

TRANSPORTATION

AFFECTED ENVIRONMENT

OVERVIEW

The study area is used for a wide range of residential, commercial, industrial, transportation and entertainment purposes. It is strategically located adjacent to Downtown, Port of Seattle, a manufacturing and industrial center, and two stadium/exhibition facilities, and contains diverse neighborhoods with a mix of uses. It is served by a number of transportation networks—interstate highway, arterial and local streets, bus transit, passenger rail, commuter rail and freight-oriented rail—that provide accessibility serving the full spectrum of transportation needs. The networks are subject to Downtown employee commuting, truck and rail freight movement, event traffic and local traffic patterns. Due to the interaction of these patterns, conditions can become congested during morning and evening peak periods and at other times.

This transportation section is based on a consultant evaluation of transportation impacts contained in Appendix G to this Draft EIS. This section addresses the topics of arterial street system performance, transit system performance, freight movement, pedestrians, bicyclists and management of stadium event-related traffic. The next section in this chapter addresses parking-related impacts, which are also addressed in Appendix G to this Draft EIS.

The section is organized to document existing conditions, predict future conditions with and without rezones in 2030, assess the transportation-related impacts of the EIS rezone alternatives, and identify possible strategies that would mitigate identified adverse impacts. The following illustrates the organization of the section:

Existing Conditions (Affected Environment)

- Arterial Street System
 - AM and PM Peak Hour traffic volumes and vehicle travel characteristics
 - Corridor operations and travel speeds
 - Intersection operations
- Transit
- Freight Movement
- Pedestrians and Bicyclists
- Event Traffic Management

Environmental Impacts

- Travel forecasts for the No Action and Action Alternatives
- Arterial street system impacts
 - 2030 Forecast traffic volumes, AM and PM Peak Hours
 - Vehicle travel characteristics
 - Corridor operations and travel speeds, AM and PM Peak Hours
 - Intersection operations, AM and PM Peak Hours
- Transit
- Freight Movement
- Pedestrians and Bicyclists
- Event Traffic Management

Mitigation Strategies

- A range of possible mitigation strategies to address identified impacts

Significant Unavoidable Adverse Impacts

- A summation of unavoidable impacts

ARTERIAL STREET SYSTEM

Street Network

The largest arterial corridors within the study area's street network serve the highest traffic volumes while supporting several different types of travel modes. Table 3-35 summarizes the characteristics of these corridors. See Appendix G for further description of corridors.

Table 3-35
Street Network Corridor Characteristics

Corridor	Classification	Direction	Lanes ¹	2007 AWDT ²	Speed Limit	Sidewalks
North-South Corridors						
1st Avenue S (Yesler Way to S Spokane St)	Principal Arterial / Minor Arterial ³	NB SB	2 2	25,000	35	Both Sides
2 nd Avenue Extension S (James St to 4 th Ave S)	Principal Arterial	NB SB	- 3	13,000	30	Both Sides
3 rd Avenue S (James St to S Jackson St)	Minor Arterial	NB ⁴ SB	2 2	7,500	30	Both Sides
4 th Avenue S ⁵ (S Washington St to S Spokane St)	Principal Arterial	NB SB	3 2	29,000	30	Both Sides
Rainier Avenue S (S Jackson St to S Dearborn St)	Principal Arterial	NB SB	2 2	31,000	30	Both Sides
East-West Corridors						
S Jackson St (Alaskan Way S to Rainier Ave S)	Principal Arterial	EB WB	2 2	16,500	30	Both Sides
S Dearborn St (Airport Way S to Rainier Ave S)	Principal Arterial	EB WB	2 2	21,500	30	One Side
S Royal Brougham Way (Alaskan Way S to 4 th Ave S)	Principal Arterial	EB WB	2 3	12,000	30	Both Sides
S Atlantic Street (Alaskan Way S to 4 th Ave S)	Principal Arterial	EB WB	2 2	19,000	30	Both Sides

Source: *The Transportation Strategic Plan, 2005 Update* (SDOT, August 2005), field survey (March 2007), The Transpo Group (July 2007)

1. The number of lanes varies especially at intersection approaches. Reported is the mid block number of lanes excluding parking lanes.
2. Average Weekday Daily Traffic Volumes. Displays the highest measured daily traffic volumes along the corridor segment.
3. 1st Avenue S is classified as Principal Arterial south of Alaskan Way Viaduct Ramps and Minor Arterial North of AWW Ramps.
4. 3rd Avenue S is SB only between Yesler Way and S Washington St and between 2nd Avenue Ext S and S Jackson St.
5. 4th Avenue is NB only between 2nd Avenue Ext S and S Washington St.

Peak Hour Traffic Volumes

Traffic volume data were collected for the study area to evaluate existing weekday traffic conditions during both the AM and PM peak hours, which typically have the highest volumes and levels of congestion in the study area (see Figure 3-41 for 2007 volumes). During the AM peak hour, traffic volumes are highest heading toward Downtown employment centers along corridors such as 1st Avenue S., 4th Avenue S. and Rainier Avenue S. During the PM peak hour, the highest traffic volumes are the reverse of the AM peak hour, also including S. Dearborn Street, S. Jackson Street, SR 519 at S. Atlantic Street, and ramps from I-90 at 4th Avenue S. However, the corridor segments in the southern part of the study area typically have the same number of vehicles in each direction during the PM peak hour as they do during the AM peak hour. In this area and further south, industrial and commercial land uses generate vehicle trips going both northbound and southbound to access the major freeways.

Vehicle Travel Characteristics

Analysis of travel patterns indicates that during both the AM and PM peak hours, through-traffic accounts for more than 90 percent of the traffic on the South Downtown road network. This means these trips have neither origins nor destinations in the study area.

- In the AM peak hour, the average number of trips having their origin or destination within the study area is about 6,800 person trips, or 3,400 vehicle trips.
- In the PM peak hour, the average number of trips having their origin or destination within the study area is about 10,600 person trips, or 5,600 vehicle trips.

(See Tables 4-2 and 4-3 in Appendix G for more information).

Corridor Operations and Travel Speeds

Arterial level of service (LOS) and average speeds are the primary criteria to measure performance along major corridors. The travel-time based “arterial level of service” measure ranging from letter grades of “A” through “F” is based on guidelines of the *Highway Capacity Manual* (Transportation Research Board, 2000), and is summarized as follows:

<u>LOS</u>	<u>Description of Operations</u>	<u>Average Travel Speed</u>
A	Describes primarily free-flow operations at average travel speeds, usually about 90% of the free flow speed (FFS) for the given street class. Vehicles are completely unimpeded in their ability to maneuver within the traffic stream. Control delay at signalized intersections is minimal.	>30
B	Describes reasonably unimpeded operations at average travel speeds, usually about 70% of the FFS for the street class. The ability to maneuver within the traffic stream is only slightly restricted, and control delays at signalized intersections are not significant.	>24-30
C	Describes stable operations, however, ability to maneuver and change lanes in mid-block locations may be more restricted than LOS B, and longer queues, adverse signal coordination, or both may contribute to lower average travel speeds of about 50% of the FFS for the street class.	>18-24
D	Borders on a range in which small increases in flow may cause substantial increases in delay and decreases in travel speed. LOS D may be due to adverse signal progression, inappropriate signal timing, high volumes, or a combination of these factors. Average travel speeds are about 40% of FFS.	>14-18
E	Characterized by significant delays and average travel speeds of 33% or less of the FFS. Such operations are caused by a combination of adverse progression, high signal density, high volumes, extensive delays at critical intersections, and inappropriate signal timing.	>10-14
F	Characterized by urban street flow at extremely low speeds, typically one-fourth of the FFS. Intersection congestion is likely at critical signalized locations, with high delays, high volumes and extensive queuing.	<10

For Class III Streets:
Typical free flow speed:
35 mph

Table 3-36 summarizes the 2007 existing conditions for level of service and average speed in the AM and PM peak hour.

During the AM peak hour, most study area corridors are experiencing some level of congestion, with several locations operating below LOS D. This can occur due to the operations at a few intersections that may operate poorly and create higher average delays. For example, Rainier Avenue S. operates at LOS E due to congestion at its intersections with S. Dearborn Street and S. Jackson Street. The 2nd Avenue Extension S. operates at LOS F due to the signal time-related delays incurred at the intersection with S. Jackson Street. Among the east-west corridors, S. Royal Brougham Way and S. Atlantic Street experience low performance. The levels of service along both corridors are exacerbated by the delays at the 1st Avenue S intersections caused by traffic using these corridors to access the Alaskan Way Viaduct as well as traffic from the Viaduct to I-90. Speeds are particularly low along these two corridors due to the closely spaced intersections with Occidental Avenue S. Furthermore, the rail crossing along S Royal Brougham Way also contributes to the total delays along this corridor.

**Table 3-36
Corridor Operations and Speeds (2007 Existing Conditions)**

Corridor/Arterial ¹	AM Peak				PM Peak			
	LOS ²		Speed ³ (mph)		LOS ²		Speed ³ (mph)	
	NB	SB	NB	SB	NB	SB	NB	SB
North – South Corridors								
1st Avenue S	D	C	15	19	D	D	16	16
2nd Avenue Extension S	- ⁴	F	- ⁴	8	- ⁴	F	- ⁴	9
3rd Avenue S	D	D	12	10	C	E	14	8
4th Avenue S	D	D	15	17	D	E	16	13
Rainier Avenue S	E	E	12	13	E	F	12	9
East – West Corridors	EB	WB	EB	WB	EB	WB	EB	WB
S Jackson Street	E	F	12	10	E	E	11	11
S Dearborn Street	E	E	11	11	F	F	9	8
S Royal Brougham Way	F	F	7	5	F	F	8	7
S Atlantic Street	E	F	11	7	E	F	11	10

Source: The Transpo Group (July 2007)

1. Corridor extents are listed in Table 4-1 of Appendix G.
2. Arterial Level of Service based on the Highway Capacity Manual, Transportation Research Board, 2000 methodology for urban arterials.
3. Arterial speed in miles per hour which includes the average speed delay encountered at each signalized intersection along the corridor as well as delays at mid-block sections.
4. 2nd Avenue Extension S is one-way southbound.

During the PM peak hour, delays are observed particularly in the southbound direction of the north-south corridors, leaving Downtown, including 1st Avenue S., 3rd Avenue S., 4th Avenue S., and Rainier Avenue S.

- Delays along 1st Avenue S. mainly occur at the intersections of S. Royal Brougham Way and S. Atlantic Street where the Downtown outbound traffic joins the traffic from the industrial areas south of the study area, which results in delays at each of the intersections. S. Atlantic Street is a particularly critical connection conveying 1st Avenue S. traffic to eastbound I-90 via S. Atlantic Street (SR 519).
- Delays along 4th Avenue S. are caused by traffic delays at the intersections with S. Jackson Street and S. Royal Brougham Way.
- Along Rainier Avenue S, the intersections with S Dearborn Street and S Jackson Street experience delays which contribute to the low speeds and LOS especially in the southbound direction.

- Delays on the east-west corridors are mainly along S. Atlantic Street and eastbound S. Royal Brougham Way and S. Jackson Street, caused by traffic heading toward I-90 and the Rainier Valley. Delays at 1st Avenue S., and due to intersection spacing and a rail crossing contributes to a share of the delays along the S. Atlantic Street and S. Royal Brougham Way corridors as well.

Intersection Operations

Table 3-37 illustrates the number of intersections, among the 49 signalized study area intersections, that operate below LOS D for the AM and PM peak hours. The level of service (LOS) is a standard measure of intersection performance that describes the average delay encountered by vehicles entering the intersection. Intersection LOS is measured on a scale from “A” to “F” as summarized below.

<u>LOS</u>	<u>Average Control Delay</u> (seconds/vehicle)	<u>General Description (signalized intersections)</u>
A	< or = 10	Free flow
B	>10 - 20	Stable flow (slight delays)
C	>20 - 35	Stable flow (acceptable delays)
D	>35 - 55	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	>55 - 80	Unstable flow (intolerable delay)
F	>80	Forced flow (jammed)

During the AM peak hour, the only intersection operating at LOS F is 1st Avenue S./S. Atlantic Street. Delays are observed on all approaches to the intersection, and traffic queues spill back to “upstream” intersections. Delays are also observed at the intersection of 1st Avenue S./S. Royal Brougham Way that operates at LOS E causing queues that can block adjacent intersections and driveways. These intersections play a key role in moving local traffic from 1st Avenue S. to 4th Avenue S. and to the Alaskan Way Viaduct and I-90 (e.g., primarily pass-through traffic). The intersection of 1st Avenue S./S. Holgate Street also operates at a LOS E due to the heavy northbound traffic in the AM peak hour. Other intersections operating at LOS E are 3rd Avenue/Yesler Way and 4th Avenue S./S Jackson Street. The delays at these intersections are the result of a high number of northbound vehicles entering the Downtown area, primarily commuters, that are conflicting with the westbound volumes.

**Table 3-37
2007 Existing Intersection Operations Along the Major Corridors**

Corridor/Arterial ¹	Number of Signalized Intersections	Number of Signalized Intersections Operating below LOS ² D	
		AM Peak Hour	PM Peak Hour
North – South Corridors			
1st Avenue S	10	3	3
2nd Avenue Extension S	5	0	0
3rd Avenue S	2	1	1
4th Avenue S (NB)	10	1	1
4th Avenue S (SB)	7	0	0
Rainier Avenue S	2	0	0
East – West Corridors			
S Jackson Street	10	1	1
S Dearborn Street	9	0	0
S Royal Brougham Way	5	1	1
S Atlantic Street	2	1	1

Source: The Transpo Group (July 2007)

1. Corridor extents are as listed in Table 4-1 of Appendix G.
2. Level of Service based on the *Highway Capacity Manual*, Transportation Research Board, 2000

As shown in Table 3-37, the same number of intersections operate below LOS D in both the AM and PM peak hours. However, these are not necessarily the same intersections given the difference in travel patterns between the AM peak hour (with a majority of northbound and westbound traffic) and the PM peak hour (with a majority of southbound and eastbound traffic). The only intersection operating at a LOS F in the PM peak hour is at 4th Avenue S./S. Jackson Street which is due, in particular, to the volume of traffic on 4th Avenue S., the low amount of signal green time devoted to eastbound vehicles and the coordination with the 2nd Avenue Extension S./ S. Jackson Street intersection.

The intersections operating at LOS E in the PM peak hour are 1st Avenue S./S. Atlantic Street and 1st Avenue S./S. Royal Brougham Way. Both intersections have a high number of southbound left turns (e.g., toward 4th Avenue S) that conflict with northbound traffic, reducing the amount of signal green time to serve both movements. The intersection of 4th Avenue S./S. Royal Brougham Way also operates at LOS E due mainly to the amount of signal green time dedicated to the southbound movement, which serves over 2,000 vehicles an hour.

TRANSIT

The Seattle Transit Plan identifies an “Urban Village Transit Network” (UVTN) to serve the City’s urban villages and neighborhoods. The identified UVTN corridors are the focus of the Transit Plan and are envisioned to be a network of high quality, reliable transit corridors. The primary transit corridors evaluated as part of this analysis include 1st Avenue S., 2nd Avenue Extension S., 3rd Avenue, 4th Avenue S., 5th Avenue S./E3 Busway and S. Jackson Street.

The study area is well served by a variety of transit that include local bus routes (King County Metro), regional bus routes (Sound Transit and partners), ferries (Washington State Ferries), commuter rail (Sound Transit), and intercity passenger rail (Amtrak Cascades). This analysis of transit service concentrates on the performance of local transit, with performance measures drawn from those developed as part of the Seattle Transit Plan. See Appendix G for more information about the various types of available transit service.

The transit service performance measures include *frequency*, *span of service*, *travel speed* and *passenger loading*.

- *Frequency*: the maximum scheduled gap between consecutive buses on the route, which should reflect the maximum waiting time a customer could experience at a bus stop before a bus arrives. The “passing” threshold is 15 minutes, meaning buses arrive every 15 minutes or more frequently.
- *Span of service*: the hours in the day that a service runs at minimum acceptable frequencies of 15 minutes or less. The scoring threshold is 12 hours of service.
- *Travel speed*: Transit travel (operating) speed is expressed as a Percentage of Posted Speed Limit (%PSL). The “passing” threshold is 30% of the posted speed limit.
- *Passenger loading*: This threshold measures the service capacity and comfort experienced by the passenger. It is expressed as a ratio of passengers to bus capacity (e.g., 1.0 = 100% of seated capacity). The “passing” threshold is 0.9 or 90% occupancy. The measurement is made based on the load that occurs about 85% of the time on the most crowded route during the most crowded time period.

Table 3-38 summarizes current bus transit performance.

Table 3-38
Bus Performance Measures (2006)

Corridor	From	To	Frequency (Minutes)	Service Span (Hours)	Speed (Percent)	Passenger Load (Ratio)
1st Ave S	Yesler Way	S R. Brougham Way	9.58	17.50	32.2%	1.20
1st Ave S	S R. Brougham Way	S Holgate St	8.95	18.00	41.3%	1.27
2nd Ave Ext S	Cherry St	4th Ave S	4.20	21.00	22.4%	1.01
3rd Ave S	James St	S Jackson St	1.60	21.00	17.5%	0.91
4th Ave S	Yesler Way	S R. Brougham Way	2.82	20.90	30.0%	1.30
5th Ave S (E3)	S R. Brougham Way	S Holgate St	5.00	18.00	43.0%	1.15
12th Ave S	Boren Ave S	S Dearborn St	12.85	10.20	33.7%	0.94
Rainier Ave S	S Washington St	S Dearborn St	85.61 ¹	16.00	33.6%	0.60
Yesler St	1st Ave S	6th Ave S	16.16	16.22	26.9%	0.51
S Jackson St	1st Ave S	8th Ave S	11.08	16.45	16.2%	0.86
S Jackson St	8th Ave S	Boren Ave S	4.65	19.83	22.8%	0.99
City of Seattle Passing Thresholds			15.00	12.00	30.0%	0.90

Source: *City of Seattle/King County Metro UVTN Monitoring Report 2006*.

Note: Shading indicates measures that are below the identified passing threshold. The performances are based on an average of the segments comprising the identified corridor.

1. Local bus routes along Rainier Avenue S. typically turn left at S. Jackson Street, so there are very few local routes along the segment of Rainier Avenue S. between S. Jackson Street and Yesler Way. Therefore the frequency value along this segment appears much higher than others.

Information in Table 3-38 indicates that most of the studied corridors meet the service frequency thresholds, and most have a relatively long period of day when transit service is available. However, in some of the more congested corridors, travel speeds fall below the passing thresholds. Also, several of these corridors are rated as deficient in passenger loading performance. Travel speeds are influenced by Downtown congestion, longer dwell times and closely spaced intersections. Passenger loading ratios indicate relatively crowded conditions during peak times on a majority of these corridors. However, if standing room was factored into the ratio, most of these corridors would probably be able to meet the passenger loading threshold standard. See Appendix G for a lengthier discussion of these measures of bus performance for existing conditions.

FREIGHT MOVEMENT

This section provides information about the type and volume of truck trips observed on study area corridors, existing major freight routes and their operating conditions. South Downtown (including south of the study area) contains a large amount of industrial lands, including Port of Seattle properties and container ship yards, railroad intermodal yards, and other businesses that rely upon the movement of trucks and freight. The arterials within the study area provide an important connection for freight transportation and are heavily used by trucks.

Freight Generators

The study area and surrounding areas generate a substantial amount of freight and truck traffic. Currently the mix of general industrial and industrial/commercial land uses comprise about half the total land surface within the study area. Many industrial and warehousing businesses are located in the vicinity along with other commercial activities and public services that use trucks or rail. The Greater Duwamish Manufacturing and Industrial Center is another major truck generator adjacent to the study area. This center is expected to accommodate at least 10% of Seattle's new employment over the next 20 years, or nearly 15,000 new jobs. Besides providing a home for the Port of Seattle's container terminals, the Greater Duwamish area is also home to King County International Airport (KCIA), located five miles south of Downtown Seattle. The Greater Duwamish and South Downtown areas also include several operations facilities that support city municipal functions. These agencies, including Seattle Public Utilities, City Light and Seattle Department of Transportation (SDOT), run truck fleets that operate all over the City. The businesses and companies in the study area and the Duwamish provide warehousing, distribution, and construction services necessary for residential, commercial and industrial land uses throughout the region.

The study area is adjacent to a major truck generator: the Port of Seattle. In fact, the Port of Seattle is one of the top three containerized cargo load centers in the Western Hemisphere, and accommodates six container terminals. One of the terminals, T-46, is located along Alaskan Way S. at the western boundary of the study area. Other major terminals such as T-25 and T-30 are located along E. Marginal Way. The Port anticipates opening T-25 and T-30 for container uses in the near future. The increased future activities for these terminals will result in additional truck traffic through the study area. However the additional truck trips due to the reactivation of T-25 and T-30 are assumed to have minimal impact along corridors such as S. Atlantic Street as illustrated in the *Terminal 30 Cargo Reactivation Report*¹.

