Puget Sound Gateway Project

SR 509, I-5 and SR 167 Funding and Phasing Study: Strategic Corridor Design Review

Appendix J:
Travel Demand Methodology

Washington State Department of Transportation

September 2013

13-07-0002091

CONTENTS

EXHIBITS

This page is intentionally blank.

INTRODUCTION

This memorandum documents the travel demand modeling process and assumptions in support of the Puget Sound Gateway Project (Gateway Project). For the purpose of producing travel demand forecast volumes, an appropriate version of the Puget Sound Regional Council (PSRC) regional travel demand model was used. This model version was updated as part of the ongoing I-90 Environmental Analysis (EA) Study. This included a base year validation test for the post tolling on SR 520. This model was used to produce toll traffic forecasts, for two horizon years, to perform toll revenue forecasting analysis in support of the Gateway Project. Travel demand modeling procedures and key input data assumptions are included below.

TRAVEL DEMAND MODELING PROCEDURES AND ASSUMPTIONS

The travel demand model used for this study was based on the current PSRC regional travel demand model (Version 1bb) validated for the SR 520 Bridge Replacement and HOV Program in support of the Final Environmental Impact Statement (FEIS) work. The PSRC model is a traditional four-step travel demand modeling system encompassing trip generation, distribution, mode choice and assignment components[1]. The validation analysis for the SR 520 model is included in the SR 520 FEIS Travel Demand Model: Base Year Validation Analysis Technical Memorandum, dated September 2010.

The SR 520 FEIS model was updated to reflect current conditions. The model update and validation were only applied to the primary travel corridors critical to this study. Subsequently, the network was further refined within the area of Gateway Project.

The following sections highlight key input data assumptions, which include value of travel time, toll rates on other (background) facilities, land use forecasts, and network definition for the Gateway Project for the year 2016 / fiscal year (FY) 2017 and 2030 / FY 2031.

Value of Travel Time

The value of time (VOT) plays a key role in tolling studies. The quality of toll modeling depends on the ability to simulate travelers' perception of value of time. WSDOT has been relying on the current Puget Sound Regional Council's model for toll studies which has its own set of VOT values. The VOT varies by vehicle class (SOV, HOV, medium, heavy trucks etc.), income groups (low, low-medium, medium and high), trip types (work vs. non-work trips) and time of travel (AM, PM, Midday, Evening and Night periods).

As part of the SR 520 Bridge Investment Grade Traffic and Revenue Study conducted for WSDOT by Wilbur Smith Associates (now CDM Smith), a set of VOTs was developed to suit investment-grade level toll modeling analysis. Note that the VOTs used in the SR 520 IG study are lower by about 40 percent than those used in the PSRC model. The first few months of field observation in 2012 suggested that the VOT used in the SR 520 Investment Grade (IG) study findings were reasonably close to actual average weekday traffic using SR 520 and I-90. In the absence of readily available corridor specific data, the VOTs used in the SR 520 IG study provide a reasonable starting point for the Gateway Project.

[1] PSRC Travel Model Documentation (for Version 1.0), Final Report (September 2007).

Exhibit J-1 shows VOTs used in the SR 520 IG study and the Gateway Project. These VOTs are similar excepting for medium and large trucks. A discussion among the WSDOT and consulting team members agreed that the VOTs used in SR 520 IG study should be suitable for the Gateway Project, excepting for medium and large trucks for which VOTs could be higher considering likely difference in truck travel patterns/characteristics using SR 520 and I-90. WSDOT staff subsequently conducted additional literature review[2] and discussions with CDM Smith and recommended using a VOT estimate of $45 and $65 per hour, respectively, for medium and large trucks, as shown in Exhibit J-1.

Exhibit J-1: Value of Travel Time (VOT) Estimates

Trip Type	SR 520 Study[1] in 2010 $s	Gateway Project in 2010 $s	Gateway Project in 2000 $s[2]
Home-Based Work (HBW) SOV Income Group 1	$9.60	$9.60	$7.70
Home-Based Work (HBW) SOV Income Group 2	$13.80	$13.80	$11.00
Home-Based Work (HBW) SOV Income Group 3	$16.80	$16.80	$13.40
Home-Based Work (HBW) SOV Income Group 4	$22.80	$22.80	$18.20
Non-Work Single-Occupant Vehicle (SOV)	$13.80	$13.80	$11.00
High Occupant Vehicle (HOV): 2-occupants	$24.00	$24.00	$19.20
High Occupant Vehicle (HOV): 3+occupants	$27.00	$27.00	$21.60
Light Truck	$30.00	$30.00	$24.00
Medium Truck	$30.00	*$45.00*	*$36.00*
Large Truck	$36.00	*$65.00*	*$51.90*
Overall Weighted Average	**$17.70**	**$17.98**	**$14.37**

[1]Source: SR 520 Bridge Investment Grade Traffic and Revenue Study Report (August 29, 2011).

[2]VOTs in year 2000 $s are shown since all costs in the demand model are in 2000 $s.

Toll Rates on Background Facilities

This section includes toll rates assumed for background facilities.

Toll Rates for SR 520 and I-90

Toll rate assumptions for background highway network are similar to those used by CDM Smith in the SR 520 IG forecasts update (August 2012). Toll rates used by CDM Smith reflect difference in toll payment method. For the purpose of consistency with assumptions used by CDM Smith, toll rates were prepared to reflect split between "Good To Go!" pass users and "Pay By Mail" users as well as time periods in the PSRC model. Resulting toll rates are referred to as "blended" SR 520 toll rates for base year (2011/FY 2012) and future years (2016/FY 2017 and 2030/FY 2031) are shown in Exhibit J-2. These "blended" toll rates are used to perform the I-90 EA base year model validation and No Build. SR 520 toll rates were also used on I-90, as shown in Exhibit J-2.

[2] For example, recently published NCHRP Report 722, Volume 2, recommends a value of $30 for light trucks and $60 for heavy trucks.

