APPENDIX L

Surface Transportation

Existing Conditions Report

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Local Jurisdiction Coordination Summary

References

APPENDIX L

Surface Transportation

Existing Conditions Report
Attachments

Attachment A: Turning Movement Count Graphics (Available by request)
Attachment B: Synchro Level-of Service (LOS) Reports (Available by request)
Attachment C: SimTraffic Queues and Travel Times (Available by request)
Attachment D: HCS LOS Reports (Available by request)
Attachment E: Approved Methods & Assumptions Documents

SAMP NTP Environmental Review:

Affected Environment: Existing Traffic Analysis Summary

Client:	Port of Seattle
Subject:	Traffic Operational Analysis – Existing Conditions
Submit to:	Steve Rybolt, Nic Longo; Port of Seattle
Submitted by:	Zach Wieben; Concord Engineering
Copied To:	Sarah Potter; Landrum and Brown
Date:	September 9, 2024

1. Introduction

This memorandum summarizes the existing traffic operational analysis for the Seattle-Tacoma International Airport's (Airport) Sustainable Airport Master Plan (SAMP) Near-Term Projects (NTPs) Environmental Review, Affected Environment chapter. The analysis assumptions, study area, transportation inventory and operational analysis results are presented in the sections below.

2. Analysis Assumptions and Study Area

The primary goal in the selection of intersections for the surface transportation study was to capture routes that connect adjacent population centers with airport uses. The establishment of the traffic analysis study area and process considered the following:

- Major signalized intersections and minor intersections along travel routes to and from the airport within the Environmental Assessment (EA) General Study Area (GSA).
- Primary and secondary routes of travel between the Near-Term Projects (NTPs) and origins/destinations outside the GSA.
- Locations and traffic movements of concern from public and agency feedback received during the scoping process.
- The Traffic Impact Analysis (TIA) procedures described in the WSDOT Design Manual Chapter 320 – Traffic Analysis.

The existing conditions analysis includes 108 intersections shown as black dots in Figure 1. A total of 63 signalized, 41 stop-controlled, and 4 uncontrolled intersections were analyzed. Freeway analysis for ramps and segments of SR 518 and I-5 at the request of WSDOT was also performed for the areas shown in purple and dark blue in Figure 1.

Intersections were analyzed for the weekday commuter PM peak hour. Review of average daily traffic (ADT) volumes and intersection turning movement counts documented in comprehensive plans and/or transportation master plans for the surrounding local agencies identified the PM peak period as the time of day with the highest traffic volumes for the roadways surrounding the Airport; therefore, the traffic analysis of existing conditions was conducted for the PM peak hour only. The PM peak hour is defined as the highest four consecutive 15-minute intervals of traffic during the PM commuter peak period (4 p.m. to 6 p.m. of a typical weekday – Tuesday, Wednesday, Thursday). The times of the peak hours varied by intersection, with 40 intersections considered isolated and using individual peaks and the remaining 68 intersections broken down into 17 subsets of intersections with network peaks for each. A summary table of which intersections were grouped for peak hour calculations is summarized in the attachments (Attachment A-1 to A-2). Intersection balancing adjustments were made for intersections included in the

17 subsets and were approved by WSDOT. Key measures of effectiveness used in the analysis include average vehicle delay (in seconds) and level-of-service (LOS). Performance metrics were collected at each of the study intersections.

Data for the existing conditions analysis was primarily collected from turning movement counts collected in Fall 2022 and Spring 2023 as well as WSDOT permanent counter data. Analysis models from the WSDOT led *SR 518 Corridor Planning* Study were utilized as well as base models that were then updated with current channelization, intersection control, and signal timings. Supplemental information such as signal timings and traffic counts were also collected from the Port of Seattle, King County, WSDOT, and the cities of Tukwila and SeaTac. All intersection analysis was conducting using Synchro 11 software. A full list of the study intersections is provided in Table 1.

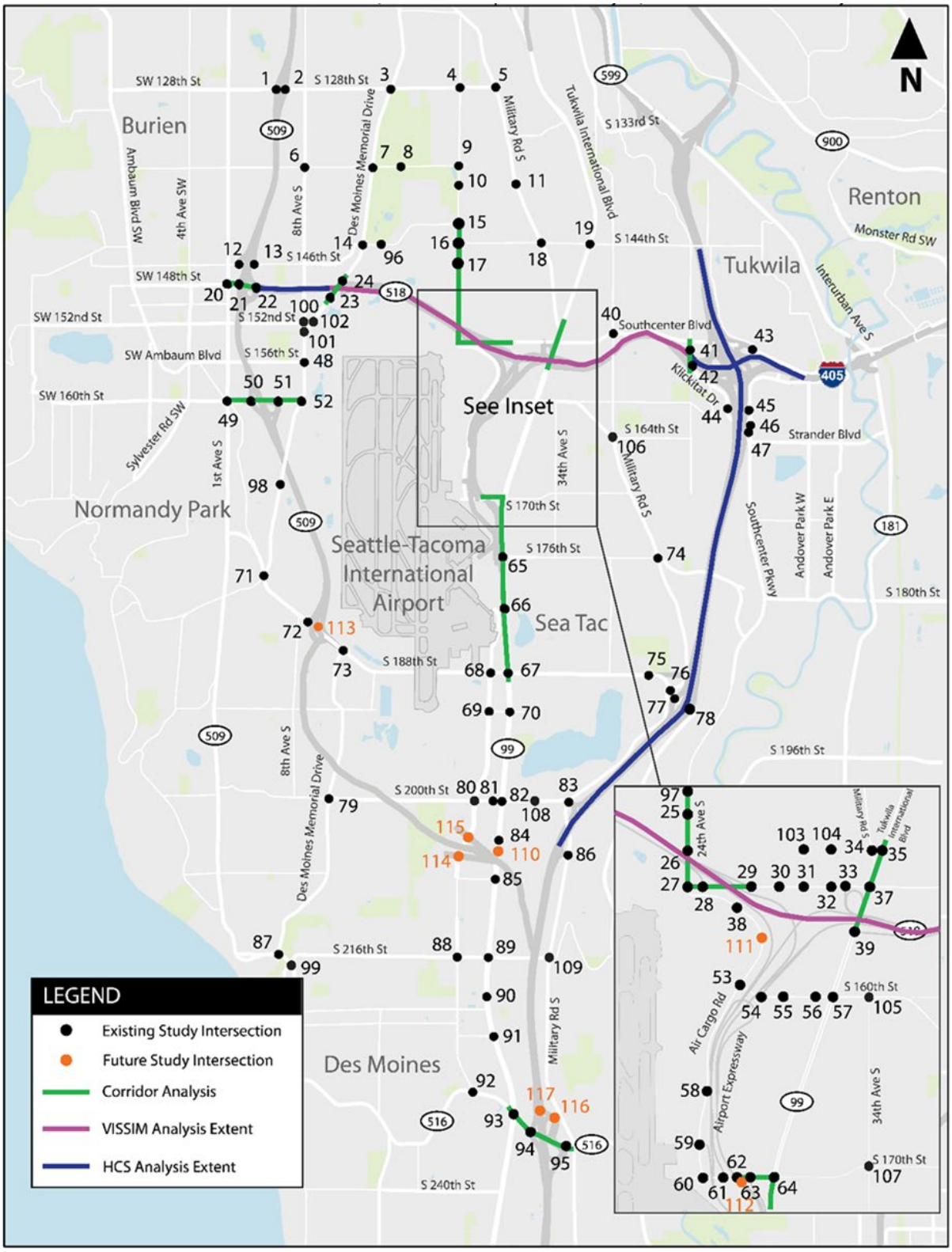


Figure 1. Study Area Intersections and Freeway Segments

3. 2022 Existing Conditions Results

3.1. Intersection Operations

Under 2022 existing conditions, 102 of 108 study intersections in the PM peak hour meet jurisdictional mobility standards. The 6 intersections that do not meet mobility standards in the PM peak within the study are listed below. A short description of the existing LOS deficiency is included:

- #23 – SR 518 EB Ramps/Des Moines Memorial Dr. (LOS F): Eastbound left turns experience approximately 55 seconds of delay and operate with a 0.30 v/c ratio at this intersection under existing conditions. The 95th-percentile queue for the eastbound left turn movement is 29 feet—or approximately one vehicle. Eastbound left turns have separated channelization from eastbound right turns. Therefore, the primary cause for the delay is northbound and southbound through trips on Des Moines Memorial Drive S. HCM 6th Edition results report the movement operates at an acceptable LOS D with about 33 seconds of delay which is better than the 55 seconds of delay reported using HCM 2000 methodology. There were 28 eastbound left turns counted in 2022.
- #33 – SR 518 WB Off-Ramp Loop/S 154th St. (LOS E): The northbound approach is stop controlled and experiences approximately 38 seconds of delay under existing conditions. Northbound volume totals 349 vehicles in the PM peak hour with a single lane provided for all movements. Northbound right turns have an extended taper that accommodate one additional vehicle simultaneously with a northbound left turn vehicle.
- #50 – SR 509 SB Ramps/SW 160th Street (LOS F): Southbound right turns experience approximately 106 seconds of delay at this intersection under existing conditions per HCM 2000 unsignalized intersection methodology. The southbound right turn is a free movement with no stop control and a downstream add lane for the existing slip lane. However, HCM 2000 results indicate the 677 PM peak hour southbound right turns is approximately 14% higher than the capacity for the lane. Weaving movements immediately downstream of the right turn prior to the Ambaum Cut Off/SW 160th St. signal may contribute some delay to the otherwise free movement. SimTraffic analysis summarized in Section 3.2 of this report indicates the Southbound approach at this intersection operates at LOS A with only 7 seconds of delay per vehicle. HCM 6th Edition methodology would assume 0 seconds of delay because there is no stop control for the movement with a downstream add-lane. This indicates the LOS F result may be a limitation in the HCM 2000 methodology.
- #83 - Military Rd. S/SB I-5 Ramps/S 200th St. (LOS E): The signalized intersection operates at LOS E below the WSDOT standard of LOS D for the ramp terminal intersection. The 304 northbound left turns in the PM peak hour operate with an average delay of approximately 151 seconds and are the critical movement for the intersection. All other movements operate with 0-83 seconds of average delay which are less than the 133-second existing cycle length.
- #93 – Pacific Highway S./SR 516/Kent-Des Moines Road S. (LOS F, Critical v/c 1.24). The signalized intersection operates at LOS F with approximately 97 seconds of average delay. The critical southbound-through movement operates with a v/c ratio of 1.24 and an average delay of approximately 183 seconds. The delay for this movement exceeds the cycle length of the intersection (175 seconds) indicating on average a southbound-through vehicle will wait more than one cycle length to be serviced. All other movements have an average delay less than 100 seconds and v/c less than 1.0 except the southbound-left movement (122 seconds, 1.04 v/c). The City of Des Moines allows LOS F operations of the intersection (average delay exceeding 80

seconds) however, it also evaluates critical movements of having a v/c less than 1.2[1]as pass/fail criteria.

- #101 - 8th Ave S./Des Moines Memorial Dr. (LOS F): The stop-controlled intersection operates at LOS F below the LOS D/E standards of Burien and SeaTac whose boundary bisects Des Moines Memorial Drive S. The intersection forms the southern point of a triangle with Des Moines Memorial Drive S., 8th Ave S., and S. 152nd Street where southbound vehicles on Des Moines Memorial Drive S. must stop and yield to southbound vehicles on 8th Ave S.

Table 1 provides a summary of the PM peak hour operational analysis existing conditions results. Level-of-service and turning movement count graphics are provided in Attachment A.

[1] Page 3-4 of *Des Moines 2035, Charting Our Course for a Sustainable Future* (2015)

Table 1. Year 2022 - Existing Conditions Traffic Analysis Results

ID	Intersection	Jurisdiction	Traffic Control	Mobility Standard^	LOS	Vehicle Delay (sec)
1	SR 509 SB Ramps/S 128th St.	WSDOT	Signalized	D	C	20.1
2	SR 509 NB Ramps/S 128th St.	WSDOT	Signalized	D	B	17.4
3	Des Moines Mem. Dr./S 128th St.	Burien/SeaTac	Signalized	E	C	22.6
4	24th Ave. S/S 128th St.	SeaTac	Signalized	D	A	7.6
5	Military Rd. S/S 128th St.	SeaTac/Tukwila	TWSC	E	B	15.0 (WB)
6	8th Ave. S/S 136th St.	Burien	Signalized	C	A	8.2
7	Des Moines Mem. Dr./S 136th St.	SeaTac	Signalized	E	A	9.5
8	18th Ave. S/S 136th St.	SeaTac	OWSC	D	B	11.1 (NB)
9	24th Ave. S/S 136th St.	SeaTac	AWSC	D	A	9.9
10	24th Ave. S/S 138th St.	SeaTac	TWSC	D	B	12.1 (WB)
11	Military Rd. S/S 138th St.	SeaTac/Tukwila	OWSC	E	B	11.4 (EB)
12	SR 509 SB Ramp/S 146th St.	WSDOT	OWSC	D	B	14.2 (SBL)
13	SR 509 NB Ramp/S 146th St.	WSDOT	Uncontrolled	D	A	4.0 (EB)
14	Des Moines Mem. Dr./S 144th St.	Burien/SeaTac	Signalized	E	C	29.1
15	24th Ave. S/S 142nd St.	SeaTac	AWSC	D	B	11.8
16	24th Ave. S/S 144th St.	SeaTac	TWSC	D	B	12.3 (WB)
17	24th Ave. S/S 146th St.	SeaTac	TWSC	D	C	16.7 (WB)
18	Military Rd. S/S 144th St.	SeaTac/Tukwila	AWSC	E	B	12.3
19	International Blvd./S 144th St.	Tukwila	Signalized	E	C	34.3
20	1st Ave. S/SW 148th St.	Burien	Signalized	D	D	50.0
21	SR 509 SB Ramps/SW 148th St.	WSDOT	Signalized	D	D	52.3
22	SR 509 NB Ramps/SW 148th St.	WSDOT	Signalized	D	A	5.0
23	SR 518 EB Ramps/Des Moines Mem. Dr.	WSDOT	OWSC	D	F	54.7 (EBL)
24	SR 518 WB Ramps/Des Moines Mem. Dr.	WSDOT	OWSC	D	C	21.6 (WB)
25	24th Ave. S/S 150th St.	SeaTac	TWSC	D	B	13.8 (WB)
26	24th Ave. S/S 152nd St.	SeaTac	OWSC	D	B	12.2 (WB)
27	24th Ave. S-Air Cargo Rd./S 154th St.	SeaTac	Signalized	D	B	10.1
28	SR 518 EB Off-Ramp/S 154th St.	WSDOT	OWSC	D	C	22.8 (SBL)
29	SR 518 WB On-Ramp/S 154th St.	WSDOT	Uncontrolled	D	A	0 (EB/WB)
30	29th Ave. S/S 154th St.	SeaTac	OWSC	E	B	13.0 (SB)
31	30th Ave. S/S 154th St.	SeaTac	TWSC	E	B	14.3 (SB)
32	32nd Ave. S/S 154th St.	SeaTac	TWSC	E	C	16.2 (SB)
33	SR 518 WB Off-Ramp /S 154th St.	WSDOT	TWSC	D	E	37.5 (NB)
34	Military Rd. S/S 152nd St.	SeaTac/Tukwila	Signalized	E	A	9.0
35	International Blvd./S 152nd St.	SeaTac/Tukwila	Signalized	E	C	24.2
37	International Blvd./S 154th St.	WSDOT	Signalized	E-Mitigated	D	38.7
38	Air Cargo Rd./S 156th St.	Port	OWSC	NA	B	13.8 (NB)
39	International Blvd./SR 518 EB On-Ramp	WSDOT	Signalized	E-Mitigated	B	10.5
40	Southcenter Blvd./42nd Ave. S	Tukwila	Signalized	E	D	35.5
41	SR 518 WB On-ramp/51st Ave. S	WSDOT	Uncontrolled	D	A	9.4 (NB)
42	SR 518 EB Off-Ramp/51st Ave. S	WSDOT	OWSC	D	C	22.5 (EBL)
43	Southcenter Blvd./Macadam Rd.	Tukwila	Signalized	E	B	15.6
44	Klickitat Dr./I-5 SB On-Ramp	WSDOT	Uncontrolled	D	B	10.0 (SBL)
45	Southcenter Blvd./I-5 NB Off-Ramp	WSDOT	Signalized	E	C	24.7
46	Klickitat Dr./Southcenter Blvd.	Tukwila	Signalized	E	D	38.1
47	Southcenter Blvd./NB I-5 Off Ramp	WSDOT	OWSC	D	C	18.4 (EBR)
48	8th Ave. S/S 156th St.	SeaTac	Signalized	E	C	20.6
49	1st Ave. S/SW 160th St.	Burien	Signalized	D	D	49.9
50	SR 509 SB Ramps/SW 160th St.	WSDOT	OWSC	D	F	105.6 (SBR)
51	SR 509 NB Ramps/SW 160th St.	WSDOT	TWSC	D	C	17.8 (NB)
52	Des Moines Memorial Dr./SW 160th St.	SeaTac	Signalized	E	B	10.0
53	Air Cargo Rd./S 160th St.	Port	AWSC	NA	C	18.2
54	Host Rd./SR 518 On-Ramp/S 160th St.	SeaTac/WSDOT	TWSC	E	C	24.5 (NBL)
55	SeaTac Rental Car Facility Dr. W/S 160th St.	SeaTac	Signalized	E	B	14.9
56	SeaTac Rental Car Facility Dr. E/S 160th St.	SeaTac	TWSC	E	B	13.7 (SBL)
57	Pacific Hwy S/S 160th St.	SeaTac	Signalized	E	D	42.3
58	Air Cargo Rd./S 166th St.	Port	OWSC	NA	B	13.5 (EB)
59	Air Cargo Rd./SB Airport Expressway On-Ramp	Port	Signalized	NA	A	1.1
60	Air Cargo Rd./S 170th St.	Port	AWSC	NA	A	7.9
61	SB Airport Expressway Off-Ramp/S 170th St.	SeaTac	Signalized	E	C	24.4
62	Doug Fox Parking Lot/S 170th Street	SeaTac	OWSC	C	B	13.4 (SBL)
63	NB Airport Expressway Off-Ramp/S 170th St.	SeaTac	Signalized	C	A	6.5
64	International Blvd/S 170th St.	SeaTac	Signalized	E-Mitigated	D	54.5

Table 1. Year 2022 - Existing Conditions Traffic Analysis Results

ID	Intersection	Jurisdiction	Traffic Control	Mobility Standard^	LOS	Vehicle Delay (sec)
65	International Blvd/S 176th St.	SeaTac	Signalized	E-Mitigated	C	29.4
66	International Blvd/S 182nd St./Arrivals Dr.	SeaTac	Signalized	E-Mitigated	D	39.8
67	International Blvd/S 188th St.	SeaTac	Signalized	E-Mitigated	E	63.2
68	28th Ave. S/S 188th St.	SeaTac	Signalized	E	D	40.8
69	28th Ave. S/S 192nd St.	SeaTac	Signalized	E	A	5.7
70	International Blvd/S 192nd St.	SeaTac	Signalized	E-Mitigated	B	19.0
71	S Normandy Rd./Ambaum Blvd. S	Burien	Signalized	D	C	27.8
72	SB SR 509 Off Ramp/Des Moines Mem Dr.	WSDOT	OWSC	D	D	27.7 (SBR)
73	Des Moines Memorial Dr./S 188th St.	SeaTac	Signalized	E	C	22.0
74	Military Rd. S/S 176th St.	SeaTac	Signalized	E	C	32.6
75	46th Ave. S/S 188th St.	SeaTac	Signalized	E	B	14.1
76	Military Rd. S/S 188th St.	SeaTac	Signalized	E	D	35.5
77	SB I-5 Ramps/S 188th St.	WSDOT	Signalized	D	C	21.3
78	NB I-5 Ramps/S 188th St.	WSDOT	Signalized	D	C	33.1
79	Des Moines Memorial Dr./S 200th St.	SeaTac/Des Moines	Signalized	E	C	27.6
80	26th Ave. S/S 200th St.	SeaTac	Signalized	E	B	19.4
81	28th Ave. S/S 200th St.	SeaTac	Signalized	E	C	29.9
82	International Blvd/S 200th St.	SeaTac	Signalized	E-Mitigated	E	61.5
83	Military Rd. S/SB I-5 Ramps/S 200th St.	WSDOT	Signalized	D	E	69.7
84	International Blvd/S 204th St.	SeaTac	Signalized	E-Mitigated	A	8.3
85	International Blvd/S 208th St.	SeaTac	Signalized	E-Mitigated	B	17.7
86	Military Rd. S/NB I-5 Ramps	WSDOT	Signalized	D	C	27.8
87	Des Moines Memorial Dr./S 216th St.	WSDOT	Signalized	E	B	12.7
88	24th Ave. S/S 216th St.	Des Moines	Signalized	D	C	26.9
89	Pacific Hwy S/S 216th St.	Des Moines	Signalized	F (v/c 1.0)	D	50.3
90	Pacific Hwy S/S 220th St.	Des Moines	Signalized	E	B	17.3
91	Pacific Hwy S/S 224th St.	Des Moines	Signalized	E	C	24.0
92	24th Ave. S/SR 516	Des Moines	Signalized	D	C	24.7
93	Pacific Hwy S/SR 516	Des Moines	Signalized	F (v/c 1.2)	F	97.4
94	SB I-5 Ramps/SR 516	WSDOT	Signalized	D	D	50.7
95	NB I-5 Ramps/SR 516	WSDOT	Signalized	D	B	19.8
96	16th Ave. S/S 144th St.	SeaTac	OWSC	D	B	10.9 (NB)
97	24th Ave. S/S 148th St.	SeaTac	OWSC	D	B	12.8 (WB)
98	Des Moines Memorial Dr./S 168th St.	Burien	TWSC	C	C	16.9 (EB)
99	SR 509/Marine View Dr./S 216th St.	WSDOT	Signalized	E	C	28.2
100	8th Ave S/S 152nd St.	Burien	AWSC	C	B	11.4
101	8th Ave S/Des Moines Memorial Dr.	Burien/SeaTac	OWSC	D/E	F	50.6 (WB)
102	S. 152nd St./Des Moines Memorial Dr.	Burien/SeaTac	OWSC	E	C	21.2 (EB)
103	30th Ave. S/S 152nd St.	SeaTac	OWSC	D	A	9.5 (NB)
104	32nd Ave. S/S 152nd St.	SeaTac	TWSC	D	A	9.7 (NB)
105	34th Ave. S/S 160th St.	SeaTac	TWSC	E	C	16.8 (NB)
106	Military Rd. S/S 164th St./42nd Ave. S.	SeaTac	Signalized	E	D	35.9
107	34th Ave. S/S 170th St.	SeaTac	AWSC	E	A	8.7
108	32nd Ave. S/S 200th St.	SeaTac	Signalized	E	A	5.6
109	Military Rd. S/S 216th St.	SeaTac	Signalized	E	D	54.0

Notes:
- Signalized and stop-controlled intersections are analyzed in Synchro, Version 11. Results are based on Highway Capacity Manual (HCM) 2000
- TWSC: Two-way stop control. Shaded cells indicate intersections that fail to meet agency LOS standards.
- For two-way stop-controlled intersections, the worst delay for the minor street movements was used to report the intersection LOS.
- Intersections not meeting mobility standards are shaded in black.
- ^LOS Standard "E-Mitigated" is defined by the Puget Sound Regional Council for Tier 1 regionally significant state highways. An "E-Mitigated" standard requires the highway to operate at LOS "E" after mitigating through transit, demand management, and transportation system management strategies.
- ^ LOS Standard "F-Exception" applies to intersections where an exception has been applied to the mobility standard and no mitigation is required with an LOS F operation. Intersections that operate at LOS 'F' but meet still meet mobility standards are highlighted in light brown.

3.2 Corridor Operations

Corridor operations were analyzed at the request of WSDOT and the Port where study intersections are closely spaced and queues/congestion from one intersection may impact upstream intersection operations. Corridor operations were conducted using SimTraffic and followed WSDOT's *Synchro & SimTraffic Protocol (August 2018)*. See Attachment E for the methods and assumptions for this corridor operations analysis documenting (Measures of Effectiveness) MOEs and calibration criteria. The SimTraffic analysis was divided into nine corridors, each consisting of between two to six intersections, listed below in Table 2.

Table 2. SimTraffic Corridors Analyzed

#	Segments of Interest	Study Intersections Included
1	24th Ave. S: S 142nd St. to S 154th St.	15, 16, 17, 97, 25, 26, 27
2	SW 148th St.: 1st Ave S to SR 509	20, 21, 22
3	Des Moines Memorial Dr. : SR 518 Ramp Terminals	23, 24
4	S 154th St.: 24th Ave S and SR 518 Ramp Terminals	27, 28, 29
5	International Boulevard: S 152nd St. to SR 518 EB On-Ramp	35, 36, 37, 39
6	51st Ave S.: SR 518 Ramp Terminals	41, 42
7	SW 160th St.: 1st Ave S. to Des Moines Memorial Dr.	49, 50, 51, 52
8	NAE Off-Ramp/S 170th St. to International Boulevard/ S 188th St.	63, 64, 65, 66, 67
9	SR 516: Pacific Highway S and I-5 Ramp Terminals	93, 94, 95

MOEs for the corridor analysis were 95th percentile queues and average corridor travel time as documented in the methods and assumption scoping document. The analysis was performed to evaluate the potential for the blocking of intersections and for turn lanes exceeding provided storage lengths which may not appear in typical isolated intersection analysis. The corridors were calibrated using intersection throughput compared to field turning movement counts as the primary metric for ensuring accuracy. The intersection throughput numbers of the simulation were compared to counts taken during the 2022 PM peak hour and evaluated using a +/-10% threshold. Additionally, reported delays from SimTraffic were compared to reported delays from the Synchro analysis. Simulation results of 11 random seeds were averaged and reported. Parameters changed for the purposes of calibration include vehicle occurrence percentage, headways at 20, 50, and 80 miles per hour, gap acceptance factor, speed factor, yellow and courtesy deceleration rate, and yellow and great reaction time. Parameters were adjusted based on recommended ranges in WSDOT's *Synchro & SimTraffic Protocol (August 2018).* SimTraffic Queueing and Blocking reports are saved after the capacity analysis reports in Appendix C for each corridor.

PM peak hour conditions for 21 of the 34 study intersections report having no queuing concerns, including the entirety of Segment 3 (Des Moines Memorial Drive S.), Segment 4 (S 154th St) and Segment 6 (51st

Ave). Queues exceeding their storage lengths are observed at multiple locations along the remaining corridors. The most severe queues and delays recorded for all study intersections are summarized below:

- Int #20 – SW 148th Street/SR 518 at 1st Avenue S: All left turn queue lengths are exceeding their storage lengths.
- Int #37 – SR 99/Tukwila International Boulevard at S. 154th Street: Eastbound and westbound left turn pockets exceed their storage capacity.
- Int #49 – 1st Avenue S. at S. 160th Street: Southbound and eastbound left turn queues exceed storage. Westbound queue extends back to upstream intersection in the WB direction (Segment 7 – SW 160th St).
- Int #93 – Pacific Highway S. at Kent-Des Moines Road: Southbound queues extended over a half-mile even after additional volume was shifted to the HOV lane to better distribute southbound trips through the intersection. Queues reported in HCM results indicate queues less than a quarter-mile, however HCM queue results may also under-report the queue length due to oversaturated conditions. Google traffic congestion maps for typical conditions indicate queuing routinely spills back to S 226th Street, approximately 2,000 feet north of the intersection. This information indicates the SimTraffic results more likely replicate the field conditions.

Arterial travel times were calculated from SimTraffic by adding running time (i.e. free flow) and delay time (stopped). The distance of the corridor divided by the combination of these two times resulted in an average corridor speed. Results for each corridor's average travel time and speed are summarized in Table 3.

Table 3. SimTraffic Corridors Travel Time and Speed Results

#	Arterial	Direction	2022 PM Existing				
			Distance (mi)	Travel Time (s/veh)	Delay (s/veh)	Running Time (s/veh)	Avg Speed (mph)
1	24th Ave S	NB	0.8	92.6	12.0	80.6	31.1
		SB	0.8	93.3	17.0	76.3	30.9
2	SW 148th St/SR 518	EB	0.2	60.6	49.1	11.5	11.9
		WB	0.2	94.9	84.2	10.7	7.6
3	DMMD	NB	0.1	11.3	2.0	9.3	31.9
		SB	0.1	9.7	0.4	9.3	37.1
4	S 154th St	EB	0.2	25.8	3.3	22.5	27.9
		WB	0.2	37.2	14.6	22.6	19.4
5	SR 99	NB	0.3	80.3	54.0	26.3	13.4
		SB	0.3	86.0	58.9	27.1	12.6
6	51st Ave S	NB	0.1	25.2	9.9	15.3	14.3
		SB	0.1	15.5	0.1	15.4	23.2
7	SW 160th St	EB	0.5	79.4	32.4	47.0	22.7
		WB	0.5	99.0	52.7	46.3	18.2
8	International Blvd	NB	1.1	221.6	104.3	117.3	17.9
		SB	1.1	264.8	152.0	112.8	15.0
	S 170th St	EB	0.1	62.0	54.0	8.0	5.8
		WB	0.1	14.7	3.7	11.0	24.5
9	S Kent Des Moines Rd	EB	0.4	156.0	114.5	41.5	9.2
		WB	0.4	100.1	60.7	39.4	14.4

3.3 SR 518 VISSIM Analysis

This section summarizes the VISSIM operational analysis conducted on SR 518 freeway mainline segments between Des Moines Memorial Drive and the I-5/I-405/SR 518 interchange.

3.3.1 Analysis Assumptions and Study Area

A full summary of the methods and assumptions of the VISSIM analysis is documented in the *SAMP SR 518 VISSIM Traffic Analysis Methods & Assumptions* document, and provided as Attachment E. The sections below provide a summary of the analysis tools, study area, peak periods, input data sources and measures of effectiveness reported. Figure 2 shows the VISSIM study area extents. Ramp terminal intersections were not included in the VISSIM model and were analyzed using Synchro/SimTraffic per scoping with WSDOT. A boundary condition was included in the VISSIM model for eastbound SR 518 at the I-5 underpass to mimic existing congestion on northbound I-405 in the PM peak hour

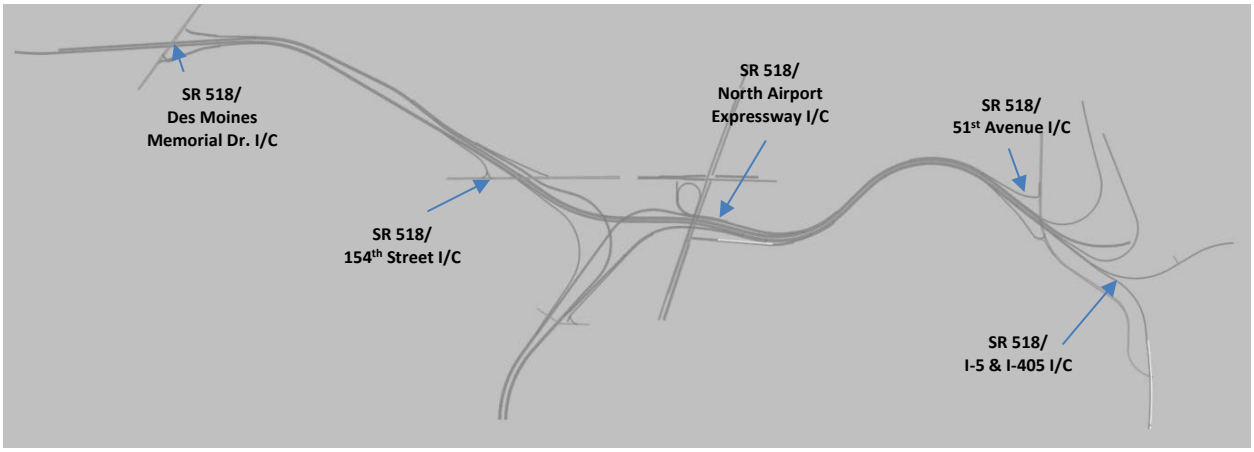


Figure 2. VISSIM Model Extents

The microscopic traffic simulation tool, VISSIM 2020 (SP 14), was used to analyze freeway and ramp operations along SR 518. The peak hour under existing conditions for the freeway system was 4:45-5:45 PM based on volume and speed data collected at WSDOT permanent counter locations along the corridor. A 2-hour peak period from 4:00-6:00 PM was used for the VISSIM analysis afternoon peak. A 30-minute simulation seeding period was also included in the VISSIM model in addition to the 2-hour analysis period. The existing demand inputs for the VISSIM model were created using traffic count data collected at the intersection, mainline, and ramps in September and October of 2022. Origin-destination data for routing was developed from Streetlight Data. Speed data used to create speed-temporal maps along the corridor was collected from WSDOT permanent data stations between I-5 and International Boulevard. Key measures of effectiveness (MOE) collected from the VISSIM analysis include corridor travel times, vehicle throughput, and segment speeds.

3.3.2 Travel Times

Corridor travel times during the PM peak period were reported from the VISSIM model. Field travel times were collected from February-April 2022 Streetlight Data provided by WSDOT. Streetlight Data aggregates and summarizes data from Bluetooth and GPS sources to provide a more robust sample size than typical floating car travel times. This data can then be refined to determine point-to-point travel patterns, volume, and travel time for vehicles along a corridor. The Streetlight Data was summarized into 1-hour increments (4:00-5:00 PM, 5:00-6:00 PM). The field travel time routes were replicated within VISSIM and compared using allowable differences as directed by WSDOT. The larger of the allowable difference in

travel time as calculated by one of two methods was used to determine when a travel time route was calibrated: 1) Table 7 in the *WSDOT VISSIM Protocol (2014)* or 2) 10% of field travel time. All travel times were rounded to the nearest 0.1 minutes.

A total of 18 travel time routes (9 eastbound, 9 westbound) were collected from the VISSIM model representing point-to-point travel times in both the eastbound and westbound directions. Each of the 18 travel time routes were collected and calibrated for the 4:00-5:00 PM and 5:00-6:00 PM hours. The point-to-point travel times also provided insight on lane-by-lane congestion in the eastbound direction as drivers approached the I-5/I-405/SR 518 interchange and lanes drop to specific freeway facilities. In general, eastbound travel times averaged between 1.9 and 4.5 minutes during the peak hour while westbound travel times average between 1.6 and 2.4 minutes. Table 4 summarizes the existing field and VISSIM travel time data.

Table 4. 2022 Travel Time Calibration Summary

	ID	#	Distance [mi]	Description		4:00 - 5:00 PM							5:00 - 6:00 PM						
				From	To	Field[1] [min]	Model [min]	Diff [min]	Diff [%]	Allowable Difference [min][2]	Allowable Difference [%]	Pass?	Field[1] [min]	Model [min]	Diff [min]	Diff [%]	Allowable Difference [min][2]	Allowable Difference [%]	Pass?
Eastbound	EB1[3]	11	1.8	EB SR 518 e/o Ramp to SB NAE	EB SR 518 to NB I-5 Ramp	2.1	2.2	0.1	5%	0.2	+/- 10%	Yes	2.8	2.5	-0.3	-11%	0.3	+/- 11%	Yes
	EB2[3]	12	1.8	EB SR 518 e/o Ramp to SB NAE	EB SR 518 to NB I-405 Ramp	2.8	3.0	0.2	7%	0.3	+/- 11%	Yes	4.3	3.9	-0.4	-9%	0.6	+/- 14%	Yes
	EB3[3]	13	1.8	EB SR 518 e/o Ramp to SB NAE	EB SR 518 to SB I-5 Ramp	2.3	2.4	0.1	4%	0.2	+/- 9%	Yes	3.0	2.9	-0.1	-3%	0.3	+/- 10%	Yes
	EB4[4]	14	1.8	NB NAE On Ramp from S 160th Street	EB SR 518 to NB I-5 Ramp	2.8	2.6	-0.2	-7%	0.3	+/- 11%	Yes	2.8	3.1	0.3	11%	0.3	+/- 11%	Yes
	EB5	15	1.8	NB NAE On Ramp from S 160th Street	EB SR 518 to NB I-405 Ramp	3.6	3.4	-0.2	-6%	0.4	+/- 11%	Yes	4.2	4.5	0.3	7%	0.6	+/- 14%	Yes
	EB6	16	1.7	NB NAE On Ramp from S 160th Street	EB SR 518 to SB I-5 Ramp	2.6	2.8	0.2	8%	0.3	+/- 12%	Yes	3.3	3.5	0.2	6%	0.4	+/- 12%	Yes
	EB7	17	1.3	EB SR 518 On Ramp from International Blvd.	EB SR 518 to NB I-5 Ramp	1.9	1.9	0.0	0%	0.2	+/- 11%	Yes	2.1	2.2	0.1	5%	0.2	+/- 10%	Yes
	EB8	18	1.3	EB SR 518 On Ramp from International Blvd.	EB SR 518 to NB I-405 Ramp	2.5	2.5	0.0	0%	0.3	+/- 12%	Yes	2.8	3.1	0.3	11%	0.3	+/- 11%	Yes
	EB9	19	1.3	EB SR 518 On Ramp from International Blvd.	EB SR 518 to SB I-5 Ramp	2.1	1.9	-0.2	-10%	0.2	+/- 10%	Yes	2.2	2.2	0.0	0%	0.2	+/- 9%	Yes
Westbound	WB1	21	1.3	SB I-5 to WB SR 518 Ramp	WB SR 518 Off Ramp to International Blvd. (Loop)	1.9	1.7	-0.2	-11%	0.2	+/- 11%	Yes	1.9	1.7	-0.2	-11%	0.2	+/- 11%	Yes
	WB2	22	1.6	SB I-5 to WB SR 518 Ramp	WB SR 518 s/o S. 154th Street Overpass	1.8	1.7	-0.1	-6%	0.2	+/- 11%	Yes	1.7	1.7	0.0	0%	0.2	+/- 12%	Yes
	WB3	23	1.7	SB I-5 to WB SR 518 Ramp	SB NAE s/o S. 160th Street Overpass	2.2	2.1	-0.1	-5%	0.2	+/- 9%	Yes	2.2	2.1	-0.1	-5%	0.2	+/- 9%	Yes
	WB4	24	1.4	SB I-405 to WB SR 518 Ramp	WB SR 518 Off Ramp to International Blvd. (Loop)	2	2.0	0.0	0%	0.2	+/- 10%	Yes	2.1	2.0	-0.1	-5%	0.2	+/- 10%	Yes
	WB5	25	1.7	SB I-405 to WB SR 518 Ramp	WB SR 518 s/o S. 154th Street Overpass	1.9	2.0	0.1	5%	0.2	+/- 11%	Yes	1.9	2.0	0.1	5%	0.2	+/- 11%	Yes
	WB6	26	1.8	SB I-405 to WB SR 518 Ramp	SB NAE s/o S. 160th Street Overpass	2.3	2.4	0.1	4%	0.2	+/- 9%	Yes	2.3	2.4	0.1	4%	0.2	+/- 9%	Yes
	WB7	27	1.1	WB SR 518 On Ramp from 51st Ave S.	WB SR 518 Off Ramp to International Blvd. (Loop)	1.7	1.7	0.0	0%	0.2	+/- 12%	Yes	1.8	1.7	-0.1	-6%	0.2	+/- 11%	Yes
	WB8	28	1.4	WB SR 518 On Ramp from 51st Ave S.	WB SR 518 s/o S. 154th Street Overpass	1.7	1.6	-0.1	-6%	0.2	+/- 12%	Yes	1.7	1.6	-0.1	-6%	0.2	+/- 12%	Yes
	WB9[4]	29	1.5	WB SR 518 On Ramp from 51st Ave S.	SB NAE s/o S. 160th Street Overpass	2.3	2.1	-0.2	-9%	0.2	+/- 9%	Yes	2.3	2.1	-0.2	-9%	0.2	+/- 9%	Yes
					Travel Time Segments Passing:	18 / 18 100%							Travel Time Segments Passing:						18 / 18 100%

Notes:

1. Field data comes from hourly Streetlight Data travel times from February through April 2022.
2. Allowable difference is the max of 10% of field time or the allowable difference using free-flowing formula in Table 7 of the WSDOT VISSIM Protocol (right). Values rounded to nearest 0.1 minutes.
3. Feb-Apr 2022 travel time data indicated faster average travel times for 5-6 PM EB SR 518 travel times that could not be calibrated within the allowable tolerances. Feb-Apr 2022 data was compared to typical travel times (Google) and showed 80th-percentile travel times for Feb-Apr 2022 would be more reflective of Sep-Oct 2022 congestion. Routes EB1, EB2, and EB3 therefore use the 80th-percentile travel times from Feb-Apr 2022 Streetlight Data.
4. Average travel time routes for EB4 and WB9 may have been skewed by circuitous routing within Streetlight Data's dataset. Median travel times from the dataset were used in place of average travel times in an attempt to exclude influence from the skewed circuitous travel times.

Facility Type	Equation
Free-Flowing	$\Delta = \frac{1}{\frac{1}{t} - \frac{4.4}{L}} - t$
Interupted Flow	$\Delta = \frac{1}{\frac{1}{t} - \frac{0.1 * 5280\ S}{3600\ L}} - t$

Δ = Allowable Travel Time Variation (+/- seconds)
t = Real World Travel Time (seconds)
L = Length (feet)
S = Free Flow Speed (mph); Posted Speed may be used for FFS if unknown

Table 7 - Travel Time Calibration Criteria

3.3.3 *Speed*

Speed data along the SR 518 corridor was collected from September and October of 2022 where available from WSDOT's permanent counters. Speed data was extracted from the VISSIM model at the same locations on the freeway network as their location in the field. Field and model speed data was then summarized in speed-temporal charts. The speed-temporal charts were used to validate the congestion profile of the freeway network by visually displaying how the average speed along the corridor changed over the peak period.

3.3.4 *Volumes*

Freeway and ramp volumes for the SR 518 corridor were developed using September and October of 2022 count data for the 4:45-5:45 PM peak hour. Freeway demand volumes were developed from count locations that were unconstrained and then balanced through the SR 518 corridor to capture the demand on the SR 518 section analyzed as opposed to only throughput volumes recorded in counts. The critical eastbound volumes were started at the west end of the model near the uncongested interchange with SR 509 and balanced eastward through the congested I-5 interchange where throughput is constrained. Freeway throughput volumes within the VISSIM model were compared to field counts (throughput) in congested and uncongested links and segments to validate the VISSIM model.

Validation of the throughput volumes within the VISSIM model was done using the Geoffrey E. Havers (GEH) Statistic per the *WSDOT VISSIM Protocol (2014)*. All ramps and freeway segments were calibrated within a GEH of 3.0. Table 5 summarizes the ramp and freeway segment GEH statistics.

Table 5. 2022 GEH Statistic Summary

Facility	Segment ID	Direction	Type	Field Volumes	Model Volumes	Diff	Diff %	GEH
SR 518	WB SR 518 between Ramp to SB I-5 and Ramp From SB I-5	WB	Mainline	2690	2703	13	0%	0.2
SR 518	WB SR 518 On-Ramp from SB I-5	WB	On-Ramp	830	820	-10	-1%	0.4
SR 518	WB SR 518 between Ramp from SB I-5 and Ramp from 51st Ave S	WB	Mainline	3520	3520	0	0%	0.0
SR 518	WB SR 518 On-ramp from 51st Ave S	WB	On-Ramp	680	666	-14	-2%	0.5
SR 518	WB SR 518 between 51st Ave S and Int Blvd/NAE Ramp	WB	Mainline	4200	4182	-18	0%	0.3
SR 518	WB SR 518 to SR 99/Intl Blvd. SB (Loop)	WB	Off-Ramp	470	465	-5	-1%	0.2
SR 518	WB SR 518 to 154 St (EB & WB)	WB	Off-Ramp	360	358	-2	0%	0.1
SR 518	WB SR 518 to SB NAE	WB	Off-Ramp	1210	1210	0	0%	0.0
SR 518	WB SR 518 between Int Blvd and On-Ramp from NB NAE/154th St	WB	Mainline	2160	2142	-18	-1%	0.4
SR 518	NB NAE to WB SR 518	WB	On-Ramp	430	431	1	0%	0.1
SR 518	WB 154th to SR 518	WB	On-Ramp	290	302	12	4%	0.7
SR 518	WB SR 518 On-Ramp from NB NAE/S 154th St (Combined)	WB	On-Ramp	720	734	14	2%	0.5
SR 518	WB SR 518 between NB NAE/S 154th St On-Ramp and DMMD Off-Ramp	WB	Mainline	2880	2876	-4	0%	0.1
SR 518	WB SR 518 to DMMD	WB	Off-Ramp	590	585	-5	-1%	0.2
SR 518	WB SR 518 between DMMD and SR 509	WB	Mainline	2290	2290	0	0%	0.0
SR 518	EB SR 518 between Off-Ramp to DMMD and On-Ramp from DMMD	EB	Mainline	2010	2068	58	3%	1.3
SR 518	EB SR 518 On-Ramp from DMMD	EB	On-Ramp	510	516	6	1%	0.2
SR 518	EB SR 518 between DMMD On-Ramp and S 154th St Off-Ramp	EB	Mainline	2520	2581	61	2%	1.2
SR 518	EB SR 518 Off-Ramp to S 154th St	EB	Off-Ramp	330	343	13	4%	0.7
SR 518	EB SR 518 between Off-Ramp to S 154th St and Off-Ramp to SB NAE	EB	Mainline	2190	2241	51	2%	1.1
SR 518	EB SR-518 Off-Ramp to SB NAE	EB	Off-Ramp	480	486	6	1%	0.3
SR 518	EB SR 518 between Off-Ramp to SB NAE and On-Ramp from NB NAE/S 160th St	EB	Mainline	1710	1755	45	3%	1.1
SR 518	NB NAE On	EB	On-Ramp	1260	1278	18	1%	0.5
SR 518	S 160th Street On	EB	On-Ramp	250	234	-16	-6%	1.0
SR 518	NB NAE/S 160th Street On-Ramp Combined	EB	On-Ramp	1510	1514	4	0%	0.1
SR 518	EB SR 518 between NAE NB on and Pacific Hwy NB on	EB	Mainline	3220	3264	44	1%	0.8
SR 518	NB Pacific Hwy on	EB	On-Ramp	570	563	-7	-1%	0.3
SR 518	EB SR 518 between Pacific Hwy and I-5	EB	Mainline	3790	3817	27	1%	0.4
SR 518	EB SR 518 to 51st Ave	EB	Off-Ramp	650	662	12	2%	0.5
SR 518	EB SR 518 between 51 St and SB I-5	EB	Mainline	3140	3152	12	0%	0.2
SR 518	EB SR 518 to I-5 NB	EB	Off-Ramp	850	850	0	0%	0.0
SR 518	EB SR 518 to I-5 SB	EB	Off-Ramp	620	618	-2	0%	0.1
SR 518	EB SR 518 @ I-5 Interchange	EB	Mainline	1670	1671	1	0%	0.0

Both Directions - Full Corridor	
Total	33
GEH >3	0
% Met	100%

WB Off-Peak - Full Corridor	
Total	15
GEH >3	0
% Met	100%

EB Peak - Full Corridor	
Total	18
GEH >3	0
% Met	100%

Total Field	50600
Total Model	50898
Difference	298
	1%

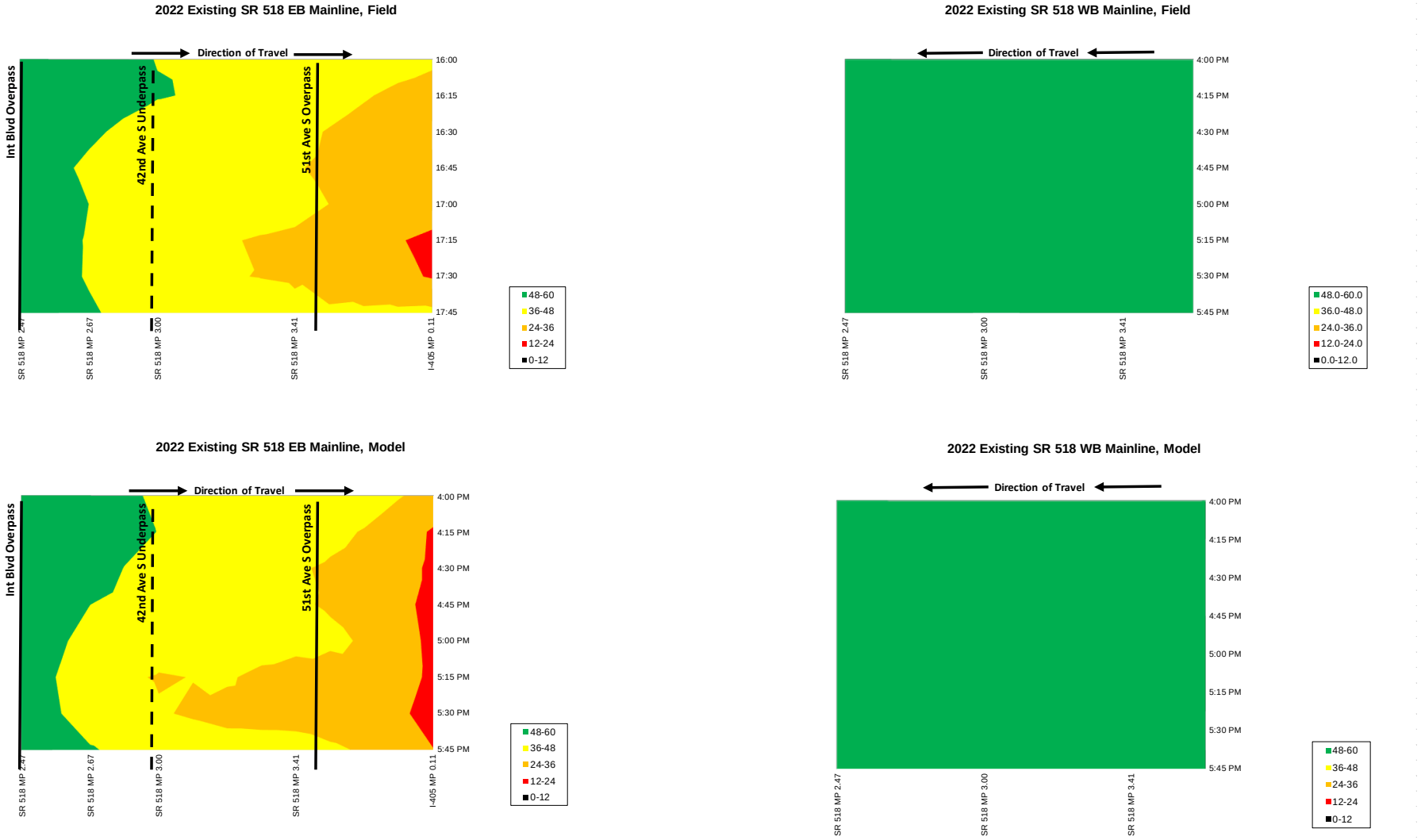


Figure 3. 2022 Existing Conditions SR 518 Corridor Speed-Temporal Maps

3.3.5 *Lane Data*

As part of the calibration and validation process, WSDOT requested lane-by-lane data for SR 518 in the eastbound direction near the I-5/I-405/SR 518 interchange. This additional step was done to ensure the observed driver behaviors and speeds in the field related to spillback congestion from northbound I-405 were replicated within the VISSIM model. Lane-by-lane data for Milepost (MP) 3.41 near the 51st Avenue S overpass was summarized from WSDOT permanent counters. Figure 4 shows the location of the lane-by-lane data. Table 6 below shows the existing eastbound lane-by-lane speeds at MP 3.41.

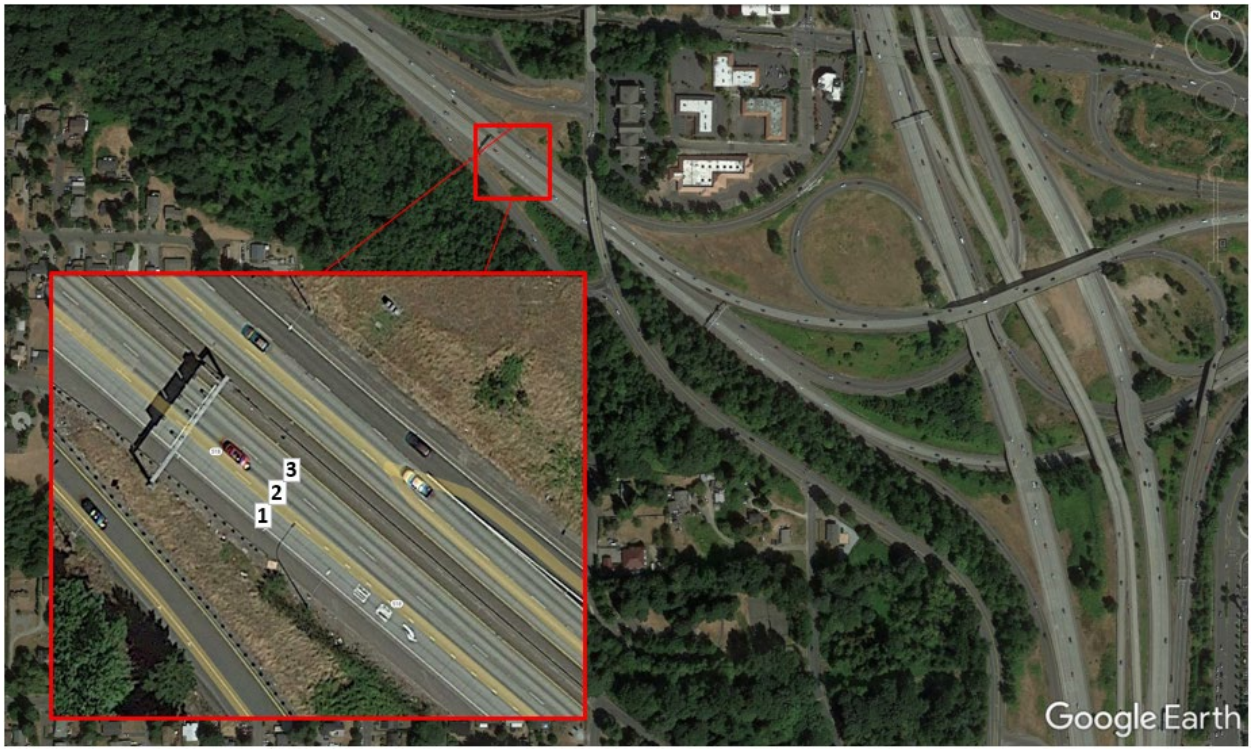


Figure 4. Eastbound SR 518 MP 3.41 Lane Identification

Table 6. Eastbound SR 518 MP 3.41 Lane-by-Lane Field Speeds

Field Data [mph]	Lane 1	Lane 2	Lane 3
Time	518es00341:_ME___1	518es00341:_ME___2	518es00341:_ME___3
4:00 PM	51	38	53
4:15 PM	50	35	51
4:30 PM	47	28	48
4:45 PM	46	27	45
5:00 PM	46	30	46
5:15 PM	45	24	44
5:30 PM	46	25	45
5:45 PM	47	26	47

The lane-by-lane data shows the congestion at the eastern end of the SR 518 corridor is primarily contributed to spillback from northbound I-405 congestion (Lane 2). Speeds in the middle lane are

consistently lower than the outside lanes for the entire two-hour peak period. This is primarily due to 1,670 vehicles in the peak hour destined for northbound I-405 and only 850 and only 620 vehicles destined to northbound (Lane 3) and southbound (Lane 1) I-5, respectively. This creates a volume imbalance across the three lanes. The primary cause for reduced speeds in Lanes 1 and 3 is drivers destined for northbound I-405 merging late into the middle lane.

