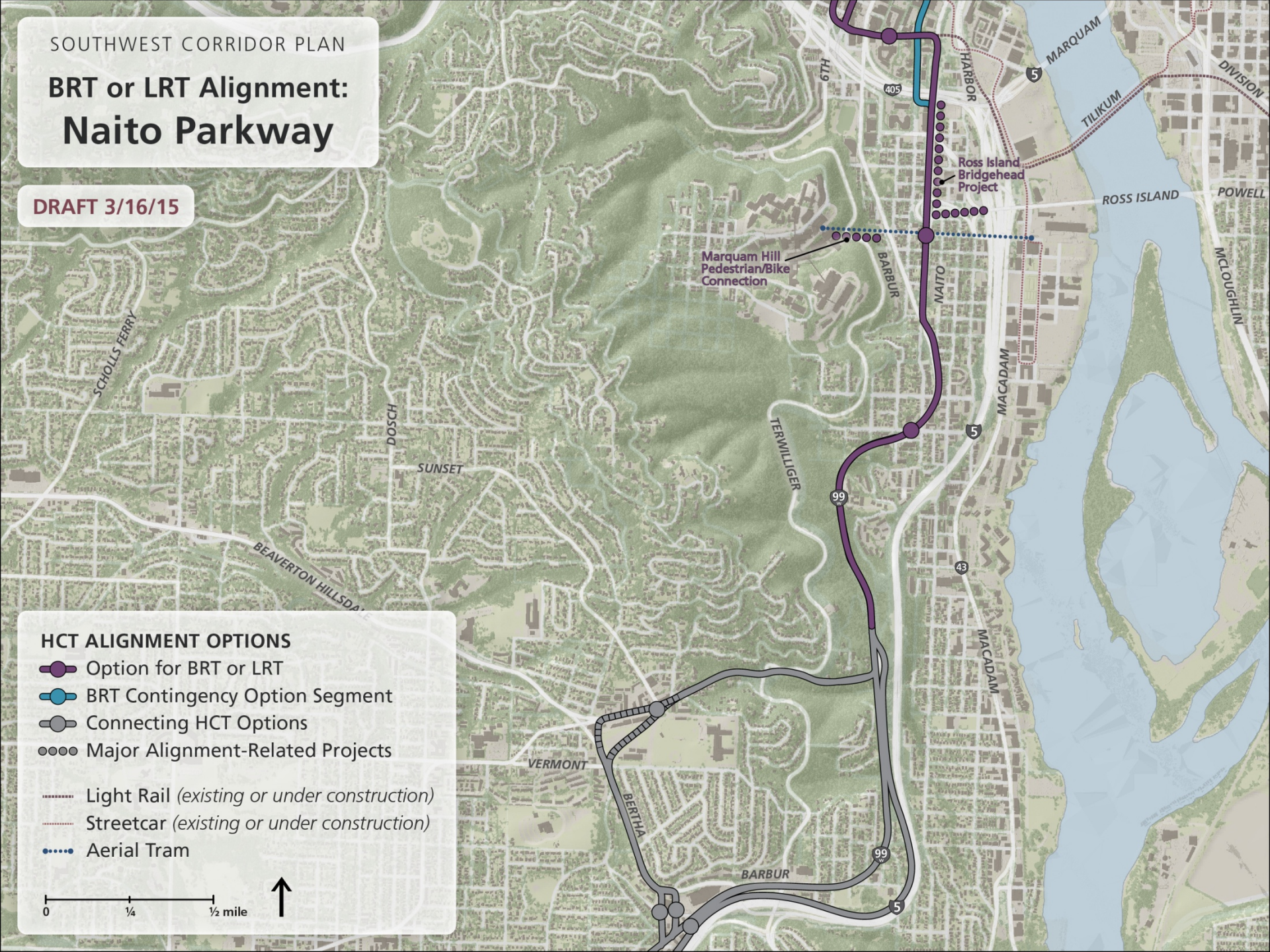

SOUTHWEST CORRIDOR PLAN

BRT or LRT Alignment: Barbur Boulevard

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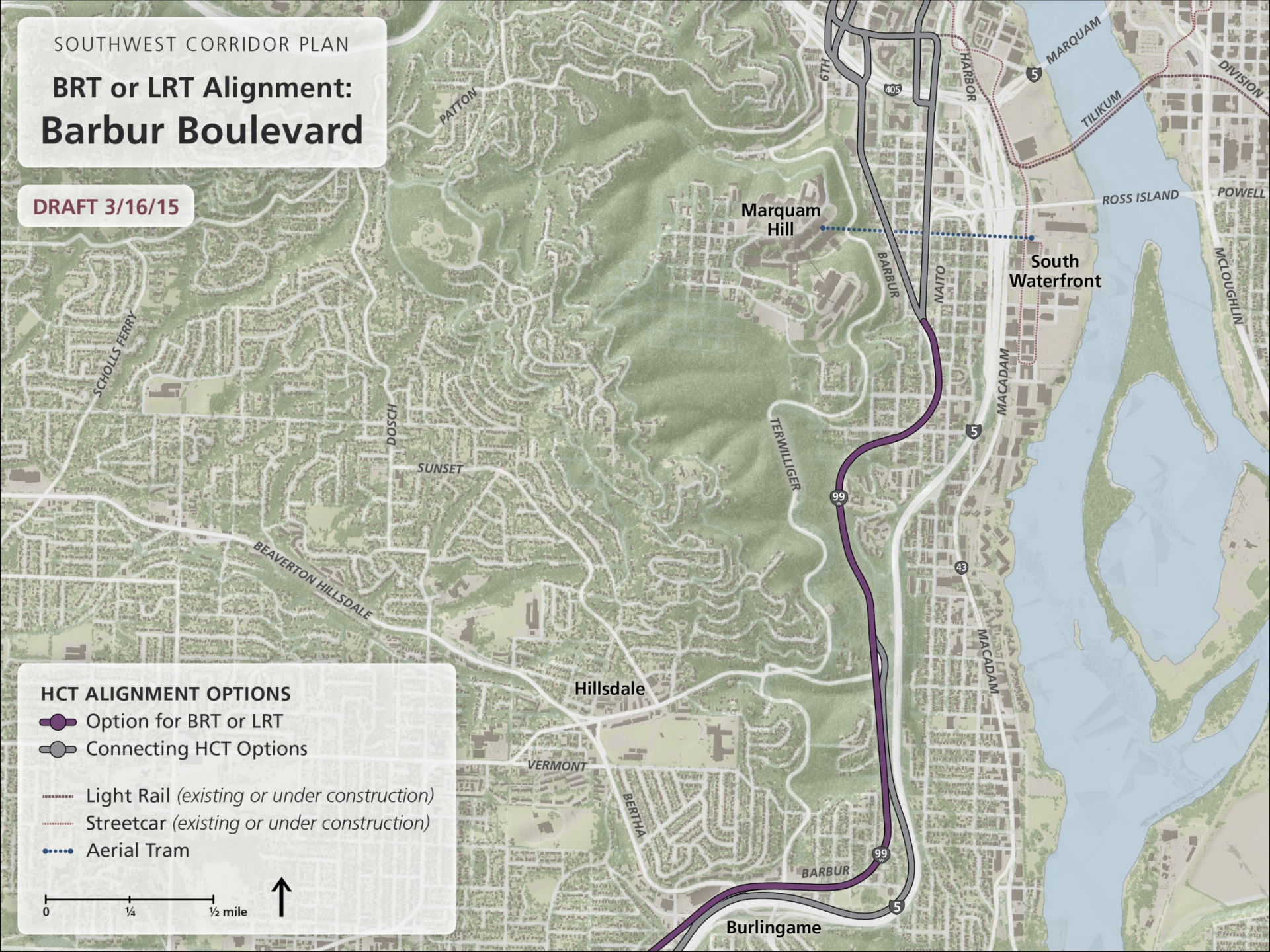

SOUTHWEST CORRIDOR PLAN

BRT or LRT Alignment:
Hillsdale Loop under Capitol

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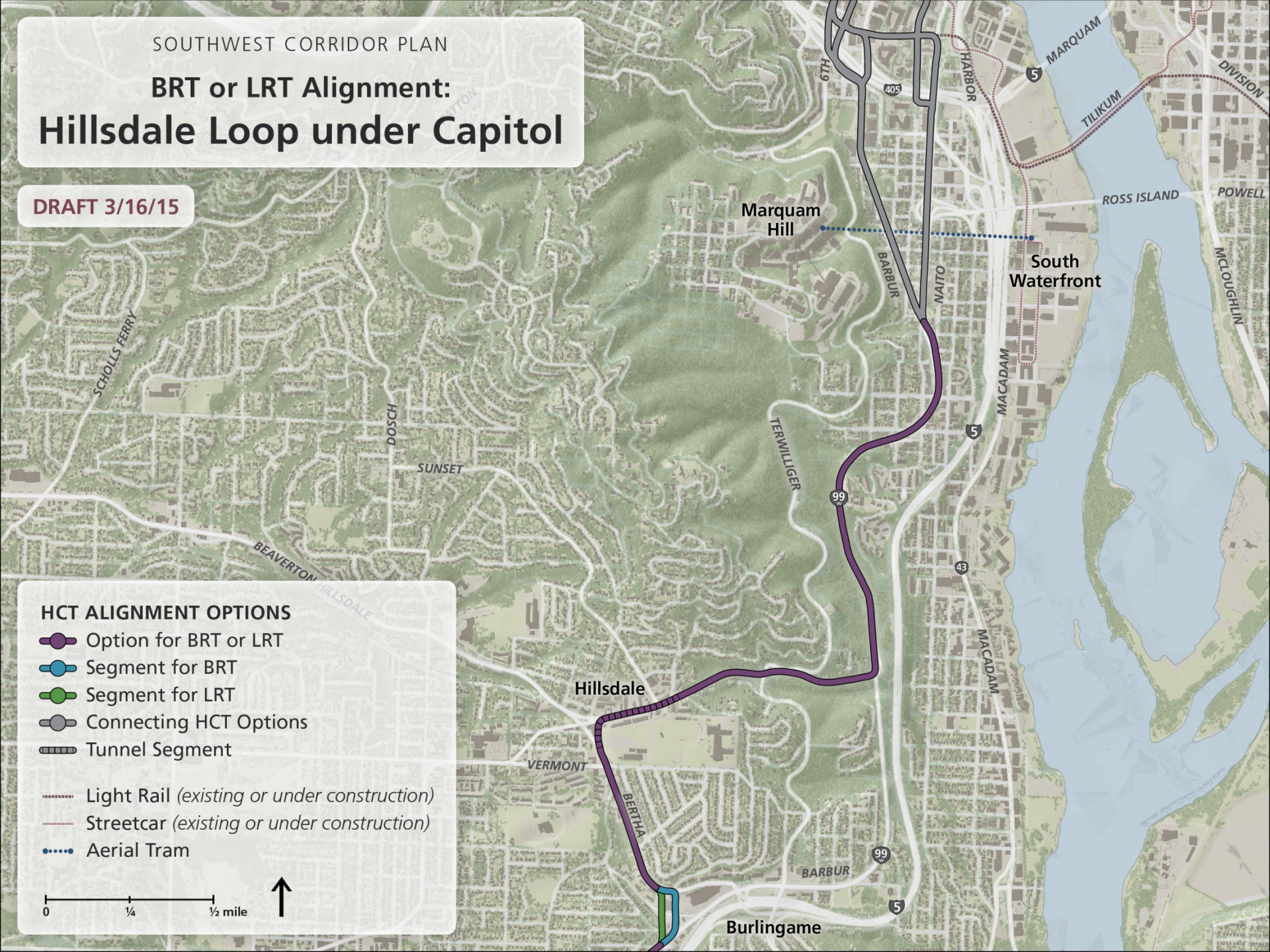