Exhibit J-2: SR 520 and I-90 Toll Rates Converted for PSRC Model Application

	SR 520 Blended Toll Rates									I-90 Toll Rates			
Model Time Period	***Model Year 2011 FY 2012***			***Model Year 2016 FY 2017***			***Model Year 2030 FY 2031***			***Model Year 2016 FY 2017***		***Model Year 2030 FY 2031***	
	GTG %	*2011 $s*	*2000 $s*	GTG %	*2016 $s*	*2000 $s*	GTG %	*2030 $s*	*2000 $s*	*2016 $s*	*2000 $s*	*2030 $s*	*2000 $s*
AM peak period	82.8%	$3.63	$2.82	96.8%	$4.26	$2.93	98.1%	$4.24	$2.06	$4.26	$2.93	$4.24	$2.06
Midday period	82.8%	$2.72	$2.11	78.0%	$3.53	$2.42	84.0%	$3.43	$1.67	$3.53	$2.42	$3.43	$1.67
PM peak period	82.8%	$3.76	$2.92	85.2%	$4.60	$3.16	93.1%	$4.47	$2.17	$4.60	$3.16	$4.47	$2.17
Evening period	82.8%	$2.63	$2.04	73.8%	$3.48	$2.39	81.7%	$3.34	$1.62	$3.48	$2.39	$3.34	$1.62
Night period	82.8%	$0.91	$0.70	71.5%	$2.09	$1.43	80.4%	$1.93	$0.94	$2.09	$1.43	$1.93	$0.94

Notes:

- There is no toll escalation after FY 2017. The difference in nominal toll rates seen above between FY 2017 and FY 2031 is due to the Good to Go! pass market share assumptions by year.
- Inflation factor 2000-2011 =
- Inflation after 2011 estimated at 2.5% per year
- HOV3+ and transit are toll exempt on both bridges in all scenarios except Scenario D. For Scenario D, only transit is toll exempt and all HOVs would pay on both bridges.
- Toll rate for 2015/FY2016 will be obtained by discounting the nominal 2016/FY2017 rates by the rate of inflation (2.5%)
- SR 520 toll rates for Calibrated Base Case were adjusted such that the daily *Good to Go!* pass (GTG) market shares estimated by the CDM Smith were matched.
  A processing fee of $1.70 in nomimal dollars is applied to "pay by mail" customers. Processing fee is assumed not to escalate after FY 2017.
- Calibrated Base Case uses a variable GTG market share by time of day such that the overall daily market share matches with the CDM Smith model's 'output'
  GTG market shares of 82.3% for the FY2017 and 88.3% for the FY2031.
- Both I-90 Toll Scenarios A & B assume the SR 520 bridge tolled at the rates shown above for Calibrated Base Case. For I-90 Toll Scenario B, toll on I-90 is assumed to be two-thrids of the SR 520 to
- Medium and heavy truck toll multipliers of 1.5X and 2.5X the auto toll.

Toll Rates on Other Facilities

This section describes toll rates assumed on other facilities.

- For the Tacoma Narrows Bridge, a single point flat toll rate of $2.12 per direction in 2010 $s (or $2.47 in 2016 $s and $3.48 in 2030) will be used in the model. This assumes no declining toll rate between 2016 and 2030.
- For the Alaskan Way Viaduct (AWV), the AWV Replacement Program Advisory Committee on Tolling and Traffic management (ACTT) developed Scenario 4 (medium) toll rates under the ongoing SR 99 Toll Feasibility Study (see Exhibit J-3). The ACTT Scenario 4 toll rates are lower than toll rates assumed for AWV under the SR 520 FEIS. The ACTT Scenario 4 assumed declining toll rate between 2016 and 2030. The same rates will be used in modeling.
- Toll rates used for SR 167 and I-405 HOT lanes are on per mile basis and the same as those used for the I-90 Pre-Environmental Toll Study. These toll rates (see Exhibit J-4) assume no declining toll rate between 2016 and 2030.

HOV Definition and Toll Exemption

It is assumed that only 3+HOV vehicles and transit are allowed using all HOV lanes in future years. Transit and 3+HOV vehicles are exempt from tolls on I-90 and SR 520.

Exhibit J-3: SR 99 Tunnel Toll Rates for 2016 and 2030 – ACTT Scenario 4

Time Period	*Model Year 2016 FY 2017*		*Model Year 2030 FY 2031*	
	2000 $s	*2016 $s*	*2000 $s*	*2030 $s*
AM Peak Period	$1.58	$2.25	$1.09	$2.25
Mid Day Period	$1.06	$1.50	$0.73	$1.50
PM Peak Period	$1.94	$2.75	$1.34	$2.75
Evening Period	$0.88	$1.25	$0.61	$1.25
Night Period	$0.00	$0.00	$0.00	$0.00

Notes:

- Toll rates used for Scenario 4 for SR 99 Tunnel Toll Feasibility Analysis.
- Inflation factor 2000-2011 = 1.2865
- Inflation after 2011 estimated at 2.5% per year
- Medium and heavy trucks multipliers of 1.5X and 1.5X

Exhibit J-4: I-405 and SR 167 HOT Lanes Toll Rates for 2016 and 2030

Time Period	*Per Mile Toll Rates*					
	Model Year 2016 FY 2017			*Model Year 2030 [a] FY 2031*		
	2000 $s	*2010 $s*	*2016 $s*	*2000 $s*	*2010 $s*	*2030 $s*
AM Peak Period	$0.14	$0.18	$0.20	$0.16	$0.20	$0.33
Mid Day Period	$0.04	$0.04	$0.05	$0.04	$0.05	$0.08
PM Peak Period	$0.14	$0.18	$0.20	$0.16	$0.20	$0.33
Evening Period	$0.04	$0.04	$0.05	$0.04	$0.05	$0.08
Night Period	$0.04	$0.04	$0.05	$0.04	$0.05	$0.08

Notes:

- The 2030 toll rates shown above were used for SR 520 FEIS Cumulative Effects
- Inflation factor 2000-2010 = 1.25162
- Inflation factor 2010-2011 = 1.02785
- Inflation after 2011 estimated at 2.5% per year
- HOV3+ and Transit are toll exempt. Trucks not allowed in the ETLs

[a]Assumes a 1% real growth in toll rates over the rate of inflation beteween 2016 and 2030

Land Use Forecasts

The SR 520 FEIS travel demand modeling relied on the current PSRC model with land use forecasts that were created by PSRC in 2006. For the SR 520 IG Study, CDM Smith updated PSRC land use forecasts to reflect the effect of economic recession. The effect in land use change, compared to 2006-based PSRC land use forecasts, amounted to a reduction of about 3% in regional total employment and 1% in households and population in 2016 and 2030. This reduction in PSRC's land use forecasts was adopted for all recent toll studies.

PSRC's new land use forecasts were not available for use in the study, being released in July 2013. In the absence of PSRC's final land use forecasts being available for this study, future years land use forecasts recently used by CDM Smith to update SR 520 IG forecasts were used. Community Attributes Inc. (CAI), in consultation with CDM Smith, prepared land use forecasts in August 2012 for the "Revised SR 520 Traffic and Revenue forecasts." includes district level summary of these land use forecasts. District boundary map is shown in Exhibit J-6. Land use forecasts shown in Exhibit 5 indicate that 4-county total households and employment are, respectively, projected to grow annually at the rate of about 1.3% and 2.9% (between 2011 and 2016) and 1.7% and 1% (between 2016 and 2030).