This congested area of the VISSIM model attempted to replicate the field data by adjusting driver behavior parameters for the links as well as adjusting lane change distances for connectors to each of the downstream freeway facilities. Table 7 compares the field and model data for the eastbound MP 3.41 lanes. Figure 5 shows the volume throughput and speed for Lane 2 throughout the 4:00-6:00 PM peak period.

Table 7. Eastbound SR 518 MP 3.41 Lane-by-Lane Field vs. Model Speeds

Field Data [mph]

Time	Lane 1 (518es00341:_ME___1)	Lane 2 (518es00341:_ME___2)	Lane 3 (518es00341:_ME___3)
4:00 PM	51	38	53
4:15 PM	50	35	51
4:30 PM	47	28	48
4:45 PM	46	27	45
5:00 PM	46	30	46
5:15 PM	45	24	44
5:30 PM	46	25	45
5:45 PM	47	26	47

Model Data [mph]

Time	103451	103452	103453
4:00 PM	53	44	55
4:15 PM	53	35	56
4:30 PM	47	31	47
4:45 PM	48	31	48
5:00 PM	49	32	50
5:15 PM	43	26	43
5:30 PM	43	28	43
5:45 PM	46	34	46

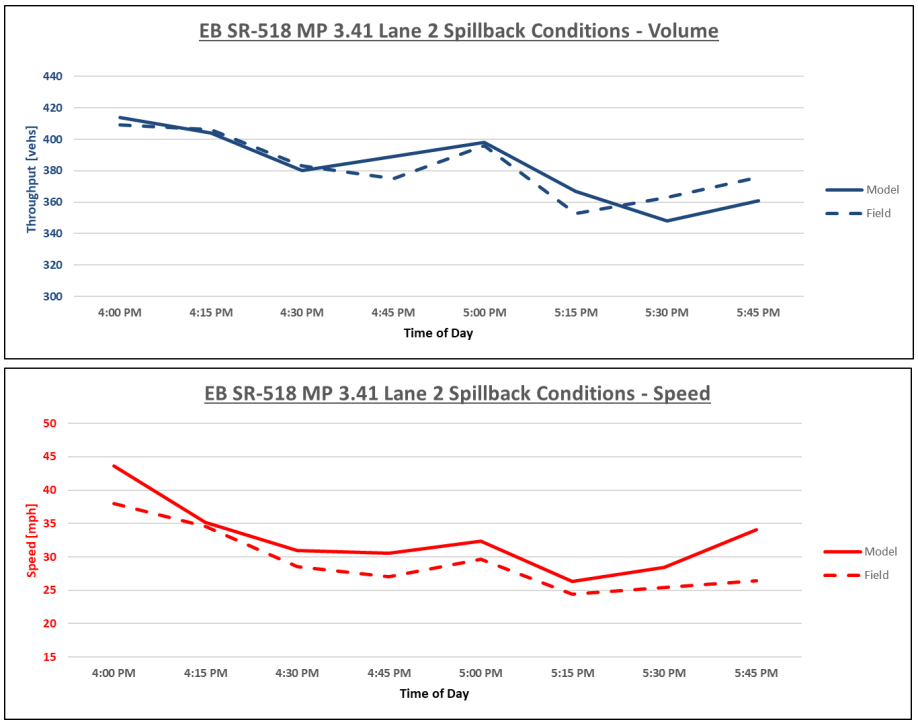


Figure 5. Eastbound SR 518 MP 3.41 Volume Throughput and Speed Comparison

The model output shows the VISSIM model is replicating field conditions and behaviors with Lane 2 showing the highest level of congestion and Lanes 1&3 showing additional congestion as vehicles merge into Lane 2. Speed and volume profiles for the peak period show Lane 2 follows the same pattern of congestion indicating the amount of spillback congestion from northbound I-405 is appropriate.

3.4 Highway Capacity Software (HCS) Analysis

WSDOT also requested Highway Capacity Software (HCS) analysis to assess impacts along regional freeways due to the planned 2nd terminal at the airport and proposed NTPs associated with the future development of the airport. The same 4:45-5:45 PM peak hour used in the VISSIM model was also used to develop volumes for the surrounding freeway system. This section will be discussing the calibration, inputs, and subsequent results of the modeling of the existing conditions of traffic on three key corridors in the vicinity of the airport: SR 518 from SR 509 to Des Moines Memorial Drive S., SR 518/I-5 & I-405 interchange area, and I-5 from Southcenter Blvd to 200th St. The approved Methods & Assumptions document for the HCS Analysis is included in Attachment E. Figure 6 shows the HCS analysis study area, and Table 8 lists the individual segments within each study area and their respective geometry.

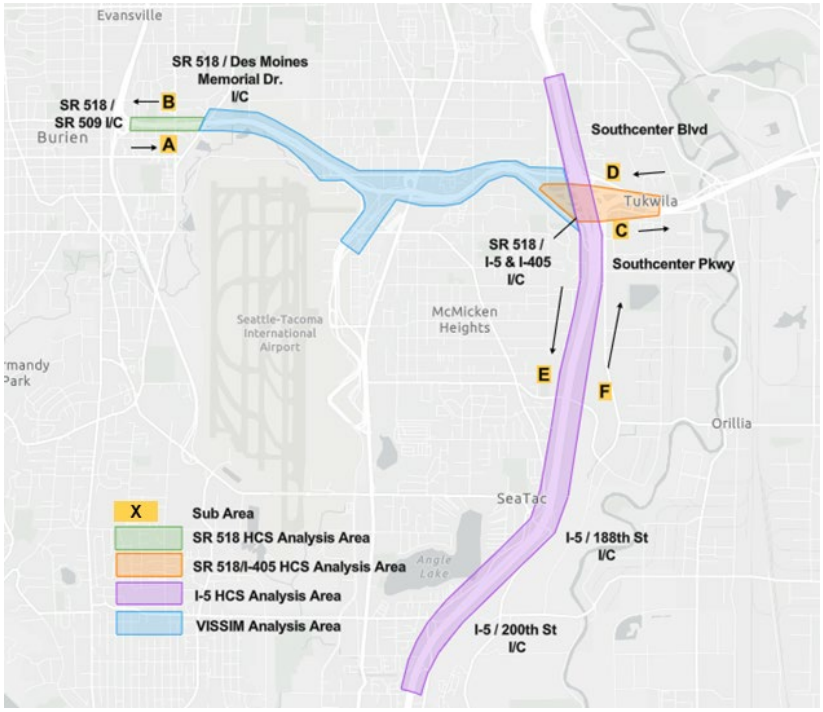


Figure 6: SAMP HCS Study Area Extent

Table 8: HCS Freeway Analysis Study Segments

Facility	ID	Study Segments	Facility Type	Analyzed Type	Number of Lanes	Basic/Overlap Type	Merge/Diverge Type			Weaving Type		
						Length (ft)	Freeway Length (ft)	Length of First Accel. /Decel. Lane (ft)	Influence Area (ft)	Short Length (ft)	Base Length (ft)	Influence Area (ft)
Sub Area A – SR 518 EB	A1	EB SR 518 from SR 509 NB Off Ramp to DMM EB off Ramp	Weaving	Weaving	3				-	140	490	1,490
	A2	EB SR 518 from DMM EB off Ramp to DMM Interchange	Mainline	Basic	2	1,790			-			-
Sub Area B – SR 518 WB	B1	WB SR 518 from DMM Undercrossing to Diverge Influence Point	Mainline	Basic	2	940			-			-
	B2	WB SR 518 from DMM Diverge Influence Point to SR 509 NB On Ramp	Off-Ramp	Diverge	2		1,500	890	1,500			-
Sub Area C – SR 518/I-5 & I-405 EB	C1	EB SR 518 from 51st St Off Ramp to I-5 NB Off Ramp	Off-Ramp	Basic (Drop)	3	1,030			-			-
	C2	EB SR 518 from I-5 NB Off Ramp to I-5 SB Off Ramp	Off-Ramp	Basic (Drop)	2	650			-			-
	C3	NB I-405 from I-5 SB Off Ramp to I-5 SB On Ramp	Mainline	N/A[1] (Skipped)	1	1,390			-			-
	C4	NB I-405 from I-5 SB On Ramp to I-5 NB On Ramp	On-Ramp	Basic (Add)[2]	2	670			-			-
	C5	NB I-405 from I-5 NB On Ramp to Southcenter Pkwy	On-Ramp	Basic (Add)[2]	3	1,180			-			-
Sub Area D – SR 518/I-5 & I-405 WB	D1	SB I-405 from Interurban Ave S 3-Lane Start Point to I-5 NB Off/Southcenter Off Ramp	Off-Ramp	Basic (Drop)[2]	3	1,820			-			-
	D2	SB I-405 from I-5 NB Off Ramp to I-5 NB On Ramp	Mainline	Basic	2	1,350			-			-
	D3	SB I-405 from I-5 NB On Ramp to I-5 SB Off Ramp	Weaving	Weaving	3				-	570	700	1,700
	D4	WB SR 518 from I-5 SB Off Ramp to I-5 SB On Ramp	Mainline	Basic	2	1,280			-			-
	D5	WB SR 518 from I-5 SB On Ramp to 51st St On Ramp	On-Ramp	Basic (Add)	3	760			-			-
Sub Area E – I-5 SB	E1	SB I-5 at Southcenter Blvd/SR 518 Off Ramp Diverge Area	Off-Ramp	Major Diverge[2,3]	6		1,500	420	1,500			-
	E2	SB I-5 from Southcenter Blvd/SR 518 Off Ramp to I-405 NB Off Ramp	Off-Ramp	Basic (Drop)[2]	5	2,240			-			-
	E3	SB I-5 from I-405 NB Off Ramp to I-405 SB On Ramp	Mainline	Basic	4	620			-			-

Facility	ID	Study Segments	Facility Type	Analyzed Type	Number of Lanes	Basic/Overlap Type	Merge/Diverge Type			Weaving Type		
						Length (ft)	Freeway Length (ft)	Length of First Accel. /Decel. Lane (ft)	Influence Area (ft)	Short Length (ft)	Base Length (ft)	Influence Area (ft)
	E4	SB I-5 from I-405 SB On Ramp to Klickitat SB On Ramp	On-Ramp	Basic (Add)[2]	5	4,330			-			-
	E5	SB I-5 at Klickitat SB On Ramp Merge Area	On-Ramp	Merge[2]	5		1,500	1,500	1,500			-
	E6	SB I-5 from Klickitat SB On Ramp Merge Area to 188th St SB Off Ramp Diverge Area	Mainline	Basic[2]	5	2,000			-			-
	E7	SB I-5 at 188th St SB Off Ramp Diverge Area	Off-Ramp	Diverge[2]	5		1,500	240	1,500			-
	E8	SB I-5 from 188th St SB Off Ramp Diverge Area to Lane Reduction Point	Mainline	Basic[2]	5	1,080			-			-
	E9	SB I-5 from Lane Reduction Point to 188th St SB On Ramp	Mainline	Basic[2]	4	2,330			-			-
	E10	SB I-5 at 188th St SB On Ramp Merge Area	On-Ramp	Merge[2]	4		1,440	520	1,440			-
	E11	SB I-5 from 188th St SB On Ramp Merge Area to 200th St SB Off Ramp Diverge Area	Mainline	Overlap[2]	4	60			-			-
	E12	SB I-5 at 200th St SB Off Ramp Diverge Area	Off-Ramp	Diverge[2]	4		1,440	180	1,440			-
	E13	SB I-5 from 200th St SB Off Ramp to 200th St SB On Ramp	Mainline	Basic[2]	4	1,730			-			-
	E14	SB I-5 at 200th St SB On Ramp Merge Area	On-Ramp	Merge[2]	4		1,500	470	1,500			-
Sub Area F – I-5 NB	F1	NB I-5 at Military Rd NB Off Ramp Diverge Area	Off-Ramp	Diverge[2]	4		1,500	290	1,500			-
	F2	NB I-5 from Military Rd NB Off Ramp to Military Rd NB On Ramp	Mainline	Basic[2]	4	900			-			-
	F3	NB I-5 at Military Rd NB On Ramp Merge Area	On-Ramp	Merge[2]	4		1,500	710	1,500			-
	F4	NB I-5 from Military Rd NB On Ramp to 188th St NB Off Ramp	Mainline	Basic[2]	4	2,090			-			-
	F5	NB I-5 at 188th St NB Off Ramp Diverge Area	Off-Ramp	Diverge[2]	4		1,500	180	1,500			-
	F6	NB I-5 from 188th St NB Off Ramp to 188th St NB On Ramp	Mainline	Basic[2]	4	2,260			-			-

Facility	ID	Study Segments	Facility Type	Analyzed Type	Number of Lanes	Basic/Overlap Type	Merge/Diverge Type			Weaving Type		
						Length (ft)	Freeway Length (ft)	Length of First Accel. /Decel. Lane (ft)	Influence Area (ft)	Short Length (ft)	Base Length (ft)	Influence Area (ft)
	F7	NB I-5 at 188th St NB On Ramp Merge Area	On-Ramp	Merge[2]	4		1,500	570	1,500			-
	F8	NB I-5 from 188th St NB On Ramp to Southcenter Pkwy Off Ramp	Mainline	Basic[2]	4	4,350			-			-
	F9	NB I-5 at Southcenter Pkwy Off Ramp Diverge Area	Off-Ramp	Diverge[2]	4		1,500	840	1,500			-
	F10	NB I-5 from Southcenter Pkwy Off Ramp to SR 518 WB/I-405 EB Off Ramp	Mainline	Basic[2]	4	110			-			-
	F11	NB I-5 at SR 518 WB/I-405 EB Off Ramp Diverge Area	Off-Ramp	Major Diverge[2,3]	4		1,500	200	1,500			-
	F12	NB I-5 from SR 518 WB/I-405 EB Off Ramp to I-405 WB HOV On Ramp	Mainline	Basic	3	2,130			-			-
	F13	NB I-5 from I-405 WB HOV On Ramp to I-405 WB On Ramp	Mainline	Basic	4	150			-			-
	F14	NB I-5 at I-405 WB On Ramp Merge Area	On-Ramp	Merge	4		1,500	1,130	1,500			-
	F15	NB I-5 from SR 518 EB On Ramp to Southcenter Blvd NB On Ramp	Mainline	Basic (Add)[2]	5	700			-			-
	F16	NB I-5 at Southcenter Blvd NB On Ramp Merge Area	On-Ramp	Merge[2]	5		1,500	1,070	1,500			-

Note:
Distance rounded to nearest 10.
[1]- One-lane freeway mainline cannot be analyzed in HCS.
[2]- HOV lane ignored due to the analysis constraint of HCS.
[3]- A major diverge area is one in which two primary roadways, each having multiple lanes, diverge from a single freeway segment. Major Diverge type analyzed as basic segment with Major Diverge checkbox checked. For major diverge areas, a model exists for computing the average density across all approaching freeway lanes within 1,500 ft of the diverge.

3.4.1 *Calibration*

Calibration for this analysis was performed by comparing calculated Average Speed data within HCS to field speed data captured via WSDOT CDR at certain locations within the different subareas, the results of which are shown below in Table 9. The Average Speed output was calibrated by altering the Speed, Capacity, and Demand Adjustment Factors, which was done in accordance with HCS standards created by the Oregon Department of Transportation in the absence of similar standards from WSDOT.

Table 9: HCS and CDR Speed Calibration

Congested Area Speed Comparison	HCS Average Speed (mph)	CDR Field Speed (mph)	Difference
Sub Area C – SR 518 EB/I-5 & I-405 NB (C4)	34.5	30.4	13%
Sub Area D – SR 518 WB/I-5 & I-405 SB (D3)	26.8	25.6	5%
Sub Area E – I-5 SB (E1 - E2)	39.0	37.8	3%
Sub Area E – I-5 SB (E4 - E9)	23.8	22.9	4%

3.4.2 *Analysis Results*

After calibrating the applicable parameters such that the calculated and field-recorded average speeds aligned, MOE data was taken from the HCS analysis. WSDOT mobility standards set a minimum acceptable LOS of D along state routes, with the critical measure of effectiveness being Density (passenger cars per mile per lane(pc/mi/ln)). Results are broken down by sub-segment as seen below in Table 10.

The HCS analysis results show most of the segments exceeding WSDOT LOS D standard are on southbound I-5 or on I-405 in both directions immediately east of the interchange with I-5. Freeway segments not meeting the LOS D standard are described in more detail below:

- EB SR 518 from 51st Street Off Ramp to NB I-405 (C1-C2) – Congestion from the I-405 /I-5 interchange causes spillback to eastbound SR 518. See VISSIM Section 3.3 for more details and analysis of this congested area.
- NB I-405 from I-5 SB On-Ramp to Southcenter Parkway (C4-C5) – Congestion on northbound I-405 is caused by multiple on-ramps from northbound and southbound I-5 converging. Downstream weaving movements also contribute to the congestion in this area.
- SB I-405 from Interurban Avenue to SR 518 (D1-D3) – Southbound congestion on I-405 is primarily caused by lane changes for on and off-ramps to and from I-5 in both the northbound and southbound directions.
- WB SR 518 from I-405 to 51st Street On Ramp (D4-D5) – Congestion on westbound SR 518 is primarily due to vehicles accelerating from the I-405 interchange area uphill. Congestion dissipates farther west as vehicles accelerate to the posted speed limit.
- SB I-5 from Southcenter Boulevard to 200th Street On Ramp (E1-E14) – Congestion on southbound I-5 is present for the entire corridor extents during the PM peak hour. The congestion in the SAMP study area generally originates near S. 200th Street on-ramp and extends north to Martin Luther King Jr Way S in Seattle.

Table 10: HCS Freeway Analysis MOE Results

Facility	ID	Study Segments	Analyzed Type	LOS	Avg Speed (S, mph)	Demand - Capacity Ratio (D/C)	Avg Density (D, pc/mi/ln)
Sub Area A – SR 518 EB	A1	EB SR 518 from SR 509 NB Off Ramp to DMM EB off Ramp	Weaving	B	56.1	0.42	13.5
	A2	EB SR 518 from DMM EB off Ramp to DMM Interchange	Basic	B	64.0	0.55	17.0
Sub Area B – SR 518 WB	B1	WB SR 518 from DMM Undercrossing to Diverge Influence Point	Basic	C	60.0	0.60	19.7
	B2	WB SR 518 from DMM Diverge Influence Point to SR 509 NB On Ramp	Diverge	B	50.5	0.61	23.6
Sub Area C – SR 518 EB /I-5 & I-405 NB	C1	EB SR 518 from 51st St Off Ramp to I-5 NB Off Ramp	Basic (Drop)	E	38.8	0.95	38.0
	C2	EB SR 518 from I-5 NB Off Ramp to I-5 SB Off Ramp	Basic (Drop)	F	34.5	1.07	45.0
	C3	NB I-405 from I-5 SB Off Ramp to I-5 SB On Ramp	N/A[1] (Skipped)	-	-		-
	C4	NB I-405 from I-5 SB On Ramp to I-5 NB On Ramp	Basic (Add)[2]	F	34.5	1.84	45.0
	C5	NB I-405 from I-5 NB On Ramp to Southcenter Pkwy	Basic (Add)[2]	F	34.5	1.70	45.0
Sub Area D – SR 518 WB/ I-5 & I-405 SB	D1	SB I-405 from Interurban Ave S 3-Lane Start Point to I-5 NB Off/Southcenter Off Ramp	Basic (Drop)[2]	F	34.5	1.37	45.0
	D2	SB I-405 from I-5 NB Off Ramp to I-5 NB On Ramp	Basic	F	34.5	1.29	45.0
	D3	SB I-405 from I-5 NB On Ramp to I-5 SB Off Ramp	Weaving	F	26.8	1.44	83.2
	D4	WB SR 518 from I-5 SB Off Ramp to I-5 SB On Ramp	Basic	F	34.5	1.28	45.0
	D5	WB SR 518 from I-5 SB On Ramp to 51st St On Ramp	Basic (Add)	F	34.5	1.02	45.0
Sub Area E – I-5 SB	E1	SB I-5 at Southcenter Blvd/SR 518 Off Ramp Diverge Area	Major Diverge[2,3]	E	39.0	0.88	35.8
	E2	SB I-5 from Southcenter Blvd/SR 518 Off Ramp to I-405 NB Off Ramp	Basic (Drop)[2]	E	39.0	0.78	35.1
	E3	SB I-5 from I-405 NB Off Ramp to I-405 SB On Ramp	Basic	E	39.0	0.83	37.4
	E4	SB I-5 from I-405 SB On Ramp to Klickitat SB On Ramp	Basic (Add)[2]	F	27.7	0.86	49.8
	E5	SB I-5 at Klickitat SB On Ramp Merge Area	Merge[2]	F	24.3	1.01	63.3
	E6	SB I-5 from Klickitat SB On Ramp Merge Area to 188th St SB Off Ramp Diverge Area	Basic[2]	F	27.4	1.01	58.7
	E7	SB I-5 at 188th St SB Off Ramp Diverge Area	Diverge[2]	F	27.0	1.00	57.9
	E8	SB I-5 from 188th St SB Off Ramp Diverge Area to Lane Reduction Point	Basic[2]	F	16.5	0.91	79.5
	E9	SB I-5 from Lane Reduction Point to 188th St SB On Ramp	Basic[2]	F	19.9	1.01	77.9
	E10	SB I-5 at 188th St SB On Ramp Merge Area	Merge[2]	F	31.6	1.17	55.7
	E11	SB I-5 from 188th St SB On Ramp Merge Area to 200th St SB Off Ramp Diverge Area	Overlap[2]	F	29.4	1.17	58.7
	E12	SB I-5 at 200th St SB Off Ramp Diverge Area	Diverge[2]	F	29.4	1.17	58.7
	E13	SB I-5 from 200th St SB Off Ramp to 200th St SB On Ramp	Basic[2]	F	23.0	1.13	70.0
	E14	SB I-5 at 200th St SB On Ramp Merge Area	Merge[2]	F	31.3	1.25	58.0
Sub Area F – I-5 NB	F1	NB I-5 at Military Rd NB Off Ramp Diverge Area	Diverge[2]	C	61.3	0.64	24.5
	F2	NB I-5 from Military Rd NB Off Ramp to Military Rd NB On Ramp	Basic[2]	C	61.7	0.71	22.9
	F3	NB I-5 at Military Rd NB On Ramp Merge Area	Merge[2]	C	59.1	0.77	26.2
	F4	NB I-5 from Military Rd NB On Ramp to 188th St NB Off Ramp	Basic[2]	C	59.2	0.77	26.0
	F5	NB I-5 at 188th St NB Off Ramp Diverge Area	Diverge[2]	D	62.5	0.77	24.6
	F6	NB I-5 from 188th St NB Off Ramp to 188th St NB On Ramp	Basic[2]	C	62.2	0.69	22.2
	F7	NB I-5 at 188th St NB On Ramp Merge Area	Merge[2]	D	58.2	0.85	29.1
	F8	NB I-5 from 188th St NB On Ramp to Southcenter Pkwy Off Ramp	Basic[2]	D	55.5	0.84	30.4
	F9	NB I-5 at Southcenter Pkwy Off Ramp Diverge Area	Diverge[2]	C	62.1	0.84	27.2
	F10	NB I-5 from Southcenter Pkwy Off Ramp to SR 518 WB/I-405 EB Off Ramp	Basic[2]	C	59.8	0.76	25.3
	F11	NB I-5 at SR 518 WB/I-405 EB Off Ramp Diverge Area	Major Diverge[2,3]	C	57.1	0.76	26.5
	F12	NB I-5 from SR 518 WB/I-405 EB Off Ramp to I-405 WB HOV On Ramp	Basic	B	65.0	0.53	16.3
	F13	NB I-5 from I-405 WB HOV On Ramp to I-405 WB On Ramp	Basic	B	65.0	0.44	13.4
	F14	NB I-5 at I-405 WB On Ramp Merge Area	Merge	B	60.5	0.59	19.6
	F15	NB I-5 from SR 518 EB On Ramp to Southcenter Blvd NB On Ramp	Basic (Add)[2]	B	64.5	0.58	18.0
	F16	NB I-5 at Southcenter Blvd NB On Ramp Merge Area	Merge[2]	B	59.9	0.68	17.9

Note:

Distance rounded to nearest 10.

[1]- One-lane freeway mainline cannot be analyzed in HCS.

[2]- HOV lane ignored due to the analysis constraint of HCS.

[3]- A major diverge area is one in which two primary roadways, each having multiple lanes, diverge from a single freeway segment. Major Diverge type analyzed as basic segment with Major Diverge checkbox checked. For major diverge areas, a model exists for computing the average density across all approaching freeway lanes within 1,500 ft of the diverge.

[4]- WSDOT Level of Service Standard for State Routes is LOS D.

4. Transit, Parking, and Non-Motorized Facilities

The sections below summarize other key transportation facilities within the SAMP NTP study area. A more complete summary of these facilities can be found in local jurisdictions transportation master plans.

4.1 Transit Service

King County Metro (local) and Sound Transit (regional) provide transit service to and from the Airport. Table 11 lists transit that serves the Airport. Sound Transit bus routes pick up and drop off on the Lower Drive while King County Metro routes pick up and drop off on SR 99 / International Blvd., near the light rail station.

The Sound Transit Link Light Rail Station is located east of, and adjacent to, the northeast corner of the Main Garage. In addition, the Link Light Rail extends further south past the airport to Angle Lake Station.

Table 11. Transit Service Summary

Route	Airport Station Location	Route Start/End Points	Weekday Buses/Day & Hours of Operation	
Bus Service				
Metro Route 124	Tukwila Station	Downtown Seattle - Tukwila Station	137	5:00 AM-2:40 AM
Metro Route 128	Tukwila Station	West Seattle - Southcenter	103	6:00 AM-12:30 AM
Metro Route 156	International Blvd.	Highline CC - Southcenter	70	5:00 AM-11:30 PM
Metro Route 161	International Blvd., Air Cargo Rd.	Kent Station - Burien TC	100	4:45 AM-3:30 AM
Rapid Ride A	International Blvd.	Federal Way TC - Tukwila Station	213	4:30 AM-4:30 AM
Rapid Ride F	Tukwila Station	Burien TC – The Landing	162	4:45 AM-12:00 AM
Sound Transit 560	Lower Drive Station	West Seattle - Bellevue	66	5:00 AM-11:15 PM
Sound Transit 574	Lower Drive Station	Lakewood - SeaTac International Airport	78	2:00 AM-11:30 PM
Light Rail Transit				
Link Light Rail	SeaTac Airport	Seattle - Angle Lake Station	Every 6 to 15 minutes	5:00 AM-1:45 AM

4.2 Taxi, Transportation Network Companies, and Shuttles

4.2.1 Taxi, Limousine, and Shuttle Service

Currently, taxis, limousines, and shuttles pick up passengers on Level 3 of the main garage. Furthermore, taxis are allocated 70 staging spaces at the north end of Level 3 of the main garage.

Taxis and limousines are also provided a ground transportation hold lot by the Airport. This 2.5-acre lot is located on the south side of S 160th St opposite the consolidated rental car facility. The ground transportation providers currently use this facility for queuing and rest service time.

4.2.2 Transportation Network Companies

There are three app-based rideshare providers at the Airport: Uber, Lyft and Wingz. Pick-up is on the 3rd floor of the airport parking garage. Premium Uber rides like Uber Black, Select, SUV, or XL meet at the baggage claim-level door the passenger selects.

4.3 Non-Motorized Facilities

For passengers and employees arriving on foot or bicycle, there are two existing intersections of which there are pathways that pedestrians and cyclists can utilize to safely access the Airport terminal:

1. S 182nd St and International Blvd. - a sidewalk can be found on the southwest corner of the intersection. The sidewalk runs along the south side of the terminal curb exit lanes and leads to the same destination as the pathway for the first intersection. Pedestrian counts at the intersection indicated 146 pedestrians crossing the street during the PM commuter peak hour. Additionally, King County Metro's Routes 156, 161, A Line as well as Sound Transit's Route 574 serve a southbound stop on International Boulevard approximately 230 feet south of the intersection with pedestrian facilities connecting the stop to the main terminal.
2. S 176th St & International Blvd. - an elevator and stairs at the Sound Transit pick-up and drop-off facility at the northeast corner of the intersection and it leads to a pedestrian bridge that access the Light Rail Station and northeast corner of the Airport parking garage on Level 4. A designated walkway along the interior perimeter of the parking garage leads to several pedestrian bridges accessing the mezzanine level of the terminal. Pedestrian counts at the intersection indicated 105 pedestrians crossed the intersection during the PM commuter peak hour. King County Metro Routes 161 and A Line serve northbound and southbound stops on the north side of intersection. Sound Transit routes 560 and 574 serve the northbound stop only.

The Port and City of SeaTac plan for a future pedestrian connection from the intersection of S 188th Street and 28th Avenue S. Pedestrian access is currently prohibited on 28th Avenue S north of S 188th Street via signage.

4.4 Parking Facilities

4.4.1 On-Airport Parking Facilities

The terminal parking garage provides approximately 12,100 parking stalls for public parking. In addition to the parking garage, the Port maintains a 1,620 stall on-airport lot north of S. 170th St. This lot is leased and operated as the Doug Fox parking lot, with shuttle service provided on a regular basis.

The Port also provides approximately 200 spaces for cell phone parking lot just south of S.170th St., between the northbound and southbound lanes of the North Airport Expressway.

4.4.2 Employee Parking

Terminal-employee parking is provided in the main garage on Floor 1 and the north employee parking Lot (NEPL). The main garage allocates approximately 600 spaces while NEPL has an allocated capacity of

4,120 spaces. The Port provides shuttle service to and from the NEPL via a route along Air Cargo Road to the parking garage service tunnel. The route provides two stops along Air Cargo Road and then two other stops at each end of the service tunnel adjacent to Main Garage Floor 1.

Parking is also provided on individual tenant lease holds in the north and south air cargo areas, general aviation area, S. 28th Ave. logistics area, Swissport, USA Inc. (Swissport) Fueling (tank farm), Delta and Alaska hangars, and several other small locations. The toll plaza area adjacent to the Main Garage also contains spaces for permitted parking and landside operations staff.

5. Summary of Analysis

The scope for the SAMP NTP Environmental Review Surface Transportation Existing Conditions Report was refined through coordination with WSDOT, FAA, and local agencies. Intersections and freeway facilities were selected for their proximity to the SAMP NTP improvement area and the potential likelihood for surface transportation impacts based on trips generated and/or rerouted from the 2nd Terminal and NTPs. Methods and Assumptions memos for each of the analyses performed in the existing conditions (SimTraffic corridor analysis, VISSIM microsimulation freeway analysis, and HCS freeway analysis) were reviewed and approved by WSDOT. Copies of the Methods and Assumptions memos are included in Attachment E. The results of the existing conditions analysis reflect current operations of surface transportation facilities and inform appropriate levels of potential mitigation for the future year analysis. Figure 7 shows a summary of which existing surface transportation facilities currently meet their operational LOS standard. The key findings of the existing conditions analysis are summarized below:

- Of the 108 existing study intersections analyzed, 102 will meet jurisdictional mobility standards. The six existing intersections that do not meet current mobility standards are listed below:
    - #23 – SR 518 EB Ramps/Des Moines Memorial Dr. (LOS F)
    - #33 – SR 518 WB Off-Ramp Loop/S 154th St. (LOS E)
    - #50 – SR 509 SB Ramps/SW 160th Street (LOS F)
    - #83 - Military Rd. S/SB I-5 Ramps/S 200th St. (LOS E)
    - #93 – Pacific Hwy S./SR 516 (LOS F)
    - #101 - 8th Ave S./Des Moines Memorial Dr. (LOS F)
- Corridor analysis was performed on nine corridors with closely spaced intersections that had potential for compounding queuing concerns. Average travel time and speeds for each of the corridors is presented in Table 3 of this report. The intersections with the highest potential for queues spilling back past existing storage are listed below:
    - #20 – SW 148th Street/SR 518 at 1st Avenue S: All four approaches' left turn queue lengths are exceeding their storage lengths.
    - #37 – SR 99/Tukwila International Boulevard at S. 154th Street: Eastbound and westbound left turn pockets exceed their storage capacity.
    - #49 – 1st Avenue S. at S. 160th Street: Southbound and eastbound left turn queues exceed storage. Westbound queue extends back to upstream intersection in the WB direction (Segment 7 – SW 160th St).
    - #93 – Pacific Highway S. at Kent-Des Moines Road: Southbound queues extended over a half-mile even after additional volume was shifted to the HOV lane to better distribute southbound trips through the intersection.
- Freeway analysis was conducted using the microsimulation tool VISSIM 2020. An existing conditions model was calibrated and validated to 2022 conditions as outlined in WSDOT's *VISSIM Protocol (2014)*. The calibrated existing model will be used as the basis for modeling

future freeway conditions. Eastbound travel times for the SR 518 corridor between the North Airport Expressway and the I-5/I-405 interchange ranged between 1.9 and 4.5 minutes during the peak hour and westbound travel times averaged between 1.6 and 2.4 minutes.

- Additional Highway Capacity Software (HCS) freeway analysis was conducted on segments outside of the VISSIM model area on SR 518, I-5, and I-405. The HCS analysis was calibrated for existing bottlenecks on southbound I-5 and northbound I-405 which impact upstream freeway segments. Of the 44 segments analyzed, 20 operated at LOS D or better meeting WSDOT LOS standard for freeway systems. Most of the segments not meeting the LOS D standard were on southbound I-5 from Southcenter Boulevard to S 200th Street. The remaining segments operating at LOS E or worse were on I-405/SR 518 near the I-5 interchange.
- The Airport is served by eight existing bus routes operated by King County Metro and Sound Transit as well as Sound Transit's Link Light Rail 1-Line with service from Northgate to Angle Lake. All routes either serve the terminal directly or have stops located on adjacent streets.
- Non-motorized trips have access to the Airport via three primary access points with connections to surface transportation options:
    - S 188th Street & 28th Avenue S
    - S 182nd Street & International Boulevard
    - S 176th Street & International Boulevard

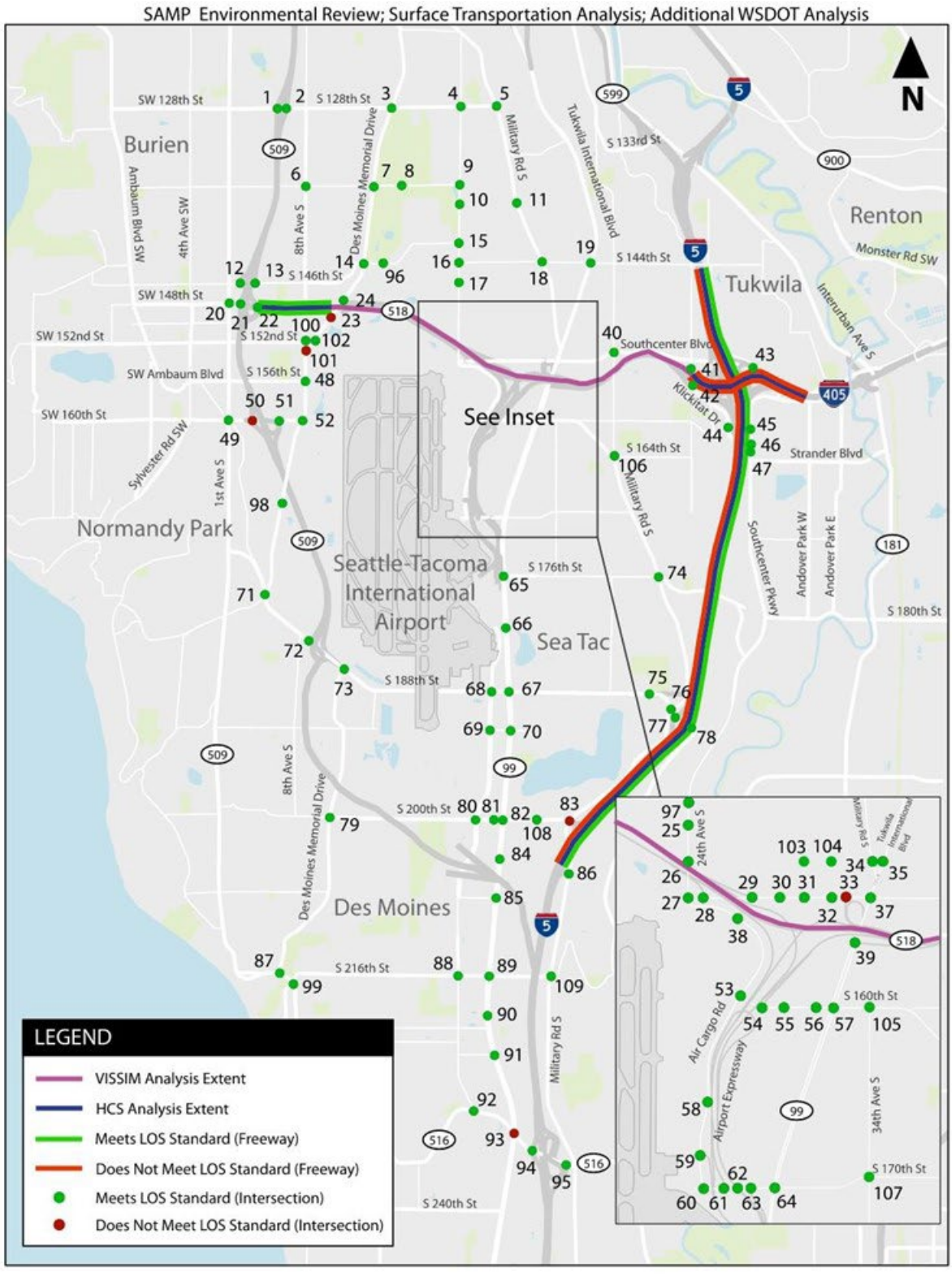


Figure 7. Intersection and HCS Analysis Results

Attachment E: Approved Analysis Methods & Assumptions Memos

Memorandum

Client:	Port of Seattle
Project:	Sustainable Airport Master Plan (SAMP) Environmental Document – Surface Transportation
Subject:	Segment Analysis Methods & Assumptions
Submit to:	Maan Sidhu, WSDOT
Submitted by:	Steve Diebol; Concord Engineering
Date:	May 1, 2023

1. Introduction and Overview

As part of the response to WSDOT's review of the Sustainable Airport Master Plan (SAMP) Traffic Analysis, Concord is proposing to segment analysis for eight (8) locations within the SAMP study area where closely spaced study intersections have operational characteristics dependent one each other. The results of the segment analysis performed for this phase of the SAMP are meant to validate improvement recommendations or identify if additional improvements are needed to address corridor issues. The purpose of the segment analysis is to quantify operations at a system-level rather than at each individual intersection. This document outlines the methods and assumptions used to perform the segment analyses. The scope of the analysis reflects WSDOT's initial comments of the individual intersection analysis documented in the SAMP Traffic Analysis.

2. Study Area and Intersections

Segments to be analyzed as a part of the analysis are identified in Table 1. These segments represent the minimum the scope and may be extended or new segments added based on stakeholder review and the outcomes of the updated traffic forecasting, intersection capacity analysis, and mitigation recommendations from the SAMP Future Conditions Traffic Analysis Summary.

Table 1: Segments of Interest

#	Segments of Interest	Study Intersections Included
1	24th Ave. S: S 142nd St. to S 154th St.	15, 16, 17, 97, 25, 26, 27
2	SW 148th St.: 1st Ave S to SR-509	20, 21, 22
3	Des Moines Memorial Dr. : SR-518 Ramp Terminals	23*, 24*
4	S 154th St.: 24th Ave S and SR-518 Ramp Terminals	27*, 28*, 29*
5	International Boulevard: S 152nd St. to SR-518 EB On-Ramp	35, 36, 37, 39
6	51st Ave S.: SR-518 Ramp Terminals	41, 42
7	SW 160th St.: 1st Ave S. to Des Moines Memorial Dr.	49, 50, 51, 52
8	NAE Off-Ramp/S 170th St. to International Boulevard/ S 188th St.	63, 64, 65, 66, 67
9	SR-516: Pacific Highway S and I-5 Ramp Terminals	93, 94, 95

Note:
[1]- DMMD – Des Moines Memorial Drive
*-Intersection also included in Preliminary Intersection Control Evaluation (ICE)

Extents of the networks are shown in Figure 1. Note that preliminary Intersection Control Evaluation (ICE) studies are being conducted as a separate task for overlapping areas as shown in Figure 1. See the Preliminary ICE Methods & Assumptions document for more information.

3. Scenarios, Analysis Tools, and Measures of Effectiveness

Study Scenarios

Study scenarios for the preliminary ICEs will match those in the SAMP Traffic Analysis (2027/2032 No Action/Proposed Action, PM peak hour only). Future traffic forecasts will remain the same as provided by the Future Conditions Traffic Analysis Summary Memo.

Analysis Tools

Traffic operational analyses will be conducted for the PM Peak period using Synchro 11 for signalized, stop controlled, and uncontrolled intersections and Sidra 9.0 for roundabouts. Measures of Effectiveness (MOEs) will be reported similar to what was previously in the SAMP Traffic Analysis. Sidra Network and SimTraffic analysis will be used to analyze potential queue spillbacks for adjacent intersections and relative changes in travel time along the networks.

Input parameters for the study intersections will match those in the updated SAMP Traffic Analysis where applicable and reflect previous comments from WSDOT. New analysis that was not completed as part of the SAMP will match parameters identified in the WSDOT's Synchro and Sidra protocols. Any deviations from these parameters will be documented.

Measures of Effectiveness

The following model outputs will be summarized for the PM peak period. The Measures of Effectiveness (MOEs) for the analysis are as follows:

- Arterial Reports (total travel time, signal delay)
- Vehicle queuing (feet) 95th percentile queue lengths based on Synchro/Sidra methodology

The SimTraffic calibration metrics will be as follows:

- Vehicles Entered/Exited (compared to projected traffic demand volumes)
- Vehicle delay per approach (compared to HCM 2000 results from the SAMP Future Conditions Traffic Analysis Summary Report)

4. Evaluation Components

The final deliverable will be a brief technical memo summarizing results and providing technical information as necessary. Tables comparing the segment analysis results to the individual intersection results and applicable outputs will be provided.

Appendix A – Study Area Map

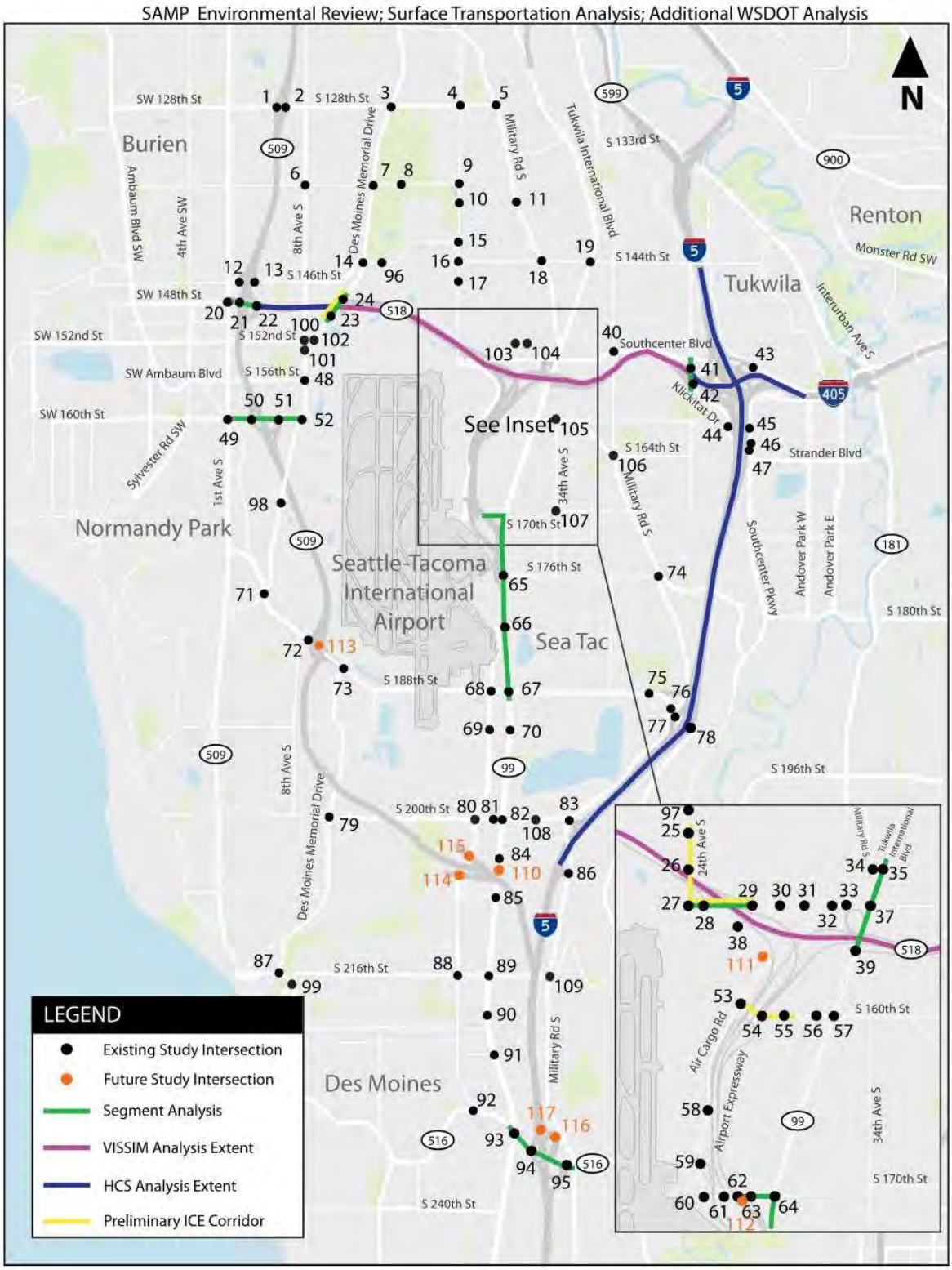


Figure 1. Study Intersections and Networks (Segment Analysis Corridors: Green)

Note: Additional segments may be identified for analysis as the SAMP traffic analysis report is updated and POS/WSDOT reviews

Memorandum

Client:	Port of Seattle
Project:	Sustainable Airport Master Plan (SAMP); SR 518 VISSIM Analysis
Subject:	VISSIM Traffic Analysis Methods & Assumptions – Phase I
Submit to:	Steve Rybolt, Nic Longo, Tom Hooper; Port of Seattle
Copied to:	Sarah Potter, Landrum & Brown
Submitted by:	Steve Diebol, Tony Woody; Concord Engineering
Date:	April 7, 2023

1. Introduction and Overview

As part of the Sustainable Airport Master Plan (SAMP) study being conducted by the Port of Seattle at Sea-Tac International Airport, traffic analysis and modeling has been requested by WSDOT to assess impacts along SR 518 due to the planned second terminal at the airport and proposed near term projects (NTP) associated with future development of the airport. The freeway analysis for a portion of the SR 518 corridor will be conducted using the VISSIM (version 11-02 or newer) microsimulation analysis tool, while freeway analysis for other locations within the overall SAMP traffic study area will be evaluated with Highway Capacity Software (HCS) and ramp terminal intersection queueing will be evaluated with Synchro. The VISSIM microsimulation analysis will provide a relative comparison of Measures of Effectiveness (MOEs) between No Action and Proposed Action conditions where existing congestion along SR 518 is highest.

2. Study Area

The study area for the VISSIM microsimulation analysis includes the mainline freeway segment of SR 518 from Des Moines Memorial Drive S. and west of the I-5/SR-518 interchange. Freeway ramps along the segment will be included in the analysis. Figure 1 depicts the extents of the freeway microsimulation analysis area.

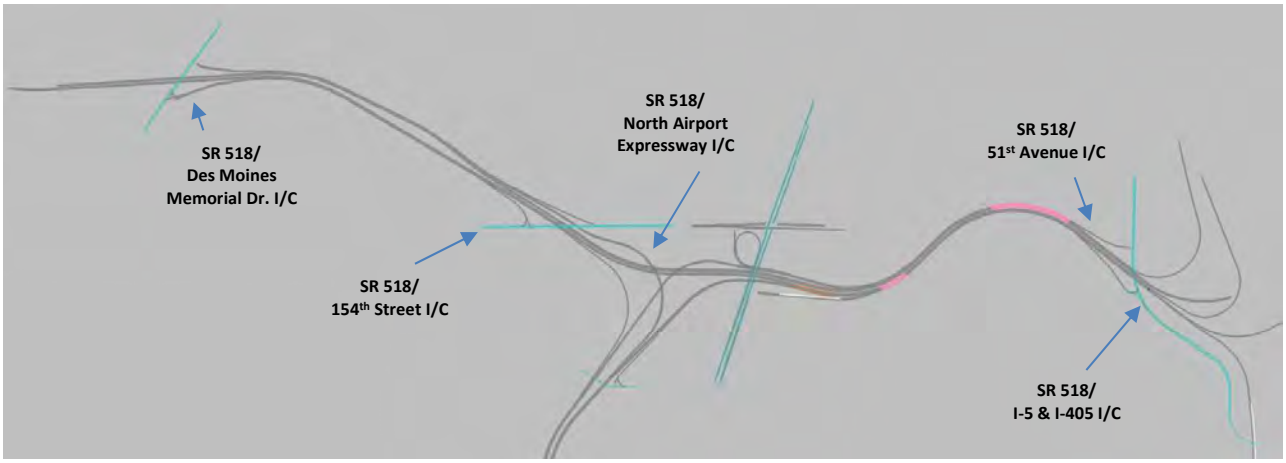


Figure 1: SR-518 Mainline Study Area Extents (Existing Conditions)

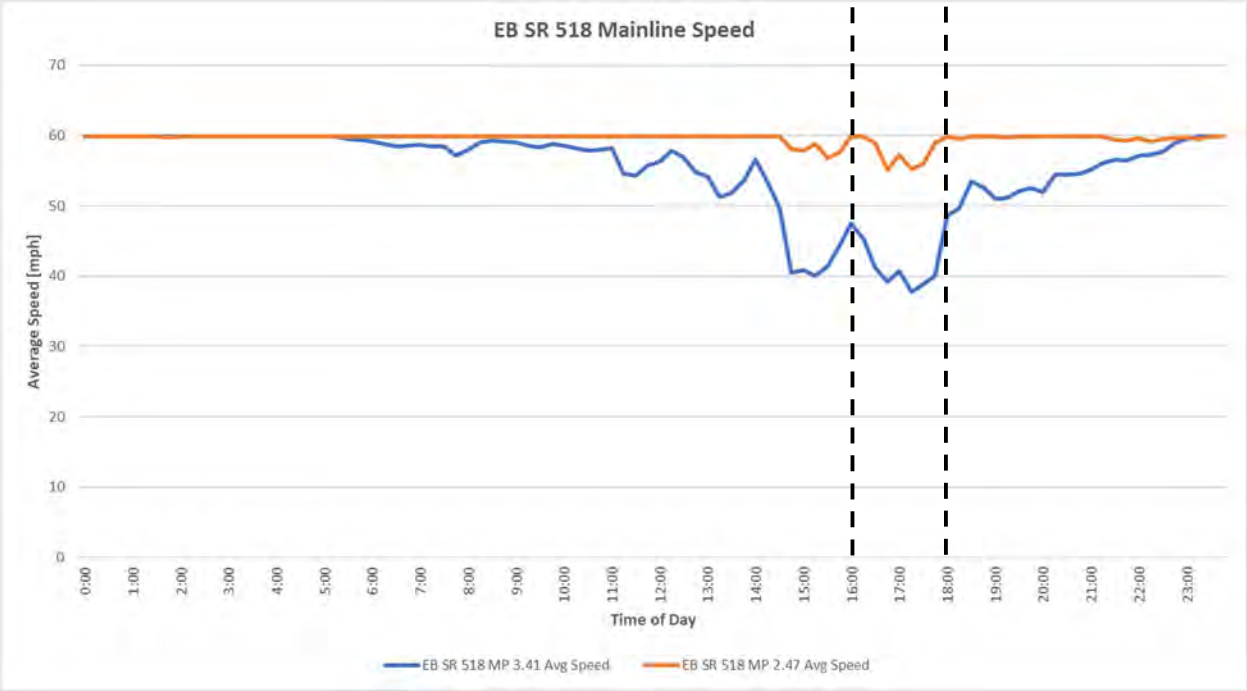
Ramp terminal intersections will not be simulated and will only be coded to facilitate vehicle routing to and from the on/off ramps along the corridor. If the Synchro/SimTraffic analysis shows a ramp terminal queue has the potential to impact mainline operations, then the extent of the queue will be verified with existing available data (Google congestion maps for typical conditions) and add a boundary condition will be added to the VISSIM model. If queuing impacts between the SR 518 mainline and the ramp terminals

are identified within the VISSIM model, ramp mitigation recommendations will be provided. In addition, if queuing impacts from the ramp terminals based on Synchro analysis results spill back to the SR 518 mainline, mitigation at the terminal intersections will also be recommended. This ramp terminal methodology is consistent with the base SR 518 VISSIM model for the Tukwila International Boulevard Station (TIBS) freeway analysis provided by WSDOT's consultant team. Existing and future ramp meters will be included within the VISSIM analysis model. Potential future ramp meters to be included in the VISSIM model will come from the SR 518 Corridor Planning Study and will be confirmed with WSDOT. Existing ramp meters are listed below:

- EB On-Ramp from S 160th Street
- EB On-Ramp from International Boulevard
- Ramp from EB SR 518 to SB I-5

3. Analysis Tools, Methods and Time Periods

Traffic operational analysis will be conducted for the pm peak period (4:00 – 6:00 pm) when congestion along SR-518 and other regional freeways (SR 509, I-5, I-405, etc.) is typically highest. This time period aligns with the peak period for which the SAMP traffic forecast was developed and also aligns with traffic analysis completed for the local intersections, arterial segments and HCS freeway analysis. Evening congestion for the airport typically occurs after 7:00 pm when regional travel demand/congestion has decreased. However, analysis of the 4:00 – 6:00 pm period represents the peak period when additional airport trips would have a higher impact on existing congestion within the freeway system. This is represented in Figure 2 showing 24-hour speed data where average speeds for eastbound SR 518 bottom below 40 mph during the 4-6 PM commuter peak period. Analyzing freeway facilities (specifically eastbound SR 518) for the 4-6 PM commuter peak is therefore the critical time period in determining potential mitigation. Average speeds for all other times of day remain above 50 mph in both directions.