SOUTHWEST CORRIDOR PLAN

BRT or LRT Alignment: Barbur

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SOUTHWEST CORRIDOR PLAN

BRT Alignment: PCC via Capitol

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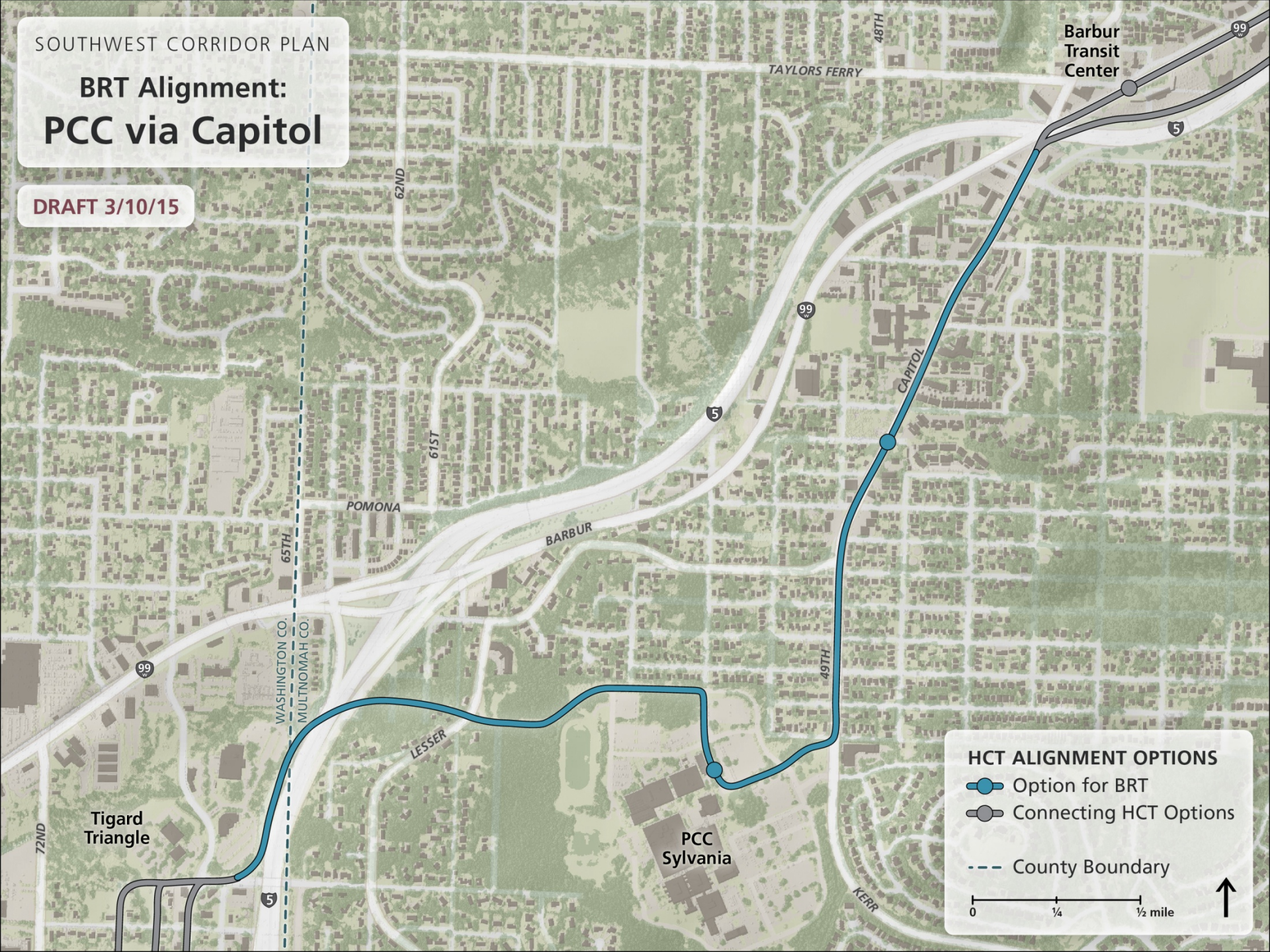

SOUTHWEST CORRIDOR PLAN

LRT Alignment:
PCC Cut-and-Cover Tunnel

DRAFT 3/10/15

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HCT Options Evaluation

1. Transit Performance
2. Access and development
3. Mobility
4. Cost
5. Engineering Complexity
6. Community and environmental impacts

South Portland: LRT options

	Naito + Barbur	Barbur + Barbur	Naito + Hillsdale	Barbur + Hillsdale	MH-H Tunnel
Transit performance					
Change in system transit trips *2035 with HCT - 2035 low build*	15,700 *new system transit trips*	15,700 *new system transit trips*	14,200 *new system transit trips*	14,800[1] *new system transit trips*	16,900 *new system transit trips*
Line ridership *2035 HCT in SW Corridor*	43,500 *line riders*	44,100 *line riders*	41,800 *line riders*	41,800[1] *line riders*	52,400 *line riders*
Travel time *PSU to Tualatin*	31.2 minutes	30.3 minutes	33.8 minutes	32.9 minutes	29.1 minutes
Signalized intersections crossed	# *intersections*	## *intersections*	### *intersections*	#### *intersections*	##### *intersections*
Access and development					
Station access to key destinations *including colleges/universities, high schools, town centers, and major employers*	?	?	?	?	?
Equitable access to transit *based on transit trips in areas with above average people of color, low income, and limited English proficiency*	moderate access	moderate access	?	?	moderate to high access
Redevelopment potential *based on acres of redevelopable land*	249 acres	219 acres	317 acres	287 acres	203 acres
Support for existing plans *including Barbur Concept Plan*	high support	moderate support	moderate to high support	moderate support	moderate support
Mobility					
Freight *based on overlap with local, regional and state freight networks*	substantial local overlap	substantial local overlap	substantial local overlap	substantial local overlap	some local overlap
Traffic *based on VIC ratio and vehicle queuing*	major opportunity for improvement	negligible impact	major opportunity for improvement	negligible impact	negligible impact
Transportation safety *opportunity to address high-crash locations*	moderate opportunity for improvement	moderate opportunity for improvement	moderate opportunity for improvement	moderate opportunity for improvement	minor opportunity for improvement
Street connectivity *change in street connections, including bike and pedestrian connections*	8-10 new connections	no change	8-10 new connections	no change	no change
Bike improvements *miles of BATP bike gaps filled (included in project cost estimates)*	2.0 miles *along 3.4 mile segment*	0.4 miles *along 3.4 mile segment*	2.1 miles *along 3.7 mile segment*	0.4 miles *along 3.7 mile segment*	0 miles *along 2.9 mile segment*
Pedestrian improvements *miles of BATP sidewalk gaps filled (included in project cost estimates)*	3.3 miles *along 3.4 mile segment*	3.1 miles *along 3.4 mile segment*	3.3 miles *along 3.7 mile segment*	3.1 miles *along 3.7 mile segment*	0 miles *along 2.9 mile segment*
Cost					
Capital cost: segment *millions of 2014 dollars*	$592 million	$441 million	$818 million	$668 million	$1,341 million
Operations and maintenance costs *TBD*	?	?	?	?	?
Engineering complexity					
Construction impacts *qualitative evaluation of temporary impacts that could occur during project construction*	moderate impact	low to moderate impact	moderate to high impact	moderate to high impact	high impact
Engineering risk *qualitative evaluation of relative risk associated with special elements of design options*	moderate to high risk	low to moderate risk	moderate to high risk	moderate to high risk	high risk
Community and environmental impacts					
Property impacts *TBD*	?	?	?	?	?
Equitable distribution of property impacts *residential impacts in areas with above average people of color, low income, and limited English proficiency*	?	?	?	?	?
Visual impacts *based on degree of visual change*	moderate to high *degree of change*	moderate to high *degree of change*	moderate to high *degree of change*	moderate to high *degree of change*	moderate *degree of change*
Impacts to parks and historic properties *potential impacts to parks, wetlands, and historic properties*	?	?	?	?	?

Questions?

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Transit Performance:

- Bored Tunnels
- South Portland
- Hillsdale
- PCC-Sylvania area

Transit Performance (Year 2035 Modeling)

1. **Travel Demand Modeling incorporates:**
   - Future land use projections
   - Future roadway network
   - Future transit network
   - Travel Behavior Survey results

2. **Measures**
   - LRT or BRT Line Riders
     The number of daily riders on the HCT line between Tualatin and downtown Portland
   - Change in System Transit Trips (new riders)
     The growth of total system transit ridership as a result of the project
   - Travel Time
     Time in minutes from PSU to Tualatin in the PM peak period

Base Modeling Alignments

1. LRT

- 31 minutes PSU to Tualatin
- 43,540 daily line trips
- adds 15,700 daily new transit trips

2. BRT

- 34.1 minutes PSU to Tualatin
- 30,800 daily line trips
- adds 8,500 daily new transit trips

Bored Tunnels compared to LRT modeling base

1. Marquam Hill – Hillsdale Tunnel

- saves 2 minutes
- adds 8,900 line trips
- adds 1,200 daily new transit trips

2. Short Tunnel

- saves less than 1 minute
- adds 6,840 line trips
- adds 400 new transit trips

Q. Why the relatively small number of new transit riders compared to line riders?
A. Because of large number of transfers in Hillsdale and the transit mall by people traveling to Marquam Hill.

Other considerations: tunneling

South Portland: Barbur compared to Naito (LRT modeling base)

- Naito takes about 1 minute longer (Barbur is faster)
- Naito gets a “free” Lincoln Station
- Barbur adds 520 line trips
- No difference in new transit trips

A Naito alignment would add trips from/to the southeast CBD (RiverPlace) with the Lincoln Station; a Barbur alignment would add trips from the rest of the route due to slightly better travel time

Other considerations: redevelopment, Ross Island bridgehead modifications, costs

Hillsdale: Hillsdale Loop with cut-and-cover tunnel compared to Barbur (LRT modeling base)

The Hillsdale Loop:

- adds nearly 3 minutes
- loses 1,710 line trips
- loses 1,400 new system trips

Hillsdale Station would be busy, but slower travel times would cost trips along the rest of the alignment

High level of local bus service through Hillsdale with the No-Build blunts the effect of adding HCT.

