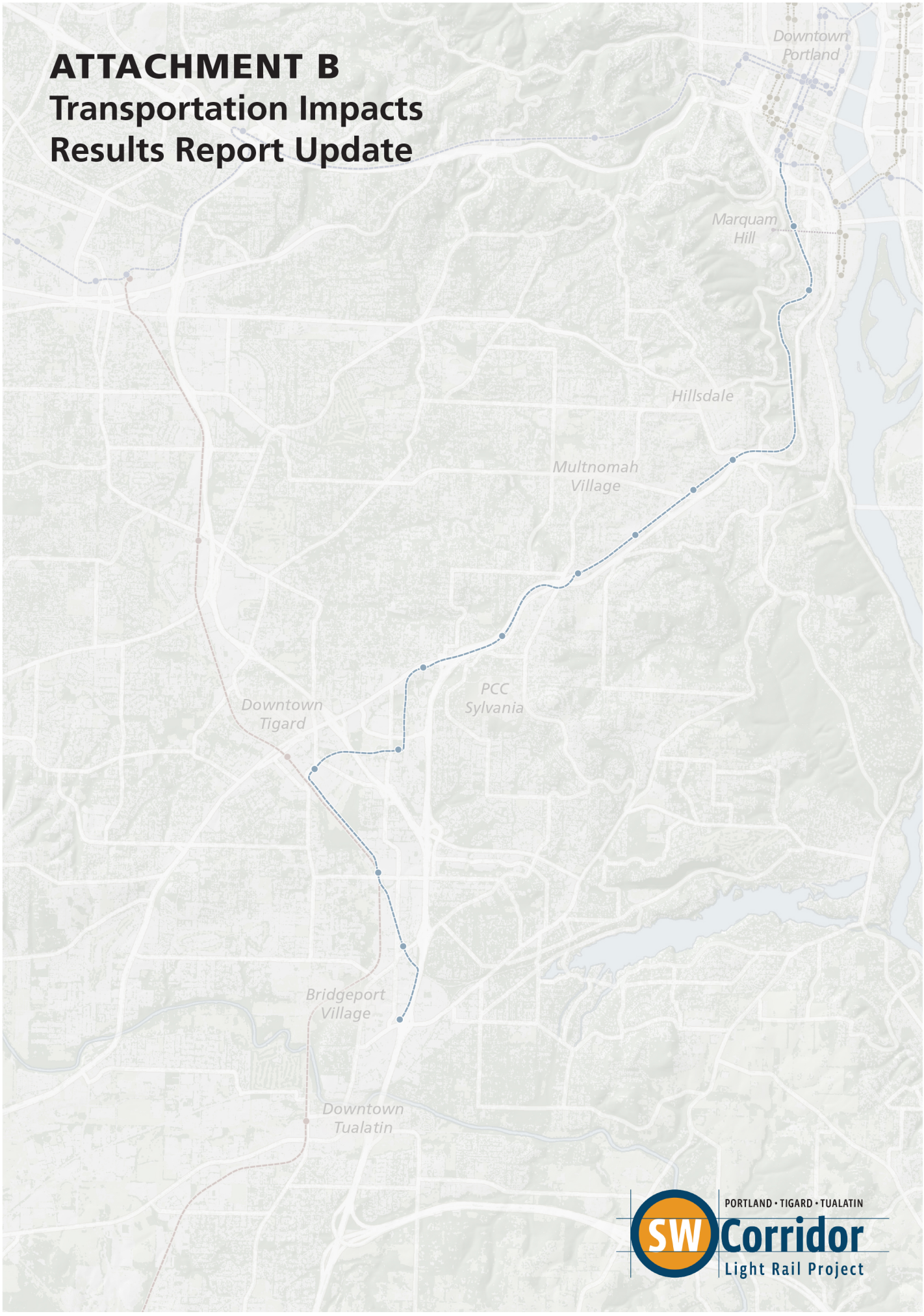
ATTACHMENT B
Transportation Impacts Results Report Update



PORTLAND • TIGARD • TUALATIN
SW Corridor
Light Rail Project

Southwest Corridor Light Rail Project
Final Environmental Impact Statement

Attachment B:
Transportation Impacts Results Report

January 2022

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1. INTRODUCTION

This Transportation Impacts Results Report contains updated data and findings based on modifications to the project design completed since the original Draft Environmental Impact Statement (EIS) Transportation Technical Report was published in 2018. This report is intended as background reference material supporting the detailed discussion in Chapter 3, Transportation Impacts and Mitigation, of the Final EIS. This report includes references to Appendices B1 through B56, which contain information supporting the findings.

This report addresses transportation system impacts for the Southwest Corridor Light Rail Project in comparison to the No-Build Alternative. Where there are impacts identified from the Project, mitigation is discussed in full in Chapter 3 of the Final EIS.

1.1. Project Description

The Project includes both the light rail investment and the related transportation improvements.

The **light rail investment** includes a light rail alignment, stations, park and rides, accompanying streetscape elements, a connection to Marquam Hill, a shuttle to the Portland Community College (PCC) Sylvania campus and a new operations and maintenance (O&M) facility, all of which are described in more detail in this report. For the Final EIS, the light rail investment includes:

- **Preferred Alternative.** The Preferred Alternative for the light rail investment represents the full 11-mile light rail alignment that would terminate in Tualatin, including 13 new light rail stations, and 5 new or modified park and rides. The Preferred Alternative also includes improvements to the connection between SW Terwilliger Parkway and the proposed Gibbs Station at SW Barbur Boulevard.

- **Terminus options.** These are two options to construct a portion of the Preferred Alternative in the event that there is insufficient funding to construct the full length of the alignment. The **Upper Boones Ferry Terminus Option** would be a 10-mile light rail alignment that would terminate at the Upper Boones Ferry Station, including 12 new light rail stations and 4 new or modified park and rides. The **Hall Terminus Option** would be an 8-mile light rail alignment that would terminate at the Hall Station, including 10 new light rail stations and 4 new or modified park and rides.

The **related transportation improvements** are additional access improvements that would extend the mobility benefits of developing light rail. These improvements are optional and could be phased to be built before, with or after the light rail investment, depending on funding availability, including other federal grants or local funding initiatives. The walking and bicycling elements of the related transportation improvements would be eligible for Federal Transit Administration (FTA) capital grant funding for the light rail investment but are currently assumed to be funded separately from that grant request. (For more information on the Project's finance plan, see Chapter 5, Evaluation of Alternatives, of the Final EIS.) The related transportation improvements consist of:

- **Ross Island Bridgehead Reconfiguration.** This option would improve access to light rail by removing pedestrian barriers in South Portland. It would add new pedestrian crossings on SW Naito Parkway and reduce regional traffic through the historic South Portland neighborhood by reconfiguring roadways and ramps at the west end of the Ross Island Bridge. This option is also referred to as SW Naito Parkway Main Street in the City of Portland's planning efforts.

- **Station access improvements.** These are 30 options for investments in pedestrian and bicycle improvements to improve access to the light rail stations. They include sidewalks, bikeways, enhanced pedestrian crossings and pedestrian bridges or multi-use paths over Interstate 5 (I-5) and Highway 217. The improvements are included in the Final EIS to facilitate incorporating them into the light rail investment at a later date if funding allows, or seeking other sources of federal funds. (See Chapter 5 of the Final EIS for more information on the Project's finance plan.)

The project area is divided geographically into three **segments** for analysis purposes:

- Segment A: Inner Portland
- Segment B: Outer Portland
- Segment C: Tigard and Tualatin

For more details on the project elements, refer to Chapter 2, Alternatives Considered, of the Final EIS.

1.2. No-Build Alternative

The **No-Build Alternative** includes projects identified in the Metro 2014 Regional Transportation Plan, Financially Constrained project list. The purpose of this alternative is to provide a point of comparison for the Project, rather than comparing the future Project to existing conditions. See Appendix A, Detailed Maps and Descriptions of the Alternatives, of this Final EIS for a list of notable projects included in the traffic and transit demand modeling for the No-Build Alternative.

1.3. Affected Environment

The Affected Environment was described as part of the Draft EIS. This report is largely focused on the impacts of the Project and the No-Build Alternative. Refer to the original Draft EIS Transportation Technical Report for more details on the Affected Environment.

1.4. Refinements to Design between Draft and Final EIS

Table 1.4-1 describes the changes made to the project design to address issues and impacts identified during the Draft EIS process. These changes were reflected in the analysis assumptions and results discussed in this report.

Table 1.4-1. Refinements Between Draft EIS Alternatives and Preferred Alternative *(multipage table)*

Element/Location	Timing	Change	Primary Reasons
Segment A			
Tie-in to Transit Mall	Pre-Final EIS	Adjusted location of alignment and changed from at-grade to grade-separated crossings of SW Sheridan St. and SW Caruthers St.	· improve travel time and reliability for light rail and buses · improve traffic safety and operations
Gibbs Station	Pre-Final EIS	Incorporated bus platforms into design of light rail station, for use by buses using the shared transitway	· improve travel time and reliability for buses

Table 1.4-1. Refinements Between Draft EIS Alternatives and Preferred Alternative *(multipage table)*

Element/Location	Timing	Change	Primary Reasons
Marquam Hill Connection	Pre-Final EIS	Replaced tunnel and bridge options with an inclined elevator Reduced scope of connection to between SW Barbur Blvd. and SW Terwilliger Blvd.	· minimize impacts to Terwilliger Parkway (both a park and a historic property) · improve pedestrian travel time and walk distance · coordination with planned OHSU improvements west of SW Terwilliger Blvd.
SW Naito Pkwy.	Pre-Final EIS	Shifted intersection of SW Naito Pkwy. and SW Barbur Blvd. north and disconnected SW Pennoyer St. from SW Barbur Blvd.	· improve constructability · improve traffic safety
SW Barbur Boulevard south of SW Naito Pkwy.	Pre-Final EIS	Replaced buffered bicycle lanes with raised protected bicycle lanes	· improve safety and comfort for people bicycling
SW Bancroft St.	Pre-Final EIS	Angled eastbound leg of SW Bancroft St.	· match existing street grades
Rasmussen Village Apartments	Pre-Final EIS	Replaced pedestrian Z-crossing with full signalized intersection	· improve access to shared transitway for buses
Segment B			
SW Barbur Boulevard, from SW Brier Pl. to SW Capitol Hwy.	Pre-Final EIS	Replaced buffered bicycle lanes with raised protected bicycle lanes	· improve safety and comfort for people bicycling
Alignment at Fulton Park	Pre-Final EIS	Shifted alignment and roadway to the north	· reduce impacts to Fulton Park
SW Terwilliger Blvd.	Pre-Final EIS	Extended northbound right-turn lane at SW Terwilliger Blvd. to I-5 off-ramp	· reduce queuing on I-5 southbound off-ramp
Barbur TC Station	Pre-Final EIS	Adjusted trackway and station location at Barbur TC to remain in SW Barbur Blvd. instead of behind P&R Added signalized intersection at bus exit from TC and SW Taylors Ferry Rd. frontage road	· improve station visibility and access · reduced cost by shortening light rail structure over I-5
Barbur TC P&R	Pre-Final EIS	Reduced assumed P&R capacity to 300 spaces and changed from structured to surface parking	· avoid traffic impacts · reduce cost
53rd P&R	Pre-Final EIS	Reduced P&R capacity to 310 spaces and changed from structured to surface parking	· reduce traffic impacts · reduce cost
53rd Station	Design Refinement 4	Shifted station and light rail trackway to north side of P&R (next to I-5)	· improve traffic safety (avoid P&R vehicles crossing tracks)
53rd Station	Pre-Final EIS	Removed pedestrian bridge over SW Barbur Blvd. at 53rd Station	· reduce cost (access provided with at-grade signalized crossing)
SW 53rd Ave. auto traffic	Pre-Final EIS	Added left-turn lane on SW 53rd Ave. at SW Barbur Blvd.	· reduce traffic impacts
SW 53rd Ave. walking and bicycling	Pre-Final EIS	Added sidewalks on SW 53rd Ave. south of SW Capitol Hwy. Added southbound (uphill) bicycle lane on SW 53rd Ave.	· improve safety and comfort of people walking and bicycling
Alignment at entry to Tigard	Design Refinement 4	Shifted alignment to cross I-5 north of SW Barbur Blvd. and cross SW Barbur Blvd./Pacific Highway in a cut-and-cover undercrossing	· reduce cost
Segment C			
Northern Tigard Triangle Station	Design Refinement 4	Shifted Baylor Station north to 68th Station Adjusted P&R from 425-space structure to 350-space surface lot	· move P&R to major highway · serve broader station area · reduce cost

Table 1.4-1. Refinements Between Draft EIS Alternatives and Preferred Alternative *(multipage table)*

Element/Location	Timing	Change	Primary Reasons
Roadway construction	Design Refinement 4	Removed construction of SW Atlanta St. between SW 69th Ave. and SW 70th Ave. and of SW 70th Ave. between SW Atlanta St. and SW Baylor St.	· no longer construct light rail along SW Atlanta St.
Sidewalks	Pre-Final EIS	Added sidewalks on east side of SW 70th Ave. between SW Baylor St. and SW Clinton St.	· provide access to hotel development currently under construction
Structure over Hwy. 217	Pre-Final EIS	Removed multiuse path from light rail structure over Hwy. 217 as a baseline assumption (not precluded, and studied as a station access improvement option in this Final EIS)	· reduce cost
Tigard TC/Hall P&R	Pre-Final EIS	Reduced P&R capacity to 100 spaces and changed from structured to surface parking	· reduce cost · reduce traffic impacts
Bonita P&R	Pre-Final EIS	Removed Bonita P&R	· reduce cost
SW UBF Rd.	Pre-Final EIS	Added regrading of SW UBF Rd. between track crossing and I-5	· additional level of design detail
UBF P&R	Pre-Final EIS	Removed UBF P&R	· reduce cost · reduce traffic impacts
Bridgeport Station	Pre-Final EIS	Relocated bus hub from north side of SW LBF Rd. to south side on ground level of P&R structure	· reduce business displacements · reduce cost

2. SEGMENT A: INNER PORTLAND

This chapter details the transportation operations for both existing and future conditions within Segment A, Inner Portland. This chapter also reviews impacts of the Ross Island Bridgehead Reconfiguration and the station access improvements, as applicable.

2.1. Study Area

Segment A is defined as the section from SW Lincoln Street to SW Brier Place. The study area includes 93 intersections, as shown in Figure 2.1-1 and Figure 2.1-2, all of which currently exist. The study area also includes the vicinity of the Ross Island Bridgehead at the interchange of U.S. Highway 26 (U.S. 26) and SW Naito Parkway (Highway 99W).

Figure 2.1-1. Study Area (AM Intersections) – Segment A: Inner Portland

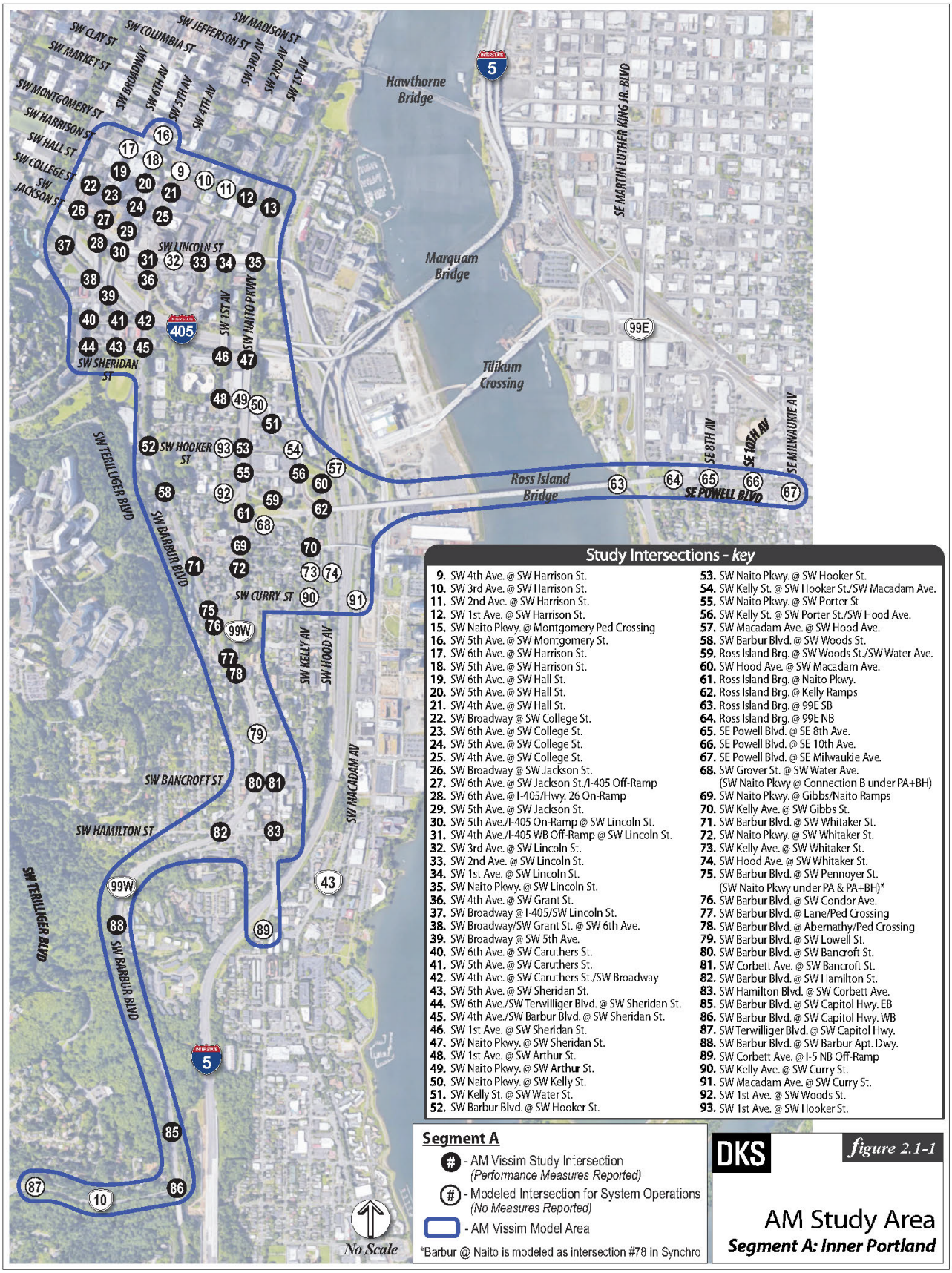


Figure 2.1-2. Study Area (PM Intersections) – Segment A: Inner Portland

2.2. Segment A Existing Conditions

2.2.1. 2017 Existing Conditions Intersection Operations

To accurately model the existing conditions on the roadway network, turning movement counts were conducted in the AM and PM peak hours for all existing study area intersections. Figures depicting turn volumes are shown in Appendix B1. The count volumes were balanced according to the ODOT Analysis Procedures Manual to account for differences in data collected on different dates. The balanced network data reflect the typical 2019 AM peak-hour traffic conditions and 2017 PM peak-hour traffic conditions. Additional data, including peaking profiles, pedestrian volumes, bicycle volumes and heavy vehicle percentages, were also input into the Vissim and Synchro models.

Table 2.2-1 shows the Highway Capacity Manual (HCM) (Synchro) operations analysis results for the existing AM and PM peak hours. Synchro was used to report Level of Service (LOS), delay and volume-to-capacity (V/C) ratios using HCM methodology. More details on the HCM existing operations analysis can be found in Appendix B2 and Appendix B3.

The table shows mobility targets for the appropriate jurisdiction for every intersection. Results for intersections that do not meet mobility targets in a peak hour are shaded gray. The worst-case approach is reported for all two-way stop control (TWSC) intersections. The worst lane (WLANE) group is listed under the WLANE columns (AM and PM) for TWSC intersections.

Table 2.2-1. HCM (Synchro) Segment A 2017 Existing Conditions Analysis *(multipage table)*

					AM				PM			
ID	Intersection	Mobility Target		Control	Delay	LOS	V/C	WLANE	Delay	LOS	V/C	WLANE
A12	SW 1st Ave./ SW Harrison St.	PBOT 2nd HR	0.99	Signal	69.8	E	0.43	-	17.4	B	0.44	-
A13	SW Naito Pkwy./ SW Harrison St.	PBOT 2nd HR	0.99	Signal	16.5	B	0.69	-	57.1	E	0.78	-
A21	SW 4th Ave./SW Hall St.	PBOT 2nd HR	0.99	Signal	30.4	C	0.44	-	24.4	C	0.35	-
A23	SW 6th Ave @ SW College St.	PBOT 2nd HR	0.99	Signal	7.0	A	0.37	-	8.6	A	0.35	-
A25	SW 4th Ave./ SW College St.	PBOT 2nd HR	0.99	TWSC	10 [>300]	A [F]	[0.87]	EBLn1	9.9 [47.5]	A [E]	[0.37]	EBLn1
A27	SW 6th Ave./ SW Jackson St./ I-405 northbound off-ramp	ODOT Ramp	0.85	TWSC	- [18.8]	A [C]	[0.11]	EBLn1	7.9 [33.4]	A [D]	[0.40]	EBLn1
A31	SW 4th Ave./I-405 northbound off-ramp/ SW Lincoln St.	ODOT Ramp	0.85	Signal	17.0	B	0.61	-	15.3	B	0.52	-
A34	SW 1st Ave./ SW Lincoln St.	PBOT 2nd HR	0.99	Signal	34.4	C	0.33	-	24.8	C	0.53	-
A35	SW Naito Pkwy./ SW Lincoln St.	PBOT 2nd HR	0.99	Signal	3.3	A	0.51	-	5.4	A	0.58	-
A37	SW Broadway/ I-405 southbound off-ramp/SW Lincoln St.	ODOT Ramp	0.85	Signal	18.0	B	0.63	-	18.1	B	0.55	-
A38	SW Broadway/SW Grant St./SW 6th Ave.	PBOT 1st HR	0.99	Signal	55.1	E	0.97	-	18.0	B	0.81	-
A39	SW Broadway/ SW 5th Ave.	PBOT 1st HR	0.99	Signal	46.9	D	0.80	-	25.9	C	0.77	-
A42	SW 4th Ave./ SW Caruthers St./ SW Broadway	PBOT 1st HR	0.99	Signal	31.9	C	0.80	-	38.4	D	0.80	-

Table 2.2-1. HCM (Synchro) Segment A 2017 Existing Conditions Analysis *(multipage table)*

ID	Intersection	Mobility Target		Control	AM				PM			
					Delay	LOS	V/C	WLANE	Delay	LOS	V/C	WLANE
A45	SW 4th Ave./ SW Barbur Blvd./ SW Sheridan St.	PBOT 1st HR	0.99	Signal	19.7	B	0.78	-	13.9	B	0.60	-
A46	SW 1st Ave./ SW Sheridan St.	PBOT 1st HR	0.99	TWSC	8.5 [15.8]	A [C]	[0.14]	WBLn1	10 [27.6]	A [D]	[0.35]	SBLn
A47	SW Naito Pkwy./ SW Sheridan St.	PBOT 1st HR	0.99	Free	0 [0]	A [A]	0	-	0 [0]	A [A]	0	-
A48	SW 1st Ave./ SW Arthur St.	PBOT 1st HR	0.99	Signal	22.2	C	0.75	-	30.4	C	0.90	-
A51	SW Kelly St./ SW Water Ave.	PBOT 1st HR	0.99	TWSC	**246.4 [47.9]**	**F [E]**	**[1.21]**	**SEL**	23 [41.9]	C [E]	[0.56]	SWLn1
A52	SW Barbur Blvd./ SW Hooker St.	PBOT 1st HR	0.99	TWSC	15.4 [45.4]	C [E]	[0.47]	WBLn1	10.2 [68.1]	B [F]	[0.57]	WBLn1
A53	SW Naito Pkwy./ SW Hooker St.	PBOT 1st HR	0.99	Free	0 [0]	A [A]	0	-	0 [0]	A [A]	0	-
A56	SW Kelly Ave./ SW Porter St./ SW Hood Ave.	ODOT Ramp	0.85	TWSC	14.8 [8.6]	B [A]	0.22	SBLn	10.4 [8.5]	B [A]	[0.14]	SBLn
A61	Ross Island Br./ SW Naito Pkwy.	ODOT/PBOT 1st HR	0.99	TWSC	**- [143.7]**	**A [F]**	**[1.24]**	**SELn1**	**- [>300]**	**A [F]**	**[>2.0]**	**SELn1**
A62	Ross Island Br./ SW Kelly Ave. ramps	ODOT/PBOT 1st HR	0.99	TWSC	- [38.8]	A [E]	[0.74]	NBLn1	**- [>300]**	**A [F]**	**[>2.0]**	**NBLn1**
A69	SW Naito Pkwy./ SW Gibbs St./ SW Naito Pkwy. ramps	ODOT/PBOT 1st HR	0.99	TWSC	- [13.3]	A [B]	[0.01]	WBLn1	- [20.1]	A [C]	[0.60]	WBLn1
A71	SW Barbur Blvd./ SW Whitaker St.	ODOT/PBOT 1st HR	0.99	TWSC	13.8 [22.5]	B [C]	[0.01] [0.33]	WBLn1	10.6 [22.3]	B [C]	[0.15]	WBLn1
A78	SW Barbur Blvd./ SW Naito Pkwy./ Ped. crossing	ODOT/PBOT 1st HR	0.99	TWSC	8.3 [11.3]	A [B]	[0.01]	EBLn1	9.4 [22.3]	A [C]	[0.09]	EBLn1
A80	SW Barbur Blvd./ SW Bancroft St.	ODOT/PBOT 1st HR	0.99	TWSC	- [31.4]	A [D]	[0.61]	WBLn1	- [13.2]	A [B]	[0.10]	WBLn1
A81	SW Corbett Ave./ SW Bancroft St.	PBOT 1st HR	0.99	TWSC	7.9 [35.3]	A [E]	[0.37]	WBLn1	**8.1 [100.5]**	**A [F]**	**[1.04]**	**EBLn1**
A82/ A84	SW Barbur Blvd./ SW Hamilton St.	ODOT/PBOT 1st HR	0.99	Signal	33.8	C	0.98	-	33.9	C	0.94	-
A83	SW Corbett Ave./ SW Hamilton St.	PBOT 1st HR	0.99	AWSC	**70.1**	**F**	**1.14**	**NBLn1**	**100.7**	**F**	**1.15**	**NBLn1**

Note: AWSC = All-way stop control; EB = eastbound; HCM = Highway Capacity Manual; HR = Hour; ID = Intersection Identification #; LOS = Level of Service; Ln = Lane; NB = northbound; ODOT = Oregon Department of Transportation; PBOT = Portland Bureau of Transportation; SB = southbound; SEL = Southeast Left; TWSC = Two-way stop control; V/C = volume-to-capacity; WB = westbound; WLANE = worst lane.

Key: Delay = Average vehicle delay (in seconds). Worst Major [Worst Minor] delay and LOS for TWSC intersections.
V/C represents intersection average for signals and worst movement for stop control intersections. Delay, LOS and V/C ratio reported for worst lane for all-way stop control. "-" represents "not applicable"

As shown in Table 2.2-1, HCM operations analysis indicates the following intersections as failing to meet mobility targets.

AM peak hour:

- **SW Kelly Avenue and SW Water Avenue.** This TWSC intersection operates above capacity according to HCM analysis. Through vehicles along SW Kelly Avenue frequently queue back from the intersection of SW First Avenue and SW Arthur Street and keep this intersection clear, which allows the left turn from SW Kelly Avenue to SW Water Avenue to clear the intersection.

- **SW Naito Parkway northbound ramp to Ross Island Bridge.** This TWSC intersection operates above capacity according to the HCM analysis. However, driver behavior at this intersection more closely resembles yield than stop-controlled conditions, allowing for higher traffic throughput from the SW Naito Parkway approach.

- **SW Corbett Avenue and SW Hamilton Street.** This all-way stop-control (AWSC) intersection experiences high volume northbound left and eastbound right turns during the AM peak hour. With relatively low conflicting volumes, northbound left-turn and eastbound right-turn vehicles exhibit behavior more typical of yielding movements at a TWSC intersection, merely slowing before completing the turn movement rather than coming to a complete stop. This driver behavior allows the intersection to service higher volumes than would be expected according to the HCM analysis.

PM Peak Hour:

- **SW Naito Parkway northbound ramp to Ross Island Bridge.** This TWSC intersection operates above capacity according to the HCM analysis. However, during the PM peak period, driver behavior at this intersection more closely resembles a zipper merge (where drivers in merging lanes are expected to take alternating turns as two lanes merge into a single lane), which allows for higher volume throughput from the SW Naito Parkway approach.

- **SW Kelly Avenue and Ross Island Bridge.** This TWSC intersection operates above capacity according to the HCM analysis. Similar to conditions at the SW Naito Parkway and Ross Island Bridge intersection, the PM peak period driver behavior at this location more closely resembles a zipper merge, allowing for higher volume throughput from the SW Kelly Avenue approach.

- **SW Corbett Avenue and SW Bancroft Street.** This TWSC intersection performs better than indicated by the HCM analysis because of more aggressive driving behavior from eastbound vehicles on SW Bancroft Street. Field observations did not indicate substantial queuing issues at this location.

- **SW Corbett Avenue and SW Hamilton Street.** Similar to the AM peak-hour conditions, this intersection experiences high volume northbound left turns and eastbound right turns during the PM peak hour. With relatively low conflicting volumes, northbound left-turn and eastbound right-turn vehicles exhibit behavior more typical of yielding movements at a TWSC intersection, merely slowing before completing the turn movement rather than coming to a complete stop. This driver behavior allows the intersection to serve higher volumes than would be expected according to the HCM analysis. Field observations noted more queuing during PM peak-hour conditions than during AM peak-hour conditions.

Additional operational issues observed during both the AM and PM peak hours were either caused by interactions between intersections or bottlenecks outside of the study area, which are operational issues that are not captured in the HCM analysis but will be addressed in the following section.

2.2.2. 2017 Existing Conditions Queuing Analysis

Two separate existing conditions simulation models were created for this analysis using the Vissim software. These existing conditions models target the following time periods:

- Segment A AM Peak
- Segment A PM Peak

All models were calibrated over a two-hour peak traffic time interval, which was 7 a.m. to 9 a.m. for the AM models and 4 p.m. to 6 p.m. for the PM model. Because of the peaking profile during the AM peak period, the volumes and routes were developed separately for the 7 a.m. to 8 a.m. and 8 a.m. to 9 a.m. hours. Model calibration included comparing modeled queues to field-observed queues and queues estimated from Google traffic maps captured during field observations. Other calibration measures included intersection traffic volumes, travel times, speeds, lane utilization and volume profiles at key system bottlenecks.

During the Draft EIS phase, two AM Vissim models were built to test localized impacts of light rail at key locations. One model focused on the light rail crossing impacts to downtown intersections. This "Downtown" model included only intersections north of I-405. The other model, the "Hamilton" model, focused on the intersection of SW Barbur Boulevard and SW Hamilton Street, and extended no farther than SW Naito Parkway on SW Barbur Boulevard, and no farther than the Ross Island Bridge on SW Naito Parkway. Neither of these models addressed the SW Fourth Avenue tie-in area or captured the impacts of the I-405 northbound on-ramp at SW Sixth Avenue to northbound AM traffic on SW Barbur Boulevard. The analysis conducted for the Final EIS includes the area covered by both previous models, as well as additional network from the Draft EIS PM Vissim model.

To more accurately capture the daily randomness of traffic in and around the study area, the model was run 15 times with unique vehicle arrival patterns, or "random seeds." The results of the 15 simulations were aggregated and averaged to produce performance metrics, such as delay, travel time and 95th percentile queues. These performance metrics are presented in the appendices to this report.

System-wide metrics were used to measure the overall performance of each analysis area modeled over the two-hour analysis time periods. These metrics are:

- total vehicles served = number of vehicles exiting the model network during the two-hour analysis period
- unserved vehicle demand = vehicle demand unable to enter the network due to queuing. This measure is an indication of greater demand than capacity. As with a V/C ratio greater than 1.00, any demand greater than capacity may result in peak spreading, mode shift, alternate routing etc.
- total vehicle hours of delay = total vehicle hours of delay for vehicles that either enter the network or are waiting to enter the network (delay for unserved demand)
- unserved demand at key gateways = list of key locations generating unserved demand

These system-wide metrics are key measures used mainly to compare the performance of future year conditions in the simulation models.

Existing Conditions – AM

The AM microsimulation model data collection, field observations, calibration and results are presented in detail in the Segment A Existing AM Vissim Report included as Appendix B4. This section summarizes the key results and findings from that Vissim report.

The system-wide metrics for the Existing AM Peak model are summarized in Table 2.2-2.

Table 2.2-2. Segment A Existing AM Simulation System Measures

Measure		Simulation Result (7 a.m.–9 a.m.)	
Total vehicles served		31,600 vehicles	
Unserved vehicle demand		0 vehicles	
Total vehicle hours of delay		930 vehicle-hours	
Unserved Demand at Key Gateways			
Gateway	**Demand**	**Unserved Demand**	**Percent Unserved Demand**
None	N/A	N/A	N/A

As expected for an existing conditions model, the system-wide metrics show that the Existing AM Peak model has the capacity to serve existing volumes, which were derived from turn movement counts.

For the AM analysis, the travel time results were broken out separately for the 7 a.m. to 8 a.m. hour and the 8 a.m. to 9 a.m. hour to capture the impacts of shifting routing as congestion causes drivers to make different routing decisions. These travel time results are shown in Table 2.2-3.

Table 2.2-3. Segment A Existing AM Travel Time Results

Travel Time Segment	Movement Served	Modeled Average Travel Time (min:ss)	Modeled Average Speed
7 a.m. to 8 a.m.			
Capitol/Barbur to Harrison/Naito	NB 99W to Downtown via SW Naito Pkwy.	4:50	25 mph
Capitol/Barbur to 4th/Lincoln	NB 99W to Downtown via SW 4th Ave.	5:20	23 mph
Capitol/Barbur to Broadway/Grant	NB 99W to NB I-405	7:00	17 mph
Harrison/Naito to Capitol/Barbur	Downtown via Naito Pkwy to SB 99W	3:45	33 mph
Broadway/Grant to Capitol/Barbur	SB I-405 to SB 99W	4:25	28 mph
RI East to Broadway/Grant	WB U.S. 26 to U.S. 26	8:10	10 mph
Broadway/Grant to RI East	EB U.S. 26 to U.S. 26	4:00	23 mph
8 a.m. to 9 a.m.			
Capitol/Barbur to Harrison/Naito	NB 99W to Downtown via SW Naito Pkwy.	6:00	21 mph
Capitol/Barbur to 4th/Lincoln	NB 99W to Downtown via SW 4th Ave.	6:40	19 mph
Capitol/Barbur to Broadway/Grant	NB 99W to NB I-405	9:10	13 mph
Harrison/Naito to Capitol/Barbur	Downtown via SW Naito Pkwy. to SB 99W	3:50	32 mph
Broadway/Grant to Capitol/Barbur	SB I-405 to SB 99W	4:35	26 mph
RI East to Broadway/Grant	WB U.S. 26 to U.S. 26	9:05	9 mph
Broadway/Grant to RI East	EB U.S. 26 to U.S. 26	4:10	22 mph

Note: EB = eastbound; I-405 = Interstate 405; NB = northbound; RI = Ross Island Bridge; SB = southbound; U.S. 26 = U.S. Highway 26; WB = westbound.

As shown in Table 2.2-3, travel times increase for all measured travel time segments during the 8 a.m. to 9 a.m. time period compared to the 7 a.m. to 8 a.m. time period, as a result of increasing congestion in the system, particularly for the northbound Highway 99W movements into downtown. Further details and measures related to the modeled travel time results are included in Appendix B4.

The observed and modeled AM queuing data are presented graphically in Appendix B4. The key queuing findings determined from field observations and the microsimulation model results are summarized by location as follows:

- **Northbound I-405 on-ramp on SW Sixth Avenue.** Congestion caused by weave conflicts between traffic from the SW Sixth Avenue I-405 northbound on-ramp and the I-405 northbound traffic attempting to access the U.S. 26 tunnel is combined with westbound queue spillback from the U.S. 26 tunnel. This congestion creates a queuing issue on the I-405 northbound on-ramp from SW Sixth Avenue, effectively metering the amount of traffic that can be served at this location. Throughout the AM commute, this bottleneck leads to westbound queues along SW Broadway, SW Caruthers Street, SW Third Avenue, SW Arthur Street and SW Kelly Avenue, and ultimately onto the Ross Island Bridge. In addition, this queue inhibits the northbound left-turn movement from SW Barbur Boulevard/SW Fourth Avenue onto westbound SW Broadway. This impact leads to northbound queues on SW Barbur Boulevard that can extend as far south as SW Whitaker Street. These queues are shown in detail in Appendix B4.

- **Northbound SW Naito Parkway on-ramp to eastbound Ross Island Bridge.** The stop-controlled merge from the SW Naito Parkway ramp onto the eastbound Ross Island Bridge presents drivers with a sight distance issue due to the high skew angle of the intersection. Heavy AM eastbound Ross Island Bridge traffic volumes from SW Arthur Street and SW Naito Parkway also make the northbound ramp movement difficult. As shown in the model results in Appendix B4 and observed in the field, queues from the northbound SW Naito Parkway ramp can extend as far south as SW Barbur Boulevard during the height of the AM peak hour.

- **Intersection of SW Hamilton Street and SW Barbur Boulevard.** Northbound traffic on SW Barbur Boulevard queues significantly during the AM peak hour. This queuing is partly a result of the high traffic volumes in the three northbound lanes. Even with a long cycle length, the time required to serve the side street and southbound left-turn movements, along with pedestrian activity, generates significant queues at this location. These queues are increased by frequent in-lane bus activity at the northbound SW Barbur Boulevard transit stop just north of SW Hamilton Street. This bus activity further degrades input in the two outside northbound lanes. As shown in Appendix B4, the combined impact of all of these operational issues is northbound queues that occasionally extend to near the SW Capitol Highway merge point during the height of the AM peak hour.

- **Intersection of SW Hamilton Street and SW Corbett Avenue.** As discussed in the 2017 Existing HCM Operations section above, the northbound left turn at this AWSC intersection serves a high traffic volume during the AM peak hour. Some of this traffic comes from vehicles bypassing northbound Interstate 5 (I-5) coming into downtown Portland, using the I-5 off-ramp to SW Corbett Avenue to bypass freeway congestion. The high northbound demand at this location leads to significant northbound queues extending as far south as the I-5 northbound off-ramp to SW Corbett Avenue.

- **Intersection of SW Capitol Highway and SW Terwilliger Boulevard.** Field observations noted that the SW Capitol Highway and SW Terwilliger Boulevard intersection acts as a bottleneck for eastbound SW Capitol Highway traffic, as indicated by the queues observed in the field and generated from the simulation model (and as shown in Appendix B4).

Overall, the AM existing conditions field observations and model indicated significant congestion throughout the study area, particularly on northbound SW Barbur Boulevard, northbound SW Corbett Avenue, and along the westbound U.S. 26 movement (westbound Ross Island Bridge to I-405 northbound at SW Sixth Avenue).

Existing Conditions – PM

The PM microsimulation model data collection, field observations, calibration and results are presented in detail in the Segment A Existing PM Vissim Report included as Appendix B5. This section summarizes the key results and findings from that Vissim report.

The system-wide metrics for the Segment A PM model are summarized in Table 2.2-4.

Table 2.2-4. Segment A Existing PM Simulation System Measures

Measure		Simulation Result (4 p.m.–6 p.m.)	
Total vehicles served		47,150 vehicles	
Unserved vehicle demand		135 vehicles	
Total vehicle hours of delay		2,860 vehicle-hours	
Unserved Demand at Key Gateways			
Gateway	**Demand**	**Unserved Demand**	**Percent Unserved Demand**
None	N/A	N/A	N/A

As expected, under existing conditions, the system-wide metrics show that the PM model can serve most of the counted demand. While some unserved demand occurs on minor model gateways, no key gateways (arterials or other high classification streets) have significant unserved demand.

For the PM analysis, the travel time results were summarized for the entire two-hour study interval (4 p.m. to 6 p.m.). Peak-hour (4:30 p.m. to 5:30 p.m.) data are also provided in Appendix B5, but the two-hour travel times were found to be more indicative of the system performance, particularly under future conditions, because increased congestion caused by system bottlenecks led to significant increases in travel time outside of the existing conditions peak hour. These travel time results are shown in Table 2.2-5.

Table 2.2-5. Segment A Existing PM Travel Time Results *(multipage table)*

Travel Time Segment	Movement Served	Modeled Average 4 p.m.–6 p.m. Travel Time (min:ss)	Modeled Average Speed
I-405 SB off-ramp/Broadway to Powell/99E	EB U.S. 26 to U.S. 26	14:45	7 mph
Milwaukie/Powell to I-405 NB on-ramp/6th	WB U.S. 26 to U.S. 26	12:35	9 mph
Barbur/Hamilton to Powell/99E	NB 99W to EB U.S. 26	10:25	9 mph
Milwaukie/Powell to Barbur/Hamilton	WB U.S. 26 to SB 99W	4:15	27 mph
Macadam/Curry to Powell/99E	NB I-5/OR 43 to EB U.S. 26	10:30	8 mph

Table 2.2-5. Segment A Existing PM Travel Time Results *(multipage table)*

Travel Time Segment	Movement Served	Modeled Average 4 p.m.–6 p.m. Travel Time (min:ss)	Modeled Average Speed
Naito/Harrison to Powell/99E	Downtown via SW Naito Pkwy. to EB U.S. 26	8:45	10 mph

Note: EB = eastbound; I-5 = Interstate 5; I-405 = Interstate 405; NB = northbound; SB = southbound; U.S. 26 = U.S. Highway 26; WB = westbound.

As shown in Table 2.2-5, travel times are slow during the PM analysis time period, particularly for both the eastbound and westbound U.S. 26 travel time segments, with vehicles averaging less than 10 miles per hour (MPH) for these segments. The travel time for northbound 99W to eastbound U.S. 26 also shows slow traffic, aligning with field observations and Google travel time data. The slow travel times for travelers accessing eastbound U.S. 26 are caused by congestion at both the west end of the Ross Island Bridge and eastbound SE Powell Boulevard at SE Milwaukie Avenue, SE 21st Avenue and SE 26th Avenue. Further details and measures related to the modeled travel time results are included in Appendix B5.

Appendix B5 presents graphically the observed and modeled PM queuing data. The key queuing findings determined from field observations and the microsimulation model results are summarized by location as follows:

- **Downtown grid encompassed by SW Harrison Street, SW Jackson Street, SW Broadway and SW Fourth Avenue.** Queues within this area vary throughout the PM peak period, depending mainly on transit and pedestrian activity related to the Portland State University campus. No one intersection generates queues consistently, but city blocks may queue up for several minutes at a time depending on the conditions.

- **I-405 southbound off-ramp to SW Broadway.** Field observations noted that this ramp remained queued during most for the peak period, indicating significant unserved demand. The simulation model focused on matching the volume throughput at this location, based on the traffic counts. Queues on the off-ramp were generated by queue spillback from the Ross Island Bridge and not directly from the signal operations at SW Broadway.

