Appendix E

Transportation

Appendix E-1: Parking

This appendix provides more information on the parking analysis completed for this document.

Existing Conditions Parking Analysis

The data used for the existing conditions parking analysis is included as Attachments 1, 2, and 3.

Future Year Parking Estimates

The future year parking estimates are based on the actual parking supplied by recent developments in South Lake Union. According to http://seattlecommercialpropertydirectory.com/, parking was provided at the following ratios for recently developed projects:

- 1 space per thousand square feet of non-residential area: Alley 24, 2200 Westlake Avenue, 2201 Westlake Avenue
- 1.4 spaces per thousand square feet of non-residential area: Amazon Headquarters
- 1.5 spaces per thousand square feet of non-residential area: 320 Westlake Avenue
- 1.6 spaces per thousand square feet of non-residential area: 428 Westlake

The current City of Seattle Municipal Code (Section 23.54.015) requires 1 space per thousand square feet of office and 2 spaces per thousand square feet for retail uses. As discussed in the text, no parking is required for multifamily residential uses in commercial zones in urban centers, which applies to most of the study area; however, parking is still usually provided. It was assumed that one parking space per dwelling unit would be supplied. Since the code regarding commercial uses is complex, and varies depending on specific land use, the following assumptions were made:

- 1 space per dwelling unit for residences
- 3 spaces per 1,000 square feet (ksf)of retail space
- 1.5 space per 1,000 square feet (ksf) of office (non-retail) space

Future growth was provided as jobs, rather than as square footage. Therefore, the assumptions used in the MXD tool were used to convert jobs to square footage. The conversion factors are:

- 500 square feet per retail employee
- 350 square feet per office (non-retail) employee

The following table shows the household and job growth and resulting parking spaces.

Table A3.13-1
ESTIMATED ADDITIONAL PARKING SPACES IN 2031

Alternative	Households	Retail Jobs	Non-retail Jobs	Total
	Expected Growth			
No Action	9,200	2,087	13,913	25,200
Alternative 1	11,900	2,856	19,040	33,796
Alternative 2	11,900	2,856	19,040	33,796
Alternative 3	11,900	2,400	16,000	30,300
	Expected New Parking Spaces			
No Action	9,200	3,131	7,305	19,636
Alternative 1	11,900	4,284	9,996	26,180
Alternative 2	11,900	4,284	9,996	26,180
Alternative 3	11,900	3,600	8,400	23,900

Source: Fehr & Peers, 2010

Appendix E-2: Roadway Operations Analysis

This appendix provides additional information on the methods used for roadway impact assessment.

Impact Threshold

The threshold for an impact on the roadway is defined as "an increase in traffic on a study corridor that operates unacceptably (as measured by d/c ratios and LOS) under the 2031 No Action scenario that results in the d/c ratio increasing by at least .01 (increases in d/c ratios of less than .01 are less than typical daily fluctuations and are not noticeable by drivers)."

The following analysis was completed to give show that an increase of less than 0.01 would not be noticeable by drivers. A Synchro network showing the intersection of Mercer Street and Fairview Avenue N was created with turning volumes for the PM peak hour. The Highway Capacity Manual LOS report determines the average delay experienced by drivers to be 85.9 seconds.

The d/c ratio on eastbound Mercer Street increasing by 0.01 equates to an additional 32 cars (i.e. one-hundredth of the total capacity). Therefore, 32 cars were added proportionally to the eastbound movements. The same growth factor (1.24 percent) was applied to the other approaches as well. The resulting Highway Capacity Manual LOS report determines the new average delay experienced by drivers to be 89.7 seconds, an increase of 3.8 seconds. Additional delay of this length would not be noticeable to drivers, and is within typical daily fluctuations. The HCM reports are included as Attachment 4.

The Difference Method

To reduce model error, a technique known as the difference method was applied for traffic volumes. Rather than take the direct output from the 2031 model, the difference method calculates the growth between the base year and 2031 models, and adds that growth to an existing count. For example, assume a road has an existing count of 450 vehicles. If the base year model showed a volume of 400 vehicles and the future year model showed a volume of 550 vehicles, then 150 cars would be added to the existing count for a total of 600 cars.

Capacity Adjustments

The increase in capacity for one-way streets is consistent with methodology recommended by the Florida Department of Transportation FDOT). Attachment 5 from FDOT's 2009 Quality/Level of Service Handbook shows the relevant table.