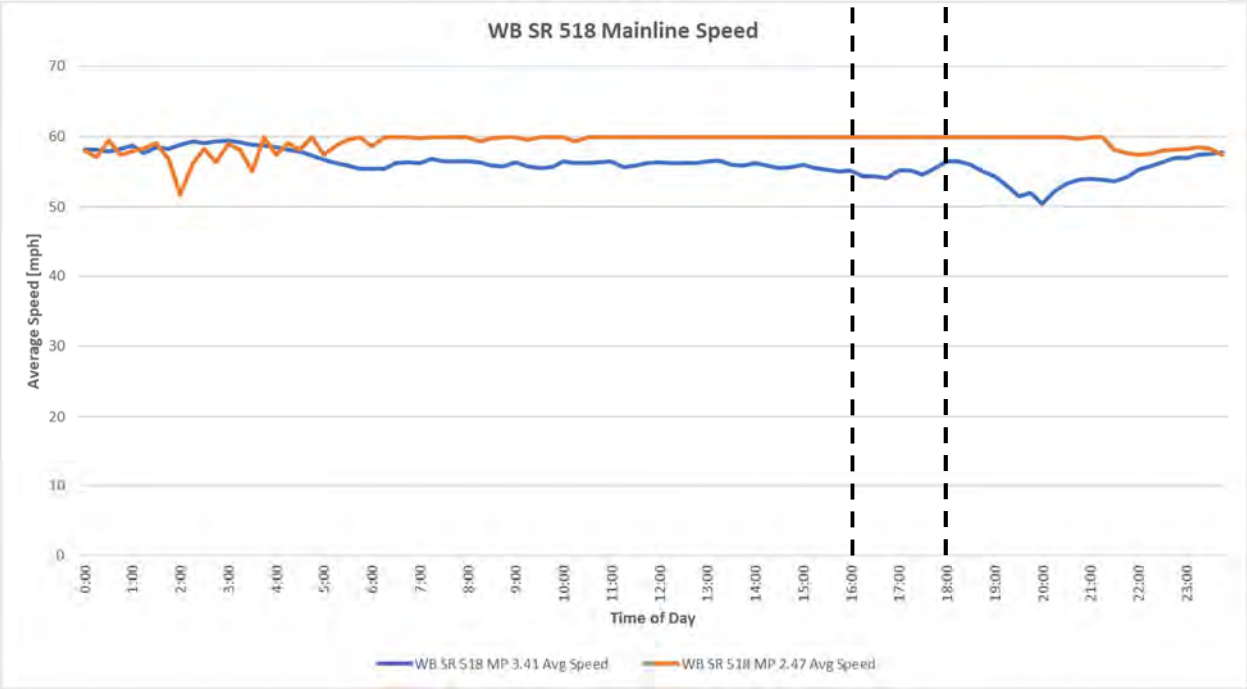


Figure 2: SR-518 Average Speeds (Source: WSDOT Loop Data, Sep/Oct, 2022)

VISSIM will be used to analyze the freeway mainline operations along SR 518. The VISSIM traffic simulation model will be constructed as a 2-hour peak period model and will only include 3 vehicle classes: Passenger Vehicle, Heavy Vehicle, and Transit. SOV/HOV splits of passenger vehicles will not be included in the VISSIM analysis due to the lack of mainline HOV facilities in the study area. The 2-hour modeling period will include a 30-minute seeding period (3:30 – 4:00 pm) and a 2-hour analysis period (4:00 – 6:00 pm).

4. Scenarios Analyzed

The VISSIM analysis will include the following five scenarios. Traffic analysis is being performed for the highest volume hour of traffic during the typical weekday (i.e., Tuesday, Wednesday, and Thursday), which is the PM peak period between 3 p.m. and 6 p.m. and is consistent with adjacent jurisdiction transportation plans and other ongoing analyses. The year 2032 was chosen as the opening day forecast year to coincide with the completion of the second terminal and associated near-term projects. Year 2037 was chosen as the long-term forecast which coincides with 5 years after all near term projects associated with the Port are completed.

- 2022 Existing Conditions – PM Peak Period
- 2032 No Action - PM Peak Period
- 2032 Proposed Action - PM Peak Period
- 2037 No Action - PM Peak Period
- 2037 Proposed Action - PM Peak Period

5. VISSIM Demand Inputs and Routing

Existing demand inputs for the VISSIM model will be developed using intersection, mainline, and ramp traffic count data collected during 2022. Future 2032 and 2037 No Action demand and routing inputs will be developed using NCHRP 765 post-processed volumes derived from dynamic traffic assignment (DTA) modeling previously completed for SAMP. SR 518 mainline volumes were post-processed and balanced using 2022 count data and DTA modeling work completed in 2020. Future 2032 and 2037 Proposed Action traffic demands and routing inputs will utilize the 2032 and 2037 No Action demands developed and incorporate volume changes from the proposed near-term projects as documented in the *SAMP Environmental Review – Affected Environment: Future Conditions Traffic Analysis Summary* memorandum.

These demands will be applied to an Origin-Destination (OD) routing structure within the VISSIM model. Routing decisions in VISSIM will be constructed using a "one-to-one" path per OD pair to avoid the complexities of calibrating parallel routes.

6. VISSIM Model Development

The SAMP SR 518 traffic analysis VISSIM models will be developed from the base SR 518 TIBS VISSIM model, which was created as part of the Sound Transit I-405 BRT program and used to test different transit stop configurations along SR 518. As part of the existing model effort, the TIBS base SR 518 model will be calibrated for the SAMP's 2022 existing conditions and validated using the methodology described in the bullet items below.

- The existing model will utilize the same study area as the base TIBS SR 518 VISSIM model (SR 518 from Des Moines Memorial Drive S. and west of the I-5/SR-518 interchange)
- The existing model will utilize roadway performance metrics from year 2022 as part of the model validation phase, which represent current operating traffic conditions for the study area.
- Model calibration will replicate boundary congested traffic conditions at the SR 518/I-405/I-5 interchange through the use of reduced speed areas within VISSIM. The reduced speeds areas will be placed on the EB SR 518 to SB I-5 ramps and the EB SR 518 to NB I-405 ramps which represent the ramps that currently experience congestion under existing conditions.
- Model validation will occur for the two-hour afternoon peak from 4:00-6:00 PM.
- Validation metrics will include EB and WB SR 518 corridor travel times between the SR 518/North Airport Expressway interchange and the SR 518/I-405/I-5 interchange, volume throughput (GEH statistic), and qualitative queueing impacts replicated through speed-temporal maps along SR 518 in the EB and WB directions.
- Qualitative validation at the lane level will occur; field data will be provided by WSDOT.

Table 1 provides a summary of the validation targets utilized for this study:

Table 1. SR 518 VISSIM Model Validation Metrics and Targets

Validation Performance Metric	Validation Target
Corridor Travel Times	EB and WB SR 518 corridor travel times within 10% of 2022 field travel time data or within allowable travel time differences per WSDOT VISSIM Protocol—whichever is greater.
Volume Throughput	SR 518 corridor mainline and ramp segments have GEH statistic less than 3.0

Table 1. SR 518 VISSIM Model Validation Metrics and Targets

Validation Performance Metric	Validation Target
Qualitative Queuing/Congestion	Based on existing VISSIM model speed-temporal maps compared to field speed-temporal maps for SR 518 under PM peak period conditions. Speed temporal maps will be developed within VISSIM using data collection measurements placed approximately ¼ mile apart along EB and WB SR 518. Speeds will be measured against WSDOT field data. Qualitative assessments will include measuring the length and duration of queuing and congestion along EB and WB SR 518.

The basis of the 2032 and 2037 SR 518 VISSIM models will be the calibrated 2022 VISSIM model. Future background improvement projects (including the preferred design for the TIBS project) will be reviewed and included in the future models. The future VISSIM models will also be updated to reflect future demands and network changes associated with each alternative and will include the major planned projects outlined in Table 2.

Table 2. Major Planned Improvements by Alternative

Planned Improvements	Future Year 2032		Future Year 2037	
	No Action	Proposed Action	No Action	Proposed Action
SR 509 Extension Phase 1	x	x	x	x
SR 509 Extension Phase 2	x	x	x	x
I-405 Renton to Bellevue Express Toll Lanes project	x	x	x	x
TIBS Project Improvements	x	x	x	x
Port of Seattle; Near-Term project and Second Terminal Improvements		x		x

Under 2032 and 2037 future conditions, traffic congestion on northbound I-405 east of I-5 is anticipated to spill back into the SR 518 study area. This congestion will be modeled in the SAMP SR-518 freeway VISSIM model by replicating the forecasted boundary conditions of the network using reduced speed areas at the eastern extent of the model. Similarly, the eastbound SR 518 to southbound I-5 ramp also experiences PM peak period congestion and will also be replicated within the freeway analysis VISSIM model. The congestion profiles for the boundary conditions at I-5 and I-405 for the 2032 and 2037 alternatives will be compared to output data from the year 2030 and 2045 *SR 518 Corridor Planning Study* VISSIM analysis models for qualitative validation of future boundary conditions.

The North Airport Expressway is not anticipated to have congestion spill back to SR-518 and Des Moines Memorial Drive after improvements associated with the Widen Arrivals and T2 Roadway projects are complete. This assumption is based on previous VISSIM modeling done by the Port of Seattle.

Measurement of Effectiveness (MOEs)

The following model outputs will be summarized for the PM peak period:

- Freeway mainline density and/or speed between interchanges, including lane by lane speeds where congestion varies between the lanes
- Corridor Travel Time: Start and end points as summarized in Table 3
- Volume Throughput
- Speed-Temporal Maps, with lane-by-lane speed-temporal maps set up for the SR 518 eastbound direction approaching I-5.

Table 3. Travel Time Routes for Calibration

Number	Travel Time Route	
	From	To
Eastbound		
EB1	EB SR 518 e/o Ramp to SB NAE	EB SR 518 to NB I-5 Ramp
EB2	EB SR 518 e/o Ramp to SB NAE	EB SR 518 to NB I-405 Ramp
EB3	EB SR 518 e/o Ramp to SB NAE	EB SR 518 to SB I-5 Ramp
EB4	NB NAE s/o S. 160th Street Overpass	EB SR 518 to NB I-5 Ramp
EB5	NB NAE s/o S. 160th Street Overpass	EB SR 518 to NB I-405 Ramp
EB6	NB NAE s/o S. 160th Street Overpass	EB SR 518 to SB I-5 Ramp
EB7	EB SR 518 On Ramp from International Blvd.	EB SR 518 to NB I-5 Ramp
EB8	EB SR 518 On Ramp from International Blvd.	EB SR 518 to NB I-405 Ramp
EB9	EB SR 518 On Ramp from International Blvd.	EB SR 518 to SB I-5 Ramp
Westbound		
WB1	SB I-5 to WB SR 518 Ramp	WB SR 518 Off Ramp to International Blvd. (Loop)
WB2	SB I-5 to WB SR 518 Ramp	WB SR 518 s/o S. 154th Street Overpass
WB3	SB I-5 to WB SR 518 Ramp	SB NAE s/o S. 160th Street Overpass
WB4	SB I-405 to WB SR 518 Ramp	WB SR 518 Off Ramp to International Blvd. (Loop)
WB5	SB I-405 to WB SR 518 Ramp	WB SR 518 s/o S. 154th Street Overpass
WB6	SB I-405 to WB SR 518 Ramp	SB NAE s/o S. 160th Street Overpass
WB7	WB SR 518 On Ramp from 51st Ave S.	WB SR 518 Off Ramp to International Blvd. (Loop)
WB8	WB SR 518 On Ramp from 51st Ave S.	WB SR 518 s/o S. 154th Street Overpass

Table 3. Travel Time Routes for Calibration

Number	Travel Time Route	
	From	To
WB9	WB SR 518 On Ramp from 51st Ave S.	SB NAE s/o S. 160th Street Overpass

Memorandum

Client:	Port of Seattle
Project:	Sustainable Airport Master Plan (SAMP)
Subject:	HCS Freeway Analysis Methods & Assumptions
Submit to:	Christina Strand, WSDOT; Steve Rybolt, Nic Longo, Tom Hooper, Port of Seattle
Copied to:	Sarah Potter, Landrum & Brown
Submitted by:	Steve Diebol, Siqi Huang, Tony Woody; Concord Engineering
Date:	March 23, 2023

1. Introduction and Overview

As part of the Sustainable Airport Master Plan (SAMP) study being conducted by the Port of Seattle at SeaTac International Airport, freeway traffic analysis has been requested by WSDOT to assess impacts along regional freeways due to the planned second terminal at the airport and proposed near term projects associated with the future development of the airport. The freeway analysis will be conducted in two parts; VISSIM analysis along a portion of SR 518 which is covered in *SR 518 VISSIM Traffic Analysis Methods & Assumptions Memorandum* and segment and ramp analysis using Highway Capacity Software (HCS) for impacted freeway segment along SR 518, I-405 and I-5. Ramp terminal intersection queuing will also be evaluated using Synchro. This document outlines the methods and assumptions used to perform the HCS freeway analysis.

2. Study Area

The study area for the HCS analysis includes the freeway segments of SR 518 from SR 509 to Des Moines Memorial Drive S., SR 518/I-5 & I-405 interchange area, and I-5 from Southcenter Blvd to S. 200th St. Figure 1 shows the HCS analysis study area and Table 1 includes the list of segments to be analyzed.

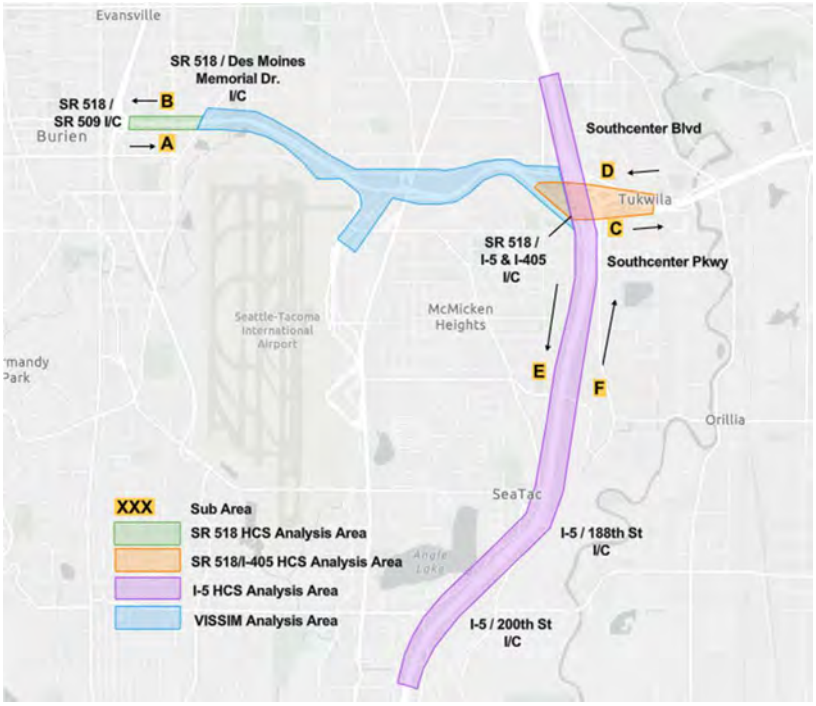


Figure 1: SAMP HCS Study Area Extents

Table 1: HCS Freeway Analysis Study Segments

Facility	ID	Study Segments	Analyzed Type	Number of Lanes	Basic/Overlap Type	Merge/Diverge Type		Weaving Type		
					Length (ft)	Freeway Length (ft)	Length of First Accel. /Decel. Lane (ft)	Short Length (ft)	Base Length (ft)	Influence Area (ft)
Sub Area A – SR 518 EB	A1	EB SR 518 from SR 509 NB Off Ramp to DMM EB off Ramp	Weaving	3				140	490	1,490
	A2	EB SR 518 from DMM EB off Ramp to DMM Interchange	Basic	2	1,790					-
Sub Area B – SR 518 WB	B1	WB SR 518 from DMM Undercrossing to Diverge Influence Point	Basic	2	940					-
	B2	WB SR 518 from DMM Diverge Influence Point to SR 509 NB On Ramp	Diverge	2		1,500	890			-
Sub Area C – SR 518/I-5 & I-405 EB	C1	EB SR 518 from 51st St Off Ramp to I-5 NB Off Ramp	Basic (Drop)	3	1,030					-
	C2	EB SR 518 from I-5 NB Off Ramp to I-5 SB Off Ramp	Basic (Drop)	2	650					-
	C3	NB I-405 from I-5 SB Off Ramp to I-5 SB On Ramp	N/A[1] (Skipped)	1	1,390					-
	C4	NB I-405 from I-5 SB On Ramp to I-5 NB On Ramp	Basic (Add)[2]	2	670					-
	C5	NB I-405 from I-5 NB On Ramp to Southcenter Pkwy	Basic (Add)[2]	3	1,180					-
Sub Area D – SR 518/I-5 & I-405 WB	D1	SB I-405 from Interurban Ave S end of accel. Lane to I-5 NB Off/Southcenter Off Ramp	Basic (Drop)[2]	3	1,820					-
	D2	SB I-405 from I-5 NB Off Ramp to I-5 NB On Ramp	Basic	2	1,350					-
	D3	SB I-405 from I-5 NB On Ramp to I-5 SB Off Ramp	Weaving	3				570	700	1,700
	D4	WB SR 518 from I-5 SB Off Ramp to I-5 SB On Ramp	Basic	2	1,280					-
	D5	WB SR 518 from I-5 SB On Ramp to 51st St On Ramp	Basic (Add)	3	760					-
Sub Area E – I-5 SB	E1	SB I-5 at Southcenter Blvd/SR 518 Off Ramp Diverge Area	Basic (Major Diverge)[2,3]	6	1,500					-
	E2	SB I-5 from Southcenter Blvd/SR 518 Off Ramp to I-405 NB Off Ramp	Basic (Drop)[2]	5	2,240					-
	E3	SB I-5 from I-405 NB Off Ramp to I-405 SB On Ramp	Basic	4	620					-
	E4	SB I-5 from I-405 SB On Ramp to Klickitat SB On Ramp	Basic (Add)[2]	5	4,330					-
	E5	SB I-5 at Klickitat SB On Ramp Merge Area	Merge[2]	5		1,500	1,500			-
	E6	SB I-5 from Klickitat SB On Ramp Merge Area to 188th St SB Off Ramp Diverge Area	Basic[2]	5	2,000					-
	E7	SB I-5 at 188th St SB Off Ramp Diverge Area	Diverge[2]	5		1,500	240			-
	E8	SB I-5 from 188th St SB Off Ramp Diverge Area to Lane Reduction Point	Basic[2]	5	1,080					-
	E9	SB I-5 from Lane Reduction Point to 188th St SB On Ramp	Basic[2]	4	2,330					-
	E10	SB I-5 at 188th St SB On Ramp Merge Area	Merge[2]	4		1,440	520			-

Table 1: HCS Freeway Analysis Study Segments

Facility	ID	Study Segments	Analyzed Type	Number of Lanes	Basic/Overlap Type	Merge/Diverge Type		Weaving Type		
					Length (ft)	Freeway Length (ft)	Length of First Accel. /Decel. Lane (ft)	Short Length (ft)	Base Length (ft)	Influence Area (ft)
	E11	SB I-5 from 188th St SB On Ramp Merge Area to 200th St SB Off Ramp Diverge Area	Overlap[2]	4	60					-
	E12	SB I-5 at 200th St SB Off Ramp Diverge Area	Diverge[2]	4		1,440	180			-
	E13	SB I-5 from 200th St SB Off Ramp to 200th St SB On Ramp	Basic[2]	4	1,730					-
	E14	SB I-5 at 200th St SB On Ramp Merge Area	Merge[2]	4		1,500	470			-
Sub Area F – I-5 NB	F1	NB I-5 at Military Rd NB Off Ramp Diverge Area	Diverge[2]	4		1,500	290			-
	F2	NB I-5 from Military Rd NB Off Ramp to Military Rd NB On Ramp	Basic[2]	4	900					-
	F3	NB I-5 at Military Rd NB On Ramp Merge Area	Merge[2]	4		1,500	710			-
	F4	NB I-5 from Military Rd NB On Ramp to 188th St NB Off Ramp	Basic[2]	4	2,090					-
	F5	NB I-5 at 188th St NB Off Ramp Diverge Area	Diverge[2]	4		1,500	180			-
	F6	NB I-5 from 188th St NB Off Ramp to 188th St NB On Ramp	Basic[2]	4	2,260					-
	F7	NB I-5 at 188th St NB On Ramp Merge Area	Merge[2]	4		1,500	570			-
	F8	NB I-5 from 188th St NB On Ramp to Southcenter Pkwy Off Ramp	Basic[2]	4	4,350					-
	F9	NB I-5 at Southcenter Pkwy Off Ramp Diverge Area	Diverge[2]	4		1,500	840			-
	F10	NB I-5 from Southcenter Pkwy Off Ramp to SR 518 WB/I-405 EB Off Ramp	Basic[2]	4	110					-
	F11	NB I-5 at SR 518 WB/I-405 EB Off Ramp Diverge Area	Basic (Major Diverge)[2,3]	4	1,500					-
	F12	NB I-5 from SR 518 WB/I-405 EB Off Ramp to I-405 WB HOV On Ramp	Basic	3	2,130					-
	F13	NB I-5 from I-405 WB HOV On Ramp to I-405 WB On Ramp	Basic	4	150					-
	F14	NB I-5 at I-405 WB On Ramp Merge Area	Merge	4		1,500	1,130			-
	F15	NB I-5 from SR 518 EB On Ramp to Southcenter Blvd NB On Ramp	Basic (Add)[2]	5	700					-
	F16	NB I-5 at Southcenter Blvd NB On Ramp Merge Area	Merge[2]	5		1,500	1,070			-

Note:
Distance rounded to nearest 10.
[1]- One-lane freeway mainline cannot be analyzed in HCS.
[2]- HOV lane ignored due to the analysis constraint of HCS.
[3]- A major diverge area is one in which two primary roadways, each having multiple lanes, diverge from a single freeway segment. Major Diverge type analyzed as basic segment with Major Diverge checkbox checked. For major diverge areas, a model exists for computing the average density across all approaching freeway lanes within 1,500 ft of the diverge.

3. Scenarios, Analysis Tools, Methods, and Measures of Effectiveness

Study Scenarios

The HCS analysis will include the following five alternatives. The year 2032 was chosen as the opening day forecast year to coincide with completion of the second terminal and associated near-term projects. Year 2037 was chosen as the long-term forecast which coincides with 5 years after all near term projects associated with the Port are completed.

- 2022 Existing Conditions – PM Peak Period (4-6 PM)
- 2032 No Action – PM Peak Period (4-6 PM)
- 2032 Proposed Action – PM Peak Period (4-6 PM)
- 2037 No Action – PM Peak Period (4-6 PM)
- 2037 Proposed Action – PM Peak Period (4-6 PM)

Analysis Tools and Methods

Traffic operational analyses will be conducted for the PM Peak period when congestion along regional freeways (SR 518, I-5, I-405, etc.) is typically highest. This time period aligns with the peak period for which the SAMP traffic forecast was developed and also aligns with traffic analysis completed for the local intersections, arterial segments and VISSIM freeway analysis. Evening congestion for the airport typically occurs after 7 PM when regional travel demand/congestion has decreased. Therefore, analysis of the 4-6 PM period represents the peak period when additional airport trips would have a higher impact on existing congestion within the freeway system.

HCS 2022 will be used to analyze the freeway mainline, merge/diverge connections and weaving segments for the study scenarios outlined above. HCS 2022 is an analytical/deterministic model tool that replicates the operational analysis procedures of the Highway Capacity Manual.

Existing volumes used in the HCS model will be developed from 2022 intersection, mainline, and ramp traffic count data. Future 2032 and 2037 No Action volumes will be developed using NCHRP 765 post-processed volumes derived from dynamic traffic assignment (DTA) modeling previously completed for SAMP. Intersection ramp volumes used for this analysis were developed from existing data from WSDOT and SAMP turning movement counts. SR 518 mainline volumes were post-processed and balanced using WSDOT counts from 2022 count data and the SAMP DTA modeling work completed in 2020. Future 2032 and 2037 Proposed Action traffic volumes will utilize the 2032 and 2037 No Action demands developed and incorporate volume changes from the proposed near-term projects as documented in the *SAMP Environmental Review – Affected Environment: Future Conditions Traffic Analysis Summary* memorandum.

Measures of Effectiveness (MOEs)

The following operational outputs will be summarized for the PM peak period. The Measures of Effectiveness (MOEs) for the analysis are as follows:

- Freeway density for overall freeway facilities and critical segments
- Level of Service (LOS) for overall freeway facilities and critical segments
- Average speed for overall freeway facilities

APPENDIX L

Surface Transportation

Future Conditions Traffic Analysis Report
Attachments

Attachment A: WSP DTA Methods & Assumptions
Attachment B: Future Forecasting Methods & Assumptions
Attachment C: NTP Trip Generation Memo
Attachment D: Freeway Volume Diagrams (Available by request)
Attachment E: 2032 and 2037 Intersection LOS Results (Available by request)
Attachment F: NTP Descriptions
Attachment G: 2032 and 2037 HCS Results (Available by request)
Attachment H: Preliminary Intersection Control Evaluation Reports (Available by request)
Attachment I: Corridor Volume and Queuing Summary (Available by request)
Attachment J: 2032 and 2037 Intersection Turning Movement Volumes (Available by request)

SAMP NTP Environmental Review:

Environmental Consequences: Future Conditions Traffic Analysis Summary

Submitted by: Concord Engineering
Date: September 9, 2024

Table of Contents

1. Executive Summary

This report summarizes the traffic analysis results for the future conditions of the Port of Seattle's (Port) Sustainable Airport Master Plan (SAMP) Near Term Projects (NTPs). The Port proposes to construct new facilities to accommodate passenger growth at the Seattle-Tacoma International Airport (Airport). These facilities include a new Second Terminal as well as relocation and expansion of existing airport support facilities to accommodate construction of the Second Terminal (see Section 2 of this report for additional details).

Methodology used in this report was reviewed by the Federal Aviation Administration (FAA) and the Washington State Department of Transportation (WSDOT). Additionally, WSDOT provided technical review of modeling results as well as forecasting and mitigation assumptions (see Section 3 for additional forecasting information). Outreach to local jurisdictions surrounding the Airport was completed to solicit feedback on analysis results and proposed mitigation.

The traffic analysis methods and assumptions, study area, and existing conditions traffic analysis results are documented in the "SAMP Affected Environment: Existing Traffic Analysis Summary" report (Existing Conditions Report) completed in August 2023. The following sections of this report describe future scenarios, future traffic volume projections, operational analysis results for intersections and freeways, and identified intersection mitigation/improvement options. The Proposed Action results summarized in this report would not change for the Hybrid Alternative also under consideration. The traffic analysis study area is shown in Figure 1 (see the Existing Conditions Report for more information about the traffic analysis study area). Existing intersections are shown in black, and new future intersections are shown in orange.

This analysis compares intersection and freeway Level of Service (LOS) results to mobility standards adopted by local jurisdictions and agencies to identify potential impacts (see Section 4 for intersection results, and Sections 6 and 7 for freeway results). Information on background improvements and other assumptions included in the analyses is provided. The intersection analysis identified 10 intersections where NTP trips would trigger a LOS deficiency as part of the Proposed Action (PA) analysis in either 2032 or 2037. Additionally, 18 intersections were identified as not meeting agency or jurisdiction mobility standards in the No Action (NA) analysis for 2032 and/or 2037 and the NTPs add additional delay. Mitigation options were analyzed to determine what capital improvements would be required to satisfy mobility standards (Section 7). The Freeway analysis showed that the NTPs would not result in any additional freeway segments operating below adopted mobility standards beyond those already operating at a deficient level in the 2032 and 2037 No Action scenarios. Freeway ramp terminal intersection mitigation requested by WSDOT will provide benefit to the freeway system by reducing queue impacts and providing additional capacity for future traffic growth.

2. Future Scenarios

The future conditions traffic analysis assumes 2032 as the Opening Year and 2037 as the Horizon Year for the NTPs. A total of 116 intersections and 8 miles of freeway were analyzed for surface transportation impacts. The extent of the study area was scoped with input from FAA, WSDOT, and local jurisdictions. Figure 1 shows the study area of the surface transportation analysis (existing intersections are shown in black, and new future intersections are shown in orange).

Review of Average Daily Traffic (ADT) volumes and intersection turning movement counts documented in the comprehensive plans and/or transportation master plans for the surrounding local agencies identified the PM peak period as the time of day with the highest traffic volumes for the roadways surrounding the Airport; therefore, the future conditions traffic analysis was conducted for the PM peak hour only (see the Existing Conditions Report for more information). The PM peak hour is defined as the highest four consecutive 15-minute intervals of traffic during the PM commuter peak period (4 p.m. to 6 p.m. of a typical weekday – Tuesday, Wednesday, Thursday). Four future scenarios were analyzed for this study:

1. 2032 No Action
2. 2032 Proposed Action
3. 2037 No Action
4. 2037 Proposed Action

2.1 No Action (2032 and 2037)

The No Action scenario consists of the future transportation network and demand including:

- Background traffic growth from land use changes;
- Changes in travel patterns associated with background roadway network changes, such as the SR 509 Stage 1B and 2 extensions;
- Expected increase in demand for air travel (SAMP NTP Constrained Operating Growth Scenario (COGS) forecast[1]);
- Planned and funded local transportation infrastructure projects, such as added turn lanes at existing intersections (see Section 4.1); and
- Previously approved Port of Seattle infrastructure projects such as the Airport Access Improvement and Congestion Reduction Project and the Air Cargo Road/S 170th Street Safety Improvement project.

[1] Sustainable Airport Master Plan – Near Term Projects, Constrained Operating Growth Scenarios, Seattle-Tacoma International Airport, Landrum & Brown, July 2023

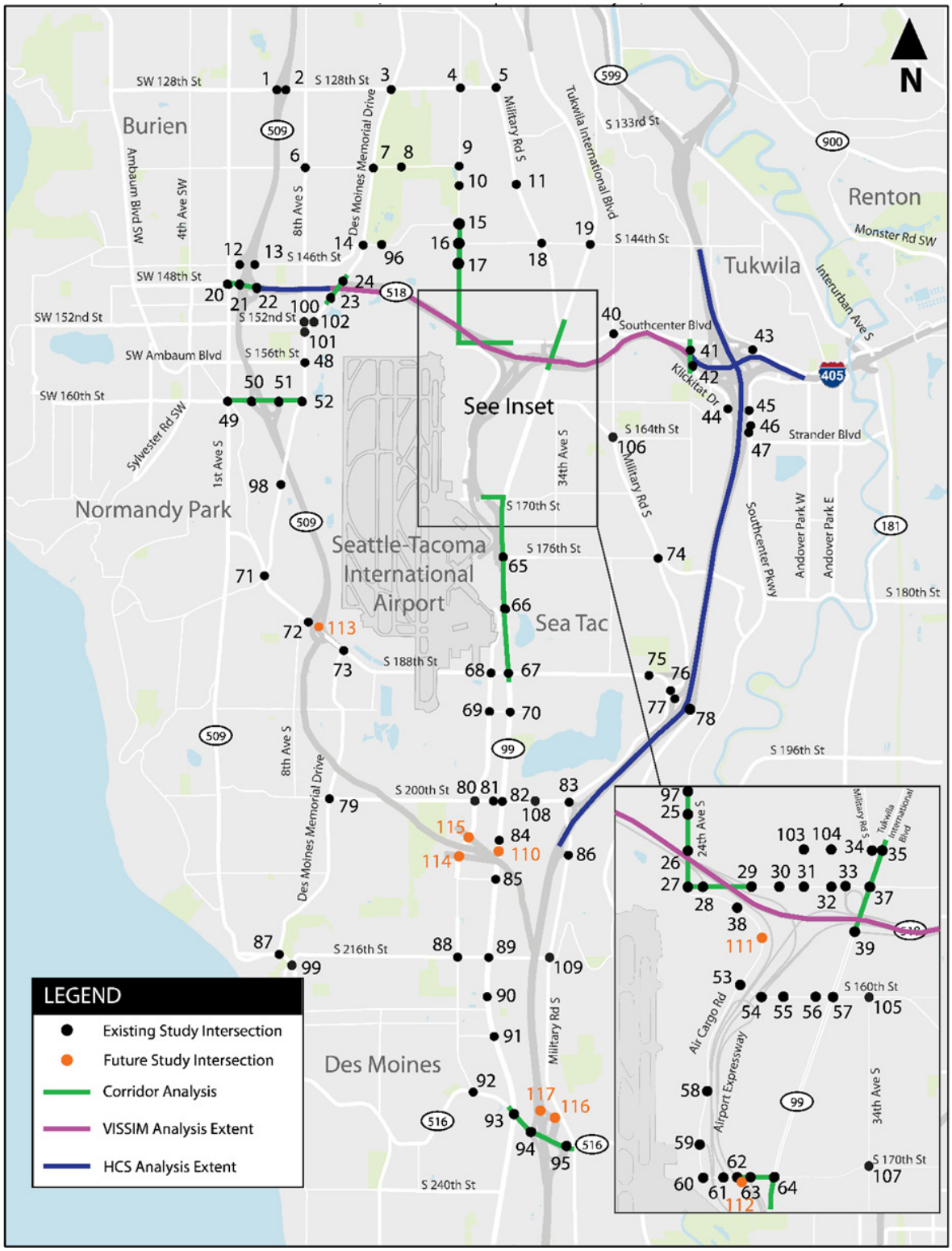


Figure 1. Traffic Analysis Study Area Intersections

2.2 Proposed Action (2032 and 2037)

The Proposed Action scenario, as compared to the No Action scenario, incorporates additional transportation and infrastructure improvements to be constructed by the Port by 2032 to accommodate projected future growth in airport employment, as well as cargo and passenger air travel demand. The collective total of all these NTPs constitute the "Proposed Action" scenario. Projects that are not funded or are expected to be completed after 2032 are not included in this traffic analysis.

A full description of the NTPs included as part of the Proposed Action analysis is included as Attachment F. Due to its size and the number of trips generated in comparison to other NTPs, the Second Terminal (NTP T02) and its associated roads and curbside operations (NTP L03) were included in the Proposed Action DTA model. Trips from all other NTPs were accounted for using separate trip generation and distribution assumptions as described in the Future Forecasting Methods and Assumptions Memo (Attachment B) and the NTP Trip Generation Memo (Attachment C).

Intersection capacity analysis was conducted for the Proposed Action scenarios and compared to the No Action scenarios to determine if the Proposed Action would cause any study intersections to degrade in performance below the local jurisdiction's mobility standards (see the Existing Conditions Report for the sources of mobility standards). Where performance degradation was indicated, intersection mitigation or improvement options were identified. Section 4 presents the traffic analysis results of future scenarios that have incorporated the identified intersection mitigation and improvements options.

3. Traffic Forecasting

3.1 Forecast Components

Table 1 provides the components that were considered in the development of each future traffic forecast.

Table 1. SAMP Traffic Forecast Components Summary

Scenario	Existing (2022)	2032 No Action	2032 Proposed Action	2037 No Action	2037 Proposed Action
MAP*	45.9	57.2	58.3	59.5	64.1
Terminal 1	X	X	X	X	X
Terminal 2			X		X
SR 509 Extension Stages 1&2		X	X	X	X
Non-Terminal Near-Term Projects			X		X

*- Million Annual Passengers from the COGs

3.3 Development of Future Traffic Volumes

Future intersection turning movement volumes were developed using a three-step process. Forecasting steps and methodologies were reviewed by WSDOT. The traffic forecasting methodology is documented in the 2032/2037 Future Forecasting Methods & Assumptions document included as Attachment B. The three-step process includes:

- Step 1 – Model and Terminal Demand Forecast
- Step 2 – Post Processed Traffic Volumes
- Step 3 – NTPs and Combined Intersection Volumes

Note that the assumptions for the No Action and Proposed Action scenarios are consistent across both the traffic forecasting models and the traffic operations analysis.

3.3.1 Step 1 - Model & Terminal Demand Forecast

The first step in determining the future intersection turning movement volumes utilized a Dynamic Traffic Assignment (DTA) model to establish future roadway segment volumes. WSP created an updated DTA model using information from the Puget Sound Gateway Project and the SR 518 Corridor Planning Study DTA models, the Puget Sound Regional Council (PSRC) 2040 land use forecast, the COGs, and other considerations detailed in the WSP report (Attachment A). WSP originally developed models for four future conditions (No Action and Proposed Action for 2027 and 2032). The major difference between the previous 2027 and 2032 DTA models was the inclusion of the SR 509 Stage 2 extension in the 2032 model. Because of the Covid-19 pandemic, the Port shifted its opening and horizon years to 2032 and 2037, respectively. This shift in opening and horizon years meant construction of the SR 509 Stage 2 extension would be included in both study years. Review of funded background network improvements planned by WSDOT and local jurisdictions were reviewed to see if any additional changes would affect regional travel patterns beyond the initial 2032 horizon year previously assumed. WSDOT acknowledged that no new improvement projects would need to be added to the DTA model and therefore regional travel patterns would remain similar to those already depicted in the 2032 No Action and Proposed Action DTA models. Airport terminal trips in the DTA models were scaled to account for the updated COGs.

For the Proposed Action scenarios, the WSP models account for transportation infrastructure changes to be constructed under the Proposed Action—primarily local access and circulation around the terminals and new direct ramps to and from Northern Airport Expressway (NAE) and the new Second Terminal.

WSP's forecasts reflect the future travel demand for the No Action conditions and Proposed Action conditions, with the exception of Non-Terminal related NTPs. Localized changes to traffic patterns associated with the Non-Terminal NTPs are not captured by the DTA model outputs, thus a traditional trip-based development traffic forecast was conducted to account for those uses (see Section 3.4).

3.3.3 Step 2 - Post-Processed Traffic Volumes

The DTA model outputs were then utilized to develop the future conditions intersection volumes. This process followed guidance from the NCHRP Report 765 and included the development of analytical tools to forecast intersection volumes, starting with the 2032 No Action scenario. Intersection volumes were then imported into Synchro and volume balancing was applied. The workflow for this step was as follows:

1. Apply screenline refinements to raw model volumes where the DTA model was not within error range of existing counts.
2. Compile volumes from future year model outputs and base year model outputs for each intersection leg approach and departure.
3. Compare volumes using the ratio and difference NCHRP factoring methods and select an appropriate method for each intersection based on existing counts.
4. Apply the factors to each intersection in iterative steps using NCHRP methods until the turning movement error is acceptable.
5. Apply manual adjustments and balance volumes where appropriate.

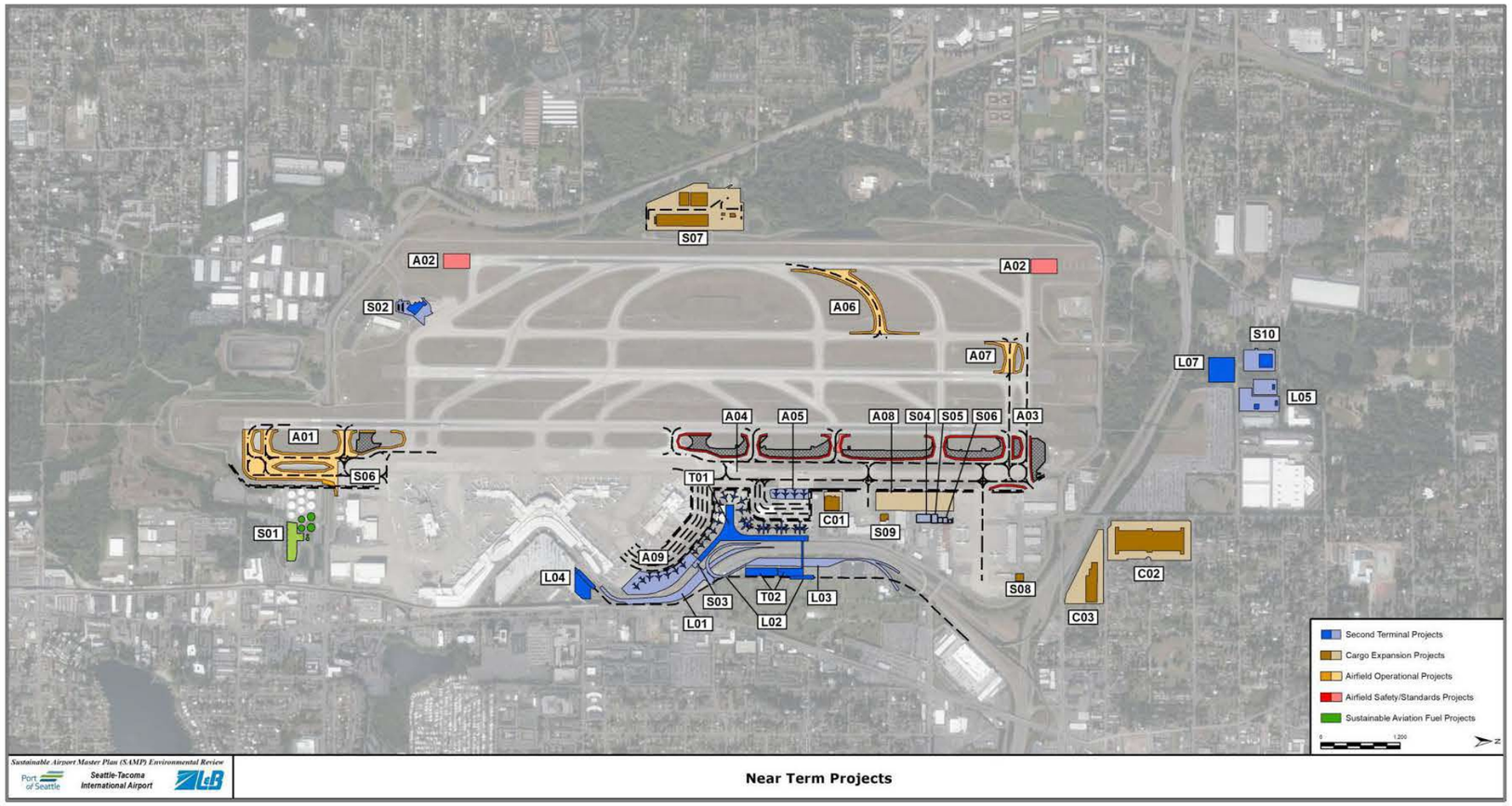
The base 2032 No Action intersection forecasts were then scaled and adjusted for 2037 Airport and Non-Airport trips. Concord calculated future 2037 volumes by applying a 2.2% average annual growth rate to non-terminal trips and increasing terminal trips by the percent change in the COGs.

The delta increase at ramp terminal intersections were applied to freeway on and off ramps. These deltas were carried through the SR 518 and I-5 corridors for use in Highway Capacity Software (HCS) and VISSIM (German for "Verkehr In Stadten- Simulations Modell") freeway PM peak hour analysis. Forecasted freeway volumes at the outer extents of the study area for Non-Airport trips from the WSP DTA models were compared to previous studies completed by WSDOT for consistency in trends and magnitude. The WSDOT studies referenced were completed for Puget Sound Gateway Program – Phase 1 of the SR 509 Completion Project Environmental Re-evaluation (January 2018), I-405, Renton to Bellevue Widening and Express Toll Lanes Project IJR (May 2018), and WSDOT's SR 518 Corridor Planning Study (May 2020). Freeway volume diagrams are included in Attachment D.

3.3.4 Step 3 - Near-Term Projects Forecasts and Combined Intersection Volumes

The third step of the traffic forecast development utilized a four-step (i.e., trip generation, trip distribution, mode choice, and trip assignment) process to evaluate the Non-Terminal NTPs under the Proposed Action conditions. The Port provided direction on all trips generated and travel patterns associated with each NTP. A summary of the NTP trip generation and trip distribution characteristics is provided Section 3.4. Additional details are provided in a separate trip generation memorandum (Attachment C). Figure 2 shows all NTPs and their locations. It should be noted that a former project L06 is no longer under consideration; the employee parking capacity from that project was added to the L07 site and no analysis was conducted for the L06 location.

SEATTLE-TACOMA INTERNATIONAL AIRPORT | SEA-TAC AIRPORT **SUSTAINABLE AIRPORT MASTER PLAN (SAMP)**
NEAR-TERM PROJECT ENVIRONMENTAL REVIEW



AIRSIDE
A01 - Taxiway A/B Extension
A02 - Runway 16R-34L Blast Pads
A04 - Taxiway B 500' Separation & RIM Mitigation
A05 - North Hold Pad
A06 - Runway 34L Highspeed Exit
A07 - Taxiway D Extension
A08 - Hardstand (north)
A09 - Hardstand (central)
A 10 - Taxiway Fillets (not shown)

LANDSIDE
L01 - NAE Relocation (southbound lanes)
L02 - Elevated Busway & Stations
L03 - Second Terminal Roads /Curbside
L04 - Main Terminal North GT Lot
L05 - North GT Holding Lot
L07 - Employee Parking Structure

TERMINAL
T01 - North Gates
T02 - Second Terminal & Parking

CARGO
C01 - Cargo 4 South Redevelopment
C02 - Off-site Cargo PH 1 (L-Shape)
C03 - Off-site Cargo PH 2 (L-Shape)

AIRPORT/AIRLINE SUPPORT
S01 - Fuel Farm Expansion
S02 - Primary ARFF
S03 - Secondary ARFF
S04 - Fuel Rack Relocation
S05 - Triculator
S06 - Consolidated De-icing Tanks
S07 - Westside Maintenance Campus
S08 - Airline Support (north)
S09 - Airline Support (west)
S10 - Centralized Rec. & Dist. Center

Figure 2. Near-Term Project Locations (Source: Landrum & Brown)

3.4 Near-Term Projects Considered

A detailed description of all NTPs is included in Attachment F. The NTP Trip Generation Memo (Attachment C) provides detailed information on trip generation methodology and trip totals for each NTP as well as summarizing which step in the forecasting methodology each NTP's trips were included.

3.4.1 Trip Generation for Non-Terminal Near-Term Projects

NTP trip generation calculations for NTPs not included in the DTA are summarized in Attachment C. These trip generation methodologies were developed with input from the Port on expected future operations as well as referencing existing turning movement counts, and data from the Institute of Transportation Engineers (ITE) *Trip Generation Manual 11th Edition*.

3.4.2 Trip Distribution and Assignment for Non-Terminal Near-Term Projects

Many of the NTPs involve the relocation and expansion of an existing use or function. For these NTPs, existing trips were removed from the study area intersection network and at the location of the existing use or function. Future trips were then distributed to the future study area intersection network and assigned to the relocated site. Trip distribution for new trips or for removal of existing trips from the study area intersection network followed two trip distribution models shown in Tables 2 and 3, unless the use or function dictated that a portion of site trips were between specific origins and destinations as discussed in Attachment C. These trip distribution models are based on existing PM peak hour traffic volumes on the roadways entering and exiting the outer extents of the study network. Trip routing to and from the NTPs and the outer extents of the study network were done with consideration of future roadway connectivity—specifically the SR 509 Stage 2 extension—which would divert some trips from existing local roads to the future freeway extension. Table 2 provides the distribution model for all local roads and freeways and Table 3 provides the distribution model used for regional freeways only.

Table 2. Network Trip Distribution Model

Direction To/From	Roadway	Inbound (From)*	Outbound (To)*
North	Surface Streets	5%	4%
	SR 509	8%	5%
	I-5	23%	18%
East	Surface Streets	14%	13%
	I-405	11%	9%
South	Surface Streets	10%	15%
	I-5	16%	21%
West	Surface Streets	13%	15%
Total		**100%**	**100%**

* - based on existing PM peak hour traffic volumes

Table 3. Regional Trip Distribution Model

Direction To/From	Roadway	Inbound (From)*	Outbound (To)*
North	SR 509	14%	9%
	I-5	40%	35%
East	I-405	19%	17%
South	I-5	27%	39%
Total		**100%**	**100%**

* - based on existing PM peak hour traffic volumes

3.5 Future Traffic Forecasts

Intersection volumes for the No Action scenarios were completed with the finalization of the post-processing and balancing. For the Proposed Action scenarios, balanced post-processed intersection volumes were combined with the trip assignment for Non-Terminal NTPs to create the total combined future traffic forecasts for the Proposed Action scenarios. Future conditions PM peak hour traffic volumes and intersection LOS and delays are illustrated in Attachment J.

4. Intersection Operations Analysis

The sections below summarize the intersection operations analysis associated with the NTPs and discuss planned local and regional background projects and operations analysis results.

4.1 Planned Local and Regional Background Projects

Local and regional agency planned and funded future projects were included in the analysis. Future projects that are planned but not funded were only included if the intersection LOS required improvements beyond those which were already funded to see if the planned but unfunded improvement would resolve the LOS deficiency as part of the mitigation analysis.

SeaTac (source: SeaTac 2024-2029 TIP)

- Int #7 (Des Moines Memorial Drive at S 136th Street): Leading pedestrian interval added to signal timings. (SeaTac TIP Proj #4)
- Int #14 (Des Moines Memorial Drive at S 144th Street): Leading pedestrian interval added to signal timings. (SeaTac TIP Proj #4)
- In #18 (Military Road S at S 144th Street): Northbound and southbound left turn lanes added (SeaTac TIP Proj #22)
- Int #27 (24th Ave S at S 154th Street): Leading pedestrian interval added to signal timings. (SeaTac TIP Proj #4)
- Int #31 (30th Ave S at S 154th St): Install sidewalk along 30th Ave S (SeaTac TIP Proj #14)
- Int #32 (32nd Ave S at S 154th St): Install bicycle lanes and sidewalk. (SeaTac TIP Proj #12)
- Int #35 (International Boulevard at S 152nd Street): Leading pedestrian interval added to signal timings. (SeaTac TIP Proj #6)

- Int #37 (International Boulevard at S 154th Street): Leading pedestrian interval added to signal timings. (SeaTac TIP Proj #6)
- Int #57 (International Boulevard at S 160th Street): Leading pedestrian interval added to signal timings. (SeaTac TIP Proj #6)
- Int #64 (International Boulevard at S 170th Street): Leading pedestrian interval added to signal timings. (SeaTac TIP Proj #6)
- Int #65 (International Boulevard at S 176th Street): Leading pedestrian interval added to signal timings as well as dedicated pedestrian phase for north leg. (SeaTac TIP Proj #6)
- Int #66 (International Boulevard at S 182nd Street): Leading pedestrian interval added to signal timings. (SeaTac TIP Proj #6)
- Int #67 (International Boulevard at S 188th Street): Leading pedestrian interval added to signal timings. (SeaTac TIP Proj #6)
- Int #68 (28th Ave S at S 188th Street): Leading pedestrian interval added to signal timings. (SeaTac TIP Proj #6)
- Int #69 (28th Ave S at S 192nd Street): Leading pedestrian interval added to signal timings. (SeaTac TIP Proj #4)
- Int #70 (International Boulevard at S 192nd Street): Leading pedestrian interval added to signal timings. (SeaTac TIP Proj #6)
- Int #75 (S 188th Street at 46th Ave S): Leading pedestrian interval added to signal timings. (SeaTac TIP Proj #4)
- Int #76 (S 188th Street at Military Road S): Leading pedestrian interval added to signal timings. (SeaTac TIP Proj #4)
- Int #80 (26th Ave S at S 200th Street): Leading pedestrian interval added to signal timings. Protected NB and SB left turn phases added. (SeaTac TIP Proj #4)
- Int #82 (International Boulevard at S 200th Street): Leading pedestrian interval added to signal timings. (SeaTac TIP Proj #6)
- Int #84: (International Boulevard at S 204th Street): Leading pedestrian interval added. (SeaTac TIP Proj #6)
- Int #85 and #110 (International Boulevard at S 208th Street): Leading pedestrian interval added to signal timings. Realign east leg of S 208th Street to be new east leg at International Boulevard at S 206th Street. East leg of S 208th Street to remain as driveway access. S 206th Street will be stop controlled. (SeaTac TIP Proj #6, WSDOT SR 509 Stage 1B).
- Int #89: (Pacific Highway S at S 216th Street): Leading pedestrian interval added. (SeaTac TIP Proj #6)
- Int #94/#95, #116/#117 (Kent-Des Moines Road at I-5 Ramps). Reconstruct interchange to accommodate Veterans Drive extension improvements and SR 509 Stage 1B intersection improvements.
- Int #103 (30th Ave S at S 152nd Street): Widen roadway to provide sidewalks, bicycle lanes along 152nd Street. (SeaTac TIP Proj #9, SeaTac TIP Proj #14)

- Int #104 (32nd Ln S at S 152nd Street): Widen roadway to provide sidewalks, bicycle lanes along 152nd Street. (SeaTac TIP Proj #9, SeaTac TIP Proj #12)
- Int #105 (34th Ave S at S 160th Street): Intersection was converted to a roundabout after City of SeaTac noted potential development north of the intersection would likely provide upgrades.
- Int #106 (Military Road S/42nd Ave S/S 164th Street): City of SeaTac has recommended converting existing signal to roundabout in future. Not part of current TIP.
- Int #107 (34th Ave S and S 170th Street): City of SeaTac has recommended the installation of traffic calming and shared bicycle facilities along 34th Ave corridor (SeaTac TIP Proj #11).