- **Northbound I-405 on-ramp on SW Sixth Avenue.** Congestion caused by weave conflicts between traffic from the SW Sixth Avenue I-405 northbound on-ramp and the I-405 northbound traffic attempting to access the U.S. 26 tunnel is combined with westbound queue spillback from the U.S. 26 tunnel. This congestion creates a queuing issue on the I-405 northbound on-ramp from SW Sixth Avenue, effectively metering the amount of traffic that can be served at this location. Throughout the PM commute, this bottleneck leads to westbound queues along SW Broadway, SW Caruthers Street, SW Third Avenue, SW Arthur Street and SW Kelly Avenue, and ultimately causes queue shockwaves to extend across the Ross Island Bridge, impacting operations on northbound Highway 99E and at SE Powell Boulevard and SE Milwaukie Avenue.

- **Ross Island Bridgehead eastbound.** The stop-controlled approaches to the Ross Island Bridgehead at SW Kelly Avenue and from the northbound SW Naito Parkway ramp contribute to a system bottleneck during the PM peak period. As congestion increases on the Ross Island Bridge due to queue spillback from the SE Powell Boulevard and SE 20th Avenue intersection, combined with high traffic and lane changes in the narrow lanes on the Ross Island Bridge, the driver behavior at the bridgehead changes.

Both the SW Kelly Avenue and northbound SW Naito Parkway ramp intersections shift from typical TWSC behavior to zipper merge or "courtesy queuing" operations. SW Kelly Avenue operates slightly more evenly than the SW Naito Parkway ramp; it exhibits one-to-one major-to-minor street vehicle merge behavior. Once the drivers engage in courtesy queuing behavior, a queue develops back up through the SW First Avenue and SW Arthur Street intersection and all the way to the I-405 southbound off-ramp at SW Broadway. The queue from the northbound SW Naito Parkway ramp builds throughout the peak hour and occasionally extends to SW Hamilton Street. The queue at northbound SW Kelly Avenue to eastbound Ross Island Bridge includes vehicles exiting I-5 northbound via SW Macadam Avenue and looping around to SW Kelly Avenue via SW Hood Avenue and SW Whitaker Street. Additional northbound vehicles on SW Corbett Avenue destined for the Ross Island Bridge eschew SW Barbur Boulevard and SW Naito Parkway entirely in favor of the SW Kelly Avenue access. Another popular shortcut is the westbound right turn from SW Gibbs Street directly onto the SW Naito Parkway northbound ramp to the Ross Island Bridge. Drivers on both northbound SW Corbett Avenue and southbound SW First Avenue use this route in an attempt to cut short the delay caused by waiting in queues on the mainline routes.

- **Intersection of SW Hamilton Street and SW Corbett Avenue.** The performance of the eastbound leg of this intersection is key to the operations at the much higher volume intersection of SW Hamilton Street and SW Barbur Boulevard. Eastbound queue spillback at this AWSC intersection occasionally extends to SW Barbur Boulevard as a slow-moving (but not stopped) queue.

- **Intersection of SW Hamilton Street and SW Barbur Boulevard.** This intersection has multiple queuing issues during the PM peak hour. Signal timing constraints and occasional northbound queue spillback from the Ross Island Bridge restrict the eastbound leg of the intersection to approximately four to six vehicles per cycle, leading to high vehicle delays and queuing. The southbound left turn also has limited green time available, and queue spillback from the SW Hamilton Street and SW Corbett Avenue intersection occasionally impedes the flow for this movement, leading to queues that can occasionally extend up SW Barbur Boulevard to near SW Naito Parkway.

Overall, the PM existing conditions field observations and model indicated significant congestion throughout the study area, particularly on movements feeding the eastbound Ross Island Bridge and on the westbound U.S. 26-to-U.S. 26 movement. In addition, there are some more localized congestion issues in the area of SW Barbur Boulevard, SW Hamilton Street and SW Corbett Avenue. Note that the congestion present during the PM conditions in Segment A is dynamic from day to day. The existing conditions microsimulation analysis focused on the best approximation of a "typical" day, and all future scenarios were built off the same set of assumptions.

2.2.3. Segment A Safety Analysis

The Draft EIS identified two distinct clusters of fatal and serious injury collisions along Segment A: (1) the Ross Island Bridge and (2) Highway 99W (SW Barbur Boulevard)/SW Naito Parkway/Ross Island Bridge western access. These clusters reported a total of 1 fatality collision and 7 serious injury collisions in the period from 2013 to 2017.

Updated 2013–2017 crash data for the Ross Island Bridgehead and SW Barbur Boulevard, for total serious injuries and collision type for serious injury collisions, are shown in Table 2.3-3 and Table 2.3-4, respectively.

Table 2.2-6. Ross Island Bridge and SW Barbur Boulevard – Total Serious Injuries, 2013–2017, Segment A

Location	Fatal	Serious Injury	Total
Study area corridor	**1**	**6**	**7**
Ross Island Bridgehead (ramps/SW Naito Pkwy./west end of bridge)	0	6	6
SW Barbur Blvd. at SW Parkhill Dr.	1	0	1

Table 2.2-7. Ross Island Bridge and SW Barbur Boulevard – Serious Injury Collision Type, 2013–2017, Segment A

Location	Pedestrian	Bicycle	Rear-End	Fixed Object	Turning	Other[1]
Study area corridor	**1**	**0**	**3**	**2**	**0**	**0**
Ross Island Bridgehead (ramps/SW Naito Pkwy./west end of bridge)	1	0	3	2	0	0
SW Barbur Blvd. at SW Parkhill Dr.	0	0	0	1	0	0

1 = "Other" includes collisions with animals, mechanical failures, or lost vehicle loads

The fatality at SW Barbur Boulevard and SW Parkhill Drive was a fixed-object collision by a single driver, and did not involve any additional passengers, pedestrians or bicyclists. The collision occurred on a straight segment of the roadway and possibly resulted from the driver merging into the roadway guardrails or other nearby fixed object.

Ross Island Bridgehead

The Draft EIS reported a total of 10 fatal and serious injury collisions (2 fatal and 8 that resulted in serious injuries) across the bridge. There were six total serious collisions and no fatalities reported in the vicinity of the Ross Island Bridgehead using updated 2013–2017 data.

The cluster at SW Barbur Boulevard and SW Naito Parkway is at a complex three-leg intersection that includes SW Abernathy Street and SW Lane Street. The intersection is not signalized and includes a median crossing refuge along SW Barbur Boulevard and mid-block crosswalk connecting to a sheltered Tri-County Metropolitan Transportation District of Oregon (TriMet) bus stop (SW Barbur Boulevard and SW Lane Street, serving Lines 1, 12 and 44) on the east side of SW Barbur Boulevard. SW Naito Parkway ties in as the northbound lane to the western access to the Ross Island Bridge and includes a marked crossing across the lane, which also provides access to the bus stop at SW Barbur Boulevard and SW Lane Street.

Three of the six crashes were rear-end collisions caused by drivers following too closely; one of these involved a motorcyclist. Of the remaining collisions, two were fixed-object collisions, and one involved a pedestrian who was struck while walking across the crosswalk at SW Barbur Boulevard and northbound SW Naito Parkway. The pedestrian crash occurred during wet and reduced visibility conditions.

2.3. Segment A Future Conditions

This section identifies potential impacts associated with the No-Build Alternative and the Preferred Alternative in Segment A in 2035 and for freeway ramp terminals in 2045. The Preferred Alternative includes an inclined elevator connecting from the Gibbs Station on SW Barbur Boulevard up to SW Terwilliger Boulevard, where a new signalized intersection would replace an existing crosswalk at SW Campus Drive. No changes to vehicular circulation are anticipated.

2.3.1. Segment A Future Intersection Operations

2035 No-Build Alternative Intersection Operations

The No-Build Alternative assumes that the Project is not constructed. The No-Build Alternative provides a basis for comparison between future scenarios with and without the Project. The only future project included within Segment A for the No-Build Alternative is a new traffic signal at the SW Fourth Avenue and SW College Street intersection to accommodate the pedestrians and cyclists added by the Green Loop multiuse path along SW Fourth Avenue, and the yet-to-be constructed Division Transit Line Project bus line.

The Synchro analysis for the No-Build Alternative is shown in Table 2.3-1. Intersections that do not meet the mobility target are shaded gray for each failing peak hour. Figures depicting turn volumes are shown in Appendix B1. More details on HCM operations analysis can be found in Appendix B6 and Appendix B7.

Table 2.3-1. HCM (Synchro) Segment A 2035 No-Build Alternative Conditions Analysis *(multipage table)*

ID	Intersection	Mobility Target		Control	AM				PM			
					Delay	LOS	V/C	WLANE	Delay	LOS	V/C	WLANE
A12	SW 1st Ave./SW Harrison St.	PBOT 2nd HR	0.99	Signal	59.2	E	0.40	-	19.3	B	0.54	-
A13	SW Naito Pkwy./SW Harrison St.	PBOT 2nd HR	0.99	Signal	25.2	C	0.70	-	50.2	D	0.84	-
A21	SW 4th Ave./SW Hall St.	PBOT 2nd HR	0.99	Signal	16.2	B	0.55	-	26.4	C	0.43	-
A23	SW 6th Ave./SW College St.	PBOT 2nd HR	0.99	Signal	8.1	A	0.37	-	7.6	A	0.35	-
A25	SW 4th Ave./SW College St.	PBOT 2nd HR	0.99	Signal	15.2	B	0.52	-	9.8	A	0.38	-
A27	SW 6th Ave./SW Jackson St./I-405 northbound off-ramp	ODOT Ramp	0.85	TWSC	8.5 [47.2]	A [E]	[0.31]	EBLn1	8.1 [30.8]	A [D]	[0.37]	EBLn1
A31	SW 4th Ave./I-405 northbound off-ramp/ SW Lincoln St.	ODOT Ramp	0.85	Signal	15.9	B	0.66	-	19.8	B	0.65	-
A34	SW 1st Ave./SW Lincoln St.	PBOT 2nd HR	0.99	Signal	24.0	C	0.28	-	21.5	C	0.61	-
A35	SW Naito Pkwy./SW Lincoln St.	PBOT 2nd HR	0.99	Signal	2.9	A	0.51	-	5.2	A	0.58	-
A37	SW Broadway/ I-405 southbound off-ramp/SW Lincoln St.	ODOT Ramp	0.85	Signal	18.1	B	0.67	-	20.2	C	0.65	-
A38	SW Broadway/SW Grant St./SW 6th Ave.	PBOT 1st HR	0.99	Signal	56.3	E	0.99	-	26.9	C	0.92	-
A39	SW Broadway/SW 5th Ave.	PBOT 1st HR	0.99	Signal	58.7	E	0.86	-	17.3	B	0.76	-
A42	SW 4th Ave./SW Caruthers St./SW Broadway	PBOT 1st HR	0.99	Signal	29.4	C	0.96	-	21.6	C	0.82	-
A45	SW 4th Ave./SW Barbur Blvd./SW Sheridan St.	PBOT 1st HR	0.99	Signal	21.2	C	0.82	-	14.2	B	0.68	-

Table 2.3-1. HCM (Synchro) Segment A 2035 No-Build Alternative Conditions Analysis *(multipage table)*

ID	Intersection	Mobility Target		Control	AM				PM			
					Delay	LOS	V/C	WLANE	Delay	LOS	V/C	WLANE
A46	SW 1st Ave./SW Sheridan St.	PBOT 1st HR	0.99	TWSC	8.4 [15.1]	A [C]	[0.13]	WBLn1	9.9 [27.7]	A [D]	[0.36]	SBLn
A47	SW Naito Pkwy./SW Sheridan St.	PBOT 1st HR	0.99	Free	0 [0]	A [A]	0	-	0 [0]	A [A]	0	-
A48	SW 1st Ave./SW Arthur St.	PBOT 1st HR	0.99	Signal	23.6	C	0.80	-	28.5	C	0.86	-
A51	SW Kelly Ave./SW Water Ave.	PBOT 1st HR	0.99	TWSC	**>300 [101.9]**	**F [F]**	**[1.40]**	**SEL**	**40.4 [>300]**	**E [F]**	**[1.33]**	**SEL**
A52	SW Barbur Blvd./SW Hooker St.	PBOT 1st HR	0.99	TWSC	14.3 [34.2]	B [D]	[0.41]	WBLn1	10.7 [142.3]	B [F]	[0.85]	WBLn1
A53	SW Naito Pkwy./SW Hooker St.	PBOT 1st HR	0.99	TWSC	- [0]	A [A]	-	-	- [0]	A [A]	-	-
A56	SW Kelly Ave./SW Porter St./SW Hood Ave.	ODOT Ramp	0.85	TWSC	17.6 [8.6]	C [A]	[0.39]	SBLn	11.4 [8.5]	B [A]	[0.23]	SBLn
A61	Ross Island Br./SW Naito Pkwy.	ODOT/PBOT 1st HR	0.99	TWSC	**0 [190.2]**	**A [F]**	**[1.35]**	**SELn1**	**0 [>300)**	**A [F]**	**[3.09]**	**SELn1**
A62	Ross Island Br./SW Kelly Ave. ramps	ODOT/PBOT 1st HR	0.99	TWSC	**0 [106.4]**	**A [F]**	**[1.07]**	**NBLn1**	**0 [>300]**	**A [F]**	**[4.25]**	**NBLn1**
A69	SW Naito Pkwy./SW Gibbs St./SW Naito Pkwy. ramps	ODOT/PBOT 1st HR	0.99	TWSC	0 [14.4]	A [B]	[0.03]	WBLn1	0 [18.6]	A [C]	[0.55]	WBLn1
A71	SW Barbur Blvd./SW Whitaker St.	ODOT/PBOT 1st HR	0.99	TWSC	14.9 [27.5]	B [D]	[0.40]	WBLn1	10.8 [23.2]	B [C]	[0.15]	WBLn1
A78	SW Barbur Blvd./SW Naito Pkwy./Ped. crossing	ODOT/PBOT 1st HR	0.99	TWSC	8.4 [11.7]	A [B]	[0.02]	EBLn1	10 [33.5]	A [D]	[0.19]	EBLn1
A80	SW Barbur Blvd./SW Bancroft St.	ODOT/PBOT 1st HR	0.99	TWSC	0 [45.2]	A [E]	[0.76]	WBLn1	0 [16.3]	A [C]	[0.28]	WBLn1
A81	SW Corbett Ave./SW Bancroft St.	PBOT 1st HR	0.99	TWSC	8 [44.8]	A [E]	[0.44]	WBLn1	**8.3 [215.8]**	**A [F]**	**[1.32]**	**EBLn1**
A82/ A84	SW Barbur Blvd./SW Hamilton St.	ODOT/PBOT 1st HR	0.99	Signal	36.7	D	0.97	-	44.1	D	0.96	-
A83	SW Corbett Ave./SW Hamilton St.	PBOT 1st HR	0.99	AWSC	**113.9**	**F**	**1.37**	**NBLn1**	**126.5**	**F**	**1.39**	**-**

Note: AWSC = All-way stop control; EB = eastbound; HCM = Highway Capacity Manual; HR = Hour; ID = Intersection Identification #; LOS = Level of Service; Ln = Lane; NB = northbound; ODOT = Oregon Department of Transportation; PBOT = Portland Bureau of Transportation; SB = southbound; SEL = Southeast Leg; TWSC = Two-way stop control; V/C = volume-to-capacity; WB = westbound; WLANE = worst lane. "-" represents "not applicable"

Key: Delay = Average vehicle delay (in seconds). Worst Major [Worst Minor] delay and LOS for TWSC intersections.
V/C represents intersection average for signals and worst movement for stop control intersections. Delay, LOS and V/C ratio reported for worst lane for all-way stop control. "-" represents "not applicable"

As shown in Table 2.3-1, HCM analysis indicated that the following intersections would fail to meet mobility targets:

AM Peak Hour:

- **SW Kelly Avenue and SW Water Avenue.** This intersection would continue to operate above the mobility target.

- **SW Naito Parkway northbound ramp to Ross Island Bridge.** This intersection would continue to operate above the mobility target.
- **SW Kelly Avenue and Ross Island Bridge.** This intersection would fail to meet mobility targets under future No-Build Alternative conditions because of increased volumes on SW Kelly Avenue.
- **SW Corbett Avenue and SW Hamilton Street**. This intersection would continue to operate above the mobility target.

PM Peak Hour:

- **SW Naito Parkway and Ross Island Bridge.** This intersection would continue to operate above the mobility target.
- **SW Kelly Avenue and Ross Island Bridge.** This intersection would continue to operate above the mobility target.
- **SW Corbett Avenue and SW Bancroft Street**. This intersection would continue to operate above the mobility target.
- **SW Corbett Avenue and SW Hamilton Street.** This intersection would continue to operate above the mobility target.

Similar to existing conditions, there are several other intersections that would have operational issues not captured in the HCM analysis due to operations at adjacent intersections or queue spillback from bottlenecks elsewhere in the area. These operational issues will be discussed further later in this section.

2045 No-Build Alternative Intersection Operations

The following analysis evaluates the ramp terminal intersections for the I-405 off-ramps under the 2045 AM and PM No-Build Alternative peak-hour conditions. In addition to the 2035 forecast, the FHWA and ODOT requested year 2045 traffic forecasts at locations where the Project could impact freeway ramp terminal operations. Table 2.3-2 shows the Synchro analysis results for the 2045 No-Build Alternative. As shown, the V/C ratio under the No-Build Alternative for both ramps would remain well below mobility targets. The Preferred Alternative would construct a new signal at the intersection of SW Sixth Avenue and SW Jackson Street, which would become the ramp terminal for the SW Sixth Avenue/I-405 off-ramp. More details on the HCM operations analysis can be found in Appendix B18.

Table 2.3-2. HCM (Synchro) Segment A 2045 AM and PM No-Build Alternative Analysis

					AM				PM			
ID	Intersection	Mobility Target		Control	Delay	LOS	V/C	WLANE	Delay	LOS	V/C	WLANE
A23	SW 6th Ave. and SW College St.	ODOT Ramp	0.85	Signal	7.8	A	0.36	-	8.6	A	0.35	-
A31	SW 4th Ave./ I-405 NB off-ramp/ SW Lincoln St.	ODOT Ramp	0.85	Signal	17.0	B	0.70	-	20.2	C	0.67	-

Note: HCM = Highway Capacity Manual; I-405 = Interstate 405; ID = Intersection Identification #; LOS = Level of Service; NB = northbound; ODOT = Oregon Department of Transportation; V/C = volume-to-capacity; WLANE = worst lane.

2035 Project Intersection Operations

Preferred Alternative

Both the AM Synchro analysis and the PM Synchro analysis for the Preferred Alternative are shown in Table 2.3-3. Intersections that would not meet the mobility target are shaded gray for each failing peak hour. Appendix B1 includes figures that depict the turn volumes. More details on the HCM operations analysis can be found in Appendix B10 and Appendix B11.

Table 2.3-3. HCM (Synchro) Segment A 2035 Preferred Alternative Conditions Analysis *(multipage table)*

					AM				PM			
ID	Intersection	Mobility Target		Control	Delay	LOS	V/C	WLANE	Delay	LOS	V/C	WLANE
A12	SW 1st Ave./ SW Harrison St.	PBOT 2nd HR	0.99	Signal	59.1	E	0.40	-	19.7	B	0.55	-
A13	SW Naito Pkwy./ SW Harrison St.	PBOT 2nd HR	0.99	Signal	22.4	C	0.71	-	50.5	D	0.89	-
A21	SW 4th Ave./ SW Hall St.	PBOT 2nd HR	0.99	Signal	26.1	C	0.51	-	25.3	C	0.39	-
A23	SW 6th Ave/ SW College St.	PBOT 2nd HR	0.99	Signal	10.3	B	0.36	-	10.6	B	0.36	-
A25	SW 4th Ave./ SW College St.	PBOT 2nd HR	0.99	Signal	17.0	B	0.54	-	9.2	A	0.34	-
A27	SW 6th Ave./ SW Jackson St./I-405 northbound off-ramp	ODOT Ramp	0.85	Signal	32.3	C	0.56	-	15.9	B	0.50	-
A31	SW 4th Ave./ I-405 northbound off-ramp/ SW Lincoln St.	ODOT Ramp	0.85	Signal	21.4	C	0.61	-	24.1	C	0.62	-
A34	SW 1st Ave./ SW Lincoln St.	PBOT 2nd HR	0.99	Signal	24.1	C	0.27	-	19.1	B	0.53	-
A35	SW Naito Pkwy./ SW Lincoln St.	PBOT 2nd HR	0.99	Signal	3.6	A	0.55	-	5.4	A	0.58	-
A37	SW Broadway/ I-405 southbound off-ramp/ SW Lincoln St.	ODOT Ramp	0.85	Signal	17.2	B	0.63	-	20.1	C	0.65	-
A38	SW Broadway/ SW Grant St./ SW 6th Ave.	PBOT 1st HR	0.99	Signal	32.7	C	0.94	-	23.7	C	0.89	-
A39	SW Broadway/ SW 5th Ave.	PBOT 1st HR	0.99	Signal	26.2	C	0.80	-	12.0	B	0.75	-
A42	SW 4th Ave./SW Caruthers St./SW Broadway	PBOT 1st HR	0.99	Signal	40.2	D	0.91	-	31.1	C	0.77	-
A45	SW 4th Ave./SW Barbur Blvd./SW Sheridan St.	PBOT 1st HR	0.99	Signal	19.4	B	0.76	-	12.4	B	0.71	-
A46	SW 1st Ave./ SW Sheridan St.	PBOT 1st HR	0.99	TWSC	8.4 [14.2]	A [B]	0.12	WBLn1	10 [28.6]	B [D]	0.36	SBLn

Table 2.3-3. HCM (Synchro) Segment A 2035 Preferred Alternative Conditions Analysis *(multipage table)*

ID	Intersection	Mobility Target		Control	AM				PM			
					Delay	LOS	V/C	WLANE	Delay	LOS	V/C	WLANE
A47	SW Naito Pkwy./ SW Sheridan St.	PBOT 1st HR	0.99	Free	0 [0]	A [A]	0	-	0 [0]	A [A]	0	-
A48	SW 1st Ave./ SW Arthur St.	PBOT 1st HR	0.99	Signal	27.4	C	0.84	-	28.8	C	0.90	-
A51	SW Kelly St./ SW Water St.	PBOT 1st HR	0.99	TWSC	**>300 [294.4]**	**F [F]**	**[1.61]**	**SEL**	**35.9 [245]**	**E [F]**	**[1.03]**	**SWLn1**
A52	SW Barbur Blvd./ SW Hooker St.[1]	PBOT 1st HR	0.99	Signal	51.8	D	0.92	-	21.9	C	0.64	-
A53	SW Naito Pkwy./ SW Hooker St.	PBOT 1st HR	0.99	TWSC	0 [0]	A [A]	-	-	0 [0]	A [A]	-	-
A56	SW Kelly Ave./ SW Porter St./ SW Hood Ave.	ODOT Ramp	0.85	TWSC	17.9 [8.6]	C [A]	[0.41]	SBLn	11.4 [8.5]	B [A]	0.24	-
A61	Ross Island Br./ SW Naito Pkwy.	ODOT/PBOT 1st HR	0.99	TWSC	**0 [164.4]**	**A [F]**	**[1.29]**	**SELn1**	**0 [>300]**	**A [F]**	**[2.78]**	**SELn1**
A62	Ross Island Br./ SW Kelly Ave. ramps	ODOT/PBOT 1st HR	0.99	TWSC	**0 [114.8]**	**A [F]**	**[1.10]**	**NBLn1**	**0 [>300]**	**A [F]**	**[4.25]**	**NBLn1**
A69	SW Naito Pkwy./ SW Gibbs St./ SW Naito Pkwy. ramps	ODOT/PBOT 1st HR	0.99	TWSC	0 [13.9]	A [B]	[0.04]	WBLn1	0 [17.6]	A [F]	[0.54]	WBLn1
A71	SW Barbur Blvd./ SW Whitaker St. [1]	ODOT/PBOT 1st HR	0.99	Signal	20.5	C	0.89	-	13.0	B	0.67	-
A78	SW Barbur Blvd./ SW Naito Pkwy./ Ped. crossing	ODOT/PBOT 1st HR	0.99	Signal	27.0	C	0.85	-	38.4	D	0.94	-
A80	SW Barbur Blvd./ SW Bancroft St.	ODOT/PBOT 1st HR	0.99	Signal	17.3	B	0.85	-	18.1	B	0.84	-
A81	SW Corbett Ave./ SW Bancroft St.	PBOT 1st HR	0.99	Signal	8.2	A	0.34	-	51.7	D	0.61	-
A82/ A84	SW Barbur Blvd./ SW Hamilton St.	ODOT/PBOT 1st HR	0.99	Signal	25.5	C	0.81	-	18.7	B	0.92	-
A83	SW Corbett Ave./ SW Hamilton St.	PBOT 1st HR	0.99	Signal	30.5	C	0.73	-	**84.6**	**F**	**1.16**	**-**

Note: EB = eastbound; HCM = Highway Capacity Manual; HR = Hour; ID = Intersection Identification #; LOS = Level of Service; Ln = Lane; NB = northbound; ODOT = Oregon Department of Transportation; PBOT = Portland Bureau of Transportation; SB = southbound; SEL = Southeast Leg TWSC = Two-way stop control; V/C = volume-to-capacity; WB = westbound; WLANE = worst lane.

[1] Intersection V/C ratio adjusted for pedestrian crossing impact. "-" represents "not applicable"

As shown in Table 2.3-3, three AM study area intersections analyzed for the Preferred Alternative would not meet mobility targets.

AM peak hour:

- **SW Kelly Avenue at SW Water Avenue.** This intersection would continue to operate above the mobility target under the Preferred Alternative. The V/C ratio would increase relative to the No-Build Alternative due to increased through volumes along northbound SW Kelly Avenue that would conflict with the southbound left turn to SW Water Avenue.

- **SW Naito Parkway northbound ramp to Ross Island Bridge.** This intersection would continue to operate above the mobility target. The intersection V/C ratio would decrease relative to the No-Build Alternative due to slightly lower northbound SW Naito Parkway volumes accessing the Ross Island Bridge.

- **SW Kelly Avenue Ramps and Ross Island Bridge.** This intersection would continue to operate above the mobility target. The intersection V/C ratio would increase slightly due to an increase in volume from SW Kelly Avenue accessing the Ross Island Bridge.

The HCM analysis for the Preferred Alternative in 2035 indicates that the following intersections would fail to meet mobility targets under PM peak-hour conditions:

- **SW Kelly Avenue at SW Water Avenue.** This intersection would continue to operate above the mobility target under the Preferred Alternative.

- **SW Naito Parkway northbound ramp to Ross Island Bridge.** This intersection would continue to operate above the mobility target, with a V/C ratio of greater than 2.0, similar to the No-Build Alternative.

- **SW Kelly Avenue Ramps and Ross Island Bridge.** This intersection would continue to operate above the mobility target, with a V/C ratio of greater than 2.0, similar to the No-Build Alternative.

- **SW Corbett Avenue and SW Hamilton Street.** This intersection would become signalized in the Preferred Alternative but would continue to operate above the mobility target due to high northbound left volumes, high southbound through volumes and high eastbound left volumes.

As indicated in previous sections, these operations results do not account for queue spillback at some of the key study area bottlenecks, such as the Ross Island Bridgehead and the I-405 northbound on-ramp. The impacts of these bottlenecks will be discussed further in the 2035 Preferred Alternative Simulation Queuing and Operations Analysis section.

Related Transportation Improvements – Ross Island Bridgehead Reconfiguration

The Ross Island Bridgehead Reconfiguration is described in Section 1.1. Both the AM Synchro analysis and the PM Synchro analysis for the Ross Island Bridgehead Reconfiguration are shown in Table 2.3-4. Intersections that would not meet the mobility target are shaded gray for each failing peak hour. More details on HCM operations analysis can be found in Appendix B12 and Appendix B13.

Table 2.3-4. HCM (Synchro) Segment A 2035 Ross Island Bridgehead Reconfiguration Conditions Analysis *(multipage table)*

					AM				PM			
ID	Intersection	Mobility Target		Control	Delay	LOS	V/C	WLANE	Delay	LOS	V/C	WLANE
A12	SW 1st Ave./ SW Harrison St.	PBOT 2nd HR	0.99	Signal	28.1	C	0.39	-	25.1	C	0.63	-
A13	SW Naito Pkwy./ SW Harrison St.	PBOT 2nd HR	0.99	Signal	19.5	B	0.64	-	32.9	C	0.76	-
A21	SW 4th Ave./ SW Hall St.	PBOT 2nd HR	0.99	Signal	25.5	C	0.51	-	24.5	C	0.39	-

Table 2.3-4. HCM (Synchro) Segment A 2035 Ross Island Bridgehead Reconfiguration Conditions Analysis
(multipage table)

ID	Intersection	Mobility Target		Control	AM				PM			
					Delay	LOS	V/C	WLANE	Delay	LOS	V/C	WLANE
A23	SW 6th Ave./ SW College St.	PBOT 2nd HR	0.99	Signal	12.3	B	0.36	-	10.0	A	0.36	-
A25	SW 4th Ave./SW College St.	PBOT 2nd HR	0.99	Signal	18.5	B	0.55	-	9.9	A	0.37	-
A27	SW 6th Ave./ SW Jackson St./ I-405 northbound off-ramp	ODOT Ramp	0.85	Signal	31.2	C	0.56	-	15.9	B	0.50	-
A31	SW 4th Ave./ I-405 northbound off-ramp/ SW Lincoln St.	ODOT Ramp	0.85	Signal	20.1	C	0.65	-	24.1	C	0.62	-
A34	SW 1st Ave./ SW Lincoln St.	PBOT 2nd HR	0.99	Signal	23.1	C	0.32	-	19.8	B	0.58	-
A35	SW Naito Pkwy./ SW Lincoln St.	PBOT 2nd HR	0.99	Signal	3.7	A	0.51	-	4.3	A	0.46	-
A37	SW Broadway/ I-405 southbound off-ramp/SW Lincoln St.	ODOT Ramp	0.85	Signal	17.3	B	0.64	-	18.2	B	0.64	-
A38	SW Broadway/ SW Grant St./SW 6th Ave.	PBOT 1st HR	0.99	Signal	34.5	C	0.95	-	24.0	C	0.90	-
A39	SW Broadway/ SW 5th Ave.	PBOT 1st HR	0.99	Signal	22.0	C	0.83	-	12.1	B	0.76	-
A42	SW 4th Ave./ SW Caruthers St./ SW Broadway	PBOT 1st HR	0.99	Signal	47.3	D	0.94	-	25.6	C	0.78	-
A45	SW 4th Ave./ SW Barbur Blvd./ SW Sheridan St.	PBOT 1st HR	0.99	Signal	20.0	C	0.79	-	12.6	B	0.71	-
A46	SW 1st Ave./ SW Sheridan St.	PBOT 1st HR	0.99	Signal	18.4	B	0.40	-	30.6	C	0.56	-
A47	SW Naito Pkwy./ SW Sheridan St.	PBOT 1st HR	0.99	Signal	14.1	B	0.84	-	18.3	B	0.54	-
A48	SW 1st Ave./ SW Arthur St.	PBOT 1st HR	0.99	Signal	23.9	C	0.85	-	46.4	D	0.87	-
A51	SW Kelly St./ SW Water St.	PBOT 1st HR	0.99	Signal	18.3	B	0.77	-	13.6	B	0.75	-
A52	SW Barbur Blvd./ SW Hooker St.[1]	PBOT 1st HR	0.99	Signal	64.1	E	0.96	-	22.0	C	0.64	-
A53	SW Naito Pkwy./ SW Hooker St.	PBOT 1st HR	0.99	Signal	7.8	A	0.74	-	22.0	C	0.69	-
A56	SW Kelly Ave./ SW Porter St./ SW Hood Ave.	ODOT Ramp	0.85	Signal	31.0	C	0.96	-	19.0	B	0.95	-

Table 2.3-4. HCM (Synchro) Segment A 2035 Ross Island Bridgehead Reconfiguration Conditions Analysis *(multipage table)*

ID	Intersection	Mobility Target		Control	AM				PM			
					Delay	LOS	V/C	WLANE	Delay	LOS	V/C	WLANE
A61	Ross Island Br./ SW Naito Pkwy. (Connection A)	ODOT/PBOT 1st HR	0.99	Signal	7.3	A	0.52	-	4.2	A	0.71	-
	Ross Island Br./ SW Naito Pkwy. (Connection B)	ODOT/PBOT 1st HR	0.99	Signal	29.1	C	0.77	-	23.3	C	0.60	-
A62	Ross Island Br./ SW Kelly Ave. ramps	ODOT/PBOT 1st HR	0.99	Signal	17.8	B	0.74	-	**94.2**	**F**	**1.15**	**-**
A69	SW Naito Pkwy./ SW Gibbs St./ SW Naito Pkwy. ramps	ODOT/PBOT 1st HR	0.99	Signal	10.3	B	0.58	-	23.3	C	0.81	-
A71	SW Barbur Blvd./ SW Whitaker St. [1]	ODOT/PBOT 1st HR	0.99	Signal	29.6	C	0.89	-	12.6	B	0.65	-
A78	SW Barbur Blvd./ SW Naito Pkwy./ Ped. crossing	ODOT/PBOT 1st HR	0.99	Signal	21.3	C	0.87	-	34.9	C	0.93	-
A80	SW Barbur Blvd./ SW Bancroft St.	ODOT/PBOT 1st HR	0.99	Signal	12.9	B	0.87	-	18.6	B	0.84	-
A81	SW Corbett Ave./ SW Bancroft St.	PBOT 1st HR	0.99	Signal	9.9	A	0.34	-	50.9	D	0.50	-
A82/ A84	SW Barbur Blvd./ SW Hamilton St.	ODOT/PBOT 1st HR	0.99	Signal	25.9	C	0.81	-	18.4	B	0.92	-
A83	SW Corbett Ave./ SW Hamilton St.	PBOT 1st HR	0.99	Signal	34.0	C	0.73	-	**69.6**	**E**	**1.03**	**-**

Notes: EB = eastbound; HCM = Highway Capacity Manual; HR = Hour; I-405 = Interstate 405; ID = Intersection Identification #; LOS = Level of Service; Ln = Lane; NB = northbound; ODOT = Oregon Department of Transportation; PBOT = Portland Bureau of Transportation; SB = southbound; V/C = volume-to-capacity; WB = westbound; WLANE = worst lane. "-" represents "not applicable"

[1] Intersection V/C ratio adjusted for pedestrian impact.

As shown in Table 2.3-4, all of the AM study area intersections analyzed would meet mobility targets for the Ross Island Bridgehead Reconfiguration.

The HCM analysis indicated that the following intersections would fail to meet mobility targets under PM peak-hour conditions for the Ross Island Bridgehead Reconfiguration:

- **SW Kelly Avenue Ramps and Ross Island Bridge.** This intersection would be reconfigured, and access to the bridge would be provided from the north side rather than the south side. As the only southbound access point for the Ross Island Bridge, the volumes would exceed the capacity.

- **SW Corbett Avenue and SW Hamilton Street.** This intersection would continue to operate above the mobility target but would improve compared to the No-Build Alternative—the intersection would have reduced eastbound left volume due to the reconfiguration of the SW Kelly Avenue ramp.

As indicated in previous sections, these operations results do not account for queue spillback at some of the key study area bottlenecks, such as the I-405 northbound on-ramp. The impacts of these bottlenecks will be discussed further in the next section.

2045 Preferred Alternative Intersection Operations

The following analysis evaluates the ramp terminal intersections for the I-405 off-ramps under 2045 AM and PM peak-hour conditions for the Preferred Alternative. Table 2.3-5 shows Synchro analysis results for the 2045 light rail alternatives. As shown, both intersections would remain well below mobility targets in both peak periods. More details on the HCM operations analysis can be found in Appendix B19.

Table 2.3-5. HCM (Synchro) Segment A 2045 AM and PM Preferred Alternative Analysis

					AM				PM			
ID	Intersection	Mobility Target		Control	Delay	LOS	V/C	WLANE	Delay	LOS	V/C	WLANE
A27	SW 6th Ave. and SW Jackson St.	ODOT Ramp	0.85	Signal	32.3	C	0.56	-	16.3	B	0.51	-
A31	SW 4th Ave./I-405 NB off-ramp/SW Lincoln St.	ODOT Ramp	0.85	Signal	19.0	B	0.63	-	27.9	C	0.67	-

Note: HCM = Highway Capacity Manual; I-405 = Interstate 405; ID = Intersection Identification #; LOS = Level of Service; NB = northbound; ODOT = Oregon Department of Transportation; V/C = volume-to-capacity; WLANE = worst lane.

2.3.2. Segment A Future Queuing Analysis

2035 No-Build Alternative Queuing and Operations Analysis

Simulation models for the future conditions with the No-Build Alternative were developed from the calibrated existing conditions models (Segment A AM and Segment A PM models). No changes were made to the modeling driver behavior assumptions, but volumes and vehicle routing patterns were updated based on the 2035 Metro Travel Demand model. There are no Metro Regional Transportation Plan projects within model area; however, five Portland Bureau of Transportation (PBOT) projects were added as part of the No-Build Alternative analysis, as follows:

- **Green Loop on SW Fourth Avenue.** This project adds a new multiuse path along the east side of SW Fourth Avenue from SW Lincoln Street to SW College Street. The project also includes a new signal at SW Fourth Avenue and SW College Street, with signalized bicycle crossings.
- **SW Fourth Avenue Central City in Motion (CCIM) Project.** This project reallocates lanes on SW Fourth Avenue to provide additional space for directional bicycle lanes/Green Loop and business access and transit lanes. Although the design for this project is ongoing, likely changes to the existing network were considered and included in the No-Build Alternative model.
- **Division Transit Line Project.** The yet-to-be-constructed Division Transit Line was added to the model. This line uses longer buses and shorter dwell times that are consistent with operations assumptions used on the Division Transit Line Project.
- **Hawthorne Bridge Signal.** This signal is at the eastbound Hawthorne Bridge and the SW Naito Parkway northbound on-ramp. Note that this project is in the PM microsimulation model study limits only, and therefore did not impact the AM model.
- **Better Naito Project**. This project converts the outside northbound lane on SW Naito Parkway to a bikeway and walk area. This project was included in the No-Build Alternative model by coding the northbound SW Naito Parkway to eastbound Hawthorne Bridge ramp as a trap lane for the outside northbound lane on SW Naito Parkway, rather than a through/ramp option lane. SW Naito Parkway

was then modeled with a single northbound lane north of the Hawthorne Bridge ramp. Note that this project is in the PM microsimulation model study limits only, and therefore did not impact the AM model.

As with the existing models, system metrics such as total vehicles served, unserved vehicle demand, total hours of delay and unserved demand at key gateways were reported for the future No-Build Alternative models, along with performance metrics such as delay, travel times and 95th percentile queues, all of which are included in the appendices to this report. In addition, eastbound and westbound throughput on the west end of the Ross Island Bridge was measured to better assess system capacity.

2035 No-Build Alternative – AM

The 2035 No-Build Alternative AM microsimulation model results are presented in detail in the Segment A No-Build AM Vissim Report included as Appendix B8. This section summarizes the key results and findings from that Vissim report.

The system-wide metrics for the Segment A AM model for the No-Build Alternative are summarized in Table 2.3-6. These metrics include unserved demand at key locations impacted either by No-Build Alternative or Preferred Alternative conditions.

Table 2.3-6. Segment A No-Build Alternative AM Simulation System Measures

Measure		Simulation Result (7 a.m.–9 a.m.)		
Total vehicles served		33,950 vehicles		
Unserved vehicle demand		1,100 vehicles		
Total vehicle hours of delay		2,870 vehicle-hours		
Unserved Demand at Key Gateways (7 a.m.–9 a.m.)				
Gateway		**Demand (vehicles)**	**Unserved Demand (vehicles)**	**% Unserved Demand**
North	NB SW Macadam Ave. at SW Curry St.	**4,870**	**345**	**7%**
	NB SW Corbett Ave. at I-5 off-ramp	**1,195**	**135**	**11%**
South	SB SW Water Ave. at SW Kelly Ave.	**525**	**100**	**20%**
	SB SE 8th Ave. at SE Powell Blvd.	1,800	75	4%
West	WB SE Powell Blvd. at SE Milwaukie Ave.	**4,140**	**465**	**11%**
Throughput at System Bottlenecks (7 a.m.–9 a.m.)				
Location		**Demand (vehicles)**	**Throughput (vehicles)**	**% Demand Served**
Ross Island Bridge WB at I-5		**6,610**	**5,890**	**89%**
Ross Island Bridge EB at I-5		3,920	3,805	97%

Note: EB = eastbound; I-5 = Interstate 5; NB = northbound; SB = southbound; WB = westbound.

Key: **Bold** = Demand exceeds volume served by 5% or more.

As shown by the system-wide metrics, under the No-Build Alternative in Segment A, the roadway network modeled for the No-Build Alternative conditions would not have sufficient capacity to serve all of the future two-hour demand (7 a.m. to 9 a.m.). However, most of the unserved demand would likely shift to other regional routes or to a different time of day (i.e., shoulder hours). Note that the total delay also includes estimated delay for unserved demand (i.e., vehicles waiting to enter the network).

As with the AM analysis for the existing conditions, the travel time results are broken out separately for 7 a.m. to 8 a.m. and 8 a.m. to 9 a.m. to capture the impacts in shifting routing over the morning commute period. These travel time results are shown in Table 2.3-7.

Table 2.3-7. Segment A 2035 No-Build Alternative AM Travel Time Results

Travel Time Segment	Movement Served	Modeled Average Travel Time (min:ss)	Modeled Average Speed
7 a.m.–8 a.m.			
Capitol/Barbur to Harrison/Naito	NB 99W to Downtown via SW Naito Pkwy.	5:00	25 mph
Capitol/Barbur to 4th/Lincoln	NB 99W to Downtown via SW 4th Ave.	5:50	21 mph
Capitol/Barbur to Broadway/Grant	NB 99W to NB I-405	7:20	16 mph
Harrison/Naito to Capitol/Barbur	Downtown via SW Naito Pkwy. to SB 99W	3:50	32 mph
Broadway/Grant to Capitol/Barbur	SB I-405 to SB 99W	4:30	27 mph
RI East to Broadway/Grant	WB U.S. 26 to U.S. 26	12:10	7 mph
Broadway/Grant to RI East	EB U.S. 26 to U.S. 26	4:15	22 mph
8 a.m.–9 a.m.			
Capitol/Barbur to Harrison/Naito	NB 99W to Downtown via SW Naito Pkwy.	5:35	22 mph
Capitol/Barbur to 4th/Lincoln	NB 99W to Downtown via SW 4th Ave.	8:40	14 mph
Capitol/Barbur to Broadway/Grant	NB 99W to NB I-405	11:45	10 mph
Harrison/Naito to Capitol/Barbur	Downtown via SW Naito Pkwy. to SB 99W	3:50	32 mph
Broadway/Grant to Capitol/Barbur	SB I-405 to SB 99W	4:40	26 mph
RI East to Broadway/Grant	WB U.S. 26 to U.S. 26	11:45	7 mph
Broadway/Grant to RI East	EB U.S. 26 to U.S. 26	4:55	19 mph

Note: EB = eastbound; I-405 = Interstate 405; NB = northbound; RI = Ross Island Bridge SB = southbound; U.S. 26 = U.S. Highway 26; WB = westbound.

