Seattle Arena

DEIS Appendix E

(Appendices A – D, and F are bound separately)

Date Published: August 15, 2013

City of Seattle
Department of Planning and Development

The intent and purpose of this Draft Environmental Impact Statement is to satisfy the procedural requirements of the State Environmental Policy Act (RCW 43.21c) and City Ordinance 114057. This document is not an authorization for an action, nor does it constitute a decision or a recommendation for an action; in its final form it will accompany the final decision on the proposal.

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Acronyms

ADA	Americans with Disabilities Act
AVO	Average Vehicle Occupancy
BNSF	Burlington Northern Santa Fe Railway
CBD	Central Business District
CONCACAF	Confederation of North, Central American and Caribbean Association Football
CPTED	Crime Prevention Through Environmental Design
DEIS	Draft Environmental Impact Statement
DPD	Department of Planning and Development
EIS	Environmental Impact Statement
FRA	Federal Railroad Administration
GMA	Growth Management Act
gsf	gross square feet
HCM	Highway Capacity Manual
I-5	Interstate (Highway) 5
I-90	Interstate (Highway) 90
ITS	Intelligent Transportation System
LOS	Level of Service
MLB	Major League Baseball
MLS	Major League Soccer
mph	miles per hour
NBA	National Basketball Association
NFL	National Football League
NHL	National Hockey League
p/min/ft	pedestrians per minute per foot
PSRC	Puget Sound Regional Council
SDOT	Seattle Department of Transportation
SEPA	State Environmental Policy Act
SIG	Seattle Intermodal Gateway
SoDo	South Downtown
SPD	Seattle Police Department
Sounders FC	Sounders Football Club
SLU	South Lake Union
SMC	Seattle Municipal Code
SR	State Route
ST	Sound Transit
SUAI	Significant unavoidable adverse impact
TCP	Traffic Control Plans
TDM	Transportation Demand Management
TEU	Twenty-foot equivalent units
TOD	Transit Oriented Development
TMP	Transportation Management Plan
UP	Union Pacific

Acronyms (Continued)

U-link	University Link Light Rail
UW	University of Washington
v/c	volume to capacity
vph	vehicles per hour
WAMU Theatre	Washington Mutual Theatre
WSDOT	Washington State Department of Transportation
WSF	Washington State Ferries
WNBA	Women's National Basketball Association
WSF	Washington State Ferries

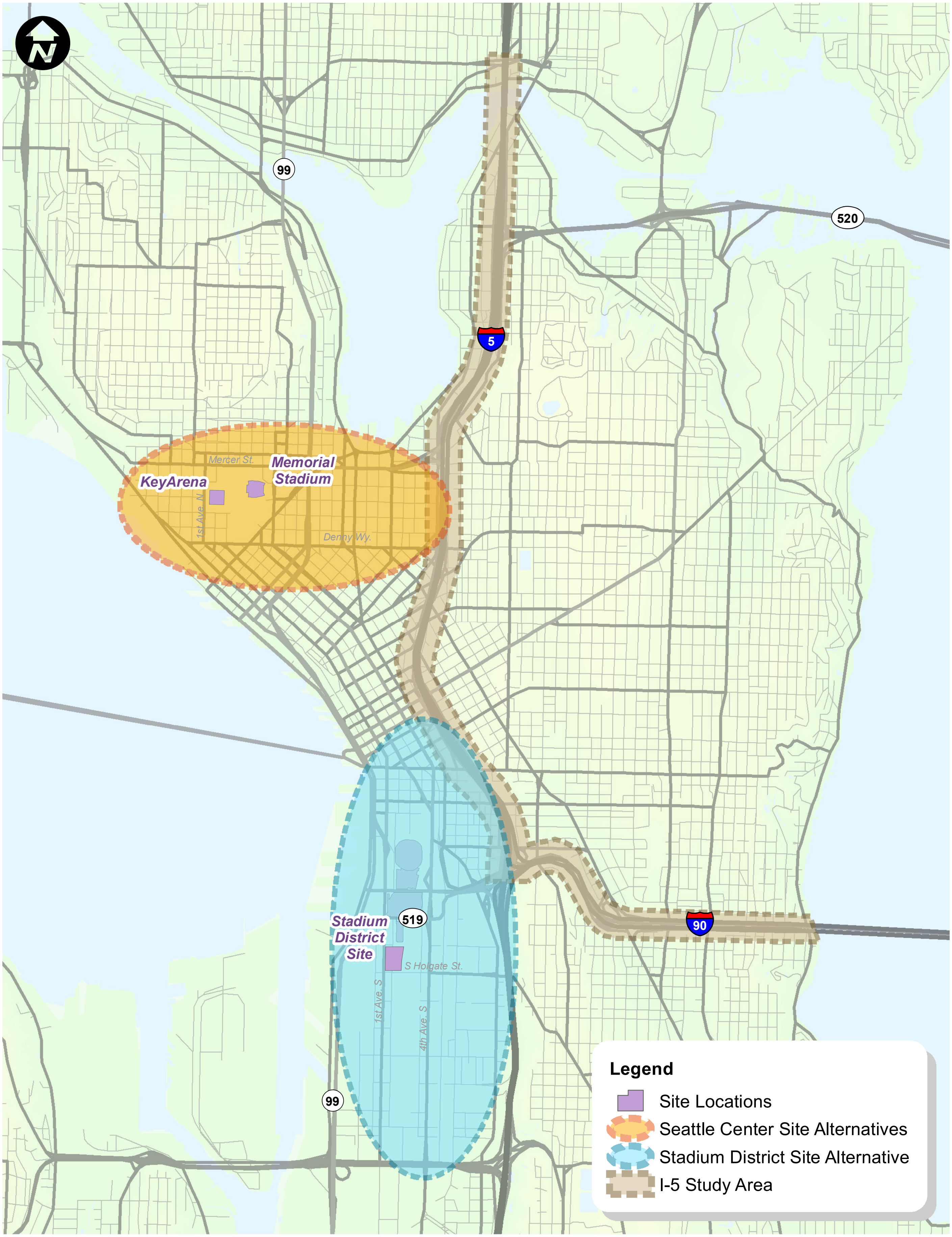
1.0 INTRODUCTION

This document provides technical information in support of the transportation element of the Environmental Impact Statement (EIS) for the proposed 20,000-seat multipurpose sports arena in Seattle. Four alternatives were identified for evaluation, including the Proposed Project. All of the site alternatives are located amidst the evolving transportation infrastructure of Seattle's downtown area. Major investments in transportation infrastructure underway include the Alaskan Way Viaduct / State Route (SR) 99 replacement project, SR 520 Bridge Replacement, the Waterfront Seattle Project, the Mercer Corridor Project, and investments in regional transit infrastructure. Specific transportation changes related to these mega-projects will affect regional transportation patterns as well as those in the vicinity of the Stadium District site, the KeyArena site and the Memorial Stadium site for years into the future; all are in different stages of visioning, design and / or construction.

This study considers four alternatives for the Arena, two at its proposed location in the Stadium Transition Area (Overlay District) of South Downtown (SoDo), and two alternatives in the Seattle Center area, as described below. Figure 1–1 shows the locations of the Alternatives in the greater downtown area of Seattle.

The Stadium District site is located immediately south of two other larger event venues, Safeco Field and CenturyLink Field. Further north lies Pioneer Square, with its blend of residential, commercial and office uses. The Port of Seattle operates several port and intermodal terminals immediately to the west, along the Duwamish waterway. The Port operates four major terminals including Terminal 5 in West Seattle, Terminal 18 on Harbor Island, Terminal 25/30, and Terminal 46. Terminal 46 is the largest of these, with primary access via the Atlantic Street / 1st Avenue intersection. South and east of the site, SoDo has a mix of commercial, industrial, and freight supportive uses over an area that extends south to Spokane Street. The site currently includes a mix of commercial and industrial uses as well as public parking.

The KeyArena lies within what is collectively known as the Seattle Center, home of the 1962 Century 21 Exposition. Seattle Center is located in the Lower Queen Anne neighborhood, east of the redeveloping South Lake Union (SLU) neighborhood. The world headquarters for the Bill and Melinda Gates Foundation is located across 5th Avenue N. to the east of the Seattle Center, where they share a parking garage at the corner of 5th Avenue N. and Harrison Streets. The Seattle Center is currently home to a wide range of cultural and educational organizations, sports teams, festivals, community programs and entertainment facilities.



Transportation/Parking Analysis Study Areas

Seattle Arena

transpoGROUP

FIGURE
1-1

KeyArena is a multipurpose arena with a capacity of over 17,000 people for basketball, about 15,000 people for hockey, and 15,000 to over 17,000 people for concerts, depending on the stage set up and seating configuration. It lies on the west edge of the Seattle Center along 1st Avenue N. KeyArena was the result of refurbishing the original 12,500-seat Seattle Center Coliseum from 1994-1995. It historically housed the Seattle Supersonics basketball team, and minor league hockey. Recently, it has been home to the Seattle University men's basketball team, the Seattle Storm WNBA team, and a range of other events. KeyArena sits in the heart of the Lower Queen Anne neighborhood, which bounds the Seattle Center on the west and north.

Memorial Stadium, owned by the Seattle School District, lies adjacent to the eastern boundary of Seattle Center. Memorial Stadium was originally constructed in 1947. It currently has a capacity of 12,000 people; historically, capacity has been as high as over 17,000 people when the Seattle Sounders professional soccer team played there in the mid-1970s. It is located between Harrison and Republican Streets, west of 5th Avenue N., and separated from 5th Avenue N. by a surface parking lot also owned by Seattle Schools.

The balance of this section is organized to present global assumptions and analysis components that are universal to all elements of the transportation analysis. These include a summary of the Alternatives, the Horizon Years for Analysis, Event Analysis Cases, Event Transportation Demands, General Study Areas, and Analysis Approach and Document Organization.

1.1 Summary of Alternatives

The alternatives are defined as follows for the purposes of the transportation review. The Proposed Action has more information developed for it as a basis for analysis, including a site plan and preliminary concept drawings. No site plans have been developed in association with Alternative 4 or 5 in the Seattle Center area.

- **Alternative 1** – No Action Alternative.
- **Alternative 2 – Proposed Project:** Stadium District 20,000-Seat Arena: state-of-the-art 20,000-seat spectator sports arena to be located at 1700 – 1st Avenue S.
- **Alternative 3 – Stadium District 18,000-Seat Arena**: State-of-the-art 18,000-seat spectator sports arena to be located at 1700 – 1st Avenue S.
- **Alternative 4 – KeyArena 20,000-Seat Arena**: Demolish the KeyArena at Seattle Center and replace it with a state-of-the-art 20,000-seat spectator sports arena
- **Alternative 5 – Memorial Stadium 20,000-Seat Arena**: Demolish the Seattle School District's Memorial Stadium and replace it with a state-of-the-art 20,000-seat spectator sports arena (KeyArena would remain)

The proposed site of the Arena (Alternatives 2 and 3) is located between 1st Avenue S. and the Burlington Northern Santa Fe (BNSF) right-of-way and between S. Holgate and S. Massachusetts Streets. It is in the SoDo neighborhood of Seattle in the Stadium Overlay District, and is zoned for the proposed spectator sports facility. The site is currently occupied by a mix of warehouse, distribution, light manufacturing, and restaurants (2) totaling approximately 129,000 gross square feet (gsf). The Safeco Field garage is located immediately north of the site, east of Occidental Avenue S. between S. Atlantic and S. Massachusetts Streets. The year-of-opening was identified as 2015, based on initial discussions around the possibility of an NBA team relocating to Seattle.

A number of site plan components are relevant to the transportation impact evaluation. These include:

- **Proposed Street Vacation** – As part of the project application, the proponent has requested the vacation of Occidental Avenue S. from S. Holgate Street to S. Massachusetts Street.

- **New North-South Connection** – A new north / south connection is proposed to be constructed on the east edge of the site extending from S. Holgate Street to S. Massachusetts Street. It is understood that this connection would generally not be open to the public, except during event conditions, as it will provide primary access to Safeco Field parking garage.

- **S. Massachusetts Street Realignment** – This roadway will be realigned to the north between 1st and Occidental Avenues S. The new roadway alignment will allow for a pedestrian plaza on the north side of the Arena. It will also eliminate the S. Massachusetts Street offset at the 1st and Occidental Avenues S. intersections.

- **Pedestrian Access** – Primary pedestrian access to the site is proposed to be located on the northwest and southwest quadrants of the building. In addition, frontage modifications along S. Holgate Street, 1st Avenue S. and S. Massachusetts Street would include wider sidewalks, street furniture, street trees, rain gardens and understory planting and related building elements.

- **Public / Pedestrian Feature** – A large public plaza that includes seating, water features, pedestrian concrete, and incorporation of permeable pavements, trees and landscaping would be located on the north end of the site.

- **Service and Loading** – The service and loading area would be accessed from the proposed north / south roadway connection, north of S. Holgate Street.

- **Parking** – Parking is not currently proposed by the Proponent. Code required parking is assumed to occur through a variety of parking agreements. In addition, a sensitivity analysis was conducted to provide an understanding of transportation impacts if the Proponent was to build parking; this evaluation assumes a 1,500-stall parking garage with access along S. Holgate Street west of 1st Avenue S.

1.2 Horizon Years for Analysis

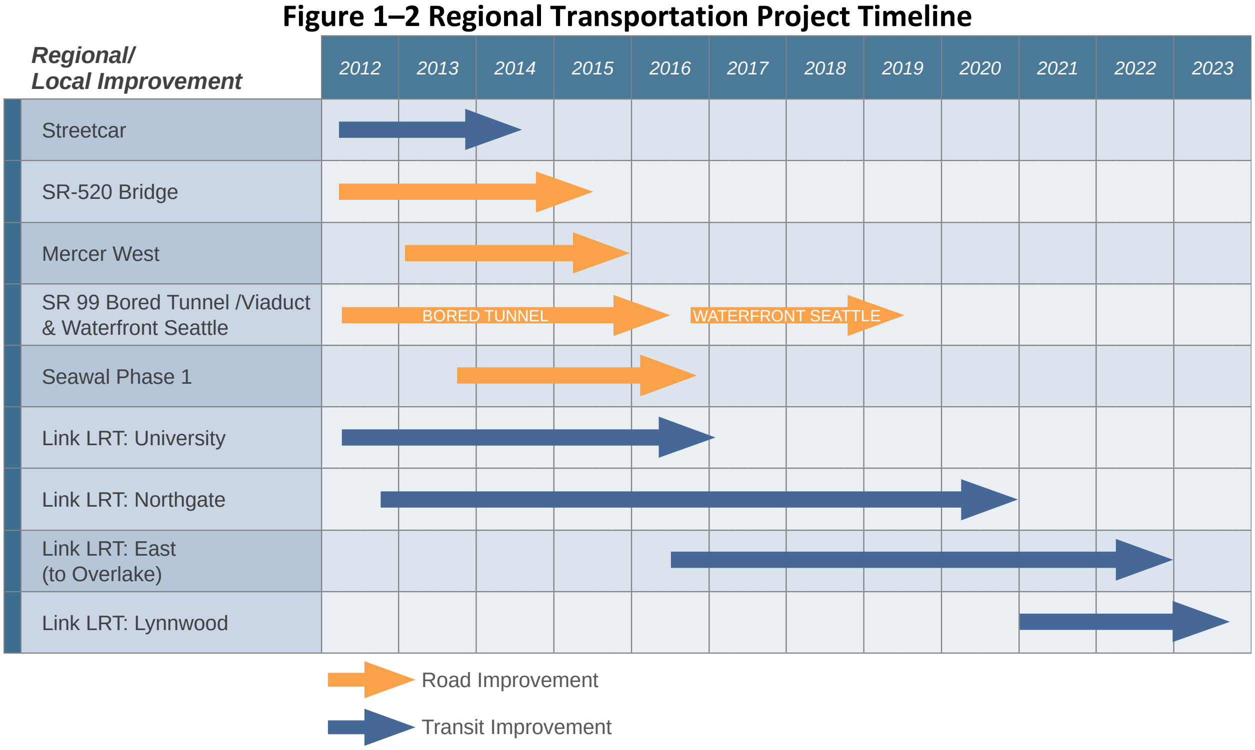
Transportation impact analysis considered not only the 2016 year of opening, but the status of the major infrastructure projects affecting transportation in the region and downtown area. The analysis was designed to recognize two primary horizon years, with additional consideration of the short-term transition during the early years of operation. This is outlined as follows:

- **2018 Horizon** – This horizon year enables short term analysis that encompasses the completion of those projects identified on Figure 1–2. This includes the expansion of the Streetcar, SR 520, Mercer West, SR 99, Waterfront Seattle, and Phase 1 of the Seawall project.

- **2030 Horizon** – This horizon year is consistent with area-wide transportation modeling of the future condition with all of the transportation infrastructure in-place, as well as the extension of Sound Transit (ST) Link Light Rail east and north as indicated.

- **2016 / Year of Opening Horizon** – This was identified in recognition that the year of opening of the arena may pre-date the completion of elements of the projects identified below. As necessary, the differences in impacts will be identified and mitigation strategy will be expanded to encompass this condition.

Figure 1–2 Regional Transportation Project Timeline



1.3 Event Analysis Cases

This section describes the basis for determining event cases for analysis of the Stadium District Alternatives and the Seattle Center Area Alternatives, separately, as the factors influencing the determination of the event cases varied between the two site areas. Alternatives 2 and 3 would be located on the same site in the Stadium District of SoDo, and would be influenced by events at CenturyLink Field and Event Center and Safeco Field. Alternatives 4 and 5 would be located on or adjacent to the Seattle Center and would be influenced by activities occurring at the Seattle Center. In the case of the Seattle Center Area Alternatives, each of the alternatives would displace one of the existing event venues.

Event cases were determined considering these factors:

- **Event Venue Major Tenant Activities** – Major tenant activities were identified for Safeco Field, CenturyLink Field and Event Center, KeyArena, and Memorial Stadium. For the Seattle Center Area Alternatives, the background level of events at the other surrounding venues was assumed to be the same for each alternative.

- **Event Calendars** – Existing and future (with Arena) event calendars were reviewed as available to assist in identifying potential seasonal overlaps between venue tenants.

- **Event Attendance Frequencies** – Using the seasonal calendars as appropriate, the frequency of event attendance levels at differing thresholds was summarized.

- **Event Analysis Cases** – Using the combination of the tenant activities and attendance, event calendars / schedules and event frequencies, analysis cases were identified that provide a basis for understanding impacts of a single event at the Proposed Arena as well as multiple event conditions.

1.3.1 Stadium District Alternatives

1.3.1.1 Event Venues - Major Tenant Activities

The following provides a more detailed summary of the activities associated with the major tenant teams at each of the existing event venues:

- **Safeco Field –** Safeco Field is home to the Seattle Mariners. The regular season runs from early April to early October. With playoffs, the season generally extends through October. There were 81 home games during the 2012 season with an average attendance of 21,258[1]. Based on a review of the 2012 master events calendar[2] for Safeco Field, there was a total of 209 days in which an event of some type was held. Considering the 81 home baseball games and overlapping baseball and non-baseball events, a total of 129 additional non-baseball activities occurred. Non-Major League

[1] Baseball Almanac, 2013
[2] Email transmittal from Susan Ranf, Seattle Mariners, March 2013

Baseball (MLB) events had significantly lower attendance ranging from a 3,000-person attendance for a college baseball game to 50-200 person receptions or meetings.

- **CenturyLink Field and Event Center -** CenturyLink Field is home to the Seattle Seahawks, Sounders FC, and the WAMU theatre. These facilities host football games, soccer matches, and other events such as Fanfest events, exhibition shows, graduations, and concerts. Seahawks football, inclusive of pre-season and playoffs runs from early August to early January. In 2012 there were 10 home games[3]. In addition to the Seahawks games, there were a number of other events held at CenturyLink Field such as the Supercross, concerts, University of Washington (UW) commencement, and the Susan G. Komen 3-Day Walk event.

  The Sounders FC season runs from mid- March through mid-November. Sounders FC play in a number of non-MLS leagues, including the US Open Cup and Confederation of North, Central American and Caribbean Association Football (CONCACAF). Considering pre-season, post-season, and all leagues, a total of 24 home games were played, averaging approximately 3 home games per month. A total of 116 concerts, flat shows, and other events were held at the Event Center and WAMU theatre in 2012. There were only 19 times in 2012 that events at CenturyLink Field overlapped with events at the Event Center. This excludes Fanfest type events that occurred or were related to CenturyLink Field events.

- **Multi-Venue Events** - When considering the 2012 Safeco Field and CenturyLink Field event calendars there were approximately 80 days that events occurred at Safeco Field and the CenturyLink Field and Event Center. Most of the events that overlapped between the two venues included smaller meetings, conferences, and flat show / concert events in the Event Center. For the occasions where major sporting events were held in both venues on the same day, the City requirement for event separation was utilized. A review of the 2012 sports team schedules shows sporting events on the same day occurred less than 10 times.

- **NBA / NHL Arena -** An event calendar for the proposed Seattle Arena was developed incorporating schedules for the NBA, NHL, and WNBA sports teams. In addition, a number of concerts and community events were identified based on information provided by the applicant.

1.3.1.2 Event Calendars

Event calendars for existing venues and the Proposed Arena were developed based on review of historical data, discussions and information from existing venue operators, and review of similar facilities in other cities.

Safeco Field and the CenturyLink Field and Event Center host a number of different events throughout the year; from major professional sports, to concerts, to flat shows, to community

[3] Includes two home playoff games in January 2012

meetings and events. Given the size and significance of some of the events that are programed, a typical year's worth of activity at each existing venue was compiled. The EIS team worked with each of the event venues to review the 2012 calendar year.

NBA, NHL, and WNBA schedules at the Proposed Arena were developed considering pre-season, regular season, and post season activities. Schedules were developed using other sports franchises as general guidance in frequency and proportion of home and away games. Schedules from the NBA and NHL 2009-2010 and 2010-2011 seasons were identified and projected forward to 2016 conditions, representing the anticipated year of opening. WNBA schedules from the 2010 Seattle Storm were utilized and modified to represent a 2016 calendar year. The 2012 event calendar previously discussed was also modified (*i.e. date-shifted to generally characterize consistent weekday and weekend event frequency*) to represent a 2016 horizon year.

Figure 1–3 summarizes an overview of the annual event calendars for the current and future venues.

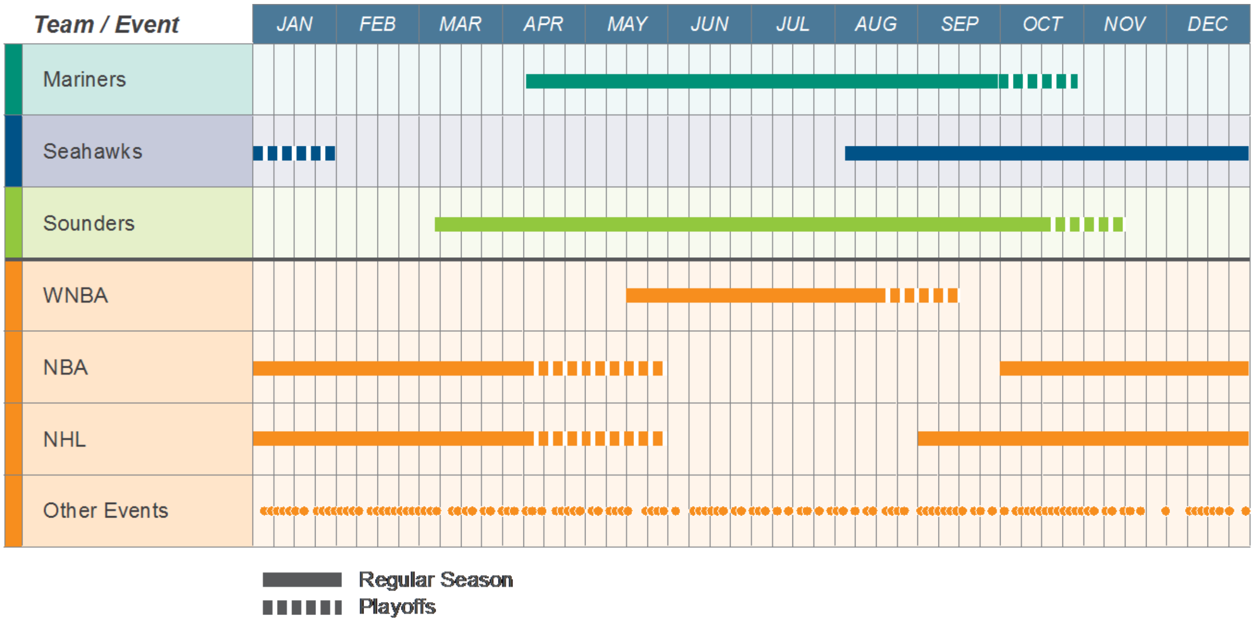
- Seattle Mariners professional baseball games at Safeco Field
- Seattle Seahawks professional football at CenturyLink Field
- Seattle Sounder soccer matches at CenturyLink Field
- Seattle Storm professional women's basketball at New Seattle Arena
- Seattle Sonics professional men's basketball at New Seattle Arena
- Seattle professional hockey team at New Seattle Arena
- Other smaller and / or less frequent events occurring at all of the venues

As shown, a number of the existing venues have overlapping tenant seasons. The Mariners and Sounders FC schedules overlap from April through November. The Seahawks season starts in August, resulting in a third existing overlapping schedule. Considering the potential for playoffs, there is a generally a four-month window (August to November) where all three existing sports teams could be playing regular season or playoff games.

The current Transportation Management Plan (TMP)[4] developed for Safeco Field and CenturyLink Field addresses this situation and requires that when a dual event is anticipated, and the attendance is expected to exceed 58,000 people for a weekday event and 65,000 people for a weekend event, the events must be separated by a minimum of 4 hours from the completion of one to the start of another.

[4] 2012 Safeco Field TMP – Dual Event conditions

Figure 1–3 Stadium District – Combined Event Schedules (Typical)



The transportation analysis relied on the following assumptions regarding event frequency in the new Arena:

- NBA Basketball – 41 regular season and 3 pre-season home games between November and mid-April; up to 16 home playoff games[5] in April and May; and pre-season games in October.
- NHL Hockey - Similar to NBA with additional NHL games occurring in September.
- With a new Arena, the NBA and NHL seasons would generally run concurrently.
- WNBA Basketball – 17 home games from mid-May to late September, plus playoffs.
- Other Arena Events - There is also the potential for increased events unrelated to the professional sports teams. Based on discussion with the proponent a total of 60-65 additional events were assumed to occur, distributed throughout the year, with a slightly higher concentration around the Thanksgiving / Christmas holidays.

The primary overlap in schedules introduced due to the Proposed Arena would be associated with the WNBA season. This would occur between May and September for the WNBA regular season, extending to October with WNBA playoffs. During these months, the Sounders FC and the WNBA averaged four home games a month. During this same period, the Mariners in 2012

[5] Note that the event frequency information provided by Pro Forma Advisors, LLC included only 2 playoff games. This section of the EIS assumes a higher number of playoff games to provide a conservative analysis regarding potential impacts.

averaged 11-16 home games per month, typically played via 2 week-long home stands. The Mariners and NHL would overlap in September.

The most significant potential overlap in schedules would occur in the event that the tenant of the Proposed Arena, professional basketball or soccer, is playing a home playoff game and overlapping with a well-attended baseball game in Safeco Field.

1.3.1.3 Frequency of Event Attendance Levels

Table 1-1 summarizes the events anticipated at the Arena. The information presented below is based on data provided by Pro Forma Advisors, LLC. This is based on data for other arenas in similar markets. Pro Forma Advisors, LLC is preparing the economic impact analysis included in this EIS. Information regarding event attendance provided by Pro Forma Advisors, LLC was based on an 18,000-seat arena. While this assumption yields a conservative analysis with respect to economic impacts, it does not represent the higher venue size as evaluated as part of Alternative 2. As such, the attendance figures provided by Pro Forma Advisors, LLC for the 18,000-seat Arena have been modified (increased) to represent a 20,000-seat Arena.

Table 1-1
Arena Event Attendance Ranges

Attendance Range (Persons)	Frequency
0 to 500	2
501 to 2,500	0
2,501 to 5,000	10
5,001 to 10,000	52
10,001 to 15,000	88
15,001 to 18,000	12
18,001 to 20,000	22
Total No. Events	186

A total of 186 events were identified as potentially occurring in the Arena. Based on typical attendance of 75 to 65 percent for NBA and NHL, respectively, the majority of the events are anticipated to have an attendance of 15,000 or less. The larger attendance events were assumed to be large concerts or playoff games where attendance is higher.

Table 1-2 illustrates the change in the number of Stadium District event days within various attendance ranges.

It is noted that, with the addition of arena events, there is not a direct correlation making it possible to add to the No Action condition. This reflects the overlap of some event levels, and the addition of arena events on background levels near an attendance range transition causing a reclassification in the with arena case. The overall number of events days occurring in the Stadium District would increase by approximately 55; events over 18,000 persons would increase by approximately 30 days. This reflects the anticipated attendance at NBA and NHL events.

Table 1-2
Stadium District Cumulative Event Day Attendance Levels and Frequency

Attendance Range (Persons)	**Number of Days**			
	Existing	**No Action**	**Future with Arena**	**Change due to Project**
0 to 500	84	84	38	-46
501 to 2,500	53	53	21	-32
2,501 to 5,000	18	18	14	-4
5,001 to 10,000	10	10	36	+26
10,001 to 15,000	21	21	81	+60
15,001 to 18,000	9	9	28	+19
18,001 to 20,000	4	4	13	0+9
20,001 to 30,000	39	39	46	+7
30,001 to 40,000	14	14	22	+8
40,001 to 50,000	13	13	16	+3
50,001 to 60,000	2	2	5	+3
Over 60,001	17	17	18	+1
Totals	**284**	**284**	**338**	**+54**
Events over 18,000	*89*	*89*	*120*	*+31*

1.3.1.4 Event Analysis Cases

Table 1-3 illustrates the event cases developed for transportation and parking analysis for the Stadium District alternatives. They represent the most frequent level of arena impact (Case S1 – Single Event), as well as an illustration of more significant potential, though comparatively rare, multiple event scenarios. Because of the complexity of the analysis and the inclusion of multiple event venues as part of baseline conditions under multiple no action comparison, the event cases have been defined (S1 – S3, reflecting Stadium District Cases 1-3) as follows:

- **Case S1 - Single Event (Arena Only)** – This designation will always describe the event case that includes the Proposed Arena, compared to a no action background condition that has no other event added in.

- **Case S2 – Dual Event (Arena plus Mariners)** – A well-attended baseball game together with a capacity event in the Proposed Arena would represent an infrequent, but significant dual event case to illustrate. In this case, the Mariner game would be added to the non-event baseline to provide a Case 2 No Action baseline for analysis comparison.

For purposes of this analysis, and given the proximity of Safeco Field to the Stadium District site, the dual (and triple) event case is characterized as including a high attendance event at Safeco Field. It should be recognized that the analysis could just as easily represent a similarly sized event at CenturyLink Field. The event case analysis assumes simultaneous events with uniform arrival and departure times as well as total cumulative attendance.

- **Case S3 – Triple Event (Arena + Mariners + CenturyLink Concert)** – A triple event scenario was identified that includes activity at all three venues as described above. While even these scenarios may be addressed, limited, or prohibited as a result of a revised event scheduling agreement, the total attendance level likely from this combination was similar to that occurring in the event of a major event at CenturyLink Field, such as Monday night football. It is assumed that a triple event case that included Soccer, Baseball, and a major event at the arena would not be scheduled; this would be clarified in the conditions of approval and event scheduling agreement. In this case, the Case 3 No Action baseline would include both the Mariner game and event at CenturyLink. As noted above, the analysis is constructed to reflect a total cumulative event of the attendance indicated.

For all analyses going forward, Case 1 will always reflect a single, Arena only event, Case 2 will always reflect a dual event (with a single event in the background) and Case 3 will always reflect a triple event with a dual event in the background.

Table 1-3
Stadium District - Event Cases for Analysis

Description		Attendance (Persons)		
		No Action	**Action**	**Project Impact**
Alternative 2 - 20,000 Seat Arena				
1)	**Case S1 – Single Event (Arena Only)**			
	New Arena	0	20,000	+20,000
	Safeco Field	0	0	+0
	CenturyLink	0	0	+0
	Total Attendance	***0***	***20,000***	***20,000***
2)	**Case S2 – Dual Event (Arena + Mariners)**			
	New Arena	0	20,000	+20,000
	Safeco Field	40,500	40,500	+0
	CenturyLink	0	0	+0
	Total Attendance	***40,500***	***60,500***	***20,000***
3)	**Case S3 - Triple Event (Arena + Mariners + CenturyLink)**			
	New Arena	0	20,000	+20,000
	Safeco Field	40,500	40,500	+0

Table 1-3 (Cont.) Stadium District - Event Cases for Analysis

Description	Attendance (Persons) No Action	Action	Project Impact
CenturyLink	5,000	5,000	+0
Total Attendance	***45,500***	***65,500***	***20,000***
Alternative 3 - 18,000 Seat Arena			
Case S1 – Single Event (Arena Only)			
New Arena	0	18,000	+18,000
Safeco Field	0	0	+0
CenturyLink	0	0	+0
Total Attendance	***0***	***18,000***	***18,000***
Case S2 – Dual Event (Arena + Mariners)			
New Arena	0	18,000	+18,000
Safeco Field	40,500	40,500	+0
CenturyLink	0	0	+0
Total Attendance	***40,500***	***58,500***	***18,000***
Case S3 - Triple Event (Arena + Mariners + CenturyLink)			
New Arena	0	18,000	+18,000
Safeco Field	40,500	40,500	+0
CenturyLink	5,000	5,000	+0
Total Attendance	***45,500***	***63,500***	***18,000***

1.3.2 Seattle Center Area Alternatives

The determination of event cases for the Seattle Center Area Alternatives was conducted with the same overall philosophy as those in the Stadium District alternatives. Differences in context between the Seattle Center and SoDo require a different methodology for determining appropriate event cases for analysis. For the Seattle Center Area Alternatives, the arena would replace an existing event venue of significance. For Alternative 4, the KeyArena would be replaced; for Alternative 5, Memorial Stadium would be replaced.

1.3.2.1 Event Activities and Frequency Data

Seattle Center is comprised of numerous event and activity venues and attractions. In contrast to the Stadium District, where fewer larger venues determine the event schedule and scenarios, the Seattle Center has many smaller venues in addition to the 17,072-seat KeyArena. There are a few large festivals that occur annually, beginning with Folklife over Memorial Day weekend, the Bite of Seattle during July, and Bumbershoot over Labor Day weekend. Other Seattle Center attractions that contribute to attendance and transportation demands include Armory, Children's Theater, Pacific Science Center, Space Needle, Experience Music Project, as well as theaters along the arts corridor on Mercer Street including Seattle Repertory Theater and McCaw Hall.

Given this diversity and frequency of smaller events, inconsistent schedules and variations in attendance, developing a representative event calendar comparable to the Stadium District Site alternatives is not a reliable basis for understanding probable cumulative event / activity scenarios at the Seattle Center. The Seattle Center provided historical and projected information on “high attendance days” for projected 2013 conditions.

The following observations were noted in the review of the Seattle Center data:

- A total of 80 high attendance days with expected attendance at or above 7,000 attendees.
- The events comprised a mix of time-specific events such as Seattle Storm basketball games in KeyArena, and daily attendance with demands occurring throughout the day such as festivals.
- 52 high attendance days would occur on weekends or holidays and 28 high attendance days would occur on weekdays.
- Festivals (Folklife, Bite, and Bumbershoot) with daily attendance averaging 30,000-60,000 persons represent 10 of the highest attendance days and are on weekends and holidays.
- Events at KeyArena represent all or a portion of 37 high attendance event days, including the festivals.
- Events at KeyArena range from private business meetings, to graduations, to concerts, to basketball games, including the Seattle University men, Seattle Storm, and the PAC 12 Women’s Basketball Tournament.
- Memorial Stadium events range from community scale events with attendance levels of approximately 500-1,500 people to School District sporting events with attendance between 3,500 and 5,000 people.
- There are also a number of non-ticketed “events” that range from informal gatherings on the Center grounds to post-event gatherings (such as after a local foot race). Which can reportedly range from 2,000 to 5,000.

Table 1-4 summarizes weekday and weekend “high attendance days” within attendance ranges provided by the Seattle Center.

Arena events related to NBA and NHL, as well as a number of others were assumed to reflect the full 20,000 capacity attendance levels. While this may overestimate actual achieved levels, it is assumed as a basis for worst-case analysis and equal comparison of alternatives. In the case of Alternative 4, existing events at the KeyArena would be replaced with the event program identified for the new arena. For Alternative 5, existing events at Memorial Stadium would be replaced by events at the new arena. Since the high end of recent Memorial Stadium

Table 1-4
Summary of Seattle Center High Attendance Days

Daily Attendance Range	Number of Days		
	Weekday	**Weekend / Holiday**	**Total**
7,000 -12,999	24	22	46
13,000 -19,999	4	9	13
20,000 -60,000	0	21	21
Totals	**28**	**52**	**80**

Source: Seattle Center Facilities Management for KeyArena and Bookings Database from the Seattle Center's Event Management System, February 2013.

events for Seattle School District functions is approximately 5,000, and the existing KeyArena regularly has events achieving over 10,000 in attendance, the "net effect" of an arena at the Memorial Stadium site would be greater than the net effect of an arena replacing the existing KeyArena.

1.3.2.2 Event Analysis Cases

Table 1-5 illustrates the event cases developed for the Seattle Center Area Alternatives. Similar to the Stadium District, analysis cases are linked to each alternative (Cases K1 and K2 for the KeyArena site; Cases M1 and M2 for the Memorial Stadium site). As mentioned before, Case 1 reflects single events (Arena only), Case 2 reflects dual events (Arena plus a background event). In the case of Alternative 4 (KeyArena site), Case K2 reflects a dual event condition with Memorial Stadium event added to no action. In the case of Alternative 5, Case M2 reflects a dual event condition with an event at KeyArena in the background.

Table 1-5
Seattle Center Area Alternatives - Event Cases for Analysis

Description	Attendance (Persons)		
	No Action	**Action**	**Project Impact**
Alternative 4 - KeyArena Site			
1) Case K1 - Single Event (Arena Only)			
KeyArena	12,000	20,000	+8000
Memorial Stadium	0	0	+0
Total Attendance	***12,000***	***20,000***	**+8000**
2) Case K2 - Dual Event (Arena + Memorial Stadium Event)			
KeyArena	12,000	20,000	+8000
Memorial Stadium	5,000	5,000	+0
Total Attendance	***17,000***	***25,000***	**+8000**

Table 1-5 (Cont.) Seattle Center Area Alternatives - Event Cases for Analysis

Description	Attendance (Persons)		
	No Action	Action	Project Impact
Alternative 5 - Memorial Stadium Site			
1) Case M1 - Single Event (Arena Only)			
KeyArena	0	0	+0
Memorial Stadium	5,000	20,000	+15000
Total Attendance	***5,000***	***20,000***	**+15000**
2) Case M2 - Dual Event (Arena + KeyArena Event)			
KeyArena	12,000	12,000	+0
Memorial Stadium	5,000	20,000	+15000
Total Attendance	***17,000***	***32,000***	**+15000**

The event cases for analysis were designed to reflect typical anticipated levels of occurrence for events at the Seattle Center. The multi-event case (Case 2) described a basis for understanding a reasonable worst case scenario for multi-venue attendance at the Seattle Center.

The following reflects the assumptions and basis of the assumptions in the table and event case summary:

- **Existing KeyArena** – A range of attendance information for events at KeyArena was provided by Seattle Center staff. KeyArena events account for the vast majority of higher attendance experience at the Seattle Center not related to one of the three major multiday festivals. During the past year, data from the KeyArena shows that the highest achieved attendance was 16,000 persons, associated with a concert event. Other higher attendance events ranged from 7,000 to 12,000 persons. This analysis assumed an attendance level of 12,000 persons.

- **Existing Memorial Stadium** – Limited information was available from the Seattle School District. The stadium is used by both the School District for events such as high school football and soccer games, as well as the community for smaller gatherings and events. The higher attendance events occurring relate to high school sporting events. This analysis assumed an attendance level of 5,000 persons.

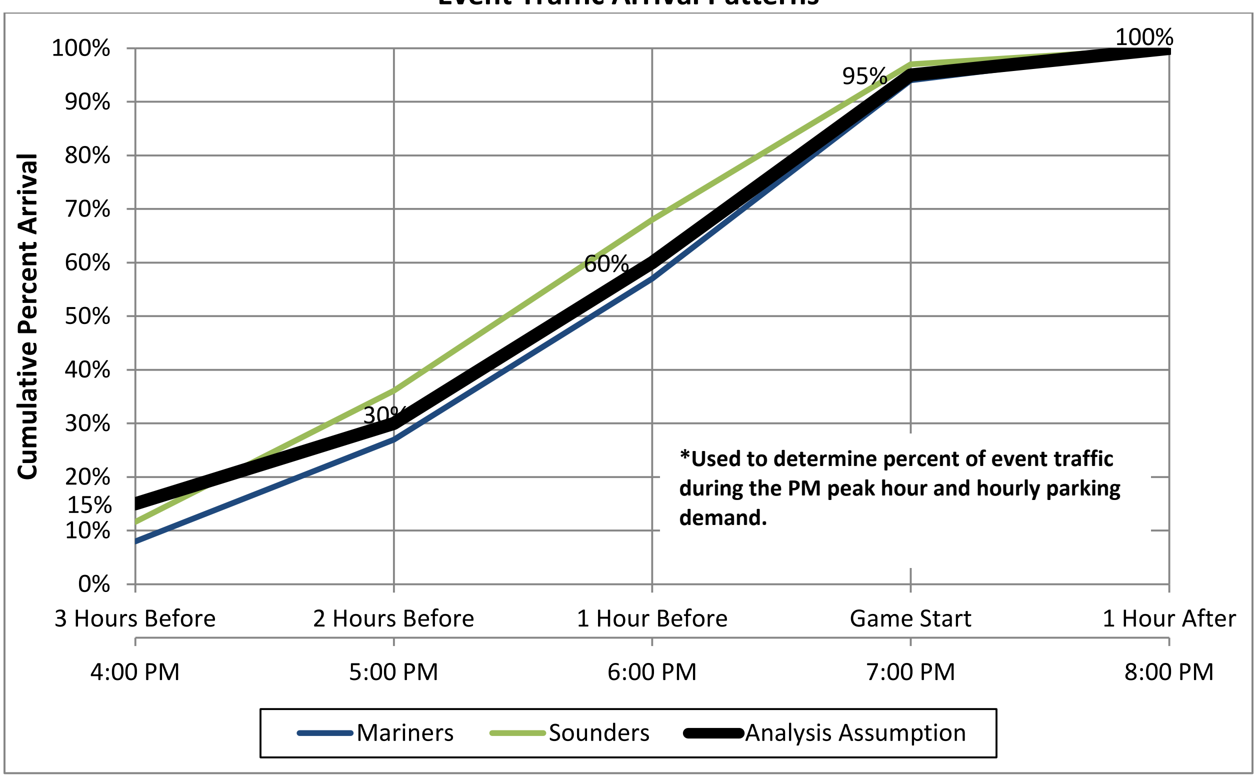
- **New Arena** – This analysis assumed a capacity attendance level of 20,000 persons for each Seattle Center Area Alternative, similar to Alternative 2. It is recognized that an arena would not operate at capacity for every event. However, for purposes of traffic analysis and event case illustration, all events have been assumed to be at capacity of an arena of 20,000-seats.

1.4 Event Transportation Demands

This section summarizes the methodology and resulting trip generation and parking demands for the No Action and Alternative event analysis cases. Forecasting of event-related traffic volumes and parking demands considers the identified event case attendance levels, mode-splits, and general arrival patterns. As the event cases defined are unique to each alternative, the following provides a discussion of the Stadium District Alternatives followed by the Seattle Center Area Alternatives.

Sporting event-related arrival patterns were for purposes of the analysis, assumed to be consistent between the Stadium District and Seattle Center Area Alternatives, based on limited available data and the intention to provide consistency in analysis comparisons. The arrival patterns developed for the project are based on a review of parking accumulation data for SoDo area garages, data from other NBA facilities, and review of traffic volume data in SoDo. Based on this information, approximately 30 percent of the event-related demand overlaps with the PM peak hour commute period (4:30 – 5:30 PM). Arrival pattern curves for the events are illustrated on Figure 1–4.

Figure 1–4
Event Traffic Arrival Patterns



1.4.1 Stadium District Alternatives

This section presents the event transportation demands associated with each analysis case described in the preceding section. First, the actual trip generation and parking demand for each venue case is identified in Table 1-6. Then, Table 1-7 through Table 1-10 present the event case demands for the packaged event cases described in the Event Case discussion above. This section covers Alternative 2 and Alternative 3.

1.4.1.1 Event Venue Transportation Demands

Table 1-6
Stadium District Event Transportation Demands (by Venue)

Event Venue	Attendance	% Auto[2]	AVO[3]	Total Auto Demand (Parking)	Weekday PM Peak Hour			
					% Total Inbound Demand[4]	In	Out	Total
2018 Horizon Year								
Mariners	40,500[1]	80%	3.16	10,253	30%	3,076	205	3,281
CenturyLink	5,000	85%	2.50	1,700	20%	340	85	425
Alternative 2	20,000	80%	2.40	6,667	30%	2,000	133	2,133
Alternative 3	18,000	80%	2.40	6,000	30%	1,800	120	1,920
2030 Horizon Year								
Mariners	40,500	74%	3.16	9,484	30%	2,845	190	3,035
CenturyLink	5,000	85%	2.50	1,700	20%	340	85	425
Alternative 2	20,000	74%	2.40	6,167	30%	1,850	123	1,973
Alternative 3	18,000	74%	2.40	5,550	30%	1,665	111	1,776

Notes: AVO = average vehicle occupancy

1. Baseball Almanac, 2013
2. Mariners and Alternatives 2 and 3 auto mode split is based on the Mariners 2001 Travel Survey as well as *Seattle Arena Multi-Modal Access & Parking Study,* May 2012. CenturyLink Field Event Center auto mode split based on *Football / Soccer Stadium and Exhibition Center Draft Environmental Impact Statement (DEIS),* January 1998.
3. Mariners AVO based on 2001 Travel Survey, CenturyLink Field Event Center AVO based on *Football / Soccer Stadium and Exhibition Center Draft Environmental Impact Statement (DEIS),* January 1998, and Alternatives 2 and 3 AVO based on research of available data for WNBA, NBA, and NHL Arena events.
4. Based on review of parking accumulation data for SoDo area garages, data from other NBA facilities, and review of traffic volume data in SoDo and *Football / Soccer Stadium and Exhibition Center Draft Environmental Impact Statement (DEIS),* January 1998.

The following provides a general overview of the assumptions applied to each of the events identified in Table 1-6.

Mariners Baseball (40,500 Attendance): Information regarding mode splits, attendance levels, and arrival patterns were provided by the Seattle Mariners staff. This attendance level represents the 85th percentile attendance levels experienced at Safeco Field since it opened; however, it substantially exceeds recent experience. As discussed previously, this could just as easily represent a CenturyLink Field event with similar attendance levels. Auto mode split data was based on information collected in 2001 and assumed an auto-usage of 80 percent (2018 horizon year). There have been substantial transit improvements in the area since 2001. As such, this higher percentage of auto-usage by the Mariners likely overstates the current level of auto demand associated with events. This would result in higher background traffic volumes and parking demand for the with Mariners event cases. Average Vehicle Occupancy (AVO) data assumed for the Mariners is based on annual TMP reports provided to the EIS consultant team by the Mariners staff. With increased transit service projected in the area by 2030 via extension of NorthLink and EastLink the auto-usage assumed for the 2030 analysis was reduced to 74 percent with the additional demand shifted to transit usage.

CenturyLink Field Event Center (5,000 Attendance): As described previously, events of varying types and sizes occur at the CenturyLink Field Event Center throughout the year. For the purposes of this analysis an event with an evening attendance of 5,000 people was assumed, consistent with a concert event. Twenty percent of the total attendance was assumed to arrive during the PM peak hour. This assumption is consistent with the Football / Soccer Stadium and Exhibition Center Draft Environmental Impact Statement (DEIS).

Seattle Arena (18,000 – 20,000 Attendance): The event cases analyzed within this report focus on an NBA basketball game with attendance levels of 20,000 (Alternative 2) and 18,000 (Alternative 3). In developing the trip generation forecasts for the NBA events, extensive research was conducted regarding available information for other venues in the US. Mode splits and arrival patterns are unique to each venue; influenced by local congestion, availability of transit, parking supply, and density of ancillary retail / commercial uses that influence arrival patterns and mode choices.

For purposes of this analysis, assumptions regarding general mode splits were made to be consistent with those assumed for the Mariners events for both the 2018 and 2030 horizon years. While baseball and basketball / hockey are different event types, review of national experience revealed no pattern of mode split that could be tied directly to the type of event. In all cases, it appeared that travel mode split to events were, where data was available, unique to each location, suggesting a greater correlation to availability and convenience of alternative travel modes than any other event-specific factor. AVO was assumed to be more-reflective of the type of event. Thus, the documented Mariners AVO of 3.16 was reduced to 2.4, based on available research. Research of other Arenas found on average an AVO of 2.5 with data ranging between 2.0 and 2.75; therefore, the an AVO of 2.4 persons is on the lower end of the range and slightly less than the average.

1.4.1.2 Event Analysis Case Transportation Demands

Table 1-7
Stadium District Event Case Transportation Demands
Alternative 2 (2018)

			PM Peak Hour		
Event Case	**Attendance**	**Total Parking Demand**	**In**	**Out**	**Total**
Case S1 - Arena Only					
Total With Proposal Events	*20,000*	*6,667*	*2,000*	*133*	*2,133*
- Proposed Arena	20,000	6,667	2,000	133	2,133
- Mariners Game	-	-	-	-	-
- CenturyLink Field Event	-	-	-	-	-
Less No Action Events					
- Mariners Game	-	-	-	-	-
- CenturyLink Field Event	-	-	-	-	-
Net Increase	**20,000**	**6,667**	**2,000**	**133**	**2,133**
Case S2 - Dual Event (Arena + Mariners)					
Total With Proposal Events	*60,500*	*16,920*	*5,076*	*338*	*5,414*
- Proposed Arena	20,000	6,667	2,000	133	2,133
- Mariners Game	40,500	10,253	3,076	205	3,281
- CenturyLink Field Event	-	-	-	-	-
Less No Action Events	*40,500*	*10,253*	*3,076*	*205*	*3,281*
- Mariners Game	40,500	10,253	3,076	205	3,281
- CenturyLink Field Event	-	-	-	-	-
Net Increase	**20,000**	**6,667**	**2,000**	**133**	**2,133**
Case S3 - Triple Event (Arena + Mariners + CenturyLink)					
Total With Proposal Events	*65,500*	*18,620*	*5,416*	*423*	*5,839*
- Proposed Arena	20,000	6,667	2,000	133	2,133
- Mariners Game	40,500	10,253	3,076	205	3,281
- CenturyLink Field Event	5,000	1,700	340	85	425
Less No Action Events	*45,500*	*11,953*	*3,416*	*290*	*3,706*
- Mariners Game	40,500	10,253	3,076	205	3,281
- CenturyLink Field Event	5,000	1,700	340	85	425
Net Increase	**20,000**	**6,667**	**2,000**	**133**	**2,133**

Table 1-8
Stadium District Event Case Transportation Demands
Alternative 2 (2030)

Event Case	Attendance	Total Parking Demand	PM Peak Hour In	PM Peak Hour Out	PM Peak Hour Total
Case S1 (Arena Only)					
Total With Proposal Events	*20,000*	*6,167*	*1,850*	*123*	*1,973*
- Proposed Arena	20,000	6,167	1,850	123	1,973
- Mariners Game	-	-	-	-	-
- CenturyLink Field Event	-	-	-	-	-
Less No Action Events					
- Mariners Game	-	-	-	-	-
- CenturyLink Field Event	-	-	-	-	-
Net Increase	**20,000**	**6,167**	**1,850**	**123**	**1973**
Case S2 - Dual Event (Arena+Mariners)					
Total With Proposal Events	*60,500*	*15,651*	*4,695*	*313*	*5,008*
- Proposed Arena	20,000	6,167	1,850	123	1,973
- Mariners Game	40,500	9,484	2,845	190	3,035
- CenturyLink Field Event	-				
Less No Action Events	*40,500*	*9,484*	*2,845*	*190*	*3,035*
- Mariners Game	40,500	9,484	2,845	190	3,035
- CenturyLink Field Event	-	-	-	-	-
Net Increase	**20,000**	**6,167**	**1850**	**123**	**1,973**
Case S3 - Triple Event (Arena+Mariners+CenturyLink)					
Total With Proposal Events	*65,500*	*17,351*	*5,035*	*398*	*5,433*
- Proposed Arena	20,000	6,167	1,850	123	1,973
- Mariners Game	40,500	9,484	2,845	190	3,035
- CenturyLink Field Event	5,000	1,700	340	85	425
Less No Action Events	*45,500*	*11,184*	*3,185*	*275*	*3,460*
- Mariners Game	40,500	9,484	2,845	190	3,035
- CenturyLink Field Event	5,000	1,700	340	85	425
Net Increase	**20,000**	**10,253**	**1,850**	**123**	**1,973**

Table 1-9
Stadium District Event Case Transportation Demands
Alternative 3 (2018)

Event Case	Attendance	Total Parking Demand	PM Peak Hour In	PM Peak Hour Out	PM Peak Hour Total
Case S1 (Arena Only)					
Total With Proposal Events	*18,000*	*6,000*	*1,800*	*120*	*1,920*
- Proposed Arena	18,000	6,000	1,800	120	1,920
- Mariners Game	-	-	-	-	-
- CenturyLink Field Event	-	-	-	-	-
Less No Action Events					
- Mariners Game	-	-	-	-	-
- CenturyLink Field Event	-	-	-	-	-
Net Increase	**18,000**	**6000**	**1,800**	**120**	**1,920**
Case S2 - Dual Event (Arena+Mariners)					
Total With Proposal Events	*60,500*	*16,253*	*4,876*	*325*	*5,201*
- Proposed Arena	18,000	6,000	1,800	120	1,920
- Mariners Game	40,500	10,253	3,076	205	3,281
- CenturyLink Field Event	-	-	-	-	-
Less No Action Events	*40,500*	*10,253*	*3,076*	*205*	*3,281*
- Mariners Game	40,500	10,253	3,076	205	3,281
- CenturyLink Field Event	-	-	-	-	-
Net Increase	**18,000**	**6,000**	**1,800**	**120**	**1,920**
Case S3 - Triple Event (Arena+Mariners+CenturyLink)					
Total With Proposal Events	*65,500*	*17,953*	*5,216*	*410*	*5,626*
- Proposed Arena	18,000	6,000	1,800	120	1,920
- Mariners Game	40,500	10,253	3,076	205	3,281
- CenturyLink Field Event	5,000	1,700	340	85	425
Less No Action Events	*45,500*	*11,953*	*3,416*	*290*	*3,706*
- Mariners Game	40,500	10,253	3,076	205	3,281
- CenturyLink Field Event	5,000	1,700	340	85	425
Net Increase	**18,000**	**6,000**	**1,800**	**120**	**1,920**

Table 1-10
Stadium District Event Case Transportation Demands
Alternative 3 (2030)

Event Case	Attendance	Total Parking Demand	PM Peak Hour In	PM Peak Hour Out	PM Peak Hour Total
Case 1 – Arena Only					
Total With Proposal Events	*18,000*	*5,550*	*1,665*	*111*	*1,776*
- Proposed Arena	18,000	5,550	1,665	111	1,776
- Mariners Game	-	-	-	-	-
- CenturyLink Field Event	-	-	-	-	-
Less No Action Events					
- Mariners Game	-	-	-	-	-
- CenturyLink Field Event	-	-	-	-	-
Net Increase	**18,000**	**5,550**	**1,665**	**111**	**1,776**
Case 2 - Dual Event (Arena+Mariners)					
Total With Proposal Events	*60,500*	*15,034*	*4,510*	*301*	*4,811*
- Proposed Arena	18,000	5,550	1,665	111	1,776
- Mariners Game	40,500	9,484	2,845	190	3,035
- CenturyLink Field Event	-	-	-	-	-
Less No Action Events	*40,500*	*9,484*	*2,845*	*190*	*3,035*
- Mariners Game	40,500	9,484	2,845	190	3,035
- CenturyLink Field Event	-	-	-	-	-
Net Increase	**18,000**	**5,550**	**1,665**	**111**	**1,776**
Case 3 - Triple Event (Arena+Mariners+CenturyLink)					
Total With Proposal Events	*65,500*	*16,734*	*4,850*	*386*	*5,236*
- Proposed Arena	18,000	5,550	1,665	111	1,776
- Mariners Game	40,500	9,484	2,845	190	3,035
- CenturyLink Field Event	5,000	1,700	340	85	425
Less No Action Events	*45,500*	*11,184*	*3,185*	*275*	*3,460*
- Mariners Game	40,500	9,484	2,845	190	3,035
- CenturyLink Field Event	5,000	1,700	340	85	425
Net Increase	**18,000**	**5,550**	**1,665**	**111**	**1,776**

1.4.2 Seattle Center Area Alternatives

This section presents the event transportation demands associated with each analysis case described in the preceding section. First, the actual trip generation and parking demand for each venue case is identified in Table 1-11. Then, Table 1-12 through Table 1-15 present the event case demands for the packaged event cases described in the Event Case discussion above. This section covers Alternative 4 and Alternative 5.

1.4.2.1 Event Venue Transportation Demands

Table 1-11
Seattle Center Area Alternatives Event Transportation Demands

Event Venue	Attendance	% Auto	AVO	Total Auto Demand (Parking)	Weekday PM Peak Hour			
					% Total Inbound Demand	In	Out	Total
2018 Horizon Year								
Existing KeyArena[1]	12,000	85%	3.0	3,400	20	680	170	850
Existing Memorial Stadium[1]	5,000	85%	3.0	1,417	20	283	71	354
Arena[2]	20,000	82%	2.4	6,833	30	2,050	137	2,187
2030 Horizon Year								
Existing KeyArena	12,000	82%	3.0	3,280	20	656	164	820
Existing Memorial Stadium	5,000	82%	3.0	1,367	20	273	68	341
Arena	20,000	79%	2.4	6,583	30	1,975	132	2,107

Notes: AVO = average vehicle occupancy

1. KeyArena and Memorial Stadium assumptions based on *Seattle Center Master Plan EIS*, January 2008.
2. Arena auto mode split based on *Seattle Arena Multi-Modal Access & Parking Study,* May 2012 and Mariners 2001 Travel Survey. AVO based on research of available data for WNBA, NBA, and NHL Arena events. Percent inbound demand based on parking accumulation data for SoDo area garages and data from other NBA facilities.

The following provides a summary of the assumptions for each venue.

KeyArena – Background Events (12,000 Attendance): For purposes of the No Action event analysis cases and evaluating the impacts of Alternatives 4 and 5, an event with a 12,000-person attendance was assumed. This assumed level of attendance is based on a review of past events at the facility from information provided by the Seattle Center. The capacity of the KeyArena is noted to be approximately 17,072. Only a limited number of maximum capacity events occur throughout the year. Mode split and percent arrival assumptions for the event traffic was based on information published in the Seattle Center Plan EIS and consideration of regional transportation improvement projects. This analysis assumes an 85 percent auto mode split for the 2018 horizon year, an 82 percent auto mode split for the 2030 horizon year, AVO of 3.0, and 20 percent arrival of event traffic during the weekday PM peak hour.

Memorial Stadium – Background Events (5,000 Attendance): For purposes of the No Action and Alternatives 4 and 5 event analysis cases an event with a 5,000-person attendance was assumed at Memorial Stadium. Mode split and percent arrival assumptions for the event traffic was based on information published in the Seattle Center Plan EIS and consideration of regional transportation improvement projects. This analysis assumes an 85 percent auto mode split for the 2018 horizon year, an 82 percent auto mode split for the 2030 horizon year, AVO of 3.0, and 20 percent arrival of event traffic during the weekday PM peak hour. As compared to the larger 20,000 attendance levels at the arena, a lower peak hour percentage was assumed due to the lower attendance levels and the nature of the events that occur in Memorial Stadium.

Arena (20,000 Attendance): As noted in the description of the Stadium District alternatives discussion, there are a number of event types that are likely to occur in the Proposed Arena. The event cases analyzed within this report focus on a NBA basketball game with attendance levels of 20,000 for both Alternative 4 and Alternative 5. For the 2018 horizon year, an auto mode split of 82 percent was used. This represents a slightly higher increase in auto usage as compared to the Stadium District alternatives. This is mainly due to the level of transit connectivity afforded in the Seattle Center area through various transit modes. Average vehicle occupancies of 2.4 for the event-related traffic was consistent with the Alternative 2 and Alternative 3 analyses. For the 2030 analysis, the auto mode split was reduced from 82 percent to 79 percent. This decrease was assumed in response to increases in transit service as assumed in the regional plans.

1.4.2.2 Event Case Transportation Demands

The following tables summarize the event case transportation demands for each Seattle Center Area Alternative, for all event cases, for 2018 and 2030 conditions.

Table 1-12
Seattle Center Area Event Case Transportation Demands
Alternative 4 (2018)

			PM Peak Hour		
Event Case	**Attendance**	**Total Parking Demand**	**In**	**Out**	**Total**
Case K1 (Arena Only)					
Total With Proposal Events	*20,000*	*6,833*	*2,050*	*137*	*2,187*
- Proposed Arena	20,000	6,833	2,050	137	2,187
- Memorial Stadium	0	0	0	0	0
Less No Action Events	*12,000*	*3,400*	*680*	*170*	*850*
- Existing KeyArena	12,000	3,400	680	170	850
- Memorial Stadium	0	0	0	0	0
Net Increase	**8,000**	**3,433**	**1,370**	**-33**	**1,337**
Case K2 - Dual Event (Arena+Memorial Stadium)					
Total With Proposal Events	*25,000*	*8,250*	*2,333*	*208*	*2,541*
- Proposed Arena	20,000	6,833	2,050	137	2,187
- Memorial Stadium	5,000	1,417	283	71	354
Less No Action Events	*17,000*	*4,817*	*963*	*241*	*1,204*
- Existing KeyArena	12,000	3,400	680	170	850
- Memorial Stadium	5,000	1,417	283	71	354
Net Increase	**8,000**	**3,433**	**1,370**	**-33**	**1,337**

Table 1-13
Seattle Center Area Event Case Transportation Demands
Alternative 4 (2030)

Event Case	Attendance	Total Parking Demand	PM Peak Hour In	PM Peak Hour Out	PM Peak Hour Total
Case K1 (Arena Only)					
Total With Proposal Events	*20,000*	*6,583*	*1,975*	*132*	*2,107*
- Proposed Arena	20,000	6,583	1,975	132	2,107
- Memorial Stadium	0	0	0	0	0
Less No Action Events	*12,000*	*3,280*	*656*	*164*	*820*
- Existing KeyArena	12,000	3,280	656	164	820
- Memorial Stadium	0	0	0	0	0
Net Increase	**8,000**	**3,303**	**1,319**	**-32**	**1,287**
Case K2 - Dual Event (Arena+Memorial Stadium)					
Total With Proposal Events	*25,000*	*7,950*	*2,248*	*200*	*2,448*
- Proposed Arena	20,000	6,583	1,975	132	2,107
- Memorial Stadium	5,000	1,367	273	68	341
Less No Action Events	*17,000*	*4,647*	*929*	*232*	*1,161*
- Existing KeyArena	12,000	3,280	656	164	820
- Memorial Stadium	5,000	1,367	273	68	341
Net Increase	**8,000**	**3,303**	**1,319**	**-32**	**1,287**

Table 1-14
Seattle Center Area Event Case Transportation Demands
Alternative 5 (2018)

Event Case	Attendance	Total Parking Demand	PM Peak Hour In	PM Peak Hour Out	PM Peak Hour Total
Case M1 (Arena Only)					
Total With Proposal Events	*20,000*	*6,833*	*2,050*	*137*	*2,187*
- Proposed Arena	20,000	6,833	2,050	137	2,187
- KeyArena	0	0	0	0	0
Less No Action Events	*5,000*	*1,417*	*283*	*71*	*354*
- Existing Memorial Stadium	5,000	1,417	283	71	354
- KeyArena	0	0	0	0	0
Net Increase	**15,000**	**5,416**	**1,767**	**66**	**1,833**
Case M2 - Dual Event (Arena+KeyArena)					
Total With Proposal Events	*32,000*	*10,233*	*2,730*	*307*	*3,037*
- Proposed Arena	20,000	6,833	2,050	137	2,187
- KeyArena	12,000	3,400	680	170	850
Less No Action Events	*17,000*	*4,817*	*963*	*241*	*1,204*
- Existing Memorial Stadium	5,000	1,417	283	71	354
- KeyArena	12,000	3,400	680	170	850
Net Increase	**15,000**	**5,416**	**1,767**	**66**	**1,833**

Table 1-15
Seattle Center Area Event Case Transportation Demands
Alternative 5 (2030)

Event Case	Attendance	Total Parking Demand	PM Peak Hour In	PM Peak Hour Out	PM Peak Hour Total
Case M1 (Arena Only)					
Total With Proposal Events	*20,000*	*6,583*	*1,975*	*132*	*2,107*
- Proposed Arena	20,000	6,583	1,975	132	2,107
- KeyArena	0	0	0	0	0
Less No Action Events	*5,000*	*1,367*	*273*	*68*	*341*
- Existing Memorial Stadium	5,000	1,367	273	68	341
- KeyArena	0	0	0	0	0
Net Increase	**15,000**	**5,216**	**1,702**	**64**	**1,766**
Case M2 - Dual Event (Arena+KeyArena)					
Total With Proposal Events	*32,000*	*9,863*	*2,631*	*296*	*2,927*
- Proposed Arena	20,000	6,583	1,975	132	2,107
- KeyArena	12,000	3,280	656	164	820
Less No Action Events	*17,000*	*4,647*	*929*	*232*	*1,161*
- Existing Memorial Stadium	5,000	1,367	273	68	341
- KeyArena	12,000	3,280	656	164	820
Net Increase	**15,000**	**5,216**	**1,702**	**64**	**1,766**

1.4.3 General Study Areas

The study areas for the Stadium District, Seattle Center's KeyArena, and Memorial Stadium Alternatives were developed based on a review of previous studies, planned transportation improvements, comments received during the scoping process, location of major parking facilities, and key travel corridors serving the respective sites. Figure 1–1 (on page 1-2) illustrates the general study areas defined for the analysis. More detailed figures showing the study area intersections and parking-specific study areas are included in subsequent sections.

1.4.4 Document Structure and Organization

This Technical Appendix is organized into three primary sections:

- **Introduction –** Describes the alternatives and universal assumptions regarding analysis horizon years, event analysis cases, and related event case transportation demands.

- **Stadium District Alternatives –** Each element of the transportation environment is discussed in its entirety. Elements of the transportation environment include:
    1. *Street System*
    2. *Public Transportation*
    3. *Pedestrian Travel*
    4. *Bicycle Travel*
    5. *Traffic Volumes*

6. *Traffic Operations*
7. *Freight and Goods Movement*
8. *Parking*
9. *Safety*

- **Seattle Center Area Alternatives –** This section is organized the same as the Stadium District Alternatives outlined above:
    1. *Street System*
    2. *Public Transportation*
    3. *Pedestrian Travel*
    4. *Bicycle Travel*
    5. *Traffic Volumes*
    6. *Traffic Operations*
    7. *Freight and Goods Movement*
    8. *Parking*
    9. *Safety*

Within the discussion of the transportation environment elements, the organization generally follows this outline:

- Methodology – The approach taken to evaluate the element of the environment
- Affected Environment (*existing conditions*)
- No Action (*Alternative 1*)
- Impacts of the Alternatives
- Mitigation Measures
- Secondary and Cumulative Impacts
- Significant Unavoidable Adverse Impacts

2.0 STADIUM DISTRICT ALTERNATIVES (ALTERNATIVES 2 AND 3)

Within the Stadium District, the proposed Seattle Arena would be located at 1700 – 1st Avenue S. on the northeast corner of the 1st Avenue S. / S. Holgate Street intersection. Figure 2–1 shows the study area defined for the Stadium District alternatives. The analysis area was determined in consideration of the primary travel patterns to and from the Stadium District in SoDo, as well as the primary parking areas. The study area generally extends from E. Marginal Way to the west, Interstate 5 (I-5) to the east, Madison Street to the north, and S. Spokane Street to the south. The ensuing transportation analysis fully encompasses these corridors and includes an evaluation of 64 study intersections inclusive of regional access points to the freeway System. This section provides an overview of the current transportation infrastructure serving the Stadium District area and provides and identifies changes resulting from planned and funded projects, as well as any changes proposed by the development alternatives.

2.1 Street System

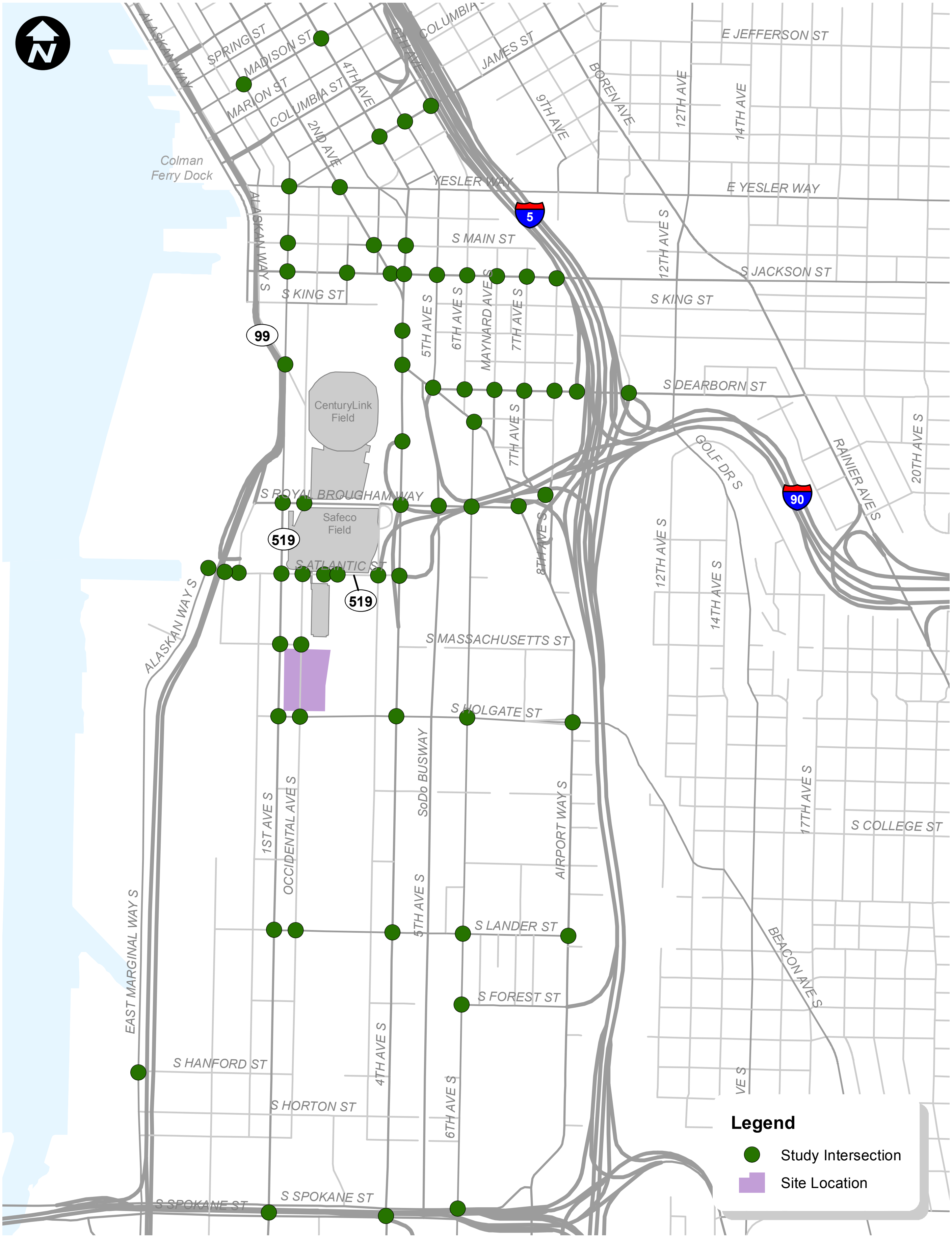
2.1.1 Methodology

The general approach to the evaluation of street system impacts included:

- Inventory of existing roadway infrastructure to determine the current condition of the street system.
- Identification of future transportation projects that would be constructed prior to project completion.
- Evaluation of street system impacts considering three changes to the street network proposed or required as a result of Alternatives 2 and 3.

2.1.2 Affected Environment

Regional Access: Regional access to the study area is provided primarily via Interstate 90 (I-90) to the east and I-5 and SR 99 to the north and south. Roadways in the immediate vicinity of the Stadium District site consist mainly of principal and minor arterials with traffic signals at major intersections. Table 2-1 summarizes the characteristics of major corridors within the study area, highlighting the roadway classification, speed limit, number of lanes, and general characterization of the non-motorized facilities. The primary routes providing north-south vehicular access in the site vicinity are Alaskan Way S., 1st Avenue S., and 4th Avenue S. East-west circulation is provided along S. Royal Brougham Way, S. Atlantic Street (Edgar Martinez Drive), S. Massachusetts Street, S. Holgate Street, and S. Lander Street. There is a direct access ramp from 4th Avenue S. at S. Atlantic Street to I-90 and I-5. The main transit corridor in the site vicinity is the SoDo Busway along 5th Avenue S., although a large number of buses travel along 1st Avenue S. and 4th Avenue S., near the Stadium District site.



Stadium District Study Intersections

Seattle Arena

FIGURE
2-1

transpoGROUP

Rail crossings: There are a number of rail facilities, both mainline tracks and tail tracks in the area resulting in numerous at-grade crossings along both S. Holgate Street and S. Lander Street. A comprehensive discussion of the rail facilities and freight activity is included in the Freight and Goods section. Notably, the S. Holgate Street railroad crossings extend from immediately east of the Arena to west of 3rd Avenue, a distance over 500 feet of intermittent track crossings.

Table 2-1
Stadium District Existing Street System Summary

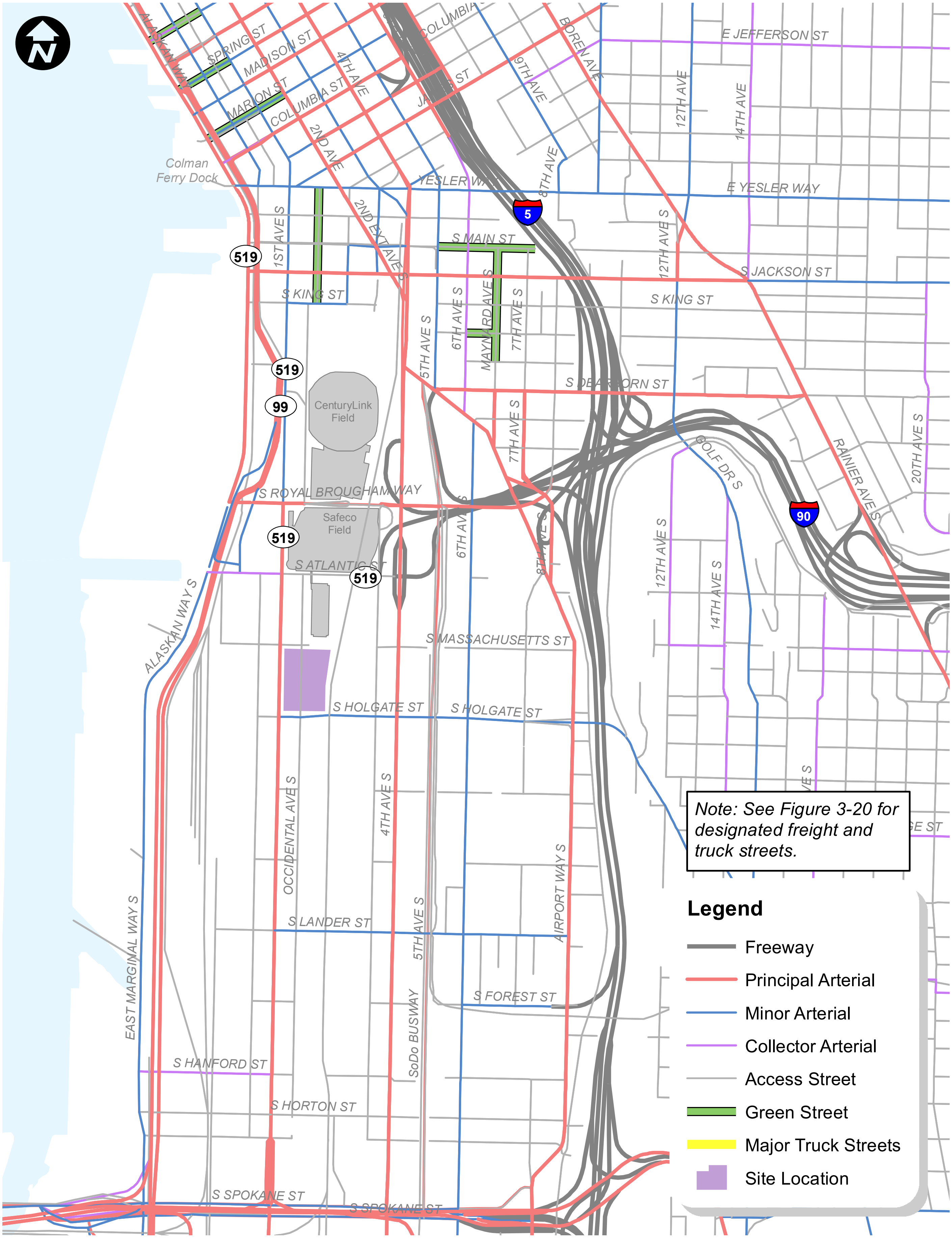
Roadway	Arterial Classification	Posted Speed Limit	Number of Travel Lanes	Parking?	Sidewalks?	Bicycle Facilities?
1st Ave S. (South of S. Royal Brougham Way)	Principal Arterial	35 mph	5 lanes	Most Blocks	Yes	Yes
1st Ave S. (North of S. Royal Brougham Way)	Minor Arterial	30 mph	4 to 5 lanes	Most Blocks	Yes	Yes
Occidental Ave S.	Access Street	25 mph	2 lanes	Yes	Some Blocks	No
S. Lander St	Minor Arterial	30 mph	5 lanes	Most Blocks	Yes	Yes
4th Ave S.	Principal Arterial	35 mph	6 lanes	Most Blocks	Yes	No
6th Ave S.	Minor Arterial	30 mph	2 lanes	Most Blocks	Most Blocks	Yes
Airport Way S.	Principal Arterial	30 to 35 mph	4 to 5 lanes	Few Blocks	Most Blocks	Yes
S. Holgate St (East of 4th Ave S.)	Minor Arterial	35mph	4 lanes	Some Blocks	Some Blocks	No
S. Holgate St (West of 4th Ave S.)	Minor Arterial	30 mph	4 lanes	Most Blocks	Some Blocks	No
S. Atlantic St (West of 1st Ave S.)	Collector Arterial	30 mph	4 lanes	Yes	Yes	No
S. Atlantic St (East of 1st Ave S.)	Access Street	30 mph	4 lanes	No	Yes	No
S. Royal Brougham Way	Principal Arterial/ Access Street	35 mph	4 lanes	Most Blocks	Yes	Most Blocks
S. Massachusetts	Access Street	25 mph	2 lanes	Most Blocks	Some Blocks	No
S. Jackson St	Principal Arterial	30 mph	2 to 4 lanes	Few Blocks	Yes	Yes
Yesler Way	Minor Arterial	30 mph	2 lanes	Yes	Yes	Yes
James St	Principal Arterial/ Minor Arterial	30 mph	2 to 4 lanes	Most Blocks	Yes	No
2nd Ave	Principal Arterial	35 mph	3 lanes	Most Blocks	Yes	Yes

Roadway	Arterial Classification	Posted Speed Limit	Number of Travel Lanes	Parking?	Sidewalks?	Bicycle Facilities?
2nd Ext Ave S.	Principal Arterial	35 mph	3 lanes	Most Blocks	Yes	Yes

Event Function – Event Traffic Control Plans: Figure 2–2 shows the street functional classifications for the study area. The effective use of several intersections and roadways segments change between without and with event conditions due to closures and restrictions implemented as part of the Traffic Control Plans (TCPs) for Mariners, Seahawks, and Sounders FC games. For example, S. Occidental Avenue between S. Massachusetts Street and S. Holgate Street is closed to all vehicles except service and emergency vehicles prior to a Mariners game. Figure 2–3 illustrates the locations included in the existing TCPs for Safeco Field and CenturyLink Field. The TCPs employed are part of the transportation management for events in the Stadium District and are a function of the event location as well as anticipated attendance levels and associated auto demands. The Seahawks TCPs impacts more locations than the Sounders FC or Mariners due to the higher attendance levels.

Freight Designations: Several of the arterials within the SoDo area have freight designations. These designations include truck streets and seaport and intermodal connectors. These routes are used by freight operators to access Port of Seattle facilities, intermodal rail yards, and other industrial uses in the SoDo area. Those designations are discussed further in the Freight and Goods section of the report and also shown on Figure 2–87.

Occidental Avenue S. Use: Occidental Avenue S. is proposed to be vacated as part of either Alternative 2 or 3. The proposed vacation would likely impact the functions described herein. Occidental Avenue S. and S. Massachusetts Street provide local access in the immediate site vicinity. The primary functions of Occidental Avenue S. include secondary access to / from the Safeco Field parking garage, an alternative corridor to 1st Avenue S. for north / south travel, access route for commercial business between S. Holgate Street and S. Atlantic Street, and charter bus staging for Safeco Field events. S. Massachusetts Street links also provides access to the Safeco Field parking garage, commercial businesses between 1st and Occidental Avenues S. and along Occidental Avenue S.

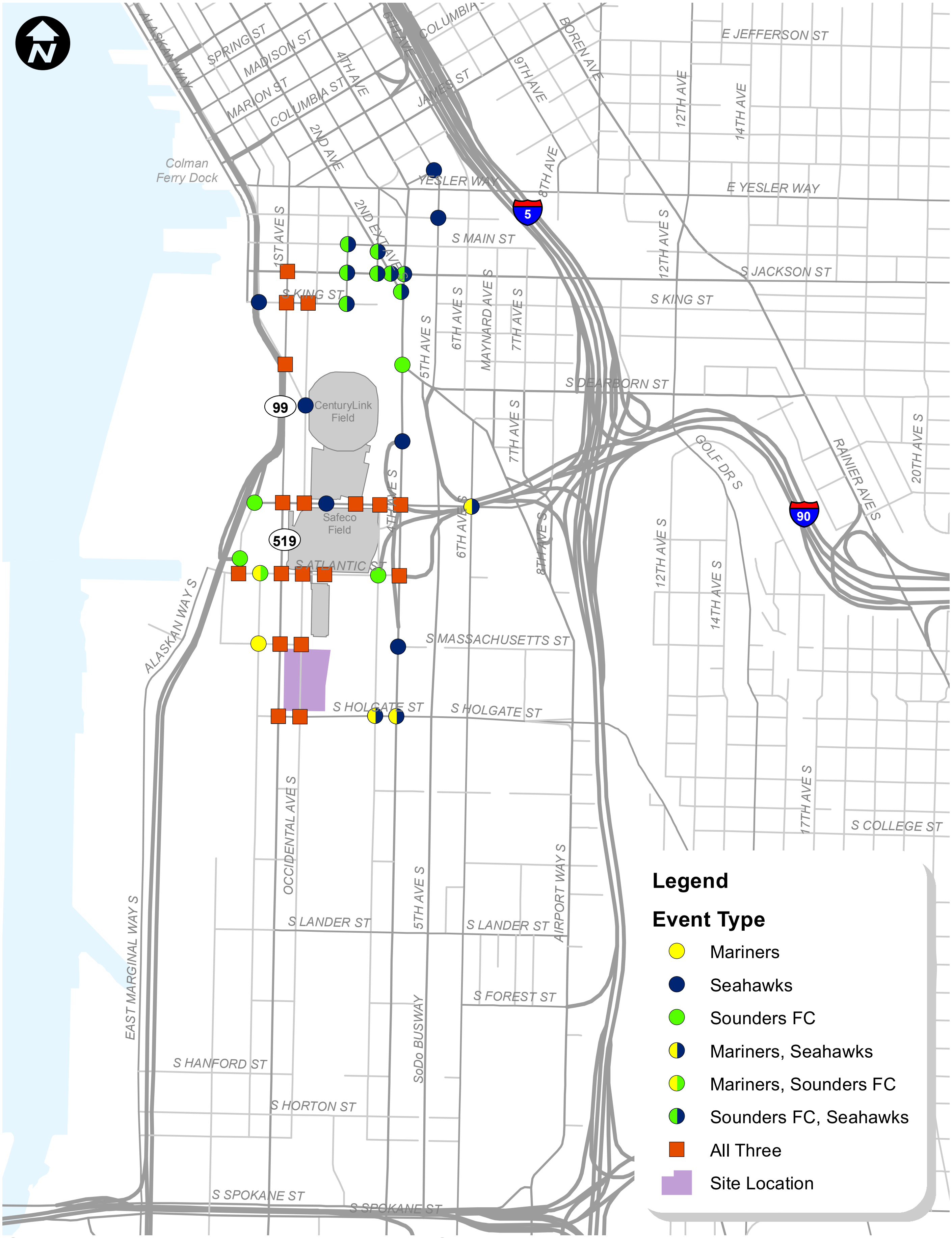


Stadium District Street System

Seattle Arena

FIGURE
2-2

transpoGROUP



Stadium District Intersections Subject to Traffic Control Plans

Seattle Arena

FIGURE
2-3

transpoGROUP

2.1.3 Impacts of No Action Alternative

The study area is undergoing major transportation system changes. A review of local and regional capital improvement programs and long-range transportation plans was conducted to determine planned funded and unfunded transportation projects that would impact the study area. The review included, but was not limited to, transportation plans from the Washington State Department of Transportation (WSDOT), City of Seattle, King County, ST, and the Port of Seattle. Table 2-2 provides a summary of key future transportation projects in the study area. In addition, the table provides an understanding of how these transportation projects were incorporated into the No Action Alternative evaluation. Many of the major street system projects impacting vehicular movements would be completed by 2018. Projects slated to be completed beyond 2018 are primarily related to the non-motorized and transit system and would likely encourage a decrease in dependence on the auto mode, during both typical commuter periods, as well as for events in the Stadium District. Following the tables is a more detailed discussion on how specific transportation projects impact the study area.

Table 2-2
Stadium District: Key Study Area Planned Transportation Projects

Project Description	Responsible Agency	Expected Completion Date	Funded?[1]	Assumed in Analysis?[2]	
				2018	2030
***Alaskan Way Viaduct Replacement*:** SR 99 viaduct replaced with a tunnel between S. Royal Brougham Way and Mercer Street.	WSDOT	2017	Yes	✓	✓
***SR 520 Bridge Replacement*:** Construction of a new SR 520 floating bridge with two general purpose lanes and one HOV / transit lane per direction. Transit and non-motorized projects between SR 202 and I-5. The eastside and floating bridge segments are funded. The westside projects in the Montlake Interchange vicinity are not funded.	WSDOT	2015	Partial	✓	✓
Mercer Corridor: Convert Mercer Street, Roy Street, and Valley Street to two-way operations and improve non-motorized access.	SDOT	2015	Yes	✓	✓
First Hill Streetcar: Two-mile streetcar line serving Capitol Hill, First Hill and International District with connections to Link Light Rail, Sounder commuter rail and bus service.	SDOT	2014	Yes	✓	✓

Table 2-2 (Continued)
Stadium District: Key Study Area Planned Transportation Projects

Project Description	Responsible Agency	Expected Completion Date	Funded?[1]	Assumed in Analysis?[2]	
				2018	2030
Link Light Rail: Extension of the regional light rail system. All segments are funded in ST2, but the year of completion may vary depending on revenue available to fund construction. The segments include:	Sound Transit				
North—University District and Capitol Hill		2016	Yes	✓	✓
North—Northgate		2021	Yes		✓
North—Lynnwood		2023	Yes		✓
East—Bellevue and Redmond		2023	Yes		✓
South—Extension to S. 200th Street		2016	Yes	✓	✓
South—Extension to Kent-Des Moines Road		2023	Yes		✓
King Street Station Multimodal Terminal: Improve station access including opening of the Grand Stairs to connect the upper Jackson plaza and King Street Station entrance and a new entrance on Jackson plaza. These connections will transform the station into a transportation hub with easy access to express buses, commuter trains and light rail service.	SDOT	2013	Yes	✓	✓
Elliott Bay Seawall Replacement: Replacement of the existing seawall along the Seattle waterfront from S. Washington Street to Broad Street.	SDOT	2019	Yes		✓
Waterfront Seattle: This project creates a continuous public waterfront between S. King Street and Bell Street and includes the design and construction of the new surface Alaskan Way and Elliott Way arterial streets.	SDOT	2014 and beyond	Partial	✓	✓
Southwest Transit Pathway: This project creates a new transit corridor on Alaskan Way and Columbia Street with a pair of bus stops near the Stadium District to replace service currently on the Alaskan Way Viaduct	SDOT / King County Metro Transit	2016	Yes	✓	✓
Convention Place TOD: Expansion of the Washington State Convention Center to include a reconfiguration or relocation of transit access, layover and passenger amenities at Convention Place Station	King County Metro Transit / King County	Unknown	No		

Table 2-2 (Continued)
Stadium District: Key Study Area Planned Transportation Projects

Project Description	Responsible Agency	Expected Completion Date	Funded?[1]	Assumed in Analysis?[2]	
				2018	2030
Rapid Ride: Bus rapid transit service in six corridors (A through F) and the potential to expand into additional corridors in the future. Service has been initiated in four of the six corridors, and the E and F Lines are expected to start service in 2014.	King County Metro Transit	2014	Yes	✓	✓
Electric Trolleybus Fleet Replacement: King County Metro Transit will replace its fleet of 159 trolleybus with modern low-floor vehicles providing more capacity on these routes	King County Metro Transit	2015	Yes	✓	✓
Industrial Way Direct Access Ramps: This project would provide a direct connection from I-5 to and from the south to the SoDo Busway.	King County Metro Transit / WSDOT	Unknown	No		
Downtown Neighborhood Projects: Installation of pedestrian countdown signals and sidewalk repairs at the 1st Avenue S. intersections with S. Main Street and S. King Street.	SDOT	2013	Yes	✓	✓
S. Lander Street Grade Separation: This project grade separates S. Lander St. roadway and the BSNF mainline railroad tracks between 1st Avenue S. and 4th Avenue S.	SDOT	Unknown	No		

1. "Yes" means the project is fully funded for construction, "partial" means the project has some, but not complete funding for construction, and "no" means the project does not have any construction funding.
2. A check indicates that the project was assumed in the analysis related to the horizon year.

Planned projects assumed in the 2018 and 2030 analyses are described in more detail in the following sections.

2.1.3.1 2018 Planned Improvements

The planned transportation projects assumed to be completed by 2018 and key features of each project are described in this section:

- **Alaskan Way Viaduct Replacement – South Portal**: This project connects the tunnel to SoDo with other key study area projects including:
  - **S. Royal Brougham Way and S. King Street Tunnel Access.** New connections to the tunnel with access to the northbound on-ramp and southbound off-ramp at the S. Royal Brougham Way / E. Frontage Road intersection and access to the northbound off-ramp and southbound on-ramp at the Alaskan Way S. / S. Dearborn Street intersection.
  - **Grade separation near S. Atlantic Street (Little 'h').** An overpass will be constructed near S. Atlantic Street between Colorado Avenue S. and E. Marginal Way S. connecting at the Alaskan Way S. / S. Dearborn Street intersection and along S. Atlantic Street at the Alaskan Way S. and Colorado Avenue S. intersections. It will provide an additional east-west connection and allow access when roadways are blocked by railroad cars.
  - **Pedestrian / Bike Trails.** Two multi-use paths are being constructed – Port Side Trail along the west side of the reconfigured Alaskan Way S. and the City Side Trail replacing the existing trail along the east side of Alaskan Way S. and extending from S. King Street to S. Atlantic Street.
  - **Frontage Roads.** East and west SR 99 frontage roads will be provided to help circulate traffic. These roads will connect with S. Atlantic Street and S. Royal Brougham Way to the east and S. Atlantic Street and S. Dearborn Street to the west. S. Royal Brougham Way will no longer connect between Alaskan Way S. and 1st Avenue S. In addition to the Frontage Roads, the existing Railroad Way S. will be replaced with a new one-way northbound-only street connecting S. Dearborn Street and Alaskan Way S.
- **North Link Light Rail – University:** This extension will connect the UW and Capitol Hill neighborhood to downtown Seattle via the Westlake Station. The project includes two stations; one near Seattle Central Community College on Capitol Hill and one near Husky Stadium. Construction is underway and service is anticipated in 2016.
- **South Link Light Rail – S. 200th Extension:** This extension will add one additional station and a new park-and-ride facility to the system south of SeaTac Airport. The project is scheduled to open for service in 2016.

- **First Hill Streetcar:** The project is a new streetcar line along S. Jackson Street, 14th Avenue, Yesler Way, and Broadway connecting Capitol Hill to Pioneer Square. The line will operate 7 days a week with 10-minute headways during the weekday peak commute hours and 15-minute headways during other periods. Service is anticipated by spring of 2014 with more than 3,000 trips per day expected. This project will also install a two-way cycle track along Broadway between Yesler Way and Denny Way.

2.1.3.2 2030 Planned Improvements

Transportation projects assumed as part of the 2030 evaluation for the SoDo study area include:

- **Waterfront Seattle:** This project extends from S. King Street to Bell Street and focuses on creating a continuous public waterfront along the edge of the City bordering Elliott Bay. The project is currently being designed and includes:
    - New Alaskan Way S. surface arterial street with flex lanes to accommodate transit and / or ferry traffic during peak periods.
    - New Elliott Way arterial connection from Alaskan Way to the Elliott Avenue / Western Avenue one-way couplet north of Pike Place Market.
    - Transit plaza and enlarged sidewalk along Columbia Street.
    - Replacement of the Marion Street Pedestrian Bridge with a wider pedestrian bridge.
    - Pedestrian and bicycle facilities throughout the Waterfront corridor.
    - Conversion of the existing Railroad Way S. into a pedestrian street.
    - Improving east-west pedestrian connections at various locations.
    - Construction of a majority of this project cannot begin until the Elliott Bay Seawall is built and the Alaskan Way Viaduct is demolished. The current estimate is for construction of the Waterfront Seattle project to begin in 2016; however, some individual projects could move forward earlier such as the Railroad Way S. pedestrian street and east-west pedestrian connection projects.
- **Link Light Rail:** The regional light rail system is anticipated to extend beyond Seattle by 2030 with four extensions planned:
    - **Northgate (North):** The light rail will extend between the University extension and Northgate. The three locations where stations are planned are the U-District near NE 45th Street and Brooklyn Avenue NE, Roosevelt High School near 12th Avenue NE and NE 65th Street, and Northgate Mall / Transit Center near NE 103rd Street. This project is under construction and service is expected in 2021.

- **Lynnwood (North):** This segment will connect from the northern point of the Northgate extension and terminate in Lynnwood. Several stations are planned along the route at NE 130th / 145th / 155th Street in Seattle / Shoreline, NE 185th Street in Shoreline, 236th Street SW in Mountlake Terrace, and 200th Street SW in Lynnwood which follows the I-5 corridor. Construction would begin in 2018 with service expected to begin in 2023.
- **East:** This extension will link Bellevue and Mercer Island to the International District / Chinatown Station in Seattle. Several stations are planned along the route: Rainier Avenue S.; Mercer Island; South Bellevue, East Main, Bellevue Transit Center, Overlake Hospital, 120th Avenue NE, and 130th Avenue NE in Bellevue; and Overlake Village and Overlake Transit Center in Redmond. Construction is expected to begin in 2015 with service in 2023.
- **South:** This segment would extend from S. 200th Street in SeaTac to add one additional station at Kent-Des Moines Road in the vicinity of Highline Community College. The project is anticipated to open for service in 2023.

2.1.4 Impacts of Alternative 2

Construction impacts related to the street system would mostly occur on 1st and Occidental Avenues S. and S. Massachusetts and Holgate Streets adjacent to the site. A construction management plan would mitigate these impacts. The plan could include scheduling street closures and other disruptions to the street system during off-peak periods to minimize impacts to the system.

As part of Alternative 2, Occidental Avenue S. between S. Massachusetts and S. Holgate Streets would be vacated. Occidental Avenue S. currently provides secondary access to and from the Safeco Field parking garage, an alternative route for north-south travel, access to the commercial businesses, and charter bus staging area for Safeco Field events.

With development of Alternative 2, the businesses along Occidental Avenue S. between S. Holgate and S. Massachusetts Streets would be removed and the land would be redeveloped with the Seattle Arena. A private access road would be constructed east of the site allowing for continued local access to the Safeco Field parking garage (for both the 2018 and 2030 horizon years). This connection is only proposed to function during events that would use the garage. Traffic currently using Occidental Avenue S. as an alternate north-south route would shift to the parallel 1st Avenue S. corridor.

Other street system changes would occur along the project frontage with the reconstruction of curb faces and the removal of all driveways on 1st Avenue S. and S. Holgate Street. S. Massachusetts Street will also be realigned to the north between 1st and Occidental Avenues S. expanding the size of the pedestrian plaza on the north side of the Arena and eliminating the existing roadway offset at its intersection with 1st and Occidental Avenues S.

2.1.5 Impacts of Alternative 3

Construction impacts and mitigation related to development of Alternative 3 would be the same as described for Alternative 2.

No additional modifications to the street system are proposed under Alternative 3 than have been noted for Alternative 2.

2.1.6 Mitigation Measures

A complete summary of potential mitigation measures to be considered across all the Transportation Elements evaluated in this report is included in Chapter 4.0 of Appendix E. This summary includes identification of both programmatic measures and physical improvements. For each of the potential mitigation measures a designation of high to low influence was noted. The following identifies those potential mitigation measures considered to have a high influence on this transportation element. These potential mitigation measures are appropriate for both Alternative 2 and Alternative 3.

- North-South connection located on the east side of the project site, connecting S. Holgate Street to the private extension of S. Massachusetts Street
- Realignment of S. Massachusetts Street between 1st Avenue S. and Occidental Avenue
- Construction management plan
- Central construction coordinator
- Street and sidewalk closure detour plans (construction)

2.1.7 Secondary and Cumulative Impacts

There are no identified secondary or cumulative impacts associated with the modifications to the street system associated with Alternative 2 or 3, including the vacation of Occidental Avenue S. As noted the impacts associated with the rerouting of traffic currently using Occidental Avenue S. are addressed in the analysis of the primary impacts.

2.1.8 Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts were identified. Occidental Avenue between S. Massachusetts and Holgate Streets would be vacated, however its function serving Safeco Field garage access and access to the Safeco Field service and emergency vehicle access would be provided by the new north-south connection on the east side of the Arena, together with the enhanced alignment of S. Massachusetts Street between 1st and Occidental Avenues South.

2.2 Public Transportation

2.2.1 Methodology

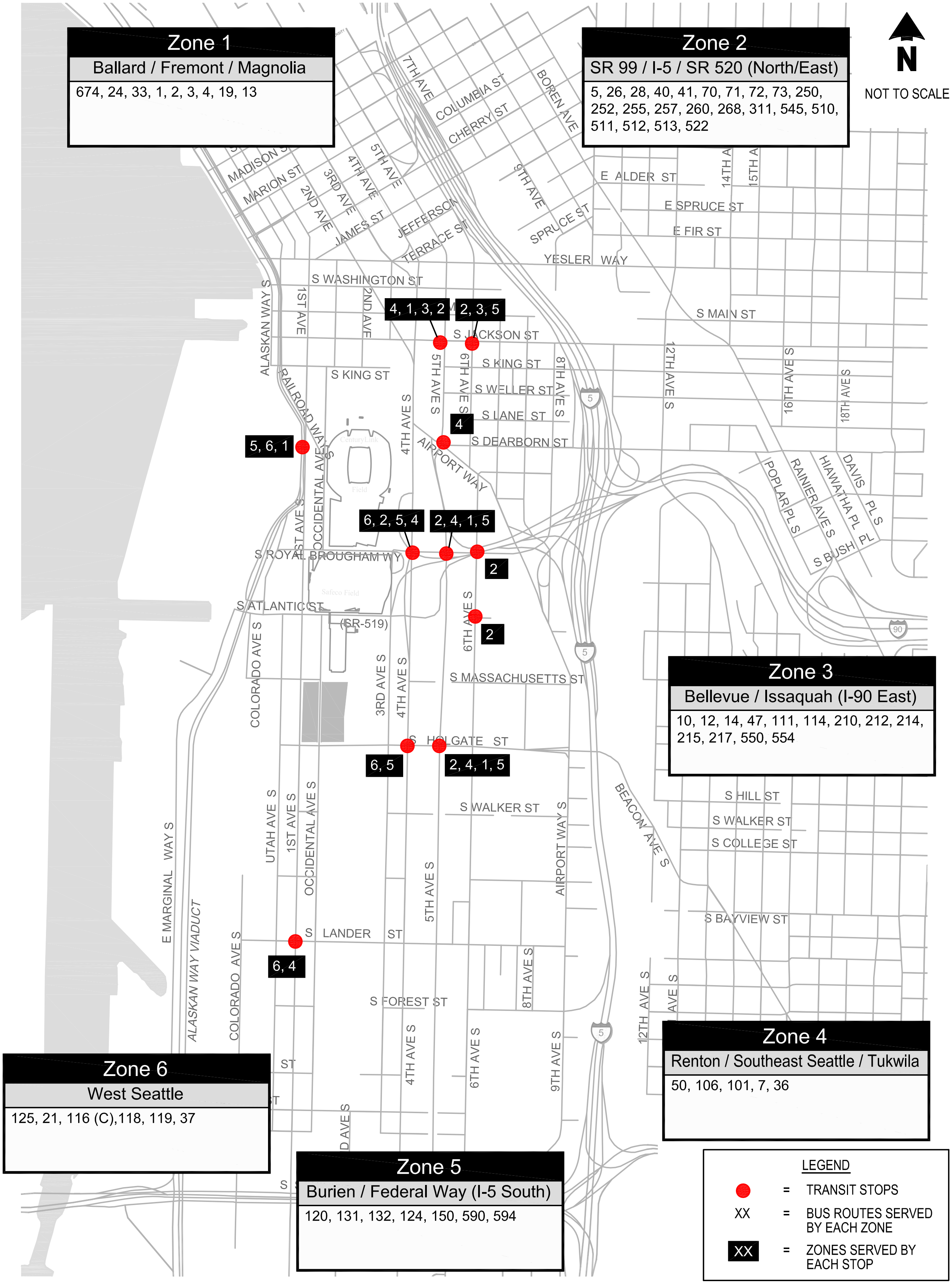
The general approach to the evaluation of public transportation impacts included:

- Determination of existing transit passenger capacity during pre-and post-event periods for weekday and weekend events
- Identification of future 2018 and 2030 growth in ridership and change in capacity
- Consideration of event ridership associated with event cases for No Action and Alternatives 2 and 3
- Evaluation of capacity needed to support Alternatives 2 and 3
- Consideration of speed and reliability under existing and future conditions

The analysis focuses on weekday event conditions because transit ridership and motorized volumes are highest during this timeframe; this provides a conservative estimate of transit capacity and reliability impacts. The following describes how transit capacity, ridership, and reliability was determined for the transit modes serving the Stadium District site.

2.2.1.1 Bus Transit

Existing Bus Ridership. Bus ridership and passenger capacity data was determined by identifying King County Metro Transit and ST buses in service from 5:00 to 7:00 PM to downtown (inbound) and 9:00 to 11:00 PM out of downtown (outbound) with bus stops near the Stadium District site. Figure 2–4 summarizes bus routes serving the Stadium District by roadway, stop location, and general downtown Seattle outbound service areas.



Stadium District Bus Routes

Seattle Arena

FIGURE
2-4

transpoGROUP

Passenger loads were calculated for buses operating inbound (to the Arena) from 5:00 to 7:00 PM and outbound (away from the Arena) from 9:00 to 11:00 PM. Data was provided by King County Metro Transit and ST, which reflects their Fall 2012 service changes. It was assumed that the 'average load at the most crowded point on the route' (King County Metro Transit) and 'boarding average' (Sound Transit) represented the number of people traveling on buses through SoDo. This is because the highest number of people on buses is generally in the downtown Seattle area. Also, inbound bus routes from the north or SR-520 (such as 510, 511, 522, and 545) would drop-off non-event passengers through downtown Seattle and have some capacity to pick-up additional patrons. The use of these buses and other buses with end/start points to the north of Stadium District site provides additional capacity to the system; however, conservatively, this was not factored into the analysis.

Total passenger capacity: King County Metro Transit bus capacity was calculated using their guidelines of multiplying the number of seats on a bus by a factor of 1.25 to account for standing passenger space. ST typically uses a factor of 1.5. Data provided by King County Metro Transit and ST included the number of seats on each bus or the type of bus serving the route by time of day and direction.

Speed and Reliability: Existing transit reliability information was provided by King County Metro Transit for most routes in the study area and some ST routes. Bus reliability is one indicator for how attractive bus transit is to people as a choice for making a trip. Reliability was reported as a percentage of on-time, early, or late buses. On-time performance information is measured at timepoints along each route. Timepoints are locations buses are scheduled to be at a specified time and the time the bus passes these points is recorded. The data provided was collected at all timepoints for all routes during a three to four month service period. King County Metro Transit considers a route on-time that is no more than one minute early to no more than five minutes late. Buses that are more than 10 minutes early or 30 minutes late are not included in the analysis. This data was used to determine the reliability of buses to meet schedules. Bus reliability is one indicator for how attractive bus transit is to people as a choice for making a trip.

Buses in the Stadium District generally travel in mixed flow lanes except within the SoDo Busway; therefore, an assessment of travel speed and time is provide in the Traffic Operations section with the evaluation of key corridors.

2018 Bus Ridership: The number of bus riders was anticipated to increase by approximately two percent annually from 2013 to 2018; this growth in ridership was based on Puget Sound Regional Council's (PSRC) Transportation 2040 long-range plan increase in transit ridership[6]. No change in bus passenger capacity (service levels) was assumed because of the uncertainty of transit funding. Although some transit agencies serving the Seattle area are experiencing service cuts, the trend for transit ridership is increasing; this could provide justification for increased or sustained transit service.

[6] Puget Sound Regional Council (PSRC). Transportation 2040. May 20, 2010. Accessed May 17, 2013 at http://www.psrc.org/assets/4847/T2040FinalPlan.pdf

2030 Bus Ridership: 2030 bus ridership was also calculated using an annual growth rate of approximately two percent based on PSRC's Transportation 2040 long-range plan. With the addition of ST Link Light Rail service, it was assumed that some of King County Metro Transit's service would no longer be offered along light rail routes. A comparison of buses operating during the analysis time periods (5:00 to 7:00 PM and 9:00 to 11:00 PM) and future Link Light Rail alignments was conducted. It was assumed that service hours for routes 41, 71, 72, 73, 510, 511 and 550 would be redistributed to other bus routes.

2.2.1.2 Light Rail

Existing Light Rail Ridership: ST provided passenger ridership and capacity data for the Spring 2012 service; this data contained information for average boardings, average maximum load, and total capacity for each train operating from 5:00 to 7:00 PM into Seattle and 9:00 to 11:00 PM out of Seattle for Central Link light rail. It was assumed each trains average maximum load would occur in downtown Seattle.

2018 Light Rail Ridership: Light rail ridership for Central Link was developed from the estimated boardings in the ST *2013 System Implementation Plan*[7]. ST estimates an average increase in ridership of approximately 8 percent annually from 2012 to 2015; from 2016 to 2018 this growth was projected to increase by approximately 54 percent annually. This represents an increase in weekday ridership from 2011 to 2018 of approximately 350 percent. The *System Implementation Plan* also identifies there would be fifteen two-car train sets and four three-car train sets during peak service. These train sets were assumed to provide service from 5:00 to 7:00 PM and from 9:00 to 11:00 PM proportionately.

2030 Light Rail Ridership: Light rail ridership, passenger capacity, and frequency of service was provided by ST for South Link, North Link, and East Link light rail services from 5:00 to 7:00 PM and from 9:00 to 11:00 PM.

2.2.1.3 Sounder Commuter Rail Service

Sounder commuter rail service was not included in this public transportation impact analysis based on the existing schedule; trains leave Seattle approximately every 30 minutes during the evening commuter period or pre-event. Only one train enters Seattle from Everett and two trains from Tacoma (Lakewood stop is not used) during the late evening. The last train south to Lakewood leaves Seattle at 6:15 PM and to Everett at 6:50 PM. Given that there is no return service for post-event, event attendees would need to find alternative modes; therefore, Sounder commuter rail service was not evaluated.

2.2.1.4 Washington State Ferry

The number and type of vessels serving Colman Dock were used to determine the available passenger capacity based on scheduled inbound (eastbound to Seattle) crossings from 5:00 to 7:00 PM and outbound (westbound to destination) crossings from 9:00 to 11:00 PM as follows:

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[7] Sound Transit (ST). 2013 Service Implementation Plan. December 20, 2012. Access April 30, 2013 at http://www.soundtransit.org/Documents/pdf/planning/2013_SIP_Final_20130212.pdf

Seattle-Bainbridge Island (Approximately 35-minute crossing time)

Outbound (Westbound—leaving Seattle):

- Monday through Friday
    - 9:00 PM – Wenatchee: Max passengers = 2,500; Max vehicles = 202
    - 10:05 PM – Tacoma: Max passengers = 2,500; Max vehicles = 202
    - 10:55 PM – Wenatchee
- Weekends and Holidays
    - 9:00 PM – Tacoma
    - 9:45 PM – Wenatchee
    - 10:40 PM – Tacoma
    - 11:15 PM – Wenatchee

Inbound (Eastbound—leaving Bainbridge Island):

- Monday through Friday
    - 4:35 PM – Wenatchee
    - 5:30 PM – Tacoma
    - 6:30 PM – Wenatchee
    - 7:10 PM – Tacoma
- Weekends and Holidays
    - 4:35 PM – Tacoma
    - 5:30 PM – Wenatchee
    - 6:30 PM – Tacoma
    - 7:10 PM – Wenatchee

Seattle- Bremerton (Approximately 60-minute crossing time)

Outbound (Westbound—leaving Seattle):

- Daily
    - 9:05 PM – Kitsap: Max passengers = 1,200; Max vehicles = 124
    - 10:30 PM – Chelan: Max passengers = 1,076; Max vehicles = 124

Inbound (Eastbound—leaving Bremerton)

- Daily
    - 5:30 PM – Kitsap
    - 6:45 PM – Chelan

The Wenatchee and Tacoma ferries operate on the Seattle to Bainbridge route and can carry a maximum of 2,500 passengers and 202 vehicles. The Kitsap and Chelan ferries operate on the Seattle to Bremerton route and can carry a maximum of 1,200 passengers and 124 vehicles.

Currently, WSF only collects ridership information for westbound (outbound) ferries at Colman Dock. The eastbound (inbound) ridership from 5:00 to 7:00 PM was estimated by assuming westbound passengers leaving from 7:00 to 9:00 AM (2012 counts) would return to Seattle from 5:00 to 7:00 PM. Also, this ridership was increased by ten percent to account for people traveling to Seattle for events not related to the Stadium District. It is anticipated that the passengers driving on the ferry to go to the Arena would be minimal given the cost of driving onto the ferry and parking at the event venue. For this analysis, it was assumed that of the 4 percent of the Arena attendees using the ferry 90 percent of ferry users would be walk-on passengers and the remaining 10 percent would drive their vehicles onto the ferry. Passengers driving were assumed to be either working in the downtown area or traveling to Seattle for a day trip while taking in an Arena event; therefore, parking demand would be encompassed in any background forecasts.

2.2.1.5 Monorail Transit

Discussions with Seattle Center Monorail staff and the existing monorail schedule were used to develop the passenger capacity and existing ridership for inbound trips to Seattle Center area from Westlake from 5:00 to 7:00 PM and the outbound trip to Westlake Center from 9:00 to 11:00 PM. Existing ridership was based on the average number of passengers typically using monorail during an average month (not the peak summer months when ridership can be higher).

2.2.1.6 Streetcar Transit

Existing Streetcar Ridership: Existing passenger capacity for the SLU Streetcar was provided by City of Seattle staff and by consulting the existing schedule. Currently, the SLU Streetcar operates from 6:00 AM to 9:00 PM, Monday through Thursday, and 6:00 AM to 11:00 PM on Friday and Saturday. Sunday service is operated from 10:00 AM to 7:00 PM. With the existing service, streetcar would not be available after events from Sunday to Thursday. Each streetcar can accommodate a maximum of 140 passengers. Existing ridership was provided by the City of Seattle, from which the average boarding, alightings, and passenger load for the Terry and Thomas and Westlake and Thomas stations were used. This information did not include detail for weekdays with and without an event at the existing venues.

2018 Streetcar Ridership: Operating hours and alignment details for the First Hill Streetcar were taken from the project's website[8] and the Environmental Checklist[9]. Passenger capacity was determined by review of these documents and discussion with City of Seattle staff.

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[8] http://www.seattlestreetcar.org/firsthill.htm

[9] Seattle Department of Transportation. *First Hill Streetcar Environmental Checklist*. September 29, 2010. Accessed April 20, 2013 at http://www.seattlestreetcar.org/about/docs/sepa/First%20Hill%20Streetcar%20SEPA%20Checklist.pdf

Ridership from 5:00 to 7:00 PM and 9:00 to 11:00 PM was estimated from the projected daily ridership developed by ST.[10] The observed July 2012 SLU Streetcar ridership was used as a basis for estimating First Hill Streetcar ridership during the weekday time periods.

2030 Streetcar Ridership: ST's ridership forecast, using its regional travel model in the initial planning for project, estimated a daily ridership of 3,000 to 3,500 passengers in 2030.[11] Currently, the SLU Streetcar has an average of 2,225 daily riders and during the peak summer months, ridership can exceed 3,000 weekday riders.[12] The observed July 2012 SLU Streetcar ridership (of approximately 2,500 daily passengers) was used to determine a ridership growth rate. It was calculated that an annual growth rate in ridership of approximately two percent would achieve the projected 2030 ridership of 3,250 passengers on the First Hill Streetcar. Ridership for the SLU Streetcar was also assumed to increase by approximately two percent per year.

2.2.2 Affected Environment

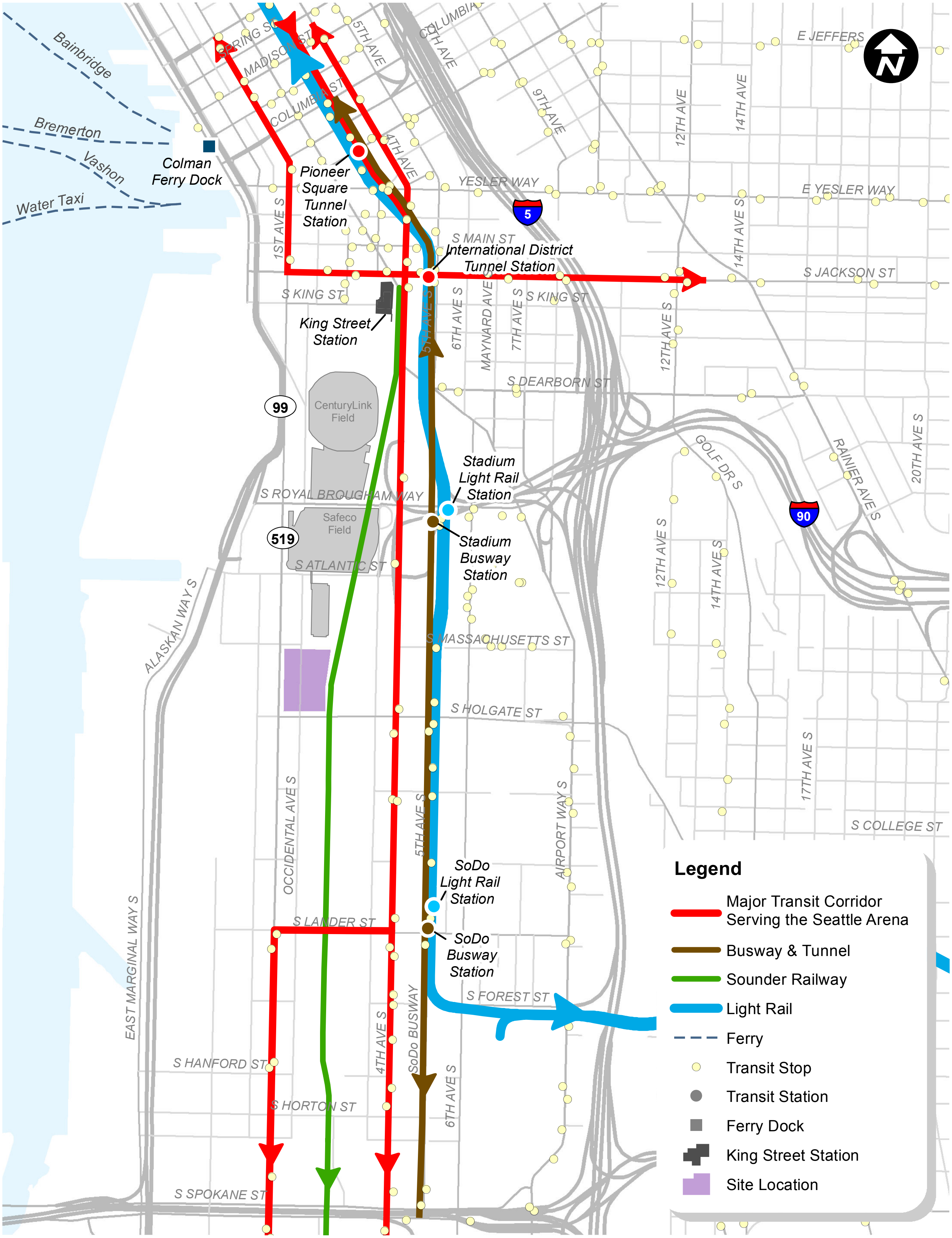
Regional public transit providers offer a number of ways for people to access the Stadium District including bus, light rail, commuter rail and ferry as illustrated on Figure 2–5.

The capacity of these transit services to transport people to and from the Stadium District varies by day (weekday or weekend service) and by the time of day (peak commuter period, evening services, etc.). This section summarizes the total passenger transit ridership and available passenger capacity to and from the Stadium District during a weekday evening; this includes inbound to downtown Seattle transit service from 5:00 to 7:00 PM and outbound from downtown Seattle transit service from 9:00 to 11:00 PM. The total and available passenger capacities for an average weekday on all available transit services are illustrated on Figure 2–6 and Figure 2–7.

[10] Sound Transit (ST). *First Hill Transit Connector Alternatives Summary Report*. April 17, 2007. Accessed April 20, 2013 at http://www.soundtransit.org/Documents/pdf/projects/link/north/FHTransitAltsRpt2007-04-17.pdf

[11] Sound Transit (ST). First Hill Transit Connector Alternatives Summary Report. April 17, 2007. Accessed April 20, 2013 at http://www.soundtransit.org/Documents/pdf/projects/link/north/FHTransitAltsRpt2007-04-17.pdf

[12] Seattle Streetcar website. FAQ About the Seattle Streetcar. Accessed April 20, 2013 at http://www.seattlestreetcar.org/faq.htm



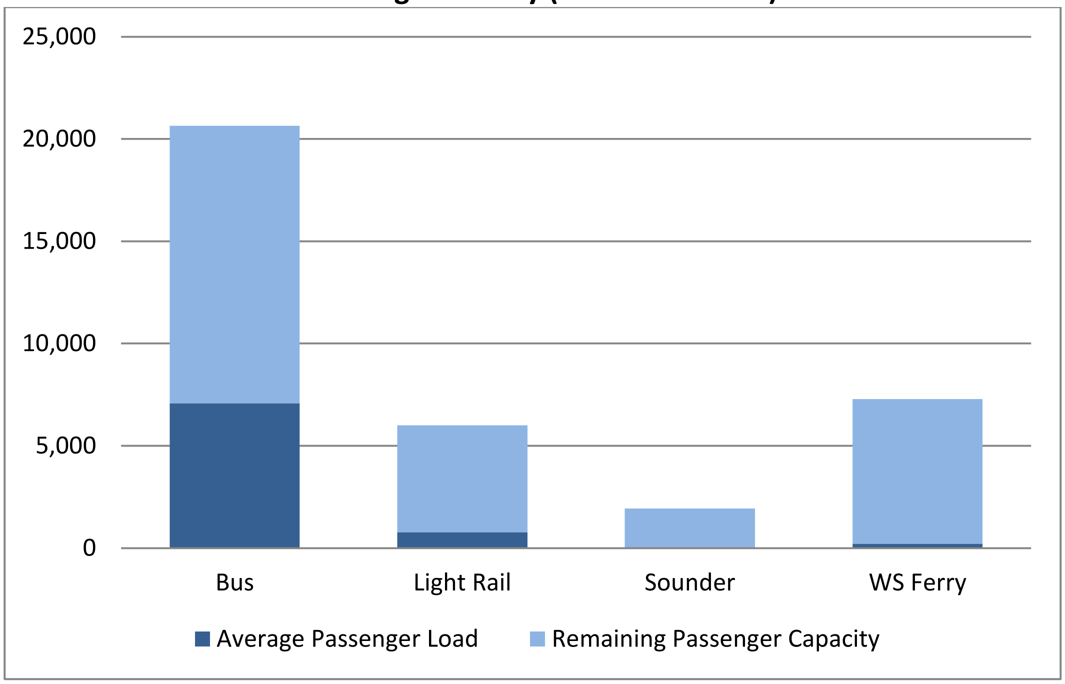
Stadium District Transit Facilities and Corridors

FIGURE 2-5

Seattle Arena

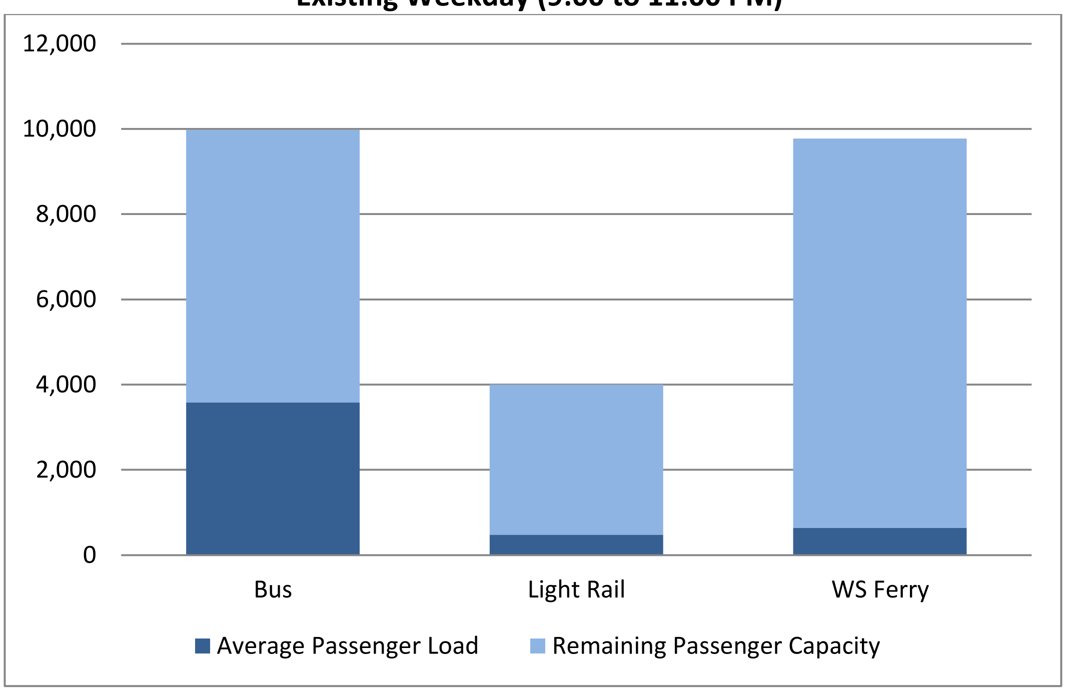
transpoGROUP

Figure 2–6 Stadium District Transit Passengers Inbound – Existing Weekday (5:00 to 7:00 PM)



Note: Remaining passenger capacity was not available for ST Sounder and King County Passenger Ferry service capacity was not included.

Figure 2–7 Stadium District Transit Passengers Outbound – Existing Weekday (9:00 to 11:00 PM)



Note: Remaining passenger capacity was not available for ST Sounder and King County Passenger Ferry service capacity was not included.

2.2.2.1 Bus Transit

Bus transit for the Stadium District is concentrated along SR 99 / Alaskan Way, 1st Avenue S., 4th Avenue S., SoDo Busway (5th Avenue S.), 6th Avenue S., and the International District Station (see Figure 2–5). Bus service to the Stadium District is currently provided by King County Metro Transit and ST. The primary bus stops serving the Stadium District are located on 4th Avenue S. and 5th Avenue S., near S. Royal Brougham Way and S. Lander Street.

The number of buses in service on routes through the Stadium District during the peak weekday afternoon commuter period is higher leaving the downtown Seattle core than entering. The number of buses in service in the late evening is less than the weekday afternoon commuter period. Bus headways, the time between buses at a bus stop, are shorter during peak weekday afternoon commuter periods (10 to 30 minutes) compared to late evening and weekend service (30 to 60 minutes).