Most freight is shipped through the port by intermodal containers that are transferred to or from railcars or trucks on the dock. At the intermodal yards, containers are transferred to and from railcars. Trucks transport the cargo to and from Port terminals and the warehousing and distribution centers. In 2002, Terminal 46 produced an average of 1,250 daily truck trips² with approximately 30 percent of those trips having a regional destination. Regional access to the terminal is provided by SR 519 and S. Spokane Street from both the viaduct level and the surface roadway, then along surface streets.

The City's arterial street system is crucial to a functioning regional international trade system. Major truck streets have been identified by the City to maintain acceptable freight mobility and access to the area (see Figure 3-42). Major arterials such as 1st Avenue S., 4th Avenue S., S. Atlantic Street, S. Dearborn Street and Airport Way S. provide access to the industrial businesses within and surrounding the study area. Many of the businesses that generate a majority of the truck trips are located outside the study area, but depend on travel through the study area to access the regional highway system, Southeast and Central Seattle neighborhoods, Downtown Seattle and areas north of Downtown.

¹ *Terminal 30 Cargo Reactivation*, Heffron Transportation, Inc, September 18, 2006.

² *Container Terminal Access Study, Year 2003 Update*, Heffron Transportation, Inc., October 2003

Major Truck Routes

The City of Seattle and WSDOT have defined several of the major corridors within the study area as major truck routes. These designated truck routes provide access between the industrial lands within the study area and the state highway system, while also facilitating travel between the industrial lands and the Port terminals.

Truck Route Designation (WSDOT)

The Washington State Freight and Goods Transportation System (FGTS) is a classification system adopted by WSDOT and used to classify state highways, county roads and city streets according to the average annual gross truck tonnage they carry. The FGTS classifies roadways using five freight tonnage classifications, T-1 through T-5, as follows:

- **T-1:** more than 10 million tons per year
- **T-2:** 4 million to 10 million tons per year
- **T-3:** 300,000 to 4 million tons per year
- **T-4:** 100,000 to 300,000 tons per year
- **T-5:** at least 20,000 tons in 60 days

Among those five classes, the system has distinguished “Washington’s Strategic Freight Corridors” that carry four million or more gross tons of freight annually (i.e., T-1 and T-2 classes). Tonnage values are estimated from truck traffic count data and converted into average weights by truck type. The FGTS 2005 update designated 43 strategic freight corridors in Seattle, some of them located in the study area. These corridors are listed in Table 3-39.

**Table 3-39
WSDOT Designated “Strategic Freight Corridors”**

Route Name	Begin	End	2005 FGTS Class¹
4 th Ave S	E Marginal Way S	S Royal Brougham Way	T-1
Airport Way S	4 th Ave S	S City Limit S	T-1
Alaskan Way S	E Marginal Way S	Yesler Way	T-1
S Dearborn St	Airport Way S	Rainier Ave S	T-1
S Royal Brougham Way	4 th Ave S	Airport Way S	T-1

Source: *Washington State Freight and Goods Transportation System 2005 Update*

1. FGTS = Freight and Goods Transportation System

Major Truck Streets Designation (City of Seattle)

The City of Seattle designates all arterials as truck streets and has also identified certain streets as Major Truck Streets. The Major Truck Streets are defined as primary routes in the Transportation Strategic Plan for the movement of good and services and serve both local and non-local truck traffic. They accommodate freight movement through the City, and to and from major freight traffic generators. Trucks in excess of 10,000 pounds of Gross Vehicle Weight are discouraged from using non-arterial (local) streets unless they have a justifiable reason for traveling there. The City uses the street designation as an important criterion for street design, traffic management decisions, and pavement design and repair. The Major Truck Streets across the study area are shown in Figure 3-42. Almost all major north-south arterial streets (Alaskan Way, 1st Avenue S., 4th Avenue S., 6th Avenue S., Airport Way S., and Rainier Avenue S.) have been designated as Major Truck Streets. Rainier Avenue S. is an important arterial that

provides truck connections to southeast Seattle neighborhoods. Four east-west arterials (S. Dearborn Street, S. Royal Brougham Way, and S. Holgate Street) are also designated as Major Truck Streets. These routes support and facilitate travel to I-5, the Alaskan Way Viaduct, and SR 519. Since the TSP was adopted prior to S. Atlantic Street being extended to SR 519, it is not officially a Major Truck Street. The City plans to include this corridor as a Major Truck Street when the TSP is next updated.

The freight and trucking community is very concerned about activities or projects that might impact the Major Truck Streets. It is important that these corridors continue to serve trucks and freight and provide efficient access to the major industrial land uses within and surrounding the study area. They are key corridors that provide access to the regional highway system and other City neighborhoods, and should accommodate the unique operations and maneuverability that large trucks require.

Truck Volumes

Vehicle classification count surveys were conducted in early 2007 for several of the major truck routes throughout the study area. A list of the corridors is shown in Table 3-40. Traffic was classified by tube counters based on the Federal Highway Administration (FHWA) vehicle classification system. In addition, 24-hour video was conducted along Airport Way S. and 6th Avenue S. to validate the information. Table 3-40 summarizes the total truck volumes for each corridor.

**Table 3-40
Average Daily Truck Volumes and Percent of Total Daily Traffic**

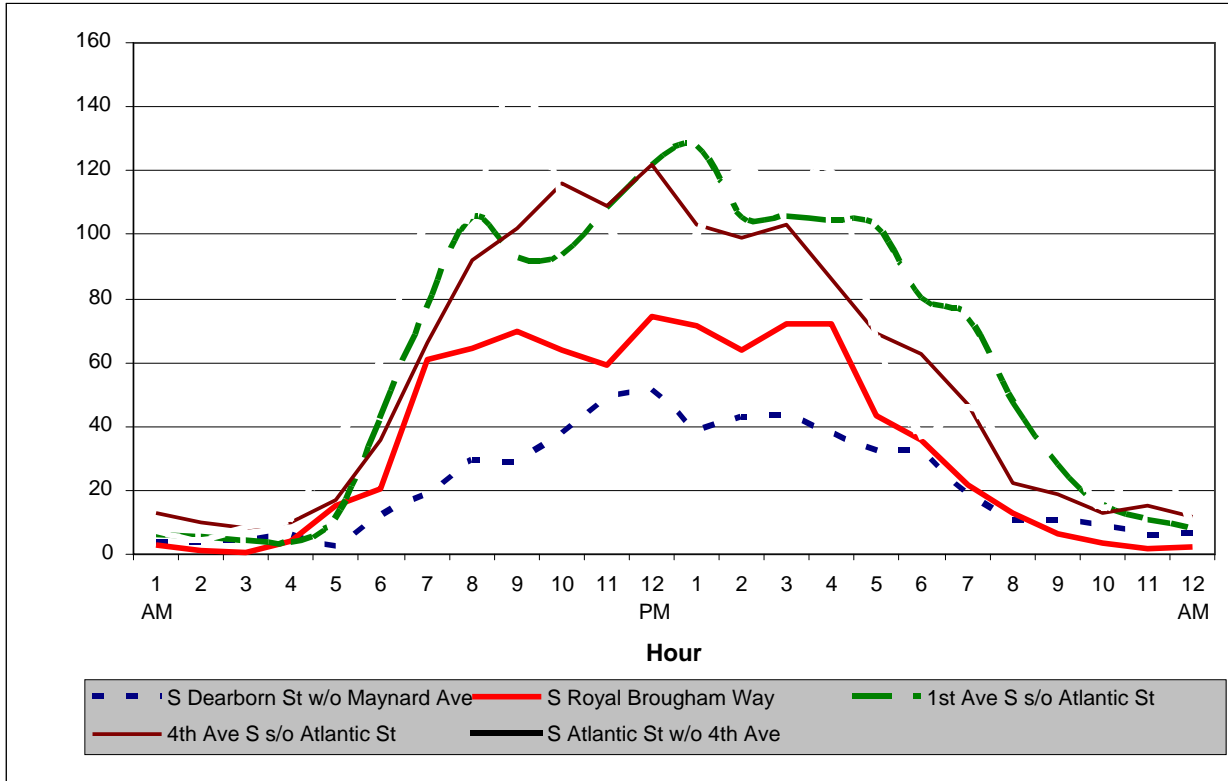
Corridor	Truck Volume		Truck Volume Both Directions	% of Total Daily Traffic ²
	NB	SB		
North-South Corridors				
Airport Way S (e/o ³ 5 th Ave)	100	155	255	2.9%
1st Ave S (n/o ³ Royal Brougham)	800	540	1,340	4.1%
1st Ave S (s/o ³ Atlantic St)	525	955	1,480	7.1%
4th Ave S (n/o ³ Royal Brougham)	490	560	1,050	4.9%
4th Ave S (s/o ³ Atlantic St)	875	480	1,355	5.3%
6th Ave S (s/o ³ Airport Way S)	50	50	100	1.9%
East-West Corridors				
	EB	WB		
S Atlantic St (w/o ³ 4 th Ave) ¹	1,000	495	1,495	8.0%
S Dearborn St (e/o ³ 6 th Ave)	225	315	540	6.0%
S Royal Brougham Way (w/o ³ 4 th Ave) ¹	295	555	850	7.2%

Source: Based on field traffic counts (2007)

1. Based on 2005 traffic count
2. Daily truck volume divided by total daily traffic volume
3. e/o = east of; n/o = north of; s/o = south of; w/o = west of

In general, trucks represent between 2 and 8 percent of all vehicles over a 24-hour weekday. The largest numbers of trucks are along the S. Atlantic Street, 1st Avenue S. and 4th Avenue S. corridors. These corridors provide access to SR 99 and SR 519 and therefore serve more trucks throughout the day. The traffic count data also indicate that corridors such as S. Dearborn Street and Airport Way S. serve a somewhat lesser volume of truck traffic than the other corridors evaluated. This is likely because the section of Airport Way S. north of S Royal Brougham Way primarily provides access to the Downtown area, while S. Dearborn Street connects with I-5 and the Rainier Valley and has less regional truck trips. Even though the S. Dearborn Street corridor serves just over 500 trucks a day, that number represents nearly 6 percent of all vehicles and is a higher percentage than many of the other corridors. The distribution of daily truck traffic over a 24-hour timeframe is shown in Figure 3-43 for each corridor.

Figure 3-43
Daily Distribution of Trucks
(hourly truck volumes)



Source: Based on field traffic counts (2007)

The data indicate that truck activity mostly occurs during daytime hours between 8:00 am and 4:00 pm. Generally, truck volumes decline between the hours of 4:00 pm and 7:00 pm and represent a small fraction of afternoon peak commuter traffic. The truck peak occurs almost in the middle of the day whereas the peak for all traffic occurs in the afternoon commuting hours. Table 3-41 provides truck peak hours and truck peak volumes with corresponding percent of total traffic in the same periods along the major arterials in the study area. The truck percent reported in Table 3-41 is highest during the day and can comprise of 10 to 11 percent of the total vehicular traffic.

**Table 3-41
Truck Peak Hour Volumes and Corresponding Percent of Total Traffic**

Corridor	Truck Peak Hour		Truck Volume Both Directions	% of Total Truck Peak Hour Traffic ²
	From	To		
North-South Corridors				
Airport Way S (e/o ³ 5 th Ave)	11:00 am	noon	23	4.0%
1st Ave S (n/o ³ Royal Brougham)	9:00 am	10:00 am	126	5.1%
1st Ave S (s/o ³ Atlantic St)	noon	1:00 pm	128	9.0%
4th Ave S (n/o ³ Royal Brougham)	11:00 am	noon	73	6.6%
4th Ave S (s/o ³ Atlantic St)	11:00 am	noon	122	7.0%
6th Ave S (s/o ³ Airport Way S)	10:00 am	11:00 am	14	3.1% ⁴
East-West Corridors				
S Atlantic St (w/o ³ 4 th Ave) ¹	8:00 am	9:00 am	149	11.1%
S Dearborn St (e/o ³ 6 th Ave)	11:00 am	noon	52	8.0%
S Royal Brougham Way (w/o ³ 4 th Ave) ¹	11:00 am	noon	75	10.1%

Source: Based on field traffic counts (2007)

1. Based on 2005 traffic count. 2. Truck peak volume divided by total traffic volume in the same period.

3. e/o = east of; n/o = north of; s/o = south of; w/o = west of 4. Based on counts in 2002 and adjusted to 2007

Truck Classes

The Federal Highway Administration (FHWA) Vehicle Classification system defines vehicles based on type of vehicle and the number of axles and wheels. The classification system uses 13 categories. Trucks are typically classes 5 through 13. Motorcycles, passenger cars, pickups, and buses are classes 1 through 4.

For the purpose of this study, the truck classes 5 through 13 have been grouped into two main categories to simplify the reporting of information. The two categories include:

- **Single-Unit Trucks** - Includes single-unit (light to medium) trucks for FHWA classes 5 to 7.
- **Multi-Unit Trucks** - Includes heavy truck types for FHWA classes 8 to 13.

A more detailed analysis of the classification data reveals that, on average, more than two-thirds of the counted trucks are either light or medium trucks (single-unit trucks). These types of trucks are typically used for local or regional delivery rather than interstate travel. Heavy trucks (single- and multi-trailers) make up less than one-third of the total number of trucks counted within the study area. Table 3-42 presents the truck distribution results for each of the surveyed locations.

**Table 3-42
Daily Truck Distributions Along Corridors**

Corridor	Direction	Truck Distribution ²	
		Single-Unit	Multi-Unit
North-South Corridors			
Airport Way S (e/o ³ 5 th Ave S)	NB	86%	14%
	SB	88%	12%
1st Ave S (n/o ³ S Royal Brougham Way)	NB	68%	32%
	SB	76%	24%
1st Ave S (s/o ³ S Atlantic St)	NB	67%	33%
	SB	72%	28%
4th Ave S (n/o ³ S Royal Brougham Way)	NB	40%	60%
	SB	65%	35%
4th Ave S (s/o ³ S Atlantic St)	NB	63%	37%
	SB	69%	31%
6th Ave S	NB	77%	23%
	SB	68%	32%
East-West Corridors			
S Atlantic St (w/o ³ 4th Ave)	EB	65%	35%
	WB	64%	35%
S Dearborn St (e/o ³ 6 th Ave S)	EB	69%	31%
	WB	69%	31%
S Royal Brougham Way (w/o ³ 4 th Ave S) ¹	EB	72%	28%
	WB	68%	32%

Source: Based on field traffic counts (2007)

1. Based on 2005 traffic count
2. Percentages of single-unit and multi-unit trucks out of the total number of daily trucks
3. e/o = east of; n/o = north of; s/o = south of; w/o = west of

Railway and Intermodal Facilities

Freight movement across the study area is also served by railway and intermodal facilities that support shipping to and from the port terminals and allow container transfer to railcars.

The railway maintains two mainline tracks through the study area, paralleling I-5 to the south and running to the north between 1st and 4th Avenues S, crossing S. Holgate Street and S. Royal Brougham Way (SR 519) at-grade. North of S. Royal Brougham Way and adjacent to S. Jackson Street is the King Street Station and a tunnel under the Downtown area that emerges north of the Pike Place Market. The railway then follows the waterfront north to Everett.

Rail crossings on truck routes are obstacles for truck movement and general traffic, especially in South Downtown where the BNSF mainline railroad, Amtrak, and Sounder Commuter Rail are located. There are approximately 63 train movements on the mainline tracks per day across the east/west arterial streets. These train volumes and associated traffic delays are expected to increase in the future. Additional freight, Amtrak, and Sounder Commuter Rail service will be using the tracks in the future, resulting in the at-grade crossings being closed more often throughout the day. The City of Seattle has very limited capability to control the frequency or the length of time the trains block street crossings.

In the study area, the S. Holgate Street and S. Royal Brougham Way corridors are two major east-west arterials that cross the BNSF, Amtrak, and Sound Transit commuter rail lines. A WSDOT study issued in 2003 showed the average time per train crossing to be 3 minutes, 10 seconds. Table 3-43 presents a

summary of the 2003 daily train volumes crossing S. Holgate Street. The same study calculated the total vehicular delay due to train crossings encountered by vehicles crossing the S. Holgate Street railway for both the AM and PM peak hours using the approach traffic volumes and the average train crossing duration during the same time period. The results indicate that the total delay due to train crossings during the AM peak hour is 5.87 vehicle-hours and 16.32 vehicle-hours during the PM peak hour. This total delay is derived by multiplying the traffic volume in the peak hour by the average delay at crossing in this period.

**Table 3-43
Number of Train Crossings per Day at S. Holgate Street (2003)**

Type of Service	Number of Train Crossing Movements
Sounder (3 trains)	12
Amtrak Cascade (3 trains)	9
Freight (BNSF)	42
TOTAL	63

Source: *S Holgate Street Railway Crossing Closure Traffic Impact Analysis*, WSDOT, December 2003

BNSF predicts annual growth in freight rail volumes of five to ten percent per year. This would translate into an annual increase of two to three trains per day. Therefore, by 2030, approximately 100 freight trains are anticipated to cross the study area during a typical weekday. Unlike passenger rail, freight rail schedules are more flexible; therefore, it is not possible to accurately predict freight rail activities at crossings during a specific time period. However, it is likely that a proportional increase in peak period delay at crossings will occur, with up to four trains crossing during each peak hour.

Amtrak conducted another study in 2005 for the S. Holgate Street crossing³. The study showed that the crossing is typically blocked for 4 hours and 24 minutes each weekday. During the peak hours, the crossings are closed about 25 percent of the time. The study anticipated longer blocking time at the crossing in the future, where analysis indicates that blockages are expected to increase to 70 percent of the time by year 2027.

Freight Operating Conditions

The efficient movement of freight through the study area is an important statewide goal for promoting economic growth and international trade. Facilitating trucks and the movement of freight is an important consideration and is evaluated in this section based upon a set of qualitative and quantitative assessments, which include:

- **Truck Connections:** Ability of current facilities to provide proper connections and circulation options for trucks.
- **Major Truck Street Travel Speed:** Travel speed on designated Major Truck Streets.
- **Design Standards:** Qualitative assessment of design standards that would facilitate truck operations.

Truck Connections

This section addresses the ability of trucks to efficiently circulate through the study area and access locations such as the state highway system, the Port, and other industrial areas.

³ *Analysis of Train Operations Across S Holgate Street, Seattle, WA*, Amtrak, HDR Engineering, January 2005.

The current Major Truck Streets provide reasonable access to I-5 and the Alaskan Way Viaduct as well as to I-90. Port properties are accessed via S. Atlantic Street, S. Royal Brougham Way, and Alaskan Way S. Currently, trucks must use at-grade mainline railroad crossings at S. Holgate Street, S. Royal Brougham Way, and S. Lander Street. In addition, there are tail tracks between 1st Avenue S. and Alaskan Way S. that occasionally close S. Atlantic Street and S. Royal Brougham Way. Tail tracks are track extensions beyond the end of a transit mainline used to build up trains. Closures of the tail track crossings, while not as frequent as closures of the mainline crossings, are also anticipated to increase in proportion to freight rail using the mainline, causing additional delays for traffic along S. Atlantic Street and S. Royal Brougham Way corridors with closure duration of up to 20 minutes. Access to Duwamish and Harbor Island industrial areas is provided by connections at S. Spokane Street south of the study area from the 1st Avenue S. and East Marginal Way corridors.

There are several planned improvements in the study area that will improve truck connections such as SR 99 improvements, completing SR 519 Phase 2, Spokane Street Viaduct that includes widening the Viaduct, closing the westbound off ramp at 4th Avenue S and adding a westbound on and off ramp at 1st Avenue S. and an eastbound loop ramp to 4th Avenue S., Alaskan Way S./S. Atlantic Street intersection improvements, and S. Lander Street Grade Separation. A more detailed description of the planned improvements is provided in Appendix G. The improvements are expected to provide more direct access to the Port properties and the SIG yard from the regional highway system. In addition, a dedicated roadway is planned to provide direct access between T-46 and the SIG yard to avoid conflicts with traffic along the City arterials.

Major Truck Street Travel Speed

The travel speed performance measure for trucks is similar to that of general traffic. It reflects the operating conditions of street segments and intersections along the truck corridors. Higher travel speeds along the corridors could result from improving the flow of vehicles and reducing the delays at intersections. The travel speeds for the Major Truck Streets were reported previously for corridor operations. It must be noted that trucks often have slower travel speeds than regular passenger vehicles due to reduced accelerating speeds and increased delay when making turns. Trucks can further be delayed at unsignalized intersections or driveways because longer gaps in traffic are needed to safely turn into or cross traffic on the major street.

Even though truck travel speed is a bit longer than that of the general traffic, the corridor operations and level of service (LOS) represents a reasonable indicator for freight operation performance. If corridor operations decline, it is assumed that truck operations will also decline proportionally, at a minimum. In addition, for an individual trucker, the time to access a specific port gate or intermodal terminal could be affected by other factors such as the operation of the gate or terminal. Such additional delays caused by those factors are not included in the analysis.

Design Standards

Not all streets in the study area have been designed to accommodate large trucks with single- or multi-unit trailers. Therefore, truck traffic often experiences operational problems on arterials due to design related issues such as short curb radii, narrow streets or travel lanes, utility poles that are close to the curb, pavement conditions on truck access routes, and signal control operations that do not assist truck turning movements.