Travel times generally would increase under No-Build Alternative conditions, particularly on travel time segments for peak commute directions, due to increased demand throughout the study area. Further details and measures related to the modeled travel time results are included in Appendix B8.

Appendix B8 presents graphically the modeled 2035 No-Build Alternative AM queuing data. The key queuing findings from the microsimulation model results are summarized by location, as follows:

- **Northbound I-405 on-ramp on SW Sixth Avenue.** The increased demand on the I-405 northbound on-ramp from SW Sixth Avenue during the time period from 7 a.m. to 8 a.m. would lead to increased queuing for all movements feeding into the westbound U.S. 26-to-U.S. 26 movement. The westbound queue would propagate throughout the network for the entire peak period and would peak at the end of the simulation, which also would lead to increased queuing on northbound SW Barbur Boulevard north of SW Naito Parkway. These queues would extend back through the SW Naito Parkway diverge between 7 a.m. and 8 a.m., and remain queued after 8 a.m. One of the impacts of these queues would be unserved demand at the following locations:
    - Southbound SW Water Avenue at SW Kelly Avenue
    - Northbound SW Macadam Avenue at SW Curry Street
    - Southbound SE Eighth Avenue (Highway 99E northbound off-ramp) at SE Powell Boulevard
    - Eastbound SE Powell Boulevard at SE Milwaukie Avenue

In addition, this queuing issue would reduce westbound throughput on the west end of the Ross Island Bridge.

- **Northbound SW Naito Parkway on-ramp to eastbound Ross Island Bridge.** The increased demand on the northbound SW Naito Parkway ramp onto eastbound Ross Island Bridge occasionally would queue back onto SW Barbur Boulevard by 8 a.m. to 8:15 a.m., but then would recede.

- **Intersection of SW Hamilton Street and SW Corbett Avenue.** Increased northbound demand on SW Corbett Avenue would lead to increased queuing at this location, resulting in unserved demand on the I-5 northbound off-ramp at SW Corbett Avenue.

Overall, the modeled 2035 No-Build Alternative AM conditions indicate increased congestion throughout the study area, particularly related to the I-405 northbound on-ramp at SW Sixth Avenue, and corresponding impacts to the westbound Ross Island Bridge and northbound SW Barbur Boulevard.

2035 No-Build Alternative – PM

The 2035 No-Build Alternative PM microsimulation model results are presented in detail in the Segment A No-Build PM Vissim Report included as Appendix B9. This section summarizes the key results and findings from that Vissim report.

The system-wide metrics for the Segment A PM model for the No-Build Alternative are summarized in Table 2.3-8. These metrics include unserved demand at key locations impacted either by the No-Build Alternative or the Preferred Alternative conditions.

Table 2.3-8. Segment A No-Build Alternative PM Simulation System Measures

Measure		Simulation Result (4 p.m.–6 p.m.)		
Total vehicles served		51,930 vehicles		
Unserved vehicle demand		720 vehicles		
Total vehicle hours of delay		4,660 vehicle-hours		
Unserved Demand at Key Gateways (4 p.m.–6 p.m.)				
Gateway		**Demand (vehicles)**	**Unserved Demand (vehicles)**	**% Unserved Demand**
North	NB SW Broadway at SW Grant St.	**670**	**80**	**12%**
	NB SW Terwilliger Blvd. at SW Sheridan St.	1,295	0	0%
	NB SW Macadam Ave. at SW Curry St.	**2,655**	**190**	**7%**
	NB SW Corbett Ave. at SW Hamilton St.	**1,380**	**170**	**31%**
South	SB I-405 off-ramp at SW Broadway	2,540	17	0.7%
	SB SW Water Ave. at SW Kelly Ave.	**430**	**90**	**21%**
	SB SE 8th Ave. at SE Powell Blvd.	**1,810**	**120**	**7%**
East	EB SW Hamilton St. at SW Barbur Blvd.	350	2	1%
Throughput at System Bottlenecks (4 p.m.–6 p.m.)				
Location		**Demand (vehicles)**	**Throughput (vehicles)**	**% Demand Served**
Ross Island Bridge WB at I-5		4,965	4,740	95%
Ross Island Bridge EB at I-5		6,520	6,370	98%

Note: EB = eastbound; I-5 = Interstate 5; I-405 = Interstate 405; NB = northbound; SB = southbound; WB = westbound.

Key: **Bold** = Demand exceeds volume served by 5% or more.

As shown by the system-wide metrics, under the No-Build Alternative in Segment A, the roadway network modeled for No-Build conditions would not have sufficient capacity to serve all of the future two-hour (4 p.m. to 6 p.m.) demand. However, most of the unserved demand would likely shift to other regional routes or to a different time of day (i.e., shoulder hours). Note that the total delay also includes estimated delay for unserved demand (i.e., vehicles waiting to enter the network).

As with the analysis for PM existing conditions, the results for the 2035 No-Build Alternative PM travel times were summarized for the study area in Segment A for the time period from 4 p.m. to 6 p.m. These travel time results are shown in Table 2.3-9.

Table 2.3-9. Segment A 2035 No-Build Alternative PM Travel Time Results

Travel Time Segment	Movement Served	Modeled Average 4 p.m.–6 p.m. Travel Time (min:ss)	Modeled Average Speed
I-405 SB off-ramp/Broadway to Powell/99E	EB U.S. 26 to U.S. 26	15:40	6 mph
Milwaukie/Powell to I-405 NB on-ramp/6th	WB U.S. 26 to U.S. 26	16:55	7 mph
Barbur/Hamilton to Powell/99E	NB Hwy. 99W to EB U.S. 26	10:55	8 mph
Milwaukie/Powell to Barbur/Hamilton	WB U.S. 26 to SB Hwy. 99W	5:20	20 mph
Macadam/Curry to Powell/99E	NB I-5/Hwy. 43 to EB U.S. 26	11:45	7 mph
Naito/Harrison to Powell/99E	Downtown via SW Naito Pkwy. to EB U.S. 26	8:00	11 mph

Note: EB = eastbound; I-405 = Interstate 405; NB = northbound; SB = southbound; U.S. 26 = U.S. Highway 26; WB = westbound.

Travel times generally would increase under No-Build Alternative conditions, particularly on the westbound U.S. 26-to-U.S. 26 segment, primarily because of increased demand on northbound SW Macadam Avenue generated by new development in South Waterfront. Further details and measures related to the modeled travel time results are included in Appendix B9. The mitigation section, below, discusses and compares the travel time for the existing, No-Build Alternative, Preferred Alternative, and Preferred Alternative with Ross Island Bridgehead Reconfiguration conditions.

The modeled 2035 No-Build Alternative PM queuing data is presented graphically in Appendix B9. The key queuing findings determined from the microsimulation model results are summarized by location, as follows:

- **Northbound SW Broadway at SW Grant Street.** Demand on this approach would increase by about 18 percent over existing conditions as increased congestion in the U.S. 26 tunnel causes drivers to seek other routes. With heavy conflicting volume on SW Broadway and stop control, this approach would be unable to serve the full demand from 4 p.m. to 6 p.m., and queues would spill out beyond the study area.

- **Northbound SW Macadam Avenue at SW Curry Street.** Increased demand (about 28 percent) and corresponding queue spillback from the I-405 northbound on-ramp at SW Sixth Avenue would lead to increased queuing and unserved demand at this location.

- **Intersection of SW Hamilton Street and SW Corbett Avenue.** Increased demand for this approach (20 percent) at the already over-capacity intersection of SW Corbett Avenue and SW Hamilton Street, combined with increased queue spillback from both SW Corbett Avenue and SW Bancroft Street and

SW Barbur Boulevard and SW Hamilton Street, would lead to increased queuing and unserved demand at this location.

- **I-405 southbound off-ramp to SW Broadway.** Demand on this approach would increase over the existing count (likely a light demand day) by 23 percent, leading to increases in queue spillback over the two-hour analysis period.

- **Intersection of SW Water Avenue and SW Kelly Avenue.** Growth in demand on southbound SW Water Avenue (nearly 50 percent) due to new development in South Waterfront and direct routing from SW Moody Avenue via SW Sheridan Street would lead to increased southbound queuing at this TWSC intersection, resulting in unserved demand on southbound SW Water Avenue.

- **Ross Island Bridgehead westbound.** Increased demand for both southbound SE Eighth Avenue (about 11 percent) and westbound SE Powell Boulevard (about 6 percent) would lead to increased queue spillback from the I-405 northbound on-ramp at SW Sixth Avenue and increased queuing on the westbound Ross Island Bridge. The net throughput on the bridge would increase but still would be below the demand.

Overall, the modeled 2035 No-Build Alternative PM conditions indicate increased congestion throughout the study area, particularly related to the westbound U.S. 26-to-U.S. 26 movement, northbound SW Macadam Avenue, and northbound SW Corbett Avenue at SW Hamilton Street.

2035 Project Queuing and Operations Analysis

Simulation models (AM and PM) for the Preferred Alternative and the Ross Island Bridgehead Reconfiguration were developed from the No-Build Alternative models. The modeling assumptions remained as agreed to by jurisdictional partners for the Draft EIS, but volumes and vehicle routing patterns were updated based on the 2035 Metro regional travel demand model.

As with the existing conditions and No-Build Alternative models, system metrics such as total vehicles served, unserved vehicle demand, total hours of delay and unserved demand at key gateways were reported for the Preferred Alternative models, along with performance metrics such as delay, travel times and 95th percentile queues, all of which are included in the appendices to this report. In addition, eastbound and westbound throughput on the west end of the Ross Island Bridge was measured to better assess system capacity.

Preferred Alternative – AM

The 2035 Preferred Alternative AM microsimulation model results are presented in detail in the Segment A Build AM Vissim Report included as Appendix B14. This section summarizes the key results and findings from that Vissim report.

The system-wide metrics for the Segment A AM model for the Preferred Alternative are summarized in Table 2.3-10. These metrics include unserved demand at key locations impacted either by the No-Build Alternative or the Preferred Alternative conditions.

Table 2.3-10. Segment A Preferred Alternative AM Simulation System Measures

Measure		Simulation Result (7 a.m.–9 a.m.)		
Total vehicles served		33,625 vehicles		
Unserved vehicle demand		820 vehicles		
Total vehicle hours of delay		2,355 vehicle-hours		
Unserved Demand at Key Gateways (7 a.m.–9 a.m.)				
Gateway		**Demand (vehicles)**	**Unserved Demand (vehicles)**	**% Unserved Demand**
North	NB SW Macadam Ave. at SW Curry St.	**4,875**	**440**	**9%**
	NB SW Corbett Ave. at I-5 off-ramp	1,135	0	0%
South	SB SW Water Ave. at SW Kelly Ave.	**540**	**155**	**28%**
	SB SE 8th Ave. at SW Powell Blvd.	1,795	50	3%
West	WB SE Powell Blvd. at SE Milwaukie Ave.	4,110	155	4%
Throughput at System Bottlenecks (7 a.m.–9 a.m.)				
Location		**Demand (vehicles)**	**Throughput (vehicles)**	**% Demand Served**
Ross Island Bridge WB at I-5		**6,610**	**6,135**	**93%**
Ross Island Bridge EB at I-5		**3,920**	**3,635**	**93%**

Note: EB = eastbound; I-5 = Interstate 5; NB = northbound; SB = southbound; WB = westbound.

Key: **Bold** = Demand exceeds volume served by 5% or more.

The system-wide metrics show that under the 2035 Preferred Alternative AM conditions, the Segment A AM model would not have the capacity to fully serve the forecasted demand. However, most of the unserved demand would likely shift to other regional routes or to a different time of day (i.e., shoulder hours). Note that the total delay also includes estimated delay for unserved demand (i.e., vehicles waiting to enter the network).

As with the AM analysis for existing conditions and for the No-Build Alternative, the travel time results are broken out separately for the time periods of 7 a.m. to 8 a.m. and 8 a.m. to 9 a.m. to capture the impacts in shifting routing over the morning commute period. These travel time results are shown in Table 2.3-11.

Table 2.3-11. Segment A 2035 Preferred Alternative AM Travel Time Results *(multipage table)*

Travel Time Segment	Movement Served	Modeled Average Travel Time (min:ss)	Modeled Average Speed
7 a.m.–8 a.m.			
Capitol/Barbur to Harrison/Naito	NB Hwy. 99W to Downtown via SW Naito Pkwy.	5:40	22 mph
Capitol/Barbur to 4th/Lincoln	NB Hwy. 99W to Downtown via SW 4th Ave.	6:21	19 mph
Capitol/Barbur to Broadway/Grant	NB Hwy. 99W to NB I-405	7:45	15 mph
Harrison/Naito to Capitol/Barbur	Downtown via SW Naito Pkwy. to SB Hwy. 99W	4:35	27 mph
Broadway/Grant to Capitol/Barbur	SB I-405 to SB Hwy. 99W	4:20	27 mph
RI East to Broadway/Grant	WB U.S. 26 to U.S. 26	10:15	8 mph
Broadway/Grant to RI East	EB U.S. 26 to U.S. 26	4:05	23 mph

Table 2.3-11. Segment A 2035 Preferred Alternative AM Travel Time Results *(multipage table)*

Travel Time Segment	Movement Served	Modeled Average Travel Time (min:ss)	Modeled Average Speed
8 a.m.–9 a.m.			
Capitol/Barbur to Harrison/Naito	NB Hwy. 99W to Downtown via SW Naito Pkwy.	8:25	15 mph
Capitol/Barbur to 4th/Lincoln	NB Hwy. 99W to Downtown via SW 4th Ave.	10:20	12 mph
Capitol/Barbur to Broadway/Grant	NB Hwy. 99W to NB I-405	11:45	10 mph
Harrison/Naito to Capitol/Barbur	Downtown via SW Naito Pkwy. to SB Hwy. 99W	4:45	26 mph
Broadway/Grant to Capitol/Barbur	SB I-405 to SB Hwy. 99W	4:30	26 mph
RI East to Broadway/Grant	WB U.S. 26 to U.S. 26	11:20	7 mph
Broadway/Grant to RI East	EB U.S. 26 to U.S. 26	4:25	21 mph

Note: EB = eastbound; I-405 = Interstate 405; NB = northbound; RI = Ross Island Bridge; SB = southbound; U.S. 26 = U.S. Highway 26; WB = westbound.

Travel times generally would increase for northbound segments as a result of added signals at SW Barbur Boulevard at the Rasmussen Apartments, SW Bancroft Street, SW Naito Parkway, SW Whitaker Street, SW Gibbs Street and SW Hooker Street. Off-peak travel times would not change much. Further details and measures related to the modeled travel time results are included in Appendix B14. The mitigation section, below, discusses and compares the travel time for the existing, No-Build Alternative, Preferred Alternative, and Preferred Alternative with Ross Island Bridgehead Reconfiguration conditions.

The modeled 2035 Preferred Alternative AM queuing data are presented graphically in Appendix B14. The key queuing findings determined from the microsimulation model results are summarized by location, as follows:

- **Northbound SW Corbett Avenue at the northbound I-5 off-ramp.** The queuing at this location would improve due to the new signal at the intersection of SW Corbett Avenue and SW Hamilton Street.

- **Westbound SE Powell Boulevard at SE Milwaukie Avenue.** The queuing at this location would improve due the benefits gained from reducing northbound left turns at SW Barbur Boulevard and SW Caruthers Street. Westbound queues from the SW Barbur Boulevard and SW Caruthers Street intersection extend back to the Ross Island Bridge during the AM peak period (7 a.m. to 9 a.m.) and can generate shockwaves that extend back to the east side of the river. The northbound left turns at SW Barbur Boulevard and SW Caruthers Street reduce the efficiency of the westbound U.S. 26 movement. As the Preferred Alternative reduces these northbound left turns, the efficiency of the westbound U.S. 26 movement increases, with benefits rippling back across the Ross Island Bridge and onto westbound SE Powell Boulevard.

- **Northbound SW Macadam Avenue at SW Curry Street.** Queuing would degrade due to some drivers avoiding northbound SW Barbur Boulevard by exiting I-5 at this location, as opposed to exiting at the Terwilliger or Corbett exits. This change would not trigger mitigation. Queuing would also increase on the I-5 northbound off-ramp but would be contained within the safe sight stopping distance of the off-ramp, and therefore would not require mitigation.

- **I-405 northbound off-ramp at SW Sixth Avenue and SW Jackson Street.** The queuing at this location would extend into the safe stopping distance of the I-405 off-ramp. This impact would be due

to the pedestrian signal that would be constructed at the intersection of SW Jackson Street and SW Sixth Avenue, as well as queue spillback from the SW College Street and SW Sixth Avenue intersection. This impact would require mitigation.

- **Northbound SW Barbur Boulevard between SW Capitol Highway (in the Woods area) and SW Naito Parkway.** The queuing on this segment would increase due to added signals and reduction from a three-lane to a two-lane section for northbound auto traffic. However, mitigation would not be required, because the queuing would be in the through lanes and not caused by queue spillback from turn lanes.

- **Eastbound SW Capitol Highway at SW Barbur Boulevard.** Queuing would increase on eastbound SW Capitol Highway due to spillback from northbound queuing on SW Barbur Boulevard. Mitigation is not required, because the queuing would be in the through lanes and not caused by queue spillback from turn lanes.

Overall, the modeled Preferred Alternative AM conditions indicate increased northbound congestion on SW Barbur Boulevard and SW Macadam Avenue, while showing improvement to northbound SW Corbett Avenue. The U.S. 26-to-U.S. 26 movements would not be negatively impacted.

Preferred Alternative with Ross Island Bridgehead Reconfiguration – AM

The results of the AM Preferred Alternative with Ross Island Bridgehead Reconfiguration microsimulation model are presented in detail in the Segment A Preferred Alternative with Bridgehead AM Vissim Report included as Appendix B15. This section summarizes the key results and findings from that Vissim report.

The system-wide metrics for the Segment A AM model for the Preferred Alternative with the Ross Island Bridgehead Reconfiguration are summarized in Table 2.3-12. These metrics include unserved demand at key locations impacted by the No-Build Alternative, Preferred Alternative, or Preferred Alternative with Ross Island Bridgehead Reconfiguration conditions.

Table 2.3-12. Segment A Preferred Alternative with Bridgehead AM Simulation System Measures

Measure		Simulation Result (7 a.m.–9 a.m.)		
Total vehicles served		33,700 vehicles		
Unserved vehicle demand		785 vehicles		
Total vehicle hours of delay		2,960 vehicle-hours		
Unserved Demand at Key Gateways (7 a.m.–9 a.m.)				
Gateway		**Demand (vehicles)**	**Unserved Demand (vehicles)**	**% Unserved Demand**
North	NB SW Macadam Ave. at SW Curry St.	**4,965**	**305**	**6%**
	NB SW Corbett Ave. at I-5 off-ramp	1,120	0	0%
South	SB SW Water Ave. at SW Kelly Ave.	590	10	2%
	SB SE 8th Ave. at SE Powell Blvd.	1,885	40	2%
West	WB SE Powell Blvd. at SE Milwaukie Ave.	4,135	315	8%
Throughput at System Bottlenecks (7 a.m.–9 a.m.)				
Location		**Demand (vehicles)**	**Throughput (vehicles)**	**% Demand Served**
Ross Island Bridge WB at I-5		**6,825**	**6,345**	**93%**
Ross Island Bridge EB at I-5		**4,125**	**3,915**	**95%**

Note: EB = eastbound; I-5 = Interstate 5; NB = northbound; SB = southbound; WB = westbound.

Key: **Bold** = Demand exceeds volume served by 5% or more.

The system-wide metrics show that under the Preferred Alternative with Ross Island Bridgehead Reconfiguration AM 2035 conditions, the Segment A AM model would not show the capacity to fully serve the forecasted demand. However, most of the unserved demand would likely shift to other regional routes or to a different time of day (i.e., shoulder hours). Note that the total delay also includes estimated delay for unserved demand (i.e., vehicles waiting to enter the network).

As with the analysis for the existing conditions, No-Build Alternative, and Preferred Alternative, the travel time results are broken out separately for the time periods from 7 a.m. to 8 a.m. and 8 a.m. to 9 a.m. in order to capture the impacts in shifting routing over the morning commute period. These travel time results are shown in Table 2.3-13.

Table 2.3-13. Segment A 2035 Preferred Alternative with Ross Island Bridgehead Reconfiguration AM Travel Time Results *(multipage table)*

Travel Time Segment	Movement Served	Modeled Average Travel Time (min:ss)	Modeled Average Speed
7 a.m.–8 a.m.			
Capitol/Barbur to Harrison/Naito	NB Hwy. 99W to Downtown via SW Naito Pkwy.	7:00	18 mph
Capitol/Barbur to 4th/Lincoln	NB Hwy. 99W to Downtown via SW 4th Ave.	6:35	19 mph
Capitol/Barbur to Broadway/Grant	NB Hwy. 99W to NB I-405	7:35	16 mph
Harrison/Naito to Capitol/Barbur	Downtown via SW Naito Pkwy. to SB Hwy. 99W	7:30	17 mph
Broadway/Grant to Capitol/Barbur	SB I-405 to SB Hwy. 99W	4:55	24 mph
RI East to Broadway/Grant	WB U.S. 26 to U.S. 26	11:30	7 mph
Broadway/Grant to RI East	EB U.S. 26 to U.S. 26	4:30	20 mph

Table 2.3-13. Segment A 2035 Preferred Alternative with Ross Island Bridgehead Reconfiguration AM Travel Time Results *(multipage table)*

Travel Time Segment	Movement Served	Modeled Average Travel Time (min:ss)	Modeled Average Speed
8 a.m.–9 a.m.			
Capitol/Barbur to Harrison/Naito	NB Hwy. 99W to Downtown via SW Naito Pkwy.	10:35	12 mph
Capitol/Barbur to 4th/Lincoln	NB Hwy. 99W to Downtown via SW 4th Ave.	11:50	10 mph
Capitol/Barbur to Broadway/Grant	NB Hwy. 99W to NB I-405	14:40	8 mph
Harrison/Naito to Capitol/Barbur	Downtown via SW Naito Pkwy. to SB Hwy. 99W	6:40	19 mph
Broadway/Grant to Capitol/Barbur	SB I-405 to SB Hwy. 99W	5:00	24 mph
RI East to Broadway/Grant	WB U.S. 26 to U.S. 26	10:40	8 mph
Broadway/Grant to RI East	EB US 26 to US 26	5:25	17 mph

Note: EB = eastbound; I-405 = Interstate 405; NB = northbound; RI = Ross Island Bridge; SB = southbound; U.S. 26 = U.S. Highway 26; WB = westbound.

Travel times generally would increase for northbound segments due to added signals on SW Naito Parkway, and increased conflicting demand for northbound left turns at SW Barbur Boulevard and SW Caruthers Street/SW Broadway. Off-peak travel times would not change substantially. Further details and measures related to the modeled travel time results are included in Appendix B15. The mitigation section, below, discusses and compares the travel time for the existing, No-Build Alternative, Preferred Alternative, and Preferred Alternative with Ross Island Bridgehead Reconfiguration conditions.

The modeled Preferred Alternative with Ross Island Bridgehead Reconfiguration AM queuing data is presented graphically in an attachment to Appendix B15. The key queuing findings determined from the microsimulation model results are summarized by location, as follows:

- **Intersection of SW Barbur Boulevard/SW 4th Avenue at SW Broadway.** The northbound queues at this intersection with the Ross Island Bridgehead Reconfiguration would increase compared to the Preferred Alternative due to increased conflicting flow from westbound SW Broadway. The increased conflicting flow at SW Broadway would be caused by a combination of increased demand and increased westbound throughput at SW Arthur Street and SW First Avenue, because the dual southbound left turn allows for increased westbound green time under the Preferred Alternative with Ross Island Bridgehead Reconfiguration conditions. The increased northbound queues on SW Fourth Avenue/SW Barbur Boulevard would spill back to the SW Naito Parkway and SW Barbur Boulevard intersection, ultimately increasing northbound queuing down through the SW Capitol Highway merge onto northbound SW Barbur Boulevard.

- **Intersection of SW Kelly Avenue and SW Water Avenue.** The eastbound left turn from SW Kelly Avenue onto SW Water Avenue would queue out of the available storage at this location. This queue spillback could be mitigated with signal timing, because the intersection as a whole would not be operating at capacity. However, any signal timing adjustment that includes increased green time for the eastbound left turn should ensure that the westbound progression between the SW Kelly Avenue/SW Macadam Avenue/SW Hood Avenue, SW Kelly Avenue/SW Water Avenue, and SW Arthur Street/SW 1st Avenue signals is not compromised.

- **New intersection of SW Naito Parkway and SW Connection A (westbound SW Powell Boulevard).** The westbound right turn at this intersection occasionally would spill back beyond the two-block storage bay and into the westbound left turn lanes on Connection A, ultimately impacting the westbound Ross Island Bridge. This queue spillback would be caused by downstream queues at the new SW Hooker Street and SW Naito Parkway intersection, typically caused by pedestrian activations. In addition, northbound SW Naito Parkway would queue back from Connection A, extend through the SW Gibb Street and SW Whitaker Street intersections, and occasionally impact operations at the SW Naito Parkway and SW Barbur Boulevard intersection, typically around 8 a.m.

- **Northbound SW Macadam Avenue.** Queues would decrease due to rerouting of westbound Ross Island Bridge demand from the northbound SW Kelly Avenue ramp on northbound SW Naito Parkway, to the new direct connection (Connection A) directly onto SW Naito Parkway. This demand previously competed with SW Macadam Avenue, and therefore there would be improved queuing under the Preferred Alternative with Ross Island Bridgehead Reconfiguration conditions.

- **Southbound SE Eighth Avenue (Highway 99E northbound off-ramp) at SE Powell Boulevard.** Despite increased demand, queues would decrease due to increased efficiency on the westbound Ross Island Bridge, caused by rerouting demand that is destined for downtown via northbound SW Naito Parkway off of SW Kelly Avenue.

- **Westbound SE Powell Boulevard at SE Milwaukie Avenue.** The queuing would increase at this location because of increased conflicting demand at the merge with SE Eighth Avenue (Highway 99E northbound off-ramp).

Overall, the modeled AM Preferred Alternative with Ross Island Bridgehead Reconfiguration conditions indicate increased northbound congestion on SW Barbur Boulevard, but improved Ross Island Bridge throughput. The mitigation threshold is not reached for any of these queuing impacts.

Preferred Alternative – PM

The PM Preferred Alternative microsimulation model results are presented in detail in the Segment A Build PM Vissim Report included as Appendix B16. This section summarizes the key results and findings in that Vissim report.

The system-wide metrics for the Segment A PM model for the Preferred Alternative are summarized in Table 2.3-14. These metrics include unserved demand at key locations impacted either by the No-Build Alternative or the Preferred Alternative conditions.

Table 2.3-14. Segment A Preferred Alternative PM Simulation System Measures

Measure	Simulation Result (4 p.m.– 6 p.m.)
Total vehicles served	51,925 vehicles
Unserved vehicle demand	665 vehicles
Total vehicle hours of delay	4,690 vehicle-hours

Table 2.3-14. Segment A Preferred Alternative PM Simulation System Measures

Unserved Demand at Key Gateways (4 p.m.– 6 p.m.)				
Gateway		**Demand (vehicles)**	**Unserved Demand (vehicles)**	**% Unserved Demand**
North	NB SW Broadway at SW Grant St.	**695**	**95**	**14%**
	NB SW Terwilliger Blvd. at SW Sheridan St.	**1,525**	**200**	**13%**
	NB SW Macadam Ave. at SW Curry St.	**2,765**	**145**	**5%**
	NB SW Corbett Ave. at SW Hamilton St.	1,265	0	0%
South	SB I-405 off-ramp at SW Broadway	2,535	18	0.7%
	SB SW Water Ave. at SW Kelly Ave.	**415**	**45**	**11%**
	SB SW 8th Ave. at SE Powell Blvd.	1,790	0	0%
East	EB SW Hamilton St. at SW Barbur Blvd.	**360**	**30**	**8%**
Throughput at System Bottlenecks (4 p.m.–6 p.m.)				
Location		**Demand (vehicles)**	**Throughput (vehicles)**	**% Demand Served**
Ross Island Bridge WB at I-5		4,965	4,935	99%
Ross Island Bridge EB at I-5		6,520	6,265	96%

Note: EB = eastbound; I-5 = Interstate 5; I-405 = Interstate 405; NB = northbound; SB = southbound; WB = westbound.

Key: **Bold** = Demand exceeds volume served by 5% or more.

As shown by the system-wide metrics, under the Preferred Alternative conditions, the roadway network modeled does not have sufficient capacity to serve all the future two-hour (4 p.m. to 6 p.m.) demand. However, most of the unserved demand would likely shift to other regional routes or to a different time of day (i.e., shoulder hours). Note that the total delay also includes estimated delay for unserved demand (i.e., vehicles waiting to enter the network).

As with the existing conditions and No-Build Alternative PM analyses, the PM Preferred Alternative travel time results were summarized for the study area from 4 p.m. to 6 p.m. These travel time results are shown in Table 2.3-15.

Table 2.3-15. Segment A 2035 Preferred Alternative PM Travel Time Results

Travel Time Segment	Movement Served	Modeled Average 4 p.m.–6 p.m. Travel Time (min:ss)	Modeled Average Speed
I-405 SB off-ramp/Broadway to Powell/ 99E	EB U.S. 26 to U.S. 26	16:20	6 mph
Milwaukie/Powell to I-405 NB on-ramp/6th	WB U.S. 26 to U.S. 26	14:40	8 mph
Barbur/Hamilton to Powell/99E	NB Hwy. 99W to EB U.S. 26	10:35	9 mph
Milwaukie/Powell to Barbur/Hamilton	WB U.S. 26 to SB Hwy. 99W	6:25	18 mph
Macadam/Curry to Powell/99E	NB I-5/Hwy. 43 to EB U.S. 26	10:20	8 mph
Naito/Harrison to Powell/99E	Downtown via SW Naito Pkwy. to EB U.S. 26	8:15	10 mph

Note: EB = eastbound; I-5 = Interstate 5; I-405 = Interstate 405; NB = northbound; SB = southbound; U.S. 26 = U.S. Highway 26; WB = westbound.

Travel times under the PM Preferred Alternative would remain relatively similar to those under the No-Build Alternative conditions. Further details and measures related to the modeled travel time results are included in Appendix B16.

Appendix B16 presents graphically the modeled Preferred Alternative PM queuing data. The key queuing findings determined from the microsimulation model results are summarized by location, as follows:

- **Intersection of northbound SW Barbur Boulevard/SW Fourth Avenue at SW Broadway.** The lane reduction on northbound SW Barbur Boulevard, combined with motor vehicle traffic decreases due to mode shifts to light rail transit, would decrease the northbound left-turn demand at this intersection by more than 40 percent. Although the westbound SW Broadway movement would experience a somewhat similar increase in demand, the efficiency of the westbound movement would be greatly enhanced, allowing for increased westbound green time and less competition for westbound queue space from the northbound left-turn movement. The increased westbound queue space would benefit the U.S. 26-to-U.S. 26 movement, leading to increased throughput for the westbound Ross Island Bridge, and decreased queuing on SE Powell Boulevard and northbound SW Macadam Avenue.

- **Northbound SW Terwilliger Boulevard at SW Sheridan Street.** The demand for both the northbound right turn and the northbound through movements at this intersection would increase under the Preferred Alternative, because access restriction on SW Barbur Boulevard would shift traffic leaving Oregon Health & Science University onto northbound SW Terwilliger Boulevard. This increased demand would cause increased queuing at this intersection, mainly due to eastbound queue spillback on SW Sheridan Street that would prevent the full northbound right-turn demand from being served.

- **Southbound left turn from SW Barbur Boulevard to SW Hooker Street.** The queuing for this movement at the new signal would occasionally extend up SW Barbur Boulevard. This would impact eastbound SW Sheridan Street when multiple light rail vehicles pass through the intersection in a short time frame. Mitigation would be required for this impact.

- **Intersection of SW Hamilton Street and SW Corbett Avenue.** Northbound queues at this intersection would decrease and the intersection would be able to serve the full demand due to the new signal.

- **Eastbound SW Hamilton Street at SW Barbur Boulevard.** This intersection would have similar queuing issues as under the No-Build Alternative conditions. It does not appear that the reduction in northbound through lanes on SW Barbur Boulevard would have much impact at this location during the PM period, but eastbound queuing on SW Hamilton Street would increase as a result of light rail transit preemptions.

With exception of the left turn from SW Barbur Boulevard to SW Hooker Street, none of these queue impacts reach the mitigation threshold. Overall, the modeled PM Preferred Alternative conditions indicate increased northbound congestion on SW Terwilliger Boulevard, while showing improvement to northbound SW Corbett Avenue.

Preferred Alternative with Ross Island Bridgehead Reconfiguration – PM

The results of the PM Preferred Alternative with Ross Island Bridgehead Reconfiguration microsimulation model are presented in detail in the Segment A Preferred Alternative with Bridgehead PM Vissim Report included as Appendix B17. This section summarizes the key results and findings from that Vissim report.

The system-wide metrics for the Segment A PM model for the Preferred Alternative with Ross Island Bridgehead Reconfiguration are summarized in Table 2.3-16. These metrics include unserved demand at

key locations impacted either by the No-Build Alternative, Preferred Alternative, or Preferred Alternative with Ross Island Bridgehead Reconfiguration conditions.

Table 2.3-16. Segment A Preferred Alternative with Ross Island Bridgehead Reconfiguration PM Simulation System Measures

Measure		Simulation Result (4 p.m.–6 p.m.)		
Total vehicles served		50,430 vehicles		
Unserved vehicle demand		460 vehicles		
Total vehicle hours of delay		4,240 vehicle-hours		
Unserved Demand at Key Gateways (4 p.m.–6 p.m.)				
Gateway		**Demand (vehicles)**	**Unserved Demand (vehicles)**	**% Unserved Demand**
North	NB SW Broadway at SW Grant St.	**740**	**80**	**11%**
	NB SW Terwilliger Blvd. at SW Sheridan St.	1,550	30	2%
	NB SW Macadam Ave. at SW Curry St.	3,115	125	4%
	NB SW Corbett Ave. at SW Hamilton St.	1,285	0	0%
	NB SW Milwaukie Ave. at SE Powell Blvd.	1,040	0	2%
South	SB I-405 off-ramp at SW Broadway	2,565	0	0%
	SB SW Water Ave. at SW Kelly Ave.	420	<5	0.3%
	SB SE 8th Ave. at SE Powell Blvd.	**1,885**	**155**	**8%**
East	EB SW Hamilton St. at SW Barbur Blvd.	350	0	0%
West	WB SE Powell Blvd. at SE Milwaukie Ave.	3,300	35	1%
Throughput at System Bottlenecks (4 p.m.–6 p.m.)				
Location		**Demand (vehicles)**	**Throughput (vehicles)**	**% Demand Served**
Ross Island Bridge WB at I-5		**5,215**	**4,745**	**91%**
Ross Island Bridge EB at I-5		6,645	6,610	99%

Note: EB = eastbound; I-5 = Interstate 5; I-405 = Interstate 405; NB = northbound; SB = southbound; WB = westbound.
Key: **Bold** = Demand exceeds volume served by 5% or more.

As shown by the system-wide metrics, under the Preferred Alternative with Ross Island Bridgehead Reconfiguration conditions, the roadway network modeled does not have sufficient capacity to serve all of the future two-hour (4 p.m. to 6 p.m.) demand. However, most of the unserved demand would likely shift to other regional routes or to a different time of day (i.e., shoulder hours). Note that the total delay also includes estimated delay for unserved demand (i.e., vehicles waiting to enter the network).

As with the analysis for the existing conditions, No-Build Alternative, and Preferred Alternative, the travel time results for the PM Preferred Alternative with Ross Island Bridgehead Reconfiguration are summarized for the study area for the time period 4 p.m. to 6 p.m. These travel time results are shown in Table 2.3-17.

Table 2.3-17. Segment A 2035 Preferred Alternative with Ross Island Bridgehead Reconfiguration PM Travel Time Results

Travel Time Segment	Movement Served	Modeled Average 4 p.m.–6 p.m. Travel Time (min:ss)	Modeled Average Speed
I-405 SB off-ramp/Broadway to Powell/99E	EB U.S. 26 to U.S. 26	11:40	8 mph
Milwaukie/Powell to I-405 NB on-ramp/6th	WB U.S. 26 to U.S. 26	17:55	6 mph
Barbur/Hamilton to Powell/99E	NB Hwy. 99W to EB U.S. 26	9:30	10 mph
Milwaukie /Powell to Barbur /Hamilton	WB U.S. 26 to SB Hwy. 99W	10:00	11 mph
Macadam/Curry to Powell/99E	NB I-5/Hwy. 43 to EB U.S. 26	7:30	10 mph
Naito/Harrison to Powell/99E	Downtown via SW Naito Pkwy. to EB U.S. 26	9:25	9 mph

Note: EB = eastbound; I-5 = Interstate 5; I-405 = Interstate 405; NB = northbound; SB = southbound; U.S. 26 = U.S. Highway 26; WB = westbound.

Travel times would change compared to both the No-Build Alternative and the Preferred Alternative conditions. The westbound U.S. 26-to-U.S. 26 route travel time would increase compared to both the No-Build Alternative and the Preferred Alternative conditions, while the eastbound U.S. 26-to-U.S. 26 route would experience improved travel time. Other travel time segments either would improve due to upgraded control at the Ross Island Bridge (stop-control to signal control) or would degrade due to added signals. Further details and measures related to the modeled travel time results are included in Appendix B17. The mitigation section, below, discusses and compares the travel time for the existing, No-Build Alternative, Preferred Alternative, and Preferred Alternative with Ross Island Bridgehead Reconfiguration conditions.

Appendix B17 presents graphically the modeled Preferred Alternative with Ross Island Bridgehead Reconfiguration PM queuing data. The key queuing findings determined from the microsimulation model results are summarized by location, as follows:

- **Northbound SW Terwilliger Boulevard at SW Sheridan Street.** The new signals at SW Kelly Avenue and SW Macadam Avenue, SW Kelly Avenue and SW Water Avenue, and SW Naito Parkway and Connection A would meter the throughput on the westbound U.S. 26-to-U.S. 26 route. This new condition would lead to reduced competing volume for northbound SW Terwilliger Boulevard compared to SW Broadway approaching the I-405 northbound on-ramp, leading to reduced northbound queuing at this location compared to the Preferred Alternative without the Ross Island Bridgehead Configuration. However, northbound queuing at this location still would increase compared to the No-Build Alternative conditions.

- **Intersection of SW First Avenue and SW Sheridan Street.** Westbound queues at this location would spill back onto SW Naito Parkway, impacting both the northbound left-turn and the southbound right-turn movements at SW Naito Parkway and SW Sheridan Street.

- **Northbound left turn at SW Naito Parkway and SW Sheridan Street.** Northbound left-turn queues at SW Naito Parkway and SW Sheridan Street would exceed the designed storage, ultimately impacting operations at the westbound Ross Island Bridge connection to SW Naito Parkway. Mitigation would be required.

- **Southbound left turn from SW First Avenue onto SW Arthur Street.** With the shift of most of the outbound downtown traffic destined for the eastbound Ross Island Bridge increasing the demand for the southbound left turn at this location, even with the dual southbound left-turn lanes, the southbound

queues would spill back beyond SW Harrison Street under the planned striping configuration. Mitigation would be required for this impact.

- **Intersection of SW Kelly Avenue and SW Water Street.** The southbound queue would improve compared to both the No-Build Alternative and the Preferred Alternative conditions at this location due to the new signal.

- **Westbound SW Macadam Avenue at SW Kelly Avenue.** The queues at this location would decrease over both the Preferred Alternative and the No-Build Alternative due to the new signal, but this is dependent on a short signal cycle length. Mitigation would be required to accommodate this short signal cycle.

- **Westbound SE Powell Boulevard.** The combination of the signal at the new intersection of Connection A and SW Naito Parkway and spillback from the signals at SW Naito Parkway and SW Barbur Boulevard, SW Naito Parkway and SW Whitaker Street, SW Naito Parkway and SW Gibbs Street, and SW Naito Parkway and Connection B (eastbound SW Powell Boulevard) would cause westbound queue spillback that occasionally would reach the Ross Island Bridge, creating queue shockwaves across the bridge that ultimately would increase queuing on SE Powell Boulevard. This increase in queuing does not meet the criteria for mitigation, but could be improved with adaptive signal timing included in the final design for both the westbound U.S. 26-to-U.S. 26 and westbound Ross Island Bridge to northbound SW Naito Parkway.

- **New intersection of Connection B and SW Kelly Avenue.** This new intersection would improve both eastbound U.S. 26-to-U.S. 26 queuing, ultimately improving queuing on the I-405 southbound off-ramp to SW Broadway and on northbound SW Naito Parkway, ultimately reducing northbound SW Barbur Boulevard queues south of the Rasmussen Apartments by more than 1,000 feet. The improved operations would result from improved efficiency and lane utilization caused by the platoon impacts of the new signal. Vehicles destined for the Highway 99E southbound on-ramp on the east side of the bridge would be better able to align in the outside lane both on the SW Kelly Avenue and Connection B approaches.

- **Intersection of SW Gibbs Street and SW Naito Parkway.** The new signal at this intersection would cause eastbound queue spillback on SW Gibbs Street, and ultimately would cause southbound queuing on SW First Avenue and SW Second Avenue.

- **Intersection of SW Hamilton Street and SW Barbur Boulevard.** Eastbound queues would improve due to reduced congestion on northbound SW Barbur Boulevard. The reduced congestion on SW Barbur Boulevard would be caused by improved throughput and reduced queuing on northbound SW Naito Parkway as a result of the replacement of the stop-controlled connection of SW Naito Parkway to the eastbound Ross Island Bridge with signals at SW Kelly Avenue and Connection B (SW Powell Boulevard), and SW Naito Parkway and Connection B.

Overall, the modeled conditions for the PM Preferred Alternative with Ross Island Bridgehead Reconfiguration indicate improved eastbound operations for the Ross Island Bridge western terminal, increased travel time for the westbound U.S. 26-to-U.S. 26 route, and improved queuing on northbound SW Macadam Avenue.

2045 No-Build and Preferred Alternative Queuing Analysis

As shown in Table 2.3-18, the results of 2045 SimTraffic analysis for the No-Build Alternative and the Preferred Alternative indicate no expected queuing issues. As mentioned above, the Preferred Alternative would construct a new signal at SW Sixth Avenue and SW Jackson Street; therefore, the location of the ramp terminal would be different for that intersection for the Preferred Alternative than for the No-Build Alternative.

Table 2.3-18. SimTraffic Queuing Results for No-Build Alternative and Preferred Alternative at I-405 Northbound Off-ramp at SW College Street/SW Jackson Street and SW Lincoln Street

	No-Build	Preferred Alternative
I-405 NB off-ramp and SW College St. (No-Build)/SW Jackson St. (Preferred Alternative)	**Northbound Right**	**Northbound Right**
Ramp length (feet[1])	1,025	1,025
Ramp length (simulation) (feet)	1,031	1,060
95th percentile queue (feet)	70	183
Upstream block time (%)	0%	0%
Storage block time (%)	0%	0%
Queuing penalty (vehicles)	0	0
I-405 NB off-ramp and SW Lincoln St.	**Northbound Right**	**Northbound Right**
Link distance (feet)	1,000	1,000
Link distance (simulation) (feet)	957	1,026
95th percentile queue (feet)	166	161
Upstream block time (%)	0%	0%
Queuing penalty (vehicles)	0	0

Note: I-405 = Interstate 405; NB = northbound.