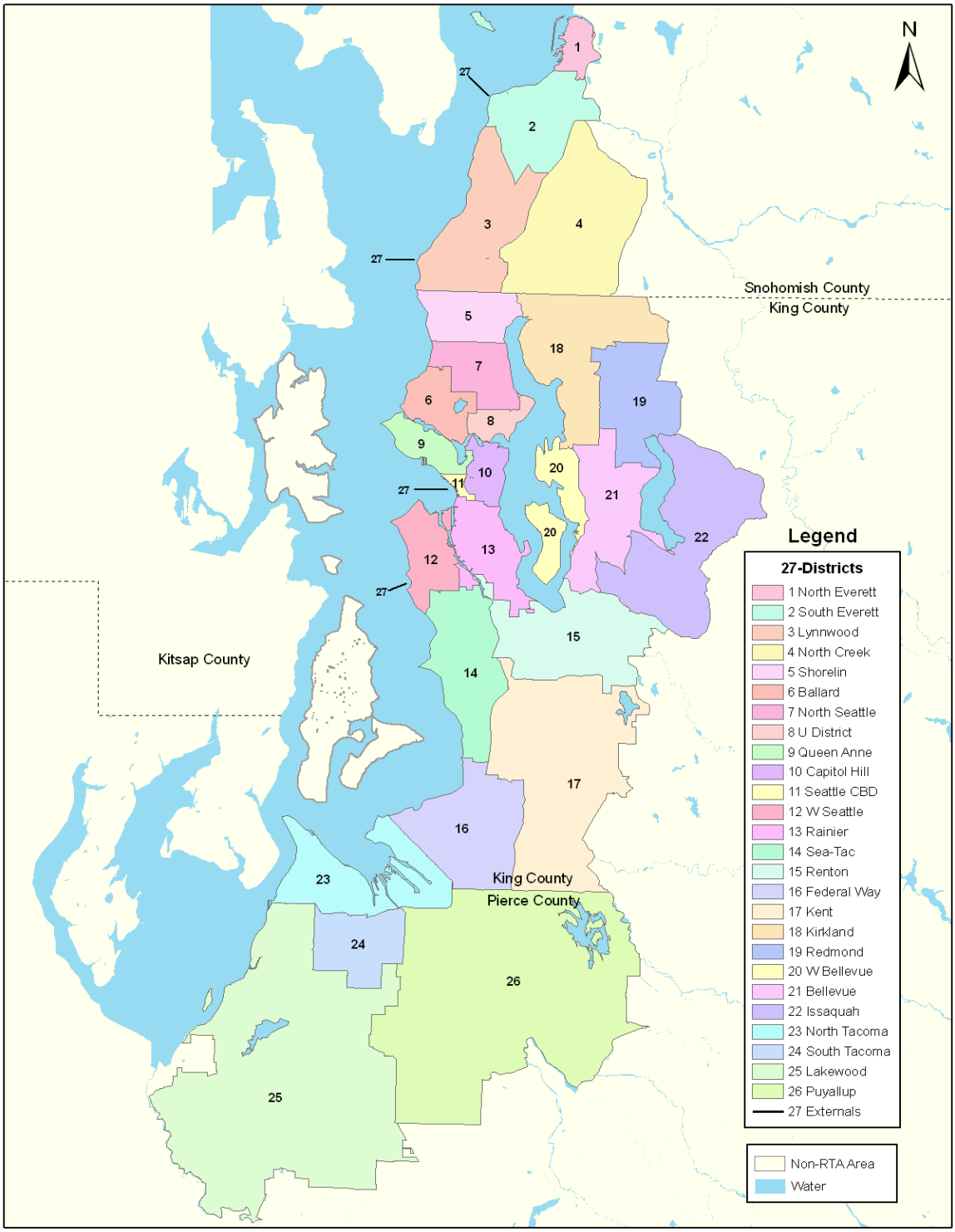
Exhibit J-5: Total Households, Population and Employment Forecasts for 2011, 2016 and 2030