The streets in the study area have limited rights-of-way and are shared by various transportation modes including cars, buses, bicycles and pedestrians. Such interaction, accompanied with the lack of proper street design and congestion, can create conflicts between truck traffic and other motorized and non-motorized transportation modes.

Data are not readily available to evaluate all the locations with design issues that contribute to poor truck operations. As part of the Alternatives evaluation, improvements that are commonly a part of higher density development, in addition to any mitigation strategies, are reviewed to identify potential design issues that could impact the operation of trucks.

PEDESTRIANS AND BICYCLISTS

This section summarizes pedestrian and bicycle conditions across the study area. The discussion in Appendix G provides greater detail, including pedestrian counts at several locations.

Pedestrian Facilities

Chinatown/Japantown

This neighborhood has a considerable amount of infrastructure for pedestrians, and at least one major pedestrian generator (a bus tunnel entrance). Nearly all intersections (both signalized and unsignalized) have marked crosswalks and there is a mid-block crossing along 5th Avenue S. between S. Weller Street and S. Dearborn Street. Sidewalks exist on most streets in this area. There is high pedestrian activity in this district, including high volumes of crosswalk use.

Along streets like 4th Avenue S. and S. Jackson Street, the combination of high traffic volumes and high pedestrian volumes increases the potential for pedestrian-vehicle conflicts. This includes the 8th Avenue S./S. Jackson Street vicinity where there are transit stops on both sides of the street. Also in this vicinity, the quality of street lighting on S. Jackson Street and S. King Street is of interest for the overall safety of pedestrians and the public using the vicinity in and under I-5. Along the southern edge of Chinatown, S. Dearborn Street and Airport Way S. near the former INS building are perceived to be challenging pedestrian crossing areas. While there are signalized intersections along most of S. Dearborn Street, the width of the street and amount of traffic that flows on the street may increase its perception as a pedestrian barrier, particularly for people that move more slowly.

Steeper slopes along 6th Avenue S., S. Washington Street and Yesler Way create impediments to pedestrian movement, particular for senior citizens that live in the vicinity. Sidewalks along some street segments in this area are missing, in need of repair or have blockages that impede pedestrian travel. These deficiencies may result in pedestrian use of the street, thereby increasing the potential for pedestrian/vehicle conflicts. On other streets just north of S. Jackson St., sidewalks are present but the slopes increase the need for pedestrian respite. Improvements are planned along Maynard Ave. S that will provide resting spots and natural features to improve aesthetics and pedestrian comfort.

Pioneer Square

This neighborhood has a considerable amount of pedestrian infrastructure. It has two major pedestrian generators (King Street Station and an access to the bus tunnel), as well as several mid-block crossings. In addition, Occidental Avenue S. is a pedestrian corridor that runs parallel to 1st Avenue S. and 2nd Avenue S. from S. Jackson Street to S. Washington Street. Most intersections have marked crosswalks. Sidewalks are present on most streets in the area.

The Pioneer Square area has a very high level of pedestrian activity, due to its mix of retail, restaurant, employment and residential uses. Also within and adjacent to the district are government centers of employment that generate pedestrian traffic. Nearby to the west is the Colman Dock ferry terminal that generates a lot of pedestrian traffic, including on a footbridge that connects to 1st Avenue.

Stadium Area

This vicinity has sidewalks on most streets, particularly near the major pedestrian generators such as Qwest Field, Safeco Field, and the Event Center. It also has the key pedestrian connection of the Weller Street bridge, which links the Chinatown area to the Stadium Area. At S Royal Brougham Way near 3rd Avenue S., the at-grade railroad crossing is an identified pedestrian safety issue because fatalities have occurred at this location in the past due to collisions with trains. The vicinity is subject to other pedestrian challenges, some due to street and parking configurations and some due to the unique manner in which event patrons use Occidental Avenue S. and other streets.

- The parking arrangement on the west side of Occidental Avenue S. approximately south of Railroad Way S. includes perpendicular parking interspersed with business entries and no sidewalk. Although a sidewalk is present on the east side of Occidental Avenue S., pedestrians may instead use the street.
- Due to longstanding habits and the attractions of street-side vending, event patrons have long perceived Occidental Avenue S south of S King Street as being a pedestrian promenade, traveling on foot in any part of the street at almost any time. This unique trait creates a condition where pedestrians and vehicles share the roadway, with potential for conflicts. During stadium events, traffic control is typically in place at several key locations and overall safety is maintained despite some mixing of pedestrians and vehicles.
- Stadium event-related pedestrian traffic also contributes to heavier use of various street segments in the vicinity, which can challenge the capacity of the sidewalks and can occasionally result in spill-over of pedestrians onto curbside lanes and jaywalking. This can occur along portions of 1st Avenue S. in the Stadium Area, particularly near Safeco Field, on S. Atlantic Street, and 4th Avenue S. near S. Royal Brougham Way. During high attendance events, pedestrians may also be more prevalent near Alaskan Way S. and S. Atlantic Street. The combination of higher traffic volumes, possible higher-speed traffic and the potential for jaywalking at S. Atlantic Street near 1st Avenue S. means this is a notable area with potential pedestrian safety issues. There is similar potential for such issues near 1st Avenue S./S. Royal Brougham Way.
- Near the existing SR 99 access ramp on the west side of 1st Avenue S, the ramp infringes on the sidewalk such that one segment is quite narrow and sheltered from view of passersby, contributing to possible public safety concerns.

South-of-Dearborn

Sidewalks are provided on most streets, some with weeds and cracked conditions. Some streets have sidewalks crossing past business entry doors and perpendicular parked cars in between, which contributes to potential pedestrian safety challenges. Airport Way S. and S. Dearborn Street, wider streets with higher speed traffic, are perceived as more difficult to cross. The characteristics of the corridors and less frequent crossing locations may contribute to potential pedestrian safety challenges. Pedestrian activity in this area is minimal, though it often does increase when there is an event at Safeco or Qwest fields due to the dispersal of event-related parking in this vicinity.

Little Saigon

Sidewalks are provided on most streets, some with weeds and cracked conditions. Pedestrian activity is highest near the intersection of 12th Avenue S. and S. Jackson Street. There are a number of locations where relatively high traffic volumes combined with pedestrian activity and physical characteristics may contribute to pedestrian safety challenges:

- 12th Avenue S./S. Jackson Street intersection vicinity
- 12th Avenue S./S. King Street intersection vicinity

- 12th Avenue S./S. Weller Street vicinity
- Mid-block vicinity on S. Jackson Street between 12th Avenue S. and Rainier Avenue S.
- Rainier Avenue S./Boren Avenue S./S. Jackson Street intersection vicinity
- Rainier Avenue S./S. Dearborn Street vicinity

Bicycle Facilities

Within the study area several roadways have infrastructure for bicycles. The infrastructure mainly consists of bicycle lanes striped onto existing roadways. Bicycle lanes are located on 2nd Avenue S. (in the Pioneer Square district), S. Dearborn Street (in the Little Saigon and south-of-Dearborn vicinities), and S. Jackson Street (in the Little Saigon vicinity). There are also several identified bicycle routes in the area, as well as multi-use paths. The multi-use paths are along Alaskan Way S. (along the border of the Stadium Area and Pioneer Square vicinities), along 5th Avenue S. (south of the south-of-Dearborn vicinity), and along I-90 to I-5 (south of the Little Saigon vicinity). Bike routes are prevalent in all vicinities. Regional bicycle connections are provided by several paths and trails in the area. The Alaskan Way trail west of the study area provides access north through the Downtown waterfront area to Magnolia. The bicycle lane along S. Dearborn Street within the Little Saigon vicinity connects to the I-90 trail, which provides connections across Lake Washington to Mercer Island and areas east of Lake Washington

To promote and encourage greater bicycle use, the City of Seattle has completed a Bicycle Master Plan. The plan identifies existing facilities, recommends improvements, discusses ways to educate the public, and identifies funding for the improvements. Several major improvements are discussed, including several miles of on-street bicycle facilities, trail connections and a signed bicycle route system. The plan also discusses the need for improvements at roadway crossings and on arterial roadways.

EVENT TRAFFIC MANAGEMENT

Event traffic management summarized in this section refers primarily to transportation management programs (TMPs), updated on an annual basis, that were required by City conditioning of permits for the two athletic stadiums, Safeco Field and Qwest Field. City decisions to permit the construction of these facilities recognized that the number of large events, their potential overlap, and their interaction with typical daily traffic in the vicinity would create substantial traffic volumes that could result in occasional severe traffic congestion. This congestion can and does result in adverse traffic delays and impaired functioning of streets and transit systems.

The TMPs include several strategies that are meant to minimize the frequency, extent and duration of traffic congestion that is influenced by event-related traffic, as well as measurable goals and other required contents. For example, the TMPs define a policy that prevents large events from simultaneously occurring at the stadiums, and requires other “special” TMPs for some added events such as playoff games that may or may not occur. Another focus of each TMP is on the immediate neighborhoods adjacent to each stadium, to discourage parking and extraneous traffic circulation within the TMP boundaries. The specific objectives for Qwest and Safeco Fields generally overlap and are mostly consistent between the two plans. Some of the specific measures are required as part of the entitlements for each venue whereas some of the other measures are done to provide incentives for patrons to carpool and travel via alternative mode versus single occupant vehicle.

Over time, it has become clearer that transportation management practices for each stadium work somewhat differently, with different characteristics that respond to the particular needs created by their events, and differences in event-goers’ characteristics that can affect traffic patterns. Observations about these differences include the following:

- The Qwest Field Event Center TMP addresses fewer large events than Safeco Field’s TMP.

- The physical location of each stadium and its parking facilities results in somewhat different traffic patterns. Qwest Field tends to generate traffic in Pioneer Square, and to/from its parking facilities near S. King Street and on 4th Avenue S. Safeco Field tends to generate southern-oriented traffic volumes where parking resources may be more accessible to event-goers. Given these patterns, there is relatively more concern for pedestrian safety in locations such as the 1st Avenue S. and S. Atlantic Street vicinity during baseball games (as compared to football games) due to the proximity of Safeco Field, the number of baseball games, and crowd behavior that may induce more jaywalking. These patterns also influence the distribution of police postings to maintain safety.
- Regionally, Qwest Field football events draw many fans from southern suburbs to its weekend day events. Safeco Field baseball events draw fans more evenly from within the region, along with fans walking from Downtown jobs on weekdays. These differences influence different patterns of arrival and pedestrian activity, e.g. “tailgating” before football events, and crowds walking south on Occidental Avenue S. for baseball games.
- Safeco Field events typically have included five to seven weekday day games that can create overlap with PM peak commuting periods, depending upon the starting times and eventual ending times of the baseball games. Experience has led authorities to favor start times that avoid games ending around the PM peak hour commuting period. However, scheduling practices of Major League Baseball and the need for occasional rainout make-up games can lead to day game schedules that are mostly beyond the control of the City and the Mariners.

Several elements of the access to each stadium will be altered as a result of specific planned transportation improvements, such as SR 519 Phase 2 and access improvements to SR 99 as part of the Alaskan Way Viaduct replacement project. Key at-grade pedestrian-vehicle conflicts in the immediate vicinity of both Qwest and Safeco Fields will be eliminated with improvements at S. Royal Brougham Way as part of the SR 519 Phase 2 project because SR 519 will be rerouted away from S. Royal Brougham Way. This transportation improvement will also affect how ingress and egress to the garage at Qwest Field is provided. The result of the improvement will likely be a re-allocation of resources related to pedestrian and traffic control.

ENVIRONMENTAL IMPACTS

This section describes future 2030 conditions for the transportation systems within the study area under the No-Action and Action Alternatives. The future transportation system conditions were established based on forecasts of regional population and employment developed by the City of Seattle and PSRC and reflected in the City's travel demand model for the No Action Alternative. The No Action Alternative establishes the baseline information for system performance against which the Action Alternatives are compared. For each of the Alternatives, a consistent set of new transportation facilities and services were assumed to be in place by 2030 and accounted for in the development of the 2030 travel forecasts.

TRAVEL FORECASTS

The No-Action and Action Alternatives were evaluated under 2030 travel conditions. These conditions assume an increase in travel as the result of forecasted increases in population and employment in the Puget Sound region and the study area. The travel forecasts are estimated based on the expected number of person trips per day generated by the future land uses. This information is calculated using the City of Seattle EMME/2 travel demand model. The model is a refined version of the Puget Sound Regional Council (PSRC) regional model with a greater emphasis on travel within the City of Seattle. The model includes smaller transportation analysis zones (TAZs) to provide more sensitivity to local arterials, but has also incorporated other specific enhancements such as updates to the local transit network. The model was utilized to forecast the number of vehicle trips and non-auto trips in the study area for the No Action and Action Alternatives based on the 2030 horizon year.

The AM and PM 3-hour peak periods were used to evaluate 2030 travel conditions. The model runs were completed by beginning with the No-Action Alternative and confirming regional and study area land uses along with the future transportation network assumptions. Once the assumptions had been confirmed and/or included, the model was run for each of the Action Alternatives. The only modifications to the model for each of the Action Alternatives included revisions to the land uses for the study area TAZs. No other modifications to the model were made under each Alternative.

The model includes a four-step modeling procedure which comprises trip generation based on the land uses, trip distribution among the TAZs, modal split among the various modes available, and trip assignment on the model network. The results from the trip generation and trip distribution components of the model are described below along with a summary of the mode share and trip assignment. Much of the model data described in this section has been compared to the base year model, which was calibrated to 2005 conditions.

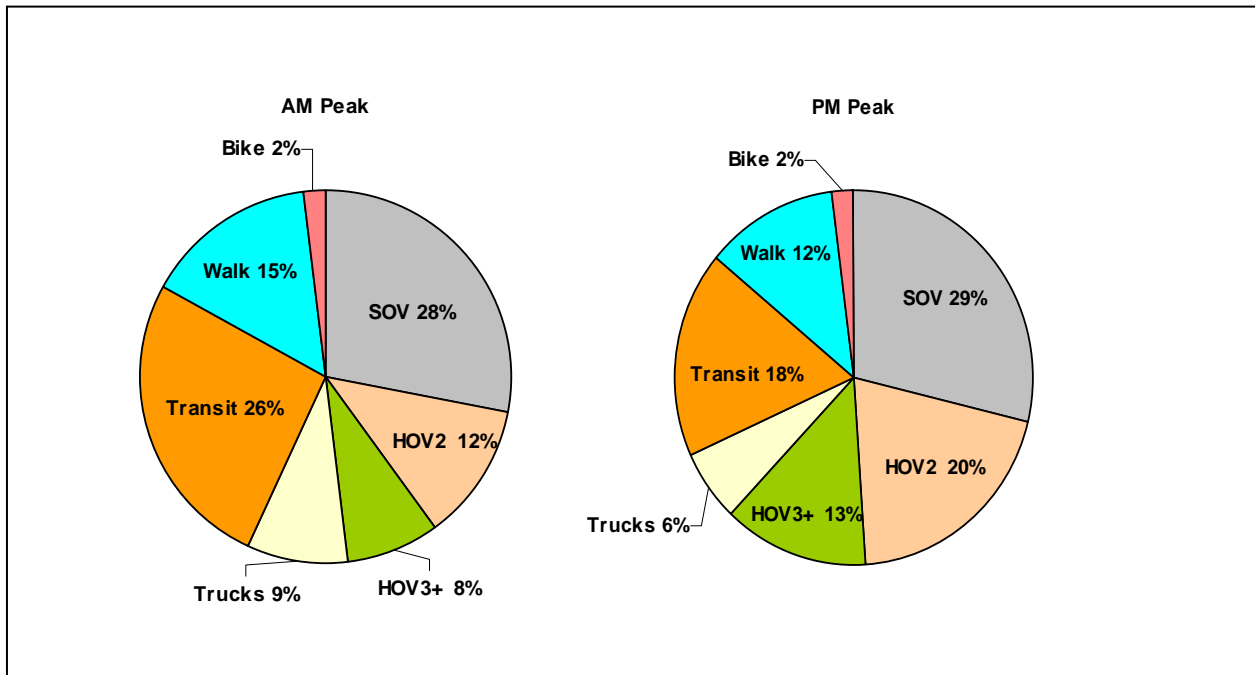
Trip Generation and Mode Share

The model estimates the number of person trips generated (produced or attracted) by each TAZ based on the types of land uses within the specified zone. Residential development is typically the producer of daily trips, whereas employment is typically the attractor of daily trips. The model includes a series of residential and employment land use categories by which it estimates travel. DPD staff developed and provided the land use information to include in the model for each of the Alternatives (see Table 5-1 in Appendix G).

The mode choice component of the model estimates the allocation of person trips among the various travel modes. Special attention was given to mode share results to assess the shifts in travel modes between the Alternatives or even over the study horizon compared to the base year travel characteristics. Figure 3-44 illustrates the six primary modes within the model and the approximate mode share for the study area TAZs under the 2030 No-Action Alternative.

The mode share results show an increase in transit share from the 2005 base year model. During the AM peak period, the percentage of transit trips increases from 24% in 2005 to 26% in 2030, while during the PM peak period transit trips increases from 16% in 2005 to 18% in 2030 under the No-Action Alternative. This shift in mode share is particularly associated with limited parking spaces in the study area and the consequent increase in parking costs.

Figure 3-44
Modal Splits for AM & PM Peak 3 Hour Periods (2030 No Action)



The number of person trips during the AM and PM peak periods has been summarized by mode in Table 3-44. The 2030 travel characteristics have been compared to the 2005 base year information for illustrative purposes. The TAZ boundaries within the model do not match the extents of the study area. Therefore, Table 3-44 also includes data for areas just outside the study area (see Figure 5-2 in Appendix G).

**Table 3-44
Peak Period Travel Characteristics¹ (Base Year vs. No-Action)**

	AM Peak Period ²			PM Peak Period ²		
	2005	2030 No-Action	% Change from 2005	2005	2030 No-Action	% Change from 2005
Average Person Trips to/from Study Area	18,200	32,100	76%	28,100	46,600	66%
Average Vehicle (Auto) Trips ³ to/from Study Area	9,100	14,600	61%	14,800	23,500	59%
Percent of Study Area Person Trips made by Transit/Walk/Bike (Non-Auto)	37%	43%	--	26%	32%	--
Study Area Person Trips made by Transit/Walk/Bike (Non-Auto)	6,800	13,600	101%	7,200	13,900	94%
Percent of Study Area Person Trips made by Vehicle (Auto)	63%	57%	--	74%	68%	--
Average Auto Occupancy	1.74	2.19	--	1.68	1.99	--

Source: City of Seattle Travel Demand Model (April 2007)

1. The information displayed in this table is based on the Model TAZ boundaries which include some areas that are outside the identified study area as shown in Figure 5-2 of Appendix G.
2. AM and PM peak periods in the SDOT Model are defined as 3 hours each.
3. Vehicle (Auto) Trips includes single occupancy vehicles, high occupancy vehicles, van pools, and trucks

2030 No Action Alternative (Alt. 4)

During both the AM and PM peak periods, the percent increase in person trips is higher than the percent increase in vehicle trips. This explains the shift in mode share between 2005 and 2030. During the AM peak period, approximately 57% of person trips are by automobile in 2030 compared to 63% in 2005. During the PM peak period, the automobile share is approximately 68% of the total trips compared to 74% in 2005. Automobile trips include single-occupancy vehicles (SOV), high-occupancy vehicles (HOV), vanpools and trucks. The increase in non-auto mode (transit/walk/bike) usage is largely attributed to the increase in parking costs in the study area and Downtown Seattle in general. Since the rate of increase in person trips is higher than that of vehicle trips, the average auto occupancy within the study area increases from 1.74 passengers per car for the AM peak period in 2005 to 2.19 in 2030. During the PM peak period, the study area average auto occupancy increases from 1.68 in 2005 to 1.99 in 2030.

2030 Action Alternatives (Alts. 1, 2, 3)

The mode share information from the model for each of the Action Alternatives is listed in Table 3-45. Similar to the No Action Alternative, a mode shift is observed from the 2005 conditions illustrated earlier. Yet, the percent of trips made by non-auto modes under each of the Action Alternatives remains similar to the No-Action Alternative. While the model is predicting a substantial increase in both auto and non-auto modes relative to the No Action Alternative, it does not indicate that non-auto travel modes will comprise a higher proportion of the travel generated within the study area. It is observed from Table 3-45 that Alternative 3 provides a slightly higher percentage of non-auto mode users.