[1] Distances throughout rounded to the nearest 25 feet.

Segment A Circulation Analysis

The project team conducted a study to understand the potential motor vehicle circulation changes associated with the Project. Figure 2.3-1, Figure 2.3-2 and Figure 2.3-3 provide an overview of forecast circulation changes associated with the Preferred Alternative and the Preferred Alternative with the Ross Island Bridgehead Reconfiguration. Findings from the study are included in Chapter 3 of the Final EIS and more details can be found in Appendix B20.

Figure 2.3-1. Traffic Circulation Changes – Segment A: Preferred Alternative (AM)

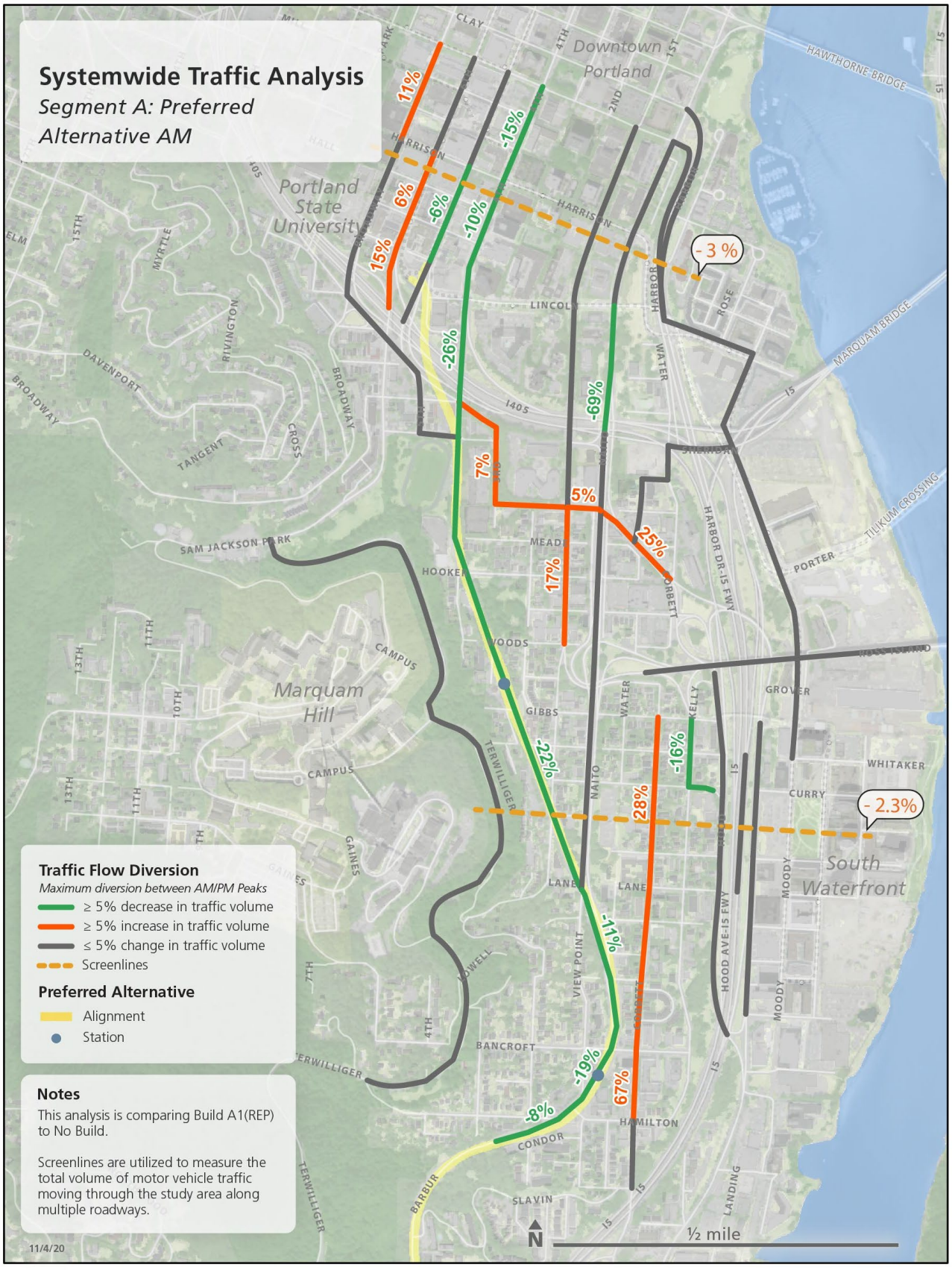


Figure 2.3-2. Traffic Circulation Changes – Segment A: Preferred Alternative (PM)

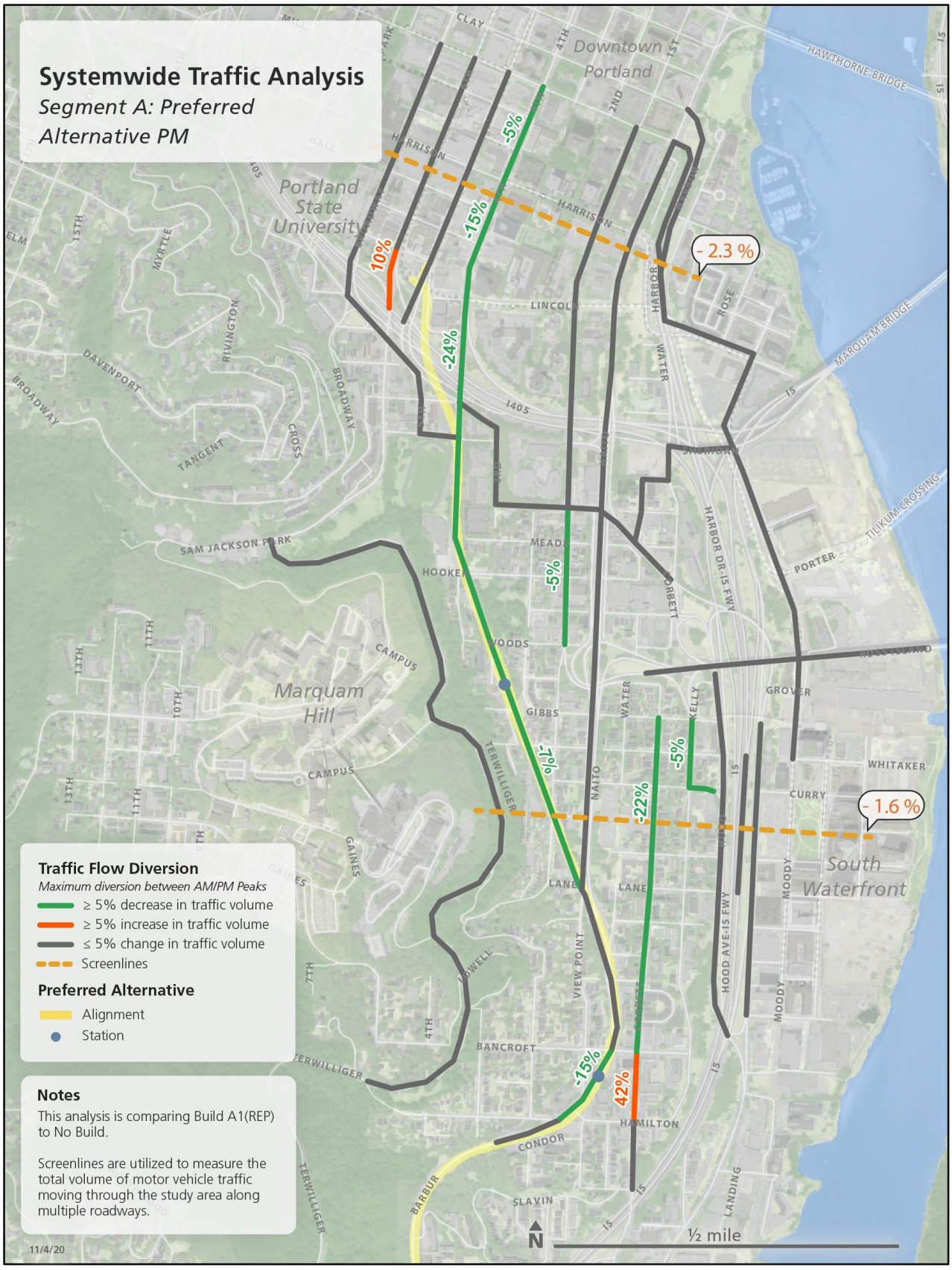


Figure 2.3-3. Traffic Circulation Changes – Segment A: Preferred Alternative with RIB Reconfiguration (AM)

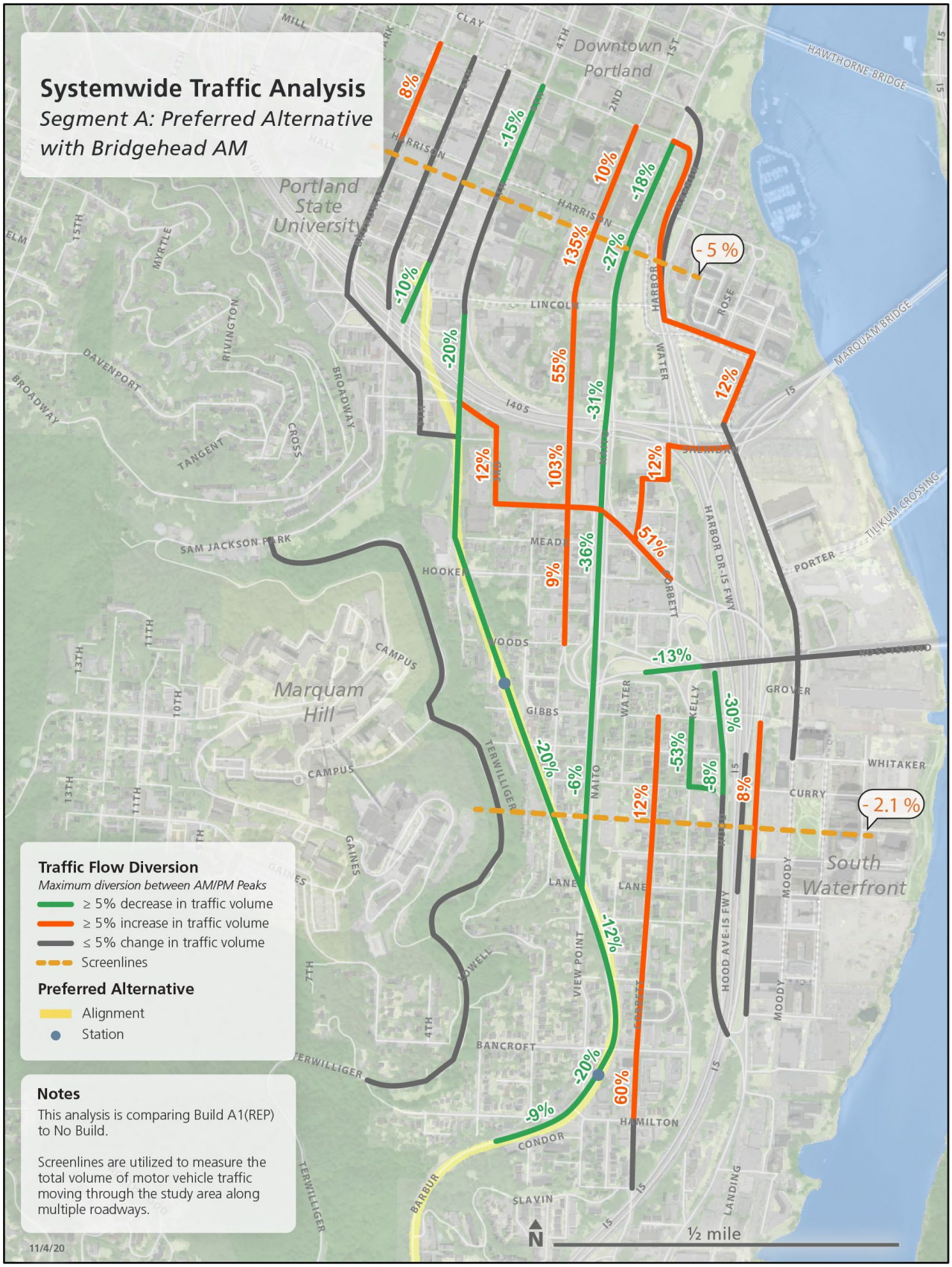
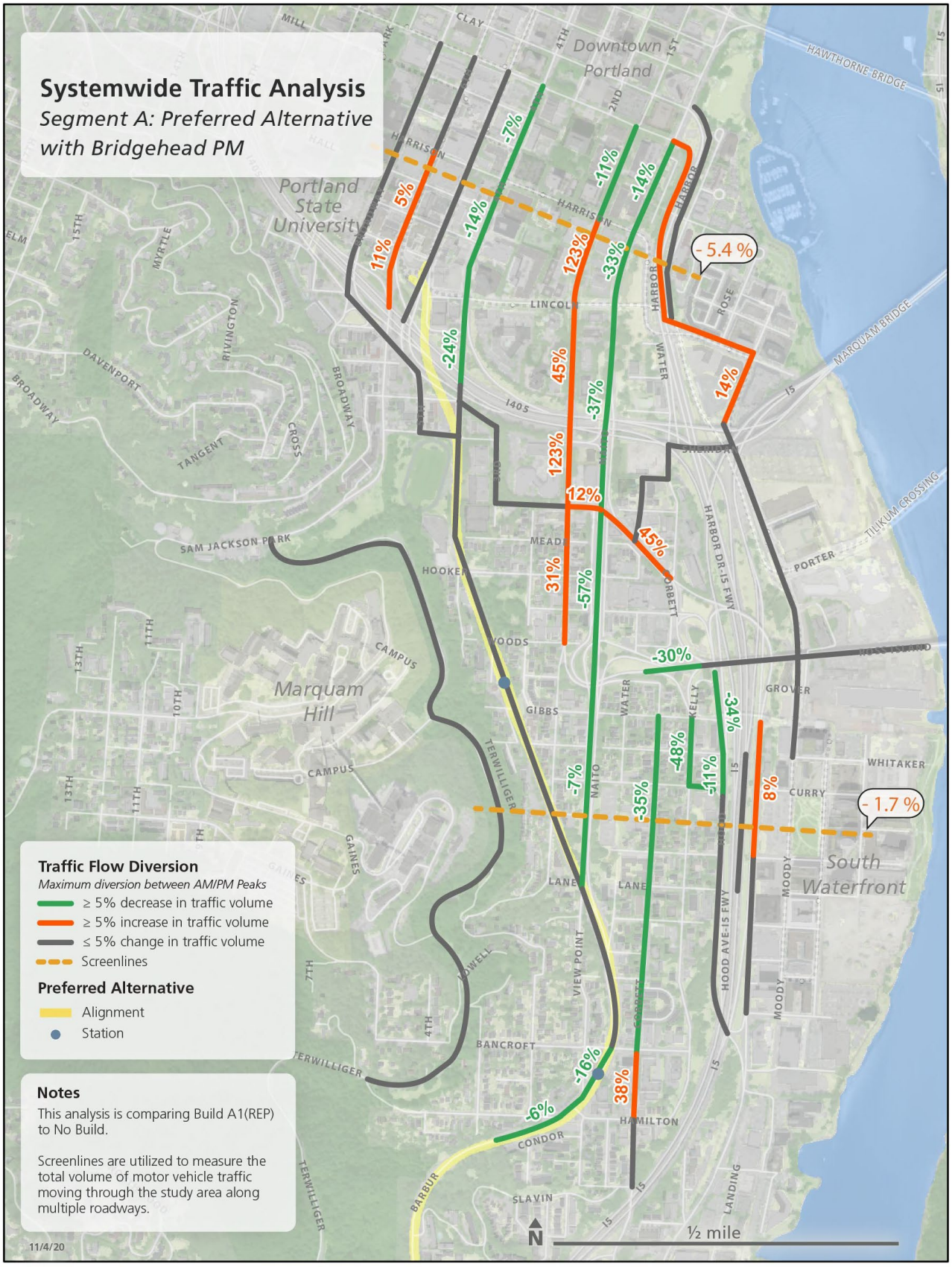


Figure 2.3-4. Traffic Circulation Changes – Segment A: Preferred Alternative with RIB Reconfiguration (PM)



2.3.3. Segment A Light Rail Station Vehicular Access Impacts

In Segment A, there are no park and ride facilities, but there are several opportunities for "hide and ride" activity on surrounding streets and in private parking lots close to the stations. However, there are only two stations (Gibbs Station and Hamilton Station) outside of the central city in Segment A. These two stations are not anticipated to generate many vehicle pick-up/drop-off trips, because this corridor is geographically constrained, where trips from farther out are likely to use stations located at SW Terwilliger Boulevard or farther out along the proposed line. Therefore, no significant impacts related to vehicular access to light rail stations in Segment A are expected.

Metro's travel model was used to develop assumptions about access mode share to each station. More information is contained in *Attachment A. Transit Impact and Travel Demand Forecasting Results Report*. The travel model does not forecast pick-ups and drop-offs by private vehicles or transportation network companies (TNC) at stations specifically. However, stations may experience pick-up and drop-off activity. This activity can be managed through design, including 'no stopping or parking' zones in station areas and other design treatments. At existing light rail stations on TriMet's system, pick-up and drop-off activity occurs to varying degrees, but is not known to cause congestion or queuing issues.

2.4. Segment A Mitigation

Segment A mitigation is discussed in Chapter 3 of the Final EIS.

3. SEGMENT B: OUTER PORTLAND

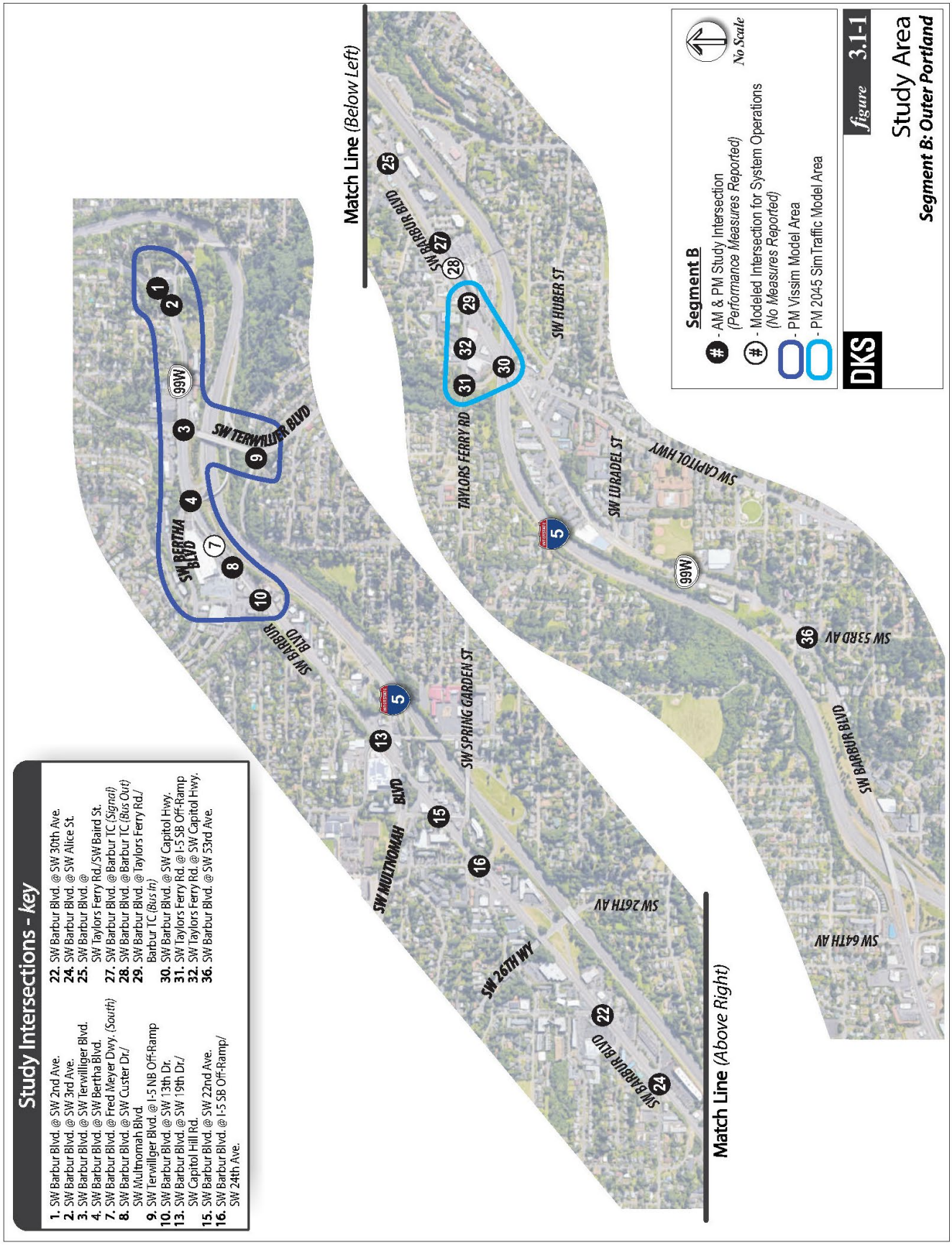
This section details the transportation operations for both existing and future conditions within Segment B: Outer Portland.

3.1. Study Area

Segment B is completely within the city limits of Portland. In this segment, there are 21 study intersections along SW Barbur Boulevard between SW Brier Place and SW 69th Avenue. It includes major signalized intersections, minor intersections and driveways at key destinations with high traffic volumes. Traffic count data were collected, and Synchro (HCM) and SimTraffic and Vissim (simulation) were used to analyze the corridor. For major signalized intersections, the LOS analysis and the V/C ratio were calculated to gauge existing intersection operations.

Figure 3.1-1 below illustrates the study area for Segment B.

Figure 3.1-1. Study Area – Segment B: Outer Portland



3.2. Segment B Existing Conditions

3.2.1. 2017 Existing Conditions Intersection Operations

To accurately model the existing conditions on the roadway network, turning movement counts were conducted in the AM and PM peak hours for all existing study area intersections. Figures depicting turn volumes are shown in Appendix B1. The count volumes were balanced in accordance with the ODOT Analysis Procedures Manual to account for differences in data collected on different dates. The resulting balanced network reflects the typical 2017 weekday AM and PM peak-hour traffic conditions. Additional data, including peaking profiles, pedestrian volumes, bicycle volumes and heavy vehicle percentages, were also input into the Vissim and Synchro models. A Synchro model was developed for all 39 study area intersections; SimTraffic was used to model queuing in the vicinity of the "Crossroads" (the area at SW Barbur Boulevard between SW Multnomah Boulevard and SW Capitol Highway); and a Vissim model was developed that includes the intersections near SW Barbur Boulevard and SW Terwilliger Boulevard. Appendix B21 and Appendix B22 include more details on the HCM operations analysis.

Table 3.2-1 shows HCM (Synchro) operations analysis results for the existing AM and PM peak hours. Synchro was used to report LOS, delay and V/C ratio using HCM methodology. As shown in Table 3.2-1, seven intersections do not meet the mobility target in at least one peak hour. Two intersections do not meet mobility targets in either peak hour. Seven of the intersections are unsignalized.

Table 3.2-1 also shows mobility targets for the appropriate jurisdiction for every intersection. Intersection results that do not meet mobility targets in a peak hour are shaded gray. The worst lane group is listed under the WLANE columns for two-way stop-controlled (TWSC) intersections.

Table 3.2-1. Segment B: Outer Portland 2017 Existing Conditions HCM (Synchro) Analysis *(multipage table)*

						AM				PM			
ID	Intersection	Note	Mobility Target		Control	Delay	LOS	V/C	WLANE	Delay	LOS	V/C	WLANE
B1	SW Barbur Blvd./ SW 2nd Ave.		ODOT/PBOT 1st HR	0.99	TWSC	17.6 [19.9]	C [C]	0.04	SBLn	12.6 [14.4]	B [B]	0.06	SBLn
B2	SW Barbur Blvd./ SW 3rd Ave.		ODOT/PBOT 1st HR	0.99	Signal	31.6	C	0.93	-	19.0	B	0.73	-
B3	SW Barbur Blvd./ SW Terwilliger Blvd.		ODOT/PBOT 1st HR	0.99	Signal	**59.1**	**E**	**1.00**	**-**	62.3	E	0.98	-
B4	SW Barbur Blvd./ SW Bertha Blvd./ I-5 ramps		ODOT Ramp	0.85	Signal	**32.6**	**C**	**0.88**	**-**	25.6	C	0.77	-
B9	SW Terwilliger Blvd./ I-5 NB off-ramp		ODOT Ramp	0.85	Signal	14.9	B	0.65	-	**33.8**	**C**	**0.87**	**-**
B10	SW Barbur Blvd./ SW 13th Dr./ ped. crossing		ODOT/PBOT 1st HR	0.99	TWSC	9.5 [42.3]	A [E]	[0.28]	EBLn1	25.1 [35.5]	D [E]	[0.67]	EBLn1
B13	SW Barbur Blvd./ SW 19th Dr./ SW Capitol Hill Rd.	1	ODOT/PBOT 1st HR	0.99	Signal	36.5	D	0.90	-	27.8	C	0.84	-
B15	SW Barbur Blvd./ SW 22nd Ave.	1	ODOT/PBOT 1st HR	0.99	TWSC	**15.7 [>300]**	**C [F]**	**[>2.0]**	**WBLn1**	**13.4 [>300]**	**B [F]**	**[>2.0]**	**-**

Table 3.2-1. Segment B: Outer Portland 2017 Existing Conditions HCM (Synchro) Analysis *(multipage table)*

ID	Intersection	Note	Mobility Target		Control	AM				PM			
						Delay	LOS	V/C	WLANE	Delay	LOS	V/C	WLANE
B16	SW Barbur Blvd./ I-5 SB off-ramp/ SW 24th Ave.	1	ODOT Ramp	0.85	Signal	15.7	B	0.85	-	15.6	B	0.62	-
B22	SW Barbur Blvd./ SW 30th Ave.	1	ODOT/PBOT 1st HR	0.99	Signal	10.7	B	0.71	-	8.3	A	0.58	-
B24	SW Barbur Blvd./ SW Alice St./ ped. crossing	1,2	ODOT/PBOT 1st HR	0.99	TWSC	0 [67.6]	A [F]	[0.21]	EBLn1	13.2 [57.8]	B [F]	[0.19]	EBLn1
B25	SW Barbur Blvd./ SW Taylors Ferry Rd./SW Baird St.	1,2	ODOT/PBOT 1st HR	0.99	TWSC	**10.3 [>300]**	**B [F]**	**[1.20]**	**WBLn1**	13.9 [181.5]	B [F]	[0.75]	EBLn1
B27	SW Barbur Blvd./ Barbur Transit Center (signal)	1,2	ODOT/PBOT 1st HR	0.99	Signal	4.9	A	0.59	-	4.4	A	0.52	-
B29	SW Barbur Blvd./ SW Taylors Ferry Rd./Barbur Transit Center (bus out)	1,2	ODOT/PBOT 1st HR	0.99	Signal	27.7	C	0.73	-	35.2	D	0.98	-
B30	SW Barbur Blvd./ SW Capitol Hwy. (Crossroads)	1,2	ODOT/PBOT 1st HR	0.99	Signal	44.4	D	0.98	-	24.6	C	0.76	-
B31	SW Taylors Ferry Rd./I-5 SB off-ramp	2	ODOT Ramp	0.85	TWSC	0 [30.8]	A [D]	[0.46]	-	**0 [222]**	**A [F]**	**[1.34]**	**-**
B32	SW Taylors Ferry Rd./SW Capitol Hwy.	2	PBOT 1st HR	0.99	AWSC	**42.8**	**E**	**1.03**	**EBLn2**	**64.2**	**F**	**1.01**	**-**
B36	SW Barbur Blvd./ SW 53rd Ave.	1,2	ODOT/PBOT 1st HR	0.99	Signal	22.4	C	0.91	-	10.6	B	0.69	-

Note: AWSC = All-way stop control; EB = eastbound; HCM = Highway Capacity Manual; HR = Hour; ID = Intersection Identification #; LOS = Level of Service; Ln = Lane; NB = northbound; ODOT = Oregon Department of Transportation; PBOT = Portland Bureau of Transportation; SB = southbound; TWSC = Two-way stop control; V/C = volume-to-capacity; WB = westbound; WLANE = worst lane. "-" represents "not applicable"

Key: Delay = Average vehicle delay (in seconds).

Worst Major [Worst stop-controlled delay] for TWSC intersections.

V/C represents intersection average for signals and worst movement for stop-controlled intersections.

Delay, LOS and V/C ratio reported for average and worst approach for TWSC and worst lane for AWSC.

1. Intersection analysis completed as part of 2016 Southwest Corridor study with review by ODOT, PBOT and Metro.

2. Intersection part of Town Center designation with 2nd hour mobility target. To maintain consistency with 2016 Southwest Corridor analysis, proximity to ramps and peak-hour park and ride trip generation rates, 1st hour analysis was performed. Intersections meeting 1st hour target also meet 2nd hour.

As shown in Table 3.2-1, HCM operations analysis indicates that the following intersections fail to meet mobility targets.

AM peak hour:

- **SW Barbur Boulevard and SW Terwilliger Boulevard.** This eight-phase signalized intersection experiences very high northbound SW Barbur Boulevard through volumes during the AM peak hour, along with high northbound SW Terwilliger Boulevard volumes.

- **SW Barbur Boulevard and SW Bertha Boulevard/I-5 ramps.** This intersection experiences high northbound SW Barbur Boulevard volumes coupled with high southbound SW Bertha Boulevard volumes accessing I-5 in the AM peak hour.

- **SW Barbur Boulevard and SW 22nd Avenue.** This TWSC intersection performs better than indicated by the HCM analysis because of more aggressive driving behavior from vehicles on the side street. Field observations did not indicate significant queuing issues at this location.

- **SW Barbur Boulevard and SW Taylors Ferry Road/SW Baird Street.** This TWSC intersection performs better than indicated by the HCM analysis because of more aggressive driving behavior from vehicles on the side street. Field observations did not indicate significant queuing issues at this location.

- **SW Taylors Ferry Road and SW Capitol Highway.** This AWSC intersection experiences delays and queuing during the AM peak-hour period because of heavy volumes of vehicles from the nearby I-5 northbound off-ramp that are traveling through the intersection and across SW Barbur Boulevard.

PM peak hour:

- **SW Terwilliger Boulevard/I-5 northbound off-ramp.** This signalized intersection is located at a freeway off-ramp. The critical movement is the left turn from the ramp.

- **SW Barbur Boulevard and SW 22nd Avenue.** This TWSC intersection performs better than indicated by the HCM analysis because of more aggressive driving behavior from vehicles on the side street. Field observations did not indicate queuing issues at this location.

- **SW Taylors Ferry Road/I-5 southbound off-ramp.** This T-intersection is stop sign controlled on the side street, which is a freeway off-ramp. Field observations showed the Off-ramp vehicle queue extends back towards the freeway gore, and there is a slow-moving queue of vehicles that extends from the intersection of SW Capitol Highway and SW Barbur Boulevard, along SW Capitol Highway and SW Taylors Ferry Road to the I-5 off-ramp.

- **SW Taylors Ferry Road and SW Capitol Highway.** Similar to the AM peak-hour period operation, this AWSC intersection experiences delays and queuing during the PM peak-hour period because of heavy volumes of vehicles from the nearby I-5 northbound off-ramp that are traveling through the intersection and across SW Barbur Boulevard.

3.2.2. 2017 Existing Conditions Queuing Analysis

The analysis included developing an existing conditions simulation model (Vissim) focused on the I-5 southbound off-ramp at SW Barbur Boulevard and the SW Barbur Boulevard and SW Terwilliger Boulevard intersection. The area analyzed by the Vissim model is shown in Figure 3.1-1. The model was calibrated over a two-hour peak traffic time interval: 7 a.m. to 9 a.m. for the AM models and 4 p.m. to 6 p.m. for the PM model. Model calibration included comparing modeled queues to field-observed queues and queues estimated from Google traffic maps captured during field observations. Other calibration measures included intersection traffic volumes. The Terwilliger Calibration Report in Appendix B23 provides a complete summary of the existing conditions model network development and calibration.

3.2.3. Segment B Safety Analysis

The Draft EIS previously identified the following clusters of fatal and serious injury collisions:

- SW Barbur Boulevard curves near Fulton Community Garden
- SW Barbur Boulevard between SW Multnomah Boulevard and SW Capitol Highway (Crossroads)

More recent data confirms that these locations are still clusters of fatal and serious injury collisions.

Updated 2013–2017 crash data for the SW Barbur Boulevard study area corridor segment are shown in Table 3.2-2 and Table 3.2-3 below.

Table 3.2-2. Segment B Fatal and Serious Injury Collisions (2013–2017)

Location	Fatal	Serious Injury	Total
Study Area Corridor	**4**	**11**	**15**
SW Barbur Blvd. curves near Fulton Community Garden	3	2	5
SW Barbur Blvd. in the vicinity of SW Bertha Blvd.	0	1	1
SW Barbur Blvd. between SW Multnomah Blvd. and SW Capitol Hwy. (Crossroads)	1	8	9

Table 3.2-3. Segment B Fatal and Serious Injury Collisions – Contributing Factors (2013–2017)

Location	Pedestrian	Bicycle	Rear-End	Fixed Object	Turning	Other[1]
Study Area Corridor	**1**	**0**	**4**	**3**	**5**	**2**
SW Barbur Blvd. curves near Fulton Community Garden	0	0	2	2	0	1
SW Barbur Blvd. in the vicinity of SW Bertha Blvd.	0	0	1	0	0	0
SW Barbur Blvd. between SW Multnomah Blvd. and SW Capitol Hwy. (Crossroads)	1	1	1	1	5	1

[1] "Other" includes collisions with animals, mechanical failures, or lost vehicle loads.

There was a total of 15 fatal or injury collisions (4 fatal and 11 that resulted in serious injuries) reported along SW Barbur Boulevard during the period of 2013 to 2017. Of the total collisions, 5 were turning collisions, 4 were rear-end collisions, 3 were fixed-object collisions, 2 were head-on or sideswipes, and 1 was a pedestrian collision.

SW Barbur Boulevard Curves near Fulton Community Garden

Through the SW Barbur Boulevard curves area near Fulton Community Garden, there are several street and driveway accesses onto SW Barbur Boulevard, as well as intersections at SW Nevada Street, SW Brier Place, and SW Second, Third, Fourth and Fifth Avenues. The intersection at SW Barbur Boulevard and SW Third Avenue is signalized and has a marked crossing. There are no signalized intersections or mid-block crossings elsewhere in the segment. There are three unsheltered TriMet bus stops within this curves segment at SW Parkhill Drive, SW Brier Place and SW Third Avenue (Lines 1, 12 and 38). A combination of curve geometry, higher speeds and the lack of safe pedestrian facilities throughout this segment contributes to the cluster of fatal and serious injuries at this location.

Two out of the three fatal crashes were fixed-object collisions where speeding or reckless driving was the primary cause. The third fatality was a head-on collision. Of the three, two occurred between 10 p.m. and 4 a.m. Conditions were dry for all collisions.

SW Barbur Boulevard in the Vicinity of SW Bertha Boulevard

A single non-fatal rear-end collision was reported at SW Barbur Boulevard and SW Bertha Boulevard between 2013 and 2017. The collision occurred on the northbound ramp from I-5 Exit 297 to SW Bertha Boulevard. The intersection at SW Barbur Boulevard and SW Bertha Boulevard is signal-controlled; the crash resulted from a vehicle colliding into another stopped vehicle at the intersection. The crash occurred during daylight hour in clear conditions.

SW Barbur Boulevard between SW Multnomah Boulevard and SW Capitol Highway (Crossroads)

From 2013 to 2017, a total of nine fatal and serious injury collisions were reported on SW Barbur Boulevard between SW Multnomah Boulevard and SW Capitol Highway. Of these, one was fatal and the remaining resulting in serious injuries. Of the total collisions, five were turning collisions, one was a pedestrian collision, one was a rear-end collision, one was a fixed-object collision, and one was a sideswipe collision.

One of the turning collisions involved a bicyclist being struck at SW Barbur Boulevard and SW Barbur Court as the bicyclist travelled eastbound across the intersection using a marked bicycle crossing. This incident occurred at approximately 6 p.m. in clear conditions.

The 2017 Safety Priority Index System (SPIS) list[1] has identified the following intersections within this segment:

- SW Barbur Boulevard at SW Capitol Hill Road
- SW Barbur Boulevard at SW Huber Street

All Road Transportation Safety Program Improvements

The All Roads Transportation Safety (ARTS) Program is designed to address safety needs on all public roads in Oregon. The program is data-driven to achieve the greatest benefits in crash reduction and is a jurisdictionally blind implementation of the federal Highway Safety Improvement Program.

One component of ARTS was a hotspot analysis to find specific locations throughout the state that would benefit the most from safety improvements. A draft list of potential hotspot projects was developed for ODOT Region 1, not all of which have so far become funded projects.

Since publication of the Draft EIS, two locations within the study area have been funded through the Safety/ARTS program for 2017 through 2021:

- SW Barbur Boulevard: SW Terwilliger Boulevard to SW 64th Avenue – Most of Segment B (Mile Post 4.08 – Mile Post 7.55) (See Section 4.2, Segment C Safety Analysis, for discussion)

[1] Based on 2017 - On-State, Top 10% SPIS Groups - By Hwy, MP, available online at: https://www.oregon.gov/ODOT/Engineering/Pages/SPIS-Reports-On-State.aspx.

- SW Barbur Boulevard at SW Capitol Highway

These locations are also consistent with the SPIS locations identified above. The funded improvements for SW Capitol Highway per the Safety/ARTS program are summarized below:

- prohibit northbound left turns from Highway 99W onto the I-5 ramp and redirect traffic flow through the jug handle
- install eastbound right-turn lane and new signal at SW Taylors Ferry Road
- address median gaps and striping
- add/improve signage
- install reflectorized backplates

The funded improvements for the segment of SW Barbur Boulevard between SW Terwilliger Boulevard and SW 64th Avenue are:

- install illumination at SW 60th Avenue, SW 64th Avenue and I-5 southbound ramp (Segment C)
- install reflectorized backplates and supplemental signal head at SW Terwilliger Boulevard, SW Bertha Boulevard, SW Capitol Hill Road, SW 19th Avenue and SW 24th Avenue
- install reflectorized backplates and supplemental signal head at I-5 southbound ramp, SW 60th Avenue and SW 64th Avenue (Segment C)

3.3. Segment B Future Conditions

This section identifies potential impacts to modes of travel associated with the No-Build Alternative and the Preferred Alternative within Segment B in 2035 and in 2045 for freeway ramp terminals.

3.3.1. Segment B Future Intersection Operations

2035 No-Build Alternative Intersection Operations

Table 3.3-1 shows the Synchro analysis results for the 2035 No-Build Alternative. As shown, eight intersections would not meet the mobility target in at least one peak period. Of these eight, three would not meet the mobility target in either peak period. Figures depicting turn volumes are included in Appendix B1. Appendix B24 and Appendix B25 provide more details on the HCM operations analysis.

Table 3.3-1. Segment B 2035 No-Build Alternative HCM (Synchro) Analysis *(multipage table)*

						AM				PM			
ID	Intersection	Note	Mobility Target		Control	Delay	LOS	V/C	WLANE	Delay	LOS	V/C	WLANE
B1	SW Barbur Blvd./ SW 2nd Ave.		ODOT/PBOT 1st HR	0.99	TWSC	17.2 [19.6]	C [C]	[0.06]	WBLn1	13 [15]	B [C]	[0.07]	SBLn
B2	SW Barbur Blvd./ SW 3rd Ave.		ODOT/PBOT 1st HR	0.99	Signal	24.2	C	0.94	-	23.9	C	0.75	-
B3	SW Barbur Blvd./ SW Terwilliger Blvd.		ODOT/PBOT 1st HR	0.99	Signal	**52.3**	**D**	**1.03**	**-**	**63.2**	**E**	**1.05**	**-**
B4	SW Barbur Blvd./ SW Bertha Blvd./ I-5 ramps		ODOT Ramp	0.85	Signal	**33.8**	**C**	**0.93**	**-**	24.5	C	0.84	-

Table 3.3-1. Segment B 2035 No-Build Alternative HCM (Synchro) Analysis *(multipage table)*

ID	Intersection	Note	Mobility Target		Control	AM				PM			
						Delay	LOS	V/C	WLANE	Delay	LOS	V/C	WLANE
B9	SW Terwilliger Blvd./ I-5 NB off-ramp		ODOT Ramp	0.85	Signal	16.0	B	0.67	-	**32.3**	**C**	**0.87**	**-**
B10	SW Barbur Blvd./ SW 13th Dr./ ped. crossing		ODOT/PBOT 1st HR	0.99	TWSC	9.9 [13.2]	A [B]	[0.36]	EBLn1	29.5 [43.4]	D [E]	[0.75]	EBLn1
B13	SW Barbur Blvd./ SW 19th Dr./ SW Capitol Hill Rd.	1	ODOT/PBOT 1st HR	0.99	Signal	32.6	C	0.87	-	28.0	C	0.85	-
B15	SW Barbur Blvd./ SW 22nd Ave.	1	ODOT/PBOT 1st HR	0.99	TWSC	**15.3 [>300]**	**C [F]**	**[>2.0]**	**WBLn1**	**13.3 [>300]**	**B [F]**	**[>2.0]**	**WBLn1**
B16	SW Barbur Blvd./ I-5 SB off-ramp/ SW 24th Ave.	1	ODOT Ramp	0.85	Signal	**12.4**	**B**	**0.87**	**-**	10.9	B	0.62	-
B22	SW Barbur Blvd./ SW 30th Ave.	1	ODOT/PBOT 1st HR	0.99	Signal	10.9	B	0.77	-	6.8	A	0.56	-
B24	SW Barbur Blvd./ SW Alice St./ ped. crossing	1,2	ODOT/PBOT 1st HR	0.99	TWSC	0 [95.6]	A [F]	[0.40]	EBLn1	13.2 [66.4]	B [F]	[0.26]	EBLn1
B25	SW Barbur Blvd./ SW Taylors Ferry Rd./ SW Baird St.	1,2	ODOT/PBOT 1st HR	0.99	TWSC	**10.6 [>300]**	**B [F]**	**[1.80]**	**WBLn1**	13.9 [177]	B [F]	[0.82]	EBLn1
B27	SW Barbur Blvd./ Barbur Transit Center (signal)	1,2	ODOT/PBOT 1st HR	0.99	Signal	2.9	A	0.59	-	5.1	A	0.51	-
B29	SW Barbur Blvd./ SW Taylors Ferry Rd./ Barbur Transit Center (bus out)	1,2	ODOT/PBOT 1st HR	0.99	Signal	16.0	B	0.71	-	23.9	C	0.91	-
B30	SW Barbur Blvd./ SW Capitol Hwy. (Crossroads)	1,2	ODOT/PBOT 1st HR	0.99	Signal	25.6	C	0.81	-	23.3	C	0.81	-
B31	SW Taylors Ferry Rd./ I-5 SB off-ramp	2	ODOT Ramp	0.85	TWSC	0 [20.7]	A [C]	[0.28]	-	**0 [202]**	**A [F]**	**[1.28]**	**NBLn1**
B32	SW Taylors Ferry Rd./ SW Capitol Hwy.	2	PBOT 1st HR	0.99	AWSC	**52.4**	**F**	**1.06**	**SBLn1**	**102**	**F**	**1.33**	**NBLn1**
B36	SW Barbur Blvd./ SW 53rd Ave.	1,2	ODOT/PBOT 1st HR	0.99	Signal	16.2	B	0.83	-	11.0	B	0.73	-

Note: AWSC = All-way stop control; EB = eastbound; HCM = Highway Capacity Manual; HR = Hour; ID = Intersection Identification #; LOS = Level of Service; Ln = Lane; NB = northbound; ODOT = Oregon Department of Transportation; PBOT = Portland Bureau of Transportation; SB = southbound; TWSC = Two-way stop control; V/C = volume-to-capacity; WB = westbound; WLANE = worst lane. "-" represents "not applicable"

Key: Delay = Average vehicle delay (in seconds).