<u>Bus Ridership</u>

Existing bus ridership was provided by King County Metro Transit and ST for buses serving the Stadium District that travel to downtown Seattle from 5:00 to 7:00 PM and out of downtown Seattle from 9:00 to 11:00 PM. The available bus service was grouped into six service zones or corridors for analysis based on the distribution of service in the region:

- Zone 1: Magnolia, Ballard and Fremont area of Seattle
- Zone 2: Along SR 99, I-5, and SR 520, and areas to the north and northeast
- Zone 3: Bellevue, Issaquah, and I-90 to the east
- Zone 4: Southeast Seattle, Tukwila, and Renton
- Zone 5: South on I-5, Federal Way, Burien, and areas to the south
- Zone 6: West Seattle

Bus transit provides almost double the passenger capacity for bringing people to an event from 5:00 to 7:00 PM (see Figure 2–8) compared to leaving an event from 9:00 to 11:00 PM (see Figure 2–9). The amount of bus passenger capacity varies to the different areas of King County; there is more bus service along SR 99, I-5, and SR 520 compared to other service centers for buses operating through the SoDo area. The occupancy rate for these buses, which is the total number of passengers on buses through the Stadium District divided by the total passenger capacity of those buses, is approximately 33 percent for both inbound (5:00 to 7:00 PM) and outbound (9:00 to 11:00 PM) service. This means that approximately 6,600 people were traveling to the Stadium District and 3,300 people were traveling away from the Stadium District to areas served by the selected King County Metro Transit and ST routes. The remaining capacity on all buses could accommodate approximately 13,300 passengers inbound and 6,000 outbound during these time frames. During peak commute periods and event days, specific buses and routes within the six zones experience higher ridership and overcrowding.

Figure 2–8 Stadium District Bus Passengers Inbound – Existing Weekday (5:00 to 7:00 PM)

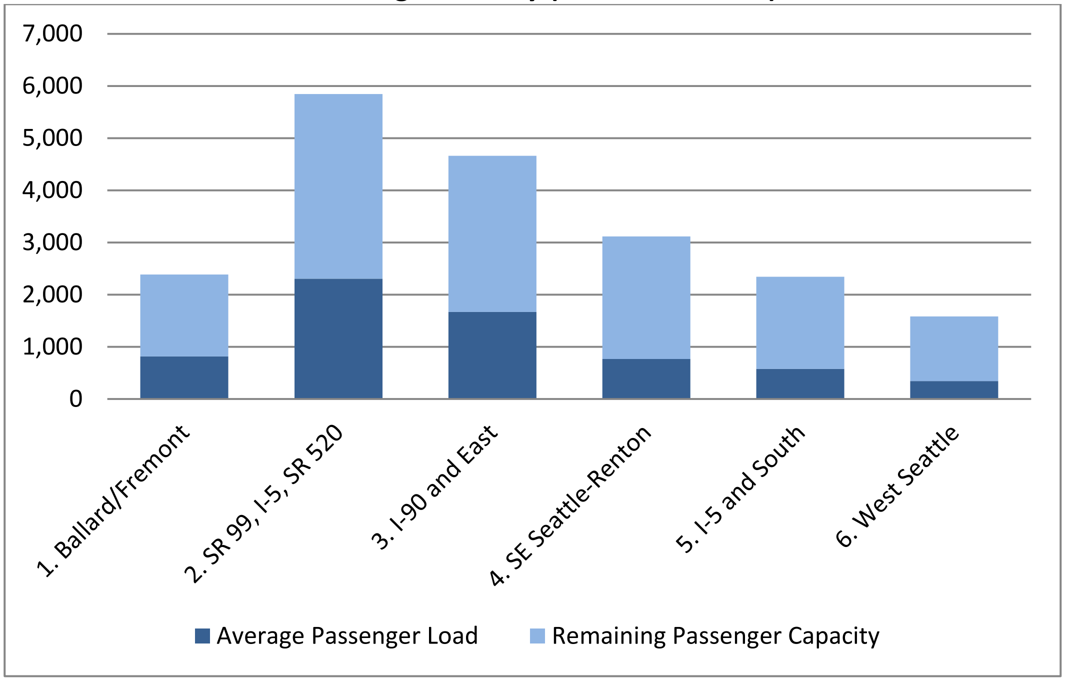
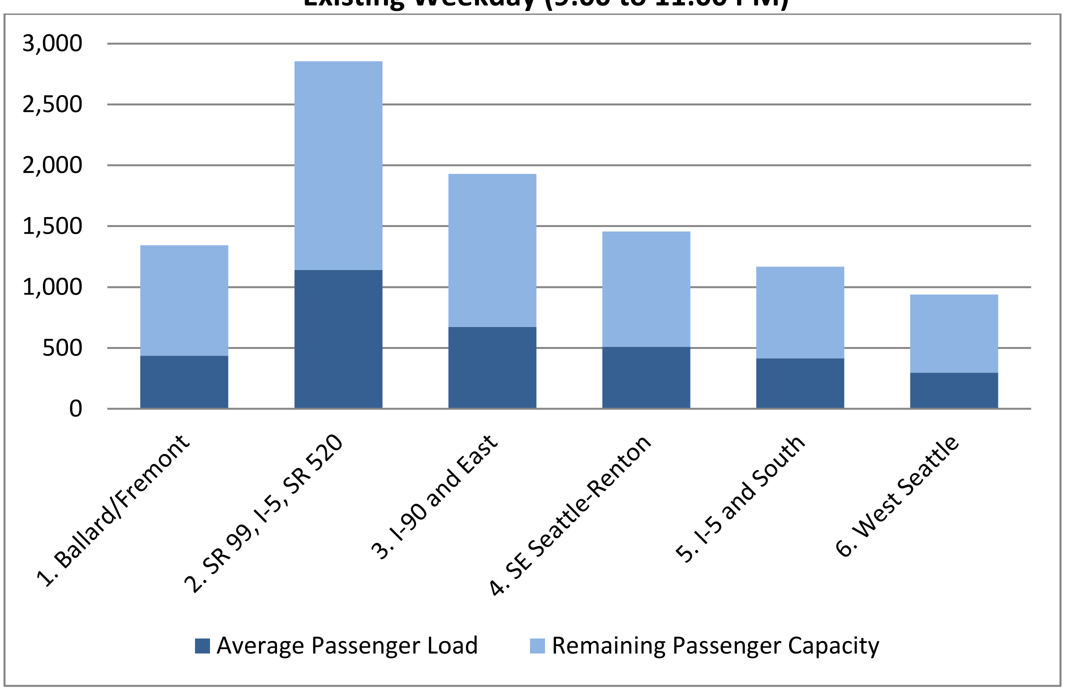


Figure 2–9 Stadium District Bus Passengers Outbound – Existing Weekday (9:00 to 11:00 PM)



Compared to weekdays, bus service (passenger capacity) is reduced by approximately 30 percent from 5:00 to 7:00 PM on weekends and approximately 10 percent from 9:00 to 11:00 PM (for combined King County Metro Transit and ST service). Based on King County Metro Transit ridership, the average number of passengers is approximately 25 percent less on weekends from 5:00 to 7:00 PM compared to weekdays and 5 percent less from 9:00 to 11:00 PM.

Speed and Reliability. As discussed in the methodology, on-time performance information was provided by King County Metro Transit for routes serving the Stadium District, including some ST routes (routes 522, 545, and 550). King County Metro Transit and ST bus service to downtown Seattle from 5:00 to 7:00 PM were on-time approximately 75 percent of the time. This indicates that buses were no more than 1 minute early to no more than 5 minutes late 75 percent of the time. Buses leaving downtown Seattle from 9:00 to 11:00 PM were on-time approximately 77 percent for King County Metro Transit and 81 percent for ST.

The travel time for buses (an indication of speed and reliability) would be similar to general purpose traffic because they operate in mixed flow through the Stadium District. The traffic operations impact analysis of this report provides a detailed evaluation of four key routes within the Stadium District including 1st Avenue S. and 4th Avenue S., which have bus service. The corridor travel time evaluation for existing weekday PM peak hour non-event and event conditions shows that increases in travel time as a result of an event are minimal with travel time differences of 30 seconds or less.

Other Service Information. King County Metro Transit has previously provided special service for sporting events such as Seahawks weekend games and Sounder FC games. This special service is paid for by the sports teams (Mariners, Sounders FC, and Seahawks). Special park-and-ride services were provided between Northgate Transit Center, South Kirkland Park-and-ride, and the Eastgate Park-and-ride for Seahawks games — this special service has not been provided for weekday games. For Sounders FC games, the special bus service was cancelled in May 2012 due to low demand. Instead of the special park-and-ride service, extra coaches were added on regular King County Metro Transit service to downtown Seattle, as needed, to accommodate Sounders FC fans (source: King County Metro Transit website).

King County Metro Transit is facing up to a 17 percent system-wide service reduction if additional funding is not secured. These reductions could begin in Fall 2014. Some of the routes included in this analysis could be impacted by these reductions. Also, some of the bus service on the Alaskan Way Viaduct is currently subsidized by mitigation funding from WSDOT, which expires in 2014. The combination of these two reductions could reduce the capacity on the routes currently providing service to SoDo.

ST provides additional bus service as necessary to accommodate passenger loads to special events. Prior to events, an assessment of extra service is determined based on ticket sales for the event.

2.2.2.2 Light Rail

ST currently provides light rail service from downtown Seattle to the Seattle-Tacoma International (Sea-Tac) Airport via the Central Link light rail. The nearest light rail stations serving the Stadium District are located along the SoDo Busway (5th Avenue S.) at S. Royal Brougham Way (Stadium Station) and Lander Street (SoDo Station). Light rail service provides riders with a reliable and uncongested trip into and out of Seattle because routes are entirely within dedicated right-of-ways.

Light rail service currently operates with two car trains per trip; each train was assumed to have a capacity of approximately 200 people. Headways, the times between trains at a station, for inbound service (to downtown Seattle) are 7.5 minutes from 5:00 PM to 6:30 PM and 10 minutes from 6:30 PM to 7:00 PM. Outbound service operates on 10-minute headways from 9:00 PM to 10:00 PM and 15-minute headways from 10:00 PM to the end of service, which is approximately 1:00 AM on weekdays. Weekday light rail service (passenger capacity) is reduced by approximately 20 percent from 5:00 to 7:00 PM on weekends and does not change from 9:00 to 11:00 PM.

Light Rail Ridership

As illustrated on Figure 2–6 and Figure 2–7, light rail provides a total capacity for approximately 2,800 passengers traveling inbound to the Stadium District from 5:00 to 7:00 PM and 1,650 passengers outbound from 9:00 to 11:00 PM. During Spring 2012 service, trains had an average maximum load of approximately 50 passengers; approximately 780 passengers were traveling inbound and 480 outbound from downtown Seattle. This represents average maximum passenger loads of less than 30 percent on each train. Total train maximum passenger capacity is approximately 400 people for two car train sets.

2.2.2.3 Sounder Commuter Rail Service

ST's Sounder commuter rail service provides service between Lakewood and Seattle with additional stops in Tacoma, Puyallup, Sumner, Auburn, Kent, and Tukwila and between Everett and Seattle with intermediate stops in Mukilteo and Edmonds. The Seattle stop is located at King Street Station. Sounder currently has only regular weekday morning and afternoon service. Trains enter Seattle approximately every 30 minutes during morning commuter periods, from 6:00 to 8:00 AM, and leave approximately every 30 minutes during the evening commuter period. Only one train enters Seattle from Everett and two trains from Tacoma (Lakewood stop is not used) during the late evening. The last weekday train south to Lakewood leaves Seattle at 6:15 PM and to Everett at 6:50 PM. There is no regularly scheduled weekend commuter rail service.

Sounder Commuter Rail Ridership

Only one train provides service to downtown Seattle from Lakewood during the 5:00 to 7:00 PM timeframe. This provides capacity for more than 1,900 passengers. Specific ridership information was not available at this time.

Other Service Information

Currently, ST provides scheduled special Sounder service to sporting events for the Mariners and Sounder FC games. One train from Lakewood to Seattle and one train from Everett to Seattle are provided for select weekend and holiday games for the Mariners and select weekend games for the Sounder FC. Trains depart Seattle 35 minutes after the end of the event, providing capacity for approximately 1,900 people to Lakewood and 1,100 people to Everett.

As discussed previously, Sounder commuter rail was not assumed as part of the Arena analysis because of no outbound service is provided or planned in the evening and event attendees would be required to use another mode to leave the Stadium District.

2.2.2.4 Washington State Ferries Transit

Washington State Ferries (WSF) provides ferry service to Seattle at Colman Dock, located near Alaskan Way and Yesler Way. Colman Dock is approximately one-mile north of the Stadium District site. Ferries to / from Seattle serve Bainbridge Island and Bremerton. The ferries have arrivals and departures scheduled throughout the day with headways of approximately 60 minutes for Bainbridge Island service and approximately 75 minutes for Bremerton service. Ferries serving both of these routes are some of the largest ferries in WSF's fleet, providing combined vehicle and passenger service. According to WSF's website, these ferries are capable of transporting 2,500 passengers per trip, in addition to vehicles. Weekend ferry service (passenger capacity) increases by approximately ten percent over weekday ferry service.

Ferry Ridership

As illustrated on Figure 2–6 and Figure 2–7, WSF Colman Dock service provides a total capacity for approximately 7,300 passengers traveling inbound to the Stadium District from 5:00 to 7:00 PM and 9,800 passengers outbound from 9:00 to 11:00 PM. Based on the assumptions described in the methodology section, an average inbound passenger load of approximately 210 passengers is estimated. During May 2012 service, ferries had an average load of approximately 640 passengers traveling outbound from 9:00 to 11:00 PM.

2.2.2.5 Passenger Ferry Transit

The King County Ferry District provides passenger-only ferry service between Seattle at Pier 50, and West Seattle and Vashon Island. Ferry departures and arrivals to Pier 50 for the West Seattle route operate on 30-to 60-minute headways, depending on the time of day. Typically, this route stops service at 7:00 PM with no weekend service, but for the summer-fall schedule (April-October), Fridays, Saturdays, and evening events for Mariners, Sounders FC and Seahawks, ferry service is extended to 10:30 PM with 60-minute headways. Passenger-only service between Pier 50 and Vashon Island operates on weekdays only with 60-minute headways.

These vessels have capacity for 170 passengers and 18 bicycles. The West Seattle route provides only two return sailings after sporting events, transporting a total of approximately

340 passengers. The Vashon Island route does not provide return service for sporting events. Ridership information was not available at this time. King County passenger ferries were not assumed to be used by event attendees because of limited service frequency during the winter months.

2.2.3 Impacts of No Action Alternative

This section describes the impacts of the No Action Alternatives for analysis years 2018 and 2030. Future weekend and weekday service characteristics were assumed to be similar to existing conditions.

2.2.3.1 Year 2018

By 2018, the Waterfront Seattle project is scheduled to be complete and will provide a pair of bus stops for the SR 99 / Alaskan Way route closer to the Stadium District. Although the exact placement of these bus stops has not been determined, they will likely provide a shorter walking distance or eliminate the need to transfer to another transit mode for people accessing the Stadium District. This is because the current routing is along the Alaskan Way Viaduct and has stops along Columbia Street or Seneca Street depending on direction of travel. No change in passenger capacity is assumed. The new fleet of King County Metro Transit trolleybuses are anticipated to reduce bus loading / unloading times at bus stops, but are not assumed to impact transit passenger demand or capacity.

ST is scheduled to complete the U-Link light rail extension and add a new station south of Sea-Tac Airport on the Central Link alignment, which would extend service. Light rail capacity would be expanded with the addition of up to four three-car trains. Also, the First Hill Streetcar is schedule to be completed in 2014; this would provide a station near 1st Avenue S. and S. Jackson Street north of the Stadium District. First Hill Streetcar hours of operation and headways between streetcars were assumed to be similar to the existing SLU Streetcar operations. This would add streetcar service to the Stadium District. No other passenger capacity changes were assumed.

Bus Transit

As described in the methodology, the number of bus riders was anticipated to increase by approximately two percent per year and headways were assumed to remain unchanged. Bus transit passenger loads would increase by approximately 2,520 inbound passengers and 2,160 outbound passengers for the No Action Case S3. The increase in passengers would be slightly less for the No Action Case S1 and Case S2.

As illustrated on Figure 2–10 and Figure 2–11, No Action Case S3 (i.e., Mariners and CenturyLink Event) could be accommodated with assumed bus service levels for all service zones. Because this scenario has the highest assumed passenger demand, the No Action Case S1 and Case S2 could also be accommodated. Similar to existing conditions, some bus routes would experience higher levels of passenger ridership and potentially overcrowding.

Figure 2–10 Stadium District Bus Transit Inbound - 2018 No Action Case S3

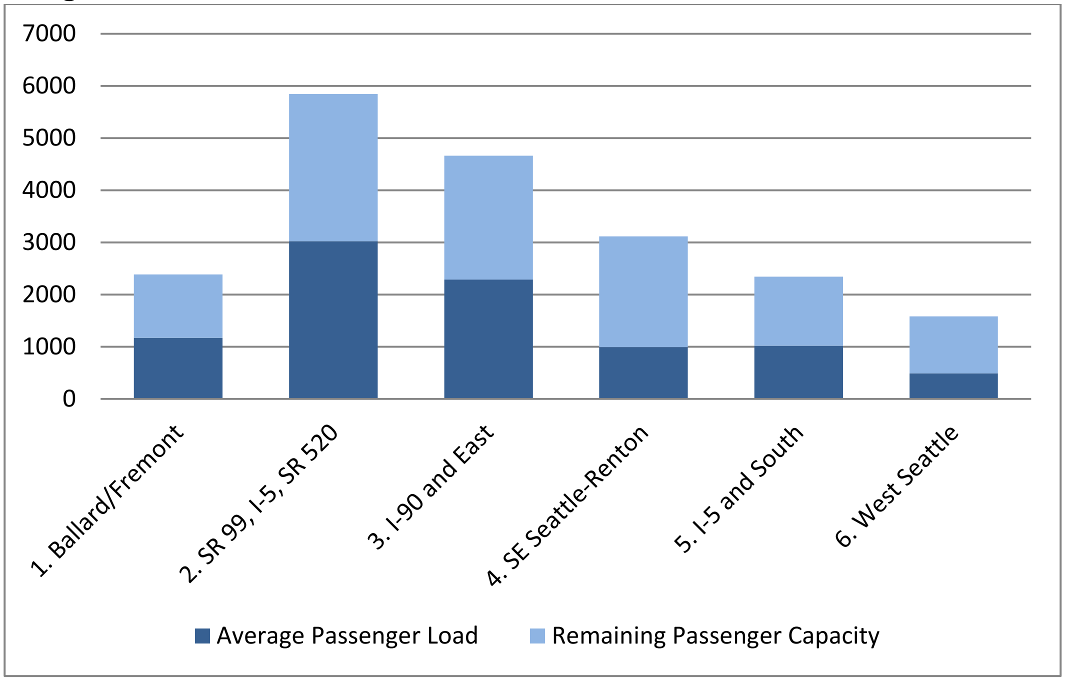
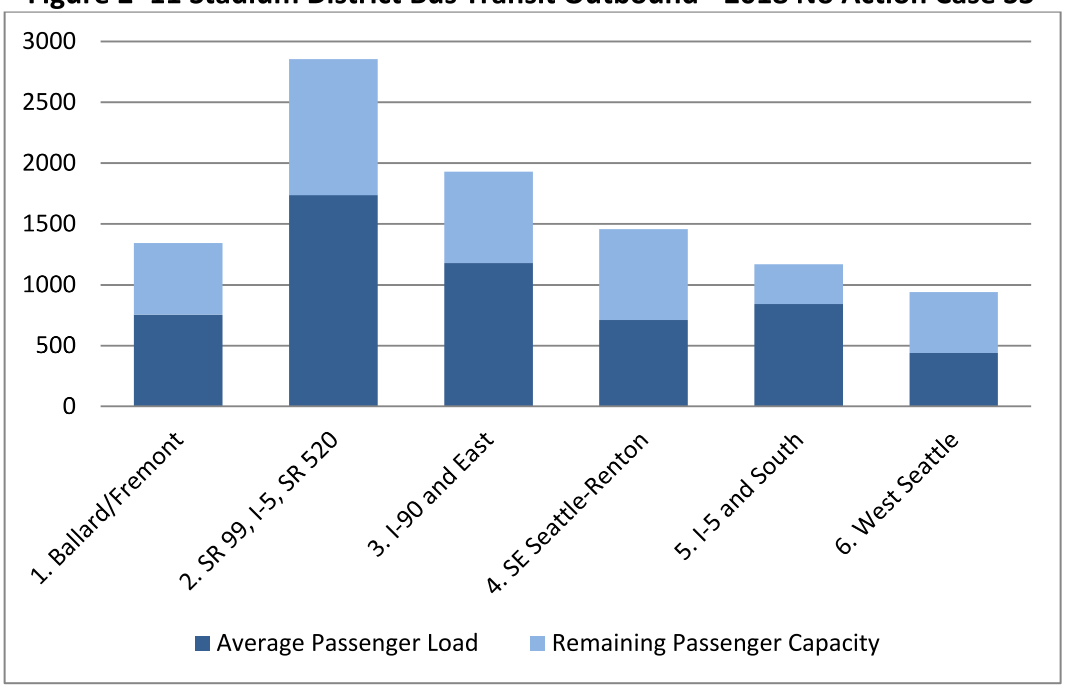


Figure 2–11 Stadium District Bus Transit Outbound - 2018 No Action Case S3



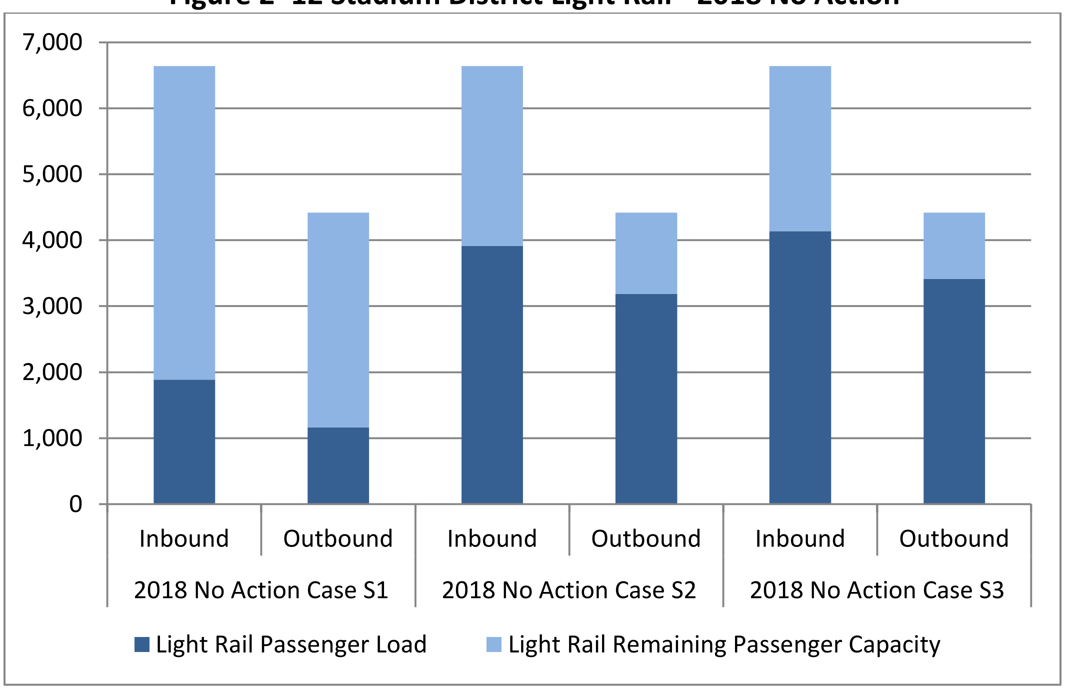
The travel time for buses (an indication of speed and reliability) would be similar to general purpose traffic because they operate in mixed flow through the Stadium District (not including the time it takes for buses to serve bus stops). As indicated in the traffic operations section of this report, travel times under 2018 conditions noticeably increase from existing conditions and further increase with the addition of event traffic, compared to existing conditions (see Section 2.6 Traffic Operations Table 2-19).

Light Rail

As described in the methodology section, ST estimates light rail ridership will increase approximately 350 percent, or 19.5 percent annually from the year 2013 to 2018. This is largely associated with 2016 completion of U-Link extension and two new stations on the Central Link light rail alignment. ST would also operate fifteen two car train sets and four three car train sets during peak service.

Headways were assumed to remain at 7.5 to 10 minutes from 5:00 to 7:00 PM and 10 to 15 minutes from 9:00 to 11:00 PM. As illustrated on Figure 2–12, light rail passenger loads would increase by approximately 3,365 inbound passengers and 2,940 outbound passengers for No Action Case S3. The increase in passengers would be slightly less for the No Action Case S1 and Case S2. The increased transit riders for these scenarios could be accommodated with assumed light rail service levels.

Figure 2–12 Stadium District Light Rail - 2018 No Action

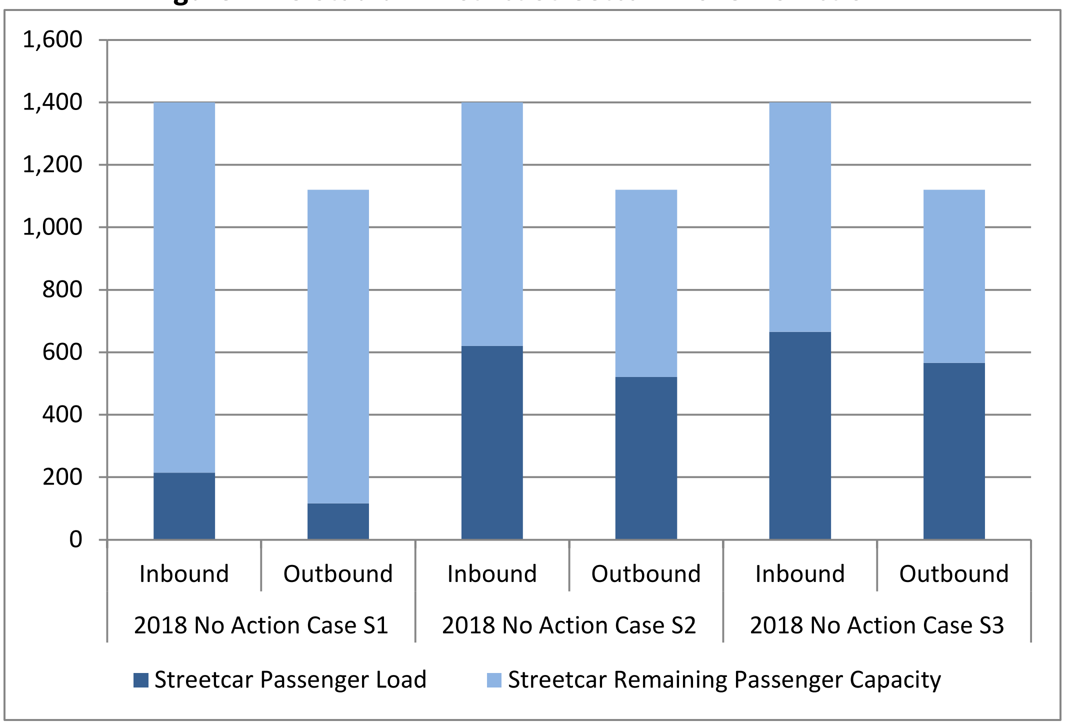


Streetcar Transit

The First Hill Streetcar would provide new service to the Stadium District, and could accommodate over 1,100 passengers from 5:00 to 7:00 PM and 9:00 to 11:00 PM. This would provide a new station near 1st Avenue S. and S. Jackson Street, north of the Stadium District. The First Hill Streetcar is anticipated to operate on 10-minute headways during the peak period and 10-to 15-minute headways during off-peak periods[13]. It is likely the peak period extends into the 5:00 to 7:00 PM time frame, but 15-minute headways, similar to the existing SLU Streetcar operations, were assumed.

As illustrated on Figure 2–13, streetcar passenger loads would increase by approximately 665 inbound passengers and 565 outbound passengers for No Action Case S3. The increase in passengers would be slightly less for the No Action Case S1 and Case S2. These scenarios could be accommodated with assumed light rail service levels.

Figure 2–13 Stadium District Streetcar - 2018 No Action

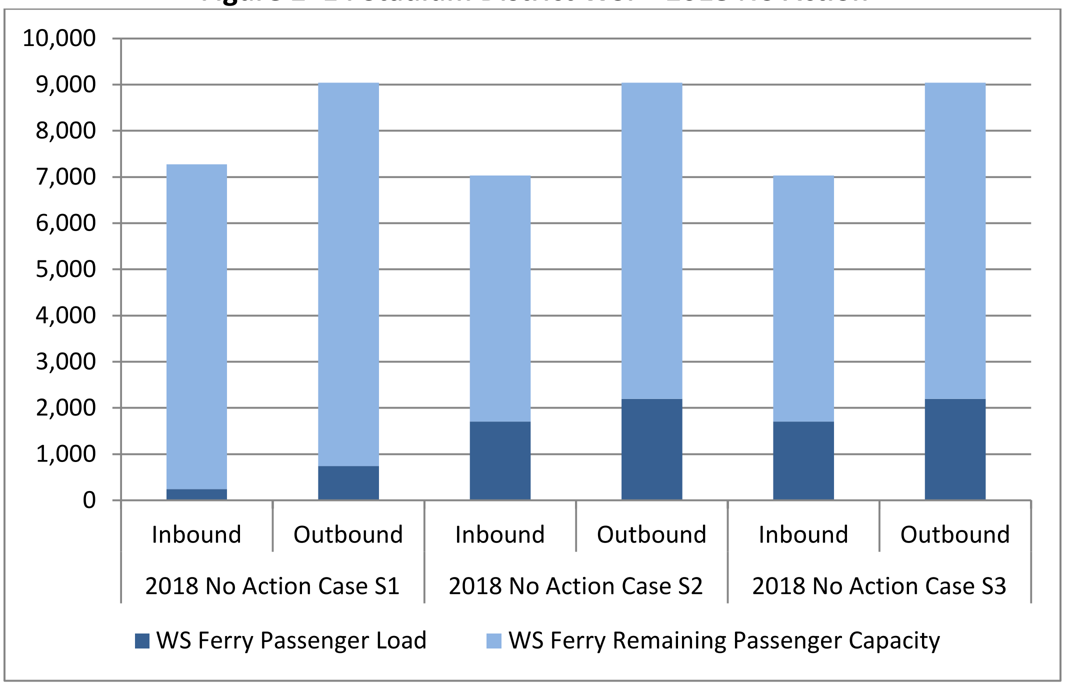


[13] Seattle Department of Transportation. *First Hill Streetcar Environmental Checklist*. September 29, 2010. Accessed April 20, 2013 at http://www.seattlestreetcar.org/about/docs/sepa/First%20Hill%20Streetcar%20SEPA%20Checklist.pdf

Washington State Ferry Service

No change in the number of WSF vessels serving Colman Dock was assumed from the year 2013 to 2018. The number of walk-on passengers was anticipated to increase by approximately three percent annually from 2013 to 2018. As illustrated on Figure 2–14, WSF passenger loads would increase by approximately 1,495 inbound passengers and 1,560 outbound passengers for the No Action Case S3. The increase in passengers would be the same for the No Action Case S2 and less for the No Action Case S1. These scenarios could be accommodated with assumed WSF service levels.

Figure 2–14 Stadium District WSF - 2018 No Action



2.2.3.2 Year 2030

By 2030, ST is anticipated to expand light rail service connecting Central Link light rail to downtown Seattle and the eastside communities of Bellevue and Redmond (Overlake) and the Lynnwood Link light rail Extension would extend light rail service north from the University of Washington (UW) in Seattle to the City of Lynnwood. South Link light rail would be extended one additional station to Kent / Des Moines in the vicinity of Highline Community College. This expanded light rail service could result in a reduction in available bus transit capacity in some of the service zones, but King County Metro Transit would redeploy these transit service hours to other parts of the region. Overall transit passenger capacity would increase by 2030.

For all other transit modes (i.e., bus, streetcar, ferry), no change in passenger capacity (service levels) was assumed because of the uncertainty of transit funding.

Bus Transit

The number of people who would use bus service was anticipated to increase by approximately two percent annually to year 2030. Headways were assumed to remain unchanged.

With the addition of ST Link Light Rail service, this analysis assumed that some transit service hours would be redeployed for buses serving areas along I-5 to the north (Zone 2: Routes 41, 71, 72, 73, 510 and 511) and I-90 to the east (Zone 3: Route 550), to other locations in the transit network not served by Link light rail. This would result in a reduction in passenger capacity of approximately 3,520 inbound to downtown Seattle and 1,940 out of downtown Seattle. It was assumed that the redeployed service would not be allocated to bus routes serving the SoDo area.

Bus transit passenger loads would increase by approximately 4,100 inbound passengers and 2,700 outbound passengers for the No Action Case S3 (slightly less for No Action Cases S1 and S2). As illustrated on Figure 2–15 and Figure 2–16, the passenger demand could not be accommodated with the 2030 assumed bus service levels for routes operating outbound to the north along SR 99, I-5 and SR 520 (Zone 2) for the No Action cases. This analysis includes the assumed redeployment of bus service to the north to account for light rail service. If the redeployment of bus service does not occur, then projected passenger demands could be accommodated under all No Action scenarios.

Figure 2–15 Stadium District Bus Transit Inbound – 2030 No Action Case S3

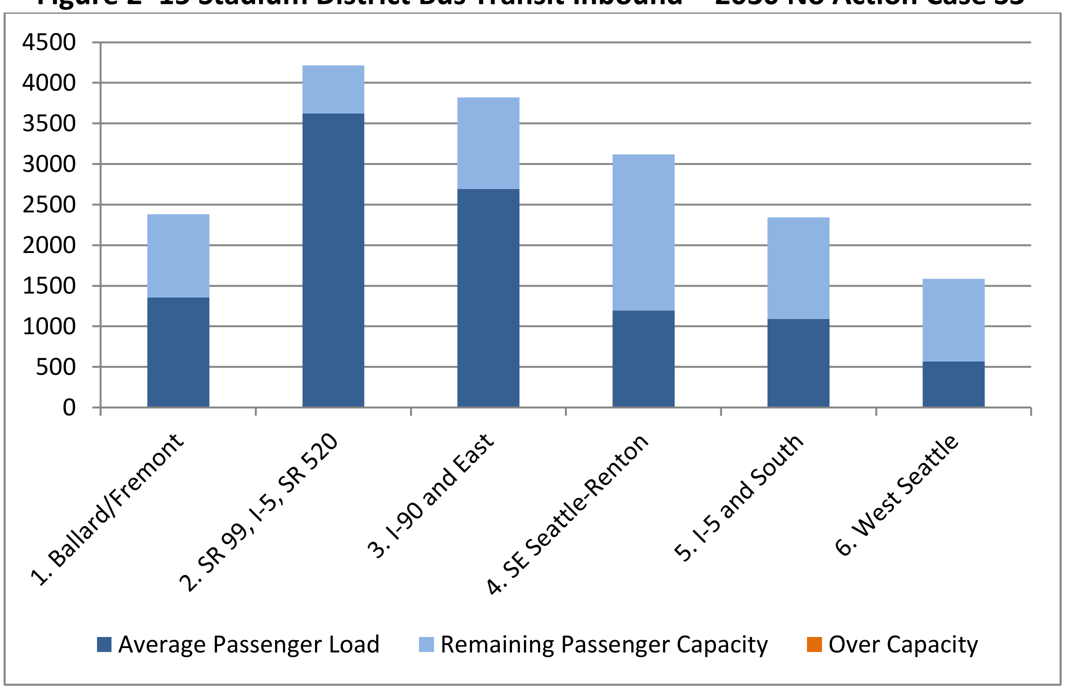
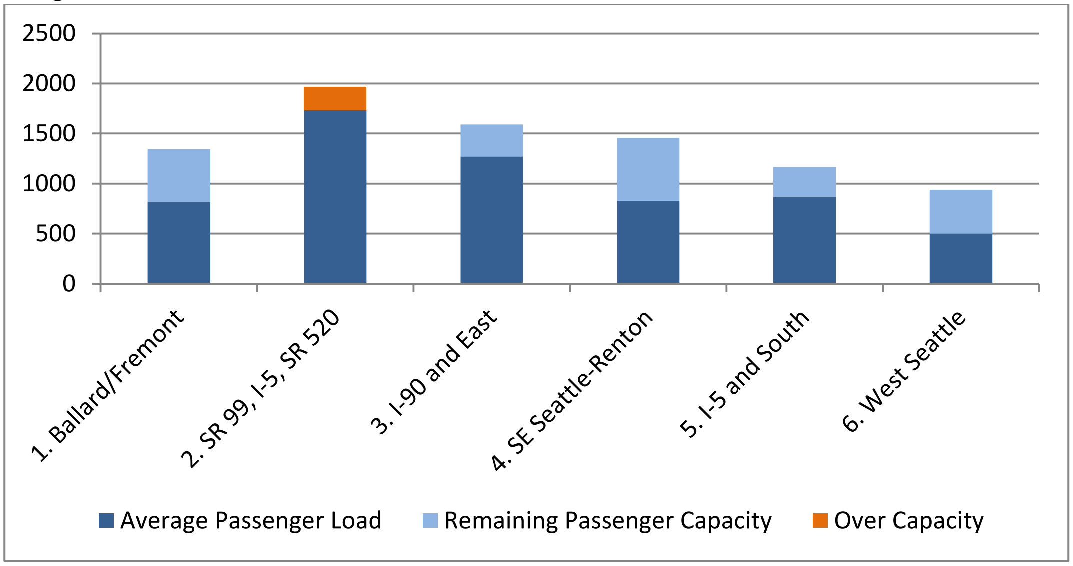


Figure 2–16 Stadium District Bus Transit Outbound – 2030 No Action Case S3



If there is redeployment of bus service (consistent with this analysis), some bus riders would transfer to other bus routes and / or light rail, which provides connections similar to current bus routes (such as downtown). For analysis purposes, it was assumed there was no shift of bus riders to other modes such as light rail. This provides a conservative assessment of passenger capacity. For No Action Case S3, Zone 2 would have approximately 230 outbound passengers would likely transfer to other bus routes or light rail. Complimentary light rail service has the available passenger capacity (approximately 20,000 inbound and 16,500 outbound) to serve these event attendees. This could place additional demand on park-and-ride lots in north Seattle, Shoreline, Mountlake Terrace, and Lynnwood and increase passenger loads on buses connecting to light rail stations. If 15 percent of non-event Zone 2 bus passengers shifted to light rail, an over capacity condition would not occur as shown on Figure 2-13.

The travel time for buses (an indication of speed and reliability) would be similar to general purpose traffic because they operate in mixed flow through the Stadium District (not including the time it takes for buses to serve bus stops). As indicated in the traffic operations section of this report, travel times under 2030 conditions are generally similar to 2018 conditions with some improvement as a result of decreased in vehicular traffic and increases in transit use (see Section 2.6 Traffic Operations Table 2-20).

Light Rail

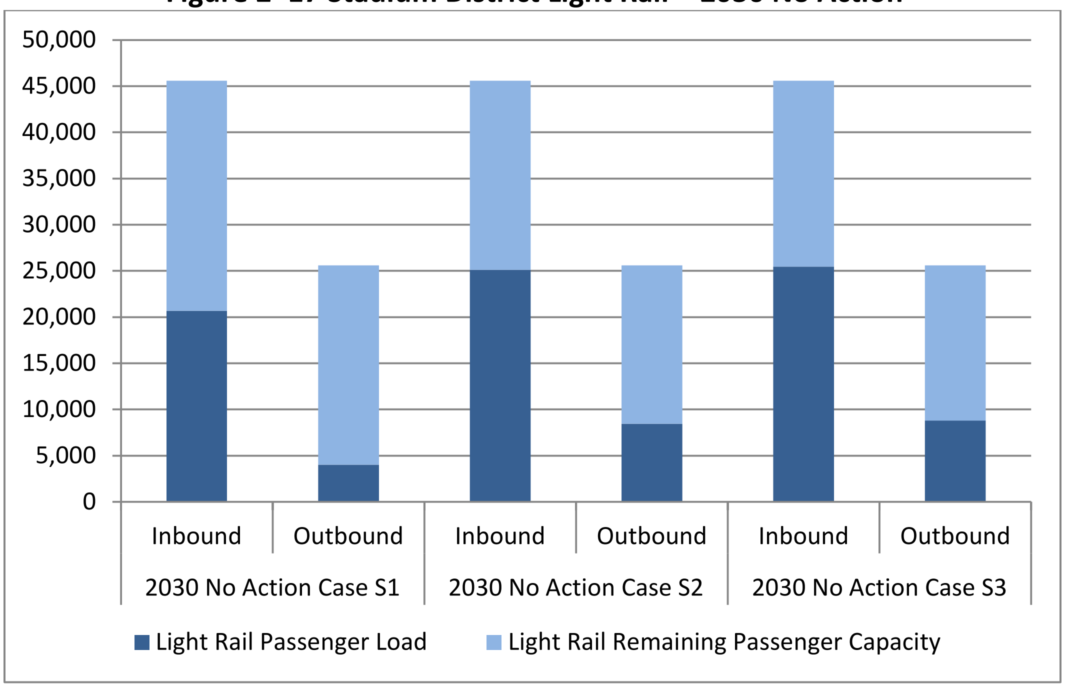
The project future ridership and system operations information for the new North Link Extension, Central Link, and East Link Light Rail was provided by ST. Headways change in the future with the addition of North Link Extension and East Link. North Link Extension trains would operate with 4-minute headways from 5:00 PM to 6:30 PM and 7.5-minute headways from 6:30 PM to 7:00 PM. The North Link trains split service in downtown Seattle to travel east for East Link service or south for Central Link service; headways are 8 minutes for East Link and Central Link service from 5:00 PM to 6:30 PM and 15 minutes from 6:30 to 7:00 PM. From 9:00

to 11:00 PM, North Link Extension would operate with 7.5-minute headways and East Link and Central Link would operate with 15-minute headways. Each train would consist of four cars.

Light rail passenger loads would increase by approximately 24,680 inbound passengers and 8,310 outbound passengers for the No Action Case S3. The increase in passengers would be slightly less for the No Action Case S1 and Case S2. More than half of the inbound ridership from 5:00 to 7:00 PM would be on the North Link Extension. Ridership estimates predict that trains would be near capacity through downtown; however, trains would not yet reach maximum load capacity. Many of the passengers boarding in downtown would be connecting to commuter rail at King Street Station. Similar to passenger loads from 5:00 to 7:00 PM, approximately half of the outbound ridership from 9:00 to 11:00 PM would be on North Link.

As illustrated on Figure 2–17, light rail passenger loads for 2030 No Action Cases could be accommodated with assumed light rail service levels.

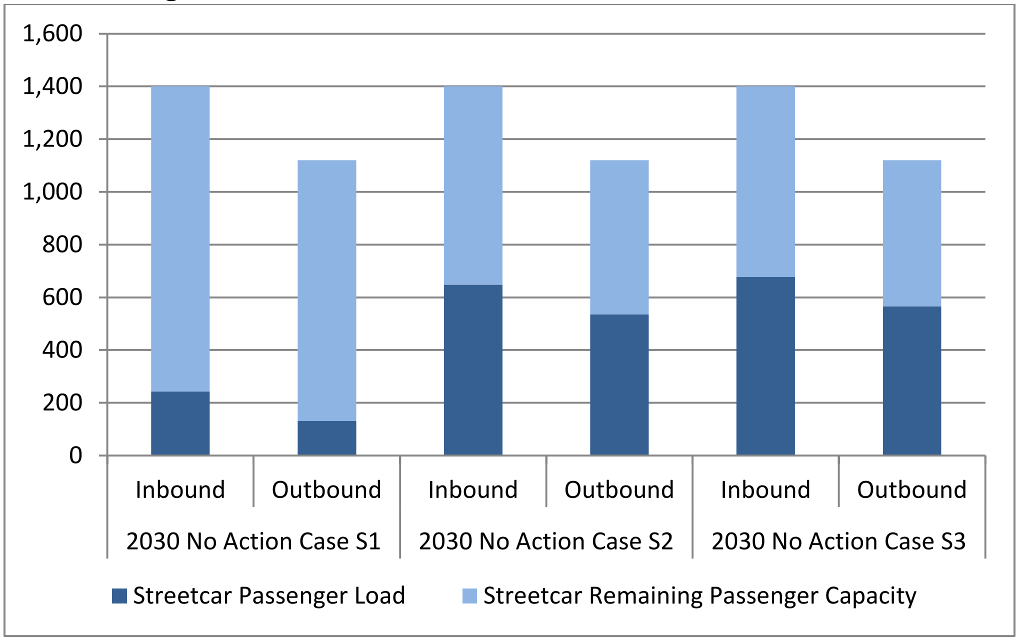
Figure 2–17 Stadium District Light Rail – 2030 No Action



<u>Streetcar Transit</u>

The number of people who would use streetcar transit was anticipated to increase by approximately two percent annually to the year 2030. Headways were assumed to remain unchanged. As illustrated on Figure 2–18, streetcar passenger loads would increase by approximately 680 inbound passengers and 565 outbound passengers for the No Action Case S3. The passenger loads would be slightly less for the No Action Case S1 and Case S2. These scenarios could be accommodated with assumed streetcar service levels.

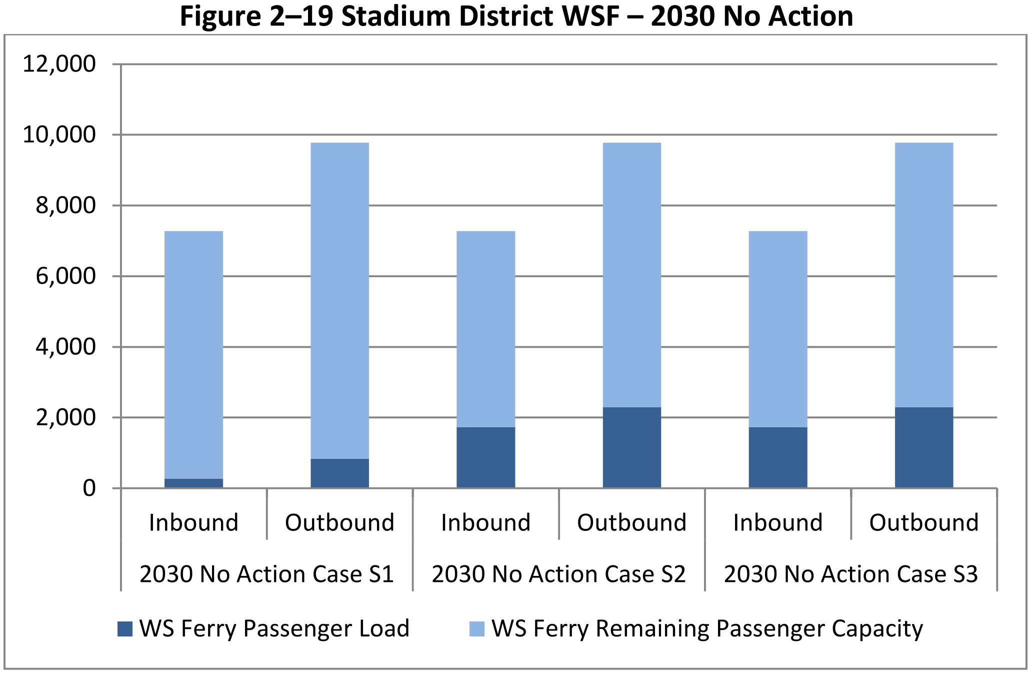
Figure 2–18 Stadium District Streetcar – 2030 No Action



Washington State Ferry Service

The number of people who would use ferry was anticipated to increase by approximately three percent annually to the year 2030. No change in the number of WSF vessels serving Colman Dock was assumed from the year 2018 to 2030. As illustrated on Figure 2–19, WSF passenger loads would increase by approximately 1, 525 inbound passengers and 1,655 outbound passengers for No Action Case S3. The increase in passengers would be the same for Case S2 and less for Case S1. These scenarios could be accommodated with assumed WSF service levels.

Figure 2–19 Stadium District WSF – 2030 No Action



2.2.4 Impacts of Alternative 2

Construction of Alternative 2 could result in some increase in ridership as a result of construction workers traveling to and from the site. It is anticipated that public transportation impacts related to construction would be less than a 20,000-seat event at the Seattle Arena. In addition, construction related activities could impact nearby transit routes and stops as well as pedestrian accessibility to these facilities. A construction management plan could be prepared and impacts to transit could be coordinated with the transit agency in advance and appropriate relocation and signage provided.

The following section describes the impacts of the Alternative 2 event cases 2018 and 2030.

2.2.4.1 Year 2018

Approximately 14 percent of Arena event attendees were estimated to use transit to travel to and from events. The travel forecasts were developed based on review of the TMPs for CenturyLink Field and Safeco Field, which included information on how event attendees currently travel events; a review of what facilities in other cities generally experience in terms of how event attendees travel to events; and an evaluation of the available passenger capacity on all transit serving the Stadium District. The analysis assumes a fully-attended event, with approximately 2,800 event attendees arriving by bus, light rail, streetcar, or ferry. Approximately 100 of these event attendees would be ferry passengers who take their vehicle on the ferry and could arrive outside the analysis period such as during the morning commute period as they take ferry to work and then attend an Arena event in the evening. As such, they are included in the No Action condition for parking and are not additive to the impact of the project. Transit service provided in the study area is assumed consistent with No Action conditions.

Bus Transit

It was estimated that approximately 29 percent of event attendees on transit would use existing bus service to the Proposed Arena. This would add approximately 800 bus passengers traveling to and from the Stadium District for the Proposed Action Case S2 and Case S3 event scenarios.

As illustrated on Figure 2–20 and Figure 2–21, Alternative 2 Case S3 could be accommodated with assumed bus service levels. Because this scenario has the highest assumed passenger demand, the Alternative 2 Case S1 and S2 could also be accommodated. Similar to existing conditions, some bus routes would experience higher levels of passenger ridership and potentially overcrowding. Also, park-and-ride lots served by transit to the Stadium District would likely experience increased use during events.

Figure 2–20 Stadium District Bus Transit Inbound – 2018 Alternative 2 Case S3

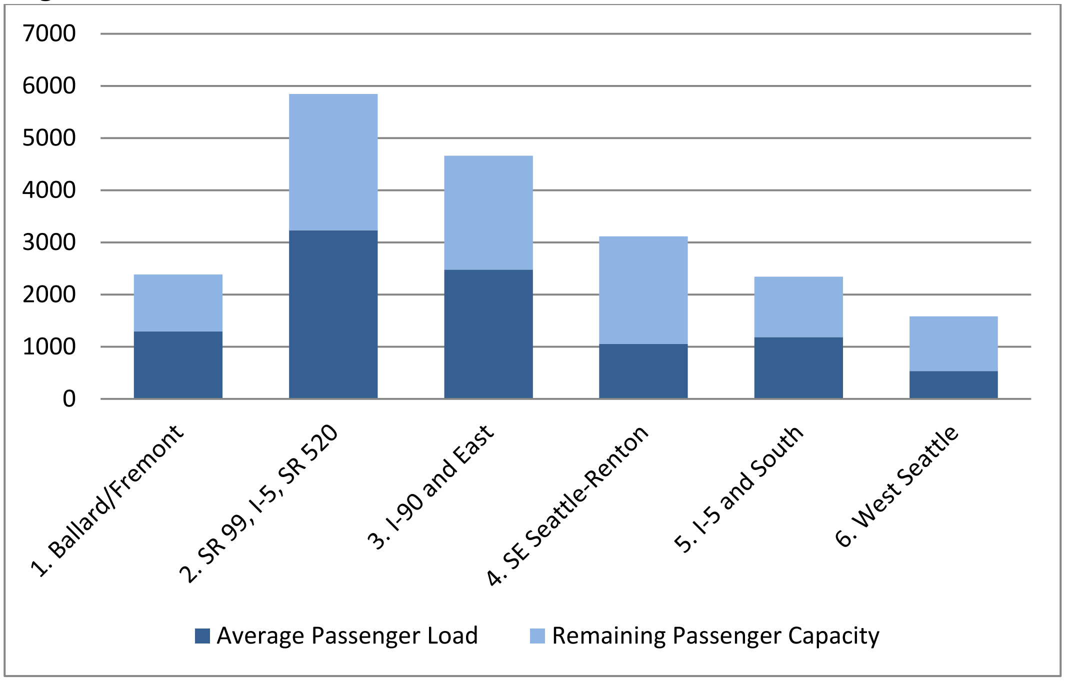
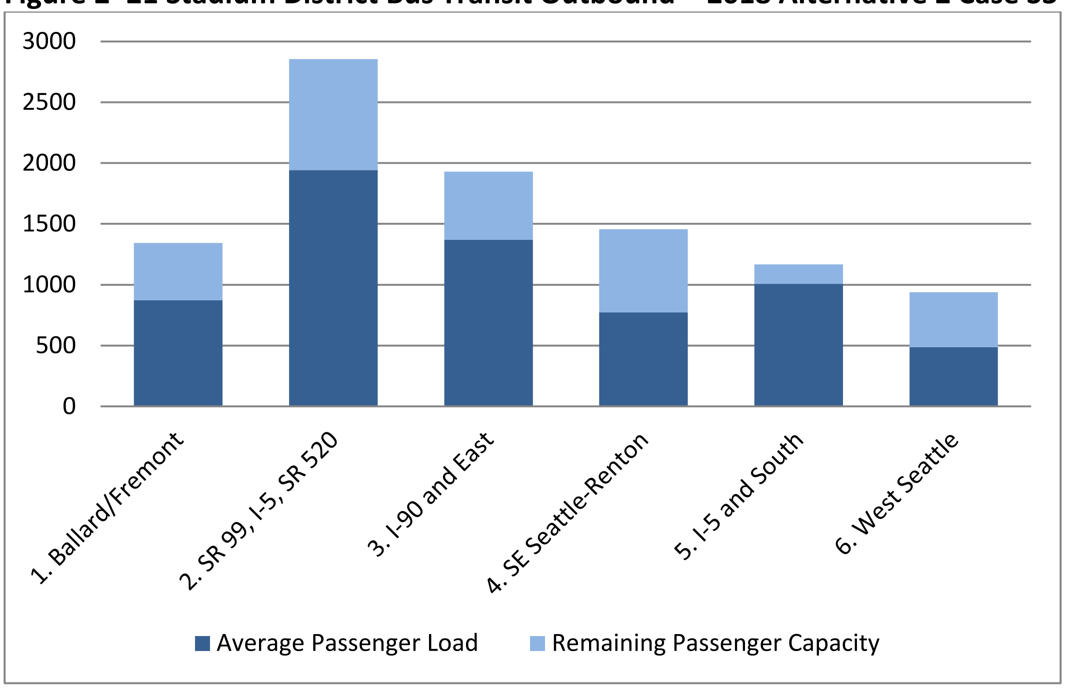


Figure 2–21 Stadium District Bus Transit Outbound – 2018 Alternative 2 Case S3



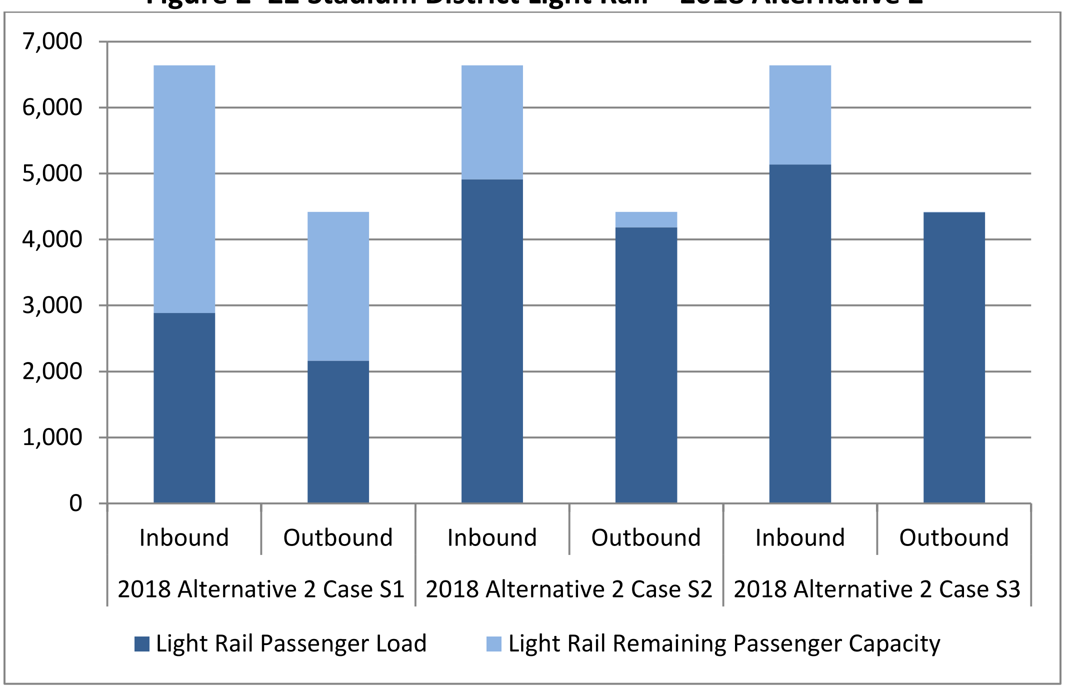
The travel time for buses (an indication of speed and reliability) would be similar to general purpose traffic because they operate in mixed flow through the Stadium District (not including the time it takes for buses to serve bus stops). As indicated in the traffic operations analysis for Alternative 2, travel times increase with the addition of Arena event traffic as compared to No

Action conditions and generally the direction of travel for each route that serves vehicle arrivals for the Arena event experiences the greatest travel time increase while the opposing direction experiences a lesser increase. In addition, travel times are estimated to see large increases with multiple concurrent events (i.e., Alternative 2 Cases S2 and S3). Additional detail related to corridor travel times is provided in Section 2.6 Traffic Operations Table 2-25.

Light Rail

It was estimated that approximately 37 percent of event attendees on transit would use existing and planned light rail service to the Proposed Arena. This would add approximately 1,000 light rail passengers traveling to and from the Stadium District on Central and North Link for Alternative 2 Case S2 and S3. As illustrated on Figure 2–22, all 2018 Alternative 2 Cases could be accommodated with assumed light rail service levels. The available passenger capacity assumed fifteen two car train sets and four three car train sets during peak service. Park-and-ride lots served by light rail to the Stadium District would likely experience increased use during events.

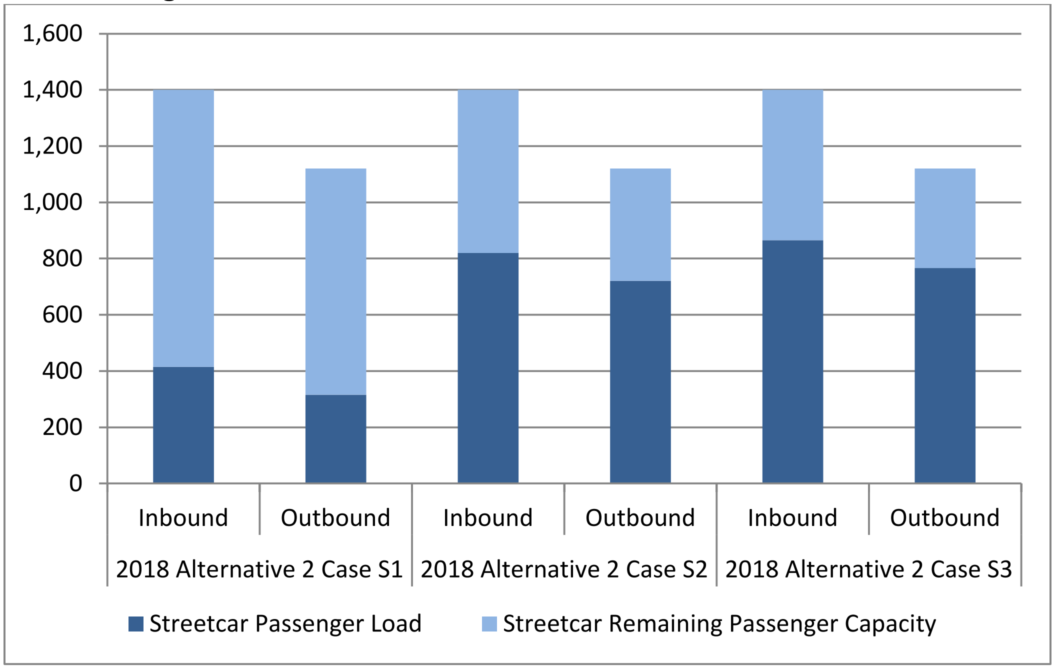
Figure 2–22 Stadium District Light Rail – 2018 Alternative 2



Streetcar

It was estimated that approximately seven percent of event attendees on transit would use streetcar service to the Proposed Arena. This would add approximately 200 streetcar passengers traveling to and from the Stadium District on the First Hill streetcar for Alternative 2 Case S2 and S3. As illustrated on Figure 2–23, these scenarios, including Alternative 2 Case S1, could be accommodated with assumed streetcar service levels.

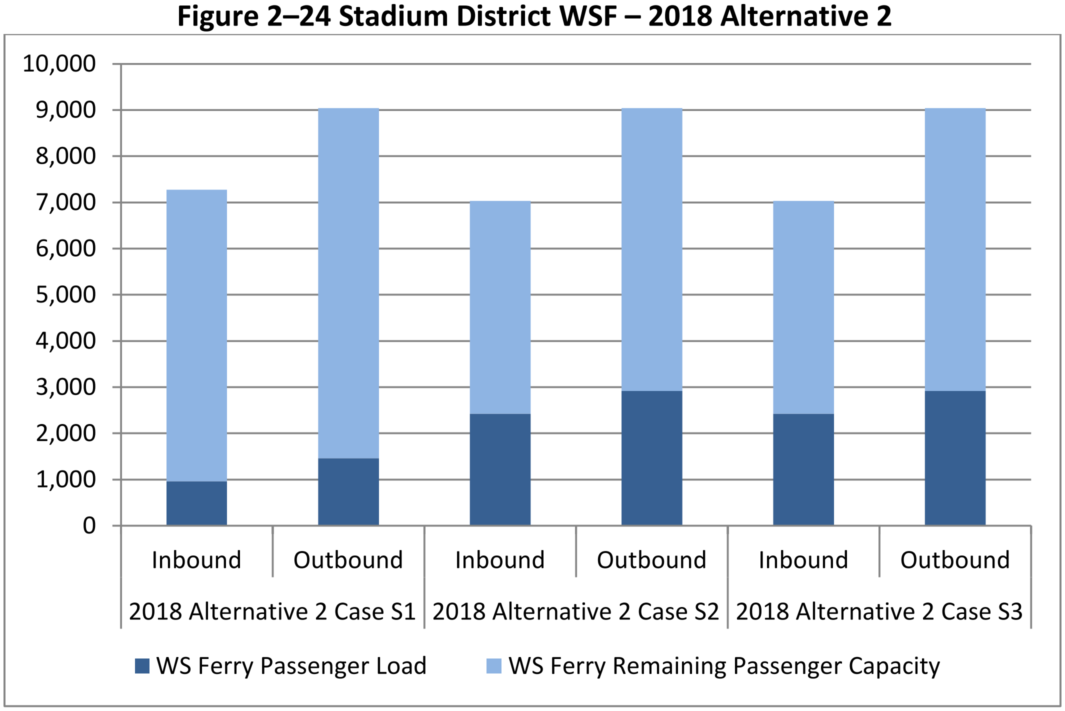
Figure 2–23 Stadium District Streetcar – 2018 Alternative 2



Washington State Ferry Service

It was estimated that approximately 26 percent of event attendees on transit would use ferry service to the Proposed Arena; this would add approximately 720 ferry passengers traveling to and from the Stadium District for Alternative 2 Case S2 and S3. As illustrated on Figure 2–24, these scenarios, including the 2018 Alternative 2 Case S1, could be accommodated with assumed WSF service levels.

Figure 2–24 Stadium District WSF – 2018 Alternative 2



2.2.4.2 Year 2030

The Proposed Project would construct a new 20,000 person Arena in the Stadium District. Approximately 19 percent of event attendees were estimated to use transit to travel to and from events. The analysis assumes a fully-attended event, with approximately 3,700 event attendees arriving by bus, light rail, streetcar, and ferry during the weekday analysis period. Consistent with the 2018 conditions, approximately 100 event attendees would be ferry passengers who take their vehicle on the ferry and could arrive outside the analysis period such as during the morning commute period as they take ferry to work and then attend an Arena event in the evening. As such, they are included in the No Action condition for parking and are not additive to the impact of the project. Transit service provided in the study area is assumed consistent with No Action conditions.

<u>Bus Transit</u>

It was estimated that approximately 16 percent of event attendees on transit would use bus service to the Proposed Arena. This reduction, as compared to 2018, was assumed to occur because of the North Link Light Rail system expansion to Lynnwood, East Link service to Bellevue and Redmond, South Link extension to Kent / Des Moines and replacement of some of the bus transit service. This would result in approximately 600 bus passengers traveling to and from the Stadium District for Alternative 2 Case S2 and S3.

As illustrated on Figure 2–25 and Figure 2–26, Alternative 2, consistent with the No Action scenario, would not accommodate passenger demand with the 2030 assumed bus service levels for outbound routes operating to the north along SR 99, I-5 and east along SR 520 (Zone 2). For analysis purposes, it was assumed there was no shift of bus riders to other modes such as light rail. This provides a conservative assessment of passenger capacity because it includes the assumed redeployment of bus service to the north to account for light rail service. If the redeployment of bus service does not occur, then projected passenger demands could be accommodated under all Alternative 2 event cases; or, if 25 percent of non-event Zone 2 bus passengers shifted to light rail, an over capacity condition would not occur as shown on Figure 2–25.

Bus riders are likely to shift from over capacity bus routes to light rail service, which would connect to similar destinations (such as downtown). For Alternative 2 Case S3, approximately 385 outbound passengers could shift to light rail. Light rail service has available passenger capacity (approximately 17,000 inbound and 14,000 outbound) to serve these riders (see Figure 2–27). This could place additional demand on park-and-ride lots in north Seattle, Shoreline, Mountlake Terrace, and Lynnwood and increase passenger loads on buses connecting to light rail stations. In addition, park-and-ride lots served by transit to and from the Stadium District would likely experience increased use during events.

The travel time for buses (an indication of speed and reliability) would be similar to general purpose traffic because they operate in mixed flow through the Stadium District (not including the time it takes for buses to serve bus stops). As described in the traffic operations section, the travel time changes resulting from an Arena event are similar between 2018 and 2030 conditions with 2030 travel time generally greater than 2018 conditions. Additional detail related to corridor travel times is provided in Section 2.6 Traffic Operations Table 2-26.

Figure 2–25 Stadium District Bus Transit Inbound – 2030 Alternative 2 Case S3

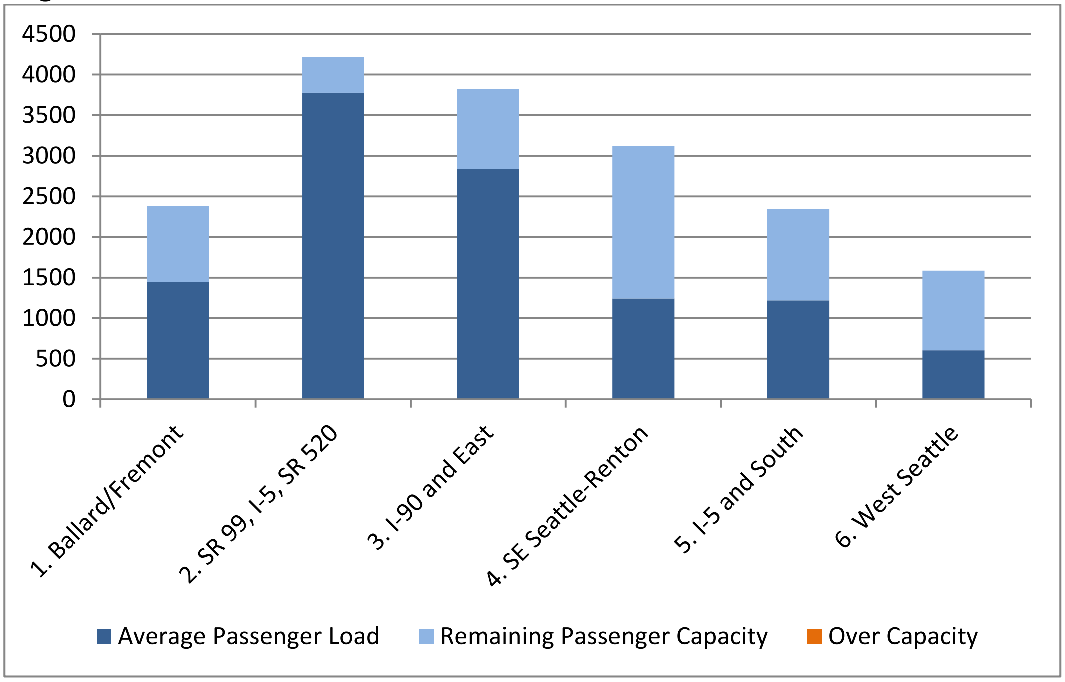
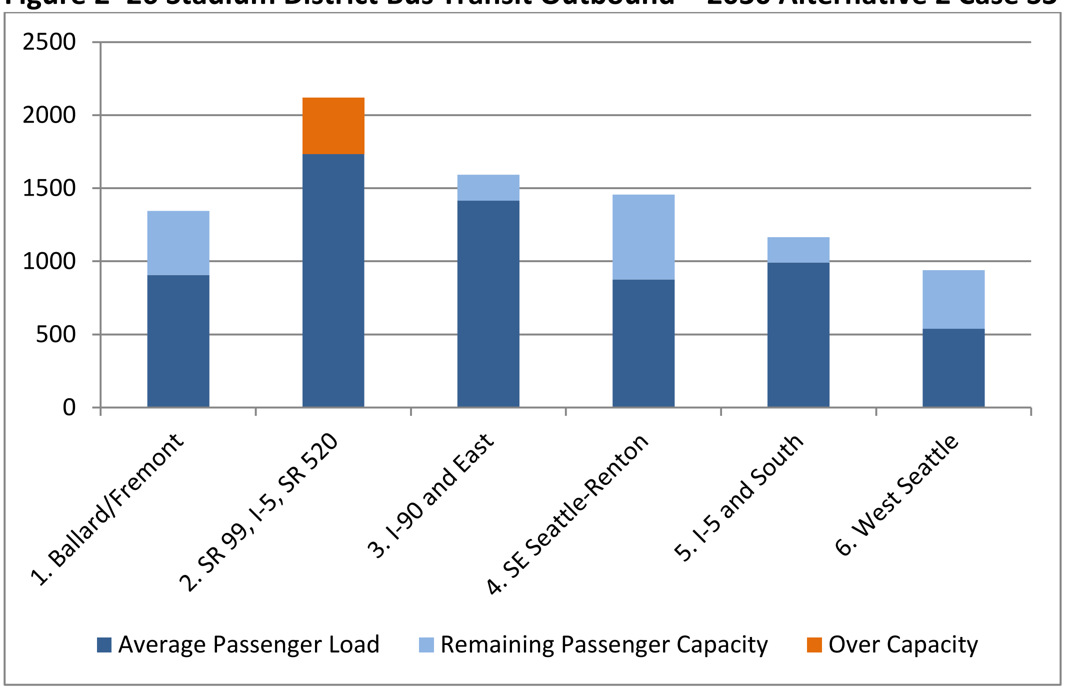


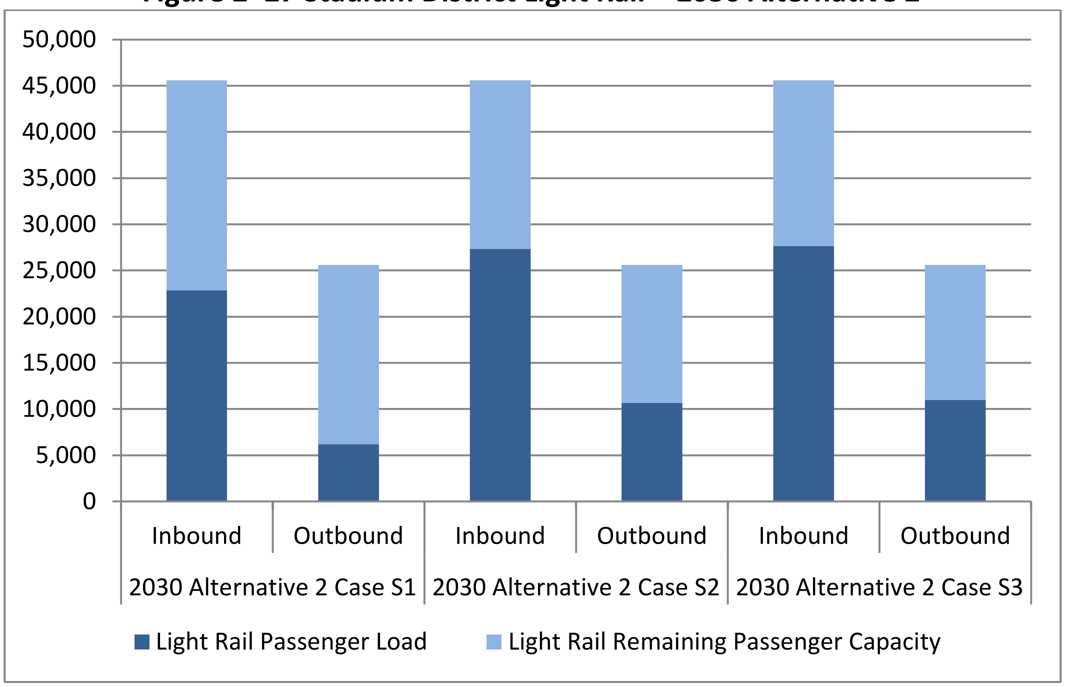
Figure 2–26 Stadium District Bus Transit Outbound – 2030 Alternative 2 Case S3



Light Rail

With the expanded light rail system, it was estimated that approximately 59 percent of event attendees on transit would use light rail service to the Proposed Arena. This would add approximately 2,200 light rail passengers traveling to and from the Stadium District on Central, North and East Link for Alternative 2 Case S2 and S3. As illustrated on Figure 2–27, these scenarios, including the 2030 Alternative 2 Case S1, could be accommodated with assumed light rail service levels. Light rail trains would be highly utilized through downtown Seattle during events with the increased light rail ridership. Non-event riders boarding trains in downtown to connect to Sounder commuter rail at King Street station could experience near capacity trains and choose to walk or ride a connecting bus as an alternative to light rail during events. Also, park-and-ride lots served by light rail to the Stadium District would likely experience increased use on event days.

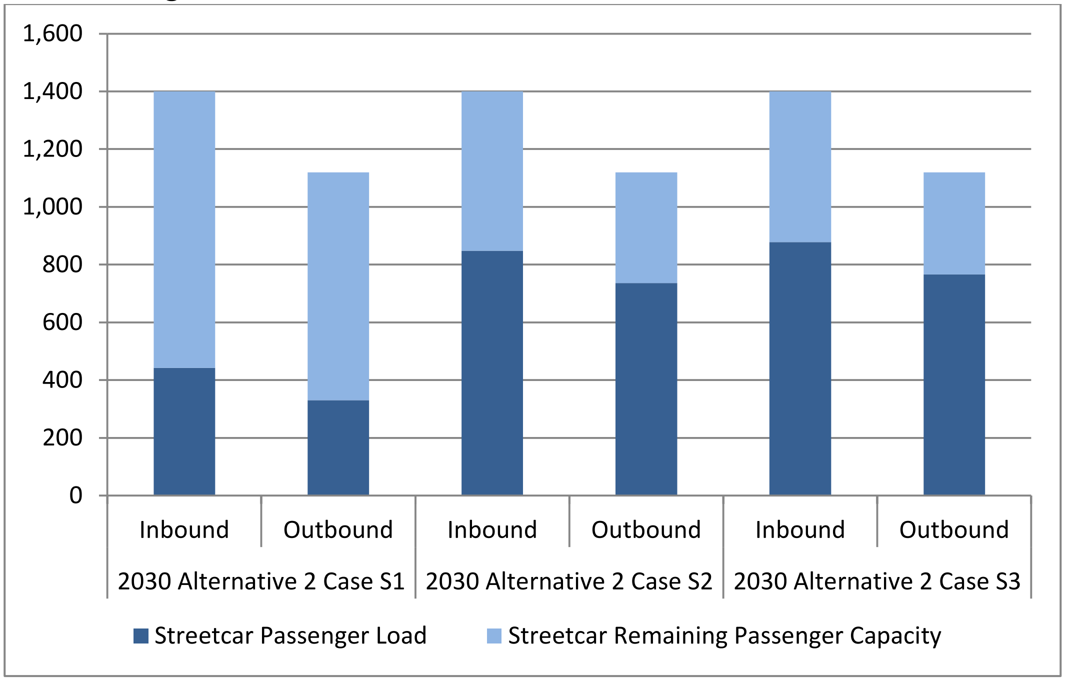
Figure 2–27 Stadium District Light Rail – 2030 Alternative 2



Streetcar

It was estimated that approximately five percent of event attendees on transit would use streetcar service to the Proposed Arena. This would add approximately 200 streetcar passengers traveling to and from the Stadium District for Alternative 2 Case S2 and S3. As illustrated on Figure 2–28, these scenarios, including the 2030 Alternative 2 Case S1, could be accommodated with assumed streetcar service levels.

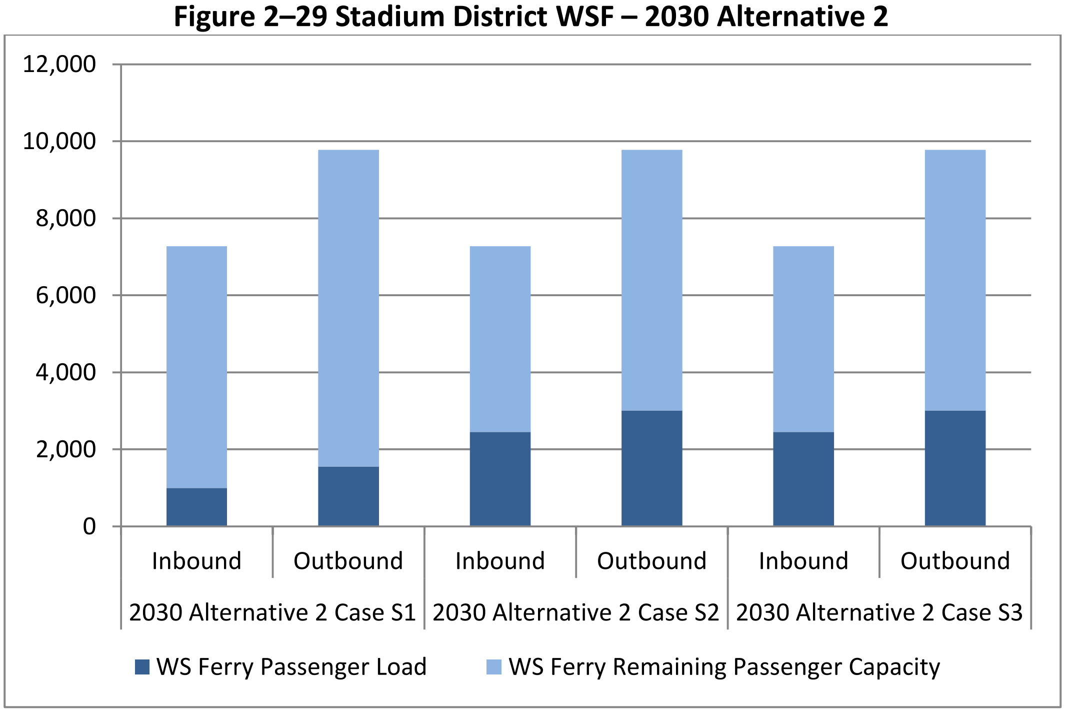
Figure 2–28 Stadium District Streetcar – 2030 Alternative 2



Washington State Ferry Service

It was estimated that approximately 19 percent of event attendees on transit would use ferry service to the Proposed Arena; this would add approximately 720 ferry passengers traveling to and from the Stadium District for Alternative 2 Case S2 and S3. As illustrated on Figure 2–29, these scenarios, including the 2030 Alternative 2 Case S1, could be accommodated with assumed WSF service levels.

Figure 2–29 Stadium District WSF – 2030 Alternative 2



2.2.5 Impacts of Alternative 3

This alternative would result in a small reduction in the number of event attendees and slightly reduce transit ridership associated with an arena. The operational and construction impacts would be similar to Alternative 2. The reduction in bus passengers is not enough to avoid the likely switch from some bus riders along the SR 99 and I-5 corridor from taking light rail instead because of estimated over capacity buses in this service corridor.

2.2.6 Mitigation Measures

A complete summary of potential mitigation measures to be considered across all the Transportation Elements evaluated in this report is included in Chapter 4.0 of Appendix E. This summary includes identification of both programmatic measures and physical improvements. For each of the potential mitigation measures a designation of high to low influence was noted. The following identifies those potential mitigation measures considered to have a high influence on this transportation element. These potential mitigation measures are appropriate for both Alternative 2 and Alternative 3.

- Premium transit service
- Shuttles
- Subsidize transit fares
- Add cars to LRT trains
- Additional trains on pocket track
- Rail/lodging/ticket packages
- Facilitate Washington State ferry use
- Facilitate King County passenger ferry service

2.2.7 Secondary and Cumulative Impacts

There could be secondary and cumulative impacts to non-event transit users due to additional passengers using transit or park-and-ride lots to attend events at the Proposed Arena. Non—event transit users may find transit more crowded, fewer parking spaces at remote lots, and longer commute times during game days.

As light rail service in the region is expanded, transit service providers are anticipated to redeploy service to avoid duplication of transit service. It is unclear how transit service provided would redeploy service, but it is likely to impact event attendees traveling to stadium events.

Major capital projects, such as Waterfront Seattle and the Southend Transit Pathways study will change how transit connects through and to downtown Seattle. These projects will bring some bus transit stop locations closer to the proposed Arena, resulting in a cumulative benefit to encourage event attendees to use transit for traveling to events.

2.2.8 Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts related to bus, rail, streetcar, and ferry transit service resulting from the Proposed Arena project have been identified.

2.3 Pedestrians

2.3.1 Methodology

The pedestrian impact evaluation included a broad assessment of the pedestrian environment in the study area and a more specific, quantitative evaluation of important pedestrian routes during event conditions. The broad analysis provides an understanding of the study area as a whole and the pedestrian environment along specific routes to and from major transportation stations and parking within this study area. The more specific quantitative analysis focuses on the 1st Avenue S., 4th Avenue S., and S. Holgate Street pedestrian links in close proximity to the Stadium District site where concentrations of pedestrian volumes are higher. Additional context related to the broad study area and key link evaluation method is provided below.

2.3.1.1 Broad Study Area Evaluation

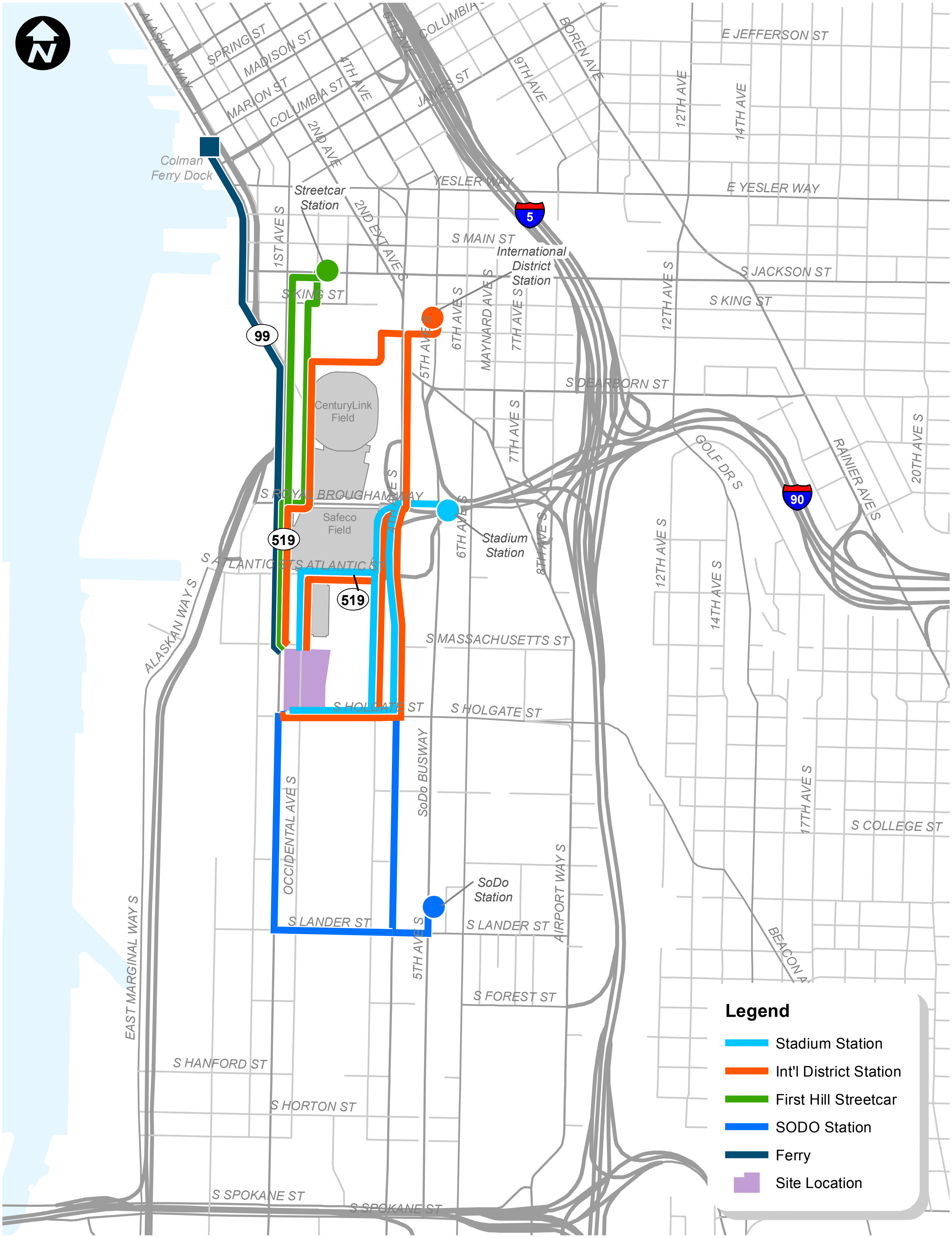
The broad study area is illustrated on Figure 2–1 on page 2-2 of the Street System section. This study area was identified based on the location of parking facilities and major transportation stations that would accommodate Arena demands. The key components of the study area evaluation include:

- Existing inventory of pedestrian facilities and identification of planned transportation projects that would impact the study area
- Analysis of the existing and future pedestrian event travel routes to and from major transportation stations and parking in terms of:
  - **Connectivity** or where gaps exist in the pedestrian facilities making it difficult to access the Stadium District site
  - **Quality** or the condition of the pedestrian facilities including lighting and space

Figure 2–30 illustrates the five key pedestrian routes identified for this assessment.

2.3.1.2 Link Evaluation

Pedestrians are associated with the event arrival period (or pre-event) and event egress period (post-event). Pre-event pedestrian demand is typically less concentrated since arrival occurs over a longer period (i.e., attendees start arriving to the Arena two to three hours prior to the event start time). Post-event egress occurs over a shorter duration (i.e., less than one hour); therefore, the concentration of pedestrian volumes is higher. The pedestrian link analysis focuses on weekday post-event conditions when the concentration of pedestrian flows would be highest. Analysis is conducted for one future period representative of both 2018 and 2030 conditions due to the conservative assumptions built into the analysis as well as the fact that the level of pedestrian volumes associated with an event far outweighs non-event background volumes. Pedestrian volumes are a function of event attendance; therefore, based on the same attendance levels 2018 and 2030 volumes would be the same.



Stadium District Key Pedestrian Routes

Seattle Arena

FIGURE
2-30

transpoGROUP

The pedestrian volumes for the analysis were based on:

- Existing data collected by direction along 1st Avenue S., 4th Avenue S., and S. Holgate Street for both event and non-event conditions. The collection of event data provides an understanding of pedestrian levels associated with a specific event attendance level, which in this case was a Mariners game with an attendance of approximately 13,000.
- Forecasting No Action Case S1 pedestrian volumes assuming growth consistent with the vehicular traffic forecasts.
- Proportionally increasing existing post-event pedestrian volumes to reflect attendance levels consistent with the No Action event case demands.
- Layering Arena pedestrian demands associated with travel demand / mode split estimates onto No Action Case S1, S2, and S3 to determine the Alternative 2 Case S1, S2, and S3 pedestrian volumes. The use of the layering approach relates to the specific travel patterns to and from the Stadium District site. Travel patterns were based on the location of major transportation stations and parking within the study area.

After establishing pedestrian volumes, the 1st Avenue S., 4th Avenue S., and S. Holgate Street links were evaluated to understand their ability to accommodate pedestrian demands. Two approaches were used for the link analysis, each tailored to the conditions that exist along the subject corridors:

- Along 1st and 4th Avenue S., an extension of the traditional Highway Capacity Manual (HCM) methodology was used.
- Along S. Holgate Street, the effect of potential railroad activity blocking east-west travel for pedestrians supersedes the effect of the sidewalk width on pedestrian "capacity" characterized by HCM. The two approaches are described below.

<u>1st and 4th Avenues S.</u>

A common measure used when analyzing different means of transportation is LOS, which for pedestrians is based on the "pedestrian's perception of the overall segment travel experience.[14]" The measurement for this is average space per pedestrians, which takes into account pedestrian "comfort and mobility.[15]" However, when considering the *adequacy* of the pedestrian facilities during an event, the travel experience is less about comfort and more about mobility, as pedestrians expect sidewalks to be more crowded near event venues. As such, a measurement based on overall mobility was used to evaluate the adequacy of pedestrian facilities, rather than a measure of comfort. Using mobility as a benchmark for evaluation provides an understanding of how crowded pedestrian facilities become with increases in demand associated with the scenarios.

[14] HCM, page 17-46
[15] HCM, page 23-7

A pedestrian flow assessment was conducted along 1st and 4th Avenues S. between S. Atlantic and Walker Streets based on the principles outlined in Chapters 17 and 23 in the 2010 HCM. The flow rate was calculated along these segments for the evaluation scenarios (i.e., existing and future event and non-event conditions). Flow rate is quantified as the number of pedestrians per-foot per-minute (p/ft/min) along a facility, so as pedestrian demand increases facilities become more crowded and the flow rate increases. To provide an understanding of free flow as compared to crowded conditions, the HCM 2010 defines the flow rate as unrestricted (or free flow) when there is a minimum of 10 pedestrians p/ft/min, as restricted between 11 and 23 p/ft/min and as severely restricted when over 23 p/ft/min. Under each scenario, the flow rate was calculated for the segments along 1st and 4th Avenue S. and compared to the HCM standards to assess whether conditions would be considered free flow (< 10 p/ft/min), restricted (11 - 23 p/ft/min), or severely restricted (>23 p/ft/min) indicating the level of crowding along the facility. For the segments considered severely restricted consideration was given as to whether the conditions were temporary, alternative routes exist, and / or mitigation may be needed to improve conditions.

A number of conservative assumptions were built into these assessments, which also need to be considered as the analysis is reviewed including:

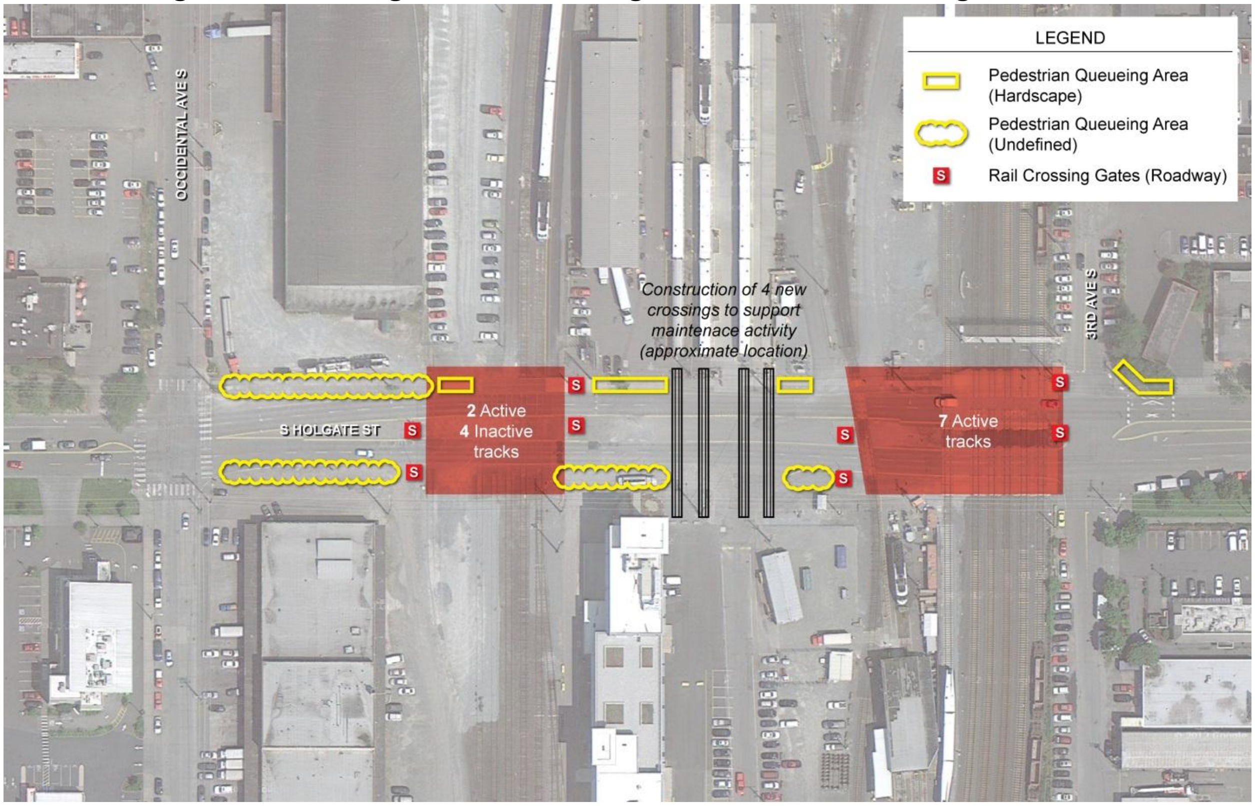
- The width of the facility was based on the most constrained area along the entire segment and considers impediments such as fire hydrants, power poles, signage etc.
- A minimum pedestrian demand of 20 pedestrians per hour was assumed.
- Hourly pedestrian demands were determined based on the peak 15-minute volume.

<u>South Holgate Street</u>

Figure 2–31 illustrates the existing and future rail crossings along S. Holgate Street. As described in the street system discussion, the total distance between the easternmost and westernmost tracks is over 500 feet, which exceeds the length of a typical city block. There is active control for the vehicle traffic at 2 of the 17 crossing locations, but only passive warning signs and no pedestrian control facilities.

There are significant train crossings that occur, without warning, throughout the day and evening. These include through trains, solid waste trains, and local yard switching and maintenance operations. This activity is expected to increase in the future. The 2010 City of Seattle South Holgate Street Study noted that the average train gate closure times increased from 8 minutes in 2004 to 12 minutes in 2009. Recent observations conducted by Paramterix to support the preparation of the Coal Train study, showed closures of up to 8 minutes based on over 100 trains observed. The number of train crossings is expected to increase in the future, which could result in increased closure durations.

Figure 2–31 S. Holgate Street Existing and Future Rail Crossing Locations



Amtrak is planning additional maintenance facilities onsite, and with that, additional crossings of Holgate with two additional tracks. This will support additional shop maintenance, and will likely result in increased frequency as well as some increase in the duration of closures. Maintenance occurs around the clock, as day trains are maintained at night, and night train maintenance occurs during the day. Figure 2–31 illustrates the Holgate frontage, and shows the additional tracks currently planned by Amtrak. As shown, the additional tracks would be located immediately east of the existing westerly tracks, with maintenance operations both north and south of Holgate Street.

Given the number of rail crossings along this street, the flow rate method would not be an effective tool for addressing pedestrian flows along S. Holgate Street; the overriding factor affecting pedestrians is the potential of a train crossing occurring and stopping flows. In this case, pedestrians flowing during post-event would accumulate at crossing stopping points (currently ungated) resulting in the need for queuing capacity. The 95th-percentile pedestrian queue lengths along S. Holgate Street during train crossings were calculated to determine storage needs under post-event conditions. The calculations assumed:

- All pedestrians on one side of the street, as a worst case characterization.
- Pedestrian demands represent the peak 15-minute volume.

- Five square-feet of space per pedestrian based on research related to personal space allocations in social settings – it is possible during crowded post-event conditions pedestrians could require less space.
- Closures between 2 and 30 minutes in duration to provide a sensitivity analysis to further understand the range of queuing capacity needed to accommodate post-event pedestrians. As discussed above, existing average train gate closure times ranged from 8 to 12 minutes; however, depending on activities, future growth, and train timing closures could be up to 30 minutes.

The results of the analysis provide an understanding of storage needed to accommodate pedestrians with train crossings and deficiencies that would occur as train crossing times and pedestrian demands increase.

Figure 2–31 depicts the general pedestrian storage areas along S. Holgate Street. It is difficult to quantify the existing pedestrian storage capacity along this roadway because sidewalks are either sporadic (north side) or non-existent (south side). In addition, there is potential for multiple train crossings at one time. As a result, the analysis focuses on comparing the alternatives to show how increases in pedestrian levels result in increases in storage needs as well as potential increases in conflicts between pedestrians and crossings.

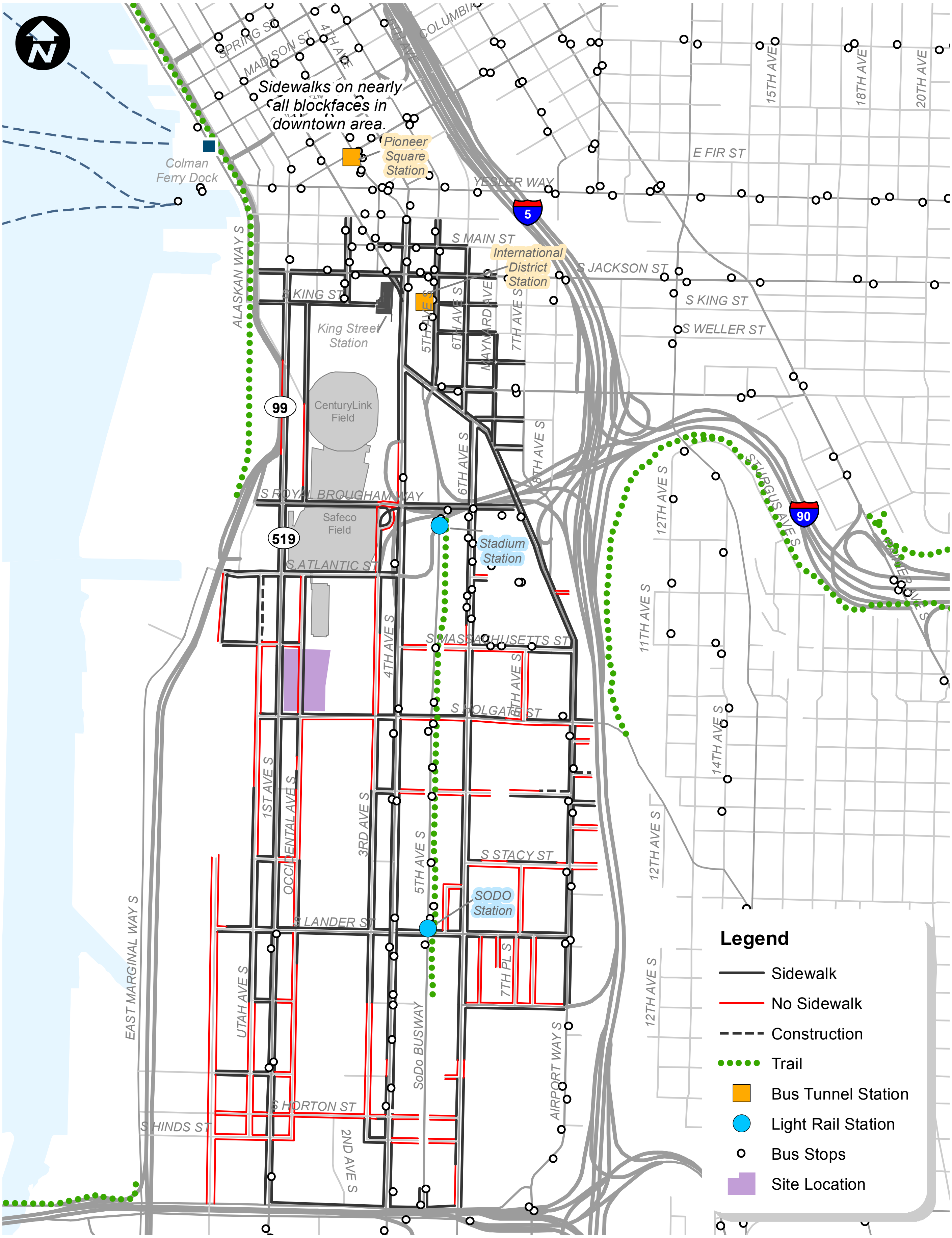
2.3.2 Affected Environment

The following describes the existing pedestrian context in terms of the broad study area and proximate links.

2.3.2.1 Broad Study Area Evaluation

A comprehensive inventory of pedestrian facilities was conducted within the study area. This inventory included identification of raised sidewalks, trails, and segments that were missing any kind of facility. Figure 2–32 summarizes the study area pedestrian network and identifies the existing trails and gaps in sidewalk network. When reviewing the inventory, there is generally a difference in the density of the sidewalk connections north of S. Holgate Street as compared to the area south of S. Holgate Street. This is likely due to the level and nature of the development that has occurred north of S. Holgate Street and its proximity to the CBD.

Most of the major north-south and east-west arterials have sidewalks on one or both sides of the streets. Impediments were identified throughout the area that included fire hydrants, signage, or power poles. These impediments reduce the useable width of the sidewalk for short distances. Sidewalks are more intermittent along minor streets such as Occidental Avenue S., Utah Avenue S., and 3rd Avenue S., south of S. Royal Brougham Way.



Stadium District Pedestrian Facilities

Seattle Arena

FIGURE
2-32

transpoGROUP

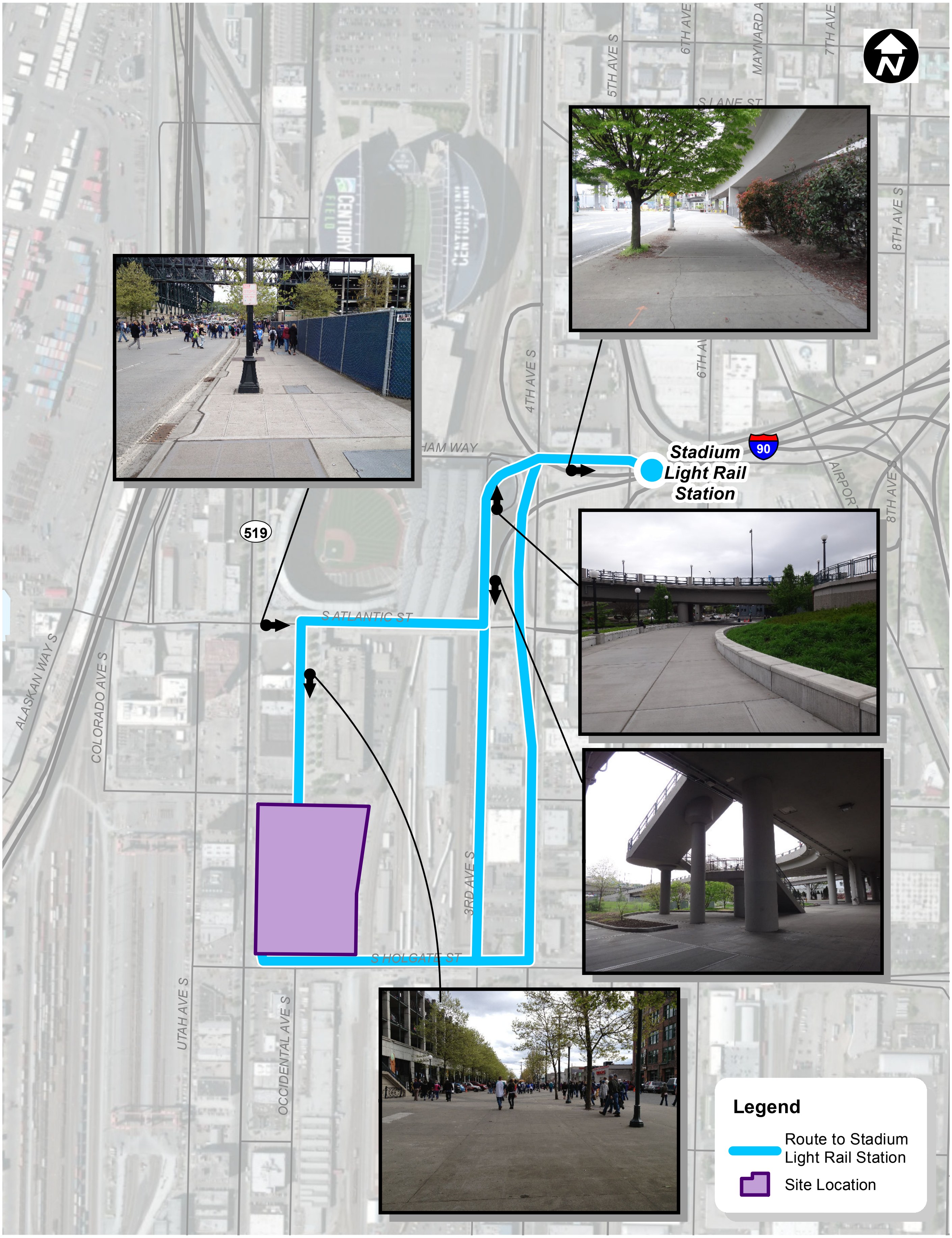
Weekday pedestrian flows in the study area without an event are generally to and from transit and employment centers or business employees walking to food establishments or parking. Employment centers in the study area include the King County offices located at 201 S. Jackson Street immediately north of CenturyLink Field and offices in the area of Union Station between 4th Avenue S. and 5th Avenue S. Transit facilities in the northern area that have a large pedestrian draw include King Street Station and the International District / Chinatown Station. Pedestrian activity near the Seattle Arena site and in the southern portion of the study area is generally low given the primarily industrial land uses. This low pedestrian activity also occurs along Occidental Avenue S. between S. Massachusetts and S. Holgate Streets where there are no sidewalks and the uses are industrial. Higher pedestrian activity in the southern portion of the study area occurs along corridors accessing transit (e.g., near the SoDo Busway and Link Light Rail stations) and larger employers (e.g., near the Starbucks Headquarters at 1st Avenue S. and S. Lander Street).

The pedestrian travel patterns in the study area change with an event conditions as the main draw becomes either CenturyLink Field or Safeco Field, with flows generally coming to and from event parking areas and transit facilities. Pedestrian volumes in the immediate vicinity of the event venues increase, particularly along 1st Avenue S., S. Jackson Street, S. Royal Brougham Way, and at the signalized pedestrian crossing of 4th Avenue S. between the Union Station Parking Garage and CenturyLink Field. 1st Avenue S. serves as a main north-south pedestrian corridor with several large parking garages in the north and parking lots and on-street parking to the south of CenturyLink Field. The pedestrian volumes along S. Jackson Street, S. Royal Brougham Way and at the 4th Avenue S. signalized crossing are generally related to transit or parking in the International District.

Based on the pedestrian travel patterns described above and the major transportation and parking, four specific routes were identified for further review:

- Stadium Station
- SoDo (Lander) Station
- International District Station
- Ferry (Colman Deck)

The review included an overall assessment of facilities, connectivity, and quality of the pedestrian environment. Figure 2–33 through Figure 2–36 shows the four pedestrian routes and pictures are provided at key locations to provide an understanding of the pedestrian experience. As part of the assessment of quality, a review of pedestrian lighting was conducted and is summarized on Figure 2–37. Key characteristics of these routes are described below.

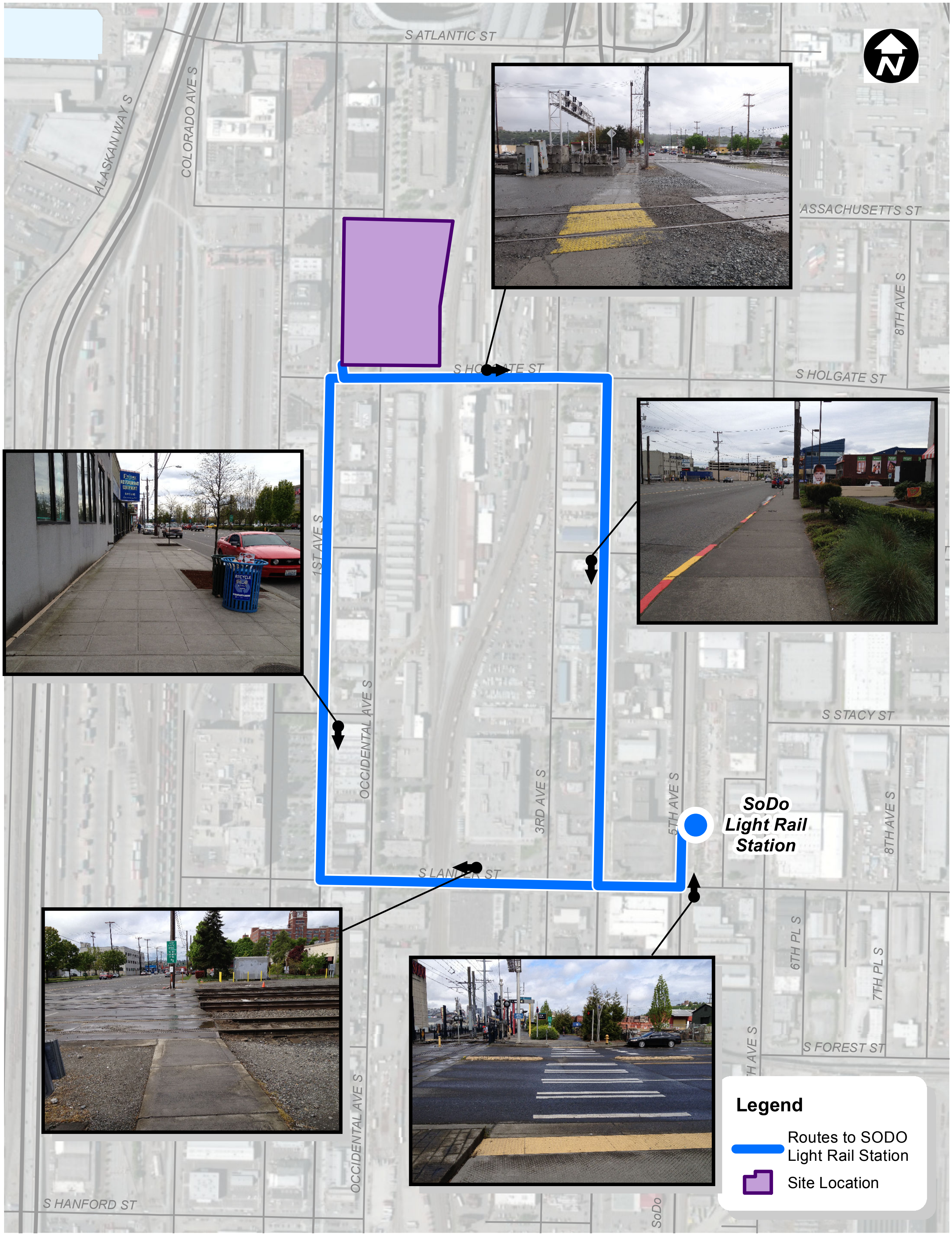


Stadium District Pedestrian Route: Stadium Station

Seattle Arena

FIGURE
2-33

transpoGROUP

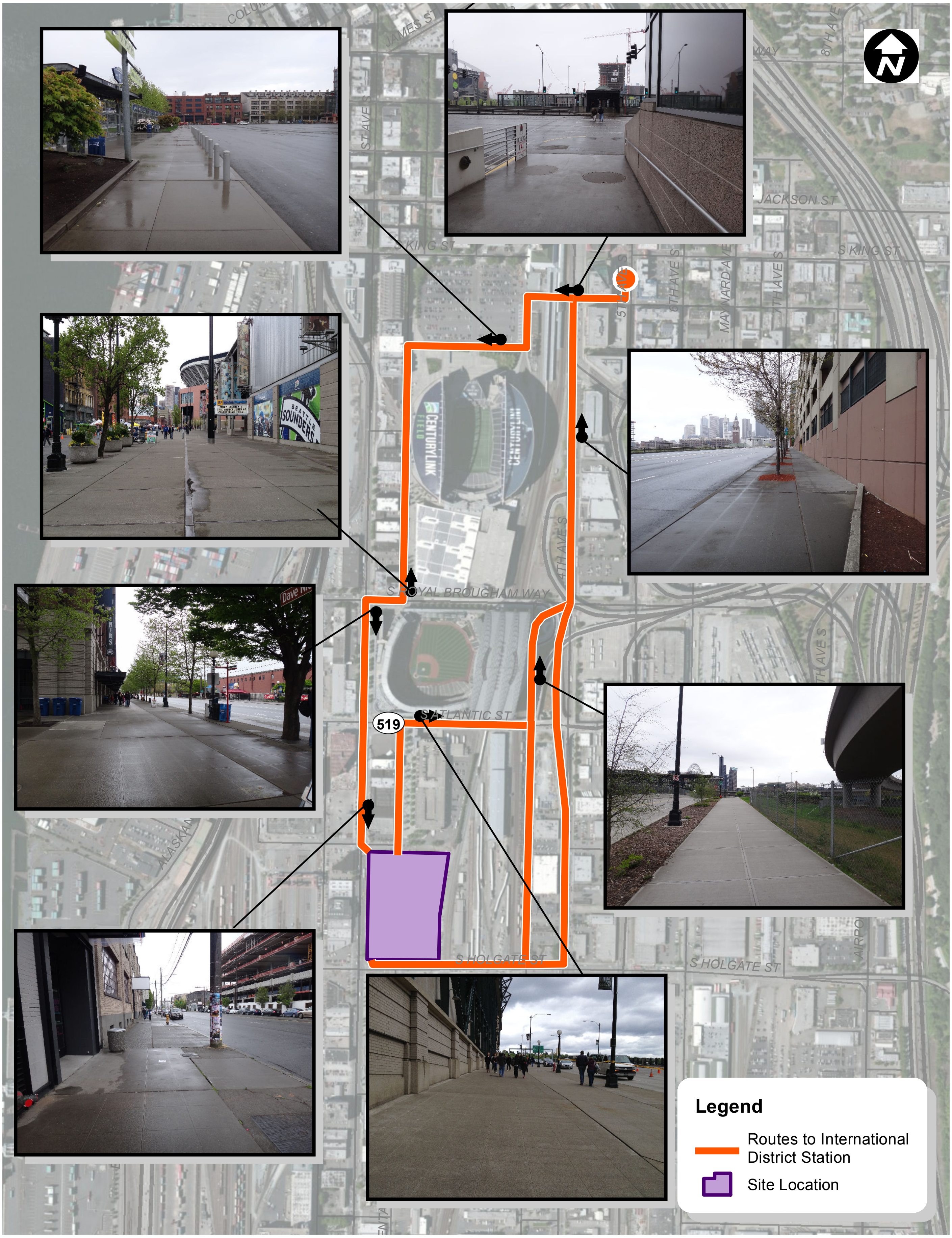


Stadium District Pedestrian Route: SoDo Station

FIGURE
2-34

Seattle Arena

transpoGROUP

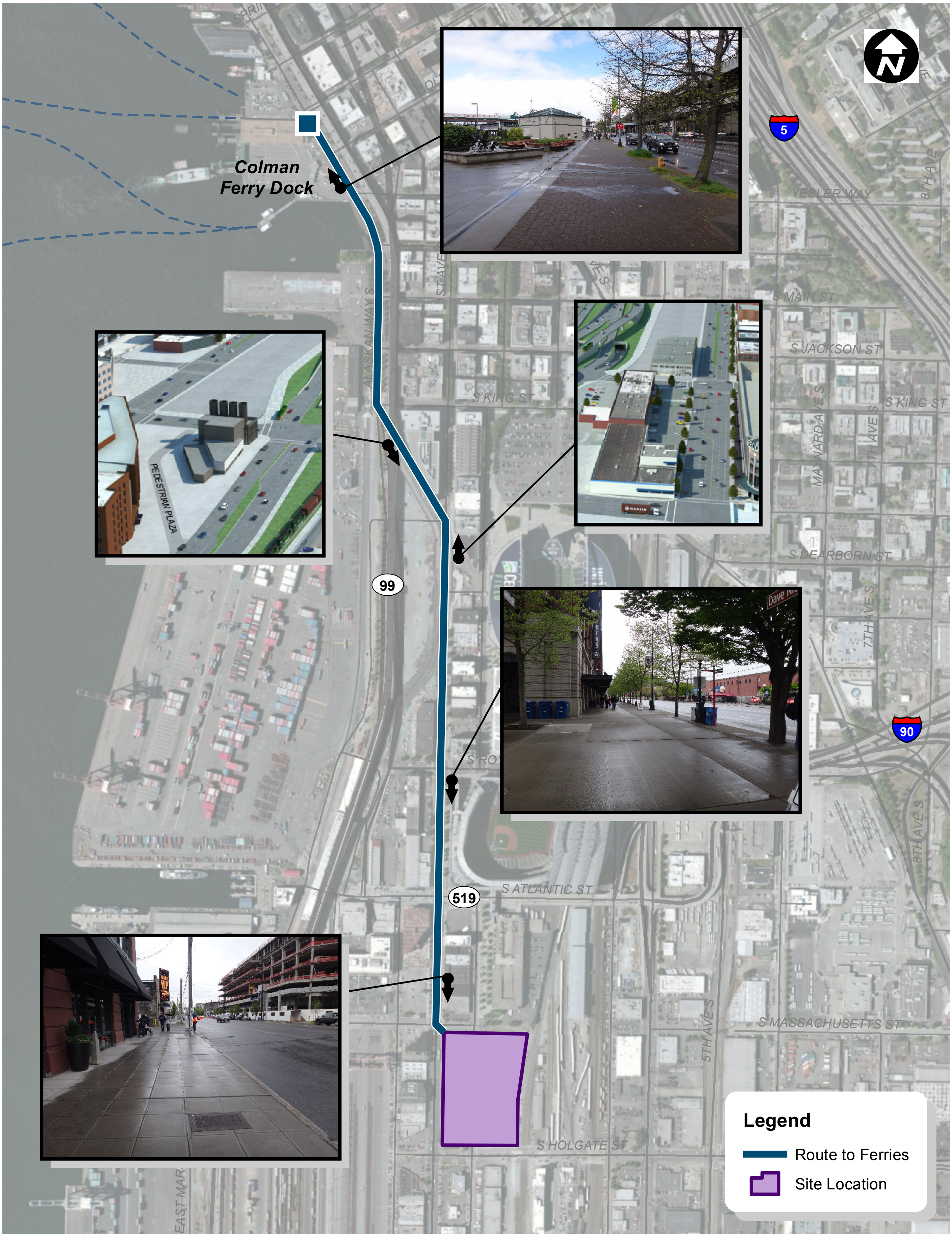


Stadium District Pedestrian Route: International District

FIGURE **2-35**

Seattle Arena

transpoGROUP

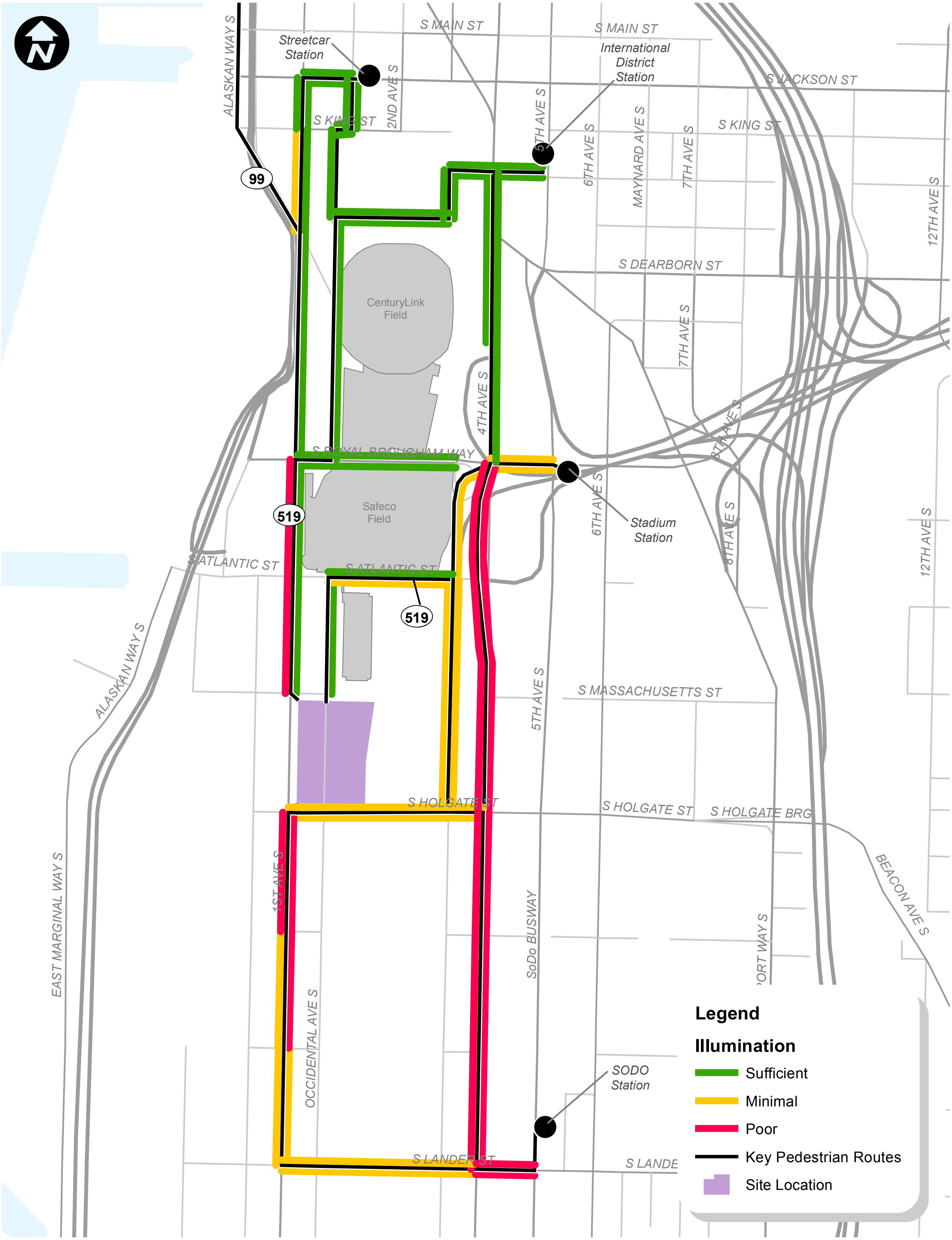


Stadium District Pedestrian Route: Ferry

Seattle Arena

FIGURE
2-36

transpoGROUP



Stadium District Pedestrian Lighting Review

Seattle Arena

FIGURE
2-37

transpoGROUP

Stadium Station Route

These routes are approximately 1/2-mile long and provide access to the closest transit facility (Stadium Station) to the site. The route from the Stadium Station along S. Atlantic Street and Occidental Avenue S. has newer facilities, wider sidewalks, and is well lit, while the routes along 3rd and 4th Avenues S. are less pedestrian-friendly with minimal to poor lighting and missing or narrow sidewalks. Key issues along this route related to the Stadium District site include:

- Some darker areas as you walk under large roadway structures as well as minimal lighting along 3rd Avenue S. and poor lighting along 4th Avenue S.
- Poor connection north-south across S. Atlantic Street due to stairs only on the north side.
- Missing sidewalks along 3rd Avenue S. on the west side between S. Atlantic Street and S. Holgate Street and on the east side between S. Massachusetts Street and S. Holgate Street.
- Narrow or constrained sidewalk sections along 4th Avenue S., south of S. Atlantic Street.
- Pedestrian safety issues along S. Holgate Street between 4th Avenue S. and the Stadium District site related to the multiple at-grade crossings that pedestrians need to traverse.

SoDo (Lander) Station Route

The two routes providing access between the site and the SoDo station are both less than one mile long with facilities varying between sidewalks and little to no shoulder. Key issues along these routes related to the Stadium District site include:

- No sidewalks along S. Holgate Street on the south side.
- Some narrow portions of sidewalk particularly west side of 4th Avenue S. and S. Lander Street.
- At-grade train crossings with only passive pedestrian warning sides could be a safety issue as the level of pedestrians increase.
- Lighting is poor along portions of 1st Avenue S. and all of 4th Avenue S. between S. Holgate Street and S. Lander Street (see Figure 2–37).