**Table 3-45
Peak Period Travel Characteristics¹ (Action Alternatives)**

	AM Peak Period ²			PM Peak Period ²		
	Alt 1	Alt 2	Alt 3	Alt 1	Alt 2	Alt 3
Average Person Trips to/from Study Area	37,790	38,270	38,790	54,080	54,550	55,250
Average Vehicle (Auto) Trips ³ to/from Study Area	17,090	17,230	17,380	27,060	27,250	27,430
Percent of Study Area Person Trips made by Transit/Walk/Bike	43%	43%	44%	31%	31%	31%
Study Area Person Trips made by Transit/Walk/Bike	16,290	16,610	16,890	16,560	16,860	17,160
Percent of Study Area Person Trips made by Auto	57%	57%	56%	69%	69%	69%
Average Auto Occupancy	2.22	2.23	2.25	2.01	2.01	2.03

Source: City of Seattle Travel Demand Model (April 2007)

1. The information displayed in this table is based on the Model TAZ boundaries which include some areas that are outside the identified study area as shown in Figure 5-2 of Appendix G.
2. AM and PM peak periods in the SDOT Model are defined as 3 hours each
3. Vehicle (Auto) Trips includes single occupancy vehicles, high occupancy vehicles, van pools, and trucks

Trip Distribution and Assignment

The allocation or distribution of trips among the various TAZs in the model was estimated using the destination choice model (gravity model) which allocates trips based on impedances between the TAZs. For trips generated in the study area during the AM peak period, approximately 51 percent of the trips are heading to the north, 24 percent to the south, 6 percent to the east, and 1 percent to the west. The remaining 18 percent stay within the study area. In the PM peak period approximately 41 percent of the trips would head to the north, 35 percent to the south, 11 percent to the east, and 1 percent to the west. The remaining 12 percent stay within the study area. See Appendix G for further discussion of trip assignment.

ARTERIAL STREET SYSTEM IMPACTS

This section summarizes the 2030 future year conditions along the arterial street system and compares the performance of the Alternatives, focusing on differences between the Action Alternatives and the No-Action Alternative. The evaluation assumes completion of planned and programmed improvements (see Section 5.2 of Appendix G), which means arterial facilities are assumed to be identical under the Alternatives.

2030 Forecast Traffic Volumes

The forecast traffic volumes were developed using the City of Seattle Travel Demand Model, leading to detailed AM and PM peak hour traffic estimates for the 2030 No-Action and Action Alternatives for the major corridors throughout the study area.

AM Peak Hour

2030 No Action Alternative (Alt. 4)

During the AM peak period, the travel demand model forecasts higher growth rates for westbound and northbound traffic than other travel directions, attributable to Downtown employment center growth. For various travel directions, this traffic growth would represent total increases of approximately 17% to 37% in traffic volumes between the 2005 base year and 2030. This translates to an approximate 1% annual growth rate, which is consistent with the historical traffic growth in the study area. Figure 3-45 illustrates

the AM peak hour forecast volumes. The highest traffic growth is seen along westbound S. Atlantic Street, due to shifts in traffic from SR 519 ramp improvements. Other streets with relatively high growth rates include S. Dearborn Street, S. Jackson Street, Rainier Avenue S., 12th Avenue S., and portions of 1st Avenue S. and 4th Avenue S. See Appendix G for further evaluation.

2030 Action Alternatives (Alts. 1, 2, 3)

The traffic forecasts for the Action Alternatives in the Pioneer Square neighborhood and Chinatown/Japantown vicinity west of I-5 forecast an expected traffic growth of less than 5 percent above the No-Action Alternative forecasts. Greater amounts of forecast traffic growth would occur in Little Saigon and South of Dearborn and to a lesser extent in the Stadium Area neighborhood, where traffic volumes are to increase another 5 to 15 percent above the No-Action forecasts. The Action Alternative traffic forecasts for the AM peak hour are similar to one another, only differing by a few percentage points along the major corridors. See Appendix G for further evaluation.

PM Peak Hour

2030 No Action Alternative (Alt. 4)

During the PM peak hour, the travel demand model forecasts higher traffic growth along the corridors serving commuter traffic leaving Downtown. An approximate 1-1.5% annual growth rate is forecast. For various travel directions, this traffic growth would represent total increases of approximately 21% to 40% in traffic volumes between 2007 and 2030. Figure 3-46 illustrates the PM peak hour forecast volumes.

Large increases in projected traffic volumes would be observed along both directions of S. Atlantic Street, reflecting the new SR 519 off-ramp, closure of S. Holgate Street and Alaskan Way improvements. The forecast PM peak traffic volumes increase along S. Atlantic Street from 1,165 and 380 vehicles per hour in 2007 for the eastbound and westbound directions, respectively, to 1,825 and 865 vehicles per hour in 2030. Forecast growth in traffic volumes is also significant along eastbound S. Dearborn Street, which is influenced by projected Little Saigon developments and traffic leaving Downtown. Westbound S. Jackson Street also would see a significant increase in traffic volumes due to growth in Downtown.

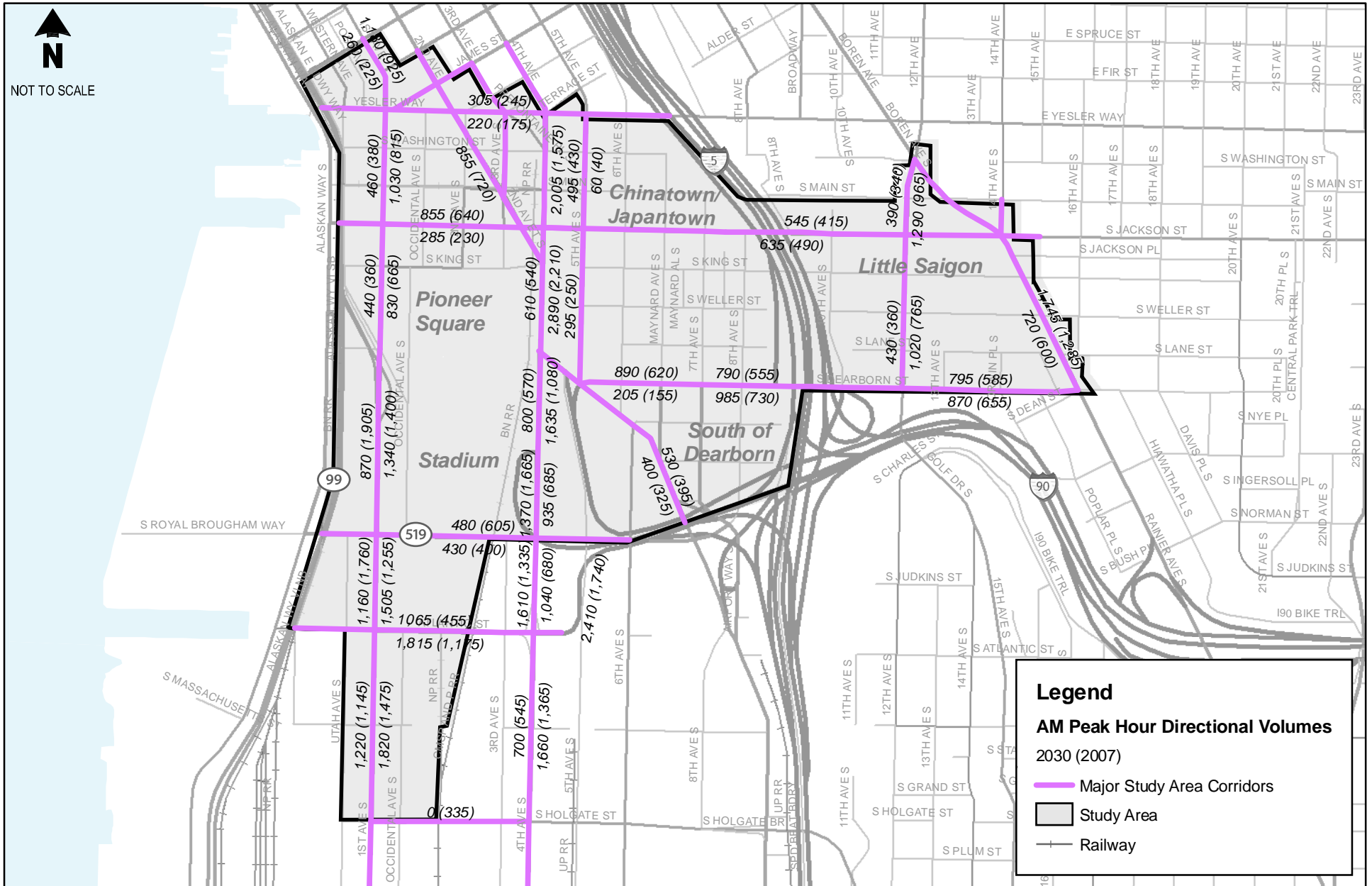


Figure 3-45
AM Peak Hour Traffic Volumes (2030 No Action Alternative)

In the north-south corridors, general traffic growth would be slightly higher along the southbound approaches of most corridors. Along 1st Avenue S., traffic volumes would drop north of S. Atlantic Street and south of S. Jackson Street due to shifts in traffic to new “frontage” roads along SR 99 assumed with Alaskan Way Viaduct improvements. Forecast traffic growth on Rainier Avenue S. would be higher for the northbound direction, influenced by increased commercial development in Little Saigon and Downtown.

2030 Action Alternatives (Alts. 1, 2, 3)

The Action Alternatives’ traffic volume forecasts for the PM peak hour are similar to one another and to the No Action Alternative. The greatest forecast increase in traffic growth above the No Action Alternative would take place in Little Saigon and to a lesser extent in south-of-Dearborn, due to projected development.

Vehicle Travel Characteristics

Given its location, many of the vehicle trips along the South Downtown study area roadways do not have an origin or destination within the study area. These trips, referred to as external trips, use South Downtown roadways to travel between their origins and destinations.

2030 No Action Alternative (Alt. 4)

The travel patterns in the 2030 No-Action Alternative would be similar to those estimated in 2005, with about 10 percent of the total traffic on roadways within the study area having an origin or destination within the study area. Nine out of 10 vehicles use study area roadways without stopping in the study area at a residence or business. These travel characteristics are similar for both the AM and PM peak periods.

2030 Action Alternatives (Alts. 1, 2, 3)

The travel patterns are identical under the Action Alternatives, indicating that the increase in vehicle trips caused by future development does not result in a significant shift in the external pass-through trips to other roadways.

Corridor Operations and Travel Speeds

This section presents peak hour arterial level of service (LOS) and average travel speeds for corridor segments under the No Action and Action Alternatives. These are the primary criteria to measure performance along study area corridors. The corridor LOS is based upon the roadway’s functional classification and the amount of time it takes a vehicle to navigate the length of the identified corridor. Results are based on the average delay per vehicle expected at each signalized intersection along the corridor. Existing timing of traffic signals was a starting point for the 2030 analysis, but where appropriate signal timings were optimized, with the same signal timing assumptions made for the No Action and the Action Alternatives.

AM Peak Hour

2030 No Action Alternative (Alt. 4)

Table 3-46 summarizes corridor operations (arterial LOS) and travel speed results for the weekday AM peak hour conditions in 2030 under the No Action Alternative, with existing conditions listed for comparison. The corridor LOS and travel speeds are expected to decline or stay the same for all corridors except along S. Royal Brougham Way, where a grade-separated structure (part of SR 519 Phase 2) would eliminate delays caused by the existing at-grade rail crossing, and traffic would shift away from S. Royal Brougham Way to S. Atlantic Street, due to a new off-ramp from I-90 (also part of SR 519 Phase 2). This

would reduce volumes using the 4th Avenue S. off-ramp that would then head westbound on S. Royal Brougham Way. The shifts in traffic to S. Atlantic Street are the primary reason why travel speeds are projected to decrease significantly along S. Atlantic Street compared to existing conditions. Westbound travel speeds on S. Dearborn Street are also projected to decrease significantly, probably related to development Downtown and on the Goodwill properties.

**Table 3-46
Corridor Operations and Travel Speeds—AM Peak Hour (2007 vs. 2030 No-Action)**

Corridor / Arterial	Extent	Direction	Arterial LOS ¹	
			2007 Existing	2030 No-Action Alternative
North-South Corridors			Travel speeds in parentheses (mph)	
1st Avenue S	Yesler Way to S Spokane Street	NB	D (15) ²	E (13)
		SB	C (19)	D (16)
2nd Avenue Extension S	James Street to 4 th Avenue S	SB	F (8)	F (5)
3rd Avenue S	James Street to S Jackson Street	NB	D (12)	D (11)
		SB	D (10)	E (8)
4th Avenue S	S Washington Street to S Spokane Street	NB	D (15)	F (7)
		SB	D (17)	F (8)
Rainier Avenue S	S Jackson Street to S Dearborn Street	NB	E (12)	F (3)
		SB	E (13)	E (11)
East-West Corridors			Travel speeds in parentheses (mph)	
S Jackson Street	Alaskan Way S to Rainier Avenue S	EB	E (12)	E (11)
		WB	F (10)	F (9)
S Dearborn Street	Airport Way S to Rainier Avenue S	EB	E (11)	E (11)
		WB	E (11)	F (6)
S Royal Brougham Way	Alaskan Way S to 4 th Avenue S	EB	F (7)	F (9)
		WB	F (5)	F (5)
S Atlantic Street	Alaskan Way S to 4 th Avenue S	EB	E (11)	F (5)
		WB	F (7)	F (2)

Source: The Transpo Group (July 2007)

1. Arterial Level of Service based on 2000 *Highway Capacity Manual* methodology for urban arterials.
2. Arterial speed in miles per hour which includes the average speed delay encountered at each signalized intersection along the corridor as well as delays at mid-block sections (which are graded by the letter assignment, i.e., "A" – "F").

Each north-south corridor would experience reduced corridor operations and travel speeds. More than half of the studied corridors are forecast to operate at LOS F conditions in 2030, including Rainier Avenue S., 4th Avenue S. and the 2nd Avenue Extension S. Volumes at the Rainier Avenue S./S. Dearborn Street intersection are the primary contributor to the LOS F arterial operations northbound, and the intersection with S. Jackson Street also contributes to the corridor's reduced performance. Projected travel speeds would decline from 12 mph currently to 3 mph in 2030. Along 4th Avenue S., increased volumes related to interchange improvements at S. Spokane Street, and increased delays at the Airport Way S. intersection would contribute to the corridor's reduced performance. Along 2nd Avenue Extension S., increased traffic volumes, particularly at the S. Jackson Street intersection, would cause a reduction in travel speed. Slight declines are also noted along 1st Avenue S. due to additional traffic south of S. Atlantic Street, and also along 3rd Avenue.

2030 Action Alternatives (Alts. 1, 2, 3)

Table 3-47 summarizes corridor operations (arterial LOS) and travel speed results for the Action Alternatives in the weekday AM peak hour, also comparing to the No Action Alternative. Only a few differences are noted between the No Action Alternative and among all of the Action Alternatives. Additional assumed traffic trips from development in the Little Saigon vicinity in the Action Alternatives contributes to the 1-2 mph difference from the No Action Alternative for the Rainier Avenue S. and S. Jackson Street corridors. The large amount of traffic passing through the area (9 out of every 10 trips), contributes to the minimal differences among the alternatives' results. See Appendix G for further evaluation.

**Table 3-47
Corridor Operations and Travel Speeds—AM Peak Hour (2030 No-Action vs. Action Alternatives)**

Corridor / Arterial	Extent	Direction	2030 Arterial LOS ¹			
			No-Action	Alternative 1	Alternative 2	Alternative 3
North-South Corridors			Travels speeds in parentheses (mph)			
1st Avenue S	Yesler Way to S Spokane Street	NB	E (13) ²	E (13)	E (12)	E (12)
		SB	D (16)	D (16)	D (16)	D (16)
2nd Avenue Extension S	James Street to 4 th Ave S	SB	F (5)	F (5)	F (5)	F (5)
3rd Avenue S	James Street to S Jackson Street	NB	D (11)	D (11)	D (11)	D (11)
		SB	E (8)	E (8)	E (8)	E (8)
4th Avenue S	S Washington Street to S Spokane Street	NB	F (7)	F (6)	F (6)	F (6)
		SB	F (8)	F (8)	F (8)	F (8)
Rainier Avenue S	S Jackson Street to S Dearborn Street	NB	F (3)	F (2)	F (2)	F (2)
		SB	E (11)	F (9)	F (9)	F (10)
East-West Corridors			Travels speeds in parentheses (mph)			
S Jackson Street	Alaskan Way S to Rainier Ave S	EB	E (11)	E (11)	E (11)	E (11)
		WB	F (10)	F (9)	F (9)	F (9)
S Dearborn Street	Airport Way S to Rainier Ave S	EB	E (11)	E (11)	E (11)	E (11)
		WB	F (6)	F (6)	F (6)	F (6)
S Royal Brougham Way	Alaskan Way S to 4 th Ave S	EB	F (9)	F (10)	F (10)	F (10)
		WB	F (5)	F (5)	F (5)	F (5)
S Atlantic Street	Alaskan Way S to 4 th Ave S	EB	F (5)	F (5)	F (5)	F (4)
		WB	F (2)	F (2)	F (2)	F (2)

Source: The Transpo Group (July 2007)

1. Arterial Level of Service based on 2000 *Highway Capacity Manual* methodology for urban arterials.
2. Arterial speed in miles per hour which includes the average speed delay encountered at each signalized intersection along the corridor as well as delays at mid-block sections (which are graded by the letter assignment, i.e., "A" - "F").

PM Peak Hour

2030 No Action Alternative (Alt. 4)

Corridor operations trends for the PM peak hour are similar to those projected for the AM peak hour. Table 3-48 summarizes the results for the No Action Alternative. Corridor LOS and travel speeds would decline or stay the same for all corridors except S. Royal Brougham Way.

**Table 3-48
Corridor Operations and Travel Speeds—PM Peak Hour (2007 vs. 2030 No-Action)**

Corridor / Arterial	Extent	Direction	Arterial LOS ¹	
			2007 Existing	2030 No-Action Alternative
North-South Corridors			Travels speeds in parentheses (mph)	
1st Avenue S	Yesler Way to S Spokane Street	NB	D (16) ²	D (16)
		SB	D (16)	E (12)
2nd Avenue Extension S	James Street to 4 th Ave S	SB	F (9)	F (8)
3rd Avenue	James Street to S Jackson Street	NB	C (14)	D (10)
		SB	E (8)	E (8)
4th Avenue S	S Washington Street to S Spokane Street	NB	D (16)	E (12)
		SB	E (13)	F (8)
Rainier Avenue S	S Jackson Street to S Dearborn Street	NB	E (12)	F (6)
		SB	F (9)	F (8)
East-West Corridors			Travels speeds in parentheses (mph)	
S Jackson Street	Alaskan Way S to Rainier Ave S	EB	E (11)	E (11)
		WB	E (11)	F (9)
S Dearborn Street	Airport Way S to Rainier Ave S	EB	F (9)	F (7)
		WB	F (8)	F (9)
S Royal Brougham Way	Alaskan Way S to 4 th Ave S	EB	F (8)	F (9)
		WB	F (7)	F (5)
S Atlantic Street	Alaskan Way S to 4 th Ave S	EB	E (11)	F (5)
		WB	F (10)	F (8)

Source: The Transpo Group (July 2007)

1. Arterial Level of Service based on 2000 *Highway Capacity Manual* methodology for urban arterials.
2. Arterial speed in miles per hour which includes the average speed delay encountered at each signalized intersection along the corridor as well as delays at mid-block sections.

Declines in corridor operations and average speed would be mainly associated with traffic leaving Downtown. Almost all of the east-west corridors would operate at an arterial LOS F, and approximately one-half of the north-south corridors would operate at LOS F. One of the corridors with the greatest difference in travel speed compared to existing conditions is S. Atlantic Street, particularly in the eastbound direction. A significant number of vehicles from Downtown and points south of the study area will continue to access regional freeways from this street. Eastbound traffic on S. Dearborn Street would also see a reduction in travel speed.

Reduction in travel speeds is also observed along southbound and northbound approaches of the north-south corridors. Although most traffic in the PM peak hour is southbound leaving Downtown, travel speeds also drop along northbound approaches, due to traffic signal priority given to southbound traffic. This is observed along 3rd Avenue (James to S. Jackson Street). Major reductions in travels speeds are also observed along Rainier Avenue S., attributed to developments in Little Saigon and the Rainier Valley. See Appendix G for further discussion.

2030 Action Alternatives (Alts. 1, 2, 3)

Table 3-49 summarizes corridor operations (arterial LOS) and travel speed results for the Action Alternatives in the weekday PM peak hour, also comparing to the No Action Alternative. Except for locations within Little Saigon, there are few predicted differences in travel speeds and arterial LOS between the Action Alternatives and the No Action Alternative. As noted for the AM peak hour, the large amount of traffic passing through the area (9 out of every 10 trips), contributes to the minor amount of differences among the alternatives' results.

Rainier Avenue S., S. Jackson Street, and S. Dearborn Street are corridors with indicated declines in average travel speeds for certain traffic movements, when comparing the Action Alternatives to the No Action Alternative. The lower average speeds under the Action Alternatives for these corridors is believed to be attributable to increased traffic generated by greater amounts of projected development within the Little Saigon and south-of-Dearborn areas.

Alternative 1 conditions are similar to the No Action Alternative in corridor operations and travel speeds. The most significant difference between these alternatives is expected along Rainier Avenue S., where southbound travel is predicted to decline from an average operating speed of 8 mph to 2 mph in the PM peak hour under Alternative 1. Increased traffic volumes at this avenue's intersections with S. Jackson Street and S. Dearborn Street are predicted to create significant delays along the corridor. A 2 mph decline in travel speed (from 7 mph to 5 mph) is also observed in eastbound traffic on S. Dearborn Street.