Worst Major [Worst stop-controlled delay] for TWSC intersections.

V/C represents intersection average for signals and worst movement for stop-controlled intersections.

Delay, LOS, and V/C ratio reported for average and worst approach for TWSC and worst lane for AWSC.

[1] Intersection analysis completed as part of 2016 Southwest Corridor study with review by ODOT, PBOT and Metro.

[2] Intersection part of Town Center designation with 2nd hour mobility target. To maintain consistency with 2016 Southwest Corridor analysis, proximity to ramps and peak-hour park and ride trip generation rates, 1st hour analysis was performed. Intersections meeting 1st hour target also meet 2nd hour.

As shown in Table 3.3-1, HCM operations analysis indicates that the following intersections fail to meet mobility targets.

AM peak hour:

- **SW Barbur Boulevard and SW Terwilliger Boulevard.** This intersection would continue to operate above the mobility target. This eight-phase signalized intersection would experience very high northbound through volumes on SW Barbur Boulevard during the AM peak hour, along with high northbound volumes on SW Terwilliger Boulevard.
- **SW Barbur Boulevard and SW Bertha Boulevard/I-5 ramps.** This intersection would continue to operate above the mobility target. This intersection would experience high northbound volumes on SW Barbur Boulevard coupled with high southbound volumes on SW Bertha Boulevard accessing I-5 in the AM peak hour.
- **SW Barbur Boulevard and SW 22nd Avenue.** This intersection would continue to operate above the mobility target. Minor street turning volumes would continue to conflict with high northbound through volumes along SW Barbur Boulevard.
- **SW Barbur Boulevard and SW 24th Avenue.** This intersection serves high volume minor street turning movements that would conflict with high northbound through volumes along SW Barbur Boulevard during the AM peak period.
- **SW Barbur Boulevard and SW Taylors Ferry Road/SW Baird Street.** This intersection would continue to operate above the mobility target. Minor street turning volumes would continue to conflict with high northbound through volumes along SW Barbur Boulevard.
- **SW Taylors Ferry Road and SW Capitol Highway.** This AWSC intersection would experience delays and queuing during the AM peak-hour period because of heavy volumes of vehicles from the nearby I-5 northbound off-ramp that are traveling through the intersection and across SW Barbur Boulevard.

PM peak hour:

- **SW Barbur Boulevard and SW Terwilliger Boulevard.** This intersection would continue to operate above the mobility target. This eight-phase signalized intersection would experience very high southbound through volumes on SW Barbur Boulevard during the PM peak hour, along with high volumes on SW Terwilliger Boulevard.
- **SW Terwilliger Boulevard and I-5 northbound off-ramp.** This intersection operates above the mobility target in the No Build alternative due to higher southbound through and eastbound left turn volume.
- **SW Barbur Boulevard and SW 22nd Avenue.** This intersection would continue to operate above the mobility target. Minor street turning volumes would continue to conflict with high northbound through volumes along SW Barbur Boulevard.
- **SW Taylors Ferry Road/I-5 southbound off-ramp.** This intersection would continue to operate above the mobility target. This T-intersection is stop sign controlled on the side street, which is a freeway off-ramp.

- **SW Taylors Ferry Road and SW Capitol Highway.** Similar to the AM peak-hour period operation, this AWSC intersection would experience delays and queuing during the PM peak-hour period because of heavy volumes of vehicles from the nearby I-5 northbound off-ramp that are traveling through the intersection and across SW Barbur Boulevard.

2045 No-Build Alternative Intersection Operations

The following analysis evaluates the ramp terminal intersections for the SW Terwilliger Boulevard interchange, SW 24th Avenue and the Crossroads area in Segment B under the 2045 No-Build Alternative AM and PM peak-hour conditions. Table 3.3-2 shows the Synchro analysis results for the 2045 No-Build Alternative. As shown, the V/C ratio under the No-Build Alternative would fail to meet mobility targets for all four intersections in at least one peak period. Appendix B26 provides more details on the HCM operations analysis.

Table 3.3-2. Segment B 2045 No-Build Alternative AM and PM HCM (Synchro) Analysis

ID	Intersection	Mobility Target		Control	AM				PM			
					Delay	LOS	V/C	WLANE	Delay	LOS	V/C	WLANE
B4	SW Barbur Blvd./SW Bertha Blvd./I-5 ramps	ODOT Ramp	0.85	Signal	**53.2**	**D**	**0.96**	**-**	**29.4**	**C**	**0.88**	**-**
B9	SW Terwilliger Blvd./I-5 NB off-ramp	ODOT Ramp	0.85	Signal	18.9	B	0.71	-	**36.0**	**D**	**0.90**	**-**
B16	SW Barbur Blvd./I-5 SB off-ramp/SW 24th Ave.	ODOT Ramp	0.85	Signal	**18.5**	**B**	**0.87**	**-**	13.4	B	0.63	-
B31	SW Taylors Ferry Rd./I-5 SB off-ramp	ODOT Ramp	0.85	TWSC	0 [24.6]	A [C]	0.33	NBLn1	**0 [>300]**	**A [F]**	**[1.99]**	**NBLn1**

Note: HCM = Highway Capacity Manual; ID = Intersection Identification #; LOS = Level of Service; Ln = Lane; NB = northbound; ODOT = Oregon Department of Transportation; SB = southbound; TWSC = Two-way stop control; V/C = volume-to-capacity; WLANE = worst lane. "-" represents "not applicable"

2035 Preferred Alternative Intersection Operations

As shown in Table 3.3-3, under the Preferred Alternative in Segment B, there are a total of seven intersections that would not meet the mobility target in at least one peak hour. Three intersections would not meet the mobility target in both peak hours. Figures depicting turn volumes are shown in Appendix B1. Appendix B28 and Appendix B29 provide more details on the HCM operations analysis.

For intersections *B13* and *B29* in Table 3.3-3, the v/c ratios were post-processed to account for pedestrian crossing impacts. The methodology for these adjustments is captured in Appendix B30.

Table 3.3-3. Segment B 2035 Preferred Alternative HCM (Synchro) Analysis *(multipage table)*

ID	Intersection	Note	Mobility Target		Control	AM				PM			
						Delay	LOS	V/C	WLANE	Delay	LOS	V/C	WLANE
B1	SW Barbur Blvd./SW 2nd Ave.		ODOT/PBOT 1st HR	0.99	Signal	6.1	A	0.71	-	9.0	A	0.63	-
B2	SW Barbur Blvd./SW 3rd Ave.		ODOT/PBOT 1st HR	0.99	Signal	4.0	A	0.63	-	6.0	A	0.59	-
B3	SW Barbur Blvd./ SW Terwilliger Blvd.		ODOT/PBOT 1st HR	0.99	Signal	41.6	D	0.96	-	**67.2**	**E**	**1.08**	**-**
B4	SW Barbur Blvd./SW Bertha Blvd./I-5 ramps		ODOT Ramp	0.85	Signal	**61.8**	**E**	**0.93**	-	52.6	D	0.81	-
B9	SW Terwilliger Blvd./I-5 NB off-ramp		ODOT Ramp	0.85	Signal	16.0	B	0.65	-	29.5	C	0.85	-
B10	SW Barbur Blvd./SW 13th Dr./ped. crossing		ODOT/PBOT 1st HR	0.99	Signal	12.5	B	0.59	-	21.3	C	0.74	-
B13	SW Barbur Blvd./SW 19th Dr./SW Capitol Hill Rd.[1]	1	ODOT/PBOT 1st HR	0.99	Signal	**48.6**	**D**	**1.02**	**-**	**41.4**	**D**	**1.03**	**-**
B15	SW Barbur Blvd./SW 22nd Ave.	1	ODOT/PBOT 1st HR	0.99	Signal	6.3	A	0.63	-	10.3	B	0.60	-
B16	SW Barbur Blvd./I-5 SB off-ramp/SW 24th Ave.	1	ODOT Ramp	0.85	Signal	**17.6**	**B**	**0.88**	**-**	17.1	B	0.70	-
B22	SW Barbur Blvd./SW 30th Ave.	1	ODOT/PBOT 1st HR	0.99	Signal	14.3	B	0.76	-	18.5	B	0.65	-
B24	SW Barbur Blvd./SW Alice St./ped. crossing	1,2	ODOT/PBOT 1st HR	0.99	Signal	2.7	A	0.58	-	2.8	A	0.53	-
B25	SW Barbur Blvd./SW Taylors Ferry Rd./SW Baird St.	1,2	ODOT/PBOT 1st HR	0.99	Signal	5.7	A	0.61	-	9.5	A	0.54	-
B27	SW Barbur Blvd./Barbur Transit Center (signal)	1,2	ODOT/PBOT 1st HR	0.99	Signal	6.0	A	0.61	-	5.8	A	0.52	-
B29	SW Barbur Blvd./SW Taylors Ferry Rd./Barbur Transit Center (bus out)	1,2	ODOT/PBOT 1st HR	0.99	Signal	**138.1**	**F**	**1.08**	**-**	**102**	**F**	**1.14**	**-**
B30	SW Barbur Blvd./SW Capitol Hwy. (Crossroads)	1,2	ODOT/PBOT 1st HR	0.99	Signal	35.6	D	0.85	-	29.3	C	0.88	-
B31	SW Taylors Ferry Rd./I-5 SB off-ramp	2	ODOT Ramp	0.85	TWSC	0 [21.9]	A [C]	[0.31]	NBLn1	**0 [14.2]**	**A [F]**	**[1.24]**	**NBLn1**
B32	SW Taylors Ferry Rd./SW Capitol Hwy.	2	PBOT 1st HR	0.99	AWSC	**52.1**	**F**	**1.06**	**SBLn1**	**101**	**F**	**1.33**	**NBLn1**

Table 3.3-3. Segment B 2035 Preferred Alternative HCM (Synchro) Analysis *(multipage table)*

ID	Intersection	Note	Mobility Target		Control	AM				PM			
						Delay	LOS	V/C	WLANE	Delay	LOS	V/C	WLANE
B36	SW Barbur Blvd./SW 53rd Ave.	1,2	ODOT/PBOT 1st HR	0.99	Signal	36.4	D	0.85	-	25.5	C	0.75	-

Note: AWSC = All-way stop control; EB = eastbound; HCM = Highway Capacity Manual; HR = Hour; ID = Intersection Identification #; LOS = Level of Service; Ln = Lane; NB = northbound; ODOT = Oregon Department of Transportation; PBOT = Portland Bureau of Transportation; SB = southbound; TWSC = Two-way stop control; V/C = volume-to-capacity; WB = westbound; WLANE = worst lane.

Intersection V/C ratio adjusted for pedestrian crossing impact. "-" represents "not applicable"

Key: Delay = Average vehicle delay (in seconds).

Worst Major [Worst stop-controlled delay] for TWSC intersections.

V/C represents intersection average for signals and worst movement for stop-control intersections.

Delay, LOS, and V/C ratio reported for average and worst approach for two-way stop control and worst lane for all-way stop control.

[1] Intersection analysis completed as part of 2016 Southwest Corridor study with review by ODOT, PBOT and Metro.

[2] Intersection part of Town Center designation with 2nd hour mobility target. To maintain consistency with 2016 Southwest Corridor analysis, proximity to ramps and peak-hour park and ride trip generation rates, 1st hour analysis was performed. Intersections meeting 1st hour target also meet 2nd hour.

As shown in Table 3.3-3, HCM operations analysis indicates that the following intersections would fail to meet mobility targets.

AM peak hour:

- **SW Barbur Boulevard and SW Bertha Boulevard/I-5 ramps.** This intersection would continue to operate above the mobility target. This intersection would experience high northbound volumes on SW Barbur Boulevard, coupled with high southbound volumes on SW Bertha Boulevard accessing I-5 in the AM peak hour. The V/C ratio at this intersection would be the same as that for the No-Build Alternative.
- **SW Barbur Boulevard and SW 19th Avenue.** This intersection would operate above the mobility target because of the pedestrian volumes accessing the light rail platform.
- **SW Barbur Boulevard and SW 24th Avenue.** This intersection would serve high volume minor street turning movements that would conflict with high northbound through volumes along SW Barbur Boulevard during the AM peak period. The V/C ratio at this intersection would be 0.01 higher than that of the No-Build Alternative.
- **SW Barbur and Barbur Transit Center/SW Taylors Ferry Road.** High pedestrian demand accessing the light rail station along with a heavy volume of left turns from SW Taylors Ferry Road to SW Barbur Boulevard would result in a delay for turning movements at this intersection.
- **SW Taylors Ferry Road and SW Capitol Highway.** This all-way stop control intersection would experience delays and queuing during the AM peak-hour period because of heavy volumes of vehicles from the nearby I-5 northbound off-ramp that are traveling through the intersection and across SW Barbur Boulevard. The V/C ratio at this intersection would be the same as that of the No-Build Alternative.

PM peak hour:

- **SW Barbur Boulevard and SW Terwilliger Boulevard.** This intersection would operate above the mobility target similar to the No-Build Alternative. This eight-phase signalized intersection would

experience very high southbound through volumes on SW Barbur Boulevard during the PM peak hour, along with high volumes on SW Terwilliger Boulevard.

- **SW Barbur Boulevard and SW 19th Avenue.** This intersection would operate above the mobility target because of the pedestrian volumes accessing the light rail platform.
- **SW Taylors Ferry Road/I-5 southbound off-ramp.** This intersection would continue to operate above the mobility target. This T-intersection is stop sign controlled on the side street, which is a freeway off-ramp. The V/C ratio at this intersection would improve slightly over that of the No-Build Alternative.
- **SW Barbur and Barbur Transit Center/SW Taylors Ferry Road.** High pedestrian demand accessing the light rail station along with a heavy volume of left turns from SW Taylors Ferry Road to SW Barbur Boulevard would result in a delay for turning movements at this intersection.
- **SW Taylors Ferry Road and SW Capitol Highway.** Similar to the AM peak-hour period operation, this AWSC intersection would experience delays and queuing during the PM peak-hour period because of heavy volumes of vehicles from the nearby I-5 northbound off-ramp that are traveling through the intersection and across SW Barbur Boulevard. The V/C ratio at this intersection would be the same as that of the No-Build Alternative.

2045 Preferred Alternative Intersection Operations

The following analysis evaluates the ramp terminal intersections for the SW Terwilliger Boulevard interchange and the Crossroads area under 2045 AM and PM peak-hour conditions for the Preferred Alternative. Table 3.3-4 shows the results of the Synchro analysis for the Preferred Alternative in 2045. The V/C ratio for the intersections either would meet the mobility target or would be within 0.03 of the V/C ratio in 2045 for the No-Build Alternative during all analysis periods and no mitigation would be required. Appendix B31 provides more details on the HCM operations analysis.

Table 3.3-4. Segment B 2045 Preferred Alternative HCM (Synchro) AM and PM Analysis

					AM				PM			
ID	Intersection	Mobility Target		Control	Delay	LOS	V/C	WLANE	Delay	LOS	V/C	WLANE
B4	SW Barbur Blvd./SW Bertha Blvd./I-5 ramps	ODOT Ramp	0.85	Signal	**70.5**	**E**	**0.97**	**-**	61.9	E	0.84	-
B9	SW Terwilliger Blvd./I-5 NB off-ramp	ODOT Ramp	0.85	Signal	15.8	B	0.66	-	**33.6**	**C**	**0.89**	**-**
B16	SW Barbur Blvd./I-5 SB off-ramp/SW 24th Ave.	ODOT Ramp	0.85	Signal	**19.6**	**B**	**0.89**	**-**	19.1	B	0.72	-
B31	SW Taylors Ferry Rd./I-5 SB off-ramp	ODOT Ramp	0.85	TWSC	0 [27]	A [D]	0.37	NBLn1	**0 [>300]**	**A [F]**	**[1.94]**	**NBLn1**

Note: HCM = Highway Capacity Manual; LOS = Level of Service; NB = northbound; ODOT = Oregon Department of Transportation; SB = southbound; TWSC = two-way stop control; V/C = volume-to-capacity; WLANE = worst lane. "-" represents "not applicable"

3.3.2. Segment B Future Queuing Analysis

2045 No-Build and Preferred Alternative Queuing Analysis – Terwilliger Boulevard Vicinity

A future 2045 No-Build Alternative Vissim simulation model was developed from the calibrated existing conditions model. Forecast years 2035 was not modeled. The 2045 PM analysis of the SW Terwilliger Boulevard interchange area requested by ODOT and the Federal Highway Administration evaluates traffic and transit performance based on a longer horizon period than that required by the FTA for the Draft EIS analysis. No changes were made to the modeling assumptions, but volumes and vehicle routing patterns were updated based on the Metro regional travel demand model. There are no Regional Transportation Plan projects included in this model area for 2045.

As with the existing conditions model, performance metrics such as delay, travel times and 95th percentile queues were pulled from the model. These metrics are included in Appendix B27. The No-Build Alternative model exhibits significant congestion. Most of the congestion would stem from capacity constraints at the SW Terwilliger Boulevard/SW Barbur Boulevard intersection. The congestion would lead to extensive queues on eastbound and westbound SW Barbur Boulevard approaches and the northbound SW Terwilliger Boulevard approach. These queues would perpetuate past the extents of the model and would prevent the model from serving the full demand volumes. The No-Build Alternative model serves only about 85 percent of the demand volume.

For the Preferred Alternative, this analysis utilized the 2045 PM Build VISSIM model which was built during the Draft EIS plus the model refinements added for a subsequent rail delay analysis. The model was then configured to evaluate four scenarios. The four scenarios represent conditions with and without the right-turn lane from the I-5 southbound off-ramp at Bertha Boulevard. Additionally, each auxiliary right-turn lane scenario was modeled with and without the I-5 southbound off-ramp queue clearance preemption at Bertha Boulevard. The auxiliary lane was a mitigation recommendation from the Draft EIS, but was not analyzed at that time.

As with 2045 No-Build model analysis, all modeled scenarios exhibit extensive congestion. The majority of the congestion stems from capacity constraints at the Terwilliger Boulevard/SW Barbur Boulevard intersection. The congestion leads to queues on eastbound and westbound SW Barbur Boulevard approaches and the northbound Terwilliger approach. These queues perpetuate past the extents of the model and prevent the model from serving the full demand volumes.

Without the auxiliary right turn lane, the I-5 southbound off-ramp experiences severe congestion. When the auxiliary right-turn lane is added from the off-ramp at Bertha to Terwilliger, the overall intersection delay improves by about 5-15 seconds compared to without the auxiliary right-turn lane. Additionally, the 95th percentile queue lengths for the I-5 southbound off-ramp are also reduced with the auxiliary right-turn lane. Scenarios with the auxiliary right-turn lane are able to achieve I-5 southbound off-ramp queue lengths no greater than the 2045 No Build conditions. This auxiliary lane is included in the Final EIS design. Off-ramp queue clearance preemption operation is also recommended as a mitigation to provide an additional layer of safety should queue conditions exceed the 2045 PM peak hour results.

2045 No-Build and Preferred Alternative Queuing Analysis – SW 24th Avenue Off-ramp

In 2045 for the No-Build Alternative and the Preferred Alternative there are no identified queuing issues at the SW 24th Avenue off-ramp, as shown in Table 3.3-5.

Table 3.3-5. Queuing Results for No-Build Alternative and Preferred Alternative at I-5 Southbound Off-ramp and SW 24th Avenue

	No-Build Alternative Westbound Left/Through	Preferred Alternative Westbound Left/Through
Ramp Length (feet[1])	600	600
Ramp Length (Simulation) (feet)	651	611
95th Percentile Queue (feet)	183	203
Upstream Block Time (%)	0%	0%
Storage Block Time (%)	1%	2%
Queuing Penalty (vehicles)	0	1

[1] Distances rounded to nearest 25 feet.

2045 No-Build and Preferred Alternative Queuing Analysis – Crossroads Area

Under the 2045 No-Build Alternative and Preferred Alternative, SimTraffic analysis shows a high level of queuing and delay at the I-5 southbound off-ramp to SW Taylors Ferry Road as well as at the adjacent intersections of SW Taylors Ferry Road and SW Capitol Highway, SW Taylors Ferry Road and SW Barbur Boulevard, and SW Capitol Highway and SW Barbur Boulevard. This queuing can be attributed for the most part to three factors: growth in regional volumes, extension of SW Taylors Ferry Road to connect with SW Oleson Road (a project included in the financially constrained planned network between 2035 and 2045) and the lack of planned projects in the Regional Transportation Plan for this interchange. Observation of the simulation runs shows that these intersections would have demand that exceeds capacity, resulting in queues backing up throughout the adjacent network. Table 3.3-6 summarizes the queue under the 2045 No-Build Alternative and the Preferred Alternative that would develop from the signal at SW Barbur Boulevard and SW Capitol Highway, through the stop-controlled intersection at SW Taylors Ferry Road and SW Capitol Highway and onto the I-5 southbound off-ramp.

Under the No-Build Alternative, the queue on the I-5 southbound off-ramp would extend onto the mainline. The upstream block time shown in Table 3.3-6 indicates the percentage of the time additional vehicles were prevented from entering the simulation network because of the queue reaching the edge of the simulation network, meaning that the queue shown theoretically would be longer than reported. The storage block time and associated queuing penalty show the amount of time the right-turn lane would be blocked by queue spillback from the left-turn lane and the effect of the blockage as a number of additional vehicles in the queue. Queues in the Preferred Alternative would be less severe because of changes in demand at the four-way stop-controlled intersection at SW Taylors Ferry Road and SW Capitol Highway. The key differences are reduced off-ramp volume in the Preferred Alternative and volume shifting from SW Taylors Ferry Road to Highway 99W.

Proposed mitigation is discussed in Chapter 3 of the Final EIS.

Table 3.3-6. Queuing Results for No-Build Alternative and Preferred Alternative in Segment B

	No-Build Alternative	Preferred Alternative
I-5 SB off-ramp and SW Taylors Ferry Rd.	**Northbound Right**	**Northbound Right**
Ramp length (feet[1])	1,050	1,050
Ramp length (simulation) (feet)	2,338	2,306
95th percentile queue (feet)	2,581	2,482
Upstream block time (%)	90%	95%
Storage block time (%)	83%	88%
Queuing Penalty (vehicles)	250	268
SW Capitol Hwy. and SW Taylors Ferry Rd.	**Eastbound Right**	**Eastbound Right**
Link distance (feet)	225	225
Link distance (simulation) (feet)	238	265
95th percentile queue (feet)	319	442
Upstream block time (%)	92%	85%
Queuing penalty (vehicles)	525	469
SW Barbur Blvd. and SW Capitol Hwy.	**Southbound Through Right**	**Southbound Through Right**
Link distance (feet)	225	225
Link distance (simulation) (feet)	176	190
95th percentile queue (feet)	315	329
Upstream block time (%)	38%	47%
Queuing penalty (vehicles)	291	368

[1] Distances throughout are rounded to the nearest 25 feet.

Segment B Circulation Analysis

Figure 3.3-1 and Figure 3.3-2 show changes in traffic volumes associated with the Preferred Alternative in Segment B. The project team also conducted a study to understand the potential motor vehicle circulation changes associated with street access changes and closures in the vicinity of Fulton Park adjacent to SW Barbur Boulevard. Findings from the study are included in Chapter 3 of the Final EIS and more details can be found in Appendix B32.

Figure 3.3-1. Traffic Circulation Changes – Segment B: Preferred Alternative AM

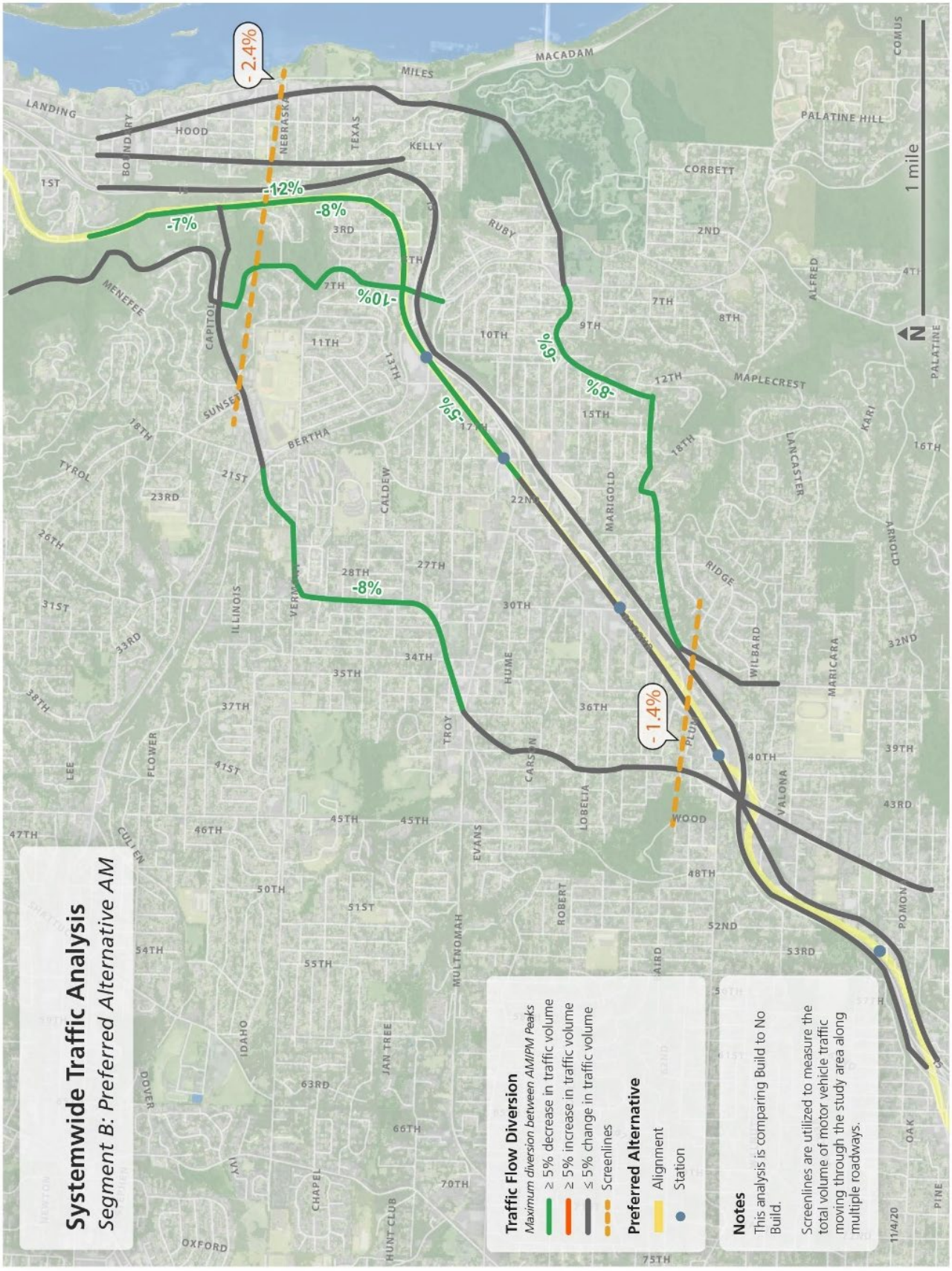
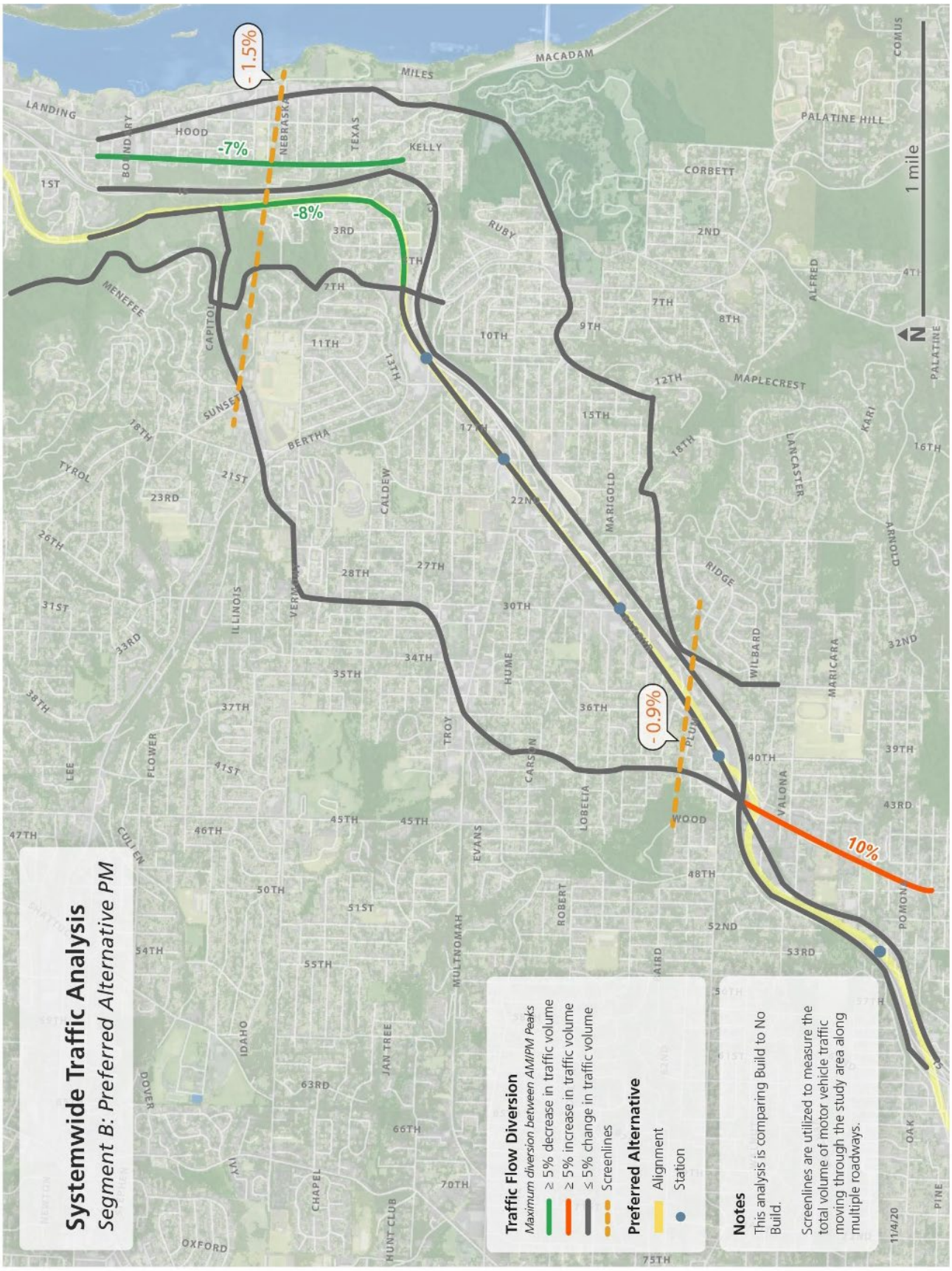


Figure 3.3-2. Traffic Circulation Changes – Segment B: Preferred Alternative PM



3.3.3. Segment B Light Rail Station Vehicular Access Impacts

The local circulation to neighborhood streets surrounding the station areas was evaluated to determine the impact of transit-related trips. There may be some redistribution of trips near light rail stations because of pick-ups and drop-offs, but this impact would be minor. The analysis of local streets near the Barbur Transit Center and the proposed 53rd Park and Ride shows that those trips can be accommodated.

Metro's travel model was used to develop assumptions about access mode share to each station. More information is contained in Attachment A, *Transit Impact and Travel Demand Forecasting Results Report***.** The travel model does not forecast pick-ups and drop-offs by private vehicles or transportation network companies (TNC) at stations specifically. However, stations may experience pick-up and drop-off activity. This activity can be managed through design, including 'no stopping or parking' zones in station areas and other design treatments. At existing light rail stations on TriMet's system, pick-up and drop-off activity occurs to varying degrees, but is not known to cause congestion or queuing issues.

Segment B Park and Ride Lots

Barbur Transit Center Park and Ride

Barbur Transit Center is an existing park and ride facility located off SW Barbur Boulevard and SW Taylors Ferry Road near SW Capitol Highway in the Crossroads area. It currently provides 382 parking stalls. Under the Preferred Alternative the number of parking stalls would be reduced to 300. Of the total model-predicted ons/offs at this station, 24 percent are expected to access the station by car. Of this vehicle demand, approximately 30 percent is expected to come from the area to the northwest of the park and ride via SW Capitol Highway and SW Taylors Ferry Road. Around 15 percent of the demand is expected to access the park and ride via southbound SW Barbur Boulevard and the remaining 55 percent from northbound SW Barbur Boulevard via SW Capitol Highway.

53rd Park and Ride

This park and ride facility is planned for the site north of the intersection of SW Barbur Boulevard and SW 53rd Avenue between SW Barbur Boulevard and I-5 under the Preferred Alternative. It will provide 310 parking stalls and secure bike parking. Of the total model-predicted ons/offs at this station, 34 percent are expected to access the station by car. All the demand for this park and ride is expected to come from the area to the southeast that contains PCC-Sylvania. Of the trips to this park and ride, 25 percent would travel via SW 53rd Avenue and approximately 15 percent would come from northbound SW Barbur Boulevard via SW 60th Avenue. Approximately 15 percent of the demand is expected to come from southbound SW Barbur Boulevard, and 45 percent of demand is expected to access this facility via I-5.

3.4. Segment B Mitigation

Segment B mitigation is discussed in Chapter 3 of the Final EIS.

4. SEGMENT C: TIGARD AND TUALATIN

This chapter details the transportation operations for both existing and future conditions within Segment C.

4.1. Study Area

Segment C is defined as the section from just west of SW 68th Parkway to Tigard and the Bridgeport Village terminus, station, and park and ride facility. Within Segment C, there are three unique subareas: Tigard, SW Carman Drive/SW Upper Boones Ferry Road and Bridgeport. The Segment C study area includes a total of 40 intersections, as depicted in Figure 4.1-1, Figure 4.1-2 and Figure 4.1-3, below. Three of the 40 intersections do not currently exist and therefore are analyzed only under future conditions.

Figure 4.1-1. Study Area – Segment C: Tigard Subarea

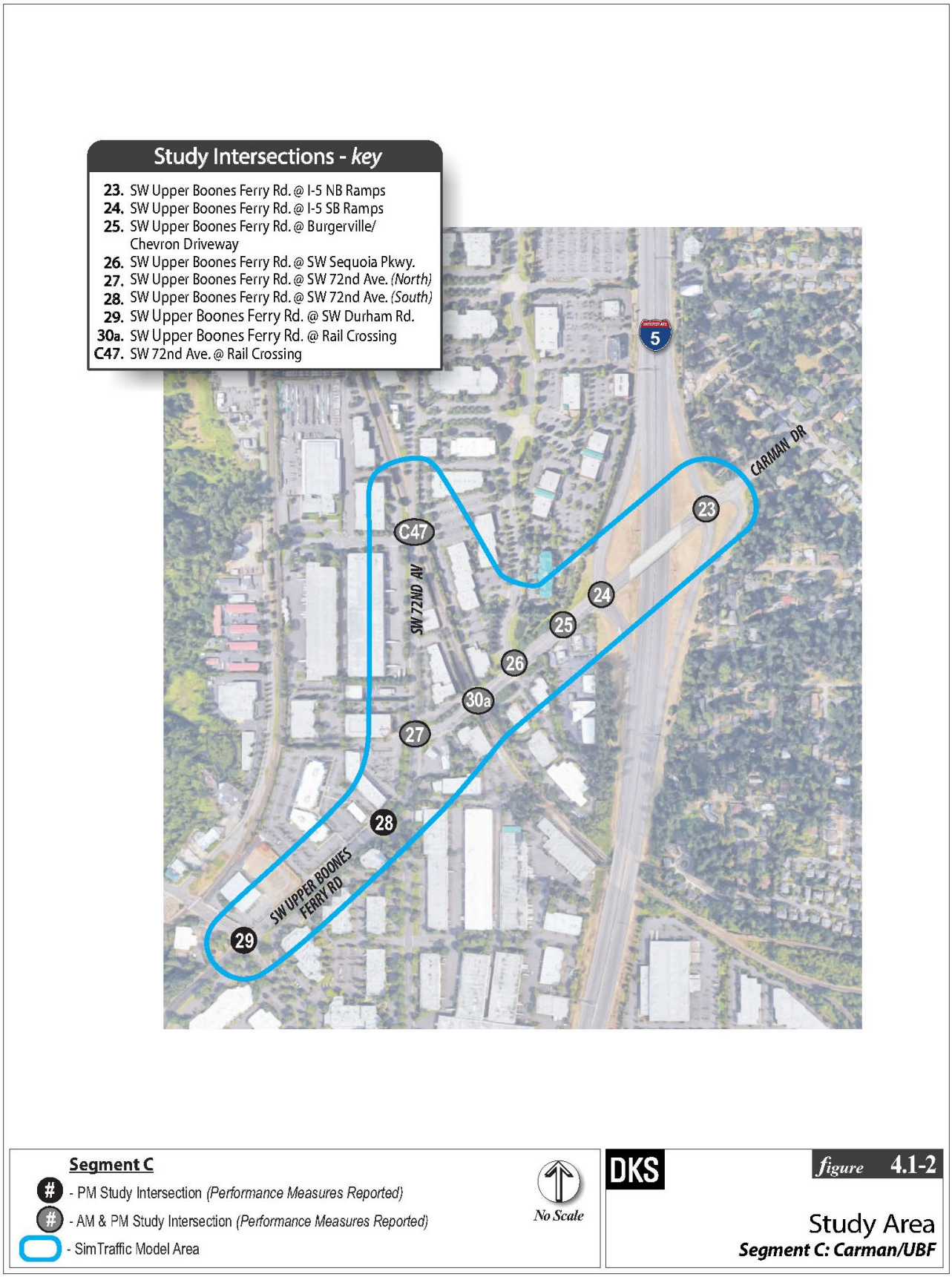
4.1.1. Tigard Subarea

The Tigard subarea of Segment C has 23 study area intersections that fall mostly within the city limits of Tigard near areas known as the Tigard Triangle and downtown Tigard and along SW Bonita Road. One intersection falls in the City of Lake Oswego. Traffic count data were collected, and Synchro was used to analyze the area for the PM peak period only. The LOS analysis and the V/C ratio were calculated to evaluate intersection operations. For study area intersections related to freeway ramp terminals or railroad crossings, Synchro was used to determine approximate 95th percentile queue lengths. Figure 4.1-1 illustrates the Tigard subarea of Segment C.

4.1.2. SW Carman Drive/SW Upper Boones Ferry Road Subarea

The SW Carman Drive/SW Upper Boones Ferry Road subarea of Segment C has nine study intersections along SW Carman Drive/SW Upper Boones Ferry Road, between SW Durham Road and the I-5 ramp terminals, all within the city limits of Tigard. It includes seven major signalized intersections and one stop-controlled access with high traffic volumes. Traffic count data were collected, and Synchro and SimTraffic were used to determine the LOS analysis, V/C ratio and selective queuing results to evaluate intersection operations. Figure 4.1-2 below illustrates the SW Carman Drive/SW Upper Boones Ferry Road subarea of Segment C.

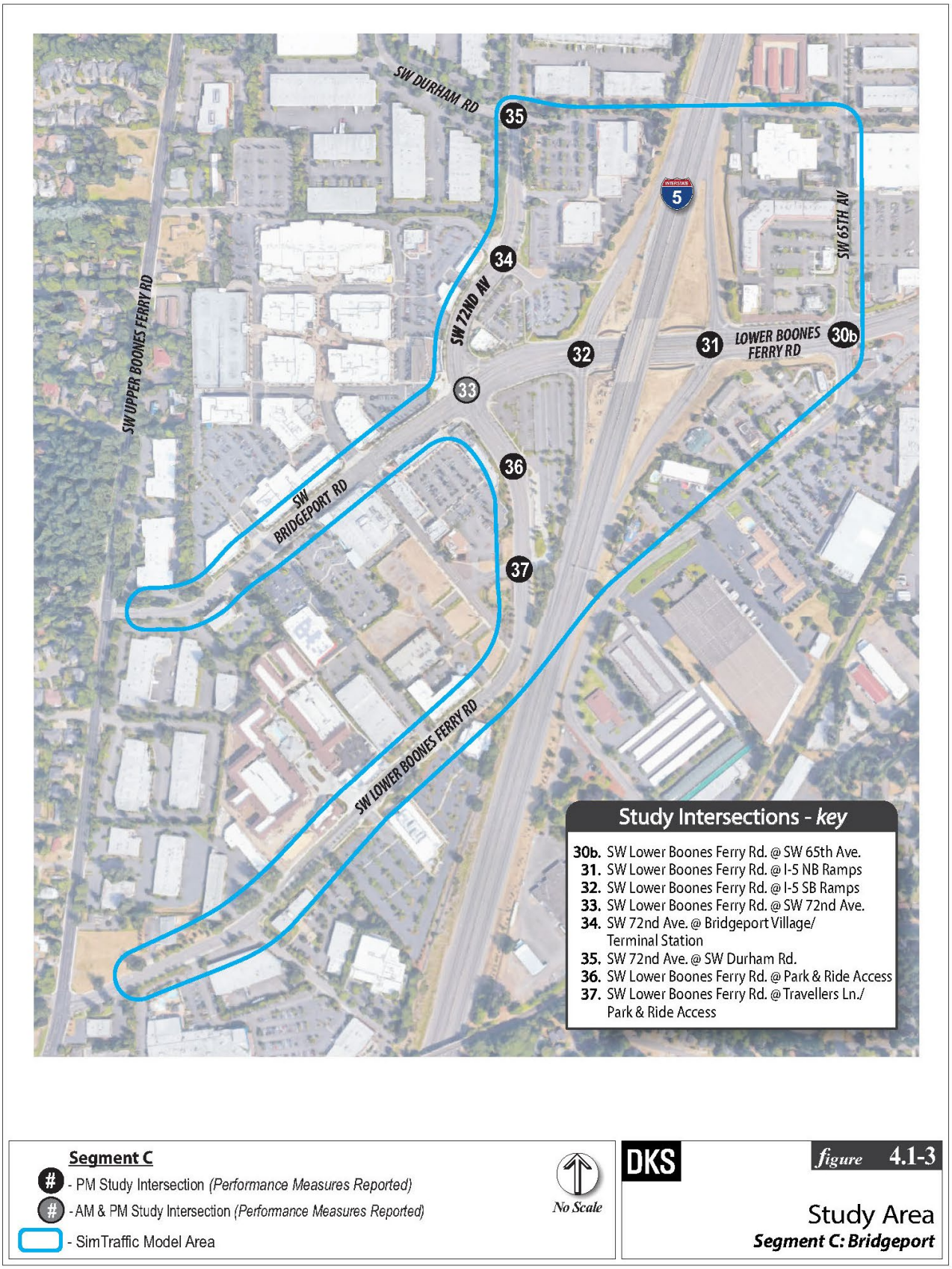
Figure 4.1-2. Study Area – Segment C: SW Carman Drive/SW Upper Boones Ferry Road Subarea



4.1.3. Bridgeport Subarea

The Bridgeport subarea of Segment C has ten study intersections near the SW Lower Boones Ferry Road interchange and the Bridgeport Village shopping center. It includes eight signalized intersections and two stop-controlled accesses near the proposed Bridgeport Park and Ride. Traffic count data were collected, and Synchro and SimTraffic were used to determine the LOS analysis, V/C ratio and selective queuing results to evaluate intersection operations. Figure 4.1-3 below illustrates the Bridgeport subarea of Segment C.