		Total Households					Total Population					Total Employment				
No.	District Name	Year 2011[a]	Year 2016[b]	2016 over 2011	Year 2030[b]	2030 over 2011	Year 2011[a]	Year 2016[b]	2016 over 2011	Year 2030[b]	2030 over 2011	Year 2011[a]	Year 2016[b]	2016 over 2011	Year 2030[b]	2030 over 2011
1	North Everett	60,600	65,800	1.09	83,700	1.38	162,900	178,200	1.09	215,700	1.32	59,100	72,700	1.23	87,200	1.48
2	South Everett	36,300	39,200	1.08	47,500	1.31	90,900	99,000	1.09	114,300	1.26	67,400	85,300	1.27	94,800	1.41
3	Lynnwood	62,600	67,700	1.08	84,200	1.35	154,400	168,300	1.09	199,400	1.29	53,900	65,800	1.22	83,100	1.54
4	North Creek	108,900	118,400	1.09	148,800	1.37	305,000	333,900	1.09	398,300	1.31	62,900	72,100	1.15	89,300	1.42
5	Shoreline	26,900	28,000	1.04	30,800	1.14	66,500	68,300	1.03	71,500	1.08	20,200	20,400	1.01	22,200	1.10
6	Ballard	50,900	55,300	1.09	64,100	1.26	105,000	112,600	1.07	124,700	1.19	40,500	42,000	1.04	48,900	1.21
7	North Seattle	46,200	48,100	1.04	54,300	1.18	100,800	104,200	1.03	112,100	1.11	33,000	38,100	1.15	44,600	1.35
8	University District	18,700	22,000	1.18	25,100	1.34	50,600	57,700	1.14	61,800	1.22	47,500	50,400	1.06	54,100	1.14
9	Queen Anne	34,100	40,400	1.18	48,200	1.41	64,800	74,700	1.15	84,500	1.30	59,300	102,600	1.73	120,200	2.03
10	Capitol Hill	46,300	52,300	1.13	58,700	1.27	86,000	97,500	1.13	104,500	1.22	62,500	79,400	1.27	93,400	1.49
11	Seattle CBD	16,700	18,800	1.13	26,200	1.57	27,000	28,100	1.04	36,600	1.36	131,500	128,600	0.98	152,800	1.16
12	W Seattle	37,400	40,300	1.08	44,000	1.18	82,800	87,900	1.06	91,400	1.10	23,100	24,200	1.05	27,300	1.18
13	Rainier	33,100	35,900	1.08	41,100	1.24	91,500	97,300	1.06	105,400	1.15	84,600	88,300	1.04	95,600	1.13
14	Sea-Tac	48,400	50,100	1.04	57,200	1.18	128,700	131,700	1.02	142,800	1.11	53,400	55,600	1.04	59,400	1.11
15	Renton	53,700	56,700	1.06	67,200	1.25	138,000	144,600	1.05	162,500	1.18	96,900	106,300	1.10	109,600	1.13
16	Federal Way	45,800	47,900	1.05	54,300	1.19	125,400	129,300	1.03	138,900	1.11	35,600	39,000	1.10	43,000	1.21
17	Kent	107,300	111,400	1.04	134,600	1.25	297,400	305,900	1.03	350,000	1.18	123,300	131,700	1.07	135,500	1.10
18	Kirkland	67,900	70,600	1.04	83,000	1.22	167,700	173,500	1.03	193,700	1.16	69,100	77,900	1.13	89,100	1.29
19	Redmond	33,600	35,600	1.06	42,200	1.26	85,400	89,900	1.05	100,600	1.18	85,300	102,100	1.20	131,800	1.55
20	West Bellevue	23,700	25,800	1.09	31,200	1.32	54,300	57,800	1.06	65,600	1.21	60,000	72,200	1.20	82,900	1.38
21	Bellevue	41,000	42,800	1.04	50,600	1.23	104,700	108,100	1.03	121,100	1.16	73,100	85,100	1.16	98,000	1.34
22	Issaquah	52,700	54,600	1.04	63,600	1.21	143,800	148,500	1.03	163,800	1.14	41,700	44,900	1.08	48,900	1.17
23	North Tacoma	73,800	77,900	1.06	93,200	1.26	181,400	194,000	1.07	223,300	1.23	93,700	106,300	1.13	125,400	1.34
24	South Tacoma	32,400	34,200	1.06	39,800	1.23	89,700	96,000	1.07	107,200	1.20	34,600	36,500	1.05	41,600	1.20
25	Lakewood	73,700	78,000	1.06	89,700	1.22	194,100	209,400	1.08	231,400	1.19	66,000	97,100	1.47	107,200	1.62
26	Puyallup	120,100	126,800	1.06	157,500	1.31	330,400	357,100	1.08	424,600	1.29	70,700	76,400	1.08	87,800	1.24
27	Rest of Region	101,800	104,900	1.03	127,900	1.26	261,800	282,900	1.08	335,000	1.28	88,400	101,500	1.15	112,400	1.27
	King County	789,000	841,300	1.07	981,800	1.24	1,931,000	2,028,600	1.05	2,243,400	1.16	1,143,500	1,291,500	1.13	1,460,100	1.28
	Kitsap County	97,200	100,200	1.03	122,500	1.26	251,200	271,900	1.08	323,100	1.29	85,500	98,800	1.16	109,600	1.28
	Pierce County	300,000	316,900	1.06	380,200	1.27	795,600	856,500	1.08	986,500	1.24	265,000	316,300	1.19	362,000	1.37
	Snohomish County	268,400	291,100	1.08	364,200	1.36	713,200	779,400	1.09	927,700	1.30	243,300	295,900	1.22	354,400	1.46
4-County Region		**1,454,600**	**1,549,500**	**1.07**	**1,848,700**	**1.27**	**3,691,000**	**3,936,400**	**1.07**	**4,480,700**	**1.21**	**1,737,300**	**2,002,500**	**1.15**	**2,286,100**	**1.32**

[a] Source: PSRC's Draft 2012 Land use Forecasts (March 2012 version) included actual demographic data for 2010. Year 2010 employment was grown by 1.5% to reflect implied regional growth in the Community Attributed Inc (CAI's) forecasts between 2010 and 2011. No adjustment was required for households and population.

[b] Source: Land use for 2016 and 2030 were prepared from CAI (December 2012) for consistency with the land use forecasts used by CDM Smith to update SR 520 forecasts in August 2012.

Exhibit J-6: District Map for Land Use Summaries



Network Definition

The Gateway Project demand model network was updated to include the proposed I-5 Express Toll Lanes (ETL) and SR 167 and SR 509 Extension improvements. Network assumptions for modeling the Gateway Project include the following:

I-5

The coding for the I-5 ETL-to-GP connectors was adjusted from the typical model convention to better reflect ETL operations, where if a toll-paying vehicle touches the tolled lanes for any distance, that vehicle would pay for using the entire segment.

Two ETLs in each direction were coded between the SR 167 Extension and the SR 509 Extension. The capacity of the ETLs was adjusted from 1,500 vehicle per hour (vph) to 1,750 vph to better reflect observed and expected operations of the ETLs; using this assumption regarding capacity better allows for tolls to be used in achieving desired operational and performance goals of the ETLs.

For 2016, Direct Access Ramps/HOV-to-HOV ramps have been added at these locations:

- SR 16: S to W, E to N
- S 317th Street: both directions
- SR 509 Extension: to/from south
- I-405 (South): S to E, W to N
- SR 599: S to S
- 46th Ave SW: both directions
- Broadway: to/from south

For 2030 only: Direct Access Ramps/HOV-to-HOV ramps have been added at these locations:

- S 272nd Street, both directions
- I-405 (South): E to N

Additional direct access links were coded, but disabled through during restrictions to allow for flexibility in future modeling analysis:

- N 145th Street, to/from south
- SR 104, to/from south
- Ash Way, to/from south
- 112th Street SE, to/from south
- I-405 (N): N-N, S-S

The peaking factors for the I-5 Reversible Lanes were adjusted by modifying the volume-delay function. This reflects the increased peak hour volumes within each time period for the reversible lanes, along with increased susceptibility to congestion due to single-lane connections to the mainline. Additionally, the I-5 Reversible Lanes during the midday period have reduced lanes to reflect the closure of the lanes at 11:00 a.m. and minimal use immediately before and after the closure.

SR 167 Extension

The SR 167 Extension was modeled as one lane in each direction between SR 161 and I-5, two lanes in each direction between I-5 and 54th Avenue E, and one lane in each direction between 54th Avenue E and SR 509.

Minor capacity reductions were made to Valley Avenue E & SR 161 to reflect model-estimated congestion from the SR 167 DTA model and better align model capacity attributes for those links with the capacity coded on nearby links.

SR 509 Extension

The SR 509 Extension was coded as one lane in each direction between S 188th Street and 28th/24th Avenue S and two lanes in each direction between 28th/24th Avenue S and I-5. A new connection to I-5 at S 228th Street in Kent was also included; this new arterial was not tolled in the model.

I-405

I-405 included ETLs from downtown Bellevue to I-5/I-405 north interchange and are tolled with peak and off-peak rates.