Other considerations: tunneling complexity, impacts, risks, costs

PCC-Sylvania Area: Direct to campus compared to Barbur (LRT modeling base)

1. **LRT to PCC with cut-and-cover tunnel**

- Saves nearly 1 minute
- Adds 2,710 line trips
- Adds 2,100 new transit trips

2. **BRT to PCC via Capitol Highway**

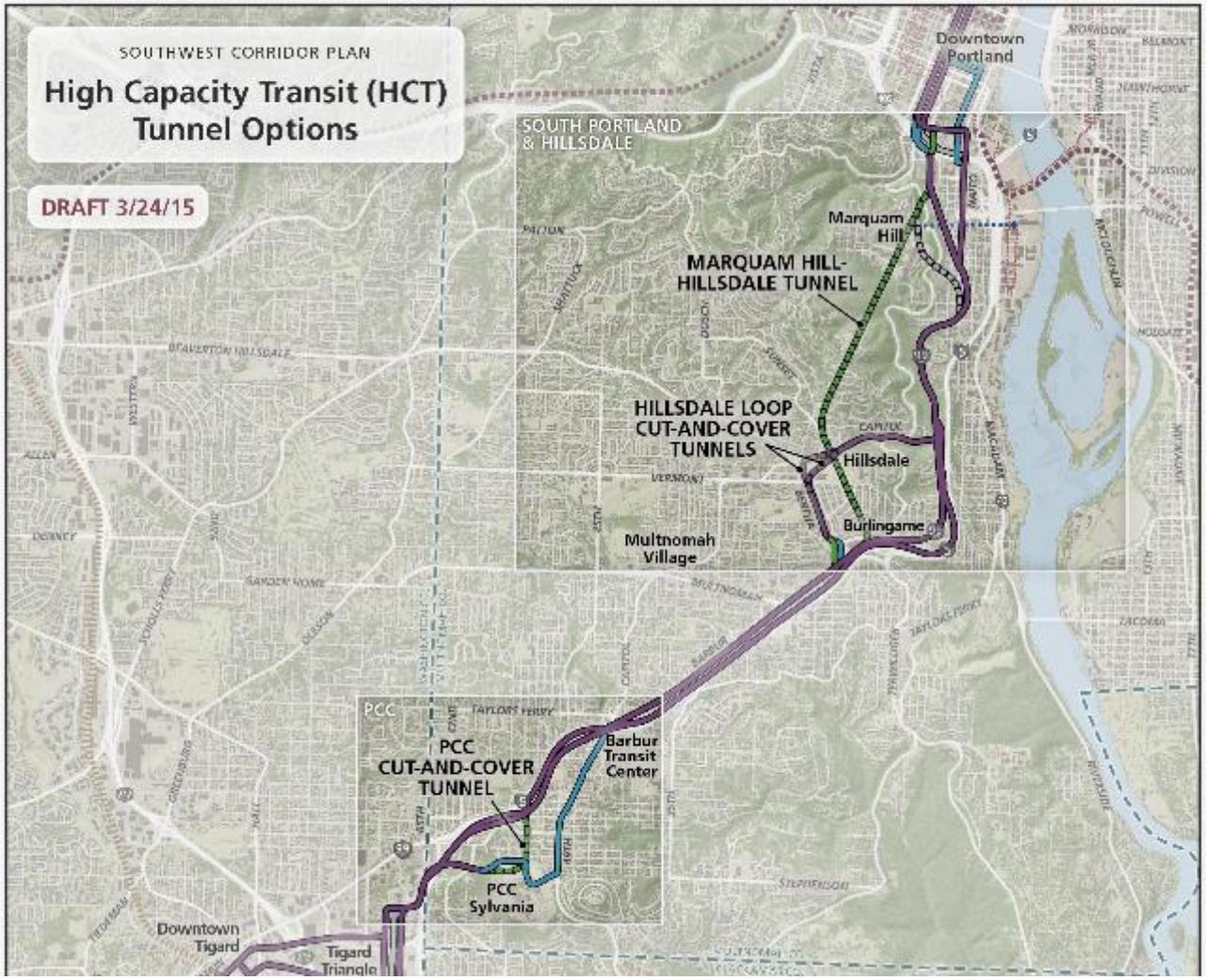
- Takes 1 ½ minutes longer
- Adds 2,120 line trips
- Adds 1,200 new transit trips

For BRT, riders attracted by PCC station overcome riders lost from additional travel time.

Other considerations: Other considerations: tunneling complexity, impacts, risks, costs

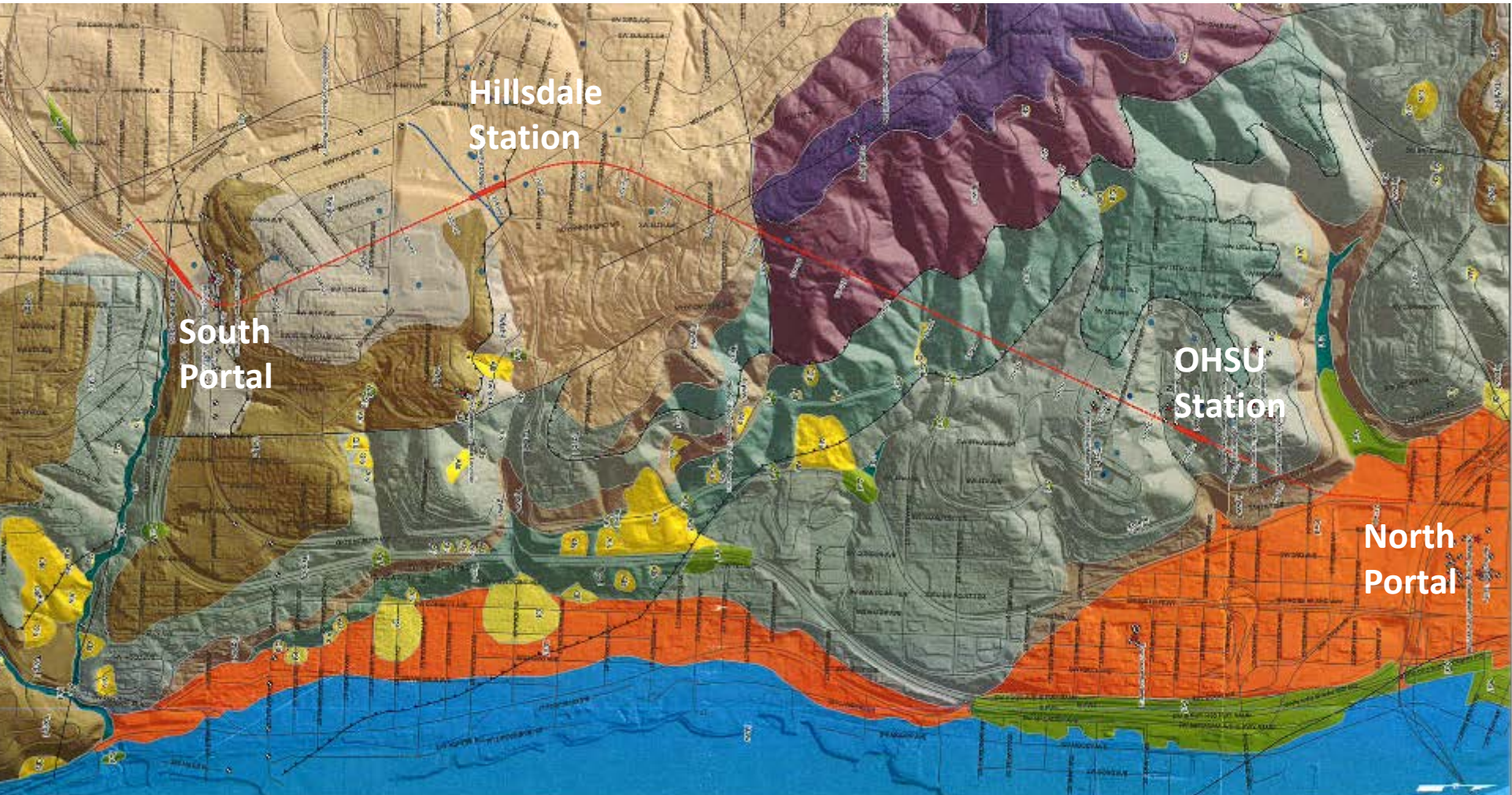
Potential Tunnels in the Southwest Corridor

Tunnel Options



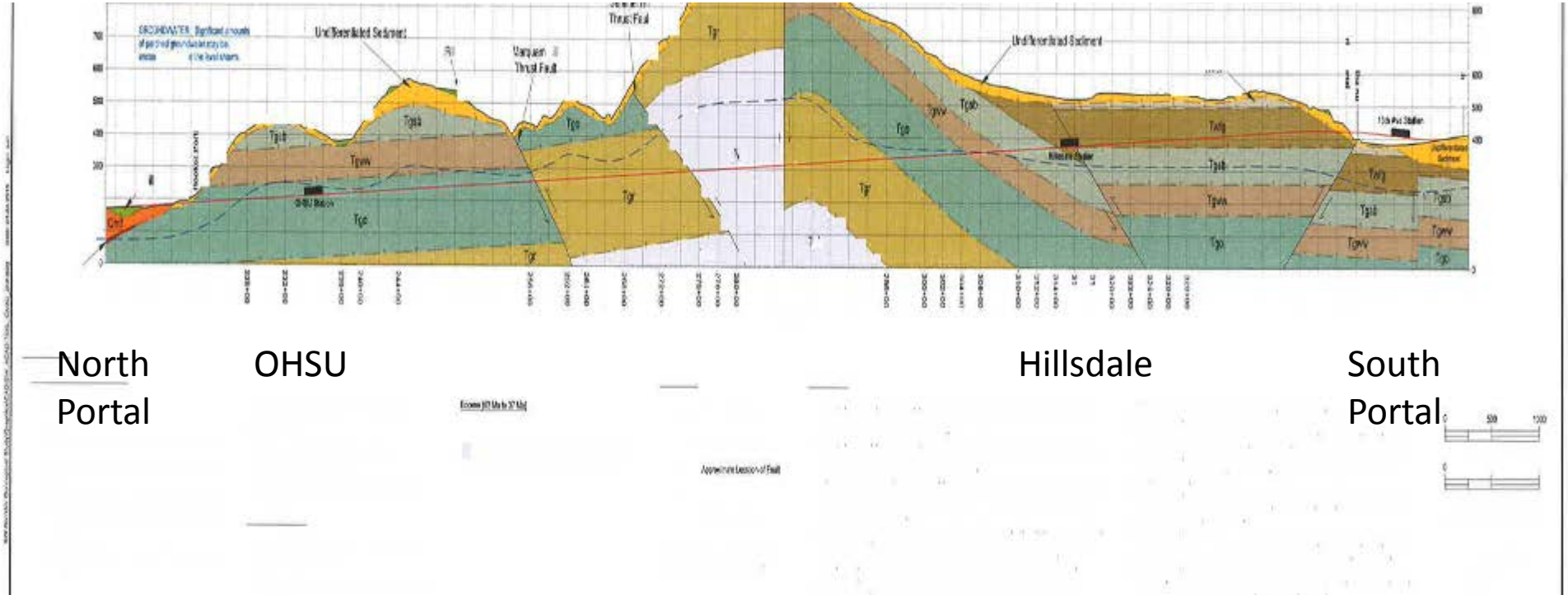
Marquam Hill-Hillsdale

Bored Tunnel with Two Stations



Marquam Area Geological Conditions

- Highly variable
- Presence of groundwater will likely require special treatments during construction and operation
- 8 distinct rock layers, including hard rock (basalt)
- Deep mined station at OHSU
- Cut-and-cover at Hillsdale