Burien (source: Burien 2023-2028 TIP)

- Int #50 and #51 (S 160th Street at SR 509 Ramps): Construction of single lane roundabouts as part of SR 509 Stage 2 Extension. (Burien TIP Project #22 and #35).
- Int #101-102 (Des Moines Memorial Drive/S 152nd Street/8th Ave S): Stop-controlled intersections were consolidated into a roundabout to improve safety and operations. (Burien TIP Proj #8).

Des Moines (source: Des Moines 2022-2027 CIP)

- Int #92 (Kent-Des Moines Road at 24th Ave S): Widen east leg of intersection to 5-lanes with two lanes in each direction and center-turn lane as well as pedestrian facilities. Southbound left turn lane added. (Des Moines CIP Project #319.606 and #319.625).
- Int #93 (Pacific Highway S at Kent-Des Moines Road): Sound Transit to construct additional northbound left and northbound right turn lanes. Improvements part of mitigation for Federal Way Link Extension.

WSDOT (source: WSDOT SR 509 Transportation Technical Report, RFP Design Drawings)

- Int #50 and #51 (S 160th Street at SR 509 Ramps): Construction of single lane roundabouts as part of SR 509 Stage 2 Extension. Also included in Burien TIP.
- Int #72 (S 188th Street at SR 509 SB Ramps): Replace existing stop control intersection with multi-lane roundabout as part of SR 509 Stage 2 Extension. North leg of roundabout will accommodate on and off-ramp vehicles for SB SR 509. (WSDOT SR 509 Stage 2).
- Int #113 (S 188th Street at SR 509 NB Ramps): Construct multi-lane roundabout as part of SR 509 Stage 2 Extension. (WSDOT SR 509 Stage 2).
- Int #114/#115 (24th Ave S at SR 509 Ramps): Construct new signalized ramp terminals as part of the half-interchange improvements (SR 509 Stage 2 Extension).

Intersections #110 and #113-117 were added to the study network for the WSDOT regional improvements as part of SR 509 Stage 1B and 2 Extensions. Furthermore, the Proposed Action eliminated intersections #58-62 and created new intersections #111 and #112. These changes are described in the LOS tables in the subsequent sections and shown in Figure 1.

Traffic signal timings (splits and offsets, cycle length optimization for isolated intersections or short corridors) were optimized for locations failing to meet mobility standards under the No Action scenario. Signal timing optimization is a regular activity conducted by traffic signal owning agencies to accommodate shifts in traffic flow and is typically conducted every 3-5 years, therefore it is reasonable to

include it in all future scenarios. Additional signal timing optimization occurred after Proposed Action trips were added if the intersection did not operate at the agency or jurisdiction's mobility standard.

4.2 Intersection Operations Results

Table 4 provides a summary of the PM peak hour operational analysis results for the 2032 conditions. Table 5 provides a summary of the PM peak hour operational analysis results for the 2037 conditions. Tables 4 and 5 summarize intersection LOS with *only funded* agency and jurisdiction improvement projects. Optimized signal timings at existing signalized intersections for the 2032/2037 No Action intersections were maintained for the 2032/2037 Proposed Action intersections. Synchro reports are provided in Attachment E.

Intersections were evaluated based on the agency or jurisdiction's mobility standard that owns and/or operates the intersection. Where city limits divide an intersection or there is joint jurisdiction, both agencies and/or jurisdictions were identified. The mobility standards were obtained from the agency and/or jurisdiction comprehensive plans to evaluate when intersection operations would reach a deficient LOS. This threshold can vary by jurisdiction and by intersection or street classification type. A summary of jurisdiction and agency LOS standards is included below:

- **City of SeaTac**
  - LOS E for principal or minor arterials
  - LOS D for collector arterials and lower classification roads
  - LOS E-Mitigated for the following intersections
    - S 188th Street at International Boulevard
    - S 200th Street at International Boulevard
    - S 170th Street at International Boulevard
- **City of Burien**
  - LOS E for intersections within the Urban Center
  - LOS D for roads designated as auto/truck priority
  - LOS C for all other roadways
- **City of Des Moines**
  - LOS D or better unless otherwise noted below
    - LOS E or F in the Marina District
    - LOS F with a maximum v/c ratio of 1.0 for S 216th Street at Pacific Highway S
    - LOS F with a maximum v/c ratio of 1.2 for Kent-Des Moines Road at Pacific Highway S
- **City of Tukwila**
  - LOS E for intersections
- **WSDOT**
  - LOS D for freeways and freeway ramp terminals

Table 4. Year 2032 Future Conditions Traffic Analysis Results – Funded Improvements Only

ID	Intersection	Jurisdiction	Mobility Standard^	2032 No Action			2032 Proposed Action		
				Traffic Control	LOS	Vehicle Delay (sec)	Traffic Control	LOS	Vehicle Delay (sec)
1	SR 509 SB Ramps/S 128th St.	WSDOT	D	Signalized	C	21.3	Signalized	C	21.7
2	SR 509 NB Ramps/S 128th St.	WSDOT	D	Signalized	B	18.7	Signalized	B	19.0
3	Des Moines Mem. Dr./S 128th St.	SeaTac (Burien)	E	Signalized	C	26.5	Signalized	C	26.6
4	24th Ave. S/S 128th St.	SeaTac	D	Signalized	A	8.4	Signalized	A	8.4
5	Military Rd. S/S 128th St.	SeaTac (Tukwila)	E	TWSC	D	25.6	TWSC	D	25.6
6	8th Ave. S/S 136th St.	Burien	C	Signalized	B	10.5	Signalized	B	10.5
7	Des Moines Mem. Dr./S 136th St.	SeaTac	E	Signalized	B	15.3	Signalized	B	15.3
8	18th Ave. S/S 136th St.	SeaTac	D	OWSC	B	11.2	OWSC	B	11.2
9	24th Ave. S/S 136th St.	SeaTac	D	AWSC	B	11.7	AWSC	B	11.6
10	24th Ave. S/S 138th St.	SeaTac	D	TWSC	B	14.8	TWSC	B	14.7
11	Military Rd. S/S 138th St.	SeaTac (Tukwila)	E	OWSC	B	14.3	OWSC	B	14.3
12	SR 509 SB Ramp/S 146th St.	WSDOT	D	OWSC	B	14.7	OWSC	C	16.5
13	SR 509 NB Ramp/S 146th St.	WSDOT	D	Uncontrolled	A	4.9	Uncontrolled	A	4.7
14	Des Moines Mem. Dr./S 144th St.	SeaTac (Burien)	E	Signalized	E	66.2	Signalized	F	267.5
15	24th Ave. S/S 142nd St.	SeaTac	D	AWSC	B	14.2	AWSC	B	14.1
16	24th Ave. S/S 144th St.	SeaTac	D	OWSC	C	16.8	OWSC	C	17.1
17	24th Ave. S/S 146th St.	SeaTac	D	TWSC	C	22.5	TWSC	E	45.3
18	Military Rd. S/S 144th St.	SeaTac (Tukwila)	E	AWSC	C	24.4	AWSC	D	25.2
19	International Blvd./S 144th St.	Tukwila	E	Signalized	D	42.7	Signalized	D	42.8
20	1st Ave. S/SW 148th St.	Burien	D	Signalized	D	43.7	Signalized	D	44.0
21	SR 509 SB Ramps/SW 148th St.	WSDOT	D	Signalized	D	46.7	Signalized	D	50.4
22	SR 509 NB Ramps/SW 148th St.	WSDOT	D	Signalized	A	8.4	Signalized	A	9.0
23	SR 518 EB Ramps/Des Moines Mem. Dr.	WSDOT	D	OWSC	F	124.0	OWSC	F	468.1
24	SR 518 WB Ramps/Des Moines Mem. Dr.	WSDOT	D	OWSC	C	23.6	OWSC	E	44.3
25	24th Ave. S/S 150th St.	SeaTac	D	TWSC	C	16.5	TWSC	C	22.3
26	24th Ave. S/S 152nd St.	SeaTac	D	OWSC	B	13.7	OWSC	D	26.0
27	24th Ave. S-Air Cargo Rd./S 154th St.	SeaTac	D	Signalized	C	28.9	Signalized	C	29.2
28	SR 518 EB Off-Ramp/S 154th St.	WSDOT	D	OWSC	F	62.2	OWSC	F	69.0
29	SR 518 WB On-Ramp/S 154th St.	WSDOT	D	Uncontrolled	0	0.0	Uncontrolled	0	0.0
30	29th Ave. S/S 154th St.	SeaTac	E	OWSC	C	16.6	OWSC	C	16.9
31	30th Ave. S/S 154th St.	SeaTac	E	TWSC	C	20.2	TWSC	C	22.5
32	32nd Ave. S/S 154th St.	SeaTac	E	TWSC	D	29.5	TWSC	D	31.3
33	SR 518 WB Off-Ramp/S 154th St.	WSDOT	D	OWSC	F	187.5	OWSC	F	266.4
34	Military Rd. S/S 152nd St.	SeaTac (Tukwila)	E	Signalized	B	12.4	Signalized	B	13.3
35	International Blvd./S 152nd St.	SeaTac (Tukwila)	E	Signalized	D	51.1	Signalized	D	51.4

ID	Intersection	Jurisdiction	Mobility Standard^	2032 No Action			2032 Proposed Action		
				Traffic Control	LOS	Vehicle Delay (sec)	Traffic Control	LOS	Vehicle Delay (sec)
37	International Blvd./S 154th St.	WSDOT	E-Mitigated	Signalized	F	86.5	Signalized	F	88.7
38	Air Cargo Rd./S 156th St.	Port	NA	OWSC	B	12.9	OWSC	C	16.6
39	International Blvd./SR 518 EB On-Ramp	WSDOT	E-Mitigated	Signalized	B	14.4	Signalized	B	16.0
40	Southcenter Blvd./42nd Ave. S	Tukwila	E	Signalized	D	37.8	Signalized	D	39.0
41	SR 518 WB On-Ramp/51st Ave. S	WSDOT	D	Uncontrolled	A	9.3	Uncontrolled	A	9.4
42	SR 518 EB Off-Ramp/51st Ave. S	WSDOT	D	OWSC	C	24.6	OWSC	D	30.4
43	Southcenter Blvd./Macadam Rd.	Tukwila	E	Signalized	B	16.7	Signalized	B	16.8
44	Klickitat Dr./I-5 SB On-Ramp	WSDOT	D	Uncontrolled	A	9.9	Uncontrolled	A	9.9
45	Southcenter Blvd./I-5 NB Off-Ramp	WSDOT	E	Signalized	C	24.0	Signalized	C	24.2
46	Klickitat Dr./Southcenter Blvd.	Tukwila	E	Signalized	C	26.9	Signalized	C	30.7
47	Southcenter Blvd./NB I-5 Off Ramp	WSDOT	D	OWSC	C	17.2	OWSC	C	17.9
48	8th Ave. S/S 156th St.	SeaTac	E	Signalized	C	33.3	Signalized	E	65.1
49	1st Ave. S/SW 160th St.	Burien	D	Signalized	E	56.2	Signalized	E	56.6
50	SR 509 SB Ramps/SW 160th St.	WSDOT	D	Roundabout	A	5.1	Roundabout	A	5.4
51	SR 509 NB Ramps/SW 160th St.	WSDOT	D	Roundabout	A	6.3	Roundabout	A	6.4
52	Des Moines Memorial Dr./SW 160th St.	SeaTac	E	Signalized	B	14.5	Signalized	B	16.4
53	Air Cargo Rd./S 160th St.	Port	N/A	AWSC	D	25.2	AWSC	A	9.9
54	Host Rd./SR 518 On-Ramp/S 160th St.	SeaTac/WSDOT	E	TWSC	E	39.2	TWSC	E	49.9
55	SeaTac Rental Car Facility Dr. W/S 160th St.	SeaTac	E	Signalized	B	17.6	Signalized	A	9.2
56	SeaTac Rental Car Facility Dr. E/S 160th St.	SeaTac	E	TWSC	C	17.0	TWSC	C	16.1
57	Pacific Hwy S/S 160th St.	SeaTac	E	Signalized	D	51.9	Signalized	D	50.7
58	Air Cargo Rd./S 166th St.	Port	N/A	OWSC	C	16.0	Not Present in PA Scenario		
59	Air Cargo Rd./SB Airport Expressway On-Ramp	Port	N/A	Signalized	A	2.0	Not Present in PA Scenario		
60	Air Cargo Rd./S 170th St.	Port	N/A	AWSC	A	8.3	Not Present in PA Scenario		
61	SB Airport Expressway Off-Ramp/S 170th St.	Port/SeaTac	E	Signalized	C	28.5	Not Present in PA Scenario		
62	Doug Fox Parking Lot/S 170th Street	SeaTac	C	OWSC	C	15.1	Not Present in PA Scenario		
63	NB Airport Expressway Off-Ramp/S 170th St.	SeaTac	C	Signalized	A	6.3	OWSC	A	9.9
64	International Blvd/S 170th St.	SeaTac	E-Mitigated	Signalized	D	54.7	Signalized	D	53.3
65	International Blvd/S 176th St.	SeaTac	E-Mitigated	Signalized	C	21.6	Signalized	C	22.7
66	International Blvd/S 182nd St./Arrivals Dr.	SeaTac	E-Mitigated	Signalized	E	58.4	Signalized	E	56.0
67	International Blvd/S 188th St.	SeaTac	E-Mitigated	Signalized	E	60.1	Signalized	D	55.0
68	28th Ave. S/S 188th St.	SeaTac	E	Signalized	D	51.9	Signalized	D	53.5
69	28th Ave. S/S 192nd St.	SeaTac	E	Signalized	A	8.8	Signalized	A	9.1
70	International Blvd/S 192nd St.	SeaTac	E-Mitigated	Signalized	B	12.4	Signalized	B	12.9
71	S Normandy Rd./Ambaum Blvd. S	Burien	D	Signalized	C	29.4	Signalized	C	29.4
72	SB SR 509 Off Ramp/Des Moines Memorial Dr.	WSDOT	D	Roundabout	A	9.0	Roundabout	A	9.3

ID	Intersection	Jurisdiction	Mobility Standard^	2032 No Action			2032 Proposed Action		
				Traffic Control	LOS	Vehicle Delay (sec)	Traffic Control	LOS	Vehicle Delay (sec)
73	Des Moines Memorial Dr./S 188th St.	SeaTac	E	Signalized	C	20.1	Signalized	C	27.3
74	Military Rd. S/S 176th St.	SeaTac	E	Signalized	C	32.9	Signalized	C	31.9
75	46th Ave. S/S 188th St.	SeaTac	E	Signalized	C	24.4	Signalized	C	24.2
76	Military Rd. S/S 188th St.	SeaTac	E	Signalized	D	45.8	Signalized	D	45.3
77	SB I-5 Ramps/S 188th St.	WSDOT	D	Signalized	C	31.8	Signalized	C	33.3
78	NB I-5 Ramps/S 188th St.	WSDOT	D	Signalized	E	63.7	Signalized	E	65.3
79	Des Moines Memorial Dr./S 200th St.	SeaTac (Des Moines)	E	Signalized	C	30.4	Signalized	C	30.9
80	26th Ave. S/S 200th St.	SeaTac	E	Signalized	C	34.3	Signalized	C	34.5
81	28th Ave. S/S 200th St.	SeaTac	E	Signalized	B	18.9	Signalized	B	18.9
82	International Blvd/S 200th St.	SeaTac	E-Mitigated	Signalized	D	48.6	Signalized	D	48.8
83	Military Rd. S/SB I-5 Ramps/S 200th St.	WSDOT	D	Signalized	D	47.7	Signalized	D	51.8
84	International Blvd/S 204th St.	SeaTac	E-Mitigated	Signalized	B	17.7	Signalized	B	17.8
85	International Blvd/S 208th St.	SeaTac	E-Mitigated	Signalized	B	18.5	Signalized	B	18.3
86	Military Rd. S/NB I-5 Ramps	WSDOT	D	Signalized	D	52.5	Signalized	E	69.3
87	Des Moines Memorial Dr./S 216th St.	WSDOT	E	Signalized	B	12.6	Signalized	B	12.7
88	24th Ave. S/S 216th St.	Des Moines	D	Signalized	C	33.0	Signalized	C	33.2
89	Pacific Hwy S/S 216th St.	Des Moines	F (v/c 1.0)	Signalized	E	66.6	Signalized	E	66.8
90	Pacific Hwy S/S 220th St.	Des Moines	E	Signalized	C	30.4	Signalized	C	30.5
91	Pacific Hwy S/S 224th St.	Des Moines	E	Signalized	D	35.7	Signalized	D	35.6
92	24th Ave. S/SR 516	Des Moines	D	Signalized	B	13.5	Signalized	B	13.6
93	Pacific Hwy S/SR 516	Des Moines	F (v/c 1.2)	Signalized	F	94.8	Signalized	F	98.2
94	SB I-5 Ramps/SR 516	WSDOT	D	Signalized	D	44.7	Signalized	D	49.2
95	NB I-5 Ramps/SR 516	WSDOT	D	Signalized	C	26.4	Signalized	C	26.9
96	16th Ave. S/S 144th St.	SeaTac	D	OWSC	B	11.8	OWSC	D	26.2
97	24th Ave. S/S 148th St.	SeaTac	D	OWSC	B	13.7	OWSC	C	17.8
98	Des Moines Memorial Dr./S 168th St.	Burien	C	TWSC	C	19.8	TWSC	C	24.8
99	SR 509/Marine View Dr./S 168th St.	WSDOT	E	Signalized	C	29.2	Signalized	C	29.5
100	8th Ave. S/S 152nd St.	Burien	C	AWSC	B	13.5	AWSC	B	13.6
101	8th Ave. S/Des Moines Memorial Dr. S	Burien/SeaTac	D/E	OWSC	F	169.0	OWSC	F	319.7
102	S 152nd St./Des Moines Memorial Dr. S	SeaTac (Burien)	E	OWSC	D	25.3	OWSC	D	34.7
103	30th Ave. S/S 152nd St.	SeaTac	D	OWSC	A	9.7	OWSC	B	10.9
104	32nd Ave. S/S 152nd St.	SeaTac	D	TWSC	B	11.2	TWSC	B	11.6
105	32nd Ave. S/S 160th St.	SeaTac	E	TWSC	F	165.6	TWSC	F	212.8
106	Military Rd. S/S 164th St./42nd Ave. S	SeaTac	E	Signalized	E	59.8	Signalized	E	70.6
107	34th Ave. S/S 170th St.	SeaTac	E	AWSC	E	36.5	AWSC	D	32.6
108	32nd Ave. S/S 200th St.	SeaTac	E	Signalized	A	6.2	Signalized	A	6.2

ID	Intersection	Jurisdiction	Mobility Standard^	2032 No Action			2032 Proposed Action		
				Traffic Control	LOS	Vehicle Delay (sec)	Traffic Control	LOS	Vehicle Delay (sec)
109	Military Rd. S/S 216th St.	SeaTac	E	Signalized	F	84.8	Signalized	F	91.8
110	S 206th St & International Boulevard	SeaTac	E	OWSC	B	10.2	OWSC	B	10.3
111	SB NAE On Ramp & Air Cargo Rd (via 160th)	Port	N/A	Not Present in NA Scenario			Uncontrolled		
112	S 170th St & SB NAE on ramp/Terminal 2 Access	Port	N/A	Not Present in NA Scenario			Roundabout	A	6.9
113	S 188th St & NB SR 509 Ramps	WSDOT	D	Roundabout	A	6.2	Roundabout	A	6.2
114	28th Ave S & SB SR 509 On Ramp	WSDOT	D	Signalized	A	0.1	Signalized	A	0.1
115	28th Ave S & NB SR 509 Off Ramp	WSDOT	D	Signalized	B	11.9	Signalized	B	11.9
116	Veterans Dr & NB I-5 On Ramp	WSDOT	D	Signalized	C	20.8	Signalized	C	22.5
117	Veterans Dr & SB I-5 Off Ramp	WSDOT	D	Signalized	B	17.6	Signalized	B	17.6

Notes:
- Signalized and stop-controlled intersections are analyzed in Synchro, Version 11. Results are based on Highway Capacity Manual (HCM) 2000
- OWSC: One-way stop control. TWSC: Two-way stop control. AWSC: All-way stop control.
- For one-way stop and two-way stop-controlled intersections, the worst delay for the minor street movements was used to report the intersection LOS. For all-way stop, roundabout, and signalized intersections, the overall intersection delay was used to report the LOS.
- LOS and Delay values for intersections not meeting mobility standards are shaded in black.
- ^LOS Standard "E-Mitigated" is defined by the Puget Sound Regional Council for Tier 1 regionally significant state highways. An "E-Mitigated" standard requires the highway to operate at LOS "E" after mitigating through transit, demand management, and transportation system management strategies.
- ^ LOS Standard "F-Exception" applies to intersections where an exception has been applied to the mobility standard by the local agency and no mitigation is required with an LOS F operation. Intersections that operate at LOS 'F' but still meet mobility standards are shaded black.
-NA: Not Applicable - The Port of Seattle does not have mobility standards for their intersections.

Table 5. Year 2037 Future Conditions Traffic Analysis Results – Funded Improvements Only

ID	Intersection	Jurisdiction	Mobility Standard^	2037 No Action			2037 Proposed Action		
				Traffic Control	LOS	Vehicle Delay (sec)	Traffic Control	LOS	Vehicle Delay (sec)
1	SR 509 SB Ramps/S 128th St.	WSDOT	D	Signalized	C	27.7	Signalized	C	29.5
2	SR 509 NB Ramps/S 128th St.	WSDOT	D	Signalized	C	21.2	Signalized	C	21.5
3	Des Moines Mem. Dr./S 128th St.	SeaTac (Burien)	E	Signalized	C	29.4	Signalized	C	29.6
4	24th Ave. S/S 128th St.	SeaTac	D	Signalized	A	8.7	Signalized	A	8.7
5	Military Rd. S/S 128th St.	SeaTac (Tukwila)	E	TWSC	D	31.4	TWSC	D	31.4
6	8th Ave. S/S 136th St.	Burien	C	Signalized	B	11.9	Signalized	B	11.9
7	Des Moines Mem. Dr./S 136th St.	SeaTac	E	Signalized	B	17.4	Signalized	B	17.5
8	18th Ave. S/S 136th St.	SeaTac	D	OWSC	B	11.7	OWSC	B	11.7
9	24th Ave. S/S 136th St.	SeaTac	D	AWSC	B	13.2	AWSC	B	13.2
10	24th Ave. S/S 138th St.	SeaTac	D	TWSC	C	16.7	TWSC	C	16.1
11	Military Rd. S/S 138th St.	SeaTac (Tukwila)	E	OWSC	C	15.5	OWSC	C	15.5
12	SR 509 SB Ramp/S 146th St.	WSDOT	D	OWSC	C	16.3	OWSC	C	18.8
13	SR 509 NB Ramp/S 146th St.	WSDOT	D	Uncontrolled	A	5.1	Uncontrolled	A	4.9
14	Des Moines Mem. Dr./S 144th St.	SeaTac (Burien)	E	Signalized	E	78.0	Signalized	F	300.1
15	24th Ave. S/S 142nd St.	SeaTac	D	AWSC	C	17.3	AWSC	C	17.3
16	24th Ave. S/S 144th St.	SeaTac	D	OWSC	C	20.0	OWSC	C	20.8
17	24th Ave. S/S 146th St.	SeaTac	D	TWSC	D	26.4	TWSC	F	73.7
18	Military Rd. S/S 144th St.	SeaTac (Tukwila)	E	AWSC	E	41.5	AWSC	E	40.6
19	International Blvd./S 144th St.	Tukwila	E	Signalized	D	52.7	Signalized	D	52.6
20	1st Ave. S/SW 148th St.	Burien	D	Signalized	D	51.6	Signalized	D	51.7
21	SR 509 SB Ramps/SW 148th St.	WSDOT	D	Signalized	E	55.3	Signalized	E	67.1
22	SR 509 NB Ramps/SW 148th St.	WSDOT	D	Signalized	B	10.4	Signalized	B	11.2
23	SR 518 EB Ramps/Des Moines Mem. Dr.	WSDOT	D	OWSC	F	261.4	OWSC	F	981.0
24	SR 518 WB Ramps/Des Moines Mem. Dr.	WSDOT	D	OWSC	E	36.1	OWSC	F	186.9
25	24th Ave. S/S 150th St.	SeaTac	D	TWSC	C	18.8	TWSC	D	27.1
26	24th Ave. S/S 152nd St.	SeaTac	D	OWSC	B	14.7	OWSC	D	33.7
27	24th Ave. S-Air Cargo Rd./S 154th St.	SeaTac	D	Signalized	C	33.4	Signalized	D	35.0
28	SR 518 EB Off-Ramp/S 154th St.	WSDOT	D	OWSC	F	150.5	OWSC	F	171.7
29	SR 518 WB On-Ramp/S 154th St.	WSDOT	D	Uncontrolled	0	0.0	Uncontrolled	0	0.0
30	29th Ave. S/S 154th St.	SeaTac	E	OWSC	C	18.1	OWSC	C	18.6
31	30th Ave. S/S 154th St.	SeaTac	E	TWSC	C	23.4	TWSC	D	27.1
32	32nd Ave. S/S 154th St.	SeaTac	E	TWSC	E	43.9	TWSC	E	47.1
33	SR 518 WB Off-Ramp/S 154th St.	WSDOT	D	OWSC	F	389.9	OWSC	F	504.9
34	Military Rd. S/S 152nd St.	SeaTac (Tukwila)	E	Signalized	B	14.3	Signalized	B	15.3
35	International Blvd./S 152nd St.	SeaTac (Tukwila)	E	Signalized	E	63.0	Signalized	E	64.0
37	International Blvd./S 154th St.	WSDOT	E-Mitigated	Signalized	F	106.3	Signalized	F	110.9
38	Air Cargo Rd./S 156th St.	Port	N/A	OWSC	B	14.0	OWSC	C	19.2
39	International Blvd./SR 518 EB On-Ramp	WSDOT	E-Mitigated	Signalized	B	16.6	Signalized	B	18.8
40	Southcenter Blvd./42nd Ave. S	Tukwila	E	Signalized	D	44.3	Signalized	D	47.8
41	SR 518 WB On-Rramp/51st Ave. S	WSDOT	D	Uncontrolled	B	10.5	Uncontrolled	B	10.8

ID	Intersection	Jurisdiction	Mobility Standard^	2037 No Action			2037 Proposed Action		
				Traffic Control	LOS	Vehicle Delay (sec)	Traffic Control	LOS	Vehicle Delay (sec)
42	SR 518 EB Off-Ramp/51st Ave. S	WSDOT	D	OWSC	D	31.1	OWSC	E	42.4
43	Southcenter Blvd./Macadam Rd.	Tukwila	E	Signalized	C	23.8	Signalized	C	24.1
44	Klickitat Dr./I-5 SB On-Ramp	WSDOT	D	Uncontrolled	B	10.3	Uncontrolled	B	10.3
45	Southcenter Blvd./I-5 NB Off-Ramp	WSDOT	E	Signalized	C	25.5	Signalized	C	25.7
46	Klickitat Dr./Southcenter Blvd.	Tukwila	E	Signalized	C	31.6	Signalized	D	39.7
47	Southcenter Blvd./NB I-5 Off Ramp	WSDOT	D	OWSC	C	19.4	OWSC	C	21.4
48	8th Ave. S/S 156th St.	SeaTac	E	Signalized	E	76.6	Signalized	F	196.7
49	1st Ave. S/SW 160th St.	Burien	D	Signalized	E	61.4	Signalized	E	62.8
50	SR 509 SB Ramps/SW 160th St.	WSDOT	D	Roundabout	A	5.2	Roundabout	A	5.6
51	SR 509 NB Ramps/SW 160th St.	WSDOT	D	Roundabout	A	6.5	Roundabout	A	6.5
52	Des Moines Memorial Dr./SW 160th St.	SeaTac	E	Signalized	B	17.1	Signalized	C	24.9
53	Air Cargo Rd./S 160th St.	Port	N/A	AWSC	E	38.0	AWSC	B	11.4
54	Host Rd./SR 518 On-Ramp/S 160th St.	SeaTac/WSDOT	E	TWSC	F	54.6	TWSC	F	122.9
55	SeaTac Rental Car Facility Dr. W/S 160th St.	SeaTac	E	Signalized	B	18.8	Signalized	B	10.2
56	SeaTac Rental Car Facility Dr. E/S 160th St.	SeaTac	E	TWSC	C	20.7	TWSC	C	19.8
57	Pacific Hwy S/S 160th St.	SeaTac	E	Signalized	E	56.9	Signalized	E	56.3
58	Air Cargo Rd./S 166th St.	Port	N/A	OWSC	C	17.9	Not Present in PA Scenario		
59	Air Cargo Rd./SB Airport Expressway On-Ramp	Port	N/A	Signalized	A	1.4	Not Present in PA Scenario		
60	Air Cargo Rd./S 170th St.	Port	N/A	AWSC	A	8.6	Not Present in PA Scenario		
61	SB Airport Expressway Off-Ramp/S 170th St.	Port/SeaTac	E	Signalized	C	31.6	Not Present in PA Scenario		
62	Doug Fox Parking Lot/S 170th Street	SeaTac	C	OWSC	C	15.9	Not Present in PA Scenario		
63	NB Airport Expressway Off-Ramp/S 170th St.	SeaTac	C	Signalized	A	6.8	OWSC	B	10.2
64	International Blvd/S 170th St.	SeaTac	E-Mitigated	Signalized	E	58.7	Signalized	E	57.4
65	International Blvd/S 176th St.	SeaTac	E-Mitigated	Signalized	C	24.8	Signalized	C	25.6
66	International Blvd/S 182nd St./Arrivals Dr.	SeaTac	E-Mitigated	Signalized	E	66.6	Signalized	E	68.1
67	International Blvd/S 188th St.	SeaTac	E-Mitigated	Signalized	E	74.8	Signalized	E	71.0
68	28th Ave. S/S 188th St.	SeaTac	E	Signalized	E	55.5	Signalized	E	58.7
69	28th Ave. S/S 192nd St.	SeaTac	E	Signalized	A	9.1	Signalized	A	9.6
70	International Blvd/S 192nd St.	SeaTac	E-Mitigated	Signalized	B	13.5	Signalized	B	13.8
71	S Normandy Rd./Ambaum Blvd. S	Burien	D	Signalized	C	32.2	Signalized	C	32.6
72	SB SR 509 Off Ramp/Des Moines Memorial Dr.	WSDOT	D	Roundabout	B	10.3	Roundabout	B	11.0
73	Des Moines Memorial Dr./S 188th St.	SeaTac	E	Signalized	C	21.7	Signalized	C	29.9
74	Military Rd. S/S 176th St.	SeaTac	E	Signalized	D	41.5	Signalized	D	38.8
75	46th Ave. S/S 188th St.	SeaTac	E	Signalized	C	31.8	Signalized	C	31.3
76	Military Rd. S/S 188th St.	SeaTac	E	Signalized	D	51.2	Signalized	D	50.7
77	SB I-5 Ramps/S 188th St.	WSDOT	D	Signalized	D	46.8	Signalized	D	51.7
78	NB I-5 Ramps/S 188th St.	WSDOT	D	Signalized	F	95.5	Signalized	F	97.9
79	Des Moines Memorial Dr./S 200th St.	SeaTac (Des Moines)	E	Signalized	D	37.9	Signalized	D	38.5
80	26th Ave. S/S 200th St.	SeaTac	E	Signalized	D	37.2	Signalized	D	37.6
81	28th Ave. S/S 200th St.	SeaTac	E	Signalized	C	21.8	Signalized	C	21.8
82	International Blvd/S 200th St.	SeaTac	E-Mitigated	Signalized	D	54.6	Signalized	E	56.3

ID	Intersection	Jurisdiction	Mobility Standard^	2037 No Action			2037 Proposed Action		
				Traffic Control	LOS	Vehicle Delay (sec)	Traffic Control	LOS	Vehicle Delay (sec)
83	Military Rd. S/SB I-5 Ramps/S 200th St.	WSDOT	D	Signalized	D	54.4	Signalized	E	64.3
84	International Blvd/S 204th St.	SeaTac	E-Mitigated	Signalized	B	19.2	Signalized	B	19.7
85	International Blvd/S 208th St.	SeaTac	E-Mitigated	Signalized	B	18.5	Signalized	B	18.3
86	Military Rd. S/NB I-5 Ramps	WSDOT	D	Signalized	E	64.6	Signalized	F	81.2
87	Des Moines Memorial Dr./S 216th St.	WSDOT	E	Signalized	B	14.4	Signalized	B	14.4
88	24th Ave. S/S 216th St.	Des Moines	D	Signalized	C	33.5	Signalized	C	33.6
89	Pacific Hwy S/S 216th St.	Des Moines	F (v/c 1.0)	Signalized	E	77.4	Signalized	E	79.0
90	Pacific Hwy S/S 220th St.	Des Moines	E	Signalized	C	32.5	Signalized	C	32.5
91	Pacific Hwy S/S 224th St.	Des Moines	E	Signalized	D	42.0	Signalized	D	42.4
92	24th Ave. S/SR 516	Des Moines	D	Signalized	B	15.3	Signalized	B	15.4
93	Pacific Hwy S/SR 516	Des Moines	F (v/c 1.2)	Signalized	F	107.7	Signalized	F	111.5
94	SB I-5 Ramps/SR 516	WSDOT	D	Signalized	E	59.6	Signalized	E	66.4
95	NB I-5 Ramps/SR 516	WSDOT	D	Signalized	C	23.7	Signalized	C	23.7
96	16th Ave. S/S 144th St.	SeaTac	D	OWSC	B	12.4	OWSC	E	43.0
97	24th Ave. S/S 148th St.	SeaTac	D	OWSC	B	15.0	OWSC	C	20.1
98	Des Moines Memorial Dr./S 168th St.	Burien	C	TWSC	C	23.4	TWSC	D	33.3
99	SR 509/Marine View Dr./S 168th St.	WSDOT	E	Signalized	C	33.2	Signalized	C	33.4
100	8th Ave. S/S 152nd St.	Burien	C	AWSC	C	15.9	AWSC	C	16.2
101	8th Ave. S/Des Moines Memorial Dr. S	Burien/SeaTac	D/E	OWSC	F	310.8	OWSC	F	538.2
102	S 152nd St./Des Moines Memorial Dr. S	SeaTac (Burien)	E	OWSC	D	32.7	OWSC	F	56.7
103	30th Ave. S/S 152nd St.	SeaTac	D	OWSC	A	9.9	OWSC	B	11.2
104	32nd Ave. S/S 152nd St.	SeaTac	D	TWSC	B	11.6	TWSC	B	12.0
105	32nd Ave. S/S 160th St.	SeaTac	E	TWSC	F	305.0	TWSC	F	377.4
106	Military Rd. S/S 164th St./42nd Ave. S	SeaTac	E	Signalized	F	95.7	Signalized	F	101.2
107	34th Ave. S/S 170th St.	SeaTac	E	AWSC	F	59.1	AWSC	F	59.8
108	32nd Ave. S/S 200th St.	SeaTac	E	Signalized	A	6.7	Signalized	A	6.8
109	Military Rd. S/S 216th St.	SeaTac	E	Signalized	F	114.1	Signalized	F	123.9
110	S 206th St & International Boulevard	SeaTac	E	OWSC	B	10.5	OWSC	B	10.6
111	SB NAE On Ramp & Air Cargo Rd (via 160th)	Port	N/A	Not Present in NA Scenario			Uncontrolled		
112	S 170th St & SB NAE On Ramp/Terminal 2 Access	Port	N/A	Not Present in NA Scenario			Roundabout	A	7.0
113	S 188th St & NB SR 509 ramps	WSDOT	D	Roundabout	A	6.6	Roundabout	A	6.7
114	28th Ave S & SB SR 509 on ramp	WSDOT	D	Signalized	A	0.1	Signalized	A	0.1
115	28th Ave S & NB SR 509 off ramp	WSDOT	D	Signalized	B	12.8	Signalized	B	12.9
116	Veterans Dr & NB I-5 On Ramp	WSDOT	D	Signalized	C	22.0	Signalized	C	24.1
117	Veterans Dr & SB I-5 Off Ramp	WSDOT	D	Signalized	C	20.3	Signalized	C	20.3

Notes:
- Signalized and stop-controlled intersections are analyzed in Synchro, Version 11. Results are based on Highway Capacity Manual (HCM) 2000
- OWSC: One-way stop control. TWSC: Two-way stop control. AWSC: All-way stop control.
- For one-way stop and two-way stop-controlled intersections, the worst delay for the minor street movements was used to report the intersection LOS. For all-way stop, roundabout, and signalized intersections, the overall intersection delay was used to report the LOS.
- LOS and Delay values for intersections not meeting mobility standards are shaded in black.
- ^LOS Standard "E-Mitigated" is defined by the Puget Sound Regional Council for Tier 1 regionally significant state highways. An "E-Mitigated" standard requires the highway to operate at LOS "E" after mitigating through transit, demand management, and transportation system management strategies.
- ^ LOS Standard "F-Exception" applies to intersections where an exception has been applied to the mobility standard by the local agency and no mitigation is required with an LOS F operation. Intersections that operate at LOS 'F' but still meet mobility standards are shaded black.
-NA: Not Applicable - The Port of Seattle does not have mobility standards for their intersections.

4.3 Intersection Mitigation and Improvements

This section summarizes intersection operations and categorizes intersections into one of four categories depending on when or if LOS deficiencies are triggered based on jurisdiction or agency mobility standards. It should be noted an intersection may change from one category to another depending on the year of analysis because of background traffic growth. The categories identified are listed below:

- Category 1: Intersection has a LOS deficiency in Proposed Action only because of additional trips added by the NTPs. Direct mitigation by the Port is proposed.
- Category 2: Intersection has a LOS deficiency in No Action and NTP trips will add additional delay. Potential background improvements have been identified to bring LOS within acceptable mobility standards. The Port would only be responsible to mitigate the delay added by the NTP trips and not bring the intersection delay back to acceptable LOS standards.
- Category 3: Intersection meets the mobility standard in both the No Action and Proposed Action scenarios but NTP trips will increase the delay. The Port is not proposing any mitigation for these intersections given that the intersection meets the mobility standard with the additional delay.
- Category 4: Intersection delay improves or does not change with the NTPs because NTP trips are diverted/rerouted or because of roadway improvements included with the NTPs. No mitigation is proposed by the Port.

The Port has an existing interlocal agreement with the City of SeaTac for transportation planning efforts and assessing transportation impacts. The Port will continue to adhere to the requirements of the existing interlocal agreement.

4.3.1 Categorization of Intersection Impacts

Category 1 mitigation options are identified for intersections which operate at or better than the local agency mobility standard under the No Action conditions, but then degrade to worse than the local agency mobility standards under the Proposed Action conditions for either the 2032 or 2037 analysis year. If the intersection falls into a different category for an analysis year, the table identifies which category it belongs to. These locations are listed in Table 6 and described individually in Section 4.3.2.

Table 6. Category 1 Intersections - Locations Failing Mobility Standards Resulting from Proposed Action

ID - Intersection	Agency	Mobility Standard	2032			2037		
			NA LOS	PA LOS	Change in Delay (sec)	NA LOS	PA LOS	Change in Delay (sec)
14 - Des Moines Mem. Dr./S 144th St.	SeaTac (Burien)	E	E	F	201.3	E	F	222.1
17 - 24th Ave. S/S 146th St.	SeaTac	D	C	E	22.8	D	F	47.3
24 - SR 518 WB Ramps/Des Moines Mem. Dr.	WSDOT	D	C	E	20.7	Category 2		
42 - SR 518 EB Off-Ramp/51st Ave. S	WSDOT	D	Category 3			D	E	11.3
48 - 8th Ave. S/S 156th St.	SeaTac	E	Category 3			E	F	120.1
83 - Military Rd. S/SB I-5 Ramps/S 200th St.	WSDOT	D	Category 3			D	E	9.9
86 - Military Rd. S/NB I-5 Ramps	WSDOT	D	D	E	16.8	Category 2		
96 - 16th Ave. S/S 144th St.	SeaTac	D	Category 3			B	E	30.6
98 - Des Moines Memorial Dr./S 168th St.	Burien	C	Category 3			C	D	9.9
102 – S 152nd St./Des Moines Memorial Dr. S	SeaTac (Burien)	E	Category 3			D	F	24.0

- NA – No Action, PA – Proposed Action, LOS – Level-of-Service, Delay (seconds)

Table 7 lists Category 2 intersections which operate worse than the local agency mobility standard under the No Action conditions and experience increased delay under the Proposed Action conditions. The Port would only be responsible to mitigate the increased delay from the additional NTP trips. Section 4.3.3 provides information on the mitigation that the Port is proposing for the additional delay.

Table 7. Category 2 Intersections - Locations Failing Mobility Standard in No Action with Added Delay in Proposed Action

ID - Intersection	Agency	Mobility Standard	2032			2037		
			NA LOS	PA LOS	Change in Delay (sec)	NA LOS	PA LOS	Change in Delay (sec)
21 - SR 509 SB Ramps/SW 148th St.	WSDOT	D	Category 3			E	E	11.8
23 - SR 518 EB Ramps/Des Moines Mem. Dr.	WSDOT	D	F	F	344.1	F	F	719.6
24 - SR 518 WB Ramps/Des Moines Mem. Dr.	WSDOT	D	Category 1			E	F	150.8
28 - SR 518 EB Ramps/S 154th St.	WSDOT	D	F	F	6.8	F	F	21.2
33 - SR 518 WB Off-Ramp (Loop)/S 154th St.	WSDOT	D	F	F	78.9	F	F	115.0
37 - International Blvd./S 154th St.	WSDOT	E-Mitigated	F	F	2.2	F	F	4.6
49 - 1st Ave. S/SW 160th St.	Burien	D	E	E	0.4	E	E	1.4
54 - Host Rd./SR 518 On-Ramp/S 160th St.	SeaTac/WSDOT	E	Category 3			F	F	68.3
78 - NB I-5 Ramps/S 188th St.	WSDOT	D	E	E	1.6	F	F	2.4
86 - Military Rd. S/NB I-5 Ramps	WSDOT	D	Category 1			E	F	16.6
89 - Pacific Hwy S/S 216th St.	Des Moines	F (v/c 1.0)	E	E	0.2	E	E	1.6
93 - Pacific Hwy S/SR 516	Des Moines	F (v/c 1.2)	F	F	3.4	F	F	3.8
94 - SB I-5 Ramps/SR 516	WSDOT	D	Category 3			E	E	6.8
101 - 8th Ave. S/Des Moines Memorial Dr. S	Burien/SeaTac	D/E	F	F	150.7	F	F	227.4
105 - 32nd Ave. S/S 160th St.	SeaTac	E	F	F	47.2	F	F	72.4
106 - Military Rd. S/S 164th St./42nd Ave. S	SeaTac	E	Category 3			F	F	5.5
107 - 34th Ave. S/S 170th St.	SeaTac	E	Category 4			F	F	0.7
109 - Military Rd. S/S 216th St.	SeaTac	E	F	F	7.0	F	F	9.8

- NA – No Action, PA – Proposed Action, LOS – Level-of-Service, Delay (seconds)

Table 8 lists Category 3 intersections which are expected to experience increases in delay but will continue operating at or better than the local agency mobility standard under the Proposed Action conditions. Mitigation is not being proposed for these intersections because they meet the mobility standard even with the additional delay.

Table 8. Category 3 Intersections - Locations Meeting LOS Mobility Standards in Both No Action and Proposed Action

ID - Intersection	Agency	Mobility Standard	2032			2037		
			NA LOS	PA LOS	Change in Delay (sec)	NA LOS	PA LOS	Change in Delay (sec)
1 - SR 509 SB Ramps/S 128th St.	WSDOT	D	C	C	0.4	C	C	1.8
2 - SR 509 NB Ramps/S 128th St.	WSDOT	D	B	B	0.3	C	C	0.3
3 - Des Moines Mem. Dr./S 128th St.	SeaTac (Burien)	E	C	C	0.1	C	C	0.2
7 - Des Moines Mem. Dr./S 136th St.	SeaTac	E	Category 4			B	B	0.1
12 - SR 509 SB Ramp/S 146th St.	WSDOT	D	B	C	1.8	C	C	2.5
16 - 24th Ave. S/S 144th St.	SeaTac	D	C	C	0.3	C	C	0.8
18 - Military Rd. S/S 144th St.	SeaTac (Tukwila)	E	C	D	0.8	Category 4		
19 - International Blvd./S 144th St.	Tukwila	E	D	D	0.1	Category 4		
20 - 1st Ave. S/SW 148th St.	Burien	D	D	D	0.3	D	D	0.1
21 - SR 509 SB Ramps/SW 148th St.	WSDOT	D	D	D	3.7	Category 2		
22 - SR 509 NB Ramps/SW 148th St.	WSDOT	D	A	A	0.6	B	B	0.8
25 - 24th Ave. S/S 150th St.	SeaTac	D	C	C	5.8	C	D	8.3
26 - 24th Ave. S/S 152nd St.	SeaTac	D	B	D	12.3	B	D	19
27 - 24th Ave. S-Air Cargo Rd./S 154th St.	SeaTac	D	C	C	0.3	C	D	1.6
30 - 29th Ave. S/S 154th St.	SeaTac	E	C	C	0.3	C	C	0.5
31 - 30th Ave. S/S 154th St.	SeaTac	E	C	C	2.3	C	D	3.7
32 - 32nd Ave. S/S 154th St.	SeaTac	E	D	D	1.8	E	E	3.2
34 - Military Rd. S/S 152nd St.	SeaTac (Tukwila)	E	B	B	0.9	B	B	1
35 - International Blvd./S 152nd St.	SeaTac (Tukwila)	E	D	D	0.3	E	E	1
38 - Air Cargo Rd./S 156th St.	Port	NA	B	C	3.7	B	C	5.2
39 - International Blvd./SR 518 EB On-Ramp	WSDOT	E-Mitigated	B	B	1.6	B	B	2.2
40 - Southcenter Blvd./42nd Ave. S	Tukwila	E	D	D	1.2	D	D	3.5
41 - SR 518 WB On-Ramp/51st Ave. S	WSDOT	D	A	A	0.1	B	B	0.3
42 - SR 518 EB Off-Ramp/51st Ave. S	WSDOT	D	C	D	5.8	Category 1		
43 - Southcenter Blvd./Macadam Rd.	Tukwila	E	B	B	0.1	C	C	0.3
45 - Southcenter Blvd./I-5 NB Off-Ramp	WSDOT	E	C	C	0.2	C	C	0.2
46 - Klickitat Dr./Southcenter Blvd.	Tukwila	E	C	C	3.8	C	D	8.1
47 - Southcenter Blvd./NB I-5 Off Ramp	WSDOT	D	C	C	0.7	C	C	2
48 - 8th Ave. S/S 156th St.	SeaTac	E	C	E	31.8	Category 1		
50 - SR 509 SB Ramps/SW 160th St.	WSDOT	D	A	A	0.3	A	A	0.4
51 - SR 509 NB Ramps/SW 160th St.	WSDOT	D	A	A	0.1	Category 4		
52 - Des Moines Memorial Dr./SW 160th St.	SeaTac	E	B	B	1.9	B	C	7.8
54 - Host Rd./SR 518 On-Ramp/S 160th St.	SeaTac/WSDOT	E	E	E	10.7	Category 2		

Table 8. Category 3 Intersections - Locations Meeting LOS Mobility Standards in Both No Action and Proposed Action

ID - Intersection	Agency	Mobility Standard	2032			2037		
			NA LOS	PA LOS	Change in Delay (sec)	NA LOS	PA LOS	Change in Delay (sec)
63 - NB Airport Expressway Off-Ramp/S 170th St.	SeaTac	C	A	A	3.6	A	B	3.4
65 - International Blvd/S 176th St.	SeaTac	E-Mitigated	C	C	1.1	C	C	0.8
66 - International Blvd/S 182nd St./Arrivals Dr.	SeaTac	E-Mitigated	Category 4			E	E	1.5
68 - 28th Ave. S/S 188th St.	SeaTac	E	D	D	1.6	E	E	3.2
69 - 28th Ave. S/S 192nd St.	SeaTac	E	A	A	0.3	A	A	0.5
70 - International Blvd/S 192nd St.	SeaTac	E-Mitigated	B	B	0.5	B	B	0.3
71 - S Normandy Rd./Ambaum Blvd. S	Burien	D	Category 4			C	C	0.4
72 - SB SR 509 Off Ramp/Des Moines Memorial Dr.	WSDOT	D	A	A	0.3	B	B	0.7
73 - Des Moines Memorial Dr./S 188th St.	SeaTac	E	C	C	7.2	C	C	8.2
77 - SB I-5 Ramps/S 188th St.	WSDOT	D	C	C	1.5	D	D	4.9
79 - Des Moines Memorial Dr./S 200th St.	SeaTac (Des Moines)	E	C	C	0.5	D	D	0.6
80 - 26th Ave. S/S 200th St.	SeaTac	E	C	C	0.2	D	D	0.4
82 - International Blvd/S 200th St.	SeaTac	E-Mitigated	D	D	0.2	D	E	1.7
83 - Military Rd. S/SB I-5 Ramps/S 200th St.	WSDOT	D	D	D	4.1	Category 1		
84 - International Blvd/S 204th St.	SeaTac	E-Mitigated	B	B	0.1	B	B	0.5
87 - Des Moines Memorial Dr./S 216th St.	WSDOT	E	B	B	0.1	Category 4		
88 - 24th Ave. S/S 216th St.	Des Moines	D	C	C	0.2	C	C	0.1
90 - Pacific Hwy S/S 220th St.	Des Moines	E	C	C	0.1	Category 4		
91 - Pacific Hwy S/S 224th St.	Des Moines	E	Category 4			D	D	0.4
92 - 24th Ave. S/SR 516	Des Moines	D	B	B	0.1	B	B	0.1
94 - SB I-5 Ramps/SR 516	WSDOT	D	D	D	4.5	Category 2		
95 - NB I-5 Ramps/SR 516	WSDOT	D	C	C	0.5	Category 4		
96 - 16th Ave. S/S 144th St.	SeaTac	D	B	D	14.4	Category 1		
97 - 24th Ave. S/S 148th St.	SeaTac	D	B	C	4.1	C	C	5.1
98 - Des Moines Memorial Dr./S 168th St.	Burien	C	C	C	5	Category 1		
99 - SR 509/Marine View Dr./S 168th St.	WSDOT	E	C	C	0.3	C	C	0.2
100 - 8th Ave. S/S 152nd St.	Burien	C	B	B	0.1	C	C	0.3
102 - S 152nd St./Des Moines Memorial Dr. S	SeaTac (Burien)	E	D	D	9.4	Category 1		
103 - 30th Ave. S/S 152nd St.	SeaTac	D	A	B	1.2	A	B	1.3
104 - 32nd Ave. S/S 152nd St.	SeaTac	D	B	B	0.4	B	B	0.4
106 - Military Rd. S/S 164th St./42nd Ave. S	SeaTac	E	E	E	10.8	Category 2		
108 - 32nd Ave. S/S 200th St.	SeaTac	E	Category 4			A	A	0.1
110 - S 206th St & International Boulevard	SeaTac	E	B	B	0.1	B	B	0.1
112 - S 170th St & SB NAE On Ramp/Terminal 2 Access[1]	Port	NA	0	A	6.9	0	A	7
113 – S 188th St & NB SR 509 Ramps	WSDOT	D	Category 4			A	A	0.1
115 – 28th Ave S & NB SR 509 Off Ramp	WSDOT	D	Category 4			B	B	0.1

Table 8. Category 3 Intersections - Locations Meeting LOS Mobility Standards in Both No Action and Proposed Action

ID - Intersection	Agency	Mobility Standard	2032			2037		
			NA LOS	PA LOS	Change in Delay (sec)	NA LOS	PA LOS	Change in Delay (sec)
116 – Veterans Dr & NB I-5 On Ramp	WSDOT	D	C	C	1.7	C	C	2.1

- NA – No Action, PA – Proposed Action, LOS – Level-of-Service, Delay (seconds)
[1]New intersection in Proposed Action analysis.

Lastly, Table 9 lists Category 4 intersections which are expected to experience no added delay or a decrease in delay and will continue to operate at or better than the local agency mobility standard under the Proposed Action conditions due to road network and traffic pattern changes. Intersection Improvement options have not been identified for these locations, as these locations reflect benefits experienced due to the Proposed Action.