Transit Network

The transit network includes implementation of Sound Transit (ST) 2 and currently expected bus integration changes that would be implemented by ST, King County Metro, and other transit agencies.

TOLL TRAFFIC MODELING & RESULTS

The updated travel demand model described in the previous section was used to produce toll traffic forecasts by time periods for 2016 and 2030. This included a process to perform toll optimization for the proposed I-5 ETL and SR 167 and SR 509 Extensions improvements.

Subsequently, optimized toll rates were used to perform full model runs. These optimized toll rates and resulting traffic results are described in this section. Additionally, tolled facility traffic estimates were used to perform toll revenue forecasting analysis as documented in the Final Report Appendix L: Gross and Net Toll Revenue.

Toll Rates

The toll rates for each facility were determined using an iterative process to select values that would balance the objective of generating revenue with the performance and utilization of each segment. In balancing these objectives, the selected toll rates were below the revenue maximizing levels. For all facilities, toll rates varied by segment, time of day, and direction. These toll rates are shown in Exhibit J-7, expressed in 2020 dollars for the assumed date of opening, July 1, 2020 (FY 2021).

For the SR 167 and SR 509 Extensions, the toll rates in Exhibit J-7 for the year of opening were assumed to remain unchanged (constant nominal dollars) for all years after 2020. Trucks with three or more axles were assumed to pay a higher rate than passenger vehicles.

The I-5 Express Toll Lanes were modeled as five separate priced segments between Tacoma and Seattle, each with their own set of toll rates by travel direction. Toll rates for the express toll lane segments will not follow a set schedule; rather, they will vary dynamically throughout the day depending on traffic conditions and congestion levels in each priced segment. Due to the wide variety of trip patterns and because many travelers will stay in the free general purpose lanes until their performance degrades sufficiently to warrant "buying in" to the express toll lanes, the modeling predicts that the priced portion of an average or typical trip will be two out of the five toll segments. The price for two segments of travel in the peak travel direction during congested weekday peak periods is predicted to range from $3.20 to $5.65 in 2020 dollars, depending on the segments and time of day. On a toll cost per mile basis, peak direction, peak period travel could range from $0.30 to $0.42 per mile, depending on the location along I-5.

The modeling work shows that the I-5 ETL tolls during off-peak times and/or travel directions, including midday hours, evenings, and nights, would be significantly lower than the peak rates due to lower congestion levels in the general purpose lanes, as shown in Exhibit J-7. While the modeling assumed a minimum segment toll of $0.25, in practice, the minimum segment toll would likely be set to ensure that toll is at least sufficient to cover the cost of toll collection.

Additionally, medium trucks were assumed to be eligible to use the ETLs at a 50 percent higher toll rate; however, large trucks were assumed to be prohibited from the lanes.

While the I-5 ETL rates will vary day-to-day, the average toll levels were assumed to increase over time. Growth in travel demand, congestion, and inflation in travelers' values of time are expected to gradually increase the price required to maintain ETL performance.

Exhibit J-7: Gateway Project Toll Rate Summary for 2020 (FY 2021)

Facility and Time Period	FY 2021 Toll Rate Ranges (in 2020 $s)[1]		Truck Toll Multipliers		Number of Tolled Segments
	Minimum Toll (1 Segment)	Full Corridor	Medium Trucks	Large Trucks	
SR 167[2]					
Peak Periods	$0.50 - $1.45	$2.05 - $2.75	1.5x	2.5x	3
Off-peak Periods	$0.45 - $0.85	$1.40 - $2.05			
SR 509[2]					
Peak Periods	$0.35 - $1.60	$0.75 - $2.05	1.5x	2.5x	2
Off-peak Periods	$0.35 - $0.75	$0.75 - $1.15			
I-5 ETL[3,4]					
Peak Periods	$0.25 - $2.95	$2.75 - $11.10	1.5x	n/a	5
Off-peak Periods	$0.25 - $1.90	$2.35 - $4.80			

Notes:

[1] Rates shown are for Good To Go account holders, expressed in year-of-opening dollars; Pay By Mail rates are assumed to be $1.70 higher, and all toll values would be less expressed in today's dollars.

[2] Rates were assumed to remain fixed over time, and not escalating with inflation.

[3] I-5 Express Toll Lanes are assumed to be dynamically priced according to conditions; the rates shown reflect the average dynamic toll ranges by period and direction in the year of opening. Average toll rates beyond FY 2021 would escalate over time with inflation in traveler values of time and increased congestion delay in the toll-free general purpose lanes.

[4] HOV 3+ vehicles are assumed to travel toll-free in the Express Toll Lanes.

Model Results

The tolled traffic results from the travel demand model, using the above network definition and toll rates, are presented in this section.

Corridor Trips

The trips on the SR 167 and SR 509 Extensions along with the I-5 ETLs are shown in Exhibits J-8 and J-9. A vehicle that travels on one or more segment on each facility is considered a tolled trip, except for HOV 3+ vehicles on the I-5 ETLs, which are considered to be toll exempt.

Between 2020 and 2030, tolled trips increase on the two freeway extensions due to increased demand and a toll rate that decreases in real dollars. However, on I-5, the growth rate in tolled trips is more limited due to increasing toll rates and a prioritization of HOV 3+ vehicles and transit during periods of congestion. The average tolled trip using the I-5 ETLs paid used just less than two of the five segments.

The financial forecasts include ramp-up adjustments during the first few years that a facility is in operation; however, these trips represent travel demand model estimates and do not reflect that adjustment.

Exhibit J-8: Model-Estimated Gateway Project Facility Trips for 2020

Facility	AM Peak Hour	PM Peak Hour	Total Daily Trips*
SR 167 Extension[2]	3,320	3,150	44,280
SR 509 Extension[2]	2,700	2,500	32,600
I-5 ETLs[3,4]	7,470	8,280	98,150
I-5 ETLs (tolled vehicles)[3]	12,230	14,023	60,810

*Prior to ramp-up adjustment of -15% in FY 2021.

[1] Weekday trip figures for 2020 (FY 2021) based on interopolation of 2016 and 2030 forecasts.

[2] Combines all directions and toll-paying vehicle classes.

[3] Does not include Night period trips, when ETLs are expected to be toll-free.

[4] Includes toll-exempt 3+ HOVs.

Exhibit J-9: Model-Estimated Gateway Project Facility Trips for 2030

Facility	AM Peak Hour	PM Peak Hour	Total Daily Trips
SR 167 Extension[1]	4,290	4,700	66,100
SR 509 Extension[1]	3,420	3,580	46,210
I-5 ETLs [2,3]	7,420	7,370	107,740
I-5 ETLs (tolled vehicles)[2]	4,070	5,150	67,290

[1] Combines all directions and toll-paying vehicle classes.