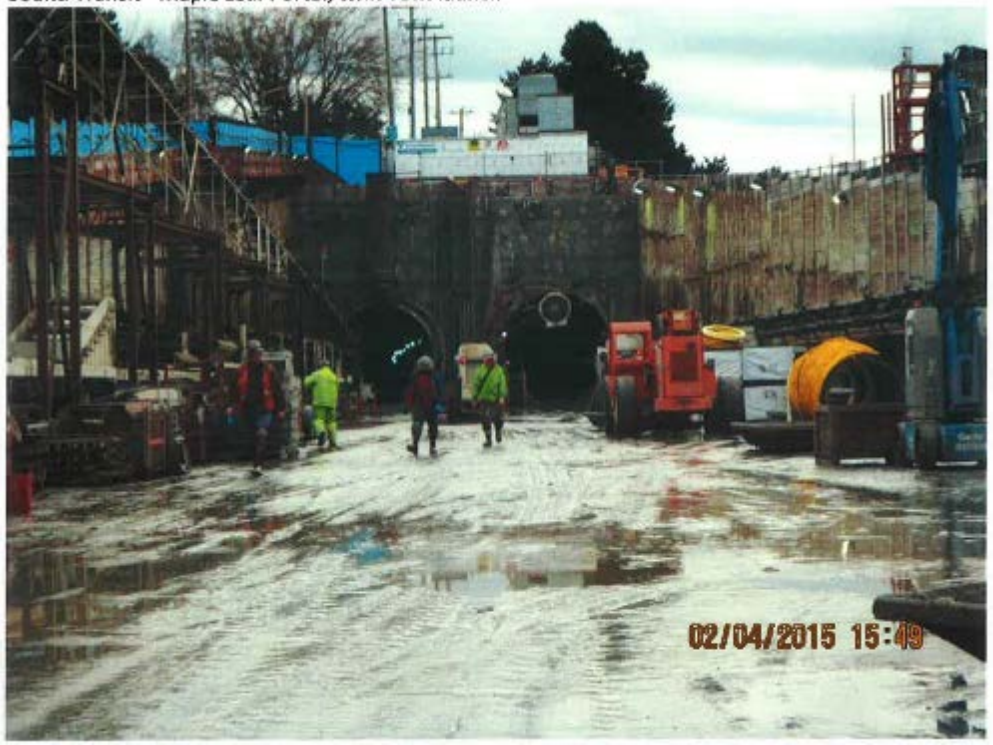


Bored Tunnel Techniques

- Tunnel boring machines would likely bore two parallel tunnels.
- May need retained cut into the hill and some conventional mining to launch TBM's.

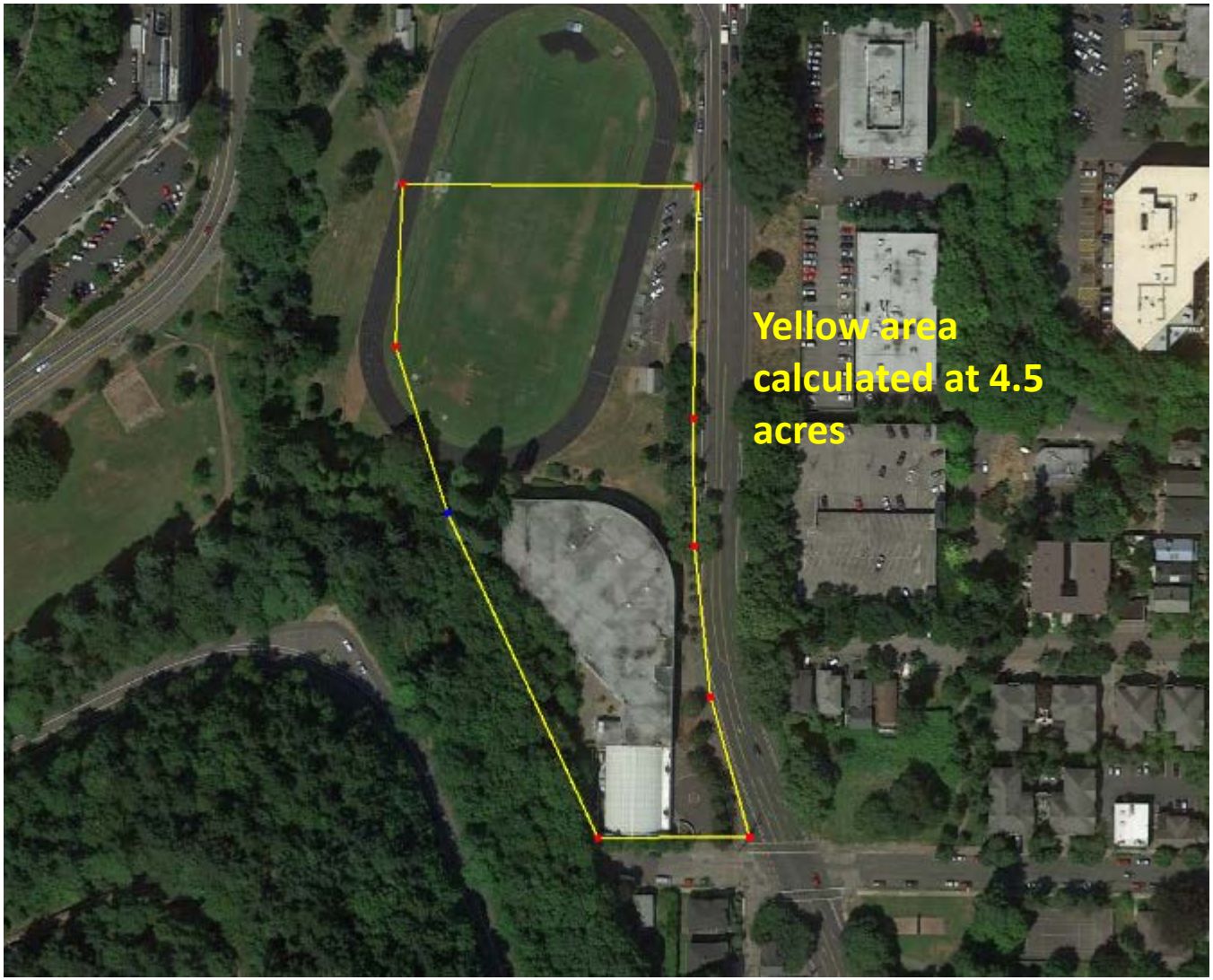
Portals

- Portals are the focus of the mining operations.
  - Multi-acre sites needed at portals for TBM launch or retrieval, construction staging
  - Spoils/muck removal
  - Material removal/haul trucks
  - Material delivery
  - Often three or more years of major activities



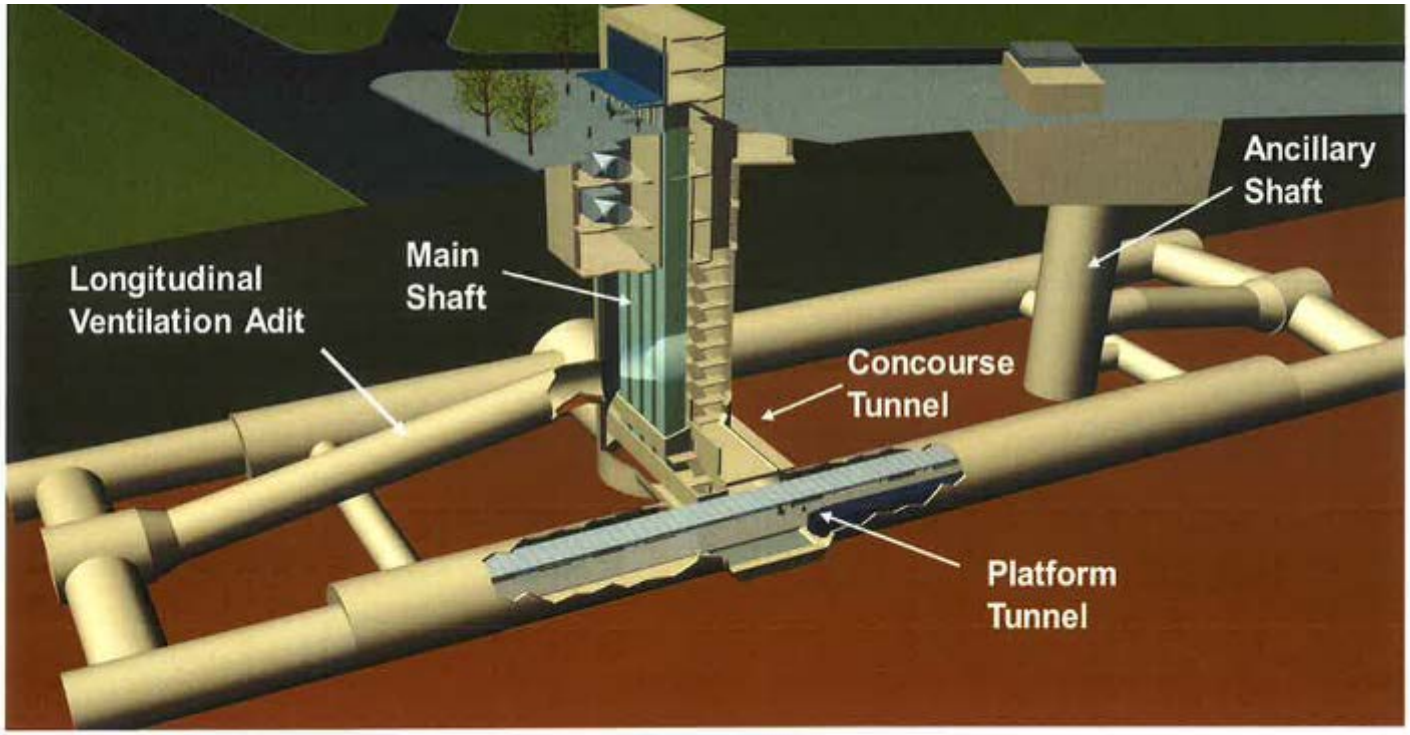
Sound Transit north portal
(about 4.5 acres)

Dunaway park near north portal



Deep mined station (Beacon Hill in Seattle)

- Still requires ample areas for staging and equipment
- Shafts can require mining/blasting to reach tunnel