International District Station Routes

The routes providing access between the site and the International District are almost one mile. The routes generally provide a pedestrian-friendly environment with sidewalks and enhancements specifically for pedestrians such as the pedestrian bridge between CenturyLink Field and King Street Station, signalized crossing along 4th Avenue S., and the pedestrian ramp at S. Royal Brougham Way and 4th Avenue S. providing access to 3rd Avenue S. There are some deficiencies south of S. Atlantic Street along 3rd and 4th Avenues S. with missing and narrow sidewalk sections and minimal to poor lighting. Key issues along these routes related to the Stadium District site include:

- If using 4th Avenue S. the connection north-south across S. Atlantic Street is poor due to stairs only on the north side.
- Some areas are darker as you walk under large roadway structures when using 4th Avenue S. towards the site as well as minimal lighting along 3rd Avenue S. and poor lighting along 4th Avenue S., south of S. Atlantic Street.
- Missing sidewalks along 3rd Avenue S. on the west side between S. Atlantic Street and S. Holgate Street and on the east side between S. Massachusetts Street and S. Holgate Street.
- Narrow or constrained sidewalk sections along 4th Avenue S., south of S. Atlantic Street.
- Pedestrian safety issues along S. Holgate Street between 4th Avenue S. and the Stadium District site related to the multiple at-grade crossings that pedestrians need to traverse.

<u>Ferry (Colman Dock) Route</u>

This route is over one mile long. Much of the route is under construction with development and transportation projects in the vicinity. Along this route lighting is poor on the west side of 1st Avenue S.

Overall, the pedestrian network is well connected along these key routes with only a few missing links. The environment is pedestrian-friendly and lighting is adequate. Issues that may rise to a level of concern along key links in close proximity to the site include the poor connection across S. Atlantic Street when coming to and from the northeast, missing and narrow sidewalks along 3rd and 4th Avenues S., south of S. Atlantic Street and the extensive at-grade train crossings along S. Holgate Street and lack of pedestrian facilities and at-grade crossing control.

2.3.2.2 Link Evaluation

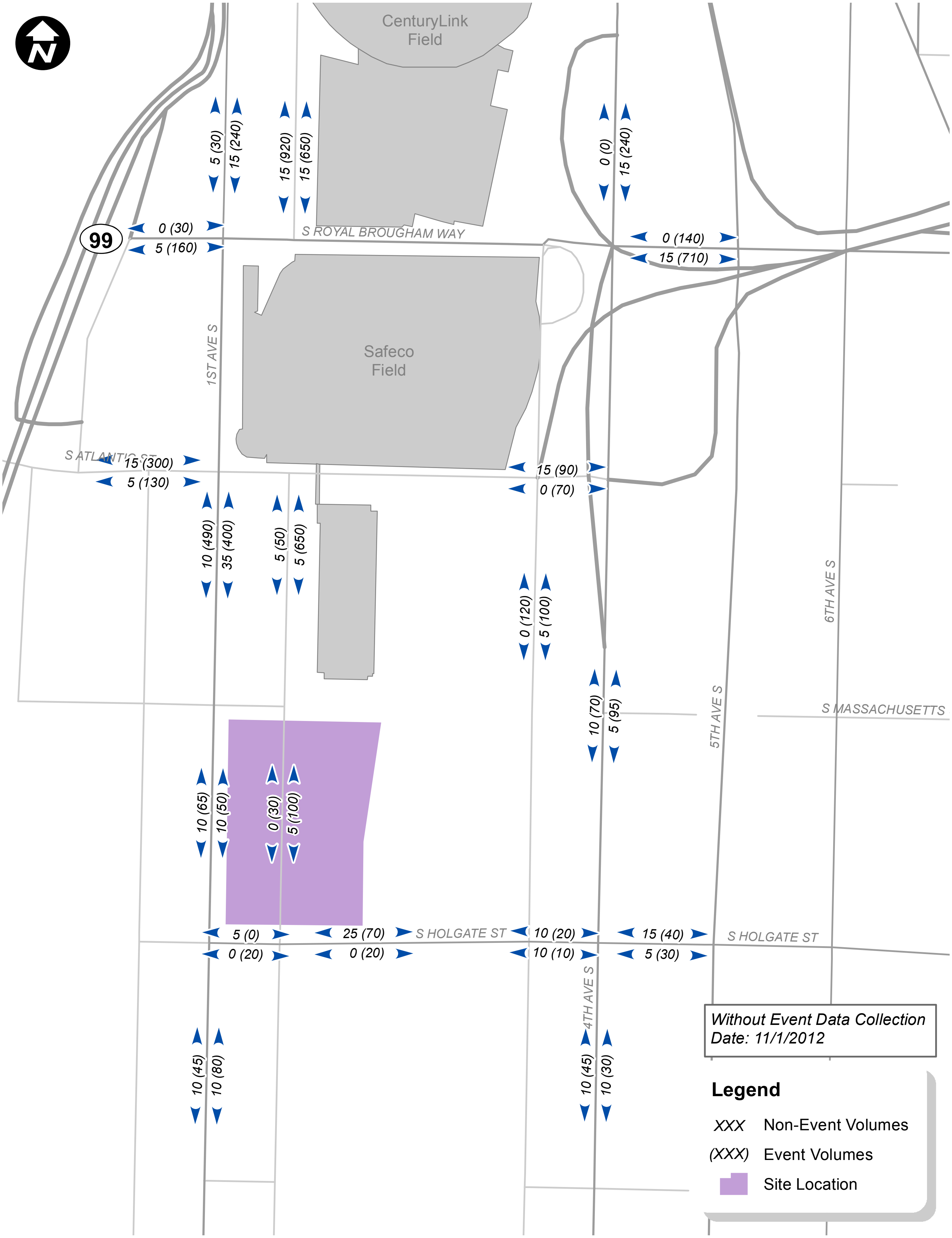
Post-event pedestrian counts were conducted along the key segments in the vicinity of the site. These counts were conducted in May 2013 and the post-event conditions represent pedestrian volumes for an attendance level of approximately 13,000.

Figure 2-38 shows the total post-event hour pedestrian volumes along the segments for non-event and post-event conditions. The pedestrian counts shown in the figure were used as a basis of the 1st and 4th Avenues S. and S. Holgate Street link evaluations summarized below.

<u>1st and 4th Avenues S.</u>

Table 2-3 below shows the 1st and 4th Avenues S. existing pedestrian flow analysis under non-event and post-event conditions. Based on the pedestrian flow rate, it was determined whether sidewalk conditions would be free flow (>10 p/ft/min), restricted (11-23 p/ft/min), or severely restricted (>23 p/ft/min).

Event conditions represent a Mariners game with 13,000 attendees. As shown in the table, based on the existing post-event pedestrian volumes along the 1st and 4th Avenues S. all sidewalk sections studied have acceptable pedestrian flow rates with and without the Mariners game. This analysis indicates that the sidewalks on the east and west sides of both 1st and 4th Avenues S. are adequate to accommodate the existing pedestrian demand.



Stadium District Existing Post-Event Pedestrian Volumes

Seattle Arena

FIGURE
2-38

transpoGROUP

Table 2-3
Pedestrian Flow Assessment – Existing Post-event

	Sidewalk Section	Non-Event[1] Pedestrian Flow Rate (p/ft/min)[2]	Non-Event[1] Level of Crowding[3]	With Event[1] Pedestrian Flow Rate (p/ft/min)[2]	With Event[1] Level of Crowding[3]
1st Avenue S.	S. Atlantic St to S. Massachusetts St				
	West Side	<1	Free Flow	3	Free Flow
	East Side	<1	Free Flow	1	Free Flow
	S. Massachusetts St. to S. Holgate St				
	West Side	<1	Free Flow	<1	Free Flow
	East Side	<1	Free Flow	<1	Free Flow
	S. Holgate St to S. Walker St				
	West Side	<1	Free Flow	<1	Free Flow
	East Side	<1	Free Flow	<1	Free Flow
4th Avenue S.	S. Atlantic St to S. Holgate St				
	West Side	<1	Free Flow	1	Free Flow
	East Side	<1	Free Flow	<1	Free Flow
	S. Holgate St to S. Walker St				
	West Side	<1	Free Flow	<1	Free Flow
	East Side	<1	Free Flow	<1	Free Flow

1. Pedestrian counts for non-event conditions conducted on May 2, 2013 and for event conditions on May 1, 2013 with a Mariners game attendance of 12,936.
2. Pedestrian flow calculation based on the 2010 *Highway Capacity Manual* (HCM) method using the peak 15-minute pedestrian demand rounded to the nearest 20 pedestrians. The calculated flow reflects the most constrained portion of the evaluated sidewalk section and is expressed in pedestrian per feet per minute (p/ft/min)
3. Based on HCM, free flow is >10 p/ft/min, restricted is 11-23 p/ft/min, and severely restricted is >23 p/ft/min.

S. Holgate Street

Pedestrians routinely get "stuck" during the traverse of the span of tracks along S. Holgate Street when a train ahead causes a gate drop and in some cases, a train behind. Event pedestrian demands are particularly prone to this as the groups of pedestrians occurring after an event have limited comfortable or safe refuge when they are stopped by a closing crossing gate. This dynamic results in a potential for conflict between pedestrians and train crossings.

Table 2-4 illustrates the existing (95th-percentile) pedestrian accumulations and associated queuing requirements expressed in square feet for train crossing interruptions between 5 and 30 minutes. As noted in the methodology, current train blockages range from less than a minute to over 8 minutes in duration. The scenarios shown in the table are simply illustrations and do not reflect actual queue observations in the field. If a higher attendance game occurred, pedestrian flows and related queues and storage needs would be greater.

Table 2-4
Existing Eastbound Pedestrian Accumulation
at Holgate Train Crossing (Post-Event)

Train Crossing (minutes)[1]	Existing Non-Event Pedestrian Demand = 20 pedestrians / hour[2]		Existing Post-event Pedestrian Demand = 140 pedestrians / hour[2]	
	95th% Peak Pedestrian Accumulation[3]	Approx. Storage Needed (sq ft)[4]	95th% Peak Pedestrian Accumulation[3]	Approx. Storage Needed (sq ft)[4]
5	5	25	19	95
10	8	40	33	165
15	10	50	46	230
20	12	60	59	295
25	14	70	72	360
30	16	80	85	425

Notes: sq ft = square-feet

1. Longest observed train crossing at Holgate Street is 8.2 minutes, per Coal Train Study (2012).
2. Volumes reflect a peak 15-minute rate multiplied by four, and are rounded to the nearest 10.
3. 95th percentile volumes indicate either that volume or less would occur 95 percent of the time.
4. Assumed 5 square feet of space per pedestrian.
5. Directional pedestrian volumes not available for non-event conditions; crosswalk counts on a non-event day indicate little to no pedestrians use the roadway without an event during the hour evaluated.

As illustrated by the sensitivity analysis for existing non-event and post-event pedestrian demands:

- Pedestrian queues range from 25 to 85 pedestrians, depending on the duration of the blockage.
- Sidewalk storage to accommodate queues based on current blockage levels of around 10 minutes range from 40 square-feet without an event to 165 square-feet with a Mariners game of approximately 13,000 attendees.
- Blockages up to 30-minutes (representing increased activity) would result in the need for over 400 square-feet of storage to accommodate existing pedestrian demands.

2.3.3 Impacts of No Action Alternative

The following describes the No Action pedestrian context in terms of the broad study area and proximate links.

2.3.3.1 Broad Study Area Evaluation

The study area was reviewed to determine if any funded planned projects would contribute to the non-motorized infrastructure connectivity or capacity and / or if additional major transportation or parking destinations would be added to the study area. The following summarizes those that were associated with larger projects, or that were determined to be substantial in scope or significance:

- **Multiuse Paths** - Two multi-use paths are being constructed as part of the Alaskan Way Viaduct Replacement Project to be completed by 2018.
- **First Hill Streetcar** - This project is slated for completion by 2014. This project constructs a modern, low-floor streetcar system connecting First Hill employment centers to the regional Link Light Rail system, including but not limited to the International District / Chinatown Station, and Capitol Hill Station at Broadway and John Street.

For the No Action condition, five specific pedestrian travel routes were identified to major transportation including Stadium Station, SoDo Station, International District, the Ferry at Colman Dock, and the First Hill Streetcar.

The Stadium Station, SoDo Station and International District routes are anticipated to be consistent with the description provided in the Affected Environment because there are no future infrastructure projects impacting these routes. Improvements are anticipated along the Ferry route as a result of the Alaskan Way Viaduct Replacement Project. Figure 2–39 shows the First Hill Streetcar pedestrian travel route and Figure 2–36 illustrates the Ferry route. Key characteristics of these two routes are described below.

<u>Ferry (Colman Dock) Route</u>

As part of the Alaskan Way Viaduct project, Railroad Way S. is being planned as an improved direct pedestrian connection between the Waterfront and Stadium District. The City is leading the design of this element of the Alaskan Way Viaduct Replacement project. It will include a variety of treatments and lighting features to invite pedestrians along an enhanced connection. There could still be some lighting deficiencies along this route on the west side of 1st Avenue S. between S. Atlantic and S. Holgate Streets as noted under existing conditions; however, redevelopment is occurring in this area and it likely that at least portions of this will be improved as part of development frontage improvements.

<u>First Hill Streetcar</u>

The nearest streetcar stop to and from the Stadium District site would be along S. Jackson Street between 5th and 6th Avenues S. The two routes providing access between the site and the streetcar stop are both less than one mile long with facilities. In general, adequate pedestrian facilities exist to / from the north along Occidental Avenue S. transitioning to 1st Avenue S., south of S. Royal Brougham Way and the two routes are well connected. This route also has poor lighting as discussed above along 1st Avenue S.

Overall, with improvements along 1st Avenue S., Railroad Way S., and Alaskan Way a more pedestrian-friendly environment would be created and the routes would remain well connected. With No Action, there would continue to be a poor connection across S. Atlantic

Stadium District Pedestrian Route: First Hill Streetcar

Seattle Arena

FIGURE
2-39

transpoGROUP

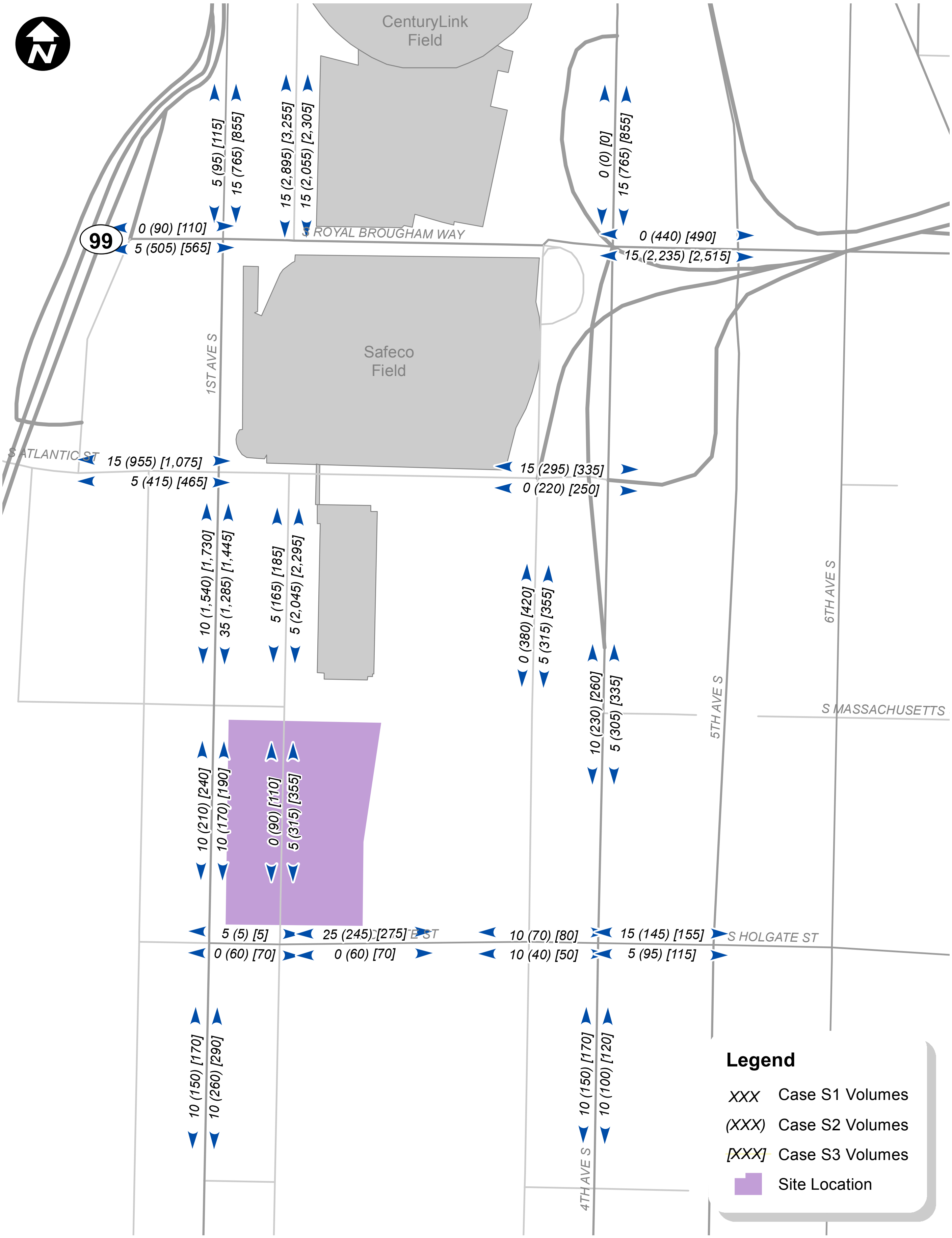
Street when coming to and from the northeast, missing and narrow sidewalks along 3rd and 4th Avenues S., south of S. Atlantic Street, and planned projects would result in additional at-grade train crossings on S. Holgate Street with no improvements to pedestrian facilities or provision of pedestrian crossing controls.

2.3.3.2 Link Evaluation

Figure 2–40 shows the forecasted No Action total post-event hour pedestrian volumes along the segments for the event cases. The pedestrian demand shown in the figure was used as a basis of the 1st and 4th Avenues S. and S. Holgate Street link evaluations.

1st and 4th Avenues S.

Table 2-5 below summarizes the 1st and 4th Avenues S. No Action pedestrian flow analysis for Case S1, S2, and S3. Based on the pedestrian flow rate, it was determined whether sidewalk conditions would be free flow (>10 p/ft/min), restricted (11-23 p/ft/min), or severely restricted (>23 p/ft/min). As shown in the table, based on the No Action post-event pedestrian volumes along the 1st and 4th Avenues S. pedestrian flow rates are anticipated to be acceptable with rates less than 10 p/ft/min. This analysis indicates that the sidewalks on the east and west sides of 1st and 4th Avenues S. are adequate to accommodate the No Action pedestrian demand under all event cases.



Stadium District No Action Post-Event Pedestrian Volumes

FIGURE 2-40

Seattle Arena

transpoGROUP

Table 2-5
Pedestrian Flow Assessment – No Action

		Case S1[1]		Case S2		Case S3	
	Sidewalk Section	**Pedestrian Flow Rate (p/ft/min)[2]**	**Level of Crowding[3]**	**Pedestrian Flow Rate (p/ft/min)[2]**	**Level of Crowding[3]**	**Pedestrian Flow Rate (p/ft/min)[2]**	**Level of Crowding[3]**
1st Avenue S.	S. Atlantic St to S. Massachusetts St						
	West Side	<1	Free Flow	8	Free Flow	9	Free Flow
	East Side	<1	Free Flow	4	Free Flow	4	Free Flow
	S. Massachusetts St. to S. Holgate St						
	West Side	<1	Free Flow	<1	Free Flow	<1	Free Flow
	East Side	<1	Free Flow	<1	Free Flow	<1	Free Flow
	S. Holgate St to S. Walker St						
	West Side	<1	Free Flow	<1	Free Flow	<1	Free Flow
	East Side	<1	Free Flow	1	Free Flow	1	Free Flow
4th Avenue S.	S. Atlantic St to S. Holgate St						
	West Side	<1	Free Flow	4	Free Flow	4	Free Flow
	East Side	<1	Free Flow	2	Free Flow	2	Free Flow
	S. Holgate St to S. Walker St						
	West Side	<1	Free Flow	3	Free Flow	3	Free Flow
	East Side	<1	Free Flow	1	Free Flow	1	Free Flow

1. No Action Case S1 pedestrian flow is consistent with existing non-event conditions since the pedestrian demand in the study area is low during the post-event time period when there is no event at the existing venues.
2. Pedestrian flow calculation based on the 2010 *Highway Capacity Manual* (HCM) method using the peak 15-minute pedestrian demand rounded to the nearest 20 pedestrians. The calculated flow reflects the most constrained portion of the evaluated sidewalk section and is expressed in pedestrian per feet per minute (p/ft/min)
3. Based on HCM, free flow is >10 p/ft/min, restricted is 11-23 p/ft/min, and severely restricted is >23 p/ft/min.

S. Holgate Street

As noted in the Affected Environment, pedestrians routinely get “stuck” during the traverse of tracks along S. Holgate Street and event pedestrian demands are particularly prone to this as the groups of pedestrians occurring after an event have limited comfortable or safe refuge in the event they are stopped by a closing crossing gate. This dynamic results in an potential for conflict between pedestrians and train crossing, and would increase in the future under No Action due to increased pedestrian levels as well as increased train activity.

Table 2-6 illustrates the existing (95th-percentile) pedestrian accumulations and associated queuing requirements expressed in square feet for train crossing interruptions between 5 and 30 minutes. The scenarios in the table are provided as an illustrative sensitivity analysis. The analysis is conservative in that they reflect all pedestrians associated with post-event egress on a single side of the street.

Table 2-6
No Action Eastbound Pedestrian Accumulation at Holgate Train Crossing (Post-Event)

Train Crossing (minutes)[1]	No Action Case S1 Pedestrian Demand = 20 pedestrians / hour[2]		No Action Case S2 Pedestrian Demand = 420 pedestrians / hour[2]		No Action Case S3 Pedestrian Demand = 480 pedestrians / hour[2]	
	95th% Peak Pedestrian Accumulation[3]	Approx. Storage Needed (sq ft)[4]	95th% Peak Pedestrian Accumulation[3]	Approx. Storage Needed (sq ft)[4]	95th% Peak Pedestrian Accumulation[3]	Approx. Storage Needed (sq ft)[4]
5	5	25	50	230	50	260
10	8	40	85	425	100	480
15	10	50	125	615	140	695
20	12	60	160	805	180	910
25	14	70	200	990	225	1,125
30	16	80	235	1,175	270	1,335

Notes: sq ft = square-feet

1. Longest observed train crossing at Holgate Street is 8.2 minutes, per Coal Train Study (2012).
2. Volumes reflect a peak 15-minute rate multiplied by four, and are rounded to the nearest 10.
3. 95th percentile volumes indicate either that volume or less would occur 95 percent of the time.
4. Assumed 5 square feet of space per pedestrian.

As illustrated by the sensitivity analysis for No Action pedestrian demands:

- No Action Case S1 conditions are consistent with existing non-event conditions since demands late in the evening in the study area are generally driven by event travel.
- The higher level of event attendance assumed for the No Action Case S2 and S3 conditions results in higher pedestrian demands and more storage needed as compared to the existing event conditions.
- Pedestrian queues range from 5 to 270 pedestrians, depending on the duration of the blockage.
- Sidewalk storage to accommodate queues based on current blockage levels of around 10 minutes range from 40 square-feet without an event to 480 square-feet.
- Blockages up to 30-minutes (representing increased activity) would result in the need for approximately 1,335 square-feet of storage to accommodate the Case S3 representing 45,500 attendees.

As noted in the Affected Environment, the pedestrian environment along S. Holgate Street, with related lack of storage, pedestrian control at the train crossings, and proliferation of rail crossings, creates an environment with opportunity for conflicts between pedestrians and rail activity. With increases in pedestrians associated with the No Action and planned increases in train activity, these issues would likely increase in the future along S. Holgate Street.

2.3.4 Impacts of Alternative 2

Alternative 2 construction would result in intermittent sidewalk closures along the frontage of the site (i.e., 1st Avenue S. and S. Massachusetts and Holgate Streets). A construction management plan would be developed and safe pedestrian circulation would be provided adjacent to the construction site through the use of temporary walkways, detours and signs.

The following describes the Alternative 2 pedestrian context in terms of the broad study area and proximate links.

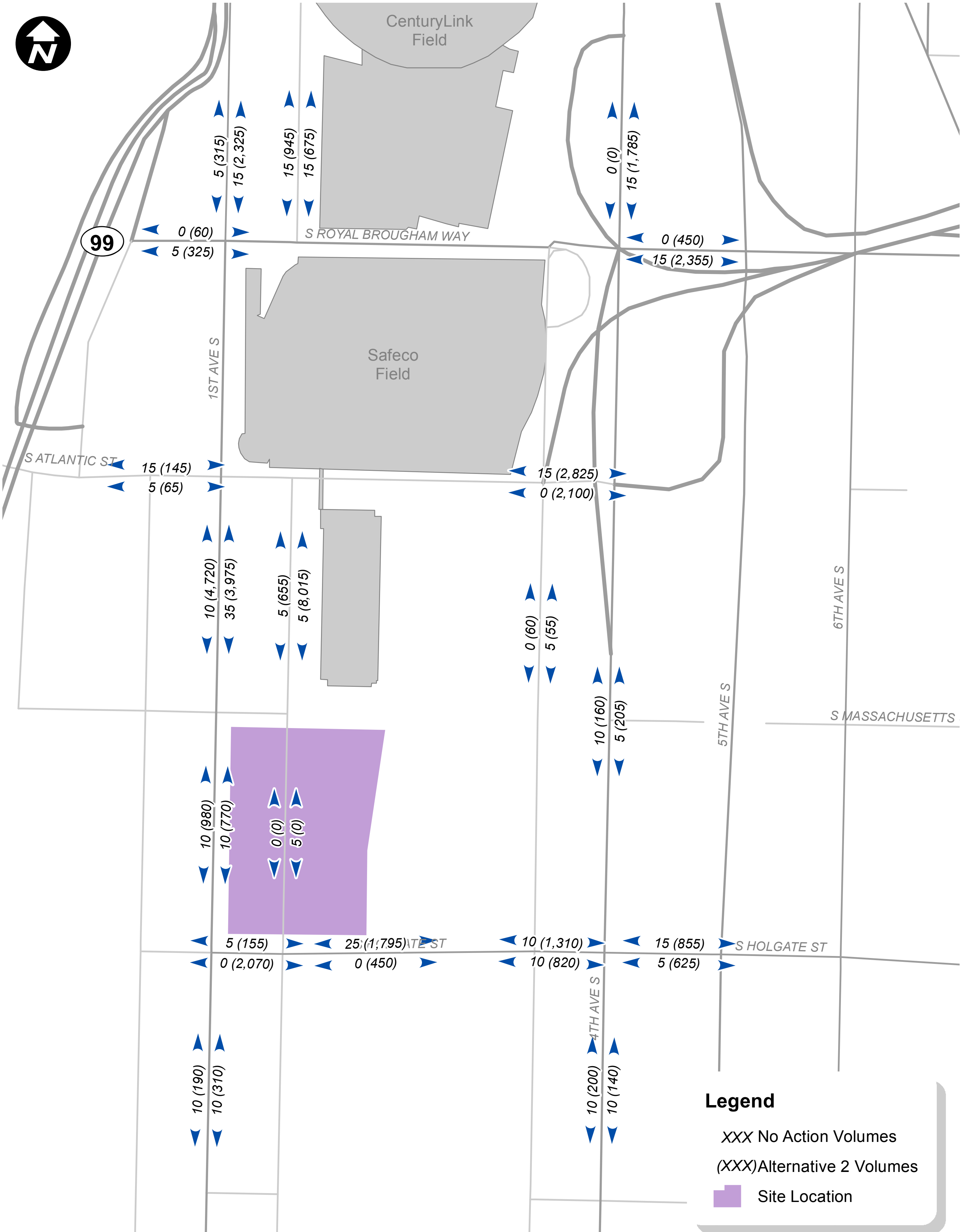
2.3.4.1 Broad Study Area Evaluation

Alternative 2 is not anticipated to change the wider study area or the pedestrian environment along the key travel routes to and from the Stadium District site described in the Affected Environment and No Action.

This alternative would result in the vacation of Occidental Avenue S. between S. Massachusetts Street and S. Holgate Street; therefore, travel patterns for pedestrians using this connection would change. Pedestrian activity occurring along this portion of Occidental Avenue S. (see existing pedestrian volumes on Figure 2–40 on page 2-69) is generally minimal during non-event conditions. As event attendance increases, use by pedestrians walking to and from parking located to the south increases. There are no sidewalk facilities along this segment of Occidental Avenue S., and the environment is poor given the undefined pedestrian area and the level of business activity occurring. Pedestrians currently using Occidental Avenue S. would likely shift to 1st Avenue S., which has an improved pedestrian environment with a connected sidewalk system. The 1st Avenue S. sidewalk frontage between S. Massachusetts and S. Holgate Streets is proposed at 15 feet, which is adequate to accommodate expected levels of pedestrians.

2.3.4.2 Link Evaluation

Figure 2–41 through Figure 2–43 show a comparison of No Action and Alternative 2 total post-event hour pedestrian volumes along the segments for the event cases. The pedestrian demand shown in the figure was used as a basis of the 1st and 4th Avenues S. and S. Holgate Street link evaluations summarized below.



Stadium District No Action and Alternative 2 Case S1 Post-Event Pedestrian Volumes

FIGURE
2-41

Seattle Arena

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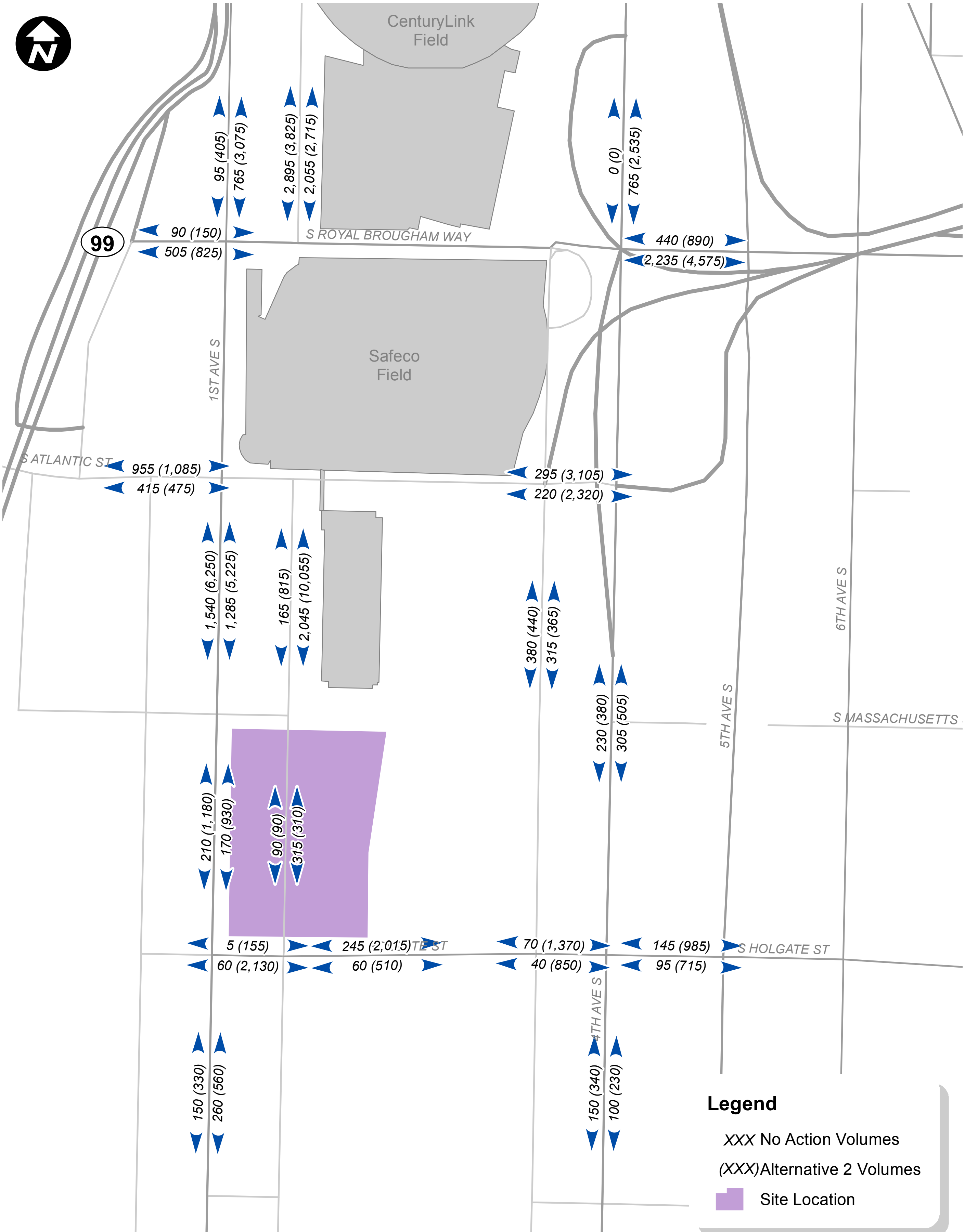
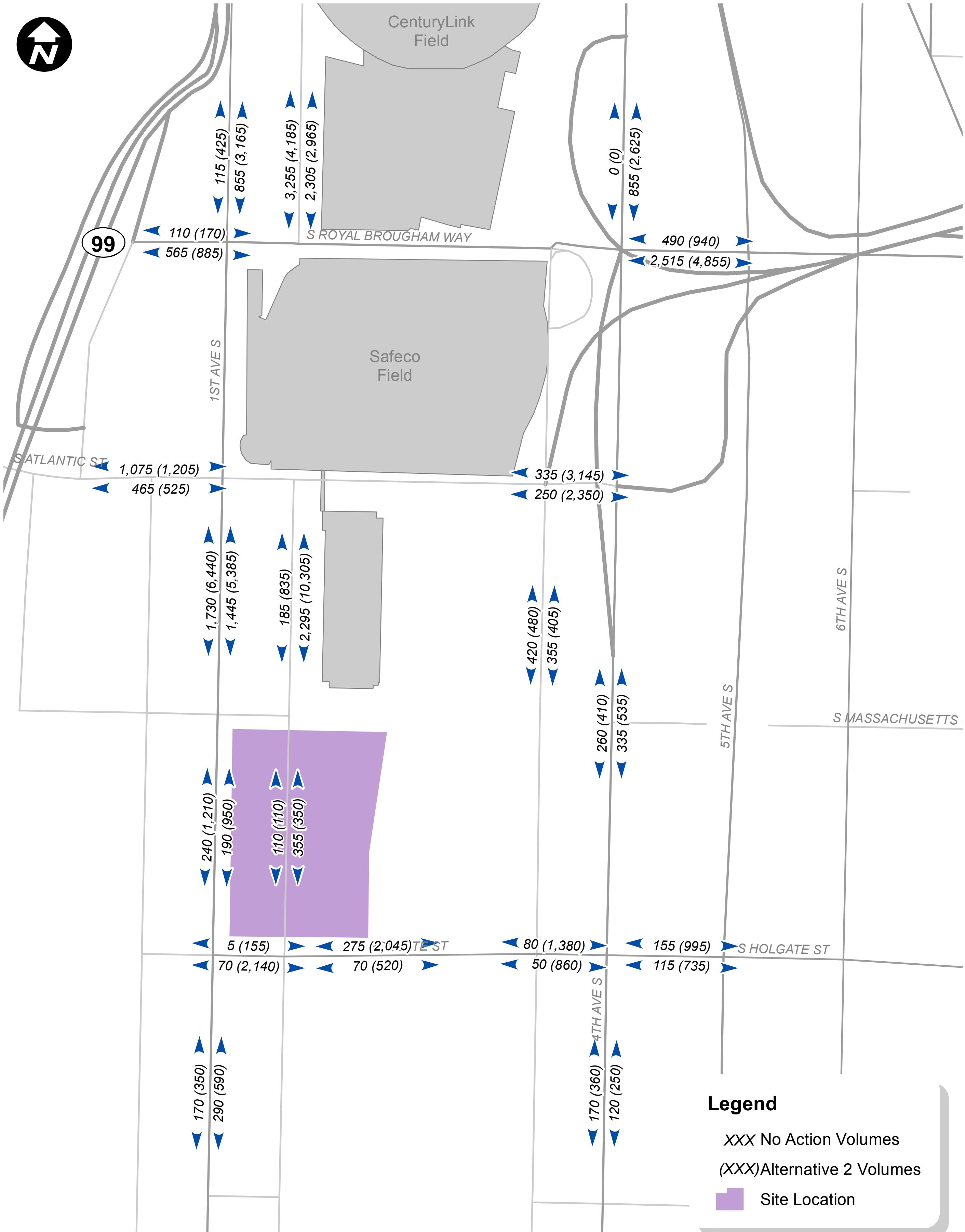


Stadium District No Action and Alternative 2 Case S2 Post-Event Pedestrian Volumes

Seattle Arena

FIGURE
2-42

transpoGROUP



Stadium District No Action and Alternative 2 Case S3 Post-Event Pedestrian Volumes

Seattle Arena

FIGURE
2-43

1st and 4th Avenues S.

Table 2-7 below shows the 1st and 4th Avenues S. Alternative 2 pedestrian flow analysis as compared to the No Action conditions for each event case. Based on the pedestrian flow rate, it was determined whether sidewalk conditions would be free flow (>10 p/ft/min), restricted (11-23 p/ft/min), or severely restricted (>23 p/ft/min). For the segments considered severely restricted consideration was given as to whether the conditions were temporary, alternative routes exist, and / or mitigation may be needed to improve conditions.

Table 2-7
Pedestrian Flow Assessment – Comparison of No Action and Alternative 2

	Sidewalk Section	**Case S1** Pedestrian Flow Rate[1] (p/ft/min) / Level of Crowding[2]		**Case S2** Pedestrian Flow Rate[1] (p/ft/min) / Level of Crowding[2]		**Case S3** Pedestrian Flow Rate[1] (p/ft/min) / Level of Crowding[2]	
		No Action[3]	**Alt 2[4]**	**No Action**	**Alt 2[4]**	**No Action**	**Alt 2[4]**
1st Avenue S.	S. Atlantic St to S. Massachusetts St						
	West Side	<1 / Free Flow	19 / Restricted	8 / Free Flow	28 / Severely Restricted	9 / Free Flow	29 / Severely Restricted
	East Side	<1 / Free Flow	35 / Severely Restricted	4 / Free Flow	39 / Severely Restricted	4 / Free Flow	39 / Severely Restricted
	S. Massachusetts St. to S. Holgate St						
	West Side	<1 / Free Flow	<1 / Free Flow	<1 / Free Flow	2 / Free Flow	<1 / Free Flow	2 / Free Flow
	East Side	<1 / Free Flow	6 / Free Flow	<1 / Free Flow	6 / Free Flow	<1 / Free Flow	6 / Free Flow
	S. Holgate St to S. Walker St						
	West Side	<1 / Free Flow	5 / Free Flow	<1 / Free Flow	5 / Free Flow	<1 / Free Flow	5 / Free Flow
	East Side	<1 / Free Flow	<1 / Free Flow	1 / Free Flow	1 / Free Flow	1 / Free Flow	1 / Free Flow
4th Avenue S.	S. Atlantic St to S. Holgate St						
	West Side	<1 / Free Flow	4 / Free Flow	4 / Free Flow	8 / Free Flow	4 / Free Flow	8 / Free Flow
	East Side	<1 / Free Flow	4 / Free Flow	2 / Free Flow	6 / Free Flow	2 / Free Flow	6 / Free Flow
	S. Holgate St to S. Walker St						
	West Side	<1 / Free Flow	13 / Restricted	3 / Free Flow	16 / Restricted	3 / Free Flow	16 / Restricted
	East Side	<1 / Free Flow	4 / Free Flow	1 / Free Flow	5 / Free Flow	1 / Free Flow	5 / Free Flow

Notes: Shading indicates locations with severely restricted flow rates.

1. Pedestrian flow calculation based on the 2010 *Highway Capacity Manual* (HCM) method using the peak 15-minute pedestrian demand rounded to the nearest 20 pedestrians. The calculated flow reflects the most constrained portion of the evaluated sidewalk section and is expressed in pedestrian per feet per minute (p/ft/min)
2. Based on HCM, free flow is >10 p/ft/min, restricted is 11-23 p/ft/min, and severely restricted is >23 p/ft/min.
3. No Action Case S1 pedestrian flow is consistent with existing non-event conditions since the pedestrian demand in the study area is low during the post-event time period when there is no event at the existing venues.

4. Assessment assumes pedestrian improvements along site frontage including 1st Avenue S. between S. Massachusetts Street and S. Holgate Street where a 15-foot pedestrian zone is assumed on the east side of the street. This results in an improved pedestrian flow rate relative to No Action.

Table 2-7 shows:

- Alternative 2 Case S1 pedestrian flows on the east side of 1st Avenue S. between S. Atlantic and S. Massachusetts Streets would be severely restricted and pedestrians would experience crowded conditions, assuming the identified peaking characteristics.
- The multi-event cases (Case S2 and S3) would cause further restricted flows on the east side as well as degrade conditions on the west side of 1st Avenue S. between S. Atlantic and S. Massachusetts Streets.
- Given the location of the doors to the Arena (northwest and southwest corners of the building) and the 15-foot wide sidewalk proposed along the frontage, flows along 1st Avenue S. between S. Massachusetts and S. Holgate Streets would be free flow.
- Pedestrian flows along 4th Avenue S. between S. Atlantic and S. Walker Streets would generally experience free flow except on the west side of 4th Avenue S. between S. Holgate and S. Walker Streets where the addition of the Arena would result in some crowding due to a constrained sidewalk section. There is capacity on the east side, so pedestrians wanting to avoid crowds could use these facilities.

The calculation of pedestrian flow rates suggests that during the peak 15 minutes associated with a capacity event egress sidewalk on the east side of 1st Avenue S., north of Massachusetts Street would be crowded as a result of the Arena. This could be mitigated by rerouting more pedestrians to Occidental Avenue S. immediately north of the site and / or providing more onsite attractions and amenities to reduce peaking characteristics of post-event egress.

S. Holgate Street

Alternative 2 would result in substantially more pedestrians along S. Holgate Street than characterized for the No Action conditions during both event ingress and egress. It is likely that conflicts between pedestrians and trains would increase with Alternative 2, exacerbating an issue that exists under current event and non-event conditions. The introduction of an Arena at this location would substantially increase and concentrate demands over currently observed levels.

Table 2-8 illustrates the existing (95th-percentile) pedestrian accumulations and associated queuing requirements expressed in square feet for train crossing interruptions between 5 and 30 minutes. The scenarios in the table are provided as an illustrative sensitivity analysis. The analysis is conservative in that they reflect all pedestrians associated with post-event egress on a single side of the street.

Table 2-8
No Action Eastbound Pedestrian Accumulation at Holgate Train Crossing (Post-Event)

Train Crossing (minutes)[1]	Alt 2 Case S1 Pedestrian Demand = 2,220 pedestrians / hour[2]		Alt 2 Case S2 Pedestrian Demand = 2,640 pedestrians / hour[2]		Alt 2 Case S3 Pedestrian Demand = 2,700 pedestrians / hour[2]	
	95th% Peak Pedestrian Accumulation[3]	Approx. Storage Needed (sq ft)[4]	95th% Peak Pedestrian Accumulation[3]	Approx. Storage Needed (sq ft)[4]	95th% Peak Pedestrian Accumulation[3]	Approx. Storage Needed (sq ft)[4]
5	210	1,045	250	1,230	250	1,255
10	400	2,015	480	2,380	490	2,430
15	595	2,975	700	3,520	720	3,595
20	790	3,930	930	4,650	950	4,755
25	980	4,880	1,160	5,780	1,180	5,905
30	1,170	5,830	1,380	6,905	1,410	7,060

Notes: sq ft = square-feet

1. Longest observed train crossing at Holgate Street is 8.2 minutes, per Coal Train Study (2012).
2. Volumes reflect a peak 15-minute rate multiplied by four, and are rounded to the nearest 10.
3. 95th percentile volumes indicate either that volume or less would occur 95 percent of the time.
4. Assumed 5 square feet of space per pedestrian.
5. Directional pedestrian volumes not available for non-event conditions; crosswalk counts on a non-event day indicate little to no pedestrians use the roadway without an event during the hour evaluated.

As illustrated by the sensitivity analysis for Alternative 2 pedestrian demands:

- Pedestrian queues and storage needs would be five times greater than characterized for the No Action conditions.
- Pedestrian queues attributable to waiting for passing trains would range from approximately 200 to 1,400 pedestrians, depending on the duration of the blockage.
- Sidewalk storage to accommodate queues based on current blockage levels of around 10 minutes would be over 2,000 square-feet.
- Blockages up to 30 minutes (representing increased activity) would result in the need for approximately 5,800 square-feet of storage to accommodate just an Arena event.

As noted in the Affected Environment, there is an existing safety issue along S. Holgate Street related to the lack of storage and pedestrian control at the train crossings. With significant increases in event-related pedestrian volumes associated with Alternative 2 and planned increases in train activity, safety issues would increase in the future along S. Holgate Street. Accommodating the large storage needs for pedestrians, particularly during post-event egress, would be difficult even with enhanced at-grade crossings and pedestrian treatments.

2.3.5 Impacts of Alternative 3

Alternative 3 construction would result in intermittent sidewalk closures along the frontage of the site (i.e., 1st Avenue S. and S. Massachusetts and Holgate Streets). A construction management plan would be developed and safe pedestrian circulation would be provided adjacent to the construction site through the use of temporary walkways, detours and signs.

With 10 percent less seats, this would result in a 10 percent reduction in the overall pedestrian demand as compared to the Alternative 2. Overall transportation impacts for Alternative 3 would be slightly less than those described for Alternative 2 and the analysis of Alternative 2 fully encompasses any transportation impacts that would occur as a result of developing Alternative 3.

2.3.6 Mitigation Measures

A complete summary of potential mitigation measures to be considered across all the Transportation Elements evaluated in this report is included in Chapter 4.0 of Appendix E. This summary includes identification of both programmatic measures and physical improvements. For each of the potential mitigation measures a designation of high to low influence was noted. The following identifies those potential mitigation measures considered to have a high influence on this transportation element. These potential mitigation measures are appropriate for both Alternative 2 and Alternative 3.

- Pedestrian Improvements (i.e. pedestrian scale lighting, S. Atlantic / 3rd Avenue south side stairs, surface street improvements or pedestrian bridge on S. Holgate Street, etc.)
- Way-finding system
- Pedestrian scale lighting improvements
- Realignment of S. Massachusetts Street between 1st Avenue S. and Occidental Avenue

2.3.7 Secondary and Cumulative Impacts

No secondary or cumulative impacts to pedestrian facilities have been identified.

2.3.8 Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts are expected.

2.4 Bicycle

2.4.1 Methodology

The general approach to the evaluation of bicycle impacts included:

- Inventory of existing bicycle facilities
- Identification of future plans related to bicycle facilities

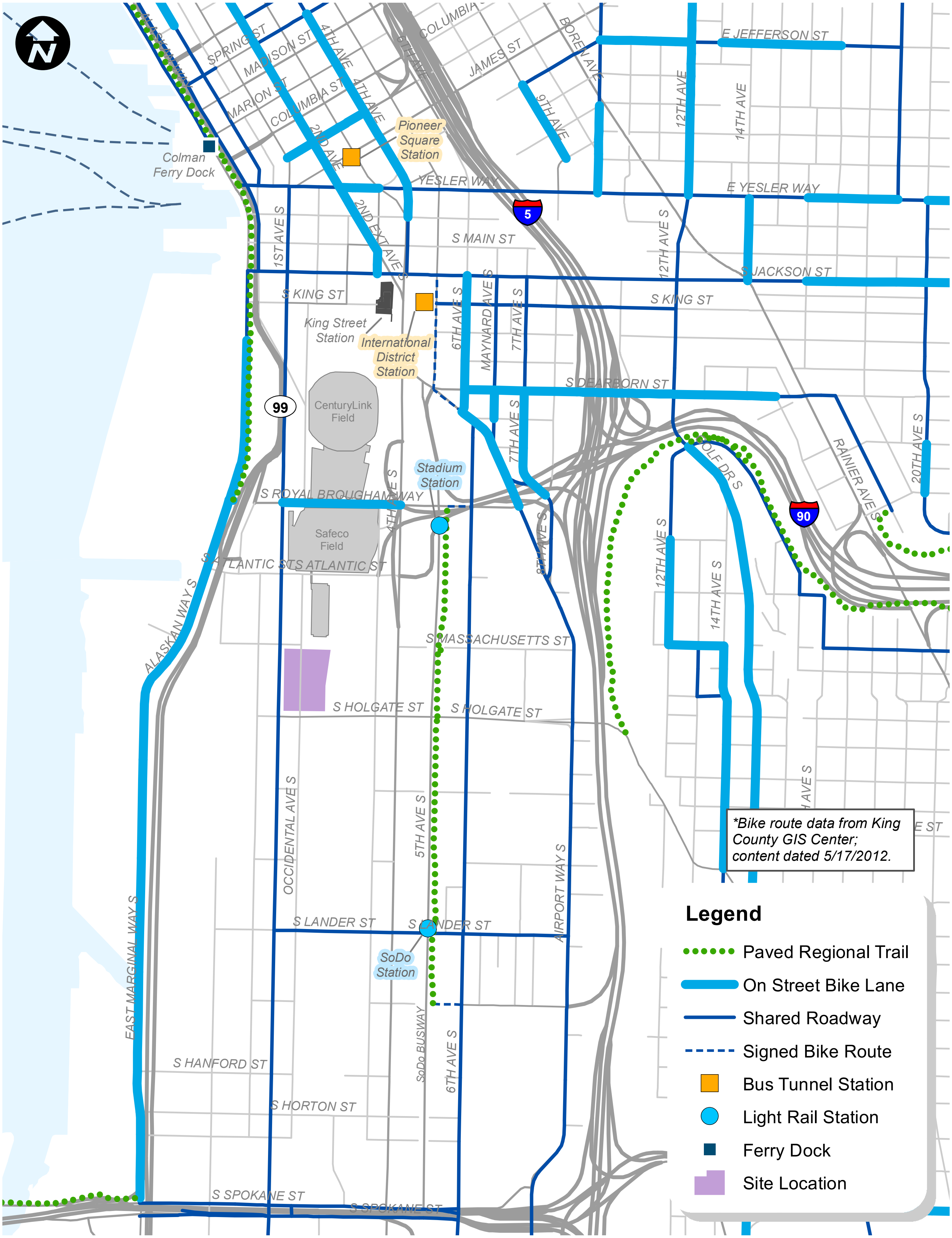
- Collection of non-event and event bicycle data in the study area
- Evaluation of bicycle impacts considering change in volumes

2.4.2 Affected Environment

Figure 2–44 illustrates the bicycle network within the study area. The primary north-south bike corridors include 1st Avenue S. and 6th Avenue S. that include sharrows and shared lanes as well as the bike lane that is provided along E. Marginal Way. The E. Marginal Way bike lane connects to the trail from West Seattle, providing a direct bike connection to downtown.

East-west bicycle connections in the study area are provided by bicycle lanes along S. Royal Brougham Way and shared lane facilities along E. Yesler Way, S. Jackson Street, S. Lander Street and S. Spokane Street.

The Elliott Bay Trail and the SoDo Trail are off-street multi-use trails in the study area. The Elliott Bay Trail runs along Alaskan Way S. in the northwestern part of the study area. It starts at S. Royal Brougham Way and travels north toward the Queen Anne neighborhood. The SoDo Trail is a shorter trail located east of the site between 4th Avenue S. and 6th Avenue S. adjacent to the SoDo Busway. It begins at S. Royal Brougham Way and ends approximately one block south of S. Lander Street. The SoDo Trail can be accessed at S. Royal Brougham Way, S. Holgate Street and S. Lander Street.



Stadium District Bicycle Facilities

FIGURE **2-44**

Seattle Arena

transpoGROUP

Weekday event and non-event bicycle volumes were collected in May 2013 along key roadways in the vicinity of the Stadium District site including 1st Avenue S., Occidental Avenue S., 3rd Avenue S., 4th Avenue S., S. Holgate Street, and S. Royal Brougham Way. The volumes were reviewed during pre-event (6:00 to 7:00 PM) and post-event conditions. Event conditions represent a Mariners game with approximately 13,000 attendees. A review of the bicycle volumes shows:

- There is little to no post-event bicycle traffic in the vicinity of the site under both non-event and event conditions. The locations with more than a few bicyclists were closer to Safeco Field. 1st and Occidental Avenues S., north of S. Royal Brougham Way had approximately 20 to 35 bicyclists post-game, and 1st Avenue S., south of S. Holgate Street had approximately 15 bicyclists. Given the travel patterns, there is a potential that some of this bicycle traffic was related to the Mariners game.
- Pre-event bicycle volumes were generally higher than post-event for both non-event and event conditions.
- A majority of the bicycle traffic was concentrated along 1st Avenue S. where there are bicycle lanes.
- In general, event bicycle volumes were slightly higher than non-event demands along the north-south corridors (i.e., 1st Avenue S. and 4th Avenue S.). For the east-west corridors (S. Royal Brougham Way, S. Atlantic Street and S. Holgate Street) the comparison of bicycle volumes was inconsistent; however, in general, the volumes were lower with the event as compared to non-event.

It is difficult to know with certainty if increased bicycle volumes with events are a result of the event attendees, bicyclists displaced from other routes, or non-event bicyclists who have chosen to ride specifically on days when events are to occur. Overall, the observed proportional change in bicycle traffic is minimal and the actual change in the number of bicycles on the road is unlikely to create a noticeable impact between event and non-event conditions.

2.4.3 Impacts of No Action Alternative

Bicycle conditions for 2018 and 2030 No Action cases are described below.

2.4.3.1 2018 Conditions

Bicycle improvements planned and funded in the SoDo study area were reviewed. The most significant projects within the study area are the two multi-use paths being constructed as part of the Alaskan Way Viaduct Replacement Project to be completed by 2018.

Bicycle use is anticipated to continue to grow in Seattle as transportation congestion and cost of parking increases. Bicycle traffic levels were identified in Affected Environment and were not identified as a significant portion of the traffic stream during pre- and post-event in the Stadium District study area. No significant change in bicycle traffic is forecasted; however, there is a likelihood that the new multiuse paths will see significant use, especially during summer months. It is possible that these facilities could attract riders from other, less comfortable street routes, thus decreasing relative bicycle volumes on other street grid routes.

2.4.3.2 2030 Conditions

There are no additional funded improvements for 2030 at this time; however, the City is going through a draft Bicycle Master Plan and the result of the planning process will be priorities for bicycle improvements.

Bicycle transportation demands in 2030 are expected to be similar to those described for the 2018 condition, which were similar to existing conditions. No new adverse impacts to bicycle travel would occur, with the exception of increased rail crossing activity (frequency and duration) at S. Holgate Street. This would continue to result in the increased potential for conflicts between bicyclists and train crossings.

In general, as traffic volumes increase in the study area due to future 2018 and 2030 growth, there is a potential for increased conflict between vehicles and bicyclists.

2.4.4 Impacts of Alternative 2

Construction of Alternative 2 may result in intermittent bicycle facility closures and re-routing along 1st Avenue S. A construction management plan could be developed to mitigate impacts. Protocol could be included in the plan related to safe bicycle circulation adjacent to the construction site through the use of temporary facilities, detours, and signs.

Alternative 2 is not anticipated to impact bicycle facilities within the study area. As described in the Affected Environment, bicycle volumes within the study area are generally low in the vicinity of the Stadium District site, and minimal increase is anticipated with the development. Development of the Seattle Arena would result in increased vehicular demands on event days within the study area, which would increase the potential conflicts between bicyclists and vehicles. Bicycle impacts in 2018 and 2030 are anticipated to be similar.

2.4.5 Impacts of Alternative 3

Construction of Alternative 3 may result in intermittent bicycle facility closures and re-routing along 1st Avenue S. A construction management plan could be developed to mitigate impacts. Protocol could be included in the plan related to safe bicycle circulation would be provided adjacent to the construction site through the use of temporary facilities, detours, and signs.

With 10 percent less seats, this would result in a 10 percent reduction in the overall vehicular demand as compared to Alternative 2. Given the lesser demand, bicycle impacts with development of Alternative 3 may be slightly less than with Alternative 2.

2.4.6 Mitigation Measures

A complete summary of potential mitigation measures to be considered across all the Transportation Elements evaluated in this report is included in Chapter 4.0 of Appendix E. This summary includes identification of both programmatic measures and physical improvements.

For each of the potential mitigation measures a designation of high to low influence was noted. The following identifies those potential mitigation measures considered to have a high influence on this transportation element. These potential mitigation measures are appropriate for both Alternative 2 and Alternative 3.

- Bicycle racks
- Bicycle route improvements

2.4.7 Secondary and Cumulative Impacts

No secondary or cumulative impacts to bicyclists or bicycle facilities have been identified.

2.4.8 Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts are expected.

2.5 Traffic Volumes

This section provides a summary of the existing and forecast traffic volumes at the study area intersections and presents the methodology used in developing traffic forecasts for the No Action, Alternative 2, and Alternative 3 analyses.

2.5.1 Methodology

2.5.1.1 Study Area

A total of 64 intersections were included in the Stadium District alternatives study area. The study area intersections are shown on Figure 2–45. Study area intersections were defined considering existing conditions, impacts of future road improvements, and potential impacts of the Proposed Arena project.

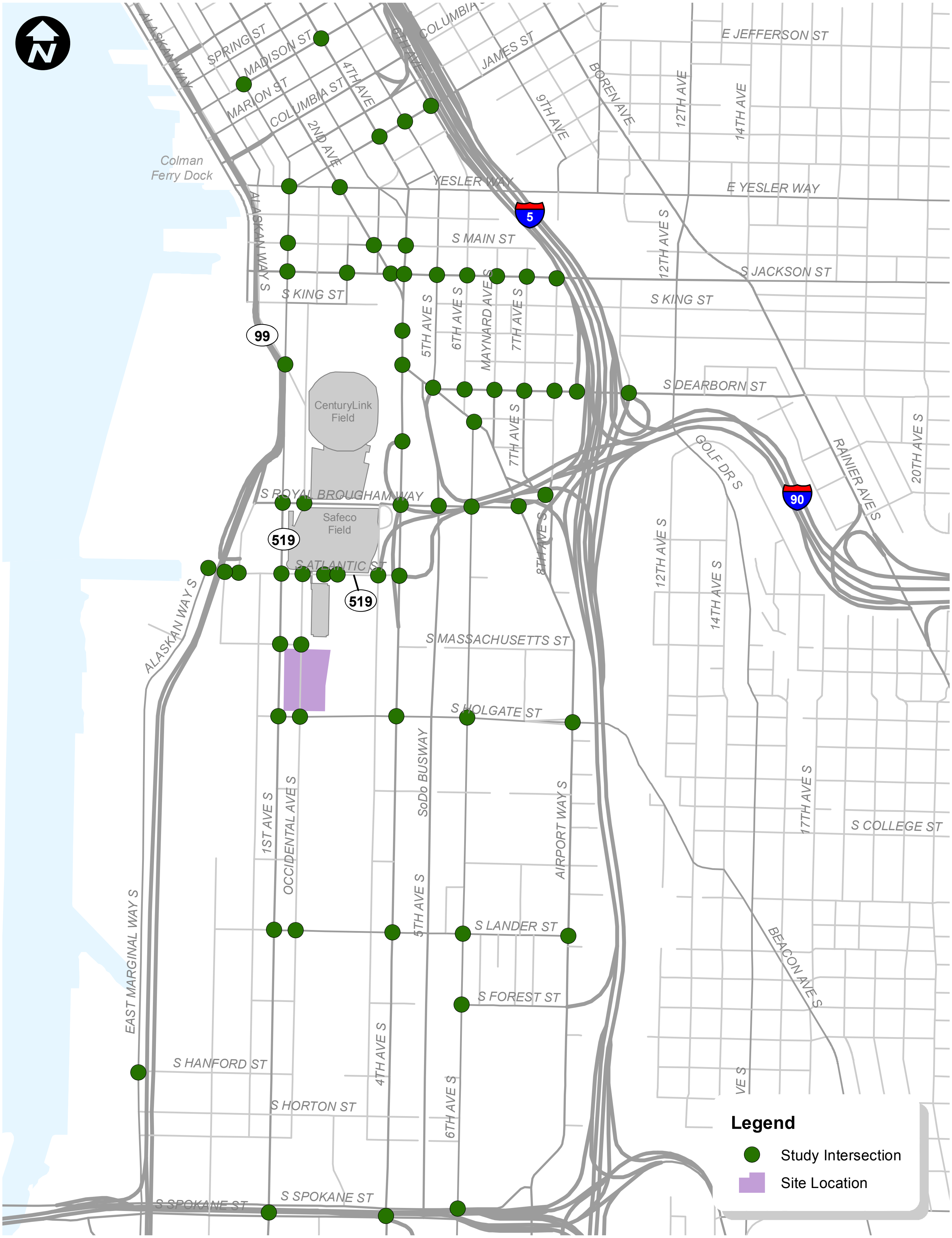
2.5.1.2 Analysis Time Periods

To determine the appropriate analysis period (weekday versus weekend), 24-hour count data from the City of Seattle was obtained and reviewed for several key locations in the vicinity of the site. Weekly data used in this comparison included counts completed in 2009, 2010, and 2011. Although newer turning movement counts have been conducted for a variety of event conditions, the use of this historical daily data provides a valid comparison of the weekly volume profile and is appropriate for determination of the “peak” day. Table 2-9 summarizes the peak hour count information for the key locations within the study area. The data presented in the table represents the peak of the daily volumes and may not necessarily correspond to the same hour at each location.

As shown in Table 2-9, traffic volumes observed during the Saturday and Sunday peak hours range from 38 percent to 76 percent of the weekday PM peak hour. Based on this information, the analysis of event traffic occurring during the weekday period represents the most appropriate basis for detailed traffic analysis through the SoDo area.

Within the weekday period, additional consideration was given to the appropriate hour for which to conduct the traffic analysis. Weekday PM peak period traffic volumes (4:00 to 7:00 PM) under event and non-event conditions were compared along key corridors in the study area and are presented on Figure 2–46.[16] The analysis shows that for the three-hour count period the system wide peak for the weekday PM peak hour under non-event and event generally occurs at the same time (i.e., 4:30 to 5:30 PM). As such, the traffic analysis results presented in this document focus on the weekday PM peak hour (4:30 to 5:30 PM) representing the highest overall traffic volumes for the system. While the event related traffic may represent a lower percentage of the overall traffic, the combined volumes represent the highest volumes within the 4:00 to 7:00 PM time period.

[16] Weekday PM Peak hour with event traffic volumes were collected on Wednesday, October 17, 2012 during a Sounders FC game with a scheduled start of 7:00 PM



Stadium District Study Intersections

Seattle Arena

FIGURE
2-45

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Table 2-9
24-Hour Count Comparison (Weekday vs. Weekend)

Location	Peak Hour Volume of the Roadway					
	Weekday (Tues-Thurs)[1]		Saturday (Percent of Weekday)		Sunday (Percent of Weekday)	
	Volume	Peak Hour	Volu me	Peak Hour	Volume	Peak Hour
S. Holgate Street, west of 4th Avenue S.[2]	850	5:00 - 6:00 PM	600 (71%)	2:00– 3:00 PM	450 (53%)	2:00– 3:00 PM
1st Avenue S., south of S. Holgate Street[3]	1,630	5:00 - 6:00 PM	1,240 (76%)	2:00– 3:00 PM	880 (54%)	2:00– 3:00 PM
S. Royal Brougham Way, east of 4th Avenue S.[4]	680	5:00 - 6:00 PM	435 (64%)	12:00 – 1:00 PM	270 (40%)	2:00– 3:00 PM
4th Avenue S., south of S. Holgate Street[5]	1,940	5:00 - 6:00 PM	1,130 (58%)	2:00– 3:00 PM	1,110 (57%)	4:00– 5:00 PM

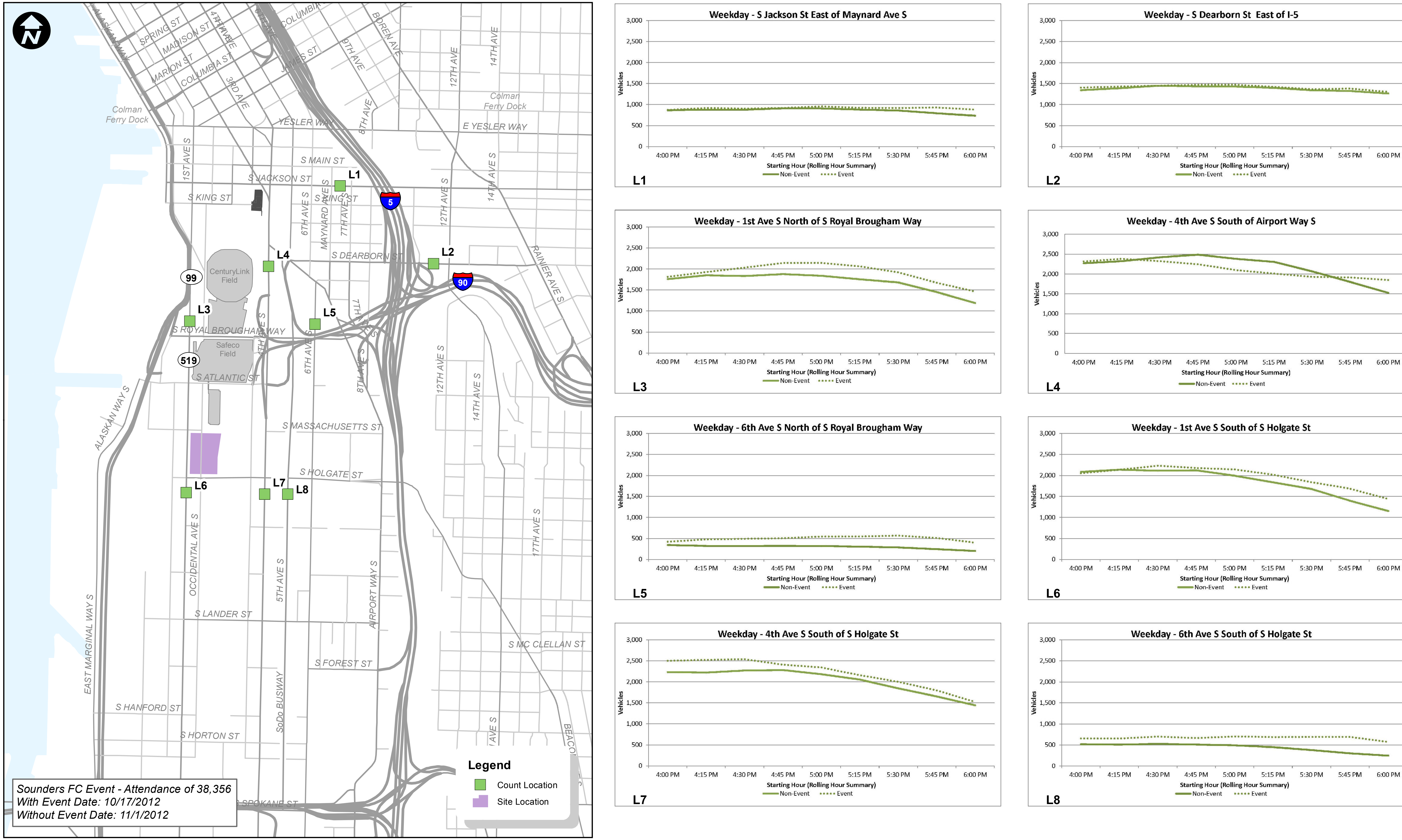
1. Peak hour between 4:00 PM -7:00 PM
2. October 2009, SDOT traffic count data
3. March 2010, SDOT count data
4. February 2011. SDOT count data
5. March 2010 traffic data.

2.5.1.3 Traffic Forecast Methodology – No Action Non-Event Analyses

Future weekday PM peak hour vehicular traffic volumes were developed based on the following general approach:

- Traffic volume forecasts from the Final EIS's for the Alaskan Way Viaduct Replacement Project (July 2011) were summarized for the overlapping study area intersections.
- Traffic forecasts at intersections not included in the Final EIS's for the Alaskan Way Viaduct Replacement Project were estimated based on existing travel patterns and approach volumes for intersections previously reported in the EIS.
- Port of Seattle truck activity for the 2018 and 2030 horizon years was based on data provided by the Port of Seattle, consistent with achieving 3.5 M TEU by 2030.
- Traffic forecasts for the No Action event cases were developed considering a no background event scenario (Case S1) and by adding traffic from either a Mariners game (Case S2) or both a Mariners game and an event at the CenturyLink Field Event Center (Case S3) to the No Action background forecasts.

Weekday PM peak hour without event traffic volumes for the 2018 and 2030 horizon years were estimated based on 2015 and 2030 traffic volume forecasts from the Final EIS for the Alaskan Way Viaduct Replacement Project (July 2011). Traffic volumes developed for the non-tolled bored tunnel alternative were used and account for anticipated changes in traffic volumes and travel patterns.



Stadium District With Non-Event and Event Weekday Traffic Volume Comparison

Seattle Arena

FIGURE
2-46

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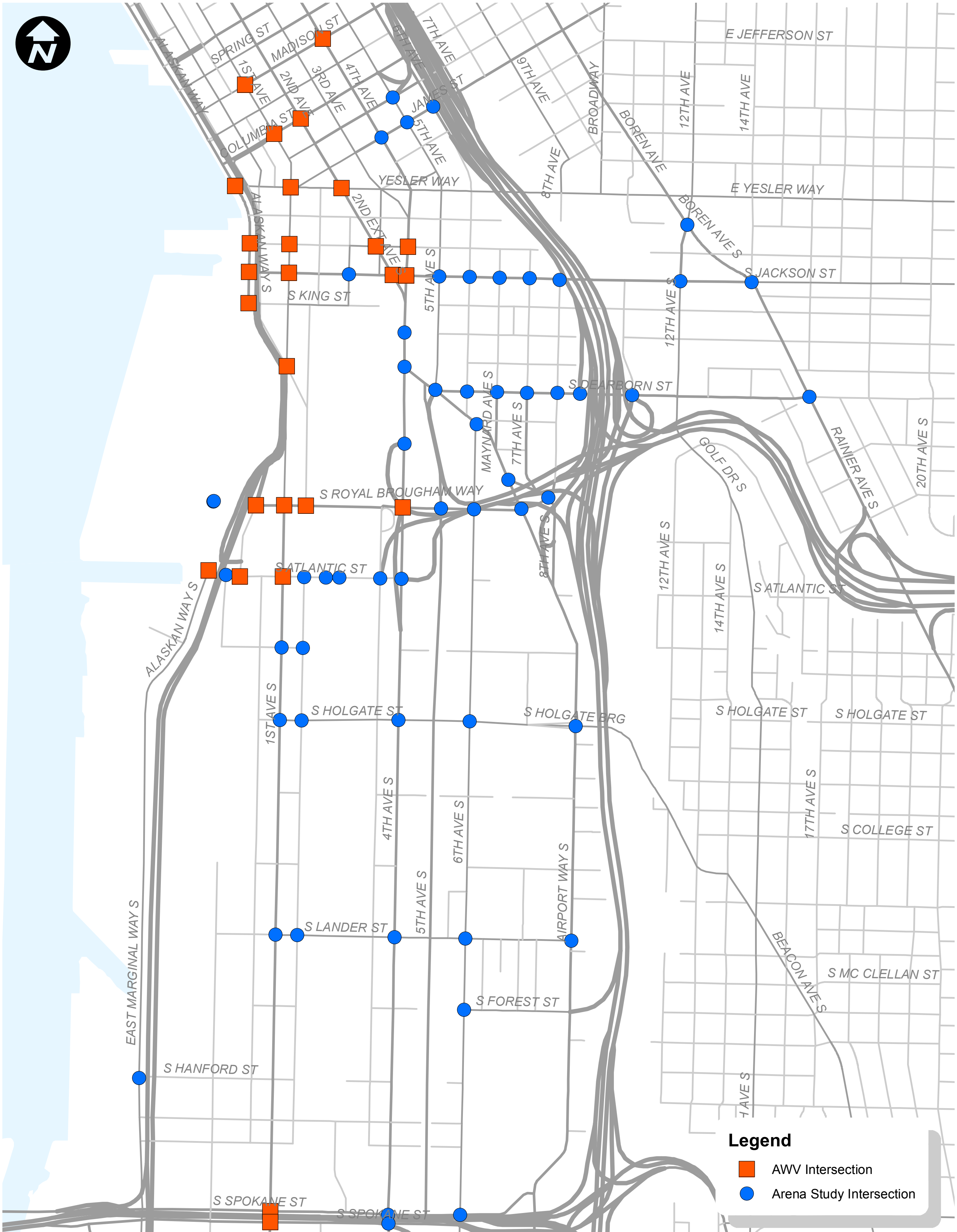
Forecast traffic volumes from the Alaskan Way Viaduct analysis were not available at all study intersections identified for this EIS. Figure 2–47 identifies the current study area intersections for the Stadium District, included in the Alaskan Way Viaduct replacement Project analysis and those that were not. Forecast traffic volumes at study intersections not included in the Alaskan Way Viaduct analysis were estimated based on traffic forecasts and entering / exiting volumes at adjacent intersections that were included in the Alaskan Way Viaduct analysis, as well as anticipated changes in general travel patterns.

The Alaskan Way Viaduct Replacement Project analysis for 2030 accounted for increased Port of Seattle truck activity during the weekday PM peak commute period based on the Port of Seattle's previously forecast increased operations to process 4.5 million 20-foot equivalent units (TEUs) per year. Additionally, most of this increase was previously assumed to occur by 2015. Because of economic conditions over the past several years, the Port of Seattle has indicated that only 3.5 million TEUs are likely to be processed each year by 2030. Forecast truck trips assigned to the roadway in the network included in the previous Alaskan Way Viaduct Replacement Project analysis were scaled to reflect the Port of Seattle's current estimate for 2018 and 2030 horizon years.

Traffic volumes developed for 2018 conditions were estimated by interpolating between 2015 and 2030 traffic volumes from the Alaskan Way Viaduct Replacement Project analysis after adjustments were made to account for the revised Port of Seattle cargo estimates. Port of Seattle truck volumes were also scaled to 2018 conditions by interpolating between the 1.87 million TEUs processed by the Port of Seattle in 2012 and the 3.5 million TEUs anticipated by 2030.

2.5.1.4 Traffic Forecast Methodology – No Action With Event Analyses

Traffic forecasts for the three No Action event cases were developed for the 2018 and 2030 horizon years. These cases included Case S1 which has no background event, Case S2 which includes a Mariners game with 40,500 people in attendance, and Case S3 that includes a Mariners game (40,500 attendance) and 5,000 person event at the CenturyLink Field Event Center. Traffic associated with these event cases are outlined in the Event Transportation Demand section of this report. Based on this methodology, under 2018 conditions the Mariners game is estimated to generate approximately 3,300 vehicular trips during the weekday PM peak hour and the event at the CenturyLink Field Event Center would generate approximately 425 trips. As traffic congestion throughout the Puget Sound region increases, attendees of events in the Stadium District would be increasingly likely to use transportation modes other than passenger cars. For the 2030 conditions, the transit mode split was increased. This increase in transit usage results in a forecast of approximately 3,100 vehicular trips associated with a Mariners event in 2030 and 400 trips forecast for an event at the CenturyLink Field Event Center.



Stadium District Alaskan Way Viaduct/Seattle Arena EIS Study Area Comparison

FIGURE
2-47

Seattle Arena

transpoGROUP

Traffic from these events was distributed to the study area roadways following the distribution shown on Figure 2–48. This distribution is based on a historical travel surveys provided by the Mariners and review of trip distributions for other Stadium District studies. These trips were then assigned throughout the study area, based on the No Action parking supply. As shown, 41 percent of vehicular trips to a Mariners game or event at CenturyLink Field Event Center were assumed to travel to the study from the north, 27 percent from the east, 27 percent from the south, and 5 percent from the west.

2.5.1.5 Traffic Forecast Methodology – Arena Event Traffic

This section presents the traffic forecasts for the 2018 and 2030 horizon years for Alternative 2. Future weekday PM peak hour vehicular traffic volumes for the Alternative were developed by adding traffic from the Seattle Arena to the No Action event cases. Similar to the No Action discussion, traffic forecasts for multiple event cases are presented in this section. As described in the Event Transportation Demand section, traffic associated with the Arena attendees was forecast based on a 20,000 person attendance level, mode splits, average vehicle occupancies, and arrival patterns.

Based on the methodology previously described, under 2018 conditions an NBA event at the Arena is estimated to generate approximately 2,150 vehicular trips during the weekday PM peak period. In 2030 as transit ridership is forecast to increase, approximately 2,000 weekday PM peak period vehicle trips would be generated by the forecast NBA event in 2030.

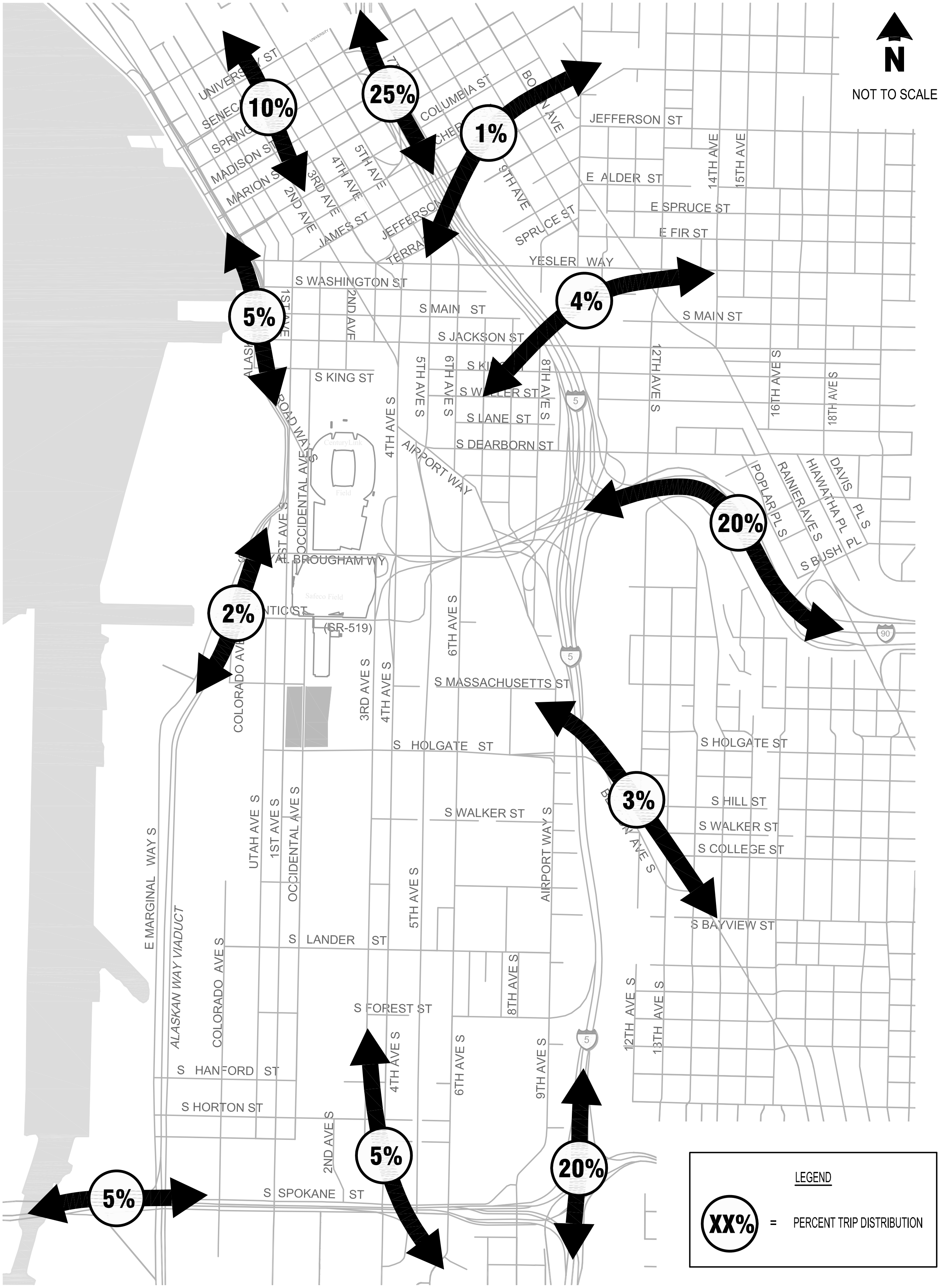
Traffic associated with an event in the Proposed Arena was distributed to the study area roadways following the distribution shown on Figure 2–48. This trip distribution pattern is based on historical travel survey data provided by the Mariners and review of trip distributions for other Stadium District studies. These trips external to the study area were then distributed throughout the study and are consistent with the No Action parking supply. Since the vacation of Occidental Avenue S. is an element of the Alternative 2 and Alternative 3 development plans, No Action traffic volumes on Occidental Avenue S. between S. Massachusetts and S. Holgate Streets were redirected to 1st Avenue S.

2.5.2 Affected Environment

Existing traffic volumes at the study area intersections were collected during without and with event conditions. The following provides an overview of the traffic volumes for both conditions.

2.5.2.1 Existing Weekday PM Peak Hour Non-Event

Weekday without event traffic counts were collected in early November 2012 from 4:00 to 7:00 PM. The system-wide peak (i.e., one-hour period with the highest volume) occurred between 4:30 and 5:30 PM Weekday PM peak hour without event traffic volumes along key corridors within the study area are summarized on Figure 2–49 and detailed intersection turning movement volumes are provided in Attachment E-1, which is available from the Seattle Department of Planning and Development (DPD) upon request.



Stadium District Event Trip Distribution Map

Seattle Arena

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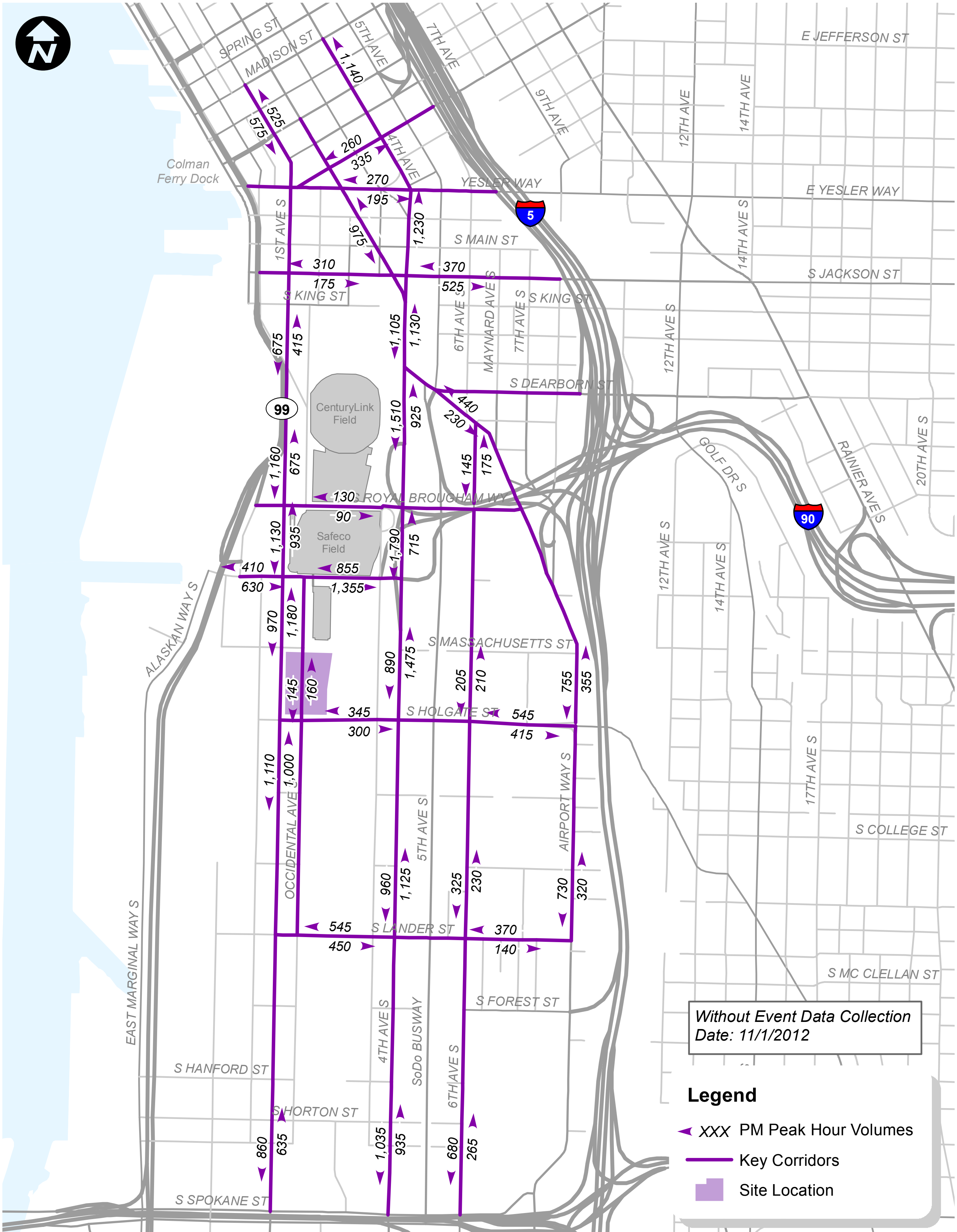
FIGURE
2-48



Stadium District Existing Non-Event Weekday PM Peak Hour Traffic Volumes

Seattle Arena

FIGURE
2-49

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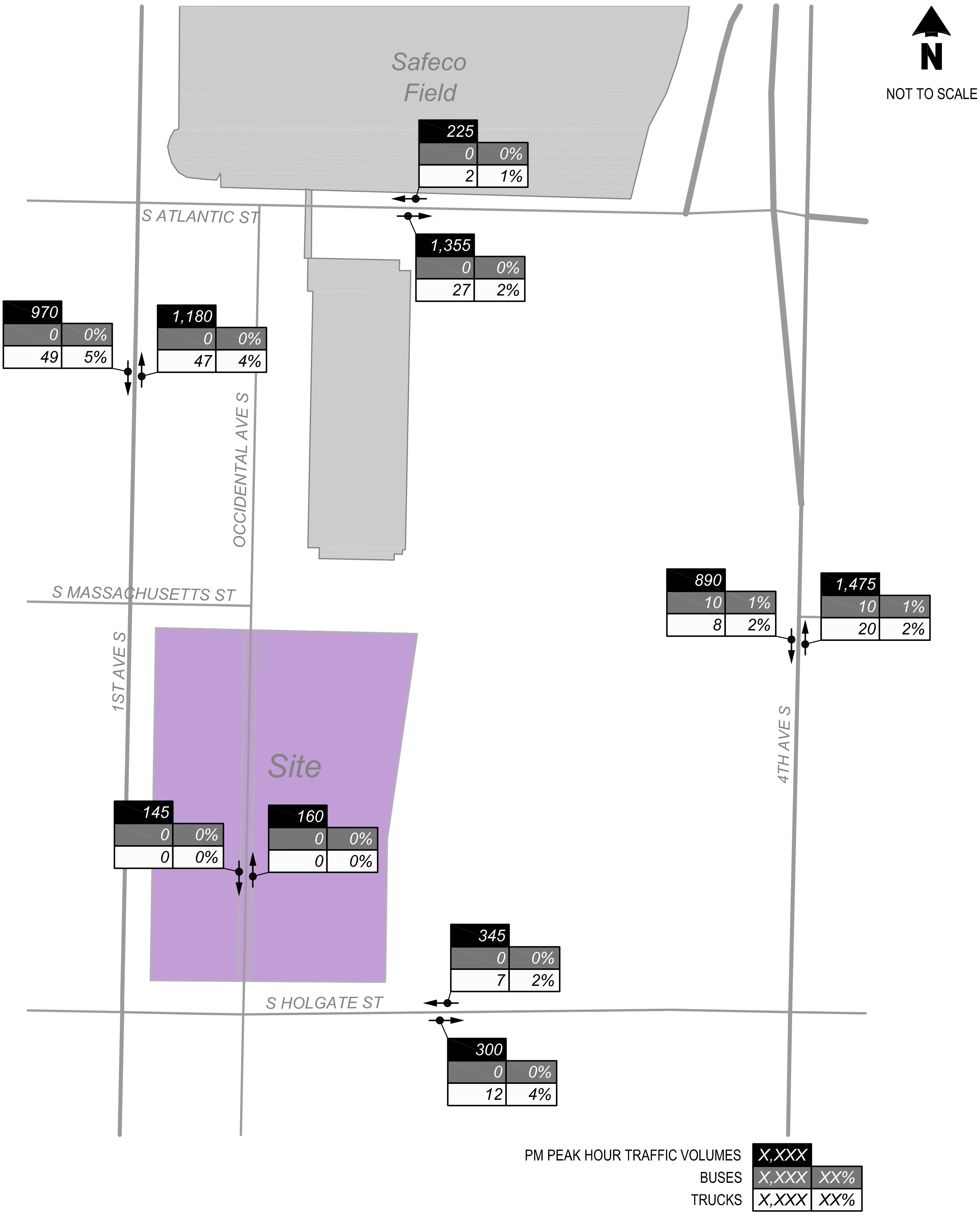
Weekday PM peak hour without event travel is primarily commuter-based with some freight transport and transit activity. Data summarized for the Port of Seattle shows that gate activity begins to decrease during the afternoon period with little-to-no activity typically occurring after 5:00 PM. However peak hour truck traffic is dependent on the arrival and departure patterns of the shipping vessels and fluctuates throughout the year, and can extend into the weekday PM peak hour period. This condition occurs on a more infrequent basis and is dependent on ship activities. A more detailed discussion of freight activity in the Stadium District area is included in the Freight and Goods Movement section of this document.

In the vicinity of the Seattle Arena site, weekday PM peak hour non-event traffic volumes are highest along the principal arterials of 1st Avenue S., 4th Avenue S., and Edgar Martinez Drive S. Along 1st Avenue S., adjacent to the site, weekday PM peak hour volumes of approximately 2,100 vehicles per hour (vph) were observed. Traffic volumes along 4th Avenue S., parallel to 1st Avenue S. were approximately 10 percent higher at 2,350 vph. Peak hour volumes of approximately 250 vph were observed along Occidental Avenue S. Along the east / west corridors including Edgar Martinez Drive S. and S. Holgate Street, weekday PM peak hour traffic volumes observed were approximately 2,200 vph and 650 vph, respectively.

Additional observations were conducted along Occidental to determine the volume and percentage of traffic utilizing Occidental Avenue S. between S. Holgate Street and S. Massachusetts Street as an alternate to 1st Avenue S. and not associated with commercial businesses along that section of S. Occidental Avenue. The observations showed that under without-event conditions, approximately 75 percent of the traffic utilizing Occidental Avenue S. was not associated with businesses along that section and were presumably using it as an alternative to 1st Avenue S.

Figure 2–50 summarizes the traffic volumes within the immediate vicinity of the Proposed Site location, including the total number of vehicles, proportion of all heavy vehicles (panel vans to semi tractor-trailers), and the number of buses. Truck volumes on the four primary streets that border the site, including 1st Avenue S., 4th Avenue S., S. Holgate Street, and Edgar Martinez Drive S. are generally less than five percent during the weekday PM peak hour. Within the immediate study area, bus traffic is primarily limited to 4th Avenue. King County Metro Transit operates three different bus bases in the area and utilizes 4th Avenue S. as a major transit corridor. Bus volumes during the weekday PM peak hour between Edgar Martinez Drive S. and S. Holgate Street total 20 buses based on scheduling information and data provided by King County Metro Transit. This represents about two percent of the total traffic volumes.



Stadium District Existing Non-Event Site Vicinity Weekday PM Peak HourTraffic Volumes

Seattle Arena

transpoGROUP

FIGURE
2-50

2.5.2.2 Existing Weekday PM Peak Hour With Event

Weekday PM Peak hour with event traffic volumes were collected on Wednesday, October 17, 2012 during a Sounders FC soccer game with a scheduled start of 7:00 PM. Traffic volumes were collected between 4:00 and 8:00 PM to capture the traffic flows of both commuters and event attendees. The peak one-hour period of combined commute and event traffic occurred between 4:30 and 5:30 PM as summarized on Figure 2–46. Event-related traffic volumes on key arterial segments are shown on Figure 2–51. When comparing the non-event and event traffic volumes, the largest percentage increase is shown along 6th Avenue S. and Edgar Martinez Drive S. This is due primarily to the location of the venue and overall lower background volumes along 6th Avenue S. as compared to 1st Avenue S. and 4th Avenue S. Increases along Edgar Martinez Drive S. are due primarily to connections to the interstate system and access to the Safeco Field parking garage. With an event, traffic volumes along Occidental Avenue S. were observed to decrease slightly. This difference is likely due to a shift in the background traffic volumes and diversion due to congestion around the Safeco Field parking garage. Existing with-event intersection turning movement volumes are provided in Attachment E-1, which is available upon request from DPD.

Similar to the discussion of the non-event conditions, further analysis of the existing volumes within the core area around the Arena site was conducted and is summarized on Figure 2–52. The traffic counts conducted under event conditions showed varying truck percentages along 1st Avenue S., 4th Avenue S., Edgar Martinez Drive S., and S. Holgate Street as compared to without-event conditions. The largest difference noted is the increase in truck volumes along S. Holgate Street and 4th Avenue S. and decrease in truck volumes along Edgar Martinez Drive S. and 1st Avenue. Shifts in the observed truck volumes could be attributed to a variety of factors including general fluctuations in truck activity on a daily basis or a change in travel patterns due to the Sounders game.

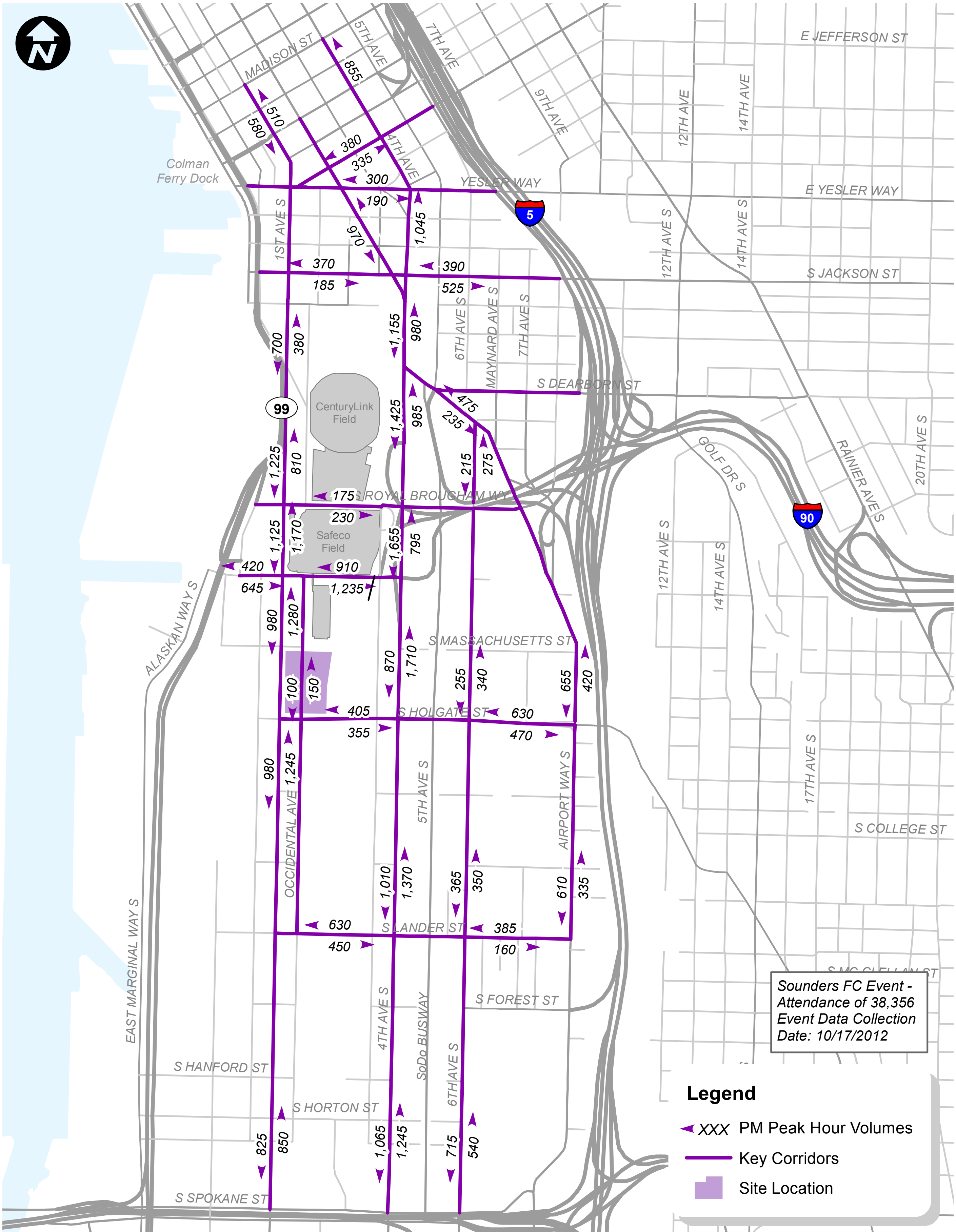
2.5.3 Impacts of No Action Alternative

Forecast traffic volumes for the No Action event cases were developed for the 2018 and 2030 horizon years. These event cases were defined as follows:

- Case S1 - No events
- Case S2 - An event with 40,500 attendance at Safeco Field
- Case S3 - An event with 40,500 attendance at Safeco Field plus 5,000 attendance at CenturyLink Field Event Center

2.5.3.1 2018 Traffic Volumes

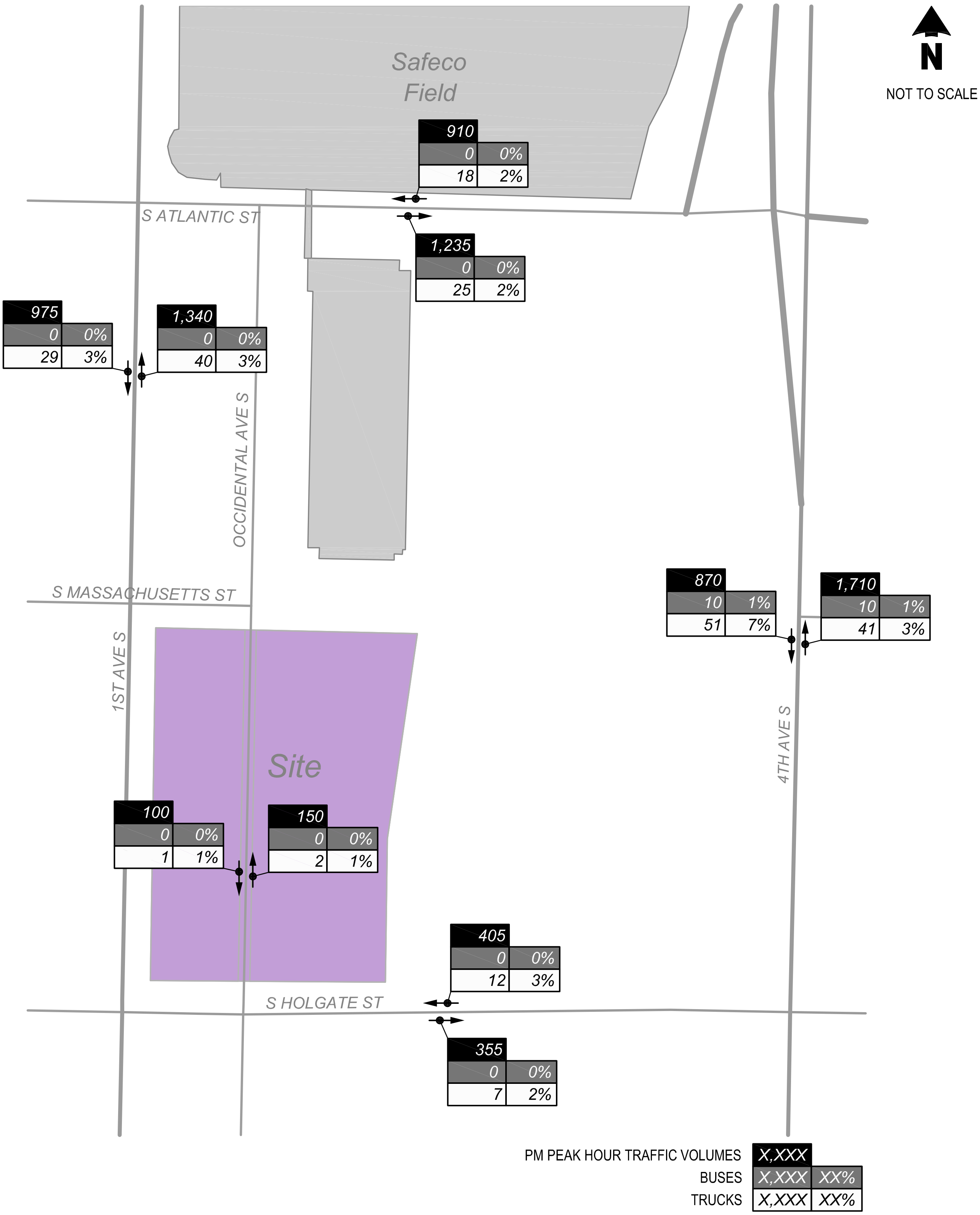
Traffic volumes along key corridors for all three event cases under 2018 conditions are summarized on Figure 2–53 through Figure 2–55. Detailed turning movement volumes for each scenario and at each study intersection are provided Attachment E-1, which is available from DPD upon request.



Stadium District Existing With Event Weekday PM Peak Hour Traffic Volumes

Seattle Arena

FIGURE
2-51



Stadium District Existing With Event Weekday PM Peak Hour Site Vicinity Traffic Volumes

Seattle Arena

FIGURE
2-52

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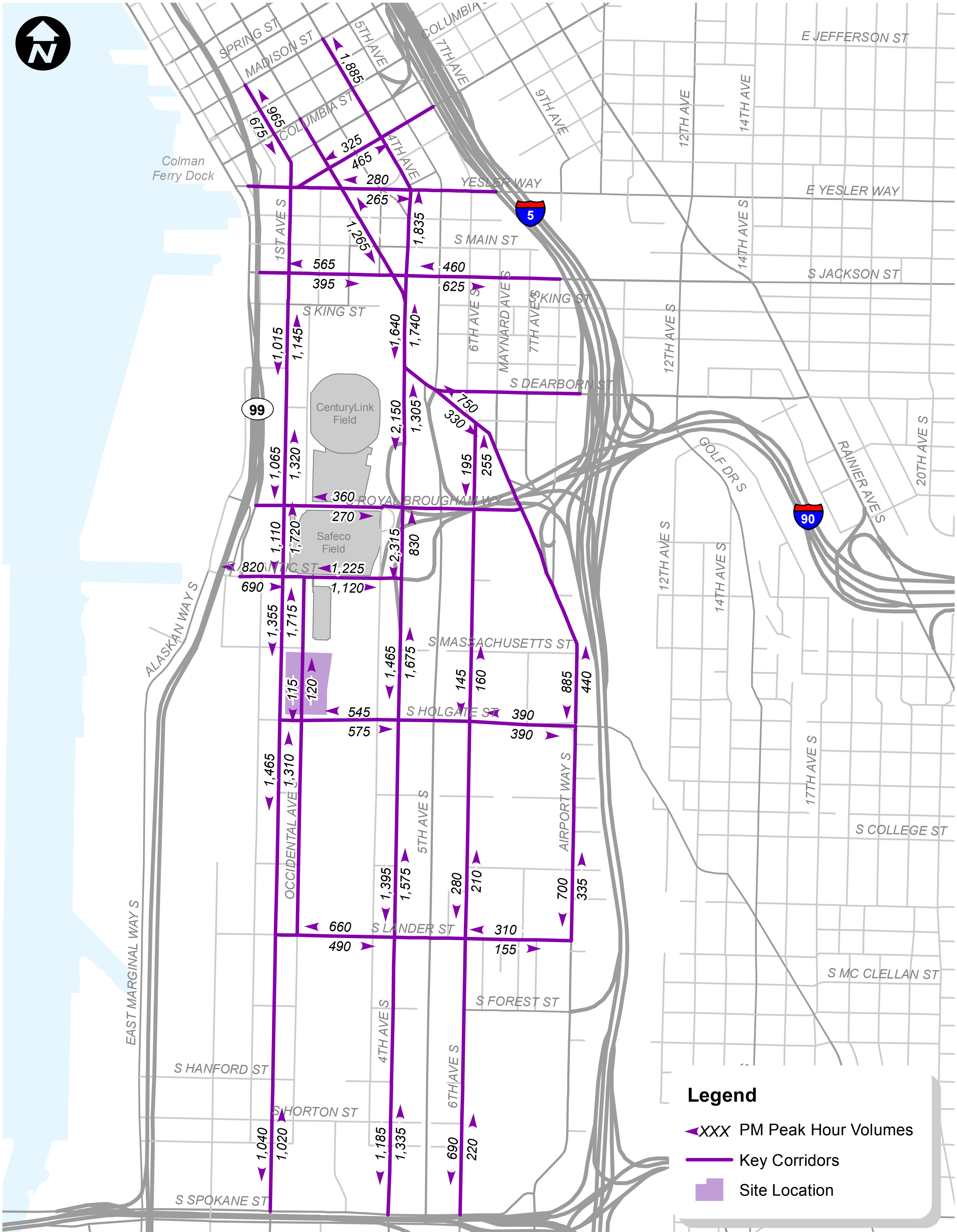
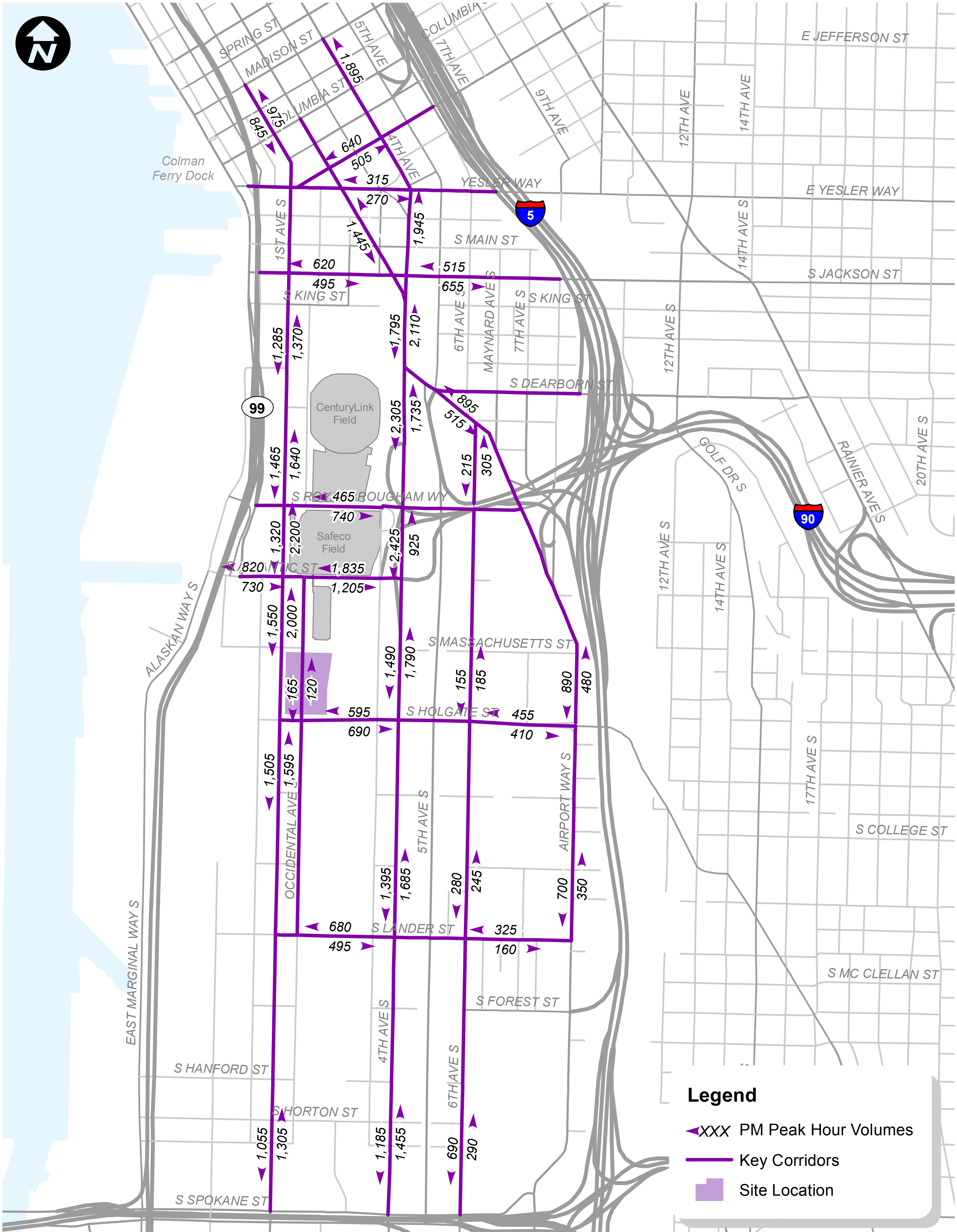


Stadium District 2018 No Action Case S1
Weekday PM Peak Hour Traffic Volumes

Seattle Arena

FIGURE
2-53



Stadium District 2018 No Action Case S2
Weekday PM Peak Hour Traffic Volumes

Seattle Arena

FIGURE
2-54

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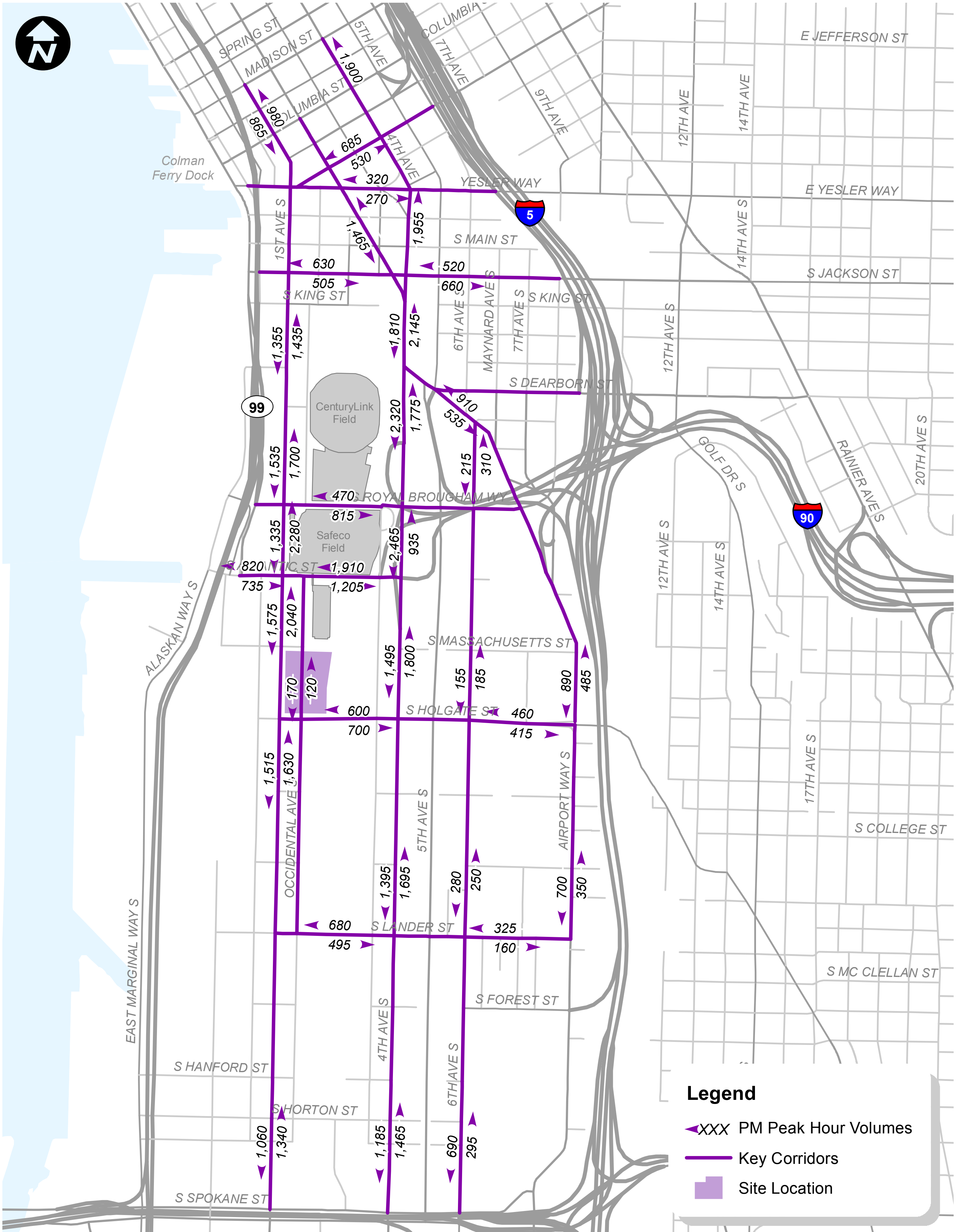


Stadium District 2018 No Action Case S3
Weekday PM Peak Hour Traffic Volumes

Seattle Arena

FIGURE
2-55

transpoGROUP

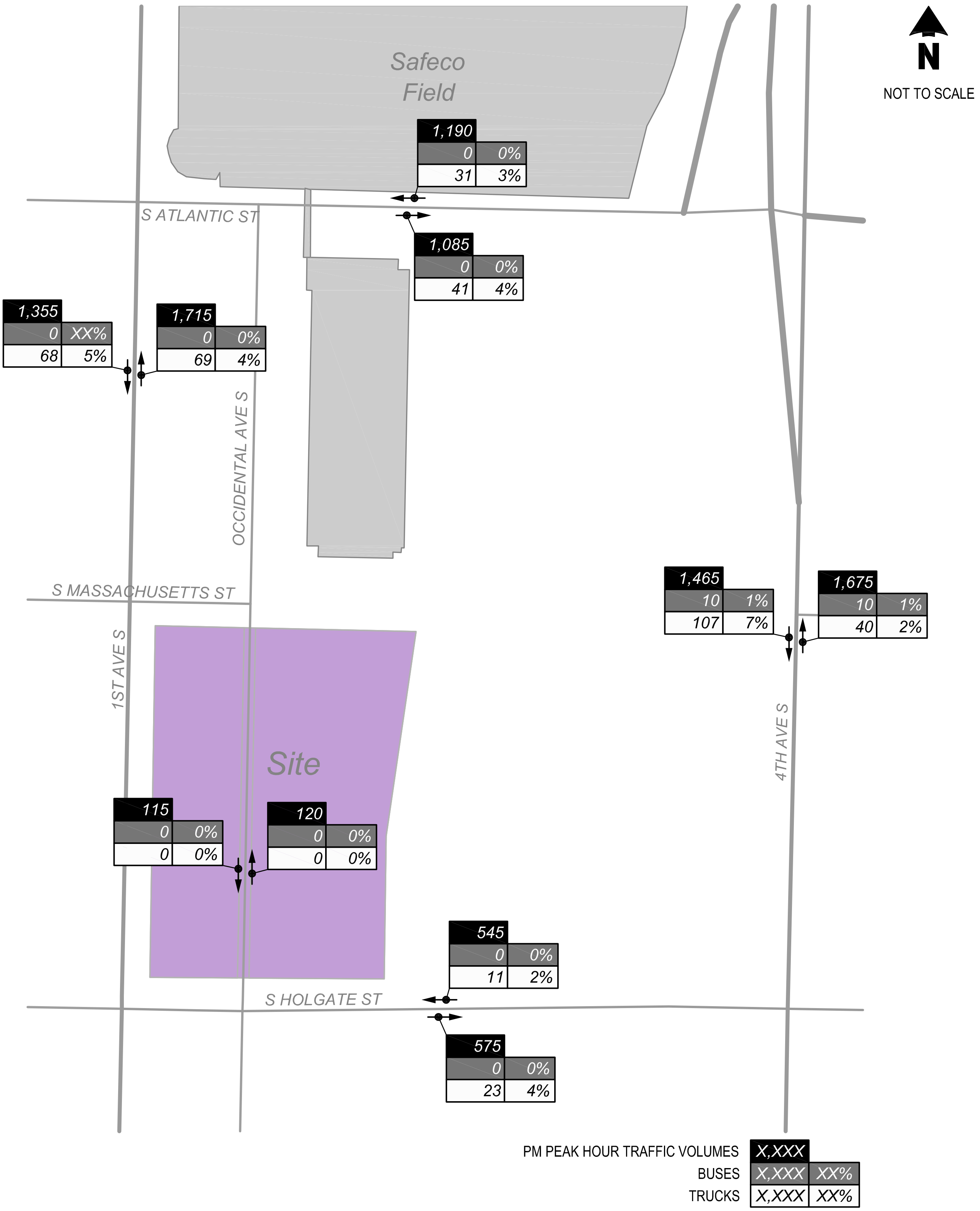
Case S1: No Action weekday PM peak hour traffic volumes for Case S1 are shown on Figure 2–53. By 2018, with the completion of the SR 99 bored tunnel project and completion of the Waterfront project, traffic volumes on the surface arterials are expected to increase significantly within the study area relative to existing conditions. Given historical growth (approximately one to two percent annually) in background traffic, the primary contributing factor to the increase in traffic is the shifts due to the configuration of the bored tunnel and the lack of access to the CBD within the tunnel. The regional connections to the Stadium District area along 1st Avenue S., 4th Avenue S., and Edgar Martinez Drive S. show:

- An increase of approximately 100 percent on 1st Avenue S., north of Railroad Way S.
- Volumes on 4th Avenue S., north of the S. King Street pedestrian crossing are anticipated to increase on the order of 50 percent
- South of the site, along both 1st Avenue S. and 4th Avenue S., traffic volumes are anticipated to increase on the order of 35 percent and 30 percent, respectively

Future truck volumes assumed in the analysis and projected for the roadways are based on the highest truck percentages observed for the existing non-event and event conditions. This provides a conservative estimate of future truck volumes and related impacts on the level of service (LOS) analysis calculations are not underestimated. In addition to the truck percentages and volumes noted in the existing conditions, additional adjustments were applied to account for the growth[17] in Port traffic. The information utilized for Port of Seattle adjustments were provided by Heffron Transportation Inc.

Figure 2–56 focuses on the traffic volumes within the vicinity of the Proposed Arena site including total volumes as well as general heavy vehicles, Port of Seattle trucks, and transit buses. Truck traffic in the core area is generally anticipated to increase in number and percentage of overall traffic. The largest increases are noted along the east / west arterials of Edgar Martinez Drive S. and S. Holgate Street access. For Port-related traffic, these roads are used to access the regional facilities or access customers in the Stadium District area, east of the railroad tracks. Figure 2–56 shows that along the primary freight routes such as 1st Avenue S., 4th Avenue S., S. Holgate Street, and Edgar Martinez Drive S., truck volumes are expected to range between one and seven percent.

[17] Pro-rated growth in TEU's from existing levels to 3.5 million by 2030



Stadium District 2018 No Action S1 Site Vicinity Weekday PM Peak Hour Traffic Volumes

Seattle Arena

FIGURE
2-56

Case S2: Traffic volumes under 2018 conditions are forecast to increase approximately 14 percent over without-event conditions throughout the study area with a 40,500 attendee Mariners game. Truck volumes defined in the No Action without event cases were held constant with this analysis. The following bullets provide an overview of the increased volumes approaching the Stadium District during the weekday PM peak hour based on the assumptions previously outlined for Mariners event arrivals:

- 1st Avenue S., between S. Royal Brougham Way and S. King Street – 23 percent increase
- 1st Avenue S., south leg of 1st Avenue S. / S. Atlantic Street intersection – 16 percent increase
- 4th Avenue S., north of Airport Way S. intersection – 16 percent increase
- 4th Avenue S., south of S. Atlantic Street ramps – 4 percent increase
- Edgar Martinez Drive S. between Occidental Avenue S. and the Westbound I-90 Off-Ramp – 31 percent increase
- S. Holgate Street between Occidental Avenue S. and 4th Avenue S. –15 percent increase

Case S3: Increases in traffic volumes under this multiple event scenario are 16 percent greater than existing conditions, or only 2 percent greater than the Case S2. Truck volumes defined in the No Action without-event cases were also held constant with this analysis. The following bullets provide an overview of the increase in volumes approaching the Stadium District during the weekday PM peak hour:

- 1st Avenue S., between S. Royal Brougham Way and S. King Street – 29 percent increase
- 1st Avenue S., south leg of 1st Avenue S. / S. Atlantic Street intersection – 18 percent increase
- 4th Avenue S., north of Airport Way S. intersection – 17 percent increase
- 4th Avenue S., south of S. Atlantic Street ramps – 5 percent increase
- Edgar Martinez Drive S. between Occidental Avenue S. and the Westbound I-90 Off-Ramp – 34 percent increase
- S. Holgate Street between Occidental Avenue S. and 4th Avenue S. – 16 percent increase

Traffic volumes can fluctuate by 5 to 10 percent day-to-day. As illustrated above, increases in traffic in the study area would be generally small with the 5,000 person attendance increase.

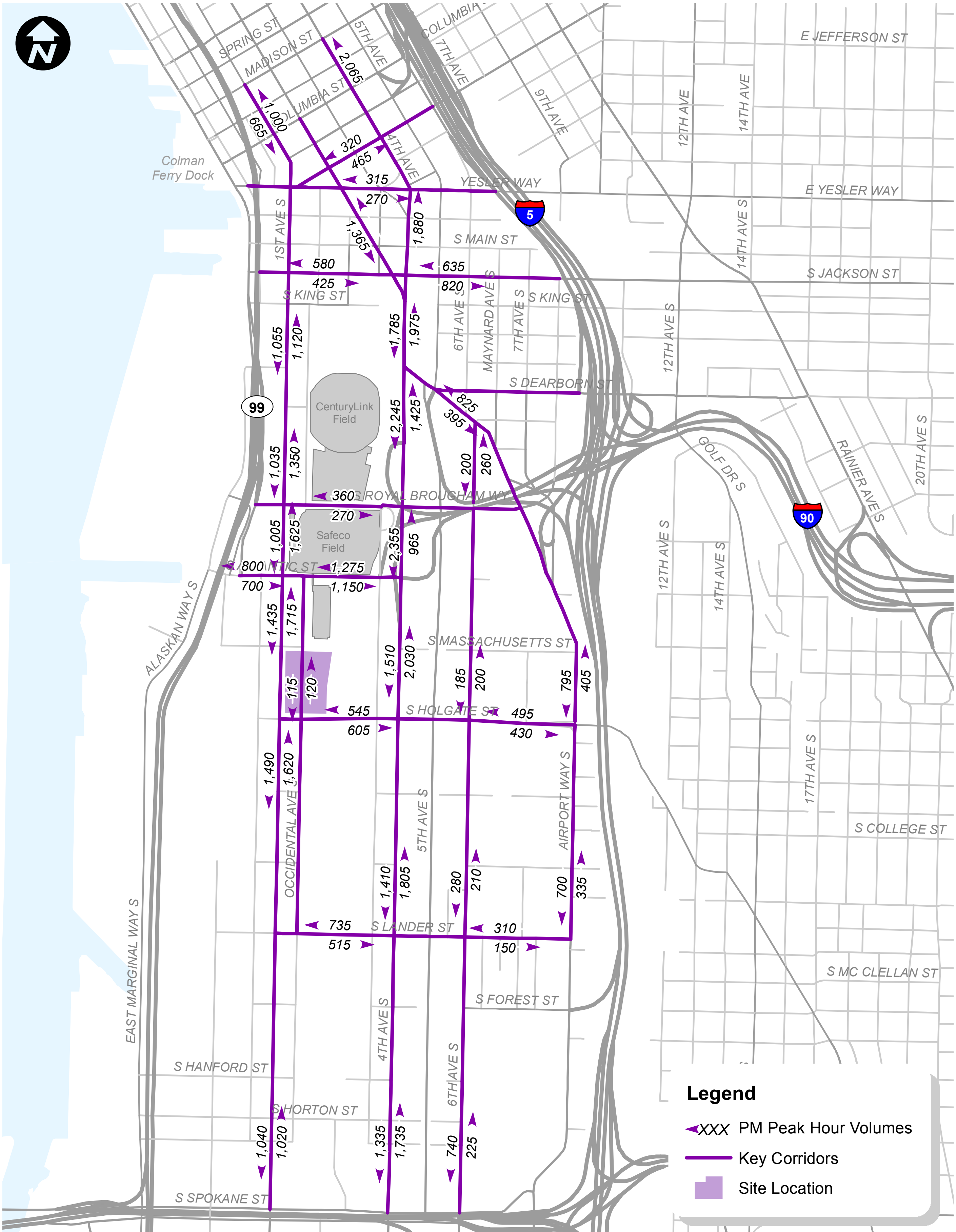
2.5.3.2 2030 Traffic Volumes

Weekday PM peak hour 2030 No Action traffic volumes are shown on Figure 2–57 through Figure 2–59. Similar to the 2018 No Action forecasts, truck volumes were based on a review of existing conditions as well as consideration of growth in Port activity.