[2] Does not include Night period trips, when ETLs are expected to be toll-free.

[3] Includes toll-exempt 3+ HOVs.

SR 167 Extension and SR 509 Extension Volumes

The forecasted 2020 and 2030 volumes on the SR 167 and SR 509 Extensions for the AM peak hour, PM peak hour, and average weekday are presented in Exhibits J-10, J-11, J-14, and J-15. Volumes through 2030 are expected to stay below capacity during peak periods.

In addition to the total vehicle volumes, combined medium and large truck volumes are presented in Exhibits J-12, J-13, J-16, and J-17. For the SR 167 Extension, truck percentages range from 16% to 20% in 2020, decreasing to 12% to 16% in 2030. Trucks are expected to comprise 14% to 17% of all vehicles for the SR 509 Extension. Truck percentages are highest in the midday, followed closely by AM and PM peak periods.

Exhibit J-10: Model-Estimated SR 167 Extension Weekday Volumes for 2020

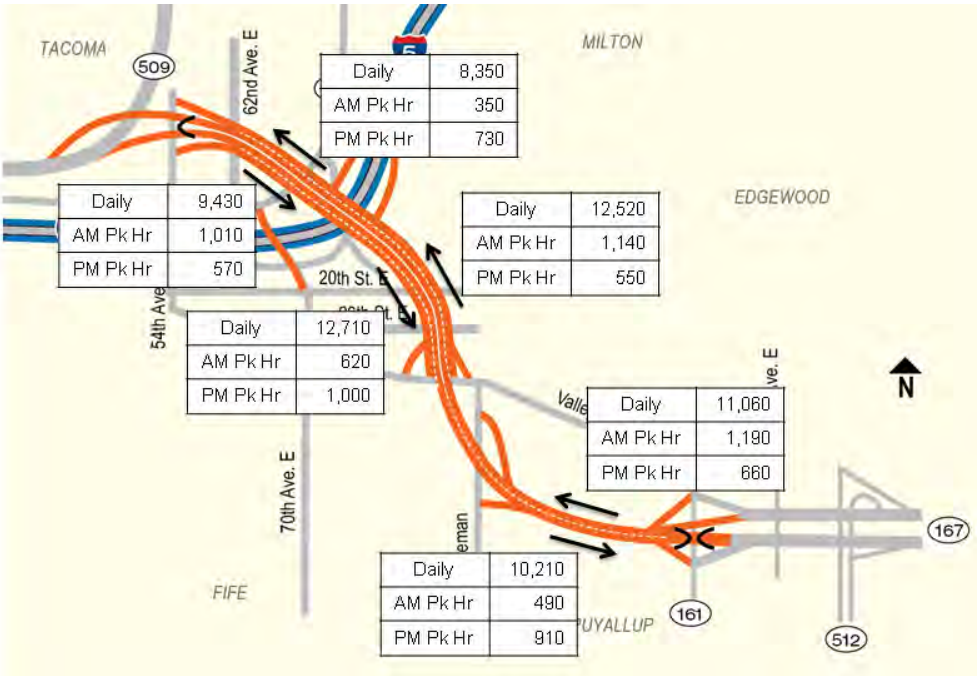


Exhibit J-11: Model-Estimated SR 167 Extension Weekday Volumes for 2030

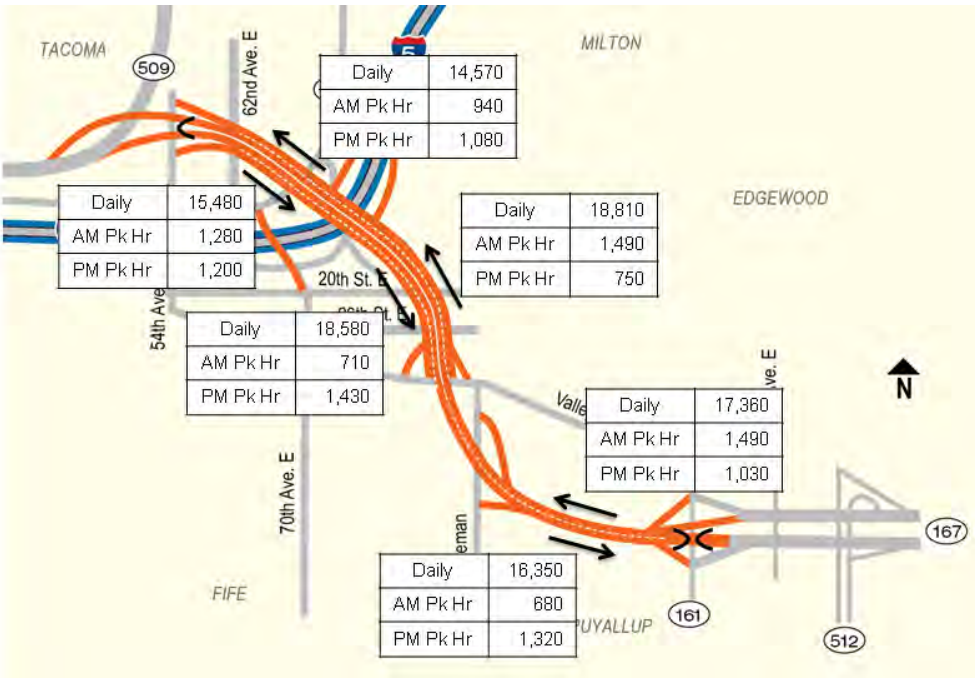