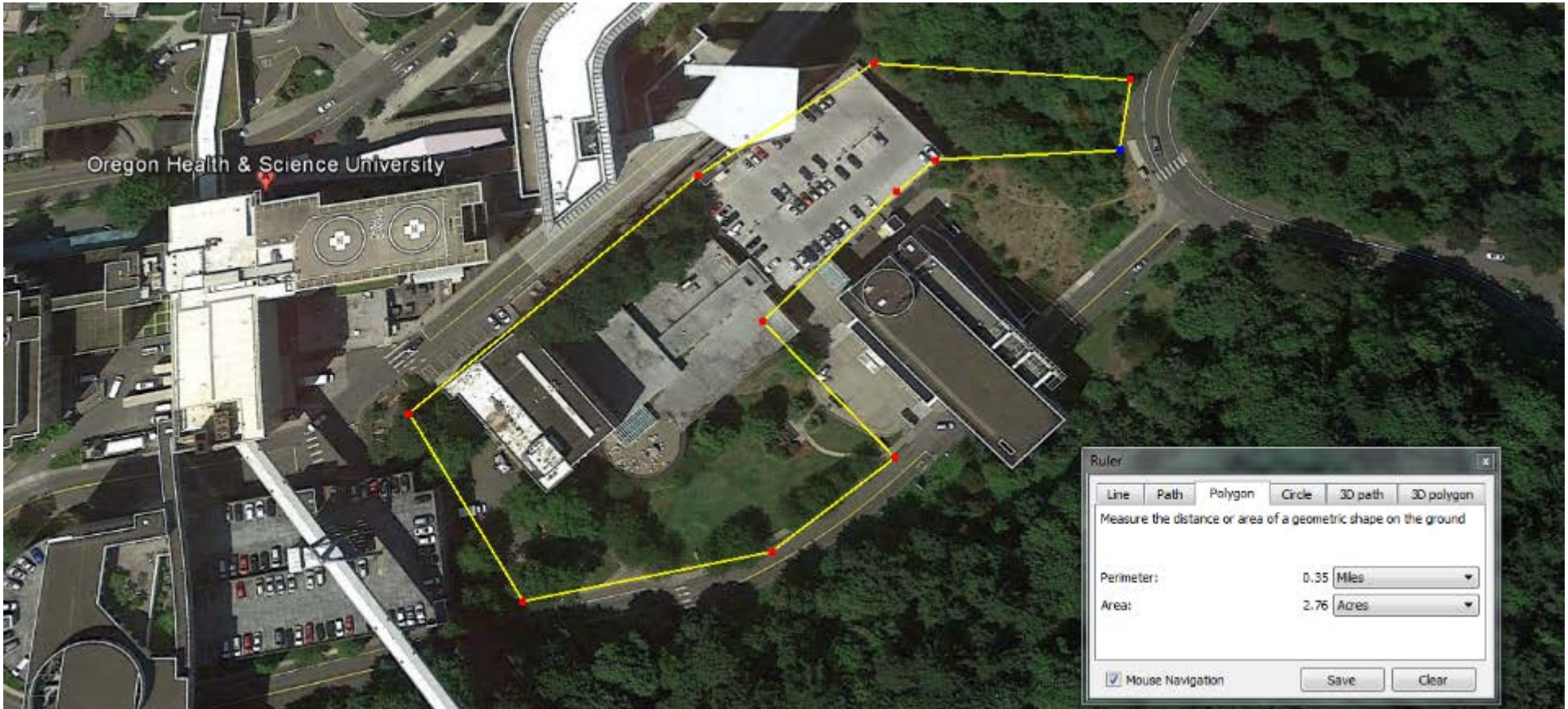


Washington Park (Zoo) station

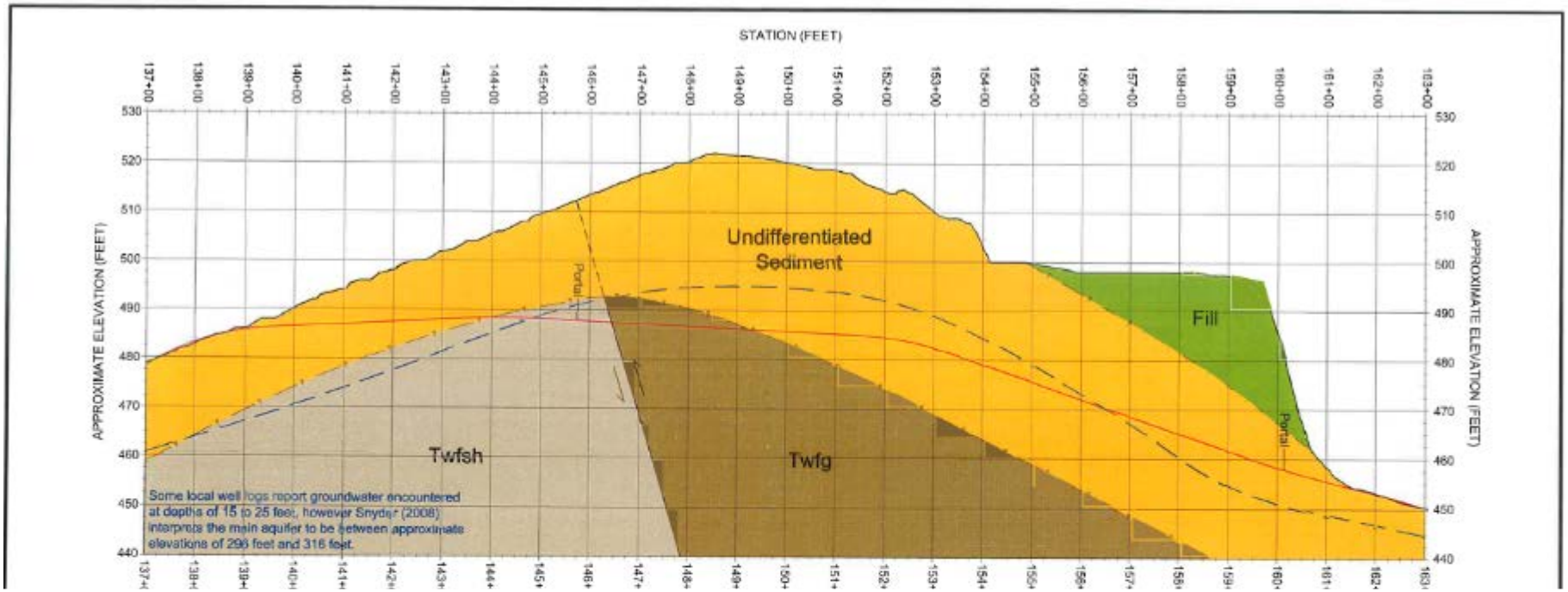
- About 3 acres used for staging

OHSU station site

- Some staging could be available with removal of dental school and parking garage, but area is constrained
- Adjacent to hospital and Casey Eye institute



Hillsdale Cut and Cover station



- Appears to be conglomerate rock
- High water table

Cut-and-cover stations

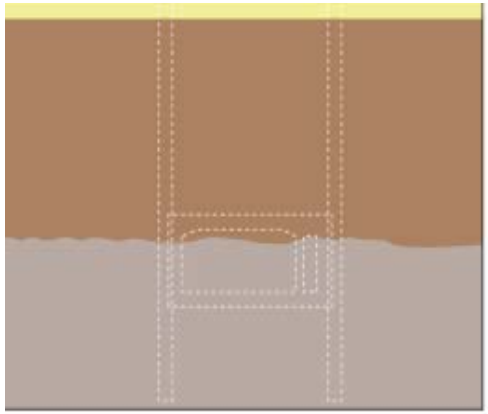
- 3 acre site typically needed for station box and staging

Roosevelt Station in north Seattle

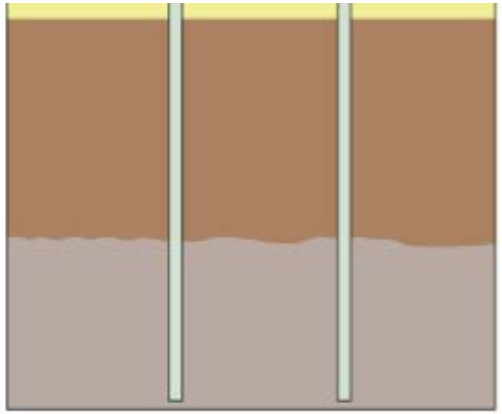
Seattle bus tunnel

(example of cut-and-cover for a station)