Table 9. Category 4 Intersections – Locations with No Added Delay or Decrease in Delay in Proposed Action

ID – Intersection	Agency	Mobility Standard	2032			2037		
			NA LOS	PA LOS	Change in Delay (sec)	NA LOS	PA LOS	Change in Delay (sec)
4 - 24th Ave. S/S 128th St.	SeaTac	D	A	A	0	A	A	0
5 - Military Rd. S/S 128th St.	SeaTac (Tukwila)	E	D	D	0	D	D	0
6 - 8th Ave. S/S 136th St.	Burien	C	B	B	0	B	B	0
7 - Des Moines Mem. Dr./S 136th St.	SeaTac	E	B	B	0	Category 3		
8 - 18th Ave. S/S 136th St.	SeaTac	D	B	B	0	B	B	0
9 - 24th Ave. S/S 136th St.	SeaTac	D	B	B	-0.1	B	B	0
10 - 24th Ave. S/S 138th St.	SeaTac	D	B	B	-0.1	C	C	-0.6
11 - Military Rd. S/S 138th St.	SeaTac (Tukwila)	E	B	B	0	C	C	0
13 - SR 509 NB Ramp/S 146th St.	WSDOT	D	A	A	-0.2	A	A	-0.2
15 - 24th Ave. S/S 142nd St.	SeaTac	D	B	B	-0.1	C	C	0
18 - Military Rd. S/S 144th St.	SeaTac (Tukwila)	E	Category 3			E	E	-0.9
19 - International Blvd./S 144th St.	Tukwila	E	Category 3			D	D	-0.1
29 - SR 518 WB Ramps/S 154th St.	WSDOT	D	0	0	0	0	0	0
44 - Klickitat Dr./I-5 SB On-Ramp	WSDOT	D	A	A	0	B	B	0
51 - SR 509 NB Ramps/SW 160th St.	WSDOT	D	Category 3			A	A	0
53 - Air Cargo Rd./S 160th St.	Port	NA	D	A	-15.3	E	B	-26.6
55 - SeaTac Rental Car Facility Dr. W/S 160th St.	SeaTac	E	B	A	-8.4	B	B	-8.6
56 - SeaTac Rental Car Facility Dr. E/S 160th St.	SeaTac	E	C	C	-0.9	C	C	-0.9
57 - Pacific Hwy S/S 160th St.	SeaTac	E	D	D	-1.2	E	E	-0.6
58 - Air Cargo Rd./S 166th St.[1]	Port	NA	C	0	-16	C	0	-17.9
59 - Air Cargo Rd./SB Airport Expressway On-Ramp[1]	Port	NA	A	0	-2	A	0	-1.4
60 - Air Cargo Rd./S 170th St.[1]	Port	NA	A	0	-8.3	A	0	-8.6
61 - SB Airport Expressway Off-Ramp/S 170th St.[1]	Port/SeaTac	E	C	0	-28.5	C	0	-31.6

62 - Doug Fox Parking Lot/S 170th Street[1]	SeaTac	C	C	0	-15.1	C	0	-15.9
64 - International Blvd/S 170th St.	SeaTac	E-Mitigated	D	D	-1.4	E	E	-1.3
66 - International Blvd/S 182nd St./Arrivals Dr.	SeaTac	E-Mitigated	E	E	-2.4	Category 3		
67 - International Blvd/S 188th St.	SeaTac	E-Mitigated	E	E	-5.1	E	E	-3.8
71 - S Normandy Rd./Ambaum Blvd. S	Burien	D	C	C	0	Category 3		
74 - Military Rd. S/S 176th St.	SeaTac	E	C	C	-1	D	D	-2.7
75 - 46th Ave. S/S 188th St.	SeaTac	E	C	C	-0.2	C	C	-0.5
76 - Military Rd. S/S 188th St.	SeaTac	E	D	D	-0.5	D	D	-0.5
81 - 28th Ave. S/S 200th St.	SeaTac	E	B	B	0	C	C	0
85 - International Blvd/S 208th St.	SeaTac	E-Mitigated	B	B	-0.2	B	B	-0.2
87 - Des Moines Memorial Dr./S 216th St.	WSDOT	E	Category 3			B	B	0
90 - Pacific Hwy S/S 220th St.	Des Moines	E	Category 3			C	C	0
91 - Pacific Hwy S/S 224th St.	Des Moines	E	D	D	-0.1	Category 3		
95 - NB I-5 Ramps/SR 516	WSDOT	D	Category 3			C	C	0
107 - 34th Ave. S/S 170th St.	SeaTac	E	E	D	-3.9	Category 2		
108 - 32nd Ave. S/S 200th St.	SeaTac	E	A	A	0	Category 3		
111 - SB NAE On Ramp & Air Cargo Rd (via 160th)	Port	NA	Not Present			Uncontrolled		
113 - S 188th St & NB SR 509 Ramps	WSDOT	D	A	A	0	Category 3		
114 - 28th Ave S & SB SR 509 On Ramp	WSDOT	D	A	A	0	A	A	0
115 - 28th Ave S & NB SR 509 Off Ramp	WSDOT	D	B	B	0	Category 3		
117 - Veterans Dr & SB I-5 Off Ramp	WSDOT	D	B	B	0	C	C	0

- NA – No Action, PA – Proposed Action, LOS – Level-of-Service, Delay (seconds)
[1]Intersection removed as part of Proposed Action analysis.

4.3.2 Options for Category 1 Intersections

This section documents intersections in the traffic analysis study area which degrade to LOS below the respective local agency mobility standards under the Proposed Action conditions (Category 1), as shown in Table 6. These locations were shown to be operating at acceptable LOS under the No Action conditions for at least one of the two future scenarios (2032 or 2037) but not under the Proposed Action conditions. Intersection mitigation options are identified to meet the agency mobility standards, or justification is provided why intersection mitigation options are not identified. Synchro reports for the conditions with intersection mitigation options identified are provided in Attachment E. Note that the results for unsignalized intersections in the tables below represent the worst approach at the intersection. Black shading indicates the intersection does not meet the agency mobility standard in the respective scenario/year.

14. Des Moines Memorial Drive & S 144th Street (West Side: City of Burien, East Side: City of SeaTac)
In 2032, the intersection degrades from LOS E with 66.2 seconds of delay to LOS F with 267.5 seconds of delay under the Proposed Action (below agency mobility standard of LOS E). In 2037, the intersection degrades from LOS E with 78.0 seconds of delay to LOS F with 300.1 seconds of delay under the Proposed Action (below agency mobility standard of LOS E).

Proposed intersection mitigation: The Port proposes widening the east leg to provide a westbound left turn lane, widening the south leg to provide a northbound right turn lane and modifying traffic signal to eliminate split phasing. The mitigation will be designed to be consistent with the City of SeaTac's long-term improvement plan ST-024 from the City's Transportation Master Plan. The Westside Trail will be replaced in-kind or improved and no change in access would occur with the proposed mitigation. With the implementation of this mitigation, the intersection is expected to operate at LOS D in 2032 and LOS D in 2037 which meets the agency mobility standard.

Scenario	No Action		Proposed Action		Proposed Action with Mitigation	
	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)
2032	E	66.2	F	>150	D	35.8
2037	E	78.0	F	>150	D	41.4

17. 24th Avenue S & S 146th Street (City of SeaTac)
In 2032, the intersection degrades from LOS C with 22.5 seconds of delay to LOS E with 45.3 seconds of delay under the Proposed Action (below agency mobility standard of LOS D). In 2037, the intersection degrades from LOS D with 26.4 seconds of delay to LOS F with 73.7 seconds of delay under the Proposed Action (below agency mobility standard of LOS D).

Proposed intersection mitigation: The Port proposes constructing a new signal and maintaining existing channelization. A leading protected northbound left turn phase should be provided to accommodate the increased volumes seen in each Proposed Action scenario. Other left turns at the intersection can be made permissively while maintaining an acceptable LOS. Design for the proposed signal will include evaluation of required intersection footprint and sight distances to implement Flashing Yellow Arrows.

Scenario	No Action		Proposed Action		Proposed Action with Mitigation	
	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)
2032	C	22.5	E	45.3	B	12.0
2037	D	26.4	F	73.7	B	13.5

24. SR 518 WB Ramps & Des Moines Memorial Drive (WSDOT)
In 2032, the intersection degrades from LOS C with 23.6 seconds of delay to LOS E with 44.3 seconds of delay under the Proposed Action (below agency mobility standard of LOS D). In 2037, the intersection degrades from LOS E with 36.1 seconds of delay to LOS F with 186.9 seconds of delay under the Proposed Action (below agency mobility standards of LOS D).

Proposed intersection mitigation: The Port proposes converting the intersection from stop control to roundabout and add a slip westbound right turn lane, the northbound and southbound approaches can remain single lane. An Intersection Control Evaluation would need to be reviewed and approved by WSDOT for implementation of the assumed mitigation. A preliminary ICE was prepared for review by WSDOT and is included in the appendices of this report. The Westside Trail will be replaced in-kind or improved and no change in access would occur with the proposed mitigation. With this mitigation the intersection is expected to operate at LOS A with 3.4 seconds of delay in the 2032 Proposed Action scenario, and LOS A with 4.1 seconds of delay in the 2037 Proposed Action scenario.

Scenario	No Action		Proposed Action		Proposed Action with Mitigation	
	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)
2032	C	23.6	E	44.3	A	3.4
2037	E	36.1	F	186.9	A	4.1

42. SR 518 EB Off-Ramp & 51st Avenue S (WSDOT)

In 2032, the intersection degrades from LOS C with 24.6 seconds of delay to LOS D with 30.4 seconds of delay under the Proposed Action which would still meet the agency standard of LOS D. In 2037, the intersection degrades from LOS D with 31.1 seconds of delay to LOS E with 42.4 seconds of delay under the Proposed Action (below agency mobility standards of LOS D).

Proposed intersection mitigation: A preliminary ICE was prepared for review by WSDOT and is included in the appendices of this report. After review of the ICE and the additional delay added by NTP trips, WSDOT declined mitigation at this intersection in favor of consolidated mitigation at Category 2 locations. More details are provided in Section 7 of this report.

48. 8th Avenue S & S 156th Street (City of SeaTac)

In 2032, the intersection degrades from LOS C with 33.3 seconds of delay to LOS E with 65.1 seconds of delay under the Proposed Action. In 2037, the intersection degrades from LOS E with 76.6 seconds of delay to LOS F with 196.7 seconds of delay under the Proposed Action (below agency mobility standards of LOS E).

Proposed intersection mitigation: The Port proposes shifting the southbound lanes west to add a dedicated southbound left and right turn lanes and a dedicated northbound left turn lane. With the additional turn lanes, the signal timing can be modified to utilize standard NEMA phasing with protected left turns on each approach. Design for the proposed signal will include evaluation of required intersection footprint and sight distances. Mitigation analysis did not include NBL and SBL flashing yellow arrows because of high northbound and southbound volume-to-capacity ratios as a conservative assumption. Inclusion of flashing yellow arrows would allow the intersection to operate more efficiently than what is identified in this report. Feasibility of flashing yellow arrows can be evaluated prior to design and construction of the signal. The Westside Trail will be replaced in-kind or improved and no change in access would occur with the proposed mitigation. With this mitigation the intersection is expected to operate at LOS D with 44.8 seconds of delay in the 2032 Proposed Action scenario, and LOS E with 60.3 seconds of delay in the 2037 Proposed Action scenario.

Scenario	No Action		Proposed Action		Proposed Action with Mitigation	
	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)
2032	C	33.3	E	65.1	D	44.8
2037	E	76.6	F	196.7	E	60.3

83. Military Road S & SB I-5 Ramps/S 200th Street (WSDOT)
In 2032, the intersection degrades from LOS D with 47.7 seconds of delay to LOS D with 51.8 seconds of delay under the Proposed Action. In 2037, the intersection degrades from LOS D with 54.4 seconds of delay to LOS E with 64.3 seconds of delay under the Proposed Action (below agency mobility standard of D).

Proposed intersection mitigation: The Port proposes modifying the existing signal timings by increasing the cycle length by ten seconds and adjusting splits. WSDOT indicated this type of signal optimization is typically done on a regular basis and would not require additional mitigation from the Port. With this mitigation the intersection is expected to operate at LOS D with 51.8 seconds of delay in the 2032 Proposed Action scenario and LOS E with 56.3 seconds of delay in the 2037 Proposed Action Scenario.

Scenario	No Action		Proposed Action		Proposed Action with Optimization	
	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)
2032	D	47.7	D	51.8	D	51.8
2037	D	54.4	E	64.3	E	56.3

86. Military Road S & NB I-5 Ramps (WSDOT)
In 2032, the intersection degrades from LOS D with 52.5 seconds of delay to LOS E with 69.3 seconds of delay under the Proposed Action (below agency mobility standard of LOS D). In 2037, the intersection degrades from LOS E (below agency mobility standards of LOS D) with 64.6 seconds of delay to LOS F with 81.2 seconds of delay under the Proposed Action. Since the intersection is not expected to meet the mobility standard under 2037 No Action conditions the goal of the mitigation will be to reach a LOS approximately equal to the No Action LOS under Proposed Action conditions.

Proposed intersection mitigation: The Port proposes modifying the existing signal timings by reducing the cycle length by five seconds and redistributing splits while maintaining the existing channelization. WSDOT indicated this type of signal optimization is typically done on a regular basis and would not require additional mitigation from the Port. With this mitigation the intersection is expected to operate at LOS D with 45.9 seconds of delay in the 2032 Proposed Action scenario. With this mitigation the intersection is expected to operate at LOS E with 65.8 seconds of delay under 2037 Proposed Action Conditions, 1.2 seconds above the LOS seen under 2037 No Action conditions.

Scenario	No Action		Proposed Action		Proposed Action with Optimization	
	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)
2032	D	52.5	E	69.3	D	45.9
2037	E	64.6	F	81.2	E	65.8

96. 16th Avenue S & S 144th Street (City of SeaTac)

In 2032, the intersection degrades from LOS B with 11.8 seconds of delay to LOS D with 26.2 seconds of delay under the Proposed Action. In 2037, the intersection degrades from LOS B with 12.4 seconds of delay to LOS E with 43.0 seconds of delay under the Proposed Action (below agency mobility standards of LOS D).

Proposed intersection mitigation: The Port proposes constructing an eastbound right turn lane. Frontage improvements (including street and pedestrian lighting) will be designed to current City standards and in coordination with the City's planned improvement project ST-024. With this mitigation the intersection is expected to operate at LOS C with 16.9 seconds of delay in the 2032 Proposed Action Scenario. The intersection is expected to operate at LOS C with 21.1 seconds of delay in the 2037 Proposed Action scenario with the recommended mitigation.

Scenario	No Action		Proposed Action		Proposed Action with Mitigation	
	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)
2032	B	11.8	D	26.2	C	16.9
2037	B	12.4	E	43.0	C	21.1

98. Des Moines Memorial Drive & S 168th Street (City of Burien)

In 2032, the intersection degrades from LOS C with 19.8 seconds of delay to LOS C with 24.8 seconds of delay under the Proposed Action. In 2037, the intersection degrades from LOS C with 23.4 seconds of delay to LOS D with 33.3 seconds of delay under the Proposed Action (below agency mobility standards of LOS C).

Proposed intersection mitigation: The Port proposes constructing a new signal and modify the westbound channelization to provide a dedicated left turn lane and a shared through and right turn lane. All left turns would be permissive under the proposed signal timing. The Westside Trail will be maintained or improved and no change in access would occur with the proposed mitigation. With this mitigation the intersection is expected to operate at LOS A with a delay of 7.3 seconds per vehicle under 2032 Proposed Action conditions. The intersection is expected to operate at LOS B with 10.5 seconds of delay per vehicle under 2037 Proposed Action conditions with proposed mitigation.

Scenario	No Action		Proposed Action		Proposed Action with Mitigation	
	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)
2032	C	19.8	C	24.8	A	7.3
2037	C	23.4	D	33.3	B	10.5

102. S 152nd Street & Des Moines Memorial Drive S (City of SeaTac/Burien)
In 2032, the intersection degrades from LOS D with 25.3 seconds of delay to LOS D with 34.7 seconds of delay under the Proposed Action. In 2037, the intersection degrades from LOS D with 32.7 seconds of delay to LOS F with 56.7 seconds of delay under the Proposed Action (below agency mobility standards of LOS E).

Proposed intersection mitigation: The Port proposes constructing a roundabout that would consolidate the intersection with intersections #100 and #101 as mitigation. The City of Burien has a TIP improvement that would convert this intersection and two adjacent intersections (#100, #101) into a roundabout. The proposed roundabout would combine the three intersections into a single four-leg roundabout with a single lane on each approach. The Westside Trail will be maintained or improved and no change in access would occur with the proposed mitigation. Future construction of roundabout will be designed to be compatible with the City of SeaTac's ST-029 improvement project as well. With this proposed mitigation, intersection #102 is expected to operate at LOS A with 6.8 seconds of delay in the 2032 Proposed Action scenario, and LOS A with 8.8 seconds of delay in the 2037 Proposed Action scenario.

Scenario	No Action		Proposed Action		Proposed Action with Mitigation	
	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)
2032	D	25.3	D	34.7	A	6.8
2037	D	32.7	F	56.7	A	8.8

4.3.3 Options for Category 2 Intersections

This section provides proposed mitigation for intersections which are expected to fail to meet mobility standards under the No Action conditions even after funded improvement projects are assumed and where the Proposed Action is expected to add additional delay as shown in Table 7 (Category 2). The Port is only responsible to mitigate the delay added by the NTPs. Synchro reports for the conditions with other improvements are provided in Attachment E. Note that the results for unsignalized intersections in the tables below represent the worst approach at the intersection.

21. SR 509 SB Ramps & SW 148th Street (WSDOT)

In 2032, the signalized intersection operates at an acceptable LOS D in both the No Action and Proposed Action scenarios. In 2037, the signalized intersection would operate at LOS E 55.3 seconds (below the agency standard of LOS D) in the No Action scenario and LOS E 67.1 in the Proposed Action scenario. The NTPs would add 11.8 seconds of average delay in 2037. The NTPs will add 195 vehicle trips to the intersection in the 2037 Proposed Action and comprise 4% of the total intersection volume.

Proposed intersection mitigation: The intersection operates as a coordinated system with adjacent intersections #20 and #22. Constructed capital improvements to improve the LOS E in No Action would require additional improvements to adjacent intersections that already operate at acceptable levels of service. Optimizing splits and offsets with Proposed Action intersection volumes at all three intersections to reduce the overall coordinated network delay would result in an added delay of approximately 9.0 seconds compared to No Action. WSDOT indicated this type of signal optimization is typically done on a regular basis and would not require additional mitigation from the Port. WSDOT requested the remainder of the delay added be mitigated at other WSDOT Category 2 intersections through consolidation of constructed improvements.

Scenario	No Action		Proposed Action		Proposed Action with Optimization	
	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)
2032	D	46.7	D	50.4	-	-
2037	E	55.3	E	67.1	E	64.3

23. SR 518 EB Ramps & Des Moines Memorial Drive (WSDOT)

In 2032, the stop-controlled approach of the intersection degrades to LOS F with 124.0 seconds of delay under the No Action scenario (which is below the agency mobility standard of LOS D), with the Proposed Action operating at LOS F with 468.1 seconds of delay. In 2037, the stop-controlled approach of the intersection degrades to LOS F with 261.4 seconds of delay under the No Action scenario (which is below the agency mobility standard of LOS D), with the Proposed Action operating at LOS F with 981.0 seconds of delay. The NTPs would add 344.1 seconds of delay in 2032 and 719.6 seconds of delay in 2037. The NTPs would add approximately 300 PM peak hour trips and would make up 16% of the total 2037 Proposed Action intersection volume.

Proposed intersection mitigation: The Port is proposing to convert the intersection to a single lane roundabout, maintaining existing channelization on the eastbound approach. Design of the intersection will accommodate the West Side Trail connection along the east side of Des Moines Memorial Drive S. The Westside Trail will be replaced in-kind or improved and no change in access would occur with the proposed mitigation. This improvement would require approval by WSDOT via an Intersection Control Evaluation. A preliminary ICE was prepared for review by WSDOT and is included in the appendices of this report (Network 1). With this improvement the intersection is expected to operate at LOS A with 5.5 seconds of delay under 2032 Proposed Action conditions, and LOS A with 6.1 seconds of delay under 2037 Proposed Action conditions. The delay reduction achieved by the Port-constructed roundabout would mitigate delay beyond what was added by NTP trips. Therefore, the constructed roundabout represents a consolidated mitigation location of Category 2 impacts at multiple WSDOT intersections.

Scenario	No Action		Proposed Action		Proposed Action with Mitigation	
	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)
2032	F	124.0	F	468.1	A	5.5
2037	F	261.4	F	981.0	A	6.1

28. SR 518 EB Off Ramp & S 154th Street (WSDOT)

In 2037, the stop-controlled approach of the intersection degrades to LOS F with over 150 seconds of delay under the No Action conditions (which is below the agency mobility standard of LOS D). The NTPs will add 21.2 seconds of delay. The NTPs would add approximately 10 PM peak hour trips in the 2037 Proposed Action scenario and would comprise 1% of the total intersection volume.

Proposed intersection mitigation: A preliminary ICE was prepared for review by WSDOT and is included in the appendices of this report (Network 2). After review of the ICE and the additional delay added by NTP trips, WSDOT declined mitigation at this intersection in favor of consolidated mitigation at WSDOT other Category 2 locations. More details are provided in Section 7 of this report.

33. SR 518 WB Off-Ramp (Loop) & S 154th Street (WSDOT)

In 2037, the stop-controlled approach of the intersection degrades to LOS F with over 300 seconds of delay under the No Action conditions (which is below the agency mobility standard of LOS D). The NTPs will add approximately 78.9 seconds of delay in 2032 and approximately 115 seconds of delay in 2037. The NTPs would add approximately 50 PM peak hour trips to the westbound off-ramp intersection in the 2037 Proposed Action scenario and comprise 2% of the total intersection volume.

Proposed intersection mitigation: The Port will install a three-phase traffic signal in the intersection's current location coordinated with intersection #37. This improvement would require design approval by WSDOT via an Intersection Control Evaluation. A preliminary ICE was prepared for review by WSDOT and is included in the appendices of this report (Network 3). The delay reduction achieved by the Port-constructed signal would mitigate delay beyond what was added by NTP trips. Therefore, the constructed signal represents a consolidated mitigation location of Category 2 impacts at multiple WSDOT intersections. The City of SeaTac has identified realigning the off-ramp with 32nd Avenue S as a preferred improvement which would require approval by WSDOT to realign the ramp as well as additional property acquisition. To date, the feasibility of this concept has not been evaluated by either the City or WSDOT and therefore was not included in the analysis. With the implementation of a signal at the current intersection location, the intersection is expected to operate at LOS C in 2032 and LOS C in 2037 which meets the agency mobility standard.

Scenario	No Action		Proposed Action		Proposed Action with Mitigation	
	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)
2032	F	187.5	F	266.4	C	28.2
2037	F	389.9	F	504.9	C	30.9

37. International Boulevard & S 154th Street (WSDOT)

In 2037, the signalized intersection is expected to operate at LOS F with 106.3 seconds of delay (below agency standard of LOS E-Mitigated). The Proposed Action would increase delay to an LOS F with 110.9 seconds of delay. The NTPs would add approximately 2.2 seconds of delay in 2032 and 4.6 seconds of delay in 2037. The NTPs would add approximately 95 PM peak hour trips to the intersection in the 2037 Proposed Action scenario and would comprise 2% of the total intersection volume.

Proposed intersection mitigation: WSDOT declined mitigation at the intersection in favor of consolidated improvements at other WSDOT Category 2 intersections. Signal improvements to the intersection immediately to the west (#33) would require coordination with intersection #37 given the proximity of the two. Eastbound and westbound channelization and coordination between the two intersections will be confirmed during completion of the future final ICE for intersection #33. No additional mitigation for intersection #37 was requested by WSDOT.

49. 1st Avenue S & SW 160th Street (City of Burien)

In 2037, the signalized intersection is expected to operate at LOS E with 61.4 seconds of delay (below agency standard of LOS D). The Proposed Action would increase delay to an LOS E with 62.8 seconds of delay. The NTPs will add approximately 0.4 seconds of delay in 2032 and 1.4 seconds of delay in 2037. The NTPs will add approximately 55 PM peak hour trips to the intersection in the 2037 Proposed Action scenario and would comprise 1% of the total intersection volume.

Proposed intersection mitigation: The City of Burien has identified corridor improvements to the SW 160th Street corridor (Project No. 22 in 2023-2028 TIP) to optimize traffic flow. Reoptimizing signal timings in the 2037 Proposed Action analysis would reduce the 2037 Proposed Action delay to LOS E with 62.0 seconds of delay—resulting in a less than one second increase in average delay. The Port is proposing a proportionate share payment for costs of the corridor improvement program ($1,500,000) equal to the NTPs percentage of trips at the intersection (1%). This results in a proportionate share payment of $15,000.

Scenario	No Action		Proposed Action		Proposed Action with Optimization	
	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)
2032	E	56.2	E	56.6	E	56.2
2037	E	61.4	E	62.8	E	62.0

54. Host Rd/SR 518 EB On Ramp & S 160th St (City of SeaTac/WSDOT)

In 2032, the Proposed Action will cause the intersection to degrade to LOS E with 49.9 seconds of delay on the worst stop-controlled approach. In the 2037 No Action, the intersection will operate at a LOS F with 54.6 seconds of delay and the Proposed Action will cause the intersection to degrade to LOS F with 122.9 seconds of delay on the worst stop-controlled approach (below the agency mobility standard LOS E). The NTPs will add approximately 10.7 seconds of delay in 2032 and approximately 68.3 seconds of delay in 2037. The NTPs are expected to decrease the volume on S 160th Street which will reduce the overall intersection volume by 25 trips (2% decrease), however the NTPs will increase northbound traffic by 130 trips.

Proposed intersection mitigation: The Port is proposing to install a two-phase traffic signal with an eastbound permitted & protected left turn. This improvement does not require roadway widening. The north leg of the intersection is within WSDOT ROW so assumed improvements will need to be reviewed and approved by WSDOT through an Intersection Control Evaluation. A preliminary ICE was prepared for review by WSDOT and is included in the appendices of this report (Network 5). With the implementation of this improvement, the intersection is expected to operate at LOS A in 2032 and 2037 Proposed Action which meets the agency mobility standard.

Scenario	No Action		Proposed Action		Proposed Action with Mitigation	
	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)
2032	E	39.2	E	49.9	A	6.0
2037	F	54.6	F	122.9	A	6.2

78. S 188th Street & I-5 Southbound Ramps (WSDOT)

In 2037, the signalized intersection would operate at LOS F 95.5 seconds (below the agency standard of LOS D) in the No Action scenario and LOS E 97.9 in the Proposed Action scenario. Reoptimization of the signal timings after the Proposed Action results in a LOS F with 85.1 seconds of delay which would drop the delay below No Action. WSDOT confirmed this type of signal optimization would occur through typical signal maintenance by WSDOT. No other improvements were proposed by the Port as mitigation for NTP trips. The NTPs will add approximately 1.6 seconds of delay in 2032 and approximately 2.4 seconds of delay in 2037.

Proposed intersection mitigation: Added delay by NTP trips at the intersection will be addressed through consolidated constructed improvements at other WSDOT Category 2 intersections as requested by WSDOT.

Scenario	No Action		Proposed Action		Proposed Action with Optimization	
	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)
2032	E	63.7	E	65.3	D	54.7
2037	F	95.5	F	97.9	F	85.1

89. Pacific Highway S & S 216th Street (City of Des Moines)

In 2037, the signalized intersection would operate at LOS E with 77.4 seconds of delay with eastbound left turns and northbound left turns operating at a v/c greater than 1.0 in the No Action scenario. The City has adopted a LOS F and v/c 1.0 standard for the intersection. Although the average delay in the 2037 No Action and Proposed Action scenarios would operate better than a LOS F, the eastbound and northbound left turns would operate at a v/c greater than 1.0. Signal timing reoptimization after the 2037 Proposed Action scenario could reduce the overall intersection delay added to less than one second per vehicle on average. No other improvements were proposed. The NTPs will add approximately 0.2 second of delay in 2032 and 1.6 seconds of delay in 2037. The NTPs will add approximately 75 PM peak hour trips to the intersection (2% increase) in the 2037 Proposed Action scenario.

Proposed intersection mitigation: The City requested that proportional impacts to City streets and intersections be evaluated using the number of NTP trips added at intersection #93. No Port mitigation is therefore identified for intersection #89.

Scenario	No Action		Proposed Action		Proposed Action with Optimization	
	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)
2032	E	66.6	E	66.8	-	-
2037	E	77.4 (v/c 1.06)	E	79.0 (v/c 1.11)	E	78.0 (v/c 1.05)

93. Pacific Highway S & Kent-Des Moines Road (SR 516) (City of Des Moines)

In 2037, the signalized intersection would operate at LOS E 107.7 seconds with southbound through lanes operating at a v/c of 1.28 in the 2037 No Action scenario. The NTPs would add approximately 135 PM peak hour trips to the intersection in the 2037 Proposed Action scenario and comprise 2% of the total intersection volume. The NTPs will add approximately 3.4 seconds of delay in 2032 and 3.8 seconds of delay in 2037.

Analysis for the intersection includes the planned improvements by Sound Transit for an additional northbound left turn lane and an additional northbound right turn lane. The City of Des Moines has adopted a LOS F and v/c 1.2 standard for the intersection. Signal timing reoptimization after the 2037 Proposed Action scenario to increase the cycle length to 185 seconds could reduce the overall intersection delay added back to No Action levels, however the southbound through lanes would still operate at a v/c of 1.22. No other improvements were proposed. The intersection was assumed to still operate uncoordinated with I-5 interchange signals to the east.

Proposed intersection mitigation: The City requested proportionate share for delay added by NTP trips be evaluated using the total number of PM peak hour trips added to intersection #93 multiplied by the City's current traffic impact fee amount ($7,651.41 per PM peak hour trip). This results in a total proportionate share payment to the City of Des Moines of $1,032,940.35 based on the current fee schedule.

Scenario	No Action		Proposed Action		Proposed Action with Optimization	
	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)
2032	F	94.8	F	98.2	F	95.3
2037	F	107.7 (v/c 1.28)	F	111.5 (v/c 1.28)	F	107.2 (v/c 1.22)

94. Kent-Des Moines Road (SR 516) & I-5 Southbound Ramps (WSDOT)

In 2032, the intersection will operate at an acceptable LOS D in both the No Action and Proposed Action scenarios. In the 2037 No Action, the intersection will operate at a LOS E with 59.6 seconds of delay and the Proposed Action will cause the intersection to degrade to LOS E with 66.4 seconds of delay (below the agency mobility standard LOS D). The NTPs would add approximately 195 PM peak hour trips to the intersection in the 2037 Proposed Action scenario and would comprise 4% of the total intersection volume. The NTPs will add approximately 4.5 seconds of delay in 2032 and 6.8 seconds of delay in 2037.

Proposed intersection mitigation: Added delay by NTP trips at the intersection will be addressed through consolidated constructed improvements at other WSDOT Category 2 intersections as requested by WSDOT. The intersection will have southbound channelization improvements constructed by WSDOT as part of the SR 509 Stage 1B and Veterans Drive extensions. The intersection will operate as a coordinated system with the corresponding northbound I-5 ramp terminal on Kent-Des Moines Road (SR 516) as well as two new intersections on Veterans Drive. Signal timings were reoptimized after the 2037 Proposed Action for the coordinated system to reduce network delay at the four intersections. This type of signal optimization would occur through typical signal maintenance by WSDOT. After optimization the intersection is expected to operate at LOS E with 66.3 seconds of delay. No other improvements were proposed.

Scenario	No Action		Proposed Action		Proposed Action with Optimization	
	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)
2032	D	44.7	D	49.2	-	-
2037	E	59.6	E	66.4	E	66.3

105. 32nd Avenue S & S 160th Street (City of SeaTac)

The intersection is expected to operate at LOS F with more than 150 seconds of delay for the northbound stop-controlled approach for both the 2032 No Action and Proposed Action scenarios which would exceed the allowable LOS D standard. The intersection would exceed 300 seconds of delay in the 2037 No Action and Proposed Action scenarios as well. The NTPs would add approximately 60 PM peak hour trips to the intersection in the 2037 Proposed Action scenario and would comprise 4% of the total intersection volume. The NTPs will add approximately 47.2 seconds of delay in 2032 and 72.4 seconds of delay in 2037.

Proposed intersection mitigation: The City of SeaTac indicated a private development located in the City of Tukwila has proposed a roundabout as an access improvement at this location in the future as part of initial site plans. However, discussion with the City of Tukwila indicated there is no timeline for when the improvement might occur. The Port is therefore proposing to construct the roundabout as mitigation given the uncertainty of the private development. Agreements with the cities of SeaTac and Tukwila will be documented outlining the timing of the roundabout construction and any potential latecomer's agreement. A multi-lane roundabout converting the westbound curb lane to right turn only while maintaining existing channelization for other approaches was assumed. With these improvements the intersection is expected to operate at LOS A under 2032 Proposed Action and 2037 Proposed Action conditions, meeting the City of SeaTac mobility standard of E.

Scenario	No Action		Proposed Action		Proposed Action with Mitigation	
	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)
2032	F	165.6	F	212.8	A	4.3
2037	F	305.0	F	377.4	A	4.5

106. Military Road S/S 164th Street/42nd Avenue S (City of SeaTac)

The signalized intersection is expected to operate at LOS F with 95.7 seconds of delay for the 2037 No Action scenario which would not meet the City's LOS E standard. The 2037 Proposed Action scenario would increase the delay to 101.2 seconds of delay. The NTPs would add approximately 90 PM peak hour trips to the intersection in the 2037 Proposed Action scenario comprising 4% of the total intersection volume. The NTPs will add approximately 10.8 seconds of delay in 2032 and approximately 5.5 seconds of delay in 2037.

Proposed intersection mitigation: The City of SeaTac has prepared a study indicating a planned but unfunded improvement to replace the signal with a roundabout to improve safety and operations. The five-leg roundabout would operate at a LOS B in both the 2037 No Action and Proposed Action scenarios. The City of SeaTac indicated the intersection improvement is part of the S 160th Street/Military Road corridor improvement project (ST 116) and that a fee payment based on the corridor improvement cost would be sufficient for the Port's proportionate share mitigation towards the intersection improvements. The current TIP only has design and ROW costs assumed for the next six years, therefore the planning-level cost identified in the City's Transportation Master Plan was used as the basis for the proportionate share calculation ($14,870,000). The Port is proposing mitigating NTP trips impacting the intersection by paying a proportionate share of intersection improvement costs equal to the NTPs' percentage of total intersection volume (4%). The Port's proportionate share payment would therefore be $594,800 for the intersection improvements.

Scenario	No Action		Proposed Action		Proposed Action with Improvements	
	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)
2032	E	59.8	E	70.6	-	-
2037	F	95.7	F	101.2	B	14.8

107. 34th Avenue S & S 170th Street (City of SeaTac)

The all-way stop control intersection is expected to operate at LOS F with 59.1 seconds of delay in the 2037 No Action scenario which would not meet the City's LOS E standard. The 2037 Proposed Action scenario would increase the delay to 59.8 seconds of delay. The NTPs would add approximately 10 PM peak hour trips to the intersection in the 2037 Proposed Action scenario comprising 1% of the total intersection volume. The NTPs will reduce delay by 3.9 seconds in 2032 and add approximately 0.7 second of delay in 2037.

Proposed intersection mitigation: No changes to the intersection's control are assumed in the City's current ST-016 improvement project. Replacing the all-way stop-control with a signal utilizing existing channelization and two-phase timing plan was assumed as the future year improvement to meet the LOS E standard. The signal would operate at an acceptable LOS B in the 2037 Proposed Action scenario. The City indicated the intersection does not have a signal identified in the current 34th Avenue S Phase 2 corridor project that is included in the 6-year TIP as ST-016, but will have conduit installed to allow installation of a signal in the future when warranted. The Port is proposing mitigating NTP trips impacting the intersection by paying a proportionate share of corridor improvement costs equal to the NTPs' percentage of total intersection volume (1%). This would equate to a $152,000 proportionate share payment by the Port.

Scenario	No Action		Proposed Action		Proposed Action with Improvements	
	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)
2032	E	36.5	D	32.6	-	-
2037	F	59.1	F	59.8	B	18.6

109. Military Road S & S 216th Street (City of SeaTac)

The signalized intersection is expected to operate at LOS F with 84.8 seconds of delay for the 2032 No Action scenario which would not meet the City's LOS E standard. The 2032 Proposed Action scenario would increase the delay to 91.8 seconds of delay. The signal would operate at LOS F with 114.1 seconds of delay for the 2037 No Action scenario and would increase the delay to 123.9 seconds of delay with the Proposed Action. The NTPs would add approximately 50 PM peak hour trips to the intersection in the 2037 Proposed Action scenario and comprise 2% of the total intersection volume. The NTPs will add approximately 7.0 seconds of delay in 2032 and approximately 9.8 seconds of delay in 2037.

Proposed intersection mitigation: There are funded improvements to widen S 216th Street to a three-lane road across I-5 as part of the SR 509 Stage 1B project on the west leg of the intersection. The intersection currently has a single westbound lane (east leg of intersection) and operates with split phasing for eastbound and westbound approaches. Removal of the split phasing to allow simultaneous eastbound and westbound through movements would be required to achieve the LOS E standard. The future improvements assumed an additional eastbound right turn lane and dedicated westbound left turn lane to achieve an LOS E in the 2037 No Action and Proposed Action scenarios. The increase in delay under Proposed Action is primarily from southbound NTP trips diverting from southbound I-5 to avoid congestion on the freeway. The intersection is not expected to see an increase in freight traffic resulting from the NTPs. The City indicated that there will likely be channelization improvements as part of project ST-140 in the current 6-year TIP and that the proportionate share calculation could be based on the TIP project cost ($2,550,000). The Port is proposing mitigating NTP trips impacting the intersection by paying a proportionate share for intersection improvement costs equal to the NTPs' percentage of total intersection volume (2%). This equates to a proportionate share payment of $51,000.

Scenario	No Action		Proposed Action		Proposed Action with Improvements	
	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)	LOS	Vehicle Delay (sec)
2032	F	84.8	F	91.8	D	53.0
2037	F	114.1	F	123.9	E	70.5

5. Arterial Corridor Operations Analysis

Corridor operations were analyzed at the request of WSDOT where study intersections are closely spaced and queues/congestion from one intersection may impact upstream intersection operations. It should be noted WSDOT does not identify a LOS or other Measures of Effectiveness (MOE) standard that is required to be maintained. The City of SeaTac maintains a concurrency model that evaluates corridor capacity

throughout the City. Per the City and Port's current interlocal agreement, projects located outside the Airport Activity Area (AAA) would be subject to SeaTac's concurrency analysis at the time of building permit application.

Corridor operations were conducted using SimTraffic and followed WSDOT's *Synchro & SimTraffic Protocol (August 2018)*. Future corridor analysis was conducted to identify queue spillback concerns and to provide additional insight on future signal timing optimization and potential impacts of proposed mitigation. The SimTraffic analysis was divided into nine corridors, each consisting of between two to six intersections, listed below in Table 10. Additional SimTraffic and Sidra Network analysis was completed for the Preliminary ICEs documented in Attachment H.

Table 10. SimTraffic Corridors Analyzed

#	Segments of Interest	Study Intersections Included
1	24th Ave. S: S 142nd St. to S 154th St.	15, 16, 17, 97, 25, 26, 27
2	SW 148th St.: 1st Ave S to SR 509	20, 21, 22
3	Des Moines Memorial Dr. : SR 518 Ramp Terminals	23, 24
4	S 154th St.: 24th Ave S and SR 518 Ramp Terminals	27, 28, 29
5	International Boulevard: S 152nd St. to SR 518 EB On-Ramp	35, 36, 37, 39
6	51st Ave S: SR 518 Ramp Terminals	41, 42
7	SW 160th St.: 1st Ave S to Des Moines Memorial Dr.	49, 50, 51, 52
8	NAE Off-Ramp/S 170th St. to International Boulevard/ S 188th St.	63, 64, 65, 66, 67
9	SR 516: Pacific Highway S and I-5 Ramp Terminals	93, 94, 95

MOEs for the corridor analysis were 95th percentile queues and average corridor travel time as documented in the methods and assumption scoping document. The analysis was performed to evaluate the potential for the blocking of intersections and for turn lanes exceeding provided storage lengths which may not appear in typical isolated intersection analysis. SimTraffic Queueing and Blocking reports are located after the capacity analysis reports in Attachment I for each corridor.

Both the 2032/2037 No Action and Proposed Action scenarios showed increase queuing spillback compared to the existing conditions. These were minimized as much as possible through future No Action and Proposed Action signal timing optimization assumptions. Increased travel times and decreased average speeds occurred on most corridors compared to the existing conditions. Corridor results in Table 11 summarize the assumed mitigated/improved scenario for Proposed Action. The Proposed Action reduced average speeds on the corridors by 0-2 miles per hour except as noted below:

- Segment 1, 24th Avenue S – 2037 Proposed Action average speeds decrease by approximately 4 mph in both the northbound and 7-8 mph in the southbound direction. This is a result of increased

volumes on 24th Avenue S because of NTPs constructed north of SR 518 as well as a new signal added in the Proposed Action scenario at 24th Avenue S at S 146th Street. The northbound and southbound approaches currently operate without and stop control and will have delay added once the signal is constructed. Northbound and southbound 95th-percentile queues at the signal are expected to be less than 250 feet in both directions and are not expected to impact adjacent intersections.

- Segment 3, Des Moines Memorial Drive – 2037 Proposed Action southbound average speed will decrease by approximately 10-22 mph. This is due to the Port constructing roundabouts at each SR 518 ramp terminal as well as increased volumes on the corridor from NTPs constructed north SR 518. The 2037 Proposed Action 95th-percentile southbound queue was 438 feet as reported from the Sidra Network analysis as part of the Preliminary ICE for this corridor for the dual roundabout configuration. This queue length would not impact the next intersection to the north (S. 144th Street).
- Segment 7, SW 160th Street – 2037 Proposed Action westbound average speed will increase by approximately 5 mph. This is due to additional green time added for westbound trips at 1st Avenue S in the 2037 Proposed Action mitigated scenario.
- Segment 8, S 170th Street – 2037 Proposed Action westbound average speed will increase by approximately 4 mile per hour because of a reduction in volume after construction of Terminal 2 and relocation of facilities served by Air Cargo Road.

Table 11. SimTraffic Corridors PM Peak Hour Travel Time and Speed Results

#	Arterial	Direction	Distance (mi)	2022 Existing		2032 No Action		2032 Proposed Action with Mitigated/Optimized				2037 No Action		2037 Proposed Action with Mitigation/Optimization			
				Travel Time (s/veh)	Avg Speed (mph)	Travel Time (s/veh)	Avg Speed (mph)	Travel Time (s/veh)	Avg Speed (mph)	Travel Time Diff, 2032 NA Mit (s/veh)	Avg Speed Diff, 2032 NA Mit (mph)	Travel Time (s/veh)	Avg Speed (mph)	Travel Time (s/veh)	Avg Speed (mph)	Travel Time Diff, 2037 NA Mit (s/veh)	Avg Speed Diff, 2037 NA Mit (mph)
Segment 1	24th Ave S	NB	0.8	92.6	31.1	96.7	29.8	110.7	26.0	14	-3.8	97.9	29.4	112.1	25.7	14.2	-3.7
		SB	0.8	93.3	30.9	114.9	25.1	156.2	18.4	41.3	-6.7	116.3	24.8	170.8	16.9	54.5	-7.9
Segment 2	SW 148th St/SR 518	EB	0.2	60.6	11.9	79.7	9.0	81.3	8.9	1.6	-0.1	66.3	10.9	71.2	10.1	4.9	-0.8
		WB	0.2	94.9	7.6	77.6	9.3	80.5	8.9	2.9	-0.4	113.9	6.3	89.8	8.0	-24.1	1.7
Segment 3	DMMD	NB	0.1	11.3	31.9	11.8	30.5	18.0	20.0	6.2	-10.5	12.0	30.0	18.2	19.8	6.2	-10.2
		SB	0.1	9.7	37.1	10.0	36.0	24.2	14.9	14.2	-21.1	10.1	35.6	28.7	12.5	18.6	-23.1
Segment 4	S 154th St	EB	0.2	25.8	27.9	27.9	25.8	28.0	25.7	0.1	-0.1	27.8	25.9	27.9	25.8	0.1	-0.1
		WB	0.2	37.2	19.4	56.3	12.8	59.5	12.1	3.2	-0.7	66.8	10.8	71.3	10.1	4.5	-0.7
Segment 5	SR 99	NB	0.3	80.3	13.4	188.0	5.7	181.2	6.0	-6.8	0.3	164.6	6.6	187.5	5.8	22.9	-0.8
		SB	0.3	86.0	12.6	168.7	6.4	200.6	5.4	31.9	-1	184.9	5.8	193.7	5.6	8.8	-0.2
Segment 6	51st Ave S	NB	0.1	25.2	14.3	29.7	12.1	33.4	10.8	3.7	-1.3	46.1	7.8	50.2	7.2	4.1	-0.6
		SB	0.1	15.5	23.2	15.5	23.2	15.5	23.2	0	0	15.6	23.1	15.6	23.1	0	0
Segment 7	SW 160th St	EB	0.5	79.4	22.7	140.0	12.9	168.9	10.7	28.9	-2.2	149.5	12.0	173.5	10.4	24	-1.6
		WB	0.5	71.4	25.2	160.2	11.2	136.0	13.2	-24.2	2	242.5	7.4	144.0	12.5	-98.5	5.1
Segment 8	International Blvd	NB	1.1	221.6	17.9	503.6	7.9	804.3	4.9	300.7	-3	618.6	6.4	900.8	4.4	282.2	-2
		SB	1.1	264.8	15.0	570.9	6.9	465.7	8.5	-105.2	1.6	646.4	6.1	678.5	5.8	32.1	-0.3
	S 170th St	EB	0.1	62.0	5.8	55.0	6.5	61.4	5.9	6.4	-0.6	61.4	5.9	65.6	5.5	4.2	-0.4
		WB	0.1	14.7	24.5	10.5	34.3	9.4	38.3	-1.1	4	10.8	33.3	9.6	37.5	-1.2	4.2
Segment 9	S Kent Des Moines Rd	EB	0.4	156.0	9.2	128.6	11.2	131.4	11.0	2.8	-0.2	126.0	11.4	157.1	9.2	31.1	-2.2
		WB	0.4	100.1	14.4	247.5	5.8	229.6	6.3	-17.9	0.5	345.7	4.2	307.2	4.7	-38.5	0.5

6. Freeway Operations Analysis

Freeway operations analysis was conducted in two phases using VISSIM and Highway Capacity Software (HCS). The study area for the freeway operations matched that analyzed for the existing conditions. Background improvement projects were incorporated into the modeling based on analysis conducted in previous studies and additional data collected from WSDOT data sources.

6.1 Future Conditions HCS Analysis

Extents of the HCS analysis focused on I-5, I-405, and SR 518 matching the extents analyzed in the existing conditions. Figure 3 shows the extents of the HCS analysis. Segmentation of the corridors was developed with input from WSDOT.

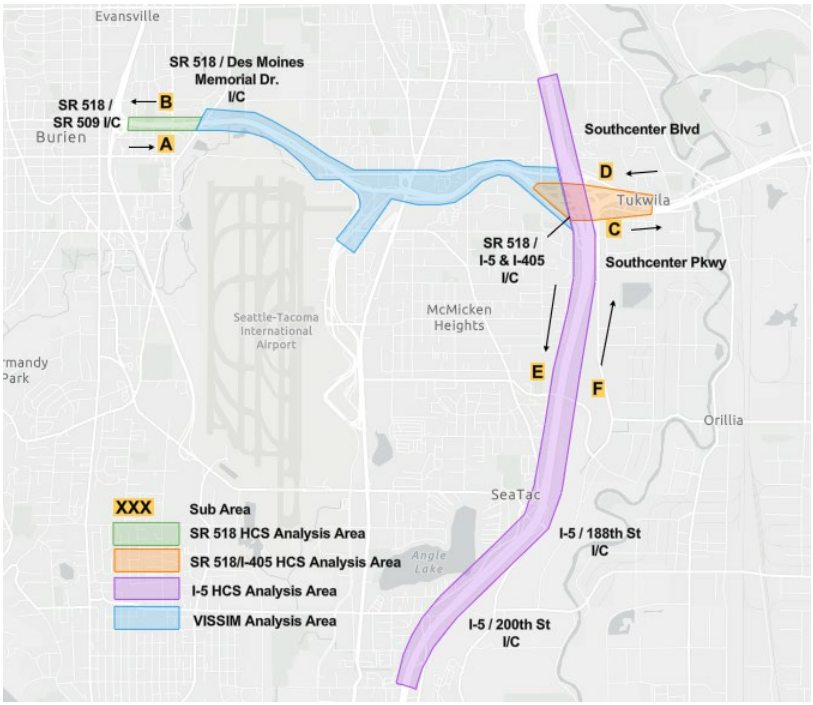


Figure 3: SAMP HCS Study Area Extent

6.1.1 Improvement Projects and Boundary Conditions

Completion of the SR 509 Stages 1B and 2 extensions will result in volume shifts and reduced congestion on the I-5 corridor. The 2018 SR 509 NEPA Re-Evaluation forecasted average speeds on southbound I-5 between I-405 and S 200th Street to be 44 mph in 2045 with completion of the SR 509 Stage 2 extension. Speed, capacity, and demand adjustment factors were modified from the assumptions used in the existing conditions to match the expected future improvements on southbound I-5 in PM peak hour. HCS speeds and densities show improvement in the 2032/2037 No Action and Proposed Action scenarios compared to the existing speed and densities, however, the 2032/2037 No Action and Proposed Action forecasted demand volumes still exceed the capacity calculated by HCS and therefore all southbound I-5 segments exceed the LOS D standard.

Completion of the I-405 Express Toll Lanes from Tukwila to I-90 will also provide speed and density improvements to northbound I-405. Southbound I-405 does not see the same benefit as northbound I-405 in the NTP study area because the SR 518/I-5/I-405 interchange still acts as a constraining factor for southbound I-405 similar to how it operates as a constraining factor for eastbound SR 518. I-405 northbound is expected to have a speed of approximately 35-45 mph immediately east of I-5 before Tukwila Parkway.

The PM peak hour HCS results show the Proposed Action will not cause any additional freeway segments to operate at a deficient LOS beyond those already operating at deficient levels in the No Action scenario. Incremental impacts to freeway speeds and densities from the Proposed Action to WSDOT's Highways of Statewide Significance will be focused on the SR 518 ramp terminals where NTP trips are highest and will benefit mainline operations by limiting queue spillback and providing additional vehicle capacity for future growth. The 2032/2037 No Action and Proposed Action HCS results are summarized in Table 12. Detailed HCS reports and freeway volumes are included in Attachment G.