Appendix E-3: Transit Analysis

This appendix summarizes the transit analysis. All future year transit information comes from the City of Seattle travel model.

Existing Conditions

The existing average headways reported in **Table 3.13-1** were calculated using current King County Metro (KCM) schedules. Average headways are the ratio of the number of minutes in the time period to the number of busses expected over the time period. Note that within each time period, the actual headway will often vary.

The existing load factors reported in **Tables 3.13-5** and **3.13-6** were provided by KCM (see Attachment 6). The peak hour for each route in each direction was chosen to reflect the highest load factor experienced over the peak period. Therefore, the time periods vary between routes as well as between directions of the same routes.

Future Year Analysis

Future year analysis was conducted the same way for both the No Action and the Action Alternatives. Future transit operations are assessed using peak hour load factors. The City of Seattle travel model uses three hour peak periods, rather than one peak hour, so assumptions were made to factor the results to represent the peak hour. These assumptions are described below.

Since load factors are based on the number of seats available on the transit route during the peak commute hour, the capacity will change under 2031 conditions as headways change. The Seattle travel model does not explicitly model PM peak period transit trips (they are modeled as the reverse of the AM trips).

Table A.13-2 displays AM peak period transit route headways from the City of Seattle travel model for the base year and 2031 conditions. Since headways can vary over the course of the peak period, weighted headways were estimated. The travel model breaks routes into multiple pieces, for example some with 15 minute headways and others with 30 minute headways. Headways are weighted based upon the ridership volume for each piece so if the 15 minute headway busses have higher ridership, the headway will be weighted more heavily toward the 15 minute headway than the 30 minute headway. An example (using Route 5 SB) is provided below to illustrate. There are 298 passengers at 20 minute headways, 1,234 passengers at 30 minute headways, and 103 passengers at 120 minute headways.

$$Weighted\ Headway = \frac{(20 * 298) + (30 * 1234) + (120 * 103)}{(298 + 1234 + 103)} = 34$$

These weighted headways are assumed to remain constant over the entire peak period for this analysis. The following table shows that all headways are expected to decrease between the base year and 2031, with the exception of the Aurora RapidRide (replacing existing Route 358) SB which will remain constant at 6 minute headways.

Table A3.13-2
NO ACTION ALTERNATIVE: SOUTH LAKE UNION AM PEAK PERIOD TRANSIT WEIGHTED HEADWAYS

Route	Termini Locations	Base Year Headway		2031 Headway	
		NB	SB	NB	SB
5	Downtown, Shoreline	33	34	26	32
8	Uptown, Rainier Valley	30	30	14	16
16	Downtown, Northgate	20	20	17	17
17	Downtown, Loyal Heights	23	21	17	15
25	Downtown, Laurelhurst	49	45	26	26
26	Green Lake, Tukwila	26	27	17	14
28	Downtown, Broadview	30	30	17	24
66	Downtown, Northgate	30	30	26	26
70	Downtown, University District	15	15	10	10
Rapid Ride	Downtown, Aurora Village Transit Center	15	6	6	6

Source: Fehr & Peers, 2010

The underlying principle used to estimate capacity is that the change in headways has an inverse relationship to the change in capacity. For example, a bus route running 35-seat busses on 30 minute headways offers 70 seats per hour. The same bus route running on 15 minute headways offers 140 seats per hour.

$$2031\ Capacity = \frac{Base\ Year\ Headway}{2031\ Headway} * Existing\ Capacity$$

To reduce model error, a technique known as the difference method was applied for transit ridership. Rather than take the direct output from the 2031 model, the difference method calculates the growth between the base year and 2031 models, and adds that growth to an existing count.

$$\begin{aligned} Forecasted\ Ridership \\ &= Existing\ Ridership + (2031\ Model\ Ridership \\ &- Base\ Year\ Model\ Ridership) \end{aligned}$$

Ridership in the City of Seattle travel model is available for the peak period only. The peak hour of transit is often assumed to contain approximately 40 percent of peak period ridership. This figure was confirmed as a reasonable average, given that KCM data indicates 44 percent of AM peak period (6-9 AM) ridership and 35 percent of PM peak period (3:15-6:30 PM) ridership occurs within the respective peak hours. Therefore, peak period ridership was multiplied by 0.4 to arrive at peak hour ridership.