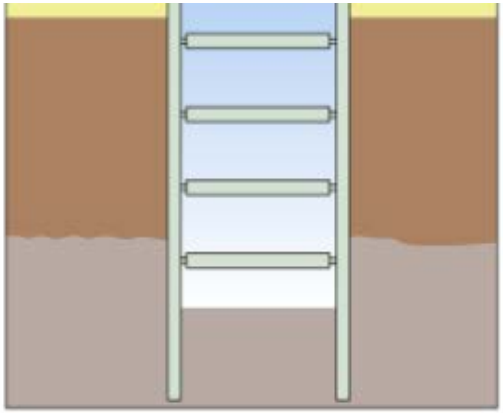
Cut and Cover station construction



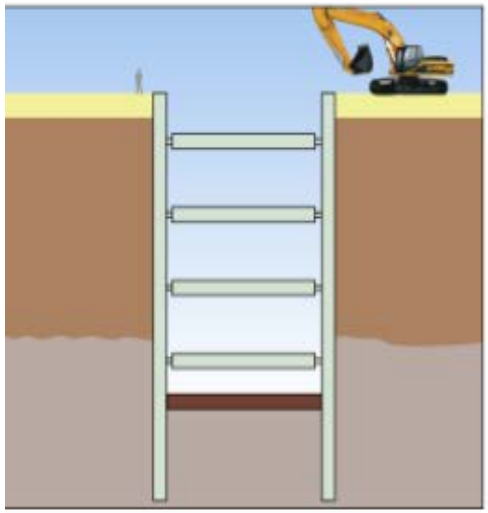
Existing Condition

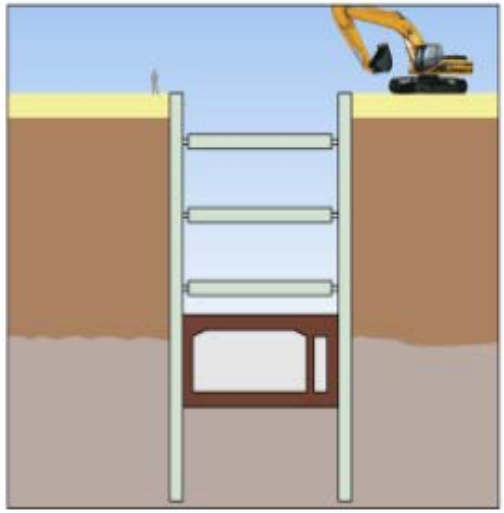


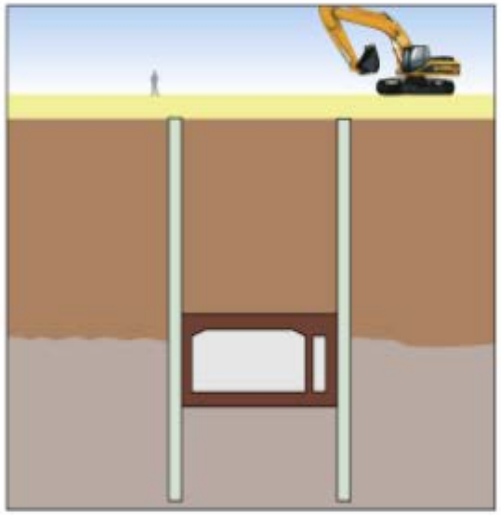
Install Diaphragm Walls



Excavate and Install Props







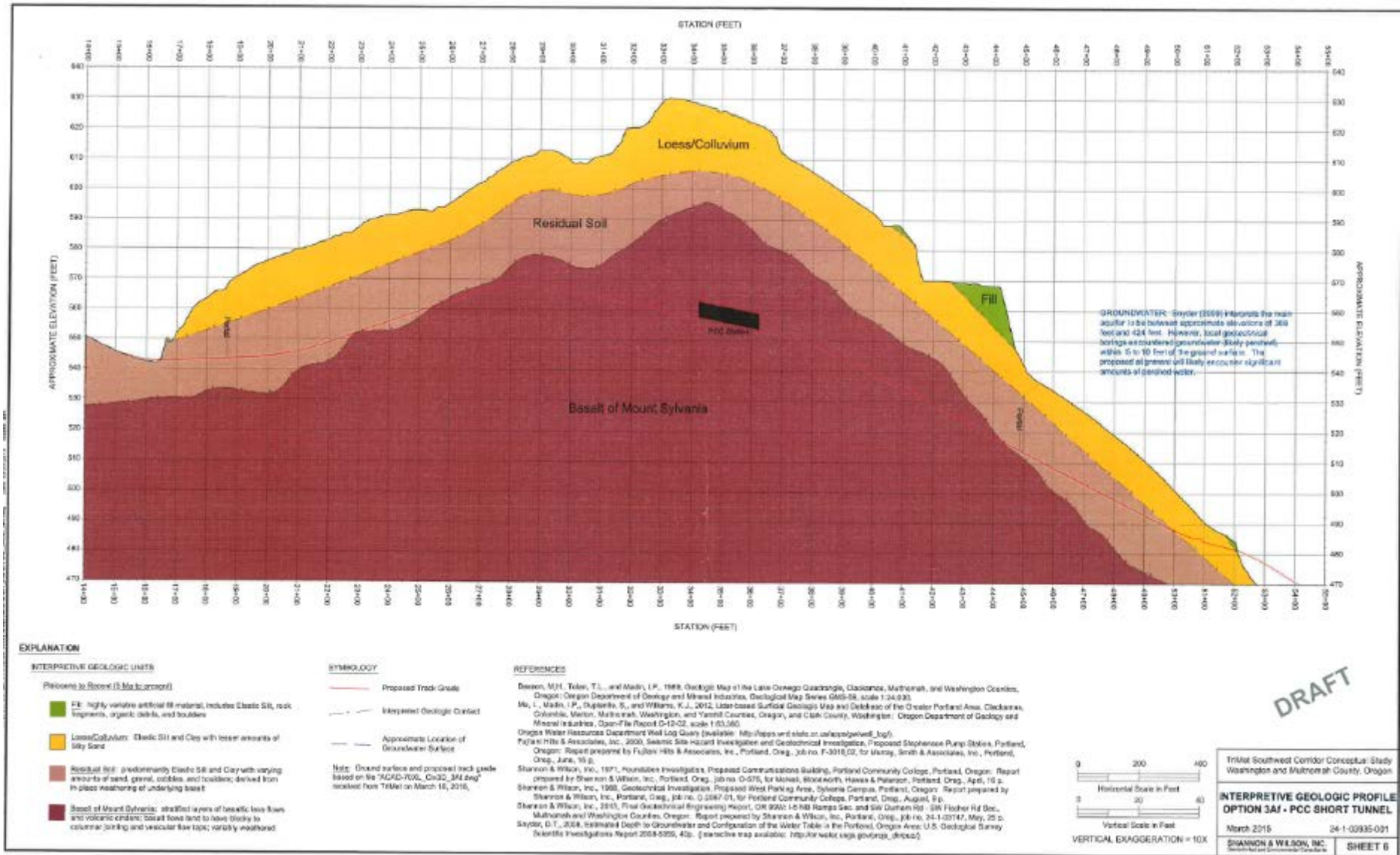
Hillsdale Cut and Cover Tunnel (BRT or LRT)

- Cut-and-cover tunnel approaching Hillsdale generally along Capitol Highway
- Cut-and-cover station with staging area in Hillsdale
- Transition to surface with portal near SW Vermont/Bertha

PCC Tunnel and Station (Likely cut-and-cover)

- Extinct volcano, with some geologic variability
- Likely not a candidate for boring with TBM's due to length of tunnel, shallow depths
- Assuming cut and cover with some mining operations
- Water table issues
- Cut-and-cover trench in largely residential area
- Need for portals and staging at both ends

Mt Sylvania



STATION (FEET)
APPROXIMATE ELEVATION (FEET)
Loess/Colluvium
Residual Soil
Fill
Basalt of Mount Sylvania
GROUNDWATER: Snyder (2009) interprets the main aquifer to be between approximate elevations of 369 feet and 424 feet. However, local geotechnical borings encountered groundwater (likely perched) within 5 to 10 feet of the ground surface. The proposed alignment will likely encounter significant amounts of perched water.
EXPLANATION
INTERPRETIVE GEOLOGIC UNITS
Pleistocene to Recent (5 Ma to present)
Fill: highly variable artificial fill material, includes Elastic Silt, rock fragments, organic debris, and boulders
Loess/Colluvium: Elastic Silt and Clay with lesser amounts of Silty Sand
Residual Soil: predominantly Elastic Silt and Clay with varying amounts of sand, gravel, cobbles, and boulders; derived from in-place weathering of underlying basalt
Basalt of Mount Sylvania: stratified layers of basaltic lava flows and volcanic cinders; basalt flows tend to have blocky to columnar jointing and vesicular flow tops; variably weathered
SYMBOLOGY
Proposed Track Grade
Interpreted Geologic Contact
Approximate Location of Groundwater Surface
Note: Ground surface and proposed track grade based on file "AGAD-70XL_Civ3D_3Alt.dwg" received from TriMet on March 16, 2015.
REFERENCES
Beeson, M.H., Tolan, T.L., and Madin, I.P., 1989, Geologic Map of the Lake Oswego Quadrangle, Clackamas, Multnomah, and Washington Counties, Oregon: Oregon Department of Geology and Mineral Industries, Geological Map Series GMS-59, scale 1:24,000.
Mu, L., Madin, I.P., Duplantis, S., and Williams, K.J., 2012, Lidar-based Surficial Geologic Map and Database of the Greater Portland Area, Clackamas, Columbia, Marion, Multnomah, Washington, and Yamhill Counties, Oregon, and Clark County, Washington: Oregon Department of Geology and Mineral Industries, Open-File Report O-12-02, scale 1:63,360.
Oregon Water Resources Department Well Log Query (available: http://apps.wrd.state.or.us/apps/gw/well_log/).
Fujitani Hills & Associates, Inc., 2000, Seismic Site Hazard Investigation and Geotechnical Investigation, Proposed Stephenson Pump Station, Portland, Oregon: Report prepared by Fujitani Hills & Associates, Inc., Portland, Oreg., job no. F-3018.02, for Murray, Smith & Associates, Inc., Portland, Oreg., June, 16 p.
Shannon & Wilson, Inc., 1971, Foundation Investigation, Proposed Communications Building, Portland Community College, Portland, Oregon: Report prepared by Shannon & Wilson, Inc., Portland, Oreg., job no. O-575, for McNeil, Blondworth, Hawes & Paterson, Portland, Oreg., April, 16 p.
Shannon & Wilson, Inc., 1988, Geotechnical Investigation, Proposed West Parking Area, Sylvania Campus, Portland, Oregon: Report prepared by Shannon & Wilson, Inc., Portland, Oreg., job no. O-2087-01, for Portland Community College, Portland, Oreg., August, 9 p.
Shannon & Wilson, Inc., 2015, Final Geotechnical Engineering Report, OR 99W: I-5 NB Ramps Sec. and SW Durham Rd - SW Fischer Rd Sec., Multnomah and Washington Counties, Oregon: Report prepared by Shannon & Wilson, Inc., Portland, Oreg., job no. 24-1-03747, May, 25 p.
Snyder, D.T., 2008, Estimated Depth to Groundwater and Configuration of the Water Table in the Portland, Oregon Area: U.S. Geological Survey Scientific Investigations Report 2008-5059, 40p. (interactive map available: http://or.water.usgs.gov/proj/_dnpaz/)
DRAFT
Horizontal Scale in Feet
Vertical Scale in Feet
VERTICAL EXAGGERATION = 10X
TriMet Southwest Corridor Conceptual Study
Washington and Multnomah County, Oregon
INTERPRETIVE GEOLOGIC PROFILE
OPTION 3A/ - PCC SHORT TUNNEL
March 2015
24-1-03935-001
SHANNON & WILSON, INC.
SHEET 6

Questions?

Southwest Corridor Technical Forum – HCT Costs

April 20, 2015

Cost Estimating

- Based on conceptual design (~3%)
- Slice project into segments
- Use costs from recent similar TriMet projects
- Tunnel costs informed by recent similar national projects
- Costs are shown in $2014 and do NOT include inflation or finance costs.