Table 12: HCS Results Summary for PM Peak Hour

Facility	ID	Study Segments	Analyzed Type	Existing			2032 NA			2032 PA			2037 NA			2037 PA		
				LOS	Avg Speed (S, mph)	Avg Density (D, pc/mi/ln)	LOS	Avg Speed (S, mph)	Avg Density (D, pc/mi/ln)	LOS	Avg Speed (S, mph)	Avg Density (D, pc/mi/ln)	LOS	Avg Speed (S, mph)	Avg Density (D, pc/mi/ln)	LOS	Avg Speed (S, mph)	Avg Density (D, pc/mi/ln)
Sub Area A – SR 518 EB	A1	EB SR 518 from SR 509 NB Off Ramp to DMM EB off Ramp	Weaving	B	56.1	13.5	C	46.0	21.1	C	45.2	22.0	C	45.4	22.9	C	44.4	24.4
	A2	EB SR 518 from DMM EB off Ramp to DMM Interchange	Basic	B	64.0	17.0	C	63.0	20.4	C	62.9	20.7	C	62.1	22.3	C	61.5	23.2
Sub Area B – SR 518 WB	B1	WB SR 518 from DMM Undercrossing to Diverge Influence Point	Basic	C	60.0	19.7	C	57.2	26.0	D	55.9	27.9	D	54.0	30.4	D	51.4	33.8
	B2	WB SR 518 from DMM Diverge Influence Point to SR 509 NB On Ramp	Diverge	B	50.5	23.6	C	50.4	29.9	C	50.4	31.2	C	50.2	33.1	C	50.2	35.0
Sub Area C – SR 518 EB /I-5 & I-405 NB	C1	EB SR 518 from 51st St Off Ramp to I-5 NB Off Ramp	Basic (Drop)	E	38.8	38.0	E	35.3	43.7	F	34.5	45.0	F	34.5	45.0	F	34.5	45.0
	C2	EB SR 518 from I-5 NB Off Ramp to I-5 SB Off Ramp	Basic (Drop)	F	34.5	45.0	F	34.5	45.0	F	34.5	45.0	F	34.5	45.0	F	34.5	45.0
	C3	NB I-405 from I-5 SB Off Ramp to I-5 SB On Ramp	N/A[1] (Skipped)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	C4	NB I-405 from I-5 SB On Ramp to I-5 NB On Ramp	Basic (Add)[2]	F	34.5	45.0	F	44.5	45.0	F	44.5	45.0	F	44.5	45.0	F	44.5	45.0
	C5	NB I-405 from I-5 NB On Ramp to Southcenter Pkwy	Basic (Add)[2]	F	34.5	45.0	F	44.5	45.0	F	44.5	45.0	F	44.5	45.0	F	44.5	45.0
Sub Area D – SR 518 WB/ I-5 & I-405 SB	D1	SB I-405 from Interurban Ave S 3-Lane Start Point to I-5 NB Off/Southcenter Off Ramp	Basic (Drop)[2]	F	34.5	45.0	F	34.5	45.0	F	34.5	45.0	F	34.5	45.0	F	34.5	45.0
	D2	SB I-405 from I-5 NB Off Ramp to I-5 NB On Ramp	Basic	F	34.5	45.0	F	34.5	45.0	F	34.5	45.0	F	34.5	45.0	F	34.5	45.0
	D3	SB I-405 from I-5 NB On Ramp to I-5 SB Off Ramp	Weaving	F	26.8	83.2	F	26.3	83.2	F	26.4	82.9	F	26.7	81.7	F	26.8	81.4
	D4	WB SR 518 from I-5 SB Off Ramp to I-5 SB On Ramp	Basic	F	34.5	45.0	F	34.5	45.0	F	34.5	45.0	F	34.5	45.0	F	34.5	45.0
	D5	WB SR 518 from I-5 SB On Ramp to 51st St On Ramp	Basic (Add)	F	34.5	45.0	F	34.5	45.0	F	34.5	45.0	F	34.5	45.0	F	34.5	45.0
Sub Area E – I-5 SB	E1	SB I-5 at Southcenter Blvd/SR 518 Off Ramp Diverge Area	Major Diverge[2,3]	E	39.0	35.8	E	39.0	39.5	E	39.0	40.0	E	39.0	40.6	F	39.0	31.5
	E2	SB I-5 from Southcenter Blvd/SR 518 Off Ramp to I-405 NB Off Ramp	Basic (Drop)[2]	E	39.0	35.1	E	39.0	39.4	E	39.0	39.4	E	39.0	40.1	F	20.6	69.5
	E3	SB I-5 from I-405 NB Off Ramp to I-405 SB On Ramp	Basic	E	39.0	37.4	F	20.0	71.9	F	20.0	71.9	F	20.0	71.9	F	20.0	71.9
	E4	SB I-5 from I-405 SB On Ramp to Klickitat SB On Ramp	Basic (Add)[2]	F	27.7	49.8	F	18.1	76.6	F	18.1	76.6	F	18.0	76.8	F	18.0	76.8
	E5	SB I-5 at Klickitat SB On Ramp Merge Area	Merge[2]	F	24.3	63.3	F	23.9	64.4	F	23.9	64.4	F	23.8	64.6	F	23.8	64.6
	E6	SB I-5 from Klickitat SB On Ramp Merge Area to 188th St SB Off Ramp Diverge Area	Basic[2]	F	27.4	58.7	F	39.5	45.0	F	39.5	45.0	F	39.5	45.0	F	39.5	45.0
	E7	SB I-5 at 188th St SB Off Ramp Diverge Area	Diverge[2]	F	27.0	57.9	F	50.3	28.2	F	50.3	28.2	F	50.1	28.4	F	50.1	28.4
	E8	SB I-5 from 188th St SB Off Ramp Diverge Area to Lane Reduction Point	Basic[2]	F	16.5	79.5	F	50.8	27.5	F	50.9	27.3	F	51.4	26.3	F	51.4	26.2
	E9	SB I-5 from Lane Reduction Point to 188th St SB On Ramp	Basic[2]	F	19.9	77.9	F	22.7	71.9	F	22.7	71.9	F	22.7	71.9	F	22.7	71.9
	E10	SB I-5 at 188th St SB On Ramp Merge Area	Merge[2]	F	31.6	55.7	F	57.3	33.1	F	57.3	33.1	F	57.1	33.8	F	57.0	33.8
	E11	SB I-5 from 188th St SB On Ramp Merge Area to 200th St SB Off Ramp Diverge Area	Overlap[2]	F	29.4	58.7	F	57.3	33.1	F	57.3	33.1	F	57.1	33.8	F	57.0	33.8
	E12	SB I-5 at 200th St SB Off Ramp Diverge Area	Diverge[2]	F	29.4	58.7	F	60.0	31.1	F	60.0	31.1	F	59.8	31.2	F	59.7	31.2
	E13	SB I-5 from 200th St SB Off Ramp to 200th St SB On Ramp	Basic[2]	F	23.0	70.0	F	32.0	51.6	F	33.4	49.5	F	33.4	48.9	F	34.4	47.5
	E14	SB I-5 at 200th St SB On Ramp Merge Area	Merge[2]	F	31.3	58.0	F	32.3	56.3	F	32.5	55.8	F	32.6	55.6	F	33.0	55.1
Sub Area F – I-5 NB	F1	NB I-5 at Military Rd NB Off Ramp Diverge Area	Diverge[2]	C	61.3	24.5	C	61.7	21.3	C	61.7	21.7	C	61.7	20.5	C	61.7	20.9
	F2	NB I-5 from Military Rd NB Off Ramp to Military Rd NB On Ramp	Basic[2]	C	61.7	22.9	C	63.9	19.5	C	63.7	19.9	C	64.4	18.4	C	64.2	18.8
	F3	NB I-5 at Military Rd NB On Ramp Merge Area	Merge[2]	C	59.1	26.2	C	59.4	24.0	C	59.3	24.5	C	59.5	23.3	C	59.5	23.7
	F4	NB I-5 from Military Rd NB On Ramp to 188th St NB Off Ramp	Basic[2]	C	59.2	26.0	C	61.5	23.2	C	61.1	23.7	C	62.1	22.3	C	61.7	22.8
	F5	NB I-5 at 188th St NB Off Ramp Diverge Area	Diverge[2]	D	62.5	24.6	C	62.4	22.8	C	62.3	23.2	C	62.2	22.3	C	62.3	22.6
	F6	NB I-5 from 188th St NB Off Ramp to 188th St NB On Ramp	Basic[2]	C	62.2	22.2	C	64.0	19.3	C	63.7	19.8	C	64.4	18.3	C	64.3	18.7
	F7	NB I-5 at 188th St NB On Ramp Merge Area	Merge[2]	D	58.2	29.1	D	58.3	27.6	D	58.2	28.2	D	58.1	27.5	D	58.0	28.1
	F8	NB I-5 from 188th St NB On Ramp to Southcenter Pkwy Off Ramp	Basic[2]	D	55.5	30.4	D	57.7	27.8	D	56.9	28.7	D	58.1	27.3	D	57.3	28.3
	F9	NB I-5 at Southcenter Pkwy Off Ramp Diverge Area	Diverge[2]	C	62.1	27.2	C	62.0	25.9	C	61.9	26.4	C	61.8	25.7	C	61.8	26.2
	F10	NB I-5 from Southcenter Pkwy Off Ramp to SR 518 WB/I-405 EB Off Ramp	Basic[2]	C	59.8	25.3	C	61.9	22.6	C	61.4	23.3	C	62.4	21.9	C	62.0	22.5
	F11	NB I-5 at SR 518 WB/I-405 EB Off Ramp Diverge Area	Major Diverge[2,3]	C	57.1	26.5	C	57.1	24.5	C	57.1	25.0	C	57.1	23.9	C	57.1	24.4
	F12	NB I-5 from SR 518 WB/I-405 EB Off Ramp to I-405 WB HOV On Ramp	Basic	B	65.0	16.3	B	65.0	14.6	B	65.0	14.8	B	65.0	13.6	B	65.0	13.8
	F13	NB I-5 from I-405 WB HOV On Ramp to I-405 WB On Ramp	Basic	B	65.0	13.4	B	65.0	12.3	B	65.0	12.4	B	65.0	11.5	B	65.0	11.7
	F14	NB I-5 at I-405 WB On Ramp Merge Area	Merge	B	60.5	19.6	B	60.9	17.8	B	60.8	17.9	B	60.9	17.1	B	60.9	17.3
	F15	NB I-5 from SR 518 EB On Ramp to Southcenter Blvd NB On Ramp	Basic (Add)[2]	B	64.5	18.0	B	64.7	17.4	B	64.6	17.8	B	64.7	17.6	C	64.5	18.2
	F16	NB I-5 at Southcenter Blvd NB On Ramp Merge Area	Merge[2]	B	59.9	17.9	B	60.0	17.6	B	59.9	17.9	C	59.8	18.1	C	59.7	18.6

Note:
Distance rounded to nearest 10.
[1]- One-lane freeway mainline cannot be analyzed in HCS.
[2]- HOV lane ignored due to the analysis constraint of HCS.
[3]- A major diverge area is one in which two primary roadways, each having multiple lanes, diverge from a single freeway segment. Major Diverge type analyzed as basic segment with Major Diverge checkbox checked. For major diverge areas, a model exists for computing the average density across all approaching freeway lanes within 1,500 ft of the diverge.
[4]- WSDOT Level of Service Standard for State Routes is LOS D.

6.2 Future Conditions VISSIM Analysis

The VISSIM model included the SR 518 mainline as well as on and off-ramps along the corridor from the east half of the Des Moines Memorial Drive interchange to the west half of the SR 518/I-5/I-405 interchange. The same extents of the SR 518 corridor modeled in existing conditions were modeled for the 2032 and 2037 No Action and Proposed Action scenarios.

6.2.1 Improvement Projects and Boundary Conditions

Queuing conditions for the SR 518 off-ramps were replicated in the 2032 and 2037 No Action VISSIM models by incorporating queueing information from the intersection corridor analysis conducted in SimTraffic. This analysis showed two off ramps would likely have queue spillback to the SR 518 mainline if the existing ramp terminal intersection control was maintained. These two locations are discussed below:

- SR 518 Westbound Off-Ramp to S 154th Street: The westbound off-ramp to S 154th Street operates as a stop-controlled intersection for the northbound off-ramp approach with an existing LOS E which does not meet WSDOT's LOS standard. Without future improvements the westbound off-ramp would operate at LOS F in the 2032 and 2037 No Action conditions and would have queues continue to build that would impact westbound SR 518 mainline operations. A boundary condition was added to the VISSIM model at the end of the off-ramp to replicate queuing conditions observed in the No Action SimTraffic models.
- SR 518 Eastbound Off-Ramp to 51st Avenue S: The eastbound off-ramp to 51st Avenue S operates as a stop-controlled intersection for the eastbound off-ramp approach with an existing LOS C. Queues from the SimTraffic corridor model showed queues from the eastbound left turn movement could spill out of the existing storage and block throughput for the eastbound right turn movement. The right turn movement has forecasted volumes of 660 PM peak hour trips in the 2032 No Action and 690 PM peak hour trips in the 2037 No Action scenarios. When blocked by the eastbound left turn queue, the queue for the eastbound off-ramp would spill back to the gore point of the SR 518 mainline. Although this did not block any mainline lanes, it had a small impact on mainline operations because of vehicles slowing earlier than expected.

In addition to the off-ramp boundary conditions added to the VISSIM model, the boundary condition from eastbound SR 518 to northbound I-405 was adjusted to account for future planned improvements. The I-405 Renton to Bellevue Widening and Express Toll Lanes Project is expected to improve mainline speeds and throughput on northbound I-405 during the PM peak hour. This project would therefore also reduce the impact of the existing boundary condition included in the existing NTP SR 518 VISSIM model. However, discussion with WSDOT indicated that complete removal of the boundary condition would not be appropriate as the single lane from eastbound SR 518 to northbound I-405 would remain as-is today and would still have physical constraints associated with its curvature and the speeds at which drivers felt comfortable driving. To verify, throughput for the single lane from eastbound SR 518 to northbound I-405 was reviewed for all hours of a typical weekday using WSDOT's permanent counter data at NB I-405 Milepost 0.11. The data showed a 95th-percentile 15-minute flowrate of 470 vehicles across all hours of a typical weekday—equivalent to a flowrate of approximately 1,880 vehicles per hour. Using the 95th-percentile of throughput over an entire weekday as the basis for the future boundary condition would improve operations because it represents existing conditions where northbound I-405 congestion spillback has less impact on eastbound SR 518 operations outside of the PM peak hour. The boundary condition in the 2032 No Action VISSIM model was adjusted to replicate the 95th-percentile throughput

which resulted in an increase of the average speed at the eastern extents of the VISSIM model to approximately 32 mph for the 4-6 PM peak period. This represented an approximately 9 mph increase in the average speed at the eastern extents of the model compared to existing conditions (23 mph). Figure 4 summarizes the speed vs. volume plot at the eastern boundary condition using WSDOT data.

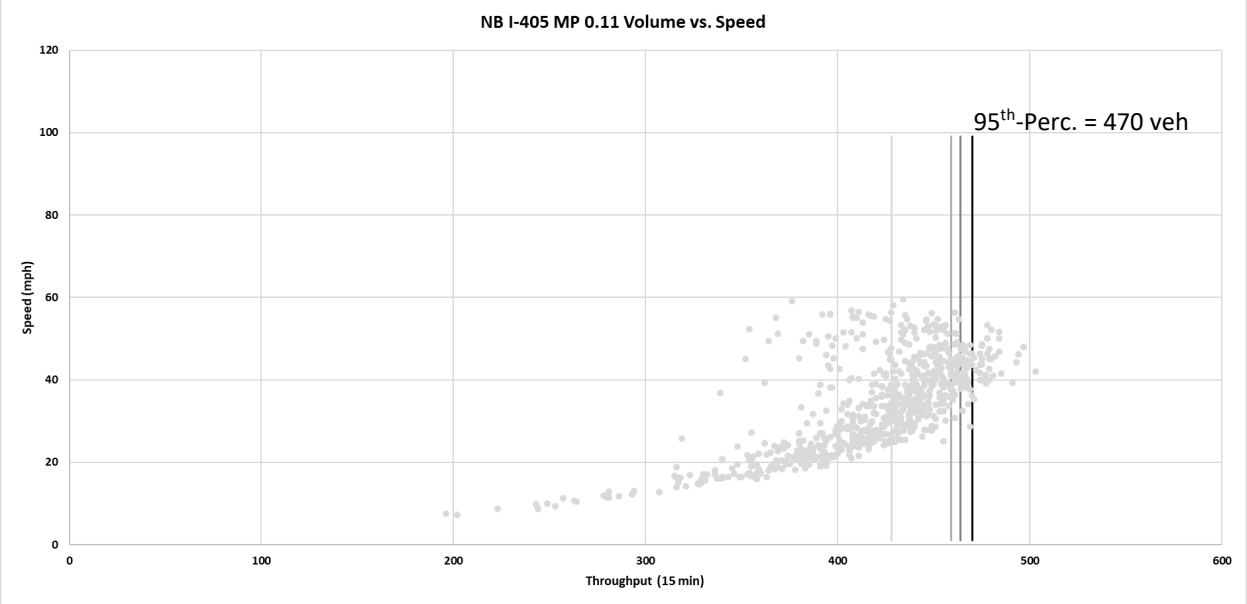


Figure 4: Eastbound SR 518 Boundary Condition Data

The future NTP SR 518 VISSIM models also included the addition of the Tukwila International Boulevard Station (TIBS) in the median of SR 518 east of the International Boulevard overpass. This station is planned to be constructed as part of Sound Transit's S1 bus rapid transit line. Preliminary conceptual striping plans were provided to change gore points for existing on and off ramps as well as include the extents of bus-only diverge and merge points in the model.

Corridor Travel Times

Travel time results were evaluated in the 2032 and 2037 VISSIM models for the same routes analyzed in the existing conditions. The travel time results are summarized in Tables 13 and 14.

ID		#	Distance [mi]	Description		2022 Existing [min]		Future Scenario									
								2032 No Action [min]		2032 Proposed Action [min]				2032 Proposed Action Mitigated [min]			
				From	To	4-5 PM	5-6 PM	4-5 PM	5-6 PM	4-5 PM	Δ No Action	5-6 PM	Δ No Action	4-5 PM	Δ No Action	5-6 PM	Δ No Action
Eastbound	EB1	11	1.8	EB SR 518 e/o Ramp to SB NAE	EB SR 518 to NB I-5 Ramp	2.2	2.5	2.3	2.5	2.5	0.2	2.8	0.3	2.5	0.2	2.8	0.3
	EB2	12	1.8	EB SR 518 e/o Ramp to SB NAE	EB SR 518 to NB I-405 Ramp	3.0	3.9	2.8	3.1	3.2	0.4	3.7	0.6	3.2	0.4	3.7	0.6
	EB3	13	1.8	EB SR 518 e/o Ramp to SB NAE	EB SR 518 to SB I-5 Ramp	2.4	2.9	2.4	2.7	2.7	0.3	3.1	0.4	2.7	0.3	3.2	0.5
	EB4	14	1.8	NB NAE On Ramp from S 160th Street	EB SR 518 to NB I-5 Ramp	2.6	3.1	2.8	3.0	3.0	0.2	3.6	0.6	3.0	0.2	3.6	0.6
	EB5	15	1.8	NB NAE On Ramp from S 160th Street	EB SR 518 to NB I-405 Ramp	3.4	4.5	3.3	3.6	3.7	0.4	4.6	1.0	3.7	0.4	4.6	1.0
	EB6	16	1.7	NB NAE On Ramp from S 160th Street	EB SR 518 to SB I-5 Ramp	2.8	3.5	2.9	3.2	3.2	0.3	3.9	0.7	3.2	0.3	3.9	0.7
	EB7	17	1.3	EB SR 518 On Ramp from International Blvd.	EB SR 518 to NB I-5 Ramp	1.9	2.2	2.2	2.2	2.2	0.0	2.3	0.1	2.2	0.0	2.3	0.1
	EB8	18	1.3	EB SR 518 On Ramp from International Blvd.	EB SR 518 to NB I-405 Ramp	2.5	3.1	2.5	2.6	2.7	0.2	2.8	0.2	2.7	0.2	2.8	0.2
	EB9	19	1.3	EB SR 518 On Ramp from International Blvd.	EB SR 518 to SB I-5 Ramp	1.9	2.2	2.1	2.2	2.2	0.1	2.3	0.1	2.2	0.1	2.3	0.1
Westbound	WB1	21	1.3	SB I-5 to WB SR 518 Ramp	WB SR 518 Off Ramp to International Blvd. (Loop)	1.7	1.7	1.7	1.7	3.0	1.3	5.8	4.1	1.7	0.0	1.7	0.0
	WB2	22	1.6	SB I-5 to WB SR 518 Ramp	WB SR 518 s/o S. 154th Street Overpass	1.7	1.7	1.7	1.7	1.9	0.2	2.8	1.1	1.7	0.0	1.7	0.0
	WB3	23	1.7	SB I-5 to WB SR 518 Ramp	SB NAE s/o S. 160th Street Overpass	2.1	2.1	2.1	2.1	2.6	0.5	4.2	2.1	2.1	0.0	2.1	0.0
	WB4	24	1.4	SB I-405 to WB SR 518 Ramp	WB SR 518 Off Ramp to International Blvd. (Loop)	2.0	2.0	2.0	2.0	3.5	1.5	6.6	4.6	2.0	0.0	2.0	0.0
	WB5	25	1.7	SB I-405 to WB SR 518 Ramp	WB SR 518 s/o S. 154th Street Overpass	2.0	2.0	2.0	2.0	2.4	0.4	3.5	1.5	2.0	0.0	2.0	0.0
	WB6	26	1.8	SB I-405 to WB SR 518 Ramp	SB NAE s/o S. 160th Street Overpass	2.4	2.4	2.4	2.4	3.1	0.7	5.0	2.6	2.4	0.0	2.4	0.0
	WB7	27	1.1	WB SR 518 On Ramp from 51st Ave S.	WB SR 518 Off Ramp to International Blvd. (Loop)	1.7	1.7	1.6	1.6	2.8	1.2	5.7	4.1	1.6	0.0	1.6	0.0
	WB8	28	1.4	WB SR 518 On Ramp from 51st Ave S.	WB SR 518 s/o S. 154th Street Overpass	1.6	1.6	1.6	1.6	1.8	0.2	2.4	0.8	1.7	0.1	1.7	0.1
	WB9	29	1.5	WB SR 518 On Ramp from 51st Ave S.	SB NAE s/o S. 160th Street Overpass	2.1	2.1	2.0	2.0	2.6	0.6	4.0	2.0	2.0	0.0	2.0	0.0

Table 13: Future VISSIM Travel Times (2032)

ID		#	Distance [mi]	Description		2022 Existing [min]		Future Scenario									
								2037 No Action [min]		2037 Proposed Action [min]				2037 Proposed Action Mitigated [min]			
				From	To	4-5 PM	5-6 PM	4-5 PM	5-6 PM	4-5 PM	Δ No Action	5-6 PM	Δ No Action	4-5 PM	Δ No Action	5-6 PM	Δ No Action
Eastbound	EB1	11	1.8	EB SR 518 e/o Ramp to SB NAE	EB SR 518 to NB I-5 Ramp	2.2	2.5	2.4	2.6	2.9	0.5	3.3	0.7	2.9	0.5	3.3	0.7
	EB2	12	1.8	EB SR 518 e/o Ramp to SB NAE	EB SR 518 to NB I-405 Ramp	3.0	3.9	2.9	3.3	3.7	0.8	4.2	0.9	3.7	0.8	4.2	0.9
	EB3	13	1.8	EB SR 518 e/o Ramp to SB NAE	EB SR 518 to SB I-5 Ramp	2.4	2.9	2.5	2.9	3.2	0.7	3.7	0.8	3.2	0.7	3.7	0.8
	EB4	14	1.8	NB NAE On Ramp from S 160th Street	EB SR 518 to NB I-5 Ramp	2.6	3.1	3.0	3.4	3.9	0.9	5.0	1.6	3.9	0.9	4.9	1.5
	EB5	15	1.8	NB NAE On Ramp from S 160th Street	EB SR 518 to NB I-405 Ramp	3.4	4.5	3.4	4.1	4.6	1.2	5.9	1.8	4.6	1.2	5.8	1.7
	EB6	16	1.7	NB NAE On Ramp from S 160th Street	EB SR 518 to SB I-5 Ramp	2.8	3.5	3.0	3.6	4.1	1.1	5.4	1.8	4.1	1.1	5.3	1.7
	EB7	17	1.3	EB SR 518 On Ramp from International Blvd.	EB SR 518 to NB I-5 Ramp	1.9	2.2	2.2	2.3	2.3	0.1	2.4	0.1	2.3	0.1	2.4	0.1
	EB8	18	1.3	EB SR 518 On Ramp from International Blvd.	EB SR 518 to NB I-405 Ramp	2.5	3.1	2.5	2.7	2.8	0.3	2.9	0.2	2.8	0.3	2.9	0.2
	EB9	19	1.3	EB SR 518 On Ramp from International Blvd.	EB SR 518 to SB I-5 Ramp	1.9	2.2	2.2	2.3	2.3	0.1	2.4	0.1	2.3	0.1	2.4	0.1
Westbound	WB1	21	1.3	SB I-5 to WB SR 518 Ramp	WB SR 518 Off Ramp to International Blvd. (Loop)	1.7	1.7	2.8	5.3	4.4	1.6	7.6	2.3	1.7	-1.1	1.7	-3.6
	WB2	22	1.6	SB I-5 to WB SR 518 Ramp	WB SR 518 s/o S. 154th Street Overpass	1.7	1.7	1.9	3.0	2.5	0.6	4.5	1.5	1.7	-0.2	1.7	-1.3
	WB3	23	1.7	SB I-5 to WB SR 518 Ramp	SB NAE s/o S. 160th Street Overpass	2.1	2.1	2.5	4.3	3.5	1.0	6.1	1.8	2.1	-0.4	2.1	-2.2
	WB4	24	1.4	SB I-405 to WB SR 518 Ramp	WB SR 518 Off Ramp to International Blvd. (Loop)	2.0	2.0	3.2	6.4	5.3	2.1	9.8	3.4	2.0	-1.2	2.0	-4.4
	WB5	25	1.7	SB I-405 to WB SR 518 Ramp	WB SR 518 s/o S. 154th Street Overpass	2.0	2.0	2.2	3.8	3.3	1.1	6.4	2.6	2.0	-0.2	2.0	-1.8
	WB6	26	1.8	SB I-405 to WB SR 518 Ramp	SB NAE s/o S. 160th Street Overpass	2.4	2.4	2.9	5.2	4.4	1.5	8.2	3.0	2.4	-0.5	2.4	-2.8
	WB7	27	1.1	WB SR 518 On Ramp from 51st Ave S.	WB SR 518 Off Ramp to International Blvd. (Loop)	1.7	1.7	2.6	5.3	4.2	1.6	6.7	1.4	1.7	-0.9	1.7	-3.6
	WB8	28	1.4	WB SR 518 On Ramp from 51st Ave S.	WB SR 518 s/o S. 154th Street Overpass	1.6	1.6	1.8	2.6	2.2	0.4	3.2	0.6	1.7	-0.1	1.7	-0.9
	WB9	29	1.5	WB SR 518 On Ramp from 51st Ave S.	SB NAE s/o S. 160th Street Overpass	2.1	2.1	2.5	4.1	3.4	0.9	5.4	1.3	2.0	-0.5	2.0	-2.1

Table 14: Future VISSIM Travel Times (2037)

The Port is proposing to construct a signal at the SR 518 westbound off-ramp to S 154th Street as mitigation (see Intersection #33 in Section 4.3.3). This signal will improve queuing conditions and prevent spillback of queues to the westbound SR 518 mainline. The boundary condition included in the No Action and Proposed Action models at this location was removed for the Proposed Action + Mitigation VISSIM models. Construction of the signal is expected to improve westbound travel times by up to 4.4 minutes in the 2037 PM peak hour compared to the 2037 No Action conditions.

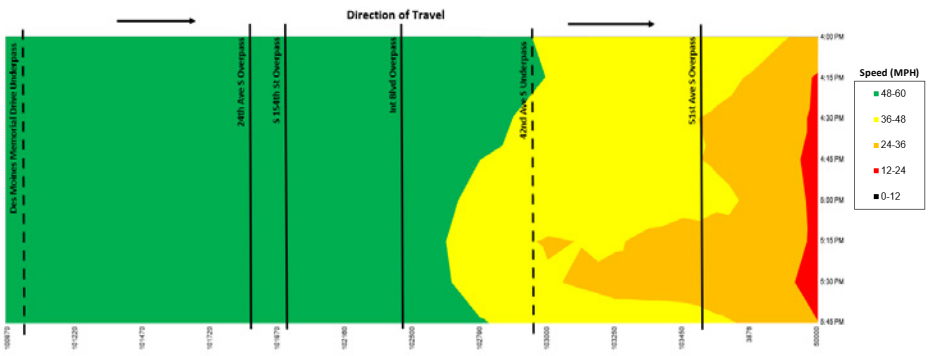
The eastbound direction shows more congestion than westbound because of the existing and future bottlenecks at the SR 518/I-5/I-405 interchange. The single lane from eastbound SR 518 to northbound I-405 will remain and limit vehicle throughput as discussed earlier. This will cause congestion to spill back from the SR 518/I-5/I-405 interchange back to International Boulevard and NAE. Eastbound SR 518 mainline travel times from west of International Boulevard to the SR 518/I-5/I-405 interchange are expected to increase by less than 1 minute between No Action and Proposed Action in both 2032 and 2037. This increase is well within the current range of existing travel times (approximately 2-8 minutes). Eastbound travel times from the International Boulevard on ramp to the SR 518/I-5/I-405 interchange are expected to increase by less than 30 seconds. The travel time from S 160th Street to the SR 518/I-5/I-405 interchange will see the highest increase of travel time of approximately 1-2 minutes which is still within the current range of existing travel times (2-6 minutes).

Corridor Speeds

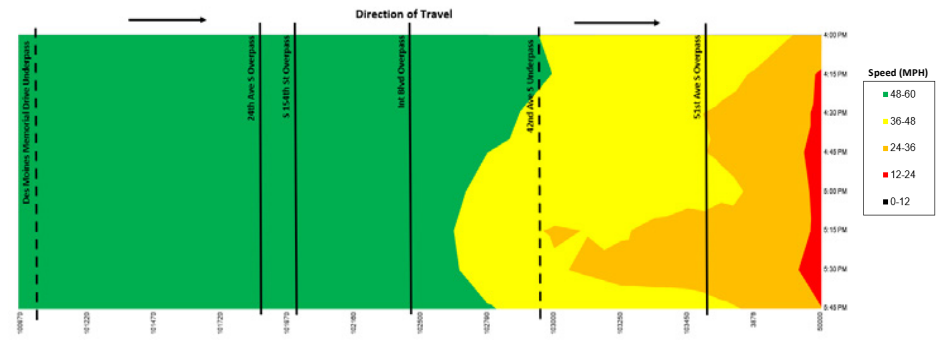
Speed-temporal maps for the entire VISSIM model extents were developed. These speed-temporal maps showed similar trends to the existing conditions with westbound showing near free-flow operations after improvements are implemented and eastbound being constrained by the existing SR 518/I-5/I-405 interchange. There is increased congestion near the eastbound on ramps from NAE and International Boulevard in the 2037 Proposed Action scenario beginning around 4:30 PM, however, this merging congestion is expected to nearly subside by 6 PM and is therefore only expected to occur during peak-of-peak time periods. As noted previously, this congestion is only expected to add 0-1 minutes of travel time for trips on eastbound SR 518 and 1-2 minutes of travel time for trips on northbound NAE. Figures 5 and 6 show the comparison of No Action and Proposed Action scenarios for 2032 and 2037.

Figure 5: 2032 and 2037 SR 518 Eastbound Speed-Temporal Maps

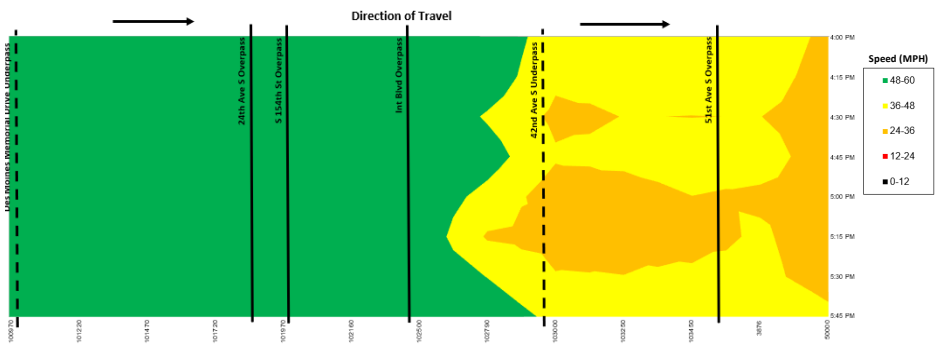
2022 Existing, Eastbound PM Peak Hour



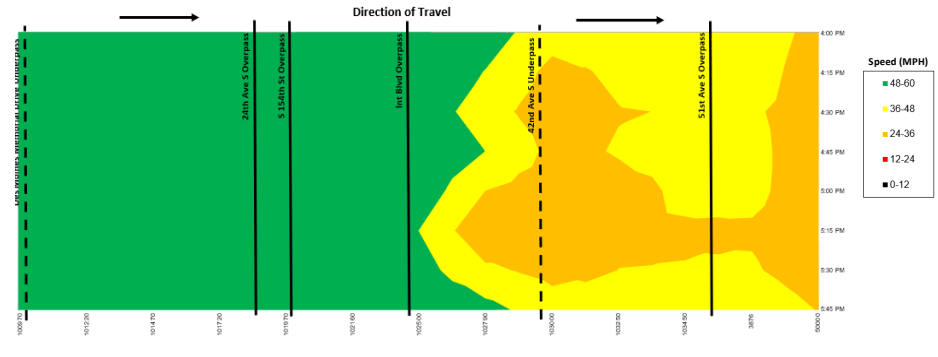
2022 Existing, Eastbound PM Peak Hour



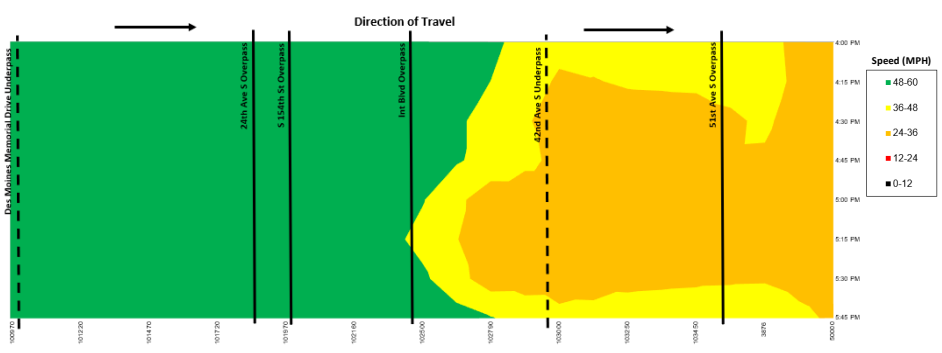
2032 No Action, Eastbound PM Peak Hour



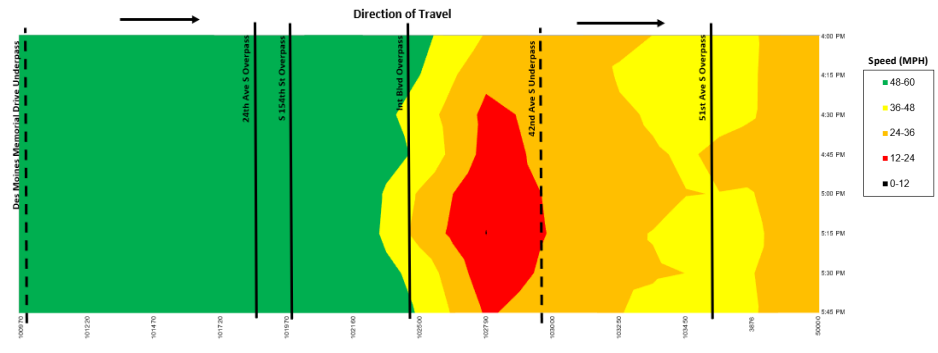
2037 No Action, Eastbound PM Peak Hour



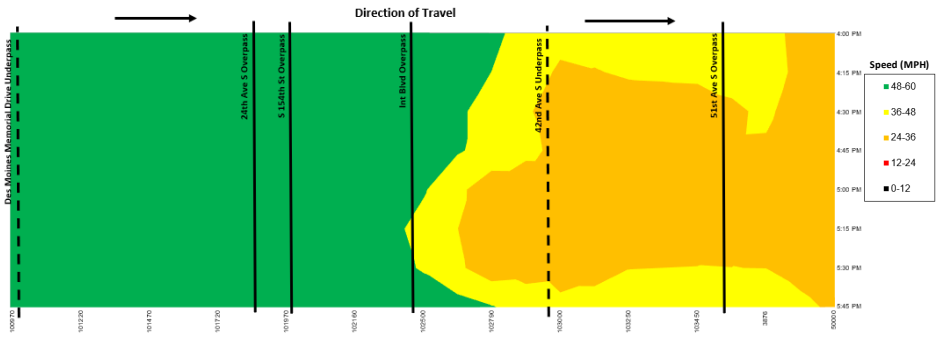
2032 Proposed Action, Eastbound PM Peak Hour



2037 Proposed Action, Eastbound PM Peak Hour



2032 Proposed Action + Mitigation, Eastbound PM Peak Hour



2037 Proposed Action + Mitigation, Eastbound PM Peak Hour

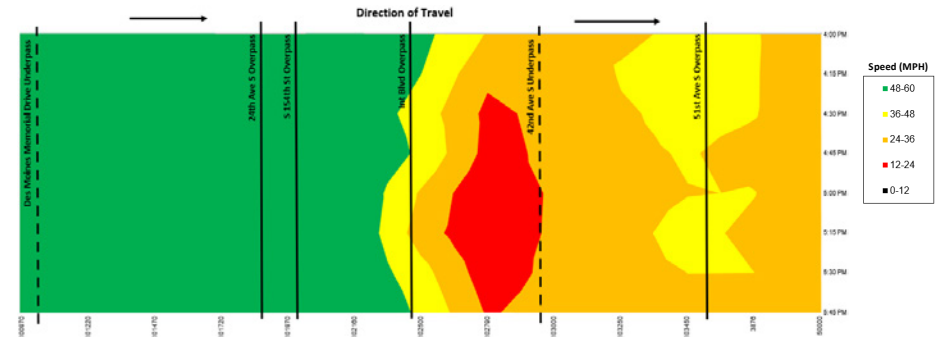
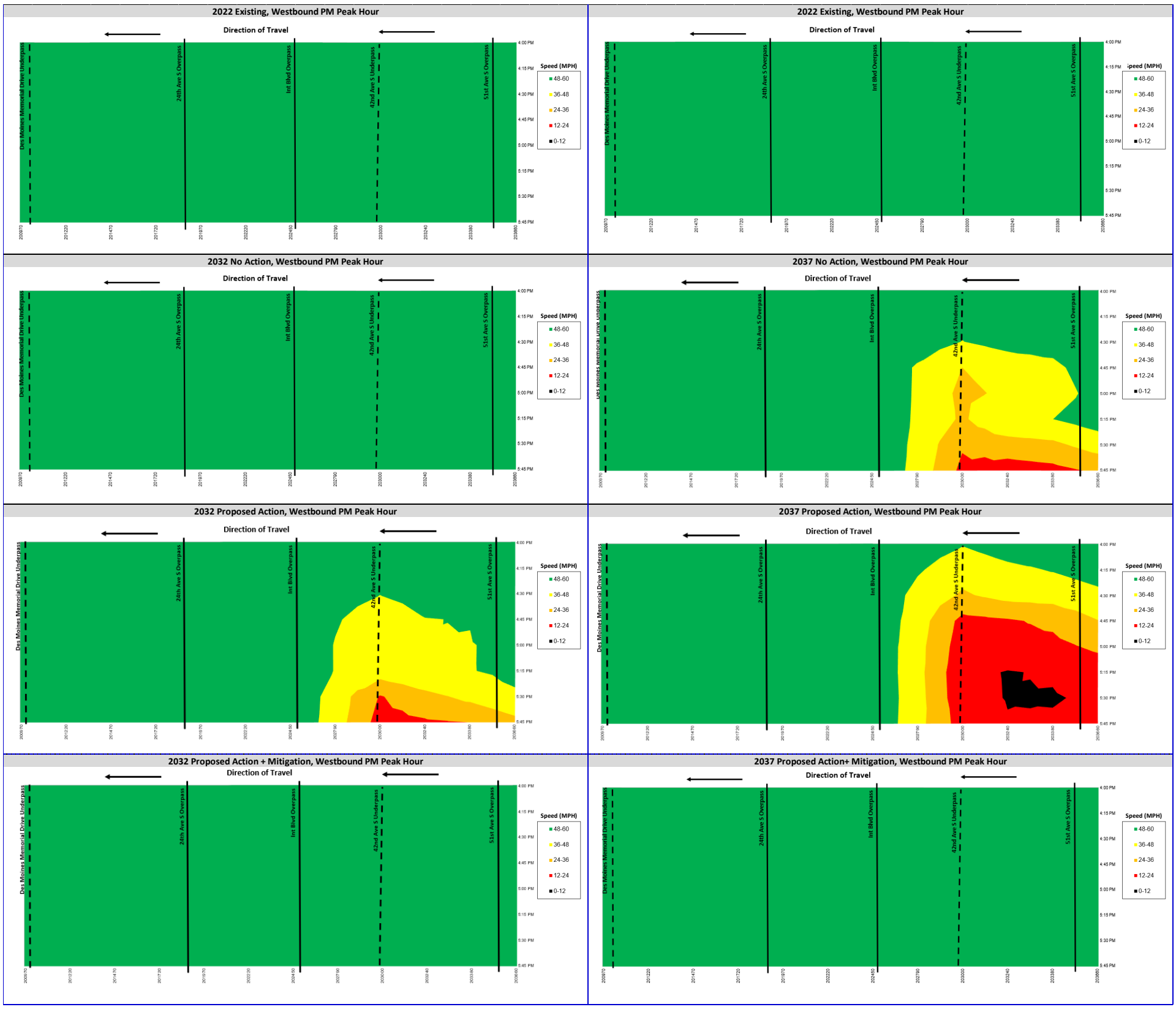


Figure 6: 2032 and 2037 SR 518 Westbound Speed-Temporal Maps



7. Mitigation Implementation

The Port is committed to implementing the mitigation triggered by the NTPs identified in this report. The mitigation proposed by the Port for each intersection will be required to be constructed prior to completion of the NTPs in 2032 even if intersections are not projected to fail mobility standards until 2037. The forecasts and mitigation in this report have been prepared so they can be used by local agencies and jurisdictions in their own planning efforts as well as a basis for mitigation coordination. The structure of the mitigation agreements between the Port and the jurisdictions and agencies identified in this report will be formalized through a written agreement with each jurisdiction and agency. These agreements will be finalized prior to the issuance of the Finding of No Significant Impact/Record of Decision (FONSI/ROD) and will include the specific terms and mitigation requirements agreed to between the Port and the jurisdiction/agency.

The mitigation identified in this report can be separated into two categories—direct impacts by the NTPs that will be mitigated through capital improvements (shown in red in Figures 7 and 8) referred to as Category 1 locations in Section 4, and indirect or proportional impacts to facilities that are expected to fail mobility standards in the No Action condition prior to additional trips from NTPs (shown in yellow in Figures 7 and 8) referred to as Category 2 locations in Section 4. Details on the Port's proposed mitigation approach for these locations are summarized in Sections 7.1 and 7.2.

Figure 7 and Figure 8 summarize the mitigation type for each surface transportation facility in the 2032 and 2037 analysis years, respectively.

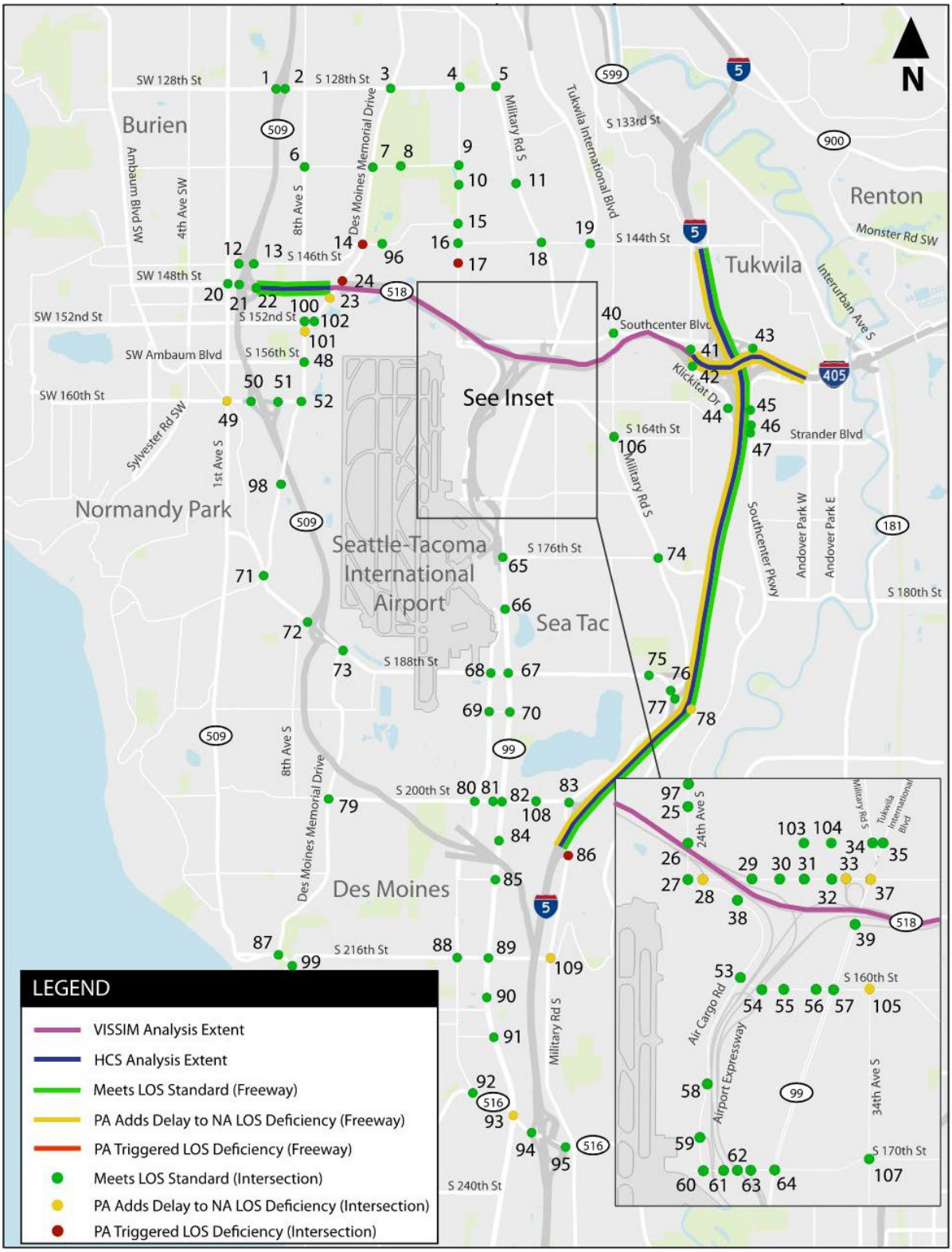


Figure 7: 2032 Surface Transportation LOS Summary

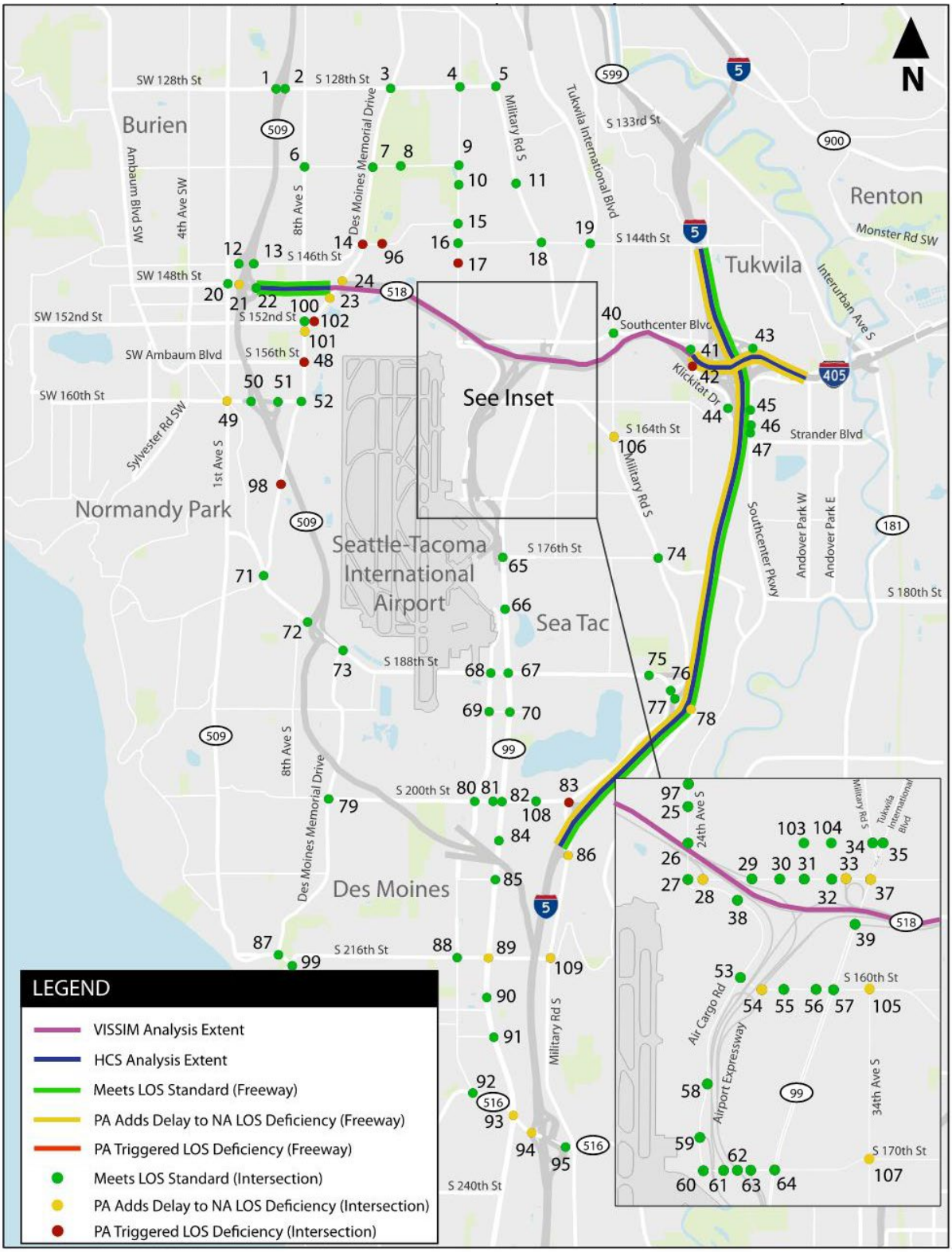


Figure 8: 2037 Surface Transportation LOS Summary

7.1 Category 1 - Direct Impacts

The NTPs have a direct impact on intersections failing local mobility standards at ten locations. The Port's proposed mitigation for each of these intersections are summarized by agency or jurisdiction in the following sections.

7.1.1 City of Burien

98: Des Moines Memorial Dr./S 168th Street – NTPs will add trips to the intersection and will require improvements to maintain a LOS C standard. Preliminary review of potential mitigation options identified signalizing the intersection as the most feasible option. Westbound channelization improvements would include construction of a dedicated left turn lane and a through-right lane. All left turns would be permissive. The Westside Trail will be maintained or improved and no change in access would occur with the proposed mitigation.

7.1.2 City of Des Moines

The NTPs do not trigger any Category 1 impacts at City of Des Moines study intersections.

7.1.3 City of SeaTac

14: Des Moines Memorial Dr./S 144th Street – NTPs will add trips to the intersection and will require improvements to the existing signalized intersection to maintain a LOS E standard. Preliminary review of potential mitigation options identified channelization improvements to the existing intersection that would widen east leg to provide a westbound left turn lane and widen the south leg to provide a northbound right turn lane. Additional modifications to the traffic signal to eliminate split phasing are also proposed. The mitigation will be designed to be consistent with the City of SeaTac's long-term improvement plan ST-024 from the City's Transportation Master Plan. The Westside Trail will be replaced in-kind or improved and no change in access would occur with the proposed mitigation.

17: 24th Avenue S/S 146th Street - NTPs will add trips to the intersection and will require improvements to the existing unsignalized intersection to maintain a LOS D standard. Preliminary review of potential mitigation options identified constructing a new signal as the most feasible mitigation option. The signal would utilize the existing channelization and would include a leading protected northbound left turn phase. Design for the proposed signal will include evaluation of required intersection footprint and sight distances to implement Flashing Yellow Arrows.

48: 8th Avenue S/S 156th Street – NTPs will add trips to the intersection and require improvements to the existing signal to maintain a LOS E standard. Preliminary review of potential mitigation options identified shifting southbound lanes west to add a dedicated southbound left and right turn lanes and a dedicated northbound left turn lane. With the additional turn lanes, the signal timing can be modified to utilize standard NEMA phasing with protected left turns on each approach. Design for the proposed signal will include evaluation of required intersection footprint and sight distances. Mitigation analysis did not include NBL and SBL flashing yellow arrows because of high northbound and southbound volume-to-capacity ratios as a conservative assumption. Inclusion of flashing yellow arrows would allow the intersection to operate more efficiently than what is identified in this report. Feasibility of flashing yellow

arrows can be evaluated prior to design and construction of the signal. The Westside Trail will be replaced in-kind or improved and no change in access would occur with the proposed mitigation.

96: 16th Avenue S/S 144th Street – NTPs will add trips to the intersection and will require improvements to the existing unsignalized intersection to maintain a LOS D standard. Preliminary review of potential mitigation options identified constructing an eastbound right turn lane as the most feasible mitigation option. Frontage improvements (including street and pedestrian lighting) will be designed to current City standards and in coordination with the City's planned improvement project ST-024.

102: S 152nd Street/Des Moines Memorial Dr. - NTPs will add trips to the intersection and require improvements to the existing unsignalized intersection to maintain a LOS E standard. The City of Burien has identified a potential roundabout to be constructed at the triangle formed by Des Moines Memorial Drive, 8th Avenue S, and S 152nd Street to consolidate the three intersections. No funding for design or construction was identified in the City of Burien's 2023-2028 TIP. The Port proposes constructing the roundabout that would consolidate the three intersections to mitigate LOS impacts. A single lane roundabout was analyzed for this analysis. The Westside Trail will be maintained or improved and no change in access would occur with the proposed mitigation. Future construction of roundabout will be designed to be compatible with the City of SeaTac's ST-029 improvement project as well. Construction of the roundabout to mitigate Category 1 impacts at intersection #102 would also eliminate the need for proportional mitigation for Category 2 impacts at intersection #101 in the City of Burien.

7.1.4 City of Tukwila

The NTPs do not trigger any Category 1 impacts at City of Tukwila study intersections.

7.1.5 WSDOT

24: SR 518 Westbound Off-Ramp/Des Moines Memorial Dr. – NTPs will add trips to the intersection and require improvements to the existing unsignalized intersection to maintain a LOS D standard. A preliminary ICE identified a roundabout as a feasible mitigation improvement. The roundabout would operate with a conceptual design of a single circulating lane, single lane northbound and southbound approaches, and a two-lane westbound approach. The Westside Trail will be replaced in-kind or improved and no change in access would occur with the proposed mitigation. Final design parameters, including those to accommodate the non-motorized trail on the east side of Des Moines Memorial Drive, will be validated in future analysis (ICE).

42: SR 518 Eastbound Off-Ramp/51st Avenue S – NTPs will add trips to the intersection and cause the intersection to exceed the LOS D standard. A preliminary ICE identified a signal as a feasible mitigation improvement until further analysis regarding the steep slopes near the intersection can confirm the feasibility of a single-lane roundabout. WSDOT declined constructed mitigation at the intersection and requested the cost of improvements be consolidated at other Category 2 intersections with higher delay impacts from NTP trips.

83: I-5 SB Ramps/Military Road S/S 200th Street – NTPs will add trips and increase delay to the intersection. Modifications to the existing signal timings could reduce the added average intersection delay to only 1.9 seconds per vehicle in the 2037 Proposed Actions, however the intersection would still operate at LOS E. Given the relatively small increase in delay from No Action to Proposed Action, WSDOT did not request

constructed mitigation at the intersection and noted signal timings will be optimized on regular intervals by WSDOT staff.

86: I-5 NB Ramps/Military Road S – NTPs will add trips and increase delay to the intersection. Modifications to the existing signal timings could completely mitigate the added delay for the 2032 Proposed Action Category 1 impact. NTPs would only add 1.2 seconds of average intersection delay per vehicle in the 2037 Proposed Action and would be a Category 2 impact. Given the relatively small increase in delay from No Action to Proposed Action, WSDOT did not request constructed mitigation at the intersection and noted signal timings will be optimized on regular intervals by WSDOT staff.

7.2 Category 2 - Proportional Impacts

The NTPs will add trips to many off-site intersections that are expected to fail LOS standards with or without the additional NTP trips. Outreach with local jurisdictions and agencies indicated that the Port would only be responsible for mitigating the delay caused by the NTPs for Category 2 impacts. Table 15 summarizes the Category 2 intersections by jurisdiction/agency and the proportionate share of future PM peak hour intersection volumes the NTP trips represent where a proportionate share payment was calculated. The Port is proposing to pay the equivalent 2037 percentage of design and construction costs for the Category 2 improvements assumed in the intersection analysis unless otherwise noted in the table for the cities of Burien, Des Moines, and SeaTac. The City of Tukwila does not have any Category 2 intersection impacts, therefore no mitigation is proposed. WSDOT requested that delay from NTP trips at intersections #21, 28, 37, 78, and 94 be consolidated through construction of Category 2 mitigation at intersections #23 and #33. The constructed Category 2 improvements will provide additional capacity beyond what is needed only to mitigate NTP trips at each intersection. This additional capacity will also accommodate future growth of volume on the highway system. Final review of proposed improvements at these locations will be reviewed through an ICE consistent with WSDOT Design Manual Chapter 1300 prior to design and construction.