Alternative 2 conditions are similar to Alternative 1 conditions with the primary measurable difference in eastbound traffic on S. Dearborn Street, with a predicted 5 mph decline in travel speed (from 7 mph to 2 mph). This further reduction in average speeds compared to Alternative 1 is believed to be attributable to additional amounts of projected development within the south-of-Dearborn vicinity under Alternative 2.

Alternative 3 conditions would have comparatively the greatest impact on corridor operations and travel speeds among the Action Alternatives. The measurable difference is for eastbound traffic on S. Dearborn Street, with a predicted 6 mph decline in travel speed (from 7 mph to 1 mph). Also, under all Action Alternatives, travel speed would decline along Rainier Avenue S. to 2 mph from the 8 mph that would occur in the 2030 No Action condition. This further reduction in average speeds compared to Alternative 1 is believed to be attributable to projected developments in Rainier Valley and the south-of-Dearborn area, which would contribute to increased delays at the Rainier Avenue S. intersections with S. Jackson Street and S. Dearborn Street.

**Table 3-49
Corridor Operations and Travel Speeds—PM Peak Hour (2030 No-Action vs. Action Alternatives)**

Corridor / Arterial	Extent	Direction	2030 Arterial LOS ¹			
			No-Action	Alternative 1	Alternative 2	Alternative 3
North-South Corridors			Travel speeds in parentheses (mph)			
1st Avenue S	Yesler Way to S Spokane Street	NB	D (16) ²	D (16)	D (16)	D (16)
		SB	E (12)	E (12)	E (12)	E (12)
2nd Avenue Extension S	James Street to 4 th Ave S	SB	F (8)	F (8)	F (8)	F (8)
3rd Avenue S	James Street to S Jackson Street	NB	D (10)	D (10)	D (10)	D (10)
		SB	E (8)	F (7)	F (7)	F (7)
4th Avenue S	S Washington Street to S Spokane Street	NB	E (12)	E (12)	E (12)	E (12)
		SB	F (8)	F (8)	F (8)	F (8)
Rainier Avenue S (NB)	S Jackson Street to S Dearborn Street	NB	F (6)	F (4)	F (4)	F (4)
		SB	F (8)	F (2)	F (2)	F (2)
East-West Corridors			Travel speeds in parentheses (mph)			
S Jackson Street	Alaskan Way S to Rainier Ave S	EB	E (11)	E (11)	E (11)	E (11)
		WB	F (9)	F (8)	F (8)	F (8)
S Dearborn Street	Airport Way S to Rainier Ave S	EB	F (7)	F (5)	F (2)	F (1)
		WB	F (9)	F (9)	F (9)	F (9)
S Royal Brougham Way	Alaskan Way S to 4 th Ave S	EB	F (9)	F (10)	F (10)	F (10)
		WB	F (5)	F (5)	F (5)	F (5)
S Atlantic Street	Alaskan Way S to 4 th Ave S	EB	F (5)	F (5)	F (5)	F (5)
		WB	F (8)	F (8)	F (8)	F (8)

Source: The Transpo Group (July 2007)

1. Arterial Level of Service based on 2000 *Highway Capacity Manual* methodology for urban arterials.

2. Arterial speed in miles per hour which includes the average speed delay encountered at each signalized intersection along the corridor as well as delays at mid-block sections.

Intersection Operations

The signalized intersections along the studied corridors were evaluated for intersection performance during the AM and PM peak hours, using LOS measures that rate the average delay encountered by vehicles entering the intersection. The analysis includes new intersections and improvements assumed to be created by the SR 519 Phase 2 and the Alaskan Way Viaduct Replacement projects. See Appendix G for further details, including Tables A-1 through A-5 at the end of that appendix.

AM Peak Hour

2030 No Action Alternative (Alt. 4)

Table 3-50 summarizes the intersections along each corridor that would operate at LOS E or F in the AM peak hour, allowing for comparison among the Alternatives of the relative congestion at intersections along each corridor. The table's totals count some intersections more than once if located on two corridors. Without double counting, the analysis indicates that a total of seven intersections are predicted to operate at LOS E or F under the No Action Alternative, of the 49 signalized intersections evaluated. Of these seven, five intersections would operate at LOS F:

- 1st Avenue S./S. Spokane Street
- 1st Avenue S./S. Atlantic Street
- 4th Avenue S./S. Spokane Street

- 4th Avenue S./Airport Way S.
- Rainier Avenue S./S. Jackson Street

The intersections of Rainier Avenue S./S. Jackson Street and 4th Avenue S./Airport Way S. would deteriorate from LOS D and C under 2007 existing conditions to LOS F under the 2030 No-Action Alternative. The predicted decline in operations is attributed to increases in through-traffic generated by external regional land use growth that would use Rainier Avenue S. and 4th Avenue S. to access Downtown. In addition, increased amounts of projected development in Little Saigon would further increase traffic volumes, including at these intersections.

The 1st Avenue S./S. Atlantic Street intersection in 2030 would operate at LOS F despite the widening of the intersection as part of the SR 519 Phase 2 project. This is predicted due to the shift in traffic from S. Royal Brougham Way to S. Atlantic Street and the assumed closure of S. Holgate Street, which would likely more than offset the capacity improvements at the intersection.

**Table 3-50
Intersection Operations—AM Peak Hour**

Corridor/Arterial	Number of Intersections ¹	Number of Intersections Operating at LOS E or F in 2030			
		No-Action	Alternative 1	Alternative 2	Alternative 3
North – South Corridors					
1st Avenue S	10	2	2	2	2
2 nd Avenue Extension S	5	0	0	0	0
3 rd Avenue	2	0	0	0	0
4 th Avenue S (NB)	10	3	3	4	4
4 th Avenue S (SB)	7	3	3	4	4
Rainier Avenue S	2	1	2	2	2
East – West Corridors					
S Jackson Street	10	1	1	1	1
S Dearborn Street	9	0	1	2	2
S Royal Brougham Way ²	4	1	1	2	2
S Atlantic Street ²	5	1	1	1	1

Source: The Transpo Group (July 2007)

1. Number of signalized intersections along the corridor segment.

2. Includes new signalized intersections constructed as part of the SR 519 Phase 2 and the Alaskan Way Viaduct reconstruction.

The intersections predicted to operate at LOS E in the AM peak hour under the 2030 No Action Alternative are located at 4th Avenue S./S. Weller Street and at the SR 99 “frontage” road where it would meet S. Royal Brougham Way. At the 4th Avenue S./S. Weller Street intersection (with a pedestrian crossing and garage entry), the predicted decline in LOS from B under 2007 existing conditions to LOS E in 2030 would be due to increased traffic volumes in the northbound direction. The predicted operations at the SR 99 “frontage” road/S. Royal Brougham Way intersection would be the result of a large amount of traffic using the Alaskan Way Viaduct to/from Downtown and to/from areas to the south.

2030 Action Alternatives (Alts. 1, 2, 3)

Table 3-50 also describes the number of intersections operating at LOS E or F for the Action Alternatives in the 2030 AM peak hour, allowing for comparison with findings for the No Action Alternative. Trends similar to the No Action Alternative are predicted.

Under Alternative 1, one additional intersection would operate at LOS E, at Rainier Avenue S./S. Dearborn Street. The LOS at this intersection would decline from LOS D under the No Action Alternative to LOS E, likely due to increased traffic volumes from projected development in the Little Saigon neighborhood. A total of eight intersections would operate below an LOS D, including five at LOS F and three intersections at LOS E.

Under Alternative 2, three additional intersections would operate at LOS E compared to the No Action Alternative. This would include Rainier Avenue S./S. Dearborn Street, Airport Way S./S. Dearborn Street, and 4th Avenue S./S. Royal Brougham Way, likely due to increased traffic volumes from projected development in the 4th Avenue S., south-of-Dearborn and Little Saigon vicinities. Also, the 4th Avenue S./S. Weller Street intersection would further decline to an LOS F, compared to LOS E under Alternative 1 and the No Action Alternative. A total of ten intersections would operate below an LOS D, including six at LOS F and four intersections at LOS E.

Under Alternative 3, three additional intersections would operate at LOS E or worse, compared to the No Action Alternative. The ten intersections predicted to operate at LOS E or F would include the same locations as identified under Alternative 2. However, the SR 99 “frontage” road/S. Royal Brougham Way intersection would further decline to an LOS F, while the 4th Avenue S./S. Weller Street intersection would operate at LOS E. These differences from Alternative 2 conclusions would likely relate to differences in the projected development patterns in the Stadium Area vicinity. A total of ten intersections would operate below an LOS D, including six at LOS F and four intersections at LOS E.

PM Peak Hour

2030 No Action Alternative (Alt. 4)

Table 3-51 summarizes the intersections along each corridor that would operate at LOS E or F in the PM peak hour, similar to the AM peak hour analysis. The analysis indicates that a total of seven intersections are predicted to operate at LOS E or F under the No Action Alternative, of the 49 signalized intersections evaluated. Of these seven, five intersections would operate at LOS F:

- Rainier Avenue S./S. Jackson Street
- Rainier Avenue S./S. Dearborn Street
- 4th Avenue S./S. Royal Brougham Way
- 1st Avenue S./S. Lander Street
- 4th Avenue S./S. Spokane Street

Intersections predicted to operate at LOS E in the PM peak hour would be 1st Avenue S./S. Royal Brougham Way, and 4th Avenue S./S. Lander Street.

Commuting patterns away from Downtown employment centers would be a primary reason for these intersections’ operations. Each of these intersections is located along principal arterials that connect with the regional freeway system and provide access to south Seattle and west Seattle neighborhoods. Other traffic would continue to use 1st Avenue S. and 4th Avenue S. to access I-5 and eastbound I-90, creating congestion at the identified intersections. Intersections along Rainier Avenue S. are expected to decline in LOS from LOS D currently to LOS F under the No Action Alternative, likely due to projected development in south Seattle, central Seattle and Little Saigon.

The intersection at 1st Avenue S./S. Atlantic Street would improve from LOS E currently to LOS D under the No Action Alternative, due to planned SR 519 Phase 2 improvements that will add dual southbound turn lanes along 1st Avenue S.

The predicted LOS F and LOS E at 1st Avenue S./S. Lander Street and 4th Avenue S./S. Lander Street intersections, respectively, would relate to assumed 2030 conditions including the closure of S. Holgate Street at the railroad tracks and a prohibition of a northbound left turn at the 4th Avenue S./S. Atlantic Street intersection as part of the SR 519 Phase 2 project.

At S. Spokane Street, the proposed interchange configuration would shift traffic at the intersection with 4th Avenue S. from the westbound approach to the northbound approach, which would probably result in an LOS F. However, it should be noted that signal timing and phasing were assumed to be the same as existing conditions despite changes in geometric configuration at this intersection.

**Table 3-51
Intersection Operations—PM Peak Hour**

Corridor/Arterial	Number of Intersections ¹	Number of Intersections Operating at LOS E or F in 2030			
		No Action	Alternative 1	Alternative 2	Alternative 3
North – South Corridors					
1st Avenue S	10	2	3	3	3
2nd Avenue Extension S	5	0	0	0	0
3rd Avenue S	2	0	0	0	0
4th Avenue S (NB)	10	3	3	3	3
4th Avenue S (SB)	7	3	3	3	3
Rainier Avenue S	2	2	2	2	2
East – West Corridors					
S Jackson Street	10	1	2	2	2
S Dearborn Street	9	1	2	2	2
S Royal Brougham Way ²	4	2	3	3	3
S Atlantic Street ²	5	2	2	2	2

Source: The Transpo Group (July 2007)

1. Number of signalized intersections along the corridor segment.

2. Includes new signalized intersections constructed as part of the SR 519 Phase 2 and the Alaskan Way Viaduct reconstruction.

2030 Action Alternatives (Alts. 1, 2, 3)

Table 3-51 also describes the number of intersections operating at LOS E or F for the Action Alternatives in the 2030 PM peak hour, allowing for comparison with findings for the No Action Alternative. During the PM peak hour, the same intersections operating at LOS E or F under the No Action Alternative would continue to operate at such levels. However, under each of the Action Alternatives, a total of twelve intersections would operate at LOS E or F, five more than under the No Action Alternative. These additional five intersections are:

- 12th Avenue S./S. Jackson Street
- Airport Way S./S. Dearborn Street
- SR 99 “frontage” road/S. Royal Brougham Way
- SR 99 “frontage” road/S. Atlantic Street
- 1st Avenue S./S. Atlantic Street

The Airport Way S./S. Dearborn Street intersection would operate at LOS F under the Action Alternatives, while the other intersections listed above would operate at LOS E. Traffic from development projected to occur in the Little Saigon vicinity under each of the Action Alternatives would contribute to additional traffic along corridors such as S. Jackson Street, 12th Avenue S., S. Dearborn Street, and Rainier Avenue S. The LOS E at 12th Avenue S./S. Jackson Street under the Action Alternatives in the PM peak hour would compare to an LOS D under the No Action Alternative.

Traffic from development projected to occur in the Stadium Area would contribute to the SR 99 “frontage” road intersections to decline to LOS E operations. These intersections would provide access to SR 99 so they are anticipated to serve a significant volume of vehicles during the PM peak hour. The LOS E at 1st Avenue S./S. Atlantic Street under the Action Alternatives in the PM peak hour would compare to an LOS D under the No Action Alternative. The intersection of 1st Avenue S./S. Royal Brougham Way would operate at LOS E for Alternatives 1 and 2, but would decline to LOS F under Alternative 3 due to increased projected development in the Stadium Area vicinity.

In summary, during PM peak hours, Alternative 1’s traffic patterns at intersections would be most similar to the No Action Alternatives in terms of the number of intersections operating at LOS E or F. Alternative 2’s and 3’s traffic patterns at intersections would perform similarly, with Alternative 3 generating more impacts in the Stadium Area than Alternative 2. The overall predicted differences in intersection operations among the alternatives are not very significant, because traffic operations would be greatly influenced by external traffic from development outside the study area, and because South Downtown acts as a gateway to Downtown.

TRANSIT

The transit analysis summarizes 2030 transit service conditions and evaluates the performance of the Urban Village Transit Network corridors under each of the Alternatives. The transit performance measures are consistent with those developed as part of the Seattle Transit Plan. The analysis focuses on:

- local bus routes, which are expected to serve a majority of the study area’s transit needs;
- expected growth in and distribution of transit ridership and corresponding impacts on local bus service; and
- differences between the Action Alternatives and the No Action Alternative.

The analysis assumes completion of planned and programmed improvements identified in section 5.2 of Appendix G, including completion of Sound Transit Phase 1 and portions of Phase 2 (the East Link). Other improvements include those projects identified in Metro’s 6-year Transit Development Plan, along with those identified as part of the Transit Now Initiative that was passed by voters in 2006.

Increased Transit Ridership

Expected increases in transit investments and land use density within Seattle are expected to result in increased demand for transit. This demand is summarized in Table 3-52.

**Table 3-52
Study Area Transit Demand Growth in Person Trips (AM Peak Period)¹**

Neighborhood	2007 ²	2030			
		No Action	Alternative 1	Alternative 2	Alternative 3
Pioneer Square/ Chinatown/Japantown	5,250	10,400	11,750	11,800	11,800
Stadium Area/South of Dearborn	150	250	350	350	500
Little Saigon	550	1,200	2,100	2,050	2,000
Total	5,950	11,850	14,200	14,200	14,300
Growth vs. 2007 Existing		99%			
Growth vs. 2030 No-Action			20%	20%	21%

Source: City of Seattle Travel Demand Model (April 2007)

1. The information displayed in this table is based on the Model TAZ boundaries which include some areas that are outside the identified study area.
2. Based on King County Metro ridership data (Fall 2006) adjusted to 3-hour period and distributed based on model distribution pattern.

The transit ridership forecasts are based primarily on the City's travel demand model developed for the AM peak hour extending from 6 AM to 9 AM.

2030 No Action Alternative (Alt. 4)

Within the study area, transit alightings and boardings are expected to increase by approximately 99% over today's conditions. While much of the growth in transit trips is expected to occur in Pioneer Square and Chinatown west of I-5, the highest forecast increase on a percentage basis is for the Little Saigon area, with ridership more than doubling over 2007 conditions. This would relate to projected residential and commercial growth in that area. In addition, Little Saigon is a farther distance from Downtown than the other study area vicinities, thereby increasing the attractiveness of transit to walking.

2030 Action Alternatives (Alts. 1, 2, 3)

Future development related to the Action Alternatives would generate more transit trips, as summarized in Table 3-52. Each of the Action Alternatives would increase transit demand by approximately 20 to 21 percent, due to residential and employment growth. Alternatives 1 and 2 would generate similar levels of increased transit trips, and Alternative 3 would generate slightly greater increases in trips in the Pioneer Square, Chinatown, Stadium Area and south-of-Dearborn areas.

Transit Travel Patterns

North-south flows would be the dominant directions for transit trips generated by the study area land uses. During the AM peak hour, approximately 78% of trips produced by the study area would be destined for areas to the north, such as Downtown Seattle and the University of Washington. Approximately 17% of transit trips would be oriented to the south, 4% to the east and 1% would stay within the study area. During the PM peak hour, the inverse of these patterns is assumed. This pattern suggests bus routes serving northerly areas would be more likely affected than routes serving other travel directions.

Transit trips destined for the study area during the AM peak hour would include 38% and 39%, respectively, from the north and south, and 11% each from the west and the east. During the PM peak hour, the inverse of these patterns is assumed. This pattern suggests bus routes serving areas to the north and south would be more likely affected than routes serving other travel directions.

Bus Performance Measures

Future conditions were evaluated using the measures described in the Affected Environment discussion above, and in Appendix G.

Frequency

2030 No Action Alternative (Alt. 4)

Similar to existing conditions, two locations with deficient service are not anticipated to have additional service that would meet the 15-minute frequency threshold. These occur along Yesler Way, and the segment of Rainier Avenue S. between S. Dearborn Street north to S. Washington Street. All of the other studied corridors are anticipated to continue to meet the 15-minute frequency threshold in 2030.

2030 Action Alternatives (Alts. 1, 2, 3)

Due to no assumed differences in local bus service, conclusions for the Action Alternatives are the same as identified for the No Action Alternative.

Span of Service

The 12th Avenue S. corridor is anticipated to continue to receive service levels similar to today. Metro's long-range plans do not identify increases in this corridor's span of service. All of the other studied corridors are anticipated to continue to meet the current span of service threshold in 2030. (The span of service thresholds would need to be increased gradually in the future to meet the objective set by the Seattle Transit Plan of 16 hours per day.)

2030 Action Alternatives (Alts. 1, 2, 3)

Due to no assumed differences in local bus service, conclusions for the Action Alternatives are the same as identified for the No Action Alternative.

Travel Speed

Increases of approximately 30% on average in other traffic volumes are expected by 2030, which would contribute to lower speeds and more delays along arterials. Anticipated congestion would create a heavier burden on transit operations and deteriorate the reliability of service. Increased dwell times at bus stops and increased ridership were factored into an anticipated transit speed calculation. The "passing" threshold for this measure is for buses to operate at an average of 30% of the posted speed limit (%PSL). Table 3-53 describes the results for the No Action and Action Alternatives.

Table 3-53
Transit Travel Speed Indicator for UVTN Corridors

Origin	From	To	2030 Travel Speed as Percentage of Posted Speed Limit ¹			
			No Action	Alternative 1	Alternative 2	Alternative 3
1st Ave S	Yesler Way	S R. Brougham Way	24%	23%	20%	23%
1st Ave S	S R. Brougham Way	S Holgate St	19%	18%	15%	16%
2nd Ave Ext S	Cherry St	4th Ave S	9%	9%	9%	9%
3rd Ave	James St	S Jackson St	14%	14%	14%	14%
4th Ave S	Yesler Way	S R. Brougham Way	17%	16%	16%	15%
Rainier Ave S	S Washington St	S Dearborn St	10%	6%	6%	6%
S Jackson St	1st Ave S	8th Ave S	16%	16%	16%	16%
S Jackson St	8th Ave S	Boren Ave S	14%	10%	10%	10%
City of Seattle Passing Threshold					30%	

Source: The Transpo Group (July 2007)

1. Based upon anticipated arterial congestion and increase in transit boardings and alightings.

2030 No Action Alternative (Alt. 4)

All UVTN corridor segments within the study area are expected to operate below the minimum acceptable standard of 30% of the posted speed limit under the No-Action Alternative. This would include the corridors that are currently operating at acceptable operating speeds such as 1st Avenue S., 4th Avenue S. and Rainier Avenue S. The results account for the future operational conditions of the corridor segment combined with the dwell time at bus stops. The corridor with the lowest operating speed is 2nd Avenue Extension S. It is expected to decline from 22% in 2007 to 9% under the No-Action Alternative. The other corridors are forecast to operate below 20% except the 1st Avenue S. section between Yesler Way and S. Royal Brougham Way which is expected to operate at 24% of the posted speed limit. Lower running speed due to higher delay along corridors and at intersections are the main reasons leading to the deterioration of transit operating speed.