LRT South Portland

Surface - $441-504 million

$2014 does not include finance or escalation cost
Naito alignment cost does not include $88M for Bridgehead Project
Cost range based on conceptual design April 2014

Tunnel $1,340 million

LRT Hillsdale

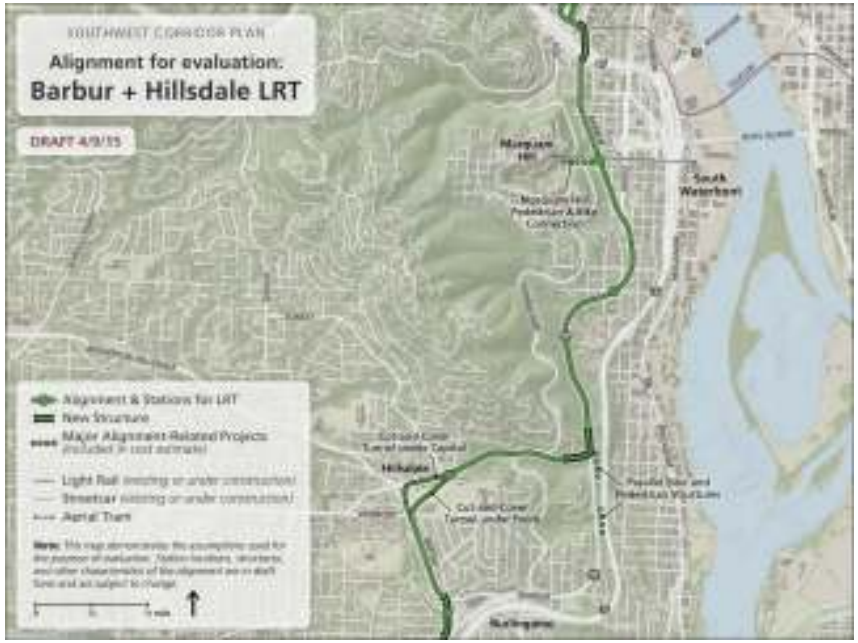
Surface - $441-504 million

$2014 does not include finance or escalation cost

Naito alignment cost does not include $88M for Bridgehead Project

Cost range based on conceptual design April 2014

Tunnel – $670-732 million



LRT PCC

Surface - $270 million

$2014 does not include finance or escalation cost
Cost range based on conceptual design April 2014

Tunnel - $515 million

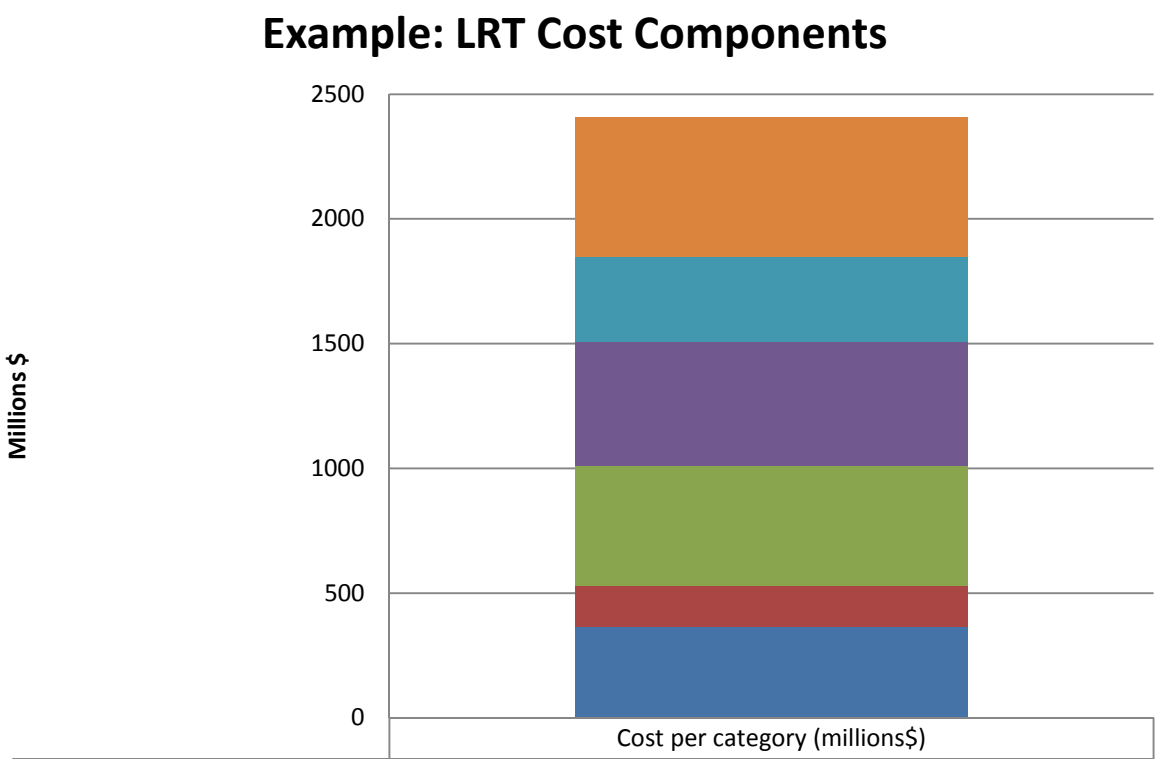
BRT South Portland & Hillsdale

Surface - $140-$242 million

$2014 does not include finance or escalation cost
Naito alignment cost does not include $88M for Bridgehead Project
Cost range based on conceptual design April 2014

Tunnel - $280-$377 million

LRT Conceptual Cost Range and Project Components

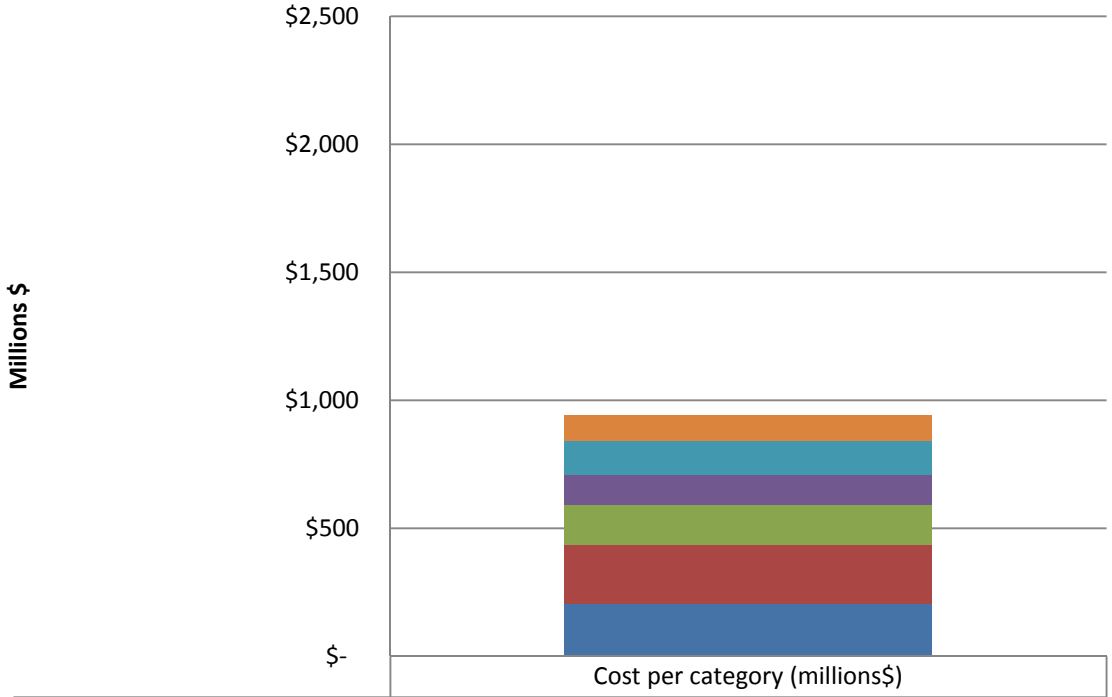


	Cost per category (millions$)
Transit Construction & Vehicles	559
Engineering, Administration & Insurance	340
Contingencies	496
Structures & requirements	481
Roads, Sidewalks, Park & Ride	167
Property & Utility Relocation	364

Surface Alignment Range
$1.8 B to $2.0 B 2014$
Tunnel Alignment Range
$2.1 to $3.2 B 2014$
Plus finance and escalation

BRT Conceptual Cost Range and Project Components

Example: BRT Cost Categories



	Cost per category (millions$)
Transit Construction & Vehicles	$100
Engineering & Administration	$130
Contingencies	$120
Structures & requirements	$152
Roads, sidewalks, P&R	$233
Property & Utility Relocation	$205

Surface Alignment Range
$680 M to $1,000 M 2014$
Tunnel Alignment Range
$880 M to $1,200 M
plus escalation & finance charges

Operating Cost by Mode

Operating costs are dependent on many variables:

- Service frequency
- Length of alignment
- Cost of operator
- Other costs of operations (e.g. cleaning bus and facilities, fuel, maintenance, etc.)

LRT train carries 266 passengers

BRT bus carries 87 passengers

- TriMet FY14 Operating cost per boarding ride
  - Rail $1.99
  - Bus $2.92

Capital and Operating Costs

- Costs are one input to the decision on mode and alignment
  - Capital costs are “one-time” costs that can be eligible for up to a 50% federal match.
  - Operating costs are a lifecycle costs that are largely paid by the region on an annual basis.

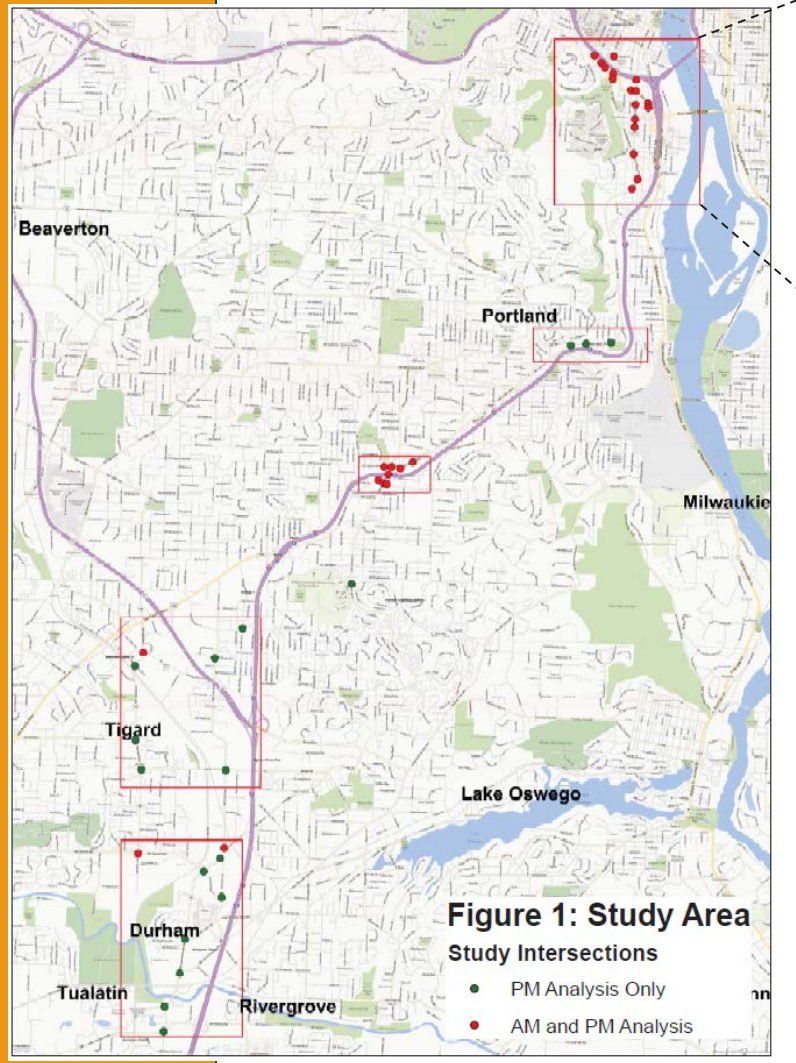
Traffic Overview

- Purpose
- Corridor-wide traffic analysis (2014)
- Targeted traffic analysis (2015)
- Next steps (DEIS analysis)