$$Peak\ Hour\ Ridership = Peak\ Period\ Ridership * 0.4$$

The previous methods were used for all transit lines that appear in both the base year and future year travel models. Ridership for new routes was estimated using direct model output since the difference method correction cannot be applied to routes that do not have existing conditions ridership estimates. The same peak factor of 40 percent was used to calculate peak hour ridership. The new lines are listed below:

- Route 21: Arbor Heights to Downtown Seattle
- Route 29: Woodland Park to Downtown Seattle
- Route 56: Alki/West Seattle to South Lake Union
- Route 121: Burien to Downtown Seattle
- Route 308: Lake Forest Park to Downtown Seattle
- Route 313: Bothell to Uptown
- Route 316: Shoreline to Uptown

Capacities for the future lines were not available from KCM. Therefore, the project team made assumptions about the size of the busses that would run based upon the estimated ridership. Bus capacity does vary among the KCM fleet, but KCM plans to purchase only low-floor busses in the future. The articulated busses have 56 seats and the standard busses have 35 seats. Lines with at least 700 riders per peak period are assumed to run 56-seat busses, while lines with fewer than 700 riders per peak period are assumed to run 35-seat busses. These assumptions are based on the types of busses that serve existing routes with higher and lower ridership.

Using these assumptions and future headways, capacity was estimated for the new lines, as follows.

$$Peak\ Hour\ Capacity = \frac{60\ minutes}{Weighted\ Headway} * Number\ of\ seats\ on\ bus$$

Off-Peak Headways

The UVTN calls for 15 minute frequencies 18 hours a day, every day of the week. Since the travel model only provides headway information for the AM peak hour, headways were extrapolated for other times of the day. The change in headway between the base year and 2030 was applied to existing midday headways.

Table A3.13-3
NO ACTION ALTERNATIVE: SOUTH LAKE UNION MIDDAY TRANSIT WEIGHTED HEADWAYS

Route	Termini Locations	Base Year Midday Headway		Change in Headway Between Base Year and 2031		2031 Estimated Headway	
		NB	SB	NB	SB	NB	SB
5	Downtown, Shoreline	15	15	0.80	0.96	12	14
8	Uptown, Rainier Valley	15	15	0.47	0.52	7	8
16	Downtown, Northgate	20	20	0.87	0.87	17	17
17	Downtown, Loyal Heights	30	30	0.76	0.73	23	22
25	Downtown, Laurelhurst	65	65	0.53	0.58	35	38
26	Green Lake, Tukwila	29	29	0.67	0.54	19	16
28	Downtown, Broadview	30	30	0.58	0.78	17	23
66	Downtown, Northgate	30	30	0.87	0.87	26	26
70	Downtown, University District	15	15	0.69	0.69	10	10
Rapid Ride	Downtown, Aurora Village Transit Center	9	9	0.40	1.00	4	9

Source: Fehr & Peers, 2010

This analysis indicated that Routes 16, 17, 25, 26, 28, and 66 would not meet the UVTN frequency goals due to their midday schedules. Of the remaining routes, the following indicated that they would not meet other UVTN frequency goals:

- Route 70 does not operate on Sundays.

- Route 5 currently has approximately 30 minute headways on Sundays. The expected decrease in headway (0.80 NB and 0.96 SB) would not bring the headway to 15 minutes.

- Route 8 very narrowly misses the goals. It currently has approximately 30 minute headways on Sundays. The expected decrease in SB headway (0.52) would not bring the headway to 15 minutes.

Mitigation

Transit mitigation was considered independently of any changes in trip generation and mode share. If the transit ridership remained the same as is expected under the Action Alternatives, then one to two busses per peak hour could be added to the routes with unacceptable load factors to bring them to an acceptable level. The following table details the calculations. The size of bus assumed for each route is the same as was assumed for the original Action Alternatives analysis.

Table A3.13-4

SOUTH LAKE UNION TRANSIT MITIGATION

Route	Termini Locations	Peak Hour Ridership	Peak Hour Capacity	Unmitigated Peak Hour Factor	Minimum Required Capacity	Assumed bus size	Additional busses required	Mitigated Load Factor
21 NB	Downtown, Arbor Heights	520	386	1.35	416	56	1	1.18
21 SB	Downtown, Arbor Heights	520	386	1.35	416	56	1	1.18
28 NB	Downtown, Broadview	240	171	1.40	192	56	1	1.06
29 NB	Downtown, Woodland Park	120	80	1.49	96	35	1	1.04
29 SB	Downtown, Woodland Park	144	80	1.79	115	35	1	1.25
56 NB	South Lake Union, West Seattle	396	258	1.53	317	56	2	1.07

Source: Fehr & Peers, 2010

Appendix E-4: MXD Tool Trip Generation

This appendix contains detailed background information on the enhanced trip generation tool used for this analysis. The complete MXD report is included as Attachment 7.