Case S1: Forecast 2030 conditions along Stadium District regional connections, 1st Avenue S., 4th Avenue S., and Edgar Martinez Drive S., show:

- An increase of approximately 100 percent on 1st Avenue S., north of Railroad Way S.
- Volumes on 4th Avenue S., north of the S. King Street pedestrian crossing are anticipated to increase 70 percent
- South of the site, along both 1st and 4th Avenues S., traffic volumes are anticipated to increase 35 percent and 55 percent, respectively
- Traffic volumes along 1st Avenue S., north of S. Atlantic Street are shown to decrease slightly from 2018 to 2030 based on modeling done for the Viaduct project

Figure 2–60 summarizes the percentage of bus and heavy vehicles relative to the total forecast volumes within the vicinity of the Proposed Arena site. This figure shows that along the primary freight routes such as 1st Avenue S., 4th Avenue S., S. Holgate Street, and Edgar Martinez Drive S., truck volumes are expected to range between one and seven percent. These heavy vehicle proportions are similar to those under 2018 conditions and with the additional increase in traffic from 2018 to 2030 conditions, provide a conservative analysis by resulting in an increase in heavy vehicle traffic similar to forecast traffic volumes.

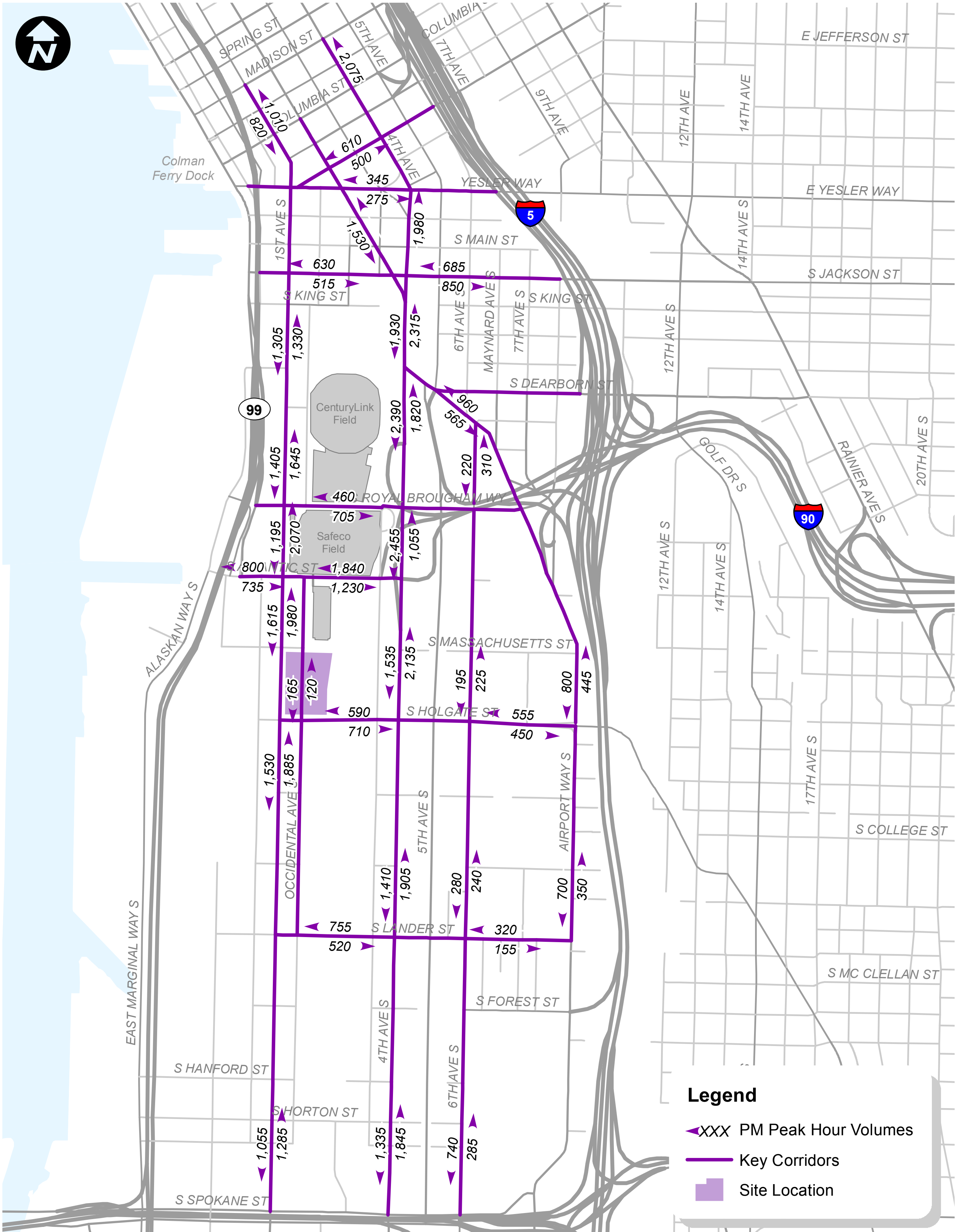


Stadium District 2030 No Action Case S1
Weekday PM Peak Hour Traffic Volumes

Seattle Arena

FIGURE
2-57

transpoGROUP

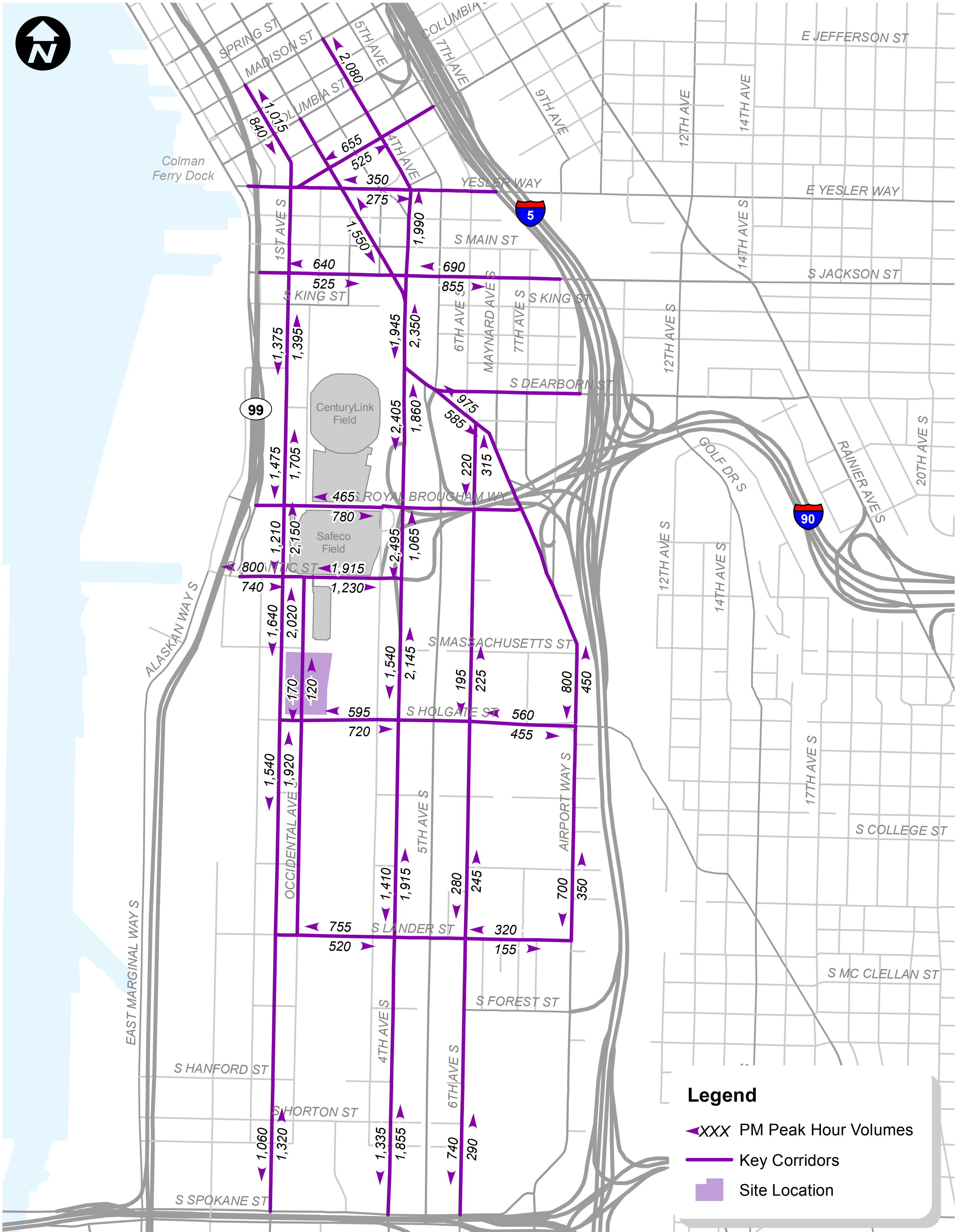


Stadium District 2030 No Action Case S2
Weekday PM Peak Hour Traffic Volumes

Seattle Arena

FIGURE
2-58

transpoGROUP

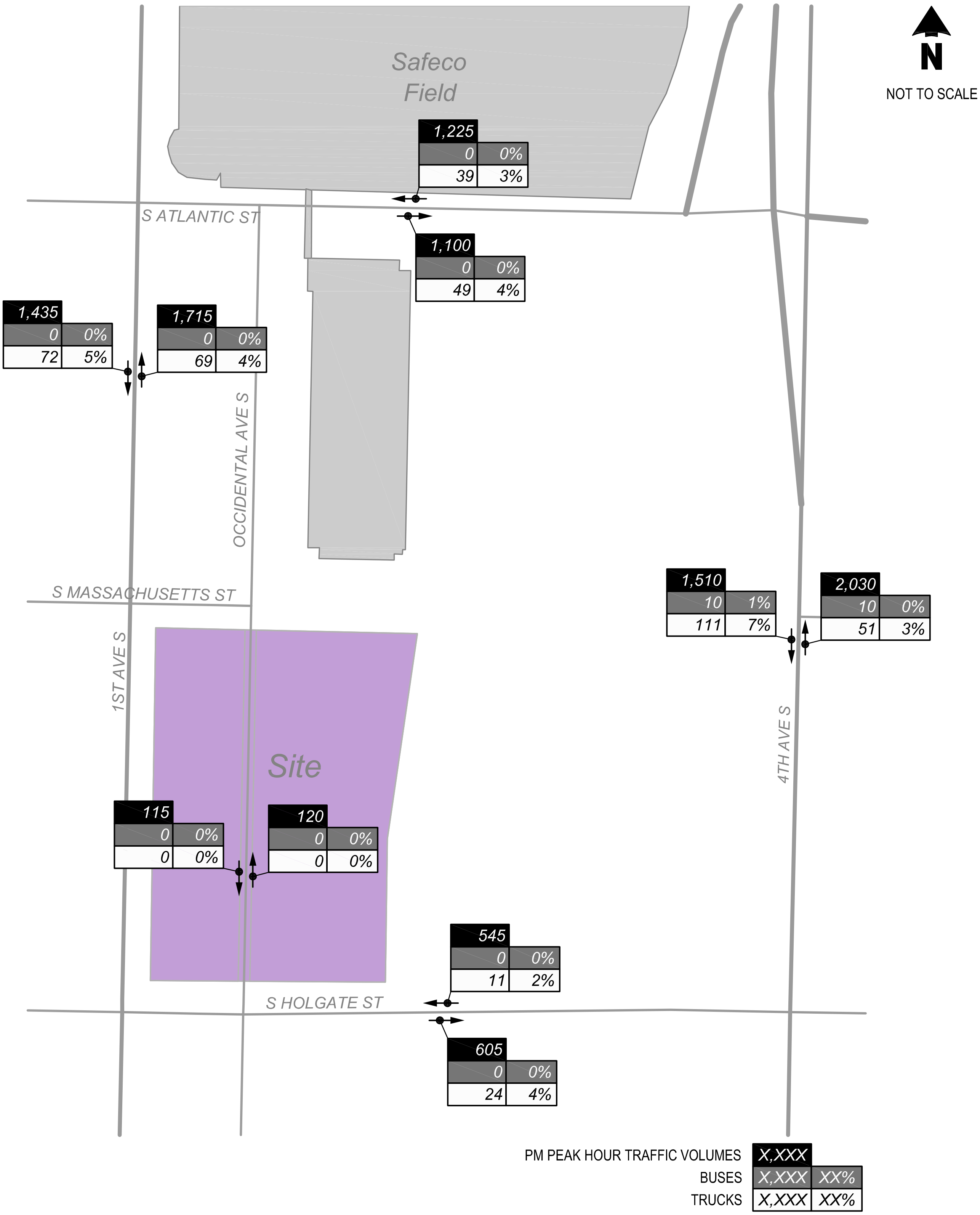


Stadium District 2030 No Action Case S3 Weekday PM Peak Hour Traffic Volumes

Seattle Arena

FIGURE
2-59

transpoGROUP



Stadium District 2030 No Action S1 Site Vicinity Weekday PM Peak Hour Traffic Volumes

FIGURE 2-60

Seattle Arena

transpoGROUP

Case S2: When compared to growth from existing conditions to 2018 conditions, growth between 2018 and 2030 would occur at a slower rate based on the forecast increases in background traffic volumes and the small decrease in the proportion of Mariners attendees choosing to travel via passenger car. The following bullets provide an overview of the increased volumes approaching the Stadium District during the weekday PM peak hour based on the assumptions previously outlined for Mariners event arrivals and CenturyLink Field Event Center arrivals:

- 1st Avenue S., between S. Royal Brougham Way and S. King Street – 21 percent increase
- 1st Avenue S., south leg of 1st Avenue S. / S. Atlantic Street intersection – 14 percent increase
- 4th Avenue S., north of Airport Way S. intersection – 13 percent increase
- 4th Avenue S., south of S. Atlantic Street ramps – 4 percent increase
- Edgar Martinez Drive S. between Occidental Avenue S. and the Westbound I-90 Off-Ramp – 28 percent increase
- S. Holgate Street between Occidental Avenue S. and 4th Avenue S. – 13 percent increase

Case S3: As with the No Action Case S2, this lesser growth due to the combined events is due increases in background traffic and the increasing likelihood of event attendees to choose travel by modes other than passenger car. The following bullets provide an overview of the increases in volumes approaching the Stadium District during the weekday PM peak hour given the assumptions outlined above for Mariners event arrivals:

- 1st Avenue S., between S. Royal Brougham Way and S. King Street – 27 percent increase
- 1st Avenue S., south leg of 1st Avenue S. / S. Atlantic Street intersection – 16 percent increase
- 4th Avenue S., north of Airport Way S. intersection – 14 percent increase
- 4th Avenue S., south of S. Atlantic Street ramps – 4 percent increase
- Edgar Martinez Drive S. between Occidental Avenue S. and the Westbound I-90 Off-Ramp – 31 percent increase
- S. Holgate Street between Occidental Avenue S. and 4th Avenue S. – 14 percent increase

2.5.4 Impacts of Alternative 2

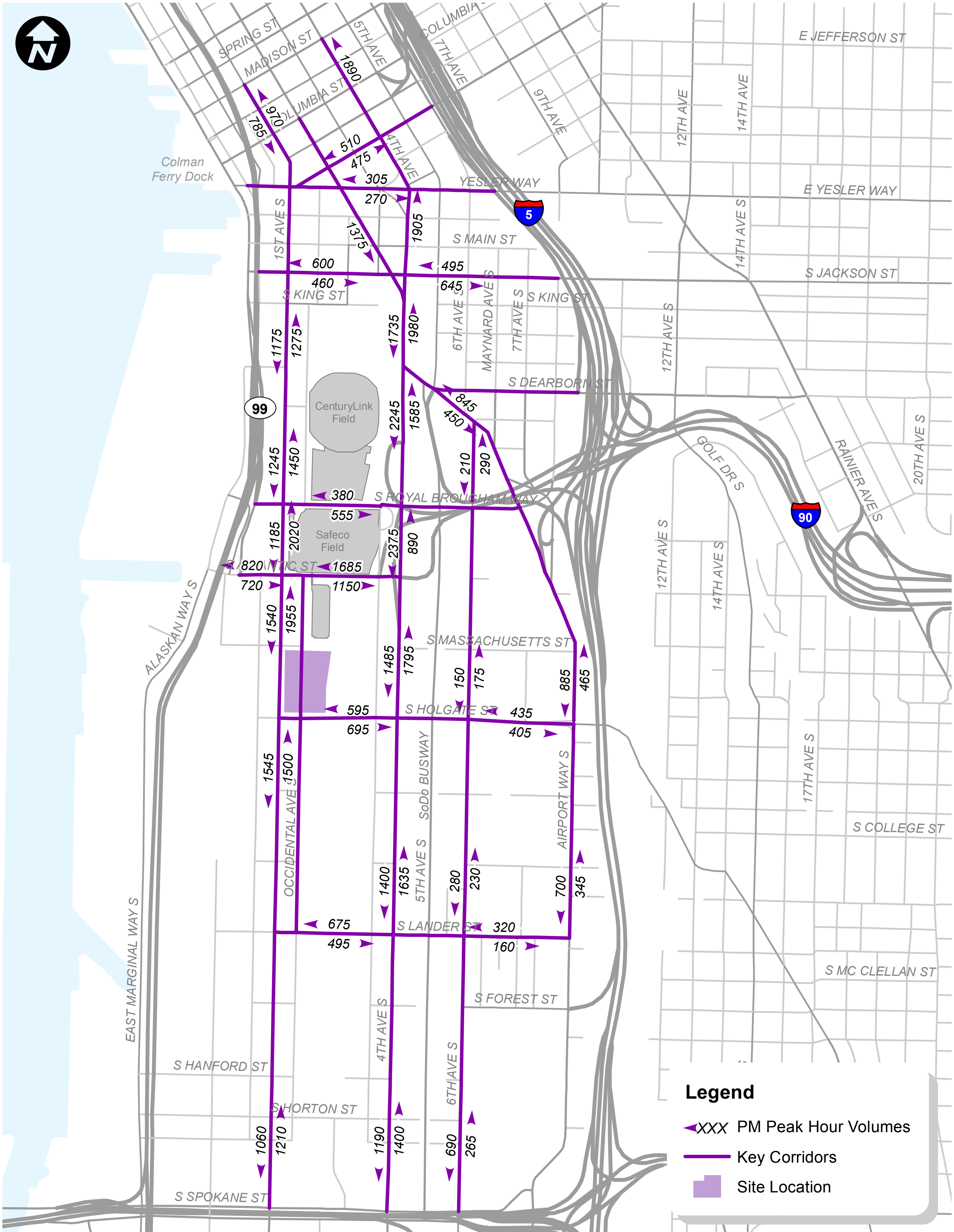
Alternative 2 would result in an increase in traffic volumes due to workers traveling to and from the site, delivery of material, and truck hauling. It is anticipated that the increase in traffic volumes would be less than generated by a 20,000-seat event at the Seattle Arena.

2.5.4.1 2018 Traffic Volumes

Traffic volumes along key corridors under 2018 conditions for the multiple event cases are summarized on Figure 2–61 through Figure 2–63. Detailed turning movement volumes for each scenario and at each study intersection are provided in Attachment E-1, which is available upon request from DPD.

As a result of the addition of trips from an event at the Proposed Arena, 2018 traffic volumes along the regional connections to the Stadium District area increase as follows depending on whether no other Stadium District events occurs, a Mariners game also occurs, or both a Mariners game and CenturyLink Field Event Center event occur:

- An increase of between 11 and 13 percent on 1st Avenue S. between S. Royal Brougham Way and S. King Street
- Volumes on 4th Avenue S., north of the S. King Street pedestrian crossing are anticipated to increase on the order of 8 to 10 percent
- South of the site, traffic volumes are anticipated to increase between 9 and 10 percent along 1st Avenue S., and between 2 and 3 percent on 4th Avenue S.

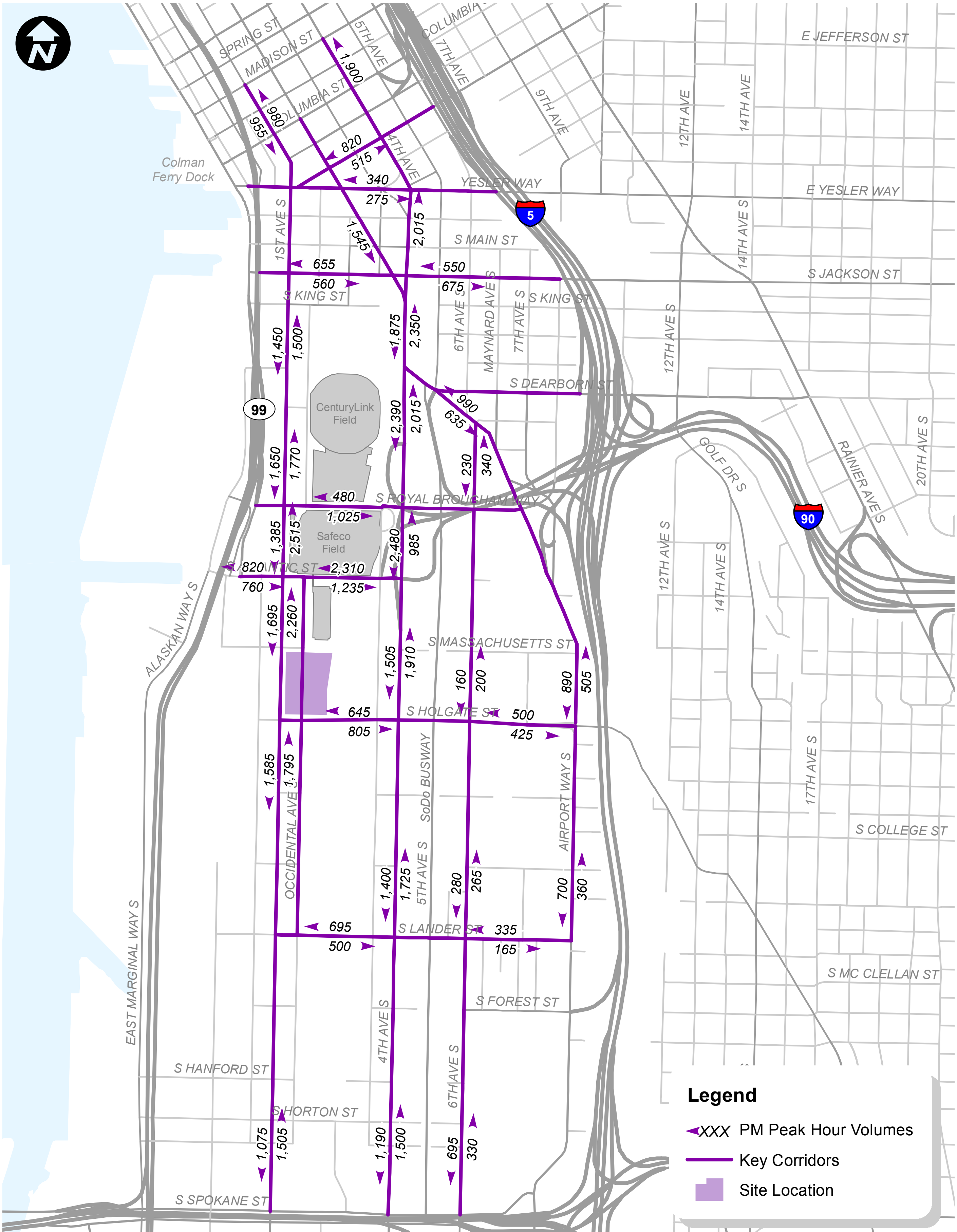


Stadium District Alternative 2 2018 Case S1
Weekday PM Peak Hour Traffic Volumes

Seattle Arena

FIGURE
2-61

transpoGROUP

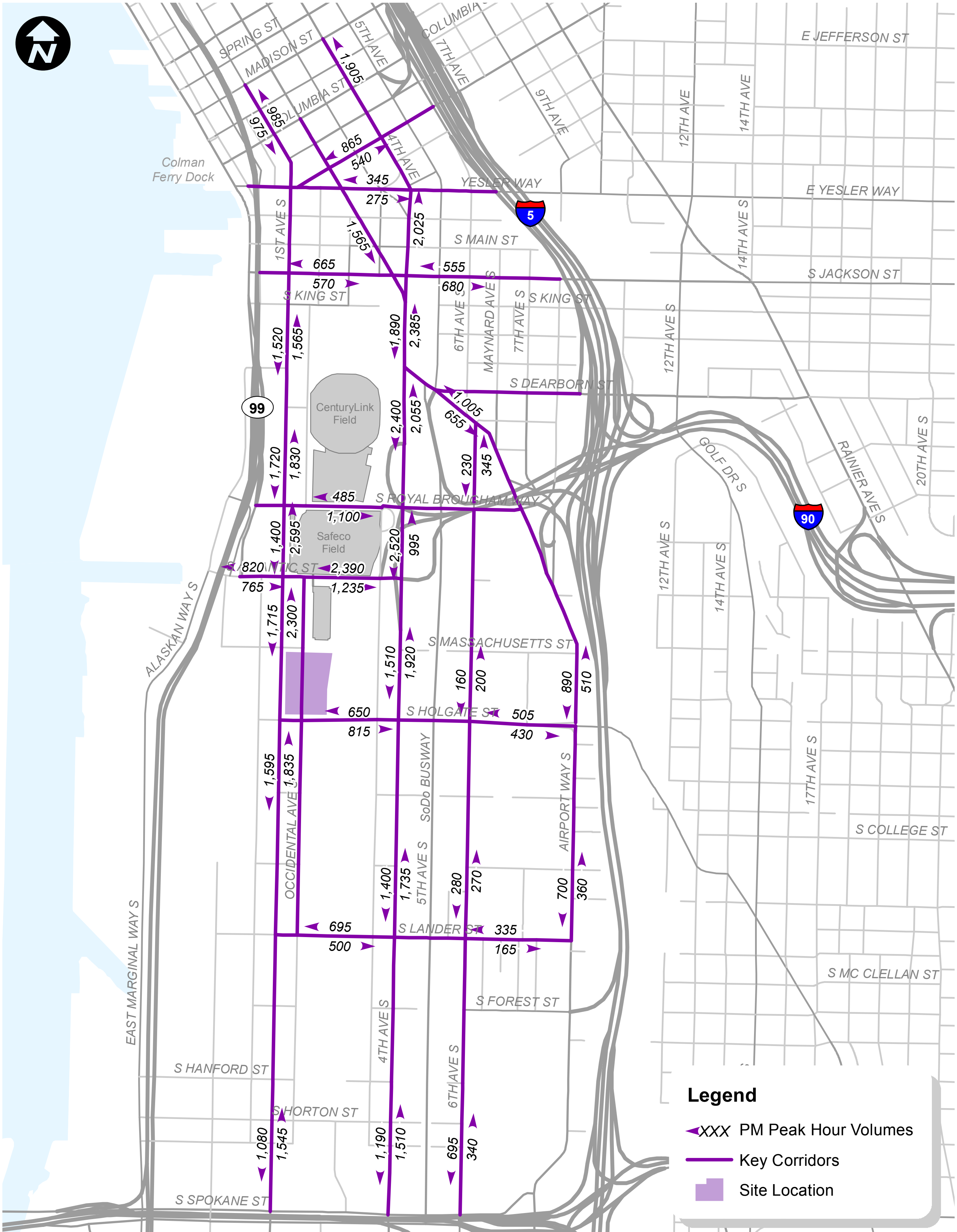


Stadium District Alternative 2 2018 Case S2
Weekday PM Peak Hour Traffic Volumes

Seattle Arena

FIGURE
2-62

transpoGROUP



Stadium District Alternative 2 2018 Case S3
Weekday PM Peak Hour Traffic Volumes

Seattle Arena

FIGURE
2-63

transpoGROUP

Figure 2–64 focuses on the traffic volumes within the vicinity of the Arena site including total volumes as well as general heavy vehicles and transit buses. Table 2-10 summarizes the total traffic volumes within the Arena vicinity and shows the percent increase in traffic volumes compared to No Action conditions.

Table 2-10
2018 Alternative 2 Arena Site Vicinity Weekday PM Peak Hour Traffic Volumes

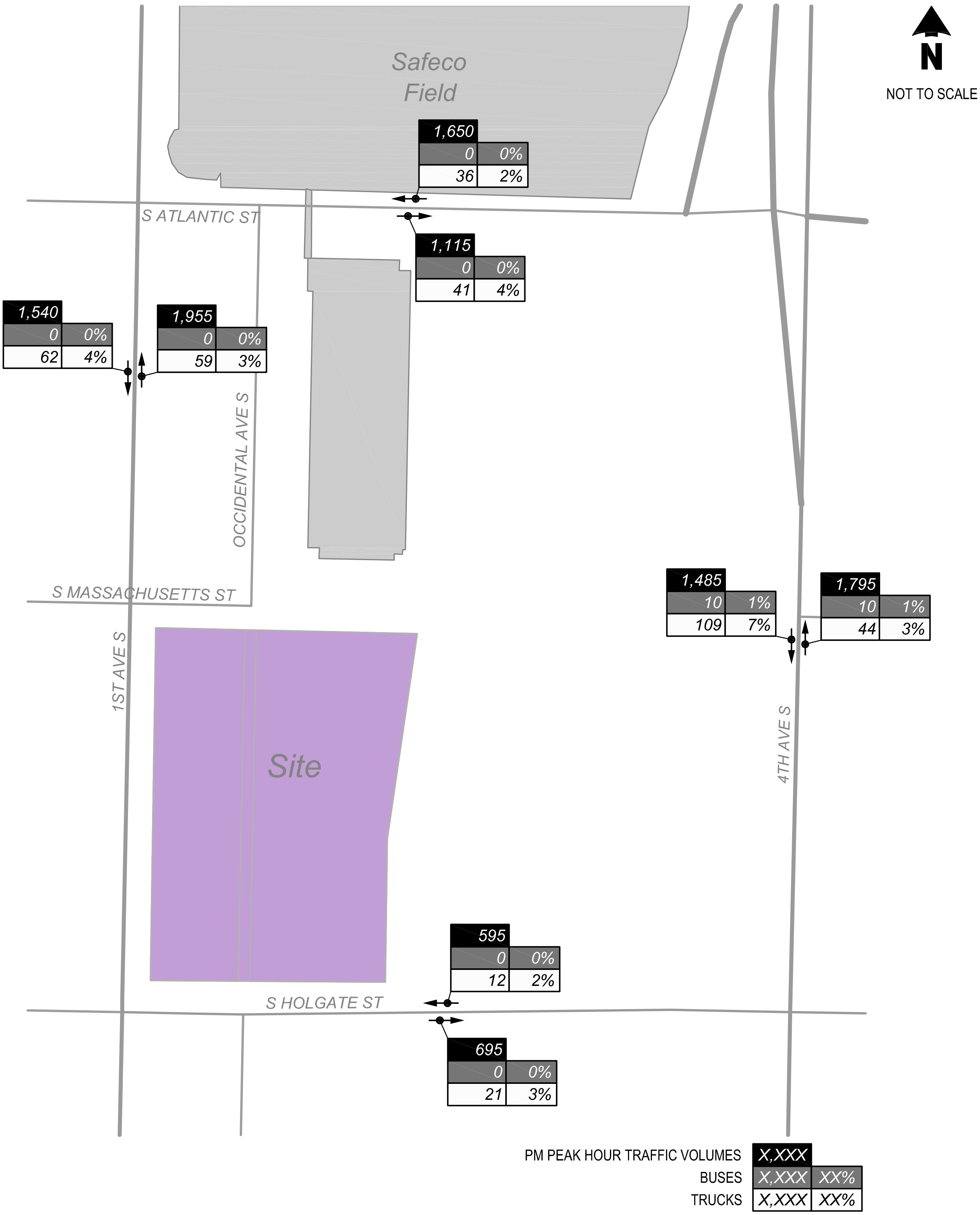
	Case S1		Case S2		Case S3	
Location	**No Action**	**Alt. 2**	**No Action**	**Alt. 2**	**No Action**	**Alt. 2**
1st Avenue S. north of S. Massachusetts Street	3,070	3,495 (+14%)[1]	3,550	3,995 (+11%)	3,615	4,015 (+11%)
Edgar Martinez Drive S. west of Westbound I-90 Off-Ramps	2,275	2,765 (+22%)	2,970	3,475 (+17%)	3,045	3,550 (+17%)
S. Holgate Street east of Occidental Avenue S.	1,120	1,290 (+15%)	1,285	1,450 (+13%)	1,300	1,465 (+13%)
4th Avenue S. north of S. Holgate Street	3,140	3,280 (+4%)	3,280	3,415 (+4%)	3,295	3,430 (+4%)

1. Percent increase from No Action conditions.

The assignment of Arena event related traffic reflects the overall distribution of parking in the area as well as the travel patterns accessing the Stadium District area. Considering a scenario with no additional events in background traffic (Case S1), roadway volumes increase between 4 and 22 percent within the Proposed Arena vicinity. The percent increase is influenced by the level of background traffic, as well as the level of event traffic. Percentage increases associated with the addition of Arena related traffic for subsequent event scenarios decrease although overall traffic volumes increase between 9 and 56 percent with all three events relative to No Action Case S1 condition. The largest increase due to Arena event traffic is forecast along Edgar Martinez Drive S. due primarily to the roadway's connection to and from the regional freeway network and the nearby Safeco Field parking garage.

2.5.4.2 2030 Traffic Volumes

Weekday PM peak hour 2030 Proposed Action traffic volumes are shown on Figure 2–65 through Figure 2–67 for all three event cases. Detailed turning movement volumes for each scenario and at each study intersection are provided in Attachment E-1, which is available upon request.

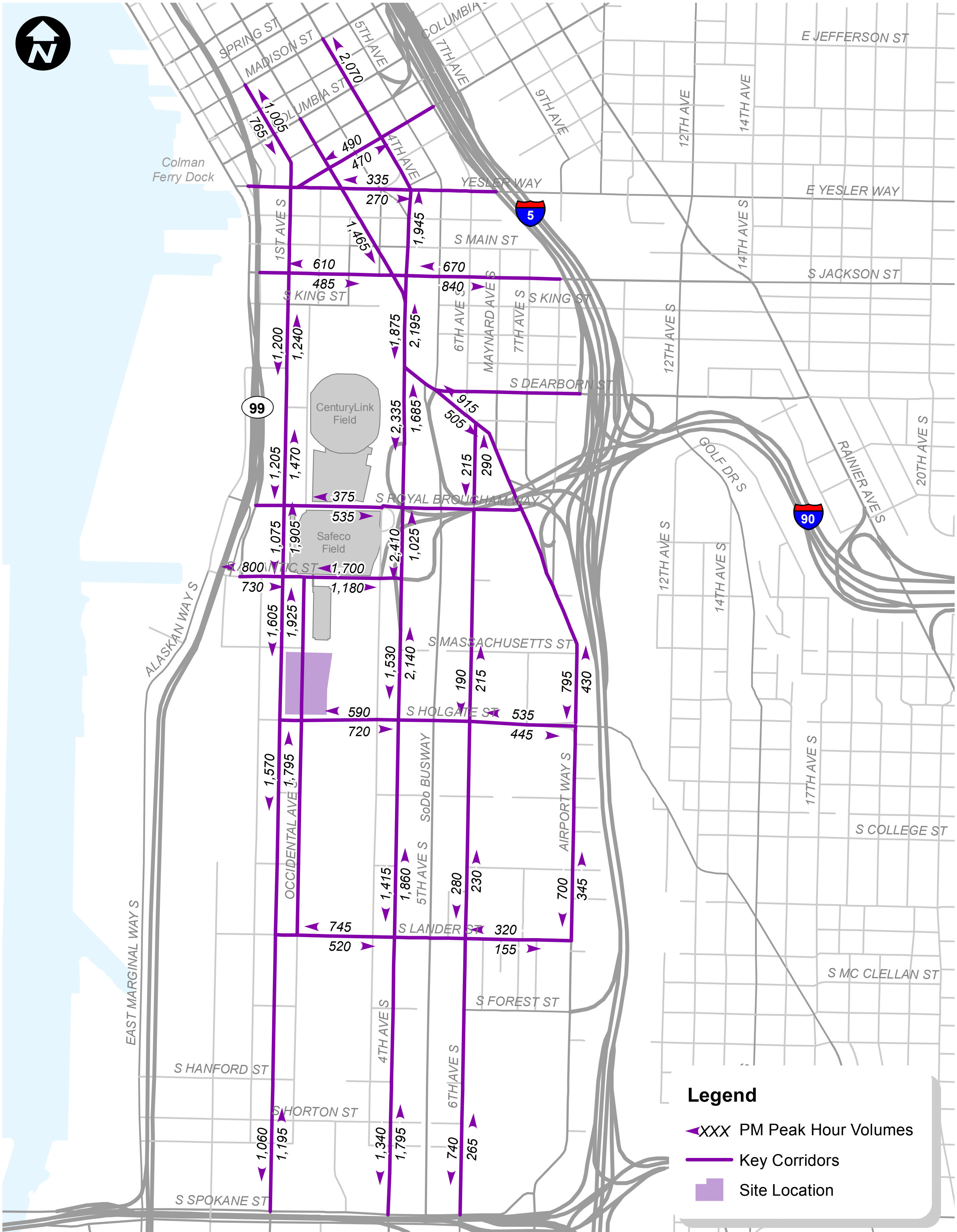


Stadium District 2018 Alternative 2 S1 Arena Site Vicinity WeekdayPM Peak Hour Traffic Volumes

FIGURE 2-64

Seattle Arena

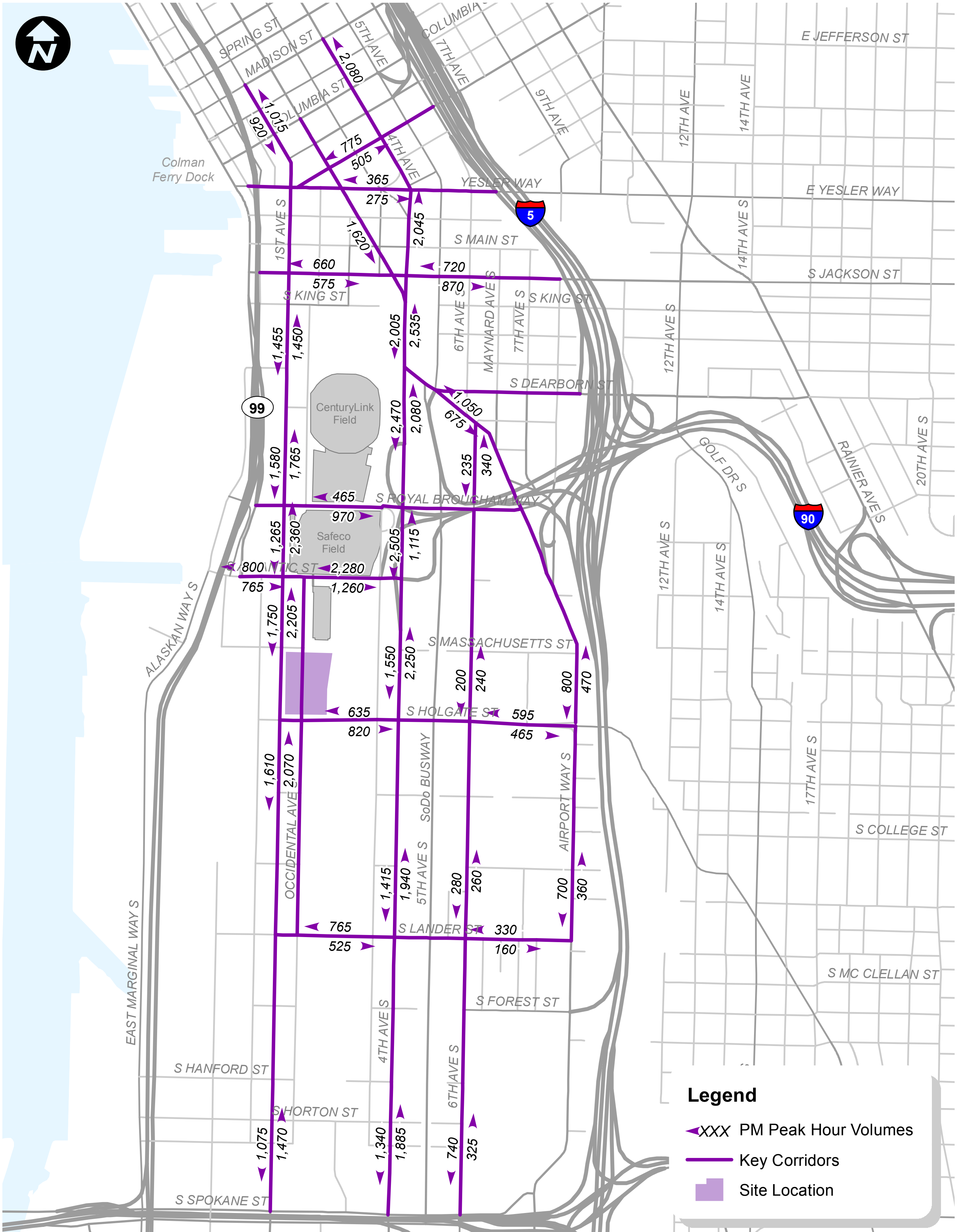
transpoGROUP



Stadium District Alternative 2 2030 Case S1 Weekday PM Peak Hour Traffic Volumes

Seattle Arena

FIGURE
2-65

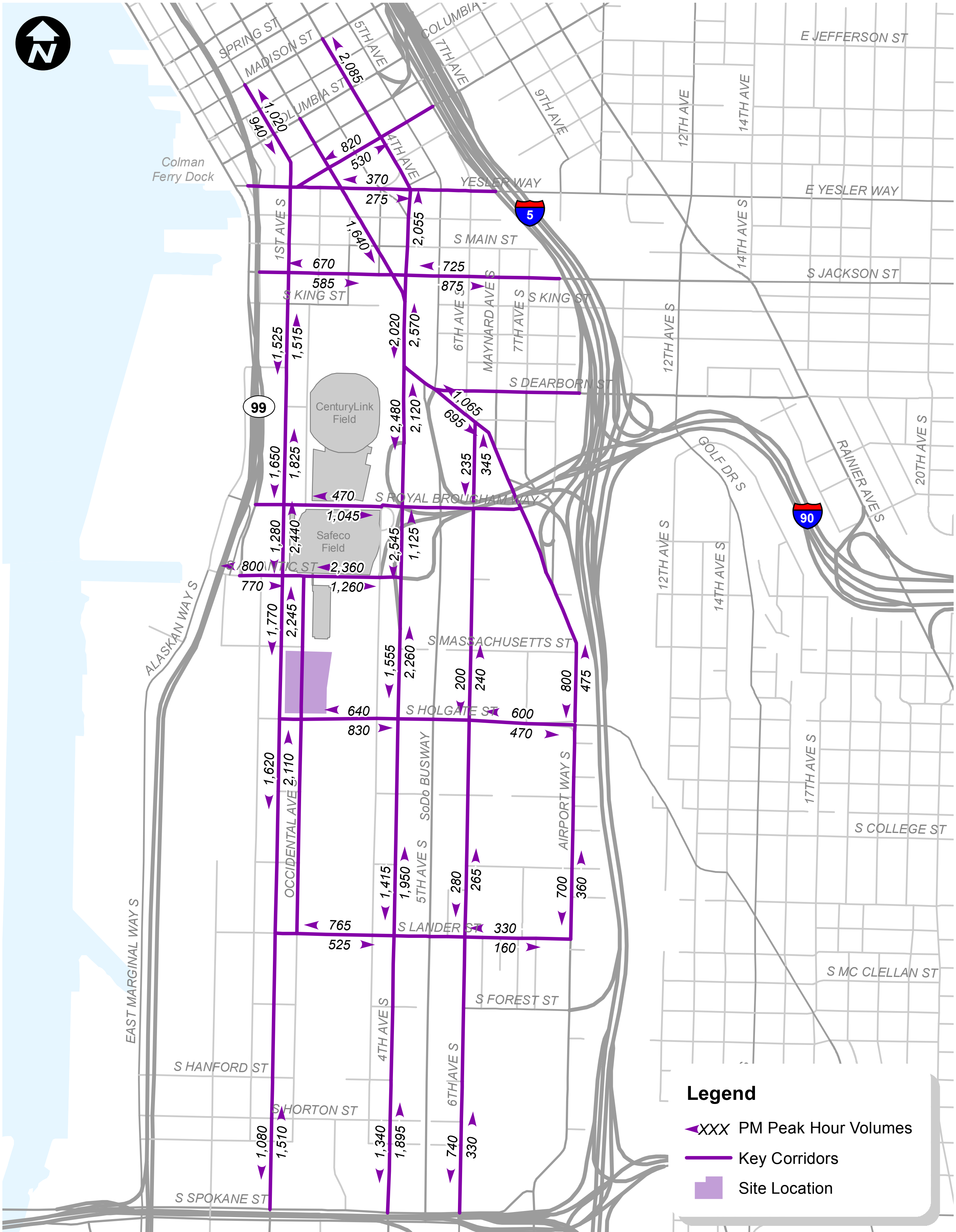


Stadium District Alternative 2 2030 Case S2 Weekday PM Peak Hour Traffic Volumes

FIGURE 2-66

Seattle Arena

transpoGROUP



Stadium District Alternative 2 2030 Case S3 Weekday PM Peak Hour Traffic Volumes

Seattle Arena

FIGURE
2-67

transpoGROUP

As a result of the addition of trips from an event at the Proposed Arena under 2030 conditions, traffic volumes along the regional connections to the Stadium District area increase as follows depending on whether no other Stadium District events occurs, a Mariners game also occurs, or both a Mariners game and CenturyLink Field Event Center event occur:

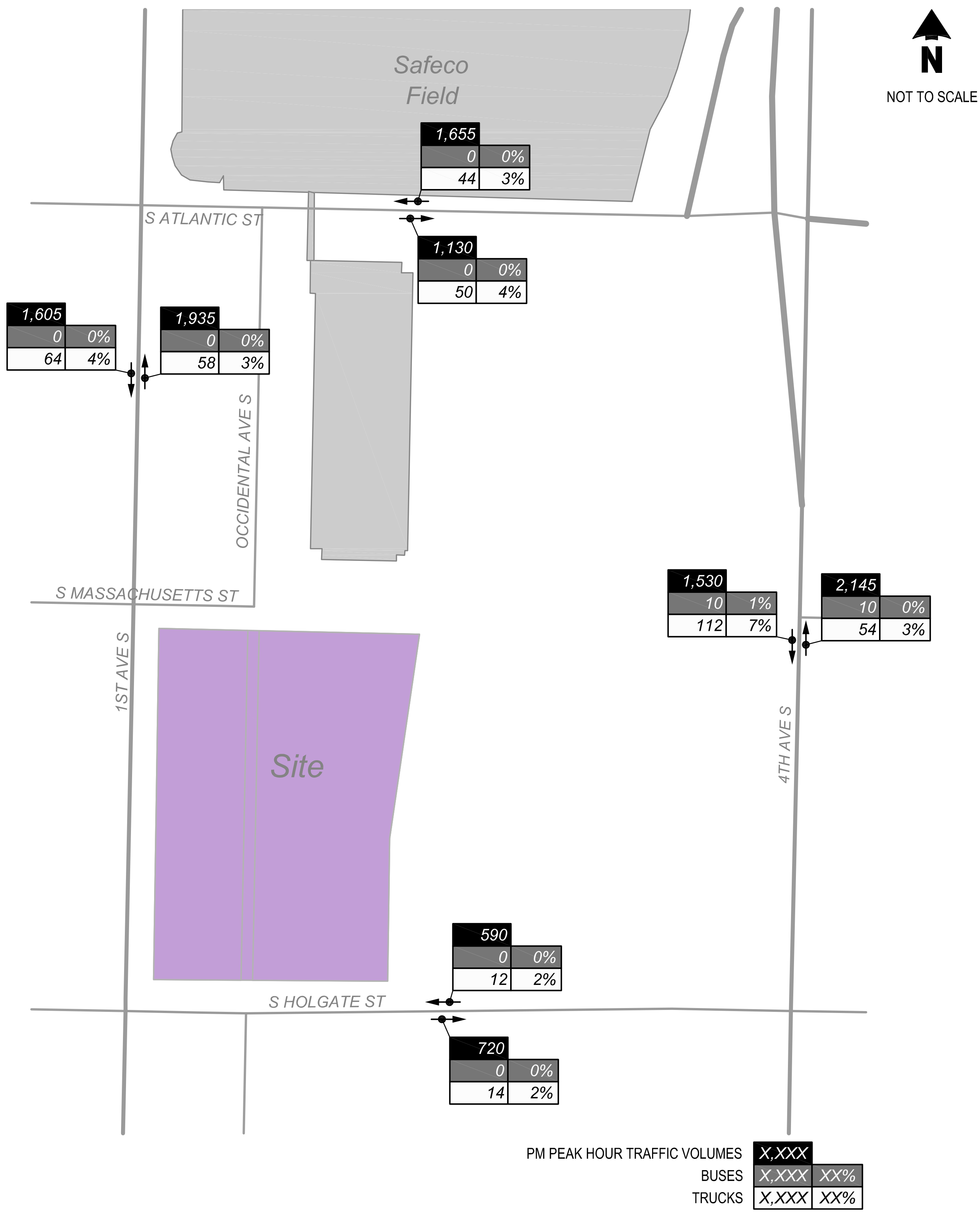
- An increase of between 10 and 12 percent on 1st Avenue S. between S. Royal Brougham Way and S. King Street
- Volumes on 4th Avenue S., north of the S. King Street pedestrian crossing are anticipated to increase on the order of 7 and 8 percent
- South of the site, traffic volumes are anticipated to increase approximately 9 percent along 1st Avenue S. regardless of other events, and between 1 and 3 percent on 4th Avenue S.

Figure 2–68 focuses on the traffic volumes within the vicinity of the Arena site and Table 2-11 summarizes the total traffic volumes within the Arena vicinity compared to 2030 No Action conditions.

Table 2-11
2030 Alternative 2 Arena Site Vicinity Weekday PM Peak Hour Traffic Volumes

	Case S1		Case S2		Case S3	
Location	**No Action**	**Alt. 2**	**No Action**	**Alt. 2**	**No Action**	**Alt. 2**
1st Avenue S. north of S. Massachusetts Street	3,150	3,540 (+12%)[1]	3,595	3,965 (+10%)	3,660	4,025 (+10%)
Edgar Martinez Drive S. west of Westbound I-90 Off-Ramps	2,325	2,780 (+20%)	2,970	3,440 (+16%)	3,045	3,520 (+16%)
S. Holgate Street east of Occidental Avenue S.	1,150	1,310 (+14%)	1,300	1,455 (+12%)	1,315	1,470 (+12%)
4th Avenue S. north of S. Holgate Street	3,540	3,670 (+4%)	3,670	3,800 (+4%)	3,685	3,815 (+4%)

1. Percent increase from No Action conditions.



Stadium District 2030 Alternative 2 S1 Arena Site Vicinity Weekday PM Peak Hour Traffic Volumes

FIGURE
2-68

Seattle Arena

transpoGROUP

As shown on Figure 2–68 and in Table 2-11, roadway volumes increase between 4 and 20 percent within the Arena vicinity as a result of Arena traffic. The percent increase is influenced by the level of background traffic, as well as the level of event traffic. The percentage increase in traffic associated with the addition of Arena related traffic for subsequent event scenarios decrease, although overall traffic volumes increase between 8 and 51 percent with all three events relative to No Action Case S1 forecasts. Consistent with the 2018 conditions, the largest increase due to Arena event traffic is forecast along Edgar Martinez Drive S. due primarily to the roadway's connection to and from the regional freeway network and the nearby Safeco Field parking garage.

2.5.4.3 Transportation Concurrency

The City of Seattle has implemented a Transportation Concurrency system to comply with one of the requirements of the Washington State Growth Management Act (GMA). The system, described in the DPD Director's Rule5-2009 and the City's Land Use and Zoning Code, is designed to provide a mechanism that determines whether adequate transportation facilities would be available "concurrent" with proposed development projects.

The screenlines closest to the project site were chosen for review. The screenlines that were analyzed are shown in Table 2-12 and include:

- The Duwamish River (Screenline 3.11),
- South of Spokane Street (Screenline 9.13), and
- South of S. Jackson Street (Screenline 10.11).

As a conservative estimate, it was assumed that all project-generated traffic traveling in the direction of the screenlines would extend across the screenlines included in this analysis.

Table 2-12
Alternative 2 Transportation Concurrency Analysis

SL#[1]	Location	Direction[2]	Capacity	2008 PM Peak Hour Volume	Alternative 2 PM Peak Hour Traffic[3]	V/C Ratio with Alt 2	LOS Standard
3.11	Duwamish River(West Seattle Freeway and Spokane Street)	EB	4,950	3,281	7	0.66	1.20
		WB	4,950	5,712	100	1.17	1.20
9.13	South of Spokane St (15th Ave S. to Rainier Ave S.)	NB	6,340	3,464	73	0.56	1.00
		SB	6,340	3,767	6	0.60	1.00
10.11	South of S. Jackson Street (Alaskan Way S. to 4th Avenue S.)	NB	12,900	7,586	380	0.62	1.00
		SB	12,980	8,671	501	0.71	1.00

1. SL# = Screenline Number
2. Direction: NB = Northbound, SB = Southbound, EB = Eastbound, WB = Westbound
3. 2018 trip generation and assignment

The transportation concurrency analysis indicates that with traffic generated by the project, the screenlines would have v/c ratios that are less than the City level of service threshold and thus, the conditions would meet concurrency requirements.

2.5.5 Impacts of Alternative 3

Alternative 3 would result in an increase in traffic volumes due to workers traveling to and from the site, delivery of material, and truck hauling. It is anticipated that the increase in traffic volumes would be less than generated by an 18,000-person event at the arena.

Under this alternative, the arena would have a capacity of 18,000 attendees. Forecast trip generation and potential impacts of this alternative was based on an assumed attendance of 18,000 attendees consistent with Alternative 2. Traffic volume impacts of Alternative 3 are anticipated to be approximately 10 percent less than those identified for Alternative 2. While the 20,000-seat event is forecast to generate approximately 2,130 trips during the weekday PM peak hour of traffic under 2018 conditions, an 18,000 attendee event would generate approximately 1,920 trips. This is a difference of 210 vehicles. Under 2030 conditions these values are estimated to be 1,970 trips and 1,780 trips, respectively, for a difference of 190 trips during the weekday PM peak hour.

Table 2-13 and Table 2-14 summarize the total traffic volumes within the arena vicinity compared to the No Action alternative for 2018 and 2030 conditions, respectively.

Table 2-13
2018 Alternative 3 Arena Site Vicinity
Weekday PM Peak Hour Traffic Volumes

	Case S1			CaseS2			Case S3		
Location	**No Act.**	**Alt. 2**	**Alt. 3**	**No Act.**	**Alt. 2**	**Alt. 3**	**No Act.**	**Alt. 2**	**Alt. 3**
1st Avenue S. north of S. Massachusetts Street	3,070	3,495 (+14%)[1]	3,410 (+11%)[1]	3,550	3,995 (+11%)	3,905 (+10%)	3,615	4,015 (+11%)	3,905 (+9%)
Edgar Martinez Drive S. west of Westbound I-90 Off-Ramps	2,275	2,765 (+22%)	2,665 (+17%)	2,970	3,475 (+17%)	3,375 (+14%)	3,045	3,550 (+17%)	3,375 (+13%)
S. Holgate Street east of Occidental Avenue S.	1,120	1,290 (+15%)	1,255 (+12%)	1,285	1,450 (+13%)	1,415 (+10%)	1,300	1,465 (+13%)	1,415 (+10%)
4th Avenue S. north of S. Holgate Street	3,140	3,280 (+4%)	3,250 (+4%)	3,280	3,415 (+4%)	3,390 (+3%)	3,295	3,430 (+4%)	3,390 (+3%)

1. Percent increase from No Action conditions.

As shown in Table 2-13, traffic volumes in the vicinity of the arena site are anticipated to increase between 3 percent and up to 17 percent with the addition of arena event traffic under 2018 conditions. Percentage increases in traffic volumes for Alternative 3 range from between one and five percent less than forecast under Alternative 2. As with Alterative 2, percentage increases resulting from the addition of arena related traffic for subsequent event scenarios decrease, although overall traffic volumes increase between 8 and 48 percent with all three events relative to No Action Case S1 scenario.

Table 2-14
2030 Alternative 3 Arena Site Vicinity
Weekday PM Peak Hour Traffic Volumes

	Case S1			CaseS2			Case S3		
Location	**No Act.**	**Alt. 2**	**Alt. 3**	**No Act.**	**Alt. 2**	**Alt. 3**	**No Act.**	**Alt. 2**	**Alt. 3**
1st Avenue S. north of S. Massachusetts Street	3,150	3,540 (+12%)[1]	3,460 (+10%)[1]	3,595	3,965 (+10%)	3,890 (+8%)	3,660	4,025 (+10%)	3,950 (+8%)
Edgar Martinez Drive S. west of Westbound I-90 Off-Ramps	2,325	2,780 (+20%)	2,690 (+16%)	2,970	3,440 (+16%)	3,345 (+13%)	3,045	3,520 (+16%)	3,425 (+12%)
S. Holgate Street east of Occidental Avenue S.	1,150	1,310 (+14%)	1,280 (+11%)	1,300	1,455 (+12%)	1,425 (+10%)	1,315	1,470 (+12%)	1,440 (+10%)
4th Avenue S. north of S. Holgate Street	3,540	3,670 (+4%)	3,645 (+3%)	3,670	3,800 (+4%)	3,775 (+3%)	3,685	3,815 (+4%)	3,790 (+3%)

1. Percent increase from No Action conditions.

Similar to 2018 conditions, traffic volumes in the vicinity of the arena site are anticipated to increase between 3 and 16 percent with the addition of an 18,000 attendee arena event as shown in Table 2-14. Traffic volumes under Alternative 3 range from between one and four percent less than Alternative 2 volumes. Although overall traffic volumes increase between 7 and 47 percent with all three events relative to No Action Case S1, percent increases associated with the addition of arena related traffic for subsequent event scenarios decrease, but the overall traffic volumes increase.

2.5.6 Mitigation Measures

A complete summary of potential mitigation measures to be considered across all the Transportation Elements evaluated in this report is included in Chapter 4.0 of Appendix E. This summary includes identification of both programmatic measures and physical improvements. For each of the potential mitigation measures a designation of high to low influence was noted. The following identifies those potential mitigation measures considered to have a high influence on this transportation element. These potential mitigation measures are appropriate for both Alternative 2 and Alternative 3.

- Event schedule protocol and management
- Port of Seattle protocols
- Public information coordinator
- Directional event signage
- Variable message and parking guidance signage
- North-South connection located on the east side of the project site, connecting S. Holgate Street to the private extension of S. Massachusetts Street
- Construction management plan

2.5.7 Secondary & Cumulative Impacts

The effective implementation of transportation demand reduction strategies through a Transportation Management Program would result in increases in demands on other transportation modes and systems, including pedestrians, transit, and bicycles.

2.5.8 Significant Unavoidable Adverse Impacts

Peak hour traffic volumes would increase substantially over current levels under No Action conditions and the order of magnitude of change in traffic volumes associated with the Arena for any event case falls within the range of current event experience. There would be an increase in traffic volumes during peak conditions on event days, which would occur more frequently with the Arena. A number of measures have been identified to reduce the level of increase in traffic volumes, including demand reduction, and management of vehicles to orient them to the most appropriate route.

2.6 Traffic Operations

This section evaluates the magnitude of traffic impacts of the project for each of the defined event cases. The traffic operations analysis included a review of four primary areas: intersection levels of service; corridor performance measured through an assessment of travel times; effects of rail traffic on key corridors, and regional impacts as identified through a review of mainline I-5 and I-90 travel speeds; and ramp terminal LOS. The following section provides further detail regarding the methodology applied to each of the four analyses. In reviewing this analysis, it is important to remember that each event cases illustrated would occur with differing frequencies. Case S1 would occur most frequent while Cases S2 and S3 would be relatively rare, or never, depending on mitigation relative to event scheduling.

2.6.1 Methodology

Intersection Level of Service: The operational performance of an intersection was determined by calculating the intersection LOS based on the procedures presented in HCM 2000 rather than the most recent HCM 2010. The use of HCM 2000 is due to limitations related to the HCM 2010 methodology for some conditions, analysis software coding bugs, a desire to apply a consistent methodology throughout the study area, and long-term acceptance of the previous HCM results. Specific limitations of the HCM 2010 methodology include the inability to model five-legged intersections as well as restrictions related to signal phasing that result in the inability to model some of the study area signalized locations. As a consistent approach to measuring intersection and corridor performance, the LOS analysis was completed using the HCM 2000 methodologies as implemented in the Synchro version 8 software program.

At signalized and all-way stop-controlled intersections, LOS is measured in average delay per vehicle for all vehicles at the intersection. At two-way stop-sign-controlled intersections, LOS is reported for the worst operating approach of the intersection. Traffic operations for an intersection can be described alphabetically with a range of LOS values (LOS A through F), with LOS A indicating free-flowing traffic and LOS F indicating extreme congestion and long vehicle delays. Intersection levels of service incorporate several intersection characteristics including signal timing, signal phasing, intersection channelization, traffic volumes, and pedestrian volumes. Table 2-15 summarizes the LOS criteria for signalized and unsignalized intersections.

The City of Seattle's Comprehensive Plan does not define a LOS standard for individual intersections; however, the City generally recognizes LOS E and F as poor operations for signalized locations and LOS F for unsignalized locations. Given the event-related nature of this analysis, and variant frequencies and intensities, traditional intersection LOS standards would not be appropriate as the sole measure of impact on traffic operations.

Table 2-15
Level of Service Criteria

LOS[1]	Average Signalized Delay[2]	Average Unsignalized Delay[2]	General Description[2]
A	< 10 seconds	< 10 seconds	Free Flow
B	10 - 20 seconds	10 - 15 seconds	Stable Flow (slight delays)
C	20 - 35 seconds	15 - 25 seconds	Stable flow (acceptable delays)
D	35 - 55 seconds	25 - 35 seconds	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	55 - 80 seconds	35 - 50 seconds	Unstable flow (intolerable delay)
F	> 80 seconds	> 50 seconds	Forced flow (jammed)

1. LOS = level of service
2. *Highway Capacity Manual*, Transportation Research Board, Special Report 209, 2000.

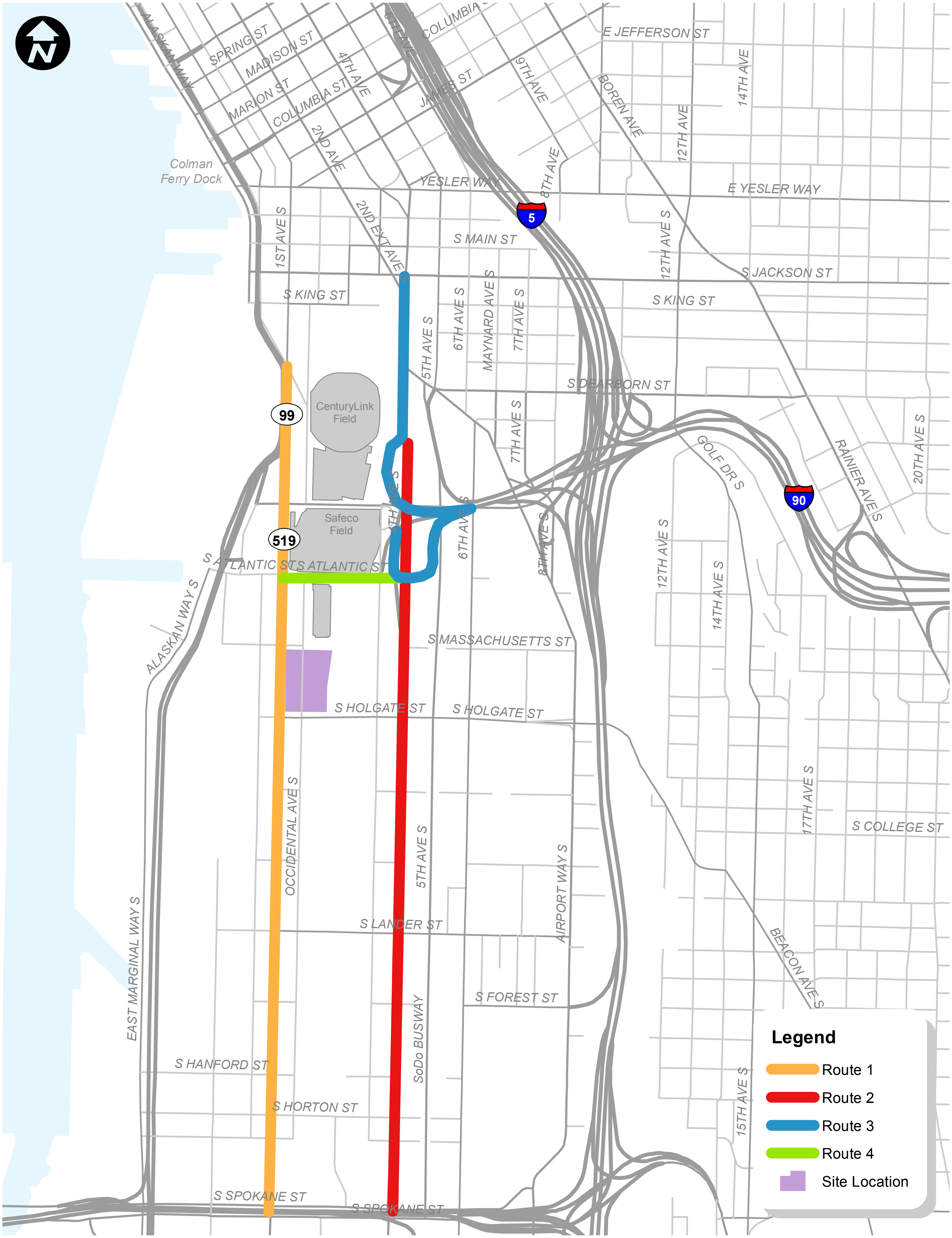
Corridor Performance: Route performance along key corridors was calculated within the study area to provide an additional level of analysis regarding the overall operations of the roadway system. This type of analysis adds context to the results of the intersection LOS described earlier, because it takes into account general travel times between intersections as well as additional delay anticipated at intersections for the specific movements relevant to the identified route.

Travel times were evaluated for four routes and were chosen based on a review of existing travel patterns in the area including key travel routes for commuters and the movement of freight and goods. These routes are generally representative of local circulation or regional travel. Figure 2–69 highlights the travel routes identified for this analysis. The four routes are described as follows:

- **Route 1** focuses on a north-south route along 1st Avenue S. between Railroad Way S. and S. Spokane Street.
- **Route 2** focuses on a north-south route along 4th Avenue S. between S. Spokane Street and the I-90 off-ramp.
- **Route 3** includes north-south travel between I-90 and the CBD along 4th Avenue S. This route represents travel to / from the regional freeway System and the CBD towards the Pioneer Square and International Districts.
- **Route 4** focuses on east-west travel between Port of Seattle facilities west of 1st Avenue S. and the I-5 / I-90 interchange. This route includes S. Atlantic Street from 1st Avenue S. to the freeway ramps on S. Atlantic Street in the vicinity of 4th Avenue S.

Travel times were calculated consistent with HCM methodologies defined for the analysis of arterial systems. This analysis utilized the approach delay for each study intersection along these four routes and a free-flow mid-block travel speed applied to the distance between each study intersection. The mid-block speed is estimated following the Bureau of Public Roads methodology.[18]

[18] NCHRP Report 387



Stadium District Corridor Travel Time Routes

FIGURE 2-69

Seattle Arena

transpoGROUP

Effects of Rail Crossings: Key corridors impacted by rail activity within the study area were analyzed using VISSIM, a microsimulation model.[19] The simulation model of the rail crossings at S. Holgate Street and S. Lander Street was utilized to conduct the assessment due to its ability to model train operations including the arrival and departure patterns associated with delays caused by the gate down times. This analysis focuses on the BNSF mainline tracks that are located immediately west of 4th Avenue S. Several other non-mainline track crossings exist along S. Holgate Street, which accommodate and facilitate the movement of trains within the rail yard, but have not been included in the model since crossing activity is infrequent during the during the weekday PM peak period.

Freeway / Regional Access Analysis. The analysis of regional access to the SoDo area focused on both mainline performance considering corridor travel speeds as well as the LOS at the ramp intersections with the surface arterials. The analysis included a review of southbound I-5 between NE 145th and I-90 and westbound I-90 between Rainier Avenue and I-5. Information prepared by the King County expert review panel in 2012 for the potential Arena was included in this analysis. This information highlights historical congestion patterns along the I-5 and I-90 corridors under event conditions. Ramp intersections also evaluated as part of the intersection LOS are highlighted in this section. The analysis of the ramp intersections is consistent with the LOS methodology previously described.

2.6.2 Affected Environment

The following sections summarize existing traffic operations within the Stadium District study area.

2.6.2.1 Intersection Operations

As part of the intersection operations analysis, signal timing and phasing information was obtained from either the Seattle Department of Transportation (SDOT) or collected in the field. Lane geometrics and traffic control were confirmed in the field and are summarized for each study area intersection in Attachment E-2, which is available from DPD upon request. LOS results for existing weekday PM peak hour without and with event[20] conditions are summarized on Figure 2–71. The number of intersections operating at LOS C or better, LOS D, LOS E, or LOS F is summarized on Figure 2–70. Detailed LOS summary tables and worksheets for each scenario are included in Attachment E-3, which is available from DPD upon request.

As shown on the figures, all study intersections operate at LOS D or better under with event and non-event and without event scenarios with the exception of the six intersections in the non-event and three intersections under the event scenarios.

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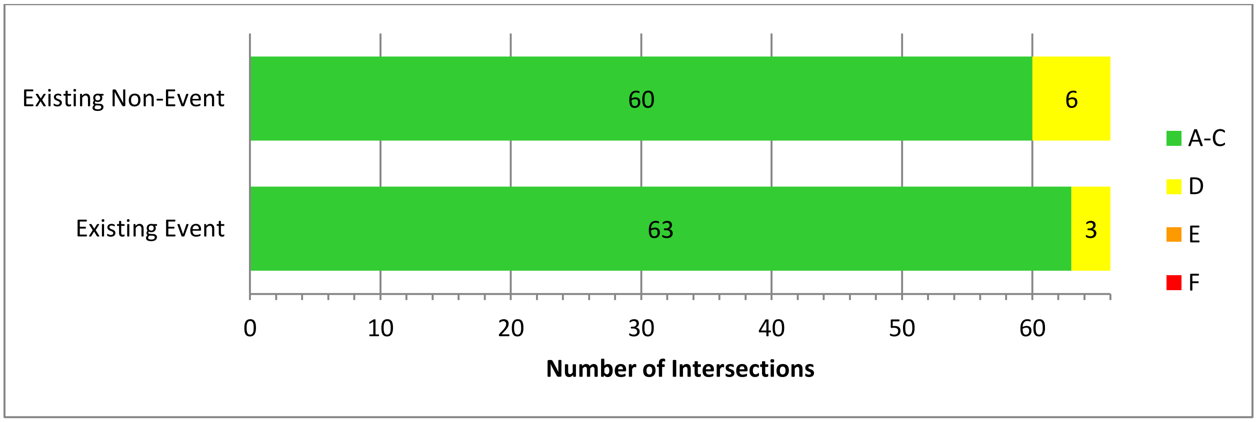
[19] Traffic operations results are presented for the system peak hour. A 20-minute seeding period was used to load traffic onto the roadway network. Vehicular traffic volumes and rail operations during this seeding period replicate traffic volumes and rail operations observed during field data collection.

[20] Existing with-event conditions were observed during the Thursday October 7, 2012 Sounders game. Without-event conditions were observed on Thursday November 1, 2012.

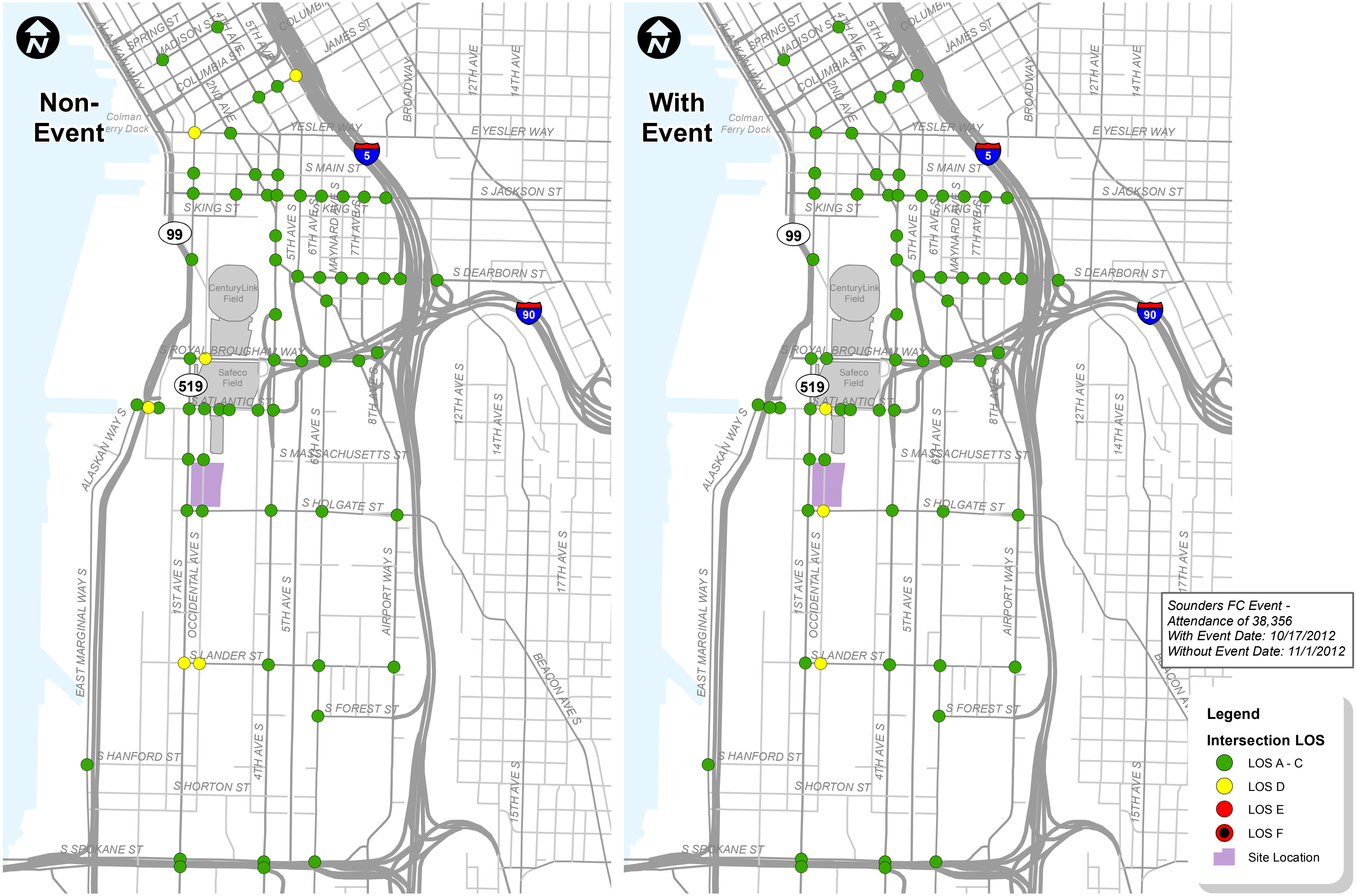
Figure 2–70 Stadium District Existing Intersection LOS Comparison



It is noted that actual driver experience may suggest worse LOS than summarized herein. As the LOS reported represents an average delay for the intersection, some movements will operate at a lower level than reported for the overall average. Also, with the high concentrations of pedestrians during events, the analytical tools employed may not fully reflect the level of pedestrian impacts to intersection performance. Intersections that would be subject to these high pedestrian concentrations during observed events include:

- 1st Avenue S. / S. Royal Brougham Way
- 1st Avenue S. / S. Atlantic Street
- 4th Avenue S. / S. Royal Brougham Way

Several locations along S. Jackson Street may be operating better than historical condition due to diversion of traffic caused by existing construction activity. In addition, previous studies and field observations of the 6th Avenue / James Street intersection suggest this intersection has operated worse than currently shown under these existing conditions.



Stadium District Existing Weekday PM Peak Hour Level of Service

Seattle Arena

FIGURE
2-71

transpoGROUP

2.6.2.2 Corridor / Route Performance

Table 2-16 summarizes the estimated existing travel times on the various routes for weekday PM peak hour non-event and with-event conditions.

Table 2-16
Existing Weekday PM Peak Hour Travel Times Non-Event & With-Event Conditions

Route	Extents	Direction	Non-Event (m:ss[1])	With-Event[2] (m:ss)
1	1st Avenue S. from Railroad Way S. to S. Horton Street	NB	6:16	6:31
	1st Avenue S. from S. Horton Street to Railroad Way S.	SB	6:49	6:50
2	4th Avenue S. from S. King Street to S. Horton Street	NB	6:20	6:54
	4th Avenue S. from S. Horton Street to S. King Street	SB	6:54	6:57
3	4th Avenue S. from S. King Street to I-90	NB	1:43	1:33
	4th Avenue S. from I-90 to S. King Street	SB	3:01	2:53
4	S. Atlantic Street from 1st Avenue S. to I-90	EB	1:39	1:24
	S. Atlantic Street from I-90 to 1st Avenue S.	WB	1:23	1:18

1. m:ss = minutes:seconds
2. Reflects counts taken for a Sounders FC game with attendance = 38,500

As shown in Table 2-16, travel times generally increase along the four routes with the addition of traffic from an event. It is noted that the level of change in travel time may not be intuitive as it relates to any event with over 38,000 attendees. A number of factors appear to contribute to this condition:

- The observed event was a Seattle Sounders FC soccer game at CenturyLink Field. While no hard data relative to mode split or net vehicle demands is available, anecdotal evidence suggests a higher reliance on non-auto travel than occurs in relation to other Stadium District events of similar attendance.

- Repeated traffic counts for other events in the area also suggest minimal local street system impacts during the weekday PM peak hour conditions.

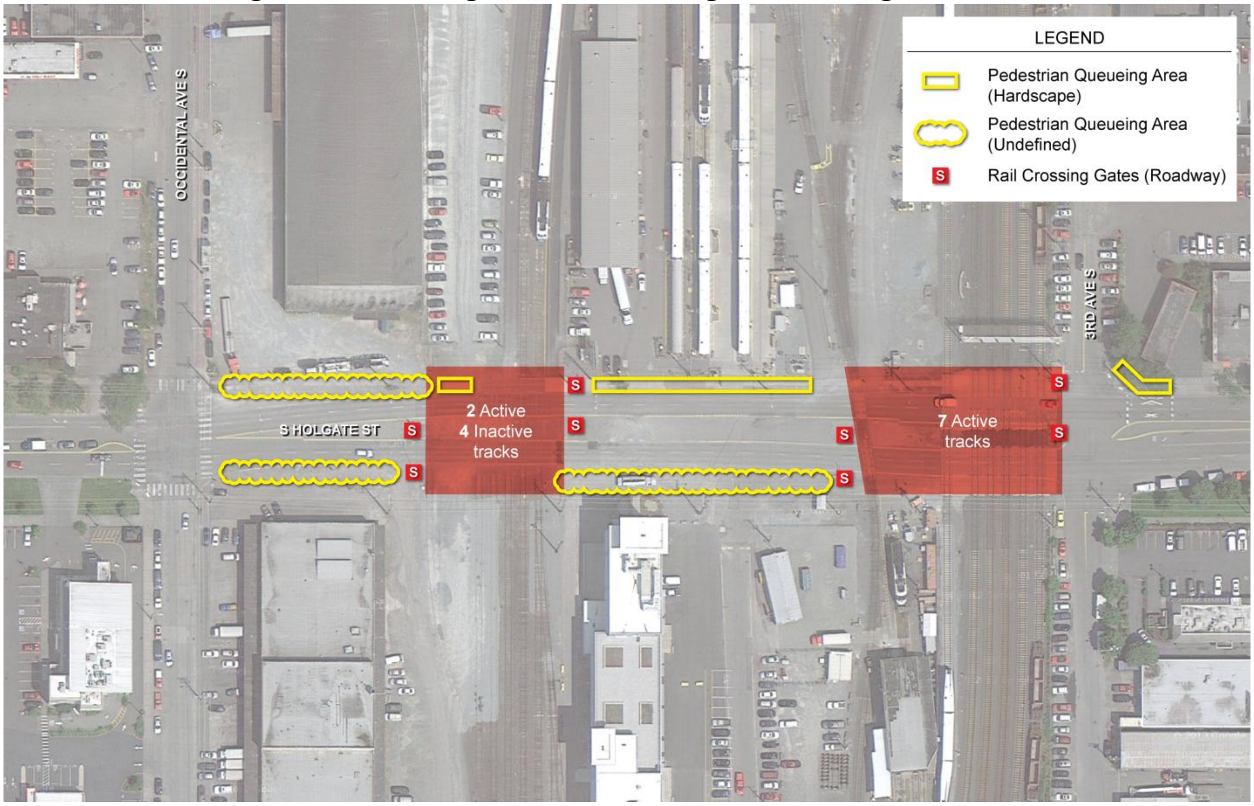
- Local businesses and downtown motorists who are aware of a pending event adjust their travel behavior, either by time or by mode to avoid being caught in event-related congestions. Depending on the size of the event, the adjusted background traffic appears to partially, if not substantially offset the added weekday PM peak hour traffic due to an event.

The slight decreases in travel time along some of the routes for an event condition can be attributed to minor changes in signal timing based on traffic volumes. These can be interpreted to experience little overall added delay during observed event conditions. Several intersections along the travel time routes are shown to have left-turn queue lengths that exceed allowable storage, but occur along arterials that have multiple through lanes. As a result, vehicles potentially blocked by these queues are anticipated to utilize the second through lane, minimizing the impact on the overall intersection capacity.

2.6.2.3 Effects of Rail Crossings

There are at-grade rail crossings throughout SoDo and the greater Duwamish impacting arterial operations. The grade-crossings that have the highest volume of train activity are located along the BNSF Railway's mainline tracks (between 1st Avenue S. and 4th Avenue S.) and also lead and tail tracks associated with the intermodal rail yards. Crossings of the mainline are located at S. Holgate Street, S. Lander Street, S. Horton Street and surface S. Spokane Streets. These mainline tracks, and adjacent spur lines, serve regional activity, trains at the intermodal yards, Sounder commuter rail trains, and Amtrak trains. Figure 2–72 shows the current rail lines and vehicle and pedestrian queuing areas at these crossings.

Figure 2–72 S. Holgate Street Existing Rail Crossing Locations



Existing Rail activity was simulated based on field observations at S. Holgate Street conducted for the *Coal Train Traffic Impact Study*. Based on these observations, trains were assumed to travel at approximately 10 to 15 mph through the study area and gate down times were noted at approximately 8:45 minutes on average. Consistent with the observations, existing rail activity assumed in the model included four passenger trains with eight cars per train and one freight train of 73 cars.

Effects of the rail crossings on S. Holgate Street and S. Lander Street between 1st Avenue S. and 4th Avenues S. on the arterial operations were assessed using the VISSIM model. Rather than reporting the queue lengths on S. Holgate Street and S. Lander Street, queue lengths on adjacent arterials (1st Avenue S. and 4th Avenue S.) are considered since existing queues have been observed to extend into the adjacent arterials as documented in the *Coal Train Traffic Impact Study* (p 16, October 2012, Parametrix). Queue lengths reported for these locations reflect a combination of effects of signal operations as well as impacts of queuing from the at-grade crossings.

Queue lengths for existing simulated conditions along 1st Avenue S. and 4th Avenues S. are summarized in Table 2-17.

Table 2-17
S. Holgate Street and S. Lander Street Rail Crossing Summary – Existing Weekday PM Peak Hour

	Scenario	Arterial Direction[1]	Maximum Arterial Queue Length[2]
S. Holgate Street Crossing	Weekday PM Peak Hour Non-Event	NB[3] 1st Ave S.	420 ft
		SB 1st Ave S.	350 ft
		NB 4th Ave S.	310 ft
		SB 4th Ave S.	390 ft
	Weekday PM Peak Hour With-Event[4]	NB 1st Ave S.	270 ft
		SB 1st Ave S.	330 ft
		NB 4th Ave S.	380 ft
		SB 4th Ave S.	890 ft
S. Lander Street Crossing	Weekday PM Peak Hour Non-Event	NB 1st Ave S.	310 ft
		SB 1st Ave S.	430 ft
		NB 4th Ave S.	300 ft
		SB 4th Ave S.	400 ft
	Weekday PM Peak Hour With-Event	NB 1st Ave S.	620 ft
		SB 1st Ave S.	510 ft
		NB 4th Ave S.	300 ft
		SB 4th Ave S.	690 ft

1. Queue lengths reported relative to 1st Avenue S. and 4th Avenue S. as S. Lander and S. Holgate storage was noted at capacity.
2. The reported maximum queue length is an average of the maximum queue lengths recorded across 10 simulation runs and represents the greater of a turning movement towards the rail crossing or the throughout movement along the corridor. Queue lengths are rounded up to the nearest 10 feet.
3. NB = northbound, SB = southbound
4. Sounders FC soccer game with attendance of 38,500

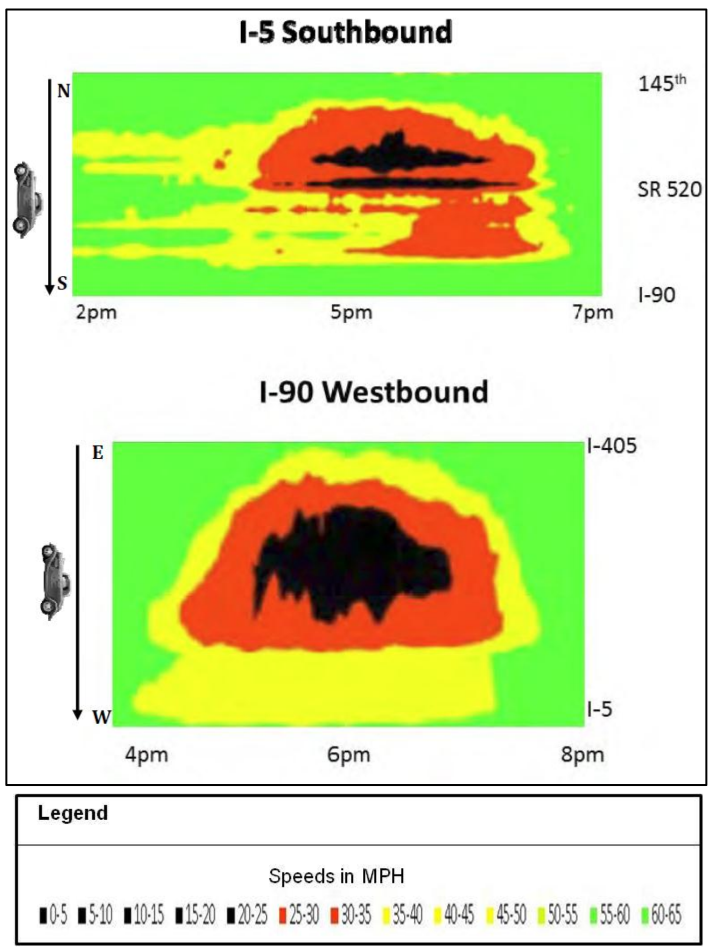
Rail crossing gates are activated approximately 8.5 minutes during the weekday PM peak hour. As shown in Table 2-17:

- Maximum queues along 1st Avenue S. and 4th Avenues S. show that maximum queue lengths along the arterial typically increase with the occurrence of the Sounders game.
- The northbound 1st Avenue S. queue at S. Holgate Street is shown to decrease and occurs as a result of increased upstream northbound congestion at 1st Avenue S. / S. Lander Street.

Model results were compared to the values reported in the coal train study for calibration purposes. The queue lengths summarized in the coal train study are generally consistent with previous analyses.

2.6.2.4 Regional Access Analysis

Figure 2–73 I-5 and I-90 Existing Weekday Congestion



Primary freeway corridors that provide regional access to the SoDo site include I-5, I-90, SR 520, and SR 99. The weekday PM peak commute period for these corridors occurs between 3:00 and 7:00 PM.

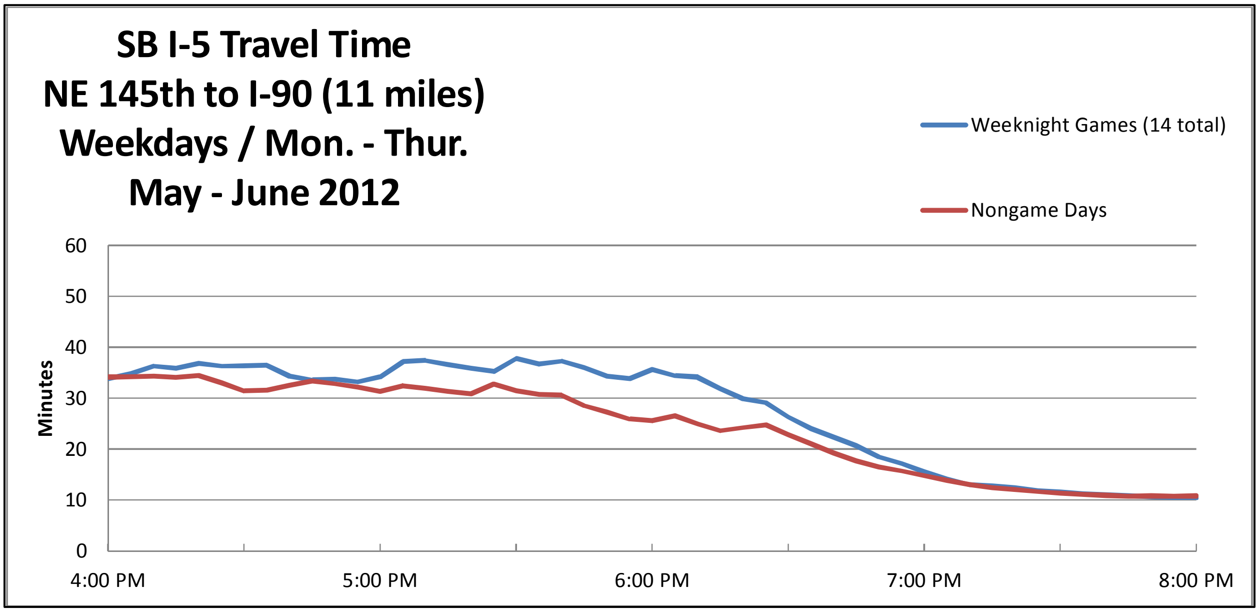
The I-5 and I-90 corridors experience congestion presently during the PM peak commute (4:00 to 7:00 PM). I-5 southbound is congested with speeds less than 30 mph from 145th Street NE through downtown Seattle (north of I-90). These lower speeds are estimated to occur from 4:30 PM to approximately 7:00 PM. I-90 westbound operates with speeds less than 30 mph from I-405 to the approach to I-5 during the 4:00 to 7:00 PM window. Figure 2–73 depicts typical daily congestion that occurs today on I-5 southbound and I-90 westbound. Travel speeds are shown relative to the time of day (x-axis) and the relative location along the corridor (Y-axis). The color green represents fre flow, while black is representative of speeds less then 25 mph.

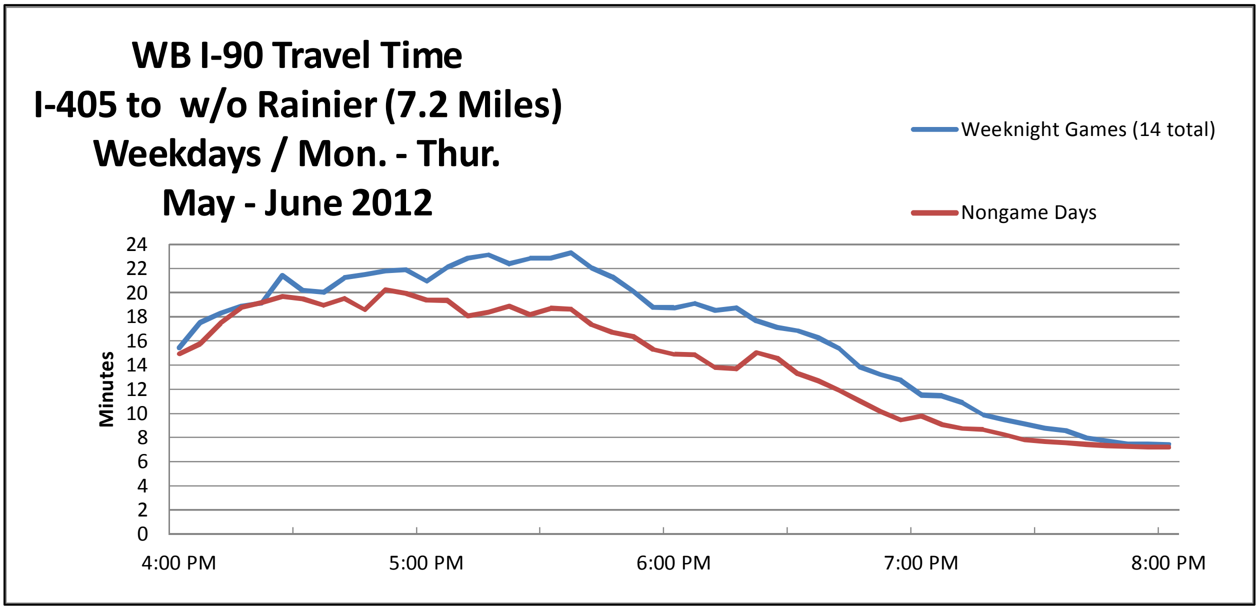
I-5 is a north-south corridor with 8 to 10 lanes of capacity through the downtown Seattle area. The corridor serves 7,000 to 7,500 vph in each direction through downtown during the evening commute. The I-5 corridor also includes a set of reversible lanes between Downtown Seattle and Northgate. This four lane facility operates in the northbound direction during the PM peak period with a volume of 4,500 vph.

I-90 is an east-west corridor connecting cities east of the Lake Washington (such as Bellevue, Issaquah, Redmond, Mercer Island) and terminates in the SoDo area of Seattle. Approaching I-5 from the east, I-90 serves up to 9,300 vph during the PM peak period, with higher eastbound volumes leaving Seattle.

When events occur at existing SoDo venues peak travel times through the city increase (see Figure 2–74). The PM peak travel times (on days with events in 2012) increased by up to eight minutes on southbound I-5 between NE 145th and I-90 and up to four minutes on westbound I-90 between I-405 and Rainer Avenue S.

Figure 2–74 I-5 and I-90 Existing Weekday Travel Times Non-Event and With Event





SR 520 is a second east-west cross-lake corridor operating between Redmond and Seattle. SR 520 is currently a four lane tolled corridor and serves up to 4,800 vph during the PM peak period. Ultimately, the corridor will be six lanes (two general purpose lanes and an HOV lane in each direction). Portions of the project are funded and under construction.

SR 99 is a north-south corridor along the Seattle waterfront through. SR 99 is also currently under construction. Today, the corridor provides six lanes through the downtown Seattle area and will be replaced by a four-lane tunnel and expanded Alaskan Way surface street when the project is complete. The tunnel is scheduled to open in 2017, and the new surface street will follow in 2018.

The traffic signals or intersections at the ramp termini operate as a constraint as traffic exits the freeway to access the SoDo area. The overall capacity of the intersection and off-ramp approach of nine arterial intersections at the I-5, I-90, and West Seattle Bridge ramp termini were reviewed to determine existing off ramp constraints. This analysis focuses on the off-ramps only as it is most impacted by the inbound regional flows to the Arena. On-ramp capacity is discussed in the intersection operations section. The analysis was completed for event[21] and non-event conditions. The study intersections include the following:

- S. Spokane Street / 1st Avenue S.
- S Spokane Street / 6th Avenue S.
- S Forest Street / 6th Avenue S.
- Edgar Martinez Drive S. / I-90 Off-Ramp
- 4th Avenue S. / I-90 Off-Ramp
- S. Dearborn Street / I-90 Off-Ramp
- S. Dearborn Street / I-5 SB Off-Ramp
- S. Dearborn Street / I-5 NB Off-Ramp
- James Street / 6th Avenue

Of the nine study intersections, all the intersections operate with an overall and off-ramp approach of LOS D or better during the normal weekday peak hour and with an event. LOS and delay per vehicle is shown in Table 2-18.

[21] Event was a Seattle Sounders soccer game with an attendance of 38,500.

Table 2-18
Stadium District Existing Ramp Terminal Weekday PM Peak Hour LOS Summary

Ramp Termini Intersection	Scenario	Overall LOS / Delay	Off-Ramp LOS / Delay
Spokane St Viaduct / 1st Ave S.	Non-Event	B / 18	D / 43
	Event[1]	C / 20	D / 42
Spokane St / 6th Ave S.	Non-Event	B / 18	B / 16
	Event	C / 31	C / 26
Forest St / 6th Ave S.	Non-Event	B / 11	B / 14
	Event	B / 11	B / 17
E. Martinez Dr S. / I-90 Off	Non-Event	A / 6	B / 18
	Event	A / 6	B / 16
4th Ave S. / I-90 Off	Non-Event	A / 8	D / 46
	Event	B / 11	D / 38
Dearborn St / I-90 Off	Non-Event	C / 32	D / 52
	Event	C / 26	D / 47
Dearborn St / I-5 SB Off	Non-Event	A / 8	D / 42
	Event	A / 7	C / 22
Dearborn St / I-5 NB Off	Non-Event	B / 19	D / 43
	Event	B / 16	B / 18
James St / 6th Ave	Non-Event	D / 37	D / 46
	Event	C / 24	C / 31

1. Sounders FC soccer game at 38,500 attendance

2.6.3 Impacts of No Action Alternative

The following sections summarize the results of the traffic operations analysis conducted for the No Action alternative. This analysis reflects the forecast traffic volumes and roadway improvements anticipated to be completed by the 2018 and 2030 horizon years. Consistent with the analysis of the Affected Environment, this section presents the results of the intersection LOS analysis, corridor performance, effects of rail crossings, and regional access to the SoDo area.

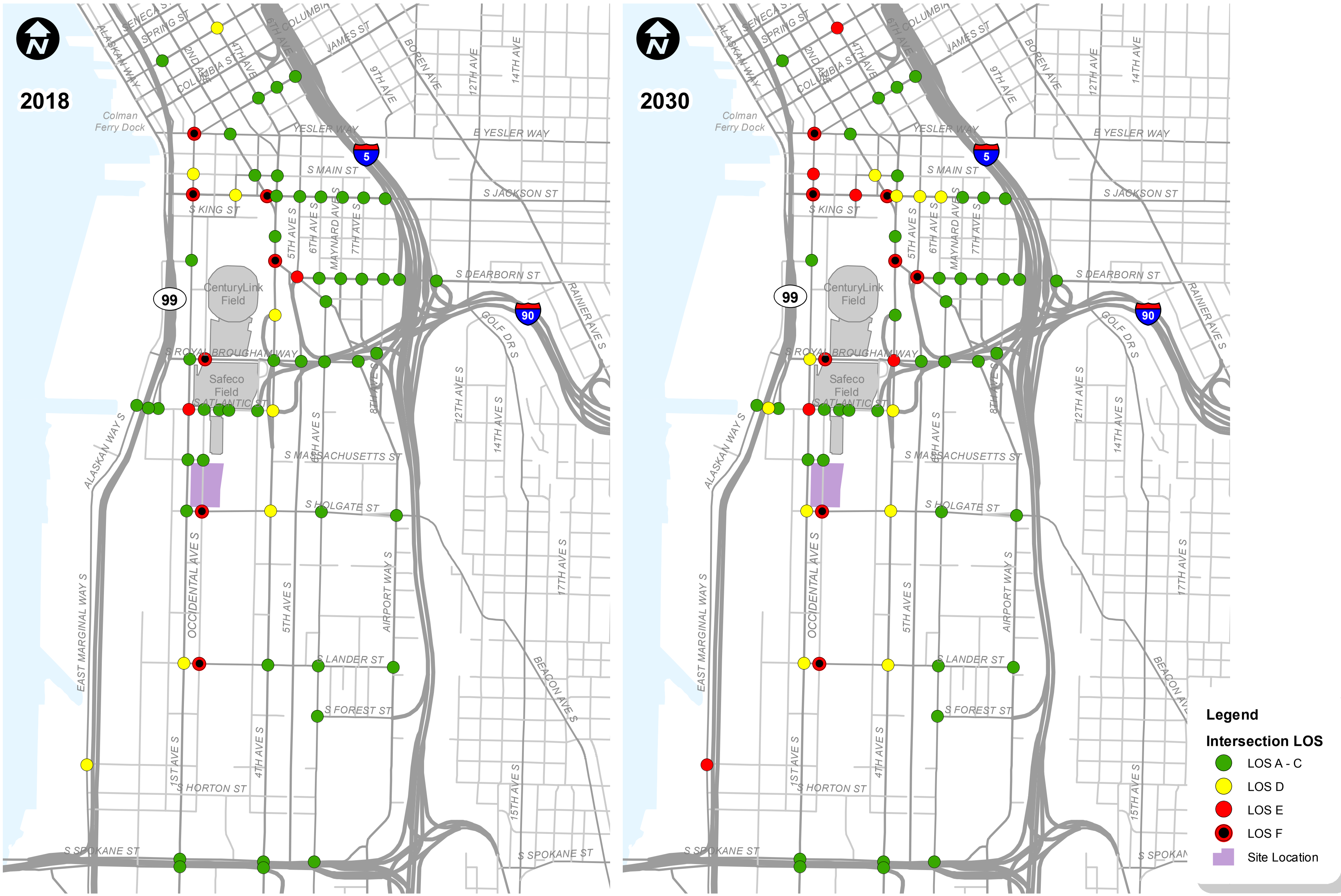
The event cases are included as part of baseline conditions for No Action.as follows:

- Case S1 - No events
- Case S2 - An event with 40,500 attendance at Safeco Field
- Case S3 - An event with 40,500 attendance at Safeco Field plus 5,000 attendance at CenturyLink Field Event Center

2.6.3.1 Intersection Operations

LOS results for 2018 and 2030 non-event peak hour conditions, with the addition of the assumed Mariners event, and with the Mariners event and event at the CenturyLink Field Event Center are summarized on Figure 2–75 through Figure 2–77. Detailed LOS summary tables and worksheets for each of these scenarios are included in Attachment E-3, which is available upon request.

A summary of the No Action LOS for all study area intersections was prepared and compared to existing conditions as summarized on Figure 2–78 for 2018 conditions, and Figure 2–79 for 2030 conditions.



Stadium District No Action Case S1 Weekday PM Peak Hour Level of Service

Seattle Arena

FIGURE **2-75**

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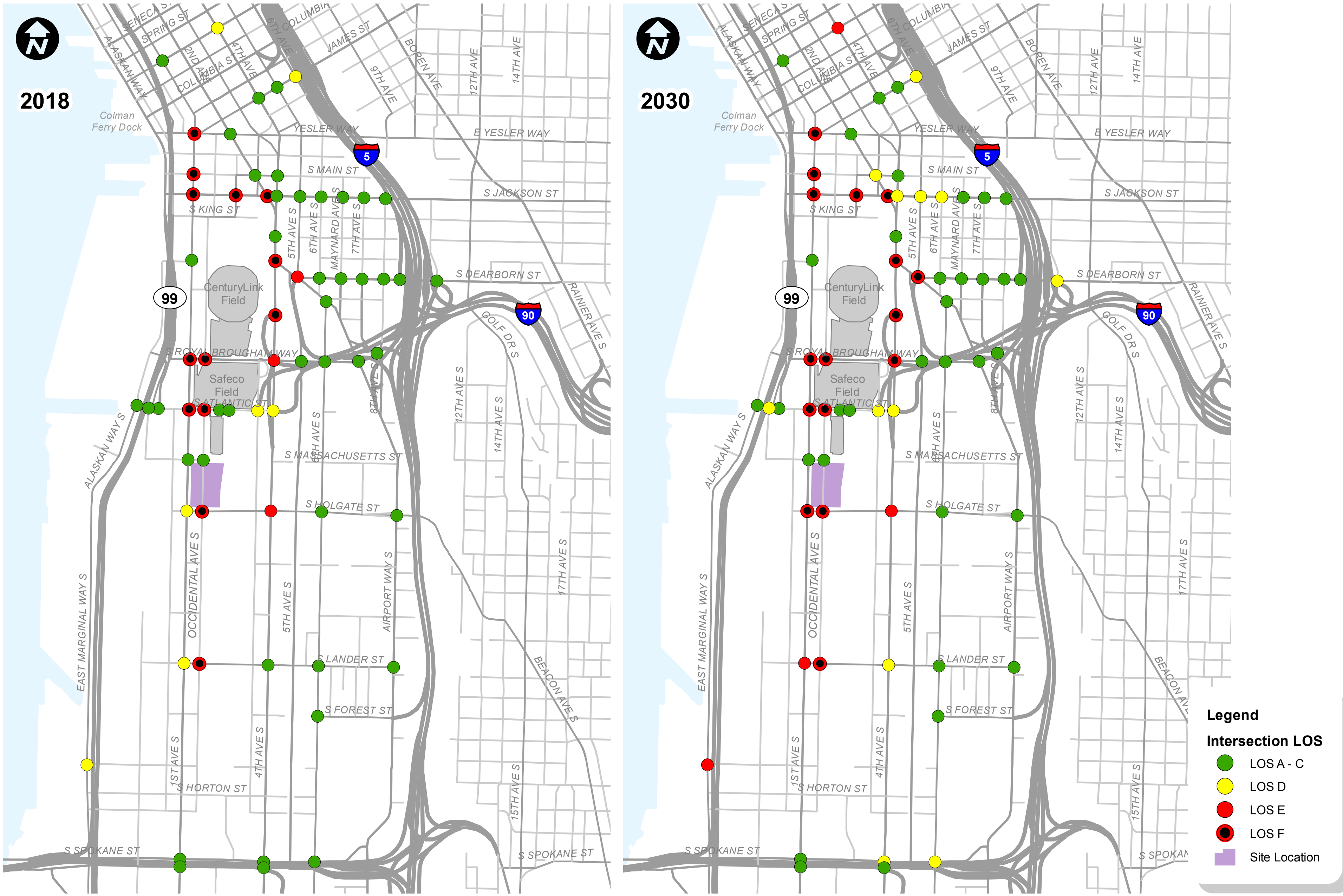
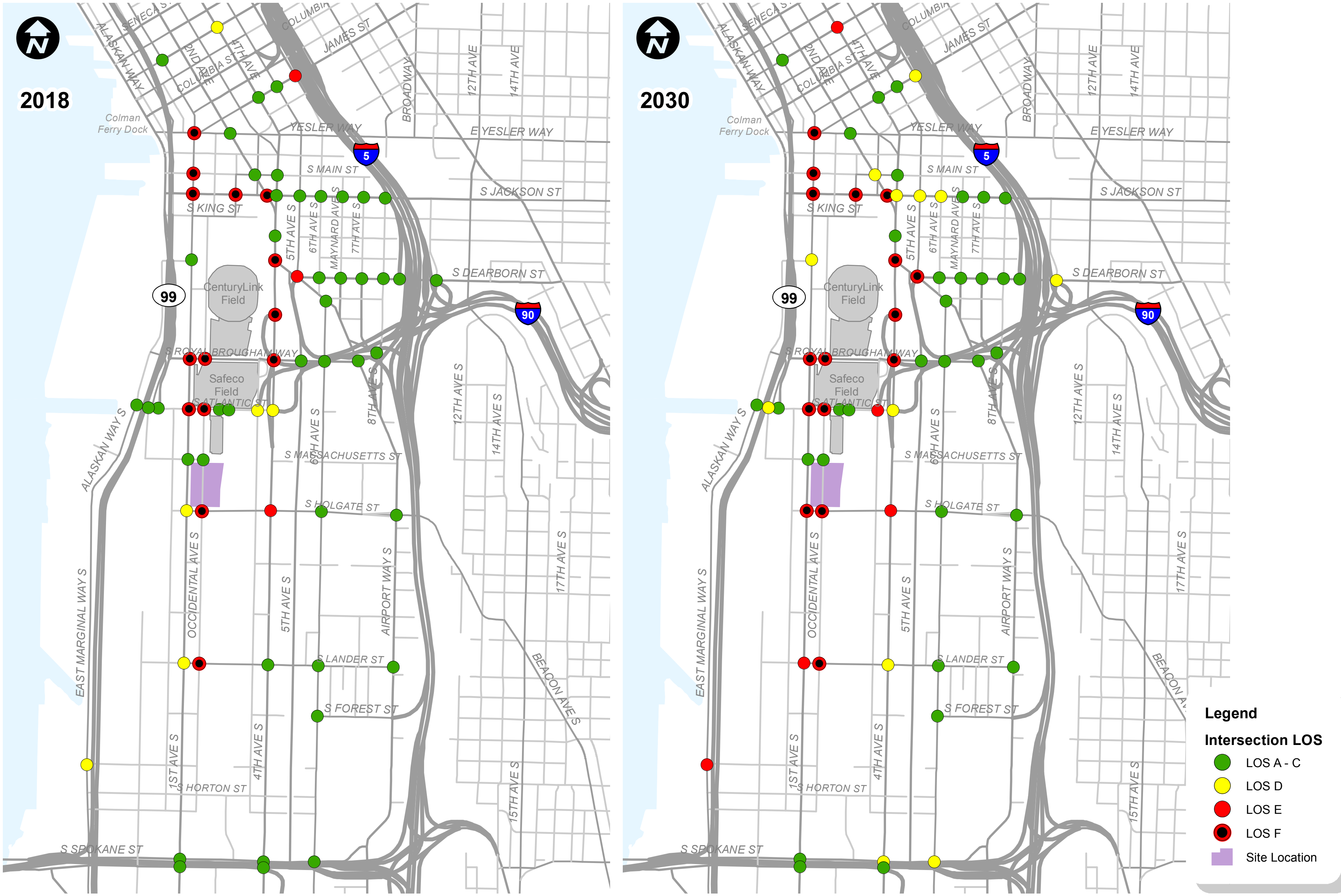


Stadium District No Action Case S2 Weekday PM Peak Hour Level of Service

Seattle Arena

FIGURE **2-76**



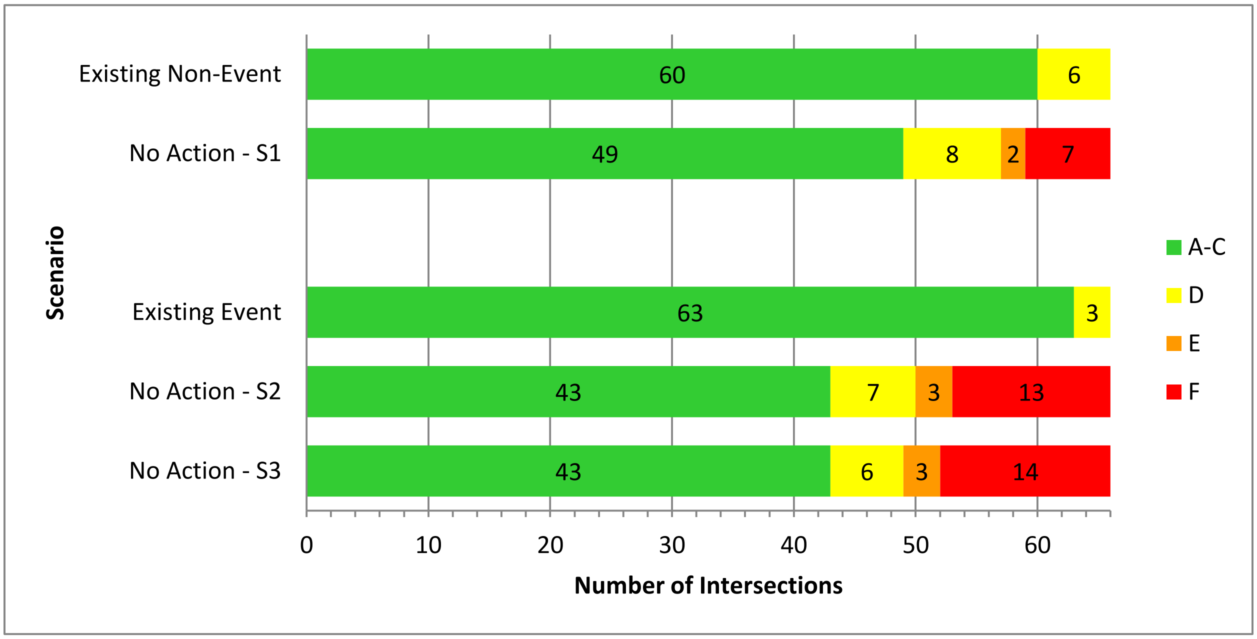
Stadium District No Action Case S3 Weekday PM Peak Hour Level of Service

Seattle Arena

transpoGROUP

FIGURE
2-77

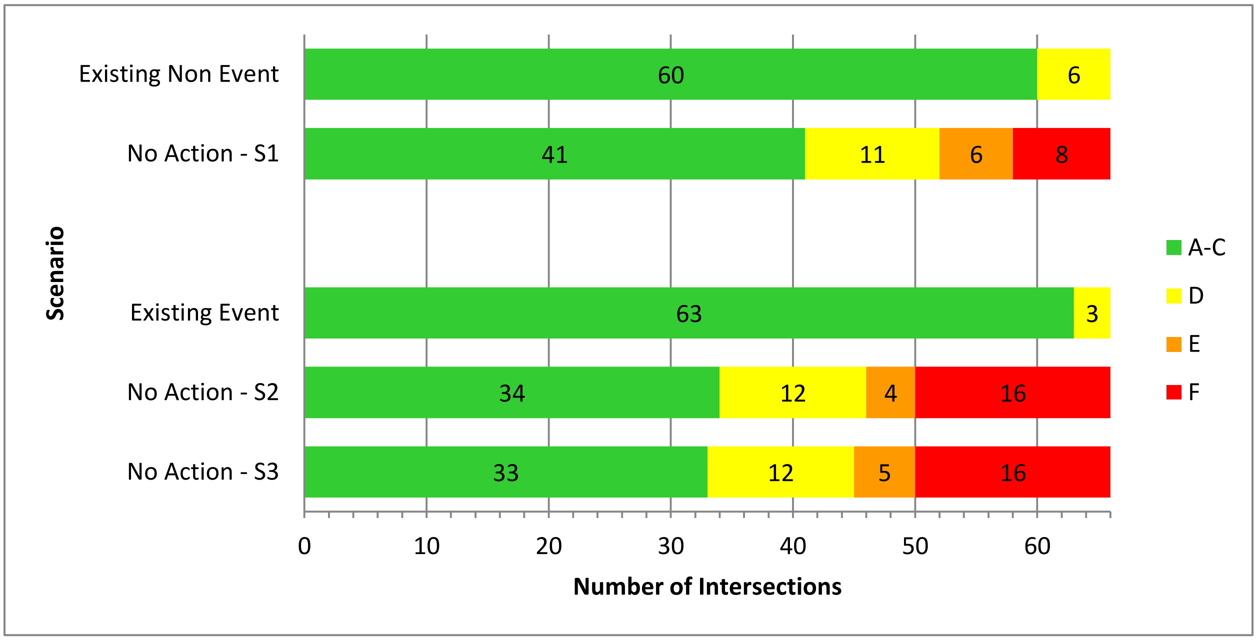
Figure 2–78 Stadium District 2018 No Action Intersection LOS Comparison



As summarized in these figures:

- Increased traffic volumes and changes in travel patterns result in a greater number of intersections operating at LOS E/F under both 2018 and 2030 No Action conditions.
- The occurrence of Mariners and CenturyLink Field Event Center events also result in worse operations throughout the study area. Seven to eight additional intersections operate at LOS E/F under 2018 conditions with one or both events (Cases S2 and S3) with seven more intersections under 2030 conditions.

Figure 2–79 Stadium District 2030 No Action Intersection LOS Comparison



Of the intersections shown to operate at LOS E or LOS F under 2018 No Action conditions (Cases S1, S2, and S3), four are located within the vicinity of the Proposed Arena site:

- 1st Avenue S. / S. Atlantic Street
- The northbound Occidental Avenue S. approach to Edgar Martinez Drive S.
- The southbound Occidental Avenue S. approach to S. Holgate Street
- 4th Avenue S. / S. Holgate Street

Under forecast 2018 non-event conditions the 1st Avenue S. / S. Atlantic Street intersection is shown to operate at LOS E, the northbound Occidental Avenue S. approach to Edgar Martinez Drive S. is forecast to operate at LOS C, the southbound Occidental Avenue S. approach to S. Holgate Street would operate at LOS F, and 4th Avenue S. / S. Holgate Street at LOS D. However, the first three locations are forecast to operate at LOS F under both 2018 No Action single event and dual event scenarios with 4th Avenue S. / S. Holgate Street at LOS E.

Under 2030 No Action conditions (non-event, single event, or dual event), up to six intersections would operate at LOS E or LOS F within the vicinity of the Proposed Arena site:

- 1st Avenue S. / S. Atlantic Street
- The northbound Occidental Avenue S. approach to Edgar Martinez Drive S.
- The westbound I-90 off-ramp onto Edgar Martinez Drive S.
- 1st Avenue S. / S. Holgate Street

- The southbound Occidental Avenue S. approach to S. Holgate Street
- 4th Avenue S. / S. Holgate Street

Under 2030 conditions, 1st Avenue S. / S. Atlantic Street is forecast to operate at LOS E and the southbound Occidental Avenue S. approach to S. Holgate Street would operate at LOS F without the addition of event traffic while the remaining four intersection would operate at LOS D or better. With the addition of either single or dual event traffic 1st Avenue S. / S. Atlantic Street, the northbound Occidental Avenue S. approach to Edgar Martinez Drive S., 1st Avenue S. / S. Holgate Street and the southbound Occidental Avenue S. approach would all operate at LOS F. Single and dual event traffic under 2030 conditions at 4th Avenue S. / S. Holgate Street is forecast to operate at LOS E. The westbound I-90 off-ramp onto Edgar Martinez Drive S. is forecast to operate at LOS E only under the dual-event scenario.

2.6.3.2 Corridor Travel Times

Table 2-19 summarizes the calculated travel times under 2018 conditions on the various routes for weekday PM peak hour for all No Action cases. Table 2-20 summarizes the estimated travel times under 2030 conditions. Existing conditions are also provided for comparison purposes.

Table 2-19
Stadium District 2018 No Action Weekday PM Peak Hour
Corridor Travel Times

Route	Extents	Direction	Case S1 (m:ss)[1]	Case S2 (m:ss)	Case S3 (m:ss)
1	1st Avenue S. from Railroad Way S. to S. Horton Street	NB	8:56 (6:16)[2]	15:26	16:41
	1st Avenue S. from S. Horton Street to Railroad Way S.	SB	8:41 (6:49)	9:27	9:36
2	4th Avenue S. from S. King Street to S. Horton Street	NB	9:07 (6:20)	11:31	11:33
	4th Avenue S. from S. Horton Street to S. King Street	SB	13:05 (6:54)	17:47	18:01
3	4th Avenue S. from S. King Street to I-90	NB	2:24 (1:43)	5:17	5:44
	4th Avenue S. from I-90 to S. King Street	SB	7:30 (3:01)	11:19	11:45
4	S. Atlantic Street from 1st Avenue S. to I-90	EB	1:38 (1:39)	1:52	1:54
	S. Atlantic Street from I-90 to 1st Avenue S.	WB	2:02 (1:23)	5:39	6:30

1. m:ss = minutes:seconds
2. (x) = Existing non-event travel times provided for comparison.

As shown in Table 2-19:

- Travel times under 2018 conditions noticeably increase from existing conditions and further increase with the addition of event traffic, compared to existing conditions.
- Travel times under 2018 conditions along route #1 southbound are forecast to exceed 10 minutes under Case S1. Under Cases S2 and S3, route #2 northbound and #3 southbound are forecasted to exceed 10 minutes and 15 minutes for northbound route #1 and southbound route #2 for Case S2 and S3.
- Eastbound travel times along route #4 are expected to increase but at a lower percentage than other routes. This direction of travel is opposite the inbound event flows, minimizing the increase in travel times. Route #4 is also subject to TCPs at Occidental Avenue S. and the Safeco Field parking garage. Traffic control at the Safeco Field garage could increase route #4 travel times beyond what is reported. However, the increase is anticipated to be approximately the same under all three No Action cases.

Results noted above likely overstate the future conditions as no diversion of background traffic was assumed in the analysis of event Cases S2 and S3.

Table 2-20
Stadium District 2030 No Action Weekday PM Peak Hour
Corridor Travel Times

Route	Extents	Direction	Case S1 (m:ss)[1]	Case S2 (m:ss)	Case S3 (m:ss)
1	1st Avenue S. from Railroad Way S. to S. Horton Street	NB	9:40 (6:16)[2]	16:23	17:37
	1st Avenue S. from S. Horton Street to Railroad Way S.	SB	8:38 (6:49)	9:31	9:52
2	4th Avenue S. from S. King Street to S. Horton Street	NB	10:59 (6:20)	14:03	14:27
	4th Avenue S. from S. Horton Street to S. King Street	SB	15:45 (6:54)	20:58	21:22
3	4th Avenue S. from S. King Street to I-90	NB	2:38 (1:43)	5:05	5:32
	4th Avenue S. from I-90 to S. King Street	SB	9:23 (3:01)	13:46	14:14
4	S. Atlantic Street from 1st Avenue S. to I-90	EB	2:58 (1:39)	3:43	3:48
	S. Atlantic Street from I-90 to 1st Avenue S.	WB	2:38 (1:23)	6:58	8:11

1. m:ss = minutes:seconds
2. (x) = Existing non-event travel times provided for comparison.

As shown in Table 2-20:

- Under 2030 conditions travel times are generally similar to 2018 conditions. Some travel time routes increase while others decrease under 2030 conditions.
- Changes in forecast travel times result from small decreases in traffic volumes at some study intersections and additional diversion from congested freeways as forecast in the Alaskan Way Viaduct Replacement study.
- Similar to 2018 conditions, eastbound travel times along route #4 are expected to increase at a lower percentage than other routes since the direction of travel is opposite the inbound event flows.

Overall this suggests that the change in travel times compared to existing conditions is more directly impacted by the traffic shifts associated with the modified infrastructure than growth in general.

2.6.3.3 Effects of Rail Crossing

Rail activity assumed for future conditions was increased beyond existing conditions for both passenger and freight rail activity. For Amtrak and ST, future increases were identified based on their respective master planning documents:

- ST plans included one additional train a day by 2018 with one more assumed for this analysis under long-term conditions.[22]
- Amtrak Cascades anticipates two addition daily round trips by 2014 and five further daily round trips under long-range planning.[23]
- Freight rail activity was increased by factoring the observed freight trains activity based on Port of Seattle growth forecasts. In addition, coal train activity is anticipated to increase to nine round trips per day under long-term (2023) conditions.[24]

[22] Sound Transit, 2013 Service Implementation Plan

[23] WSDOT, Amtrak Cascades Mid-Range and Long-Range Plans (2008 and 2006, respectively)

[24] Coal Train Traffic Impact Study, Parametrix (October 2012)

Figure 2–80 S. Holgate Street Existing and Future Rail Crossing Locations

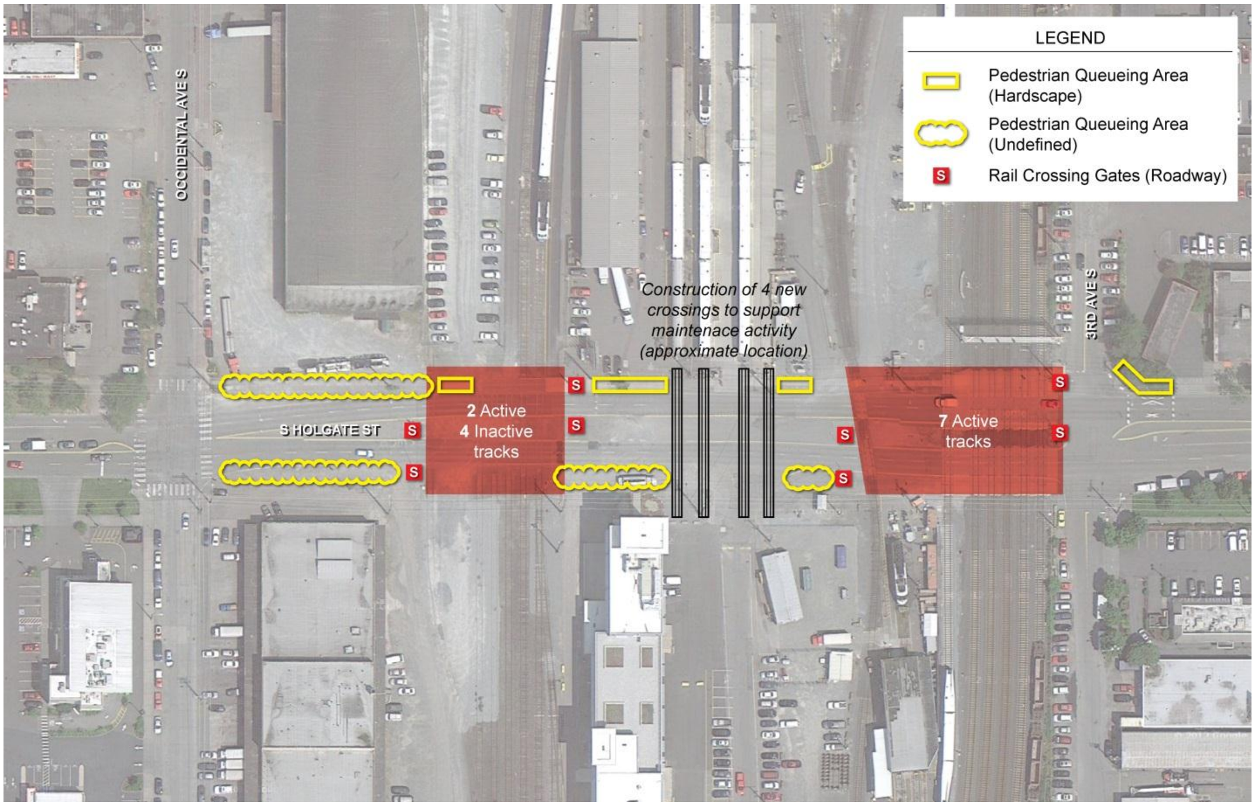


Figure 2–80 shows additional train crossing planned by Amtrak and located just south of the inspection pit tracks that currently terminate on the north side of S. Holgate Street. These tracks will provide access to a planned service building. These tracks are anticipated to service Amtrak trains during the late night hours and thus have not been assumed to add to the train crossing activity along S. Holgate Street during the evening commute peak hour.