Exhibit J-12: Model-Estimated SR 167 Extension Weekday Truck Volumes for 2020

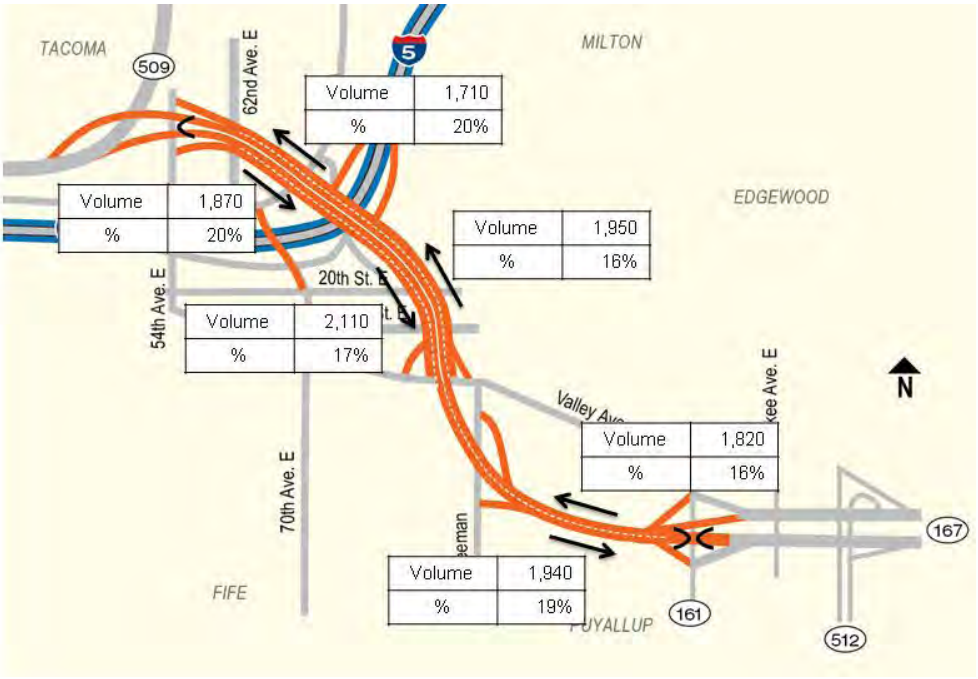


Exhibit J-13: Model-Estimated SR 167 Extension Weekday Truck Volumes for 2030

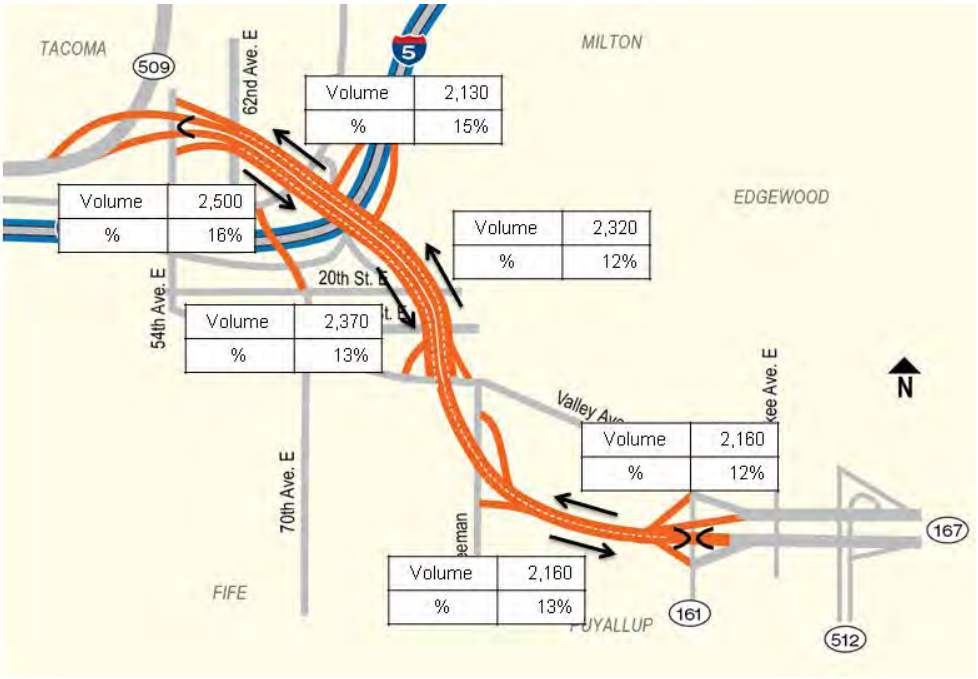


Exhibit J-14: Model-Estimated SR 509 Extension Weekday Volumes for 2020

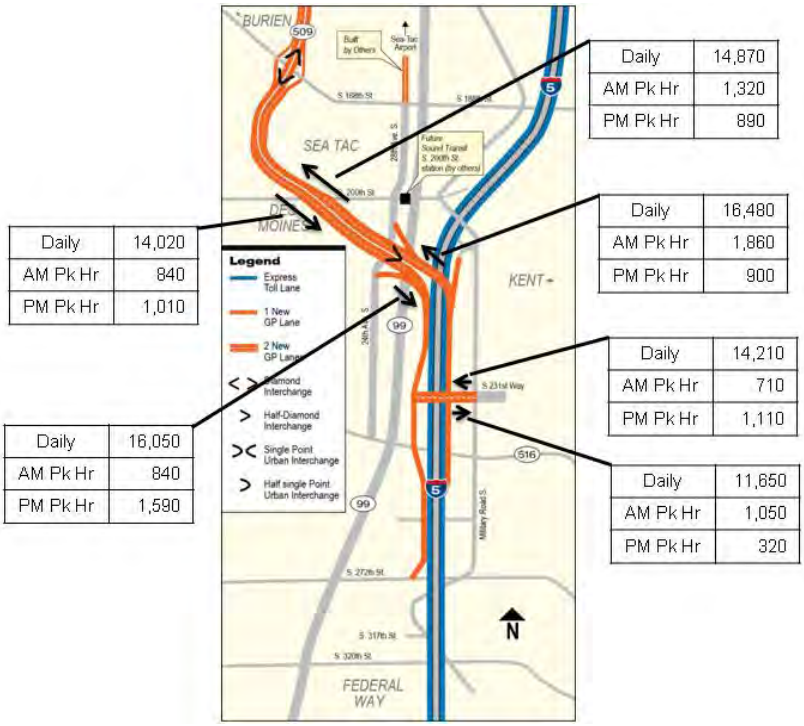


Exhibit J-15: Model-Estimated SR 509 Extension Weekday Volumes for 2030

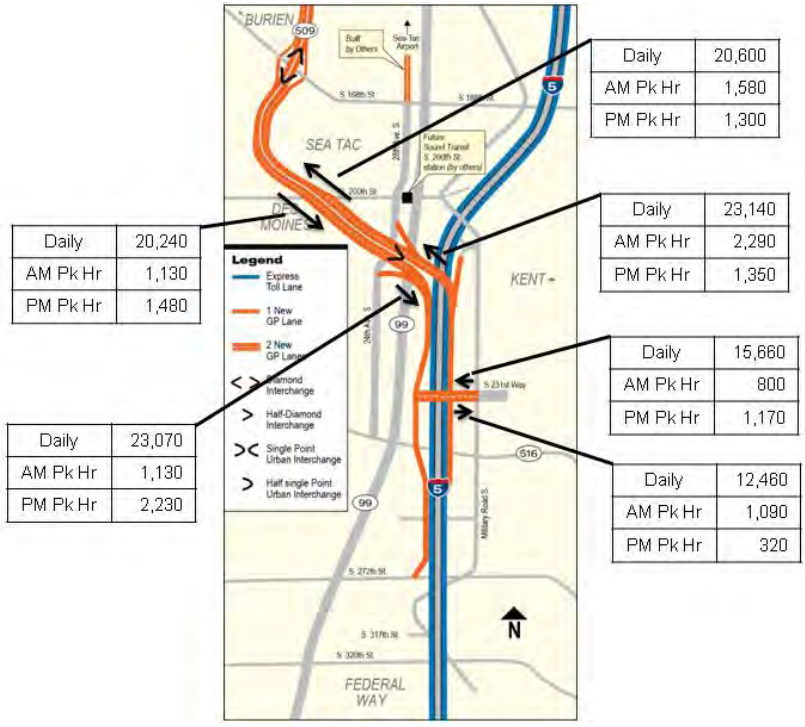


Exhibit J-16: Model-Estimated SR 509 Extension Weekday Truck Volumes for 2020

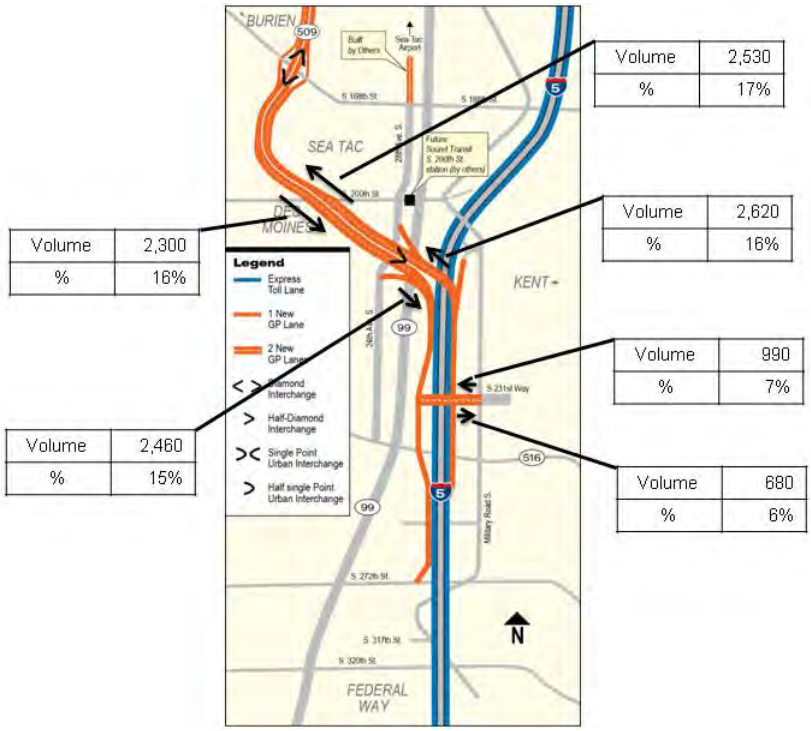
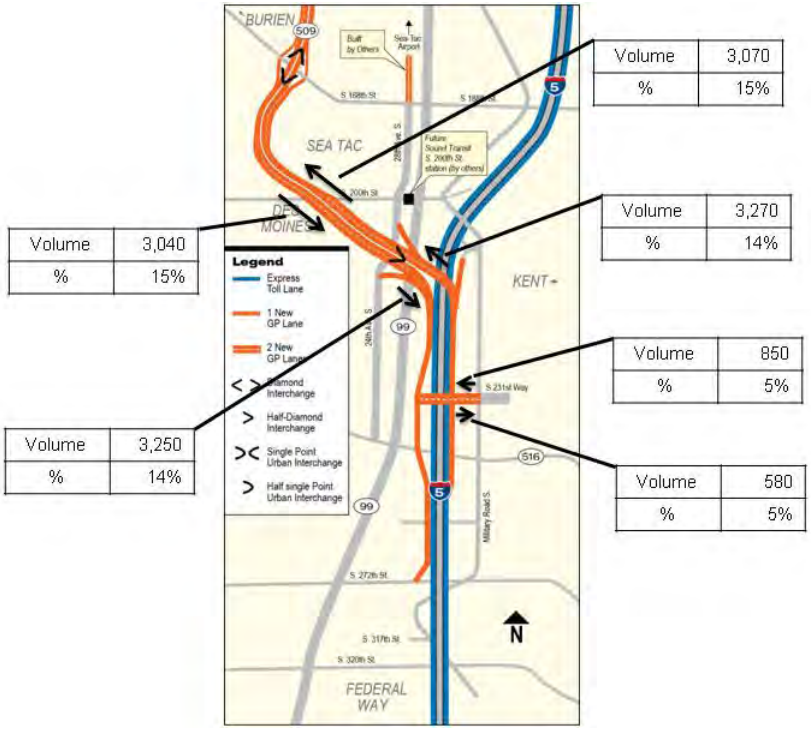


Exhibit J-17: Model-Estimated SR 509 Extension Weekday Truck Volumes for 2030



I-5 ETL Performance Measures

The Gateway Project improves overall performance of I-5, by adding to the Vehicle Miles Traveled (VMT) and Vehicle Hours of Traveled (VHT) and reducing the Vehicle Hours of Delay (VHD) within the I-5 corridor between SR 16 and I-90. A summary of these performance measures is shown in Exhibit J-18.