Model Validation

To ensure the accuracy of the MXD model, a set of 16 independent mixed use sites that were not included in the 239 initial model development MXD sites were tested to validate the model. Among the validation sites, use of the MXD model produced superior statistical performance when comparing the model results to observed data than are found when using traditional ITE methods. Specifically, the MXD model had a significantly lower root mean squared error (RMSE) and higher pseudo-R squared than traditional ITE methods when comparing estimated to observed external vehicle trips. Estimates from the ITE *Trip Generation Handbook* had an RMSE of 40% and pseudo-R squared of 0.58 (i.e., the ITE method only explains about 58 percent of the variability in external vehicle trips), modified estimates using ITE's traditional trip internalization techniques had an RMSE of 32% and pseudo-R squared of 0.73, whereas modified estimates using the MXD model had an RMSE of only 26% and pseudo-R squared of 0.82.

Trip Generation Tables

Table A3.13-5 summarizes the daily, AM, and PM trip generation for all four alternatives. Mitigated trip generation is also shown for the three action alternatives. The following table is a more detailed version of **Tables 3.13-8** and **3.13-16**

ITE gross trips are generally based on vehicle trip generation data from suburban development projects with very little transit, pedestrian, or bicycle trip generation. In this case, gross trips were estimated using the "High Rise Condo – ITE 232,", "Shopping Center – ITE 820," and "General Office – ITE 710" land use types. The MXD model estimates the number of internal trips and external trips made by auto, pedestrian, bicycle, and transit by calculating the probability that a gross ITE trip will use one of these alternative modes.

When this calculation is made, the vehicle-trip is converted into a person-trip. The MXD model assumed an ITE average vehicle occupancy of 1.1 persons per vehicle. This means that one vehicle trip shifted to another mode becomes 1.1 person-trips. Therefore, the sum of the auto and non-auto trips will be greater than the ITE gross trips.

Mode share must be calculated using the same unit of trips (i.e. vehicle-trips or person-trips). Therefore, the mode share is calculated before the conversion factor is applied to internal, bicycle, pedestrian, and transit trips.

Table A3.13-5
TRIP GENERATION BY ALTERNATIVE

	Alternative	Daily Auto Trips (mode share %)	Daily Non-auto Trips (mode share %) Internal, Bike & Pedestrian	Daily Non-auto Trips (mode share %) Transit	PM Peak Auto Trips (mode share %)	PM Peak Non-auto Trips (mode share %) Internal, Bike & Pedestrian	PM Peak Non-auto Trips (mode share %) Transit	AM Peak Auto Trips (mode share %)	AM Peak Non-auto Trips (mode share %) Internal, Bike & Pedestrian	AM Peak Non-auto Trips (mode share %) Transit
	No Action Alternative - Current Zoning	108,946 (49.4%)	70,540 (29.1%)	52,337 (21.6%)	12,648 (51.4%)	7,279 (26.9%)	6,091 (21.7%)	11,285 (56.2%)	4,688 (21.2%)	4,991 (22.6%)
UNMITIGATED	Alternative 1 - Maximum Increases to Height and Density	136,973 (48.3%)	93,828 (30.1%)	67,509 (21.6%)	15,554 (50.5%)	9,429 (27.8%)	7,371 (21.7%)	13,262 (55.6%)	5,722 (21.8%)	5,945 (22.6%)
UNMITIGATED	Alternative 2 - Mid-Range Increases to Height and Density	136,888 (48.3%)	93,908 (30.1%)	67,509 (21.6%)	15,548 (50.4%)	9,435 (27.8%)	7,371 (21.7%)	13,257 (55.5%)	5,728 (21.8%)	5,944 (22.6%)
UNMITIGATED	Alternative 3 - Moderate Increases to Height and Density	117,326 (48.1%)	81,403 (30.3%)	57,855 (21.6%)	13,605 (50.3%)	8,334 (28.0%)	6,449 (21.7%)	12,239 (55.2%)	5,411 (22.2%)	5,501 (22.6%)
MITIGATED	Alternative 1 - Maximum Increases to Height and Density	108,027 (38.1%)	115,933 (37.2%)	77,236 (24.8%)	12,244 (39.7%)	11,835 (34.9%)	8,606 (25.4%)	10,787 (45.2%)	6,947 (26.5%)	7,443 (28.3%)
MITIGATED	Alternative 2 - Mid-Range Increases to Height and Density	107,936 (38.1%)	116,030 (37.2%)	77,235 (24.8%)	12,236 (39.7%)	11,844 (34.9%)	8,606 (25.4%)	10,782 (45.2%)	6,953 (26.5%)	7,442 (28.3%)
MITIGATED	Alternative 3 - Moderate Increases to Height and Density	92,607 (38.0%)	100,310 (37.4%)	66,139 (24.6%)	10,715 (39.6%)	10,435 (35.1%)	7,526 (25.3%)	9,951 (44.9%)	6,556 (26.9%)	6,873 (28.2%)