Figure 4.1-3. Study Area – Segment C: Bridgeport Subarea



4.2. Segment C Existing Conditions

4.2.1. 2017 Existing Conditions Intersection Operations and Queuing

The existing conditions analysis for Segment C was not updated for the Final EIS. Segments A and B were updated in response to local agency requests for updated information, partly to aid in analysis of the Ross Island Bridgehead Reconfiguration which changed substantially from the Draft to Final EIS.

4.2.2. Segment C Safety Analysis

The Draft EIS previously identified the following clusters of fatal and serious injury collisions:

- SW Barbur Boulevard between I-5 and Highway 217
- SW Barbur Boulevard/SW Hall Boulevard
- Highway 217/SW 72nd Avenue

The 2017 SPIS list[2] has identified the following intersections within this segment:

- SW Barbur Boulevard at SW 64th Avenue
- SW Barbur Boulevard at SW 65th Avenue

Given updates in the design since the Draft EIS, the safety analysis locations within Segment C have been updated to:

- Highway 99W/Barbur Junction – Exit 294 interchange
- SW Hall Boulevard – SW Garden Place to SW Burnham Street
- I-5 Exit 290 at SW Lower Boones Ferry Road

In the study area in the period of 2013 to 2017, there were a total of 12 serious injury collisions and no fatal collisions reported in this segment. There were 4 of each rear-end, turning, and "other" collision types, including sideswipes. No collisions were identified on the short segment of SW Barbur Boulevard between SW 65th and SW 68th Avenues. Table 4.2-1 shows the collision numbers and severity and Table 4.2-2 shows the collision type in the study area at each identified cluster location.

Table 4.2-1. Segment C Fatal and Serious Injury Collisions (2011–2015)

Location	Fatal	Serious Injury	Total
Study Area Corridor	**0**	**12**	**12**
Hwy. 99W/Barbur Junction – Exit 294 interchange	0	6	6
SW Hall Blvd., SW Garden Pl. to SW Burnham St.	0	2	2
I-5 Exit 290 at SW Lower Boones Ferry Rd.	0	4	4

Note: I-5 = Interstate 5.

[2] Based on 2017 - On-State, Top 10% SPIS Groups - By Hwy, MP, available online at: https://www.oregon.gov/ODOT/Engineering/Pages/SPIS-Reports-On-State.aspx.

Table 4.2-2. Segment C Fatal and Serious Injury Collision Type (2011–2015)

Location	Pedestrian	Bicycle	Rear-End	Fixed Object	Turning	Other[1]
Study Area Corridor	**0**	**0**	**4**	**0**	**4**	**4**
Hwy. 99W/Barbur Junction – Exit 294 interchange	0	0	1	0	4	1
SW Hall Blvd., SW Garden Pl. to SW Burnham St.	0	0	0	0	0	2
NB I-5 – Exit 290 to SW Lower Boones Ferry Rd.	0	0	3	0	0	1

Note: I-5 = Interstate 5; NB = northbound.

[1] "Other" includes collisions with animals, mechanical failures, or lost vehicle loads.

Highway 99W/Barbur Junction – Exit 294 Interchange

Six collisions were reported at the Highway 99W/SW Barbur Boulevard Junction – Exit 294 interchange. Four of the six crashes were turning collision types. One was a fatal rear-end collision at a stop. The other was a fixed-object collision resulting in serious injuries.

SW Hall Boulevard between SW Garden Place and SW Burnham Street

The two collisions on SW Hall Boulevard between SW Garden Place and SW Burnham Street were motorcycle-related incidents at stop signs—meaning that severe injuries occurred as a result of distracted driving and late stopping at signed intersections.

I-5 Exit 290 at SW Lower Boones Ferry Road

Four serious injury collisions were reported in the vicinity of the Exit 290 interchange at SW Lower Boones Ferry Road. All collisions occurred at the northbound exit from the I-5 mainline to SW Lower Boones Ferry Road. Three of the four collisions were rear-end collisions as a result of distracted driving, speeding and/or following too closely as drivers prepared to exit I-5. The remaining collision was a sideswipe, potentially caused by drivers trying to pass each other on the narrow off-ramp.

4.3. Segment C Future Conditions

This section identifies potential impacts to travel associated with the No-Build Alternative and the Preferred Alternative in 2035 within the segment, and in 2045 for freeway ramp terminals.

4.3.1. Operations and Maintenance (O&M) Facility

The O&M facility is planned as part of the Preferred Alternative in Segment C and would displace active light industrial buildings. The trip generation for the existing land uses was estimated and compared with the anticipated trip generation for the Hunziker O&M Facility. The estimated trips for the existing uses are shown for each site in Table 4.3-1.

Table 4.3-1. Estimated Trip Generations for Hunziker O&M Facility

O&M Facility	Estimated Existing Employees	Estimated Existing AM Peak Hour Trips	Estimated Existing PM Peak Hour Trips	Estimated Existing Daily Trips
Hunziker O&M	185	81	78	559

Note: Existing trip estimate is based on ITE Trip Generation 9th Edition average rate for light industrial use.

Based on employee density at the TriMet Ruby Junction O&M facility, the planned O&M facility for the Project is estimated to have approximately 130 employees reporting to the site in three shifts. Because of the timing of the shifts, only 10 auto trips are expected to be generated by the site both during the AM peak hour and the PM peak hour. The planned O&M facility is estimated to generate fewer trips during the AM and PM peak hours than the existing land uses.

4.3.2. Segment C Future Intersection Operations

2035 No-Build Alternative Intersection Operations

Tigard Subarea

Table 4.3-2 and Table 4.3-3 show Synchro analysis results under the No-Build Alternative for the AM and PM peak hours in the Tigard subarea of Segment C (for Tigard Downtown, Tigard Triangle and PM only for the SW Bonita Road areas). Figures depicting turn volumes are shown in Appendix B1. More details on HCM operations analysis can be found in Appendix B33.

Mobility targets for the appropriate jurisdiction are shown for every intersection. Intersection results that do not meet those mobility targets in a particular peak hour are shaded gray. The worst lane group is listed under the WLANE columns for each TWSC intersection.

During the AM and PM peak hours, the intersection of SW 65th Avenue at SW Haines Street/I-5 northbound ramps would exceed the applicable mobility targets. The intersection of SW 71st Avenue and Highway 99W would exceed applicable mobility targets in the PM peak hour, though this is a minor intersection and it is assumed that traffic would instead use the immediately adjacent signalized intersections of SW 69th Avenue or SW 72nd Avenue.

Table 4.3-2. Segment C 2035 No-Build Alternative HCM (Synchro) Analysis – Tigard Subarea (Tigard Downtown and Tigard Triangle) *(multipage table)*

					AM				PM			
ID	Intersection	Mobility Target		Control	Delay	LOS	V/C	WLANE	Delay	LOS	V/C	WLANE
C2	SW Hall Blvd./Hwy. 99W	ODOT	1.10	Signal	34.6	C	0.80	-	64.0	E	0.92	-
C3	SW Greenburg Rd./ SW Main St./Hwy. 99W	ODOT	1.10	Signal	35.6	D	0.71	-	36.4	D	0.78	-
C9a	SW Hall Blvd./ SW Hunziker St./ SW Scoffins St. (north)	ODOT	1.10	Signal	17.1	B	0.67	-	43.9	D	0.89	-
C9B	SW Hall Blvd./ SW Hunziker St./ SW Scoffins St. (south)	ODOT	1.10	Signal	18.5	B	0.59	-	28.9	C	0.67	-
C10	SW Hall Blvd./ SW Commercial St.	ODOT	1.10	TWSC	1.8 [41.6]	A [E]	[0.17]	EBLn1	5.10 [106.6]	A [F]	[0.37]	EBLn1
C11	SW Hall Blvd./ SW Burnham St.	ODOT	1.10	Signal	9.2	A	0.55	-	14.2	B	0.65	-
C40	Light rail crossing/ SW Hunziker St.	N/A	N/A	RR	-	-	-	-	-	-	-	-
C41	Hall Station/ SW Hunziker St.	Tigard	1.00	TWSC	-	-	-	-	-	-	-	-
C13	SW 72nd Ave./ SW Dartmouth St.	Tigard	1.00	Signal	-	-	-	-	18.6	B	0.67	-

Table 4.3-2. Segment C 2035 No-Build Alternative HCM (Synchro) Analysis – Tigard Subarea (Tigard Downtown and Tigard Triangle) *(multipage table)*

ID	Intersection	Mobility Target		Control	AM				PM			
					Delay	LOS	V/C	WLANE	Delay	LOS	V/C	WLANE
C15	SW 72nd Ave./ SW Beveland St.	Tigard	1.00	Signal	-	-	-	-	23.9	C	0.72	-
C17	SW 65th Ave./ SW Haines St./ I-5 NB ramps	ODOT Ramp	0.85	AWSC	**30.1 [41.2]**	**D [E]**	**0.88**	**NBLn1**	**51.9 [83.2]**	**F [F]**	**1.04**	**NBLn1**
C18	SW 68th Pkwy./ SW Atlanta St.	Tigard	1.00	AWSC	18.1 [28.8]	C [D]	0.79	WBLn1	14.3 [16.2]	B [C]	0.50	WBLn3
C19	SW 68th Pkwy./ SW Dartmouth St./ I-5 SB ramps	ODOT Ramp	0.85	Signal	24.1	C	0.55	-	29.2	C	0.66	-
C20a	SW Hall Blvd./ Existing Railroad (WES)	N/A	N/A	Railroad Signal	3	A	0.46	-	3.60	A	0.52	-
B37	I-5 NB off-ramp/ SW 60th Ave.	ODOT Ramp	0.85	Signal	37.8	D	0.43	-	44.7	D	0.44	-
B38	SW Barbur Blvd./ SW 60th Ave.	ODOT/ PBOT 1st HR	0.99	Signal	26.5	C	0.54	-	26.7	C	0.56	-
B39a	I-5 SB off-ramp/ SW Barbur Blvd./ SW 64th Ave.	ODOT Ramp	0.85	Signal	37.8	D	0.74	-	40.0	D	0.82	-
B39b	I-5 NB on-ramp/ SW Barbur Blvd./ SW 64th Ave.	ODOT Ramp	0.85	Signal	13.1	B	0.49	-	10.4	B	0.37	-
C42	SW 68th Ave./Hwy. 99W	ODOT	1.10	Signal	20.1	C	0.86	-	26.2	C	0.86	-
C43	SW 68th Ave./ Park and Ride	Tigard	1.00	TWSC	-	-	-	-	-	-	-	-
C44	SW 72nd Ave./Hwy. 99W	ODOT	1.10	Signal	29.8	C	0.81	-	49.8	D	0.91	-
C46	SW 72nd Ave./ Elmhurst St.	Tigard	1.00	TWSC	-	-	-	-	1.50 [37.8]	A [E]	[0.29]	WBLn1

Note: AWSC = all-way stop control; HCM = Highway Capacity Manual; ID = Intersection Identification #; Ln = lane; LOS = Level of Service; ODOT: Oregon Department of Transportation; NB = northbound; RR = railroad; SB = southbound; TWSC = two-way stop control; V/C = volume-to-capacity; WB = westbound; WES = Westside Express Service (Commuter Rail); WLANE = worst lane. "-" represents "not applicable"

Key: [Worst stop-controlled delay] for TWSC intersections.

V/C represents intersection average for signals and worst movement for stop-controlled intersections.

Table 4.3-3. Segment C 2035 No-Build Alternative HCM (Synchro) PM Analysis – Tigard Subarea (SW Bonita Road)

ID	Intersection	Mobility Target		Control	Delay	LOS	V/C	WLANE
C20b	SW Bangy Rd./SW Bonita Rd.	Lake Oswego	LOS E	Signal	17.4	B	0.65	-
C21	SW Sequoia Pkwy./SW Bonita Rd.	Tigard	1.00	Signal	11.7	B	0.65	-
C22	SW 72nd Ave./SW Bonita Rd.	Tigard	1.00	Signal	50.3	D	0.85	-

Note: HCM = Highway Capacity Manual; LOS = Level of Service; V/C = volume-to-capacity; WLANE = worst lane.

Key: V/C represents intersection average for signals and worst movement for stop-controlled intersections.

SW Carman Drive/SW Upper Boones Ferry Road Subarea

Table 4.3-4 shows the Synchro analysis results under the No-Build Alternative for the existing AM and PM peak hours in this subarea of Segment C. Eight intersections were analyzed during the PM peak hour for

this subarea, and six intersections were analyzed in the AM peak hour. Figures depicting turn volumes are shown in Appendix B1. More details on HCM operations analysis can be found in Appendix B34.

All of the intersections analyzed during the AM peak hour would operate within applicable mobility targets. During the PM peak hour, the I-5 northbound ramp terminal is expected to exceed the ODOT mobility target. Data available for the existing Portland & Western Railroad crossing indicates that train traffic does not cross at this location on the average day during the PM peak hour; therefore, traffic along SW Upper Boones Ferry and SW 72nd Avenue is not impacted by train traffic and operational outputs are not available.

Table 4.3-4. Segment C 2035 No-Build Alternative HCM (Synchro) Analysis – SW Carman Drive/SW Upper Boones Ferry Road Subarea

ID	Intersection	Note	Mobility Target		Control	AM				PM			
						Delay	LOS	V/C	WLANE	Delay	LOS	V/C	WLANE
C23	I-5 NB ramps/SW Carman Dr./SW Upper Boones Ferry Rd.		ODOT Ramp	0.85	Signal	35.0	D	0.82	-	**41.1**	**D**	**0.88**	**-**
C24	I-5 SB ramps/SW Upper Boones Ferry Rd.		ODOT Ramp	0.85	Signal	27.7	C	0.80	-	18.5	B	0.68	-
C26	SW Sequoia Pkwy./SW Upper Boones Ferry Rd.	1	Tigard	1.00	Signal	13.1	B	0.53	-	16.3	B	0.56	-
C27	SW 72nd Ave. (north)/SW Upper Boones Ferry Rd.	1	Tigard	1.00	Signal	25.8	C	0.82	-	40.8	D	0.96	-
C28	SW Upper Boones Ferry Rd./SW 72nd Ave. (south)	1, 2	Tigard	1.00	Signal	-	-	-	-	17.3	B	0.78	-
C29	SW Durham Rd./SW Upper Boones Ferry Rd.	1, 2	Tigard	1.00	Signal	-	-	-	-	44.0	D	0.88	-
C30a	SW Upper Boones Ferry Rd./RR		N/A	N/A	Railroad	0.20	A	0.34	-	-	-	-	-
C47	SW 72nd Ave./RR		N/A	N/A	Railroad	0.50	A	0.35	-	-	-	-	-

Note: HCM = Highway Capacity Manual; I-5 = Interstate 5; ID = Intersection Identification #; LOS = Level of Service; ODOT: Oregon Department of Transportation; NB = northbound; RR = railroad; SB = southbound; V/C = volume-to-capacity; WLANE = worst lane. "-" represents "not applicable"

Delay = Average vehicle delay (seconds).

V/C represents intersection average for signals and worst movement for stop-controlled intersections.

[1] Intersection reflects RTP Financially Constrained Project in future year 2035 analysis.

[2] PM only

Bridgeport Subarea

Table 4.3-5 shows the Synchro analysis results under the No-Build Alternative for the AM and PM peak hours in the Bridgeport subarea of Segment C. Eight intersections were analyzed during the PM peak hour for this subarea, and one intersection was analyzed in the AM peak hour. Figures depicting turn volumes are shown in Appendix B1. More details on HCM operations analysis can be found in Appendix B35.

During the AM peak hour, the one analyzed intersection in the Bridgeport subarea would operate within applicable mobility targets. During the PM peak hour, the I-5 northbound ramp terminal is expected to exceed the mobility target, while the intersection of SW Travelers Lane/SW Lower Boones Ferry Road at the existing park and ride access is expected to exceed the mobility target.

Table 4.3-5. Segment C 2035 No-Build Alternative HCM (Synchro) Analysis – Bridgeport Subarea

ID	Intersection	Note	Mobility Target		Control	AM				PM			
						Delay	LOS	V/C	WLANE	Delay	LOS	V/C	WLANE
C30b	SW 65th Ave./SW Lower Boones Ferry Rd.	1	Wash. Co.	0.99	Signal	-	-	-	-	46.3	D	0.81	-
C31	I-5 NB ramps/SW Lower Boones Ferry Rd.	1	ODOT Ramp	0.85	Signal	-	-	-	-	**23.7**	**C**	**0.91**	-
C32	I-5 SB ramps/SW Lower Boones Ferry Rd.	1	ODOT Ramp	0.85	Signal	-	-	-	-	11.7	B	0.70	-
C33	SW 72nd Ave./SW Lower Boones Ferry Rd.		Wash. Co.	0.99	Signal	35.6	D	0.71	-	44.6	D	0.85	-
C34	SW 72nd Ave./Bridgeport Station	1	Tigard	1.00	Signal	-	-	-	-	13.7	B	0.49	-
C35	SW 72nd Ave./ SW Durham Rd.	1	Tigard	1.00	Signal	-	-	-	-	15.5	B	0.84	-
C36	Park and ride access/ SW Lower Boones Ferry Rd.	1	Wash. Co.	0.99	TWSC	-	-	-	-	0.6 [14.0]	A [B]	[0.15]	WBLn1
C37	SW Travelers Ln./park and ride access/SW Lower Boones Ferry Rd.	1	Wash. Co.	0.99	TWSC	-	-	-	-	**13.1 [240.1]**	**B [F]**	**[1.11]**	**EBLn1**

Note: HCM = Highway Capacity Manual; I-5 = Interstate 5; ID = Intersection Identification #; LOS = Level of Service; ODOT: Oregon Department of Transportation; NB = northbound; RR = railroad; SB = southbound; TWSC = two-way stop control; V/C = volume-to-capacity; WLANE = worst lane.

Delay = Average vehicle delay (seconds). "-" represents "not applicable"

Delay, LOS, and V/C ratio reported for average and worst approach for TWSC.

[1] PM only

2035 No-Build Alternative Intersection Operations Summary

The one intersection analyzed during the AM peak hour in Segment C is expected to exceed applicable operating standards. Five intersections in Segment C would fail to meet applicable operating standards in the PM peak hour under the No-Build Alternative in 2035:

- **SW 65th Avenue at SW Haines Street/I-5 northbound ramps.** This intersection would continue to operate as an all-way stop, and the northbound traffic must use a shared lane, which operates above capacity in both the AM peak hour (V/C = 0.88) and in the PM peak hour (V/C = 1.08). Most of the northbound movements are traveling through the intersection after exiting northbound I-5 at Exit 293 (SW Haines Street).

- **I-5 northbound ramps at SW Carman Drive.** During the PM peak hour, this intersection would exceed ODOT's mobility target. The large volume of traffic getting onto the freeway from the west would approach its capacity and cut into the green time of the opposing traffic because of split phasing for eastbound and westbound approaches.

- **I-5 northbound ramps at SW Lower Boones Ferry Road.** During the PM peak hour, this intersection would exceed ODOT's mobility target.

- **SW Travelers Lane/SW Lower Boones Ferry Road at the Bridgeport Park and Ride access.** This TWSC intersection would exceed Washington County mobility targets in the PM peak hour. Traffic on the side streets would experience long delays attempting to turn left onto SW Travelers Lane/SW Lower Boones Ferry Road.

2045 No-Build Alternative Intersection Operations

A supplemental analysis was conducted at the Segment C freeway ramp terminals for a forecast year of 2045; only the PM peak period was analyzed. As shown in Table 4.3-6, Table 4.3-7 and Table 4.3-8 for each of the subareas, three of the six ramp terminals in Segment C would fail to meet applicable operating standards under the No-Build Alternative in forecast year 2045; this is the same as for forecast year 2035. More details on HCM operations analysis can be found in Appendix B36, Appendix B37, and Appendix B38.

Table 4.3-6. Segment C 2045 No-Build Alternative HCM (Synchro) Analysis – Tigard Subarea

							PM	
ID	Intersection	Mobility Target		Control	Delay	LOS	V/C	WLANE
C17	SW 65th Ave./SW Haines St./I-5 NB ramps	ODOT Ramp	0.85	AWSC	**58.5 [90.6]**	**F [F]**	**1.08**	**NBLn1**
C19	SW 68th Pkwy./SW Dartmouth St./I-5 SB ramps	ODOT Ramp	0.85	Signal	30.0	C	0.68	-
B37	SW Barbur Blvd./SW 60th Ave.	ODOT Ramp	0.85	Signal	45.6	D	0.49	-
B38	I-5 NB off-ramp/SW 60th Ave.	ODOT Ramp	0.85	Signal	29.5	C	0.59	-
B39a	I-5 SB off-ramp/SW Barbur Blvd./SW 64th Ave.	ODOT Ramp	0.85	Signal	40.0	D	0.82	-
B39b	I-5 NB on ramp/SW Barbur Blvd./SW 64th Ave.	ODOT Ramp	0.85	Signal	11.3	B	0.40	-

Note: HCM = Highway Capacity Manual; I-5 = Interstate 5; ID = Intersection Identification #; Ln = lane; LOS = Level of Service; ODOT = Oregon Department of Transportation; NB = northbound; SB = southbound; V/C = volume-to-capacity; WLANE = worst lane.

Key: V/C represents intersection average for signals and worst movement for stop-controlled intersections.

Table 4.3-7. Segment C 2045 No-Build Alternative HCM (Synchro) Analysis – SW Carman Drive/SW Upper Boones Ferry Road Subarea

							PM	
ID	Intersection	Mobility Target		Control	Delay	LOS	V/C	WLANE
C23	I-5 NB ramps/SW Carman Dr./Upper Boones Ferry Rd.	ODOT Ramp	0.85	Signal	**45.7**	**D**	**0.91**	**-**
C24	I-5 SB ramps/SW Upper Boones Ferry Rd.	ODOT Ramp	0.85	Signal	19.1	B	0.70	-

Note: HCM = Highway Capacity Manual; I-5 = Interstate 5; ID = Intersection Identification #; LOS = Level of Service; ODOT = Oregon Department of Transportation; NB = northbound; SB = southbound; V/C = volume-to-capacity; WLANE = worst lane.

Key: V/C represents intersection average for signals and worst movement for stop-controlled intersections.

Table 4.3-8. Segment C 2045 No-Build Alternative HCM (Synchro) Analysis – Bridgeport Subarea

								PM	
ID	Intersection	Note	Mobility Target		Control	Delay	LOS	V/C	WLANE
C31	I-5 NB ramps/SW Lower Boones Ferry Rd.	1	ODOT Ramp	0.85	Signal	**31.0**	**D**	**0.97**	**-**
C32	I-5 SB ramps/SW Lower Boones Ferry Rd.	1	ODOT Ramp	0.85	Signal	11.9	B	0.73	-

Note: HCM = Highway Capacity Manual; I-5 = Interstate 5; ID = Intersection Identification #; LOS = Level of Service; ODOT = Oregon Department of Transportation; NB = northbound; SB = southbound; V/C = volume-to-capacity; WLANE = worst lane. "-" represents "not applicable"

Key: V/C represents intersection average for signals and worst movement for stop-controlled intersections.

[1] Intersection analysis completed as part of 2016 Southwest Corridor study with review by ODOT, PBOT and Metro.

2035 Preferred Alternative Intersection Operations

Tigard Subarea

Table 4.3-9. through Table 4.3-10. show the Synchro analysis results for the Preferred Alternative for the AM and PM peak hours for the Tigard subarea in Segment C. Figures depicting turn volumes are shown in Appendix B1. More details on HCM operations analysis can be found in Appendix B39. It should be noted that under the Preferred Alternative, some intersections will have their intersection control or lane

configurations modified from the No-Build Alternative configuration; the "control" column indicates the assumed traffic control.

Mobility targets for the appropriate jurisdiction are shown for every intersection. Intersection results that do not meet these mobility targets in a particular peak hour are shaded gray. The worst lane group is listed under the WLANE columns for TWSC intersections.

Compared to the No-Build Alternative, the Preferred Alternative would have the same intersections that would exceed operational standards during the AM and PM peak hours .

Table 4.3-9. Segment C 2035 Preferred Alternative HCM (Synchro) Analysis – Tigard Subarea *(multipage table)*

ID	Intersection	Mobility Target		Control	AM				PM			
					Delay	LOS	V/C	WLANE	Delay	LOS	V/C	WLANE
C2	SW Hall Blvd. at Hwy. 99W	ODOT	1.10	Signal	34.4	C	0.78	-	62.0	E	0.91	-
C3	SW Greenburg Rd./SW Main St. at Hwy. 99W	ODOT	1.10	Signal	35.2	D	0.69		37.5	D	0.81	-
C9a/b	SW Hall Blvd. at SW Hunziker St./SW Scoffins St.	ODOT	1.10	Signal	18.5	B	0.57		28.5	C	0.78	-
C10	SW Hall Blvd. at SW Commercial St.	ODOT	1.10	Signal	5.6	A	0.51		9.5	A	0.70	-
C11	SW Hall Blvd. at SW Burnham St.	ODOT	1.10	Signal	9.1	A	0.53		14.1	B	0.67	-
C40	Light rail crossing/SW Hunziker St.		1.00	RR	13.5	B	0.25		13.9	B	0.26	-
C41	Hall Station/SW Hunziker St.	Tigard	1.00	TWSC	0.5 [12]	A [B]	0.04	NBL1	1 [20.4]	A [C]	[0.18]	NBL1
C13	SW 72nd Ave. at SW Dartmouth St.	Tigard	1.00	Signal	-	-	-	-	18.4	B	0.67	-
C15	SW 72nd Ave. at SW Beveland St.	Tigard	1.00	Signal	-	-	-	-	23.7	C	0.71	-
C17	SW 65th Ave. at SW Haines St./I-5 NB ramps	ODOT Ramp	0.85	AWSC	29.1 [40.3]	D [E]	**0.88**	NBLn1	**51.0 [79.0]**	**F [F]**	**1.05**	**NBLn1**
C18	SW 68th Pkwy. at SW Atlanta St.	Tigard	1.00	AWSC	17.9 [27.6]	C [D]	0.77	WBLn1	14.7 [19.0]	B[C]	0.59	WBLn1
C19	SW 68th Pkwy. at SW Dartmouth St./I-5 SB ramps	ODOT Ramp	0.85	Signal	24.4	C	0.56	-	29.2	C	0.66	-
C20a	SW Hall Blvd. at existing railroad (WES)	N/A	N/A	Railroad	2.9	A	0.44	-	3.8	A	0.55	-
B37	I-5 NB off-ramp/SW 60th Ave.	ODOT Ramp	0.85	Signal	38.6	D	0.47	-	44.7	D	0.47	-
B38	SW Barbur Blvd./SW 60th Ave.	ODOT/ PBOT 1st HR	0.99	Signal	28.5	C	0.56	-	32.2	C	0.57	-
B39a	I-5 SB off-ramp/SW Barbur Blvd./SW 64th Ave.	ODOT Ramp	0.85	Signal	35.4	D	0.74	-	42.8	D	0.83	-
B39b	I-5 NB on-ramp/SW Barbur Blvd./SW 64th Ave.	ODOT Ramp	0.85	Signal	7.2	A	0.51	-	4.90	A	0.42	-
C42	SW 68th Ave./Hwy. 99W	ODOT	1.10	Signal	28.9	C	0.84	-	48.5	D	0.87	-
C43	SW 68th Ave./Park and Ride	Tigard	1.00	TWSC	2.8 [14.3]	A [B]	0.02	WBLn1	3.7 [13.6]	A [B]	[0.29]	WBLn2
C44	SW 72nd Ave./Hwy. 99W	ODOT	1.10	Signal	29.8	C	0.81	-	46.1	D	0.89	-
C45	SW 71st Ave./Hwy. 99W	ODOT	1.00	TWSC	0.30 [40.8]	A [E]	0.23	SBLn1	**11.0 [400.9]**	**B [F]**	**[1.55]**	**SBLn1**

Table 4.3-9. Segment C 2035 Preferred Alternative HCM (Synchro) Analysis – Tigard Subarea *(multipage table)*

ID	Intersection	Mobility Target		Control	AM				PM			
					Delay	LOS	V/C	WLANE	Delay	LOS	V/C	WLANE
C46	SW 72nd Ave./Elmhurst St./light rail	Tigard	1.00	TWSC	-	-	-	-	1.2	A	[0.24]	-

Note: AWSC = all-way stop control; HCM = Highway Capacity Manual; I-5 = Interstate 5; ID = Intersection Identification #; Ln = lane; LOS = Level of Service; ODOT = Oregon Department of Transportation; NB = northbound; SB = southbound; TWSC = two-way stop control; V/C = volume-to-capacity; WB = westbound; WES = Westside Express Service (Commuter Rail); WLANE = worst lane. "-" represents "not applicable"

Key: [Worst stop-controlled delay] for TWSC intersections.

V/C represents intersection average for signals and worst movement for stop-controlled intersections.

Table 4.3-10. Segment C 2035 Preferred Alternative HCM (Synchro) Analysis – Tigard Subarea (SW Bonita Road)

ID	Intersection	Mobility Target		Control	PM			
					Delay	LOS	V/C	WLANE
C20	SW Bangy Rd./SW Bonita Rd.	Lake Oswego	LOS E	Signal	17.4	B	0.65	-
C21	SW Sequoia Pkwy./SW Bonita Rd.	Tigard	1.00	Signal	11.7	B	0.65	-
C22	SW 72nd Ave./SW Bonita Rd.	Tigard	1.00	Signal	50.3	D	0.85	-

Note: HCM = Highway Capacity Manual; ID = Intersection Identification #; LOS = Level of Service; V/C = volume-to-capacity; WLANE = worst lane.

Key: V/C represents intersection average for signals and worst movement for stop controlled intersections. "-" represents "not applicable"

Of the two intersections that would exceed their mobility target under the Preferred Alternative in the Tigard subarea, one would result in operational impacts that meet the V/C ratio threshold for mitigation. Queuing impacts are summarized in the next section.

AM and PM peak hours:

- **SW 71st Avenue at Highway 99W.** This intersection is currently a two-way stop, and the southbound traffic must use a shared lane, which already operates above capacity (V/C = 1.32) in the No-Build Alternative PM peak hour. The expected increase in the V/C ratio to 1.55 under the Preferred Alternative would meet the threshold for triggering mitigation; however, because it is reasonable to assume that vehicles would use the signalized intersection of SW 69th Avenue or SW 72nd Avenue at Highway 99W instead of waiting for a gap in traffic, mitigation is not triggered at this location.
- **SW 65th Avenue at SW Haines Street/I-5 northbound ramps.** Some of the 68th Park and Ride trips would have to travel through this intersection, which would add additional demand to an intersection that already would exceed mobility targets under the No-Build Alternative. The expected increase in the V/C ratio of 0.01 is below the threshold for triggering mitigation.

SW Carman Drive/SW Upper Boones Ferry Road Subarea

Table 4.3-11. shows the Synchro analysis results for the Preferred Alternative for the AM and PM peak hours for the SW Carman Drive/SW Upper Boones Ferry Road subarea. Figures depicting turn volumes are shown in Appendix B1. More details on HCM operations analysis can be found in Appendix B40. During the PM peak hour, the I-5 northbound ramp terminal at SW Carman Drive/Upper Boones Ferry Road is expected to continue to exceed mobility targets under the Preferred Alternative. Similar to the No-Build Alternative during the AM peak hour, all analyzed intersections are expected to meet mobility targets.

Table 4.3-11. Segment C 2035 Preferred Alternative HCM (Synchro) Analysis – SW Carman Drive/SW Upper Boones Ferry Road Subarea

ID	Intersection	Note	Mobility Target		Control	AM				PM			
						Delay	LOS	V/C	WLANE	Delay	LOS	V/C	WLANE
C23	I-5 NB ramps/SW Carman Dr./Upper Boones Ferry Rd.		ODOT Ramp	0.85	Signal	39.0	D	0.82	-	**41.1**	**D**	**0.88**	**-**
C24	I-5 SB ramps/SW Upper Boones Ferry Rd.		ODOT Ramp	0.85	Signal	24.1	C	0.83	-	18.5	B	0.68	-
C26	SW Sequoia Pkwy./SW Upper Boones Ferry Rd.	1	Tigard	1.00	Signal	14.1	B	0.51	-	16.3	B	0.56	-
C27	SW 72nd Ave. (north)/SW Upper Boones Ferry Rd.	1	Tigard	1.00	Signal	25.8	C	0.82	-	39.7	D	0.96	-
C28	SW Upper Boones Ferry Rd./SW 72nd Ave. (south)	1	Tigard	1.00	Signal	-	-	-	-	17.3	B	0.78	-
C29	SW Durham Rd./SW Upper Boones Ferry Rd.	1	Tigard	1.00	Signal	-	-	-	-	47.9	D	0.87	-
C30a	SW Upper Boones Ferry Rd at railroad				Railroad	7.1	A	0.35	-	7.3	A	0.33	-
C47	SW 72nd Ave./railroad		Tigard	1.00	Railroad	7.8	A	0.36	-	8.9	A	0.44	-

Note: HCM = Highway Capacity Manual; I-5 = Interstate 5; ID = Intersection Identification #; LOS = Level of Service; ODOT = Oregon Department of Transportation; V/C = volume-to-capacity; WLANE = worst lane. "-" represents "not applicable"

Key: V/C represents intersection average for signals and worst movement for stop controlled intersections.

[1] Intersection reflects RTP Financially Constrained Project in future year 2035 analysis.

PM peak hour:

- **SW Carman Drive/I-5 northbound ramps.** Although the intersection is expected to exceed applicable mobility targets under the Preferred Alternative, the V/C ratio is not expected to increase from the No-Build Alternative condition, and therefore would not meet the threshold for triggering mitigation.

Bridgeport Subarea

Two scenarios were evaluated for the Bridgeport subarea: a 950-space park and ride and a 700-space park and ride.[3]

Bridgeport 950-Space Park and Ride

Table 4.3-12. shows Synchro analysis results for the Preferred Alternative for the AM and PM peak hour for the Bridgeport subarea with a 950-space park and ride. Figures depicting turn volumes are shown in Appendix B1. More details on HCM operations analysis can be found in Appendix B41.

During the PM peak hour, the I-5 northbound ramp terminal is expected to continue to exceed mobility targets. All other intersections are expected to meet applicable mobility targets. The intersection of the Bridgeport Park and Ride access at SW Travelers Lane/SW Lower Boones Ferry Road would become signalized as part of the Preferred Alternative, and the V/C ratio would improve compared to the No-Build Alternative condition.

[3] These park and ride capacities differ from those reported in elsewhere in the Final EIS due to rounding. The traffic analysis applies to the 710- and 960-space park and ride scenarios described elsewhere in the Final EIS.

The single intersection analyzed in the AM peak hour is expected to meet applicable mobility targets.

Table 4.3-12. Segment C 2035 Preferred Alternatives HCM (Synchro) Analysis – Bridgeport Subarea with 950-Space Park and Ride

ID	Intersection	Note	Mobility Target		Control	AM				PM			
						Delay	LOS	V/C	WLANE	Delay	LOS	V/C	WLANE
C30b	SW 65th Ave./SW Lower Boones Ferry Rd.	1	Wash. Co.	0.99	Signal	-	-	-	-	46.7	D	0.81	-
C31	I-5 NB ramps/SW Lower Boones Ferry Rd.	1	ODOT Ramp	0.85	Signal	-	-	-	-	**27.2**	**C**	**0.94**	**-**
C32	I-5 SB ramps/SW Lower Boones Ferry Rd.	1	ODOT Ramp	0.85	Signal	-	-	-	-	12.3	B	0.71	-
C33	SW 72nd Ave./SW Lower Boones Ferry Rd.	1	Wash. Co.	0.99	Signal	39.7	D	0.75	-	51.8	D	0.90	-
C34	SW 72nd Ave./Bridgeport Station	1	Tigard	1.00	Signal	-	-	-	-	12.9	B	0.47	-
C35	SW 72nd Ave./SW Durham Rd.	1	Tigard	1.00	Signal	-	-	-	-	15.1	B	0.83	-
C36	Park and ride access/SW Lower Boones Ferry Rd.	1	Wash. Co.	0.99	TWSC	-	-	-	-	2.9 [23.9]	A [C]	[0.62]	WBLn1
C37	SW Travelers Ln./park and ride access/SW Lower Boones Ferry Rd.	1	Wash. Co.	0.99	Signal	-	-	-	-	18.8	B	0.86	-

Note: HCM = Highway Capacity Manual; I-5 = Interstate 5; ID = Intersection Identification #; Ln = lane; LOS = Level of Service; NB = northbound; ODOT = Oregon Department of Transportation; SB = southbound; TWSC = two-way stop control; V/C = volume-to-capacity; WB = westbound; WLANE = worst lane. "-" represents "not applicable"

Key: [Worst stop-controlled delay] for TWSC intersections.

V/C represents intersection average for signals and worst movement for stop-controlled intersections.

[1] Intersection analysis completed as part of 2016 Southwest Corridor study with review by ODOT, PBOT and Metro.

PM peak hour:

- **SW Lower Boones Ferry Road/I-5 northbound ramps.** Although the intersection is expected to exceed applicable mobility targets under the Preferred Alternative, the V/C ratio is expected to increase by 0.03 from the No-Build Alternative condition, and therefore would not meet the threshold for triggering mitigation.

Bridgeport 700-Space Park and Ride

Table 4.3-13 shows Synchro analysis results for the Preferred Alternative for the AM and PM peak hour for the Bridgeport subarea with a 700-space park and ride. Figures depicting turn volumes are shown in Appendix B1. More details on HCM operations analysis can be found in Appendix B41.

During the PM peak hour, the I-5 northbound ramp terminal is expected to continue to exceed mobility targets. All other intersections are expected to meet applicable mobility targets. The intersection of the Bridgeport Park and Ride access at SW Travelers Lane/SW Lower Boones Ferry Road would become signalized as part of the Preferred Alternative, and the V/C ratio would improve compared to the No-Build Alternative condition.

The single intersection analyzed in the AM peak hour is expected to meet applicable mobility targets.

Table 4.3-13. Segment C 2035 Preferred Alternative HCM (Synchro) Analysis – Bridgeport Subarea with 700-Space Park and Ride

ID	Intersection	Note	Mobility Target		Control	AM				PM			
						Delay	LOS	V/C	WLANE	Delay	LOS	V/C	WLANE
C30b	SW 65th Ave./SW Lower Boones Ferry Rd.	1	Wash. Co.	0.99	Signal	-	-	-	-	46.6	D	0.81	-
C31	I-5 NB ramps/SW Lower Boones Ferry Rd.	1	ODOT Ramp	0.85	Signal	-	-	-	-	**25.8**	**C**	**0.93**	**-**
C32	I-5 SB ramps/SW Lower Boones Ferry Rd.	1	ODOT Ramp	0.85	Signal	-	-	-	-	12	B	0.71	-
C33	SW 72nd Ave./SW Lower Boones Ferry Rd.	1	Wash. Co.	0.99	Signal	37.3	D	0.72	-	46.2	D	0.88	-
C34	SW 72nd Ave./Bridgeport Station	1	Tigard	1.00	Signal	-	-	-	-	12.9	B	0.47	-
C35	SW 72nd Ave./SW Durham Rd.	1	Tigard	1.00	Signal	-	-	-	-	14.8	B	0.82	-
C36	Park and ride access/SW Lower Boones Ferry Rd.	1	Wash. Co.	0.99	TWSC	-	-	-	-	1.4 [17.2]	A [C]	0.38	WBLn1
C37	SW Travelers Ln./park and ride access/SW Lower Boones Ferry Rd.	1	Wash. Co.	0.99	Signal	-	-	-	-	13.3	B	0.77	-

Note: HCM = Highway Capacity Manual; I-5 = Interstate 5; ID = Intersection Identification #; Ln = lane; LOS = Level of Service; NB = northbound; ODOT = Oregon Department of Transportation; SB = southbound; TWSC = two-way stop control; V/C = volume-to-capacity; WB = westbound; WLANE = worst lane. "-" represents "not applicable"

Key: [Worst stop-controlled delay] for TWSC intersections.

V/C represents intersection average for signals and worst movement for stop-controlled intersections.

[1] Intersection analysis completed as part of 2016 Southwest Corridor study with review by ODOT, PBOT and Metro.

PM peak hour:

- **SW Lower Boones Ferry Road/I-5 northbound ramps.** Although the intersection is expected to exceed applicable mobility targets under the Preferred Alternative, the V/C ratio is expected to increase by 0.02 from the No-Build Alternative condition, and therefore would not meet the threshold for triggering mitigation.

Terminus Options – Tigard Subarea

Table 4.3-14 shows Synchro analysis results under the terminus options for the AM and PM peak hours in the Tigard Subarea of Segment C. Operations analysis was conducted only for the Tigard Subarea with respect to the terminus options. More details on HCM operations analysis can be found in Appendix B39.[4]

Intersection performance for the terminus options would generally be similar to that of the Preferred Alternative. The intersection of SW 65th Avenue at SW Haines Street/I-5 NB ramps would exceed mobility targets in 2035 and exceed the mitigation threshold as compared to the No-Build Alternative. Mitigation is proposed for this impact and discussed in Chapter 3 of the Final EIS.

[4] In Appendix B39, the terminus options are referred to as the "Build MOS."