The conversion of the HOV lanes to ETLs is expected to reduce corridor VHD due to the better utilization of those lanes, reducing congestion for the GP lanes while having limited effects on ETL speed and travel time reliability. VMT and VHT are expected to increase due to added capacity from the added lane between the SR 167 Extension and SR 509 Extension and due to demand caused by reduced delay on the facility.

Exhibit J-18: Model-Estimated Daily VMT, VHT, and VHD for the I-5 Corridor

	2020			2030		
	VMT	**VHT**	**VHD**	**VMT**	**VHT**	**VHD**
Without Gateway Project	5,714,100	141,300	45,480	5,962,600	162,300	63,000
I-5 GP Lanes	5,429,600	136,400	45,400	5,614,500	156,100	62,600
I-5 HOV Lanes	284,500	4,900	80	348,100	6,200	400
With Gateway Project	7,413,700	164,700	40,600	7,890,600	188,200	56,600
I-5 GP Lanes	6,097,200	139,700	37,600	6,348,500	158,100	52,200
I-5 ETLs	1,316,500	25,000	3,000	1,542,100	30,100	4,400
Change with Project	1,699,600	23,400	(4,880)	1,928,000	25,900	(6,400)
I-5 GP Lanes	667,600	3,300	(7,800)	734,000	2,000	(10,400)
I-5 HOV Lanes/ETLs	1,032,000	20,100	2,920	1,194,000	23,900	4,000

This page is intentionally blank.