Appendix E-5: CAPCOA Research

This appendix contains background information on the CAPCOA research used as a basis for mitigation. The MXD trip generation tool predicts mode share based primarily on land use and demographic information. It does not take additional travel demand management measures into account. The CAPCOA research provides guidance on the mode share shift expected when various travel demand management (TDM) programs are enacted. This appendix summarizes the process used to apply both types of measures. Attachment 8 contains the parking section from the CAPCOA research report. The full report, Quantifying Greenhouse Gas Mitigation Measures, is available online.

The pedestrian and bicycle system mitigation measures were factored into the MXD model to produce the mitigated trip generation based on land use changes alone. The results are shown in the following table.

Table A3.13-6
LAND USE MITIGATION REDUCTION RATE CALCULATIONS

Alternative	Unmitigated Net Trips			Mitigated Net Trips (Increased intersection density taken into account)			MXD (Land Use) Reduction Rate		
	AM	PM	Daily	AM	PM	Daily	AM	PM	Daily
Alternative 1	13,262	15,554	136,973	12,691	14,404	127,090	4.3%	7.4%	7.2%
Alternative 2	13,257	15,548	136,888	12,684	14,395	126,984	4.3%	7.4%	7.2%
Alternative 3	12,239	13,605	117,326	11,707	12,606	108,949	4.3%	7.3%	7.1%

Source: Fehr & Peers, 2010

The CAPCOA research provides estimates on the amount of trip reduction that may take place given certain TDM measures. The 15 percent reduction in trip generation used for this analysis assumes that the maximum parking limits reduce parking supply (on a per square foot/dwelling unit basis) by 25 percent compared to the No Action alternative and that unbundled parking costs an average of $100 per month per space. See the attached CAPCOA report for details.

The land use reductions and TDM reductions should be multiplicative, rather than additive, meaning that the reduction rate to be applied to the mitigated net trips should be less than 15 percent. The following formula was used to identify the final TDM reduction percentage:

$$1 - (1 - MXD\ reduction\ rate) * (1 - TDM\ reduction\ rate) - MXD\ reduction\ rate$$

The following table shows the results. These reduction rates were applied to the unmitigated net trips above to identify the additional trips that should be subtracted from the mitigated net trips.

Table A3.13-7TDM MITIGATION REDUCTION RATE CALCULATIONS

Alternative	TDM Reduction Rate per CAPCOA Research			Additional Trip Reductions			Final Number of Trips		
	AM	PM	Daily	AM	PM	Daily	AM	PM	Daily
Alternative 1	14.4%	13.9%	13.9%	1,904	2,161	19,064	10,787	12,244	108,027
Alternative 2	14.4%	13.9%	13.9%	1,903	2,159	19,048	10,782	12,236	107,936
Alternative 3	14.3%	13.9%	13.9%	1,756	1,891	16,342	9,951	10,715	92,607

Source: Fehr & Peers, 2010

Appendix E-6: Commute Trip Reduction Surveys

This appendix contains background information on the CTR programs in place in South Lake Union.

Attachment 9 contains the table of 16 companies with SOV rates and goals. Green indicates the company met their goal, yellow indicates they reduced their but did not meet their goal, and red indicates the rate increased.

Attachment 10 contains the detailed reports used to create **Table 3.13-7**.