Table 4.3-14. Segment C 2035 Terminus Options HCM (Synchro) Analysis – Tigard Subarea

ID	Intersection	Mobility Target		Control	AM				PM			
					Delay	LOS	V/C	WLANE	Delay	LOS	V/C	WLANE
C2	SW Hall Blvd. at Hwy. 99W	ODOT	1.10	Signal	33.5	C	0.77	-	60.6	E	0.90	-
C3	SW Greenburg Rd./SW Main St. at Hwy. 99W	ODOT	1.10	Signal	35.3	D	0.69	-	42.1	D	0.80	-
C9a/b	SW Hall Blvd. at SW Hunziker St./SW Scoffins St.	ODOT	1.10	Signal	21.6	C	0.66	-	30.2	C	0.77	-
C10	SW Hall Blvd. at SW Commercial St.	ODOT	1.10	Signal	6.2	A	0.58	-	10.8	B	0.72	-
C11	SW Hall Blvd. at SW Burnham St.	ODOT	1.10	Signal	9.2	A	0.56	-	14.5	B	0.69	-
C40	Light rail crossing/SW Hunziker St.		1.00	RR	14.4	B	0.31	-	14.3	B	0.28	-
C41	Hall Station/SW Hunziker St.	Tigard	1.00	TWSC	1.4 [13.6]	A [B]	0.13	NBL1	2.3 [17.7]	A [C]	0.35	NBL1
C13	SW 72nd Ave. at SW Dartmouth St.	Tigard	1.00	Signal	-	-	-	-	18.7	B	0.68	-
C15	SW 72nd Ave. at SW Beveland St.	Tigard	1.00	Signal	-	-	-	-	23.6	C	0.71	-
C17	SW 65th Ave. at SW Haines St./I-5 NB ramps	ODOT Ramp	0.85	AWSC	32.3 [47.6]	D [E]	0.93	NBL1	51 [79]	F [F]	1.05	NBL1
C18	SW 68th Pkwy. at SW Atlanta St.	Tigard	1.00	AWSC	25.2 [48]	D [E]	0.90	WBL1	15.6 [17.1]	C [C]	0.61	WBL1
C19	SW 68th Pkwy. at SW Dartmouth St./I-5 SB ramps	ODOT Ramp	0.85	Signal	24.7	C	0.57	-	30.6	C	0.69	-
C20a	SW Hall Blvd. at existing railroad (WES)	N/A	N/A	Railroad	3.1	A	0.47	-	3.9	A	0.56	-
B37	I-5 NB off-ramp/SW 60th Ave.	ODOT Ramp	0.85	Signal	38.7	D	0.47	-	44.9	D	0.46	-
B38	SW Barbur Blvd./SW 60th Ave.	ODOT/ PBOT 1st HR	0.99	Signal	29.3	C	0.56	-	31.7	C	0.57	-
B39a	I-5 SB off-ramp/SW Barbur Blvd./SW 64th Ave.	ODOT Ramp	0.85	Signal	35	C	0.76	-	43.9	D	0.83	-
B39b	I-5 NB on-ramp/SW Barbur Blvd./SW 64th Ave.	ODOT Ramp	0.85	Signal	8.1	A	0.52	-	6.1	A	0.43	-
C42	SW 68th Ave./Hwy. 99W	ODOT	1.10	Signal	27.1	C	0.83	-	46.4	D	0.86	-
C43	SW 68th Ave./Park and Ride	Tigard	1.00	TWSC	2.6 [8]	A [A]	0.10	SBL	3.6 [13]	A [B]	0.23	WBL2
C44	SW 72nd Ave./Hwy. 99W	ODOT	1.10	Signal	30	C	0.81	-	46	D	0.89	-
C45	SW 71st Ave./Hwy. 99W	ODOT	1.00	TWSC	0.4 [41.9]	A [E]	0.24	SBL1	10.1 [362.9]	B [F]	1.47	SBL1
C46	SW 72nd Ave./Elmhurst St./light rail	Tigard	1.00	TWSC	-	-	-	-	19.9	B	0.49	-

Note: AWSC = all-way stop control; HCM = Highway Capacity Manual; I-5 = Interstate 5; ID = Intersection Identification #; Ln = lane; LOS = Level of Service; ODOT = Oregon Department of Transportation; NB = northbound; SB = southbound; TWSC = two-way stop control; V/C = volume-to-capacity; WB = westbound; WES = Westside Express Service (Commuter Rail); WLANE = worst lane. "-" represents "not applicable"

Key: [Worst stop-controlled delay] for TWSC intersections.

V/C represents intersection average for signals and worst movement for stop-controlled intersections.

2045 Preferred Alternative Intersection Operations

As shown in Table 4.3-15, Table 4.3-16, Table 4.3-17 and Table 4.3-18, the 2045 Preferred Alternative generally would add traffic to the ramp terminals, but no additional intersections would exceed operational standards beyond the same three that would exceed standards for the 2035 Preferred Alternative in the PM peak hour. Mitigation would not be triggered at any intersection location because the increase in V/C compared to the No-Build Alternative does not meet the mitigation threshold. See the previous section, which summarizes the impacts from the 2035 Preferred Alternative, for a discussion of the intersections that would be significantly impacted in year 2045 as well. More details on 2045 HCM operations analysis can be found in Appendix B42, Appendix B43, and Appendix B44.

Table 4.3-15. Segment C 2045 Preferred Alternative HCM (Synchro) Analysis – Tigard Subarea*)*

ID	Tigard Subarea	Mobility Target		Control	PM			
					Delay	LOS	V/C	WLANE
C17	SW 65th Ave./SW Haines St./I-5 NB ramps	ODOT Ramp	0.85	AWSC	**68.8 [102.3]**	**F [F]**	**1.11**	**NBLn1**
C19	SW 68th Pkwy./SW Dartmouth St./I-5 SB ramps	ODOT Ramp	0.85	Signal	**30**	**C**	**0.69**	-
B37	SW Barbur Blvd./SW 60th Ave.	ODOT Ramp	0.85	Signal	45.9	D	0.51	-
B38	I-5 NB off-ramp/SW 60th Ave.	ODOT Ramp	0.85	Signal	34.1	C	0.60	-
B39a	I-5 SB off-ramp/SW Barbur Blvd./SW 64th Ave.	ODOT Ramp	0.85	Signal	42.3	D	0.82	-
B39b	I-5 northbound on ramp/SW Barbur Blvd./SW 64th Ave.	ODOT Ramp	0.85	Signal	5.1	A	0.44	-

Note: AWSC = all-way stop control; HCM = Highway Capacity Manual; I-5 = Interstate 5; ID = Intersection Identification #; Ln = lane; LOS = Level of Service; NB = northbound; ODOT = Oregon Department of Transportation; SB = southbound; V/C = volume-to-capacity; WLANE = worst lane. "-" represents "not applicable"

Key: V/C represents intersection average for signals and worst movement for stop-controlled intersections.

Table 4.3-16. Segment C 2045 Preferred Alternative HCM (Synchro) Analysis – SW Carman Drive/SW Upper Boones Ferry Road Subarea

ID	Intersection	Mobility Target		Control	PM			
					Delay	LOS	V/C	WLANE
C23	I-5 NB ramps/SW Carman Dr./Upper Boones Ferry Rd.	ODOT Ramp	0.85	Signal	**45.7**	**D**	**0.91**	-
C24	I-5 SB ramps/SW Upper Boones Ferry Rd.	ODOT Ramp	0.85	Signal	19.1	B	0.70	-

Table 4.3-17. Segment C 2045 Preferred Alternative HCM (Synchro) Analysis – Bridgeport Subarea with 950-Space Park and Ride

ID	Intersection	Note	Mobility Target		Control	PM			
						Delay	LOS	V/C	WLANE
C31	I-5 NB ramps/SW Lower Boones Ferry Rd.	1	ODOT Ramp	0.85	Signal	**35.4**	**D**	**1.00**	-
C32	I-5 SB ramps/SW Lower Boones Ferry Rd.	1	ODOT Ramp	0.85	Signal	12.4	B	0.75	-

Note: HCM = Highway Capacity Manual; I-5 = Interstate 5; ID = Intersection Identification #; LOS = Level of Service; NB = northbound; ODOT = Oregon Department of Transportation; SB = southbound; V/C = volume-to-capacity; WLANE = worst lane. "-" represents "not applicable"

Key: V/C represents intersection average for signals and worst movement for stop controlled intersections.

[1] Intersection analysis completed as part of 2016 Southwest Corridor study with review by ODOT, PBOT and Metro.

Table 4.3-18. Segment C 2045 Preferred Alternative HCM (Synchro) Analysis – Bridgeport Subarea with 700-Space Park and Ride

ID	Intersection	Note	Mobility Target		Control	PM			
						Delay	LOS	V/C	WLANE
C31	I-5 NB ramps/SW Lower Boones Ferry Rd.	1	ODOT Ramp	0.85	Signal	**33.6**	**C**	**0.98**	**-**
C32	I-5 SB ramps/SW Lower Boones Ferry Rd.	1	ODOT Ramp	0.85	Signal	12.0	B	0.74	-

Note: HCM = Highway Capacity Manual; I-5 = Interstate 5; ID = Intersection Identification #; LOS = Level of Service; NB = northbound; ODOT = Oregon Department of Transportation; SB = southbound; V/C = volume-to-capacity; WLANE = worst lane. "-" represents "not applicable"

Key: V/C represents intersection average for signals and worst movement for stop controlled intersections.

[1] Intersection analysis completed as part of 2016 Southwest Corridor study with review by ODOT, PBOT and Metro.

4.3.3. Segment C Future Queuing Analysis

2035 No-Build Alternative

Tigard Subarea

Table 4.3-19 through Table 4.3-22 summarize the SimTraffic analysis of the 95th percentile queues in the Tigard subarea in both the AM and PM peak periods for the No-Build Alternative. More details on queuing can be found in Appendix B45. Queuing along SW Hall Boulevard at the existing Westside Express Service (WES) Commuter Rail crossing could extend beyond the next adjacent intersection (SW Commercial Street) for vehicles traveling southbound. Queuing at the WES crossing for northbound vehicles does not appear to be a concern under the 2035 No-Build Alternative conditions. The queue on the I-5 southbound off-ramp to SW Barbur Boulevard at SW 64th Avenue would extend into the safe stopping sight distance of the ramp in the PM peak hour under the No-Build Alternative conditions.

Table 4.3-19. Segment C 2035 No-Build Alternative AM Peak 95th Percentile Queuing SimTraffic Analysis – Tigard Subarea (Downtown Tigard)

Study Intersection No.		C2	C3	C9a	C9b	C10	C11	C20a	C40	C41
Approach	Movement	SW Hall Blvd./Hwy. 99W	SW Greenburg Rd./SW Main St./Hwy. 99W	SW Hall Blvd./SW Hunziker St./SW Scoffins St. (north)	SW Hall Blvd./SW Hunziker St./SW Scoffins St. (south)	SW Hall Blvd./SW Commercial St.	SW Hall Blvd./SW Burnham St.	SW Hall Blvd./existing railroad (WES)	Light rail crossing/SW Hunziker St.	Hall Station/SW Hunziker St.
NB	Left	114	47	-	75	150	300	-		
	Thru	1,297	313	70	645	286	2,216[1]	324		
	Right	350	909	-	-	-	-	-		
SB	Left	404	425	189	-	-	-	-		
	Thru	516	1,777	292	30	21	181	149		
	Right	265	80	-	-	-	86	-		
EB	Left	335	400	-	-	-	182	-		
	Thru	648	4,335	-	522	613	-	-		
	Right	-	-	-	-	92	250	-		
WB	Left	454	247	-	-	-	-	-		
	Thru	359	329	131	-	-	-	-		
	Right	-	-	91	-	-	-	-		

N/A – SimTraffic does not calculate 95th percentile queue lengths for stop-controlled intersections.

[1] Queue may be longer than shown due to model limits.

Note: EB = eastbound; NB = northbound; SB = southbound; WB = westbound; WES = Westside Express Service (Commuter Rail).

Shading indicates that the intersection was not evaluated for this scenario and/or time period. "-" represents "not applicable"

Table 4.3-20. Segment C 2035 No-Build Alternative PM Peak 95th Percentile Queuing SimTraffic Analysis – Tigard Subarea (Downtown Tigard) ***(multipage table)***

Study Intersection No.		C2	C3	C9a	C9b	C10	C11	C20a	C40	C41
Approach	Movement	SW Hall Blvd./Hwy. 99W	SW Greenburg Rd./SW Main St./Hwy. 99W	SW Hall Blvd./SW Hunziker St./SW Scoffins St. (north)	SW Hall Blvd./SW Hunziker St./SW Scoffins St. (south)	SW Hall Blvd./SW Commercial St.	SW Hall Blvd./SW Burnham St.	SW Hall Blvd./existing railroad (WES)	Light rail crossing/SW Hunziker St.	Hall Station/SW Hunziker St.
NB	Left	350	121	38	87	150	300	-		
	Thru	1,297	463	64	708	292	2,218	326		
	Right	350	574	-	-	-	-	-		
SB	Left	500	413	190	-	-	-	-		
	Thru	1,170	1,762	320	78	471	327	290		
	Right	300	115	-	-	-	151	-		
EB	Left	335	400	-	-	-	190	-		
	Thru	648	2,228	60	189	86	-	-		
	Right	-	-	-	-	78	1,144	-		
WB	Left	593	269	-	-	-	-	-		

Table 4.3-20. Segment C 2035 No-Build Alternative PM Peak 95th Percentile Queuing SimTraffic Analysis – Tigard Subarea (Downtown Tigard) *(multipage table)*

Study Intersection No.		C2	C3	C9a	C9b	C10	C11	C20a	C40	C41
Approach	Movement	**SW Hall Blvd./**Hwy. 99W	**SW Greenburg Rd./SW Main St./**Hwy. 99W	**SW Hall Blvd./SW Hunziker** St./SW Scoffins St. (north)	**SW Hall Blvd./SW Hunziker St./SW Scoffins St. (south)**	**SW Hall Blvd./SW Commercial St.**	**SW Hall Blvd./SW Burnham St.**	**SW Hall Blvd./**existing railroad (WES)	**Light rail crossing/**SW Hunziker St.	**Hall** Station/SW Hunziker St.
	Thru	671	448	380	-	151	-	-		
	Right	-	-	946	-	-	-	-		

N/A – SimTraffic does not calculate 95th percentile queue lengths for stop-controlled intersections.

Note: EB = eastbound; NB = northbound; SB = southbound; WB = westbound; WES = Westside Express Service (Commuter Rail).

Shading indicates that the intersection was not evaluated for this scenario and/or time period. "-" represents "not applicable"

Table 4.3-21. Segment C 2035 No-Build Alternative AM Peak 95th Percentile Queuing SimTraffic Analysis – Tigard Subarea (Tigard Triangle)

Study Intersection No.		C13	C15	C17	C18	C19	B37	B38	B39a	B39b	C42	C43	C44	C45	C46
Approach	Movement	**SW 72nd Ave./SW Dartmouth St.**	**SW 72nd Ave./SW Beveland St.**	**SW 65th Ave./SW Haines St./I-5 NB ramps**	**SW 68th Pkwy./SW Atlanta St.**	**SW 68th Pkwy./SW Dartmouth St./I-5 SB ramps**	**I-5 NB off-ramp/SW 60th Ave.**	**SW Barbur Blvd./SW 60th Ave.**	**I-5 SB off-ramp/SW Barbur Blvd./SW 64th Ave.**	**I-5 NB off-ramp/SW Barbur Blvd./SW 64th Ave.**	**SW 68th Ave./Hwy. 99W**	**SW 68th Ave./park and ride**	**SW 72nd Ave./Hwy. 99W**	**SW 71st Ave./Hwy. 99W**	**SW 72nd Ave./ Elmhurst St.**
NB	Left			-	-	55	-	67	-	-	131		104	-	
	Thru			222	55	116	159	-	-	-	125		210	-	
	Right			-	-	66	-	-	-	-	48		170	-	
SB	Left			-	67	189	-	-	-	24	414		132	-	
	Thru			-	80	388	55	-	1,000	81	199		156	140	
	Right			-	-	-	-	-	-	-	-		-	-	
EB	Left			-	-	108	-	-	126	-	131		309	33	
	Thru			114	62	150	332	697	474	338	580		1,649	588	
	Right			8	-	53	-	-	-	-	-		510	-	
WB	Left			-	146	-	-	65	336	-	52		181	-	
	Thru			172	57	181	-	262	396	-	191		235	-	
	Right			-	68	-	-	-	-	-	-		-	-	
SW	Thru			-	-	-	-	-	390	-	-		-	-	

N/A – Synchro does not calculate 95th percentile queue lengths for stop-controlled intersections.

Note: EB = eastbound; I-5 = Interstate 5; NB = northbound; SB = southbound; WB = westbound, SW=southwest bound.

Shading indicates that the intersection was not evaluated for this scenario and/or time period. "-" represents "not applicable"

Table 4.3-22. Segment C 2035 No-Build Alternative PM Peak 95th Percentile Queuing SimTraffic Analysis – Tigard Subarea (Tigard Triangle)

Study Intersection No.		C13	C15	C17	C18	C19	B37	B38	B39a	B39b	C42	C43	C44	C45	C46
Approach	Movement	SW 72nd Ave./SW Dartmouth St.	SW 72nd Ave./SW Beveland St.	SW 65th Ave./SW Haines St./I-5 NB ramps	SW 68th Pkwy./SW Atlanta St.	SW 68th Pkwy./SW Dartmouth St./I-5 SB ramps	I-5 NB off-ramp/SW 60th Ave.	SW Barbur Blvd./SW 60th Ave.	I-5 SB off-ramp/SW Barbur Blvd./SW 64th Ave.	I-5 NB off-ramp/SW Barbur Blvd./SW 64th Ave.	SW 68th Ave./Hwy. 99W	SW 68th Ave./park and ride	SW 72nd Ave./Hwy. 99W	SW 71st Ave./Hwy. 99W	SW 72nd Ave./ Elmhurst St.
NB	Left	376	230	-	-	118	-	74	-	-	441		170	-	-
	Thru	492	780	323	64	267	265	-	-	-	345		988	-	145
	Right	174	386	-	-	155	-	-	-	-	115		170	-	-
SB	Left	171	114	-	69	189	-	-	-	27	157		217	-	68
	Thru	330	393	-	65	324	39	-	334	55	113		344	1,104	-
	Right	-	-	-	-	-	-	-	-	-	-		-	-	-
EB	Left	151	111	-	-	260	-	-	235	-	158		400	84	-
	Thru	228	98	170	74	327	1,019	460	291	208	535		1,637	168	-
	Right	171	-	34	-	61	-	-	-	-	-		381	-	-
WB	Left	183	274	-	79	-	-	125	362	-	217		274	-	-
	Thru	194	363	143	174	228	-	368	873	-	728		390	-	99
	Right	-	-	-	74	14	-	-	-	-	-		-	-	-
SW	Thru	-	-	-	-	-	-	-	1,133	-	-		-	-	-

N/A – SimTraffic does not calculate 95th percentile queue lengths for stop-controlled intersections.

Note: EB = eastbound; I-5 = Interstate 5; NB = northbound; SB = southbound; WB = westbound, SW=southwest bound.

Shading indicates that the intersection was not evaluated for this scenario and/or time period. "-" represents "not applicable"

SW Carman Drive/SW Upper Boones Ferry Road Subarea

Table 4.3-23 and Table 4.3-24 summarize the Synchro analysis of the 95th percentile queues in the SW Carman Drive/SW Upper Boones Ferry subarea for the AM and PM peak periods for the No-Build Alternative in 2035. More details on queuing can be found in Appendix B46. In the AM peak period, queuing would be worst on the I-5 northbound ramp terminal for the northbound left-turn onto SW Carman Drive/SW Upper Boones Ferry Road. In the PM peak period, queuing would be compounded along SW Upper Boones Ferry Road in both directions, with westbound traffic queues extending east of the study area. Traffic in both the eastbound and westbound directions would extend across the existing at-grade railroad crossing, and the intersection of SW Upper Boones Ferry Road at SW Durham Road would experience particularly long queues for the eastbound through movement.

Table 4.3-23. Segment C 2035 No-Build Alternative AM Peak 95th Percentile Queuing SimTraffic Analysis – SW Carman Drive/SW Upper Boones Ferry Road Subarea

Study Intersection No.		C23	C24	C26	C27	C28	C29	C30a	C47
Approach	Movement	I-5 NB ramps/ SW Carman Dr.	I-5 SB Ramps/SW Upper Boones Ferry Rd.	SW Sequoia Pkwy./SW Upper Boones Ferry Rd.	SW 72nd Ave. (north)/ SW Upper Boones Ferry Rd.	SW Upper Boones Ferry Rd./SW 72nd Ave. (south)	SW Durham Rd./SW Upper Boones Ferry Rd.	SW Upper Boones ferry Rd./ existing railroad crossing	SW 72nd Ave. (north)/ existing railroad
NB	Left	659	-	33	56			-	-
	Thru	325	-	39	727			-	0
	Right	-	-	-	366			-	-
SB	Left	-	-	72	221			-	-
	Thru	-	84	109	234			-	0
	Right	-	358	74	-			-	-
EB	Left	380	-	118	-			-	-
	Thru	401	296	194	49			31	-
	Right	-	-	-	-			-	-
WB	Left	-	143	48	327			-	-
	Thru	509	350	242	200			100	-
	Right	-	-	87	-			-	-

Note: EB = eastbound; I-5 = Interstate 5; NB = northbound; SB = southbound; WB = westbound.

Shading indicates that the intersection was not evaluated for this scenario and/or time period. "-" represents "not applicable"

Table 4.3-24. Segment C 2035 No-Build Alternative PM Peak 95th Percentile Queuing SimTraffic Analysis – SW Carman Drive/SW Upper Boones Ferry Road Subarea

Study Intersection No.		C23	C24	C26	C27	C28	C29	C30a	C47
Approach	Movement	I-5 NB ramps/ SW Carman Dr.	I-5 SB ramps/SW Upper Boones Ferry Rd.	SW Sequoia Pkwy./SW Upper Boones Ferry Rd.	SW 72nd Ave. (north)/ SW Upper Boones Ferry Rd.	SW Upper Boones Ferry Rd./SW 72nd Ave. (south)	SW Durham Rd./SW Upper Boones Ferry Rd.	S SW 72nd Ave. (north)/ existing railroad crossing SW Upper Boones Ferry	S SW 72nd Ave. (north)/ existing railroad crossing
NB	Left	340	-	71	99	-	78	-	-
	Thru	231	-	44	481	1,792	1,615	-	-
	Right	-	-	-	502	200	-	-	-
SB	Left	-	-	324	708	-	450	-	-
	Thru	-	247	1,191	700	143	1,306	-	248
	Right	-	302	250	-	-	304	-	-
EB	Left	210	-	142	-	77	450	-	-
	Thru	361	265	228	103	533	2,493	329	
	Right	-	-	-	-	-	-	-	-
WB	Left	-	236	104	346	200	182	-	-
	Thru	840	514	360	200	462	441	233	
	Right	-	-	165	-	-	419	-	-

Note: EB = eastbound; I-5 = Interstate 5; NB = northbound; SB = southbound; WB = westbound. "-" represents "not applicable"

Bridgeport Subarea

Table 4.3-25 and Table 4.3-26 summarize the SimTraffic simulation for the 95th percentile queues in the Bridgeport subarea for the AM and PM peak periods for the No-Build Alternative in 2035. More details on queuing can be found in Appendix B47. In the AM peak period, only the intersection of SW 72nd Avenue at SW Lower Boones Ferry Road was analyzed; the northbound queue is expected to extend beyond the adjacent access and the southbound left-turn to spill out of the storage bay at that intersection.

In the PM peak period, queuing would begin to back into adjacent intersections in both directions between SW 72nd Avenue and SW 65th Avenue.

Table 4.3-25. Segment C 2035 No-Build Alternative AM Peak 95th Percentile Queuing SimTraffic Analysis – Bridgeport Subarea

Study Intersection No.		C30b	C31	C32	C33	C34	C35	C36	C37
Approach	Movement	SW 65th Ave./SW Lower Boones Ferry Rd.	I-5 NB ramps/ SW Lower Boones Ferry Rd.	I-5 SB ramps/ SW Lower Boones Ferry Rd.	SW 72nd Ave./SW Lower Boones Ferry Rd.	SW 72nd Ave./ Bridgeport Village/ Terminal Station	SW 72nd Ave./SW Durham Rd.	Park and ride access/ SW Lower Boones Ferry Rd.	SW Travelers Ln./park and ride access/SW Lower Boones Ferry Rd.
NB	Left				28				
	Thru				289				
	Right				288				
SB	Left				496				
	Thru				269				
	Right				-				
EB	Left				104				
	Thru				212				
	Right				-				
WB	Left				335				
	Thru				259				
	Right				94				

Note: EB = eastbound; I-5 = Interstate 5; NB = northbound; SB = southbound; WB = westbound.

Shading indicates that the intersection was not evaluated for this scenario and/or time period. "-" represents "not applicable"

Table 4.3-26. Segment C 2035 No-Build Alternative PM Peak 95th Percentile Queuing SimTraffic Analysis – Bridgeport Subarea

Study Intersection No.		C30b	C31	C32	C33	C34	C35	C36	C37
Approach	Movement	SW 65th Ave./SW Lower Boones Ferry Rd.	I-5 NB ramps/ SW Lower Boones Ferry Rd.	I-5 SB ramps/ SW Lower Boones Ferry Rd.	SW 72nd Ave./SW Lower Boones Ferry Rd.	SW 72nd Ave./ Bridgeport Village/ Terminal Station	SW 72nd Ave./SW Durham Rd.	Park and ride access/ SW Lower Boones Ferry Rd.	SW Travelers Ln./park and ride access/SW Lower Boones Ferry Rd.
NB	Left	628	454	-	90	174	437	-	220
	Thru	628	-	-	331	318	322	446	>5,280
	Right	-	242	-	317	-	-	-	-
SB	Left	-	-	149	462	83	96	59	71
	Thru	504	-	-	513	320	624	14	197
	Right	200	-	123	-	-	-	-	-
EB	Left	345	262	-	160	76	-	-	-
	Thru	478	329	294	364	68	228	-	220
	Right	410	-	309	-	-	516	-	-
WB	Left	380	-	350	403	85	-	-	-
	Thru	5,705	336	262	338	48	67	-	299
	Right	-	247	-	101	-	-	85	-

Note: EB = eastbound; I-5 = Interstate 5; NB = northbound; SB = southbound; WB = westbound.

"-" represents "not applicable"

2045 No-Build Alternative

The 2045 No-Build Alternative was analyzed to understand potential impacts to the freeway ramp terminals during the PM peak hour only.

Tigard Subarea

Table 4.3-27 summarizes the Synchro analysis of the 95th percentile queues in the Tigard subarea for the 2045 No-Build Alternative. More details on queuing can be found in Appendix B48. The queue on the I-5 southbound off-ramp to SW Barbur Boulevard at SW 64th Avenue would extend into the safe stopping sight distance of the ramp in the PM peak hour under 2045 No-Build Alternative conditions.

Table 4.3-27. Segment C 2045 No-Build Alternative PM Peak 95th Percentile Queuing Synchro Analysis – Tigard Subarea (Tigard Triangle)

Study Intersection No.		C13	C15	C17	C18	C19	B37	B38	B39a	B39b	C42	C43	C44	C45	C46
Approach	Movement	SW 72nd Ave./SW Dartmouth St.	SW 72nd Ave./SW Beveland St.	SW 65th Ave./SW Haines St./I-5 NB ramps	SW 68th Pkwy./SW Atlanta St.	SW 68th Pkwy./SW Dartmouth St./ I-5 SB ramps	I-5 NB off-ramp/SW 60th Ave.	SW Barbur Blvd./SW 60th Ave.	I-5 SB off-ramp/SW Barbur Blvd./SW 64thAve.	I-5 NB off-ramp/SW Barbur Blvd./SW 64th Ave.	SW 68th Ave./Hwy. 99W	SW 68th Ave./park and ride	SW 72nd Ave./Hwy. 99W	SW 71st Ave./Hwy. 99W	SW 72nd Ave./ Elmhurst St.
NB	Left			-		141	-	83	-	-					
	Thru			522		332	286	-	-	-					
	Right			-		200	-	-	-	-					
SB	Left			-		190	-	-	-	29					
	Thru			-		353	42	-	334	58					
	Right			-		-	-	-	-	-					
EB	Left			-		275	-	-	233	-					
	Thru			212		309	1,011	462	345	184					
	Right			32		56	-	-	-	-					
WB	Left			-		251	-	145	276	-					
	Thru			172		232	-	330	756	-					
	Right			-		26	-	-	-	-					
SW	Thru			-		-	-	-	1,158	-					

N/A – SimTraffic does not calculate 95th percentile queue lengths for stop-controlled intersections.

Note: EB = eastbound; I-5 = Interstate 5; NB = northbound; SB = southbound; WB = westbound.

Shading indicates that the intersection was not evaluated for this scenario and/or time period. "-" represents "not applicable"

SW Carman Drive/SW Upper Boones Ferry Road Subarea

Table 4.3-28 summarizes the SimTraffic simulation of the 95th percentile queues in the SW Carman Drive/SW Upper Boones Ferry subarea for the PM peak period for the 2045 No-Build Alternative. More details on queuing can be found in Appendix B49. Queuing would be similar to the No-Build Alternative in 2035 but with slightly longer queues for most movements.

Table 4.3-28. Segment C 2045 No-Build Alternative PM Peak 95th Percentile Queuing SimTraffic Analysis – SW Carman Drive/SW Upper Boones Ferry Road Subarea

Study Intersection No.		C23	C24	C26	C27	C28	C29	C30a	C47
Approach	Movement	I-5 NB ramps/ SW Carman Dr.	I-5 SB ramps/SW Upper Boones Ferry Rd.	SW Sequoia Pkwy./SW Upper Boones Ferry Rd.	SW 72nd Ave. (north)/ SW Upper Boones Ferry Rd.	SW Upper Boones Ferry Rd./SW 72nd Ave. (south)	SW Durham Rd./SW Upper Boones Ferry Rd.	SW Upper Boones Ferry Rd./existing railroad crossing	SW 72nd Ave. (north)/existing railroad crossing
NB	Left	273	-						
	Thru	157	-						
	Right	-	-						
SB	Left	-	220						
	Thru	-	-						
	Right	-	94						
EB	Left	554	-						
	Thru	533	4,046						
	Right	-	-						
WB	Left	-	117						
	Thru	613	288						
	Right	-	-						

Note: EB = eastbound; I-5 = Interstate 5; NB = northbound; SB = southbound; WB = westbound.

Shading indicates that the intersection was not evaluated for this scenario and/or time period. "-" represents "not applicable"

Bridgeport Subarea

Table 4.3-29 summarizes the SimTraffic simulation for the 95th percentile queues in the Bridgeport subarea for the PM peak period for the 2045 No-Build Alternative. More details on queuing can be found in Appendix B50. Queuing would be comparable to the No-Build Alternative in 2035; however, there would be a significant increase in queuing on the I-5 northbound off-ramp, where the queue would extend onto the freeway in 2045 under No-Build Alternative conditions.

Table 4.3-29. Segment C 2045 No-Build Alternative PM Peak 95th Percentile Queuing SimTraffic Analysis – Bridgeport Subarea

Study Intersection No.		C30b	C31	C32	C33	C34	C35	C36	C37	C38	C39
Approach	Movement	SW 65th Ave./SW Lower Boones Ferry Rd.	I-5 NB ramps/SW Lower Boones Ferry Rd.	I-5 SB ramps/SW Lower Boones Ferry Rd.	SW 72nd Ave./SW Lower Boones Ferry Rd.	SW 72nd Ave./Bridgeport Station	SW 72nd Ave./SW Durham Rd.	Park and ride access/SW Lower Boones Ferry Rd.	SW Travelers Ln./park and ride access/SW Lower Boones Ferry Rd.	SW Hazel Fern Rd./SW Bridgeport Rd.	REI/Bridgeport Village/SW Bridgeport Rd.
NB	Left		2,176	-							
	Thru		-	-							
	Right		1,755	-							
SB	Left		-	146							
	Thru		-	-							
	Right		-	123							
EB	Left		246	-							
	Thru		474	307							
	Right		-	328							
WB	Left		-	448							
	Thru		3,887	315							
	Right		212	-							

Note: EB = eastbound; I-5 = Interstate 5; NB = northbound; SB = southbound; WB = westbound.

Shading indicates that the intersection was not evaluated for this scenario and/or time period. "-" represents "not applicable"

2035 Preferred Alternative

Tigard Subarea

Table 4.3-30 through Table 4.3-31 summarize the SimTraffic analysis for the 95th percentile queues for the AM and PM peak hours in the Tigard subarea for the Preferred Alternative in 2035. More details on queuing can be found in Appendix B51. The addition of light rail through the study area intersections is expected to create more delay than would exist under the No-Build Alternative, causing queuing to increase where vehicles must wait for trains to pass. The queue on the I-5 southbound off-ramp to SW Barbur Boulevard at SW 64th Avenue would extend into the safe stopping sight distance of the ramp in the PM peak hour. The increase would be minor and would not trigger the need for mitigation.

Table 4.3-30. Segment C 2035 Preferred Alternative AM Peak 95th Percentile Queuing SimTraffic Analysis – Tigard Subarea (Downtown Tigard)

Study Intersection No.		C2	C3	C9a/b	C10	C11	C20a	C40	C41
Approach	Movement	SW Hall Blvd./Hwy. 99W	SW Greenburg Rd./SW Main St./Hwy. 99W	SW Hall Blvd./SW Hunziker St./SW Scoffins St. (north)	SW Hall Blvd./SW Commercial St.	SW Hall Blvd./SW Burnham St.	SW Hall Blvd./existing railroad (WES)	Light rail crossing/SW Hunziker St.	Hall Station/SW Hunziker St.
NB	Left	164	54	74	150	300	-	-	46
	Thru	1,012	312	629	291	2,214[1]	326	-	-
	Right	350	856	-	-	-	-	-	-
SB	Left	352	425	149	-	-	-	-	-
	Thru	487	1792	237	254	212	147	-	-
	Right	278	22	-	-	72	-	-	-
EB	Left	335	400	39	-	174	-	-	-
	Thru	653	4,418	149	82	-	-	142	-
	Right	-	-	-	61	383	-	-	-
WB	Left	422	264	102	-	-	-	-	-
	Thru	327	300	130	-	-	-	116	37
	Right	-	-	-	-	-	-	-	-

N/A – SimTraffic does not calculate 95th percentile queue lengths for stop-controlled intersections.

[1] Queue may be longer than shown due to model limits.

Note: EB = eastbound; NB = northbound; SB = southbound; WB = westbound; WES = Westside Express Service (Commuter Rail). "-" represents "not applicable"

Table 4.3-31. Segment C 2035 Preferred Alternative PM Peak 95th Percentile Queuing SimTraffic Analysis – Tigard Subarea (Downtown Tigard) ***(multipage table)***

Study Intersection No.		C2	C3	C9a/b	C10	C11	C20a	C40	C41
Approach	Movement	SW Hall Blvd./Hwy. 99W	SW Greenburg Rd./SW Main St./Hwy. 99W	SW Hall Blvd./SW Hunziker St./SW Scoffins St.	SW Hall Blvd./SW Commercial St.	SW Hall Blvd./SW Burnham St.	SW Hall Blvd./existing railroad (WES)	Light rail crossing/SW Hunziker St.	Hall Station/SW Hunziker St.
NB	Left	350	131	126	150	300	-	-	83
	Thru	1,010	610	631	288	2,205[1]	324	-	-
	Right	500	359	-	-	-	-	-	-
SB	Left	500	404	138	-	-	-	-	-
	Thru	1,169	1,013	419	612	326	281	-	-
	Right	300	165	-	-	161	-	-	-
EB	Left	335	400	39	-	187	-	-	-
	Thru	645	2,377	121	113	-	-	140	-
	Right	-	-	-	91	974	-	-	-

Table 4.3-31. Segment C 2035 Preferred Alternative PM Peak 95th Percentile Queuing SimTraffic Analysis – Tigard Subarea (Downtown Tigard) *(multipage table)*

Study Intersection No.		C2	C3	C9a/b	C10	C11	C20a	C40	C41
Approach	Movement	SW Hall Blvd./Hwy. 99W	SW Greenburg Rd./SW Main St./Hwy. 99W	SW Hall Blvd./SW Hunziker St./SW Scoffins St.	SW Hall Blvd./SW Commercial St.	SW Hall Blvd./SW Burnham St.	SW Hall Blvd./existing railroad (WES)	Light rail crossing/SW Hunziker St.	Hall Station/SW Hunziker St.
WB	Left	592	270	141	-	-	-	-	-
	Thru	686	646	175	-	-	-	180	2,507
	Right	-	-	-	-	-	-	-	-

N/A – Synchro does not calculate 95th percentile queue lengths for stop-controlled intersections.

[1] Queue may be longer than shown due to model limits.

Note: EB = eastbound; NB = northbound; SB = southbound; WB = westbound WES = Westside Express Service (Commuter Rail). "-" represents "not applicable"

Table 4.3-32. Segment C 2035 Preferred Alternative AM Peak 95th Percentile Queuing SimTraffic Analysis – Tigard Subarea (Tigard Triangle)

Study Intersection No.		C13	C15	C17	C18	C19	B37	B38	B39a	B39b	C42	C43	C44	C45	C46
Approach	Movement	SW 72nd Ave./SW Dartmouth St.	SW 72nd Ave./SW Beveland St.	SW 65th Ave./SW Haines St./I-5 NB ramps	SW 68th Pkwy./SW Atlanta St.	SW 68th Pkwy./SW Dartmouth St./I-5 SB ramps	I-5 NB off-ramp/SW 60th Ave.	SW Barbur Blvd./SW 60th Ave.	I-5 SB off-ramp/SW Barbur Blvd./SW 64th Ave.	I-5 NB off-ramp/SW Barbur Blvd./SW 64th Ave.	SW 68th Ave./Hwy. 99W	SW 68th Ave./park and ride	SW 72nd Ave./Hwy. 99W	SW 71st Ave./OR 99W	SW 72nd Ave./ Elmhurst St.
NB	Left			-	-	59	-	49	-	-	109	-	105	-	
	Thru			296	63	139	211	-	-	-	165	-	199	-	
	Right			-	-	82	-	-	-	-	70	-	175	-	
SB	Left			-	69	189	-	-	-	26	167	64	145	-	
	Thru			-	73	332	49	-	1,001	95	278	19	121	901	
	Right			-	-	-	-	-	-	-	-	-	-	-	
EB	Left			-	-	132	-	-	0	-	134	-	400	57	
	Thru			108	56	135	442	646	545	248	558	-	>5,280	595	
	Right			-	-	59	-	-	-	-	260	-	510	-	
WB	Left			-	138	-	-	68	497	-	117	25	220	-	
	Thru			142	73	178	-	280	561	-	516	-	146	-	
	Right			-	66	-	-	-	-	-	-	34	-	-	
SW	Thru			-	-	-	-	-	395	-	-	-	-	-	

N/A – SimTraffic does not calculate 95th percentile queue lengths for stop-controlled intersections.

Note: EB = eastbound; I-5 = Interstate 5; NB = northbound; SB = southbound; WB = westbound.

Shading indicates that the intersection was not evaluated for this scenario and/or time period. "-" represents "not applicable"

Table 4.3-33. Segment C 2035 Preferred Alternative PM Peak 95th Percentile Queuing SimTraffic Analysis – Tigard Subarea (Tigard Triangle)

Study Intersection No.		C13	C15	C17	C18	C19	B37	B38	B39a	B39b	C42	C43	C44	C45	C46
Approach	Movement	SW 72nd Ave./SW Dartmouth St.	SW 72nd Ave./SW Beveland St.	SW 65th Ave./SW Haines St./I-5 NB ramps	SW 68th Pkwy./ SW Atlanta St.	SW 68th Pkwy./ SW Dartmouth St./I-5 SB ramps	I-5 NB off-ramp/ SW 60th Ave.	SW Barbur Blvd./ SW 60th Ave.	I-5 SB off-ramp/ SW Barbur Blvd./SW 64th Ave.	I-5 NB off-ramp/ SW Barbur Blvd./SW 64th Ave.	SW 68th Ave./ Hwy. 99W	SW 68th Ave./park and ride	SW 72nd Ave./Hwy. 99W	SW 71st Ave./Hwy. 99W	SW 72nd Ave./ Elmhurst St.
NB	Left	400	208	-	-	167	-	87	-	-	210	-	170	-	-
	Thru	498	560	786	69	707	311	-	-	-	282	522	1,021	-	45
	Right	201	87	-	-	167	-	-	-	-	117	-	170	-	-
SB	Left	147	93	-	131	176	-	-	-	23	116	38	214	-	372
	Thru	569	494	-	264	421	36	-	463	61	119	55	313	1,909	490
	Right	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EB	Left	161	101	-	-	279	-	-	206	-	241	-	400	113	-
	Thru	569	106	185	68	294	1570	502	260	79	564	-	1,631	526	-
	Right	183	-	22	59	49	-	-	-	-	-	-	329	-	-
WB	Left	261	275	-	251	-	-	380	791	-	240	444	182	-	-
	Thru	460	416	348	141	947	-	5,377	958	-	941	444	270	-	289
	Right	-	-	-	78	55	-	-	-	-	-	-	-	-	-
SW	Thru	-	-	-	-	-	-	-	1148	-	-	-	-	-	-

N/A – SimTraffic does not calculate 95th percentile queue lengths for stop-controlled intersections.

Note: EB = eastbound; I-5 = Interstate 5; NB = northbound; SB = southbound; WB = westbound. "-" represents "not applicable"

SW Carman Drive/SW Upper Boones Ferry Road Subarea

Table 4.3-34 through Table 4.3-35 summarize the SimTraffic simulation for the 95th percentile queues for the AM and PM peak hours for the 2035 Preferred Alternative in the SW Carman Drive/SW Upper Boones Ferry Road subarea. More details on queuing can be found in Appendix B52. The at-grade crossing of SW Upper Boones Ferry Road is expected to impacted queuing.

Compared to the No-Build Alternative, the Preferred Alternative would increase queuing during the AM peak hour at the I-5 ramp terminals. The southbound right-turn movement and the westbound through movement at the southbound ramp terminal would have increased queuing that could potentially impact the freeway.

Compared to the No-Build Alternative, the Preferred Alternative would increase queuing during the PM peak hour slightly in the eastbound direction.

Table 4.3-34. Segment C 2035 Preferred Alternative AM Peak 95th Percentile Queuing SimTraffic Analysis – SW Carman Drive/SW Boones Ferry Road Subarea

Study Intersection No.		C23	C24	C26	C27	C28	C29	C30a	C47
Approach	Movement	I-5 NB ramps/SW Carman Dr.	I-5 SB ramps/ SW Upper Boones Ferry Rd.	SW Sequoia Pkwy./SW Upper Boones Ferry Rd.	SW 72nd Ave. (north)/ SW Upper Boones Ferry Rd.	SW Upper Boones Ferry Rd./SW 72nd Ave. (south)	SW Durham Rd./SW Upper Boones Ferry Rd.	SW Upper Boones Ferry Rd./existing railroad crossing	SW 72nd Ave. (north)/existing railroad
NB	Left	589	-	31	57			-	-
	Thru	325	-	45	568			-	344
	Right	-	-	-	218			-	-
SB	Left	-	-	79	241			-	-
	Thru	-	80	125	343			-	353
	Right	-	597	77	-			-	-
EB	Left	376	-	169	-			-	-
	Thru	377	309	216	53			269	-
	Right	-	-	-	-			-	-
WB	Left	-	241	89	335			-	-
	Thru	637	442	349	200			222	-
	Right	-	-	96	-			-	-

Note: EB = eastbound; I-5 = Interstate 5; NB = northbound; SB = southbound; WB = westbound.