As noted in the existing conditions, based on anticipated queuing along S. Holgate Street and S. Lander Street and maximum storage being exceeded, queue lengths relative to 1st Avenue S. and 4th Avenue S. are reported. Total crossing gate arm down times and queue lengths along 1st Avenue S. and 4th Avenues S. are summarized in Table 2-21.

Table 2-21
Stadium District No Action S. Holgate Street and S. Lander Street Rail Crossing Impact Summary

	Scenario	Gate Down Time (m:ss)[1]	Arterial Direction	Maximum Arterial Queue Length[2]		
				Existing	2018	2030
S. Holgate Street Crossing	Weekday PM Peak Hour Case S1	Existing = 8:40 2018 = 14:30 2030 = 20:30	NB[3] 1st Ave S.	420	660	1,000
			SB 1st Ave S.	350	660	650
			NB 4th Ave S.	310	530	580
			SB 4th Ave S.	390	850	850
	Weekday PM Peak Hour Case S2	2018 = 14:30 2030 = 20:30	NB 1st Ave S.	420	1,010	1,000
			SB 1st Ave S.	350	660	650
			NB 4th Ave S.	310	560	600
			SB 4th Ave S.	390	850	850
	Weekday PM Peak Hour Case S3	2018 = 14:30 2030 = 22:30	NB 1st Ave S.	420	1,010	1,000
			SB 1st Ave S.	350	660	670
			NB 4th Ave S.	310	470	720
			SB 4th Ave S.	390	850	850
S. Lander Street Crossing	Weekday PM Peak Hour Case S1	Existing = 8:40 2018 = 16:30 2030 = 21:00	NB 1st Ave S.	310	820	830
			SB 1st Ave S.	430	1080	1,080
			NB 4th Ave S.	300	410	570
			SB 4th Ave S.	460	1020	960
	Weekday PM Peak Hour Case S2	2018 = 16:30 2030 = 21:00	NB 1st Ave S.	310	880	890
			SB 1st Ave S.	430	1,090	1,090
			NB 4th Ave S.	300	510	700
			SB 4th Ave S.	460	1,030	1,020
	Weekday PM Peak Hour Case S3	2018 = 16:30 2030 = 21:00	NB 1st Ave S.	310	890	880
			SB 1st Ave S.	430	1,060	1,090
			NB 4th Ave S.	300	450	710
			SB 4th Ave S.	460	1,010	1,060

1. Gate down times reported are approximate and may range +/- 1 minute. Variance due to multiple seeds and VISSIM modeling methodology.
2. The reported maximum queue length is an average of the maximum queue lengths recorded across 10 simulation runs and represents the greater of a turning movement towards the rail crossing or the throughout movement along the corridor. Queue lengths are rounded up to the nearest 10 feet.
3. NB = northbound, SB = southbound

As shown in Table 2-21:

- Rail crossing gates are activated approximately 15 minutes during the weekday PM peak hour in 2018 and 21 minutes in 2030.
- Queues on 1st Avenue S. generally increase under Case S2 by 2018 and 2030.

    - Along 4th Avenue S. at S. Holgate Street the queue is shown to decrease which occurs as a result of increased upstream northbound congestion at 4th Avenue S. / S. Lander Street.

- Maximum queues along 4th Avenues S. also increase under Case S2 and Case S3 by 2018 and 2030 with the exception of the northbound queues at S. Holgate Street and S. Lander Street.

    - Along 4th Avenue S. at S. Holgate Street and S. Lander Street the queue is shown to decrease slightly which occurs as a result of increased upstream congestion on 4th Avenue S.

2.6.3.4 Regional Access Analysis

The primary corridors serving the downtown area are I-5 and I-90. Today during the late afternoon commute, these freeways are congested for approximately two to three hours. The corridors are "at capacity" during the peak period today; therefore the traffic volumes served would not significantly increase during the peak period of 4:00 to 6:00 PM for No Action 2018 and 2030 conditions. As traffic demand increases by 2018 and 2030, the hours of congestion or "peak spreading" would lengthen or transit ridership may increase.

Regional or freeway access to the Stadium District is constrained by signals at the terminal of the off ramps. Operations of nine arterial intersections at the I-5, I-90, and West Seattle Bridge ramp termini were reviewed for the No Action event cases. The analysis was conducted for the PM peak hour for 2018 and 2030. The expected operations of the study intersections are shown in Table 2-22.

Table 2-22
Stadium District No Action Weekday PM Peak Hour
Ramp Terminal LOS Summary

Ramp Terminal Intersection	Scenario	2018		2030	
		Overall LOS / Delay	Off-Ramp LOS / Delay	Overall LOS / Delay	Off-Ramp LOS / Delay
Spokane St / 1st Ave	Case S1	C / 24	D / 46	C / 31	D / 53
	Case S2	C / 27	D / 46	C / 32	D / 50
	Case S3	C / 27	D / 45	C / 33	D / 50
Spokane St / 6th Ave	Case S1	C / 22	C / 30	C / 25	C / 35
	Case S2	C / 23	C / 33	C / 28	D / 38
	Case S3	C / 24	C / 33	C / 28	D / 39
Forest St / 6th Ave	Case S1	B / 16	C / 22	B / 17	C / 25
	Case S2	B / 16	C / 22	B / 17	C / 25
	Case S3	B / 16	C / 22	B / 17	C / 25
Edgar Martinez Dr / I-90 Off	Case S1	A / 10	C / 22	B / 12	C / 28
	Case S2	D / 37	E / 73	D / 45	F / 91
	Case S3	D / 48	F / 94	E / 57	F / 113
4th Ave / I-90 Off	Case S1	D / 45	D / 54	C / 29	E / 63
	Case S2	F / 98	F / 139	F / 87	F / 98
	Case S3	F / 88	F / 149	F / 91	F / 107
Dearborn St / I-90 Off	Case S1	E / 59	F / >180	F / 82	F / >180
	Case S2	E / 61	F / >180	F / 89	F / >180
	Case S3	E / 62	F / >180	F / 86	F / >180
Dearborn St / I-5 SB Off	Case S1	B / 10	D / 54	B / 13	E / 64
	Case S2	B / 12	D / 54	B / 15	E / 65
	Case S3	B / 12	D / 54	B / 15	E / 65
Dearborn St / I-5 NB Off	Case S1	C / 31	D / 55	C / 32	E / 60
	Case S2	C / 31	D / 55	D / 37	E / 65
	Case S3	C / 31	E / 56	D / 37	E / 67
James St / 6th Ave	Case S1	C / 31	B / 19	C / 28	C / 21
	Case S2	D / 46	D / 35	D / 40	C / 33
	Case S3	E / 55	D / 52	D / 49	D / 47

Under 2018 conditions during the PM peak hour with an event at the existing stadiums, the 4th Avenue S. / I-90 Off-Ramp would operate with an overall LOS E, but operates acceptable at LOS C under Case S1 conditions. In addition, the following off-ramp locations would operate at LOS E/F and include one to five intersections, depending on the number of events:

<u>Case S1</u>

- Dearborn Street / I-90 Off-Ramp

<u>Case S2</u>

- Edgar Martinez Drive S. / I-90 Off-Ramp
- 4th Avenue S. / I-90 Off-Ramp
- Dearborn Street / I-90 Off-Ramp

<u>Case S3</u>

- Edgar Martinez Drive S. / I-90 Off-Ramp
- 4th Avenue S. / I-90 Off-Ramp
- Dearborn Street / I-90 Off-Ramp
- Dearborn Street / Northbound I-5 Off-Ramp

Under 2030 conditions during the PM peak hour, traffic operations near the freeway access to the Stadium District are generally similar to 2018. 4th Avenue S. / I-90 Off-Ramp would operate with an overall LOS F, but operates acceptably at LOS C under non-event conditions. In addition, the off-ramps approaches located at the following intersections would operate at LOS E/F and include three to five of the nine intersections, depending on the number of events:

Case S1

- 4th Avenue S. / I-90 Off-Ramp
- Dearborn Street / I-90 Off-Ramp
- Dearborn Street / Southbound I-5 Off-Ramp
- Dearborn Street / Northbound I-5 Off-Ramp

Case S2

- Edgar Martinez Drive S. / I-90 Off-Ramp
- 4th Avenue S. / I-90 Off-Ramp
- Dearborn Street / I-90 Off-Ramp
- Dearborn Street / Southbound I-5 Off-Ramp
- Dearborn Street / Northbound I-5 Off-Ramp

Case S3

- Edgar Martinez Drive S. / I-90 Off-Ramp
- 4th Avenue S. / I-90 Off-Ramp
- Dearborn Street / I-90 Off-Ramp
- Dearborn Street / Southbound I-5 Off-Ramp
- Dearborn Street / Northbound I-5 Off-Ramp

2.6.4 Impacts of Alternative 2

As described for traffic volumes, construction impacts related to traffic operations would occur as a result of increased traffic levels. To minimize impacts to operations, a construction management plan would be developed and could include scheduling the most intensive construction activities such that they are spread out over time and prohibiting material deliveries from leaving or entering the area during AM and PM peak hours when feasible.

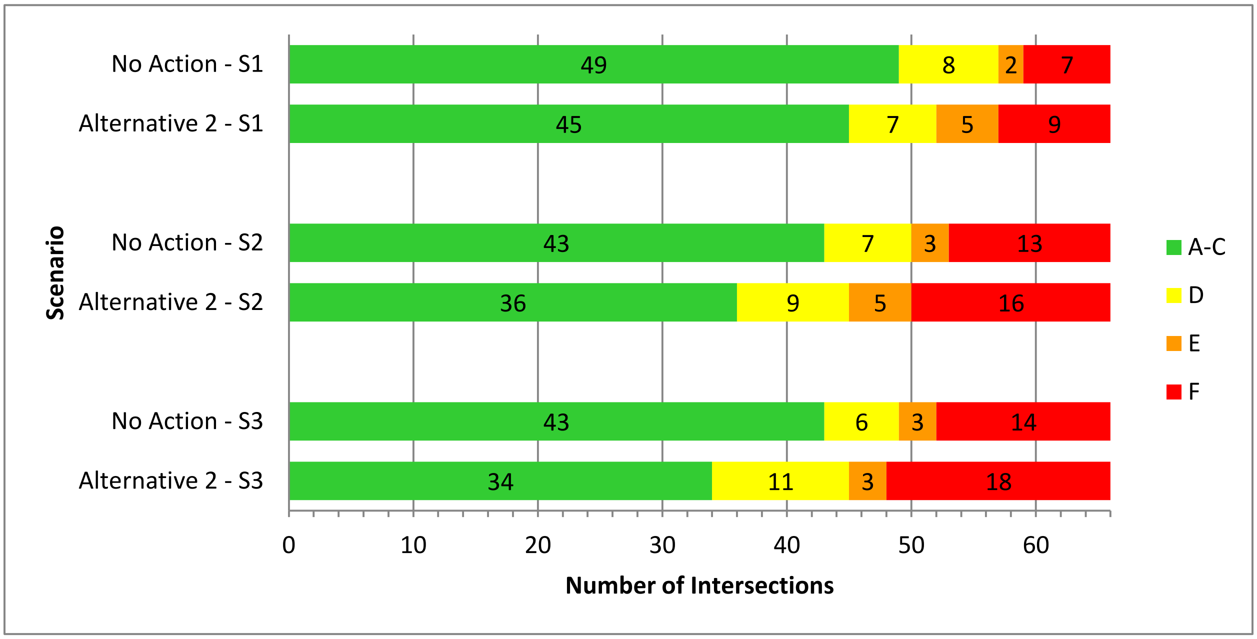
The following sections summarize the results of the traffic operation analysis conducted for Alternative 2. This analysis reflects the addition of traffic from a 20,000 attendee event at the Proposed Arena site to study area roadways. The No Action traffic forecasts and operations analyses used in establishing the impacts of the project utilized a layering effect of event-related traffic volumes without applying any diversions in background traffic volumes. Based on a review of the non-event and event volume comparisons discussed previously in this report, this approach likely overstates the cumulative and incremental impact of the project.

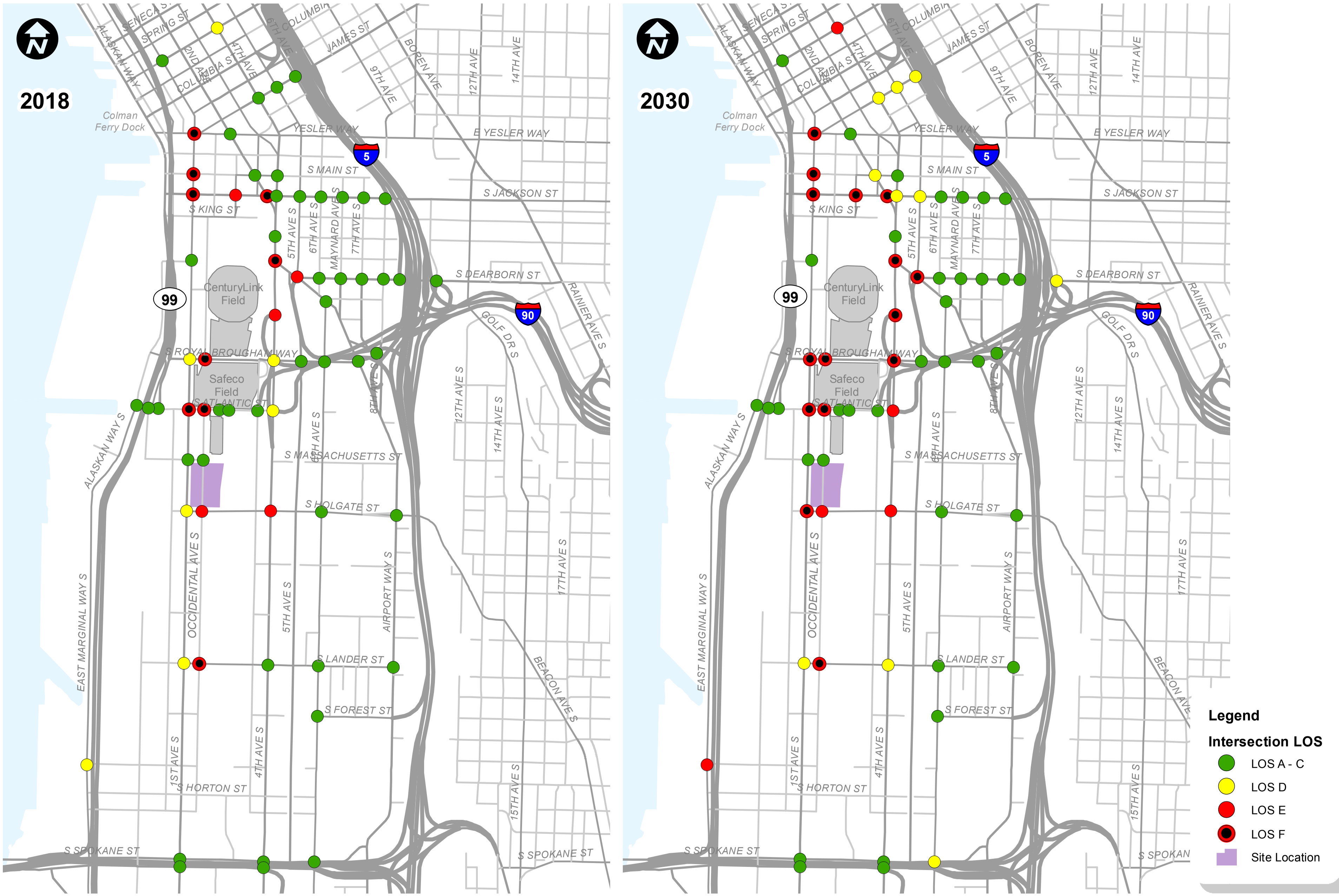
2.6.4.1 Intersection Operations

LOS results for 2018 and 2030 peak hour conditions Alternative 2 Case S1, S2, and S3, are summarized on Figure 2–82 through Figure 2–84. Detailed LOS summary tables and worksheets for each of these scenarios are included in Attachment E-3, which is available from DPD upon request.

A summary of the Alternative 2 LOS for all study area intersections was prepared and compared to No Action conditions as summarized on Figure 2–81 for 2018 conditions, and Figure 2–85 for 2030 conditions.

Figure 2–81 Stadium District 2018 Alternative 2 Intersection LOS Comparison



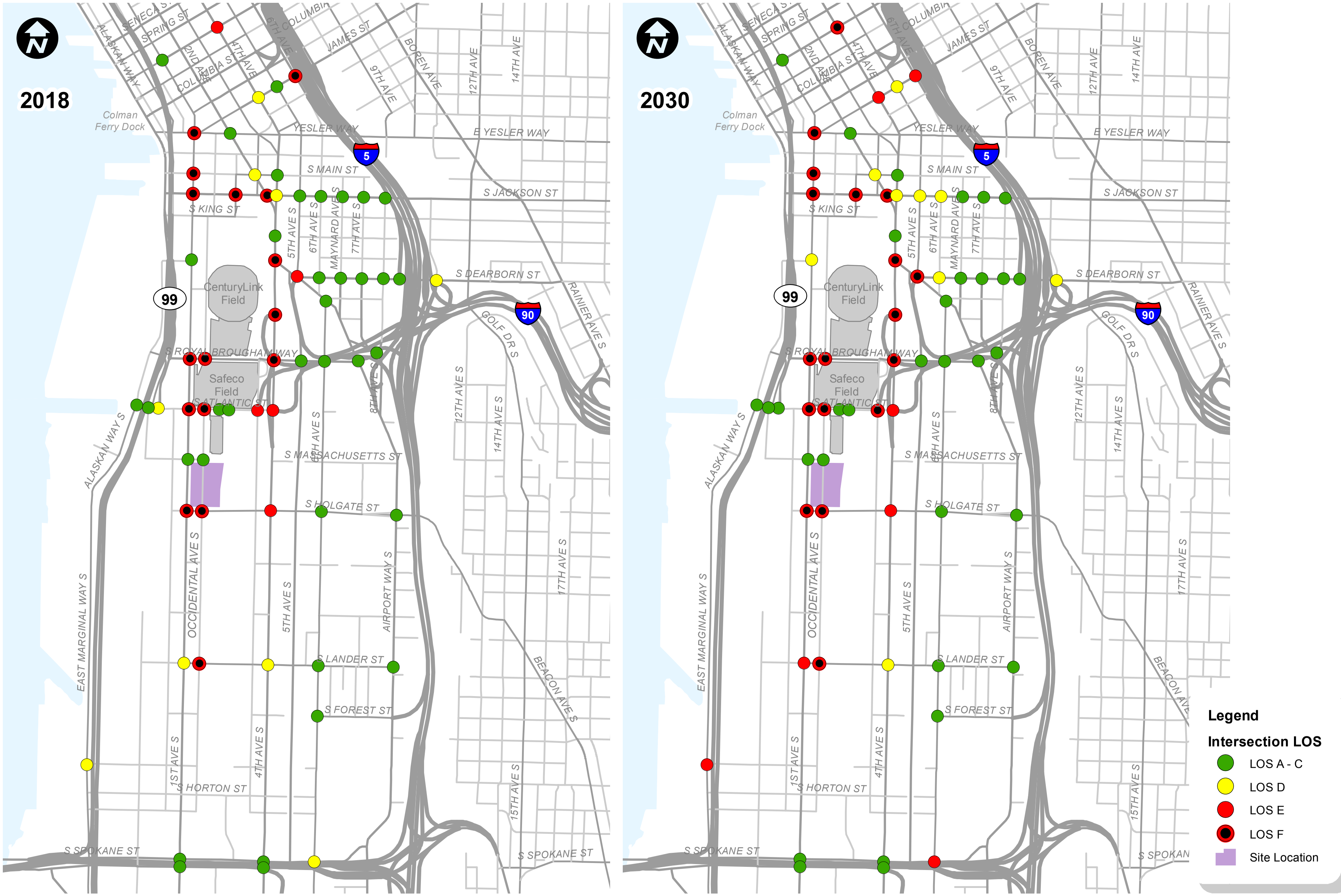


Stadium District Alternative 2 Case S1 Weekday PM Peak Hour Level of Service

Seattle Arena

FIGURE **2-82**

transpoGROUP

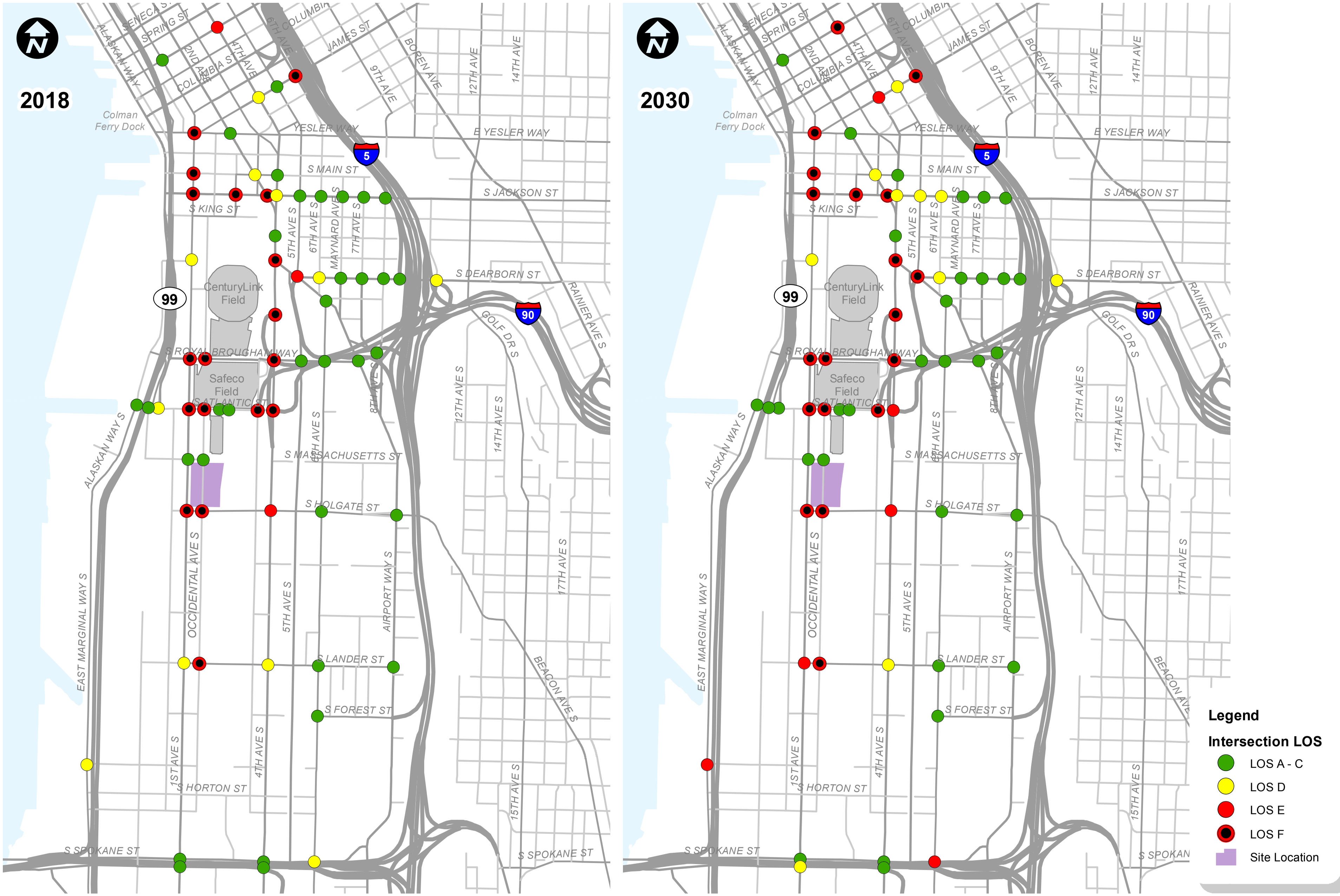


Stadium District Alternative 2 Case S2 Weekday PM Peak Hour Level of Service

Seattle Arena

FIGURE
2-83

transpoGROUP

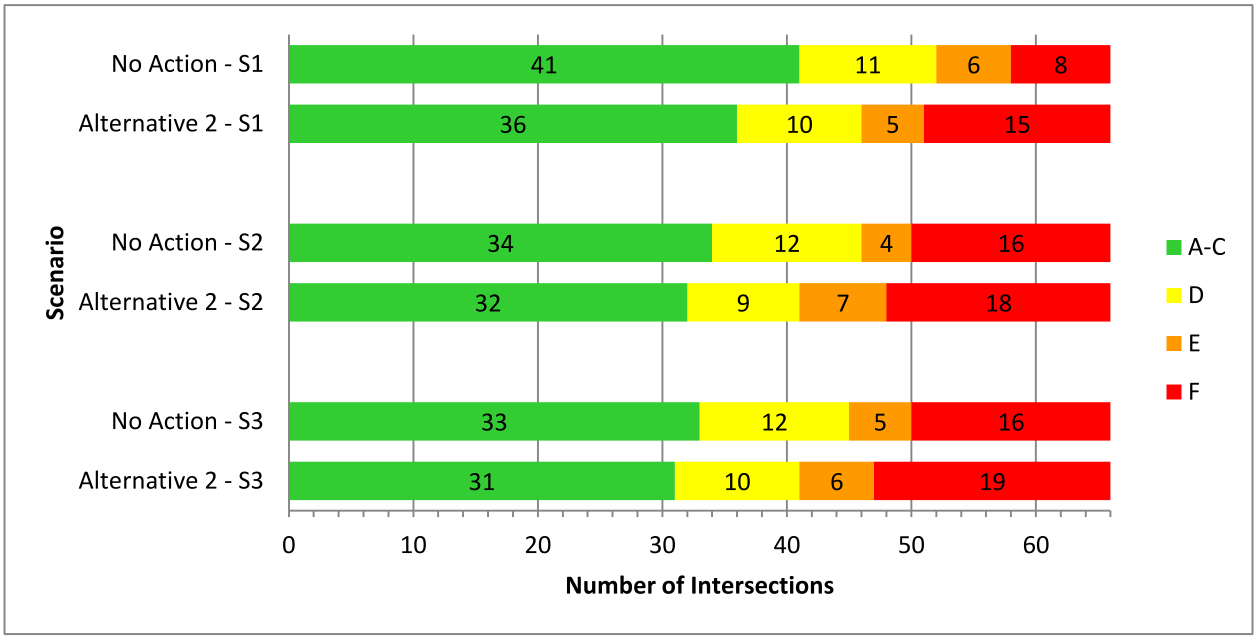


Stadium District Alternative 2 Case S3 Weekday PM Peak Hour Level of Service

Seattle Arena

FIGURE **2-84**

Figure 2–85 Stadium District 2030 Alternative 2 Intersection LOS Comparison



As shown:

- As illustrated by comparing Figure 2–81 and Figure 2–85, the addition of Arena event trips results in a greater number of LOS E/F values under 2018 and 2030 conditions.

- With a single event day a total of 14 study intersections would operate at LOS E/F under 2018 conditions with an Arena event while a Mariners only event is forecast to have 16 intersections at LOS E/F. Under 2030 conditions with a single event (either Arena or Mariners only) a total of 20 intersections are forecast to operate at LOS E/F.

- With Case S2 (Arena and Mariners), in 2018, seven additional intersections would operate at LOS E/F for a total of 21 intersection. By 2030, five additional intersections would operate at LOS E/F for a total of 25 intersections.

- Under No Action Case S3 the same number of intersections would operate at LOS E/F, but with two additional intersections that would degrade from LOS E to LOS F for both 2018 conditions and one additional intersection under 2030 conditions.

Table 2-23 summarizes the intersections that operate at LOS E or LOS F under 2018 Alternative 2 conditions and forecast results for 2030 conditions are summarized in Table 2-24. Note that some intersections would only operate at LOS E or LOS F under the multiple event scenarios (Case S2 and S3). Also note that the Occidental Avenue S. / S. Holgate Street intersection are shown to improve to LOS E from LOS F under both 2018 and 2030 non-event conditions. This reported improvement is due the removal of the north leg of the intersection which decreases the number of possible conflict points at the intersection, resulting in improved operations.

Table 2-23
2018 Alternative 2 Weekday PM Peak Hour Intersections at LOS E or LOS F

Roadway	Case S1		Case S2		Case S3	
	No Action	Alt 2	No Action	Alt 2	No Action	Alt 2
4th Avenue S. / Madison Street	D	D	D	E	D	E
6th Avenue / James St	C	C	D	F	E	F
1st Avenue S. / Yesler Way	F	F	F	F	F	F
1st Avenue S. / Main Street	D	F	F	F	F	F
1st Avenue S. / S. Jackson Street	F	F	F	F	F	F
2nd Avenue S. / S. Jackson Street	D	E	F	F	F	F
2nd Avenue S. Extension / S. Jackson Street	F	F	F	F	F	F
4th Avenue S. / Seattle Boulevard S-Airport Way S.	F	F	F	F	F	F
5th Avenue S. / Airport Way S. / S. Dearborn Street / I-90 WB Off-Ramp	E	E	E	E	E	E
4th Avenue S. / I-90 WB Off-Ramp	D	E	F	F	F	F
1st Avenue S. / S. Royal Brougham Way	C	D	F	F	F	F
Occidental Avenue S. / S. Royal Brougham Way	F	F	F	F	F	F
4th Avenue S. / S. Royal Brougham Way	C	D	E	F	F	F
1st Avenue S. / S. Atlantic Street	E	F	F	F	F	F
Occidental Avenue S. / Edgar Martinez Drive S.	C	F	F	F	F	F
I-90 off-ramp / Edgar Martinez Drive S.	A	C	D	E	D	F
I-90 on-ramp / Edgar Martinez Drive S. / 4th Avenue S.	D	D	D	E	D	F
1st Ave S. / S. Holgate Street	C	D	D	F	D	F
Occidental Avenue S. / S. Holgate Street	F	E[1]	F	F	F	F
4th Ave S. / S. Holgate Street	D	E	E	E	E	E
Occidental Avenue S. / S. Lander Street	F	F	F	F	F	F

1. LOS and delay improve with Alternative 2 as a result of reduced conflicts at this intersection due to the vacation of Occidental Avenue S. between S. Holgate Street and S. Massachusetts Street.

Table 2-24
2030 Alternative 2 Weekday PM Peak Hour Intersections at LOS E or LOS F

Roadway	Case S1		Case S2		Case S3	
	No Action	**Alt 2**	**No Action**	**Alt 2**	**No Action**	**Alt 2**
4th Avenue / Madison Street	E	E	E	F	E	F
4th Avenue / James St	C	D	C	E	C	E
6th Avenue / James St	C	D	D	E	D	F
1st Avenue S. / Yesler Way	F	F	F	F	F	F
1st Avenue S. / Main Street	E	F	F	F	F	F
1st Avenue S. / S. Jackson Street	F	F	F	F	F	F
2nd Avenue S. / S. Jackson Street	E	F	F	F	F	F
2nd Avenue S. Extension / S. Jackson Street	F	F	F	F	F	F
4th Avenue S. / Seattle Boulevard S-Airport Way S.	F	F	F	F	F	F
5th Avenue S. / Airport Way S. / S. Dearborn Street / I-90 WB Off-Ramp	F	F	F	F	F	F
4th Avenue S. / I-90 WB Off-Ramp	C	F	F	F	F	F
1st Avenue S. / S. Royal Brougham Way	D	F	F	F	F	F
Occidental Avenue S. / S. Royal Brougham Way	F	F	F	F	F	F
4th Avenue S. / S. Royal Brougham Way	E	F	F	F	F	F
1st Avenue S. / S. Atlantic Street	E	F	F	F	F	F
Occidental Avenue S. / Edgar Martinez Drive S.	C	F	F	F	F	F
I-90 off-ramp / Edgar Martinez Drive S.	B	B	D	F	E	F
I-90 on-ramp / Edgar Martinez Drive S. / 4th Avenue S.	D	E	D	E	D	E
1st Ave S. / S. Holgate Street	D	F	F	F	F	F
Occidental Avenue S. / S. Holgate Street	F	E[1]	F	F	F	F
4th Ave S. / S. Holgate Street	D	E	E	E	E	E
1st Avenue S. / S. Lander Street	D	D	E	E	E	E
Occidental Avenue S. / S. Lander Street	F	F	F	F	F	F
6th Avenue S. / S. Spokane Street	C	D	D	E	D	E
E. Marginal Way / S. Hanford Street	E	E	E	E	E	E

1. LOS and delay improve with Alternative 2 as a result of reduced conflicts at this intersection due to the vacation of Occidental Avenue S. between S. Holgate Street and S. Massachusetts Street.

2.6.4.2 Corridor Travel Times

Table 2-25 summarizes the calculated weekday PM peak hour travel times under 2018 conditions on the defined routes. Table 2-26 summarizes the calculated travel times under 2030 conditions. No Action results conditions are shown in parentheses and provided for comparison purposes.

Table 2-25
2018 Alternative 2 Weekday PM Peak Hour Corridor Travel Times

Route	Extents	Direction	Case S1 (m:ss)[1]	Case S2 (m:ss)	Case S3 (m:ss)
1	1st Avenue S. from Railroad Way S. to S. Horton Street	NB	12:18 (8:56)[2]	24:12 (15:26)	25:54 (16:41)
	1st Avenue S. from S. Horton Street to Railroad Way S.	SB	9:18 (8:41)	9:57 (9:27)	10:25 (9:36)
2	4th Avenue S. from S. King Street to S. Horton Street	NB	10:21 (9:07)	13:21 (11:31)	13:43 (11:33)
	4th Avenue S. from S. Horton Street to S. King Street	SB	15:54 (13:05)	21:34 (17:47)	21:59 (18:01)
3	4th Avenue S. from S. King Street to I-90	NB	3:29 (2:24)	7:13 (5:17)	7:44 (5:44)
	4th Avenue S. from I-90 to S. King Street	SB	9:41 (7:30)	15:19 (11:19)	15:59 (11:45)
4	S. Atlantic Street from 1st Avenue S. to I-90	EB	1:46 (1:38)	3:05 (1:52)	3:08 (1:54)
	S. Atlantic Street from I-90 to 1st Avenue S.	WB	3:35 (2:02)	10:04 (5:39)	11:19 (6:30)

1. m:ss = minutes:seconds
2. (x) = No Action travel times provided for comparison.

As shown in Table 2-25 and Table 2-26:

- Travel times increase with the addition of Arena event traffic as compared to No Action conditions. In general, the direction of travel for each route that serves vehicle arrivals for the Arena event (e.g., northbound 1st Avenue S.) experiences the greatest travel time increase while the opposing direction experiences a lesser increase (e.g., southbound 1st Avenue S.).

- Some routes show a small improvement in travel time as a result of the signal timing optimization procedures, but in general travel time routes are forecast to increase as a result of Arena traffic.

- Travel times for all travel routes with only an Arena event are less than a No Action Case S2 (Mariners-only event condition). Travel times in specific directions are calculated to see large increases with multiple concurrent events (e.g. northbound 1st Avenue S., and westbound S. Atlantic Street).

- The patterns of travel time changes resulting from an Arena event are similar between 2018 and 2030 conditions with 2030 travel time generally greater than 2018 conditions.

Table 2-26
2030 Alternative 2 Weekday PM Peak Hour Corridor Travel Times

Route	Extents	Direction	Case S1 (m:ss)[1]	Case S2 (m:ss)	Case S3 (m:ss)
1	1st Avenue S. from Railroad Way S. to S. Horton Street	NB	14:46 (9:40)[2]	24:15 (16:23)	25:59 (17:37)
	1st Avenue S. from S. Horton Street to Railroad Way S.	SB	9:17 (8:38)	10:43 (9:31)	11:14 (9:52)
2	4th Avenue S. from S. King Street to S. Horton Street	NB	13:04 (10:59)	16:52 (14:03)	17:17 (14:27)
	4th Avenue S. from S. Horton Street to S. King Street	SB	19:52 (15:45)	23:22 (20:58)	23:48 (21:22)
3	4th Avenue S. from S. King Street to I-90	NB	4:17 (2:38)	9:13 (5:05)	9:45 (5:32)
	4th Avenue S. from I-90 to S. King Street	SB	13:41 (9:23)	16:39 (13:46)	17:17 (14:14)
4	S. Atlantic Street from 1st Avenue S. to I-90	EB	2:14 (2:58)	2:52 (3:43)	2:54 (3:48)
	S. Atlantic Street from I-90 to 1st Avenue S.	WB	3:34 (2:38)	10:59 (6:58)	12:18 (8:11)

1. m:ss = minutes:seconds
2. (x) = No Action travel times provided for comparison.

2.6.4.3 Effects of Rail Crossing

Rail activity assumed in the modeling is consistent with the level of rail activity identified for the No Action alternative. The traffic volumes in VISSIM were updated to reflect the forecast traffic volumes for the Alternative 2 analysis cases. Total crossing gate arm down times and queue lengths along 1st Avenue S. and 4th Avenue S. are summarized in Table 2-27.

Table 2-27

Alternative 2 S. Holgate Street and S. Lander Street Rail Crossing Impact Summary

	Scenario	Alt 2 Gate Down Time[1] (m:ss)	Arterial Direction	Maximum Arterial Queue Length[2] 2018 No Action	2018 Alt 2	2030 No Action	2030 Alt 2
S. Holgate Street Crossing	Weekday PM Peak Hour Case S1	2018 = 14:30 2030 = 22:30	NB[3] 1st Ave S.	660	980	1,000	1,010
			SB 1st Ave S.	660	670	650	670
			NB 4th Ave S.	530	520	580	990
			SB 4th Ave S.	850	850	850	850
	Weekday PM Peak Hour Case S2	2018 = 14:30 2030 = 22:30	NB 1st Ave S.	1,010	1,000	1,000	1,010
			SB 1st Ave S.	660	670	650	670
			NB 4th Ave S.	560	560	600	990
			SB 4th Ave S.	850	850	850	850
	Weekday PM Peak Hour Case S3	2018 = 14:30 2030 = 22:30	NB 1st Ave S.	1,010	1,000	1,000	1,010
			SB 1st Ave S.	660	670	670	670
			NB 4th Ave S.	470	980	720	980
			SB 4th Ave S.	850	850	850	850
S. Lander Street Crossing	Weekday PM Peak Hour Case S1	2018 = 16:45 2030 = 22:30	NB 1st Ave S.	820	850	830	890
			SB 1st Ave S.	1080	1080	1,080	1,090
			NB 4th Ave S.	410	490	570	940
			SB 4th Ave S.	1020	980	960	1,070
	Weekday PM Peak Hour Case S2	2018 = 16:45 2030 = 22:30	NB 1st Ave S.	880	880	890	890
			SB 1st Ave S.	1,090	1,080	1,090	1,090
			NB 4th Ave S.	510	820	700	940
			SB 4th Ave S.	1,030	1,070	1,020	1,070
	Weekday PM Peak Hour Case S3	2018 = 16:45 2030 = 22:30	NB 1st Ave S.	890	890	880	890
			SB 1st Ave S.	1,060	1,090	1,090	1,090
			NB 4th Ave S.	450	880	710	940
			SB 4th Ave S.	1,010	1,070	1,060	1,060

1. Gate down times reported are approximate and may range +/- 1 minute. Variance due to multiple seeds and VISSIM modeling methodology.
2. The reported maximum queue length is an average of the maximum queue lengths recorded across 10 simulation runs and represents the greater of a turning movement towards the rail crossing or the throughout movement along the corridor. Queue lengths are rounded up to the nearest 10 feet.
3. NB = northbound, SB = southbound

As shown in Table 2-27:

- Rail crossing gates are activated approximately 15 to 17 minutes during the weekday PM peak hour in 2018 and 23 minutes in 2030.

- Maximum queues on 1st Avenue S. generally increase with the addition of an event at the new Arena by 2018 and 2030 with the exception of the northbound queue at 1st Avenue S. / S. Holgate Street during the 2018 Case S2 scenario.
    - Along 1st Avenue S. at S. Holgate Street the queue is shown to decrease by approximately 10 feet between Alternative 1 and Alternative 2 in the dual event scenario. This decrease represents less than one vehicle and is likely caused by increased congestion and blocking occurring elsewhere in the roadway vicinity.
- Maximum queues along 4th Avenue S. also increase between Alternative 2 and No Action for all scenarios by 2018 and 2030 with the exception of the northbound queues at S. Holgate Street and southbound queue at S. Lander Street.
    - Along 4th Avenue S. at S. Holgate the northbound queue is shown to decrease by 10 feet between Alternative 1 and Alternative 2 during the non-event scenario. This decrease represents less than one vehicle and is likely caused by increased congestion and blocking occurring in the nearby roadway vicinity.
    - Along 4th Avenue S. at S. Lander Street the southbound queue is shown to decrease by 40 feet between Alternative 1 and Alternative 2 during the non-event scenario.

2.6.4.4 Regional Access Analysis

Traffic would access the new Arena in the Stadium District via I-5, I-90, SR 99, and local arterials. It is estimated up to 25 percent of the trips that would access the Arena would come from the north via I-5, 20 percent from the east via I-90, and 20 percent via I-5 from the south. The other 35 percent of the trips would access the area via local arterials and SR 99.

The following analysis was completed for conditions with 20,000 spectators under Case S1 through Case S3.

For an event at the new Arena, up to an additional 1,300 vph would enter the city via I-5 or I-90 to reach the Stadium District. This is a 6 to 11 percent increase in trips compared to a typical evening commute on any one of those corridors. Table 2-28 shows the typical traffic volumes for a weekday and the anticipated increase in traffic with the Arena, and also with the Arena combined with other events (single and dual event scenarios).

The typical weekday traffic flow values shown in Table 2-28 are existing volumes, but represent future 2018 conditions. Traffic demand (or volume of vehicles that want to use these corridors) increase as land use changes; however, because the corridors are at or near capacity, additional traffic is not served during the peak hour of congestion. Instead “peak separating” occurs and traffic demand is served over multiple hours. Therefore, existing traffic volumes served through these areas during the peak of congestion would be similar in future years unless capacity was increased for I-5 or I-90, but the duration of congestion would increase as traffic demands increase.

Table 2-28 also focuses on the travel directions of I-5 and I-90 that would experience the greatest increase in trips from an Arena event. During the weekday PM peak hour, the majority of the trips (about 94 percent) associated with the Arena are inbound trips (or trips heading to the Arena).

Table 2-28
2018 Alternative 2 Increase in Weekday PM Peak Hour Traffic on Freeway Corridors

Location	Typical Weekday PM Peak Hour Traffic (vph)	Increase in traffic with SoDo Arena (vph / % compared to typical weekday traffic)		
		Case S1	Case S2	Case S3
I-5 Southbound (through downtown CBD)	7,500 vph	500 vph / 7%	1,250 vph / 17%	1,350 vph / 18%
I-5 Northbound (north of Spokane Street)	7,200 vph	400 vph / 6%	1,000 vph / 14%	1,100 vph / 15%
I-90 Westbound (Approaching I-5)	3,800 vph	400 vph / 11%	1,000 vph 27%	1,100 vph / 29%

As previously described, the I-5 and I-90 corridors experience congestion presently during the PM peak commute, and events at the existing venues result in increased travel time approaching downtown. The PM peak travel times (on days with events in 2012) increased by up to eight minutes on southbound I-5 between NE 145th and I-90, and up to four minutes on I-90 between I-405 and Rainer Avenue S. It is anticipated with the Proposed Arena traffic, PM peak travel times would increase similar to today for a typical event day only at the new Arena (Case S1).

Traffic volumes and congestion levels on the freeway systems would increase on a game day compared to a typical commute day. About 208 annual events currently occur in the Stadium District, although not all "events" impact weekday PM peak hour commute times equally. The Proposed Arena is anticipated to host approximately 22 events per year with attendance in the 18,000 to 20,000 range. These events are assumed to typically be evening events. When considering all events currently occurring, and those additional events related to the Proposed Arena, approximately 40 additional days with events would occur (See Table 1-2).

Regional or freeway access to the Stadium District is constrained by signals at the terminal of the off ramps. Overall intersection and off-ramp approach operations of nine arterial intersections at the I-5, I-90, and West Seattle Bridge ramp termini were reviewed. The analysis was conducted for the weekday PM peak hour for 2018 and 2030 horizon years, under non-event and with event conditions and summarized in Table 2-29 and Table 2-30, respectively.

Table 2-29
2018 Alternative 2 Weekday PM Peak Hour Ramp Terminal LOS Summary

Ramp Terminal Intersection	Scenario	2018 No Action		2018 Alternative 2	
		Overall LOS / Delay	Off-Ramp LOS / Delay	Overall LOS / Delay	Off-Ramp LOS / Delay
Spokane St / 1st Ave	Case S1	C / 24	D / 46	C / 32	D / 52
	Case S2	C / 27	D / 46	C / 34	D / 54
	Case S3	C / 27	D / 45	D / 36	E / 57
Spokane St / 6th Ave	Case S1	C / 22	C / 30	D / 41	D / 36
	Case S2	C / 23	C / 33	D / 41	D / 36
	Case S3	C / 24	C / 33	D / 41	D / 44
Forest St / 6th Ave	Case S1	B / 16	C / 22	A / 9	B / 12
	Case S2	B / 16	C / 22	A / 9	B / 12
	Case S3	B / 16	C / 22	A / 9	B / 12
Edgar Martinez Dr S./ I-90 Off	Case S1	A / 10	C / 22	B / 15	C / 27
	Case S2	D / 37	E / 73	E / 76	F / 135
	Case S3	D / 48	F / 94	F / 90	F / 157
4th Ave / I-90 Off	Case S1	D / 45	D / 54	E / 58	E / 61
	Case S2	F / 98	F / 139	F / 118	F / 118
	Case S3	F / 88	F / 149	F / 120	F / 128
Dearborn St / I-90 Off	Case S1	E / 59	F / >180	D / 42	F / 109
	Case S2	E / 61	F / >180	D / 43	F / 109
	Case S3	E / 62	F / >180	D / 44	F / 109
Dearborn St / I-5 SB Off	Case S1	B / 10	D / 54	B / 13	E / 64
	Case S2	B / 12	D / 54	B / 15	E / 69
	Case S3	B / 12	D / 54	B / 15	E / 68
Dearborn St / I-5 NB Off	Case S1	C / 31	D / 55	C / 32	E / 58
	Case S2	C / 31	D / 55	D / 37	E / 63
	Case S3	C / 31	E / 56	D / 37	E / 64
James St / 6th Ave	Case S1	C / 31	B / 19	C / 32	B / 16
	Case S2	D / 46	D / 35	E / 75	F / 91
	Case S3	E / 55	D / 52	F / 88	F / 111

Table 2-30
2030 Alternative 2 Weekday PM Peak Hour Ramp Terminal LOS Summary

Ramp Terminal Intersection	Scenario	2030 No Action		2030 Alternative 2	
		Overall LOS / Delay	Off-Ramp LOS / Delay	Overall LOS / Delay	Off-Ramp LOS / Delay
Spokane St / 1st Ave	Case S1	C / 31	D / 53	C / 34	D / 55
	Case S2	C / 32	D / 50	D / 36	E / 57
	Case S3	C / 33	D / 50	D / 37	E / 58
Spokane St / 6th Ave	Case S1	C / 25	C / 35	D / 36	D / 40
	Case S2	C / 28	D / 38	D / 45	D / 50
	Case S3	C / 28	D / 39	D / 47	D / 53
Forest St / 6th Ave	Case S1	B / 17	C / 25	A / 10	B / 14
	Case S2	B / 17	C / 25	B / 10	B / 14
	Case S3	B / 17	C / 25	B / 10	B / 14
Edgar Martinez Dr S. / I-90 Off	Case S1	B / 12	C / 28	B / 17	C / 31
	Case S2	D / 45	F / 91	E / 76	F / 136
	Case S3	E / 57	F / 113	F / 89	F / 157
4th Ave / I-90 Off	Case S1	C / 29	E / 63	E / 74	E / 64
	Case S2	F / 87	F / 98	F / 131	F / 126
	Case S3	F / 91	F / 107	F / 135	F / 137
Dearborn St / I-90 Off	Case S1	F / 82	F / >180	D / 48	F / 119
	Case S2	F / 89	F / >180	D / 53	F / 119
	Case S3	F / 86	F / >180	D / 53	F / 119
Dearborn St / I-5 SB Off	Case S1	B / 13	E / 64	B / 12	E / 59
	Case S2	B / 15	E / 65	B / 14	E / 63
	Case S3	B / 15	E / 65	B / 14	E / 63
Dearborn St / I-5 NB Off	Case S1	C / 32	E / 60	C / 33	D / 54
	Case S2	D / 37	E / 65	D / 38	E / 62
	Case S3	D / 37	E / 67	D / 38	E / 64
James St / 6th Ave	Case S1	C / 28	C / 21	C / 30	B / 18
	Case S2	D / 40	C / 33	E / 69	E / 69
	Case S3	D / 49	D / 47	F / 80	F / 88

By 2018, during the PM peak hour, three of the freeway terminus study intersections in the Stadium District operate at LOS F (see Table 2-29), with these representing two additional locations beyond No Action conditions. These include:

- Edgar Martinez Drive S. / I-90 Off-Ramp (Case S2S3)
- 4th Avenue / I-90 Off-Ramp (Cases S2 and S3)
- James Street / 6th Avenue (Cases S2 and S3)

In addition, the following off-ramps would operate at LOS E or LOS F:

Case S1

- 4th Avenue S. / I-90 Off-Ramp
- Dearborn Street / I-90 Off-Ramp
- Dearborn Street / Southbound I-5 Off-Ramp
- Dearborn Street / Northbound I-5 Off-Ramp

Case S2

- Edgar Martinez Drive S. / I-90 Off-Ramp
- 4th Avenue S. / I-90 Off-Ramp
- Dearborn Street / I-90 Off-Ramp
- Dearborn Street / Southbound I-5 Off-Ramp
- Dearborn Street / Northbound I-5 Off-Ramp
- James Street / 6th Avenue

Case S3

- S. Spokane Street / 1st Avenue S.
- Edgar Martinez Drive S. / I-90 Off-Ramp
- 4th Avenue S. / I-90 Off-Ramp
- Dearborn Street / I-90 Off-Ramp
- Dearborn Street / Southbound I-5 Off-Ramp
- Dearborn Street / Northbound I-5 Off-Ramp
- James Street / 6th Avenue

LOS F conditions means the more trips are approaching the intersection than can be served. Queues would build on some approaches through the peak commute and as traffic enters the city to the Stadium District. Advance signing such as the variable message signs on the freeway and cell phone applications with information on parking availability and congestion are types of measures that could help better direct traffic to underutilized ramps.

In 2030 during the PM peak hour, the same three freeway terminus intersections near the Stadium District would operate at LOS F (see Table 2-29) as under 2018 conditions. These include:

- 4th Avenue / I-90 Off-Ramp (Cases S2 and S3)
- Dearborn Street / I-90 Off-Ramp (Cases S2 and S3)
- James Street / 6th Avenue (Case S3)

In addition, the following off-ramps would operate at LOS E or LOS F under 2030 conditions:

Case S1

- Edgar Martinez Drive S. / I-90 Off-Ramp
- 4th Avenue S. / I-90 Off-Ramp
- Dearborn Street / I-90 Off-Ramp
- Dearborn Street / Southbound I-5 Off-Ramp

Case S2

- S. Spokane Street / 1st Avenue S.
- Edgar Martinez Drive S. / I-90 Off-Ramp
- 4th Avenue S. / I-90 Off-Ramp
- Dearborn Street / I-90 Off-Ramp
- Dearborn Street / Southbound I-5 Off-Ramp
- Dearborn Street / Northbound I-5 Off-Ramp
- James Street / 6th Avenue

Case S3

- S. Spokane Street / 1st Avenue S.
- Edgar Martinez Drive S. / I-90 Off-Ramp
- 4th Avenue S. / I-90 Off-Ramp
- Dearborn Street / I-90 Off-Ramp
- Dearborn Street / Southbound I-5 Off-Ramp
- Dearborn Street / Northbound I-5 Off-Ramp
- James Street / 6th Avenue

2.6.4.5 Post-Event Traffic Operations

At the end of a Stadium District sporting event attendees typically depart the venue in a highly concentrated flow that can affect traffic operations within the vicinity of the venue and throughout the SoDo area. Post-event traffic counts for a Mariners game[25] indicate that the peak 15 minutes near the end of an event can range between 30 to 40 percent of the total hourly flow that includes this peak with traffic volumes greatest travelling away from the venue.

As a result of this surge, all Stadium District professional sporting events implement a Traffic Control Plan (TCP) to aid in the dispersion of event attendees to the transportation network. A TCP helps to alleviate this outbound surge in event attendees. However, post-event surge traffic volumes were observed to be less than the peak 15-minute period during a non-event peak evening commute period. This indicates that the analysis of the peak evening commute period represents a worst-case condition.

In addition to the traffic operations impacts outlined above, the increase in the number of event days in the Stadium District and the resulting increases in event traffic volumes related to the Arena would have an impact on emergency vehicle access and circulation to the Stadium District site as well as through the area. This may require emergency response vehicles to use on-board flashing lights and sirens to navigate through the congestion and reduce delays. In

[25] April 11, 2013

addition, during periods of heavy congestion, manual traffic control may be necessary to facilitate the passage of emergency vehicles.

2.6.5 Impacts of Alternative 3

As described for traffic volumes, construction impacts related to traffic operations would occur as a result of increased traffic levels. To minimize impacts to operations, a construction management plan would be developed and could include scheduling the most intensive construction activities such that they are spread out over time and prohibiting material deliveries from leaving or entering the area during AM and PM peak hours when feasible.

Alternative 3 includes the development of an 18,000-person capacity arena on the same site evaluated for Alternative 2. As noted in the traffic volumes section, when considering the mode splits associated with event attendees, the difference between an event with 20,000 and 18,000 attendees equates to approximately 200 vph during the weekday PM peak hour. Given the distribution of traffic to the area, this difference in overall activity would not likely be discernible by the average motorist and would be within the daily fluctuations in the background traffic. Traffic operations measures reported for Alternative 2 are expected to be slightly worse than would occur under Alternative 3, but identified impacts are anticipated to be similar.

2.6.6 Mitigation Measures

A complete summary of potential mitigation measures to be considered across all the Transportation Elements evaluated in this report is included in Chapter 4.0 of Appendix E. This summary includes identification of both programmatic measures and physical improvements. For each of the potential mitigation measures a designation of high to low influence was noted. The following identifies those potential mitigation measures considered to have a high influence on this transportation element. These potential mitigation measures are appropriate for both Alternative 2 and Alternative 3.

- Event schedule protocol and management
- Port of Seattle protocols
- Public information coordinator
- Directional event signage
- Variable message and parking guidance signage
- SDOT traffic control center improvements
- Traffic signal control / improvements
- North-South connection located on the east side of the project site, connecting S. Holgate Street to the private extension of S. Massachusetts Street

- Event ingress / egress plan
- Traffic operations group
- Construction management plan

2.6.7 Secondary and Cumulative Impacts

Major capital projects, such as Waterfront Seattle and the SR 99 Tunnel, will change how vehicles from the north and the south access downtown. Major freeways are at or near capacity for much of the peak morning and evening commuter periods in the Puget Sound region. Future growth in the number of vehicles is anticipated to occur mostly outside of the peak commuter periods. Much of the growth in passenger trips in the region is estimated to occur on transit. Regional tolling strategies, such as those considered in PSRCs Transportation 2040, would have a regional impact on vehicle travel. One of the tolling policy objectives is to achieve some performance objective, such as LOS. This change to the regional freeway system would likely result in some event attendees choosing another mode, such as public transit.

2.6.8 Significant Unavoidable Adverse Impacts

Several intersections are forecast to operate at LOS E or LOS F under the No Action alternative as well as in the case of additional traffic due to events at the Arena. On event days, delays would be expected to increase as a result of Arena event traffic. Some of these increases may be significant.

2.7 Freight and Goods Movement

This section describes the existing, No Action, and future impacts associated with the development alternatives on the movement of freight and goods within the SoDo area.

2.7.1 Methodology

The impacts of the alternatives on freight and goods movements are evaluated based on the overall truck volumes, existing and future transportation facilities, and future increases and changes in traffic volumes. This analysis examines the impacts the additional traffic associated with the alternatives have on intersection and arterial performance. Technical data presented in this section is consistent with data presented in the traffic operations section of this report.

2.7.2 Affected Environment

2.7.2.1 Transportation Network

The transportation network includes designated truck routes, and Port of Seattle terminal facilities, and rail yards and lines.

Truck Routes

The Major Truck Route designation guides the roadway design as well as traffic management. Local and federal agencies have identified several roadway routes as Seaport Highway Connectors and Intermodal Connectors that provide access between Port facilities and the regional highway system. As shown on Figure 2–86, several study area roadways are designated as both a Major Truck Route and a Seaport Highway Connector including E. Marginal Way S., SR 99, the West Seattle Bridge, S. Atlantic Street, and S. Royal Brougham Way. In addition, 1st Avenue S., 4th Avenue S., 6th Avenue S., Airport Way S., S. Dearborn Street, S. Holgate Street, and S. Spokane Street including the Viaduct and Swing Bridge are designated as Major Truck Routes.

Port of Seattle Terminals

The Port of Seattle operates four major container terminals (see Figure 2–86) located just south of downtown Seattle: Terminal 5 in West Seattle, Terminal 18 on Harbor Island, and Terminals 25/30 and 46 along East Marginal Way S. These terminals facilitate the transfer of import and export cargo containers between ships and land transportation modes such as railcars or trucks. Terminals 5 and 18 support drayage and intermodal transfers as well as have on-dock rail capability, where containers to a common destination can be loaded directly onto a train at the terminal.

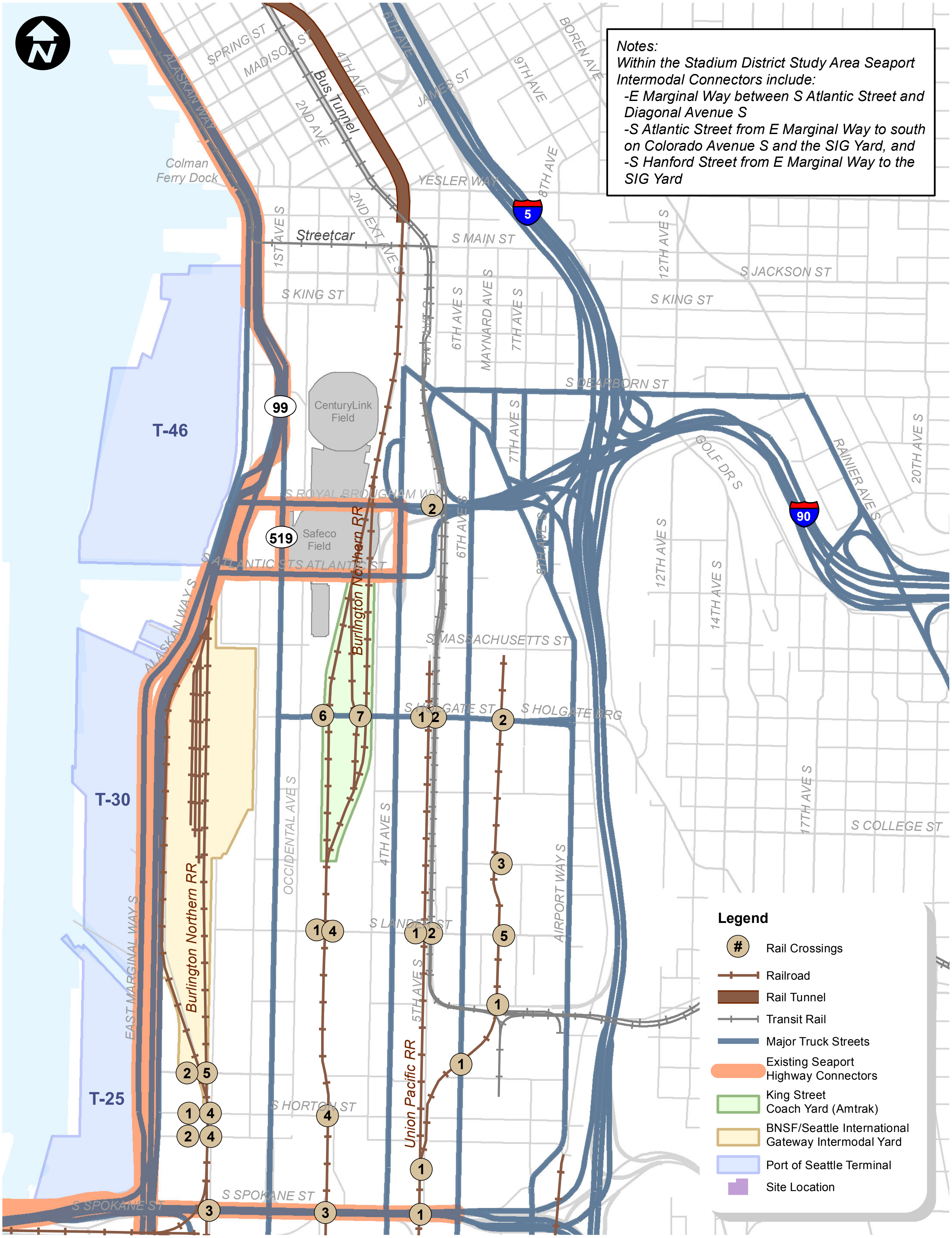
Rail Facilities

Within the study area there are three primary freight rail facilities:

- The BNSF mainline railroad tracks
- The BNSF Seattle International Gateway (SIG Yard)
- The Amtrak Seattle King Street Coach Yard maintenance facility

These facilities and the existing at-grade crossings are shown on Figure 2–86. In addition to these facilities, the Union Pacific's (UP) Argo Yard located south of S. Spokane Street provides intermodal service to Port of Seattle terminals, but is located outside of the immediate study area.

BNSF Tracks: The BNSF mainline runs north-south through the SoDo neighborhood providing rail service between Portland, Seattle, and Vancouver B.C. Within the study area, the mainline runs between 1st Avenue S. and 4th Avenue S. from the Great Northern Tunnel near the 4th Avenue S. / S. Washington Street intersection to south of Spokane Street. Several small spur tracks along the mainline serve adjacent businesses. UP operates a spur track that runs along the west side of 5th Avenue S. / SoDo Busway beginning near S. Massachusetts Street and extending south of the West Seattle Bridge. Smaller spur tracks extend further east across 4th Avenue S. and north along 5th Avenue S. to S. Massachusetts Street. These spur lines allow freight train access to the intermodal facilities, industrial uses in the area, and the Port of Seattle facilities.



Stadium District Rail and Freight Facilities

Seattle Arena

FIGURE
2-86

transpoGROUP

SIG Yard: The SIG Yard is divided into two facilities, the North SIG Yard, which is accessed by trucks from S. Massachusetts Street at Colorado Avenue, and Main SIG, which is accessed by trucks from S. Hanford Street east of E. Marginal Way. There is no internal truck connection between these two yards. Containers destined to or originating from locations beyond the Pacific Northwest generally make their overland trip by train. This cargo, known as "intermodal," is either loaded on a train on T-5 or T-18 or is trucked between the marine terminal and the near-dock rail yards. All intermodal cargo on the east waterway Terminals 30 and 46, travels by truck.

The lead and tail tracks that connect to the SIG Yard extend along the east side of SR 99 from south of S. Spokane Street through the yard and north, crossing over Alaskan Way to the west side of Alaskan Way, adjacent to Terminal 46. These tracks support both arriving and departing trains as well as train building, in which segments of a train are put together (or taken apart). This activity can block street crossings of the lead or tail tracks for long periods of time. A new Atlantic Street Overcrossing is due to be completed by year end 2013 which will provide a grade-separated overpass for vehicles to bypass blockages of surface Atlantic Street. Train arrivals, departures, and train building activities will continue to block the at-grade crossings located south of the SIG Yard at S. Hanford, Horton, Hinds and Spokane Streets.

Amtrak Maintenance Facility: Amtrak's King Street Coach Yard is located adjacent to the proposed Seattle Arena site. The rail yard extends south from Edgar Martinez Drive S. to south of S. Walker Street, east to 3rd Avenue S., and across the rail spur line that serves the King Street Coach Yard. The site currently includes as many as 14 sets of active rail lines. The rail yard serves many functions including locomotive and passenger car maintenance, train washing, and staging / parking. Along S. Holgate Street a total of 13 rail crossing exist with 9 being active crossings.

2.7.2.2 Traffic Volumes

Traffic counts throughout the SoDo study area generally show trucks dispersed among multiple streets during the weekday PM peak hour. Truck volumes on major arterial truck routes (i.e. S. Atlantic Street, 4th Avenue S., S. Spokane Street) tend to be greater than on local streets as many trucks access the regional freeway via their arterial connections. Roadways in the immediate vicinity of the project site that accommodate local and regional trucks include S. Atlantic Street, S. Holgate Street, 1st Avenue S., and S. Holgate Street. Truck percentages along these routes range from two to seven percent with the highest percentage of traffic along southbound 4th Avenue S. and the highest PM peak hour truck volumes along 1st Avenue S. based on existing traffic counts. As discussed later in this section, truck volumes can vary day-to-day and month-to-month based on activity at the Port of Seattle terminals.

A detailed summary of BNSF mainline rail traffic, including existing rail traffic observations, within the SoDo neighborhood was completed in October 2012 and was presented within the *Coal Traffic Impact Study* (Parametrix). Within SoDo, between 65 and 85 rail movements occur each weekday at the BNSF mainline at-grade rail crossings with trains travelling at average speeds of approximately six to eight mph. On average, the rail activity at the BNSF mainline rail crossings at S. Holgate Street, S. Lander Street, and S. Horton Street blocked each roadway an average of 2.0 to 3.3 minutes per train. This equates to a total daily closure of 2.8 to 3.7 hours over a 24-hour period, and about 8.5 minutes during the PM peak hour.

Truck and rail traffic generated by the Port varies by season and day-to-day. The peak season for import cargo usually occurs beginning in September and peaking in October. During these periods, the potential for having multiple ships in port simultaneously exists. Export cargo peaks are typically associated with agricultural exports from Eastern Washington with a peak season that lasts from mid-summer through late fall. Truck volumes fluctuate on a daily basis according to ship arrivals at the terminals and the sizes of those ships, or as a result of multiple ships in port.

Export cargo to be loaded must arrive at the terminal one to three days before the ship arrives in port. Once the ship arrives, the import cargo is unloaded as quickly as possible and intermodal containers (those destined inland via rail) are trucked to the nearby rail terminals for loading onto train cars. Export containers stored in the terminal yard are then loaded onto the ship. The unloading and loading operation is managed to minimize the amount of time the ship spends at the Port. After the ship is unloaded, trucks are dispatched by freight hauling firms to pick up import containers with local or regional destinations. Under normal operations, most of the truck trip activity occurs during the daytime operating hours between 7:30 AM and 5:00 PM. However, extended gate operations, either nighttime or early morning operations, can occur for larger ships if a ship is late in arriving due to inclement weather, or for large volumes of cargo dedicated to a few customers.

Truck traffic to and from Port of Seattle facilities within the SoDo study area is driven by the number of container units handled by the local terminals. A total of 7,230 one-way daily truck trips were generated on average per day by the Port of Seattle terminals based on available data from 2010 when 2.1 million TEUs were processed. In 2012, total tonnage was a little over 10 percent less than processed in 2010, to 1.87 million TEUs in 2012 and data provided by the Port of Seattle suggest a total of 7,300 daily truck trips were generated.

2.7.2.3 Traffic Operations

Potential traffic operations impacts to the movement of freight and goods within the SoDo study area were evaluated based on intersection and corridor operations, and potential rail crossing impacts in the vicinity of the proposed site.

Near the Proposed Arena site, operations at the four intersections shown in Table 2-31 are highly utilized by truck traffic and are shown along with their overall intersection LOS and average delay for all vehicle types. Specific details regarding the LOS methodology are summarized in the Traffic Operations section.

Table 2-31
Stadium District Existing Weekday PM Peak Hour Intersection Operations at Key Freight Intersections

Intersection	Non-Event LOS / delay	With-Event[1] LOS / delay
1st Avenue S. / S. Atlantic Street	D / 34	C / 26
4th Avenue S. / Edgar Martinez Drive S.	C / 26	B / 18
1st Avenue S. / S. Holgate Street	B / 17	B / 15
4th Avenue S. / S. Holgate Street / S. Holgate Street	C / 26	C / 24

1. Reflects counts taken for a Sounders FC game with attendance = 38,500

As shown in Table 2-31, all intersections are calculated to operate at LOS D or better under existing non-event and with-event conditions. The LOS reported represents an average delay for the intersection; some movements will operate at a lower level than reported for the overall average. Also, with the high concentrations of pedestrians during events, the analytical tools employed may not fully reflect the level of pedestrian impacts to intersection performance and additional delay may be incurred for right-turning vehicles. Depending on the specific event and attendance, 1st Avenue S. / S. Atlantic Street and 4th Avenue S. / Edgar Martinez Drive S. would experience high levels of pedestrian demands that could contribute to delays in excess of those reported. In addition, general reductions in traffic volumes in the area associated with pre-event conditions may relate to non-event traffic avoiding travel during known event days.

Three corridors within the SoDo study area are heavily utilized by freight truck traffic: S. Atlantic Street – Edgar Martinez Drive S., 1st Avenue S., and 4th Avenue S. Existing travel times along these corridors are summarized in Table 2-32 and specific details regarding the corridor performance methodology are summarized in the Traffic Operations section 2.6.

Table 2-32
Existing Weekday PM Peak Hour Travel Times Non-Event & With-Event Conditions on Key Freight Corridors

Extents	Direction	Non-Event (m:ss[1])	With-Event[2] (m:ss)
1st Avenue S. from Railroad Way S. to S. Horton Street	NB	6:16	6:31
1st Avenue S. from S. Horton Street to Railroad Way S.	SB	6:49	6:50
4th Avenue S. from S. King Street to S. Horton Street	NB	6:20	6:54
4th Avenue S. from S. Horton Street to S. King Street	SB	6:54	6:57
S. Atlantic Street from 1st Avenue S. to I-90	EB	1:39	1:24
S. Atlantic Street from I-90 to 1st Avenue S.	WB	1:23	1:18

1. m:ss = minutes:seconds
2. Reflects counts taken for a Sounders FC game with attendance = 38,500

As shown in Table 2-32, travel times generally increase along the four routes with the addition of traffic from an event. It is noted that the level of change in travel time may not be intuitive as it related to an event with an approximate attendance of 38,500 people. A number of factors appear to contribute to these conditions:

- The observed event was Seattle FC soccer game and while no specific data relative to mode split or net vehicle demands is available, anecdotal evidence suggests a higher reliance on non-auto travel than occurs in relation to other Stadium District events of similar attendance.
- Repeated traffic counts for other events in the area also suggest minimal local street system impacts during weekday PM peak hour conditions.
- Local businesses and downtown motorists who are aware of a pending event adjust their travel behavior, either by time or mode, to avoid being caught in event-related congestion. Depending on the size of event, the adjusted background traffic appears to partially, if not substantially offset the added weekday PM peak hour traffic due to the event.

There are at-grade rail crossings throughout SoDo and the Duwamish area impacting arterial operations along S. Holgate Street and S. Lander Street with related secondary impacts to the 1st Avenue S. and 4th Avenue S. corridors. Vehicular queues from rail crossings along S. Holgate and S. Lander Streets between 1st and 4th Avenues S. often extend into 1st and 4th Avenues S. This issue along 1st and 4th Avenues S. is further compounded with through traffic being obstructed (or blocked) by the rail crossing queues resulting in even longer queues and more congestion. Because of this, the effects of the rail crossings on S. Holgate Street and S. Lander Street on 1st Avenue S. and 4th Avenue S. were assessed using the VISSIM model. Existing rail crossing impacts using queue lengths on the adjacent arterials are summarized in Table 2-33 and described in further detail in the Traffic Operations section 1-28.

Table 2-33
S. Holgate Street and S. Lander Street Rail Crossing Summary – Existing PM Peak Hour

	Scenario	Arterial Direction	Maximum Arterial Queue Length[1]
S. Holgate Street Crossing	Weekday PM Peak Hour Non-Event	NB[2] 1st Ave S.	420 ft
		SB 1st Ave S.	350 ft
		NB 4th Ave S.	310 ft
		SB 4th Ave S.	390 ft
	Weekday PM Peak Hour With-Event[3]	NB 1st Ave S.	270 ft
		SB 1st Ave S.	330 ft
		NB 4th Ave S.	380 ft
		SB 4th Ave S.	890 ft
S. Lander Street Crossing	Weekday PM Peak Hour Non-Event	NB 1st Ave S.	310 ft
		SB 1st Ave S.	430 ft
		NB 4th Ave S.	300 ft
		SB 4th Ave S.	400 ft
	Weekday PM Peak Hour With-Event	NB 1st Ave S.	620 ft
		SB 1st Ave S.	510 ft
		NB 4th Ave S.	300 ft
		SB 4th Ave S.	690 ft

1. The reported maximum queue length is an average of the maximum queue lengths recorded across 10 simulation runs and represents the greater of a turning movement towards the rail crossing or the throughout movement along the corridor. Queue lengths are rounded up to the nearest 10 feet and reflect an average gate down time of approximately 8.5 minutes.
2. NB = northbound, SB = southbound
3. Sounders FC game with attendance = 38,500

Rail crossing gates are activated approximately 8.5 minutes during the weekday PM peak hour. As shown in Table 2-33, queue lengths along 1st Avenue S. and 4th Avenue S. typically increase with the occurrence of the Sounders FC game.

The northbound 1st Avenue S. queue at S. Holgate Street is shown to decrease and occurs as a result of increased upstream northbound congestion at 1st Avenue S. / S. Lander Street. When considered in the context of modest changes in LOS and travel times due to the same event, it illustrates the significance of gate closure on traffic operations.

2.7.3 Impacts of No Action Alternative

Forecast conditions under the No Action alternative for freight and goods movement within the SoDo study are described in the following sections.

2.7.3.1 Transportation Network

Several planned projects were identified that may alter truck travel routes within the study area as summarized in the Street System section 2-1.

- Alaskan Way Viaduct Replacement
  - In addition to the circulation changes associated with the South Portal, a secondary project that includes the grade separation from E. Marginal Way and Alaskan Way S. to S. Atlantic Street when trains block S. Atlantic Street between Alaskan Way S. and Colorado Avenue S. is underway. This project is referred to as the little 'h.' This project is included in analysis of 2018 and 2030 conditions.
- S. Lander Street Grade Separation
  - This project would grade separate vehicular, pedestrian, bike, and truck traffic from rail traffic on S. Lander Street at the existing BNSF mainline rail crossing between 1st Avenue S. and 4th Avenue S. Improved delays and reliably reduced congestion from this rail crossing could result in increased truck traffic along this roadway. This project is not included in 2018 or 2030 analyses since it is currently unfunded.
- Waterfront Seattle
  - This project would create a continuous public waterfront between S. King Street and Bell Street, and may attract some increase in truck traffic. This project is included in analysis of 2018 and 2030 conditions.

2.7.3.2 Traffic Volumes

Within the SoDo study area general freight movement volumes are anticipated to increase similarly to background conditions with the exception of Port of Seattle traffic that is directly linked to the number of container units processed. In general, the proportion of truck traffic along study area roadways were assumed equal to existing conditions with adjustments made to reflect forecast increases in Port of Seattle handling and the addition of event related vehicular trips that primarily consist of passenger car travel.

Under future conditions Port of Seattle terminals within the SoDo neighborhood will operate similarly to existing conditions but with an increased amount of processed cargo. The Port of Seattle anticipates increasing the number of shipping containers it processes to 3.5 million TEUs by 2030, which exceeds recent growth trends. The Port of Seattle has indicated that this increase will result in the need to expand the Port's operating hours beyond the typical operating hours of 7:30 AM and 5:00 PM currently in place today such that approximately

20 percent of the container volume is processed between 6:00 and 11:00 PM. For analyses of 2018 conditions, 2.41 million TEUs were forecast for Port of Seattle activity by interpolating between 2012 and 2030 processing rates. Overall growth in container processing is estimated at 29 percent by 2018 and 87 percent by 2030 based on Port of Seattle estimates, when compared with 2012 levels.

As a result of this increased activity, truck trips to and from Port of Seattle facilities would also increase. As previously described, a total of 7,300 one-way daily truck trips were generated on average per day by the Port of Seattle terminals in 2012. Information provided by the Port of Seattle indicates that Port facilities could generate up to 13,700 one-way daily truck trips by 2030.

Anticipated changes to both freight and passenger rail activity within the study area are summarized in Table 2-34.

Table 2-34
Anticipated Future Changes to Daily Rail Activity

Operator	2013	2018	2030
SoundTransit[1]	18 train crossings	20 train crossings	22 round train crossings *estimated[2]
Amtrak Cascades[3]	6 southbound crossings 7 northbound crossings	16 train crossings	26 train crossings
Freight Rail[4]	30 train crossings[5]	88 train crossings *estimated[6]	130 train crossings *estimated[6]

1. Current Sound Transit schedule (April 2013) and *2013 Service Implementation Plan* (Sound Transit, December 2012).
2. 2030 Sound Transit train crossings were assumed to increase similarly from 2018 to 2030 as from 2013 to 2018, resulting in two addition crossings.
3. Current Amtrak schedule, *Amtrak Cascades Mid-Range Plan* (WSDOT, December 2008), and *Long Range Plan for Amtrak Cascades* (WSDOT, February 2006).
4. Includes coal train activity.
5. Existing freight rail includes all observed freight rail activity including existing coal train activity.
6. Future freight rail accounts for general freight rail activity increases consistent with forecast Port of Seattle container processing and forecast increases in coal train activity.

2.7.3.3 Traffic Operations

Intersection operations at the four intersections highly utilized by truck traffic near the Proposed Arena site are shown in Table 2-35 for 2018 and 2030 conditions. Results shown are consistent with the analysis presented in the Traffic Operations. Existing operations are also included for comparison.

Table 2-35
Stadium District No Action Weekday PM Peak Hour Intersection Operations at Key Freight Intersections

	Intersection	Case S1 LOS / delay	Case S2 LOS / delay	Case S3 LOS / delay
2018	1st Avenue S. / S. Atlantic Street	E / 76 (D / 34)[1]	F / 156	F / 166
	4th Avenue S. / Edgar Martinez Drive S.	D / 36 (C / 26)	D / 39	D / 43
	1st Avenue S. / S. Holgate Street	C / 34 (B / 17)	D / 45	D / 47
	4th Avenue S. / S. Holgate Street	D / 50 (C / 26)	E / 63	E / 63
2030	1st Avenue S. / S. Atlantic Street	E / 76	F / 168	F / 180
	4th Avenue S. / Edgar Martinez Drive S.	D / 46	D / 50	D / 54
	1st Avenue S. / S. Holgate Street	D / 50	F / 84	F / 90
	4th Avenue S. / S. Holgate Street	D / 54	E / 67	E / 69

1. (x) - Existing condition non-event operations provided for comparison.

As shown in Table 2-35, the 1st Avenue S. / S. Atlantic Street intersection is anticipated to operate at LOS E under 2018 non-event conditions. This doubling of delay is a result of general growth as well as the effects of shifted traffic due to the completion of the Alaskan Way Viaduct South Portal improvements. Under Case S2 or S3, overall intersection operations are calculated to worsen to LOS F with the addition of event traffic. In addition, the 4th Avenue S. / S. Holgate Street / S. Holgate Street intersection is forecast to operate at LOS E under Case S2 and S3. The remaining intersections are anticipated to remain at LOS D or better under all 2018 No Action conditions.

Under 2030 conditions, traffic operations are similar to 2018 conditions with the further addition of 1st Avenue S. / S. Holgate Street operating at LOS F under Case S2 and S3.

It is noted that all future estimates of event traffic volumes are simply additive to No Action conditions. While existing counts and analysis show modest impacts to traffic volumes and operations on event days, this additive approach likely overestimates future traffic and congestion related to events. However, it does provide a consistent basis for comparing alternatives. There is no reliable way to assess the amount of diverted non-event traffic likely to occur for any given event.

Table 2-36 summarizes the calculated weekday PM peak hour travel times along the key corridors utilized for freight and goods movement under 2018 conditions on the defined routes. Table 2-37 summarizes the calculated travel times under 2030 conditions. No Action results conditions are shown in parentheses and provided for comparison purposes.

Table 2-36
Stadium District 2018 No Action Weekday PM Peak Hour
Freight Corridor Travel Times

Extents	Direction	Case S1 (m:ss[1])	Case S2 (m:ss)	Case S3 (m:ss)
1st Avenue S. from Railroad Way S. to S. Horton Street	NB	8:56 (6:16)[2]	15:26	16:41
1st Avenue S. from S. Horton Street to Railroad Way S.	SB	8:41 (6:49)	9:27	9:36
4th Avenue S. from S. King Street to S. Horton Street	NB	8:15 (6:20)	10:19	10:37
4th Avenue S. from S. Horton Street to S. King Street	SB	12:51 (6:54)	16:59	17:19
S. Atlantic Street from 1st Avenue S. to I-90	EB	1:38 (1:39)	1:52	1:54
S. Atlantic Street from I-90 to 1st Avenue S.	WB	2:02 (1:23)	5:39	6:30

1. m:ss = minutes:seconds
2. (x) - Existing travel times provided for comparison.

As shown in Table 2-36:

- Travel times for freight corridors under 2018 conditions increase from existing conditions, increasing from approximately two minutes to six minutes, depending on route and travel direction. Travel times further increase with the addition of event traffic, in some cases nearly tripling.
- Freight corridor travel times along 1st Avenue S. and 4th Avenue S. under 2018 conditions are forecasted to exceed 10 minutes with Case S1 and S2 traffic, and exceed 15 minutes for northbound 1st Avenue S. and southbound 4th Avenue S.
- Eastbound freight corridor travel times along S. Atlantic Street are expected to increase but less so than other routes. This direction of travel is opposite the inbound event flows, minimizing the increase in travel times. S. Atlantic Street is also subject to TCPs at Occidental Avenue S. and the Safeco Field parking garage. Event traffic control could increase S. Atlantic Street travel times beyond what is reported.

As described earlier, the actual impact due to event traffic is likely to be less than reflected herein since no assumed diversion or reduction in non-event traffic is assumed.

Table 2-37
Stadium District 2030 No Action Weekday PM Peak Hour
Freight Corridor Travel Times

Extents	Direction	Non-Event (m:ss[1])	With Single Event (m:ss)	With Dual Events (m:ss)
1st Avenue S. from Railroad Way S. to S. Horton Street	NB	9:40 (6:16)[2]	16:23	17:37
1st Avenue S. from S. Horton Street to Railroad Way S.	SB	8:38 (6:49)	9:31	9:52
4th Avenue S. from S. King Street to S. Horton Street	NB	10:59 (6:20)	14:03	14:27
4th Avenue S. from S. Horton Street to S. King Street	SB	15:45 (6:54)	20:58	21:22
S. Atlantic Street from 1st Avenue S. to I-90	EB	2:58 (1:39)	3:43	3:48
S. Atlantic Street from I-90 to 1st Avenue S.	WB	2:38 (1:23)	6:58	8:11

1. m:ss = minutes:seconds
2. (x) - Existing non-event travel times provided for comparison.

As shown in Table 2-37:

- Under 2030 conditions freight corridor travel times are generally similar to 2018 conditions; some increase while others decrease. Increases range from approximately 2 minutes to 9.5 minutes when compared to existing conditions.
- Travel time changes result from small changes in forecast volumes at some study intersections and additional diversion from congested freeways as forecast in the Alaskan Way Viaduct Replacement study.
- Similar to 2018 conditions, eastbound freight corridor travel times along S. Atlantic Street are expected to increase at a lower percentage than other routes since the direction of travel is opposite the inbound event flows.

As described earlier, the actual impact due to event traffic is likely to be less than reflected herein since no assumed diversion or reduction in non-event traffic is assumed.

Rail activity assumed for future conditions was increased beyond existing conditions for both passenger and freight rail activity. Additional details are provided in the Traffic Operations section 2.6. Total crossing gate arm down times and queue lengths along 1st Avenue S. and 4th Avenues S. are summarized in Table 2-38.

Table 2-38
No Action S. Holgate Street and S. Lander Street Rail Crossing Impact Summary

	Scenario	Gate Down Time (m:ss)[1]	Arterial Direction	Maximum Arterial Queue Length[2]		
				Existing[3]	2018	2030
S. Holgate Street Crossing	Weekday PM Peak Hour Case S1	Existing = 8:30 2018 = 14:30 2030 = 20:30	NB[4] 1st Ave S.	420	660	1,000
			SB 1st Ave S.	350	660	650
			NB 4th Ave S.	310	530	580
			SB 4th Ave S.	390	850	850
	Weekday PM Peak Hour Case S2	2018 = 14:30 2030 = 20:30	NB 1st Ave S.	420	1,010	1,000
			SB 1st Ave S.	350	660	650
			NB 4th Ave S.	310	560	600
			SB 4th Ave S.	390	850	850
	Weekday PM Peak Hour Case S3	2018 = 14:30 2030 = 22:30	NB 1st Ave S.	420	1,010	1,000
			SB 1st Ave S.	350	660	670
			NB 4th Ave S.	310	470	720
			SB 4th Ave S.	390	850	850
S. Lander Street Crossing	Weekday PM Peak Hour Case S1	Existing = 8:30 2018 = 16:30 2030 = 21:00	NB 1st Ave S.	310	820	830
			SB 1st Ave S.	430	1080	1,080
			NB 4th Ave S.	300	410	570
			SB 4th Ave S.	460	1020	960
	Weekday PM Peak Hour Case S2	2018 = 16:30 2030 = 21:00	NB 1st Ave S.	310	880	890
			SB 1st Ave S.	430	1,090	1,090
			NB 4th Ave S.	300	510	700
			SB 4th Ave S.	460	1,030	1,020
	Weekday PM Peak Hour Case S3	2018 = 16:30 2030 = 21:00	NB 1st Ave S.	310	890	880
			SB 1st Ave S.	430	1,060	1,090
			NB 4th Ave S.	300	450	710
			SB 4th Ave S.	460	1,010	1,060

1. Gate down times reported are approximate and may range +/- 1 minutes. Variance due to multiple seeds and VISSIM modeling methodology.
2. The reported maximum queue length is an average of the maximum queue lengths recorded across 10 simulation runs and represents the greater of a turning movement towards the rail crossing or the throughout movement along the corridor. Queue lengths are rounded up to the nearest 10 feet.
3. Representative of non-event case.
4. NB = northbound, SB = southbound

As shown in Table 2-38:

- Rail crossing gates are activated approximately 15 minutes during the weekday PM peak hour in 2018 and 21 minutes in 2030.
- Queues on 1st Avenue S. freight corridor generally increase under Case S2 with the occurrence of a Mariners game and under Case S3 with the occurrence of both a Mariners game and event at CenturyLink Field Event Center by 2018 and 2030.
- Maximum queues along the 4th Avenue S. freight corridor also increase with the occurrence of the events by 2018 and 2030.
- Some minor decreases to queue lengths are shown but are generally small and likely due to small variations in the simulation runs.

2.7.4 Impacts of Alternative 2

Major truck routes surrounding the site could be intermittently impacted by construction. A construction management plan would be developed to minimize any street closures or other impacts as a result of the Seattle Arena construction. This management plan would include use of manual flaggers and signs to help vehicle circulation. In addition, key stakeholders would be notified of any major roadway closures.

Forecast conditions for freight and goods movement within the SoDo study with a 20,000 attendee event at the proposed Stadium District site are described in the following sections.

2.7.4.1 Transportation Network

With the construction of the Proposed Arena, the only change to the existing freight system assumed in the analysis is the vacation of Occidental Avenue S. between S. Massachusetts Street and S. Holgate Street. This change does not impact any of the major freight routes within the study area but would divert local truck deliveries for businesses along Occidental Avenue S., north of S. Massachusetts Street and along S. Massachusetts Street east of 1st Avenue S.

2.7.4.2 Traffic Volumes

With the addition of event traffic to SoDo study area roadways, truck and rail traffic volumes would not be directly impacted except for local truck patterns impacted by the vacation of Occidental Avenue S. Truck and rail volumes would generally remain the same as No Action conditions for purposes of assessing the alternative generated impacts. Some degree of “event traffic avoidance” may occur similar to existing conditions.

2.7.4.3 Traffic Operations

Intersection operations at the four intersections highly utilized by truck traffic near the Proposed Arena site are shown in Table 2-39 for 2018 and 2030 conditions.

Table 2-39
Stadium District Alternative 2 Weekday PM Peak Hour Intersection Operations at Key Freight Intersections

	Intersection	Case S1 LOS / delay	Case S2 LOS / delay	Case S3 LOS / delay
2018	1st Avenue S. / S. Atlantic Street	F / 126 (E / 76)[1]	F / >180 (F / 156)	F / >180 (F / 166)
	4th Avenue S. / Edgar Martinez Drive S.	D / 27 (D / 36)	E / 74 (D / 39)	F / 81 (D / 43)
	1st Avenue S. / S. Holgate Street	D / 53 (C / 34)	F / 112 (D / 45)	F / 118 (D / 47)
	4th Avenue S. / S. Holgate Street	E / 60 (D / 50)	E / 70 (E / 63)	E / 71 (E / 63)
2030	1st Avenue S. / S. Atlantic Street	F / 120 (E / 76)	F / >180 (F / 168)	F / >180 (F / 180)
	4th Avenue S. / Edgar Martinez Drive S.	E / 63 (D / 46)	E / 70 (D / 50)	E / 76 (D / 54)
	1st Avenue S. / S. Holgate Street	F / 97 (D / 50)	F / 146 (F / 84)	F / 154 (F / 90)
	4th Avenue S. / S. Holgate Street	E / 59 (D / 54)	E / 68 (E / 67)	E / 69 (E / 69)

1. (x) - No Action operations provided for comparison.

As shown in Table 2-39, the 1st Avenue S. / S. Atlantic Street intersection is anticipated to worsen to LOS F with the addition of Arena traffic to 2018 non-event conditions and 4th Avenue S. / S. Holgate Street / S. Holgate Street would worsen to LOS E. The remaining intersections are anticipated to remain at LOS D or better under non-event conditions. Under Case S2 or S3, overall intersection operations would worsen at all four intersections with all operating at LOS E or LOS F and delay at 1st Avenue S. / S. Atlantic Street further worsening beyond non-event conditions.

Under 2030 conditions, all four intersections are estimated to operate at LOS E or LOS F with the addition of event traffic and are all worse than No Action Case S1 conditions. With additional event traffic LOS values would remain the same as 2030 Arena-only conditions but delays would further increase when multiple events occur.

These increases in LOS / delay at key intersections under both 2018 and 2030 conditions would similarly increase delays for freight trucks travelling through these intersections. As shown, the results for both 2018 and 2030 conditions with only Arena event traffic are similar to and slightly better than No Action conditions with only a Mariners event.

As described earlier, all future event cases (Cases S1 to S3) likely overestimate actual demands and thus congestion during these periods since no reduction in non-event traffic was assumed.

Table 2-40 summarizes the calculated weekday PM peak hour travel times along the key corridors for freight movement under 2018 conditions on the defined routes. Table 2-40 summarizes the calculated travel times under 2030 conditions. No Action results conditions are shown in parentheses and provided for comparison purposes.

Table 2-40
Stadium District 2018 Alternative 2 Weekday PM Peak Hour Freight Corridor Travel Times

Extents	Direction	Case S1 (m:ss[1])	Case S2 (m:ss)	Case S3 (m:ss)
1st Avenue S. from Railroad Way S. to S. Horton Street	NB	12:18 (8:56)[2]	24:12 (15:26)	25:54 (16:41)
1st Avenue S. from S. Horton Street to Railroad Way S.	SB	9:18 (8:41)	9:57 (9:27)	10:25 (9:36)
4th Avenue S. from S. King Street to S. Horton Street	NB	10:21 (9:07)	13:21 (11:31)	13:43 (11:33)
4th Avenue S. from S. Horton Street to S. King Street	SB	15:54 (13:05)	21:34 (17:47)	21:59 (18:01)
S. Atlantic Street from 1st Avenue S. to I-90	EB	1:46 (1:38)	3:05 (1:52)	3:08 (1:54)
S. Atlantic Street from I-90 to 1st Avenue S.	WB	3:35 (2:02)	10:04 (5:39)	11:19 (6:30)

1. m:ss = minutes:seconds
2. (x) - No Action travel times provided for comparison.

As shown in Table 2-40 and Table 2-41:

- Freight corridor travel times increase with the addition of Arena event traffic. Changes in 2018 range from approximately 0.25 minutes to 3.5 minutes under Case S1, to 1.25 minutes to 8 minutes under Case S3. Under 2030 the range of increases is similar to 2018 conditions.
- In general, the direction of travel for each freight corridor travel time route that serves vehicles arriving for the Arena event (i.e. northbound 1st Avenue S.) experiences the greatest travel time increase while the opposing direction experiences a lesser increase (i.e. southbound vs. northbound 1st Avenue S.).
- Some routes show a small improvement in freight corridor travel time as a result the signal timing optimization procedures, but in general travel time routes will increase as a result of Arena traffic.
- Travel times for all freight corridor routes with only an Arena event are less than the No Action Case S2 (Mariners only) conditions. Travel times for specific routes and directions are calculated to see large increases with multiple concurrent events (i.e. northbound 1st Avenue S., eastbound S. Atlantic Street).

- The patterns of travel time changes resulting from an Arena event are similar between 2018 and 2030 conditions with 2030 travel times generally greater than 2018 conditions.

As described earlier, all future event cases (Cases S1 to S3) likely overestimate actual demands and thus congestion during these periods since no reduction in non-event traffic was assumed.

Table 2-41
Stadium District 2030 Alternative 2 Weekday PM Peak Hour Freight Corridor Travel Times

Extents	Direction	Case S1 (m:ss[1])	Case S2 (m:ss)	Case S3 (m:ss)
1st Avenue S. from Railroad Way S. to S. Horton Street	NB	14:46 (9:40)[2]	24:15 (16:23)	25:59 (17:37)
1st Avenue S. from S. Horton Street to Railroad Way S.	SB	9:17 (8:38)	10:43 (9:31)	11:14 (9:52)
4th Avenue S. from S. King Street to S. Horton Street	NB	13:04 (10:59)	16:52 (14:03)	17:17 (14:27)
4th Avenue S. from S. Horton Street to S. King Street	SB	19:52 (15:45)	23:22 (20:58)	23:48 (21:22)
S. Atlantic Street from 1st Avenue S. to I-90	EB	2:14 (2:58)	2:52 (3:43)	2:54 (3:48)
S. Atlantic Street from I-90 to 1st Avenue S.	WB	3:34 (2:38)	10:59 (6:58)	12:18 (8:11)

1. m:ss = minutes:seconds
2. (x) - No Action travel times provided for comparison.

Rail activity assumed in the modeling is consistent with the level of rail activity identified for the No Action alternative. The traffic volumes in VISSIM were updated to reflect the forecast traffic volumes for the Alternative 2 event analysis cases. Total crossing gate arm down times and queue lengths along 1st and 4th Avenues S. are summarized in Table 2-42, and are the same as assumed for the No Action conditions.

Table 2-42
Alternative 2 S. Holgate Street and S. Lander Street Rail Crossing Impacts Summary

	Scenario	Alt 2 Gate Down Time (m:ss)	Arterial Direction	Maximum Arterial Queue Length[1] 2018 No Action	2018 Alt 2	2030 No Action	2030 Alt 2
S. Holgate Street Crossing	Weekday PM Peak Hour Case S1	2018 = 15:00 2030 = 23:00	NB[2] 1st Ave S.	660	980	1,000	1,010
			SB 1st Ave S.	660	670	650	670
			NB 4th Ave S.	530	520	580	990
			SB 4th Ave S.	850	850	850	850
	Weekday PM Peak Hour Case S2	2018 = 15:00 2030 = 23:00	NB 1st Ave S.	1,010	1,000	1,000	1,010
			SB 1st Ave S.	660	670	650	670
			NB 4th Ave S.	560	560	600	990
			SB 4th Ave S.	850	850	850	850
	Weekday PM Peak Hour Case S3	2018 = 15:00 2030 = 23:00	NB 1st Ave S.	1,010	1,000	1,000	1,010
			SB 1st Ave S.	660	670	670	670
			NB 4th Ave S.	470	980	720	980
			SB 4th Ave S.	850	850	850	850
S. Lander Street Crossing	Weekday PM Peak Hour Case S1	2018 = 16:30 2030 = 22:30	NB 1st Ave S.	820	850	830	890
			SB 1st Ave S.	1080	1080	1,080	1,090
			NB 4th Ave S.	410	490	570	940
			SB 4th Ave S.	1020	980	960	1,070
	Weekday PM Peak Hour Case S2	2018 = 16:30 2030 = 22:30	NB 1st Ave S.	880	880	890	890
			SB 1st Ave S.	1,090	1,080	1,090	1,090
			NB 4th Ave S.	510	820	700	940
			SB 4th Ave S.	1,030	1,070	1,020	1,070
	Weekday PM Peak Hour Case S3	2018 = 16:30 2030 = 22:30	NB 1st Ave S.	890	890	880	890
			SB 1st Ave S.	1,060	1,090	1,090	1,090
			NB 4th Ave S.	450	880	710	940
			SB 4th Ave S.	1,010	1,070	1,060	1,060

1. The reported maximum queue length is an average of the maximum queue lengths recorded across 10 simulation runs and represents the greater of a turning movement towards the rail crossing or the throughout movement along the corridor. Queue lengths are rounded up to the nearest 10 feet.
2. NB = northbound, SB = southbound

As shown in Table 2-42:

- Rail crossing gates are activated approximately 15 to 17 minutes during the weekday PM peak hour in 2018 and 23 minutes in 2030.

- Maximum queues on 1st Avenue S. are generally similar or increase with the addition of an event at the new Arena by 2018 and 2030 with the exception of the northbound queue at 1st Avenue S. / S. Holgate Street during the 2018 dual event scenario.
    - Northbound 1st Avenue S. at S. Holgate Street queues are shown to decrease by approximately 10 feet between the No Action alternative and Alternative 2 under Case S2 and S3 (2 or 3 event cases). This decrease represents less than one vehicle and is likely caused by increased congestion and blocking occurring elsewhere in the roadway vicinity.
- Maximum queues along 4th Avenue S. also increase between the No Action alternative and Alternative 2 for all scenarios by 2018 and 2030 with the exception of the northbound queues at S. Holgate Street and southbound queue at S. Lander Street.
    - Northbound 4th Avenue S. queues at S. Holgate Street in 2030 are shown to decrease by 10 feet during the non-event scenario. This decrease represents less than one vehicle and is likely caused by increased congestion and blocking occurring in the nearby roadway vicinity.
    - Southbound queues on 4th Avenue S. at S. Lander Street are shown to decrease by 40 feet between the 2018 No Action alternative and Alternative 2 during the non-event scenario which is also likely caused by increased congestion and blocking occurring in the nearby roadway vicinity.

2.7.5 Impacts of Alternative 3

Major truck routes surrounding the site could be intermittently impacted by construction. A construction management plan would be developed to minimize any street closures or other impacts as a result of the arena construction. This management plan would include the use of manual flaggers and signs to help vehicle circulation. In addition, key stakeholders would be notified of any major roadway closures.

Alternative 3 includes the development of an 18,000-person capacity arena on the same site evaluated for Alternative 2. In general, impacts to freight and goods anticipated under Alternative 3 would be slightly less than reported for Alternative 2. Overall traffic volumes for Alternative 3 are approximately one percent less during the weekday PM peak hour under both 2018 and 2030 conditions.

2.7.6 Mitigation Measures

A complete summary of potential mitigation measures to be considered across all the Transportation Elements evaluated in this report is included in Chapter 4.0 of Appendix E. This summary includes identification of both programmatic measures and physical improvements. For each of the potential mitigation measures a designation of high to low influence was noted. The following identifies those potential mitigation measures considered to have a high influence on this transportation element. These potential mitigation measures are appropriate for both Alternative 2 and Alternative 3.

- Port of Seattle protocols
- Public information coordinator
- Construction management plan

2.7.7 Secondary and Cumulative Impacts

As described previously, there would be direct impacts to the movement of freight and goods caused by an increase in traffic volumes and congestion for the No Action Alternative by 2018 and 2030. These impacts would be increased on game days. Secondary and cumulative impacts to other motorists could occur by truckers choosing to reroute to avoid congestion at specific intersections.

Changes in Port of Seattle operations could change the amount of heavy trucks on some routes through the Stadium District, especially if service hours are extended later in the day and into the evening. This could add delay and congestion on arterial streets and intersections in the project vicinity, and add delay to some surface transit routes in SoDo.

2.7.8 Significant Unavoidable Adverse Impacts

Several intersections are forecast to operate at LOS E or LOS F under No Action conditions, as well as in the case of additional traffic due to events at the Arena. On event days, delays would be expected to increase as a result of Arena event traffic. These conditions would impact freight activity to the extent identified in the impact analysis.

2.8 Parking

The Seattle Municipal Code (SMC) 23.54.015 Table A shows a minimum parking requirement of one space per eight seats for entertainment uses. This results in a parking requirement of 2,500 to 2,250 spaces depending on the size of the Arena. SMC also notes that the required parking for spectator sports facilities does not have to be dedicated, but must be available when the facility is in use (i.e., three hours before event start and one hour after the event expected end time). For the purposes of this analysis, it is assumed that no new attendee[26] parking would be built and code required parking would be met through shared agreements with existing or new parking facilities not associated with the Arena. The remainder of this discussion focusses on the impact of the Arena's parking demand on the existing and future parking supply in the study area.

2.8.1 Methodology

The following describes the general approach to the parking analysis:

- Establish the study area and appropriate time period for the evaluation

[26] The proposal includes 60-70 on-site parking spaces for players, coaches, and arena staff.

- Document existing parking for non-event conditions to provide an understanding of the underlying parking without an event
- Document existing parking with an event to provide an illustration of actual parking demand associated with observations during a Mariners game with over 20,000 attendees
- Examine effect of future “pipeline” development on parking supply and demand under the No Action Alternative
- Evaluate No Action conditions associated with the existing event venues (Safeco Field and the CenturyLink Field Event Center) to provide a basis for understanding the impact of the Proposed Arena on multiple event conditions
- Add parking demand for the Arena to each of the defined No Action baseline event cases and compare with Arena parking demand to the No Action condition to identify impacts of Alternatives 2 and 3
- Identify mitigation strategies, where appropriate, to reduce the effect of the identified Alternative 2 and 3 impacts

The balance of this methodology section describes the study area for the parking analysis, how the Stadium District parking patterns were used to determine the analysis time periods, and parking supply assumptions. Parking demand assumptions specific to existing and future conditions are described in the individual Affected Environment, No Action, and Alternative 2 sections.

2.8.1.1 Study Area

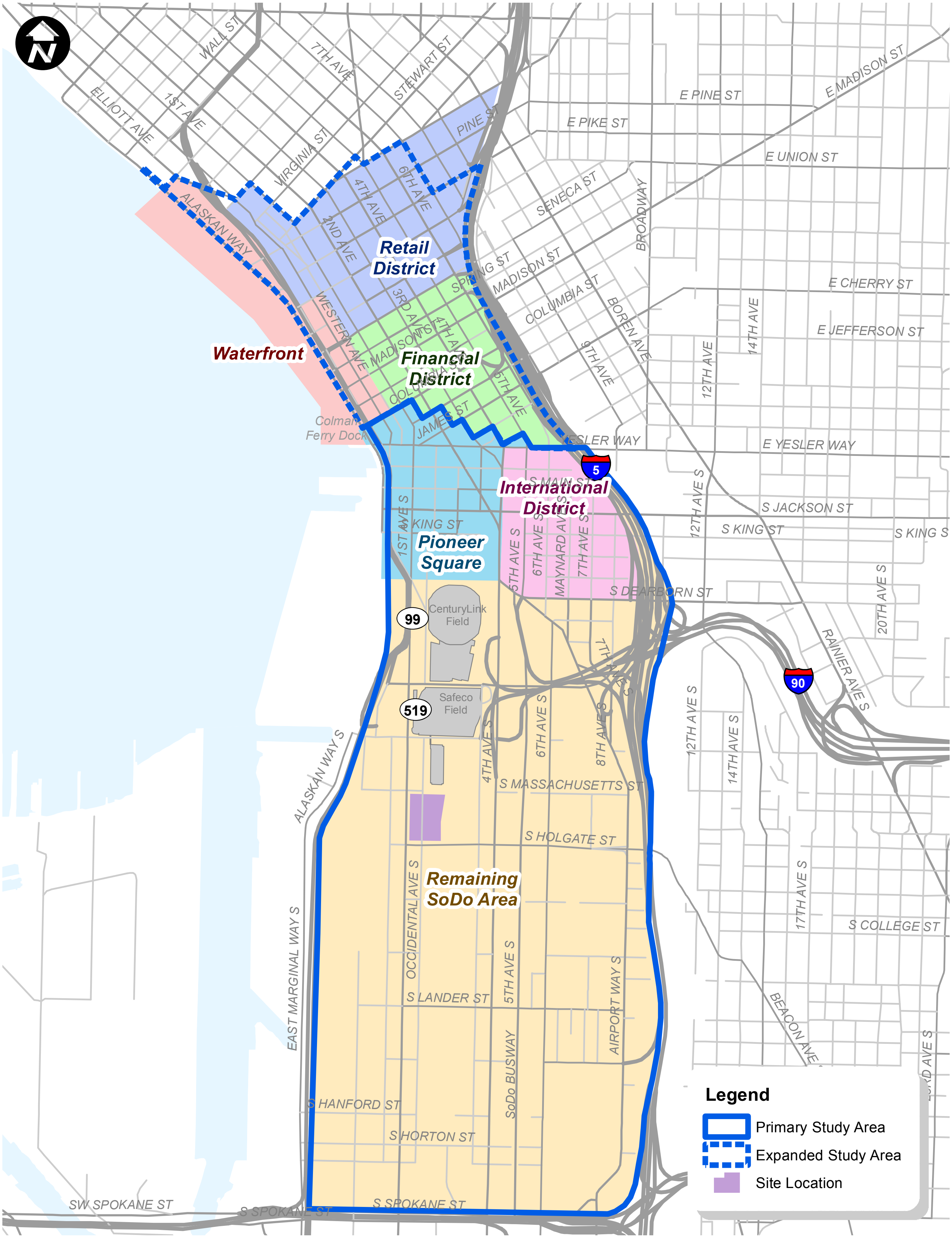
The study area evaluated for parking is shown on Figure 2–87. Because of the size of the nearby event venues, the study area for parking is larger than would otherwise be needed if the Arena were located independent of other large event sites.

I-5 creates a physical barrier in the study area with little to no pedestrian connections from parking areas between the Stadium District site and parking areas east of I-5; therefore, the study area includes only the areas west of I-5 where there are viable pedestrian connections to the Arena site. The study area was further subdivided into primary and expanded study areas. The primary study area is considered within an approximate one-mile radius of the Stadium District site. It includes the neighborhoods of Pioneer Square, International District and SoDo, and extends from just north of Yesler Street to Spokane Street on the south. This area represents an approximate 5- to 20-minute walking distance for Seattle Arena event attendees.

An expanded study area was also evaluated considering the CBD. The evaluation of the expanded study area helps accommodate parking associated with larger multi-event cases at either CenturyLink Field or Safeco Field. The CBD is divided into three subareas – waterfront, financial, and retail to provide an understanding of the Arena impacts within the larger CBD.

2.8.1.2 Analysis Time Periods

Event arrival patterns shown on Figure 1–5 (on page 1-17) suggest Arena arrivals would generally begin between two-and three-hours prior to the start. The 2012-2013 NBA, 2011-2013 NHL, and 2012 WNBA schedules indicate the typical start time for Arena sporting events is around 7:00 PM To determine the parking analysis period, existing non-event and Arena hourly parking demands for weekday and weekend conditions between 4:00 and 8:00 PM were examined assuming a 7:00 PM game start.



Stadium District Parking Study Area

Seattle Arena

FIGURE
2-87

transpoGROUP

Weekday

The following figures illustrate the hourly parking demand for the existing weekday non-event, Arena only, and combine non-event and Arena conditions. Figure 2–88 illustrates the weekday hourly demand in the study area and shows that parking demand decreases sharply until about 6:00 PM. Between 6:00 and 7:00 PM a slight increase in parking was observed, coinciding with arrivals for evening activities in some neighborhoods. Figure 2–89 shows Arena-only hourly parking demand for a 7:00 PM start time. A majority of vehicles associated with the Arena would be parked by 7:00 PM with approximately five percent of the vehicles arriving after the game start. Figure 2–90 illustrates the total (non-event plus Arena) hourly parking demand, and shows that on weekdays the peak occurs at 7:00 PM (start time).

Figure 2–88 Stadium District Hourly Parking Demand – Weekday: Non-Event

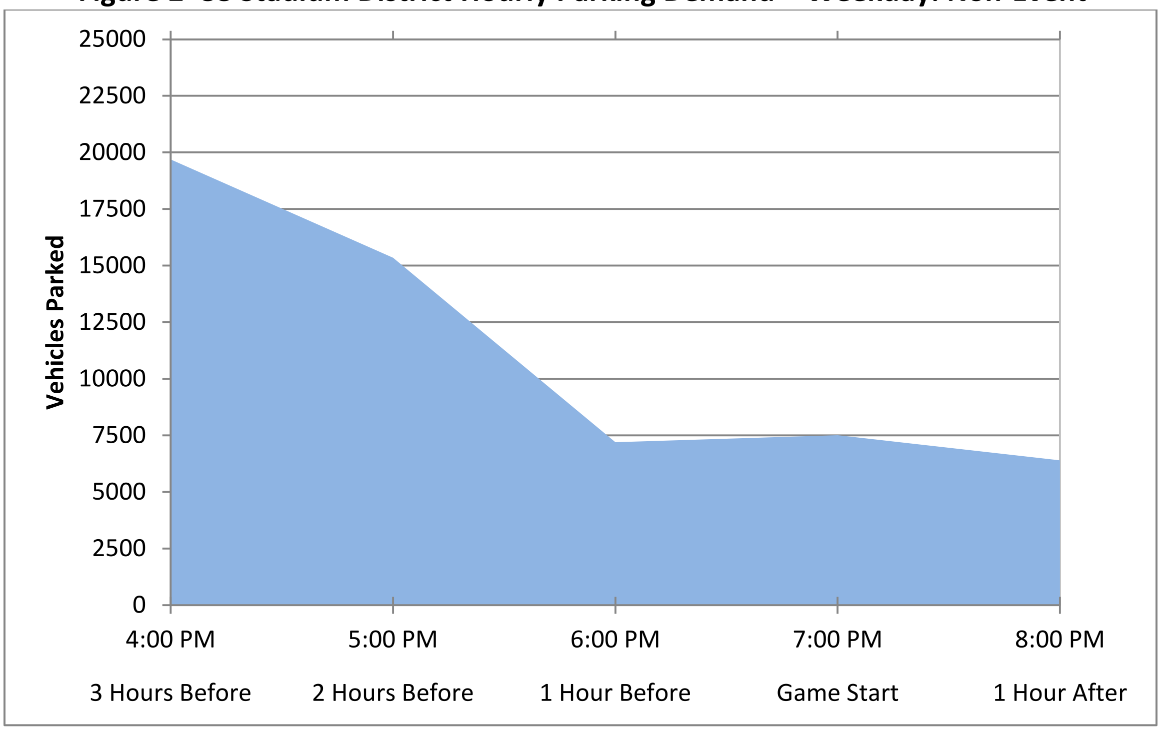


Figure 2–89 Stadium District Hourly Parking Demand – Weekday: Arena Only

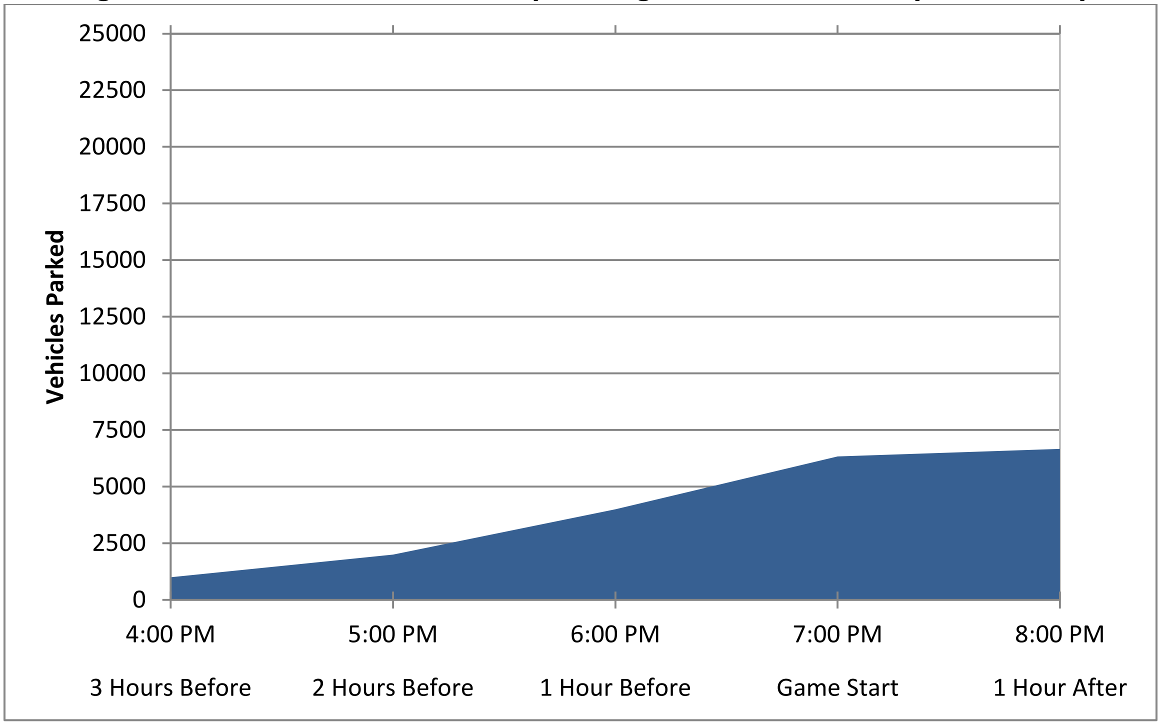
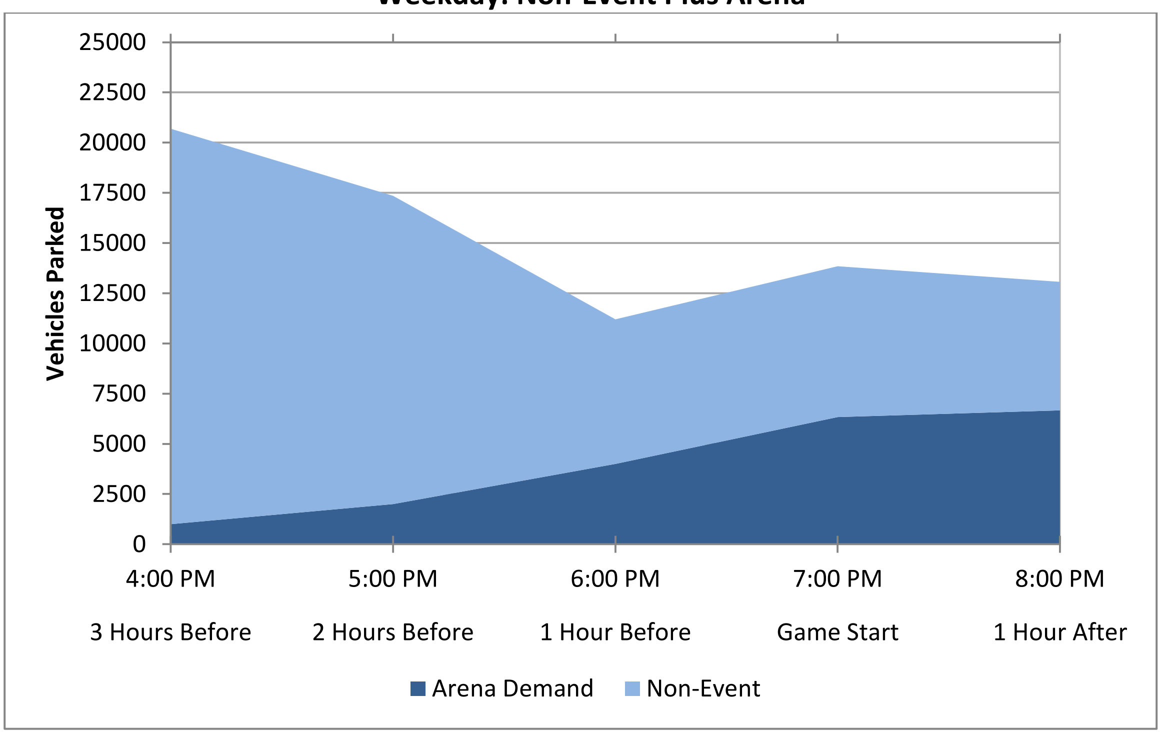


Figure 2–90 Stadium District Hourly Parking Demand – Weekday: Non-Event Plus Arena



Weekend

This same approach was taken for the weekend conditions. Conditions are documented for a Saturday evening, which typically has higher non-event parking demand than occurs on a Sunday. Figure 2–91 illustrates the existing non-event Saturday hourly demand in the study area and shows that parking demand is generally stable with a slight increase between 7:00 and 8:00 PM. Figure 2–92 shows the Arena hourly parking demand for a 7:00 PM event start time. As discussed for the weekday, a majority of vehicles associated with the Arena would be parked by 7:00 PM (start time) with approximately five percent of the vehicles arriving after the game start. Figure 2–93 illustrates the total (non-event plus Arena) hourly parking demand and shows that on weekends the peak occurs at 8:00 PM for a 7:00 PM game.

Figure 2–91 Stadium District Hourly Parking Demand – Existing Weekend: Non-Event

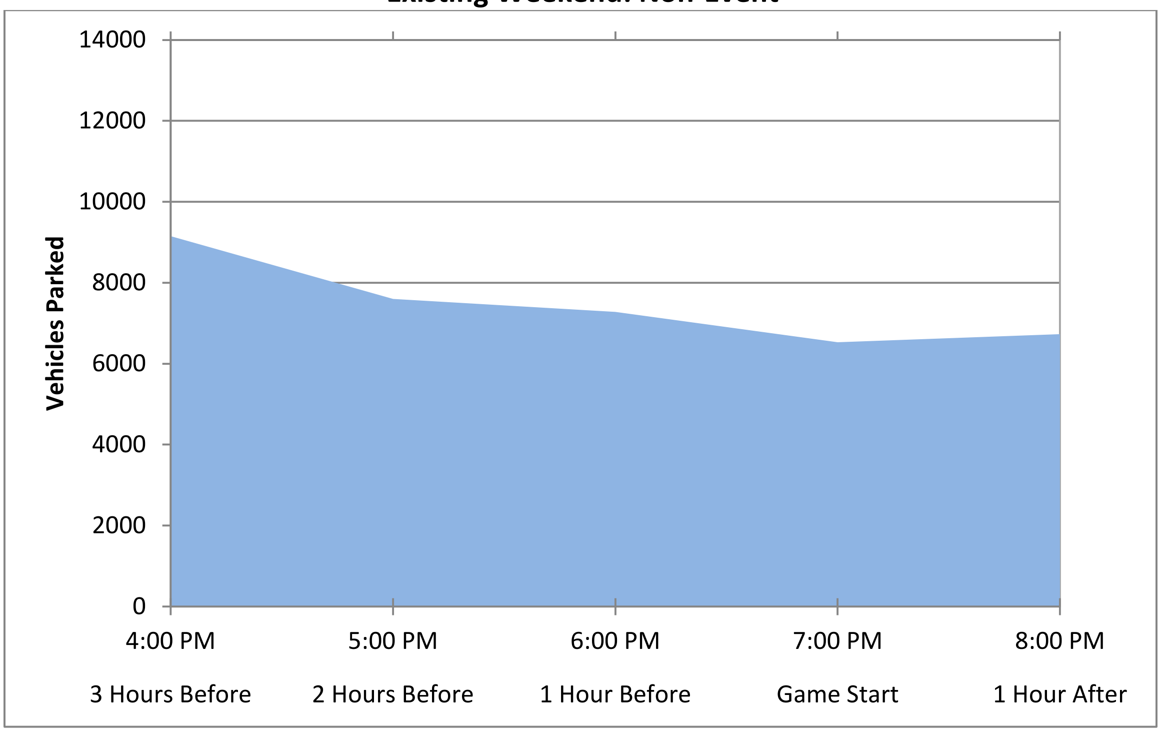


Figure 2–92 Stadium District Hourly Parking Demand - Weekend: Arena Only

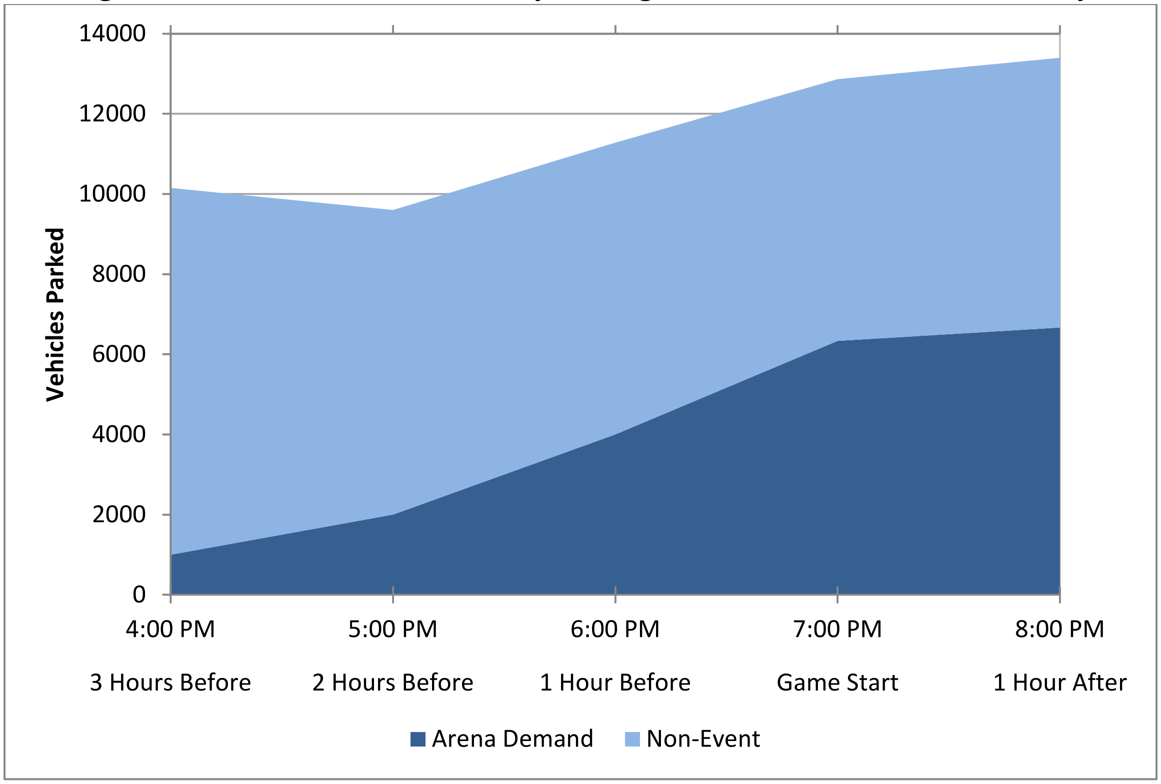
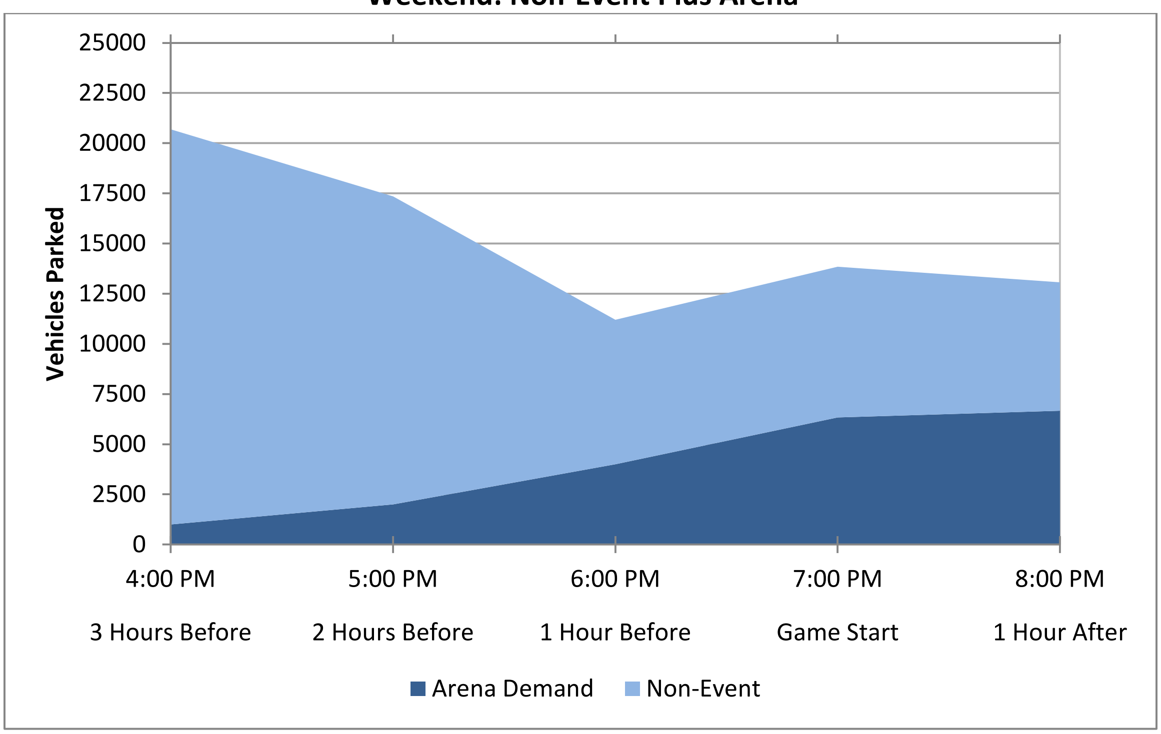


Figure 2–93 Stadium District Hourly Parking Demand –
Weekend: Non-Event Plus Arena



Based on the information presented above, the quantified parking impact illustrations focus on:

- Weekday: 7:00 PM (Game Start) conditions
- Weekend: 8:00 PM (One-Hour After Game Start) conditions

2.8.1.3 Parking Supply Assumptions

For the purposes of this analysis, a single parking supply for both weekday and weekend conditions is used to represent physical availability of parking that is generally open to or that could be made available to the public. The supply includes on-street and off-street parking spaces that are available to the general public and would potentially be available for Seattle Arena event parking. This publicly-available parking supply includes private off-street parking lots and garages that are restricted for employee and customer use, but were observed to be open for event parking during data collection. There is a potential that additional private parking spaces could be available for event parking. The parking supply represents conditions at game start on an event day for both weekday and weekend conditions. Parking supply varies by time of day and day of the week. Factors affecting parking supply include:

- **Time of Day and Day of Week.** Parking in the study area is operated differently depending on the day of the week and the time of day.
    - On-street parking supply is impacted by time and loading zone restrictions. Parking within Pioneer Square, the International District, and CBD is generally two-hour paid parking Monday through Saturday. Pioneer Square and the Stadium District have time limited or paid parking is until 6:00 PM while the International District and CBD have paid parking until 8:00 PM. Near to the Stadium District Site, 1st Avenue S. parking has a one to two-hour time restriction and along S. Holgate Street there is no parking between 1st Avenue S. and 5th Avenue S., but east of 5th Avenue S. there is some unrestricted on-street parking.
    - Many of the study area off-street parking garages close after the commute period (i.e., around 6:00 PM) on weekdays due to limited demand without an event in the Stadium District. These garages are often closed or open limited hours on the weekends.
- **Stadium District Event Conditions.**
    - During an event day, many of the off-street parking lots and garages extend hours of operation. In addition, there are private lots that would otherwise be closed to the public, which allow event parking including the Safeco Field parking garage.