Appendix E-7: Comprehensive Plan Mode Share Goal Consistency

This section describes the evaluation to determine consistency with the Seattle Comprehensive Plan mode split goals. The Comprehensive Plan sets the following two goals:

- South Lake Union work trips mode split: 50% non-SOV
- South Lake Union resident trips mode split: 75% non-SOV

The trip generation analysis shown in **Table 3.13-8** and the Seattle travel model's estimate of SOV and HOV mode shares were used to determine the expected mode splits in 2031.

Under all three height and density alternatives, the project meets the first goal of at least 50 percent of South Lake Union work trips being made by non-SOV modes. However, the goal of 75 percent of all trips by South Lake Union residents being made by non-SOV modes is not met, as shown in **Table A3.13-17**. The mode shares of the three action alternative are closer to the goal than that of the No Action Alternative.

Table A3.13-17
SOUTH LAKE UNION RESIDENTS 2031 MODE SHARE

Alternative	Total Auto Mode Share (SOV & HOV)	SOV Mode Share
No Action Alternative	49.4%	27.6%
Alternative 1	48.3%	27.0%
Alternative 2	48.3%	27.0%
Alternative 3	48.1%	26.9%

Source: Fehr & Peers, 2010

Applying auto trip reduction rates correlated to the mitigation measures, the SOV mode share is reduced from approximately 27 percent to approximately 21 percent, which meets the Comprehensive Plan goal. Therefore, all three mitigated alternatives would meet the City's mode share goals while the No Action Alternative would not. Details of these calculations are provided in the remainder of this appendix.

The Seattle travel model trip tables break trips down by type including home based work (HBW), home based non-work (HBNW), and non-home based (NHB). The model also breaks trips down by mode. The HBW trips were used to determine the mode share for the goal of at least 50 percent non-SOV work trips into South Lake Union (Goal 1). All three trip types were used to determine mode share for the goal of at least 75 percent non-SOV total trips by South Lake Union residents (Goal 2). The mode shares were used to approximate SOV and HOV use, since the MXD model does not distinguish between the two.

Comprehensive Plan Goal 1

The following table shows the number of person-trips made by SOV, HOV2 (2 passengers), and HOV3+ (3 or more passengers). Since the MXD results do not distinguish SOV from HOV trips, these proportions were applied to the MXD projection of total auto share. All alternatives have less than 50 percent SOV mode share so the first goal from the Comprehensive Plan is met.

Table A3.13-8
COMPREHENSIVE PLAN MODE SHARE GOAL 1: AUTO OCCUPANCY CALCULATION

Mode	Work Trips to SLU	Percentage of Total Auto Trips
SOV	28,105	86.1%
HOV2	3,159	9.7%
HOV3+	1,368	4.2%
Total	32,632	100.0%

Source: City of Seattle travel model, 2010

Table A3.13-9
COMPREHENSIVE PLAN MODE SHARE GOAL 1: SOV CALCULATION

Mode	Total Auto Trips per MXD	SOV Trips
No Action	49.4%	42.5%
Alternative 1	48.3%	41.6%
Alternative 2	48.3%	41.6%
Alternative 3	48.1%	41.4%

Source: City of Seattle travel model, 2010

Comprehensive Plan Goal 2

A similar method to that used for Goal 1 is used here. The sum of all three trip types originating in South Lake Union is calculated. This is an approximation of the trips made by South Lake Union residents.

Table A3.13-10
COMPREHENSIVE PLAN MODE SHARE GOAL 2: AUTO OCCUPANCY CALCULATION

Mode	HBW Trips from SLU	HBNW Trips from SLU	NHB Trips from SLU	Total Trips from SLU	Percentage of Total Auto Trips
SOV	2,736	10,436	21,467	34,639	55.9%
HOV2	594	5,304	10,667	16,565	26.8%
HOV3+	340	3,086	7,284	10,710	17.3%
Total	3,670	18,826	39,418	61,914	100.0%

Source: Fehr & Peers, 2010

The breakdown of SOV and HOV types was then applied to the MXD auto mode share for both the mitigated and unmitigated alternatives. The 75 percent non-SOV goal is not met under the unmitigated alternatives, but is met under the mitigated alternatives.

Table A3.13-11
COMPREHENSIVE PLAN MODE SHARE GOAL 2: SOV CALCULATION (UNMITIGATED AND MITIGATED)

Alternative	Unmitigated		Mitigated	
	Total Auto Trips per MXD	SOV Trips	Total Auto Trips per MXD	SOV Trips
No Action	49.4%	27.6%		
Alternative 1	48.3%	27.0%	38.1%	21.3%
Alternative 2	48.3%	27.0%	38.1%	21.3%
Alternative 3	48.1%	26.9%	38.0%	21.3%

Source: Fehr & Peers, 2010

Appendix E-8: Growth Management Act Concurrency

This section describes the evaluation to determine concurrency with Growth Management Act concurrency standards.