Purpose of Traffic analysis

- Ensure things work
- Consider need for traffic mitigation
  - i.e. new signals, signal re-timing, new transit lanes, new turn lanes
- Evaluate changes to roadways for better transit or access by passengers
  - i.e. new crosswalks, potential lane conversions
- Meet agency requirements (i.e. ODOT, cities)
- Prepare for federally-required NEPA DEIS

Corridor-wide traffic analysis (2014)

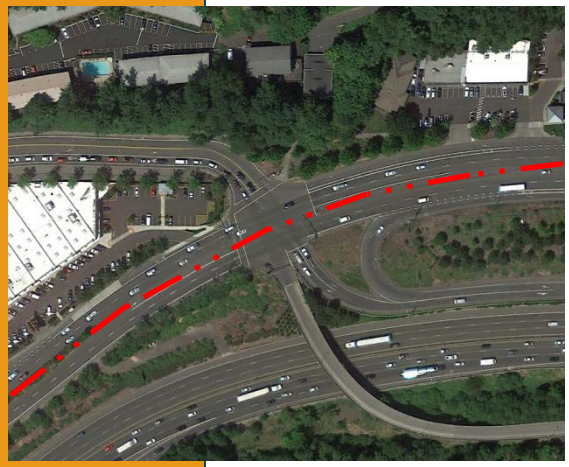


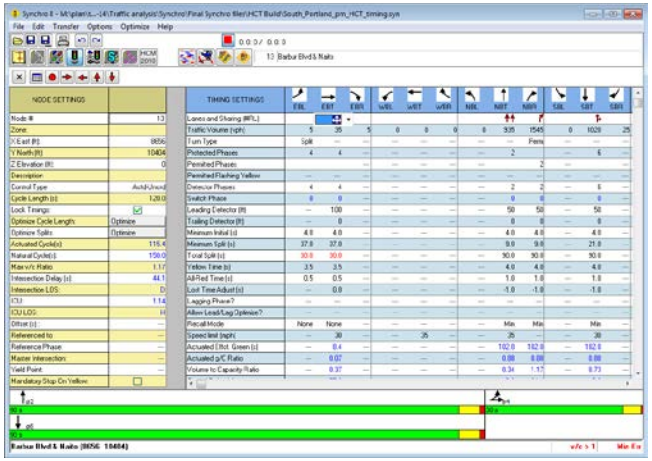
- Analyzed 44 key intersections
- Looked at existing, future No-build, future Buil
- Considered AM and PM peaks
- Existing traffic counts, regional modeled growt
- Considered impacts of LRT or BRT on corridor

Corridor-wide traffic analysis (2014)

Intersection	Low-Build	HCT	
19. *I-5 Ramps/Bertha Blvd & Barbur Blvd*			

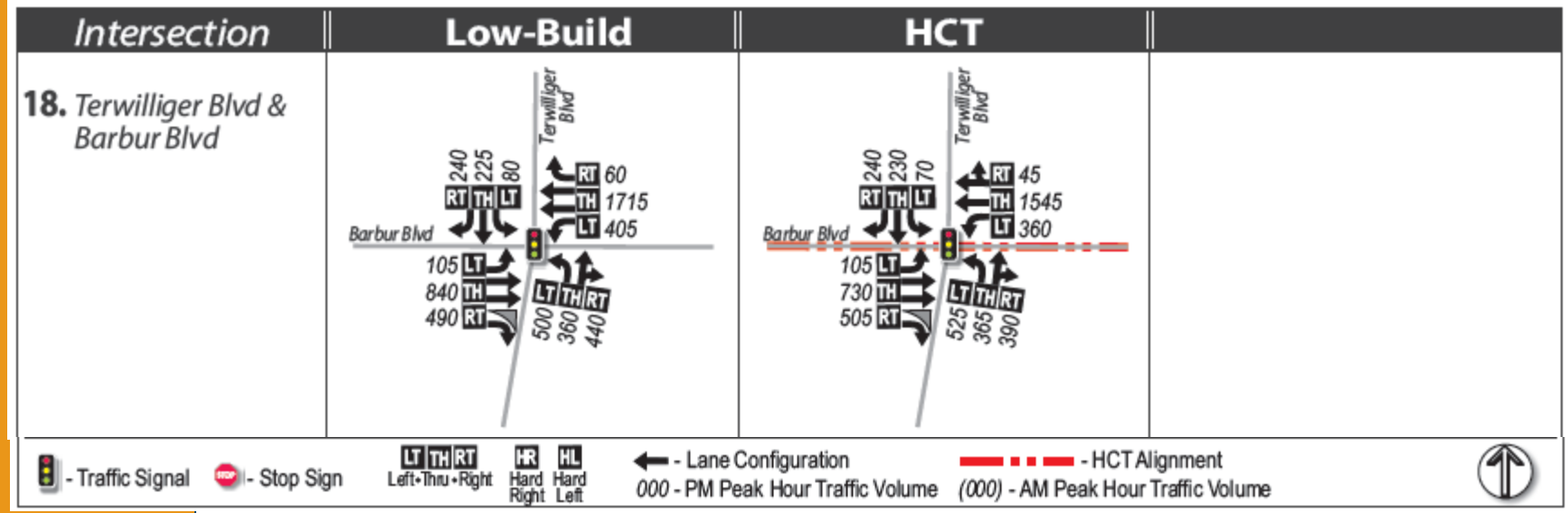
- Traffic Signal
- Stop Sign
LT TH RT Left•Thru•Right
HR Hard Right
HL Hard Left
- Lane Configuration
000 - PM Peak Hour Traffic Volume
- HCT Alignment
(000) - AM Peak Hour Traffic Volume

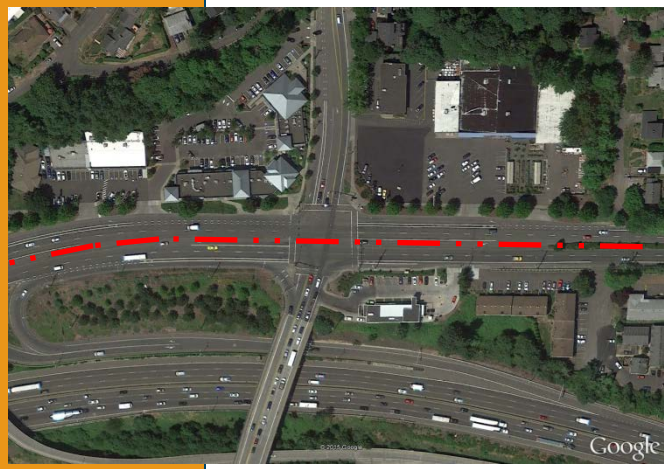


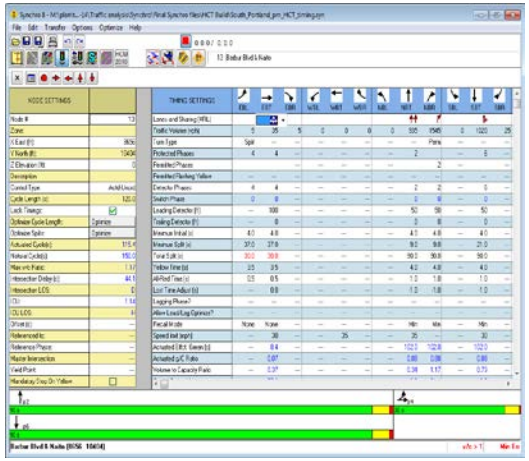


Year 2035 PM Peak Volume/Capacity ratio	
No-build	Build
1.00	0.99

Corridor-wide traffic analysis (2014)





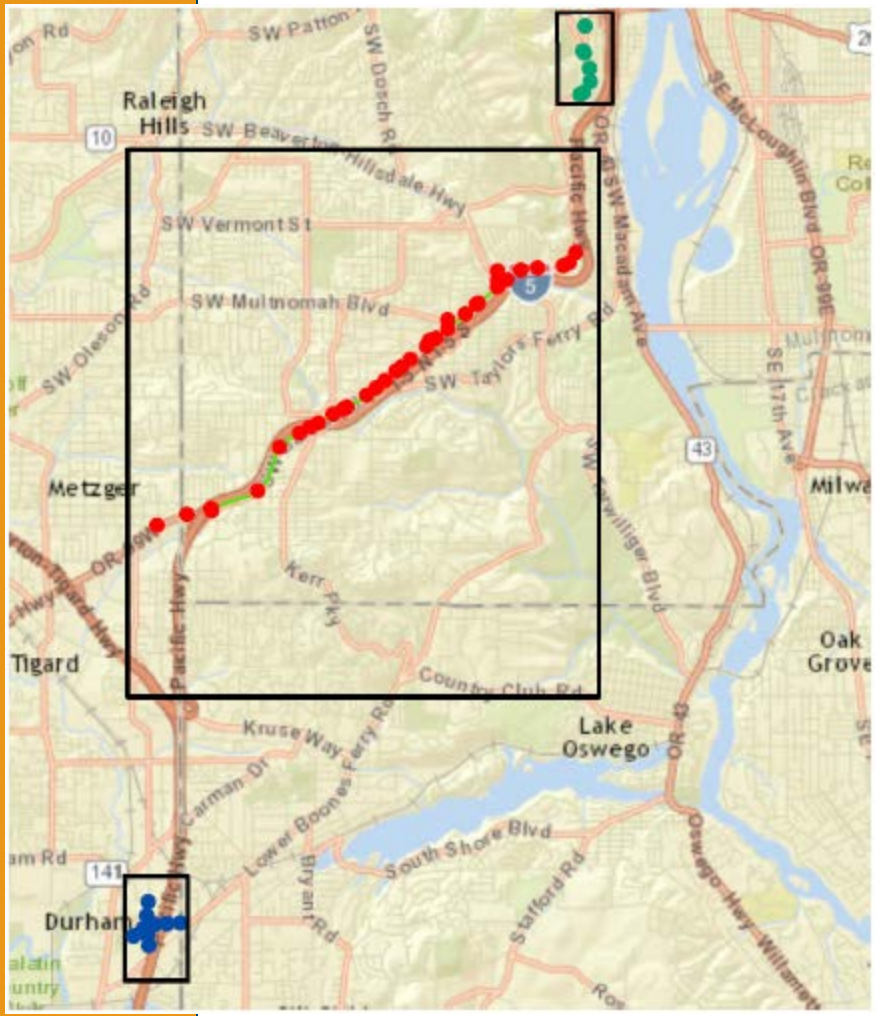


Year 2035 PM Peak Volume/Capacity ratio	
No-build	Build
1.39	1.24

Corridor-wide Findings (2014)

- Transit generally provides some benefit to traffic
- Several areas for further study:
  - S. Portland including Ross Island Bridgehead and Hamilton Street area
  - Effect of possible medians on Barbur
  - Traffic effects of Park ‘n Rides

Targeted traffic analysis (2015)



North area

- Hamilton intersection

Central area

- Median and U-turns on Barbur

South area

- Tualatin Park ‘n Ride near Bridgeport Village

Next Steps beyond 2015

- DEIS Traffic Analysis – more detail
- Ross Island Bridgehead projects – more detailed analysis
- Detailed safety analysis
- All will build on work already done