Table 15: Category 2 Proposed Mitigation Summary

Jurisdiction/Agency and Intersection	2032 Port Proportionate Share	2037 Port Proportionate Share	Mitigation Method (Improvement)
City of Burien			
49 – 1st Ave S/SW 160th Street	1%	1%	Proportionate Share Payment of $15,000 (Corridor Improvements, TIP #22)
101 – 8th Ave S/Des Moines Memorial Dr	-	-	Constructed Improvements (Roundabout, See #102 Proposed Mitigation, Section 7.1.3)
City of Des Moines			
89 – Pacific Hwy S/S 216th St.	-	-	Consolidated Payment at Intersection #93
93 – Pacific Hwy S/SR 516	100 PM peak hour trips	135 PM peak hour trips	Per Trip Impact Fee totaling $1,032,940.35
City of SeaTac			
54 – Host Rd./S 160th St./SR 518 EB On-Ramp	-	-	Constructed Improvements (Signal)
101 – 8th Ave S/Des Moines Memorial Dr.	-	-	Constructed Improvements (Roundabout, See #102 Proposed Mitigation, Section 7.1.3)
105 – 34th Ave S/S 160th St	-	-	Constructed Improvements (Roundabout)
106 – Military Rd S/S 164th St/42nd Ave S	4%	4%	Proportionate Share Payment of $594,800 (Roundabout/Corridor, ST 116)
107 – 34th Ave S/S 170th St	-1%	1%	Proportionate Share Payment of $152,000 (Intersection/Corridor, ST 016)
109 – Military Rd S/S 216th St.	2%	2%	Proportionate Share Payment of $51,000 (Channelization, ST 140)
City of Tukwila			
No Category 2 Impacts	-	-	-
WSDOT			
21 – SR 509 SB Ramps/SW 148th St	3%	4%	Consolidated with Constructed Mitigation at Other Cat. 2 Intersections
23 – SR 518 EB Ramps/Des Moines Memorial Dr.	-	-	Constructed Improvements (Roundabout)
28 – SR 518 EB Ramps/S 154th St	1%	1%	Consolidated with Constructed Mitigation at Other Cat. 2 Intersections
33 – SR 518 WB Ramp (Loop)/S 154th St	-	-	Constructed Improvements (Signal)
37 – International Blvd/S 154th St	2%	2%	Consolidated with Constructed Mitigation at Other Cat. 2 Intersections
78 – NB I-5 Ramps/S 188th St	1%	1%	Consolidated with Constructed Mitigation at Other Cat. 2 Intersections
94 – SB I-5 Ramps/SR 516	3%	4%	Consolidated with Constructed Mitigation at Other Cat. 2 Intersections

Attachment A: WSP DTA Methods & Assumptions

SUSTAINABLE AIRPORT MASTER PLAN (SAMP)

Near Term Projects Traffic and Environmental Support

Dynamic Traffic Assignment (DTA) Modeling Documentation Summary

INTRODUCTION

The Port of Seattle is currently preparing an Environmental Review for the Sustainable Airport Master Plan (SAMP) Near Term Projects. The SAMP environmental team has determined that the most suitable traffic volume forecasts for use in the environmental review traffic analysis are those provided by the Dynamic Traffic Assignment (DTA) models developed as part of the recent WSDOT SR 518 Corridor Planning Study.

The DTA models from the SR 518 study were modified and updated to represent five distinct scenarios specific to the purposes of the SAMP environmental process (in order of model development):

- Existing 2019
- Future year 2027, with one airport terminal (No Action)
- Future year 2027, with two airport terminals (Proposed Action)
- Future year 2032, with one airport terminal (No Action)
- Future year 2032, with two airport terminals (Proposed Action)

The one airport terminal options reflect the main terminal only. The two airport terminal options include the main terminal and the proposed second airport terminal. The main terminal is referred to as terminal one (T1) and the proposed north terminal is referred to as terminal two (T2) within this document and preceding materials. The terminals' demand varies according to each scenario which is represented in the Terminal Traffic Forecasts as provided by the airport advance planning team.

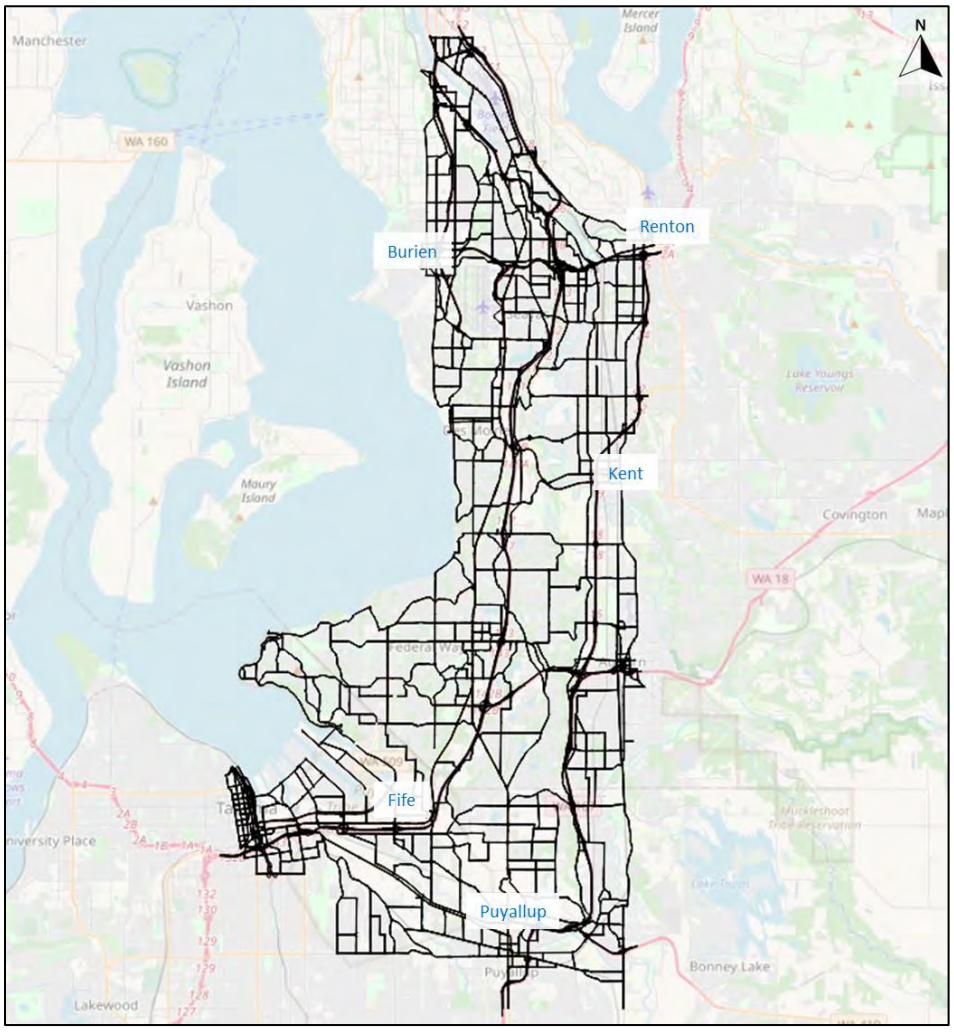
DTA MODEL BACKGROUND - PUGET SOUND GATEWAY PROGRAM

As part of the SR 167 and SR 509 Completion Projects for the Gateway Program, a dynamic traffic assignment (DTA) model based on INRO Dynameq software was developed to assess current and future traffic flow conditions for the I-5 corridor, SR 167 and SR 509 extensions, freeway ramp facilities, and nearby arterial intersections. This mesoscopic modeling platform was deemed suitable for the purposes of investigating corridor-level performance, route and pathway diversion, and the effects of segment-based facility tolling due to its blending of traffic assignment capabilities with the intersection/link operational analysis characteristics of traffic simulation tools thereby bridging the "gap" between the more commonly used macroscopic and microscopic paradigms. This model's base year was calibrated to 2015 traffic conditions. The model's network coverage and key freeway and arterial facilities are shown in Figure 1.

For the purposes of the Puget Sound Gateway Program, the future year models were developed to represent a near term horizon year of 2025 and a longer-range horizon of 2045. These two horizon years

were intended to capture an interim opening of Stage 1 elements and a full completion of Stage 2 elements, respectively.

Figure 1 DTA Model Network Coverage



EXISTING BASE YEAR (2019) MODEL REFINEMENTS

The original Puget Sound Gateway Program base year model was updated to reflect 2019 traffic conditions in the study area as shown in Figure 2. Key updates to the model network included

- Intersection and roadway geometry
- Model input demand
- Signal programs

The key screenlines used for volume comparison are shown in the Figure 3.

Figure 2 Study Area for Airport Traffic Influences

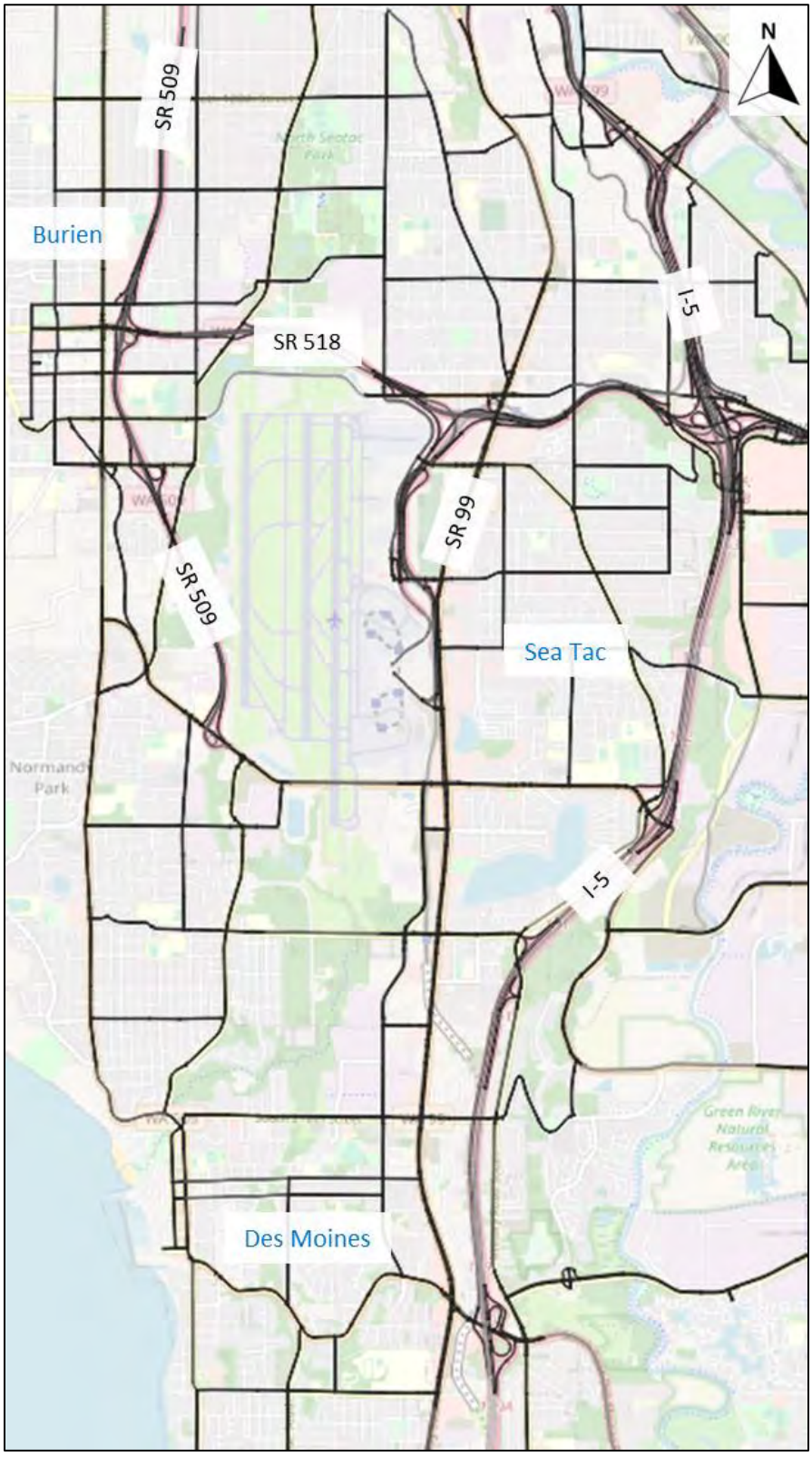
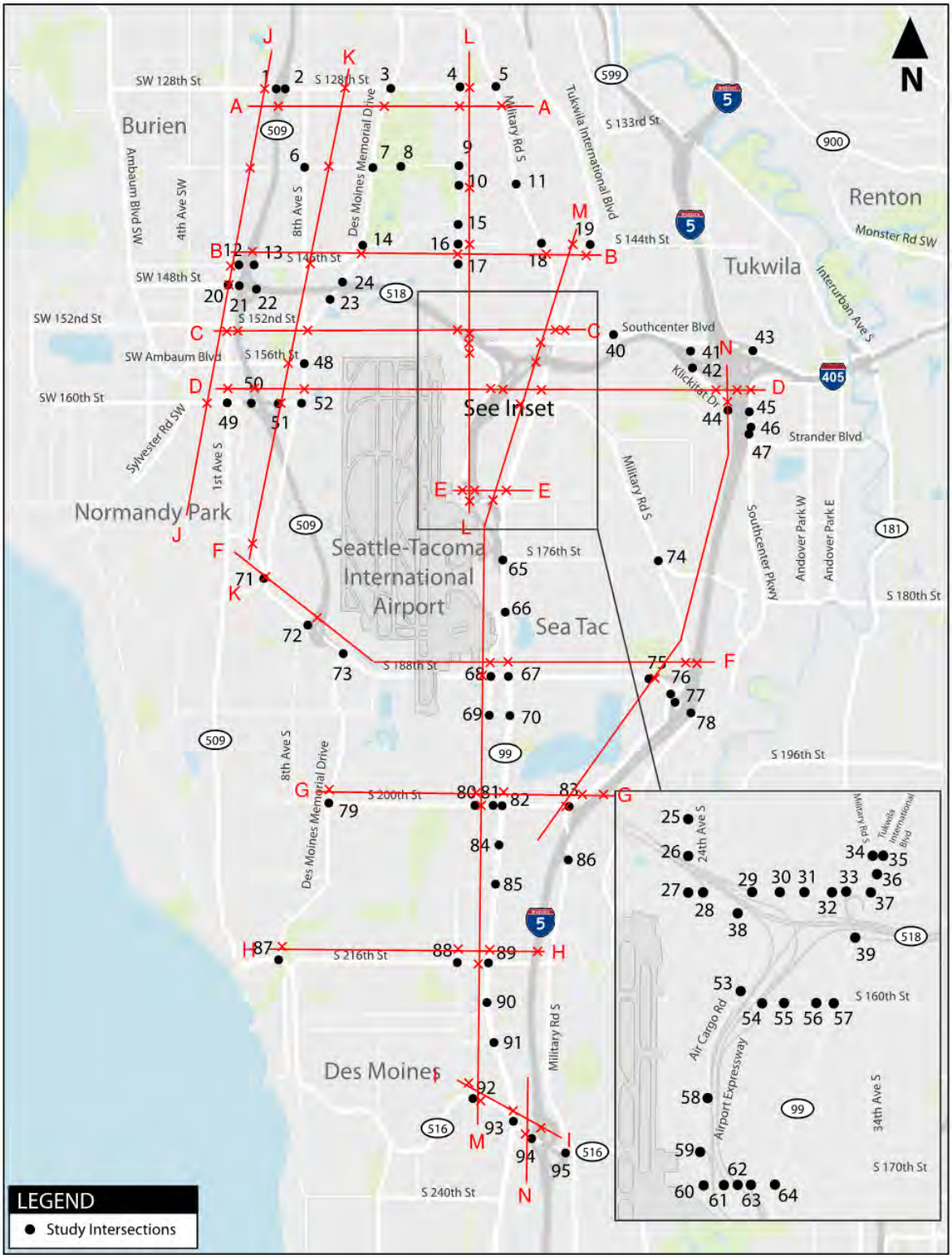


Figure 3 Screenlines and study intersections



DEMAND ADJUSTMENTS

The original DTA base year model reflected traffic demand calibrated to year 2015 conditions and showed lower demand of 50-55% along key screenlines when compared to 2019 traffic counts. In order to reflect more current 2019 traffic levels, the model input demand matrices were scaled by a factor of 1.25. The screenline volume comparison between the DTA model output and traffic counts is shown in Table 1.

Table 1 2019 Screenline PM peak hour volume comparison to 2019 traffic counts

NB/SB Screenlines		WSP's DTA Model	Concord's 2019 Count	Difference (to 2019 counts)	Difference (In Percent)
S of S 128th St	A	1075	1663	-588	-35%
	NB	387	759	-372	-49%
	SB	688	904	-216	-24%
N of S 144th St	B	1840	3366	-1526	-45%
	NB	668	1401	-733	-52%
	SB	1172	1965	-793	-40%
N of S 154th St/SR 518	C	1872	3846	-1974	-51%
	NB	566	1753	-1187	-68%
	SB	1306	2093	-787	-38%
N of S 160th St	D	5547	7658	-2111	-28%
	NB	2192	3488	-1296	-37%
	SB	3355	4170	-815	-20%
N of S 170th St	E	4955	6743	-1788	-27%
	NB	2669	3322	-653	-20%
	SB	2286	3421	-1135	-33%
N of S 188th St	F	4307	4455	-148	-3%
	NB	1393	1483	-90	-6%
	SB	2914	2972	-58	-2%
N of S 200th St	G	4990	4794	196	4%
	NB	988	1421	-433	-30%
	SB	3071	3152	-81	-3%
N of S 216th St	H	4059	4573	-514	-11%
	NB	988	1421	-433	-30%
	SB	3071	3152	-81	-3%
				Average	**-25%**

The above table shows that, on average, the screenline volumes between the updated DTA base year model and 2019 traffic count data were within a target validation threshold of 25 percent. This range is deemed reasonable to represent the scale of the study area, given the complexity and the breadth of the DTA model.

SUSTAINABLE AIRPORT MASTER PLAN (SAMP)

Sea-Tac's Sustainable Airport Master Plan (SAMP) is a long-term blueprint for airport development to meet the needs of the traveling public, while balancing three – often competing – elements: economic/financial, environmental and social impact. Four future year DTA models were created in line with the SAMP Near Term Projects environmental review horizon years and background terminal assumptions. These scenarios included the following:

- Future year 2027, with one airport terminal (No Action)
- Future year 2027, with two airport terminals (Proposed Action)
- Future year 2032, with one airport terminal (No Action)
- Future year 2032, with two airport terminals (Proposed Action)

FUTURE YEAR MODELS

As part of WSDOT's SR 518 Corridor Planning Study which was completed in mid-2020, the 2025 Gateway Program's Dynameq model was updated to represent 2030 traffic conditions. It encompassed the Sustainable Airport Master Plan (SAMP) elements, including the proposed second airport terminal (T2).

The future year regional growth rates were calculated based on Puget Sound Regional Council's (PSRC) Land Use Vision 2 (LUV 2). Table 2 and Table 3 show the future year growth rates for the study area and the entire model extends. For the purposes of demand changes in the DTA models to arrive at 2027- and 2032-year models, the Airport study area growth rate only is used.

Table 2 Future growth rates from PSRC LUV 2

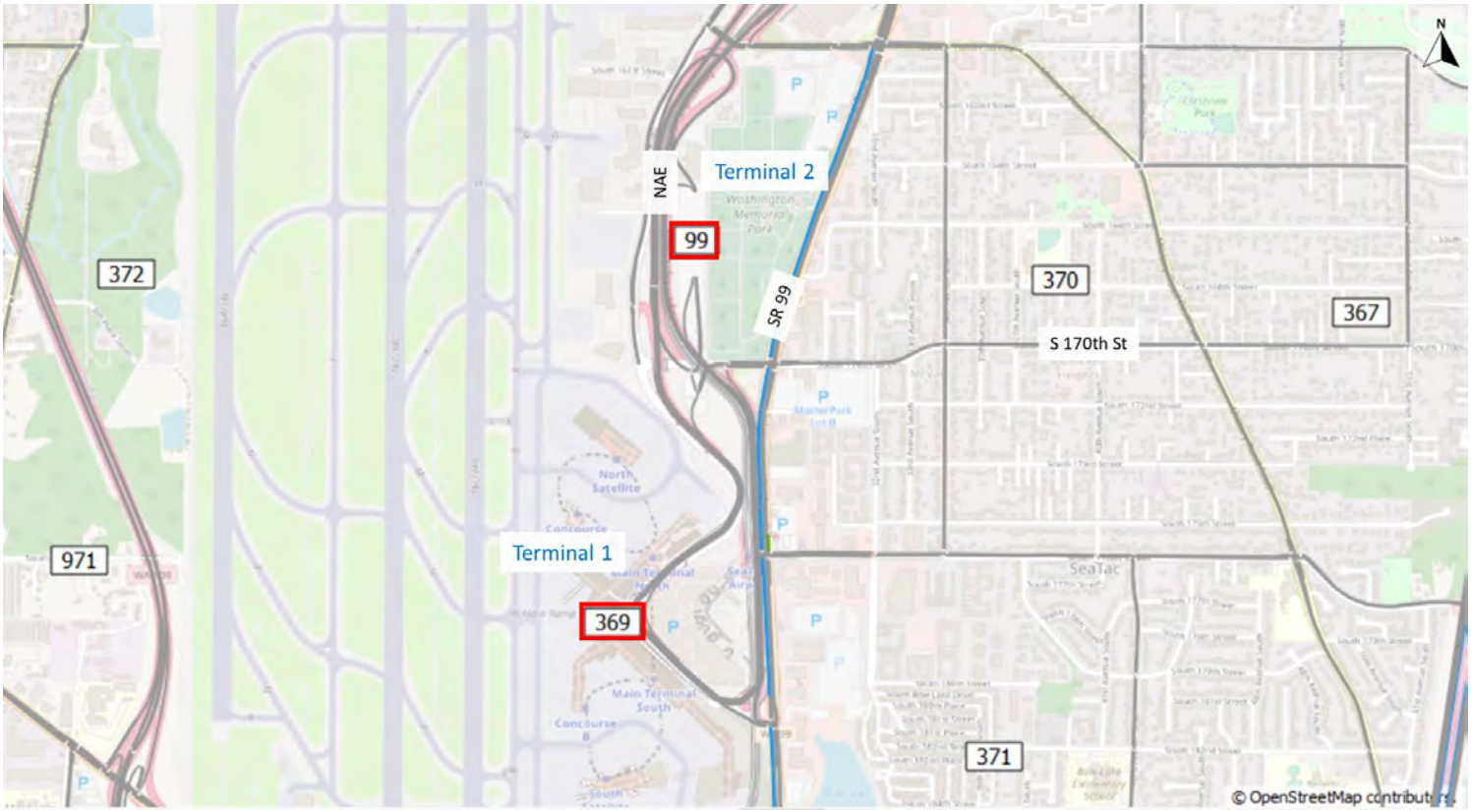
Years	Growth rate per year
	Airport study area
2025 to 2030	2.5%
2030 to 2040	2.2%

Table 3 Growth rates from PSRC LUV 2

PSRC's Land Use Vision 2 (LUV.2) Trip Ends - by year, mode and PA format									
Sea-Tac Aviation Planning Services IDIQ									
	Year 2015						Total		
	Productions			Attractions					
	Passenger	Truck	Total	Passenger	Truck	Total	2015		Growth per year
Airport Study Area	374,393	16,813	391,206	459,550	11,678	471,228	862,434		
DTA Study Area	2,090,607	110,995	2,201,603	2,391,510	108,440	2,499,950	4,701,553		
	Year 2019 (Interpolated)						2019		2015 to 2019
Airport Study Area	408,887	17,783	426,670	501,754	12,493	514,246	940,916	9%	2.3%
DTA Study Area	2,299,104	114,709	2,413,814	2,598,031	111,762	2,709,792	5,123,606	9%	2.2%
	Year 2025						2025		2019 to 2025
Airport Study Area	460,627	19,238	479,865	565,059	13,715	578,775	1,058,639	13%	2.1%
DTA Study Area	2,611,849	120,281	2,732,130	2,907,812	116,743	3,024,556	5,756,686	12%	2.1%
	Year 2030 (Interpolated)						2030		2025 to 2030
Airport Study Area	507,676	22,521	530,197	642,732	15,979	658,711	1,188,908	12%	2.5%
DTA Study Area	2,826,175	130,131	2,956,306	3,144,322	125,957	3,270,279	6,226,585	8%	1.6%
	Year 2040						2040		2030 to 2040
Airport Study Area	601,775	29,087	630,861	798,077	20,507	818,583	1,449,445	22%	2.2%
DTA Study Area	3,254,827	149,831	3,404,659	3,617,341	144,384	3,761,725	7,166,384	15%	1.5%
Source: PSRC's Land Use Vision 2 based Trip Ends without Suppression Factors									

Within the DTA model, the airport zones 369 and 99 represent T1 and T2, respectively. The inbound and outbound demand levels for these zones were adjusted according to the SAMP terminal-level forecasts for each scenario.

Figure 4 Airport Centroids within DTA Model



FUTURE YEAR 2032 – ONE AIRPORT TERMINAL (NO ACTION)

The SR 518 Corridor Planning Study 2030 DTA model was used as a foundation for the Future 2032 SAMP DTA model reflecting terminal one (T1 only). Key assumptions for the 2032 SAMP one-terminal model include the following:

- SR 509 Extension Stage 1 and Stage 2 are complete (between I-5 and S 188th Street)
- The SAMP roadway elements are not included (since only terminal one is assumed)

The response time factor[1] was increased at the following locations in order to balance demand levels on critical arterials and achieve reasonable trip distribution patterns:

- Air Cargo Road southbound (between S 154th Street and S 170th Street)
- S 160th Street in both directions (between Air Cargo Road and NAE)
- S 154th Street eastbound (between SR 99 and 42nd Avenue S)
- NAE northbound off ramp at S 170th Street
- Tukwila International Boulevard in both directions (between Boeing Access Road and S 112th Street)
- East Marginal Way South in both directions (between S 130th Street and WA 599)

The overall 2030 model's demand matrices were increased by a factor of 1.15 to represent 2032 region-wide traffic demand. In addition, the airport zone for terminal one is adjusted to match the SAMP terminal volume projections. Table 4 and Table 5 show the volume comparison between existing year and 2032 (with one terminal) DTA models at the screenlines.

Table 4 2032 – One Terminal East-West screenline volume comparison to 2019 DTA model

EB/WB Screenlines		2019 DTA model	2032 One Terminal DTA model	% Diff to Existing volume (DTA)	
				Volume Difference	Percent
S of S 128th St	A	1075	1746	671	62%
	NB	387	621	234	60%
	SB	688	1125	437	64%
N of S 144th St	B	1840	1796	-44	-2%
	NB	668	845	177	26%
	SB	1172	951	-221	-19%
N of S 154th St/SR 518	C	1872	2056	184	10%
	NB	566	863	297	52%
	SB	1306	1193	-113	-9%
N of S 160th St	D	5547	7151	1604	29%
	NB	2192	2810	618	28%
	SB	3355	4341	986	29%
N of S 170th St	E	4955	6667	1712	35%
	NB	2669	2921	252	9%
	SB	2286	3746	1460	64%

[1] In Dynameq models, Response Time Factor is defined as a multiplication factor that is applied to the driver response time of the vehicle while it is on the link.

N of S 188th St	F	4307	4111	-196	-5%
	NB	1393	1259	-134	-10%
	SB	2914	2852	-62	-2%
N of S 200th St	G	4990	8397	3407	68%
	NB	988	670	-318	-32%
	SB	3071	3164	93	3%
N of S 216th St	H	4059	3834	-225	-6%
	NB	988	670	-318	-32%
	SB	3071	3164	93	3%
				Average	24%

Table 5 2032 – One Terminal North-South Screenline volume comparison to DTA model

NB/SB Screenlines		2019 DTA model	2032 One Terminal DTA model	% Diff to Existing volume (DTA)	
				Volume Difference	Percent
W of SR 509	J	5372	6643	1271	24%
	EB	2989	3103	114	4%
	WB	2383	3540	1157	49%
W of Des Moines Mem Pkwy	K	6372	7492	1120	18%
	EB	2853	3643	790	28%
	WB	3519	3849	330	9%
E of 24th Ave S/Air Cargo Rd	L	6319	6972	653	10%
	EB	2300	3106	806	35%
	WB	4019	3866	-153	-4%
W of SR 99/IB	M	12168	12709	541	4%
	EB	6913	6689	-224	-3%
	WB	5255	6020	765	15%
W of I-5	N	8480	9068	588	7%
	EB	4192	5179	987	24%
	WB	4288	3889	-399	-9%
				Average	13%

The overall average traffic demand growth within the study area for this 2032 DTA model compared to the existing (base year) model is approximately 18 percent. The traffic demand at terminal one is shown in Table 6. The Port of Seattle is conducting advanced planning on certain elements of the Near-Term Projects. As part of that effort, the Port prepared a Terminal Traffic Forecast. The Port's Terminal Traffic Forecast was compared to the DTA model's terminal traffic as a way of demonstrating the reasonableness of the DTA results.

The volumes shown in Table 6 demonstrate a reasonable match between the DTA model demand levels and those developed by the Port's advanced planning team.

Table 6 2032 – One Terminal Airport Demand Comparison

Terminal Entering	**Port Terminal Forecast**	**DTA**	**Difference**
Terminal 1: From SB/NB NAE (to T1, GT, Parking)	3455	3363	-93
Terminal Exiting	**Port Terminal Forecast**	**DTA**	**Difference**
Terminal 1: From SB/NB NAE (to T1, GT, Parking)	3455	3361	-14

FUTURE YEAR 2032 – TWO AIRPORT TERMINALS (PROPOSED ACTION)

The SR 518 Corridor Planning Study 2030 DTA model was again used to develop the Future 2032 model with two terminals. The key assumptions reflected in this model are:

- SR 509 Extension Stage 2 is complete
- The SAMP roadway elements are included
- The proposed roundabout on S 170th Street (to/from the airport loop roadway) is operational
- North Airport Access realignment and reconfiguration
- Air Cargo hook ramp to SB NAE (north of S 160th Street)

The updates incorporated into the 2032 One Terminal DTA model were carried into the Two Terminal DTA model. Similarly, the overall SR 518 Study 2030 model demand matrices were increased by a factor of 1.15 to achieve 2032 regional traffic demand levels. The airport zone traffic volume (as shown in Figure 4) are adjusted to match the SAMP terminal demand forecast. Table 7 and Table 8 show the volume comparison between existing year and the 2032 DTA model with two terminals at the screenline level.

Table 7 2032 – Two Terminals East-West screenline volume comparison to 2019 DTA model

EB/WB Screenlines		2019 DTA model	2032 Two Terminal DTA model	% Diff to Existing volume (DTA)	
				Percent	Percent
S of S 128th St	A	1075	1738	663	62%
	NB	387	647	260	67%
	SB	688	1091	403	59%
N of S 144th St	B	1840	1795	-45	-2%
	NB	668	795	127	19%
	SB	1172	1000	-172	-15%
N of S 154th St/SR 518	C	1872	1999	127	7%
	NB	566	786	220	39%
	SB	1306	1213	-93	-7%
N of S 160th St	D	5547	7049	1502	27%
	NB	2192	2911	719	33%
	SB	3355	4138	783	23%
N of S 170th St	E	4955	5614	659	13%
	NB	2669	1915	-754	-28%
	SB	2286	3699	1413	62%
N of S 188th St	F	4307	4271	-36	-1%
	NB	1393	1324	-69	-5%
	SB	2914	2947	33	1%
N of S 200th St	G	4990	8202	3212	64%
	NB	8534	9848	1314	15%
	SB	10460	12387	1927	18%
N of S 216th St	H	4059	3714	-345	-8%

	NB	988	819	-169	-17%
	SB	3071	2895	-176	-6%
				Average	20%

Table 8 2032 – Two Terminals North-South Screenline volume comparison to 2019 DTA model

NB/SB Screenlines		2019 DTA model	2032 Two Terminal DTA model	% Diff to Existing volume (DTA)	
				Percent	Percent
W of SR 509	J	5372	6897	1525	28%
	EB	2989	3244	255	9%
	WB	2383	3653	1270	53%
W of Des Moines Mem Pkwy	K	6372	7489	1117	18%
	EB	2853	3514	661	23%
	WB	3519	3975	456	13%
E of 24th Ave S/Air Cargo Rd	L	6319	6957	638	10%
	EB	2300	2918	618	27%
	WB	4019	4039	20	0%
W of SR 99/IB	M	12168	12321	153	1%
	EB	6913	6195	-718	-10%
	WB	5255	6126	871	17%
W of I-5	N	8480	9012	532	6%
	EB	4192	4647	455	11%
	WB	4288	4365	77	2%
				Average	13%

The overall average traffic demand growth within the study area for the 2032 Two Terminal DTA compared to the existing (base year) model is approximately 16 percent.

The traffic demand at the two terminals is shown in Table 9 which also shows how the DTA model's traffic demand differs with respect to the Port's Terminal Traffic Forecast.

Table 9 2032 – Two Terminals Airport Demand Comparison

Terminal Entering	**Port Terminal Forecast**	**DTA**	**Difference**
Terminal 1: From SB/NB NAE (to T1, GT, Parking)	2161	2124	-37
Terminal 2: From SB/NB NAE, 170th (to T2)	1382	1395	13
Total	3543	3519	-24
Terminal Exiting	**Port Terminal Forecast**	**DTA**	**Difference**
Terminal 1: From SB/NB NAE (to T1, GT, Parking)	2161	2175	14
Terminal 2: From SB/NB NAE, 170th (to T2)	1382	1328	-54
Total	3543	3503	-40

The above table shows that the airport's entering traffic volume is lower than the Port's Terminal Traffic Forecast by only 24 vehicles per hour while the exiting volume is lower by roughly 40 vehicles.

FUTURE YEAR 2027 – ONE AIRPORT TERMINAL (NO ACTION)

The 2032 DTA one terminal model was used as the basis for developing the 2027 DTA model with one terminal. Key assumptions for this updated model included the following:

- SR 509 Extension Stage 1 (only to 24th/28th Ave S) is complete
- The airport terminal elements remain the same as in existing year

The 2032 one terminal model demand was reduced by a factor of 0.95 to reflect a 2027 horizon year. The airport zones were further modified to match the SAMP forecasts specifically entering and exiting the terminal. Table 10 and Table 11 show the volume comparison between the existing (base year) DTA model and the 2027 DTA one terminal model at the targeted screenlines.

Table 10 2027 – One Terminal East-West screenline volume comparison to 2019 DTA model

EB/WB Screenlines		2019 DTA model	2027 One Terminal DTA model	% Diff to Existing volume (DTA)	
				Percent	Percent
S of S 128th St	A	1075	1504	429	40%
	NB	387	487	100	26%
	SB	688	1017	329	48%
N of S 144th St	B	1840	1487	-353	-19%
	NB	668	627	-41	-6%
	SB	1172	860	-312	-27%
N of S 154th St/SR 518	C	1872	1729	-143	-8%
	NB	566	671	105	19%
	SB	1306	1058	-248	-19%
N of S 160th St	D	5547	6311	764	14%
	NB	2192	2464	272	12%
	SB	3355	3847	492	15%
N of S 170th St	E	4955	6625	1670	34%
	NB	2669	3020	351	13%
	SB	2286	3605	1319	58%
N of S 188th St	F	4307	4158	-149	-3%
	NB	1393	1246	-147	-11%
	SB	2914	2912	-2	0%
N of S 200th St	G	4990	5638	648	13%
	NB	988	1082	94	10%
	SB	3071	2789	-282	-9%
N of S 216th St	H	4059	5014	955	24%
	NB	988	1619	631	64%
	SB	3071	3395	324	11%
				Average	12%

Table 11 2027 – One Terminal North-South Screenline volume comparison to 2019 DTA model

NB/SB Screenlines		2019 DTA model	2027 One Terminal DTA model	% Diff to Existing volume (DTA)	
				Percent	Percent
W of SR 509	J	5372	6340	968	18%
	EB	2989	2898	-91	-3%
	WB	2383	3442	1059	44%
W of Des Moines Mem Pkwy	K	6372	6818	446	7%
	EB	2853	3222	369	13%
	WB	3519	3596	77	2%
E of 24th Ave S/Air Cargo Rd	L	6319	6475	156	2%
	EB	2300	2639	339	15%
	WB	4019	3836	-183	-5%
W of SR 99/IB	M	12168	13805	1637	13%
	EB	6913	7104	191	3%
	WB	5255	6701	1446	28%
W of I-5	N	8480	8339	-141	-2%
	EB	4192	3649	-543	-13%
	WB	4288	4690	402	9%
				Average	8%

The overall average traffic demand growth within the study area for this DTA modeling scenario, as compared to the existing year model, was approximately 10 percent.

The traffic demand at the terminal in the DTA model and the Port's Terminal Traffic Forecast are shown in

Table 12.

Table 12 2027 – One Terminal Airport Demand Comparison

Terminal Entering	Port Terminal Forecast	DTA	Difference
Terminal 1: From SB/NB NAE (to T1, GT, Parking)	3296	3139	-157
Terminal Exiting	**Port Terminal Forecast**	**DTA**	**Difference**
Terminal 1: From SB/NB NAE (to T1, GT, Parking)	3296	3239	-57

The above table shows traffic volumes entering the terminal in the DTA model (during the peak period) as slightly lower than the Port's Terminal Traffic Forecast by 157 vehicles with exiting volumes similarly lower by 57 vehicles. These differences were determined to be within a reasonable range of terminal demand targets.

FUTURE YEAR 2027 – TWO AIRPORT TERMINALS (PROPOSED ACTION)

As with the 2027 DTA one terminal model development, the 2032 DTA two terminal model described previously was used as a basis for the 2027 DTA model with two airport terminals. The following key assumptions were reflected in this model:

- SR 509 Extension Stage 1 is complete (only to 24th/28th Ave S) and no Stage 2 segment
- The SAMP roadway elements are included

The 2032 DTA two terminal model demand was reduced by a factor of 0.95 in order to represent 2027 traffic demand levels. The airport zones were further adjusted/modified to match the inbound and outbound SAMP terminal forecasts. Table 13 and Table 14 show the screenline volume comparison between the existing (base) year DTA model and 2027 DTA two terminal model.

Table 13 2027 – Two Terminals East-West screenline volume comparison to 2019 DTA model

EB/WB Screenlines		2019 DTA model	2027 Two Terminal DTA model	% Diff to Existing volume (DTA)	
				Percent	Percent
S of S 128th St	A	1075	1431	356	33%
	NB	387	489	102	26%
	SB	688	942	254	37%
N of S 144th St	B	1840	1490	-350	-19%
	NB	668	534	-134	-20%
	SB	1172	956	-216	-18%
N of S 154th St/SR 518	C	1872	1767	-105	-6%
	NB	566	586	20	4%
	SB	1306	1181	-125	-10%
N of S 160th St	D	5547	6560	1013	18%
	NB	2192	2651	459	21%
	SB	3355	3909	554	17%
N of S 170th St	E	4955	5737	782	16%
	NB	2669	1955	-714	-27%
	SB	2286	3782	1496	65%
N of S 188th St	F	4307	4053	-254	-6%
	NB	1393	1305	-88	-6%
	SB	2914	2748	-166	-6%
N of S 200th St	G	4990	5616	626	13%
	NB	988	1036	48	5%
	SB	3071	2807	-264	-9%
N of S 216th St	H	4059	4987	928	23%
	NB	988	1551	563	57%
	SB	3071	3436	365	12%

				Average	9%

Table 14 2027 – Two Terminals North-South Screenline volume comparison to 2019 DTA model

NB/SB Screenlines		2019 DTA model	2027 Two Terminal DTA model	% Diff to Existing volume (DTA)	
				Percent	Percent
W of SR 509	J	5372	6222	850	16%
	EB	2989	2907	-82	-3%
	WB	2383	3315	932	39%
W of Des Moines Mem Pkwy	K	6372	6778	406	6%
	EB	2853	2951	98	3%
	WB	3519	3827	308	9%
E of 24th Ave S/Air Cargo Rd	L	6319	6806	487	8%
	EB	2300	2782	482	21%
	WB	4019	4024	5	0%
W of SR 99/IB	M	12168	13302	1134	9%
	EB	6913	6463	-450	-7%
	WB	5255	6839	1584	30%
W of I-5	N	8480	8432	-48	-1%
	EB	4192	4518	326	8%
	WB	4288	3914	-374	-9%
				Average	8%

The overall average traffic demand growth reflected in the 2027 DTA two terminal model (network wide) compared to the existing year model was approximately 8 percent.

The traffic demand at the two terminals is shown in Table 15 and shows the difference between the DTA model traffic demand (inbound and outbound) and the Port's Terminal Traffic Forecast.

Table 15 2027 – Two Terminals Airport Demand Comparison

Terminal Entering	**Port Terminal Forecast**	**DTA**	**Difference**
Terminal 1: From SB/NB NAE (to T1, GT, Parking)	2071	2096	25
Terminal 2: From SB/NB NAE, 170th (to T2)	1324	1371	47
Total	3395	3467	72
Terminal Exiting	**Port Terminal Forecast**	**DTA**	**Difference**
Terminal 1: From SB/NB NAE (to T1, GT, Parking)	2071	2082	11
Terminal 2: From SB/NB NAE, 170th (to T2)	1324	1302	-22
Total	3395	3384	-11

The above table shows that the airport's entering traffic volume in the DTA model is higher than the Port's Terminal Traffic forecast by 72 vehicles and the exiting volume is lower by 11 vehicles. Both the entering and

exiting traffic levels reflected in the DTA model were considered well within a reasonable range of projected terminal demand.

Attachment B: Future Forecasting Methods & Assumptions

Memorandum

Client:	Port of Seattle
Project:	Sustainable Airport Master Plan (SAMP)
Subject:	2032/2037 Future Forecasting Methods & Assumptions
Submit to:	Steve Rybolt, Nic Longo, Tom Hooper; Port of Seattle
Copied to:	Sarah Potter, Landrum & Brown
Submitted by:	Steve Diebol, Tony Woody, Zach Wieben; Concord Engineering
Date:	June 21, 2023

1. Introduction and Overview

As part of the Sustainable Airport Master Plan (SAMP) environmental review for proposed Near-Term Projects (NTP), the Port of Seattle (Port) will be conducting traffic forecasting and operational analysis for future year scenarios. The Near-Term Projects (NTPs) being evaluated in the SAMP Environmental Assessment (EA) are expected to be constructed and occupied by 2032. Future analysis scenarios include the opening year (2032) and an additional horizon year five years after opening (2037). The purpose of this memo is to summarize the methods and assumptions used to develop the 2032 and 2037 traffic forecasts. Information about the Dynamic Traffic Assignment (DTA) models used (Section 2), local intersection improvements (Section 3), the post processing steps and procedures used to translate link data from the DTA models to turning movement forecasts (Section 4), the four-step process to determine additional trips from NTPs on the road network (Section 5), and the calculation of 2032 and 2037 turning movement forecasts (Section 6) are documented in the following sections.

2. Base DTA Models

INRO Dynameq DTA models were adapted from their original use as part of WSDOT's Gateway Program by the consulting firm WSP. The DTA model extends from Tacoma to south Seattle and includes major regional freeways and local arterial routes. DTA models are a mesoscopic modeling tool that attempt to predict future shifts in travel patterns based on congestion/delay without the detailed analysis required for microscopic simulation or deterministic operational analysis models. Figure 1 shows the transportation analysis zones (TAZs) included in the DTA model study area. The darker purple area shaded represents the Airport Study Area where more granular updates to the model were made to account for future roadway improvements constructed by the Port. WSP completed DTA modeling in 2020 using a 2019 base year, and their results will be reused for the updated analysis using 2022 traffic counts.

WSP updated the 2015 existing Gateway Program DTA model to 2019 through modifications to existing freeway and arterial facilities as well as increasing overall travel demand to calibrate to 2019 traffic counts conducted in the Airport Study Area. Calibration of the model was completed using North-South and East-West traffic demand screenlines within the Airport Study Area. The Port has since changed the opening year of the NTPs and 2nd Terminal from 2027 to 2032. Furthermore, since the previous analysis was completed a determination was made between the Port, WSDOT, and Concord to change the existing analysis year to 2022 as well to capture more recent roadway volumes and travel patterns which may have changed from pre-COVID conditions. Capacity of major freeway facilities on I-5, SR-509 and SR-518 remained the same between 2019 and 2022 except for the addition of an eastbound off-ramp from SR-518 to Des Moines Memorial Drive. The 2022 PM peak hour count at Des Moines Memorial Drive and the EB SR 518 ramps showed less than 40 eastbound off-ramp trips—or about 2% of total eastbound SR 518 volume. The opening of this low volume ramp is not expected to have had a significant impact on travel patterns between 2019 and 2022. Therefore, no changes to the previous 2019 DTA model were required.

The 2025 Gateway Program's DTA model was adapted for use by WSDOT's SR 518 Corridor Planning Study for the year 2030. WSP then increased the travel demand within the model by a 2.2% annual growth rate within the Airport Study Area derived from Puget Sound Regional Council's (PSRC) Land Use Vision 2 (LUV2) to arrive at a 2032 base model. A previous 2027 run of the DTA analysis will not be used for forecasting as the new opening year will be 2032. Forecasting for 2037 will use straight growth from the 2032 forecast, as DTA modeling for the 2032 conditions is representative of 2037 conditions with no major background improvement projects expected to be completed between 2032 and 2037 and regional and intercity travel patterns expected to remain the same. Previous DTA modeling of a 2027 scenario will be disregarded, as the new year of completion for NTPs is 2032. These updates as well as the calibration efforts and additional details are documented in WSP's *DTA Modeling Documentation Summary*. Improvement projects in the DTA models beyond the original existing year of 2019 are shown in Table 1. The study area of the DTA model is shown in Figure 1.

Table 1: DTA Model Improvement Projects

Improvement	2032 No Action	2032 Proposed Action
SR 518 EB Off Ramp to Des Moines Memorial Drive	X	X
SR 509 Extension Stage 1 and 2	X	X
SR 167 Extension	X	X
SR 18 Triangle Stage B	X	X
Second Terminal and Roadway Realignment/Reconfiguration Elements		X
Roundabout at S 170th Street to/from Airport Loop Roadway		X
Air Cargo Road Hook Ramp to SB North Airport Expressway		X

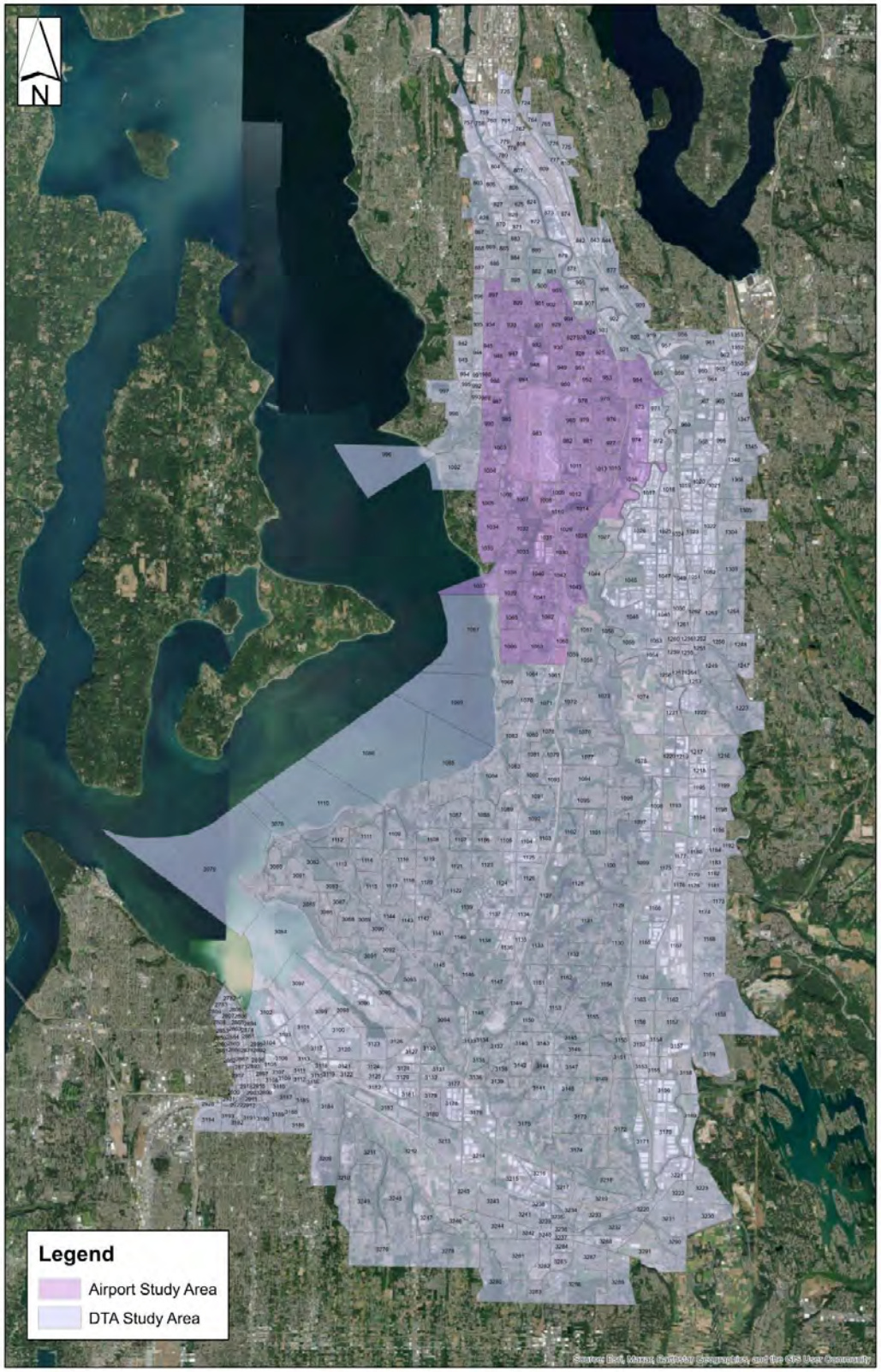


Figure 1: DTA Model Study Area

3. Local Intersection Improvements

Local intersection improvements were observed between the previous 2019 network and the 2022 existing field conditions. None of these local intersection improvements are expected to change travel patterns or DTA modeling parameters. These improvements are only expected to have marginal improvements to vehicle delay for minor approaches. Vehicle travel patterns from 2019 to 2022 are therefore expected to remain consistent. The local intersection improvements were reflected in updated Synchro models only. The local intersection improvements are identified in Table 2.

Table 2. Local Intersection Improvements (2019-2022)

Intersection		Intersection Improvement
9	24th Ave S @ S 136th St	Minor-leg stop control converted to all-way stop control
15	24th Ave S @ S 142nd St	Minor-leg stop control converted to all-way stop control
34	Military Rd S @ S 152nd St	Intersection converted from all-way stop control to signal. South leg of intersection removed.
35	Tukwila International Blvd @ S 152nd St	Added eastbound right turn lane.
36	Tukwila International Blvd @ Military Rd	East leg removed (shared link with south leg of Int #34). Intersection removed from analysis.
59	Air Cargo Rd @ SB NAE On-Ramp	Converted from uncontrolled to signalized.
60	Air Cargo Rd @ S 170th St	Added additional westbound right turn lane. Combined all southbound movements to single lane.
61	S 170th St @ Cell Phone Lot Entrance	Southbound bypass from NAE to cell-phone lot added. Southbound through movement at signal removed.
63	S 170th St @ NB NAE Off-Ramp	Minor-leg stop control converted to signal.
79	S 200th St @ Des Moines Memorial Dr	Added left turn pockets on all approaches. Added westbound right turn pocket.

4. Post-Processing Procedure

Direct link volume output from the 2032 No Action DTA model will be post-processed to develop 2032 future turning movement forecasts at the study intersections. Post-processing will follow procedures

identified in the National Cooperative Highway Research Program (NCHRP) Report 765. The general procedure of the NCHRP 765 methodology is outlined below:

- Nominal and percentage differences between the 2032 No Action and 2019 Existing DTA models are calculated. Manual adjustments previously made to the Existing DTA link volumes will be maintained. Manual adjustments were also made to the 2032 No Action DTA link volumes where unexpected decreases in volume occurred between the 2019 and 2032 DTA models and will be maintained.
- The delta (difference) or annual growth rate between 2032 No Action and 2019 Existing DTA link volumes are added to the 2022 Existing count link volumes to calculate target 2032 No Action link volumes for the intersection turning movements. Deltas between the 2032 No Action and 2019 Existing DTA link volumes are assumed to have a floor of -25% and a ceiling of +1500% of the 2022 existing count volume. New target link volumes for 2032 No Action are expected to be lower than the previously developed 2032 No Action volumes because of the decrease in traffic volumes documented in the 2022 intersection counts and due to growth added for only 10 years instead of 13.
- Estimates for future 2032 No Action turning movements will be developed using the Iterative Procedure – Directional Method (i.e. Furness Method) outlined in NCHRP 765. Iterations will occur until the total entering and exiting link volumes of the intersection turning movements are within 10% of the target link volumes unless otherwise agreed to by WSDOT.
- Turning movement volumes developed by the NCHRP 765 procedure will be exported to Synchro where any necessary intersection balancing adjustments will occur.
- Turning movement forecasts from the post processing procedure will be compared to other corridor studies (SR 509 Gateway, SR 518 Corridor, etc.) for any necessary manual adjustments based on previous comments from WSDOT.
- Final 2032 No Action balanced intersection turning movement volumes will be provided to WSDOT for concurrence.