- The existing Stadium District has TCPs, which result in some on-street parking closures during an event[27].

Existing Supply: Parking supply is based on data collected by Transpo Group supplemented by data from the SDOT, the Mariners, and PSRC. Figure 2–94 illustrates the on-and off-street parking within the primary study area.

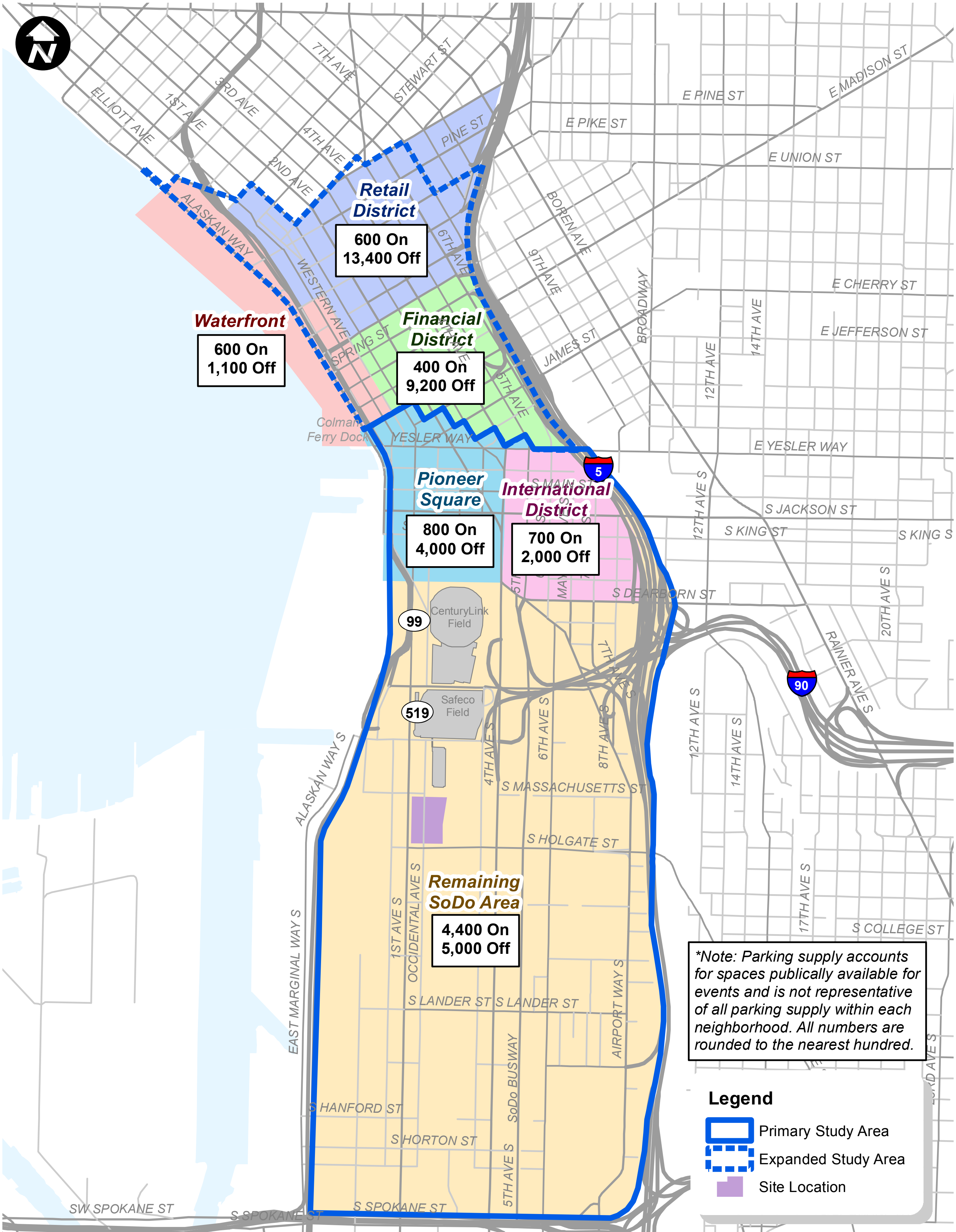
Drivers utilize on- and off-street parking supply differently and these supplies are managed in different ways. On-street parking supply is often more desirable than off-street parking because there is an opportunity to be in close proximity or even adjacent to a driver’s destination. In addition, Seattle on-street hourly parking rates are often less expensive than off-street parking and within the study area on-street parking is free after 6:00 or 8:00 PM (as well as all day Sunday). From 8:00 AM to 6:00 / 8:00 PM when on-street parking has time restrictions (e.g., one- to two-hour time limits), it is used for short-term parking; however, lifting time limits at event start times causes long-term use by event attendees. Given the convenient location and limited cost, on-street parking typically fills first during Stadium District events, which results in limited short-term parking for adjacent businesses. In addition, drivers may circulate through the Stadium District and adjacent neighborhoods to park on-street and save money.

Off-street parking is generally provided for long-term use. During an event a flat rate is usually charged and garages and lots closest to the venue typically have higher rates.

There are approximately 16,900 parking spaces located within the primary study area and an additional 26,100 within the expanded study area for a total of 43,000 parking spaces. The primary study area has approximately 5,900 on-street and 11,000 off-street spaces while the expanded study area has approximately 1,600 on-street and 24,500 off-street spaces.

No Action Supply: The City provided information on future pipeline development that would likely be constructed and occupied by 2018. Key development projects considered in the parking forecasts include the North Lot (north of CenturyLink Field) and Home Plate (southwest corner of 1st Avenue S. and S. Atlantic Street) projects. Based on a review of pipeline projects, approximately 2,300 additional parking spaces will be developed with many potentially available for event parking. Even if all residential and retail parking were reserved, a substantial portion of the office parking would likely be available. However, to be conservative, no additional parking supply was assumed under the No Action Alternative.

[27] The Safeco Field TCP results in approximately 30 parking spaces closed. This was not specifically accounted for in the parking supply; however, there were a number of other conservative assumptions including no increase in parking supply as a result of pipeline development.



Stadium District Existing On- and Off-Street Event Parking Supply

Seattle Arena

FIGURE
2-94

transpoGROUP

Action Alternative Supply: Development on the Stadium District site would displace several businesses including approximately 400 event parking spaces. This would result in approximately 16,500 parking spaces within the primary study area and 26,100 spaces in the expanded study area for a total of 42,600 spaces.

The following sections describe the existing and 2018 parking demand for the primary and expanded study areas. No additional analysis is provided for the 2030 parking conditions. Accurately forecasting long-term parking demand is difficult given the uncertainty of area wide development and economic drivers. In addition, changes to parking policies relate to TDM may continue to evolve. With the continued investments in transit (i.e., light rail, streetcar, etc.) by 2030, it is anticipated that there will be a continued mode shift from auto to transit. This will result in a lower overall parking demand. Given this, overall parking impacts for Cases S1, S2, and S3 may be less than described herein for 2030 depending on the amount and type of redevelopment that occurs.

2.8.2 Affected Environment

Parking demand is based on data collected by Transpo Group supplemented by data from the SDOT, the Mariners, and PSRC. To understand how an event in the Stadium District affects parking availability, parking demand was inventoried during a Mariners games on Thursday, April 11 and Saturday, April 13, 2013. The following describes the existing weekday and weekend parking demand within the primary and expanded study areas.

2.8.2.1 Weekday Occupancy

Figure 2–95 through Figure 2–98 illustrates weekday non-event and event parking occupancy within the primary and expanded study areas.

Figure 2–95 Stadium District Parking Occupancy – Weekday: Existing Non-Event (Primary Study Area)

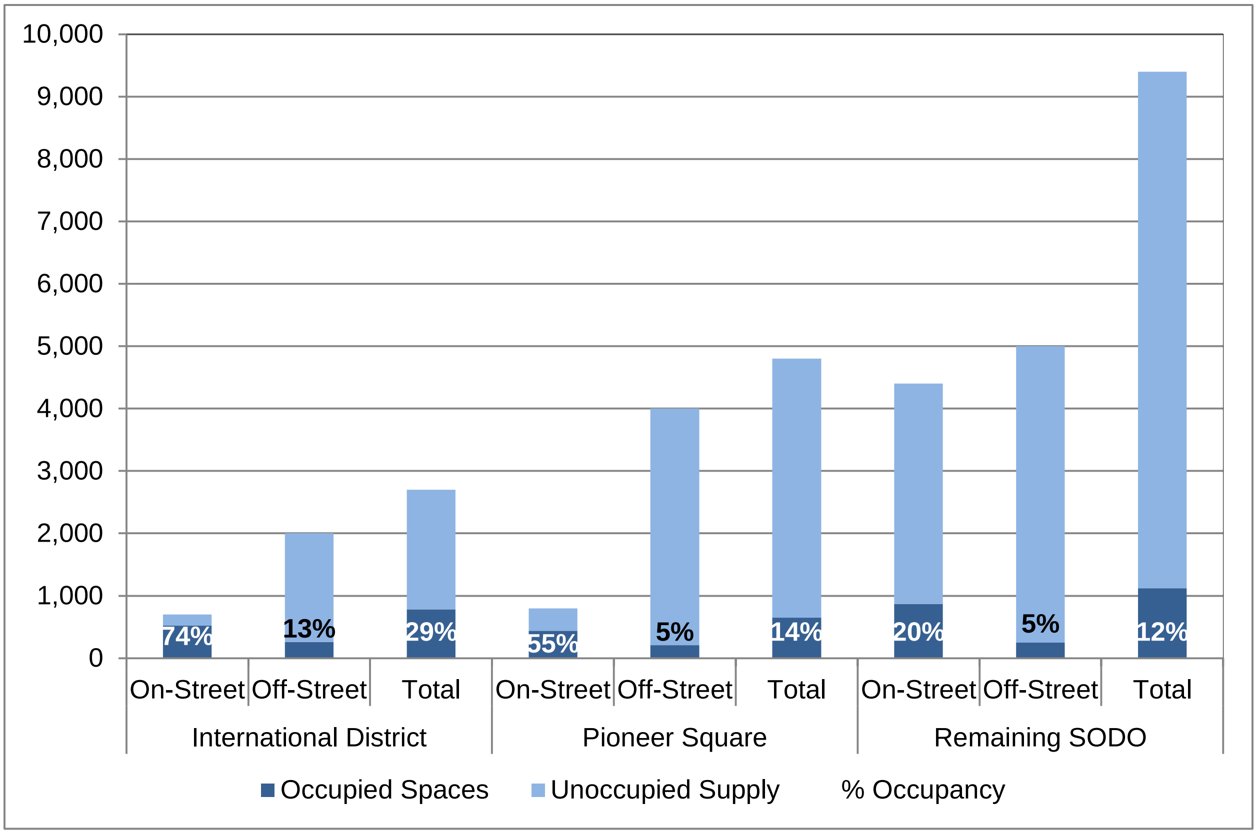


Figure 2–96 Stadium District Parking Occupancy – Weekday: Existing Non-Event (Expanded Study Area)

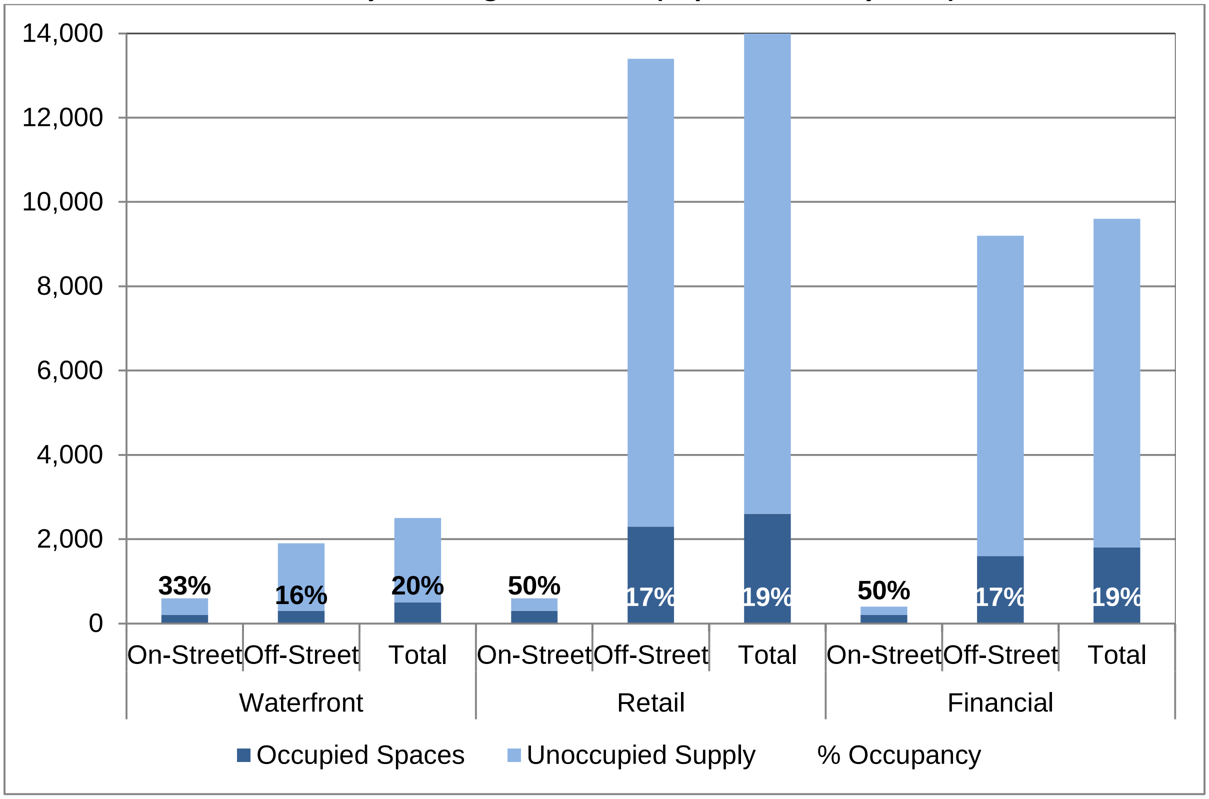


Figure 2–97 Stadium District Parking Occupancy –
Weekday: Existing With Event, 22,900 Attendance (Primary Study Area)

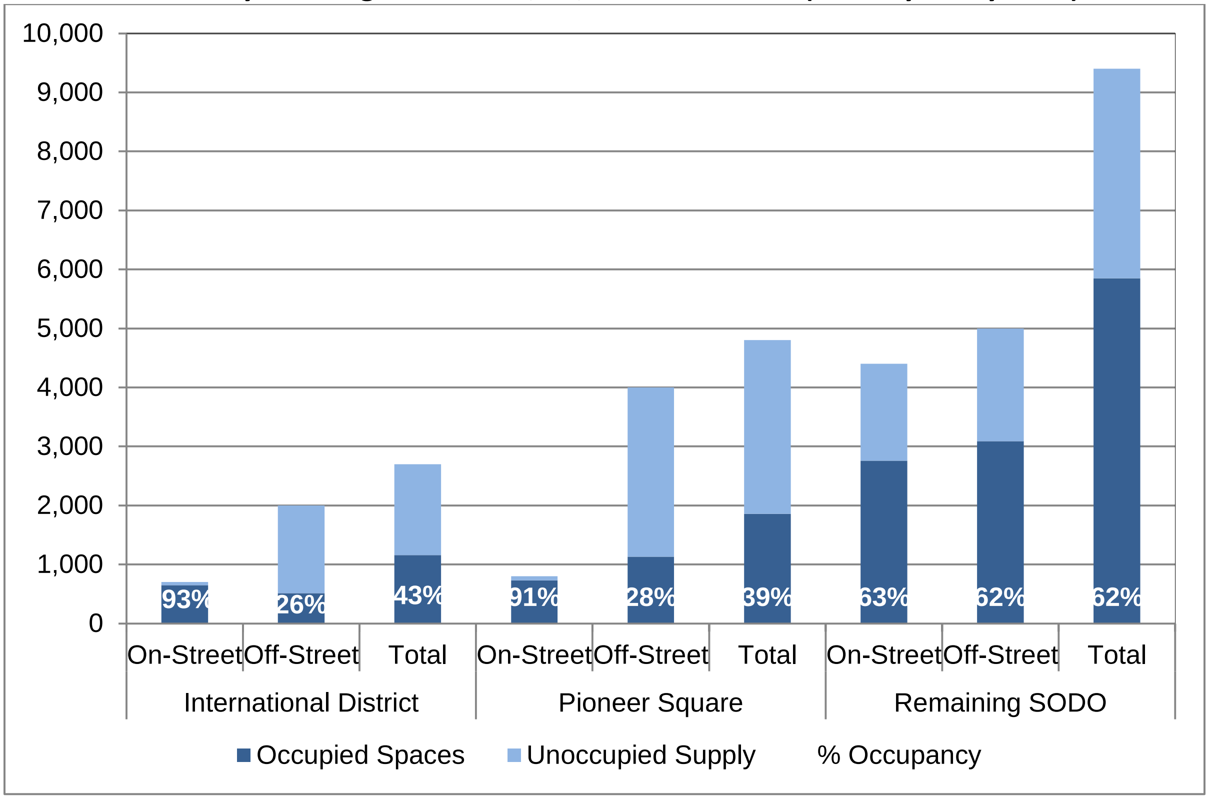
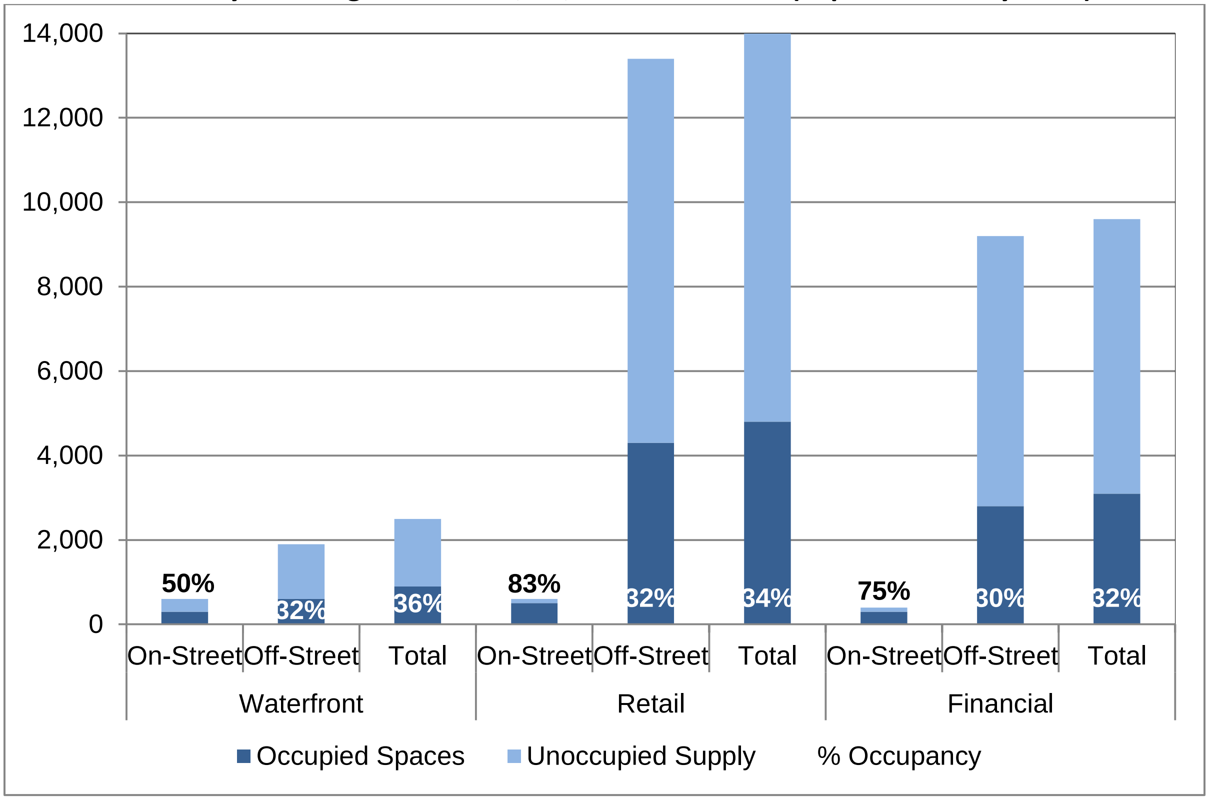


Figure 2–98 Stadium District Parking Occupancy –
Weekday: Existing With Event, 22,900 Attendance (Expanded Study Area)



It becomes difficult to locate parking spaces within an area when occupancies are 85 to 90 percent and generally areas with occupancies at that level are considered "full." As shown in the figures above:

- Non-event occupancies are generally low within both the primary and expanded study areas. Higher occupancy levels are found on-street especially in the International District and Pioneer Square neighborhoods as well as the retail area of the CBD where there are night activities such as restaurants and bars.
- During an event, overall occupancy increases within both the primary and expanded study areas with greater increases near Safeco Field within the primary study area.
- On-street parking becomes "full" within an event in both the International District and Pioneer Square neighborhoods.
- Field observations showed that on-and off-street facilities in the immediate vicinity of Safeco Field were full with a Mariners game. The figures show that there is additional parking within both the primary and expanded study areas; however, this parking is generally located in areas that are further from Safeco Field.

2.8.2.2 Weekend Occupancy

Figure 2–99 through Figure 2–102 illustrates weekend non-event and event parking occupancy within the primary and expanded study areas.

Figure 2–99 Stadium District Parking Occupancy – Weekend: Existing Non-Event (Primary Study Area)

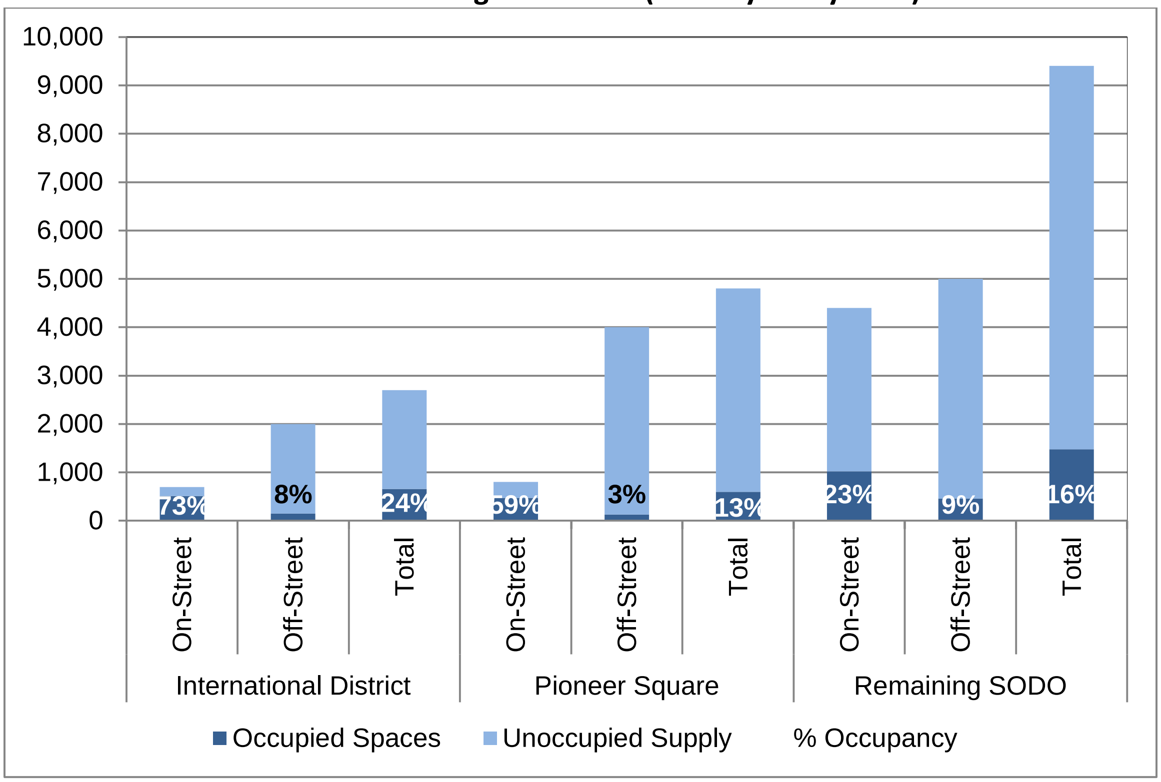


Figure 2–100 Stadium District Parking Occupancy –
Weekend: Existing Non-Event (Expanded Study Area)

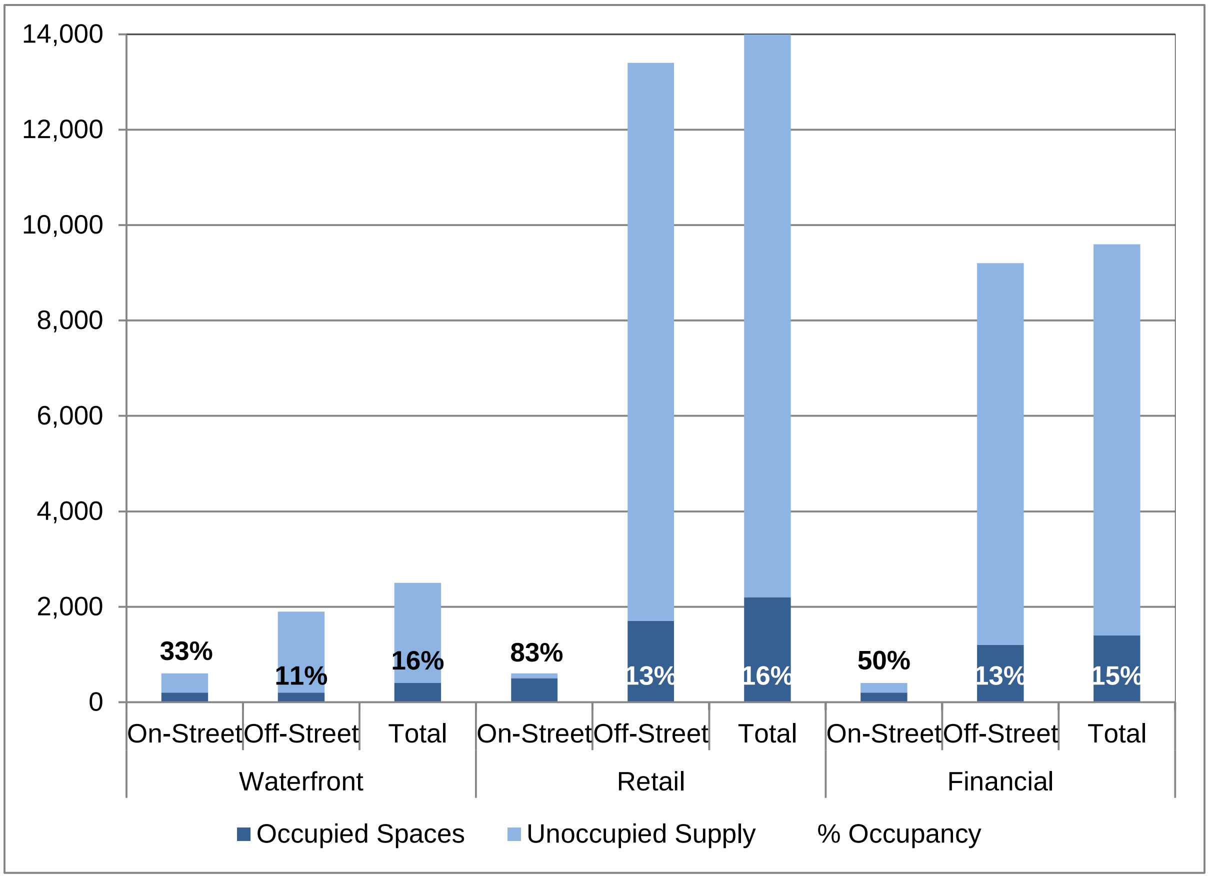


Figure 2–101 Stadium District Parking Occupancy – Weekend: Existing With Event, 23,500 Attendance (Primary Study Area)

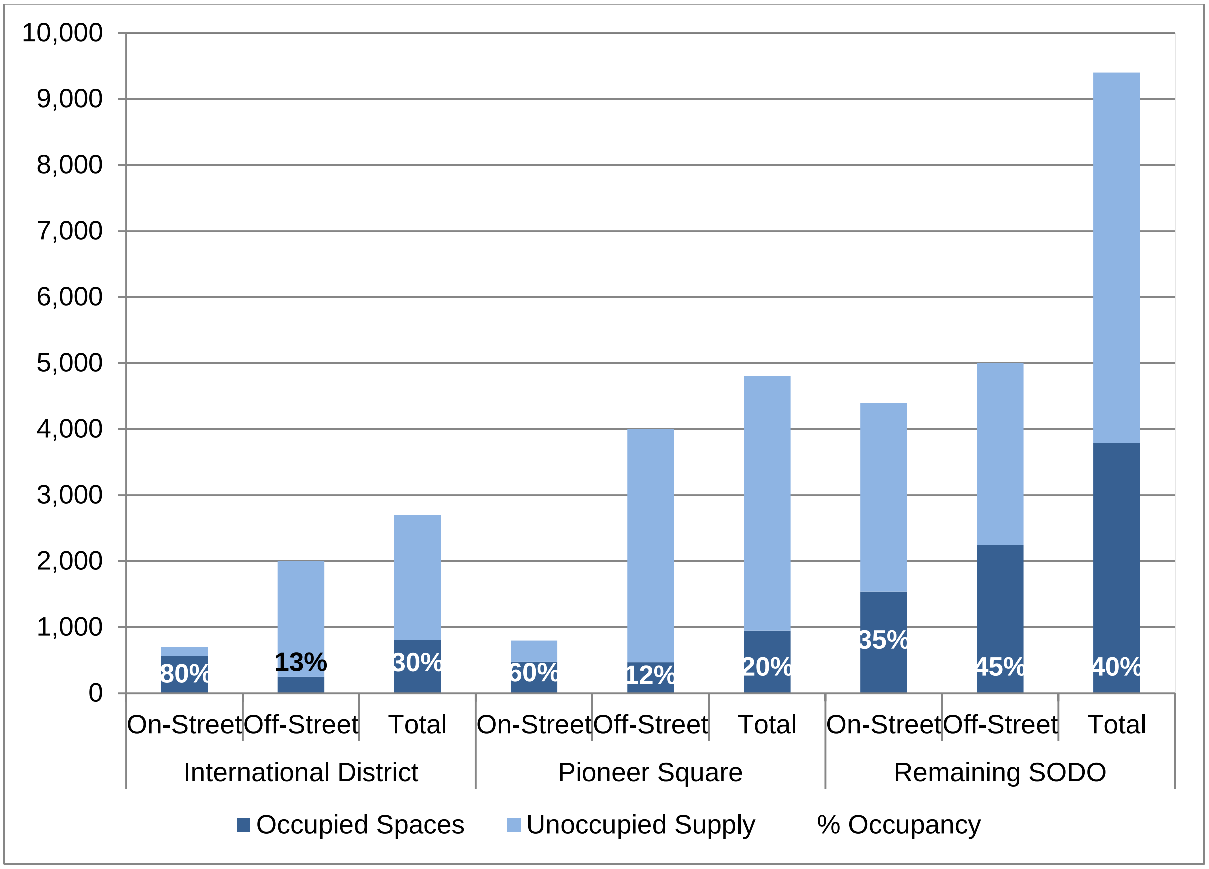
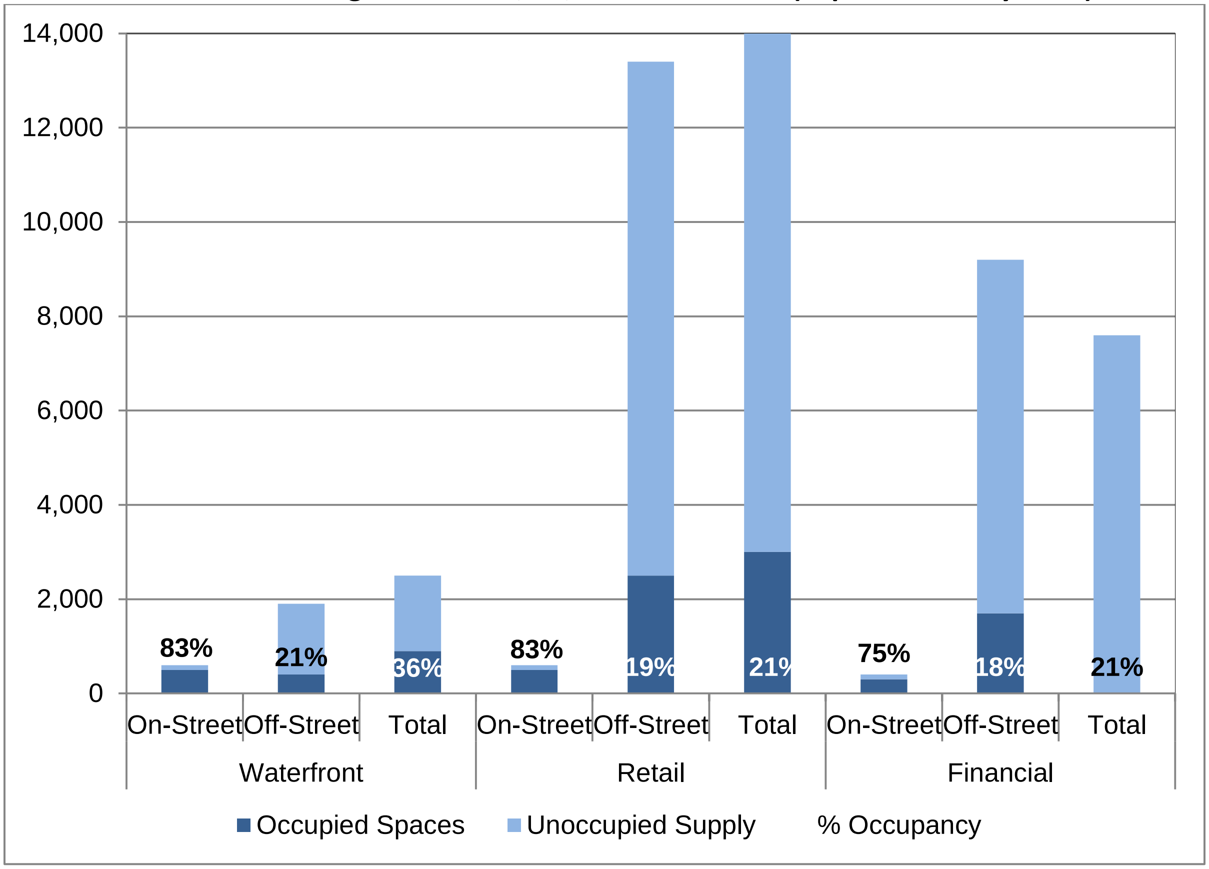


Figure 2–102 Stadium District Parking Occupancy – Weekend: Existing With Event, 23,500 Attendance (Expanded Study Area)



As shown in the figures above:

- Non-event occupancies for the weekend are similar to a weekday where occupancy levels are below 85 percent and higher occupancies are found on-street.
- During an event, overall occupancy increases within both the primary and expanded study areas with greater increases near Safeco Field within the primary study area.
- Field observations showed that on-and off-street facilities in the immediate vicinity of Safeco Field were full with a Mariners game. The figures show that there is additional parking within both the primary and expanded study areas; however, this parking is generally located in areas that are further from Safeco Field.
- Although the weekend game attendance was slightly higher than the weekday, weekend event occupancies are generally lower than weekdays. The lower weekend occupancy is likely a result of a lower overall non-event parking demand on weekends.

2.8.3 Impacts of No Action Alternative

The Affected Environment provides context related to on-and off-street parking supply; however, projecting specifically where someone would park is difficult because the location depends on a variety of factors such as duration of stay, proximity to use, cost of parking, etc. Given the uncertainty around specific parking behavior, the review of future conditions considers the parking supply as a whole rather than separate consideration of on-and off-street parking.

2.8.3.1 Demand Forecasts

As described in the methodology portion of this section, the City provided information on future pipeline development that would likely be constructed and occupied by 2018. For purposes of this analysis and taking into account known development, the existing non-event parking demand was increased by 10 percent on the weekdays and 5 percent on the weekends for the overall study area. The majority of this increased demand was allocated to SoDo and the CBD where most of the pipeline projects would be located.

For the No Action Case S2 and S3, parking demand for the Mariners and Event Center was added to the non-event conditions. It was assumed that the arrival curve for these events would be consistent with that shown on Figure 1–5 with 95 percent arrival by 7:00 PM and 100 percent by 8:00 PM (assuming a 7:00 PM event start). The distribution of parking among neighborhoods assumed 80 percent within the primary study area, which is closest to the venues and the remaining 20 percent within the CBD. The No Action parking demand Case S2 and S3 was determined by adding the Mariners and Event Center parking demand to the No Action Case S1 parking demand, simply a layering process, with no adjustments or reductions in non-event demand.

2.8.3.2 Weekday Occupancy

Figure 2–103 through Figure 2–108 illustrate weekday No Action Case S1, S2, and S3 parking occupancy within the primary and expanded study areas.

Figure 2–103 Stadium District Parking Occupancy – Weekday: No Action Case S1 (Primary Study Area)

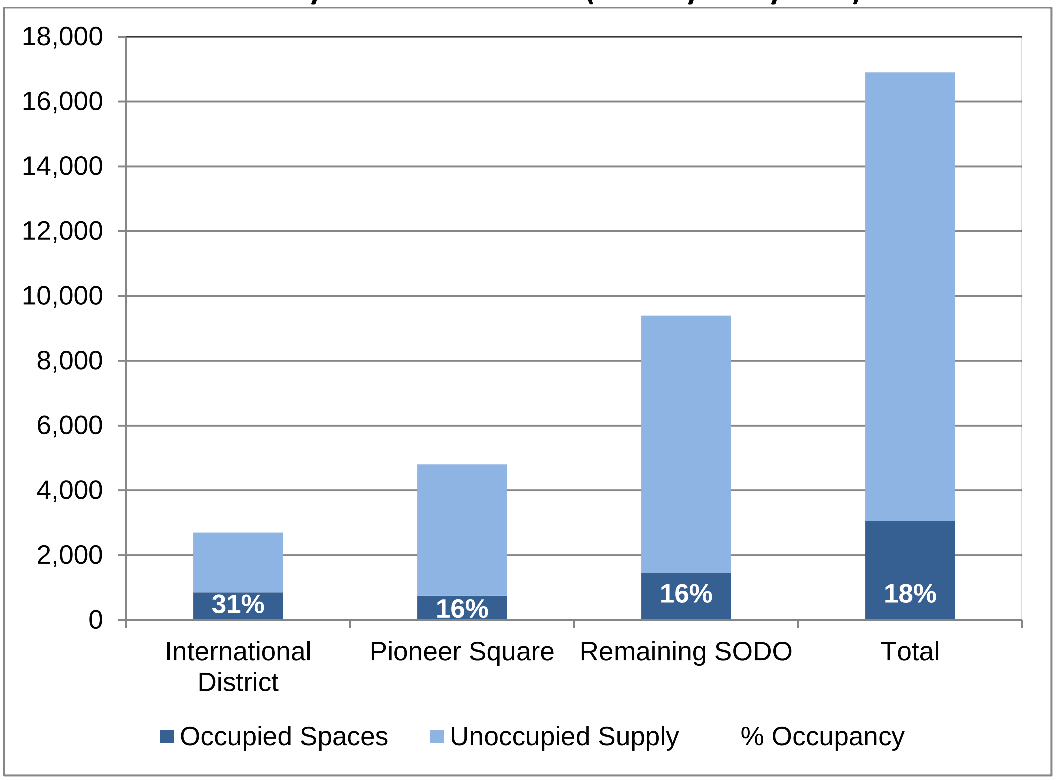


Figure 2–104 Stadium District Parking Occupancy – Weekday: No Action Case S1 (Expanded Study Area)

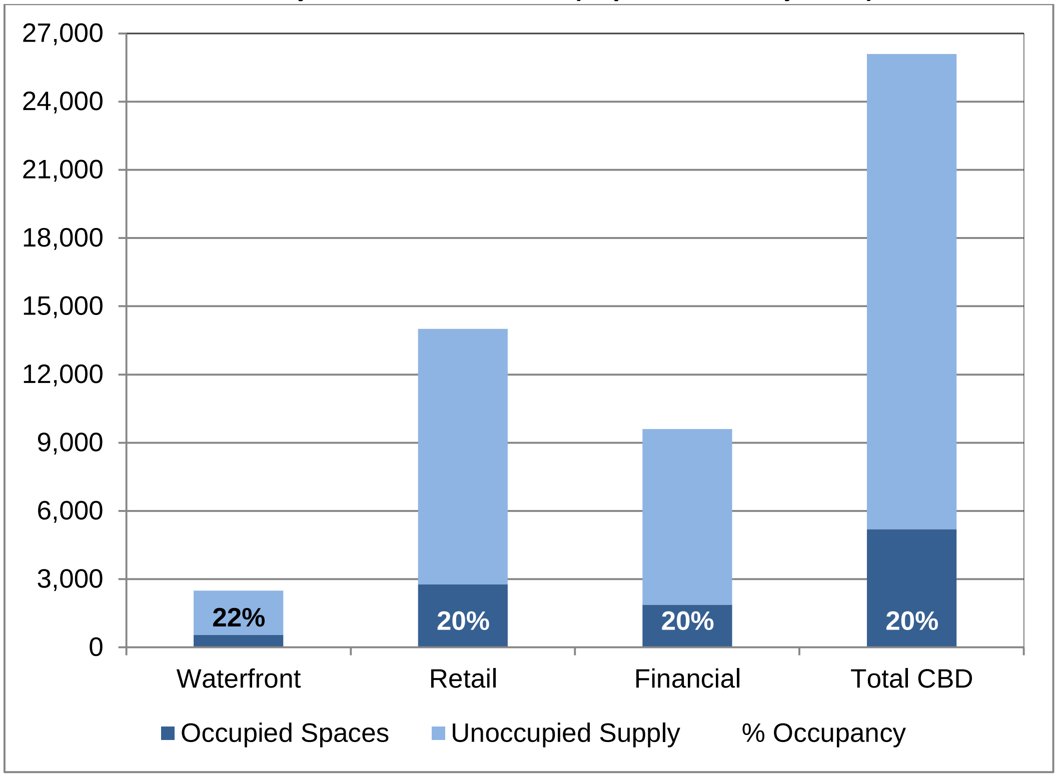


Figure 2–105 Stadium District Parking Occupancy – Weekday: No Action Case S2 (Primary Study Area)

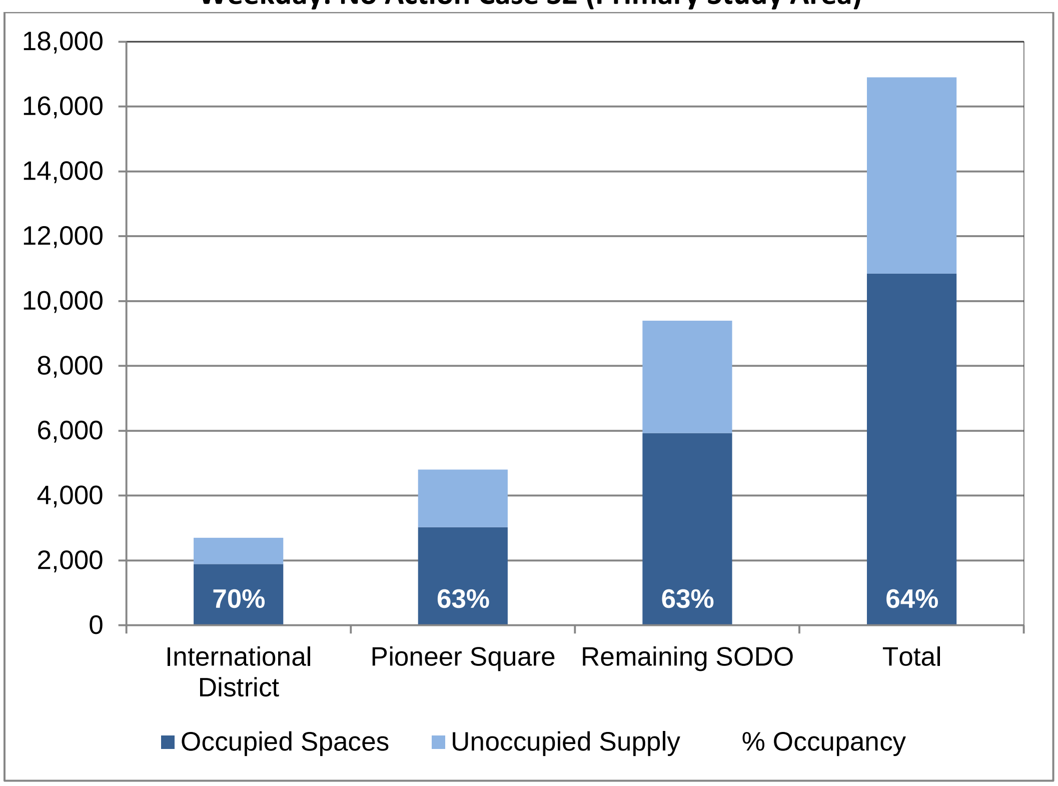


Figure 2–106 Stadium District Parking Occupancy – Weekday: No Action Case S2 (Expanded Study Area)

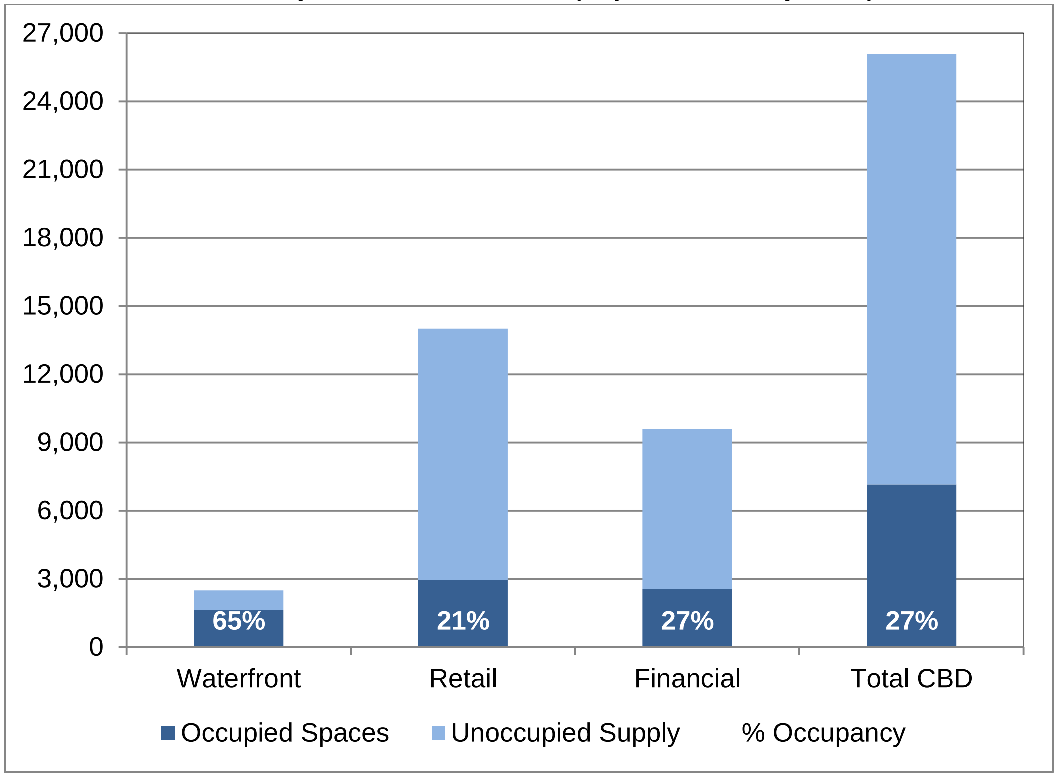


Figure 2–107 Stadium District Parking Occupancy – Weekday: No Action Case S3 (Primary Study Area)

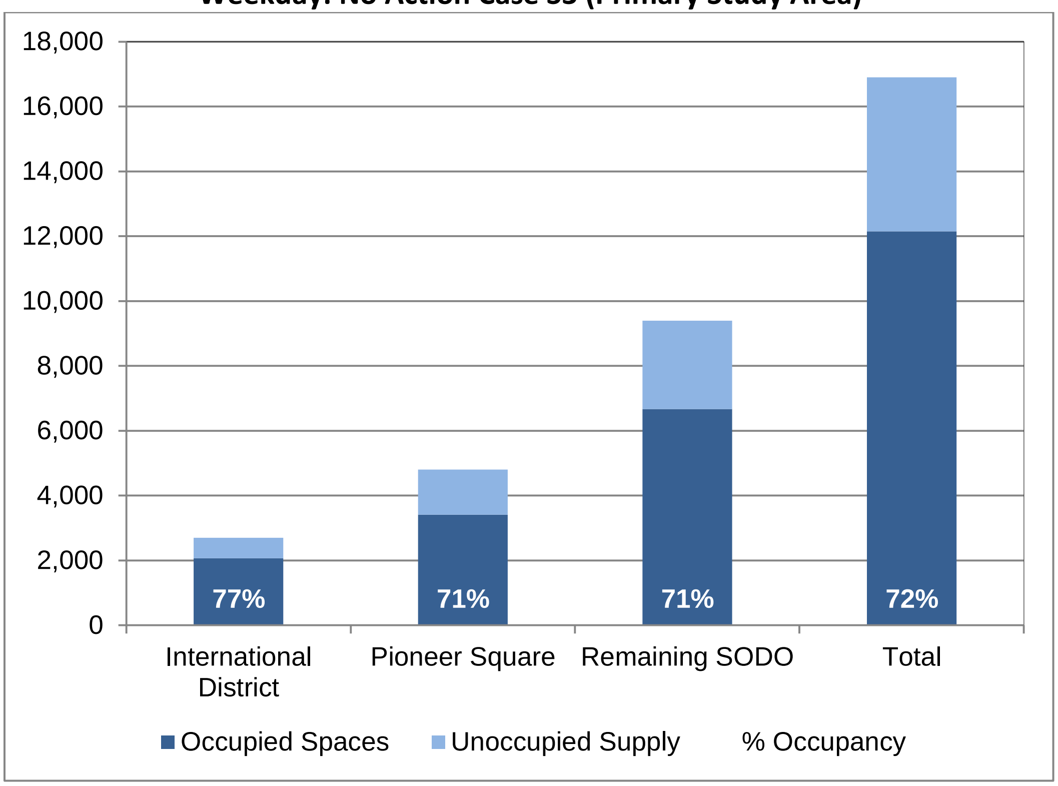
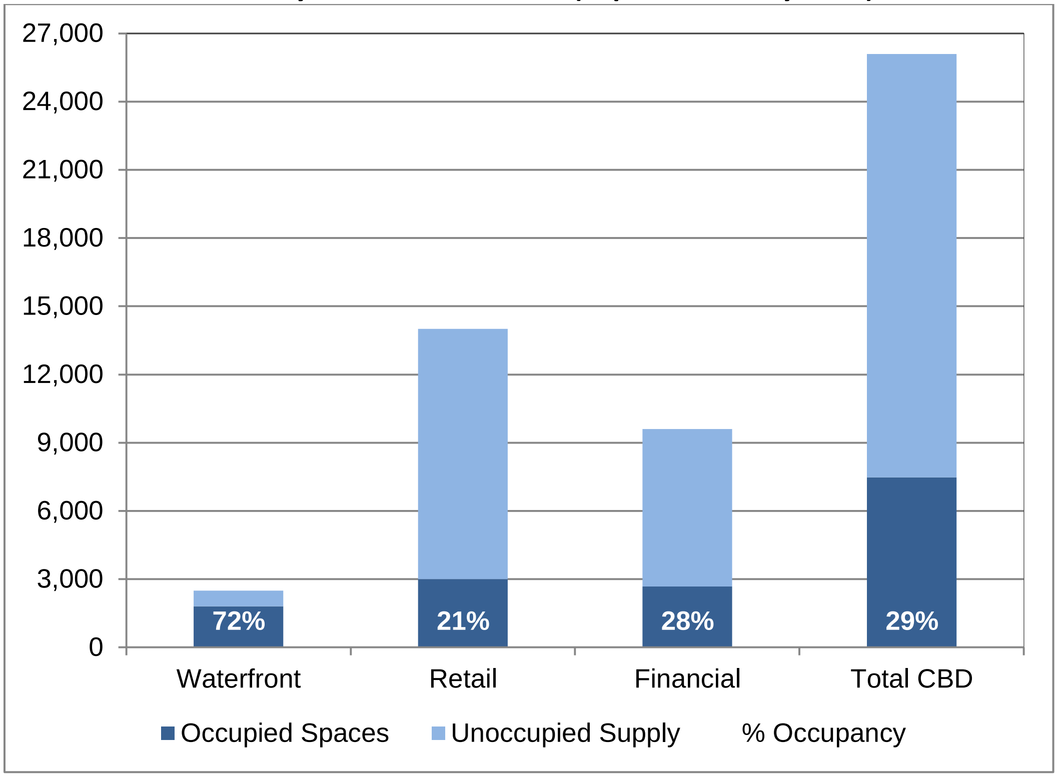


Figure 2–108 Stadium District Parking Occupancy – Weekday: No Action Case S3 (Expanded Study Area)



As shown in the figures above:

- No Action Case S1 occupancies in the primary study area are higher than existing conditions as a result of anticipated development primarily in the Pioneer Square and SoDo areas.
- For the No Action Case S2, representing a Mariners event totaling 40,500 attendees, parking utilization is substantially higher than observed for the Mariner game with approximately 20,000 attendees.
- Parking utilization in the International District and Pioneer Square neighborhoods would continue to increase with the single and dual event conditions.
- Overall primary study area occupancies are calculated to be 60 to 80 percent for the event cases and the utilization of parking would continue to be concentrated around the event venues themselves.
- Parking occupancies for the CBD would be generally very low except for the Waterfront (65 to 72 percent), which is the most proximate area to the Stadium District.

Looking at the primary and expanded study area in combination, the overall parking occupancy of the potential supply would be approximately 20 percent for No Action Case S1, 40 percent for Case S2, and 45 percent for Case S3 indicating parking is available; however, it may not be in preferred locations depending on where visitors are going.

2.8.3.3 Weekend Occupancy

Figure 2–109 through Figure 2–114 illustrate weekday No Action Case S1, S2, and S3 parking occupancy within the primary and expanded study areas.

Figure 2–109 Stadium District Parking Occupancy – Weekend: No Action Case S1 (Primary Study Area)

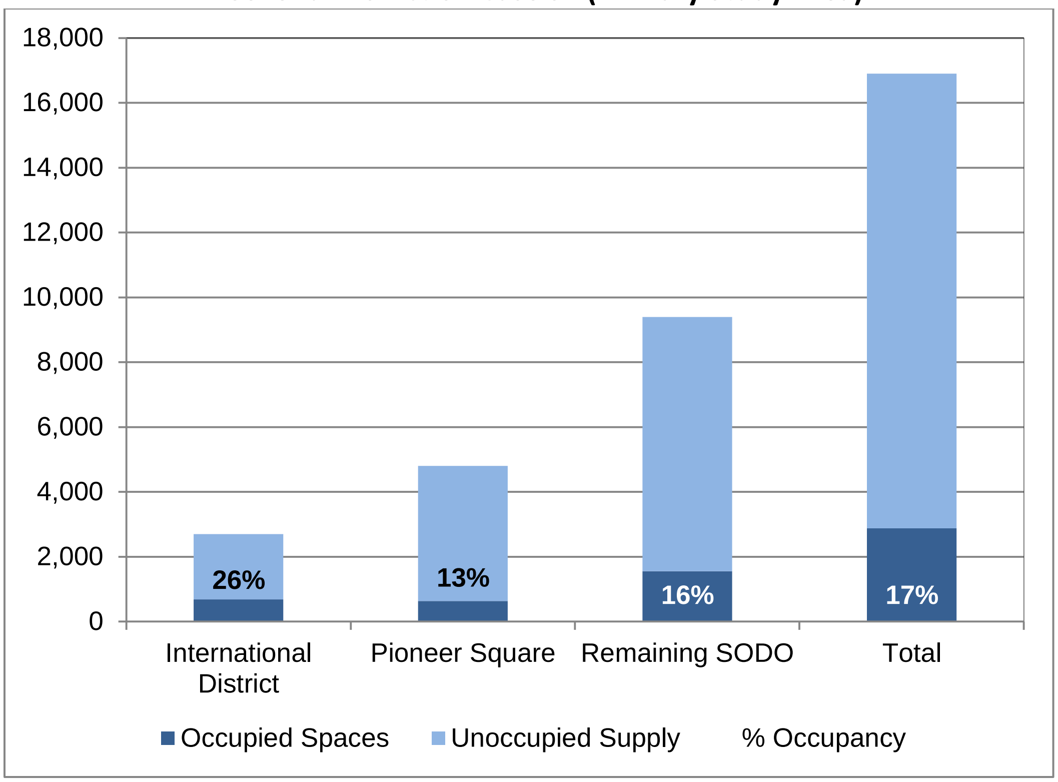


Figure 2–110 Stadium District Parking Occupancy – Weekend: No Action Case S1 (Expanded Study Area)

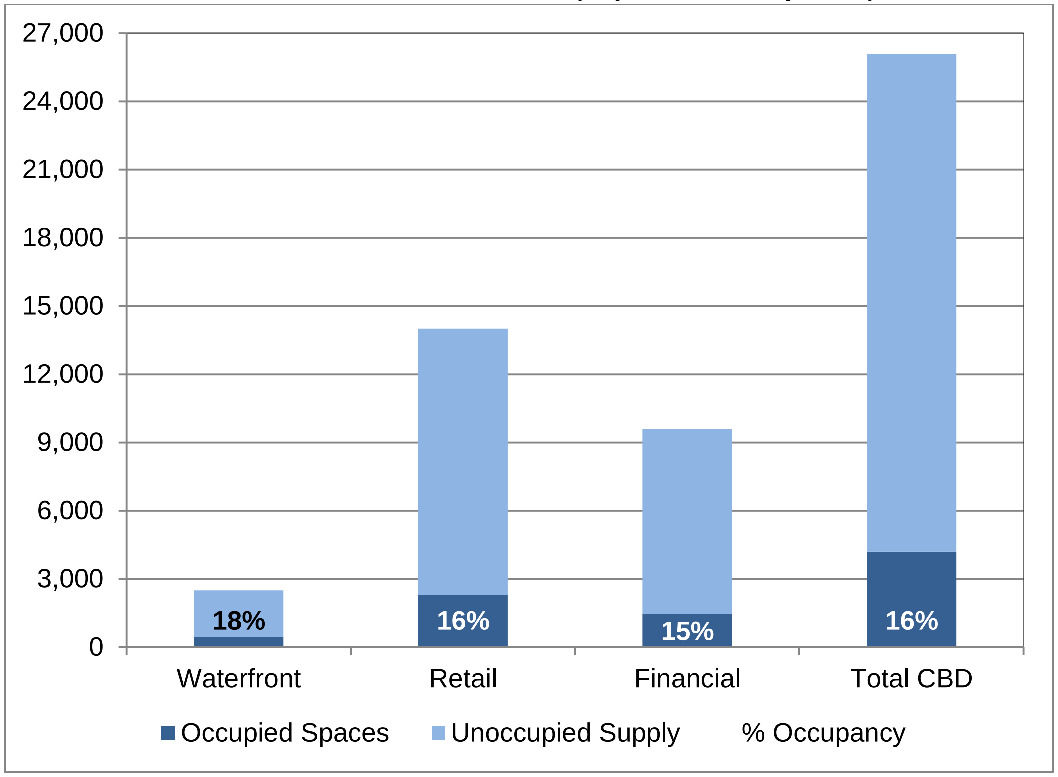


Figure 2–111 Stadium District Parking Occupancy – Weekend: No Action Case S2 (Primary Study Area)

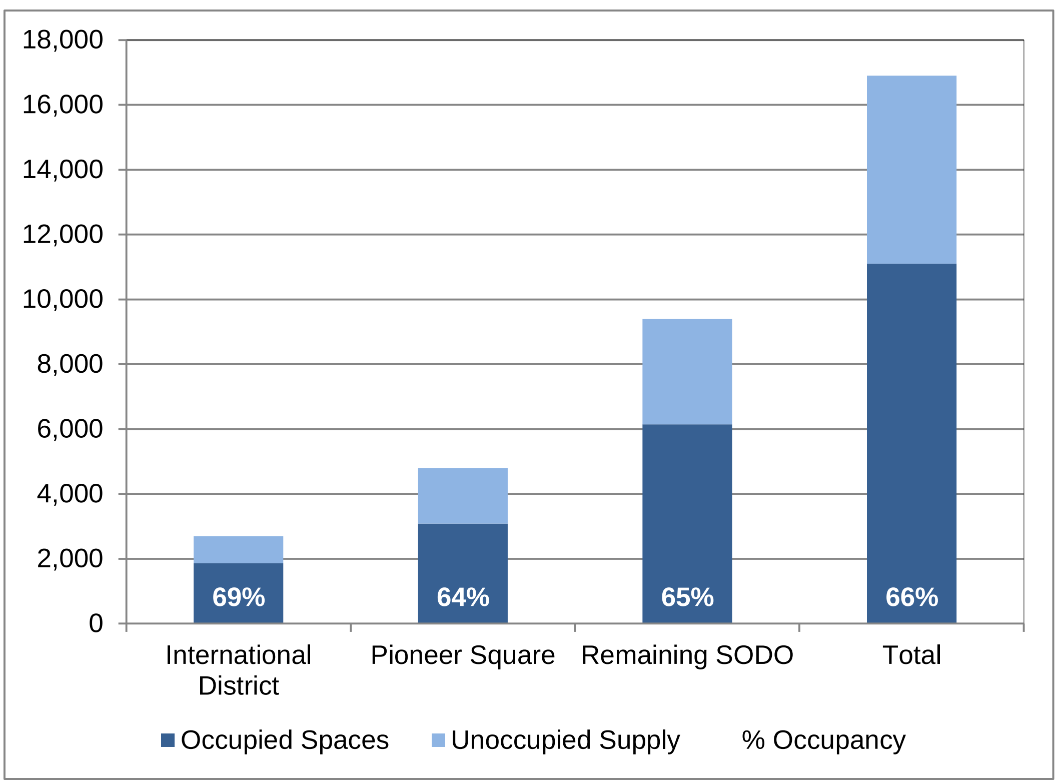


Figure 2–112 Stadium District Parking Occupancy – Weekend: No Action Case S2 (Expanded Study Area)

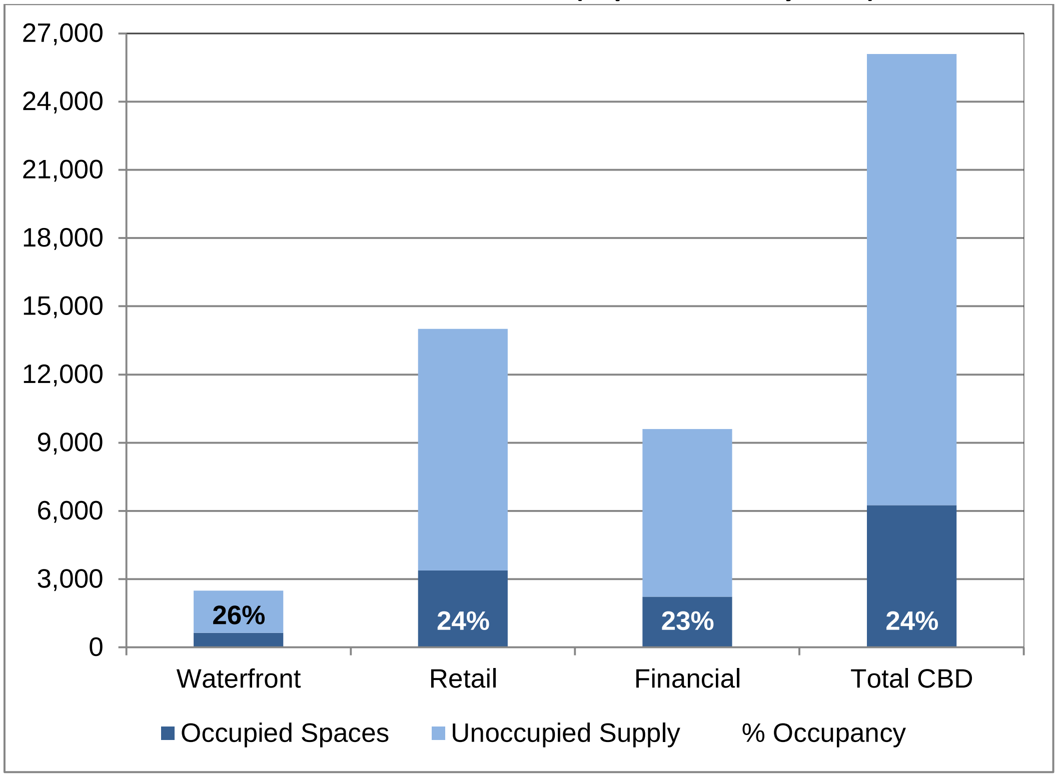


Figure 2–113 Stadium District Parking Occupancy – Weekend: No Action Case S3 (Primary Study Area)

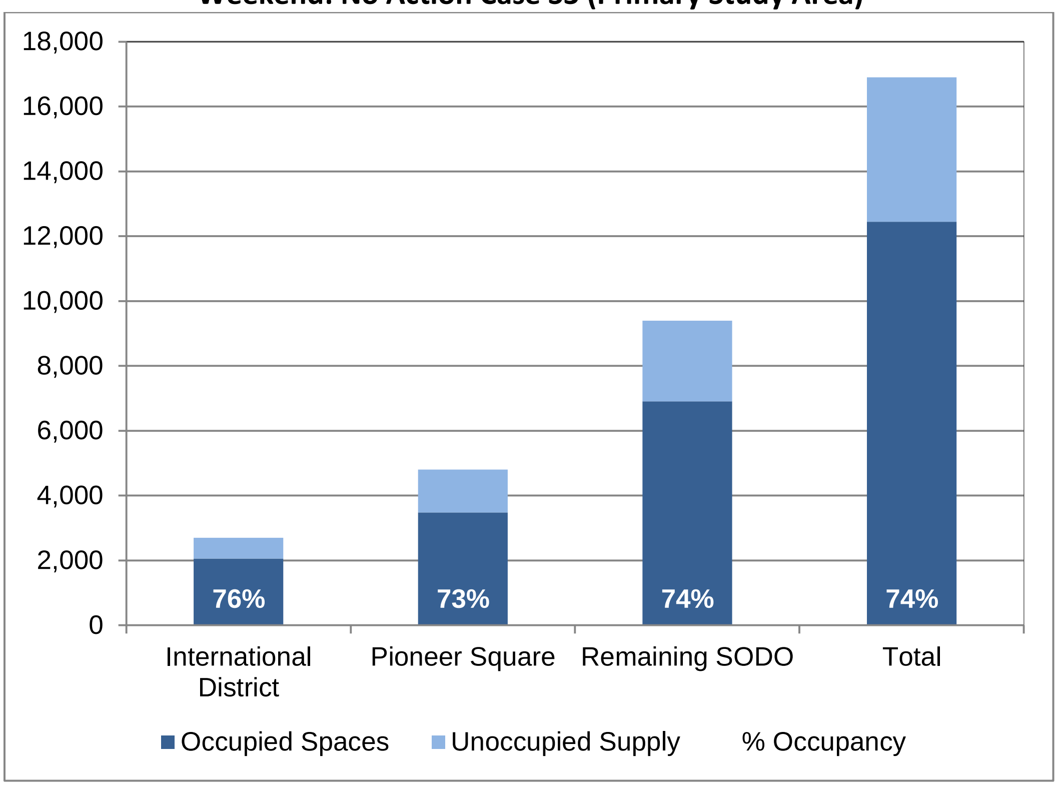
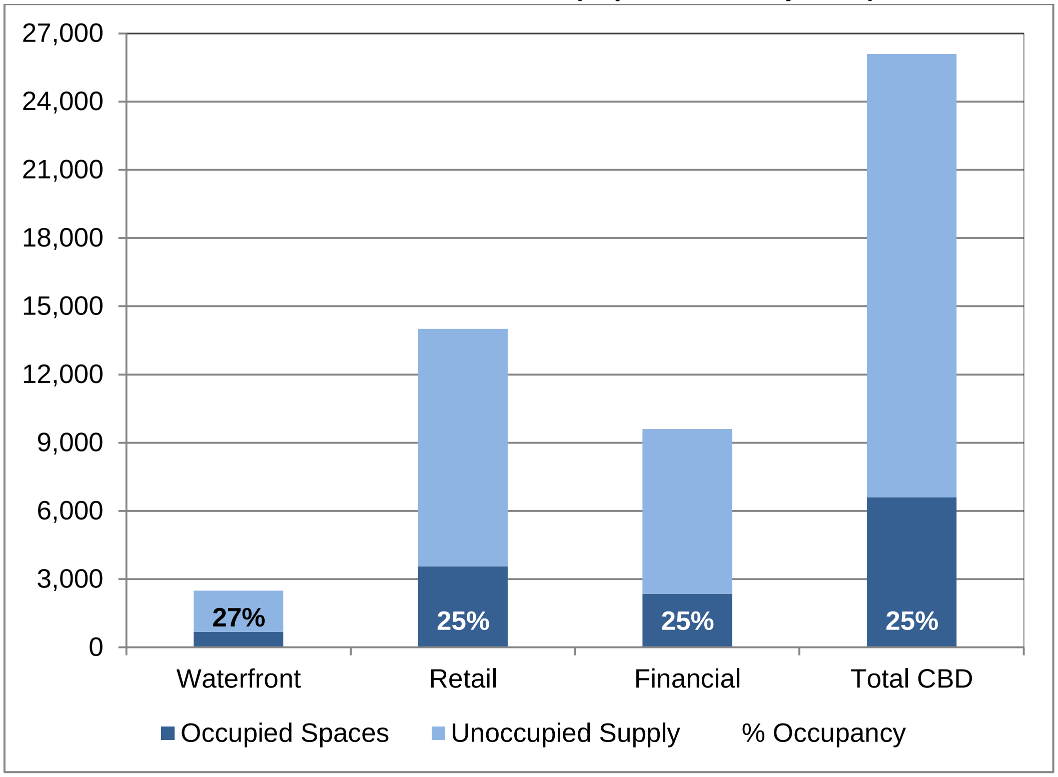


Figure 2–114 Stadium District Parking Occupancy – Weekend: No Action Case S3 (Expanded Study Area)



As shown in the figures above:

- No Action Case S1 occupancies in the primary study area are similar to existing conditions with only slight increases as a result of the anticipated future development.
- For the No Action Case S2 condition, representing a Mariners event totaling 40,500 attendees, parking utilization is substantially higher than observed for the Mariner game with approximately 20,000 attendees.
- Compared to weekday, the weekend No Action Case S2 and S3 occupancies are lower within both the primary and expanded study areas as a result of lower non-event demands. The lower weekend non-event demands within the primary study area allows for more event-related parking to occur within this area.
- Parking utilization in the International District and Pioneer Square neighborhoods would continue to increase with the single and dual event conditions.
- Overall primary study area occupancies are calculated to be 60 to 80 percent for the event cases and the utilization of parking would continue to be concentrated around the event venues themselves.

- Parking occupancies for the CBD would be lower than weekday conditions given the ability to accommodate more of the event parking demand within the primary study area.

Looking at the primary and expanded study area in combination, the overall parking occupancy of the potential supply would be approximately 15 percent for No Action Case S1, 40 percent for Case S2, and 45 percent for Case S3 indicating parking is available; however, parking may not be in preferred locations depending on where visitors are going.

2.8.4 Impacts of Alternative 2

Parking impacts related to construction would be minimized by providing off-street parking, securing parking in near-by garages, as well as encouraging use of alternative modes. It is anticipated that parking impacts related to construction would be less than the 20,000-seat Seattle Arena. In addition, construction activities could result in the need to close on-street parking adjacent to the site. These closures would be coordinated with SDOT and appropriate notice and signs would be provided.

Alternative 2 is compared to the No Action Alternative to identify parking impacts of the Seattle Arena.

2.8.4.1 Arena Demand Forecasts

Alternative 2 parking demand represents an Arena event with an attendance of 20,000 people assuming the event arrival patterns described on Figure 1–5. Based on the arrival curve, 95 percent of the attendee arrivals occur by 7:00 PM and 100 percent by 8:00 PM. Similar to the No Action, 80 percent of the parking was assumed within the primary study area, which is closest to the venues and the remaining 20 percent within the expanded study area or CBD. For the multi-event scenarios (Cases S2 and S3), the parking demand of the combined events exceeds the parking supply within the primary study area; therefore, for these cases, it is assumed parking would occur within the closer neighborhoods until an approximately 90 percent utilization is reached and the remaining parking would occur within the CBD. The total Alternative 2 parking demand for each event case is determine by adding the Seattle Arena parking demand to the No Action Case S1, S2, and S3. A simple layering process was used with no adjustments or reductions in non-event demand.

2.8.4.2 Weekday Occupancy

Figure 2–115 through Figure 2–120 provide a comparison between the No Action and Alternative 2 event cases within the primary and expanded study areas.

Figure 2–115 Stadium District Parking Occupancy – Weekday: No Action and Alternative 2 Case S1 (Primary Study Area)

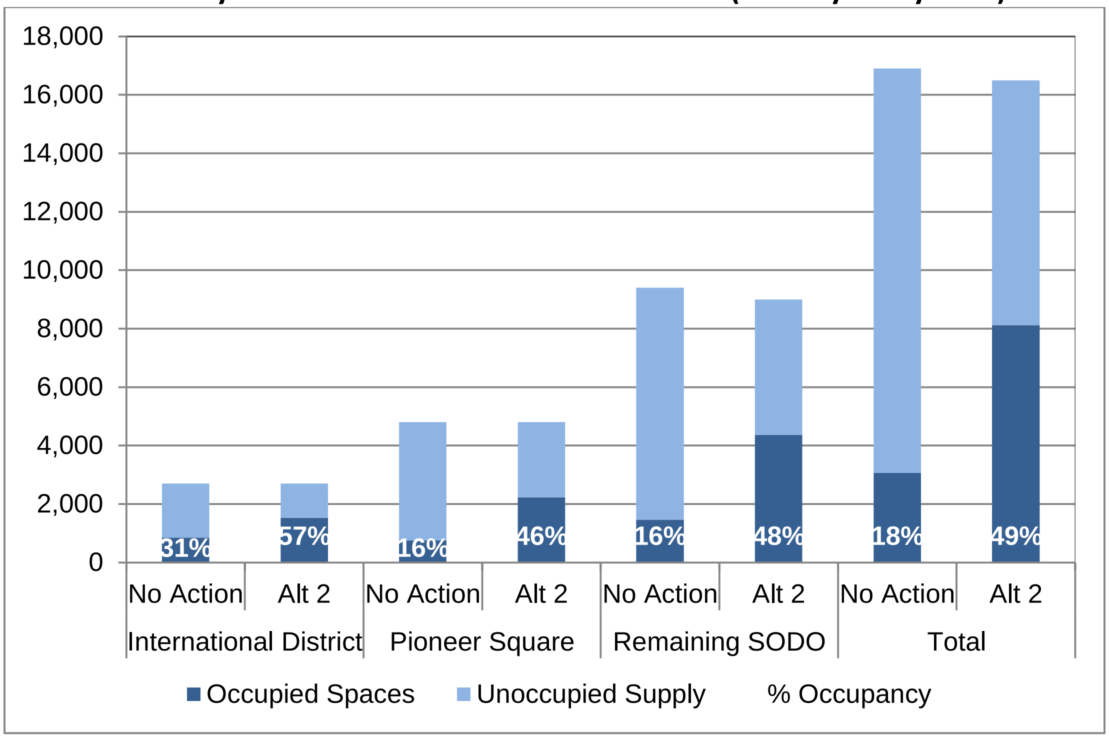


Figure 2–116 Stadium District Parking Occupancy – Weekday: No Action and Alternative 2 Case S1 (Expanded Study Area)

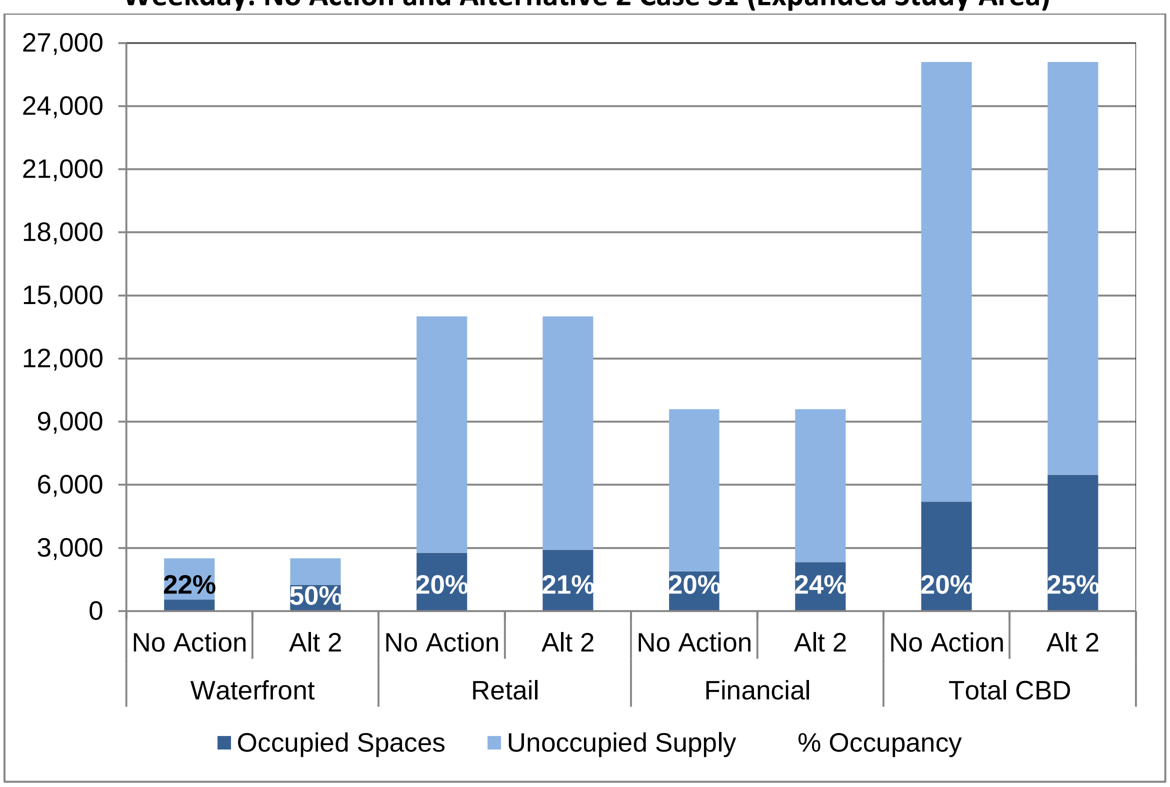


Figure 2–117 Stadium District Parking Occupancy – Weekday: No Action and Alternative 2 Case S2 (Primary Study Area)

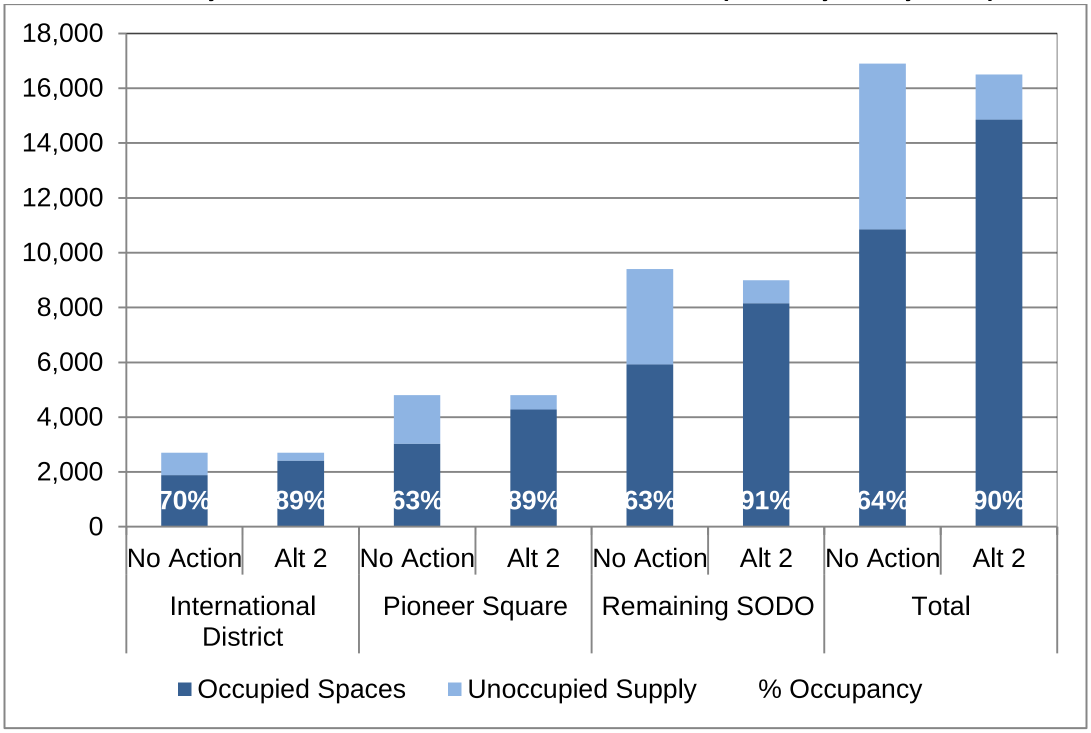


Figure 2–118 Stadium District Parking Occupancy – Weekday: No Action and Alternative 2 Case S2 (Expanded Study Area)

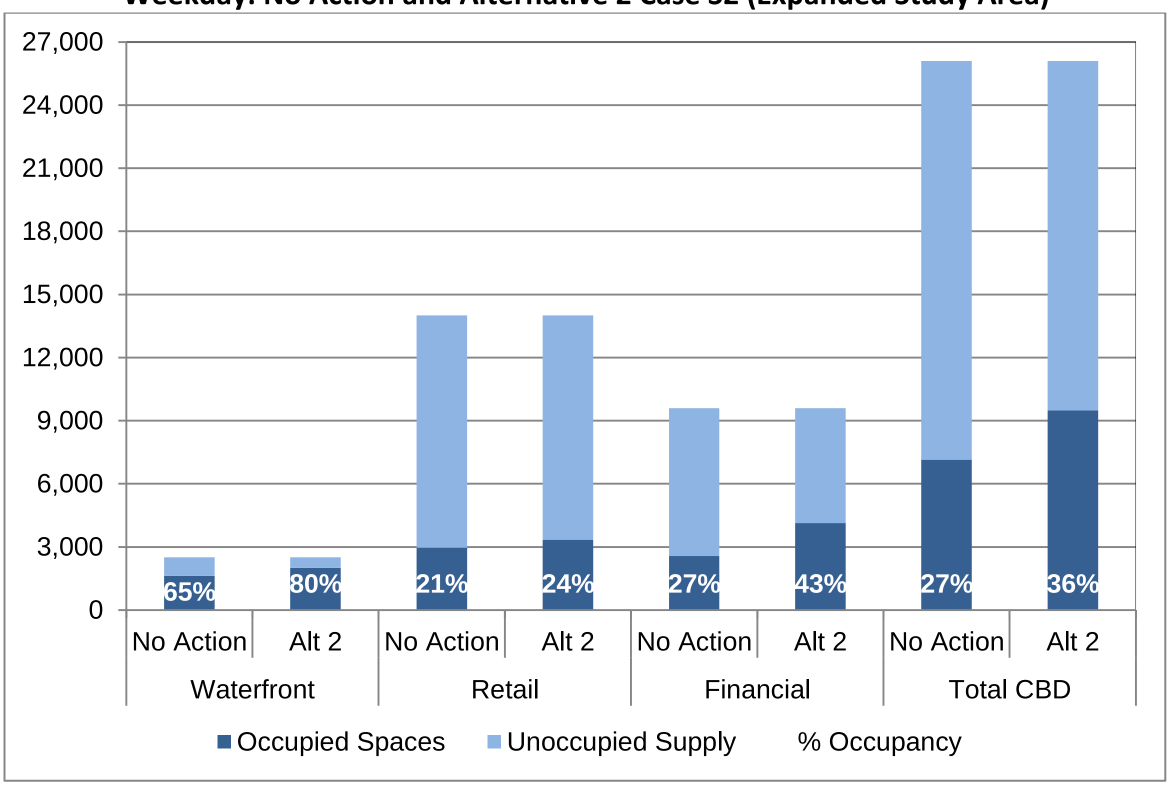


**Figure 2–119 Stadium District Parking Occupancy –
Weekday: No Action and Alternative 2 Case S3 (Primary Study Area)**

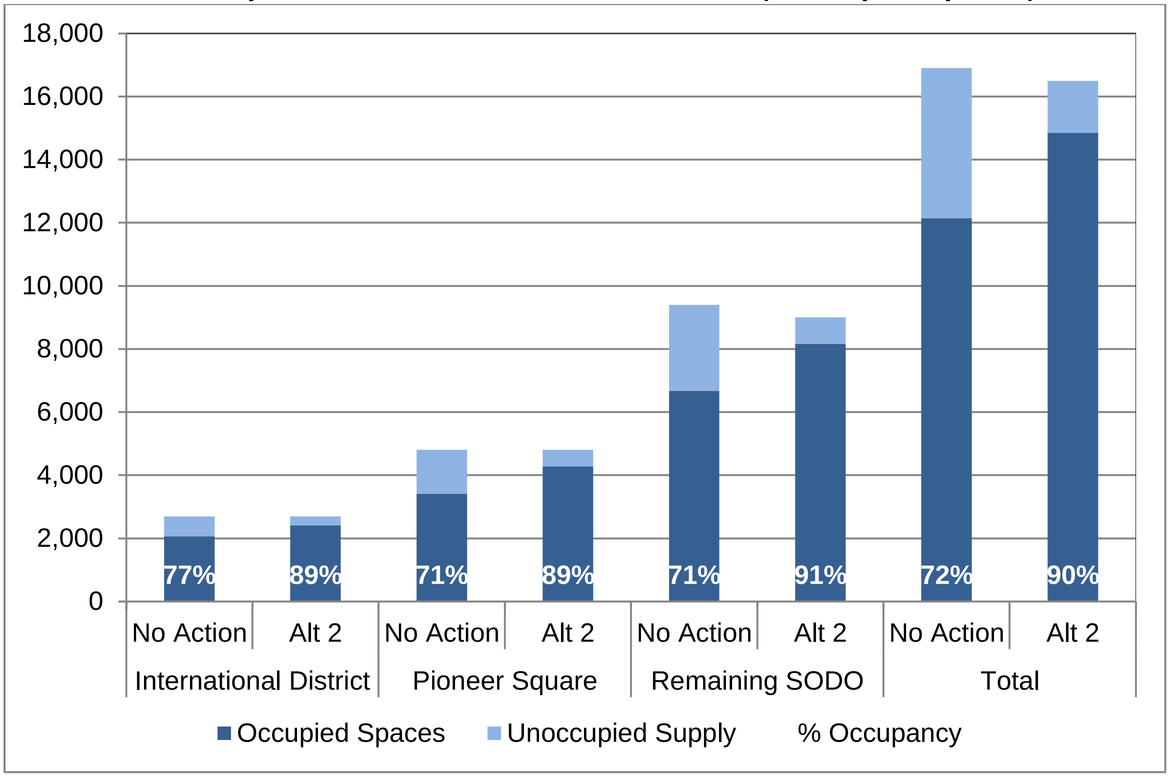
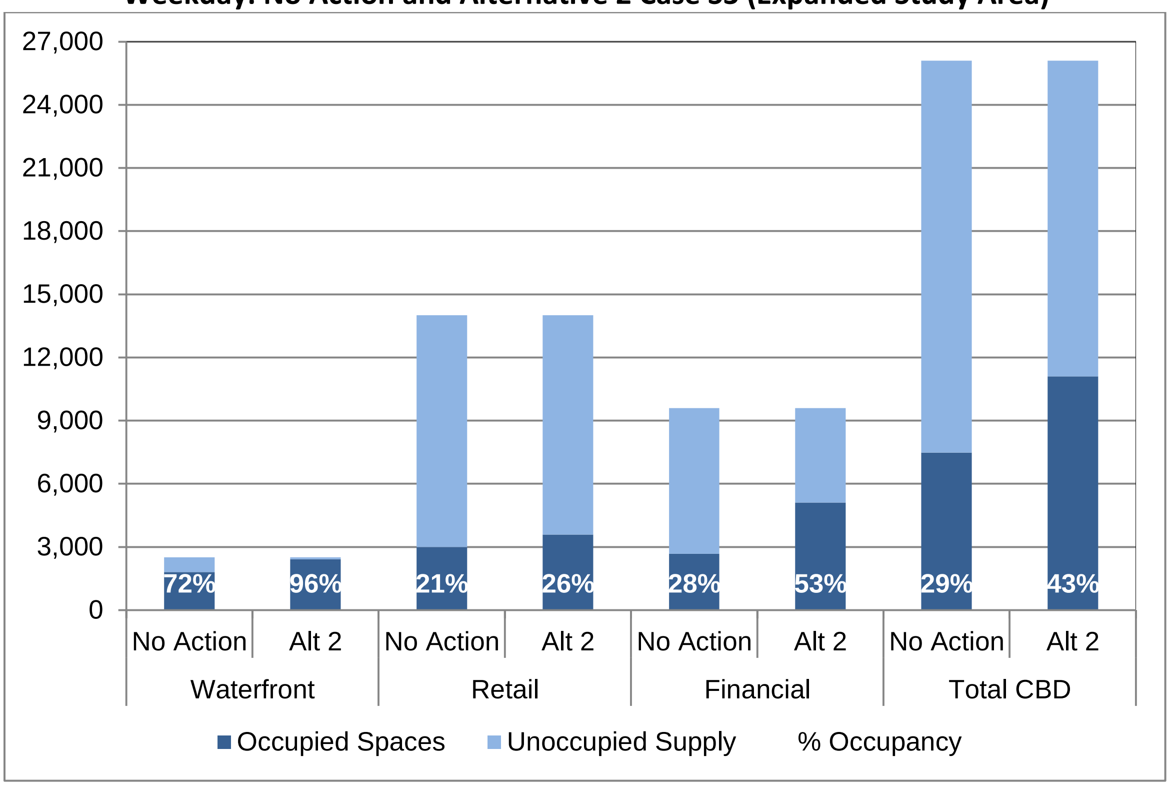


**Figure 2–120 Stadium District Parking Occupancy –
Weekday: No Action and Alternative 2 Case S3 (Expanded Study Area)**



As shown in the figures above:

- Arena parking demand could be fully accommodated within the primary study area under Case S1 (i.e., no other events at nearby venues).
- Event parking would spill into the expanded study area under multi-event conditions (Case S2 and S3).
- For the Arena plus Mariners and / or Event Center scenarios (Case S2 and S3), parking occupancies within the primary study area would be approximately 90 percent as compared to the No Action event cases, which would have occupancies of approximately 60 to 80 percent.
- For Case S3, the Waterfront area within the CBD would become full.

It is anticipated with any of the event cases parking closer to the Arena and / or other event venues would be more highly utilized. As the areas near the venues become full it would likely become more difficult to find parking. The primary study area would be full for multi-event Cases S2 and S3. There would be parking available within the CBD even with multiple events in the study area; however, in some cases this may be considered less desirable given the greater walking distance from the venue.

2.8.4.3 Weekend Occupancy

Figure 2–121 through Figure 2–126 illustrate weekday Case S1, S2, and S3 parking occupancy within the primary and expanded study areas.

Figure 2–121 Stadium District Parking Occupancy – Weekend: No Action and Alternative 2 Case S1 (Primary Study Area)

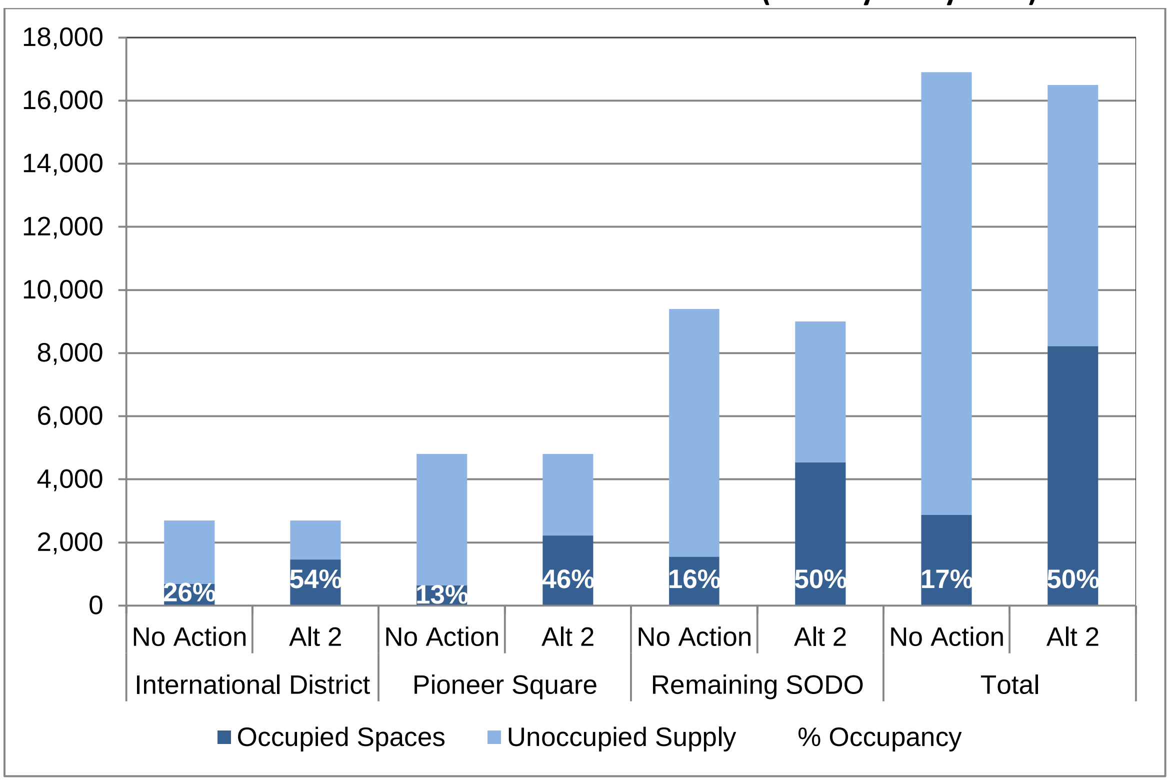


Figure 2–122 Stadium District Parking Occupancy – Weekend: No Action and Alternative 2 Case S1 (Expanded Study Area)

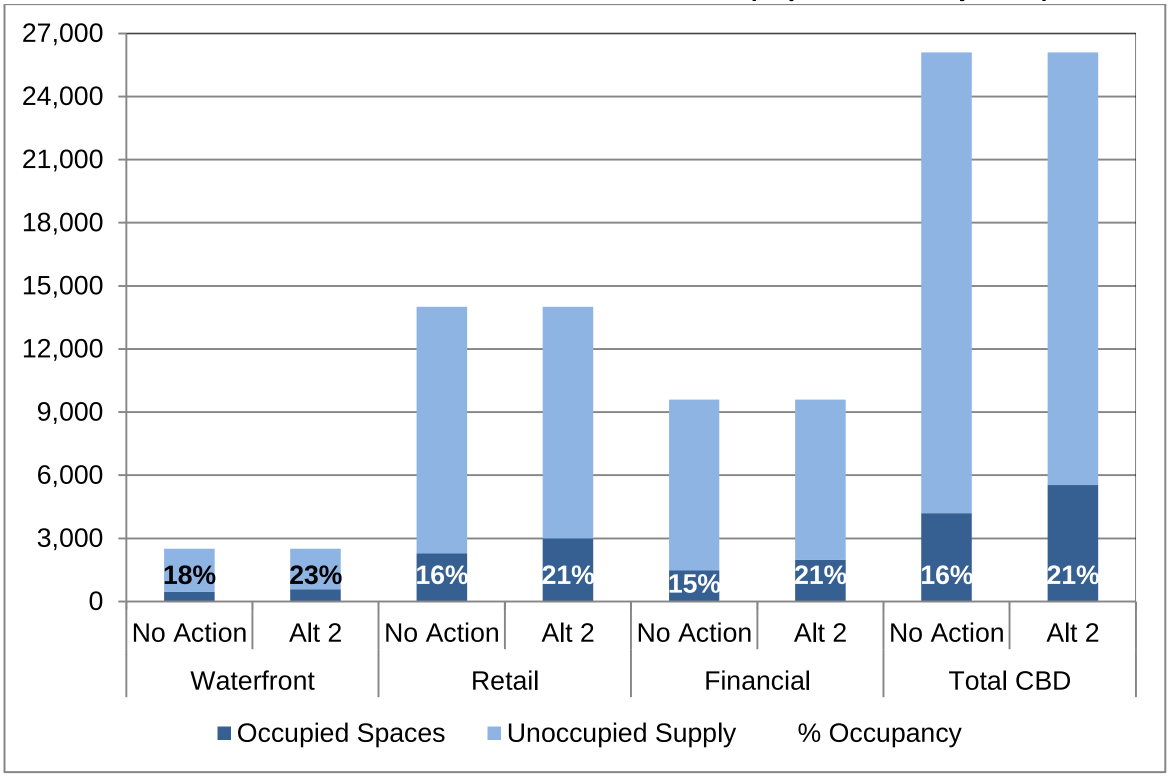


Figure 2–123 Stadium District Parking Occupancy – Weekend: No Action and Alternative 2 Case S2 (Primary Study Area)

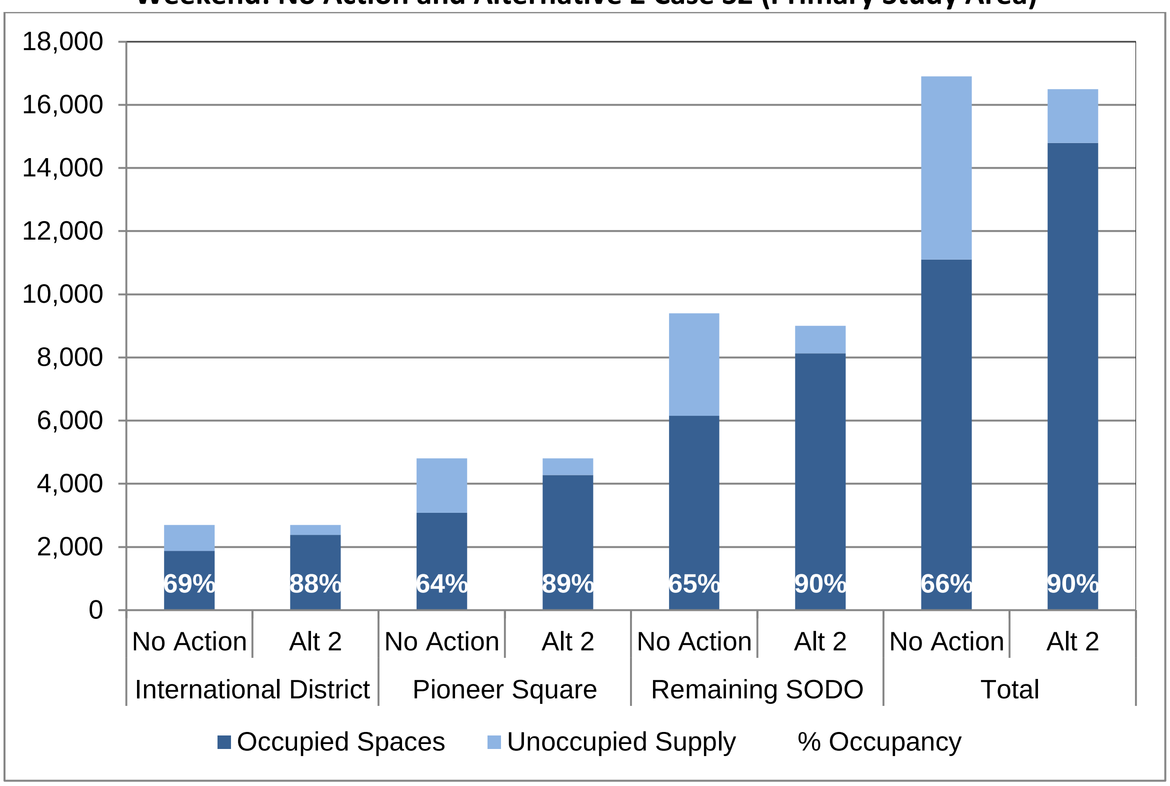


Figure 2–124 Stadium District Parking Occupancy – Weekend: No Action and Alternative 2 Case S2 (Expanded Study Area)

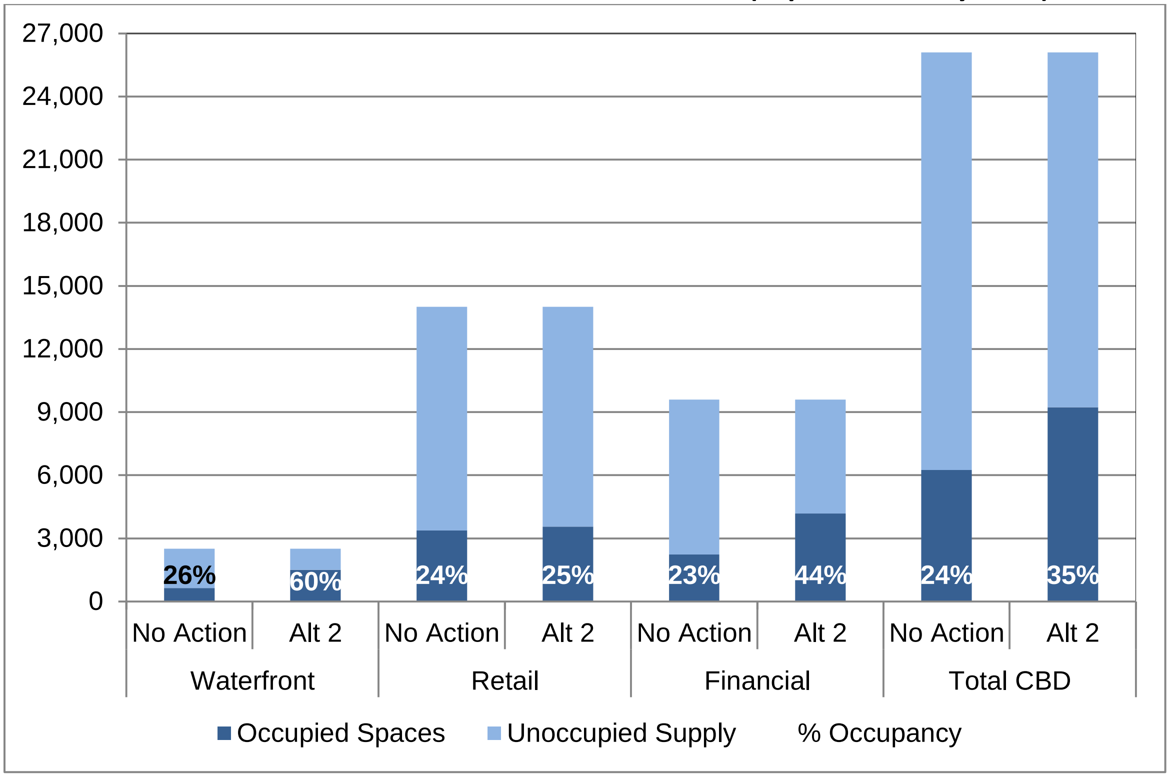


Figure 2–125 Stadium District Parking Occupancy – Weekend: No Action and Alternative 2 Case S3 (Primary Study Area)

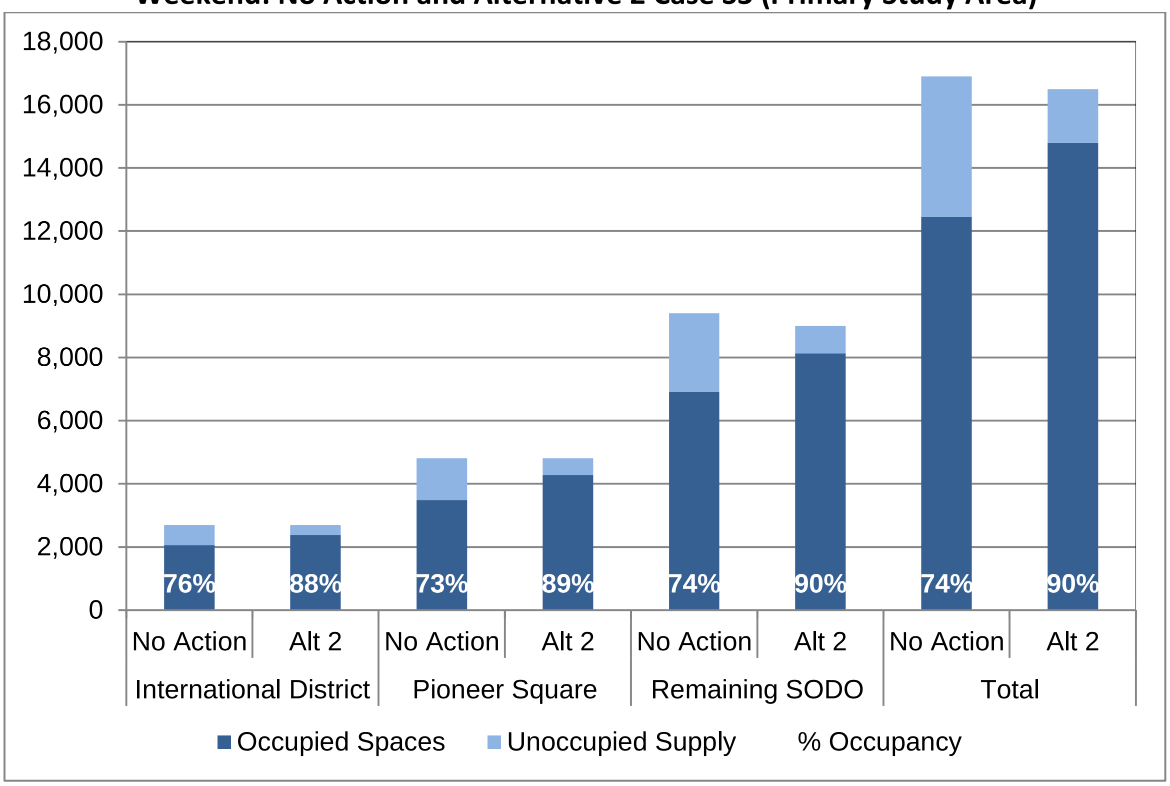
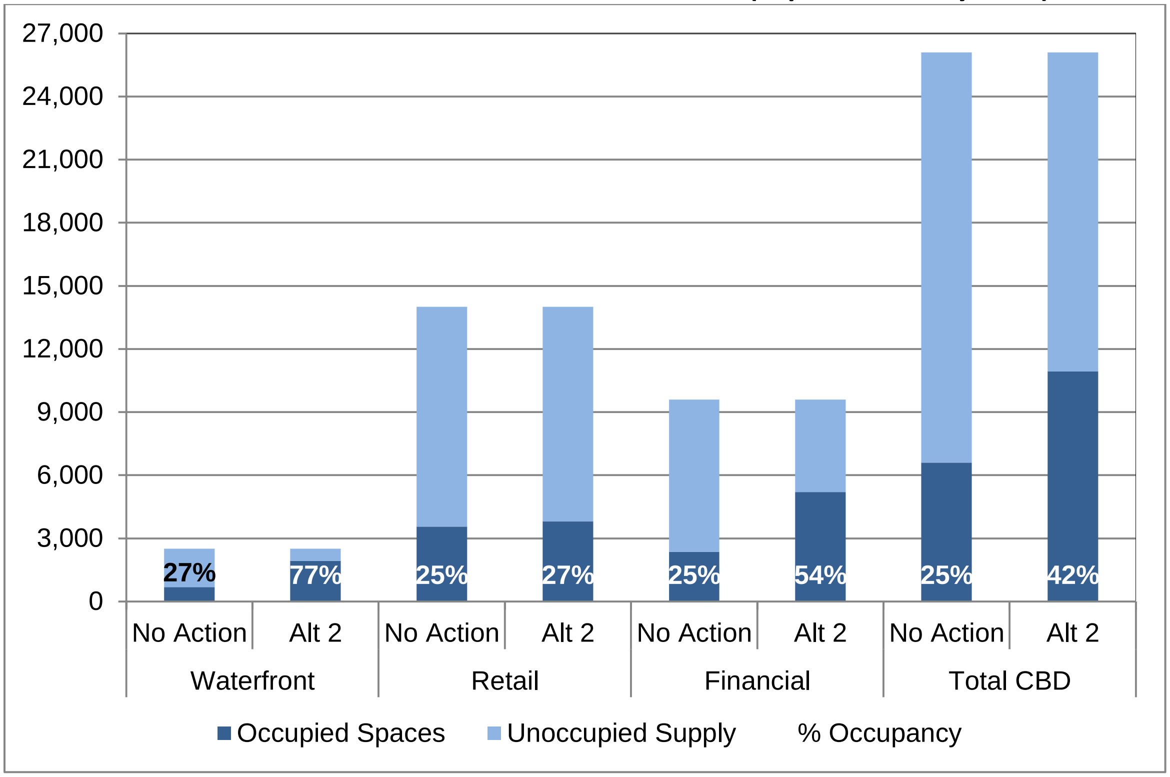


Figure 2–126 Stadium District Parking Occupancy – Weekend: No Action and Alternative 2 Case S3 (Expanded Study Area)



As shown in the figures above:

- Similar to weekday conditions, weekend Arena parking demand could be fully accommodated within the primary study area under Case S1 (i.e., no other events at nearby venues).
- Event parking would spill into the expanded study area under multi-event conditions (Case S2 and S3).
- For Alternative 2 Case S3, parking occupancies within the primary study area would be approximately 90 percent as compared to the No Action Case S3, which would have occupancies of approximately 60 to 80 percent.
- Given the lower overall weekend non-event parking demand within the expanded study, occupancies in this area lower than the weekday.

It is anticipated with any of the event cases parking closer to the Arena and / or other event venues would be more highly utilized. As the areas near the venues become full, it would likely become more difficult to find parking. The primary study area would be full for multi-event cases (Case S2 and S3). There would be parking available within the CBD even with multiple events; however, in some cases this may be considered less desirable given the greater walking distance from the venue.

The Proposed Arena would result in an increase in events within the Stadium District regardless of the event case or day of week. The resulting parking demand associated with the Arena could displace some observed SoDo overnight truck parking to other areas (likely south of the Stadium District), which may be consider less convenient locations.

2.8.5 Impacts of Alternative 3

Parking impacts related to construction would be minimized by providing off-street parking, securing parking in near-by garages, as well as encouraging use of alternative modes. It is anticipated that parking impacts related to construction would be less than the 18,000-seat Seattle Arena. In addition, construction activities could result in the need to close on-street parking adjacent to the site. These closures would be coordinated with SDOT and appropriate notice and signs would be provided.

With 10 percent less seats, this would result in a 10 percent reduction in the overall parking demand as compared to Alternative 2. Given the lesser demand, overall transportation impacts for the Alternative 3 would be slightly less than those described for the Alternative 2 and the analysis of the Alternative 2 fully encompasses any transportation impacts that would occur as a result of developing Alternative 3.

2.8.6 Mitigation Measures

A complete summary of potential mitigation measures to be considered across all the Transportation Elements evaluated in this report is included in Chapter 4.0 of Appendix E. This summary includes identification of both programmatic measures and physical improvements. For each of the potential mitigation measures a designation of high to low influence was noted. The following identifies those potential mitigation measures considered to have a high influence on this transportation element. These potential mitigation measures are appropriate for both Alternative 2 and Alternative 3.

- Event schedule protocol and management
- Expand on-street parking controls
- Shared use parking protocol
- Establish covenant parking agreements
- Parking for event staff
- Pre-sell reserved arena covenant parking
- Promote and pre-sell offsite private parking

2.8.7 Secondary and Cumulative Impacts

Short term parking restrictions may be implemented to support event related activities as a result of traffic control plans, or other efforts to balance traffic, transit, freight and goods movement, and parking demands. In general, the impacts identified for the proposed Arena without other concurrent events are similar in magnitude and slightly less than for a Mariners event. However, the addition of the proposed Arena would increase the number of days in the SoDo neighborhood where an event occurs and could add cumulatively to reduction of parking availability in the SoDo neighborhood.

- Impacts of a TCP resulting in loss of parking
- Reduced parking supply as a result of potential improvements at study intersections and along roadways

2.8.8 Significant Unavoidable Adverse Impacts

As described in the impact analysis, the increase in event days anticipated with the Arena (especially the increase in high attendance event days) would result in the increased frequency of parking impacts. This results in greater competition for parking with other area stakeholders, including commercial businesses in neighborhoods such as SoDo, Pioneer Square, and the International District.

2.9 Safety

2.9.1 Methodology

Collisions were reviewed at the study area intersections and at-grade rail crossings. Records of reported collisions were obtained from SDOT for the five-year period between January 1, 2007, and December 31, 2011. A summary of the total and average annual reported accidents at each study intersection is provided in Attachment E-4, which is available from DPD upon request. The City of Seattle has adopted criteria for assigning high accident location status to signalized intersections with 10 or more reported collisions per year and unsignalized intersections with 5 or more reported collisions per year. Intersections designated as high accident locations are targeted for future safety improvements in an effort to reduce the occurrence of accidents.

2.9.2 Affected Environment

Fewer than 5 collisions per year were reported at each unsignalized study intersections and for the signalized locations only the 6th Avenue / James Street intersection had an average of more than 10 collisions per year. No fatalities were identified in the study area during the five-year period.

A review of the collisions at the 6th Avenue / James Street intersection shows the number of collisions per year has decreased over the 5-year period with 15 collisions in 2007 to 8 collisions in 2011. A majority of the collisions at this location involved left-turning vehicles along James

Street not granting right-of-way to vehicles traveling the opposite direction. These collisions are likely occurring as a result of the high traffic volume and the permitted left-turn phasing on the westbound approach James Street not yielding to oncoming eastbound traffic, which is typical of intersections with dual left-turn lanes with higher levels of turning traffic. The left turning collisions at this location could likely be reduced by providing protected left-turn phasing, which would be a trade-off with traffic operations, likely causing more delay that could increase other types of collisions such as rear-end.

The data were also reviewed for collisions involving pedestrians or bicyclists. Within the study area, 34 of the 64 study locations had collisions involving pedestrians and bicyclists. The only location that averaged more than one collision per year involving a pedestrian or bicyclists is the 5th Avenue S. / S. Jackson Street intersection, which has a much higher pedestrian demand than other locations in the study area. This intersection is located near the International District Station transit hub on the southwest corner of this intersection resulting in higher levels of pedestrian activity.

Collisions were also reviewed at the at-grade railroad crossings along S. Royal Brougham Way, S. Atlantic Street, S. Holgate Street, S. Lander Street, S. Hanford Street, S. Horton Street, and S. Spokane Street based on data provided by SDOT as well as the Federal Railroad Administration (FRA) database of accident reports. Vehicular traffic at these crossings is controlled by gates and non-motorized traffic is generally controlled through passive warning signs. Based on a review of *Pedestrian/Bicycle Warning Devices and Signs at Highway-Rail and Pathway-Rail Grade Crossings* (Illinois Center for Transportation, April 2013), implementation of control devices for non-motorized traffic should be evaluated on a case-by-case basis. There were 12 collisions in the 5-year time period related to trains at the at-grade crossings. These collisions occurred at the S. Atlantic Street, S. Royal Brougham Way, S. Hanford Street, S. Hinds Street, S. Holgate Street, and S. Royal Brougham Way crossings. A majority of the collisions resulted in property damage or injury. Implementation of active warning or gates for pedestrians could help prevent these types of safety issues. There was a pedestrian fatality in 2011 at the S. Holgate Street crossing between 3rd Avenue S. and Occidental Avenue S; however, the collision review shows there were extenuating circumstances and the fatality was not a result of the train track or roadway conditions.

2.9.3 Impacts of No Action Alternative

As traffic volumes increase, the potential for traffic safety issues increases proportionately. The overall vehicular and non-motorized traffic in the area under 2018 and 2030 conditions are anticipated to be higher than occurs under existing conditions. There are changes in transportation infrastructure underway and the effect of these changes on transportation safety is unknown. The projects are all designed to current standards of practice.

2.9.4 Impacts of Alternative 2

Alternative 2 construction would increase vehicular traffic within the study area, which could result in increased conflicts between vehicular, pedestrian, and bicycle traffic. It is anticipated that safety impacts related to construction would be less than the 20,000-seat Seattle Arena.

As traffic volumes increase, the potential for traffic safety issues increases proportionately. Alternative 2 would increase both vehicular and non-motorized traffic within the study area. In the immediate vicinity of the site, there are several at-grade rail crossings along S. Holgate Street that are uncontrolled for non-motorized traffic. Increased pedestrian activity at these locations as a result of travelling to and from the Seattle Arena could result in increased safety issues. The *Pedestrian/Bicycle Warning Devices and Signs at Highway-Rail and Pathway-Rail Grade Crossings* (Illinois Center for Transportation, April 2013) notes that for at-grade crossings active warning devices are generally observed by users more often when paired with gates. This document also says that there is no standard procedure for determining control or warning devices and an evaluation should be conducted on a case-by-case basis. The S. Holgate Street corridor has multiple at-grade rail crossings closely spaced in the immediate vicinity of the site and pedestrian gates may not be feasible or appropriate. As described previously in the Pedestrian section, consideration could also be given to a grade separated pedestrian bridge that would be oriented east-west over the train tracks connecting the Arena to the S. Holgate Street / 4th Avenue S. intersection.

2.9.5 Impacts of Alternative 3

Alternative 3 construction would increase vehicular traffic within the study area, which could result in increased conflicts between vehicular, pedestrian, and bicycle traffic. It is anticipated that safety impacts related to construction would be less than the 18,000-seat arena.

Alternative 3 would have similar safety impacts as identified with Alternative 2; however, these impacts would be to a less extent since the traffic levels would be lower with the smaller venue.

2.9.6 Mitigation Measures

A complete summary of potential mitigation measures to be considered across all the Transportation Elements evaluated in this report is included in Chapter 4.0 of Appendix E. This summary includes identification of both programmatic measures and physical improvements. For each of the potential mitigation measures a designation of high to low influence was noted. The following identifies those potential mitigation measures considered to have a high influence on this transportation element. These potential mitigation measures are appropriate for both Alternative 2 and Alternative 3.

- Pedestrian Improvements (i.e. pedestrian scale lighting, S. Atlantic / 3rd Avenue south side stairs, surface street improvements or pedestrian bridge on S. Holgate Street, etc.)
- North-South connection located on the east side of the project site, connecting S. Holgate Street to the private extension of S. Massachusetts Street

2.9.7 Secondary and Cumulative Impacts

No secondary or cumulative impacts have been identified.

2.9.8 Significant Unavoidable Adverse Impacts

Increased frequency of events together with the proximity of the Arena to the S. Holgate Street rail crossings would increase the potential for conflict between pedestrians and rail, east of the site. If a pedestrian overpass were constructed, this issue would be largely eliminated. With at-grade improvements together with increased manual control of pedestrians at crossings, the potential would be reduced but not eliminated.

2.10 Occidental Avenue South Street Vacation

An element of the Alternative 2 and Alternative 3 proposals includes the vacation of Occidental Avenue S. between S. Holgate Street and S. Massachusetts Street. The cumulative conditions with an arena event, inclusive of the street vacation, were accounted for in the analysis of Alternatives 2 and 3. This section provides a focused comparison of conditions intended to isolate the impacts of the vacation itself. It includes a comparison to developing the site under the current zoning; assuming no vacation of Occidental Avenue S. This comparative analysis is required by the City of Seattle to support the Occidental Avenue S. street vacation review process. This additional development scenario is not considered an alternative for purposes of the EIS evaluations. This section evaluates the proposed street vacation, independently, and in the context of the development proposal.

2.10.1 Context

Occidental Avenue S. is classified as an access street. It serves a variety of purposes, ranging from local access for adjacent business and events, staging for events at Safeco Field and CenturyLink Field, event parking, to a potential route bypass to 1st Avenue S. during periods of higher traffic congestion.

North. North of S. Massachusetts Street, Occidental Avenue S. serves as service access and parking for businesses on the west side (with primary frontages on 1st Avenue S.), and provides access to the Safeco Field parking garage, including surface parking to the immediate east side of the garage. This parking access is provided via S. Massachusetts Street, via its' intersection with Occidental Avenue, which also provides access to the Safeco Field parking garage, the surface parking to the east, as well as the service road and fire lane south and west of the Safeco Field garage.

Site Area. The area of Occidental Avenue S. to be vacated connects S. Holgate Street with S. Massachusetts Street. The street section serves on-street parking in some sections, as well as access to the parcels adjacent to the street to the east and west. In addition, it provides continuity of connection between S. Horton Street and S. Atlantic Street.

South. South of S. Holgate Street, Occidental Avenue S. provides access and parking to local commercial businesses with primary frontages on 1st Avenue S. to the immediate west, as well as to freight related warehouse business operations on the east side of Occidental Avenue S., immediately south of S. Holgate Street. It exists as a contiguous connection from S. Atlantic Street to S. Horton Street, a distance of over one mile.

2.10.2 Issues

The Mariners emphasized the importance of maintaining accessibility to the Safeco Field parking garage and surface parking lot, as well as the service road and fire lane, and noted the use of the plaza area between the parking structure and Occidental Avenue S. for bus staging.

- **Safeco Field Parking Garage – Access and Usage.** The parking garage is used daily by staff and vendors at the facility, with approximately 250 parking spaces identified for these uses. Another 50 spaces are leased to adjacent office properties, except during game days. In addition, use by major events, such as Mariner games and CenturyLink Field events are identified in the primary analysis of transportation and parking impacts of the Arena. Access to the garage is provided directly from S. Atlantic Street on the north, as well as on the south and east frontages, which access the street system via S. Massachusetts Street and / or Occidental Avenue S.

- **Service Road / Surface Parking Lot.** This drive, which extends east via an extension of S. Massachusetts Street, provides direct southerly access to the parking garage. In addition, it connects service activity (trucks, food delivery, etc.) for Safeco Field with the local street system, connecting under S. Atlantic Street to Safeco Field itself from east of the parking garage. This connection also serves as the fire lane for Safeco Field.