2030 Action Alternatives (Alts. 1, 2, 3)

Most of Action Alternatives are expected to operate at even lower speeds than those under the No-Action Alternative. The reduced speeds would be the result of increased delays along the arterials combined with additional bus passengers that increase dwell times. All corridor travel speed indicators are forecast to drop several percentage points under each of the Action Alternatives, except for the S. Jackson Street section between 1st and 8th Avenues S., and 2nd Avenue Extension S. and 3rd Avenue (south of James Street), that are expected to remain operating almost at the same operating speed as the No-Action Alternative. This is due to similar arterial operations and travel speeds in the future. Travel speed along 1st Avenue S. is most affected by Alternative 2. Alternative 3 would result in a further slight decline in transit speed along 4th Avenue S., due to increased projected commercial growth on the corridor that would create more congestion and delays for buses.

Passenger Loading

The passenger loading factor reflects the quality of trip in terms of convenience and comfort. This is expressed as the ratio of passengers to the corridor service capacity. The corridor service capacity is calculated by multiplying the bus frequency by the average number of bus seats. The minimum passing threshold is 90% of seated capacity as defined by the Seattle Transit Plan.

To determine the passenger loading factors, the growth in transit person trips was assessed for the study corridors. Based on the model forecasts, all transit corridors will experience some growth by 2030 except the E3 Busway/5th Avenue S segment, where bus ridership will drop by almost one half along the transit

way due to trips moving to Light Rail. The corridors with the highest growth rates include 3rd Avenue (south of James Street) and a segment of S. Jackson Street. The resulting passenger loading ratios are listed in Table 3-54. These assume no increase is introduced to the operation levels of local bus services along the corridors.

**Table 3-54
Passenger Loading Ratio by UVTN Transit Network Corridor**

Origin	From	To	2007	2030 Passenger Loading Ratio			
				No Action	Alternative 1	Alternative 2	Alternative 3
1st Ave S	Yesler Way	S R. Brougham Way	1.20	1.31	1.27	1.26	1.31
1st Ave S	S R. Brougham Way	S Holgate St	1.27	1.43	1.40	1.40	1.40
2nd Ave Ext S	Cherry St	4th Ave S	1.01	1.37	1.39	1.40	1.36
3rd Ave S	James St	S Jackson St	0.91	1.52	1.53	1.53	1.48
4th Ave S	Yesler Way	S R. Brougham Way	1.30	1.49	1.50	1.52	1.49
5th Ave S	S R. Brougham Way	S Holgate St	1.15	0.64	0.64	0.65	0.63
Rainier Ave S	S Washington St	S Dearborn St	0.60	0.75	0.74	0.74	0.75
S Jackson St	1st Ave S	8th Ave S	0.86	1.67	1.63	1.65	1.61
S Jackson St	8th Ave S	Boren Ave S	0.99	1.18	1.17	1.17	1.10
City of Seattle Passing Threshold						0.90	

Source: City of Seattle Travel Model (April 2007) and current transit capacity.

2030 No Action Alternative (Alt. 4)

Almost all corridors will experience growth in loading during the peak period. This growth will result from growing population and employment not only in the study area but also in the region. Regional (or through) trips represent a high share of the loading factor of transit routes crossing the study area. Due to this growth, the existing passenger loading ratios will exceed the 90% threshold of seated capacity on almost all north-south corridors, except for Rainier Avenue S. and the 5th Avenue S. busway. The 5th Avenue S. loading ratio declines due to trips switching to Light Rail. The new Light Rail service also results in Rainier Avenue S. not having as much growth in transit trips, thus resulting in acceptable passenger loading ratios for the corridor. Corridors such as S. Jackson Street and 3rd Avenue (south of James Street) are expected to decline sharply in the future from increased transit ridership. Similar to 2007 results, 1st Avenue S. and the 2nd Avenue Extension S. will continue to not meet the passenger loading ratio in 2030.

2030 Action Alternatives (Alts. 1, 2, 3)

The passenger loading ratios for each of the Action Alternatives are similar to those expected under the No-Action Alternative. The passenger loading ratios would change influenced by the location of projected new development under each Alternative. Table 3-54 highlights that corridors such as 5th Avenue S. and Rainier Avenue S. would continue to operate at acceptable load levels, whereas S. Jackson Street segments would be over capacity similar to the other remaining corridors where demand would exceed average seated capacity of buses. Since local demand represents only a small percentage of total transit ridership, large differences between the Action Alternatives are not observed.

FREIGHT MOVEMENT

This section provides information about the future 2030 freight operating conditions for the No-Action and Action Alternatives. Efficient movement of freight and truck traffic within the study area is critical to the region's economic development due to proximity to the Port of Seattle, Intermodal Rail Yard, and the Greater Duwamish Manufacturing and Industrial Center. The freight evaluation focuses on the expected growth and distribution of freight traffic and the impacts on the Major Truck Streets under each of the Alternatives. The evaluation is based on a set of qualitative and quantitative assessments that compare freight operating conditions against those under the No-Action Alternative. The assessments include the ability of trucks to efficiently circulate through the study area and access major destinations such as the Port, regional highway system, local businesses and other land uses; the change in travel time expected along the Major Truck Streets; and design standard issues that could impact truck operations and maneuvers.

The evaluation assumes completion of the planned and programmed improvements identified in Section 5.2 of Appendix G. A significant amount of transportation investment is expected to occur by 2030 that will benefit the overall movement of freight within and through the study area. These improvements include projects such as SR 519 Phase 2, Alaskan Way Viaduct, S. Lander Street grade separation, and the Spokane Street Viaduct improvements that include widening the Viaduct, closing the westbound off-ramp at 4th Avenue S and adding a westbound on- and off-ramp at 1st Avenue S. and an eastbound loop ramp to 4th Avenue S. The improvements have been assumed under each of the Alternatives and incorporated into the evaluation results.

Freight Growth

Future freight demand was estimated for future 2030 conditions based in part on Seattle's travel demand model. The model includes a truck component that was adapted from the PSRC regional travel model, which in turn was derived from the FASTrucks Forecasting Model developed in the year 2000 for the Washington State Department of Transportation. The model includes special generators for Port of Seattle terminals and also uses employment categories to estimate light, medium and heavy truck generation. The model results were further adjusted based on forecasts presented in the Container Terminal Access Study completed in 2003 for the Port of Seattle and later updated in 2005⁴. The updated study identified the growth in truck trips from the surrounding container terminals.

In 2004, the Port of Seattle moved 1.8 million twenty foot container equivalent units (TEUs), an increase of 20 percent over 2003. In 2006, there were approximately 2 million TEUs carried. Within the next two years, Terminals T-25/T-30 will be reactivated and anticipated to generate 234,000 TEUs in 2009 and 560,000 TEUs by 2030⁵. Also, it is anticipated that Port volumes would increase to about 4.9 million TEUs by year 2030. This growth results in more truck traffic along the study area arterials. Specific growth rates for Terminal 46, which borders the study area, were noted and included in the forecasts and analyses of the AM and PM peak hour corridor and intersection operations analysis.

The Action Alternatives would generate a higher number of local and delivery truck trips as more employment land uses are proposed within the study area than the No-Action Alternative. The additional demand generated by the study area land uses of Action Alternatives would range from 16 to 17 percent during the AM peak and from 25 to 27 percent during the PM peak period. This increase in local delivery truck trips coupled with the truck trip growth from the Port of Seattle and the industrial areas south of the study area, will create a need for improved access and circulation throughout the study area. By 2030, truck generation is anticipated to increase by approximately 33 to 34 percent throughout the Puget Sound Region. The study area share of truck trips is less than 5 percent of the total regional truck activity

⁴ *Port Truck Trips for Transportation Planning Studies*, Memorandum, Heffron Transportation Inc, July 19, 2005

⁵ *Terminal 30 Cargo Reactivation*, Heffron Transportation Inc, prepared for Port of Seattle, September 18, 2006

reflected in the model based on a summary of the model TAZ data. The data indicate the Action Alternatives do not significantly increase the total share of truck trips as compared to the No-Action Alternative.

Truck Travel Characteristics

The model was also used to assist in identifying local and regional truck travel characteristics based on the distribution of commercial land uses throughout the region. It is expected that each of the 2030 Alternatives (including No-Action) will have similar travel patterns. Figure 3-47 illustrates the distribution of truck trips to and from the study area based on the 2030 model trip tables. The travel characteristics are for all types of trucks from delivery trucks to semi-trucks. The study area only includes a portion of the Port of Seattle container yards, but no other regional truck distribution centers. Figure 3-47 shows that approximately 80 percent of trucks will be originating or destined for locations north or south of the study area in the AM and PM peak hours. Truck trips to the Eastside will comprise 12 percent. Another 3 percent will connect to areas in Kitsap County and beyond. Truck trips that are produced and attracted within the study area will be approximately 4 percent of the total truck trips generated by the study area land uses.

Freight Performance Measures

Improved freight mobility is a major goal of the State of Washington and the City of Seattle. Efficient movement of goods and services through the study area is critical for the economic success of major industrial stakeholders within and bordering the study area such as the Port of Seattle. The future performance of freight transportation was assessed using the performance measures identified in Chapter 2 of Appendix G. These measures include Truck Connections, Travel Speed on Major Truck Streets, and Street Design Standards. These indicators provide a mechanism to measure the impacts the Alternatives might have on freight and compare them against one another on a relative basis.

Truck Connections

This performance measure addresses the ability of trucks to efficiently circulate through the study area and access locations such as the regional highway system, the Port of Seattle container yards, and other local industrial businesses. The City of Seattle designated Major Truck Streets are a system of streets that are meant to serve both local and non-local truck traffic. The circulation of trucks is primarily served by these streets. The Major Truck Streets were previously highlighted in Section 4.3.2. As discussed in Chapter 4, the existing Major Truck Streets provide good access to I-5 and the Alaskan Way Viaduct, as well as I-90. Arterials such as 1st Avenue S., 4th Avenue S., S. Royal Brougham Way, S. Atlantic Street, and S. Dearborn Street provide much of the truck circulation throughout the study area.

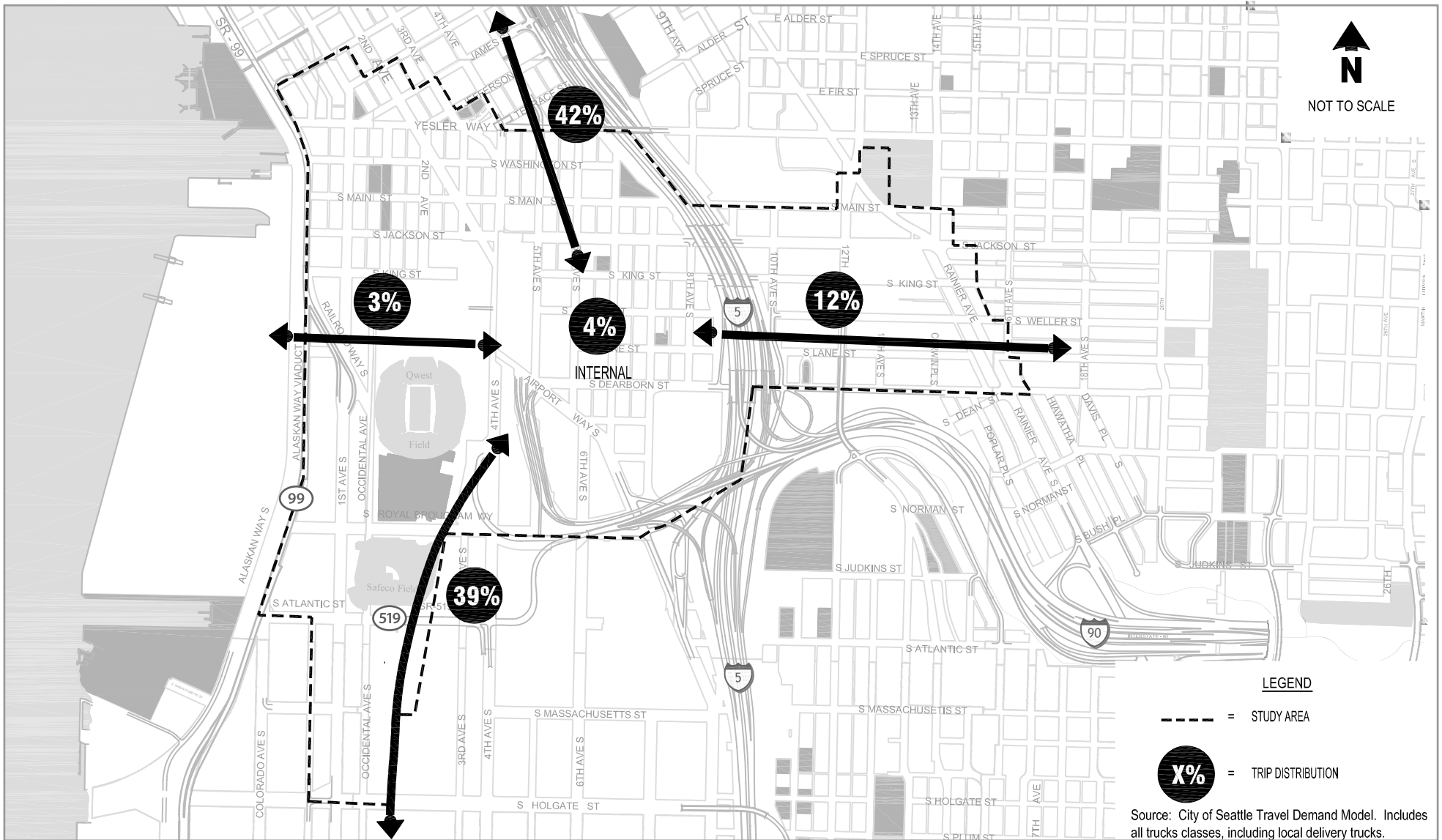


Figure 3-47
Study Area Truck Trip Distribution (2030)

No-Action Alternative (Alt. 4)

East-west connectivity between I-5, I-90, the Port, and the other industrial lands in South Downtown is expected to be improved by 2030 with the completion of SR 519 Phase 2. The project will provide direct westbound access from I-5 and I-90 to the S Atlantic Street corridor. This project provides improved access to Terminal 46 and the 1st Avenue S. corridor, eliminating possible delays caused by trains along S. Royal Brougham Way. Trucks would no longer have to use the S. Royal Brougham Way corridor to access the waterfront after exiting at 4th Avenue S.

Improvements as part of the Alaskan Way Viaduct Replacement project will improve regional access to the south with the completion of new freeway ramps along the S. Atlantic Street corridor just west of 1st Avenue S. Trucks heading to/from the south will be able to connect to the Alaskan Way Viaduct, which is not possible today at that location. Other improvements in truck connections are those just outside the study area such as the S. Lander Street overpass and the 1st Avenue S. and 4th Avenue S. ramps to the Spokane Street Viaduct. The S. Lander Street overpass will reduce delays caused by train activity and the 1st Avenue S. and 4th Avenue S. ramps to the Spokane Street Viaduct will provide improved access to the regional highway system.

The only improvement likely to negatively impact truck connections is the possible closure of S. Holgate Street. Truck trips between 4th Avenue S. and 1st Avenue S. will be negatively impacted as there will be fewer connections crossing the railroad tracks in this area. However, the City of Seattle has not yet committed to this project and is still evaluating the feasibility and impacts. Even with the assumption of S. Holgate Street being closed between 3rd Avenue S. and Occidental Avenue S., the other freight improvements within the study area will result in improved truck connections under the No Action Alternative.

Action Alternatives (Alts. 1, 2, 3)

The Action Alternatives are not likely to limit or change the available connections to trucks. While an increase in intensity of land use may impact the total volumes and delays encountered along the Major Truck Streets, the Major Truck Streets will still provide the connections needed to serve the study area. The arterials not designated as Major Truck Streets will also assist in providing local delivery routes to access the new commercial and residential land uses.

The Action Alternatives in the study area would create additional commercial and employment-oriented land uses, which would also generate more demand for local deliveries. The greatest amount of additional non-residential development is forecast for the Little Saigon neighborhood under Alternative 1 and in the Stadium Area neighborhood under Alternatives 2 and 3. Under those Action Alternatives, the increase in land use intensity would result in additional delivery trucks on S. Dearborn Street and Rainier Avenue S. to access the Little Saigon neighborhood and on 1st Avenue S., 4th Avenue S., S. Royal Brougham Way and S. Atlantic Street corridors to access the Stadium Area neighborhood. These corridors are designated as Major Truck Streets and provide primary access to the neighborhoods for local deliveries.

However, the increase in land use intensity would make it more difficult for local delivery trucks and other locally generated truck traffic to access the Major Truck Streets. The additional general vehicle traffic would cause more delay to trucks that are accessing the Major Truck Streets from local streets or vice versa. There would likely be fewer gaps in traffic, making it difficult for trucks to access the Major Truck Street system from local streets or driveways within the study area. Moreover, the higher residential and employment densities would add more non-motorized trips (bicycles and pedestrians) on streets and would create more interaction with general traffic, including trucks, at crosswalks and bicycle lanes, thus creating further frictions and impediments for trucks on study area arterials.

Travel Speed on Major Truck Streets

Travel speed is an indicator of the operating conditions along Major Truck Streets. Higher travel speed means smoother flow along routes and shorter delays at intersections. Since trucks are sharing streets with other types of vehicles, truck speed is directly affected by the operating speed of the general traffic. Usually, posted speed for trucks on highways is lower than that for other vehicles. This is true for I-90 and I-5 mainline freeways. Posted speeds along the arterial streets in the study area, which are much lower than the freeway speeds (30 to 35 mph), do not assign speeds for trucks different from those assigned to the general traffic. It is expected that trucks move slower than general traffic because of the mechanical characteristics of these large vehicles. Trucks have slower acceleration speeds and take more time to maneuver. However, the results of the arterial and intersection traffic analysis provide a reasonable indicator of each Alternative's relative impacts to truck travel speeds.

The majority of truck trips occur during the mid-day hours along routes within the study area. While the mid-day hours have the highest truck volumes, they have lower passenger vehicle volumes than are observed in the AM and PM peak hours. The increase in land use intensity within the study area would have more of an impact during the peak hours when there is less roadway capacity available, but not as much impact during the mid-day when less congestion occurs, thereby impacting the majority of truck trips proportionately less.

Existing and future travel speed conditions reported by this study are based on an integrated analysis that takes into consideration both link running speed and delays at intersections. The analysis is consistent with the corridor operations data presented in this section and Section 5.4 of Appendix G, except that it focuses on specific truck corridor segments. Table 3-55 shows the analysis results of travel speed along the Major Truck Streets for AM and PM peaks hours, based on the worst 15-minute analysis.

No-Action Alternative (Alt. 4)

Travel speeds along most of the truck routes will generally decline by 2030 compared to 2007 existing conditions. The reduction in speed is the result of the increase in traffic volumes of approximately 30 percent or greater expected under the No Action Alternative, combined with little or no additional roadway capacity. The exceptions are northbound traffic at 1st Avenue S. and eastbound traffic at S. Royal Brougham Way due to completion of the Alaskan Way Viaduct frontage roads and grade separation of S. Royal Brougham Way. East-west routes along S. Dearborn Street and S. Royal Brougham Way will likely operate with average speeds of 10 mph or less. North-south routes show relatively better performance than the east-west routes, while 1st Avenue S. is expected to operate at speeds higher than any other route, mostly due to shifts in traffic to the new Alaskan Way Viaduct frontage roads.

Action Alternatives (Alts. 1, 2, 3)

Generally, all Action Alternatives result in slightly lower average speeds on truck routes than the No Action Alternative as increased development generates additional traffic. The PM peak hour speeds are much lower than those expected in the AM peak hour. The AM peak hour travel times would likely have the most impact on truck trips, since more truck trips normally occur in the morning than in the early evening. However most of the truck trips occur outside both the AM and PM peak hours during the mid-day when travel speeds are typically higher due to less overall traffic volumes along the corridors.

The Action Alternatives' travel speeds along Major Truck Streets are similar to one another. Alternative 3 would have the greatest impacts compared to the other Alternatives especially along the S. Dearborn Street corridor, which would be congested due to poor intersection operations along the corridor and especially at the Rainier Avenue S. and Airport Way S. intersections. Alternative 3 would generate a higher number of trips on study area streets than the other Alternatives which would result in higher

congestion and delays. Corridor speeds in Alternatives 1 and 2 are similar even though Alternative 1 shows slightly higher speeds along 1st Avenue S. in the AM peak hour and along S. Dearborn Street in the PM peak hour.