Methodology

The Seattle Comprehensive Plan uses peak hour volume-to-capacity (v/c) ratios across designated screenlines to assess arterial LOS for GMA Concurrency assessment. The v/c ratio is defined as the ratio of measured traffic volumes to calculated roadway capacity[1]. Since busses (the primary transit mode) operate in the same roadways as general traffic, the City uses the same screenline analysis for transit. Within the traffic impact analysis area (bounded by S King Street to the south, the ship canal to the north, Elliott Avenue to the west and Broadway to the east), screenlines run along four corridors: the Ship Canal, Fairview Avenue, S Jackson Street and I-5. **Figure 3.13-24** in the Draft EIS shows the traffic impact analysis area and the screenlines it contains.

The screenline analysis was based upon methods outlined in the *Department of Planning and Development Director's Rule 5-2009* which summarizes the 2008 traffic volumes and capacities at each of the City's screenlines. From this document, the capacities of the key facilities were determined and the v/c ratio was calculated using the most recent traffic counts available from the City of Seattle.

Concurrency Standard

As previously described, the Seattle Comprehensive Plan uses v/c ratios across designated screenlines to assess arterial LOS. Each screenline is assigned a maximum acceptable v/c threshold. In the event a screenline's measurement approaches this threshold, the Comprehensive Plan calls for vehicular demand reduction strategies to be pursued before increasing capacity. **Table A3.13-12** displays the screenlines and their respective v/c thresholds in detail.

[1] As noted above, v/c ratios measure vehicles that pass a given point during the peak hour and do not consider queuing. Demand/capacity ratios were not used for GMA concurrency analysis since the Comprehensive Plan specifies the use of v/c ratios.

Table A3.13-12
TRAFFIC IMPACT ANALYSIS AREA SCREENLINES

Screenline Number	Screenline Location Segment	LOS Standard (v/c ratio)
5.11	Ship Canal—Ballard Bridge	1.20
5.12	Ship Canal—Fremont Bridge	1.20
5.13	Ship Canal—Aurora Bridge	1.20
5.16	Ship Canal—University & Montlake Bridges	1.20
8	Fairview Avenue N—Denny Way to Valley Street	1.20
10.11	South of S Jackson Street—Alaskan Way to 4th Avenue S	1.00
12.12	East of CBD—S Jackson Street to E Pine Street	1.20

Source: City of Seattle Comprehensive Plan, 2005.

Existing Screenline Results

Table A3.13-13 displays the peak hour v/c ratios for the relevant screenlines. The peak hour count for each direction was used to calculate the v/c ratio. The *Department of Planning and Development Director's Rule 5-2009* document provided the capacity for each screenline. None of the screenlines currently exceed the GMA Concurrency LOS standard stated in the Comprehensive Plan.

Table A3.13-13
EXISTING SCREENLINE V/C RATIOS

Screenline Number	Screenline Location Segment	NB/EB	SB/WB
5.11	Ship Canal—Ballard Bridge	1.09	0.94
5.12	Ship Canal—Fremont Bridge	0.89	0.71
5.13	Ship Canal—Aurora Bridge	0.89	0.82
5.16	Ship Canal—University & Montlake Bridges	0.91	0.87
8	Fairview Avenue N—Denny Way to Valley Street	0.86	0.75
10.11	South of S Jackson Street—Alaskan Way to 4th Avenue S	0.35	0.41
12.12	East of CBD—S Jackson Street to E Pine Street	0.50	0.60

Source: City of Seattle count data, 2005-2010.

No Action Alternative Screenline Results

Table A3.13-14 displays the v/c ratios for the relevant screenlines. As shown, the Ballard Bridge screenline exceeds the Comprehensive Plan standard in both directions. The Fairview Avenue N screenline exceeds the threshold of significance in the westbound direction only.