- **Plaza and Adjacent Right of Way.** This section of the sidewalk and right-of-way is open space for pedestrians during most periods; during events at Safeco Field, as well as some CenturyLink Field events, it is used for charter bus staging and pick-up / drop-off, ADA assisted parking.

In addition to the issues raised by the Mariners, concern has been expressed that Occidental Avenue S. is used by freight haulers and other traffic as a bypass to congestion on 1st Avenue S. With a section of Occidental Avenue S. closed, there would be reduced ability to avoid primary arterial congestion.

2.10.3 Methodology

The analysis of the Occidental Avenue S. street vacation included a review of the impacts related to the following:

- Trip Generation
- Public Transportation
- Pedestrians
- Bicycle
- Traffic Volumes
- Traffic Operations (Intersection Operations / Local Circulation and Traffic Diversion)
- Freight and Goods

- Parking
- Safety

The core methodology used to conduct the analysis of each element is consistent with that described previously in each of the respective sections. The future 2030 conditions were compared for two scenarios. First, the impact of the physical change in street connectivity was evaluated, independent of the proposed development or build-out under the current zoning. This is referred to as No-Build. Second, the comparative impact of the two site development scenarios is summarized. This is referred to as Build.

1. **No Build – Street Vacation Only:** This scenario provides the most direct basis for understanding the singular effects of the vacation itself, without additional site development influences. The No Action 2030 conditions without an event (i.e., no site development or background event activity) without and with a street vacation are compared.
2. **Build – Site Development Options:** This scenario compares the results of the analysis conducted for Alternative 2 Case S1, with the vacation of Occidental Avenue S., to the development of a commercial project on the project site, without the Occidental Avenue S. vacation, based on build-out under current zoning.

Development under existing zoning without a street vacation is based on information submitted to the Design Review Board by the Proponent. Based on this submittal and information from the Proponent, a total of 940,000 gross square-feet (gsf) of commercial space was assumed. The analysis assumed 15,000 gsf would be restaurant, 35,000 gsf would be general retail, and the remaining would be office. Trip rates used to forecast trip generation for the commercial development were consistent with the Home Plate project located on the southwest corner of the 1st Avenue S. / S. Atlantic Street intersection. This methodology utilized vehicle trip rates from the ITE *Trip Generation Manual*, 9th Edition and applied local mode splits and average vehicle occupancies appropriate for this area in order to determine the peak hour trips.

Table 2-43 compares weekday PM peak hour trip generation for Alternative 2 (Case S1) and Alternative 3 (Case S1) to the trip generation associated with the potential development that could occur under current zoning without the vacation of Occidental Avenue S.

Table 2-43
Occidental Avenue S. Street Vacation Weekday PM Peak Hour Trip Generation Summary – 2030 Horizon year

	No Street Vacation Development Potential (Build)	With Street Vacation: Alternative 2[1] Case S1	With Street Vacation: Alternative 3[1] Case S1
Total Trips	1,112	1,970	1,770
Less Pass-by	161	-	-
Net New	**1,010**	**1,970**	**1,770**

1. See section (Event Transportation Demand)

As shown in the table, the proposed street vacation would enable the arena project, which would result in overall increases in trip generation of up to 74 percent over what would be generated by development under the current zoning. This characterization assumes a capacity level event at the Arena (consistent with the analysis presented in other sections) compared to an average weekday PM peak hour associated with the development of a commercial project under current zoning. Two other factors for consideration include:

- While lower in trip generation, the development of nearly one-million square feet of office on the subject site would result in traffic impacts to every working day of the year; an Arena would be expected to have capacity level events on a limited number of days each year, with a variety of below capacity events on other days. All event activity at the Arena would combine to a lower level of frequency than that of a commercial project.
- The proposed Arena is not proposing to construct parking in association with its development. As such, total event parking demand would be accommodated throughout the SoDo primary and extended (CBD) study areas, as described in the parking impact section of this document.

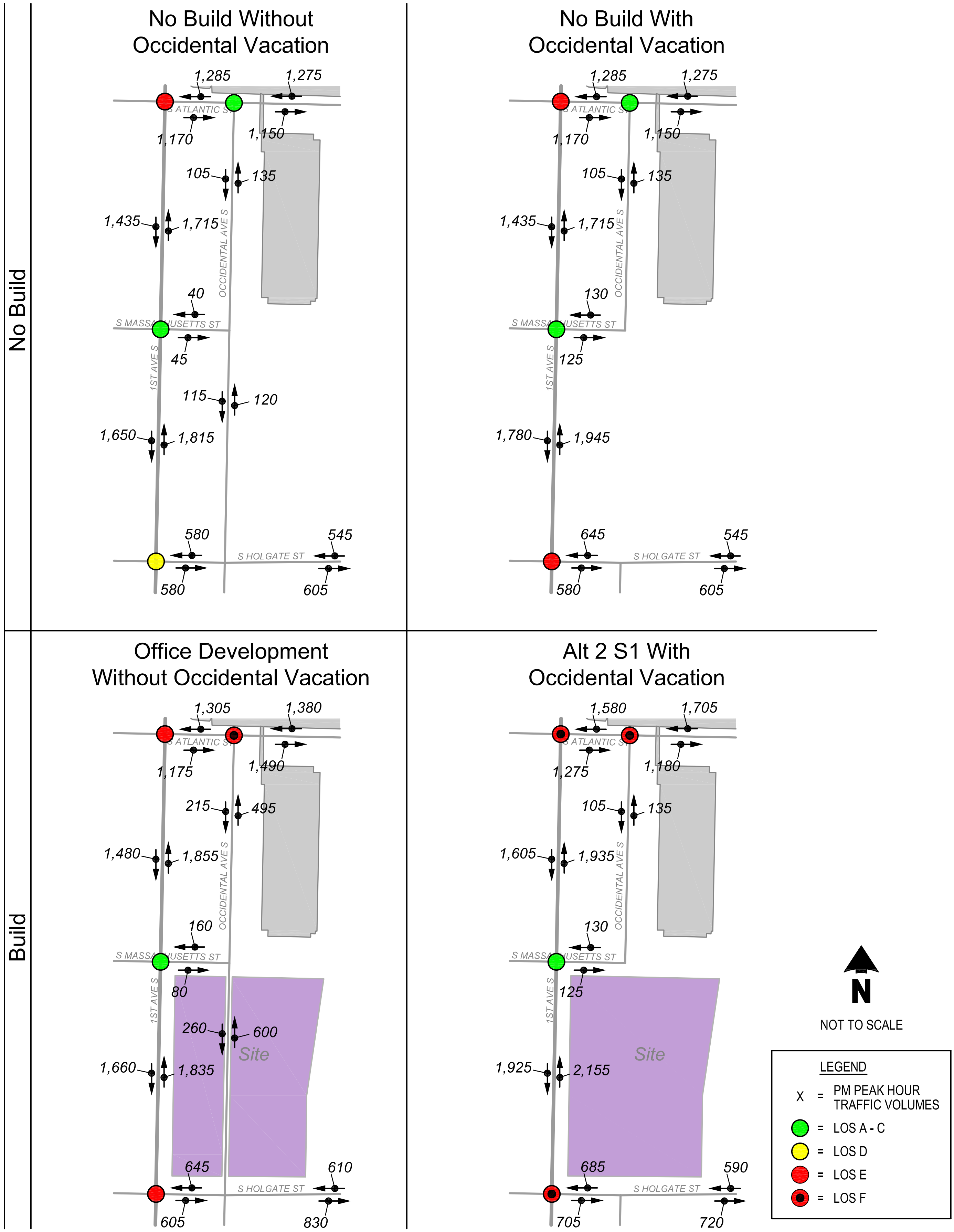
Figure 2–127 shows the PM peak hour directional volumes along site vicinity street links and LOS at key local intersections. The No-Build (top two boxes on Figure 2–127) scenario shows the effect of the street closure on 2030 No Action traffic volumes during the PM peak hour. The Build scenario (bottom two boxes on Figure 2–127) compares the traffic volumes associate with the two site development options described above (i.e., Arena or commercial project).

2.10.4 Secondary and Cumulative Impacts

No secondary or cumulative impacts were identified.

2.10.5 Significant Unavoidable Adverse Impacts

The vacation of Occidental Avenue for the block between S. Holgate and Massachusetts Streets would result in the permanent interruption of a parallel route to 1st Avenue South from S. Horton Street to S. Atlantic Street. The operation of the intersection at S. Holgate Street at 1st Avenue S. would degrade to LOS F on event days with a capacity event in the Arena; the range of mitigation offered could reduce the level of impact at this location, depending on the effectiveness of the range of public information, traffic routing and management, and final location of any potential new parking facilities.



Occidental Avenue S. Street Vacation - 2030 LOS/Volume Comparison

FIGURE 2-127

Seattle Arena

transpoGROUP

2.10.6 Analysis Summary

The following provides a summary of the key transportation elements and stakeholder issues associated with the impacts of vacating Occidental Avenue S. from two perspectives. First, the impact of the physical change in street connectivity is evaluated, independent of the proposed Arena or buildout under the current zoning. Second, the comparative impact of the two development scenarios is summarized. Together, this provides decision makers with an understanding of each component of the outcome of the proposed vacation, as well as the cumulative effects. For comparisons, all analyses considered 2030 conditions; the analysis is completed for each element of this transportation element. The summary of impacts is described in relation to Alternative 2 only; impacts associated with Alternative 3 would be similar, but would reflect 10 percent less demand due to the difference in the seating capacity of Alternative 3.

Trip Generation

2030 No Build

- Not applicable, no Stadium District site trip generation associated with the No Build.

2030 Build

- Alternative 2 Case S1 increases trip generation by approximately 960 trips with a capacity level event as compared to development with the current zoning.

Public Transportation

2030 No Build

- Street vacation results in minor impacts associated with diversion of traffic and moderate increases in peak hour congestion along the 1st Avenue S. corridor in the immediate site vicinity.

2030 Build

- Increased demand for public transportation associated with the Arena as described in the Public Transportation section of this document.
- With development under current zoning, increases in transit demand and need to connect pedestrians to transit would occur, especially along the S. Holgate Street corridor, which would connect to transit service along 4th Avenue S. as well as to the Link Light Rail corridor.
- Impacts to transit service speed and reliability would occur with the Arena on event days, at the magnitude and frequencies described in the Public Transportation section. With development under current zoning, overall traffic impacts would occur that would also impact transit speed and reliability. Impacts at 4th Avenue S. / S. Holgate Street would be similar to that of the Arena; impacts to the 1st Avenue S. corridor would be somewhat less due to the probable access configuration along the Occidental Avenue S.

corridor (Note: No commercial project is proposed; access configuration was assumed for purposes of the analysis.)

Pedestrians

2030 No Build

- With the street vacation, pedestrian would be rerouted from Occidental Avenue S. to 1st Avenue S. along the site frontage. At that point they would have the option to continue on 1st Avenue S. or redirect back to Occidental Avenue S., resulting in out-of-direction travel. Pedestrians volumes were observed to be low with and without an event.

2030 Build

- The Arena would result in concentrated, though comparatively infrequent, pedestrian demands during event ingress / egress; pedestrian demands associated with the development under current zoning would result in lower, more evenly distributed pedestrian demands occurring throughout the day, and especially during lunch breaks.
- In either case, additional pedestrian demands would contribute to increased use of local sidewalk, including S. Holgate Street. Impacts of Arena related pedestrian peak demands are documented in the Pedestrian section; the impacts of the development under current zoning would be less, but also contribute to existing issues with pedestrian safety crossing the railroad tracks to the east. Office pedestrians could orient eastward to connect to bus and / or Link Light Rail service for commuting.

Bicycles

2030 No Build

- Bicycle use of Occidental Avenue S. has been observed to be low; as a result its vacation in the proposed limits would not result in a significant adverse impact. It is acknowledged that, to the extent that bicycles travel on Occidental Avenue S., the vacation of this section would result in inconvenience and diversion, primarily to 1st Avenue S. between S. Holgate Street and S. Massachusetts Street.

2030 Build

- With development under current zoning, no disruption in bicycle routing would occur; however, additional trip generation associated with the development would add to traffic on Occidental Avenue S. near the site, and potentially conflict with bicycle travel compared to current conditions.
- With the proposed Arena, the diversion of bicyclists due to the closure of Occidental Avenue S. would occur as described previously; added events and related traffic would increase the potential for conflict with bicycles throughout SoDo depending on the specific route traveled.

<u>Traffic Volumes</u>

2030 No Build

- With the street vacation, non-event weekday PM peak hour traffic volumes of approximately 235 vehicles per hour (vph) would be shifted from Occidental Avenue S. to 1st Avenue S. resulting in a six percent increase in weekday PM peak hour traffic volumes along 1st Avenue S. between S. Holgate and S. Massachusetts Streets.
- S. Massachusetts Street east of 1st Avenue S. could experience an increase of approximately 170 vph, as diverted through traffic shifts back to Occidental Avenue S.

2030 Build

- The difference between trip generation associated with development under the current zoning and Alternative 2 would result in the following changes in total traffic along links in the immediate vicinity of the Stadium District site:
- 1st Avenue S. from S. Holgate Street to S. Massachusetts Street: +585 vph as a result of the Arena
- 1st Avenue S. from S. Massachusetts Street to S. Atlantic Street: +205 vph as a result of the Arena
- Occidental Avenue S. from S. Massachusetts Street to S. Atlantic Street: -470 vph as a result of the Arena
- S. Atlantic Street from east of Occidental Avenue S.: +15 vph as a result of the Arena (Note: Westbound traffic volumes would increase by approximately 300 vehicles due to the inbound orientation of weekday PM peak hour Arena traffic).

<u>Traffic Operations</u>

Intersection Operations

2030 No Build

- The vacation of Occidental Avenue S. would divert traffic to 1st Avenue S. This shift would degrade the LOS at the 1st Avenue S. / S. Holgate intersection from LOS D to LOS E.

2030 Build

- The Arena and street vacation would degrade intersection operations along 1st Avenue S. as compared to the current zoning:
    - 1st Avenue S. / S. Atlantic Street: LOS E to LOS F
    - 1st Avenue S. / S. Holgate Street: LOS E to LOS F
- Traffic volumes and operations east of the site, at 4th Avenue S. / S. Holgate Street would not materially change between the two build scenarios.

- As described in the traffic operations section, the more concentrated impacts associated with event traffic would occur less frequently than the everyday added congestion associated with site buildout under the current zoning.

Local Access / Traffic Diversion

2030 No Build

- Peak hour traffic volumes would be nominal and minimal impacts to circulation are identified, as described in relation to traffic volumes and operations
- With the street vacation, the continuity of Occidental Avenue S. from S. Horton Street to S. Atlantic Street would be interrupted, disrupting a potential parallel route to 1st Avenue S. during periods of congestion. However, northbound and southbound through traffic volumes across S. Holgate Street are minor, and do not represent a significant movement.
- Impacts to emergency vehicle access to the south could occur if the street was vacated without providing a parallel replacement link to S. Holgate Street.

2030 Build

- The impact of eliminating the Occidental Avenue S. connection to S. Holgate Street would be mitigated by the Arena proposal to replace it with a north-south drive connecting S. Holgate Street with the extension of S. Massachusetts Street, which would provide access to the Safeco Field garage, surface parking, and service roadway. It is anticipated that an events agreement would be crafted to assure that the use of the drive would be available during all appropriate event and activity times for Safeco Field operations.
- Increased reliance on access to the Safeco Field garage, Occidental Avenue S., north of the Arena, and the businesses on the west side of Occidental Avenue S. would be enhanced by the proposed realignment of S. Massachusetts Street between 1st Avenue S. and Occidental Avenues S.
- The private drive along the east edge of the Arena would help support emergency vehicle access to the Safeco Field garage and operations during event periods.
- With the Arena, emergency vehicle access would be maintained or enhanced with the north-south drive on the east side of the arena, together with a realigned S. Massachusetts Street. The benefits of these improved connections would be offset somewhat by the additional event days and related traffic volumes and congestion.
- With the Arena, which includes the development of a parallel access drive between S. Holgate and Massachusetts Streets, and the realignment of S. Massachusetts Street from 1st to Occidental Avenues S., access to the section of Occidental Avenue S., north of S. Massachusetts Street, as well as the plaza adjacent to the right-of-way near the garage would be maintained.

- The realignment of S. Massachusetts Street also increases the space south of S. Massachusetts Street for pedestrian gatherings associated with the Arena, reducing the likelihood of spillover into the street that would otherwise conflict with access traffic to the Safeco Field garage, service roadway, surface parking lot, and other operations.

Freight and Goods

2030 No Build

- A limited number of trucks currently utilize Occidental Avenue S. for deliveries in the immediate site vicinity. Those trucks serving existing uses along this section of Occidental Avenue S. would be redirected to 1st Avenue S. Traffic counts conducted for the weekday PM peak hour showed no trucks.
- The contiguous connection of Occidental Avenue S. between S. Atlantic Street and S. Horton Street would be interrupted by the vacation. To the extent that a freight vehicle uses Occidental Avenue S. to bypass 1st Avenue S. congestion during peak or other periods, this route would be altered. Use of Occidental Avenue S. could occur at realigned S. Massachusetts Street, as well as between S. Holgate and S. Horton Streets.

2030 Build

- Site related truck traffic is likely to decrease except during pre / post-event conditions with Arena; office development would require onsite loading docks and would receive deliveries throughout the day.
- Added congestion on event day would impact general area freight along with other traffic; building under no vacation would impact area-wide traffic and freight to a lesser degree, but at a higher frequency.

Parking

2030 No Build

- The elimination of this section of Occidental Avenue S. would result in the removal of on-street parking for this street segment. Based on the parking supply surveys and actual usage, approximately 50 spaces would be removed.

2030 Build

- With redevelopment under current zoning, the impact to on-street parking is not clear. It is likely that some amount of formal on-street parking would be provided along an improved curb. With new formal parking spaces and the development of commercial uses near street level, the likelihood of higher local parking utilization on an everyday weekday basis would occur.
- With the Arena, approximately 50 on-street parking spaces would also be removed.

Traffic Safety

2030 No Build

- Addition of pedestrians and bicycles to 1st Avenue S. for the Occidental Avenue S. street vacation could increase vehicle / pedestrian / bicycle conflicts. Sidewalk exists on 1st Avenue S.; thus, pedestrian safety would be unlikely to be noticeably impacted. Bicycles would be required to interact with 1st Avenue S. vehicular traffic, which has a higher level of activity as compared to Occidental Avenue S.; therefore, bicyclists would experience increased conflicts.

2030 Build

- In either case, additional pedestrian demands would contribute to increased use of local sidewalk, including S. Holgate Street. Impacts of Arena related pedestrian peak demands are documented previously; the impacts of the development under current zoning would be less, but also contribute to existing issues with pedestrian safety crossing the railroad tracks to the east. Office pedestrians could orient eastward to connect to bus and / or Link light service for commuting.

2.11 Parking Garage Sensitivity Analysis

Although not included with Alternative 2 or 3, an offsite parking garage could be provided to meet parking code requirements should a shared parking agreement not be reached with any existing garage operators to accommodate the code-required parking. This section summarizes the potential impacts associated with the construction of a 1,500 stall parking garage accessed from S. Holgate Street immediately west of 1st Avenue S. Potential impacts of the garage were evaluated within the vicinity of the Arena site to identify potential changes to previously presented analysis results. The analysis focuses on the primary transportation elements summarized throughout this document. This includes:

- Traffic volumes
- Pedestrian circulation patterns
- Intersection LOS at intersections within the Arena vicinity
- Freight and Goods
- Parking

The core methodology used to conduct the analysis of each element is consistent with that described previously in each of the respective sections. The analysis was conducted for forecast 2030 conditions based on the same trip generation used for both Alternative 2 Case S1 (Arena only) and Case S3 (Arena, Mariners, and CenturyLink events). The Safeco Field parking garage was assumed to be open and available in both Cases S1 and S3.

Table 2-44 provides a summary of the key transportation elements associated with the construction of a 1,500 stall parking garage on S. Holgate Street west of 1st Avenue S.

Table 2-44
Parking Garage Sensitivity Analysis

Transportation Element	2030 Alternative 2 With Addition of S. Holgate Street Garage
Vehicular Traffic Volumes	• For both Case S1 and S3, weekday PM peak hour traffic volumes would generally be similar to the Alternative 2 analysis presented previously with approximately 5 percent more vehicles westbound vehicles on S. Atlantic Street and southbound 1st Avenue S. between S. Holgate Street and S. Atlantic Street. • Peak hour activity associated with the garage loading is estimated to total 150 vehicles per hour (vph) under Case S1 and 385 vph under Case S3 during the weekday PM peak hour.
Pedestrian Circulation	• Because of its proximity to the proposed Arena site, pedestrian volumes crossing 1st Avenue S. at the S. Holgate Street intersection would increase.
Traffic Operations	• Levels of service at the intersections within the vicinity of the project would remain the same as the Alternative 2 analysis with the exception of northbound Occidental Avenue S. at Edgar Martinez Drive S., which would worsen from LOS E to LOS F under Case S1. • Delays would increase at 1st Avenue S. / S. Atlantic Street and 1st Avenue S. / S. Holgate Street with both operating at LOS F due to either increased vehicular and / or pedestrian volumes.
Traffic Safety	• Safety impacts within the study area would remain similar to Alternative 2.
Freight and Goods	• S. Holgate Street west of 1st Avenue S. provides access to local businesses and would experience increased traffic volumes and delay. • Additional delay to freight movement along S. Atlantic Street and 1st Avenue S. would occur due to increases in intersection delay.
Parking	• The parking garage would increase the available parking supply and reduce parking demand in other locations such as Downtown, Pioneer Square, and the International District.

2.11 Interim 2016

The Seattle Arena is anticipated to be completed by 2016 prior to completion of the Waterfront Seattle project and Link Light Rail (Northgate, East, and Lynnwood). The study provided a review of potential transportation impacts for 2018 when all of the major infrastructure improvements (Alaskan Way Viaduct, Waterfront Seattle, SR 520 Bridge Replacement, Mercer Corridor, and Link Light Rail (University) would be substantially complete. This section is intended to provide an understanding of interim Seattle Arena transportation impacts prior to completion of all the major infrastructure projects in the study areas.

The interim impacts of an Arena at the Stadium District site are generally anticipated to be less than identified for 2018 conditions since less background growth is anticipated by 2016.

However, the Waterfront Seattle project is anticipated to be under construction in 2016 and is the primary notable difference between the 2016 and 2018 transportation network. During the Waterfront Seattle construction, the project is anticipated to divert surface street traffic onto neighboring roadways. The resulting increase in traffic volumes along these roadways may temporarily worsen vehicular traffic operations.

Within the Stadium District study area, this diverted traffic would most likely increase traffic volumes along 1st Avenue S., north of S. King Street. Under 2018 conditions, the intersections along this segment of 1st Avenue S. were shown to operate at LOS F after the completion of the Waterfront Seattle project. With diverted traffic using 1st Avenue S. and the addition of Arena traffic under 2016 conditions, traffic operations may be worse than reported 2018 operations. Traffic volumes along 1st Avenue S. are expected to decrease with the completion of the Waterfront Seattle project and return to the level of impacts identified for 2018 conditions.

3.0 SEATTLE CENTER AREA ALTERNATIVES (ALTERNATIVES 4 AND 5)

Within the Seattle Center area, the potential sites for the Seattle Arena are the existing KeyArena and Memorial Stadium. The Seattle Center is one of the main performing arts and entertainment areas in the City. There are "events" nearly every day throughout the year, from classes to performances to recreational sports, to larger events such as festivals and concerts. Larger events at Memorial Stadium currently have an attendance of approximately 5,000 people, while the average attendance at KeyArena is approximately 12,000 people. Figure 3–1 shows the Seattle Center study area. The study area was defined based on the primary travel patterns for traffic to and from the Seattle Center area, as well as anticipated parking impacts. The transportation analysis includes an evaluation of approximately 50 study intersections as illustrated on Figure 3–1.

3.1 Street System

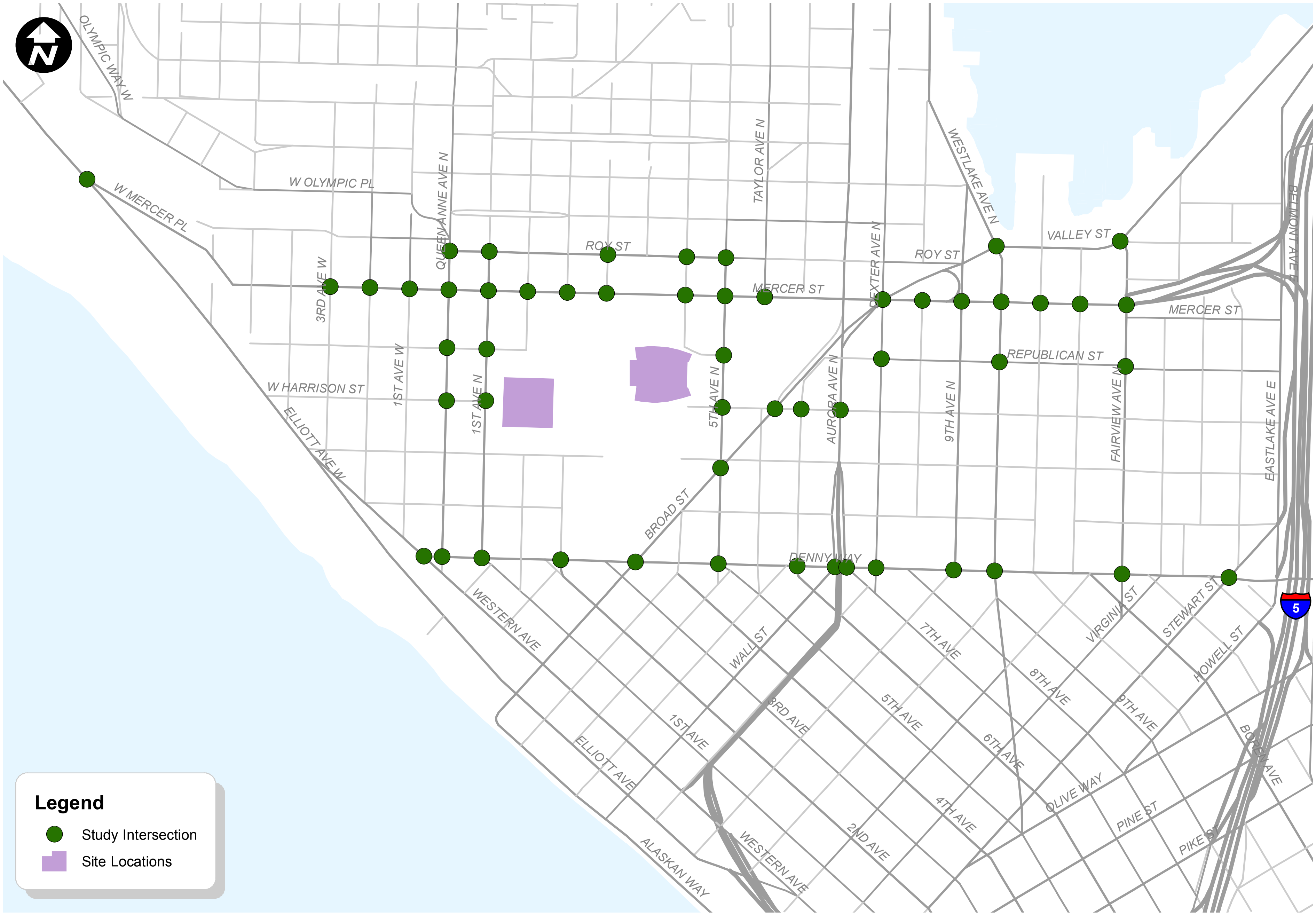
3.1.1 Methodology

The general approach to the evaluation of street system impacts included:

- Inventory of existing roadway infrastructure
- Identification of future transportation projects
- Evaluation of street system impacts considering Alternative 4 and 4 changes to the street network

3.1.2 Affected Environment

Regional access to the area is provided primarily via I-5 and SR 99 to the east. Table 3-1 summarizes the characteristics of major corridors within the study area, highlighting the roadway classification, speed limit, number of lanes, and general characterization of the non-motorized facilities. Roadways in the immediate vicinity of the Seattle Center consist mainly of principal arterials that are a combination of one-and two-way multi-lane streets with on-street parking and sidewalks. Signalized intersections are controlled with actuated traffic signals, which are generally coordinated with adjacent signals. Traffic on the minor approach of unsignalized intersections is controlled with stop signs. The primary arterial routes serving the area are Queen Anne Avenue N., 1st Avenue N. and 5th Avenue N. running north-south and Mercer Street and Denny Way running east-west.



Seattle Center Area Study Intersections

Seattle Arena

FIGURE
3-1

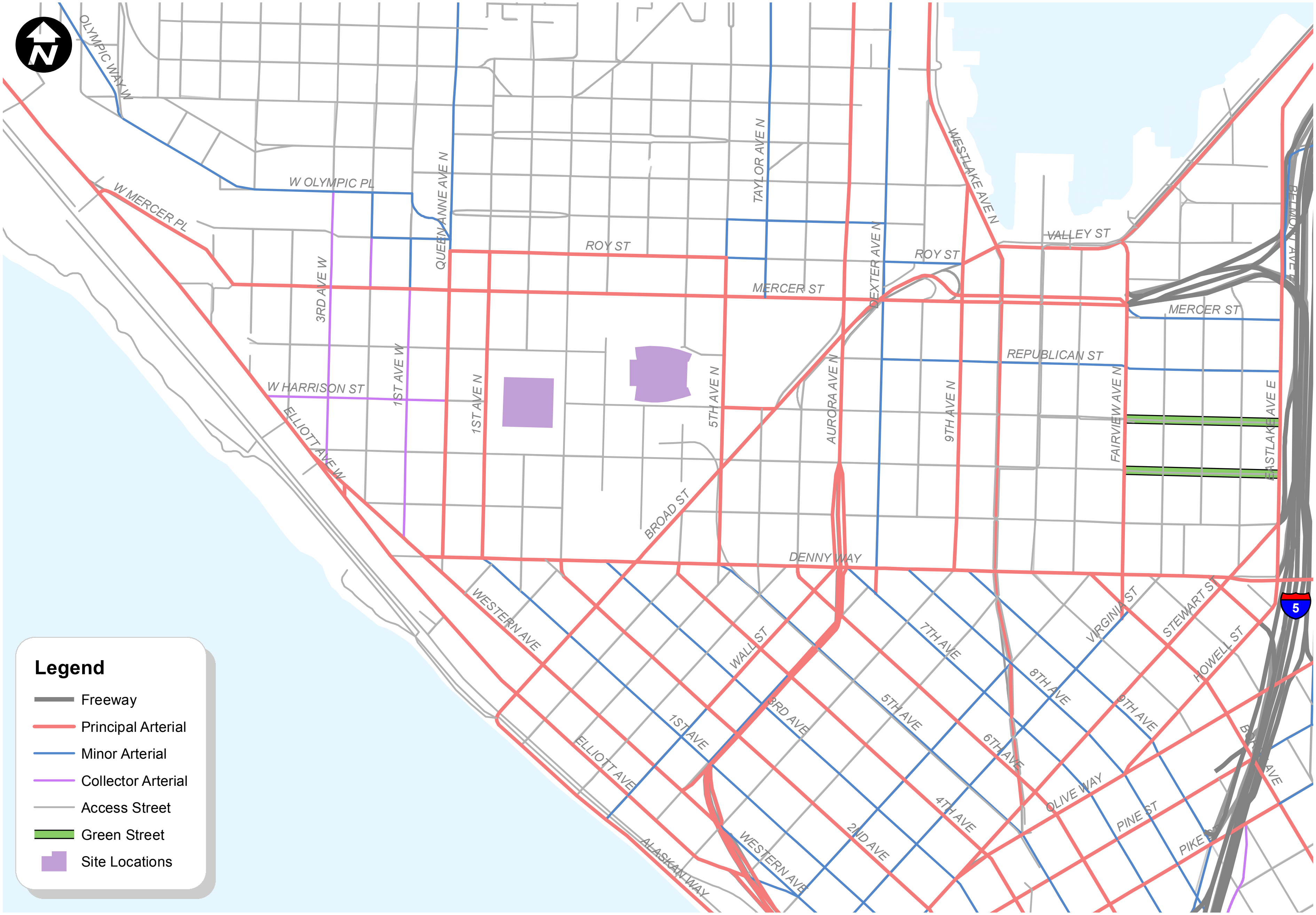
transpoGROUP

Table 3-1
Seattle Center Area Existing Street System Summary

Roadway	Arterial Classification	Posted Speed Limit	Number of Travel Lanes	Parking?	Sidewalks?	Bicycle Facilities?
Mercer St (West of Aurora Ave N.)	Principal Arterial	30 mph	4 lanes	Some Blocks	Free Flow	Most Blocks
Mercer St (East of Aurora Ave N.)	Principal Arterial	30 mph	5:00 to 7:00 lanes	Free Flow	Free Flow	No
W. Mercer Pl	Principal Arterial	30 mph	2 lanes	Free Flow	Some Blocks	No
W. Mercer St	Principal Arterial	30 mph	2 lanes	Free Flow	Free Flow	No
Roy St (West of 5th Ave N.)	Principal Arterial	30 mph	2 lanes	Most Blocks	Free Flow	Free Flow
Roy St (East of 5th Ave N.)	Access Street	30 mph	2 lanes	Free Flow	Free Flow	No
Denny Way	Principal Arterial	30 mph	4 to 5 lanes	No	Free Flow	No
Broad St	Principal Arterial	30 mph	4 to 5 lanes	No	Free Flow	No
1st Ave N.	Principal Arterial	30 mph	2 to 3 lanes	Most Blocks	Free Flow	Free Flow
Queen Anne Ave N.	Principal Arterial	30 mph	2 lanes	Most Blocks	Free Flow	Free Flow
Elliott Ave W.	Principal Arterial	35 mph	6 to 7 lanes	Most Blocks	Some Blocks	No
9th Ave N.	Principal Arterial	30 mph	2 lanes	Free Flow	Free Flow	Free Flow
Dexter Ave N.	Minor Arterial	30 mph	4 lanes	Free Flow	Free Flow	Free Flow
Westlake Ave N.	Principal Arterial	30 mph	4 lanes	Most Blocks	Free Flow	Most Blocks
Fairview Ave N.	Principal Arterial	30 mph	5 lanes	Most Blocks	Free Flow	No
Stewart St	Principal Arterial	30 mph	4 lanes	Some Blocks	Free Flow	Free Flow
Aurora Ave N.	Principal Arterial	40 mph	6 to 7 lanes	No	Most Blocks	No
5th Ave N.	Principal Arterial	30 mph	4 to 5 lanes	Most Blocks	Free Flow	No
Western Ave N.	Principal Arterial	35 mph	3 lanes	Most Blocks	Free Flow	No
Republican St	Minor Arterial	30 mph	2 lanes	Free Flow	Free Flow	No
Harrison St	Access Street	30 mph	NA	NA	Free Flow	Most Blocks
Valley St	Principal Arterial	30 mph	6 lanes	No	Free Flow	Free Flow

Figure 3–2 shows the street functional classifications for the study area. Unlike the Stadium District, the Seattle Center does not have event-related TCPs that change the use of intersections and roadways during events. There were TCPs for the Seattle Center area, when the Sonics NBA franchise played at the KeyArena, including manual traffic control at intersections and key garage exits, lane restrictions, etc. Currently, there are special event signal timing plans for the Mercer Street and Denny Way corridors to flush post-event traffic from the Seattle Center to I-5 and SR 99. This provides for faster egress than would otherwise occur with the surge in traffic after an event. It is noted that these were initiated at a time when Mercer Street was a four-lane one-way eastbound arterial connecting directly to I-5, and the KeyArena still accommodated the Sonics.

Several of the arterials within the Seattle Center area have freight designations. These designations include truck streets and seaport and intermodal connectors. These routes are used by freight operators to access Port of Seattle facilities and the region. Those designations are discussed further in the Freight and Goods section of the report



Seattle Center Area Street System

Seattle Arena

FIGURE
3-2

transpoGROUP

3.1.3 Impacts of No Action Alternative

The study area is undergoing major transportation system changes. A review of local and regional capital improvement programs and long-range transportation plans was conducted to determine planned (funded and unfunded) transportation projects that would impact the study area. The review included, but was not limited to, transportation plans from WSDOT, City of Seattle, King County, ST, and the Port of Seattle. Table 3-2 provides a summary of key future transportation projects in the study area. In addition, the table provides an understanding of how these transportation projects were incorporated into the No Action Alternative evaluation. Many of the major street system projects impacting vehicular movements would be completed by 2018. Projects slated to be completed beyond 2018 are primarily related to the non-motorized and transit system and would a decrease in dependence on the auto mode, during both typical commuter periods, as well as for events in the Seattle Center.

Following the tables is a more detailed discussion on how specific transportation projects impact the study area.

Table 3-2
Seattle Center Area: Key Study Area Planned Transportation Projects

Project Description	Responsible Agency	Expected Completion Date	Funded?[1]	Assumed in Analysis?[2]	
				2018	2030
***Alaskan Way Viaduct Replacement*:** SR 99 viaduct replaced with a tunnel between S. Royal Brougham Way and Mercer Street.	WSDOT	2017	Yes	✓	✓
***SR 520 Bridge Replacement*:** Construction of a new SR 520 floating bridge with 2 general purpose lanes and 1 HOV / transit lane per direction. Transit and non-motorized projects between SR 202 and I-5. The eastside and floating bridge segments are funded. The westside projects in the Montlake Interchange vicinity are not funded.	WSDOT	2015	Partial	✓	✓
Mercer Corridor: Convert Mercer Street, Roy Street, and Valley Street to two-way operations and improve non-motorized access.	SDOT	2015	Yes	✓	✓
First Hill Streetcar: Two-mile streetcar line serving Capitol Hill, First Hill and International District with connections to Link light rail, Sounder commuter rail and bus service.	SDOT	2014	Yes	✓	✓

Table 3-2 (Continued)
Seattle Center Area: Key Study Area Planned Transportation Projects

Project Description	Responsible Agency	Expected Completion Date	Funded?[1]	Assumed in Analysis?[2] 2018	2030
Link Light Rail: Extension of the regional light rail system. All segments are funded in ST2, but the year of completion may vary depending on revenue available to fund construction. The segments include:	Sound Transit				
North—University District and Capitol Hill		2016	Yes	✓	✓
North—Northgate		2021	Yes		✓
North—Lynnwood		2023	Yes		✓
East—Bellevue and Redmond		2023	Yes		✓
South—Extension to S. 200th Street		2016	Yes	✓	✓
South—Extension to Kent-Des Moines Road		2023	Yes		✓
King Street Station Multimodal Terminal: Improve station access including opening of the Grand Stairs to connect the upper Jackson plaza and King Street Station entrance and a new entrance on Jackson plaza. These connections will transform the station into a transportation hub with easy access to express buses, commuter trains and light rail service.	SDOT	2013	Yes	✓	✓
Elliott Bay Seawall Replacement: Replacement of the existing seawall along the Seattle waterfront from S. Washington Street to Broad Street.	SDOT	2019	Yes		✓
Waterfront Seattle: This project creates a continuous public waterfront between S. King Street and Bell Street and includes the design and construction of the new surface Alaskan Way and Elliott Way arterial streets.	SDOT	2014 and beyond	Partial	✓	✓
Southwest Transit Pathway: This project creates a new transit corridor on Alaskan Way and Columbia Street.	SDOT / King County Metro Transit	2016	Yes	✓	✓
Convention Place TOD: Expansion of the Washington State Convention Center to include a reconfiguration or relocation of transit access, layover and passenger amenities at Convention Place Station.	King County Metro Transit / King County	Unknown	No		

Table 3-2 (Continued)
Seattle Center Area: Key Study Area Planned Transportation Projects

Project Description	Responsible Agency	Expected Completion Date	Funded?[1]	Assumed in Analysis?[2]	
				2018	2030
Rapid Ride: Bus rapid transit service in 6 corridors (A through F) and the potential to expand into additional corridors in the future. Service has been initiated in 4 of the 6 corridors, and the E and F Lines are expected to start service in 2014.	King County Metro Transit	2014	Yes	✓	✓
Electric Trolleybus Fleet Replacement: Metro will replace its fleet of 159 trolleybus with modern low-floor vehicles providing more capacity on these routes.	King County Metro Transit	2015	Yes	✓	✓
Industrial Way Direct Access Ramps: This project would provide a direct connection from I-5 to and from the south to the SoDo Busway.	King County Metro Transit / WSDOT	Unknown	No		
Downtown Neighborhood Projects: Installation of pedestrian countdown signals and sidewalk repairs at the 1st Avenue S. intersections with S. Main Street and S. King Street.	SDOT	2013	Yes	✓	✓
S. Lander Street Grade Separation: This project grade separates S. Lander St. roadway and the BSNF mainline railroad tracks between 1st Avenue S. and 4th Avenue S.	SDOT	Unknown	No		

1. "Yes" means the project is fully funded for construction, "partial" means the project has some, but not complete funding for construction, and "no" means the project does not have any construction funding.
2. A check indicates that the project was assumed in the analysis related to the horizon year.

Planned projects assumed in the 2018 and 2030 analyses are described in more detail in the following sections.

3.1.3.1 2018 Planned Projects

The planned transportation projects assumed to be completed by 2018 and key features of each project are described below:

- **Mercer Corridor:** This project extends between I-5 and Elliott Avenue W. The main purpose is to improve the east-west connection in the area by turning Mercer Street into a two-way corridor and improving access for pedestrians and bicyclists. The project is separated into two phases, Mercer East and Mercer West. The impact to the study area of each phase is:

    - **Mercer East:** This portion of the project is located between Fairview Avenue N. and Dexter Avenue N. It provides two-way operations along both Mercer Street and Valley Street. The portion along Mercer Street is complete and has three travel lanes in each direction and sidewalks on both sides. Two new traffic signals are provided along Mercer Street at the Terry Avenue NE and Boren Avenue N. intersections. Valley Street is currently under construction and will have one lane in each direction with bicycle and pedestrian improvements. The project is scheduled to be completed by summer of 2013.

    - **Mercer West:** The portion stretches from Dexter Avenue N. to 5th Avenue W. Mercer Street will have three travel lanes in each direction between Dexter Avenue N. and 5th Avenue W., two lanes in each direction between 5th Avenue N. and 1st Avenue W., and one lane in each direction between 1st Avenue W. and 5th Avenue W. Roy Street will also be converted to have two-way operations with one lane of travel lane in each direction. Pedestrian and bicycle improvements will be provided along both Mercer Street and Roy Street, including bike lanes in both directions along Roy Street between 5th Avenue N. and Queen Anne Avenue N., a bike path on the north side of Mercer Street near the Aurora Avenue underpass, and new and / or improved sidewalks along the project corridor. This project is scheduled to be complete by mid-2015 and will connect to improvements made in the area related to the Alaskan Way Viaduct Replacement Project.

- **Alaskan Way Viaduct Replacement – North Portal**: This portion of the project provides connections transportation system in the Seattle Center area:

    - **Tunnel Access at Republican Street and 6th Avenue N.:** Access to SR 99 will be provided via new ramps at Republican Street. The northbound off-ramp traffic will exit to the east toward Dexter Avenue N. and the southbound traffic will merge onto SR 99 via a new 6th Avenue N. between Harrison Street and Mercer

Street west of SR 99. The new 6th Avenue N. roadway will have one to two lanes in each direction and a traffic signal at the SR 99 ramp intersection.

  - **New Street Connections to Aurora Avenue N. (SR 99):** John Street, Thomas Street, and Harrison Street will connect to Aurora Avenue N. Thomas Street will have bike lanes between Dexter Avenue N. and 5th Avenue N. Aurora Avenue N. will have two travel lanes in each direction, an additional transit-only lane, and turn pockets between Denny Way and Harrison Street. The Denny Way intersections with John Street, Thomas Street, and Harrison Street will be signalized.

3.1.3.2 2030 Planned Projects

Transportation improvements assumed as part of the 2030 evaluation for the Seattle Center study area include:

- **Link Light Rail:** The regional light rail system is anticipated to extend beyond Seattle by 2030 with four extensions planned:
  - **Northgate:** The light rail will extend between the University extension and Northgate. The three locations where stations are planned are the U-District near NE 45th Street and Brooklyn Avenue NE, Roosevelt High School near 12th Avenue NE and NE 65th Street, and Northgate Mall / Transit Center near NE 103rd Street. This project is under construction and service is expected in 2021. **Lynnwood:** This segment will connect from the northern point of the Northgate extension and terminate in Lynnwood. Several stations are planned along the route at NE 130th / 145th / 155th Street in Seattle / Shoreline, NE 185th Street in Shoreline, 236th Street SW in Mountlake Terrace, and 200th Street SW in Lynnwood which follows the I-5 corridor. Construction would begin in 2018 with service expected to begin in 2023.
  - **East:** This extension will link Bellevue and Mercer Island to the International District / Chinatown Station in Seattle. Several stations are planned along the route: Rainier Avenue S.; Mercer Island; South Bellevue, East Main, Bellevue Transit Center, Overlake Hospital, 120th Avenue NE, and 130th Avenue NE in Bellevue; and Overlake Village and Overlake Transit Center in Redmond. Construction is expected to begin in 2015 with service in 2023.
  - **South:** This segment would extend Link from S. 200th Street in SeaTac to add one additional station at Kent-Des Moines Road in the vicinity of Highline Community College. The project is anticipated to open for service in 2023.

3.1.4 Impacts of Alternative 4

Construction impacts related to the street system would mostly occur on Mercer Street, Denny Way, and 1st Avenue N. adjacent to the site. Street closures and other disruptions to the street system would be minimized and scheduled during the off-peak periods to minimize impacts to the system.

Planned offsite improvements in the study area for 2018 and 2030 conditions are consistent with the No Action Alternative. No additional changes offsite or within the Seattle Center area street system have been identified as a result of Alternative 4. No plans for an arena on the KeyArena site have been prepared.

3.1.5 Impacts of Alternative 5

Construction impacts related to the street system would mostly occur on Mercer Street, Denny Way, and 5th Avenue N. adjacent to the site. Street closures and other disruptions to the street system would be minimized and scheduled during the off-peak periods to minimize impacts to the system.

Planned offsite improvements in the study area for 2018 and 2030 conditions are consistent with the No Action Alternative. No additional changes offsite or within the Seattle Center area street system have been identified as a result of Alternative 5. No plans for an arena on the Memorial Stadium site have been prepared.

3.1.6 Mitigation Measures

A complete summary of potential mitigation measures to be considered across all the Transportation Elements evaluated in this report is included in Chapter 4.0 of Appendix E. This summary includes identification of both programmatic measures and physical improvements. For each of the potential mitigation measures a designation of high to low influence was noted. The following identifies those potential mitigation measures considered to have a high influence on this transportation element. These potential mitigation measures are appropriate for both Alternative 4 and Alternative 5.

- Construction management plan
- Central construction coordinator
- Street and sidewalk closure detour plans (construction)

3.1.7 Secondary and Cumulative Impacts

No secondary or cumulative impacts have been identified.

3.1.8 Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts are expected.

3.2 Public Transportation

3.2.1 Methodology

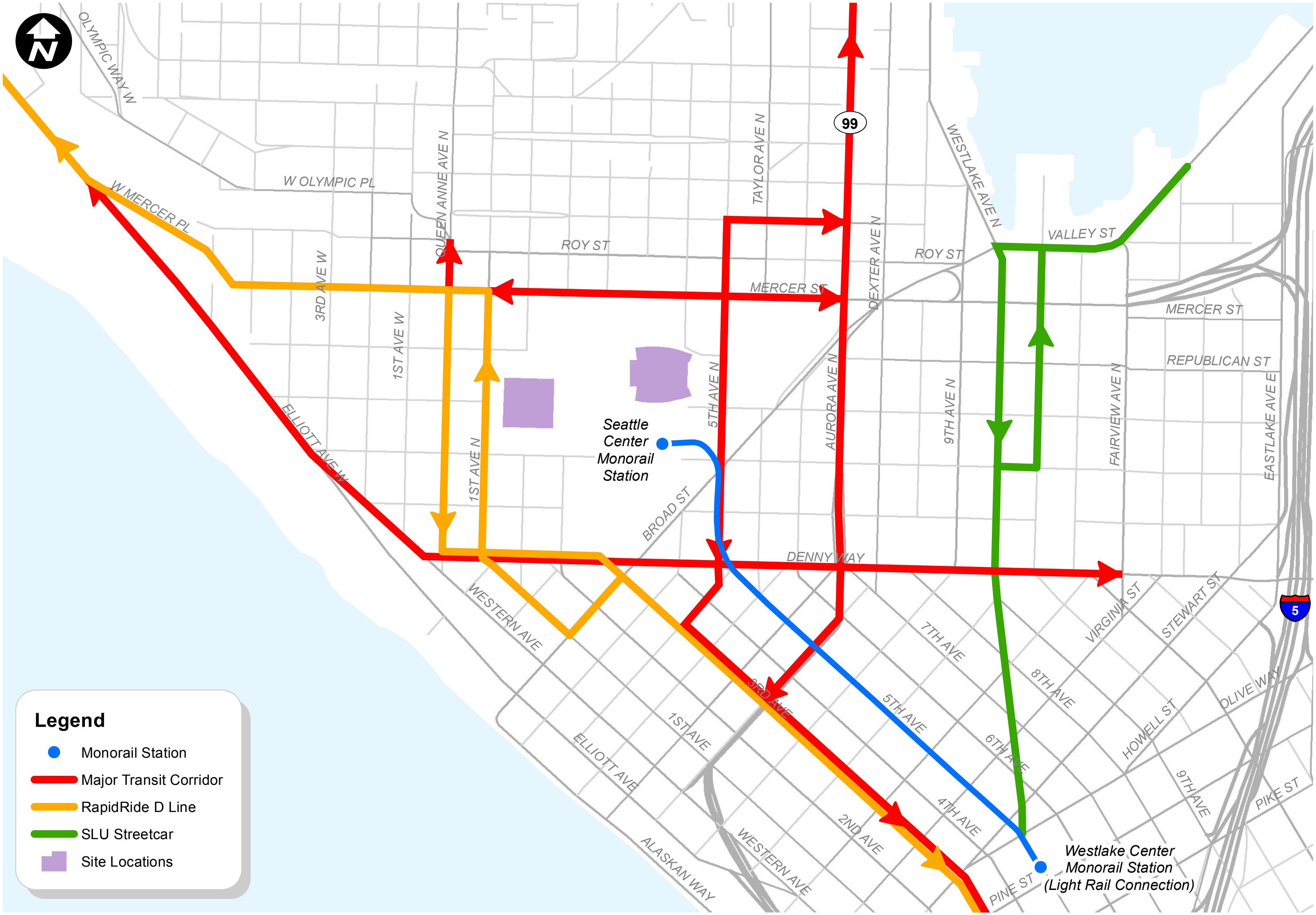
The general approach to the evaluation of public transportation impacts included:

- Determination of existing transit passenger capacity during pre-and post-event periods for weekday and weekend events
- Identification of future 2018 and 2030 growth in ridership and change in capacity
- Consideration of event ridership associated with event cases for No Action and Alternatives 4 and 5
- Evaluation of capacity needed to support Alternatives 4 and 5
- Consideration of speed and reliability under existing and future conditions

The analysis focuses on weekday event conditions because transit ridership and motorized volumes are highest during this timeframe; this provides a conservative estimate of transit capacity and reliability impacts. The Seattle Center area transit capacity and ridership was developed in the same manner described for the Stadium District.

3.2.2 Affected Environment

Regional public transit is provided by King County Metro Transit and the City of Seattle and offers a number of ways for people to access Seattle Center area including bus, streetcar, and monorail transit as illustrated on Figure 3–3. Figure 3–4 summarizes bus routes serving the Seattle Center by roadway, stop location, and general downtown Seattle service areas.



Seattle Center Area Transit Facilities and Corridors

Seattle Arena

FIGURE **3-3**

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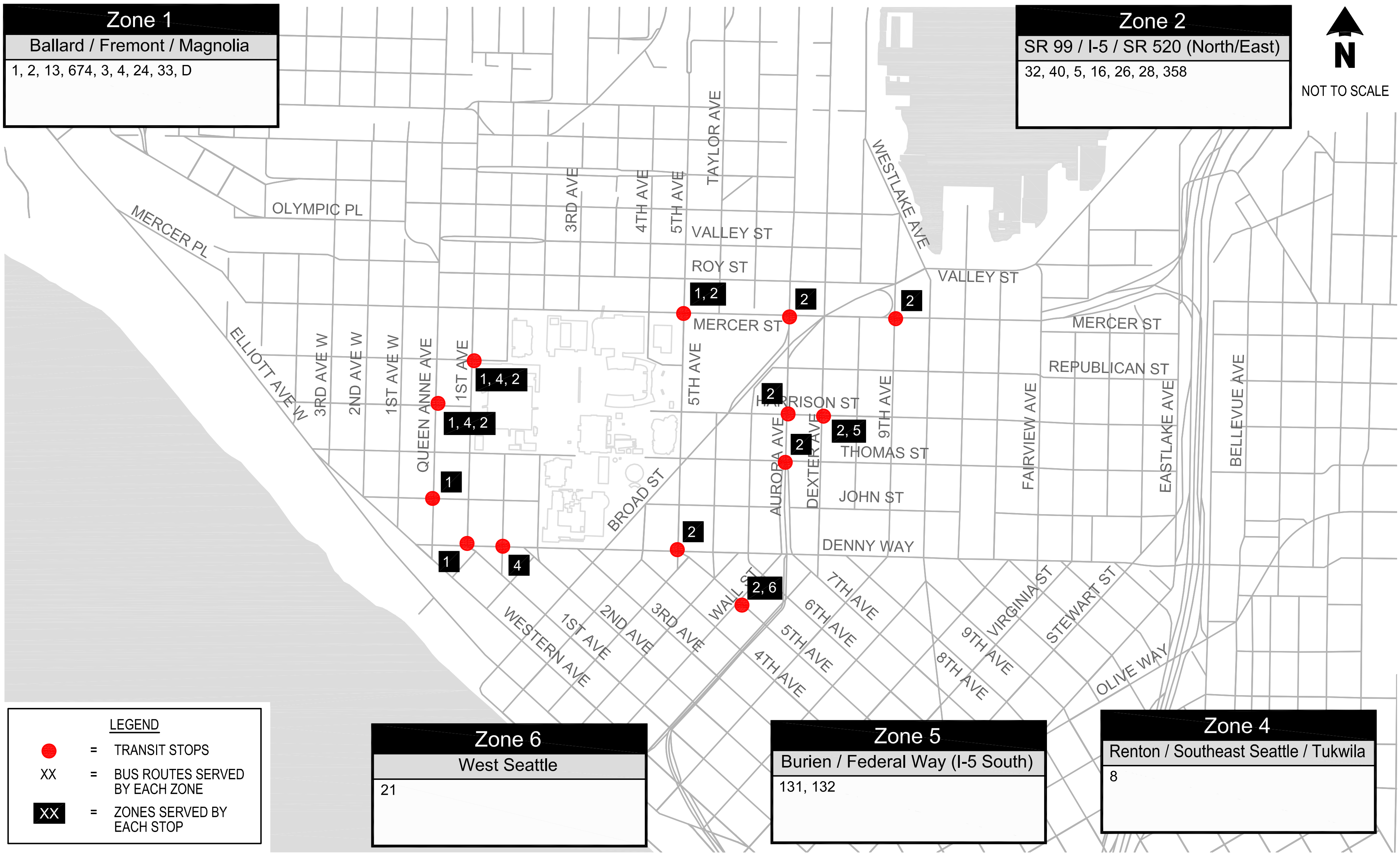


NOTE: No Zone 3 service provided in study area.

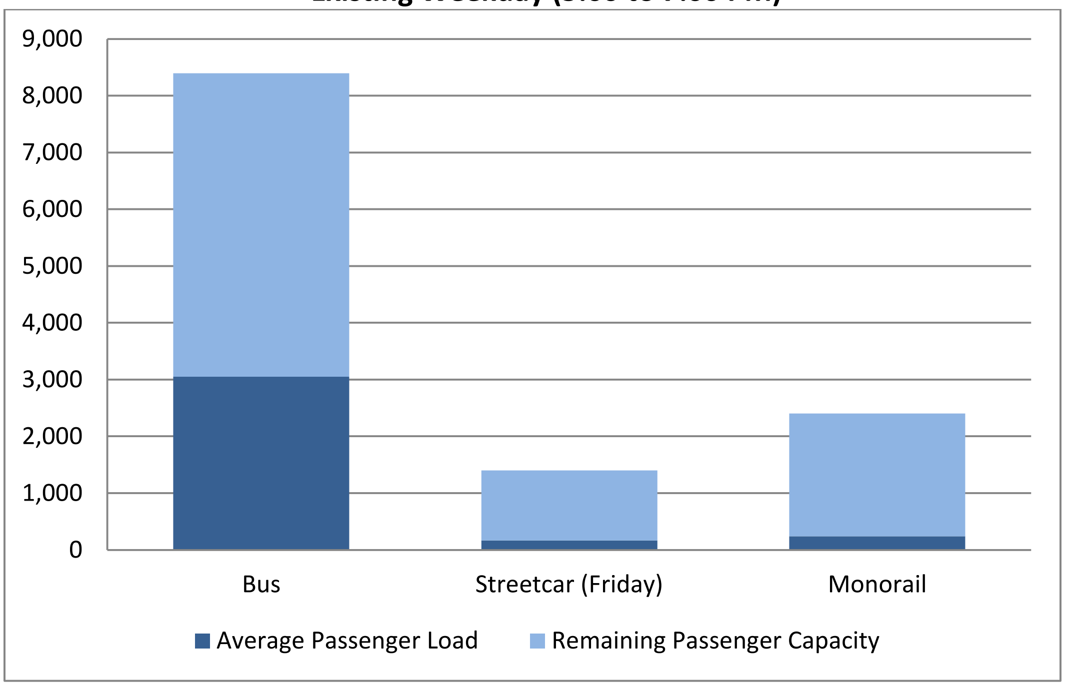
Seattle Center Area Bus Routes

Seattle Arena

FIGURE
3-4

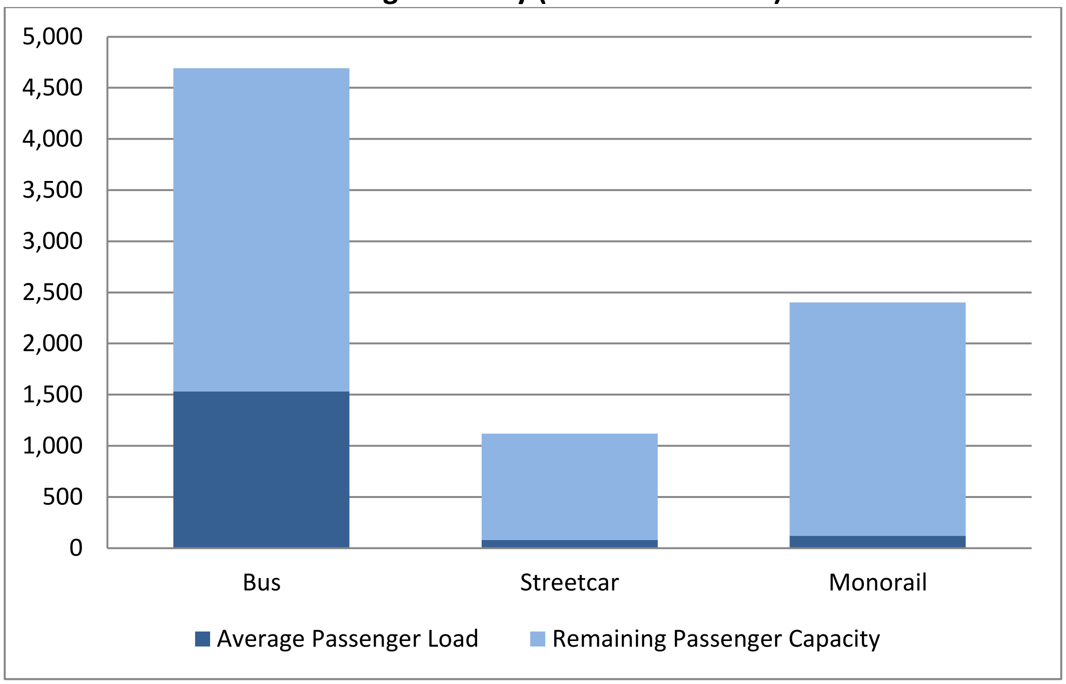
The capacity of these transit services to transport people to and from the Seattle Center area varies by day (weekday or weekend service) and by the time of day (peak commuter period, evening services, etc.). This section summarizes the total passenger capacity and available passenger capacity to and from the Seattle Center area during a weekday evening for transit modes; this includes inbound to downtown Seattle transit service from 5:00 to 7:00 PM and outbound from downtown Seattle transit service from 9:00 to 11:00 PM. The total and available passenger capacities for an average weekday on all available transit services are illustrated on Figure 3–5 and Figure 3–6.

Figure 3–5 Seattle Center Area Transit Passengers Inbound – Existing Weekday (5:00 to 7:00 PM)



Note: Streetcar and monorail Friday service was used for outbound passenger capacity because outbound service is not provided after 9 PM Monday through Thursday.

Figure 3–6 Seattle Center Area Transit Passengers Outbound – Existing Weekday (9:00 to 11:00 PM)



Note: Streetcar and monorail Friday service was used for outbound passenger capacity because outbound service is not provided after 9 PM Monday through Thursday.

3.2.2.1 Bus Transit

Bus transit for the Seattle Center area is concentrated along 1st Avenue, Queen Anne Avenue N., Mercer Street, Denny Way, 5th Avenue, Aurora Avenue N., and Dexter Avenue N. (see Figure 3–3). Bus service to the area is currently provided by King County Metro Transit.

The number of buses in service on routes through the Seattle Center area during the peak weekday afternoon commuter period is higher leaving the downtown Seattle core than entering. Also, the number of buses in service in the late evening is less than the weekday afternoon commuter period. Similarly, bus headways are shorter during peak weekday afternoon commuter periods (10 to 30 minutes) compared to late evening and weekend service (30 to 60 minutes).

Bus Ridership: Existing bus ridership was provided by King County Metro Transit for buses serving the Seattle Center area that travel to downtown Seattle from 5:00 to 7:00 PM and out of downtown Seattle from 9:00 to 11:00 PM. There is no ST service to Seattle Center area. The available bus service was grouped into six service zones or corridors consistent with the Stadium District analysis:

- Zone 1: Magnolia, Ballard and Fremont area of Seattle
- Zone 2: Along SR 99, I-5, and SR 520, and areas to the north and northeast

- Zone 3: Bellevue, Issaquah, and areas east along I-90 to the east
- Zone 4: Southeast Seattle, Tukwila, and Renton
- Zone 5: South on I-5, Federal Way, Burien, and areas to the south
- Zone 6: West Seattle

Bus transit provides almost double the passenger capacity for bringing people to an event from 5:00 to 7:00 PM (see Figure 3–7) compared to leaving an event from 9:00 to 11:00 PM (see Figure 3–8). Also, the amount of bus passenger capacity varies to the different areas of King County; there is more bus service to Ballard / Fremont and along SR 99, I-5, and SR 520 compared to other service centers, for buses operating through the Seattle Center area. The occupancy rate for these buses, which is the total number of passengers on buses through the Seattle Center area divided by the total passenger capacity of those buses, is approximately 36 percent for both inbound (5:00 to 7:00 PM) and approximately 33 percent outbound (9:00 to 11:00 PM) service. This means that approximately 3,000 people were traveling to the Seattle Center area and 1,500 people were traveling away from the Seattle Center area to areas served by the selected King County Metro Transit routes. Also, the remaining capacity on all buses could accommodate approximately 5,350 passengers inbound and 3,150 outbound during these time frames. During peak commute periods and event days, specific buses and routes within the six zones experience higher ridership and overcrowding.

Figure 3–7 Seattle Center Area Bus Passengers Inbound – Existing Weekday (5:00 to 7:00 PM)

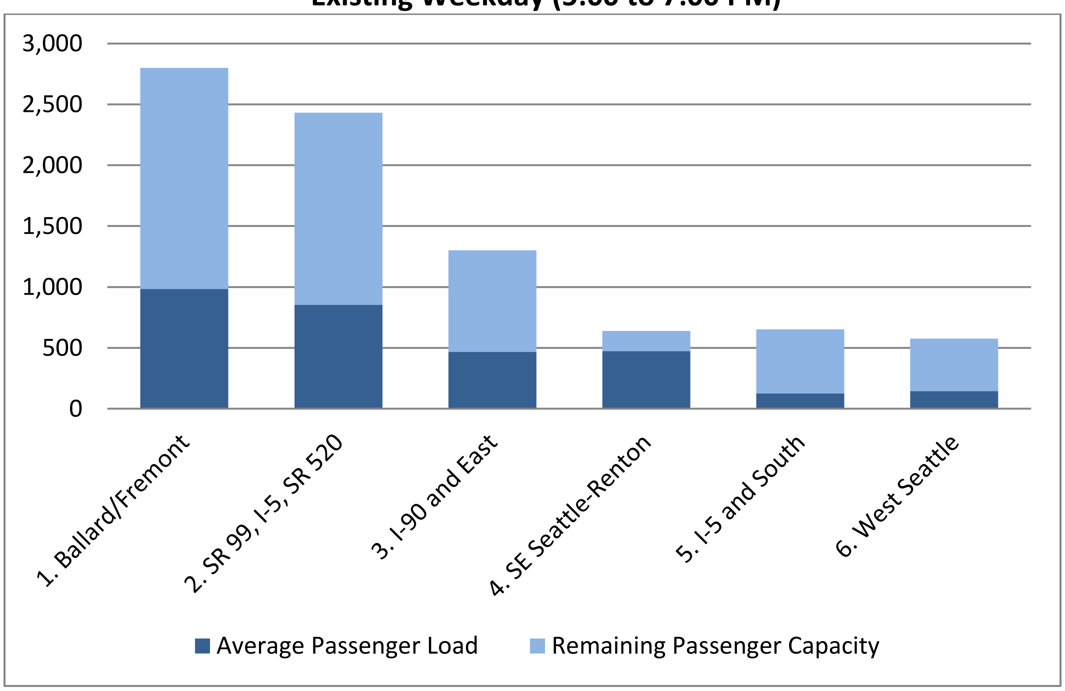
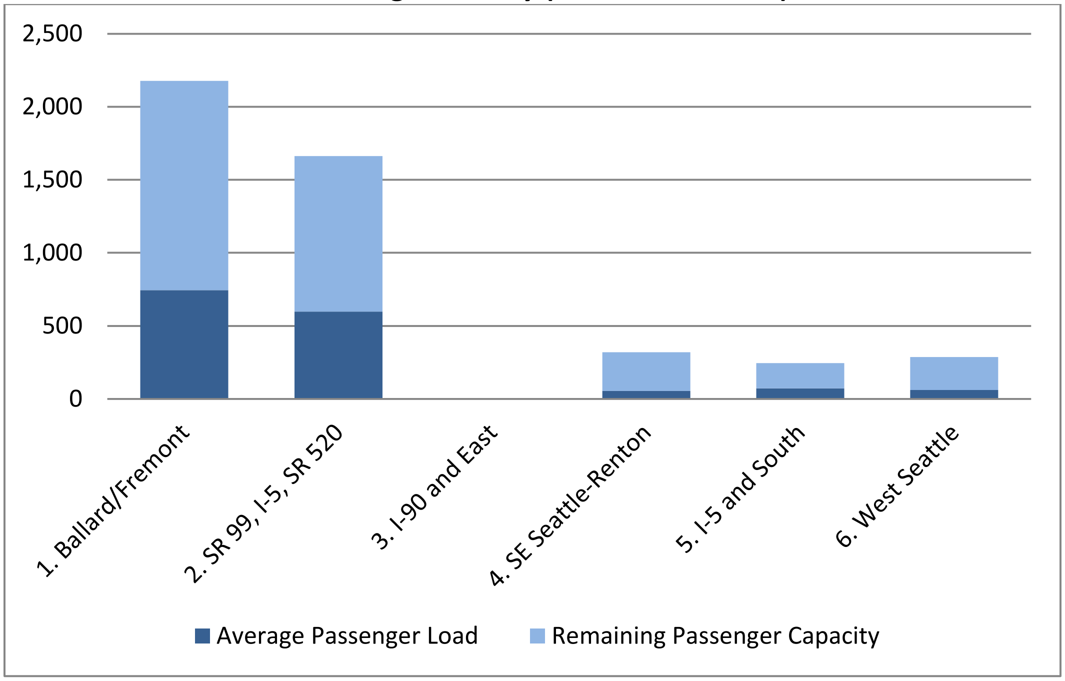


Figure 3–8 Seattle Center Area Bus Passengers Outbound – Existing Weekday (9:00 to 11:00 PM)



Weekday bus service (passenger capacity) is reduced by approximately 30 percent from 5:00 to 7:00 PM on weekends and approximately 10 percent from 9:00 to 11:00 PM. Based on King County Metro Transit ridership, the average number of passengers is approximately 30 percent less on weekends from 5:00 to 7:00 PM compared to weekdays and almost no change from 9:00 to 11:00 PM.

Speed and Reliability. On-time performance information was provided by King County Metro Transit for routes serving the Seattle Center area, which was used to determine the reliability of buses to meet schedules. Bus reliability is one indicator for how attractive bus transit is to people as a choice for making a trip.

King County Metro Transit bus service to downtown Seattle from 5:00 to 7:00 PM was on-time approximately 75 percent of the time. This indicates that buses were no more than 1 minute early to no more than 5 minutes late 75 percent of the time. Buses leaving downtown Seattle from 9:00 to 11:00 PM were on-time approximately 77 percent of the time.

The travel time for buses (an indication of speed and reliability) would be similar to general purpose traffic because they operate in mixed flow through the Seattle Center area (not including the time it takes for buses to serve bus stops). The traffic operations impact analysis of this report provides a detailed evaluation of three key routes within the Seattle Center area including Mercer Street, Denny Way, and 5th Avenue, which have bus service (see Section 3.6 Traffic Operations Table 3-12).

Other Service Information. King County Metro Transit is facing up to a 17 percent system-wide service reduction if additional funding is not secured. These reductions could begin in Fall 2014. Some of the routes included in this analysis could be impacted by these reductions (for the Viaduct replacement construction mitigation). The funding cut could reduce the capacity on the routes currently providing service to Seattle Center.

ST provides additional bus service as necessary to accommodate passenger loads to special events. Prior to events, an assessment of extra service is determined based on ticket sales for the event. Historically, when the Sonics were playing at KeyArena, ST notes that they did not typically experience a notable ridership uptake because getting to KeyArena would involve a transfer.

3.2.2.2 South Lake Union Streetcar

The SLU Streetcar provides service between SLU and Westlake shopping center with five intermediate stops along Westlake Avenue and Terry Avenue N. in both directions. Stops are located within a 10-minute walk of the Seattle Center area; the closest stop is located at the intersection of Westlake Avenue and Thomas Street. Currently, the streetcar operates on 15-minute headways. The SLU Streetcar operates from 6:00 AM to 9:00 PM Monday through Thursday, and 6:00 AM to 11:00 PM on Friday and Saturday. Sunday service is operated from 10:00 AM to 7:00 PM. With the existing service, streetcar service would not be available after events from Sunday to Thursday. Weekday streetcar service (passenger capacity) is reduced by approximately 20 percent from 5:00 to 7:00 PM on weekends and no change from 9:00 to 11:00 PM.

<u>Streetcar Ridership</u>

As illustrated on Figure 3–5 and Figure 3–6, streetcar transit provides a total capacity for approximately 1,120 passengers traveling inbound and outbound to the Seattle Center area (the Streetcar does not provide outbound service Monday through Thursday). The City of Seattle provided a limited sampling of daily streetcar passenger observations summarized by stop; on average, the SLU Streetcar carried 2,200 passengers. By applying the daily average load at stop closest the Seattle Center area, streetcars would be carrying approximately 165 passengers inbound and 80 passengers outbound from Westlake Center in downtown Seattle. This means the SLU Streetcar has a remaining passenger capacity of approximately 1,235 inbound passengers (see Figure 3–5) and 1,040 outbound passengers (see Figure 3–6). Because the average daily passenger load was used in this analysis, it is likely the passenger loads are higher from 5:00 to 7:00 PM and lower from 9:00 to 11:00 PM.

3.2.2.3 Monorail

The Seattle Center Monorail, which is owned by the City of Seattle, provides a non-stop connection between Westlake Center (near 5th Avenue and Pine Street) to Seattle Center. The Monorail operates on 10-minute headways from 7:30 AM to 9:00 PM Monday through Thursday, and from 7:30 AM to 11:00 PM on Friday. The Seattle Center Monorail also provides a direct connection to light rail at Westlake Center. Weekend monorail service or passenger capacity from 5:00 to 7:00 PM is the same as weekday service.

Monorail Ridership

Existing monorail ridership was provided by Seattle Monorail Services, the operator of the Seattle Center Monorail. Today, monorail transit provides a total capacity for approximately 2,400 passengers traveling inbound and outbound to Seattle Center. As illustrated on Figure 3–5 and Figure 3–6, monorail transit has approximately 240 passengers from Seattle Center to Westlake Center (inbound to downtown Seattle) from 5:00 to 7:00 PM and approximately 120 passengers to Seattle Center from 9:00 to 11:00 PM (Friday-only because service stops at 9:00 PM Monday through Thursday). This means the remaining capacity on monorail could accommodate approximately 2,160 passengers inbound and 2,280 outbound during these time frames.

Other Service Information

Seattle Monorail Services noted that monorail ridership increases by approximately 150 to 200 people with events at KeyArena such as concerts and Sonics games. There is a slight increase in ridership of approximately 40 to 50 passengers with events at Safeco Field and CenturyLink Field.

3.2.2.4 Washington State Ferries Transit

WSF provides ferry service to Seattle at Colman Dock, located near Alaskan Way and Yesler Way. Colman Dock is approximately one and a half miles south of the Seattle Center area. Ferries to / from Seattle serve Bainbridge Island and Bremerton. The ferries have arrivals and departures scheduled throughout the day with headways of approximately 60 minutes for Bainbridge Island service and approximately 75 minutes for Bremerton service. Ferries serving both of these routes are some of the largest ferries in WSF's fleet, providing combined vehicle and passenger service. According to WSF's website, these ferries are capable of transporting 2,500 passengers per trip, in addition to vehicles. Weekend ferry service (passenger capacity) increases by approximately ten percent over weekday ferry service.

Ferry Ridership

WSF Colman Dock service provides a total capacity for approximately 7,300 passengers traveling inbound to the Seattle Center area from 5:00 to 7:00 PM and 9,800 passengers outbound from 9:00 to 11:00 PM. Currently, WSF only collects ridership information for westbound (outbound) ferries at Colman Dock. The eastbound (inbound) ridership from 5:00 to 7:00 PM was estimated by assuming westbound passengers leaving from 7:00 to 9:00 AM (2012 counts) would return to Seattle from 5:00 to 7:00 PM. Also, this ridership was increased by ten percent to account for people traveling to Seattle for events not related to the Seattle Center. These assumptions result in an average inbound passenger load of approximately 210 passengers. During May 2012 service, ferries had an average load of approximately 640 passengers traveling outbound from 9:00 to 11:00 PM.

3.2.3 Impacts of No Action Alternative

This section describes the impacts of the No Action Alternatives for analysis years 2018 and 2030. As compared to weekday, weekend service characteristics were assumed to be similar to existing conditions.

3.2.3.1 Year 2018

By 2018, the Alaskan Way Viaduct Replacement project is scheduled to be complete and would reconnect John Street, Thomas Street and Harrison Street, which were previously bisected by SR 99. This improvement was not assumed to change ridership, but would provide alternative pedestrian connections to and from the SLU Streetcar and bus transit routes to the Seattle Center area. The new fleet of King County Metro Transit trolley buses are anticipated to reduce bus loading / unloading times at bus stops, but were not assumed to impact passenger demand or capacity.

For all transit modes serving the Seattle Center, no change in passenger capacity (service levels) was assumed because of the uncertainty of transit funding.

Bus Transit

As described in the methodology, the number of bus riders was anticipated to increase by approximately two percent annually from 2013 to 2018. Headways were assumed to remain unchanged (King County Metro Transit Rapid Ride E-Line could be operational by this time and would provide a slight increase in overall service). Bus transit passenger loads would increase by approximately 975 inbound passengers and 810 outbound passengers for No Action Case K2/M2 (this includes transit riders for 12,000 patron events at KeyArena and 5,000 patron events at Memorial Stadium as well as background growth).

As illustrated on Figure 3–9 and Figure 3–10, No Action Case K2/M2 could be accommodated with assumed bus service levels for all service zones, except for outbound routes serving I-90 and areas to the east of Seattle. Buses do not operate directly from Seattle Center to I-90 in the evening and event attendees would be required to use other bus routes, monorail, or streetcar to transfer to bus service to the east in downtown Seattle. The remaining passenger capacity on these modes is sufficient to accommodate the approximately 180 event attendees connecting from the Seattle Center area to east side transit service in downtown Seattle (see Figure 3–11 and Figure 3–12). The number of event attendees required to transfer would be less for other No Action scenarios because there are less event attendees.

Because the No Action Case K2/M2 scenarios has the highest assumed passenger demand, the No Action Case K1 (12,000 patrons) and Case M1 (5,000 patrons) could also be accommodated. Similar to existing conditions, some bus routes would experience higher levels of passenger ridership and potentially overcrowding.

Figure 3–9 Seattle Center Area Bus Transit Inbound – 2018 No Action Case K2/M2

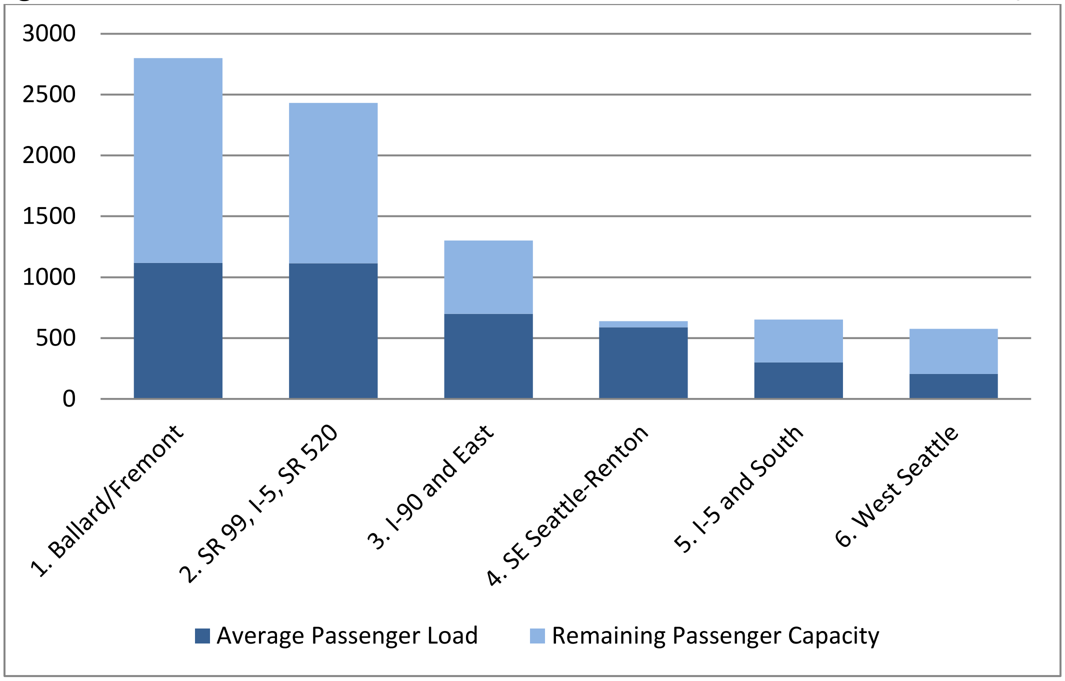
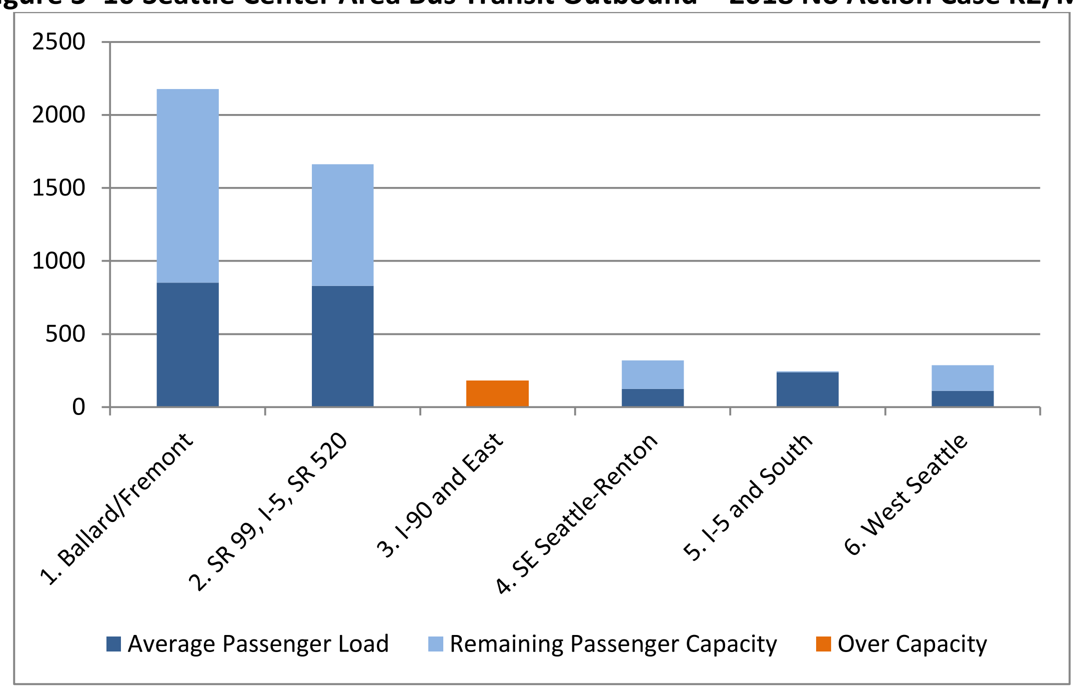


Figure 3–10 Seattle Center Area Bus Transit Outbound – 2018 No Action Case K2/M2

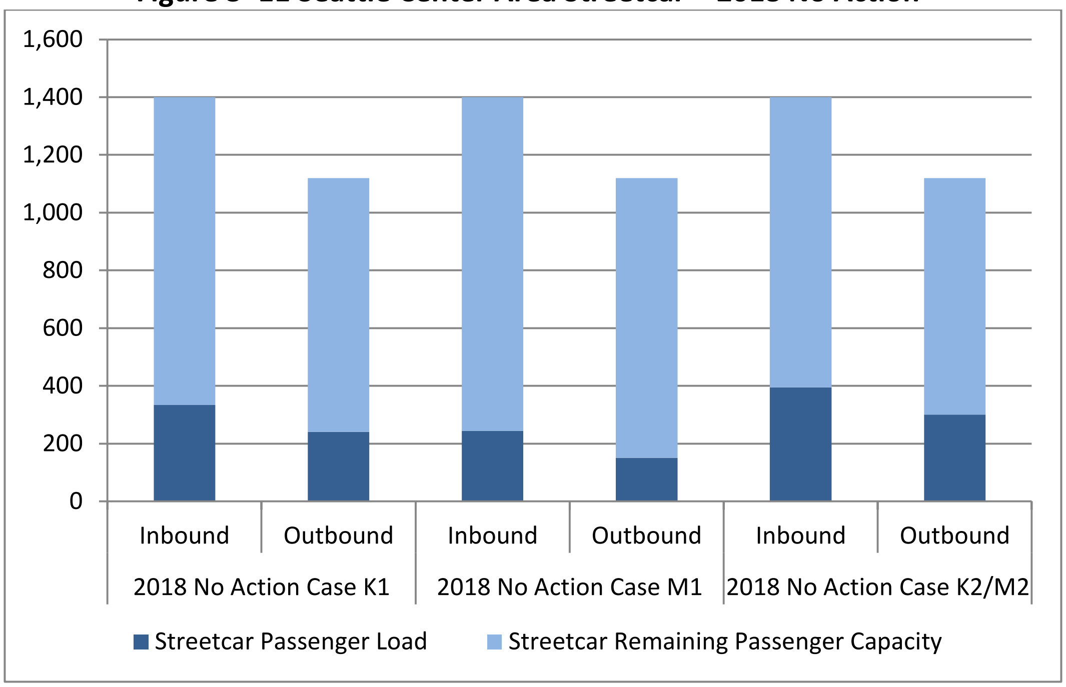


The travel time for buses (an indication of speed and reliability) would be similar to general purpose traffic because they operate in mixed flow through the Stadium District (not including the time it takes for buses to serve bus stops). As indicated in the traffic operations section of this report, travel times under 2018 conditions increase from existing conditions and further increase with the addition of event traffic, compared to existing conditions (see Section 3.6 Traffic Operations Table 3-14).

Streetcar Transit

The number of people who would use streetcar transit was anticipated to increase by approximately two percent annually from year 2013 to year 2018. Headways were assumed to remain unchanged. As illustrated on Figure 3–11, streetcar passenger loads would increase by approximately 230 inbound passengers and 220 outbound passengers for No Action Case K2/M2. Because No Action Case K2/M2 has the highest assumed passenger demand and could be accommodated with existing streetcar service levels, No Action Case K1 and Case M1 could also be accommodated.

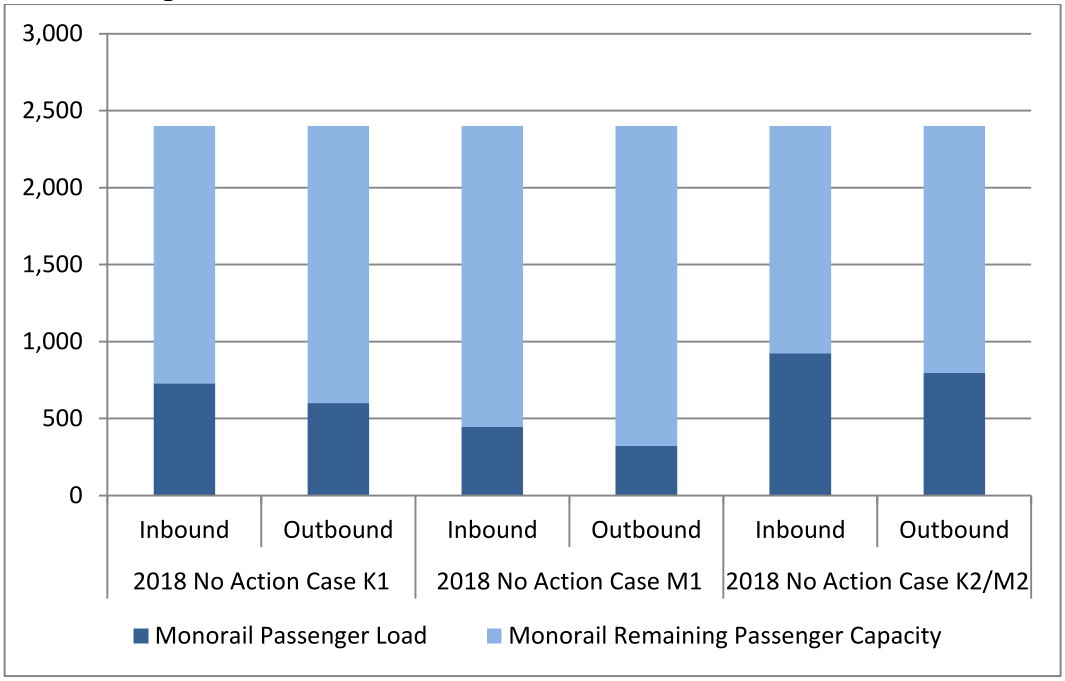
Figure 3–11 Seattle Center Area Streetcar – 2018 No Action



Monorail Transit

The number of people who would use the Seattle Monorail was anticipated to increase by approximately one percent annually from year 2013 to year 2018. Headways were assumed to remain unchanged. As illustrated on Figure 3–12, monorail passenger loads would increase by approximately 680 inbound passengers and 675 outbound passengers for the No Action Case K2/M2. Because Case K2/M2 has the highest assumed passenger demand and could be accommodated with existing monorail service levels, the No Action Case K1 and Case M1 with an event at either Memorial Stadium or KeyArena could also be accommodated.

Figure 3–12 Seattle Center Area Monorail – 2018 No Action



Washington State Ferries

No change in the number of WSF vessels serving Colman Dock was assumed from the year 2013 to 2018. The number of walk-on passengers was anticipated to increase by approximately three percent annually from 2013 to 2018. Approximately 340 inbound passengers and 405 outbound passengers would use WSF service for part of their trip to events at Seattle Center for the No Action Case K2/M2. Event attendees would connect between Colman Dock and the Seattle Center area using bus, monorail, streetcar, and / or other services such as a taxi, walking, or bicycling. It is difficult to anticipate the impact of these event attendees on public transit. Many of them would already be in or around the Seattle area, having completed the ferry-leg of their trip in the morning for the commute into work. From 5:00 to 7:00 PM bus routes through downtown would experience an increase in passenger demand as some ferry riders use bus service to travel to an event at the Seattle Center area. Another 80 patrons were assumed to drive to connect to Seattle Center and complete part of their trip using WSF service.

3.2.3.2 Year 2030

For all transit modes serving the Seattle Center area, no change in passenger capacity (service levels) was assumed because of the uncertainty of transit funding.

Bus Transit

The number of people who would use bus service was anticipated to increase by approximately two percent annually to year 2030. Headways were assumed to remain unchanged. Bus transit passenger loads would increase by approximately 1,920 inbound passengers and 1,275 outbound passengers for No Action Case K2/M2. Because No Action Case K2/M2 has the highest assumed passenger demand and could be accommodated with existing bus service levels, No Action Case K1 and Case M1 could also be accommodated. As illustrated on Figure 3–13 and Figure 3–14, the No Action Case K2/M2 (assumes 12,000 patrons at KeyArena and another 5,000 patrons at Memorial Stadium) could be accommodated with assumed bus service levels for all service zones, except for:

- Inbound bus routes serving southeast Seattle and Renton areas (Zone 4): Bus passengers would use other bus and light rail service to downtown Seattle accessed via park and ride lots or local feeder bus service and transfer in downtown Seattle to bus, monorail, and / or streetcar services. This would impact approximately 100 passengers.
- Outbound buses serving I-90 and areas to the east (Zone 3): Buses do not operate directly from the Seattle Center area to I-90 in the evening and event attendees would transfer to other bus routes, monorail, or streetcar to connect to additional service in downtown Seattle. The remaining passenger capacity on these modes is sufficient to accommodate the approximately 175 event attendees connecting from the Seattle Center area to east side transit service in downtown Seattle (see Figure 3–15 and Figure 3–16).
- Outbound bus routes serving I-5 and south (Zone 5): The number of buses operating directly from the Seattle Center area south I-5 in the evening decreases. Event attendees would transfer to other bus routes, monorail, or streetcar to access additional bus service in downtown Seattle. The remaining passenger capacity on these modes is sufficient to accommodate the approximately 10 event attendees connecting from the Seattle Center area to this south using transit service in downtown Seattle (see Figure 3–15 and Figure 3–16).

Figure 3–13 Seattle Center Area Bus Transit Inbound – 2030 No Action Case K2/M2

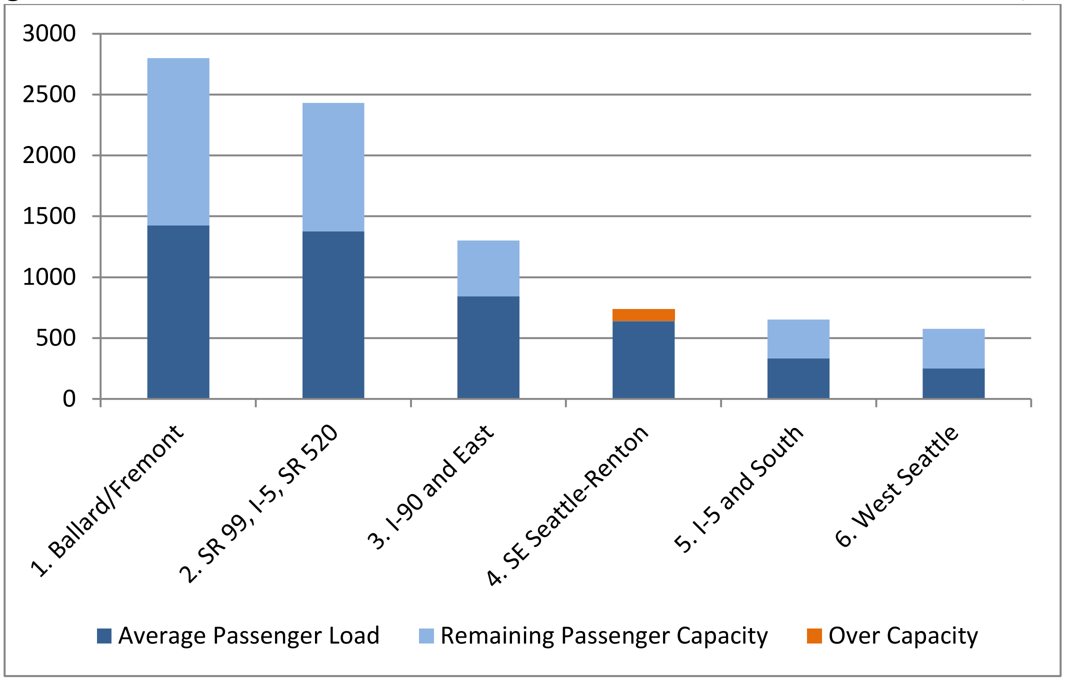
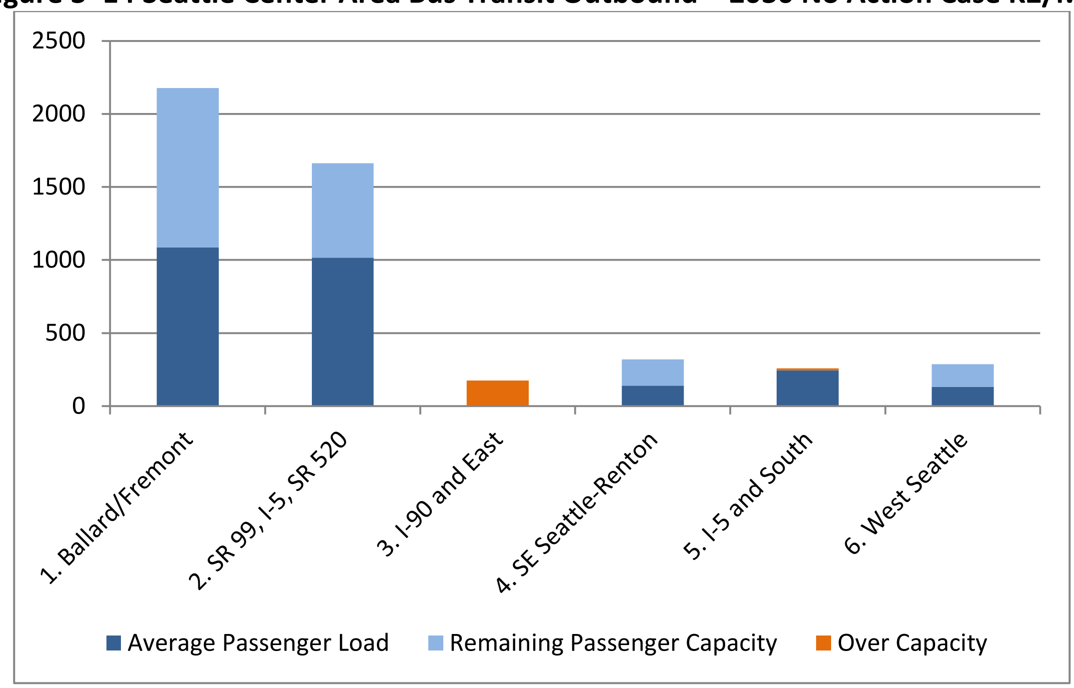


Figure 3–14 Seattle Center Area Bus Transit Outbound – 2030 No Action Case K2/M2

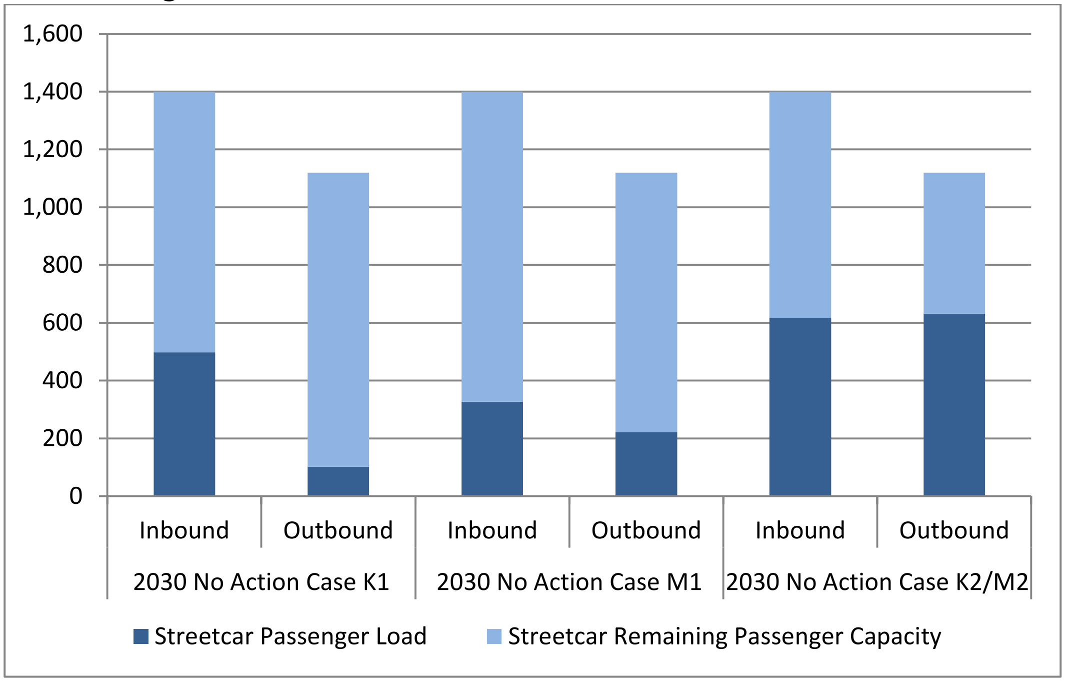


The travel time for buses (an indication of speed and reliability) would be similar to general purpose traffic because they operate in mixed flow through the Seattle Center are (not including the time it takes for buses to serve bus stops). As indicated in the traffic operations section of this report, travel times under 2030 conditions are generally similar to 2018 conditions (see Section 3.6 Traffic Operations **Table 3-15**).

Streetcar Transit

The number of people who would use streetcar service was anticipated to increase by approximately two percent annually to year 2030. Headways, the time between streetcars at stations, were assumed to remain unchanged. As illustrated on Figure 3–15, streetcar passenger loads would increase by approximately 450 inbound passengers and 430 outbound passengers for the No Action Case K2/M2. This scenario and the 2030 No Action Case K1 and Case M1, which would have fewer passengers, could be accommodated with assumed streetcar service levels.

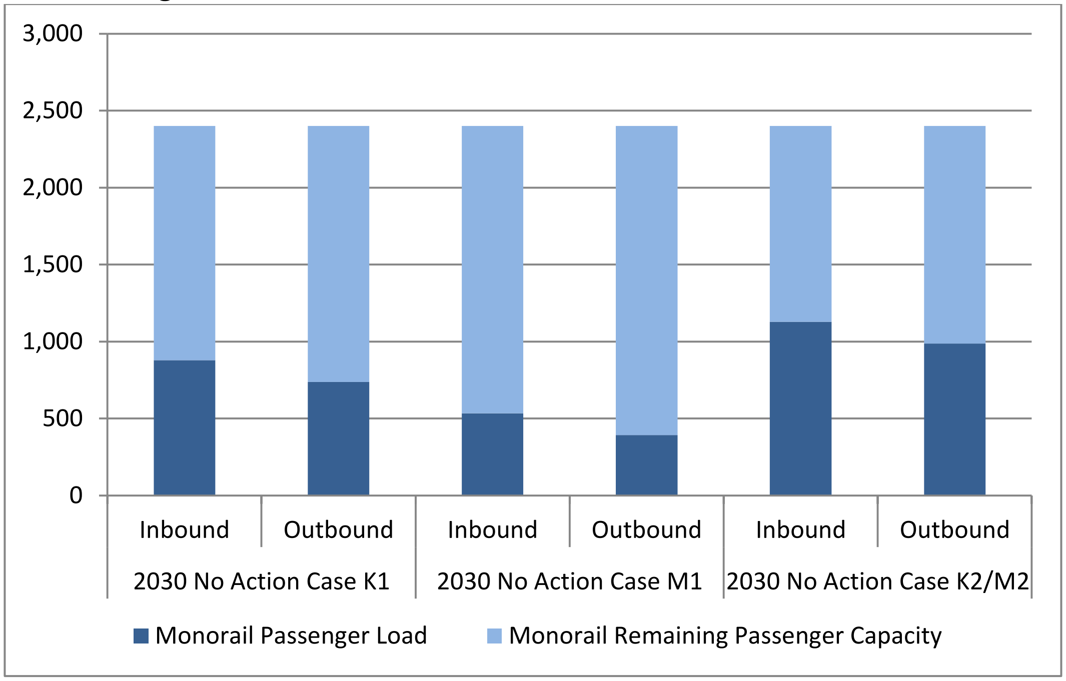
Figure 3–15 Seattle Center Area Streetcar – 2030 No Action



Monorail Transit

The number of people who would use the Seattle Monorail was anticipated to increase by approximately one percent annually to year 2030. Headways, the time between trains at stations, were assumed to remain unchanged. As illustrated on Figure 3–16, monorail passenger loads would increase by approximately 890 inbound passengers and 870 outbound passengers for the No Action Case K2/M2. This scenario and the 2030 No Action Case K1 and Case M1, which would have fewer passengers, could be accommodated with assumed monorail service levels.

Figure 3–16 Seattle Center Area Monorail – 2030 No Action



Washington State Ferry Service

The number of people who would use ferry was anticipated to increase by approximately three percent annually to the year 2030. No change in the number of WSF vessels serving Colman Dock was assumed from the year 2018 to 2030. Approximately 370 inbound passengers and 500 outbound passengers would use WSF service for part of their trip to events at Seattle Center for No Action Case K2/M2. This scenario and the 2030 No Action Case K1 and Case M1, which would have fewer passengers, could be accommodated with assumed ferry service levels.

Event attendees would connect between Colman Dock and the Seattle Center area using bus, monorail, streetcar, and / or other services such as a taxi, walking, or bicycling. It is difficult to anticipate the impact of these event attendees on public transit on weekdays. Many of them would already be in or around the Seattle area, having completed the ferry-leg of their trip in the morning for the commute into work. From 5:00 to 7:00 PM bus routes through downtown would experience an increase in passenger demand as some ferry riders use bus service to travel to an event at Seattle Center. Another 25 patrons would drive to connect to Seattle Center and complete part of their trip using WSF service.

3.2.4 Impacts of Alternative 4

This alternative would result in a small reduction in the number of event attendees using transit to travel to the Seattle Center area compared to Alternative 5. The operational and construction impacts would be similar to Alternative 5. The reduction in bus passengers is not enough to avoid the likely switch from some bus riders along the I-90 corridor from taking light rail instead because of estimated over capacity buses in this service corridor.

3.2.5 Impacts of Alternative 5

Construction of Alternative 5 could result in some increase in ridership as a result of construction workers traveling to and from the site. It is anticipated that public transportation impacts related to construction would be less than a 20,000-seat event at the arena. In addition, construction related activities could impact nearby transit routes and stops as well as pedestrian accessibility to these facilities. A construction management plan could be prepared and impacts to transit could be coordinated with the transit agency in advance and appropriate relocation and signage provided.

This section describes the impacts of the Alternative 5 Cases for analysis years 2018 and 2030.

3.2.5.1 Year 2018

The analysis assumes a fully-attended event, with approximately 2,400 event attendees arriving by bus, light rail (using another transit mode to connect to the Seattle Center area), streetcar, monorail, and ferry: eight percent arrive by transit and another four percent arrive by ferry. As discussed for the Stadium District site, it is anticipated that the passengers driving on the ferry to go to the arena would be minimal given the estimated traffic congestion between the ferry dock and arena. The analysis assumed that approximately 90 percent of ferry riders would use transit to connect to the arena.

Approximately 10 percent of event attendees using ferry would take their vehicle on the ferry and could arrive outside the analysis period such as during the morning commute period as they take ferry to work and then attend an Arena event in the evening. As such, they are included in the No Action condition for parking and are not additive to the impact of the project.

Transit service provided in the study area is assumed consistent with No Action conditions. Also, park-and-ride lots served by light rail to the Seattle Center area would experience increased use during events.

Bus Transit

It was estimated that approximately 29 percent of event attendees on transit would use existing bus service to the arena. This would add approximately 480 bus passengers traveling to and from the Seattle Center area.

As illustrated on Figure 3–17 and Figure 3–18, this Alternative (which assumes 20,000 event attendees at a new arena and 12,000 event patrons at KeyArena Stadium for Case M2) could be accommodated with assumed bus service levels for all service zones, except for:

- Outbound buses serving I-90 and areas to the east (Zone 3): buses do not operate directly from the Seattle Center area to I-90 in the evening and event attendees would transfer to other bus routes, monorail, or streetcar to connect to additional service in downtown Seattle. The remaining passenger capacity on these modes is sufficient to accommodate the approximately 315 event attendees connecting from Seattle Center to east side transit service in downtown Seattle (see Figure 3–19 and Figure 3–20).

- Outbound bus routes serving I-5 and south (Zone 5): the number of buses operating directly from the Seattle Center area south I-5 in the evening decreases. Event attendees would transfer to other bus routes, monorail, or streetcar to access additional bus service in downtown Seattle. The remaining passenger capacity on these modes is sufficient to accommodate the approximately 115 event attendees connecting from the Seattle Center area to the south using transit service in downtown Seattle (see Figure 3–19 and Figure 3–20).

The number of event attendees required to transfer to other bus routes, monorail, or streetcar to access additional bus service in downtown Seattle would be less for Case M1 because there are less event attendees: the overcapacity condition for outbound bus routes serving I-5 is anticipated to occur for Case M2. Also, park-and-ride lots served by transit to the Seattle Center area would likely experience increased use during events.

Figure 3–17 Seattle Center Area Bus Transit Inbound – 2018 Alternative 5 Case M2

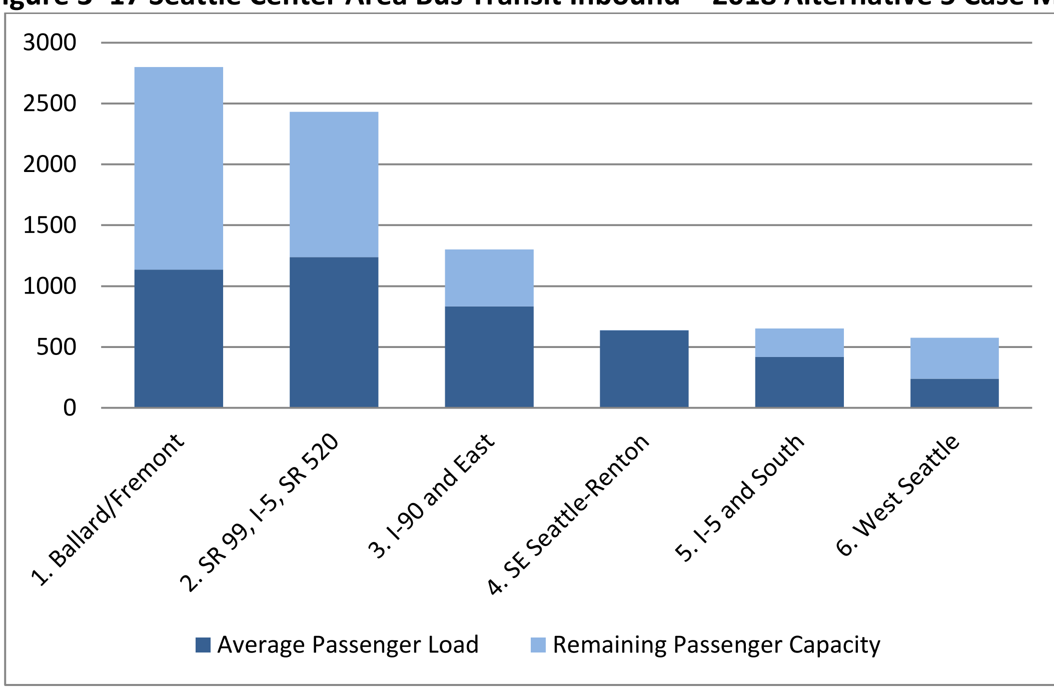
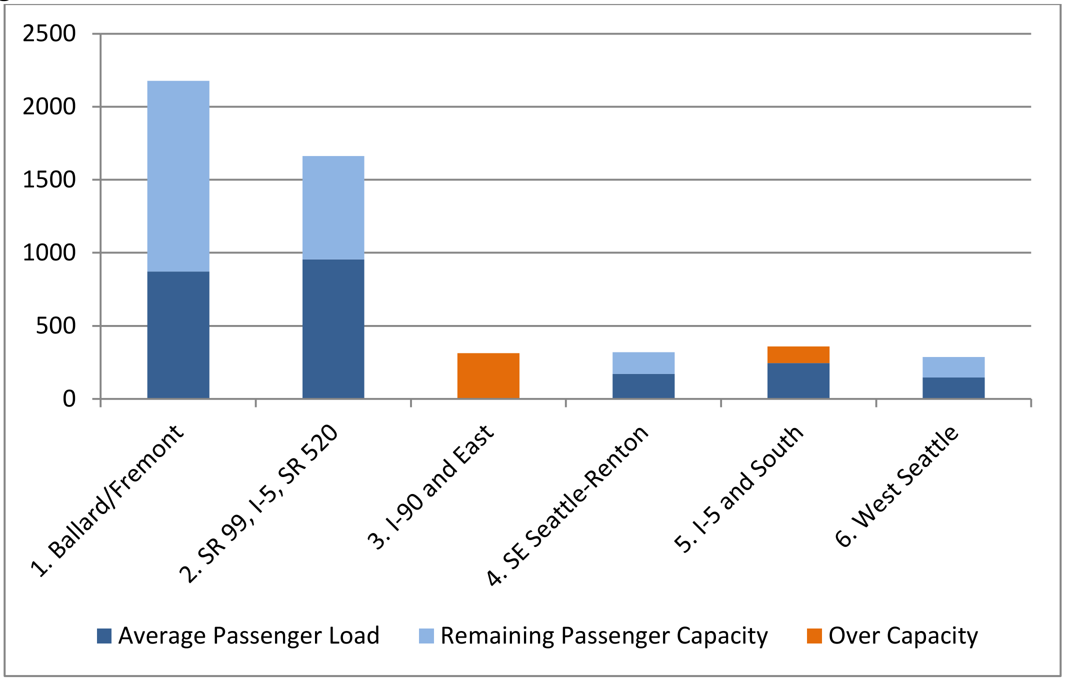


Figure 3–18 Seattle Center Bus Transit Area Outbound – 2018 Alternative 5 Case M2

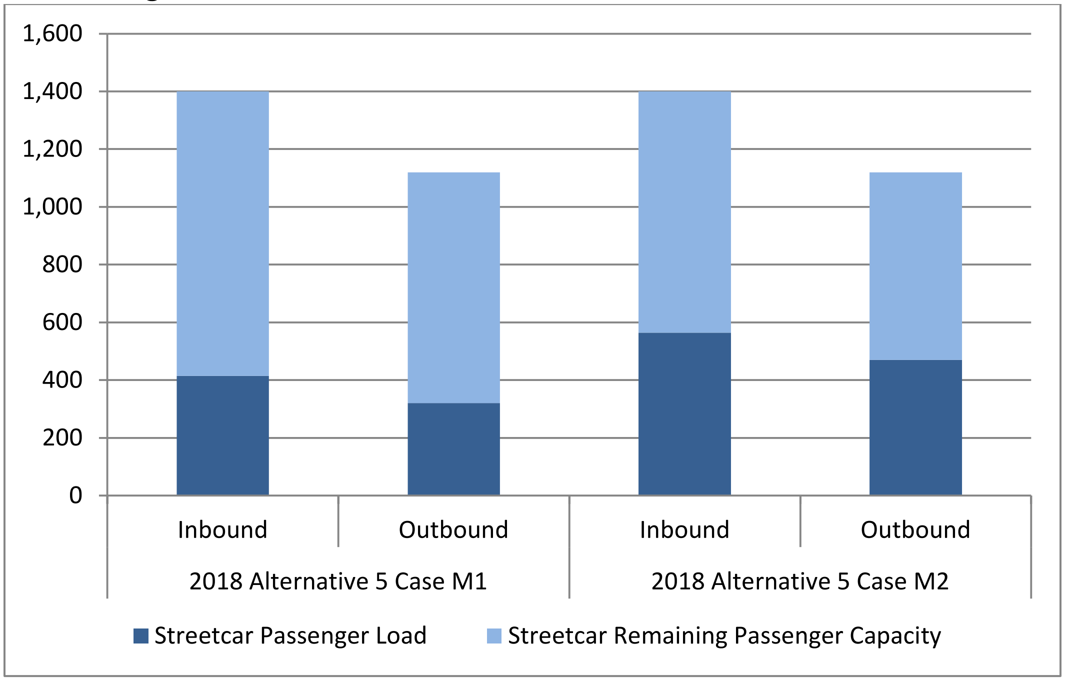


The travel time for buses (an indication of speed and reliability) would be similar to general purpose traffic because they operate in mixed flow through the Seattle Center area (not including the time it takes for buses to serve bus stops). As indicated in the traffic operations analysis for Alternative 5, travel times increase with the addition of arena event traffic with a substantial increase of over 30 minutes along westbound Mercer Street. It is noted that No Action and all future estimates of event traffic volumes are simply additive to No Action conditions with no consideration of potential traffic diversion due to event conditions. This additive approach likely overestimates future traffic and congestion related to events; however, it does provide a consistent basis for comparing alternatives. Additional detail related to corridor travel times is provided in Section 3.6 Traffic Operations Table 3-26.

Streetcar Transit

It was estimated that approximately 10 percent of event attendees on transit would use streetcar service to the arena. This would add approximately 170 streetcar passengers traveling to and from the Seattle Center arena on the SLU streetcar for Case M2. This scenario and the 2018 Case M1 could be accommodated with assumed streetcar service levels (see Figure 3–19).

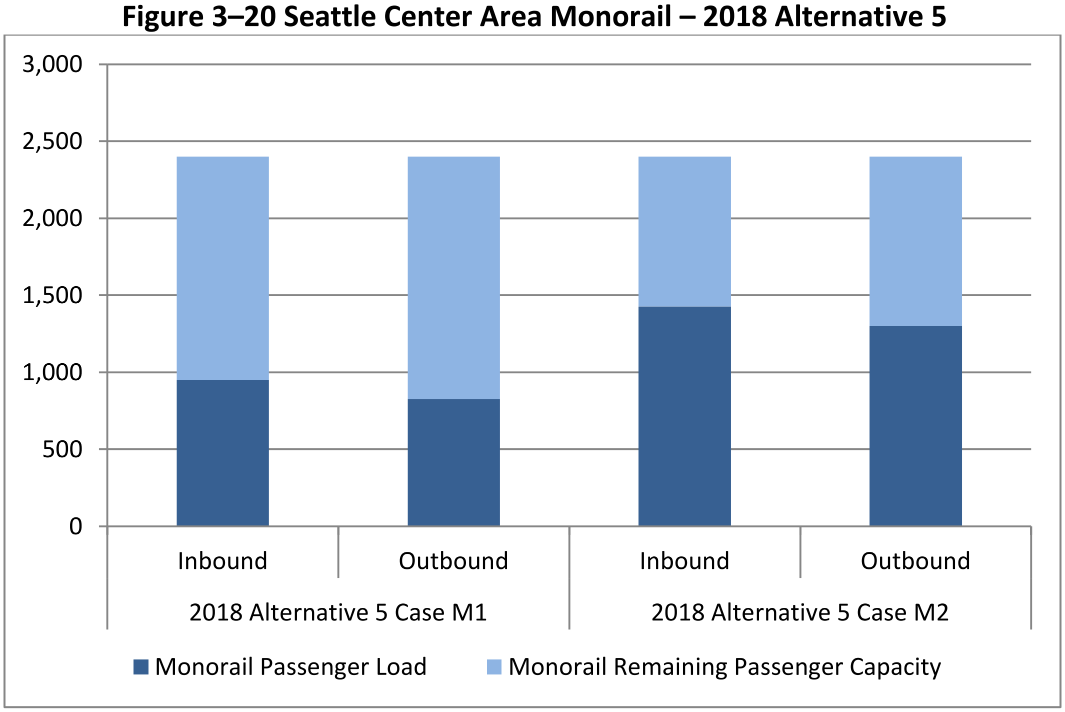
Figure 3–19 Seattle Center Area Streetcar – 2018 Alternative 5



<u>Monorail Transit</u>

It was estimated that approximately 30 percent of event attendees on transit would use monorail service to the arena. This would add approximately 500 monorail passengers traveling to and from the Seattle Center area for the Alternative 5 Case M2. This scenario and the 2018 Alternative 5 Case M1 could be accommodated with assumed monorail service levels (see Figure 3–20).

Figure 3–20 Seattle Center Area Monorail – 2018 Alternative 5



Washington State Ferries

No change in the number of WSF vessels serving Colman Dock was assumed from the year 2013 to 2018. The number of walk-on passengers was anticipated to increase by approximately three percent annually from 2013 to 2018. Approximately 630 event attendees would use WSF service for part of their trip to events at Seattle Center for the Alternative 5 Case M2 scenario: there is sufficient capacity to accommodate event attendees. Event attendees would connect between Colman Dock and the Seattle Center area using bus, monorail, streetcar, and / or other services such as a taxi, walking, or bicycling. It is difficult to anticipate the impact of these event attendees on public transit. Many of them would already be in or around the Seattle area, having completed the ferry-leg of their trip in the morning for the commute into work. From 5:00 to 7:00 PM bus routes through downtown would experience an increase in passenger demand as some ferry riders use bus service to travel to an event at Seattle Center.

3.2.5.2 Year 2030

Alternative 5 would construct a new 20,000-seat arena near the Seattle Center. Approximately ten percent of patrons were estimated to use transit to travel to and from events. The analysis assumes a fully-attended event, with approximately 2,520 event attendees arriving by bus, light rail, streetcar, and ferry: ten percent arriving by transit and another four percent arriving by ferry. Consistent with 2018 conditions, approximately 10 percent of event attendees using ferry would take their vehicle on the ferry and could arrive outside the analysis period such as during the morning commute period as they take ferry to work and then attend an Arena event in the evening. As such, they are included in the No Action condition for parking and are not additive to the impact of the project.

Transit service provided in the study area is assumed consistent with No Action conditions. Also, park-and-ride lots served by light rail to the Seattle Center area would experience increased use during events.

Bus Transit

It was estimated that approximately 24 percent of event attendees taking transit would use bus service to the arena. This would add approximately 480 bus passengers traveling to and from the Seattle Center area (see Affected Environment, *Bus Ridership* for how passenger capacity was determined).

As illustrated on Figure 3–21 and Figure 3–22, this Alternative (which assumes 20,000 event attendees at a new arena and 12,000 patrons at KeyArena for Case M2) could be accommodated with assumed bus service levels for all service zones, except for:

- Inbound bus routes serving southeast Seattle and Renton areas (Zone 4): Bus passengers would use other bus and light rail service to downtown Seattle accessed via park and ride lots or local feeder bus service and transfer in downtown Seattle to bus, monorail, and / or streetcar services. This would impact approximately 140 passengers.

- Outbound buses serving I-90 and areas to the east (Zone 3): Buses do not operate directly from the Seattle Center area to I-90 in the evening and event attendees would transfer to other bus routes, monorail, or streetcar to connect to additional service in downtown Seattle. The remaining passenger capacity on these modes is sufficient to accommodate the approximately 310 event attendees connecting from the Seattle Center area to east side transit service in downtown Seattle (see Figure 3–23 and Figure 3–24).

- Outbound bus routes serving I-5 and south (Zone 5): The number of buses operating directly from the Seattle Center area south I-5 in the evening decreases. Event attendees would transfer to other bus routes, monorail, or streetcar to access additional bus service in downtown Seattle. The remaining passenger capacity on these modes is sufficient to accommodate the approximately 130 event attendees connecting from Seattle Center to this south using transit service in downtown Seattle (see Figure 3–23 and Figure 3–24).

The number of event attendees required to transfer would be less for other event cases because there are less event attendees, but would have the same over capacity considerations except for I-5 and south.

Figure 3–21 Seattle Center Area Bus Transit Inbound – 2030 Alternative 5 Case M2

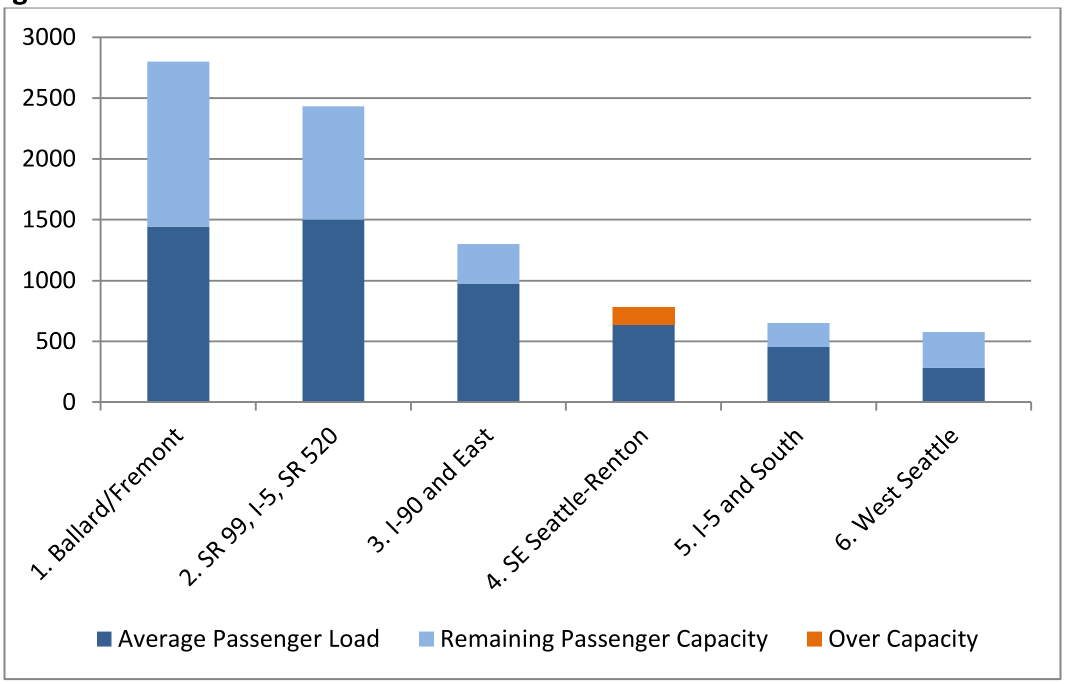
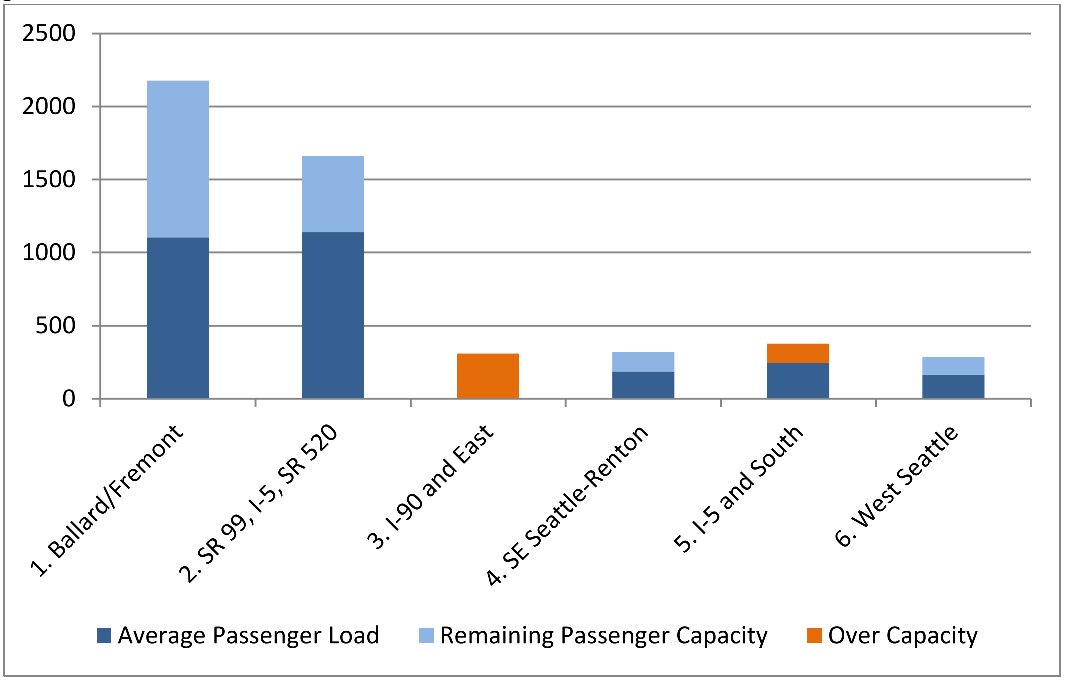


Figure 3–22 Seattle Center Area Bus Transit Outbound – 2030 Alternative 5 Case M2

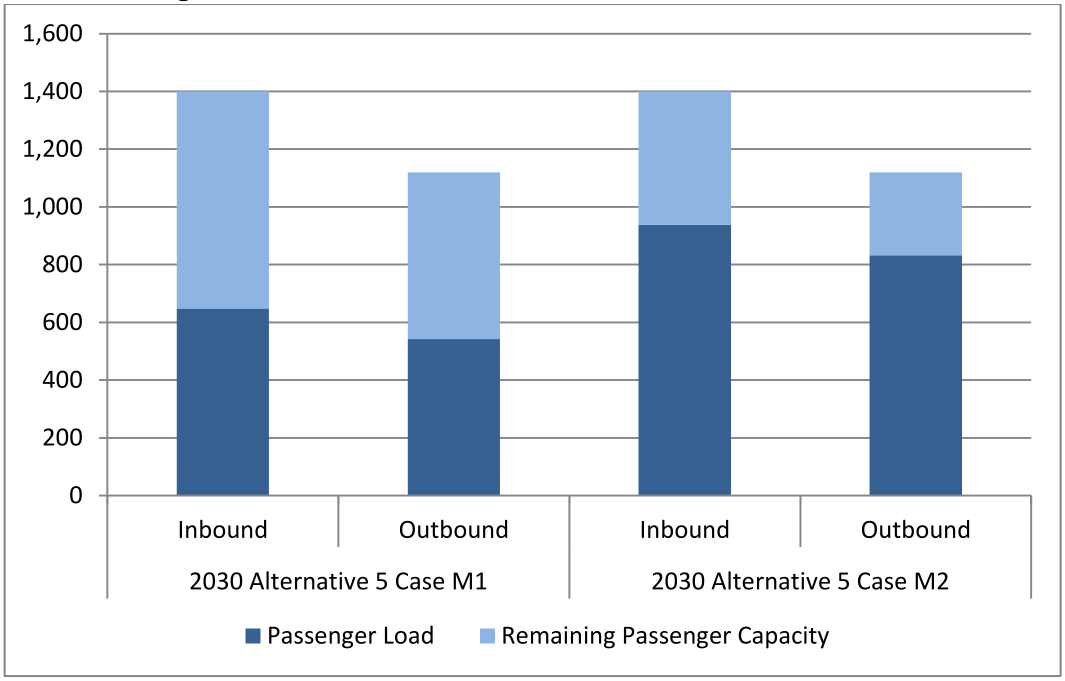


The travel time for buses (an indication of speed and reliability) would be similar to general purpose traffic because they operate in mixed flow through the Seattle Center area (not including the time it takes for buses to serve bus stops). As indicated in the traffic operations analysis for Alternative 5, 2030 travel times are similar to 2018 conditions. Additional detail related to corridor travel times is provided in Section 3.6 Traffic Operations.