**Table 3-55
Travel Speed along Major Truck Streets**

Corridor	Extents ¹	Speed Limit (mph) ²	Direction	2007	2030 Travel Speeds (mph) ²			
					No-Action	Alternative 1	Alternative 2	Alternative 3
AM Peak Hour								
1 st Ave S	S King St to S Holgate St	35	NB	12	14	14	12	12
			SB	19	16	16	15	14
4 th Ave S	S Dearborn St to S Holgate St	30	NB	17	10	9	9	9
			SB	15	14	13	12	11
S Dearborn St	5 th Ave S to Rainier Ave S	30	EB	11	11	10	10	10
			SB	11	6	6	6	6
S Royal Brougham Way	1 st Ave S to 4 th Ave S	30	EB	7	10	10	10	10
			WB	5	5	5	5	5
S Atlantic St	1 st Ave S to 4 th Ave S	30	EB	11	6	6	5	5
			WB	7	13	13	13	12
S Holgate St	8 th Ave S to Boren Ave S	30	EB	11	CLOSED			
			WB	11	CLOSED			
PM Peak Hour								
1 st Ave S	S King St to S Holgate St	35	NB	15	18	17	17	17
			SB	17	12	12	12	11
4 th Ave S	S Dearborn St to S Holgate St	30	NB	18	16	16	16	15
			SB	11	9	9	9	8
S Dearborn St	5 th Ave S to Rainier Ave S	30	EB	9	7	5	2	1
			WB	8	9	9	9	9
S Royal Brougham Way	1 st Ave S to 4 th Ave S	30	EB	8	9	10	10	10
			WB	7	5	5	5	5
S Atlantic St	1 st Ave S to 4 th Ave S	30	EB	11	8	7	7	6
			WB	10	10	10	10	9
S Holgate St	8 th Ave S to Boren Ave S	30	EB	10	CLOSED			
			WB	12	CLOSED			

Source: The Transpo Group (July 2007)

1. The corridor extents are for the street segments that are within the study area boundaries. These extents differ slightly than those reported for the corridor operations results in Section 5.4 to be more specific on the impacts to the Major Truck Streets.
2. Miles per hour

There is little sensitivity predicted between the Action Alternatives in the time it takes to travel the Major Truck Streets through the study area. However, the future analysis indicates truck operations would encounter low average speeds, similar to the general traffic, along the Major Truck Streets for each of the Alternatives. Reductions in truck travel speed would increase the costs of moving freight within and through the study area regardless of the Alternative.

Design Standards

There is the potential for increased development within the study area to impact the design and function of the designated Major Truck Streets. A greater amount of residential or retail development will create additional demand on the City's sidewalk system due to an increase in pedestrians, while also requiring additional vehicle access points to the arterial street system. In other cases, bike lanes have been targeted for Major Truck Streets such as 4th Avenue S. as part of the Bicycle Master Plan. Each of these items has the potential to introduce alternative roadway designs to better accommodate other modes of travel. For example, additional pedestrians could warrant new crosswalk locations or curb bulb-outs to reduce the crossing distance and exposure to pedestrians, while bike lanes could reduce the width of lanes (or eliminate lanes altogether) to provide right-of-way for bicyclists. Each of these design treatments might impact the ease of truck navigation through the study area.

However, a primary focus of many of the transportation investments in the South Downtown area has been to better facilitate the movement of freight, whether it is more direct access to the regional highway system or eliminating conflicts between trains and passenger vehicles. Improvements such as SR 519 Phase 2, Alaskan Way Viaduct, S. Lander Street grade separation, and S. Spokane Street ramps are expected to include all design elements required for appropriate truck movements such as lane width, bridge vertical clearance, pavement structure, and minimum turning radii. The project designs will also include treatments for non-motorized elements, such as including a pedestrian pathway along the S. Royal Brougham Way structure, in addition to the truck design elements. While none of the land use alternatives has specifically identified impacts to roadway designs, it is reasonable to assume that there is the potential for design treatments to be introduced as part of specific development projects that could affect the movement of trucks.

In addition, oversized heavy vehicles are routed to and through the study area periodically. One primary example is the special event venues where equipment and shows have over-dimensional trucks that need special routing to accommodate the larger loads, operating under a permit. Not all study area streets are designed to accommodate these types of vehicles. The Right of Way Improvement Manual suggests that a 20-foot high by 20-foot wide envelope be maintained on routes that the City decides to maintain for these kinds of trips.

No-Action Alternative (Alt. 4)

A growing number of trucks will be traveling through the study area due to future growth at the Port of Seattle and other industrial businesses within and surrounding the study area under the No Action Alternative. The growth in the neighborhoods will have the potential to introduce unfavorable design treatments for trucks. For example, the No-Action Alternative assumes additional residential and commercial development for the Pioneer Square, Chinatown/Japantown, and Little Saigon areas. The future growth could potentially impact designs along S. Dearborn Street, which is the southern border to the Chinatown/Japantown and Little Saigon areas. These could include reduced lane widths and/or turning radii to accommodate additional turn lanes or wider sidewalks. On the western side of the study area, growth in the Pioneer Square neighborhood could impact design treatments along 1st Avenue S. New mid-block crosswalks, bike lanes, or even dedicated transit lanes could reduce lane widths along the corridor. Other than the S. Dearborn Street and 1st Avenue S. corridors, most other Major Truck Streets only pass through the Stadium Area and South-of-Dearborn neighborhoods, both of which would remain largely unchanged in land use in this alternative.

Action Alternatives (Alts. 1, 2, 3)

As part of the Action Alternatives, the same background growth in industrial land uses and regional truck traffic will take place adjacent to the study area as assumed under the No-Action Alternative. However, as part of the Action Alternatives, increased residential and commercial land development would be located across the study area and would need to be served by commercial vehicles of different sizes depending on the type of business activity. It is anticipated that light, medium and heavy trucks would

need to have good circulation and access to the arterial street system based on the regional and local land use growth.

Additional land use within the study area along with growth in surrounding land use intensity would result in more trucks primarily through the South-of-Dearborn and Stadium Area vicinities. These neighborhoods are bisected or adjacent to Major Truck Streets such as S. Dearborn Street, Airport Way S., SR 519, 1st Avenue S. and 4th Avenue S. Traffic growth along these corridors would not be limited to trucks only. More cars and non-motorized movements would occur along these corridors as more people and businesses would be located in the study area. This would pose challenges to provide the proper streetscape design to accommodate all users. Better visibility, adequate non-motorized facilities, signage and improved street lighting are a few examples of streetscape design features that could be incorporated into the roadway prism. Similar to the No-Action Alternative, there are design treatments that can impact truck movements and make it more difficult for trucks to circulate through the study area. Currently there are no specific street design revisions that are assumed to occur in the future to support the Action Alternatives, but such revisions could be considered to mitigate possible impacts in the future.

PEDESTRIANS AND BICYCLISTS

This section summarizes and compares the impacts to pedestrians and bicyclists under each of the Alternatives. Qualitative performance measures used for pedestrians and bicycles are as follows: how well the current facilities would serve the new pedestrian and bicycle population resulting from development in the study area; how accessible pedestrian attractors are to new and existing pedestrian and bicycle users; and how pedestrians and bicyclists would be affected by growth in traffic volumes from new development.

By 2030, several pedestrian and bicycle improvement projects are planned to be completed as part of each of the Alternatives. These projects include the Link Light Rail Stadium Station and the planned pedestrian/bicycle pathway nearby; the SR 519 project, with grade separation at the S. Royal Brougham Way railroad crossing; and grade separation of the S. Lander Street railroad crossing. The grade separation at Royal Brougham is an important project as there have been a number of railcar/pedestrian collisions at that location, one in 2005 which resulted in a fatality.

The analysis focuses on the differences between the Action Alternatives and the No Action Alternative. To compare the different Alternatives, the amount and location of proposed land uses were considered, because new pedestrian and bicycle trips would be generated by the new land uses.

Pedestrians

A portion of the new trips generated by future land use development would be pedestrian in nature. These trips would include walking trips between land uses, as well as trips to/from transit stops. The primary facilities that will support increased pedestrian travel include the City's sidewalk system, crosswalks, signals and multi-use trails. Impacts to the existing pedestrian facilities are summarized below.

No Action Alternative (Alt. 4)

The No Action Alternative assumes the existing zoning for the area will continue. The largest amount of growth projected to occur would be in the Little Saigon, Chinatown/Japantown, and Pioneer Square neighborhoods, all of which currently serve a large number of pedestrians. In Pioneer Square, the projected growth is mainly focused in the vicinities along 1st Avenue S. and S. King Street. Both roadways currently provide sidewalks for pedestrian use, except at locations near the present SR 99 ramps (which are anticipated to be removed in the future). Chinatown/Japantown is projected to experience

mainly residential growth, which would be spread throughout the neighborhood. The streets in this area provide sidewalks to serve pedestrians. In Little Saigon, the projected growth would be mainly along S. Dearborn Street, which provides sidewalks. However, the infrastructure on other roadways in Little Saigon is currently less conducive to pedestrians, specifically S. King Street and S. Weller Street, due to poor conditions from overgrown vegetation and trip hazards from heaving and cracking.

Two other areas anticipated to experience growth where there is currently not as much pedestrian activity on a daily basis are the South-of-Dearborn and Stadium Areas. The Stadium Area growth would likely be mostly along 1st Avenue S., which provides sidewalks to serve pedestrians except in the location of the existing SR 99 ramps as noted above. The growth forecast in the South-of-Dearborn area is more likely to occur west of 7th Avenue S. including 6th Avenue S. and along Airport Way S. While sidewalks are present on these roadways, they have cracks and are in need of improvement. In addition, east-west movement is difficult from this area as it is bounded on one side by I-90 and the other by 4th Avenue S. and the I-90 off-ramps.

Pedestrian access to existing major attractors is expected to remain largely similar to current conditions. The Stadium and Pioneer Square areas will have good access to Colman Dock, King Street Station, the bus tunnel entrances, and event facilities near S. Royal Brougham Way. The neighborhoods east of 4th Avenue S. will most likely continue to access these facilities via current major pedestrian crossings, along 4th Avenue S. near King Street Station and at S. Jackson Street. Pedestrians in the South-of-Dearborn area will have the most difficulty traveling to major area attractors as connectivity to/from the west is poor, with S Royal Brougham Way at the very south of the South of Dearborn neighborhood providing the closest east-west connection. In addition, while the Link Light Rail Stadium station will be located just off 5th Avenue S., south of S. Royal Brougham Way, some sidewalk segments connecting to the station site, such as along 6th Avenue S. and parts of Airport Way S., are in poor condition.

Future development would increase traffic, pedestrian and bicycle volumes, and may result in a potential increase in vehicle/pedestrian and vehicle/bicycle conflicts. However, planned improvements, particularly the grade-separation of pedestrians at S. Royal Brougham Way, will help minimize impacts and separate motorized transportation from non-motorized transportation. Other future development would also be expected to result in improved sidewalk conditions over time, which would eliminate a number of deficiencies.

Action Alternatives (Alts. 1, 2, 3)

The Action Alternatives disperse residential growth in the area, though the majority of the growth is focused in the Chinatown/Japantown, Little Saigon, and Pioneer Square areas. This is similar to the No Action Alternative; however, the amount of growth planned under the Action Alternatives is greater. The corridors that would experience the most growth are also similar to the No-Action Alternative (S. Dearborn Street, 1st Avenue S., and 6th Avenue S.), along with the addition of 4th Avenue S. and S. Jackson Street. The majority of these three neighborhoods have good pedestrian connections including S. Jackson Street and sections of 4th Avenue S. However, some areas could use improved pedestrian access, particularly on the west side of 4th Avenue S. near the I-90 off-ramp which lacks sidewalks.

As discussed for the No Action Alternative, access to major pedestrian attractors is expected to remain similar to existing access conditions. A large amount of growth is projected for the western portion of the study area, which is near the majority of the pedestrian attractors. However, there is also quite a bit of growth projected in the Little Saigon and South-of-Dearborn neighborhoods under all Alternatives. This implies that east-west pedestrian movement needs in the area would become greater. Potential conflicts with traffic volumes could occur along roadways with lesser non-motorized connections, particularly in the South-of-Dearborn neighborhood and along sections of 1st Avenue S. and 4th Avenue S.

The Alternatives' pedestrian impacts summarized:

- Zoning change leading to residential uses where none currently exist, such as the South-of-Dearborn neighborhood, suggests a need for improved pedestrian crossings of S. Dearborn Street to access Chinatown/Japantown and the many services in this neighborhood.
- Under the No Action Alternative, current facilities and planned improvements should accommodate most of the expected growth in pedestrian activity, with the exception of probable needed improvements in the South-of-Dearborn neighborhood.
- The increase in growth under the Action Alternatives could lead to an increase in conflicts between pedestrians and motor vehicles, particularly in neighborhoods with new types of land use being introduced.
- In terms of pedestrian activity and impacts over the entire study area, there is no substantially distinguishable difference between the Action Alternatives.

Bicyclists

The City of Seattle Bicycle Master Plan (BMP) identifies several bicycle improvements in the South Downtown area. The BMP goals are to increase the use of bicycling and improve bicycle safety in Seattle. These goals are to be met by developing a system of bicycle facilities (including “sharrows”—pavement markings designating bicyclists’ use of the roadway, bike lanes, and multi-use paths), providing supporting facilities for bicyclists, identifying partners to assist in bicycle education and enforcement, and obtaining funding to execute the identified improvements. The completion of all of these projects will improve regional and local connectivity and enable easier movement around the South Downtown area and to major attractors (for example, Qwest Field and Colman Dock) for non-motorized travel.

No-Action Alternative (Alt. 4)

The largest amount of growth is planned in the Little Saigon, Chinatown/Japantown, and Pioneer Square neighborhoods. Bicycle facilities exist in these areas to serve that growth. In particular, bike lanes exist along S. Dearborn Street, 2nd Avenue S., and a portion of S. Jackson Street. In addition, there are several roadways designated as bike routes in each of the areas, (parts of 1st Avenue S., 4th Avenue S., 6th Avenue S., 7th Avenue S., 12th Avenue S., Maynard Avenue S., and S. Jackson Street), but there are no markings communicating this to motorists.

The Stadium and South-of-Dearborn areas currently do not have the same level of bicycle activity as the other three areas, but a projected increase in growth will likely result in an increase in bicycle activity. Both of these neighborhoods do not have very good bicycle connections, particularly the Stadium Area. The only designated bike route in that area is along 1st Avenue S., with no east-west connection available. The South-of-Dearborn area does have more bike routes (6th Avenue S., 7th Avenue S., Maynard Avenue S., and Airport Way S.), as well as a bike lane nearby along S. Dearborn Street. However, the majority of these routes are north-south and the S. Dearborn Street bike lane stops at 6th Avenue S. to the west. This leaves no direct bicycle connection to the west, which is the direction of several major attractors. It also leaves no direct connection to the Link Light Rail station, though the bike route along 6th Avenue S. travels close to the station.

The changes in land uses are expected to increase traffic volumes. The increase in vehicular volumes should proportionally increase the potential for conflicts between bicycles and vehicles. The planned improvements, particularly those as part of the Bicycle Master Plan, will help minimize conflicts between vehicles and bicyclists.

Action Alternatives (Alts. 1, 2, 3)

As stated previously, the corridors that will experience the most growth under the three Action Alternatives are also similar to the No-Action Alternative (S. Dearborn Street, 1st Avenue S., and 6th Avenue S.), with the addition of 4th Avenue S. and S. Jackson Street. All of these corridors have at least a portion designated for bicycle use, with S. Dearborn Street and S. Jackson Street having bicycle lanes. Still, the growth in these areas would contribute to a need for additional improvements, particularly to better facilitate east-west connections.

As further growth is anticipated in all Alternatives in all the neighborhoods, the effects of existing bicycle deficiencies defined previously would be further felt with future development under the Action Alternatives. Conflicts with traffic are likely to occur where bicycle facilities are absent, particularly in the southern (Stadium Area and South-of-Dearborn) vicinities.

The Alternatives' bicycle impacts summarized:

- All four Alternatives assume projected growth is focused in Chinatown/Japantown, Little Saigon, and Pioneer Square, which have some bicycle facilities to accommodate growth. The other two neighborhoods are in need of bicycle facilities to support growth.
- The increase in growth under the Action Alternatives would most likely intensify existing bicycle facility deficiencies. The increase also could lead to an increase in conflicts between bicyclists and motor vehicles, particularly in neighborhoods with few or limited bicycle facilities.
- In terms of bicycle activity and impacts over the entire study area, there is no substantially distinguishable difference between the Action Alternatives.

EVENT MANAGEMENT

Future development in the South Downtown study area and anticipated road network impacts would alter traffic patterns and access routes over time. This would likely create some changes in how event traffic is managed. Changes to event traffic management needs and programs will likely take place in stages as new development and street network changes occur. This will likely result in a need to progressively adapt the TMPs for the stadium and event venues in the Stadium Area.

Conceptually, this evolution over time could affect event traffic management in several ways. For this analysis, these potential effects are categorized as:

- Increased vehicle traffic volumes and congestion;
- Changes in event goers' vehicular traffic routing and destinations, arising from changes in the street network and differences in parking availability;
- Changes in pedestrian traffic flow patterns, and the potential for increased and decreased pedestrian-vehicle conflicts;
- Changes that might arise due to future development in specific locations; and
- Changes in the definition of police postings and related traffic operational issues.

Increased Vehicle Traffic Volumes

Because the SR 519 Phase 2 improvements will include changes on S. Atlantic Street and S. Royal Brougham Way, S. Atlantic Street will become the vicinity's primary route to and from I-90 and I-5. The anticipated increases in traffic volumes in the 1st Avenue S./S. Atlantic Street vicinity will alter traffic flow patterns, increasing congestion and use of street capacity. The higher traffic volumes could increase the potential for pedestrian-vehicle conflicts, particularly for baseball events with large attendance. It could also conceivably alter how traffic is controlled by police during events both in the evenings and for

weekday afternoon games. These factors suggest a need to evaluate strategies that would improve pedestrian safety controls in this area. These could involve physical improvements as well as improvements in event traffic management practices by the police.

Possible Changes in Vehicle Traffic Patterns

The anticipated increases in peak-hour congestion in many of the corridors near the Stadium Area could alter how event goers access the area and which parking or alternate transportation choices they choose. For example, event traffic that may use 4th Avenue S. from the I-90 off-ramps and S. Royal Brougham Way may divert to S. Atlantic Street and 1st Avenue S. In addition, availability of free or lower-cost parking could result from future development and road network construction. This could cause a reorientation of many event attendees' intended destinations, perhaps to locations further south, north or east of the immediate stadium vicinity. Depending on how police choose to control traffic flows, it may be more difficult for some event goers to reach their original intended destination. Until event attendees would learn new patterns, this would probably create driver confusion and additional congestion in the stadium vicinity. These factors would probably be most adverse to traffic conditions if they occurred prior to weekday afternoon and evening baseball games or weekday evening football games, when other pass-through traffic is at peak or near-peak levels, or large concert or exhibition events where attendees may be unfamiliar with access routes.

Possible Changes in Pedestrian Traffic Flow Patterns

With increases in future development under the various alternatives, different configurations of pedestrian facilities might result. For example, the "over-tracks" development might provide a new pedestrian promenade route from the north, accessing Qwest Field and potentially Safeco Field as well. This type of facility would be of great benefit to pedestrian comfort and safety, and provide additional routes for pedestrians, such as improved connections from the Qwest Field north parking lot to points east. Under the No-Action Alternative, this "over-tracks" development would not likely occur and the additional pedestrian connection would not be in place.

The future development condition also may generate additional pedestrian volumes from points further north, south or east with available parking supply spread further from the Stadium Area. The longer pedestrian travel distances will likely result in more street crossings and an increase in the potential for pedestrian-vehicle conflicts.

The planned S. Royal Brougham Way improvements would generate some probable pedestrian benefits, in that portions of that street would have much less traffic, affording safer pedestrian conditions. Also, an elevated route over the railroad tracks would reduce the potential for train-pedestrian conflicts, which are a known existing safety hazard.

Possible Changes Related to Future Nearby Development

Future development, such as in the north half of the Qwest Field north parking lot, would introduce new land uses into the area. The new land uses would alter pedestrian flow patterns to some degree and also could alter vehicle circulation needs as well. This could create additional potential for pedestrian-vehicle conflicts. This could be controlled by providing sufficient sidewalks in high-traffic areas, and prudent adjustments in police control practices along certain street segments and intersections. These will need to be evaluated on a year-by-year basis, anticipating and proactively planning for how event traffic can safely mix with pedestrians as well as vehicular traffic seeking access to the new development. There would probably also be a need to examine how safe pedestrian routing near large construction sites can be established during construction periods.

Possible Changes in Police Postings

Related to all of the above influences on event traffic, changes over time in pedestrian and vehicular traffic patterns and the road network itself would probably create a need to adjust police posting patterns and management of traffic flows. The police postings would likely need to be evaluated every year for each of the venues' TMPs based on the expected conditions for the upcoming year. Conceivably, this could generate a need for additional police resources to be engaged if a more widespread area is subject to higher traffic volumes, parking access, and potential pedestrian-vehicle conflicts.

MITIGATION STRATEGIES

POSSIBLE MITIGATION STRATEGIES

A range of possible mitigation strategies are presented in this section. Mitigation strategies conceptually include approaches such as reduction in travel demands, implementation of funding mechanisms, construction of physical improvements, and traffic and parking management policies. Due to the growth in regional and local traffic and planned development projects alone, future conditions would benefit from implementation of most of the mitigation strategies described in this section even under the No Action Alternative. While reference is made to mitigating the Action Alternatives, the City may wish to consider incorporating some of these strategies regardless of which Action Alternative is selected, if any.