Table A3.13-14
NO ACTION ALTERNATIVE: SCREENLINE V/C RATIOS

Screenline Number	Screenline Location Segment	NB/EB	SB/WB
5.11	Ship Canal—Ballard Bridge	**1.35**	**1.24**
5.12	Ship Canal—Fremont Bridge	1.11	0.96
5.13	Ship Canal—Aurora Bridge	1.08	0.98
5.16	Ship Canal—University & Montlake Bridges	1.14	1.07
8	Fairview Avenue N—Denny Way to Valley Street	1.02	**1.21**
10.11	South of S Jackson Street—Alaskan Way to 4th Avenue S	0.52	0.72
12.12	East of CBD—S Jackson Street to E Pine Street	0.45	0.64

Source: Fehr & Peers, 2010

Action Alternatives Screenline Results

Table A3.13-15 displays the v/c ratios for the screenlines within the traffic impact analysis area for all four alternatives. The 2031 travel model provided the volumes and capacities for all four future year scenarios.

As shown in the bold text, two screenlines exceed the Comprehensive Plan's v/c ratios under the three height and density rezone alternatives. These are the same two screenlines that exceeded the v/c ratio under the No Action Alternative. The screenline analysis indicates that the GMA concurrency requirements will not be met under 2031 conditions with or without the height and density rezone.

Table A3.13-15
ACTION ALTERNATIVES COMPARISON: SCREENLINE V/C RATIOS

Screenline Number	Screenline Location Segment	No Action Alternative		Alternative 1		Alternative 2		Alternative 3	
		NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB
5.11	Ship Canal—Ballard Bridge	**1.35**	**1.24**	**1.37**	**1.25**	**1.38**	**1.26**	**1.36**	**1.24**
5.12	Ship Canal—Fremont Bridge	1.11	0.96	1.13	0.99	1.13	0.98	1.11	0.98
5.13	Ship Canal—Aurora Bridge	1.08	0.98	1.10	0.99	1.10	0.99	1.09	0.98
5.16	Ship Canal—University & Montlake Bridges	1.14	1.07	1.16	1.09	1.16	1.09	1.15	1.08
8	Fairview Avenue N—Denny Way to Valley Street	1.02	**1.21**	1.05	**1.22**	1.05	**1.22**	1.03	**1.21**
10.11	South of S Jackson Street—Alaskan Way to 4th Avenue S	0.52	0.72	0.52	0.73	0.52	0.73	0.52	0.72
12.12	East of CBD—S Jackson Street to E Pine Street	0.45	0.64	0.46	0.66	0.46	0.66	0.45	0.65

Source: Fehr & Peers, 2010

Mitigated Action Alternatives Screenline Results

Following the mitigation measures discussed in Chapter 3.13, the screenlines were re-evaluated. The results are shown in **Table A3.13-16**. The Ballard Bridge screenline continues to exceed the standard under all three mitigated alternatives. However, the v/c ratios under the mitigated scenarios are all less than or equal to the v/c ratios under the No Action Alternative. Therefore, the mitigated alternatives (in particular, Alternative 3) perform better than the No Action Alternative in terms of GMA concurrency.

The Fairview Avenue N screenline exceeds the Comprehensive Plan standard in the westbound direction under the No Action Alternative and Alternative 1. Alternatives 2 and 3 meet GMA concurrency requirements since they equal the maximum acceptable threshold.

Table A3.13-16
MITIGATED ACTION ALTERNATIVES COMPARISON: SCREENLINE V/C RATIOS

Screenline Number	Screenline Location Segment	No Action Alternative		Alternative 1		Alternative 2		Alternative 3	
		NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB	NB/EB	SB/WB
5.11	Ship Canal—Ballard Bridge	**1.35**	**1.24**	**1.35**	**1.23**	**1.35**	**1.23**	**1.34**	**1.22**
5.12	Ship Canal—Fremont Bridge	1.11	0.96	1.10	0.96	1.10	0.95	1.08	0.94
5.13	Ship Canal—Aurora Bridge	1.08	0.98	1.07	0.97	1.07	0.97	1.06	0.97
5.16	Ship Canal—University & Montlake Bridges	1.14	1.07	1.13	1.06	1.13	1.06	1.12	1.05
8	Fairview Avenue N—Denny Way to Valley Street	1.02	**1.21**	1.02	**1.21**	1.02	1.20	1.02	1.20
10.11	South of S Jackson Street—Alaskan Way to 4th Avenue S	0.52	0.72	0.51	0.71	0.51	0.71	0.51	0.70
12.12	East of CBD—S Jackson Street to E Pine Street	0.45	0.64	0.44	0.64	0.44	0.64	0.44	0.63

Source: Fehr & Peers, 2010