Shading indicates that the intersection was not evaluated for this scenario and/or time period. "-" represents "not applicable"

Table 4.3-35. Segment C 2035 Preferred Alternative PM Peak 95th Percentile Queuing SimTraffic Analysis – SW Carman Drive/SW Boones Ferry Road Subarea

Study Intersection No.		C23	C24	C26	C27	C28	C29	C30a	C47
Approach	Movement	I-5 NB ramps/SW Carman Dr.	I-5 SB ramps/ SW Upper Boones Ferry Rd.	SW Sequoia Pkwy./SW Upper Boones Ferry Rd.	SW 72nd Ave. (north)/ SW Upper Boones Ferry Rd.	SW Upper Boones Ferry Rd./SW 72nd Ave. (south)	SW Durham Rd./SW Upper Boones Ferry Rd.	SW Upper Boones Ferry Rd./existing railroad crossing	SW 72nd Ave. (north)/existing railroad
NB	Left	320	-	55	107	-	76	-	-
	Thru	195	-	45	499	1,811	1,606	-	377
	Right	-	-	-	506	200	-	-	-
SB	Left	-	-	325	808	-	438	-	-
	Thru	-	215	809	852	157	1,924	-	833
	Right	-	272	250	-	-	288	-	-
EB	Left	409	-	149	-	44	450	-	-
	Thru	370	268	240	94	537	2,281	348	-
	Right	-	-	-	-	-	-	-	-
WB	Left	-	239	91	336	200	183	-	-
	Thru	851	458	312	200	474	439	242	-
	Right	-	-	67	-	-	418	-	-

Note: EB = eastbound; I-5 = Interstate 5; NB = northbound; SB = southbound; WB = westbound.

"-" represents "not applicable"

Bridgeport Subarea

Two scenarios were evaluated for the 2035 Preferred Alternative in the Bridgeport subarea: a 950-space park and ride, and a 700-space park and ride. More details on queuing can be found in Appendix B53.

Table 4.3-36 and Table 4.3-38 summarize the SimTraffic simulation for the 95th percentile queues in the Bridgeport subarea for the Preferred Alternative in the AM and PM peak periods with a 950-space park and ride.

In the AM peak period, only the intersection of SW 72nd Avenue/SW Lower Boones Ferry Road was analyzed; compared to the No-Build Alternative, the Preferred Alternative with these conditions is expected to have the westbound left-turn queue spill out of the storage bay.

Compared to the No-Build Alternative in the PM peak period, the Preferred Alternatives would cause increased queuing at the I-5 northbound ramp terminal, impacting the safe stopping sight distance on the ramp. The signal timing along SW Lower Boones Ferry Road between I-5 and SW 72nd Avenue would need to be adjusted to better progress traffic on the northbound ramp as mitigation. Table 4.3-38 shows what the performance of the Preferred Alternative would be if the signal timing along SW Lower Boones Ferry Road between I-5 and SW 72nd Avenue was adjusted to better progress traffic on the northbound ramp. This potential revised signalization strategy would be confirmed with partner jurisdictions during final design.

There also would be increased queuing at SW 72nd Avenue/SW Durham Road, as well as increased queuing for movements exiting the proposed park and ride access at SW Lower Boones Ferry Road.

Table 4.3-36. Segment C 2035 Preferred Alternative AM Peak 95th Percentile Queuing SimTraffic Analysis – Bridgeport Subarea with 950-Space Park and Ride

Study Intersection No.		C30b	C31	C32	C33	C34	C35	C36	C37
Approach	Movement	SW 65th Ave./SW Lower Boones Ferry Rd.	I-5 NB ramps/SW Lower Boones Ferry Rd.	I-5 SB ramps/SW Lower Boones Ferry Rd.	SW 72nd Ave./SW Lower Boones Ferry Rd.	SW 72nd Ave./Bridgeport Station	SW 72nd Ave./SW Durham Rd.	Park and ride access/SW Lower Boones Ferry Rd.	SW Travelers Ln./park and ride access/SW Lower Boones Ferry Rd.
NB	Left				65				
	Thru				283				
	Right				302				
SB	Left				520				
	Thru				277				
	Right				-				
EB	Left				113				
	Thru				248				
	Right				-				
WB	Left				438				
	Thru				265				
	Right				50				

Note: EB = eastbound; I-5 = Interstate 5; NB = northbound; SB = southbound; WB = westbound.

Shading indicates that the intersection was not evaluated for this scenario and/or time period. "-" represents "not applicable"

Table 4.3-37. Segment C 2035 Preferred Alternatives PM Peak 95th Percentile Queuing SimTraffic Analysis – Bridgeport Subarea with 950-Space Park and Ride *(multi-page table)*

Study Intersection No.		C30b	C31	C32	C33	C34	C35	C36	C37
Approach	Movement	SW 65th Ave./SW Lower Boones Ferry Rd.	I-5 NB ramps/SW Lower Boones Ferry Rd.	I-5 SB ramps/SW Lower Boones Ferry Rd.	SW 72nd Ave./SW Lower Boones Ferry Rd.	SW 72nd Ave./Bridgeport Station	SW 72nd Ave./SW Durham Rd.	Park and ride access/SW Lower Boones Ferry Rd.	SW Travelers Ln./park and ride access/SW Lower Boones Ferry Rd.
NB	Left	465	662	-	90	149	442	-	220
	Thru	465	-	-	330	243	296	441	>5,280
	Right	-	364	-	574	-	-	-	-
SB	Left	-	-	155	533	49	100	-	229
	Thru	1,255	-	-	555	478	559	124	370
	Right	200	-	119	-	-	-	-	-
EB	Left	345	217	-	160	75	-	-	-
	Thru	486	349	332	387	82	240	-	159
	Right	410	-	350	-	-	618	-	-
WB	Left	380	-	351	417	55	-	-	-
	Thru	5,386	323	321	354	45	89	-	338
	Right	-	-	-	89	-	-	307	-

Note: EB = eastbound; I-5 = Interstate 5; NB = northbound; SB = southbound; WB = westbound.

"-" represents "not applicable"

Table 4.3-38. Segment C 2035 Preferred Alternatives PM Peak 95th Percentile Queuing SimTraffic Analysis – Bridgeport Subarea with 950-Space Park and Ride with Revised Signalization Strategies

Study Intersection No.		C30b	C31	C32	C33	C34	C35	C36	C37
Approach	Movement	SW 65th Ave./SW Lower Boones Ferry Rd.	I-5 NB ramps/SW Lower Boones Ferry Rd.	I-5 SB ramps/SW Lower Boones Ferry Rd.	SW 72nd Ave./SW Lower Boones Ferry Rd.	SW 72nd Ave./Bridgeport Station	SW 72nd Ave./SW Durham Rd.	Park and ride access/SW Lower Boones Ferry Rd.	SW Travelers Ln./park and ride access/SW Lower Boones Ferry Rd.
NB	Left	543	516	-	90	215	516	-	220
	Thru	543	-	-	334	447	515	436	>5,280
	Right	-	255	-	574	-	-	-	-
SB	Left	-	-	161	488	37	98	-	233
	Thru	1,303	-	-	527	414	505	39	361
	Right	200	-	137	-	-	-	-	-
EB	Left	345	291	-	160	76	-	-	-
	Thru	482	472	374	485	67	216	-	100
	Right	410	-	348	-	-	470	-	-
WB	Left	380	-	332	447	50	-	-	-
	Thru	4,897	380	269	360	44	85	-	265
	Right	-	-	-	125	-	-	307	-

Note: EB = eastbound; I-5 = Interstate 5; NB = northbound; SB = southbound; WB = westbound.

"-" represents "not applicable"

Bridgeport 700-Space Park and Ride

Table 4.3-39 and Table 4.3-40 summarize the SimTraffic simulation for the 95th percentile queues in the Bridgeport subarea for the Preferred Alternative in the AM and PM peak periods with a 700-space park and ride.

In the AM peak period, only the intersection of SW 72nd Avenue/SW Lower Boones Ferry Road was analyzed; compared to the No-Build Alternative, the Preferred Alternative with these conditions is expected to have the westbound left-turn queue spill out of the storage bay.

Compared to the No-Build Alternative in the PM peak period, the Preferred Alternative would cause increased queuing at the I-5 northbound ramp terminal for the northbound approach, but the safe stopping sight distance would be maintained without the need for mitigation.

There is also increased queuing at SW 72nd Avenue/SW Durham Road, as well as for movements exiting the proposed park and ride access at SW Lower Boones Ferry Road.

Table 4.3-39. Segment C 2035 Preferred Alternative AM Peak 95th Percentile Queuing SimTraffic Analysis – Bridgeport Subarea with 700-Space Park and Ride

Study Intersection No.		C30b	C31	C32	C33	C34	C35	C36	C37
Approach	Movement	SW 65th Ave./SW Lower Boones Ferry Rd.	I-5 NB ramps/SW Lower Boones Ferry Rd.	I-5 SB ramps/SW Lower Boones Ferry Rd.	SW 72nd Ave./SW Lower Boones Ferry Rd.	SW 72nd Ave./Bridgeport Station	SW 72nd Ave./SW Durham Rd.	Park and ride access/SW Lower Boones Ferry Rd.	SW Travelers Ln./park and ride access/SW Lower Boones Ferry Rd.
NB	Left				61				
	Thru				261				
	Right				307				
SB	Left				520				
	Thru				258				
	Right				-				
EB	Left				103				
	Thru				244				
	Right				-				
WB	Left				406				
	Thru				262				
	Right				58				

Note: EB = eastbound; I-5 = Interstate 5; NB = northbound; SB = southbound; WB = westbound.

Shading indicates that the intersection was not evaluated for this scenario and/or time period.

"-" represents "not applicable"

Table 4.3-40. Segment C 2035 Preferred Alternatives PM Peak 95th Percentile Queuing SimTraffic Analysis – Bridgeport Subarea with 700-Space Park and Ride

Study Intersection No.		C30b	C31	C32	C33	C34	C35	C36	C37
Approach	Movement	SW 65th Ave./SW Lower Boones Ferry Rd.	I-5 NB ramps/SW Lower Boones Ferry Rd.	I-5 SB ramps/SW Lower Boones Ferry Rd.	SW 72nd Ave./SW Lower Boones Ferry Rd.	SW 72nd Ave./Bridgeport Station	SW 72nd Ave./SW Durham Rd.	Park and ride access/SW Lower Boones Ferry Rd.	SW Travelers Ln./park and ride access/SW Lower Boones Ferry Rd.
NB	Left	559	573	-	90	172	447	-	220
	Thru	559	-	-	335	246	223	437	>5,280
	Right	-	333	-	574	-	-	-	-
SB	Left	-	-	148	528	35	81	-	225
	Thru	1,073	-	-	544	480	498	134	390
	Right	200	-	119	-	-	-	-	-
EB	Left	344	253	-	160	68	-	-	-
	Thru	492	401	313	359	78	240	-	162
	Right	410	-	333	-	-	553	-	-
WB	Left	380	-	335	374	52	-	-	-
	Thru	4,665	335	278	331	47	70	-	359
	Right	-	-	-	88	-	-	307	-

Note: EB = eastbound; I-5 = Interstate 5; NB = northbound; SB = southbound; WB = westbound.

"-" represents "not applicable"

Terminus Options – Tigard Subarea

Queuing with the terminus options would generally be similar to the Preferred Alternative, assuming a 100-stall Hall Park and Ride. During development of the terminus options, a 300-stall Hall Park and Ride was considered and tested to evaluate impacts. Table 4.3-41 and Table 4.3-42 describe queuing at study intersections for the terminus options in the Tigard Subarea, assuming a 300-stall Hall Park and Ride. With 300 stalls, there would be increased queues on SW Hunziker Street. This queuing impact would cause safety concerns and mitigation would be required. However, mitigation is not required because the terminus options include a 100-stall park and ride, which reduces traffic impacts. More details can be found in Appendix B51.[5]

[5] In Appendix B51, the terminus options are referred to as the "Build MOS."

Table 4.3-41. Segment C 2035 Terminus Options AM Peak 95th Percentile Queuing SimTraffic Analysis – Tigard Subarea (Downtown Tigard)

Study Intersection No.		C2	C3	C9a/b	C10	C11	C20a	C40	C41
Approach	Movement	SW Hall Blvd./Hwy. 99W	SW Greenburg Rd./SW Main St./Hwy. 99W	SW Hall Blvd./SW Hunziker St./SW Scoffins St. (north)	SW Hall Blvd./SW Commercial St.	SW Hall Blvd./SW Burnham St.	SW Hall Blvd./existing railroad (WES)	Light rail crossing/SW Hunziker St.	Hall Station/SW Hunziker St.
NB	Left	130	95	64	150	300	-	-	59
	Thru	1,009	265	633	299	2,216[1]	326	-	-
	Right	350	894	-	-	-	-	-	-
SB	Left	404	425	181	-	-	-	-	-
	Thru	557	1,789	257	275	217	151	-	-
	Right	300	12	-	-	79	-	-	-
EB	Left	335	400	38	-	164	-	-	-
	Thru	645	4,047	164	189	-	-	143	-
	Right	-	-	-	91	443	-	-	-
WB	Left	449	267	109	-	-	-	-	-
	Thru	450	362	139	-	-	-	120	36
	Right	-	-	-	-	-	-	-	-

N/A – SimTraffic does not calculate 95th percentile queue lengths for stop-controlled intersections.

[1] Queue may be longer than shown due to model limits.

Note: EB = eastbound; NB = northbound; SB = southbound; WB = westbound; WES = Westside Express Service (Commuter Rail). "-" represents "not applicable"

Table 4.3-42. Segment C 2035 Terminus Options PM Peak 95th Percentile Queuing SimTraffic Analysis – Tigard Subarea (Downtown Tigard)

Study Intersection No.		C2	C3	C9a/b	C10	C11	C20a	C40	C41
Approach	Movement	SW Hall Blvd./Hwy. 99W	SW Greenburg Rd./SW Main St./Hwy. 99W	SW Hall Blvd./SW Hunziker St./SW Scoffins St. (north)	SW Hall Blvd./SW Commercial St.	SW Hall Blvd./SW Burnham St.	SW Hall Blvd./existing railroad (WES)	Light rail crossing/SW Hunziker St.	Hall Station/SW Hunziker St.
NB	Left	350	126	110	150	300	-	-	457
	Thru	1,008	575	631	290	2,218[1]	324	-	-
	Right	350	319	-	-		-	-	-
SB	Left	500	424	137			-	-	-
	Thru	1,101	1,298	420	620	326	280	-	-
	Right	300	236	-	-	177	-	-	-
EB	Left	335	400	45	-	190	-	-	-
	Thru	646	3,278	154	93		-	141	-
	Right	-	-	-	70	950	-	-	-
WB	Left	592	270	142	-		-	-	-
	Thru	672	644	169	-	-	-	177	3,809
	Right	-	-	-	-	-	-	-	-

N/A – SimTraffic does not calculate 95th percentile queue lengths for stop-controlled intersections.

[1] Queue may be longer than shown due to model limits.

Note: EB = eastbound; NB = northbound; SB = southbound; WB = westbound; WES = Westside Express Service (Commuter Rail). "-" represents "not applicable"

2045 Preferred Alternative

Tigard Subarea

Table 4.3-43 summarizes the SimTraffic analysis for the 95th percentile queues in the Tigard subarea for the 2045 Preferred Alternative for the PM peak hour. More details on queuing can be found in Appendix B54. The addition of light rail through study area intersections is expected to create more delay than would occur with the 2045 No-Build Alternative, causing queuing to increase where vehicles must wait for trains to pass.

Table 4.3-43. Segment C 2045 Preferred Alternative PM Peak 95th Percentile Queuing SimTraffic Analysis – Tigard Subarea (Tigard Triangle)

Study Intersection No.		C13	C15	C17	C18	C19	B37	B38	B39a	B39b	C42	C43	C44	C45	C46
Approach	Movement	SW 72nd Ave./SW Dartmouth St.	SW 72nd Ave./SW Beveland St.	SW 65th Ave./SW Haines St./I-5 NB ramps	SW 68th Pkwy./SW Atlanta	SW 68th Pkwy./SW Dartmouth St./I-5	I-5 NB off-ramp/SW 60th	SW Barbur Blvd./SW 60th	I-5 SB off-ramp/SW Barbur Blvd./SW 64th	I-5 NB off-ramp/SW Barbur Blvd./SW 64th	SW 68th Ave./Hwy. 99W	SW 68th Ave./Park and ride	SW 72nd Ave./Hwy. 99W	SW 71st Ave./Hwy. 99W	SW 72nd Ave./ Elmhurst St.
NB	Left			-		138	-	92	-	-					
	Thru			420		303	271	-	-	-					
	Right			-		197	-	-	-	-					
SB	Left			-		190	-	-	-	24					
	Thru			-		325	40	-	371	78					
	Right			-		-	-	-	-	-					
EB	Left			-		253	-	-	197	-					
	Thru			316		296	1,365	615	341	95					
	Right			77		58	-	-	-	-					
WB	Left			-		246	-	380	918	-					
	Thru			196		229	-	4,210	963	-					
	Right			-		66	-	-	-	-					
SW	Thru			-		-	-	-	1,126	-					

N/A – Synchro does not calculate 95th percentile queue lengths for stop-controlled intersections.

EB = eastbound; I-5 = Interstate 5; NB = northbound; SB = southbound; WB = westbound.

Shading indicates that the intersection was not evaluated for this scenario and/or time period. "-" represents "not applicable"

SW Carman Drive/SW Upper Boones Ferry Road Subarea

Table 4.3-44 summarizes the SimTraffic simulation for the 95th percentile queues under the 2045 Preferred Alternative in this subarea for the PM peak period. More details on queuing can be found in Appendix B55. Queuing would be similar to the 2035 Preferred Alternative condition but with slightly longer queues for most movements.

Table 4.3-44. Segment C 2045 Preferred Alternative PM Peak 95th Percentile Queuing SimTraffic Analysis – SW Carman Drive/SW Upper Boones Ferry Road Subarea

Study Intersection No.		C23	C24	C26	C27	C28	C29	C30a	C47
Approach	Movement	I-5 NB ramps/SW Carman Dr.	I-5 SB ramps/SW Upper Boones Ferry Rd.	SW Sequoia Pkwy./SW Upper Boones Ferry Rd.	SW 72nd Ave. (north)/ SW Upper Boones Ferry Rd.	SW Upper Boones Ferry Rd./SW 72nd Ave. (south)	SW Durham Rd./SW Upper Boones Ferry Rd.	SW Upper Boones Ferry Rd./existing railroad crossing	SW 72nd Ave. (north)/existing railroad crossing
NB	Left	273	-						
	Thru	157	-						
	Right	-	-						
SB	Left	-	-						
	Thru	-	220						
	Right	-	94						
EB	Left	554	-						
	Thru	533	4,046						
	Right	-	-						
WB	Left	-	117						
	Thru	613	288						
	Right	-	-						

Note: EB = eastbound; I-5 = Interstate 5; NB = northbound; SB = southbound; WB = westbound.

Shading indicates that the intersection was not evaluated for this scenario and/or time period. "-" represents "not applicable"

Bridgeport Subarea

Two scenarios were evaluated for the Bridgeport subarea for the 2045 Preferred Alternative: a 950-space park and ride and a 700-space park and ride. More details on queuing can be found in Appendix B56.

Bridgeport 950-Space Park and Ride

Table 4.3-45 and Table 4.3-46 summarize the year 2045 SimTraffic simulation for the 95th percentile queues in the Bridgeport subarea for the 2045 Preferred Alternatives in the AM and PM peak periods with a 950-space park and ride.

In the AM peak period, only the intersection of SW 72nd Avenue/SW Lower Boones Ferry Road was analyzed; compared to the No-Build Alternative, the Preferred Alternative with these conditions is expected to have the westbound left-turn queue spill out of the storage bay.

Compared to the No-Build Alternative in the PM peak period, the Preferred Alternative would cause increased queuing at the I-5 northbound ramp terminal extending back onto the freeway. The northbound ramp would need to be extended beyond its current length to provide adequate queue storage of approximately 1,200 feet. Table 4.3-45 shows what the performance of the Preferred Alternative would be if the signal timing along SW Lower Boones Ferry Road between I-5 and SW 72nd Avenue was adjusted to better progress traffic on the northbound ramp, illustrating that more storage is needed at this location. These strategies would be confirmed with partner jurisdictions during final design.

There also would be increased queuing at SW 72nd Avenue/SW Durham Road, as well as increased queuing for movements exiting the proposed park and ride access at SW Lower Boones Ferry Road.

Table 4.3-45. Segment C 2045 Preferred Alternative PM Peak 95th Percentile Queuing SimTraffic Analysis – Bridgeport Subarea 950-Space Park and Ride

Study Intersection No.		C30b	C31	C32	C33	C34	C35	C36	C37	C38	C39
Approach	Movement	SW 65th Ave./SW Lower Boones Ferry Rd.	I-5 NB ramps/SW Lower Boones Ferry Rd.	I-5 SB ramps/SW Lower Boones Ferry Rd.	SW 72nd Ave./SW Lower Boones Ferry Rd.	SW 72nd Ave./Bridgeport Station	SW 72nd Ave./SW Durham Rd.	Park and ride access/SW Lower Boones Ferry Rd.	SW Travelers Ln./park and ride access/SW Lower Boones Ferry Rd.	SW Hazel Fern Rd./SW Bridgeport Rd.	REI/Bridgeport Village/SW Bridgeport Rd.
NB	Left		2,686	-							
	Thru		-	-							
	Right		1,868	-							
SB	Left		-	144							
	Thru		-	-							
	Right		-	128							
EB	Left		221	-							
	Thru		415	296							
	Right		-	334							
WB	Left		-	439							
	Thru		4,097	448							
	Right		256	-							

Note: EB = eastbound; I-5 = Interstate; NB = northbound; SB = southbound; WB = westbound.

Shading indicates that the intersection was not evaluated for this scenario and/or time period. "-" represents "not applicable"

Table 4.3-46. Segment C 2045 Preferred Alternative PM Peak 95th Percentile Queuing SimTraffic Analysis – Bridgeport Subarea 950-Space Park and Ride with Revised Signalization Strategies

Study Intersection No.		C30b	C31	C32	C33	C34	C35	C36	C37	C38	C39
Approach	Movement	SW 65th Ave./SW Lower Boones Ferry Rd.	I-5 NB ramps/SW Lower Boones Ferry Rd.	I-5 SB ramps/SW Lower Boones Ferry Rd.	SW 72nd Ave./SW Lower Boones Ferry Rd.	SW 72nd Ave./Bridgeport Station	SW 72nd Ave./SW Durham Rd.	Park and ride access/SW Lower Boones Ferry Rd.	SW Travelers Ln./park and ride access/SW Lower Boones Ferry Rd.	SW Hazel Fern Rd./SW Bridgeport Rd.	REI/Bridgeport Village/SW Bridgeport Rd.
NB	Left		869	-							
	Thru		-	-							
	Right		496	-							
SB	Left		-	159							
	Thru		-	-							
	Right		-	143							
EB	Left		284	-							
	Thru		460	378							
	Right		-	349							
WB	Left		-	351							
	Thru		5297	327							
	Right		297	-							

Note: EB = eastbound; I-5 = Interstate 5; NB = northbound; SB = southbound; WB = westbound.

Shading indicates that the intersection was not evaluated for this scenario and/or time period. "-" represents "not applicable"

Bridgeport 700-Space Park and Ride

Table 4.3-47 and Table 4.3-48 summarize the SimTraffic simulation for the 95th percentile queues in the Bridgeport subarea for the 2045 Preferred Alternative in the AM and PM peak periods with a 700-space park and ride.

In the AM peak period, only the intersection of SW 72nd Avenue/SW Lower Boones Ferry Road was analyzed; compared to the No-Build Alternative, the Preferred Alternative is expected to have the westbound left-turn queue spill out of the storage bay.

Compared to the No-Build Alternative in the PM peak period, the Preferred Alternative would cause increased queuing at the I-5 northbound ramp terminal, impacting the safe stopping sight distance on the ramp. Table 4.3-45 shows what the performance of the Preferred Alternative would be if the signal timing along SW Lower Boones Ferry Road between I-5 and SW 72nd Avenue was adjusted to better progress traffic on the northbound ramp. This potential revised signalization strategy would be confirmed with partner jurisdictions during final design.

There also would be increased queuing at SW 72nd Avenue/SW Durham Road, as well as increased queuing for movements exiting the proposed park and ride access at SW Lower Boones Ferry Road.

Table 4.3-47. Segment C 2045 Preferred Alternative PM Peak 95th Percentile Queuing SimTraffic Analysis – Bridgeport Subarea 700-Space Park and Ride

Study Intersection No.		C30b	C31	C32	C33	C34	C35	C36	C37	C38	C39
Approach	Movement	SW 65th Ave./SW Lower Boones Ferry Rd.	I-5 NB ramps/SW Lower Boones Ferry Rd.	I-5 SB ramps/SW Lower Boones Ferry Rd.	SW 72nd Ave./SW Lower Boones Ferry Rd.	SW 72nd Ave./Bridgeport Station	SW 72nd Ave./SW Durham Rd.	Park and ride access/SW Lower Boones Ferry Rd.	SW Travelers Ln./park and ride access/SW Lower Boones Ferry Rd.	SW Hazel Fern Rd./SW Bridgeport Rd.	REI/Bridgeport Village/SW Bridgeport Rd.
NB	Left		3,054	-							
	Thru		-	-							
	Right		2,114	-							
SB	Left		-	153							
	Thru		-	-							
	Right		-	132							
EB	Left		221	-							
	Thru		402	294							
	Right		-	316							
WB	Left		-	440							
	Thru		3,786	484							
	Right		279	-							

Note: EB = eastbound; I-5 = Interstate 5; NB = northbound; SB = southbound; WB = westbound.

Shading indicates that the intersection was not evaluated for this scenario and/or time period. "-" represents "not applicable"

Table 4.3-48. Segment C 2045 Preferred Alternative PM Peak 95th Percentile Queuing SimTraffic Analysis – Bridgeport Subarea 700-Space Park and Ride with Revised Signalization Strategies *(multi-page table)*

Study Intersection No.		C30b	C31	C32	C33	C34	C35	C36	C37	C38	C39
Approach	Movement	SW 65th Ave./SW Lower Boones Ferry Rd.	I-5 NB ramps/SW Lower Boones Ferry Rd.	I-5 SB ramps/SW Lower Boones Ferry Rd.	SW 72nd Ave./SW Lower Boones Ferry Rd.	SW 72nd Ave./Bridgeport Station	SW 72nd Ave./SW Durham Rd.	Park and Ride access/SW Lower Boones Ferry Rd.	SW Travelers Ln./Park and Ride access/SW Lower Boones Ferry Rd.	SW Hazel Fern Rd./SW Bridgeport Rd.	REI/Bridgeport Village/SW Bridgeport Rd.
NB	Left		596	-							
	Thru		-	-							
	Right		456	-							
SB	Left		-	192							
	Thru		-	-							
	Right		-	114							
EB	Left		268	-							
	Thru		462	395							
	Right		-	350							
WB	Left		-	371							
	Thru		4,161	271							
	Right		279	-							

Note: EB = eastbound; I-5 = Interstate 5; NB = northbound; SB = southbound; WB = westbound.

Shading indicates that the intersection was not evaluated for this scenario and/or time period. "-" represents "not applicable"

Segment C Circulation Analysis

Figure 4.3-1 and Figure 4.3-2 show changes in traffic volumes associated with the Preferred Alternative. Findings from the study are included in Chapter 3 of the Final EIS.

Figure 4.3-1. Traffic Circulation Changes – Segment C: Preferred Alternative AM

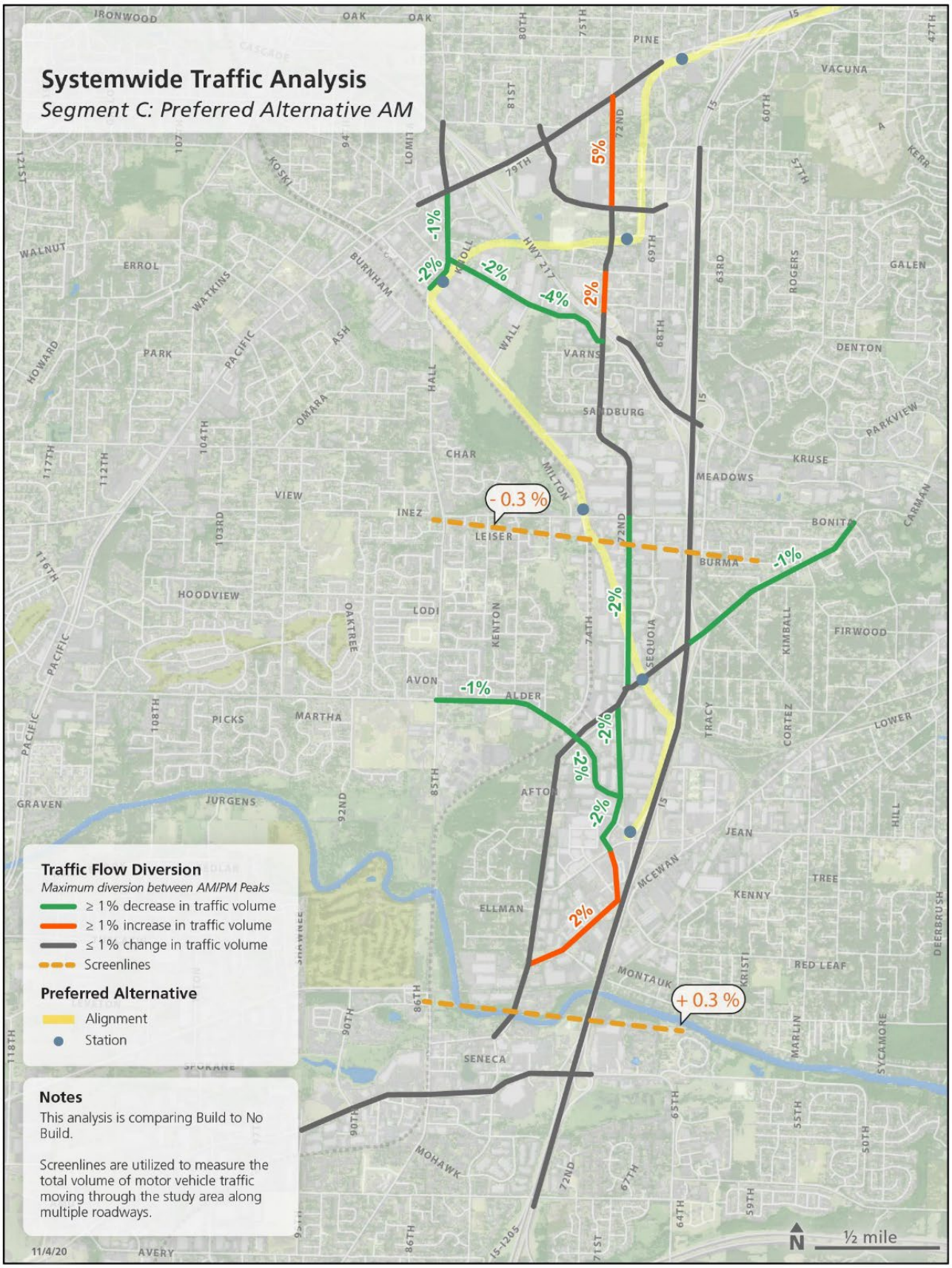
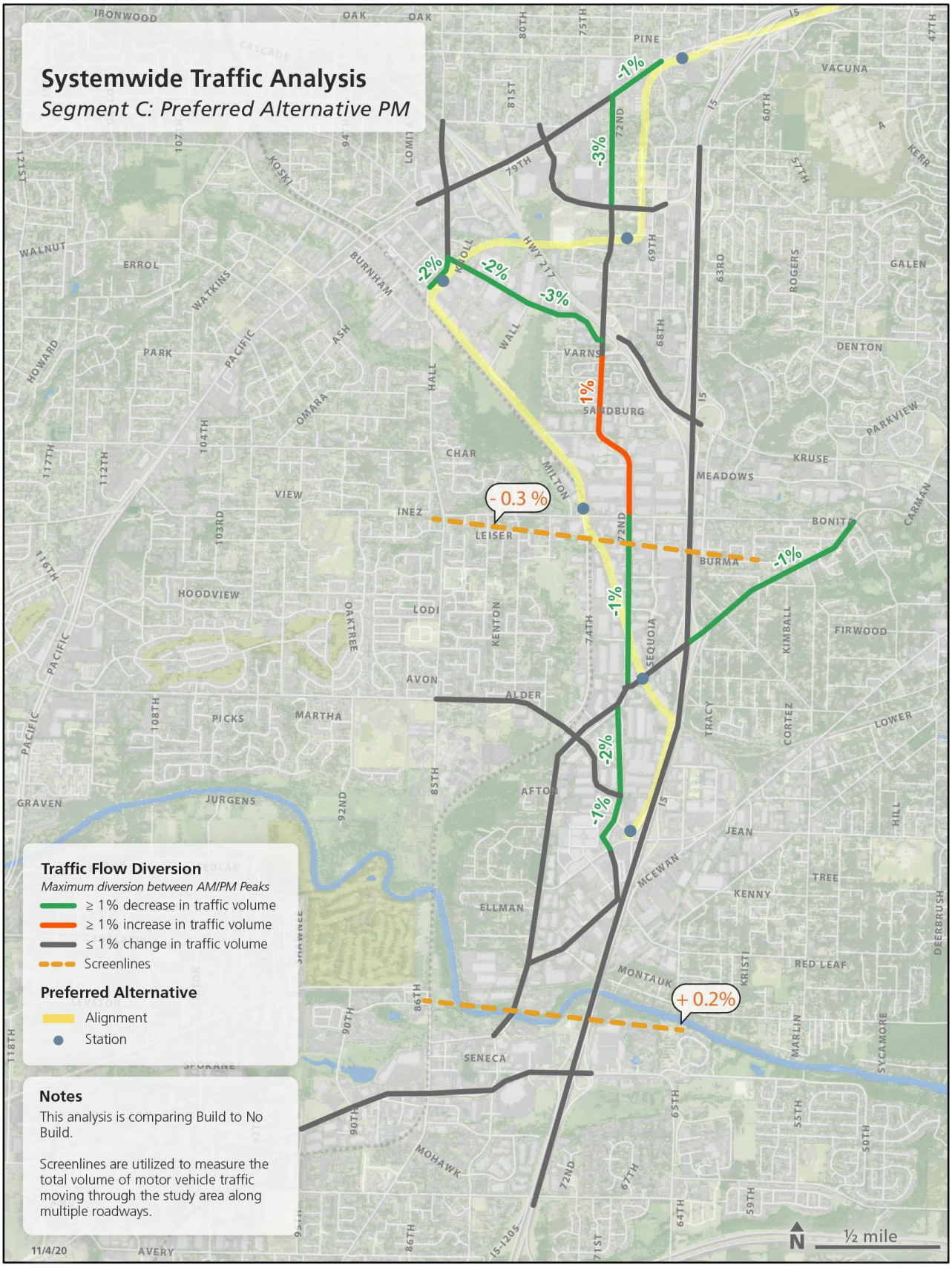


Figure 4.3-2. Traffic Circulation Changes – Segment C: Preferred Alternative PM



Terminus Options – Tigard Subarea

Table 4.3-49 describes queuing performance for the PM peak in 2045 for the terminus options, assuming a 300-stall Hall Park and Ride. Queues would generally be similar to the of the Preferred Alternative and would not trigger mitigation, with respect to the No-Build Alternative. More information can be found in Appendix B54.[6]

Table 4.3-49. Segment C 2045 Terminus Options PM Peak 95th Percentile Queuing SimTraffic Analysis – Tigard Subarea (Tigard Triangle)

Study Intersection No.		C17	C19	B37	B38	B39a	B39b
Approach	Movement	SW 65th Ave./SW Haines St./I-5 NB ramps	SW 68th Pkwy./SW Dartmouth St./I-5 SB ramps	I-5 NB off-ramp/SW 60th Ave.	SW Barbur Blvd./SW 60th Ave.	I-5 SB off-ramp/SW Barbur Blvd./SW 64th Ave.	I-5 NB off-ramp/SW Barbur Blvd./SW 64th Ave.
NB	Left	-	112	-	94	-	-
	Thru	380	354	294	-	-	-
	Right	-	200	-	-	-	-
SB	Left	-	190	-	-	-	28
	Thru	-	725	41	-	367	83
	Right	-	-	-	-	-	-
EB	Left	-	267	-	-	258	-
	Thru	205	274	1,381	585	370	90
	Right	25	57	-	-	-	-
WB	Left	-	251	-	439	918	-
	Thru	181	234	-	3,956	964	-
	Right	-	37	-	-	-	-
SW	Thru	-	-	-	-	1,181	-

N/A – Synchro does not calculate 95th percentile queue lengths for stop-controlled intersections.

EB = eastbound; I-5 = Interstate 5; NB = northbound; SB = southbound; WB = westbound.

"-" represents "not applicable"

4.3.4. Segment C Light Rail Station Vehicular Access Impacts

Circulation through neighborhood streets surrounding the station areas was evaluated to determine the local impact of transit-related vehicle trips. There could be some resulting redistribution of trips near light rail stations due to pick-ups and drop-offs, but this impact would be minor. The analysis of surrounding local streets shows that those pick-up/drop-off trips can be accommodated. At park and rides, the intersection analysis described above includes the traffic volumes associated with park and ride access and egress.

Metro's travel model was used to develop assumptions about access mode share to each station. More information is contained in *Attachment A. Transit Impact and Travel Demand Forecasting Results Report***.** The travel model does not forecast pick-ups and drop-offs by private vehicles or transportation network

[6] In Appendix B54, the terminus options are referred to as the "Build MOS."

companies (TNC) at stations specifically. However, stations may experience pick-up and drop-off activity. This activity can be managed through design, including 'no stopping or parking' zones in station areas and other design treatments. At existing light rail stations on TriMet's system, pick-up and drop-off activity occurs to varying degrees, but is not known to cause congestion or queuing issues.

Segment C Park and Ride Lots

Hall Park and Ride

The Hall Park and Ride structure would be adjacent to the Hunziker O&M facility, and has a planned capacity of 100 vehicle spaces and access off of SW Hunziker Road just east of the light rail crossing on SW Hunziker Road. The location and limited size of this location will likely serve primarily local users.

Bridgeport Park and Ride (Bridgeport Village)

The Bridgeport Park and Ride structure would be adjacent to the Bridgeport Village shopping center, just west of I-5. The park and ride is planned as a parking structure with a capacity of 950 or 700 vehicle spaces, with access off of SW Lower Boones Ferry Road at SW Travelers Lane. This location has the potential to serve both local users and regional users because of its proximity to I-5.

Based on the regional travel demand model, approximately 30 percent of vehicle trips to the Bridgeport Park and Ride would use I-5 to go to and from the south, while 40 percent would use SW Lower Boones Ferry to go to and from the south. Approximately 16 percent would go to and from the north on SE 72nd Avenue; 12 percent would go to and from the east on SW Lower Boones Ferry Road; and 2 percent would go to and from the west on SW Bridgeport Road.

4.4. Segment C Mitigation

Segment C mitigation is discussed in Chapter 3 of the Final EIS. The following section describes the mitigated operations in Segment C.

4.4.1. 2035 Preferred Alternative Mitigated Operations

Tigard Subarea

Table 4.4-1 shows the PM peak hour Synchro analysis results for the Preferred Alternative for the Tigard subarea in Segment C, but including dedicated double left-turn lane northbound on SW 68th Avenue at Highway 99W.

Mobility targets for the appropriate jurisdiction are shown for every intersection. Intersection results that do not meet these mobility targets in a particular peak hour are shaded gray. The worst lane group is listed under the WLANE columns for two-way stop controlled intersections.

Compared to the Preferred Alternative, the same intersections would exceed operational standards during the PM peak hour. The intersection of SW 68th Avenue at OR 99W has lower delay. The benefits of the mitigation are in the reduction in queuing.

Table 4.4-1. Segment C 2035 Preferred Alternative with Operational Mitigation HCM (Synchro) Analysis – Tigard Subarea

ID	Intersection	Mobility Target		Control	AM				PM			
					Delay	LOS	V/C	WLANE	Delay	LOS	V/C	WLANE
C2	SW Hall Blvd. at OR 99W	ODOT	1.10	Signal	-	-	-	-	61.9	E	0.91	-
C3	SW Greenburg Rd./SW Main St. at OR 99W	ODOT	1.10	Signal	-	-	-	-	37.4	D	0.80	-
B37	I-5 NB off ramp/SW 60th Ave.	ODOT Ramp	0.85	Signal	-	-	-	-	44.7	D	0.47	-
B38	SW Barbur Blvd./SW 60th Ave.	ODOT/ PBOT 1st HR	0.99	Signal	-	-	-	-	24.4	C	0.57	-
B39a	I-5 SB off ramp/SW Barbur Blvd./SW 64th Ave.	ODOT Ramp	0.85	Signal	-	-	-	-	42.8	D	0.83	-
B39b	I-5 NB on ramp/SW Barbur Blvd./SW 64th Ave.	ODOT Ramp	0.85	Signal	-	-	-	-	6.6	A	0.42	-
C42	SW 68th Ave./OR 99W	ODOT	1.10	Signal	-	-	-	-	27.1	C	0.88	-
C43	SW 68th Ave./Park and Ride	Tigard	1.00	TWSC	-	-	-	-	3.7 [13.6]	A [B]	[0.29]	WBL2
C44	SW 72nd Ave./OR 99W	ODOT	1.10	Signal	-	-	-	-	49.5	D	0.89	-
C45	SW 71st Ave./OR 99W	ODOT	1.00	TWSC	-	-	-	-	24.6 [381.3]	C [F]	[1.51]	SBL1

Key: [Worst stop-controlled delay] for TWSC intersections.

V/C represents intersection average for signals and worst movement for stop controlled intersections.

Ln = lane; NB = northbound.

"-" represents "not applicable"

4.4.2. 2035 Preferred Alternative Mitigated Queuing

Tigard Subarea

Table 4.4-2 summarize the Synchro analysis for the PM peak hour 95th percentile queues in the Tigard subarea for the Preferred Alternative in Segment C with a project measure that adds a dedicated double left-turn lane northbound on SW 68th Avenue at OR 99W. This project modification reduces the queuing on the I-5 southbound off ramp to approximately 930 feet and provides safe stopping site distance for traffic exiting I-5 southbound.

Table 4.4-2. Segment C 2035 Preferred Alternative with Queuing Mitigation PM Peak 95th Percentile SimTraffic Analysis – Tigard Subarea

Study Intersection No.		C2	C3	B37	B38	B39a	B39b	C42	C43	C44	C45
Approach	Movement	SW Hall Blvd./OR 99W	SW Greenburg Rd./SW Main St. at OR 99W	I-5 NB off ramp/SW 60th Ave.	SW Barbur Blvd./SW 60th Ave.	I-5 SB off ramp/SW Barbur Blvd./SW 64th Ave.	I-5 NB on ramp/SW Barbur Blvd./SW 64th Ave.	SW 68th Ave./OR 99W	SW 68th Ave./Park and Ride	SW 72nd Ave./OR 99W	SW 71st Ave./OR 99W
NB	Left				79			284		170	
	Thru			348				274	482	886	
	Right							93		170	
SB	Left						26	117	72	198	
	Thru			39		531	67	105	21	331	755
	Right										
EB	Left					213		150		400	74
	Thru			1,394	476	239	170	499		1,632	141
	Right									272	
WB	Left				380	913		236	444	212	
	Thru				1,507	949		909	444	386	
	Right										
SW	Thru					928					

N/A – Synchro does not calculate 95th percentile queue lengths for stop-controlled intersections.

EB = eastbound; NB = northbound; SB = southbound; WB = westbound; SW = southwest bound. "-" represents "not applicable"