Turning movement forecast calculations for the additional 2032 Proposed Action, 2037 No Action, and 2037 Proposed Action scenarios will not follow the NCHRP 765 procedure and are outlined in Section 6 of this memo.

5. NTP Four-Step Forecasting Procedure

Near-Term Projects (NTPs) with the exception of the Second Terminal were not included in the original 2032 Proposed Action DTA model. It was determined land use functions within the model were not finite enough to accurately determine changes in turning movement volumes associated with the NTPs. Instead, forecasting for the NTPs was done using the traditional 4-step process—Trip Generation, Trip Distribution, Mode Choice, and Route Assignment. General processes for each of the four steps are outlined below:

- *Trip Generation* – Trip generation for each of the NTPs will come from one or a combination of the following sources: Institute of Transportation Engineers Trip Generation Manual, existing driveway counts, Port of Seattle airport passenger forecast, and/or Port of Seattle employee forecasts. These sources will be used to calculate the total number of trips entering and exiting the NTPs. Specific trip generation calculations for each NTP will be documented in the SAMP NTP

Trip Generation Memo. Uses based on airport activity forecasts may have different trip generation in 2032 and 2037.

- *Trip Distribution* – Trip origins and destinations for trips to and from the NTPs will be determined based on the proposed land use of each NTP and the location of supporting land uses, as well as general travel patterns entering and exiting the study area. Input will be provided by the Port as to what services each NTP will support and where those services will be located in the Airport Study Area. Part of the trip distribution process will be identifying the number of local (to/from land uses associated with the airport) or regional (to/from freeway/arterial facilities) trips expected for each NTP.
- *Mode Choice* – Trip generation and distribution for the NTPs is focused on vehicle trips. All trips are assumed to be vehicle or truck. Access for pedestrian and non-motorized trips from existing and future facilities to the NTPs will be included in the final report but is not included in this traffic forecasting methods and assumptions.
- *Route Assignment* – Route assignment will be based on the future road network after construction of the Second Terminal is complete. It is assumed vehicle trips will travel the most efficient route between origin and destinations with respect to distance traveled and delay and will adhere to restrictions on local roads (i.e. weight, height, etc.) if applicable. Route assignments for NTP trips will be based on whether trips are local (to/from land uses near the airport) or regional (to/from freeway/arterial facilities) and will account for the relocation of any existing trips.

A complete set of turning movement forecasts for each NTP will be developed and will be layered onto the future No Action turning movement forecasts. The four-step process will be completed for each NTP for the 2032 and 2037 analysis years. Calculations and assumptions for the NTP 4-step process will be documented in the NTP Trip Generation Memo to be submitted for review and concurrence to WSDOT/FAA.

6. 2032 and 2037 Forecasting Calculations

WSDOT has agreed that updating the 2032 No Action and Proposed Action DTA models for the new 2037 horizon year would not provide substantially different travel patterns than those already established in the 2032 DTA models. This is because previous DTA models were created to model travel patterns before and after Phase 2 of the SR 509 extension was complete. Both analysis years will now include completion of the SR 509 Phase 2 Extension as a background improvement project negating the need for separate analysis year DTA models. Review of local agency comprehensive plans did not indicate any other large scale funded infrastructure improvement projects would be completed between 2032 and 2037 that would likely change regional or intercity travel patterns within the Airport Study Area. As a result, the 2037 intersection forecasts will be calculated using the 2032 No Action turning movement forecasts that were post-processed with output from the 2032 No Action DTA model. Methodology for calculating 2032 No Action, 2032 Proposed Action, 2037 No Action, and 2037 Proposed Action intersection turning movement forecasts are described below:

- *2032 No Action* – Intersection turning movement forecasts for the 2032 No Action scenario will be developed using the NCHRP Report 765 procedure identified in Section 4 of this memo.
- *2032 Proposed Action* – Trips associated with the airport terminal zones from the previous 2032 Proposed Action DTA model have been isolated to show the origins and destinations for the terminal uses. These trip values will be scaled proportionately to the updated airport passenger

forecasts provided by the Port and for the 2nd terminal project. These trips will be added to the 2032 No Action turning movement forecasts. Additionally, trips from the four-step NTP forecasting procedure for non-terminal NTPs will also be added to the 2032 No Action turning movement forecasts. The summation of these additional trips to the 2032 No Action intersection turning movements will represent the 2032 Proposed Action turning movement forecasts.

- *2037 No Action* – The final 2032 No Action turning movements will be increased by a 2.2% annual growth rate to 2037 to calculate the 2037 No Action turning movement forecasts. The 2.2% annual growth rate is derived from growth in total passenger and truck trip ends from PSRC's LUV2 model for TAZs within the Airport Study Area between 2030 and 2040, which is documented in the *DTA Modeling Documentation Summary*.
- *2037 Proposed Action* – The same methodology used to develop the 2032 Proposed Action turning movement forecasts will be used to develop the 2037 Proposed Action turning movement forecasts. Trip generation for the NTPs as well as travel demand for the airport terminal zones will be updated to reflect 2037 passenger volumes. Trips associated with the airport terminals and NTPs will be added to the 2037 No Action turning movements to calculate 2037 Proposed Action turning movements.

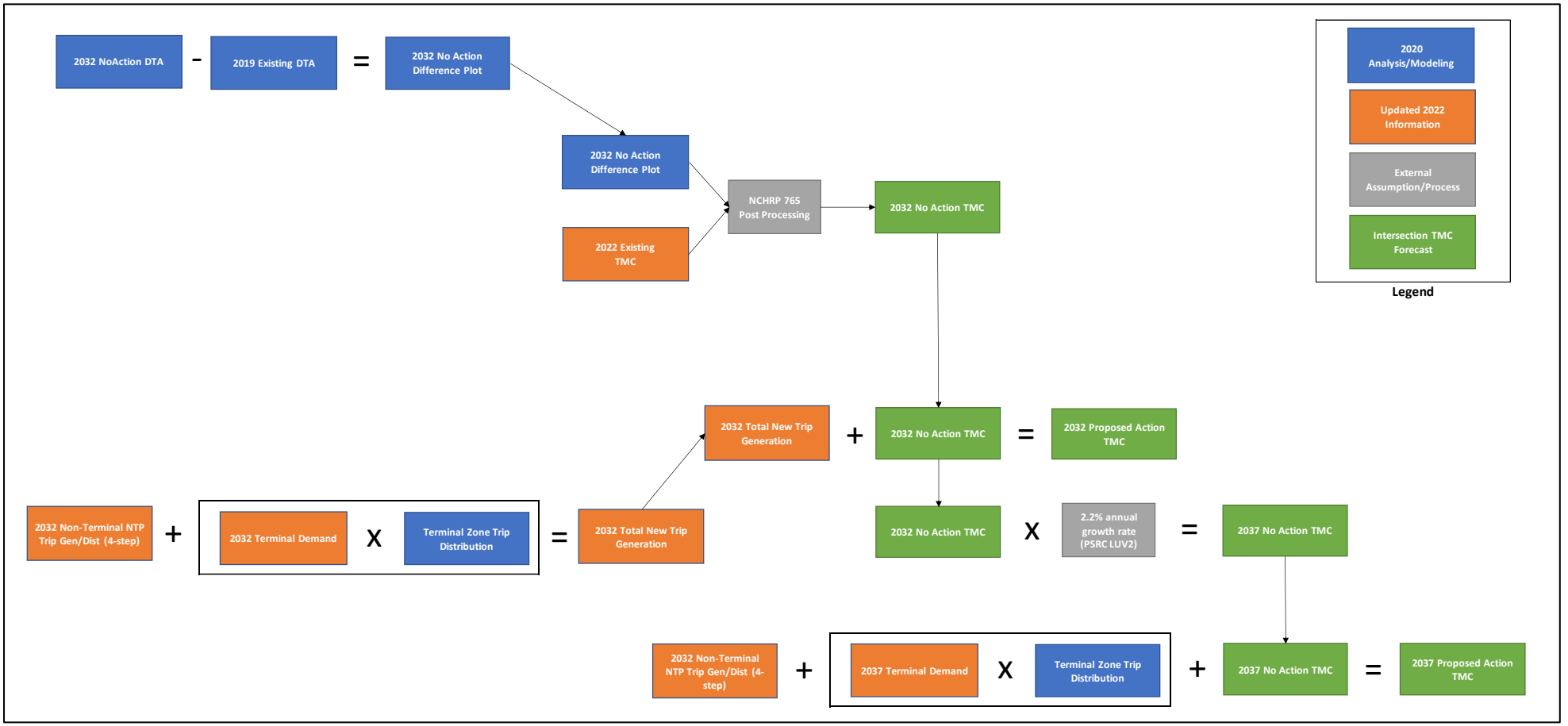


Figure 2: SAMP Future Volume Forecasting Flow Chart

Attachment C: NTP Trip Generation Memo

SAMP Near-Term Projects Trip Generation Assumptions

This document summarizes the trip generation, distribution, mode split, and assignment assumptions for the proposed Non-Terminal Near-Term Projects evaluated in SAMP.

1 Second Terminal and Parking – T01/T02

This project involves construction of a new multi-level approximately 836,200 square foot parking garage, with a footprint of approximately 120,000 square feet adjacent to the new terminal. The garage would provide approximately 1,350 parking spaces. Ancillary projects not expected to generate additional trips include the NAE relocation of southbound lanes (L01), elevated busway and stations (L02), and main terminal north GT lot (L04).

A Dynamic Traffic Assignment (DTA) transportation demand model was developed by WSP for use in assigning the vehicular trips associated with the new second terminal and adjustments to flight departures and arrivals between the two terminals in the future. The model included second terminal roads and curbside (L03) improvements and are therefore excluded from the analysis included in this memo. See the Model Documentation Summary report for more information.

2 Aircraft Rescue and Fire Fighting (ARFF) – S02 & S03

The existing Aircraft Rescue and Fire Fighting (ARFF) facility located at the western terminus of S 170th St. (approximately 28,800 sf) will be displaced due to construction of the North Gates Concourse (T01). The function of the existing facility will be shared by two future sites, one (S02) located near the southwest corner of the airfield with access from Starling Dr serving as the primary ARFF facility, and the other (S03) located near the present location of the Cell Phone Lot with access from the future S 170th St on the west leg of the future roundabout serving as the secondary ARFF facility.

2.1 Existing Use and Project Assumptions

1. An existing PM peak hour count was collected at S 170th St & Air Cargo Rd on Tuesday September 9, 2022 from 4:00-5:00 PM and observed 20 ARFF trips (5 inbound, 15 outbound).
2. To be conservative, it is assumed each future facility (S02 and S03) generates the same number of trips as the existing facility.
3. The existing ARFF trips were relocated to the new facility that is nearby (S03), while new trips were generated for the new facility (S02) located on Starling Dr.

Table 1 shows the existing and future ARFF trips by location.

Table 1. ARFF PM Trips

Scenario	Existing Site			S02 Site			S03 Site		
	In	Out	Total	In	Out	Total	In	Out	Total
2022 Existing	**5**	**15**	**20**	**0**	**0**	**0**	**0**	**0**	**0**
Relocated Trips	-5	-15	-20	5	15	20	0	0	0
New Trips	0	0	0	0	0	0	5	15	20
2032/2037 Total Trips	**0**	**0**	**0**	**5**	**15**	**20**	**5**	**15**	**20**

2.2 Trip Distribution and Assignment Assumptions

Trips to and from the existing ARFF were reassigned to S03, with the only considerable change in routing being for trips to/from the north on Air Cargo Road, which was redirected to International Blvd. Other trips on S 170th St will remain on that roadway.

For new trips assigned to S02, the small number of local trips were assumed to be to/from all study area routes using a **network trip distribution model,** shown in Table 2 that is weighted by volume from existing counts.

Table 2. Network Trip Distribution Model

Direction	Roadway	Inbound	Outbound
North	Surface Streets	5%	4%
	SR 509	8%	5%
	I-5	23%	18%
East	Surface Streets	14%	13%
	SR 518	11%	9%
South	Surface Streets	10%	15%
	I-5	16%	21%
West	Surface Streets	13%	15%
Total		**100%**	**100%**

3 S07 - Westside Maintenance Campus

Existing maintenance uses located in the North Air Cargo area (bound by S 154th St to the north, Air Cargo Road to the east, S 170th St to the south, and the airfield to the west) will be demolished to make way for the North Gates Concourse (T01). These uses will be consolidated at the new Westside Maintenance Campus, which will be built on land on the west side of the airport that currently accommodates construction trailers and is otherwise vacant land. The facility would co-locate the maintenance facilities with other related functions, including a vehicle fuel rack, airfield deicer storage, and an approximately 400,000 square foot multi-bay building.

3.1 Existing Use and Growth Assumptions:

1. Existing employment for maintenance operations, primarily housed in Cargo 4, consists of 163 total staff (64 day-shift) in 2022.
2. WSDOT data indicates 88% of airport employees travel via passenger vehicles, thus 56 exiting vehicular trips are assumed to be generated by the existing day shift staff.
3. Interviews with staff indicate 47 day-shift employees park at Cargo 4, and the remaining 9 park at the main terminal garage, with their shift terminating at 4:30 pm. This is the only shift that produces PM peak hour traffic.
4. Based on ITE Trip Generation Manual 11th Edition Land Use Code 170 (Utilities), it is assumed 18 percent of total PM peak hour trips are inbound. Assuming these are pick up/drop off or chained trips not requiring parking additional inbound and outbound trips were added to the expected employee shift trips to achieve the 18% identified by ITE.

5. Future (2040) employment is described in Volume 2, Appendix C as having 355 total staff (142 day-shift) in 2040. Interpolating the day shift value to 2032 and 2037 yields 108 and 129 staff, respectively.
6. With 88% traveling by passenger vehicles, this equates to 149 trips in 2032. As a conservative assumption, the percentage of employee trips traveling by passenger vehicles was increased to 100% for the 2037 analysis and resulted in201 trips in 2037.
7. Therefore, future trips at the Westside Maintenance Center included the 79 trips relocated from the Cargo 4 parking area, 9 relocated from the main garage, and 61 and 113 additional new trips in 2032 and 2037, respectively.

Table 3 shows the existing and future maintenance employee trips by location.

Table 3. Maintenance Employee PM Trips

Scenario	North Cargo Area			Main Terminal Garage			Westside Maintenance Campus		
	In	Out	Total	In	Out	Total	In	Out	Total
2022 Existing Trips	**16**	**63**	**79**	**0**	**9**	**9**	**0**	**0**	**0**
2032 Relocated Trips	-16	-63	-79	0	-9	-9	16	72	88
2032 New Trips	0	0	0	0	0	0	11	50	61
2032 Total Trips	**0**	**0**	**0**	**0**	**0**	**0**	**27**	**122**	**149**
2037 Relocated Trips	-16	-63	-79	0	-9	-9	16	72	88
2037 New Trips	0	0	0	0	0	0	20	93	113
2037 Total Trips	**0**	**0**	**0**	**0**	**0**	**0**	**36**	**165**	**201**

3.2 Trip Distribution and Assignment Assumptions

The 2022 existing trips would be relocated from the area of S 161st St & Air Cargo Rd and the Main Terminal garage to the new location on Des Moines Memorial Drive at S 168th Street. A maintenance driveway for trucks will be located off S 160th Street east of Des Moines Memorial Drive, however a nominal number of PM peak hour trips would be expected at this location. The relocated trips were subtracted from the network using the **network trip distribution model**. Future total employee trips, including relocated trips and new trips, were distributed based on the **network trip distribution model**.

4 North Air Cargo Area Projects – C01, S04, S05, S06, S08, S09 & A08

Several existing uses located in the North Air Cargo Area (bound by S 154th St to the north, Air Cargo Road to the east, S 170th St to the south, and the airfield to the west) will be demolished to construct the North Gates Terminal (T01), new air cargo hardstands and airline support facilities. One new cargo warehouse will be constructed in this area.

4.1 Existing Use and Project Assumptions:

1. Facilities to be demolished in the North Cargo area (See Figure 1):
    a. Swissport building
    b. Cargo 4 building
    c. POS airport maintenance
    d. United Airlines maintenance building
    e. Two air cargo hardstands

f. Existing fuel rack and de-icing tanks (to be relocated)

2. Projects to be constructed in the North Cargo area:
    a. Cargo 4 South Redevelopment (C01) building (80,000 sf)
    b. Fuel Rack Relocation (S04)
    c. Triculator (S05)
    d. Consolidated De-Icing Tanks (S06)
    e. Airline Support (north, S08 and west, S09) buildings (~40,000 sf total)
    f. Air Cargo Hardstand North (A08)
3. Net change in total building area approximately ~73,000 sf decrease

4.2 Trip Generation Calculations

Existing trip generation rates for the North Cargo Area and maintenance facilities was calculated by using PM peak hour driveway counts along Air Cargo Road and gross building square footages available through King County property records. Figure 1 and Table 4 summarize the building and driveway information.

Figure 1: Existing North Cargo Area Buildings and Driveways

Table 4. Existing North Cargo Area Building and Driveway Trip Generation Rate Summary

Building	Size (SF)	Driveway ID(s)	PM Peak Hour Trips In	PM Peak Hour Trips Out	Driveway TG Rate (per 1,000 SF)
A	48500	38	86	70	0.77
B	79950				
C	25000				
D	25000				
E	25000				
F	80500	101	18	25	0.48
I	9700				
G	45200	102	51	56	0.50
H	36410				
J	61250				
K	48818				
L	24000				
M	25565	103	10	17	1.06
N	67150	104, 105, 106, 107	29	31	0.89
O	41900	58	46	41	1.43
P	18850				
Q	52210	108	32	37	1.32
Total	**715,003**		**272**	**277**	**0.77**

The driveway data showed the North Cargo Area generating 549 total PM peak hour trips, equivalent to 0.77 vehicle trips per 1,000 SF of building area. The existing North Cargo Area contains uses including cargo shipments, aircraft services/maintenance, offices, and general airport support services. The calculated average trip generation rate is comparable to ITE trip generation rates for a mix of similar land uses that are included in the North Cargo Area. Table 5 summarizes the comparison of these trip generation rates.

Table 5. Comparable ITE Trip Generation Rates

ITE Land Use Code (LUC), 11th Edition	PM Peak Hour TG Rate (per 1,000 SF)
LUC 030 – Intermodal Truck Terminal	1.87
LUC 110 – General Light Industrial	1.10
LUC 130 – Industrial Park	0.34
LUC 150 - Warehousing	0.18
LUC 710 – General Office Building	1.44
Average	*0.99*
Existing North Cargo Area	*0.77*

Trip generation calculations for the future North Cargo Area were completed by using the rates observed at the existing driveways. Buildings G, J, D, and Q will be removed with construction of the Second Terminal and new structures in the North Cargo Area. Trips from the existing driveways that serve Buildings G, J, D, and Q today were removed based on the proportion of building area each of

them comprised of the total building area served by the respective driveways. Trips for the proposed Cargo 4 South Redevelopment (C01) building (80,000 sf) and Airline Support (north, S08 and west, S09) buildings (~40,000 sf total) were calculated using the estimated building square footages and average trip generation rate for the North Cargo Area. A summary of the existing and future trips associated with the North Cargo Area are summarized in Table 6:

Table 6. North Cargo Area PM Trips

Land Use	Description	Inbound	Outbound	Total
Existing Count Data	Existing North Air Cargo Area:	272	277	549
	Future North Air Cargo Area:	228	231	459
	North Air Cargo Area Reduction:	-44	-46	-90

4.3 Trip Distribution and Assignment Assumptions

Note that the total trips for the reduction in North Air Cargo Area (-90) is approximately equal to the number of trips relocated for the westside maintenance campus (-79).

Existing trips associated with maintenance uses in the North Cargo Area were relocated per Section 2. No further adjustments were applied to trips generated within the North Cargo Area.

5 L-Shape Lot Off-Site Cargo – C02 & C03

This project involves constructing a new approximately 330,000 square foot cargo warehouse building (C02) on the Port's 'L-shaped' parcel located north of SR 518. The development would include warehouse, office space, truck terminals, and parking for visitors and employees.

This project involves constructing a new approximately 90,000 square foot cargo warehouse building (C03) on the Port's 'L-shaped' parcel located north of SR 518. The development would include warehouse, office space, truck terminals, and parking for visitors and employees.

The analysis evaluates the total impact of Phase 1 (C02) and Phase 2 (C03) combined since both are expected to be constructed by 2032. The L-Shape Lot parcels combined are approximately 30.5 acres per TM-6.

5.1 Trip Generation Assumptions:

Table 7 shows the trip generation estimates for the L-Shape Lot.

Table 7. L-Shape Lot PM Trips

Land Use	Description	Inbound	Outbound	Total
Existing North Cargo Area TG Data (0.77 / 1,000 SF)	C02, 330,00 SF	127	127	254
	C03, 90,000 SF	34	35	69
	Total	161	162	323

Table 8 shows the future total trips for the North Cargo Area and the L-Shape Lot. No growth is expected for the North Cargo Area because excess cargo capacity was assumed to be leased in 2032 so the buildings would still operate at 100% capacity.

Table 8. Existing and Future North Air Cargo Area and L-Shape Lot PM Trips

Scenario	North Cargo Area			L-Shape Lot			Total		
	In	Out	Total	In	Out	Total	In	Out	Total
2022 Existing (Estimated)	**272**	**277**	**549**	**0**	**0**	**0**	**272**	**277**	**549**
Maintenance Relocated	-16	-63	-79	0	0	0	-16	-63	-79
New Trips	0	0	0	161	162	323	161	162	323
2032/2037 Future	**256**	**214**	**470**	**161**	**162**	**323**	**417**	**376**	**793**

5.2 Trip Distribution and Assignment Assumptions

Existing count data for the North Cargo Area showed 25% of PM peak hour vehicle trips were truck trips with the other 75 percent being staff, visitor, and other trips via passenger vehicles. Mode split for staff, visitor, others is unknown, therefore no mode reduction is assumed.

Of truck trips, 50 percent are assumed to be to/from the North Cargo Area, and 50 percent are assumed to be to and from regional major roads (SR 509, I-405, I-5, SR 99) using a **regional trip distribution model,** shown in Table 9 below, that is weighted by volume from existing counts. Passenger vehicle trips (30 percent of site trips) are assumed to be to/from all study area routes using a **network trip distribution model** from Table 2 that is weighted by volume from existing counts.

Table 9. Regional Trip Distribution Model

Direction	Roadway	Inbound	Outbound
North	SR 509	14%	9%
	I-5	40%	35%
East	SR 518	19%	17%
South	I-5	27%	39%
Total		100%	100%

6 L05 - North Ground Transportation Holding Lot

This project involves construction of three surface parking lots and associated amenities to accommodate the displaced existing lots and future growth. The three lots will total approximately 180,000 square feet and will be located on property north and east of the intersection of S 146th St and 16th Ave S. The lot will serve demand from the North Ground Transportation Lot on S 160th St. displaced by construction of the new Elevated Busway and Stations (L02) and the South Ground Transportation Lot on S 190th St displaced by the fuel farm expansion (S01). The new lots would be used for ground transportation holding of taxis, transportation network company vehicles, and other chartered vehicles as they await trip requests or passenger arrival.

6.1 Existing Use and Growth Assumptions

1. An existing PM peak hour count was collected at S 160th St & the Ground Transportation Holding Lot on Thursday September 22, 2022 from 4:15-5:15 PM and observed 449 GT lot trips

(215 inbound, 234 outbound). An existing PM peak hour count was collected at S 190th St & 28th Ave S, which is the access point for the South Ground Transportation Holding Lot, on Thursday October 27, 2022 from 4:30-5:30 PM and observed 11 bus trips (5 inbound, 6 outbound).

2. Future forecasted ground transportation needs were provided in the POS memo "Long-Term Ground Transportation Facility Needs" dated July 8, 2016. The memo included calculations of future arriving and departing trips by mode. The existing (2014) and future/PAL 4 (2034) trips by taxi, limo, and airporter/charter vehicles were scaled based on the Million Annual Passenger demand to the future SAMP years. The future ground transportation parking lot trips were projected based on the ratio of increase for the forecasted trips from the memo.

Table 10 shows the future Ground Transportation Lot trips by location.

Table 10. Ground Transportation PM Trips

Scenario	S 160th St Lot			S 190th St Lot			S 146th St Lot		
	In	Out	Total	In	Out	Total	In	Out	Total
2022 Existing	**215**	**234**	**449**	**5**	**6**	**11**	**0**	**0**	**0**
Existing Relocated	-215	-234	-449	-5	-6	-11	220	240	460
New Trips	0	0	0	0	0	0	65	71	136
2032 Future	**0**	**0**	**0**	**0**	**0**	**0**	**285**	**311**	**596**
Existing Relocated	-215	-234	-449	-5	-6	-11	220	240	460
New Trips	0	0	0	0	0	0	96	104	200
2037 Future	**0**	**0**	**0**	**0**	**0**	**0**	**316**	**344**	**660**

6.2 Trip Distribution and Assignment Assumptions

Trips are expected to be distributed evenly between inbound from the terminals, inbound from region, outbound to terminals, and outbound to region. It is assumed trips are split evenly between trips to and from the terminal and trips to and from the region using the **regional trip distribution model** for both inbound and outbound trips.

All existing trips at the S 160th St lot and the S 190th St lot were removed from the network based on the above methodology. All future trips were assigned to the new lot on S 146th St.

7 L07 - Employee parking

The previously proposed 1,500 stall Employee Parking Surface Lot (L06) and the proposed 2,000 stall Employee Parking Structure (L07) projects are combined to an expanded 3,500 stall parking structure at the L07 site north of SR 518 and south of S 146th St. adjacent to and west of the existing North Employee Parking Lot (NEPL). The purpose of the project is to provide additional capacity to accommodate increased demand for employee parking.

7.1 Existing Use and Growth Assumptions

1. Historical gate counts at the North Employee Parking Lot (NEPL) were averaged from dates of adjacent intersection peak hour counts in March 2018, June 2019, and October 2019 when the NEPL was 100% utilized.
2. The existing NEPL provides 4,122 parking stalls.

3. Parking requirements were scaled based on the ratio of increase of the remote parking requirements and the Million Annual Passenger demand.
4. Employee lot parking trips were calculated based on the existing trip rate per parking stall (4,122 stalls and 380 trips, or 0.09 trips per occupied stall in the PM peak hour). The parking requirements in the future years were then multiplied by this ratio to obtain the future trips at the new parking structure.
5. Parking demand was calculated based on a linear relationship between million annual passengers and employee parking demand. PM peak hour trips were then increased proportionally based on the increase in total parking demand.

Table 11 shows the future trips at the NEPL and the new parking structure.

Table 11. Remote Employee Parking PM Trips

Scenario	NEPL			New S 146th St Deck			Total		
	In	Out	Total	In	Out	Total	In	Out	Total
2019 Data (100% Occupancy)	**156**	**224**	**380**	**0**	**0**	**0**	**156**	**224**	**380**
2032 Future	156	224	380	50	73	123	206	297	503
2037 Future	156	224	380	70	101	171	226	325	551

7.2 Trip Distribution and Assignment Assumptions

Existing trips at NEPL to remain and all new trips were assigned to the new parking structure. Trips to the new parking structure were distributed according to the **network trip distribution model**.

8 S10 - Centralized Receiving and Distribution Center (CRDC)

This project involves constructing a new 55,000 square foot Centralized Receiving & Distribution Center on Port-owned property north of SR 518, and south of S. 144th Street to improve security and more efficiently screen and move supplies to Airport dining and retail concessionaires in the current and proposed future passenger terminals. The new CRDC would include a warehouse and office space, truck terminals and parking for visitors and employees.

8.1 Traffic Characteristics

The facility is expected to have 40-50 employees and will operate between the hours of 3 a.m. and 11 a.m. A nominal number of trips may occur during the PM peak hour for building maintenance, but the facility would not normally generate any PM peak hour trips. Based on the CRDC Needs Assessment Study, the facility will reallocate 8 existing PM peak hour delivery trips (4 inbound, 4 outbound) to the central terminal to the morning hours. No other changes are expected during the PM peak hour.

9 Summary of Near-Term Project Trip Generation

A summary of NTP trip development methodology is provided in Table 12. NTPs indicated as included in the DTA in Table 12 were included in forecasting Step 1 identified in the Future Conditions Report (Section 3.2.1). NTPs not included in the DTA model and instead were included with an individual or specific trip generation identified in this report were included in forecasting Step 3 identified in the Future Conditions Report (3.3.1)

Table 12. Summary NTP Trip Generation Methodology and Assumptions

Project		Included in DTA Model?	NTP Trip Generation Assumptions			
			Existing Trips Removed or Relocated?	New Trips in 2032?	New Trips in 2037?	Trip Generation Notes
C02/C03 – Off-Site Cargo PH 1 & 2 (L-Shape)		N	N	Y	Y	Cargo facility expansion located north of SR 518. New facilities expected to operate at 100% capacity in both 2032 and 2037.
L02 – Elevated Busway and Stations		N	Y	N	N	Construction of the elevated bus way will displace the current North GT Holding Lot on S 160th Street. These existing trips were relocated as part of L05.
L03 – Second Terminal Roads/Curbside		Y	-	-	-	New road linkages included in DTA model.
L04 – Main Terminal North GT Lot		Y	-	-	-	Main terminal trips included in DTA model.
L05 – North GT Holding Lot		N	Y	Y	Y	Trips from existing North and South GT Holding Lots relocated. Anticipated growth in trips for 2032 and 2037 as well.
L07 – Employee Parking Structure		N	N	Y	Y	Additional parking for airport employees based on anticipated growth in passenger demand.
T01 – North Gates, T02 – Second Terminal & Parking		Y	-	-	-	Second Terminal trips for North Gates accounted for in DTA model.
S01 – Fuel Farm Expansion		N	Y	N	N	Fuel farm will relocate existing South GT Holding Lot facilities. These existing trips are consolidated with the new trips generated in L05.
S02 – Primary (South) ARFF		N	Y	N	N	Primary ARFF facility relocated to south end of airfield to accommodate construction of North Gates (T01). Relocated trips based on count of existing ARFF facility.
S03 – Secondary (North) ARFF		N	N	Y	Y	New secondary ARFF facility. Assumed the same trip generation as primary ARFF facility as conservative assumption.
S07 – Westside Maintenance Campus		N	Y	Y	Y	Existing maintenance facilities relocated from North Cargo Area. Increase in employee and chained trips from 2032 to 2037 as a result of increased flight operations.
S10 – Centralized Rec. & Dist. Center		N	Y	Y	Y	Less then 10 existing PM peak hour trips to/from main terminal reassigned to AM peak hour. Small number of PM peak hour trips assumed for building maintenance. Employee shift occurring from 3 AM to 11 AM.
North Cargo Area Projects	A08 – North Cargo Hardstand	N	Y	N	N	Overall reduction in net building square footage for the North Cargo Area to accommodate A08, C01, S04, S05, S06, S08, and S09. Relocated trips from existing maintenance facility (S07) accounts for overall net reduction in trips generated within the North Cargo Area.
	C01 – Cargo 4 South Redevelopment					
	S04 – Fuel Rack Relocation					
	S05 – Triculator					
	S06 – De-Icing Tanks					
	S08 – North Airline Support					
	S09 – West Airline Support					

"Y" = Yes, "N" = No

Table 13 summarizes the NTP trip totals for each of the NTPs not included in the DTA modeling. Combined Future Trips in 2032 and 2037 for each NTP are calculated by adding Existing Trips and Relocated Existing Trips to the expected New Trip Generation for the respective year. Note that the C02/C03 project is expected to generate the same number of total trips in 2032 as in 2037. This is because the study assumes the full buildout of the L-Shape lot in 2032, despite the demand for cargo handling floor area not requiring the full use of the space. The remainder of the floor space is expected to be leased by the Port to private operators for similar uses, thus the total trips will be the same in both years. By 2037, the Port will occupy a larger footprint within the L-Shape lot and their portion of the total site trips shown in the table will increase, but total trips will not change. Also note that ARFF trips are expected to remain constant between 2032 and 2037, as fire and rescue staff are not expected to increase in that time frame.

Table 13. Summary of Non-DTA Model Near-Term Projects Trip Relocation and Generation

Project ID	Project/Site Name & Description	Existing Trips			Existing Trips to be Relocated			New Trip Generation for 2032			Combined Future Trips (2032) [Existing + New]			New Trip Generation for 2037			Combined Future Trips (2037) [Existing + New]		
		In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total
C02/ C03[1]	Off-Site Cargo (L-Shape)	0	0	0	0	0	0	161	162	323	161	162	323	161	162	323	161	162	323
L02	Elevated Busway (Existing North GT Lot To Be Relocated)	215	234	449	-215	-234	-449	0	0	0	0	0	0	0	0	0	0	0	0
L05	New GT Lot S 146th St (Relocated North & South GT Lots Trips)	0	0	0	220	240	460	65	71	136	285	311	596	96	104	200	316	344	660
L07	New Employee Parking Structure	0	0	0	0	0	0	50	73	123	50	73	123	70	101	171	70	101	171
S01	Fuel Farm Expansion (Existing South GT Lot To Be Relocated)	5	6	11	-5	-6	-11	0	0	0	0	0	0	0	0	0	0	0	0
S02	Existing ARFF Site (Removed with construction of T01)	5	15	20	-5	-15	-20	0	0	0	0	0	0	0	0	0	0	0	0
S02	Primary (South) ARFF Site	0	0	0	5	15	20	0	0	0	5	15	20	0	0	0	5	15	20
S03	Secondary (North) ARFF	0	0	0	0	0	0	5	15	20	5	15	20	5	15	20	5	15	20
S07	Westside Maintenance Campus	0	0	0	16	72	88	11	50	61	27	122	149	20	93	113	36	165	201
S10	Main Terminal Deliveries / CRDC (To Be Eliminated in PM Peak)	4	4	8	-4	-4	-8	0	0	0	0	0	0	0	0	0	0	0	0
Total		**229**	**259**	**488**	**12**	**68**	**80**	**292**	**371**	**663**	**533**	**698**	**1,231**	**352**	**475**	**827**	**593**	**802**	**1,395**

1. No future growth was included for the North Air Cargo area as it is expected that the Port of Seattle will lease excess space in 2032 and 2037, maintaining 100% capacity for both analysis years.

Attachment F: NTP Descriptions

Near-Term Project Summary

A total of thirty-two near-term projects are included in the proposed action conditions. 10 of the 32 NTPs are not expected to have any impact on the surface transportation analysis. The remaining 22 NTPs have some sort of impact on surface transportation and were accounted for in the analysis. Trip generation information for NTPs impacting the surface transportation analysis is documented in Attachment C.

The following NTPs do not generate, relocate, or reduce any vehicle trips and were therefore excluded from the surface transportation analysis:

- **A01 – Taxiway A/B Extension**. Extension of parallel Taxiways A and B by approximately 1,800 feet to provide access to the south end of Runway 16L/34R. Includes construction of parallel taxiway connectors from Taxiway B to Runway 16L/34R and the relocation of Taxiway S 310 feet south. Taxiways would have in-pavement centerline lights, elevated taxiway edge lights, hold position markings with in-pavement lights, elevated runway guard lights, and signage. Also includes the relocation of the Runway 34R glideslope antenna and shelter to the southeast, adjustment of the Runway 34R glideslope angle, adjustment of the PAPI to match the glideslope, amendments to flight procedures to accommodate the change in glideslope angle, and the construction of a new vehicle service road bridge over S. 188th St. No trips are expected to be generated by the project.
- **A02 – Runway 16R/34L Blast Pads**. Expansion of Runway 16R/34L blast pads from 200 feet by 200 feet to 220 feet by 400 feet to meet current FAA standards. No trips are expected to be generated by the project.
- **A03 – Taxiway C/D Reconfiguration and Runway Incursion Mitigation (RIM).** Modification of existing taxiway geometry of Taxiways C and D to correct non-standard intersection angles and reconfigure non-standard intersections. Also included is the extension of Taxiways C and D by approximately 500 feet to intersect with Taxilane A and removal of pavement north of Taxiway C to mitigate the existing RIM location. No trips are expected to be generated by the project.
- **A04 - Taxiway B 500' Separation.** Relocation of Taxiways A and B 100 feet east between Taxiways C and L to provide the required 500 feet runway/taxiway separation. Includes extending Taxiways C, D, E, H, and K to the relocated Taxiway B. Taxiways would have in-pavement centerline lights, elevated taxiway edge lights, hold position markings with in-pavement lights, elevated runway guard lights, and signage. No trips are expected to be generated by the project.
- **A05 – North Hold Pad.** Construction of a new approximately 90,000 square foot hold pad for four aircraft to reduce congestion on the taxiways and at the terminal. No trips are expected to be generated by the project.
- **A06 – Runway 34L High-Speed Exit.** Construction of a new high-speed exit for Runway 34L arrivals between Taxiways J and E to allow for more efficient use of the runway by arriving aircraft. The high-speed exit would be equipped with in-pavement centerline lights, elevated taxiway edge lights, hold position markings with in-pavement lights, and taxiway signage. No trips are expected to be generated by the project.
- **A07 – Taxiway D Extension.** Extension of Taxiway D by approximately 500 feet from Runway 16C/34C west to Taxiway T. Includes in-pavement centerline lights, elevated taxiway edge lights, hold position marking with in-pavement lights, elevated runway guard lights, and signage. No trips are expected to be generated by the project.

- **A09 – Central Hardstand.** Construction of a new approximately 292,000 square foot hardstand for seven aircraft north of Concourse D and east of the North Satellite to accommodate increased demand for passenger hardstand operations and overnight parking of passenger aircraft. Buses would bring passengers to/from aircraft on the hardstand. Construction of A09 requires relocating portions of the North Airport Expressway (L01). No trips are expected to be generated by the project.
- **A10 – Taxiway Fillets.** Construction of new full strength pavement panels and shoulders, and the installation of edge lighting and signage to bring taxiway fillets up to current FAA standards. No trips are expected to be generated by the project.
- **L06** – As a result of comments received during scoping, the Port integrated Project L06 (a proposed surface lot for employee parking) into Project L07. Therefore, this NTP is not being carried forward.

The following NTPs in some way alter vehicle trips and are accounted for in the surface transportation analysis:

- **A08 – North Cargo Hardstand.** Construction of a new approximately 360,000 square foot (1,200 feet by 300 feet) cargo aircraft hardstand in the North Cargo area east of Taxiway A. The hardstand would accommodate five aircraft for loading and unloading of cargo freight and parking of cargo aircraft. Construction of A08 will require the relocation of the existing United maintenance hangar and Swissport cargo facility (S08), relocation of the Port's aviation maintenance facility (S07), and relocation of ground service equipment maintenance (S09). Trip generation for the project is included in the North Cargo Area calculations.
- **T01 – North Gates.** Construction of a new multi-level terminal concourse and aircraft apron to accommodate up to 19 gates. The new terminal concourse would have a footprint of approximately 203,000 square feet and contain three levels (approximately 609,000 square feet total). The new concourse would include a ramp level for baggage handling and aircraft support functions; a concourse level with passenger holdrooms, concessions, restrooms, and other passenger and airline support functions; a mezzanine level with office space; and an above-ground elevated pedestrian walkway to the passenger terminal. The new facility would be located north of the North Satellite Concourse and would displace the Aircraft Rescue and Firefighting (ARFF) station (S02), Cargo 6 warehouse (C01), deicing tanks (S06), North Airport Expressway (L01) and fuel rack (S04). The new concourse would also include an elevated pedestrian walkway to connect to the existing north satellite concourse.
- **T02 – Second Terminal and Parking.** Construction of a new multi-level passenger terminal. The new terminal would be approximately 575,000 square feet in size, with a footprint of approximately 166,000 square feet. The new terminal would include a basement level for baggage handling and screening; a baggage claim level for arriving passengers; an interstitial (or open) level connected to a new garage that provides commercial curbside space; and a departures level with passenger check-in and security screening facilities. This would be located across the Airport Expressway from the proposed terminal concourse, connected via an elevated pedestrian walkway. A new multi-level parking garage would also be provided. The garage would provide approximately 1,350 parking spaces. The new facilities would displace the Doug Fox Parking Lot.

- **C01 – Cargo 4 South Redevelopment.** Construction of a new approximately 80,000 square foot building (warehouse and office space, truck terminals, and parking) on the Cargo 4 South site located in the existing central cargo area of the Airport.
- **C02 – Offsite Cargo Phase 1.** Construction of a new approximately 330,000 square foot cargo warehouse building (warehouse, office space, truck terminals, and parking) on the Port's L-shaped parcel located north of State Route (SR) 518.
- **C03 – Offsite Cargo Phase 2.** Construction of a new approximately 90,000 square foot cargo warehouse building (warehouse and office space, truck terminals, and parking) on the Port's L-shaped parcel located north of SR 518.
- **L01 – North Airport Expressway (NAE) Relocation (southbound lanes).** Construction of approximately 7,300-linear-feet of new airport roadways to access the second terminal and to alleviate congestion on existing roadways. The new roadway would replace a section of the existing roadways eliminated for the construction of A09 and T01. The relocated portion of the NAE would also be widened from three lanes to four lanes.
- **L02 – Elevated Busway and Stations.** Construction of approximately 6,000-linear-feet of elevated busway and three stations to connect the main terminal, new second terminal, and Rental Car Facility. The busway and stations would be located along the eastern edge of airport property and would tie into existing bus routes. Construction would displace the ground transportation holding lot (L05).
- **L03 – Second Terminal Roads and Curbside.** Construction of a loop ramp from the southbound lanes of the NAE to provide access to the new passenger terminal. The ramp would connect to the existing S. 160th St. Loop, westbound SR 518 on-ramp at S. 160th St., or the existing northbound lanes of the NAE. Split-level curbsides would also be constructed for arriving vehicles, departing vehicles, and commercial vehicles such as shuttles, taxis, and ride-share companies. No trips are expected to be generated by the project.
- **L04 – Northeast Ground Transportation Center (NE GTC).** Construction of a NE GTC on the north side of the existing parking garage. The NE GTC facility would be approximately 255,000 square feet and would include: 1) expansion of the existing charter and cruise bus lot below the new building on the ground floor level, 2) a shuttle bus platform on level two serving as the southern terminus of the elevated busway (approximately 87,000 square feet), 3) passenger circulation and check-in facilities on level three providing terminal-quality space for passengers arriving/departing on the elevated busway and Link Light Rail at the Airport Station to transition to/from the main terminal (approximately 64,000 square feet), and 4) office space on levels four and five (approximately 52,000 square feet per level).
- **L05 – North Ground Transportation (GT) Holding Lot.** Relocation of the GT holding lot on Port property north of SR 518 and south of S. 144th St. to replace the existing North GT Holding Lot displaced by L02 and South Ground Transportation Holding Lot on S 190th St displaced by S01. The new lots located north and east of the intersection of S 146th St and 16th Ave S would be used for ground transportation holding of taxis, transportation network company vehicles, and other chartered vehicles as they await trip requests or passenger arrival.
- **L07 – Employee Parking Structure.** Construction of a new eight-story (i.e., one below grade and seven above grade) parking structure that would provide approximately 3,500 parking stalls on

Port property north of SR 518 and south of S. 144th St. adjacent to and west of the existing North Employee Parking Lot (NEPL) to accommodate employee parking demand.

- **S01 – Fuel Farm Expansion.** Expansion of the existing fuel farm onto the existing South GT Holding Lot. This would include four new settling tanks, adding approximately 10-million-gallons storage capacity; an approximately 500,000-gallon blending tank and approximately 100,000-gallon Sustainable Aviation Fuels (SAF) receipt tank; additional piping; expanded spill containment dike; and a new truck fuel rack to support the delivery of SAF for blending.
- **S02 – Primary ARFF Facility.** Relocation of the Primary ARFF station for construction of T01. The new ARFF would be approximately 50,000 square feet and would be located on the south airfield between Runway 16R/34L and Runway 16C/34C.
- **S03 – Secondary ARFF Facility.** Construction of an approximately 10,000 square foot Secondary ARFF to provide ambulatory response to the terminals and concourses, fuel spill and fire response to the concourse ramp areas, and back-up emergency response to the airfield. The Secondary ARFF facility would be integrated within the new Concourse (T01) at the southeast end of the concourse and would have both airside and landside access.
- **S04 – Fuel Rack Relocation.** Relocation of the fuel rack from the Cargo 6 area to the Cargo 3 area for construction of T01. The fuel rack is part of the existing fuel distribution system at SEA, where fuel trucks refill.
- **S05 – Triculator.** Relocation of the triculator building from east of the existing ARFF station to the north cargo area to clear the site for A09. The triculator transfers aircraft waste to the sewer system.
- **S06 –De-icing Tanks.** Relocation of de-icing fluid tanks currently located at Cargo 6 and Cargo 7 to a northern location and southern location to clear the site for the new concourse. Each site would have a containment system and two tanks, one for Type I de-icing fluid (for shorter-term protection) and the second for Type IV de-icing fluid (for longer-term protection). Each set of tanks would also have a blending station.
- **S07 – Westside Maintenance Campus.** Relocation of the Port's aviation maintenance facility (AMF) for construction of A08 and T01. The AMF would be located on vacant land on the west side of the Airport in the Westside Maintenance Campus, co-locating it with other related functions. The AMF facilities would include a vehicle fuel rack, airfield deicer storage, snow equipment storage, multi-bay buildings and associated maintenance facilities. The existing S. 168th St. access would be reconstructed, and a new access road would also be constructed from S. 157th Place to the new facility.
- **S08 – North Airline Support.** Construction of an approximately 15,000 square foot airline support building in the northeast corner of the North Cargo area to accommodate displaced aircraft maintenance functions from the United Airlines maintenance building and Swissport cargo facility. Both facilities are located in the area proposed for the construction of A08.
- **S09 – West Airline Support.** An approximately 12,500 square foot expansion of the existing (approximately 25,700 square foot) AMB/AFCO III building used for cargo operations to the west. The expanded building would accommodate displaced Ground Service Equipment maintenance functions for construction of A08.
- **S10 – Centralized Receiving and Distribution Center (CRDC).** Construction of a new approximately 55,000 square foot CRDC on Port property north of SR 518 and south of S. 144th St. to improve

security and efficiency in moving supplies to SEA dining and retail concessionaires in the passenger terminals. The new CRDC would include a warehouse, office space, truck terminals, and parking for visitors and employees.

APPENDIX L

Surface Transportation

Local Jurisdiction Coordination Summary

Surface Transportation Meeting Summary

Meetings were held with local jurisdictions (WSDOT, City of SeaTac, City of Burien, City of Des Moines, and the City of Tukwila), presenting the SAMP NTP Environmental Review traffic analysis results and the Port's proposed mitigation.

WSDOT

- Weekly meetings were held throughout the preparation of the analysis.
- A meeting presenting the results and proposed mitigation occurred on March 26, 2024 with follow-up discussions on April 16, 24, and 30, 2024.
- On April 30, 2024, WSDOT presented the Port and FAA mitigation requirements for impacts to WSDOT controlled intersections.
- The Future Conditions Report was provided to WSDOT on May 14, 2024.
- WSDOT reviewed the Future Conditions Report and provided comments back on June 6, 2024.
- The Future Conditions Report was updated and provided back to WSDOT on June 19, 2024.
- WSDOT responded on June 25, 2024 they had no further comments on the Future Conditions Report at this time.

Des Moines

- A meeting presenting the results and proposed mitigation occurred on April 1, 2024.
- A meeting summary was sent on April 2, 2024.
- On April 15, 2024, the City of Des Moines provided an email containing the City mitigation requirements.

Burien

- A meeting presenting the results and proposed mitigation occurred on April 10, 2024.
- A meeting summary was sent on April 11, 2024.
- On April 26, 2024, the City of Burien provided an email indicating the City had no additional comments on the analysis or proposed mitigation.

Tukwila

- A meeting presenting the results and proposed mitigation occurred on April 10, 2024.
- A meeting summary was sent on April 11, 2024.
- On April 26, 2024 the City of Tukwila provided an email indicating the City had no additional comments on the analysis or proposed mitigation.

City of SeaTac

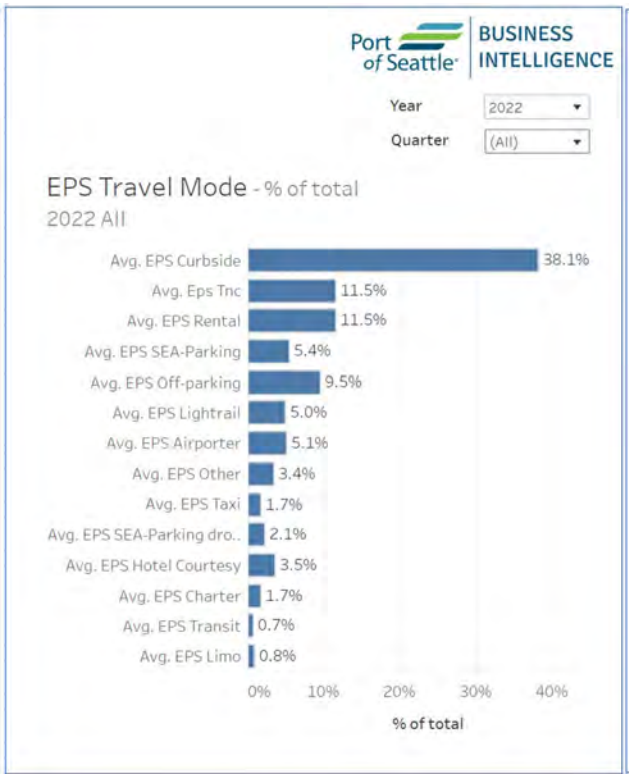
- A meeting presenting the results and proposed mitigation occurred on April 1, 2024.
- A meeting summary was sent on April 2, 2024.
- On April 23, 2024, the City of SeaTac provided an email with comments.
- A follow-up meeting was held on May 10, 2024 to address comments.
- A meeting summary was sent on May 14, 2024.

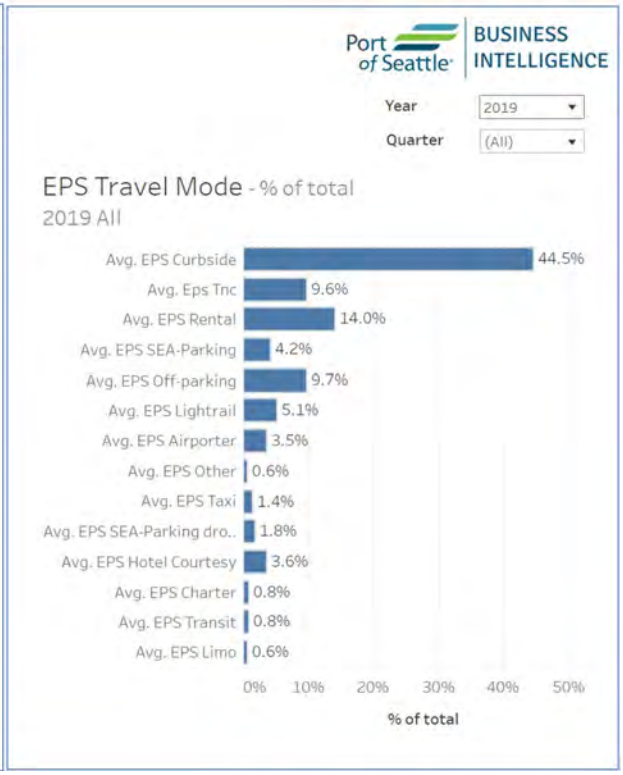
APPENDIX L

Surface Transportation

References

Transportation Modes at SEA
Puget Sound Regional Council Adopted LOS for Regionally Significant State Highways





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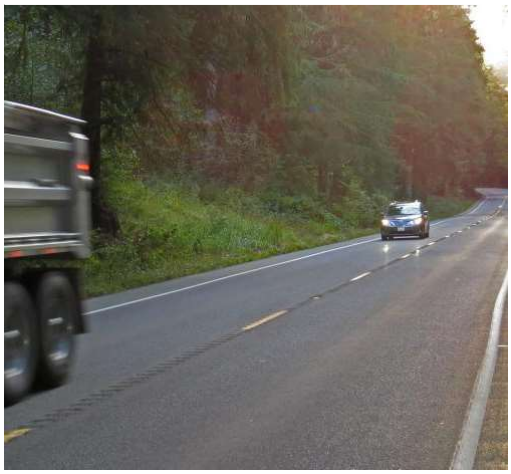
Puget Sound Regional Council



Adopted Level of Service Standards for Regionally Significant State Highways

In compliance with 1998 amendments (HB 1487, the "Level of Service Bill") to the Growth Management Act (GMA) the Puget Sound Regional Council Executive Board adopted level of service (LOS) standards for regionally significant state highways in the central Puget Sound region. Regionally significant state highways are state transportation facilities that are not designated as being of statewide significance (also called non-HSS).

Level of Service Standards

This table (along with the map) explains the level of service standards.

Tier	LOS Standard	Description
1	LOS "E/mitigated"	Tier 1: For this process, the "inner" urban area is generally defined as a 3-mile buffer around the most heavily traveled freeways (I-5, I-405, SR 167, SR 520, and I-90), plus all designated urban centers (most are located in the freeway buffer already). The standard for Tier 1 routes is LOS "E/mitigated," meaning that congestion should be mitigated (such as transit) when p.m. peak hour LOS falls below LOS "E."
2	LOS "D"	Tier 2: These routes serve the "outer" urban area - those outside the 3-mile buffer - and connect the "main" urban growth area (UGA) to the first set of "satellite" UGA's (e.g., SR 410 to Enumclaw). These urban and rural areas are generally farther from transit alternatives, have fewer alternative roadway routes, and locally adopted LOS standards in these areas are generally LOS "D" or better. The standard for Tier 2 routes is LOS "D."
3	LOS "C"	Tier 3: Rural routes are regionally significant state routes in rural areas that are not in Tier 2. The standard for rural routes is LOS "C," consistent with the rural standard in effect for those routes once they leave the four counties in the PSRC region, such as SR 530 entering Skagit County.

The LOS will be measured consistent with the latest edition (preferred) of the Highway Capacity Manual and based on a one-hour p.m. peak period.

- Maps +
- Level of Service Standards for State Ferry Routes +
- How Level of Service Standards Will Be Used +
- Local Compliance With Requirements +
- Mitigation Strategies +
- Level of Service Standards for Highways of Statewide Significance +
- System Updates and Amendments +
- Local Concurrency +