Impacts to travel are forecast within the study area by 2030 with or without the Alternatives' projected changes to land use and zoning. As the region continues to grow, more travel will take place within the study area since it acts as a gateway to Downtown Seattle. Growth in vehicle trips, combined with increased transit and freight traffic, will increase delays for all users of the transportation system. In most of the neighborhoods, except Little Saigon, projected traffic volumes under any of the Action Alternatives are not likely to be more than four percent higher than those expected under the No Action Alternative. This overall pattern is reflected in the analysis of performance measures such as arterial travel speeds and transit passenger loading, where the Action Alternative results are very similar to those under the No Action Alternative. However, within the Little Saigon neighborhood transportation impacts are likely to be more noticeable than in other neighborhoods, regardless of the specific Action Alternative.

In order to reduce the future impacts to the transportation system, a series of mitigation strategies could be implemented over time as development occurs. While some strategies would improve mobility for multiple modes of travel, other mitigation strategies may improve one mode of travel but have negative effects on another mode (see Table 6-1 in Appendix G for further portrayal of tradeoffs).

Transportation Demand Management

The transportation system consists of two basic components: the supply side, which is usually the road infrastructure and transit system, and the demand side, which are the travelers using the system. Due to right-of-way limitations and City policies, expansion of the roadway system is not a strategy that the City is encouraging. Therefore, mitigation strategies are more focused on reducing the number of single-occupancy vehicles entering the study area than increasing roadway capacity.

The City has implemented aggressive transportation demand management strategies (TDM) in Downtown Seattle that have helped reduce the percentage of workers driving alone to Downtown. These same strategies could be used in connection with future development within the South Downtown study area. Continuing and strengthening these strategies would help reduce the impacts to the arterial corridors,

while also reducing overall parking demand. The following strategies could continue to be promoted throughout the study area:

- Promoting carpooling or car sharing
- Incorporating flex-car with subsidies
- Providing discount transit passes
- Expanding use of vanpools
- Supporting increased use of telecommuting
- Encouraging alternative travel modes like walking and biking
- Requiring preferential parking for carpools and vanpools
- Discontinuing parking subsidies
- Providing a guaranteed ride home program
- Providing incentives for using alternative modes

Area Specific Land Use Modifications

Recommendations for rezones in parts of the study area could be influenced by the transportation impact conclusions. This could allow for zoning and future land uses that would generate lesser levels of peak hour traffic impacts.

Transportation Mitigation Payment Program

The City of Seattle could develop a program which would require new development in the area to share in the funding and implementation of a system of improvements or program enhancements to help address the need for increased mobility within the study area. A transportation mitigation payment program would define the process where developers would contribute their fair share in costs of their identified impacts. This could take the form of a transportation impact fee program, a local improvement district (LID), a transportation benefit district (TBD), or SEPA traffic mitigation. A mitigation payment program could be multi-modal and focus on transit, pedestrian, bicycle, and freight improvements, including additional programs or strategies to promote these travel modes. Such a program would provide developers and the City with more certainty of what mitigation fees would be, and provides an appropriate funding source for needed improvements.

Arterial Street System Strategies

This section describes mitigation strategies that are identified to help reduce impacts to arterial and intersection traffic operations, and to facilitate mobility for all users of the arterial street system. The strategies identified are not tied to specific developments but are policy-oriented measures or programs to enhance traffic circulation and operations.

Access Management

Access management policies would restrict or prohibit direct access to and from major corridors, such as 1st Avenue S. and 4th Avenue S. north of S. Royal Brougham Way, or Rainier Avenue S. north of S. Dearborn Street. Installation of traffic signals or left-turn lanes to serve specific developments could be restricted or prohibited. New traffic control such as signals or turn lanes would reduce the capacity of the corridor and increase overall delays. Full access would only be provided at existing intersections or along the surrounding collector or local street system, where capacity exists or is provided by the developer. If a major corridor is the only option for access, then access could be restricted to right-in/right-out only.

Signal Timing Optimization & Phasing

Monitoring and continuous updating of signal plans is a vital aspect to improving arterial and intersection operations. As traffic volumes shift or grow due to new development and increases in through-traffic, the periodic re-timing or synchronizing of traffic signals is critical. By doing so, movements into and out of the City during the AM and PM peak periods would be accommodated by providing more signal green

time and appropriate signal cycle lengths that respond to peak directional flow while facilitating local circulation needs. The mitigation program could provide additional funding that would allow for more frequent analysis and updates for signal timing. The mitigation program also could help fund investments in traffic signal equipment to support improved coordination. The improvements to signal phasing and coordination must be balanced against the need to reduce vehicular delay with pedestrian safety and mobility.

Seattle Traffic Management Center/Intelligent Transportation Systems (ITS)

Expanding the existing Seattle Traffic Management Center (TMC) and increasing its funding is another important measure in improving signal operations within the study area. Enhancing the TMC would enable faster response to incidents and help off-set the consequences of the daily variations in traffic patterns and volumes. This is particularly important in the Stadium Area during events. Traffic along the arterials would be able to be monitored more frequently and signal timing plans could be adapted to changing travel patterns or to facilitate unusually heavy traffic flows. Dynamic message signing could help direct drivers through the area and assist visitors in finding available parking.

On-Street Parking Removal / Additional Time of Day Restrictions

The City should consider removal of on-street parking along the minor street approaches at intersections with key arterials to provide for additional turn lanes or vehicle queuing storage space. New turn lanes on the minor street approaches would allow the City to consider providing longer signal cycle lengths and more green time for traffic on the intersecting major arterial. More efficient signal operations also would be a benefit of having additional turn lanes on the minor streets. These issues would have to be studied on a case-by-case basis taking into consideration the impacts of these measures on parking supply, pedestrian crossings, and transit. Possible locations would be within the Chinatown/Japantown and Little Saigon neighborhoods. Locations should be considered closely when evaluating traffic impact assessments for new developments. Time of day restrictions, such as are currently in place on several Downtown streets, can also be imposed on existing zones in order to avoid peak hour capacity reductions.

Transit Strategies

Without the Action Alternatives, the performance of the transit system is expected to decline significantly due to the growth in demand, coupled with the increase in traffic congestion and delays along the UVTN corridors. The differences in performance of the transit system under the 2030 No Action Alternative and the Action Alternatives would be very similar, with small differences noted along key corridors such as 4th Avenue S. and Rainier Avenue S.

This section describes the mitigation strategies to reduce impacts to the transit system, and provide more people-moving capacity throughout the study area, sometimes at the expense of other traffic. Transit mitigation is grouped into three categories focusing on frequency and span of service, travel time, and passenger comfort and convenience. The most significant measures focus on improving transit speed and reliability along the transit corridors, as most are anticipated to be operating below UVTN performance standards.

Local Bus Frequency and Span of Service

Work with King County Metro to increase the level and availability of transit service along key UVTN corridors. For example, increasing the frequency of bus service along the Rainier Avenue S. and Yesler Way corridors can provide continual 15-minute bus service during most times of the day and therefore, would meet the minimum performance standards. In addition, expanding the span of service along the 12th Avenue S corridor by a few hours would be required to meet the 12-hour span of service threshold. The increased frequency and longer span of service is needed to mitigate additional development in the Little Saigon neighborhood under each of the Alternatives or under the No-Action Alternative.

Increases in peak hour transit capacity are generally needed in all of the major corridors except Rainier Avenue S. and 5th Avenue S. This could be achieved by either providing larger transit vehicles or higher frequency (shorter headways) along the corridors. Alternatives 1 and 2 require more capacity than Alternative 3 for the S. Jackson Street corridor, 2nd Avenue Ext S., and 3rd Avenue S. sections north of S. Jackson Street. Ultimately, transit improvements in the study area could be addressed at an area-wide level and will provide the most benefit when transit speed and reliability can be better predicted and not impacted as much by arterial congestion.

Dedicated HOV or Bus Lanes

Without additional transit facilities to improve the speed and reliability of the transit system, additional bus service will be difficult to fully implement. Significant revisions to the arterial street system would likely be needed to improve transit reliability and operations to accommodate increased person trips within the study area, while also accommodating transit trips that pass through the study area. Dedicating lanes for transit along the most congested corridors would be needed to meet travel speed and passenger loading performance measures. This could be accomplished by the removal of general purpose lanes or on-street parking to provide the width required to accommodate a dedicated transit lane. Candidate corridors are 1st Avenue S., 4th Avenues S., Rainier Avenue S., and S. Jackson Street which all currently accommodate at least five lanes. Yesler Way is another potential corridor, which currently has three lanes with on-street parking on both sides.

Removal of on-street parking through Pioneer Square on 1st Avenue S. and S. Jackson Street corridors could create a dedicated lane for transit or other high-occupancy vehicles (HOVs). However, removal of on-street parking would have a major impact on area businesses and would also increase the forecast parking deficiencies within the neighborhood. Conversion of general purpose travel lanes along 1st Avenue S., 4th Avenue S. north of S. Royal Brougham Way, and Rainier Avenue S. would improve transit speed and reliability but would also significantly impact arterial and intersection operations for non-transit vehicles, including freight. The decision of switching a general purpose lane to a transit lane should be considered based on a thorough analysis of the person-carrying demand and capacity of the two options. These measures could be studied in conjunction with other transportation modes to assess their impact on overall operations and circulation. Freight mobility is very important in the area, so any modifications that further restrict freight could be investigated and studied further. Moreover, the final decision on introducing HOV/bus lanes could be taken based on more thorough examination and analysis of impacts along the candidate corridors outside the limits of the study area and their connections to the regional transportation system.

Transit Signal Priority

Implementing transit signal priority can also improve transit mobility on City streets. Mitigation could be provided, in part, through investments in technologies to better facilitate transit vehicles along the UVTN corridors such as 1st Avenue S., 4th Avenue S., S. Jackson Street, and Rainier Avenue S. Queue bypass lanes complemented with transit signal priority treatments, could be installed in locations where buses have to often wait through multiple signal cycles.

Bus Bulbs / In-line Stops

Provision of bus bulbs at transit stops can make for easier and faster arrival, access, and departure for buses. This mitigation measure is site-specific and would be best applied on corridors with at least two lanes per direction. The bus bulbs also would allow for additional space on sidewalks for installing shelters and other transit amenities at the bus stops. In-line bus stops would likely increase delays along the corridor for other vehicles and freight, so they could be primarily explored for locations that minimize impacts to other modes of travel. Note that the bulb-outs may reduce some on-street parking if located in parking lanes, due to needed tapers.

Real-Time Information & Transit Amenities

Transit mitigation also could include providing transit kiosks at major transit stops. In addition, amenities such as improved transit shelters and benches can be useful in improving passenger comfort and convenience. Additional right-of-way for wider sidewalks also would be desirable where these facilities are located.

Freight Strategies

Impacts to freight are expected under the No Action Alternative due to increased congestion within the study area. The most direct mitigation impacts to freight movement would be to increase travel speed. Other strategies address roadway and intersection design standards and truck circulation needs. However, many of the mitigation strategies for other travel modes could impact freight operations and could be balanced against the needs for freight mobility. Items such as curb bulb-outs, narrow travel lanes, new crosswalks or signals, and driveway access locations all can adversely impact truck operations and maneuverability. These types of other mitigation could be discouraged along the Major Truck Streets to promote the efficient movement of goods and services, and reduce delays to trucks, knowing that many major streets also serve other uses and modes especially in the denser urban neighborhood. As individual capital projects are undertaken to maintain and enhance streets for multiple users, the City could evaluate various transportation needs, including those for freight movement. Final design decisions will be guided by adopted plans, the Right of Way Improvement Manual, and the recently passed Complete Streets Ordinance.

Traffic Management Strategies

These strategies would include incorporating traffic management strategies, such as providing signal priority along freight corridors through the use of specific traffic signal plans, which would improve truck mobility along City surface streets. One strategy would be to devote a higher percentage of signal green time to serve established freight movements at the expense of competing movements, particularly outside of major commute peak hours. This strategy could be applied along S. Dearborn Street, Airport Way S., 1st Avenue S., 4th Avenue S., or S. Atlantic Street corridors; however, the primary corridor would have to be chosen for those corridors that intersect such as 1st Avenue S. and S. Atlantic Street. These timing strategies would only be implemented after studying the impact to transit operations or other modes of travel. Another strategy would be to introduce technologies that improve communications to better manage logistics, including dispatching of commercial vehicles and dissemination of real-time traffic information to avoid delay where possible.

Fund Truck Route Design Improvements

A dedicated funding program could be established to improve existing truck routes by upgrading street infrastructure to better facilitate truck operations and movement. This could include establishment of a program to fund regular improvements to the major truck streets to accommodate wider turning radii, signal upgrades, relocation of utility poles or other obstacles, and more frequent pavement overlays. Poor pavement conditions also result in an increase in road noise and vibrations that are disruptive to people in adjacent buildings, in particular, sensitive residential, educational and health care land uses. Other funds could go toward installing concrete on major truck streets that front new development to prolong the life of the street and reduce the amount of maintenance required.

Performance Standards

The City could develop and adopt performance standards for the major freight corridors. This would help in identifying operational thresholds for Major Truck Streets and better identifying impacts to freight movement. For example, one criterion might establish truck travel speed standards (expressed as an absolute minimum speed or as percent of the posted speed) similar to those developed for transit. This system-wide action plan would create a measurable threshold that would help maintain minimum level of

system performance to support freight movement. The performance standards also could be used in prioritizing capital and maintenance improvements within the City.

Local Truck Access

New development could comply with delivery trucks requirements for proper access, maneuvering and operations. Where sizeable facilities are planned to serve light trucks (like utility trucks) and heavier delivery trucks, on-site spaces could be planned for loading zones and docks to allow adequate accessibility, loading and maneuvering. Limited number of loading/unloading zones could be provided for light delivery trucks to serve adjacent small shops and businesses that can not be accessed off-street. Intersections at local streets could have turning radii that provide for reasonable access by fire trucks, sanitation trucks, and light delivery vehicles. Curb parking on both sides of the local street must not obstruct accessibility of delivery and utility trucks to land uses. Where the right-of-way or free space allows, controls or special lanes and spaces could be imposed to separate and channelize the heavier trucks away from areas designed for automobiles and pick up trucks.

Pedestrian And Bicycle Strategies

All of the Alternatives would generate increased pedestrian and bicycle activity throughout the study area, with the Action Alternatives likely to contribute a higher proportion of pedestrians and bicyclists than under the No Action Alternative. Pedestrians and bicyclists impacts could be addressed with these identified strategies.

Sidewalk Improvements & Maintenance

The City and/or property owners could develop a program to help fund improvements to the sidewalk system to address existing trip hazards, locations not meeting ADA requirements, and to construct missing linkages. Improvements also could include the installation or replacement of non-code compliant curb ramps, and resurfacing of sidewalks to provide safer travel. Developers also could be required to include these measures on their street frontage where substandard facilities exist. The City is currently completing a citywide study of the pedestrian system, which will include recommended projects to improve the sidewalk and trail system covering the study area.

Pedestrian Crossings and Linkages

Enhancing pedestrian linkages to the Stadiums, waterfront, and adjoining neighborhoods will help mitigate and support the higher pedestrian volumes under the Action Alternatives. Installing a pedestrian crossing along 4th Avenue S. near S. Atlantic Street to join in to the pedestrian staircase leading up to the elevated S. Atlantic Street overpass is one of the specific improvements that have been identified. Other pedestrian crossings also should be considered or enhanced along 1st Avenue S. north of S. Royal Brougham Way. Other locations for new crossings or enhancements to existing facilities could be located along Airport Way S. and S. Dearborn Street to facilitate easier pedestrian access to and from the South-of-Dearborn area. As development occurs along 1st Avenue S., Airport Way S., and S. Dearborn Street, additional opportunities for pedestrians to safely cross the corridors could be provided. Linkages to the waterfront trail along Alaskan Way could be promoted and improved. Attractive and safe pedestrian access to neighborhood activity centers (community centers, health care facilities, active retail and cultural amenities) could be emphasized and provided. The use of all-way walk signals within the Pioneer Square, Japantown/Chinatown, and Little Saigon neighborhoods could be explored. These will allow for improved pedestrian crossings while also potentially improving vehicle operations.

Pedestrian Scale Facilities

Programs to improve the pedestrian environment with decorative lighting, more landscaping treatments, and street furniture, such as benches, throughout the neighborhoods could be required of new developments. Allow for increased sidewalk width to accommodate these facilities. These facilities

would encourage increased pedestrian travel by enhancing safety and comfort. In larger developments, providing for convenient pedestrian passage through the site may be beneficial.

Bicycle Lanes and Sharrows

Mitigation measures to accommodate bicyclists are included in the Seattle Bicycle Master Plan. While these measures may eventually be incorporated, increased development in the study area would make them even more critical. They are included as mitigation strategies because future development may provide the opportunity to incorporate these measures specifically when frontage improvements are incorporated. The Bicycle Master Plan lists the following specific improvements:

- **Installation of bike lanes**
 - 7th Avenue S (I-90 trail extension to S. Dearborn Street)
 - Airport Way S. (I-90 trail extension to 6th Avenue S.)
 - S. Royal Brougham Way (up to the new pedestrian structure associated with the SR 519 Phase 2 project).
- **Striping sharrows** (pavement markings designating bicyclists use of the roadway)
 - 6th Ave. S. from Airport Way S. to S. Jackson St. and S. Washington St. to Yesler Way
 - 7th Avenue S. from S. Dearborn Street to S. Jackson Street
 - Yesler Way from Alaskan Way S. to 2nd Avenue and from 3rd Avenue to 8th Avenue
 - S. King Street from 5th Avenue S. to Rainier Avenue S.
 - 4th Avenue S. (from S. Jackson Street to Yesler Way)
 - S. Jackson Street (from Alaskan Way S. to 5th Avenue S.)
 - Maynard Avenue S. (from S. Dearborn Street to S. Jackson Street);

Multi-Use Path

Extending the I-90 multi-use trail from its current terminus to completion, as included in the Bicycle Master Plan would provide a better regional connection to serve additional bicycle traffic generated under the No Action and Action Alternatives.

Event Management Strategies

As the South Downtown area continues to change and more development occurs, the appropriate allocation of resources to achieve the TMP goals is the primary mitigation strategy for events. The resources could be focused on how event traffic and parking will be managed based on the expected impacts of the Alternatives. Mitigation strategies for each Alternative are dependent on the specific timing and nature of the proposed developments and capital transportation improvement projects (such as SR 519).

Mitigation strategies for event management are important for all Action Alternatives, as well as the No Action Alternative. These measures may need to be most aggressive under Alternative 3 due to more intense projected development levels assumed in the immediate area of the stadiums, compared to the other Action Alternatives.

Parking and Traffic Control

Increased development and density in the immediate vicinity of each stadium combined with added development along the major corridors providing access to the stadiums would create additional pressures on the accessibility of each venue. This would require additional revisions to traffic control depending on the nature of the parking supply changes that could occur. More resources would need to be contributed to better direct traffic to/from the events, while also providing local access to close-in areas. For example, the increased development in the South-of-Dearborn and Stadium Area would require a certain level of accessibility to be maintained. As a result of increased development density along 1st Avenue S., an

increased program of pedestrian and traffic control, along with further access restrictions, would be necessary to ensure continued efficient event traffic management. Overall, it is expected that the area and number of intersections where traffic control is provided would need to be expanded based on the increase in level of development, with Alternative 3 requiring the highest level of resources.

Parking Restrictions and Enforcement

During major events, additional parking restrictions and enforcement measures in the South-of-Dearborn and Stadium Area could be necessary given the intensity of development under the Action Alternatives. Increased signage would need to be installed to assure that appropriate parking restrictions are in place during events to accommodate the continued needs of surrounding residences and businesses. Higher levels of parking enforcement also would be desirable if issues occur that impact the adjacent businesses and/or residential areas.

Pre-Sell of Parking

Continuing and enhancing a program of pre-selling parking would help to offset impacts associated with continued development around each stadium. The pre-sold parking permits would reduce the overall traffic volumes created by the additional circulation associated with searching for parking.

Intelligent Transportation Solutions

Additional measures to mitigate the impacts to event traffic management would include potential Intelligent Transportation System (ITS) solutions such as parking guidance, variable message signs, and additional camera installations to assist with security and traffic management.

Pedestrian Safety

The City and event managers could work to provide additional traffic control measures during events to increase pedestrian safety and efficiency along the surrounding corridors such as 1st Avenue S. and 4th Avenue S. during events. Increased development in the study area would generate additional pedestrian demand, which would require more resources in place to safely direct combined event and resident pedestrian traffic.

Subsidized Transit

Additional subsidies for use of transit to/from events would help to reduce the overall impacts of increased development on event traffic and parking. This could be explored as part of the annual review and update of the TMPs.

SIGNIFICANT UNAVOIDABLE ADVERSE IMPACTS

Alternatives 1, 2 and 3 would accommodate additional amounts of future development within the study area which would contribute to additional travel demands and congestion along arterial corridors. The additional development would also increase traffic access and circulation in the area, reducing the efficiency of through-traffic. This added congestion would contribute to measurably poorer performance of the transportation network, in terms of slower average speed of movements along corridors and somewhat worse performance at several intersections that would experience LOS F conditions. It would also contribute to declines in bus transit efficiency and freight mobility within the study area.