<u>Streetcar Transit</u>

It was estimated that approximately 16 percent of event attendees on transit would use streetcar service to the arena. This would add approximately 320 streetcar passengers traveling to and from the Seattle Center area on the SLU Streetcar for Alternative 5 Case M2. This scenario and the 2030 Alternative 5 Case M1 could be accommodated with assumed streetcar service levels (see Figure 3–23).

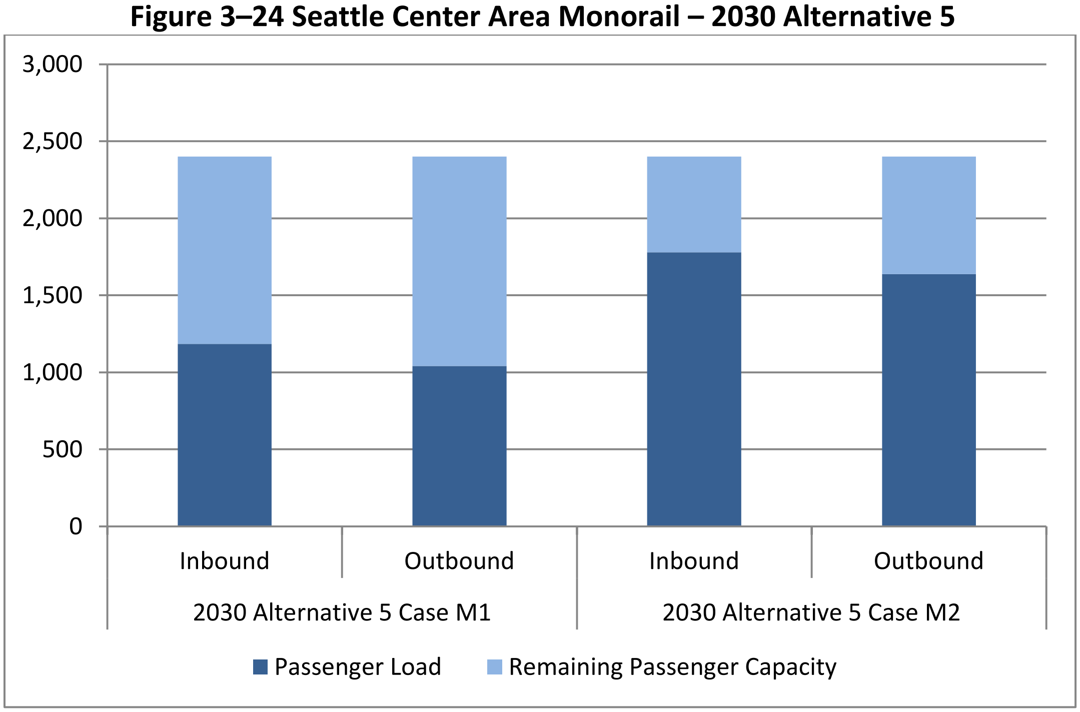
Figure 3–23 Seattle Center Streetcar – 2030 Alternative 5



Monorail Transit

It was estimated that approximately 32 percent of event attendees on transit would use monorail service to the arena. This would add approximately 650 monorail passengers traveling to and from Seattle Center for Alternative 5 Case M2. Alternative 5 Case M1 could also be accommodated with assumed monorail service levels (see Figure 3–24).

Figure 3–24 Seattle Center Area Monorail – 2030 Alternative 5



Washington State Ferries

The number of people who would use ferry was anticipated to increase by approximately three percent annually to the year 2030. No change in the number of WSF vessels serving Colman Dock was assumed from the year 2018 to 2030. Approximately 630 event attendees would use WSF service for part of their trip to events at Seattle Center for the Alternative 5 Case M2 scenario. These attendees can be accommodated with the current WSF service. Event attendees would connect between Colman Dock and the Seattle Center area using bus, monorail, streetcar, and / or other services such as a taxi, walking, or bicycling. It is difficult to anticipate the impact of these event attendees on public transit. Many of them would already be in or around the Seattle area, having completed the ferry-leg of their trip in the morning for the commute into work. From 5:00 to 7:00 PM bus routes through downtown would experience an increase in passenger demand as some ferry riders use bus service to travel to an event at Seattle Center.

3.2.6 Mitigation Measures

A complete summary of potential mitigation measures to be considered across all the Transportation Elements evaluated in this report is included in Chapter 4.0 of Appendix E. This summary includes identification of both programmatic measures and physical improvements. For each of the potential mitigation measures a designation of high to low influence was noted. The following identifies those potential mitigation measures considered to have a high influence on this transportation element. These potential mitigation measures are appropriate for both Alternative 4 and Alternative 5.

- Premium transit service
- Shuttles
- Subsidize transit fares
- Rail/lodging/ticket packages

3.2.7 Secondary and Cumulative Impacts

A 1st Avenue streetcar currently being considered as part of the Center City Transit Study would provide another way for event attendees, especially those using ferry services, to connect to Seattle Center. This would reduce the number of people using bus, monorail, and South Lake Union Streetcar transit services.

3.2.8 Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts related to bus, streetcar, and monorail transit service resulting from Alternatives 4 and 5 have been identified.

3.3 Pedestrians

3.3.1 Methodology

The pedestrian environment in the Seattle Center study area is significantly different than that described in the Stadium District. There is a well-connected gridded sidewalk network with multiple paths for pedestrians to take to and from the Seattle Center area. With the multitude of pedestrian paths in the study area capacity is not an issue, and performing a link evaluation does not provide an understanding of pedestrian impacts. Given the difference between the two study areas, a methodology tailored toward the Seattle Center study area was used to evaluate pedestrian impacts. The approach included:

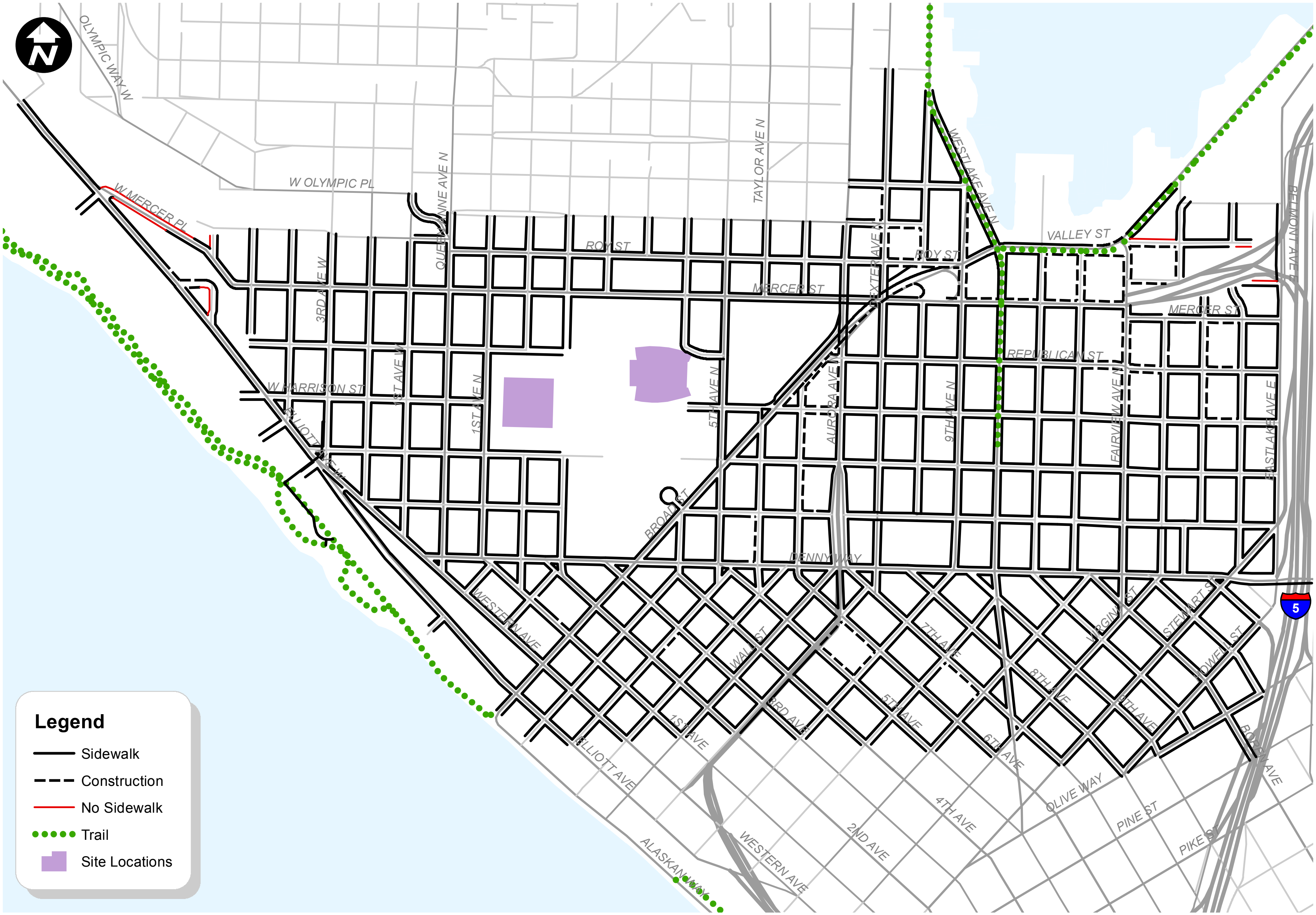
- Inventory of existing pedestrian facilities
- Identification of existing gaps in connectivity
- Review of existing pedestrian volumes
- Determination of future plans related to pedestrian facilities and the potential shift in pedestrian travel patterns with new facilities
- Evaluation of pedestrian impacts considering changes in volumes

3.3.2 Affected Environment

Figure 3–25 shows the pedestrian network in the study area and identifies both existing trails and gaps in the sidewalk network. Sidewalks are provided along nearly all roadways with few exceptions. There is a missing connection in the northwest portion of the study area along West Mercer Place as well as limited east-west connections across SR 99. A large amount of construction is occurring within the study area particularly in the South Lake Union area along Mercer Street.

The study area contains a gridded pedestrian network creating high connectivity between activities centers, businesses and parking; however, as noted above, connectivity from the the Seattle Center area to east of SR 99 is limited. Off-street parking surrounds the Seattle Center area, with a large concentration of parking directly to the east (adjacent to Memorial Stadium) and southwest (near KeyArena). Sidewalks connect these parking lots to the Seattle Center area.

There are two off-street multi-use trail in the study area, the Elliot Bay Trail and Cheshiahud Lake Union Loop. The Elliot Bay Trail runs along the Waterfront to the west of the study area; it extends between the Waterfront and SoDo neighborhood to the south and to Magnolia on the north. Pedestrians can access the trail at several crossings along Elliot Avenue W. The Cheshiahud Lake Union Trail connects the SLU neighborhood with Gasworks Park and links a number of pocket parks that ring the lake. Access to the Cheshiahud Trail is currently limited due to the lack of connections across SR 99.



Seattle Center Area Pedestrian Facilities

Seattle Arena

transpoGROUP

FIGURE
3-25

Significant transportation improvement projects have been under construction in the study area for the past several years. Due to the continuing effects of ongoing construction, previous studies and historical data sources were utilized to understand existing pedestrian activity near the Seattle Center. Higher pedestrian volumes are seen along the principal arterials of Mercer Street, Denny Way, Queen Anne Avenue N., 1st Avenue N., and 5th Avenue N. The intersections with the highest pedestrian activity are Queen Anne Avenue N. / Mercer Street and 1st Avenue N. / Mercer Street. These high pedestrian volumes are reflective of the intersection proximity to the Seattle Center and commercial uses in the area.

3.3.3 Impacts of No Action Alternative

There are several area-wide transportation projects that will enhance the pedestrian system in the Seattle Center study area. In addition, planned development is anticipated to increase pedestrian demands. This section focuses on general pedestrian demands and shifting pedestrian orientations associated with new facilities and linkages.

3.3.3.1 2018 Conditions

The SR 99 North Portal and Mercer Corridor projects will result in enhanced pedestrian connectivity and infrastructure. The Mercer Corridor improvements are scheduled to be completed by 2015. Pedestrian improvements are also included on Roy and Valley Streets. The completion of these improvements will create a viable pedestrian linkage between the Seattle Center area and the SLU Neighborhood as well as the SLU Park and related trail connections.

In addition, the completion of the SR 99 North Portal will result in sidewalk connections across SR 99 at John, Harrison and Thomas Streets, effectively linking the Seattle Center area and the neighborhood surrounding the Bill and Melinda Gates Foundation Campus with the SLU area.

Under No Action, changes in non-motorized demands are likely to occur as a result of ongoing redevelopment associated with neighborhoods surrounding the Seattle Center; however, no significant change in the Seattle Center area pedestrian activity is anticipated. There could be some increase in general pedestrian activity between the Seattle Center and points east, with the enhancements to the Mercer Corridor as well as connections across SR 99 described above. In addition, pedestrian activity would likely increase in SLU and the Denny Triangle neighborhoods as a result of commercial or residential redevelopment. In general, increased pedestrian activity is considered a positive impact since with this activity a sense of pedestrian and personal safety results.

3.3.3.2 2030 Conditions

No additional major infrastructure projects are funded or planned that would directly affect the Seattle Center area non-motorized transportation in 2030. While pedestrian travel is expected to grow between 2018 and 2030, no significant increases or jumps in activity are foreseen.

Overall, the No Action Alternative would not result in an adverse impact to non-motorized transportation for the Seattle Center area alternatives.

3.3.4 Impacts of Alternative 4

Alternative 4 construction would result in intermittent sidewalk and pedestrian facility closures along the frontage of the site. A construction management plan would be developed and safe pedestrian circulation would be provided adjacent to the construction site through the use of temporary walkways, detours and signs.

Development of Alternative 4 would not result in any changes to the pedestrian facilities within the Seattle Center area. Consistent with the Stadium District, pedestrian levels associated with an event at an arena would be highest during the post-event egress. Currently, average attendance for the KeyArena is approximately 12,000 people. Alternative 4 would result in a net increase of 8,000 pedestrians for a total of 20,000 pedestrians associated with an arena event. As discussed previously, the existing and planned pedestrian network is well-connected and facilities will accommodate increased pedestrian demand levels. This type of pedestrian demand or higher is already accommodated at the Seattle Center with the several festivals held there each year.

Increases in pedestrian as well as vehicle demands on events days would increase the potential for conflicts between these two modes. Pedestrian impacts in 2018 and 2030 are anticipated to be similar.

3.3.5 Impacts of Alternative 5

Alternative 5 construction would result in intermittent sidewalk and pedestrian facility closures along the frontage of the site. A construction management plan would be developed and safe pedestrian circulation would be provided adjacent to the site through the use of temporary walkways, detours and signs.

Pedestrian impacts associated with Alternative 5 are anticipated to be consistent with those described for Alternative 4.

3.3.6 Mitigation Measures

A complete summary of potential mitigation measures to be considered across all the Transportation Elements evaluated in this report is included in Chapter 4.0 of Appendix E. This summary includes identification of both programmatic measures and physical improvements. For each of the potential mitigation measures a designation of high to low influence was noted. The mitigation measure considered to have a high influence on this transportation element is a wayfinding sytem. This potential mitigation measure is appropriate for both Alternative 4 and Alternative 5.

3.3.7 Secondary and Cumulative Impacts

No secondary or cumulative impacts have been identified.

3.3.8 Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts are expected.

3.4 Bicycle

3.4.1 Methodology

The general approach to the evaluation of bicycle impacts included:

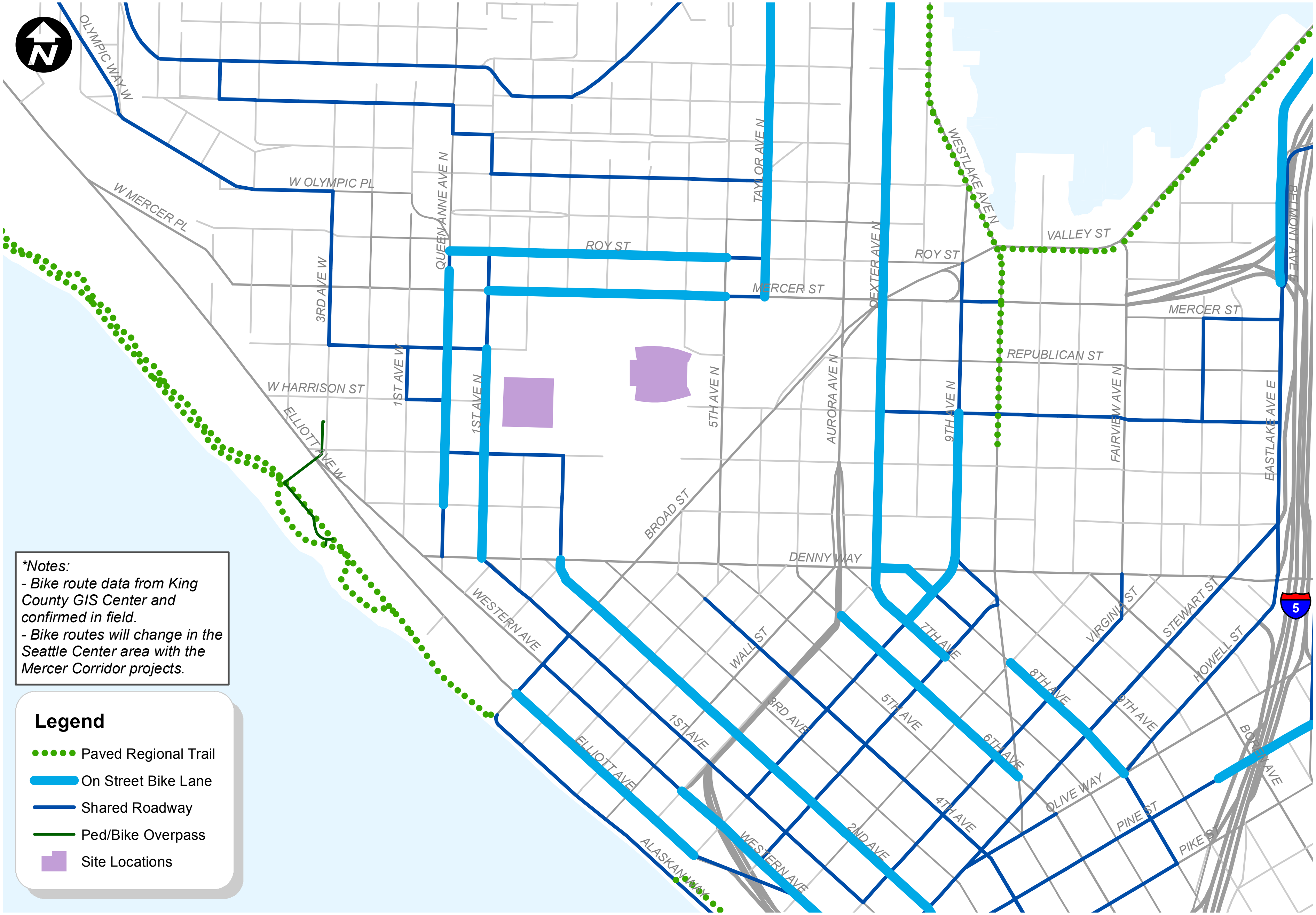
- Inventory of existing bicycle facilities
- Identification of future plans related to bicycle facilities
- Evaluation of bicycle impacts considering changes in volumes

3.4.2 Affected Environment

Figure 3–26 illustrates the bicycle network within the study area. The study area facilities consist mostly of bike lanes and designated shared roadways. The streets with bicycle facilities closest to the arena sites (KeyArena and Memorial Stadium) are Queen Anne Avenue N. and 1st Avenue N. to the west, and Mercer Street and Roy Street to the north. All four of these streets have a mix of on-street bike lane and sharrows (i.e., marked shared bicycle in the vehicle travel lanes). In addition, portions of the arterial streets to the west and south of Seattle Center are designated routes for bicycles including 2nd Avenue N., Thomas Street, W. Harrison Street, W. Republican Street, and 3rd Avenue W.

As described in the Pedestrians section (3.3), there are off-street multi-use trails in the study area, including the Elliot Bay Trail and Cheshiahud Lake Union Loop. The Elliot Bay Trail runs along the waterfront to the west of the study area; it extends between the Waterfront and SoDo to the south and to Magnolia on the north. Bicyclists can access the trail at several crossings along Elliot Avenue W. The Cheshiahud Lake Union Trail connects the SLU neighborhood with Gasworks Park and links a number of pocket parks that ring the lake.

SDOT bicycle counts from January and July 2012 were reviewed to understand the level of bicycle traffic in the study area. The SDOT bicycle counts included three locations within the Seattle Center area. Commuter peak hour bicycle volumes ranged from 8 at the Mercer Street / Fairview Avenue N. intersection to 155 at the intersection of Dexter Avenue N. / Denny Way. The Mercer Street / 9th Avenue N. intersection saw 29 bicyclists during the commuter peak hour. The high counts along Dexter Avenue N. are consistent with this street's function as the primary bicycle route to downtown from the north. In addition, the combination of high traffic volumes coupled with construction activity along Mercer Street likely contributes to lower volumes at the Mercer Street / Fairview Avenue N. intersection. While the average number of peak hour cyclists in this data was much higher (nearly 50 percent) in the summer compared to winter counts, both Mercer Street intersections were marginally less in the summer than the winter, perhaps reflecting peak summer construction activity disrupting bicycle route choices.



Seattle Center Area Bicycle Facilities

Seattle Arena

FIGURE
3-26

3.4.3 Impacts of No Action Alternative

Bicycle conditions for 2018 and 2030 No Action cases are described below.

3.4.3.1 2018 Conditions

Bicycle improvements planned and funded in the Seattle Center study area were reviewed. Ongoing projects associated with the Alaskan Way Viaduct North Portal, as well as the Mercer East and West projects will result in enhanced bicycle connectivity and infrastructure. The Mercer Corridor improvements are scheduled to be completed by 2015. Bicycle improvements are included on Roy and Valley Streets as well as 5th Avenue N. The completion of these improvements will create a viable bicycle linkage between the Seattle Center area and the SLU Neighborhood as well as the SLU Park and related trail connections. In addition, the completion of the North Portal will result in sidewalk connections across SR 99 at John, Harrison and Thomas Streets, effectively linking the Seattle Center area and the neighborhood surrounding the Bill and Melinda Gates Foundation with the SLU area.

Bicycle use is anticipated to continue to grow in Seattle as transportation congestion and cost of parking increases. Under No Action, changes in bicycle demands are likely to occur as a result of ongoing redevelopment associated with neighborhoods surrounding the Seattle Center area and more direct connections between this area and SLU and the Cheshiahud Lake Union Loop Trail. No significant change in bicycle traffic is forecasted resulting in an adverse impact.

3.4.3.2 2030 Conditions

There are no additional funded improvements for 2030 at this time; however, the City is going through a draft Bicycle Master Plan and the result of the planning process will be priorities for bicycle improvements.

Bicycle demand is expected to grow between 2018 and 2030; however, no significant increases in bicycle volumes are foreseen and no new adverse impacts to bicycle travel would occur.

In general, as traffic volumes increase in the study area due to future 2018 and 2030 growth, there is a potential for increased conflict between vehicles and bicyclists.

3.4.4 Impacts of Alternative 4

Construction of Alternative 4 may result in intermittent bicycle facility closures or rerouting along Mercer Street and 1st Avenue N. as well as within the Seattle Center area. A construction management plan would be developed and safe bicycle circulation would be provided adjacent to the construction site through the use of temporary facilities, detours, and signs.

Alternative 4 is not anticipated to impact bicycle facilities within the study area. As described in the Affected Environment, bicycle volumes within the study area vary from one corridor to the next; however, Alternative 4 is anticipated to result in minimal increase in bicycle activity. Development of the arena would result in increased vehicular demands on event days within the study area, which would increase the potential conflicts between bicyclists and vehicles. Bicycle impacts in 2018 and 2030 are anticipated to be similar.

3.4.5 Impacts of Alternative 5

Construction of Alternative 5 may result in intermittent bicycle facility closures or re-routing along Mercer Street as well as within the Seattle Center area. A construction management plan would be developed and safe bicycle circulation would be provided adjacent to the construction site through the use of temporary facilities, detours, and signs.

Bicycle impacts associated with Alternative 5 are anticipated to be consistent with those described for Alternative 4.

3.4.6 Mitigation Measures

A complete summary of potential mitigation measures to be considered across all the Transportation Elements evaluated in this report is included in Chapter 4.0 of Appendix E. This summary includes identification of both programmatic measures and physical improvements. For each of the potential mitigation measures a designation of high to low influence was noted. The following identifies those potential mitigation measures considered to have a high influence on this transportation element. These potential mitigation measures are appropriate for both Alternative 4 and Alternative 5.

- Bicycle racks
- Bicycle route improvements

3.4.7 Secondary and Cumulative Impacts

No secondary or cumulative impacts have been identified.

3.4.8 Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts are expected.

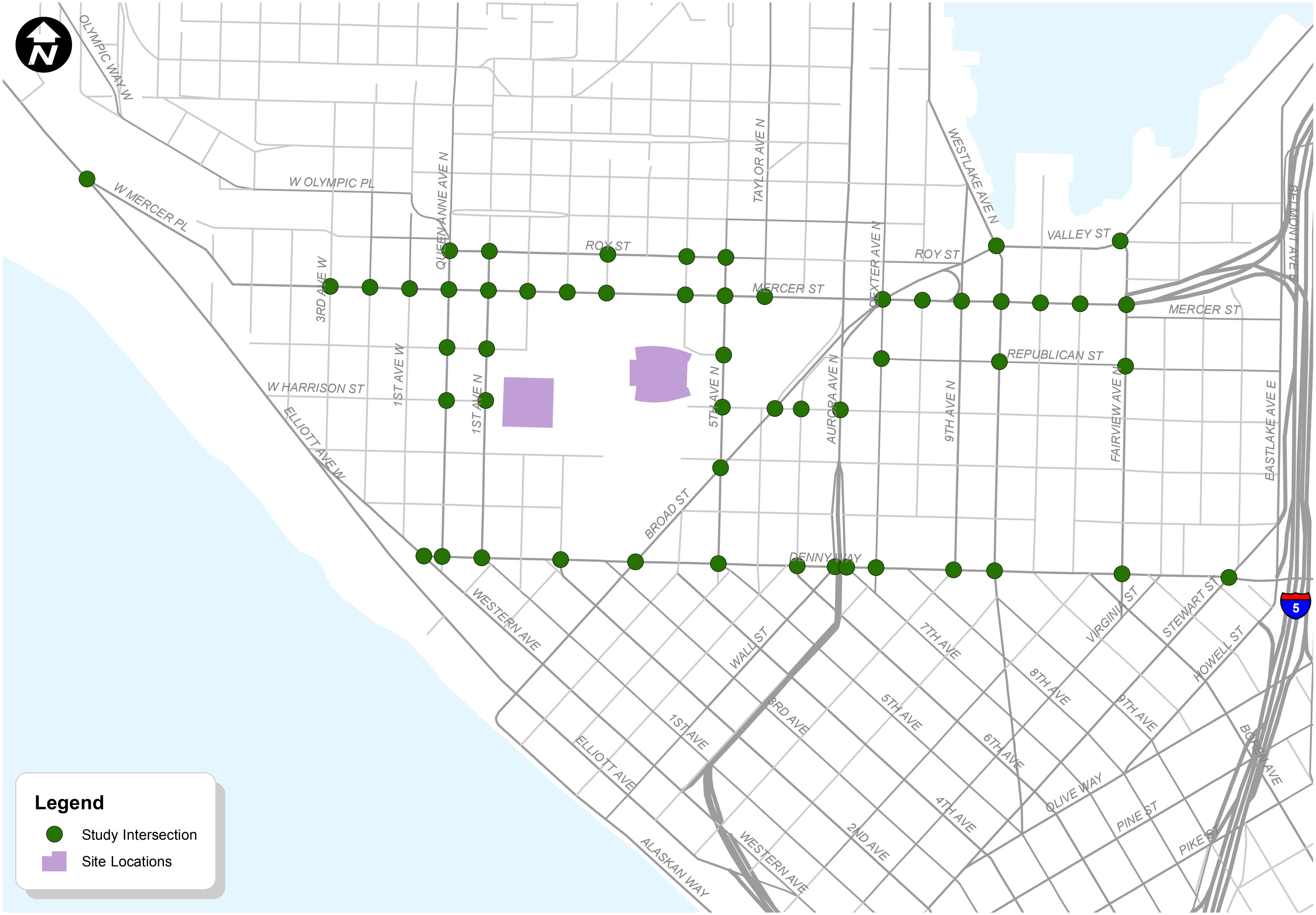
3.5 Traffic Volumes

This section provides a summary of the existing and forecast traffic volumes in the study area and presents the method used to develop traffic forecasts for No Action and Alternatives 4 and Alternative 5.

3.5.1 Methodology

3.5.1.1 Study Area

A total of 53 intersections were addressed for the Seattle Center Area Alternatives, as shown on Figure 3–27. Study intersections were defined considering existing conditions, impacts of future road improvements, and potential impacts of an arena.



Seattle Center Area Study Intersections

Seattle Arena

transpoGROUP

FIGURE
3-27

3.5.1.2 Analysis Time Periods

Similar to the SoDo alternatives, the peak periods for the traffic analyses for the Seattle Center Area Alternatives were identified based on a review of existing traffic. To determine the appropriate analysis period, City of Seattle 24-hour tube counts were reviewed to understand variations in traffic volumes throughout the week, specifically related to weekday and weekend trends. Table 3-3 summarizes the 24-hour tube count information for several key locations within the study area where data was available. The data presented in Table 3-3 represents the peak of the day and may not necessarily correspond to the same hour at each location but has been presented in this way to compare the "relative" peak hour volumes for each time period.

Table 3-3
Seattle Center Area 24-hour Count Comparison (Weekday versus Weekend)

Location	Peak Hour Volume of the Roadway (vehicles)		
	Weekday[1]	Saturday[2] (Percent of Weekday)	Sunday[3] (Percent of Weekday)
Mercer Street, west of 1st Avenue N.[4]	1,010	1,030 (102%)	920 (91%)
W. Mercer Street at 1st Avenue W.[5]	1,160	935 (81%)	825 (71%)
Denny Way, west of 2nd Avenue[6]	2,395	1,940 (81%)	1,580 (66%)
5th Avenue N., between Mercer Street and Republican Street[7]	1,465	1,360 (93%)	1,180 (81%)
1st Avenue N., south of Republican Street[4]	940	1,020 (109%)	755 (80%)
1st Avenue N., south of Mercer Street[4]	860	865 (101%)	680 (79%)

1. Weekday traffic volumes represent the PM peak hour between 4:00 to 7:00 PM
2. Saturday peak hour traffic volumes are from 12:00 to 1:00 PM along Mercer Street west of 1st Avenue N., 1:00 to 2:00 PM for W. Mercer Street, 2:00 to 3:00 PM for Denny Way, 6:00 to 7:00 PM for 5th Avenue N., and 7:00 to 8:00 PM for1st Avenue.
3. Sunday peak hour traffic volumes are from 1:00 PM to 2:00 PM along Mercer Street west of 1st Avenue N. and W. Mercer Street, 2:00 to 3:00 PM for Denny Way, 5:00 to 6:00 PM for 5th Avenue N., and 6:00 to 7:00 PM for1st Avenue.
4. July 2007 traffic data.
5. April 2011 traffic data.
6. January 2013 traffic data.
7. October 2006 traffic data.

As shown in Table 3-3, traffic volumes observed during the Saturday period ranged between about 80 and 110 percent of the weekday volumes. During a peak hour, volumes on a Sunday are the lightest and range between about 65 and 90 percent of the weekday PM peak hour. Based on this information, the analysis of event traffic occurring during the weekday or Saturday period represents the most appropriate basis for detailed traffic analysis through the Seattle Center area. Data related to Saturday conditions is inconclusive since half of roadway segments have Saturday traffic volumes that are approximately equal to the weekday traffic volumes. Therefore, given that traffic analysis relies on intersection turning movements, data was collected in March 2013 at key locations for Saturday as a second point of comparison (see Table 3-4).

Table 3-4
Seattle Center Area Existing Intersection Traffic Count Comparison (Weekday vs. Weekend)

Location	Weekday[1]	Saturday[1] (Percent of Weekday)
5th Avenue N. / Mercer Street	2,520	2,645 (105%)
Fairview Avenue N. / Mercer Street	7,990	4,960 (62%)
Westlake Avenue N. / Denny Way	3,005	2,650 (88%)

1. Weekday traffic volumes represent forecasted 2013 PM peak hour conditions based on the Mercer Corridor projects and data provided by SDOT.
2. Saturday traffic volumes represent the PM peak hour between 4:00 to 7:00 PM in March 2013.

As shown in Table 3-4, traffic volumes observed during the Saturday period ranged between 62 to 105 percent of the weekday volumes. Based on this information, the analysis of event traffic occurring during the weekday period represents the most appropriate basis for detailed traffic analysis through the Seattle Center area since the weekday traffic volumes are generally higher. Traffic volumes generally fluctuate day-to-day by up to five percent; therefore, the differences at 5th Avenue N. / Mercer Street are within the day-to-day changes in traffic volumes.

Within the Seattle Center study area, significant transportation improvement projects have been under construction for the past several years. Due to ongoing construction activities and impacts to traffic circulation and roadway capacities, existing traffic counts were not conducted within the defined study area. Instead previous traffic models and studies developed for the area were reviewed and utilized to develop estimated "existing" condition traffic volumes and are presented in detail in a later section. A more comprehensive discussion of these models is included in the Affected Environment section of this chapter.

3.5.1.3 Traffic Forecast Methodology – No Action Analyses

Future weekday PM peak hour vehicular traffic volumes were developed based on the following general approach:

- Traffic volume forecasts from the Final EIS's for the Alaskan Way Viaduct Replacement Project (July 2011) were summarized for the overlapping study area intersections.
- Traffic forecasts at intersections not included in the Final EIS's for the Alaskan Way Viaduct Replacement Project were estimated based on existing travel patterns and approach volumes for intersections previously reported in the EIS.

- Traffic forecasts for the No Action event cases were developed by adding traffic from either a 5,000 attendee event at Memorial Stadium, a 12,000 attendee event at KeyArena, or both events.

Similar to the Stadium District, analysis cases are linked to each alternative (Cases K1 and K2 for the KeyArena site; Cases M1 and M2 for the Memorial Stadium site). As before Case 1 reflects single events and Case 2 reflects dual events. In the instance of a single event, Case K1 reflects the 12,000 attendee event at KeyArena and M1 reflects a 5,000-person event at Memorial Stadium. Case K2 and M2 reflect a dual event condition (referenced jointly as K2/M2 under No Action), and in the instance of the No Action alternative includes both the Memorial Stadium event added to an event at KeyArena.

Traffic forecasts for the three No Action cases were developed for the 2018 and 2030 horizon years. Based on this methodology, under 2018 conditions a 5,000 person event at Memorial Stadium is estimated to generate approximately 360 vehicular trips during the weekday PM peak hour and the 12,000 person event at the KeyArena would generate approximately 850 trips. As traffic congestion throughout the Puget Sound region increases, attendees of events in the Seattle Center area would be increasingly likely to use transportation modes other than passenger cars. For the 2030 conditions, the transit mode split was increased. This increase in transit usage results in a forecast of approximately 350 vehicular trips associated with a Memorial Stadium event in 2030 and 820 trips forecast for a KeyArena event.

3.5.1.4 Traffic Forecast Methodology – Arena Event Traffic

Traffic forecasts for the 2018 and 2030 horizon years were prepared for Alternative 4 and Alternative 5. Future weekday PM peak hour vehicular traffic volumes for the each alternative were developed by adding traffic from the arena to the No Action volumes. Similar to the No Action discussion, traffic forecasts for multiple event cases are presented in this section. The Alternative 4 and Alternative 5 event cases are compared to the corresponding No Action event case to define the impacts of the Alternative. The Alternative 4 cases are described below; similar comparisons were completed for Alternative 5:

- No Action Case K1 is compared to Alternative 4 Case K1
    - No Action Case K1 is a 12,000 attendee KeyArena event
    - Alternative 4 Case K1 is a 20,000 attendee Arena event at KeyArena site
- No Action Case K2 is compared to Alternative 4 Case K2
    - No Action Case K2 is a 5,000 attendee Memorial Stadium event and 12,000 attendee KeyArena event
    - Alternative 4 Case K2 is a 5,000 attendee Memorial Stadium event and 20,000 attendee Arena event at KeyArena site

As described in the Event Transportation Demand section (section 1-17), traffic associated with the arena attendees was forecast based on a 20,000 attendance level, mode splits, average vehicle occupancies, and arrival patterns tailored for the Seattle Center area venues. Forecast traffic volumes for the 2018 and 2030 horizon years for the multiple event cases were developed by adding the arena related to traffic to the No Action event cases.

For 2018 conditions, an NBA event is estimated to generate approximately 2,050 vehicular trips during the weekday PM peak period. As attendees increasingly choose travel modes other than passenger cars further into the future (2030), PM peak hour trip generation would reduce to approximately 1,975 vehicles per hour (vph).

Traffic associated with an event in the arena was distributed to the study area roadways following the distribution shown on Figure 3–28. This regional trip distribution pattern is consistent with assumptions for the Stadium District site, modified to reflect localized access patterns. These trips external to the study area were then distributed throughout the study are consistent with the No Action parking supply.

3.5.2 Affected Environment

The following summarizes the existing traffic volumes in the study area.

3.5.2.1 Existing Weekday PM Peak Hour - Without Event

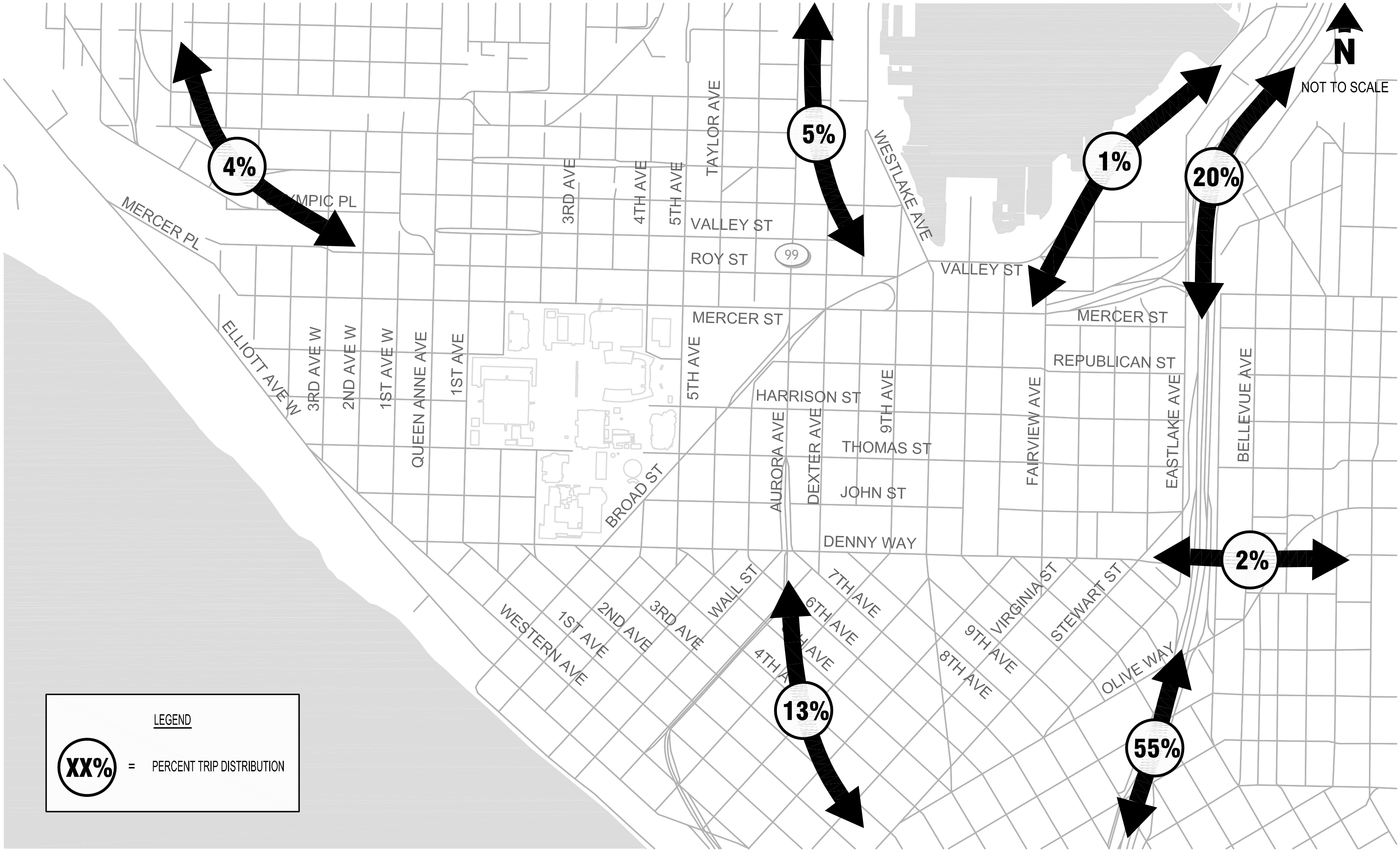
Within the Seattle Center study area, significant transportation improvement projects have been under construction for the past several years. Due to ongoing construction activities and impacts to traffic circulation and roadway capacities, existing traffic counts were not conducted within the defined study area. Instead previous traffic models and studies developed for the area were reviewed. These studies and the extents of the intersections used from each study are as follows:

- Existing 2010 traffic volumes for the Mercer West project
    - Roy Street from Queen Anne Avenue N. to 5th Avenue N.
    - Mercer Street-W. Mercer Place from Elliot Avenue W. to 5th Avenue N.
    - Republican Street / 5th Avenue N.
- Forecast 2010 traffic volumes for the Mercer East project (with two-way travel on Mercer Street)
    - Mercer Street from Broad Street to Fairview Avenue N.
    - Broad Street at Westlake Avenue N. and Fairview Avenue N.
    - Republican Street at Dexter Avenue N., Westlake Avenue N., and Fairview Avenue N.

    - 5th Avenue N. at Harrison Street and Broad Street

- Existing 2010 traffic volumes from SDOT's Denny Way Signal optimization
    - Denny Way from Western Avenue to Stewart Street

The traffic volumes from each of these studies were then compared and balanced. The balanced 2010 weekday peak hour traffic volumes were then forecasted to 2013 conditions based on an annual growth rate of 1.5 percent per year consistent with studies completed in the SLU area. The resulting 2013 estimated weekday PM peak hour traffic volumes are summarized on Figure 3–29, with detailed estimated turning movement volumes provided in Attachment E-1, which is available from DPD upon request.

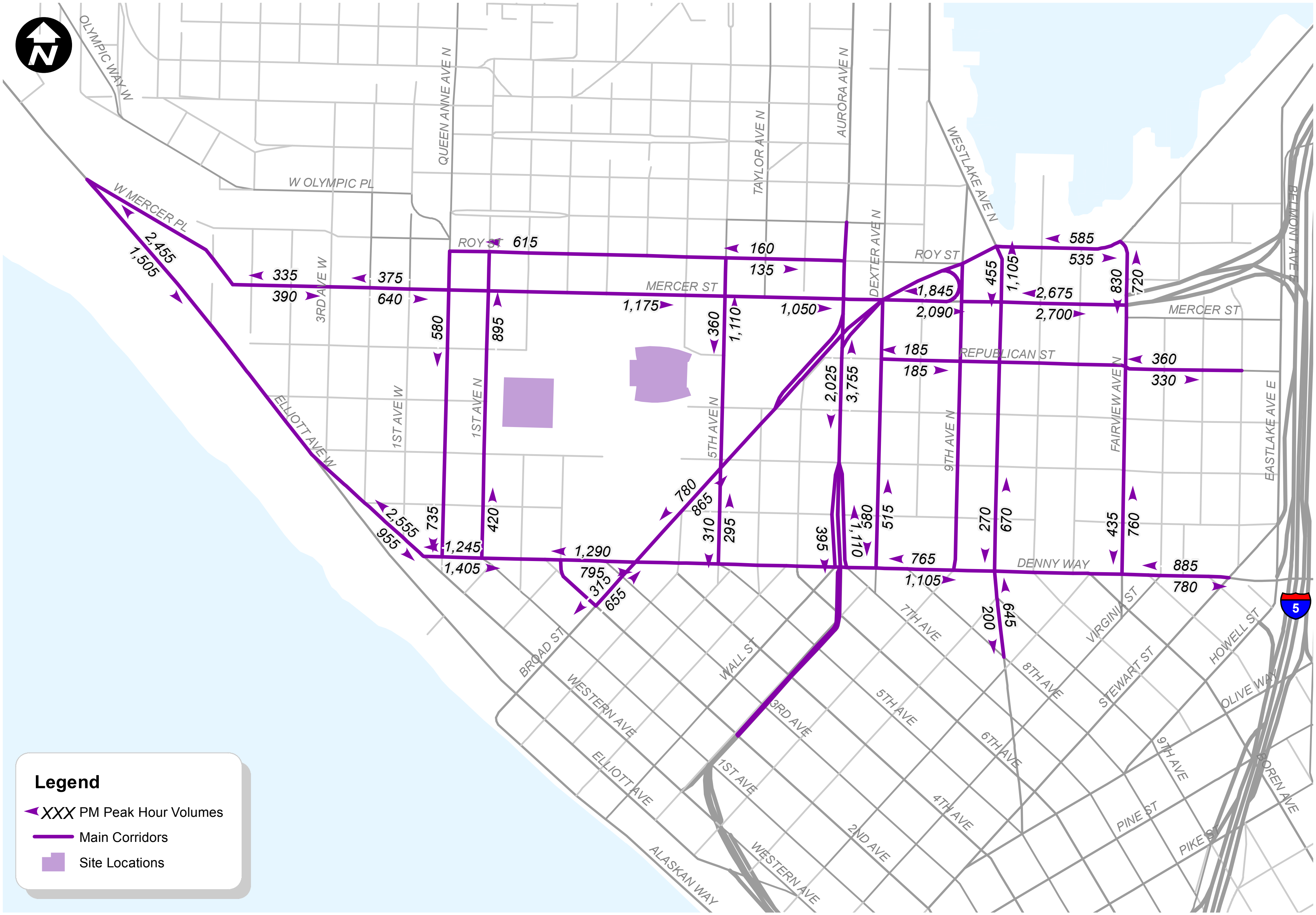


Seattle Center Area Event Trip Distribution Map

Seattle Arena

transpoGROUP

FIGURE
3-28



Seattle Center Area Existing Weekday PM Peak Hour Traffic Volumes

Seattle Arena

FIGURE
3-29

transpoGROUP

As shown on Figure 3–29, weekday PM peak hour traffic within the study area is concentrated along the Mercer Street, Denny Way, and Elliot Avenue W. corridors. Traffic volumes are greatest along Mercer Street in the vicinity of the ramps to and from I-5 and decrease further to the west. Mercer Street has over 1,000 vehicles during the peak hour along the Seattle Center frontage and over 5,000 vehicles near the I-5 / Fairview Avenue N. interchange. Denny Way has approximately 2,000 vehicles during the peak hour along Seattle Center frontage and approximately 1,700 vehicles near I-5. Elliot Avenue W. carries approximately 4,000 vehicles during the peak hour near W. Mercer Place.

Truck volumes on the primary streets that border the Seattle Center, including 1st Avenue S., Mercer Street, 5th Avenue N., Broad Street, and Denny Way are generally less than five percent during the weekday PM peak hour.

3.5.3 Impacts of No Action Alternative

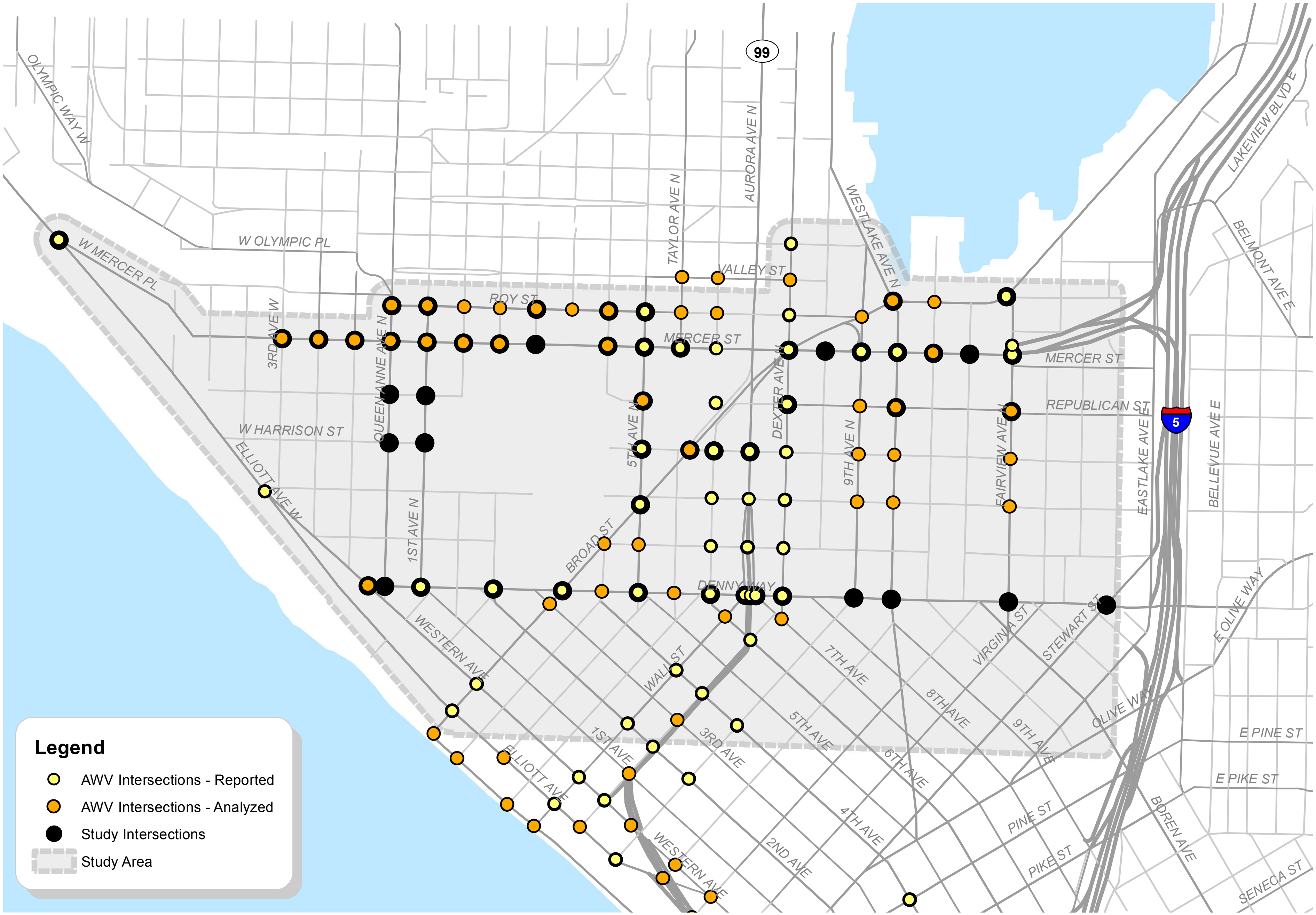
Weekday PM peak hour without event traffic volumes for the 2018 and 2030 horizon years were estimated based on 2015 and 2030 traffic volume forecasts from the Final EIS's for the Alaskan Way Viaduct Replacement Project (July 2011). Traffic volumes developed for the non-tolled bored tunnel alternative were used and account for anticipated changes in traffic volumes and travel patterns.

Forecast traffic volumes from the Alaskan Way Viaduct analysis were available at nearly all study intersections identified for this EIS and accounted for two-way travel along Mercer Street (both E. Mercer and W. Mercer projects completed). Figure 3–30 identifies the current study area intersections for the Seattle Center study area, included in the Alaskan Way Viaduct replacement Project analysis and those that were not. Forecast traffic volumes at study intersections not included in the Alaskan Way Viaduct analysis were estimated based on traffic forecasts and entering / exiting volumes at adjacent intersections that were included in the Alaskan Way Viaduct analysis, as well as anticipated changes in general travel patterns.

Traffic volumes developed for 2018 conditions were estimated by interpolating between 2015 and 2030 traffic volumes from the Alaskan Way Viaduct Replacement Project analysis.

Traffic forecasts for the three No Action event cases were developed for the 2018 and 2030 horizon years. These cases include:

- Case M1 - 5,000-person event at Memorial Stadium
- Case K1 - 12,000-person event at the KeyArena
- Case K2/M2 - A 5,000-person event at Memorial Stadium and a 12,000-person event at KeyArena that occur at the same time



Seattle Center Area Alaskan Way Viaduct/Seattle Arena EIS Study Area Comparison

Seattle Arena

FIGURE
3-30

transpoGROUP

Event traffic associated with these three event cases are outlined in the Event Transportation Demand section of this report. Based on this methodology, under 2018 conditions the 5,000 person event at Memorial Stadium is estimated to generate approximately 360 vehicular trips during the weekday PM peak hour and the 12,000-person event at Key Arena would generate approximately 850 trips.

As traffic congestion throughout the Puget Sound region increases, attendees of events in the Seattle center would be increasingly likely to use transportation modes other than passenger cars. For the 2030 conditions, the transit mode split was increased. This increase in transit usage results in a forecast of approximately 350 vehicular trips associated with a 5,000-person event at Memorial Stadium in 2030 and 820 trips forecast for a 12,000-person event at the KeyArena.

Traffic from these events was distributed to the study area roadways. The distribution is consistent with event travel patterns in the Seattle Center area. Trips were then assigned throughout the study area, consistent with the No Action parking supply. As shown, 28 percent of vehicular trips to an event at either Memorial Stadium or KeyArena were assumed to travel to the study from the north, 2 percent from the east, 68 percent from the south, and 2 percent from the west.

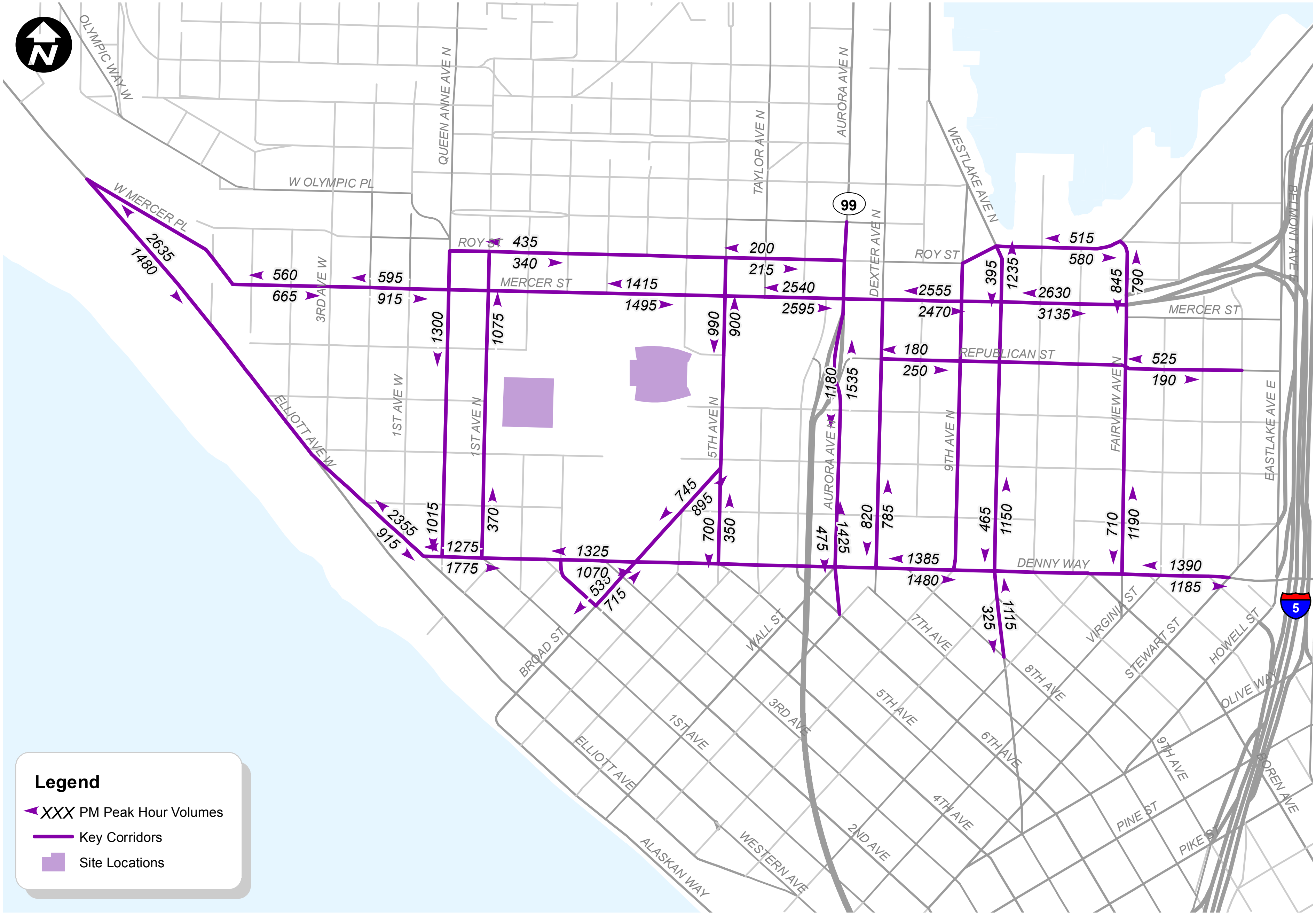
3.5.3.1 2018 Traffic Volumes

Traffic volumes along key corridors under 2018 conditions are summarized on Figure 3–31 through Figure 3–33 for the No Action Cases K1, M1, and K2/M2. Detailed turning movement volumes for each scenario and at each study intersection are provided in Attachment E-1, which is available from DPD upon request.

2018 No Action Case K1 traffic volumes are shown on Figure 3–31. The following provides a general overview of the increases in volumes from existing conditions given the assumptions outlined above for the 12,000-person event at KeyArena:

- Mercer Street, between 1st Avenue N. and 5th Avenue N. – 148 percent increase
- Denny Way, between 1st Avenue N. and 5th Avenue N. – 15 percent increase
- 1st Avenue N., south of Mercer Street – 20 percent increase
- 5th Avenue N., north of Denny Way – 29 percent increase

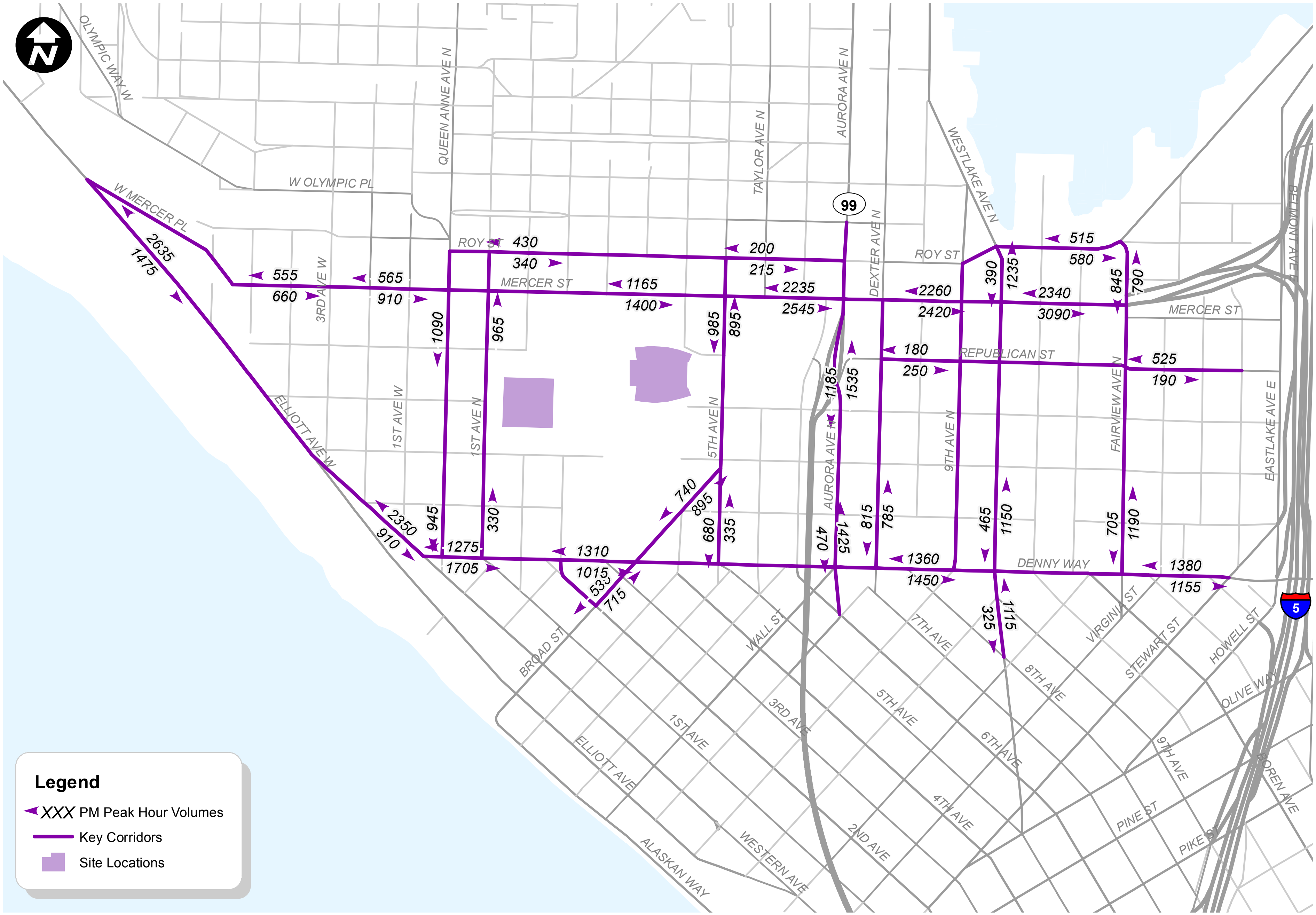
Given historical growth (approximately one to two percent annually) in background traffic, the primary contributing factor to the increase in traffic is the shifts due to the configuration of the bored tunnel and the lack of access to the Central Business District from within the tunnel.



Seattle Center Area 2018 No Action Case K1
Weekday PM Peak Hour Traffic Volumes

Seattle Arena

FIGURE
3-31

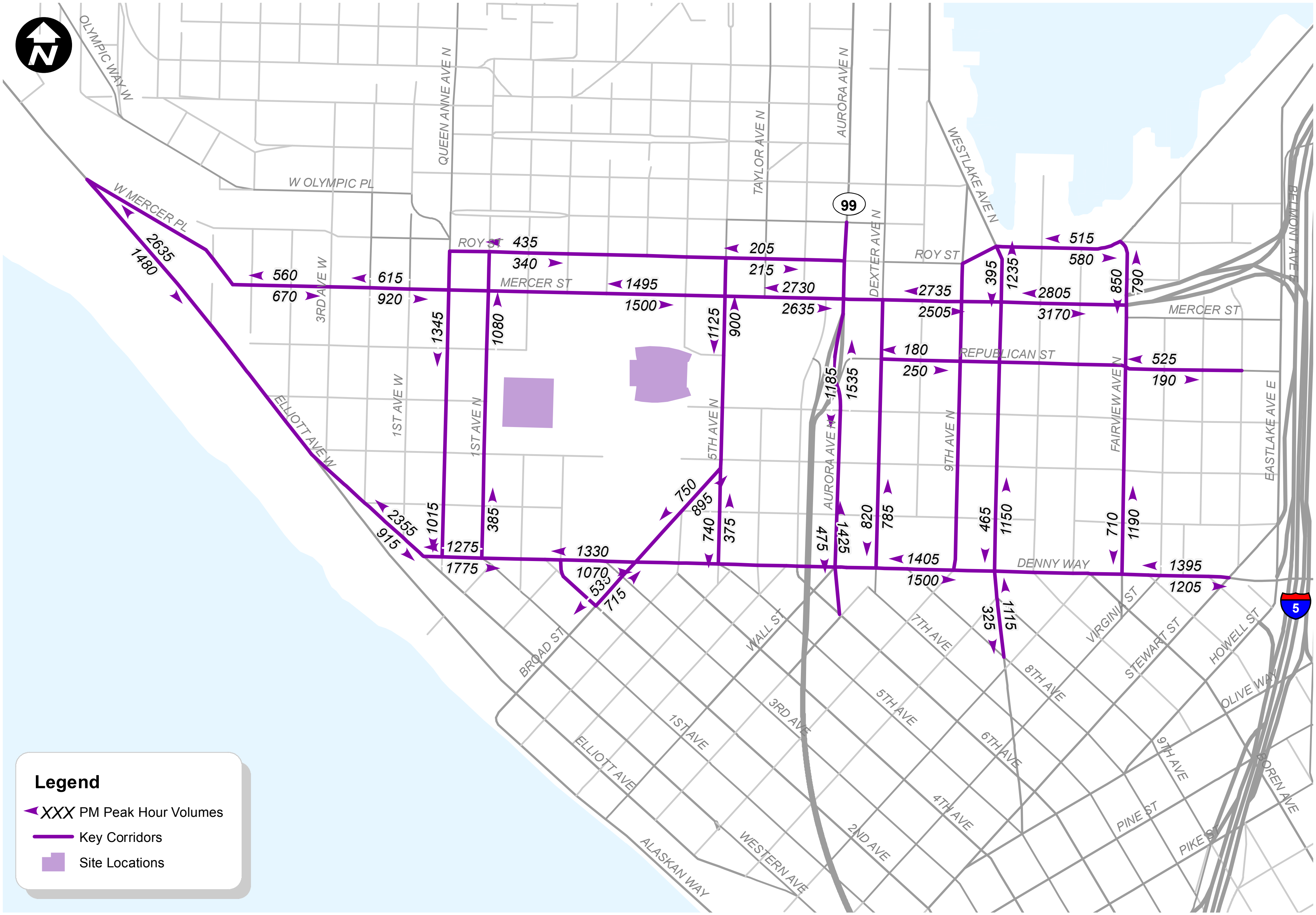


Seattle Center Area 2018 No Action Case M1
Weekday PM Peak Hour Traffic Volumes

Seattle Arena

transpoGROUP

FIGURE
3-32



Seattle Center Area 2018 No Action Case K2/M2 Weekday PM Peak Hour Traffic Volumes

Seattle Arena

FIGURE 3-33

transpoGROUP

2018 No Action Case M1 traffic volumes are shown on Figure 3–32. The following provides a general overview of the increases in volumes from existing conditions given the assumptions outlined above for the 5,000-person event at Memorial Stadium:

- Mercer Street, between 1st Avenue N. and 5th Avenue N. – 118 percent increase
- Denny Way, between 1st Avenue N. and 5th Avenue N. – 12 percent increase
- 1st Avenue N., south of Mercer Street – 8 percent increase
- 5th Avenue N., north of Denny Way – 28 percent increase

2018 No Action Case K2/M2 traffic volumes are shown on Figure 3–33. The following provides a general overview of the increases in volumes from existing conditions given the assumptions outlined above for dual events at Memorial Stadium and KeyArena:

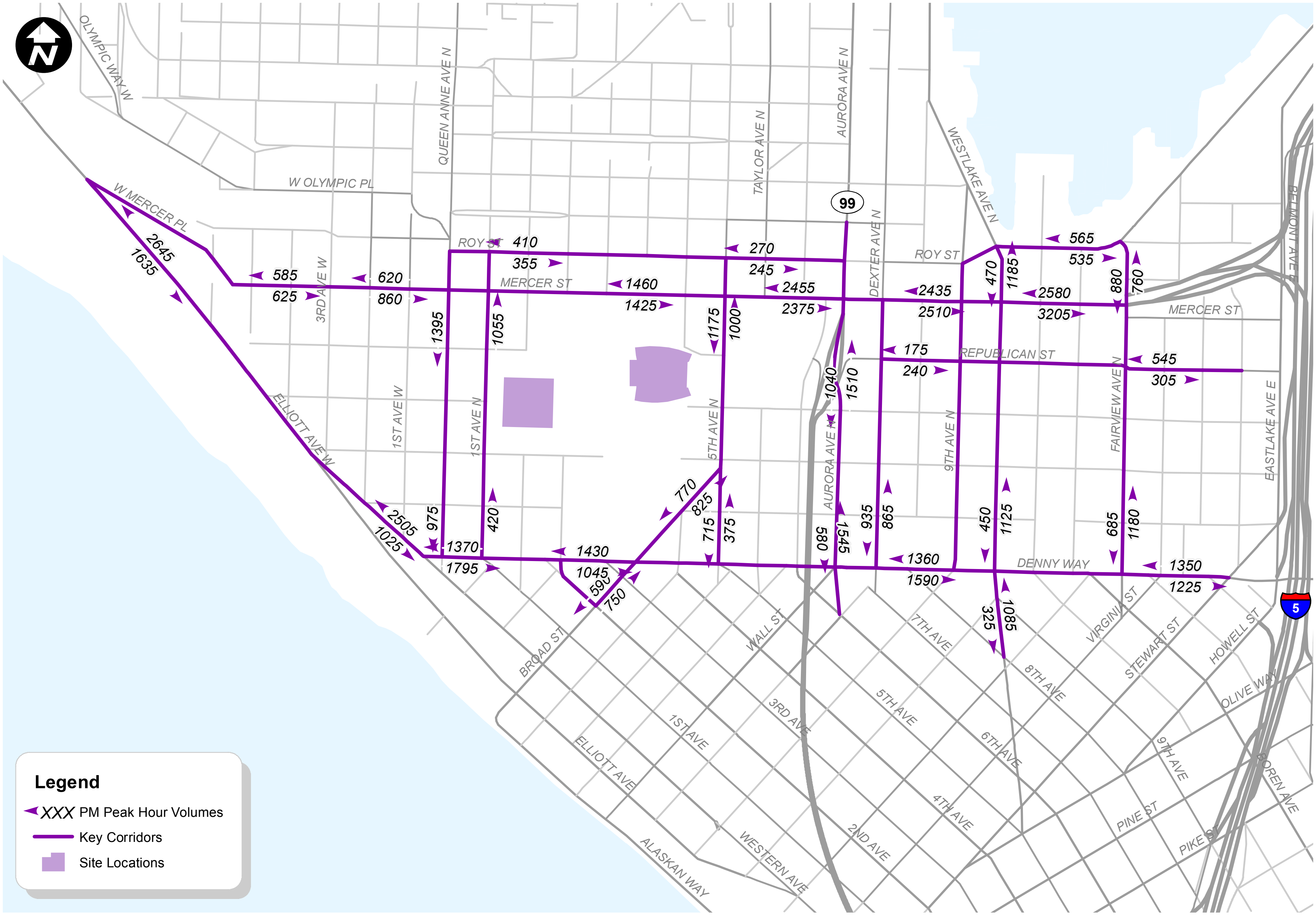
- Mercer Street, between 1st Avenue N. and 5th Avenue N. – 155 percent increase
- Denny Way, between 1st Avenue N. and 5th Avenue N. – 15 percent increase
- 1st Avenue N., south of Mercer Street – 21 percent increase
- 5th Avenue N., north of Denny Way – 38 percent increase

3.5.3.2 2030 Traffic Volumes

Traffic volumes along key corridors under 2030 conditions are summarized on Figure 3–34 through Figure 3–36 for the No Action Cases M1, K1, and K2/M2. Detailed turning movement volumes for each scenario and at each study intersection are provided in Attachment E-1, which is available from DPD upon request.

2030 No Action Case K1 traffic volumes are shown on Figure 3–34. The following provides a general overview of the increases in volumes from existing conditions given the assumptions outlined above for the 12,000-person event at KeyArena:

- Mercer Street, between 1st Avenue N. and 5th Avenue N. – 146 percent increase
- Denny Way, between 1st Avenue N. and 5th Avenue N. – 19 percent increase
- 1st Avenue N., south of Mercer Street – 18 percent increase
- 5th Avenue N., north of Denny Way – 48 percent increase

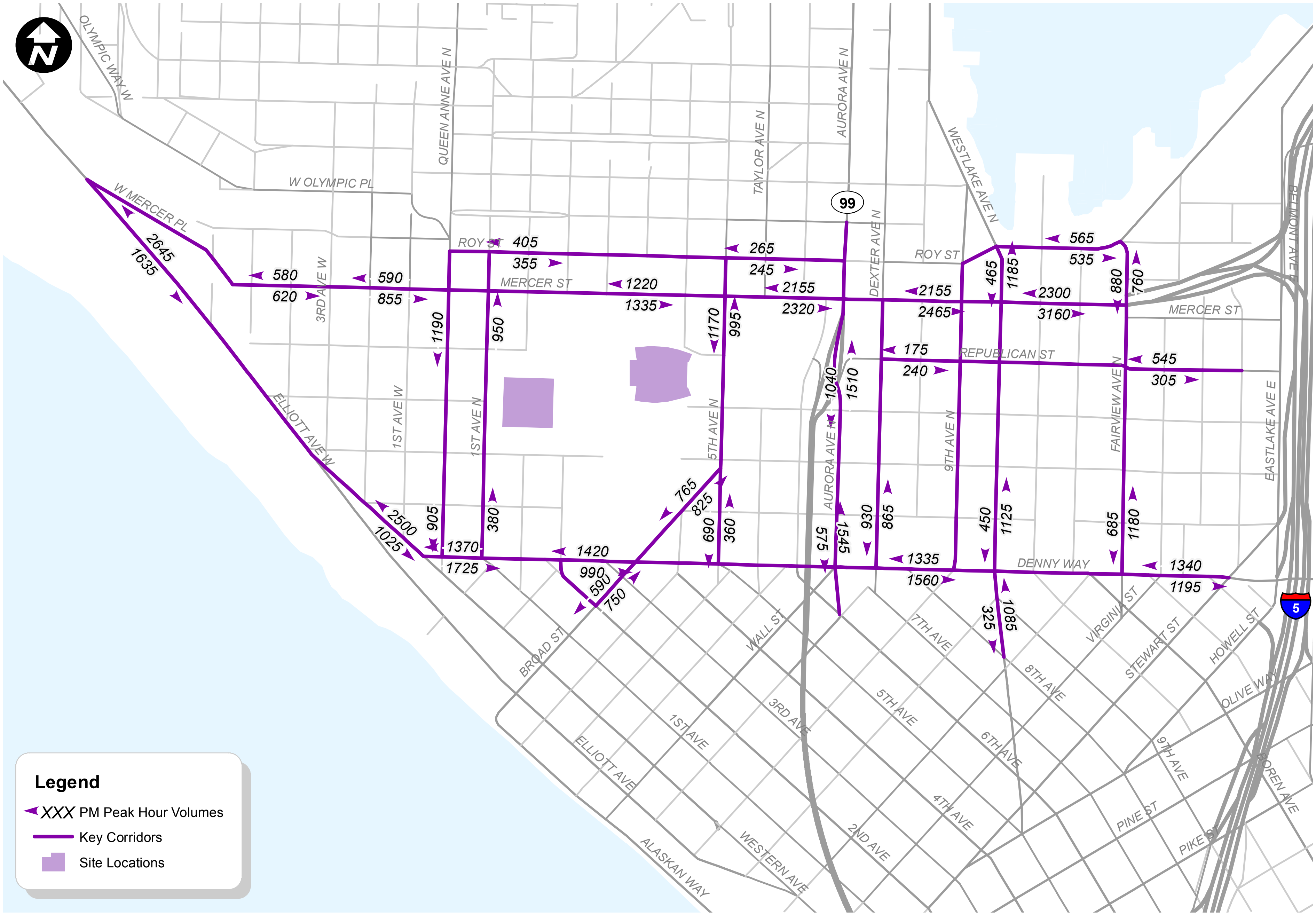


Seattle Center Area 2030 No Action Case K1
Weekday PM Peak Hour Traffic Volumes

Seattle Arena

FIGURE
3-34

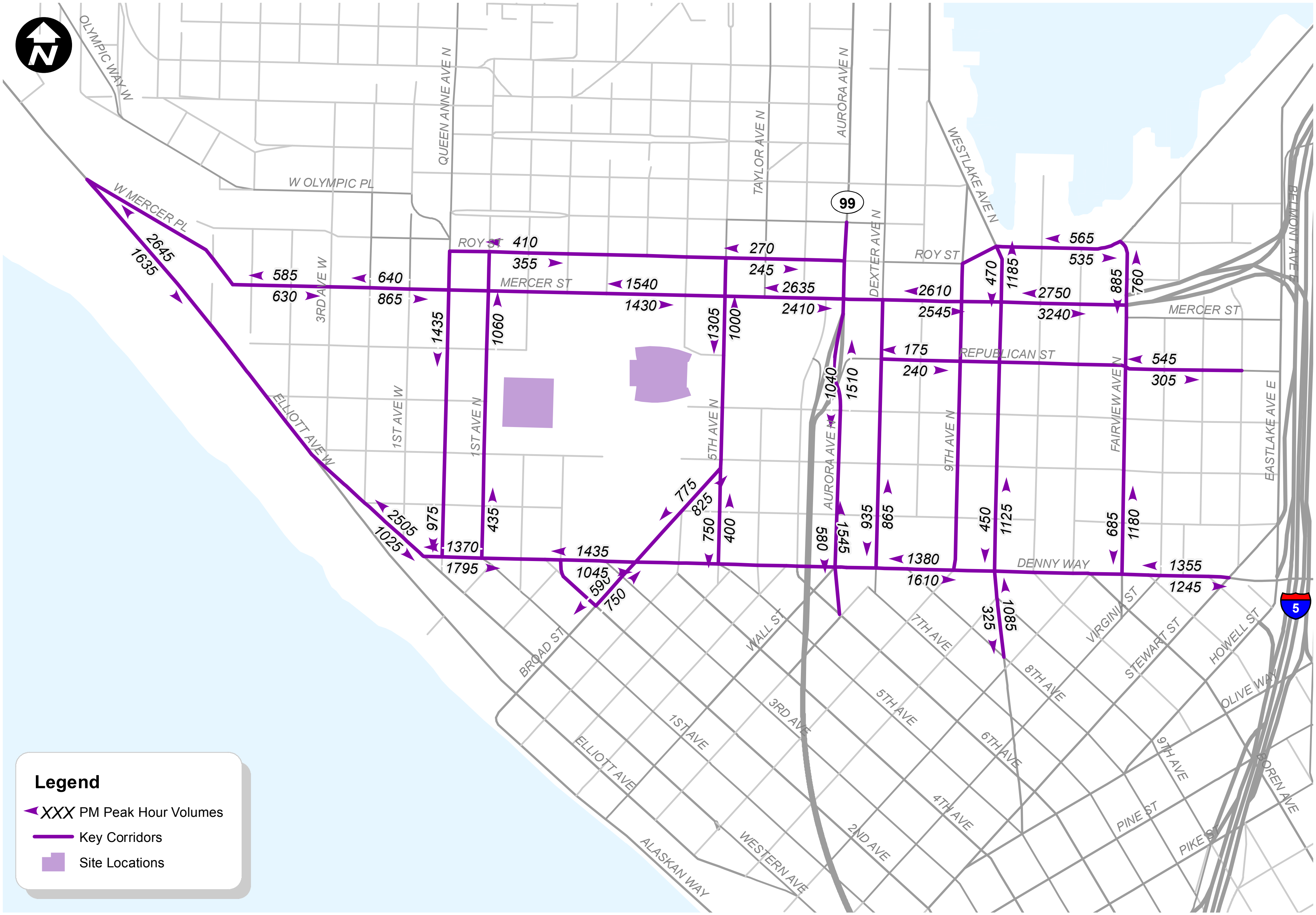
transpoGROUP



Seattle Center Area 2030 No Action Case M1
Weekday PM Peak Hour Traffic Volumes

Seattle Arena

FIGURE
3-35



Seattle Center Area 2030 No Action Case K2/M2
Weekday PM Peak Hour Traffic Volumes

Seattle Arena

FIGURE
3-36

transpoGROUP

2030 No Action Case M1 traffic volumes are shown on Figure 3–35. The following provides a general overview of the increases in volumes from existing conditions given the assumptions outlined above for the 5,000-person event at Memorial Stadium:

- Mercer Street, between 1st Avenue N. and 5th Avenue N. – 117 percent increase
- Denny Way, between 1st Avenue N. and 5th Avenue N. – 16 percent increase
- 1st Avenue N., south of Mercer Street – 6 percent increase
- 5th Avenue N., north of Denny Way – 47 percent increase

2030 No Action Case K2/M2 are shown on Figure 3–36. The following provides a general overview of the increases in volumes from existing conditions given the assumptions outlined above for dual events at Memorial Stadium and KeyArena:

- Mercer Street, between 1st Avenue N. and 5th Avenue N. – 153 percent increase
- Denny Way, between 1st Avenue N. and 5th Avenue N. – 19 percent increase
- 1st Avenue N., south of Mercer Street – 18 percent increase
- 5th Avenue N., north of Denny Way – 57 percent increase

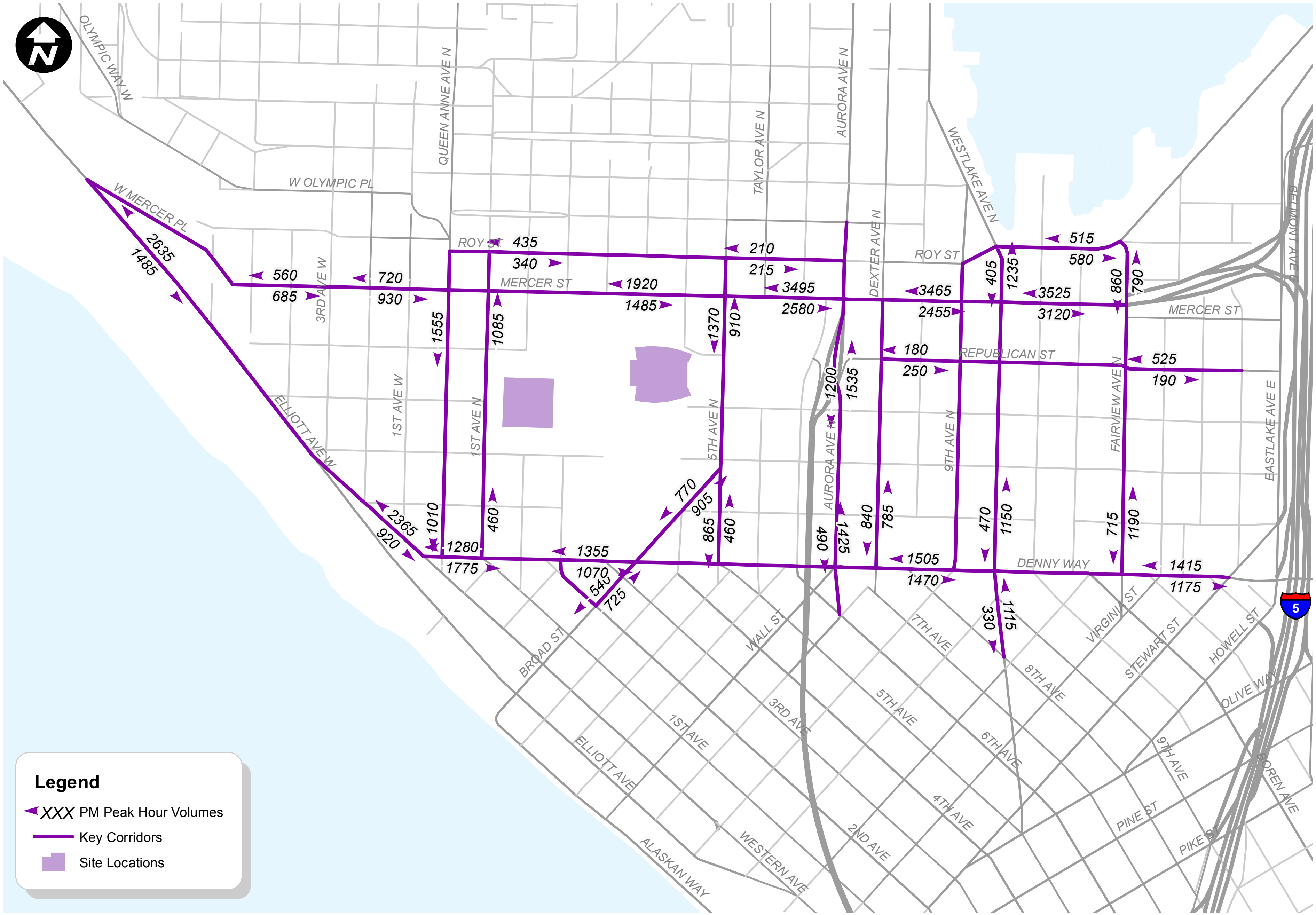
3.5.4 Impacts of Alternative 4

Alternative 4 would result in an increase in traffic volumes due to workers traveling to and from the site, delivery of material, and truck hauling. It is anticipated that the increase in traffic volumes would be less than generated by a 20,000-seat event at the arena.

3.5.4.1 2018 Traffic Volumes

Traffic volumes along key corridors under 2018 conditions for No Action Cases K1 and K2 are summarized on Figure 3–37 and Figure 3–38. Detailed turning movement volumes for each scenario and at each study intersection are provided in Attachment E-1, which is available from DPD upon request.

Table 3-5 summarizes the total traffic volumes at several locations within the arena vicinity under Alternative 4 Case K1. This table includes locations with a greater proportion of regional traffic (i.e. Mercer Street east of Terry Avenue N. accessing I-5) and locations near the Seattle Center (i.e. Mercer Street east of 3rd Avenue N.) and shows the percent increase in traffic volumes compared to 2018 No Action conditions.

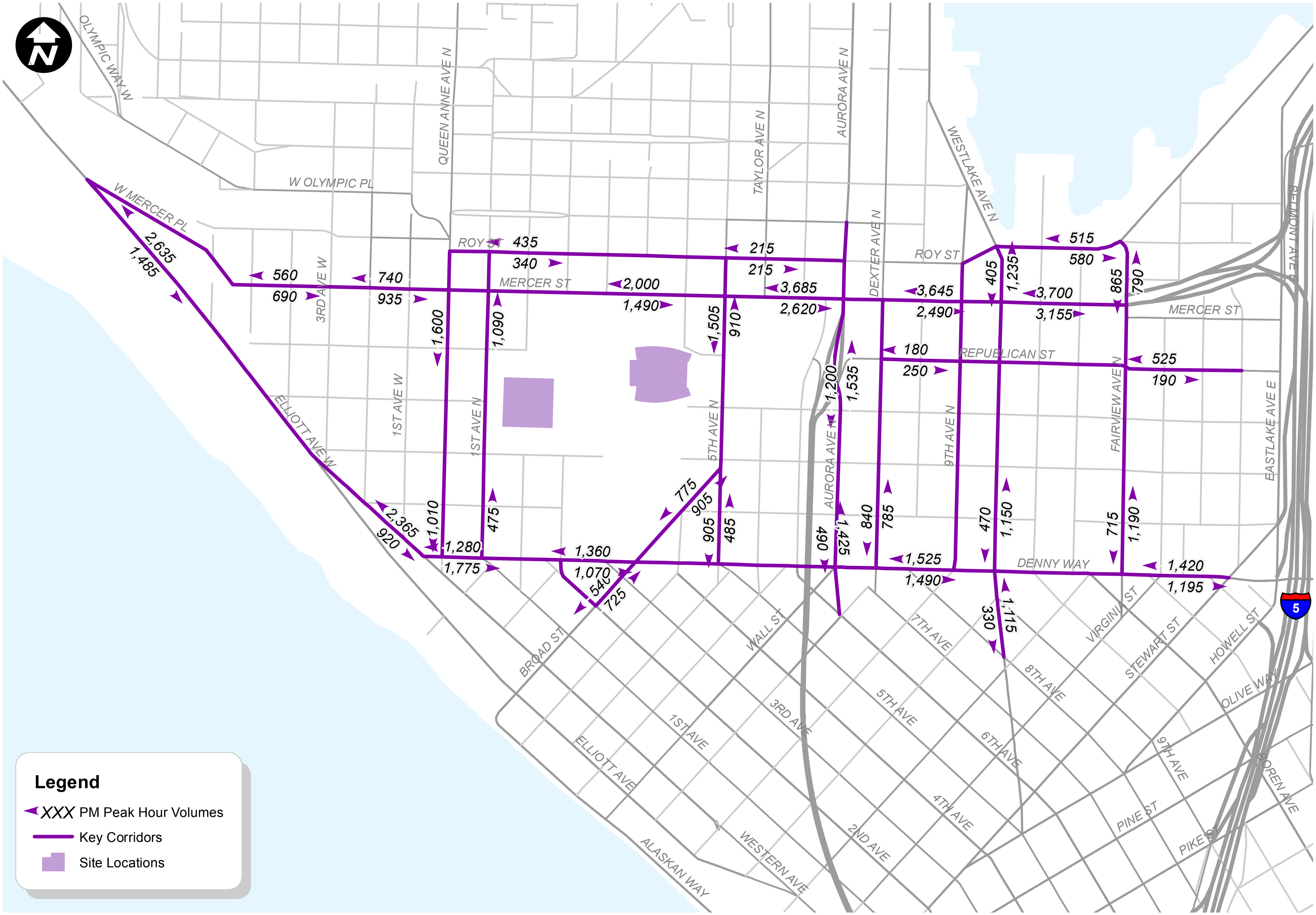


Seattle Center Area 2018 Alternative 4 Case K1 Weekday PM Peak Hour Traffic Volumes

Seattle Arena

FIGURE **3-37**

transpoGROUP



Seattle Center Area 2018 Alternative 4 Case K2
Weekday PM Peak Hour Traffic Volumes

Seattle Arena

FIGURE
3-38

transpoGROUP

Table 3-5
2018 Alternative 4 Weekday PM Peak Hour Traffic Volumes Comparison

	Case K1		Case K2	
Location	**No Action**	**Alternative 4**	**No Action**	**Alternative 4**
Mercer Street east of Terry Avenue N.	5,765	6,645 (+15%)[1]	5,975	6,855 (+15%)
Denny Way west of Stewart Street	2,575	2,590 (+1%)	2,600	2,615 (+1%)
Western Avenue northwest of Denny Way	3,270	3,285 (+1%)	3,270	3,285 (+1%)
Mercer Street east of 3rd Avenue N.	2,910	3,405 (+17%)	2,995	3,490 (+17%)
Queen Anne Avenue N. south of Mercer Street	1,300	1,555 (+20%)	1,345	1,600 (+19%)
1st Avenue N. south of Mercer Street	1,075	1,085 (+1%)	1,080	1,090 (+1%)
5th Avenue N. south of Mercer Street	1,890	2,280 (+21%)	2,025	2,415 (+19%)

1. Percent increase from No Action conditions.

The assignment of arena event related traffic reflects the overall distribution of parking in the area as well as the travel patterns accessing the Seattle Center area. Comparing No Action Case K1 to Alternative 4 Case K1, roadway volumes increase between 1 and 21 percent within the arena vicinity under either 2018 or 2030. The percent increase is influenced by the level of background traffic, as well as the level of event traffic. As a result, proportional increases under the Case K2 (multiple event scenario) are slightly less than Case K1, although the total projected volumes increase.

3.5.4.2 2030 Traffic Volumes

Weekday PM peak hour 2030 Alternative 4 traffic volumes are shown on Figure 3–39 and Figure 3–40 for the Alternative 4 Cases K1 and K2. Detailed turning movement volumes for each scenario and at each study intersection are provided in Attachment E-1, which is available from DPD upon request.

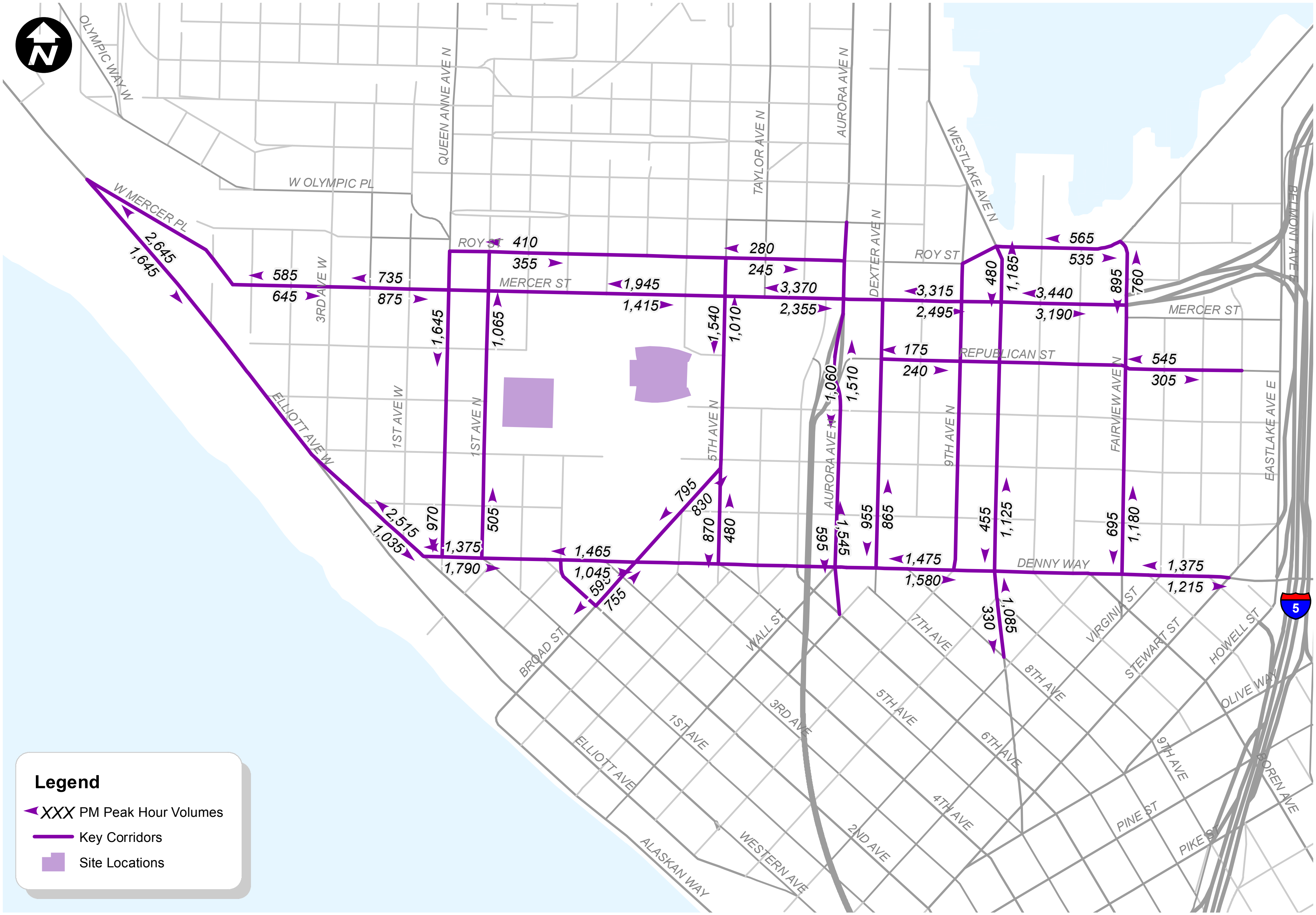
Table 3-6 summarizes the total traffic volumes within the arena vicinity and shows the percent increase in traffic volumes compared to 2030 No Action Case K2 conditions.

Table 3-6
2030 Alternative 4 Weekday PM Peak Hour Traffic Volumes Comparison

Location	Case K1		Case K2	
	No Action	Alternative 4	No Action	Alternative 4
Mercer Street east of Terry Avenue N.	5,785	6,630 (+15%)1	5,990	6,835 (+14%)
Denny Way west of Stewart Street	2,575	2,590 (+1%)	2,600	2,615 (+1%)
Western Avenue northwest of Denny Way	3,530	3,550 (+1%)	3,530	3,550 (+1%)
Mercer Street east of 3rd Avenue N.	2,885	3,360 (+16%)	2,970	3,445 (+16%)
Queen Anne Avenue N. south of Mercer Street	1,395	1,645 (+18%)	1,435	1,685 (+17%)
1st Avenue N. south of Mercer Street	1,055	1,065 (+1%)	1,060	1,070 (+1%)
5th Avenue N. south of Mercer Street	2,175	2,550 (+17%)	2,305	2,680 (+16%)

1. Percent increase from No Action conditions.

As shown on Figure 3–39 and Figure 3–40, and Table 3-6, roadway volumes increase between 1 and 18 percent within the arena vicinity as a result of the addition of arena traffic under either cases K1 and K2. The percent increase is influenced by the level of background traffic, as well as the level of event traffic. As a result, proportional increases under the Case K2 multiple event scenario are slightly less than for Case K1, although the project volumes increase.

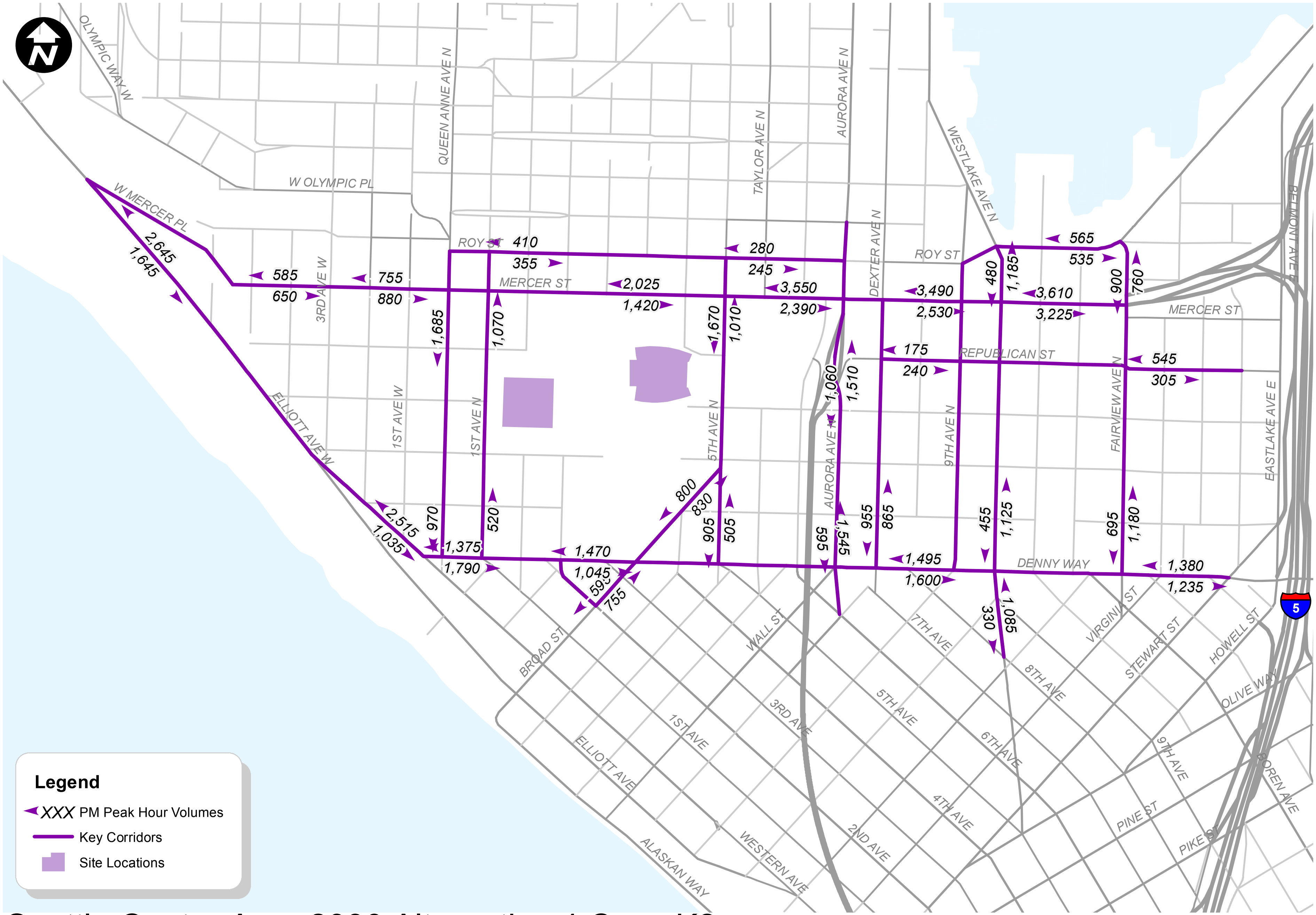


Seattle Center Area 2030 Alternative 4 Case K1
Weekday PM Peak Hour Traffic Volumes

Seattle Arena

FIGURE
3-39

transpoGROUP



Seattle Center Area 2030 Alternative 4 Case K2
Weekday PM Peak Hour Traffic Volumes

Seattle Arena

FIGURE
3-40

transpoGROUP

3.5.4.3 Transportation Concurrency

The City of Seattle has implemented a Transportation Concurrency system to comply with one of the requirements of the Washington State Growth Management Act (GMA). The system, described in the DPD Director's Rule 5-2009 and the City's Land Use and Zoning Code, is designed to provide a mechanism that determines whether adequate transportation facilities would be available "concurrent" with proposed development projects.

The screenlines closest to the project site were chosen for review. The screenlines that were analyzed are shown in Table 2-13 and include:

- Magnolia (Screenline 2)
- Ship Canal (Freemont Bridge, Screenline 5.12),
- Ship Canal (Aurora Bridge, Screenline 5.13), and
- South of Lake Union (Screenline 8).

As a conservative estimate, it was assumed that all project-generated traffic traveling in the direction of the screenlines would extend across the screenlines included in this analysis.

Table 3-7
Alternative 4 Transportation Concurrency Analysis

SL#[1]	Location	Dir[2]	Capacity	2008 Volume	Alternative 4 Traffic[3]	V/C Ratio with Project	LOS Standard
2	Magnolia	EB	4,300	611	39	0.15	1.00
		WB	4,300	1,141	3	0.27	1.00
5.12	Ship Canal (Freemont Bridge)	NB	1,600	1,757	3	1.10	1.20
		SB	1,600	1,229	40	0.79	1.20
5.13	Ship Canal (Aurora Bridge	NB	5,100	4,472	3	0.88	1.20
		SB	5,100	3,756	40	0.74	1.20
8	South Lake Union	EB	6,000	4,509	55	0.76	1.20
		WB	3,600	3,020	195	0.89	1.20

1. SL# = Screenline Number
2. Direction: NB = Northbound, SB = Southbound, EB = Eastbound, WB = Westbound
3. 2018 trip generation and assignment

The transportation concurrency analysis indicates that with traffic generated by the project, the screenlines would have v/c ratios that are less than the City level of service threshold and thus, the conditions would meet concurrency requirements.

3.5.5 Impacts of Alternative 5

Alternative 5 would result in an increase in traffic volumes due to workers traveling to and from the site, delivery of material, and truck hauling. It is anticipated that the increase in traffic volumes would be less than generated by a 20,000-seat event at the arena.

3.5.5.1 2018 Traffic Volumes

Traffic volumes along key corridors under 2018 conditions for the multiple event cases are summarized on Figure 3–41 and Figure 3–42. Detailed turning movement volumes for each scenario and at each study intersection are provided in Attachment E-1, which is available from DPD upon request.

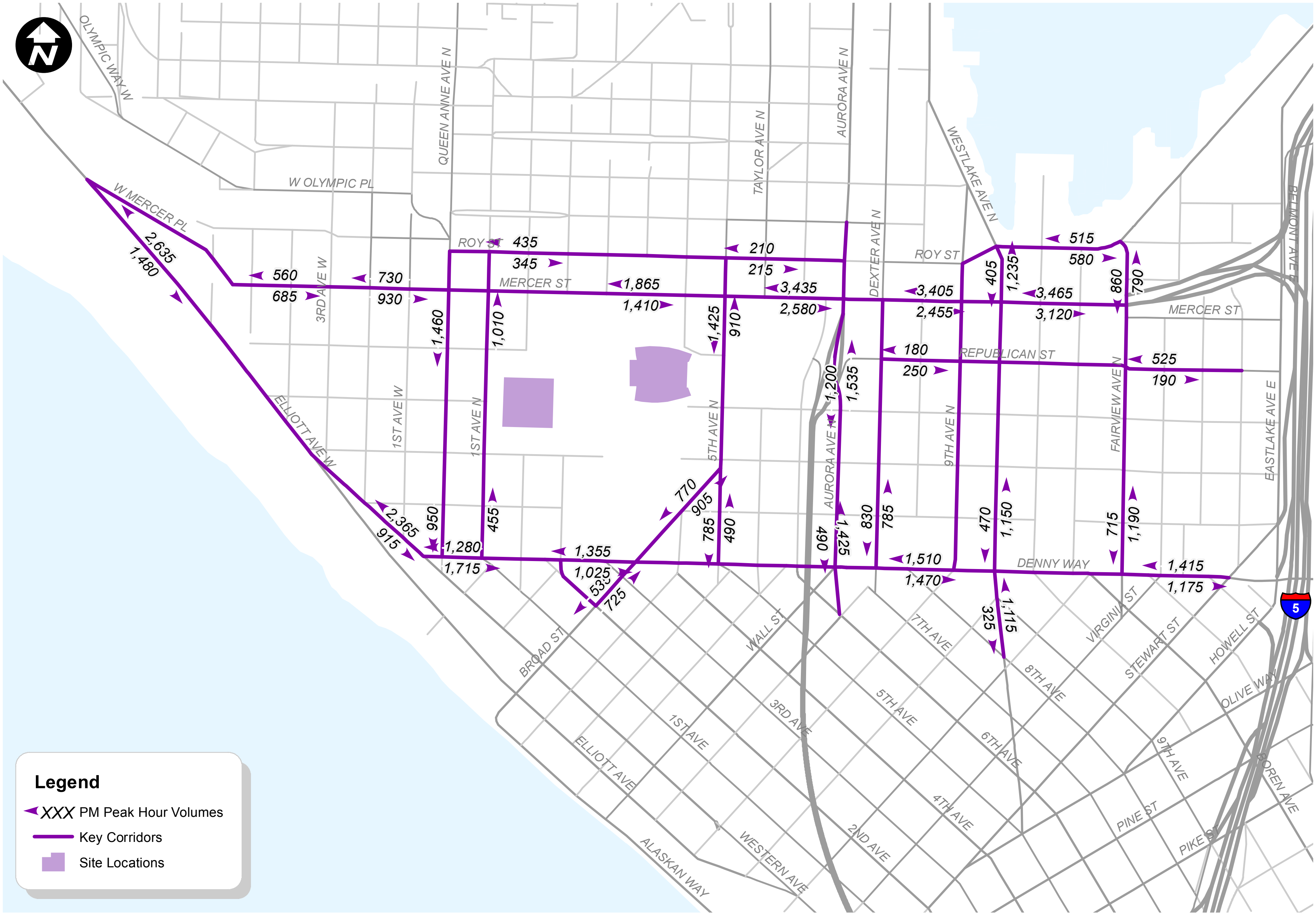
Table 3-8 summarizes the total traffic volumes within the arena vicinity and shows the percent increase in traffic volumes compared to 2018 No Action conditions for Cases M1 and M2.

Table 3-8
2018 Alternative 5 Weekday PM Peak Hour Traffic Volumes Comparison

	Case M1		Case M2	
Location	**No Action**	**Alternative 4**	**No Action**	**Alternative 4**
Mercer Street east of Terry Avenue N.	5,430	6,585 (+21%)[1]	5,975	7,130 (+19%)
Denny Way west of Stewart Street	2,535	2,590 (+2%)	2,600	2,655 (+2%)
Western Avenue northwest of Denny Way	3,260	3,280 (+1%)	3,270	3,290 (+1%)
Mercer Street east of 3rd Avenue N.	2,565	3,275 (+28%)	2,995	3,705 (+24%)
Queen Anne Avenue N. south of Mercer Street	1,090	1,460 (+34%)	1,345	1,715 (+28%)
1st Avenue N. south of Mercer Street	965	1,010 (+5%)	1,080	1,125 (+4%)
5th Avenue N. south of Mercer Street	1,880	2,335 (+24%)	2,025	2,480 (+22%)

1. Percent increase from No Action conditions.

The assignment of arena event related traffic reflects the overall distribution of parking in the area as well as the travel patterns accessing the Seattle Center area. Comparing No Action Case M1 to Alternative 4 Case M1, roadway volumes increase between 5 and 24 percent within the arena vicinity under either 2018 or 2030. The percent increase is influenced by the level of background traffic, as well as the level of event traffic. As a result, proportional increases under the Case M2 multiple event scenario are slightly less than for Case M1, the single event scenario.

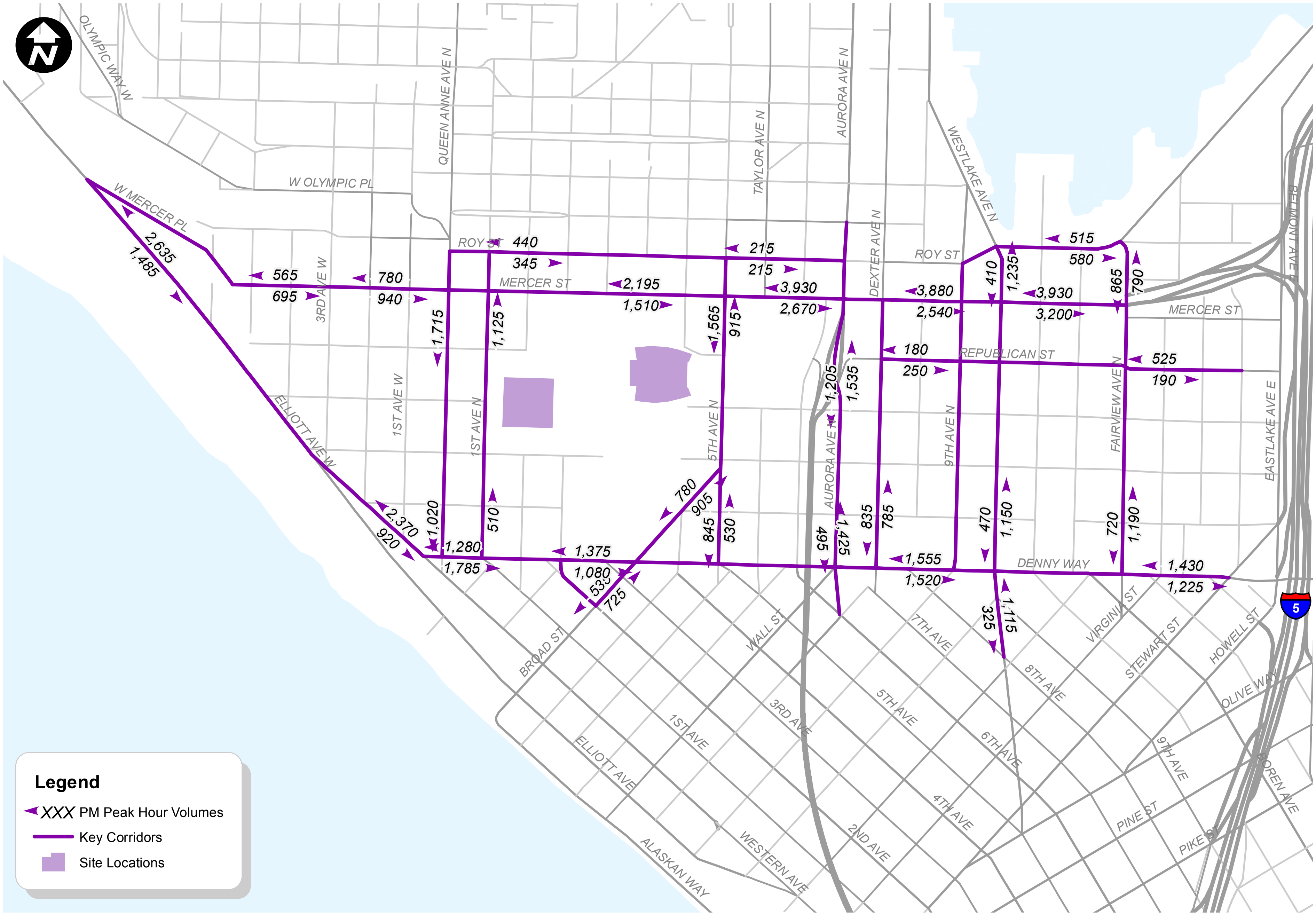


Seattle Center Area 2018 Alternative 5 Case M1
Weekday PM Peak Hour Traffic Volumes

Seattle Arena

FIGURE
3-41

transpoGROUP



Seattle Center Area 2018 Alternative 5 Case M2
Weekday PM Peak Hour Traffic Volumes

Seattle Arena

transpoGROUP

FIGURE
3-42

When compared to the growth identified for the Alternative 4 cases, growth under Alternative 5 is greater. This increase is due to the increase growth in attendees with an arena event at either site. At the KeyArena site the anticipated growth increases from 12,000 attendees to 20,000 attendees for an increase of 8,000 attendees. At Memorial Stadium event attendance would increase from 5,000 to 20,000 for an increase of 15,000 attendees.

3.5.5.2 2030 Traffic Volumes

Weekday PM peak hour 2030 Proposed Action traffic volumes are shown on Figure 3–43 and Figure 3–44 for the assumed NBA event at Memorial Stadium and with the addition of a 12,000 person event at KeyArena. Detailed turning movement volumes for each scenario and at each study intersection are provided in Attachment E-1, which is available from DPD upon request.

Table 3-9 summarizes the total traffic volumes within the arena vicinity and shows the percent increase in traffic volumes compared to 2030 No Action conditions for Cases M1 and M2.

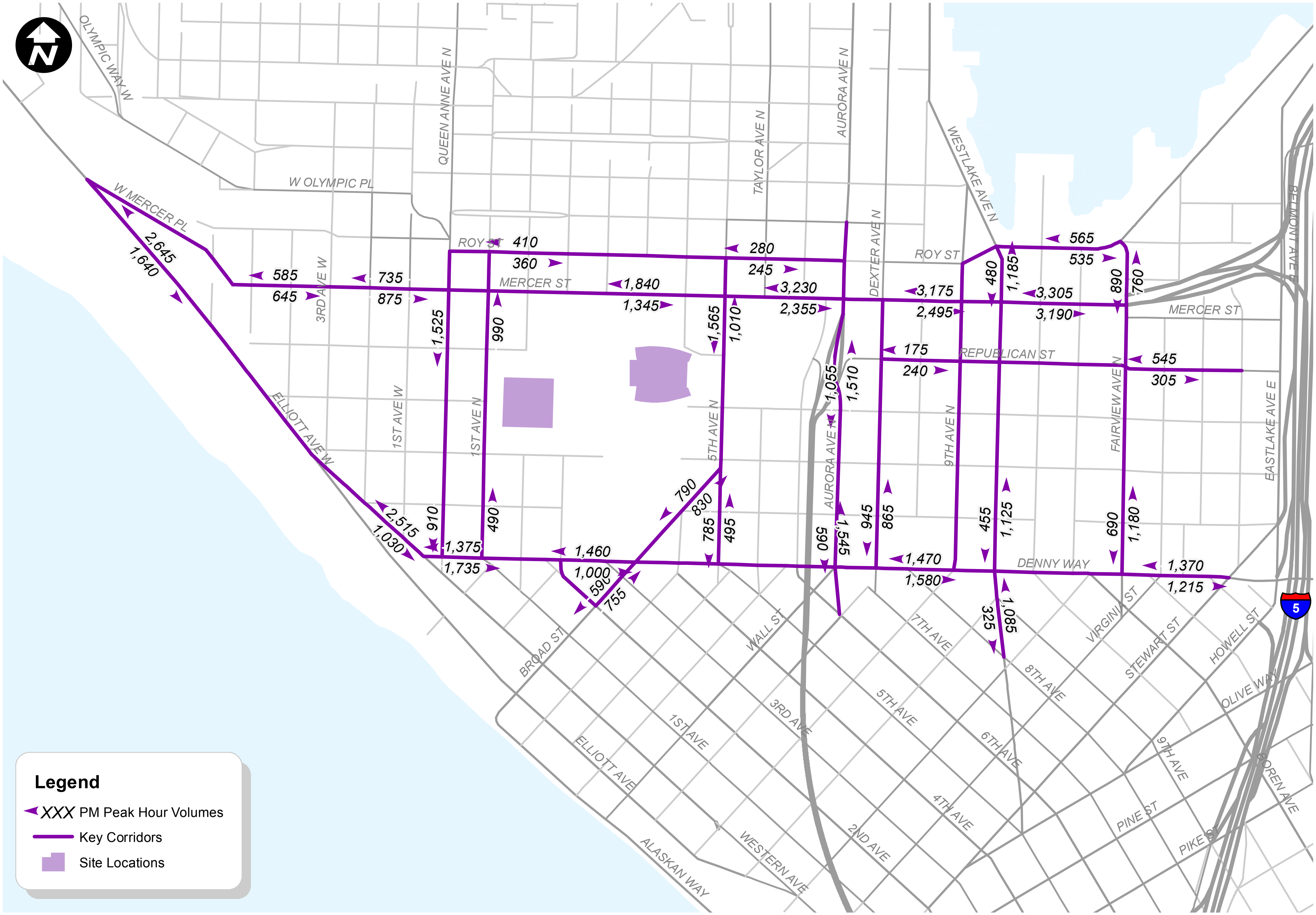
Table 3-9
2030 Alternative 5 Weekday PM Peak Hour Traffic Volumes Comparison

	Case M1		Case M2	
Location	**No Action**	**Alternative 4**	**No Action**	**Alternative 4**
Mercer Street east of Terry Avenue N.	5,460	6,495 (+19%)[1]	5,990	7,025 (+17%)
Denny Way west of Stewart Street	2,535	2,585 (+2%)	2,600	2,650 (+2%)
Western Avenue northwest of Denny Way	3,525	3,545 (+1%)	3,530	3,550 (+1%)
Mercer Street east of 3rd Avenue N.	2,555	3,185 (+25%)	2,970	3,600 (+21%)
Queen Anne Avenue N. south of Mercer Street	1,190	1,525 (+28%)	1,435	1,770 (+23%)
1st Avenue N. south of Mercer Street	950	990 (+4%)	1,060	1,100 (+4%)
5th Avenue N. south of Mercer Street	2,165	2,575 (+19%)	2,305	2,715 (+18%)

1. Percent increase from No Action conditions.

As shown on Figure 3–43 and Figure 3–44, and Table 3-9, roadway volumes increase between 1 and 28 percent within the arena vicinity as a result of the addition of arena traffic under either cases M1 and M2. The percent increase is influenced by the level of background traffic, as well as the level of event traffic. As a result, increases under the Case M2 multiple event scenario are slightly less than for Case M1, the single event scenario.

As explained for 2018 Alternative 5 traffic volumes, growth under Alternative 5 is greater than growth identified for Alternative 4. This proportional increase is due to the increased growth in attendees with an arena event at either site.

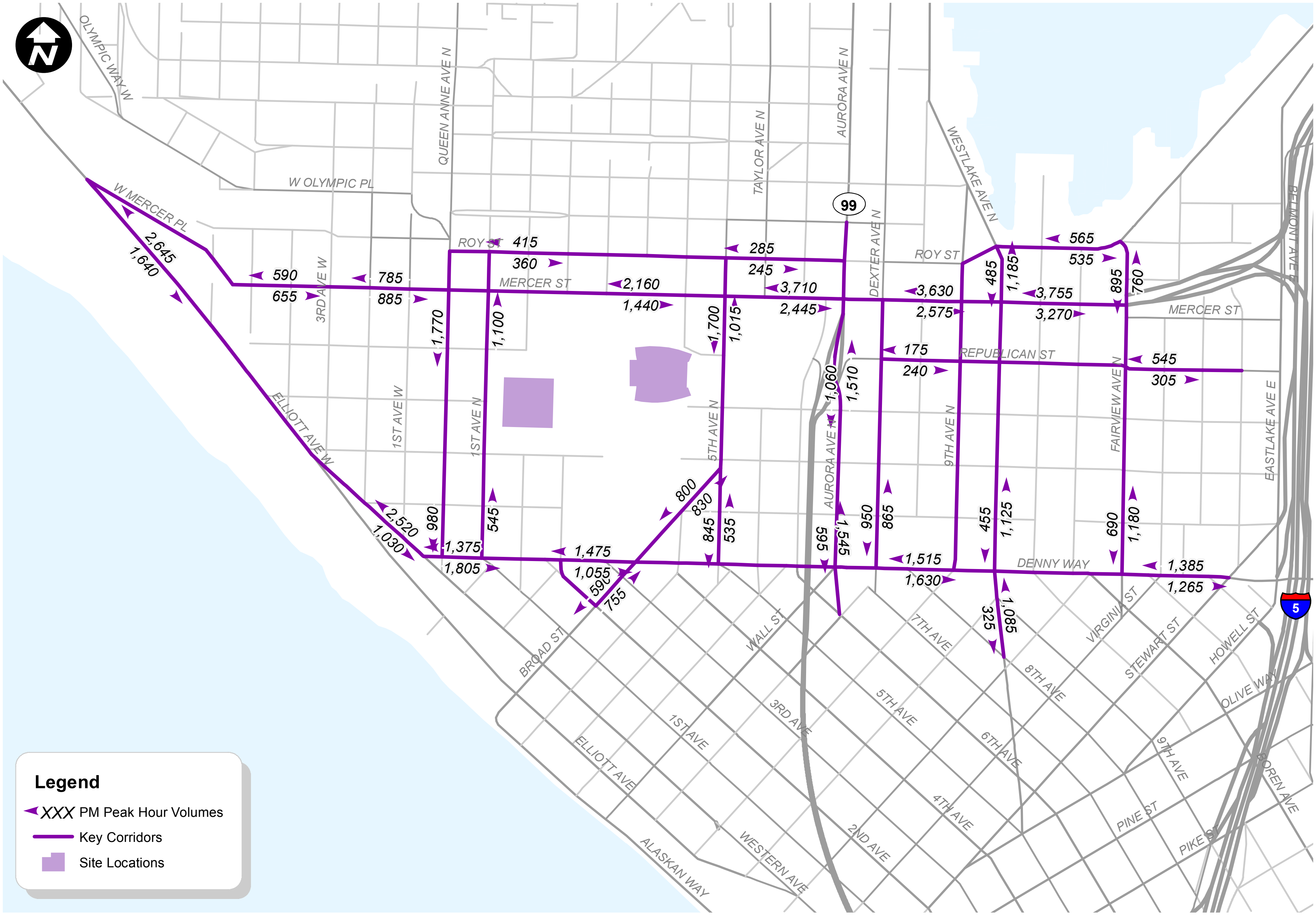


Seattle Center Area 2030 Alternative 5 Case M1
Weekday PM Peak Hour Traffic Volumes

Seattle Arena

FIGURE
3-43

transpoGROUP



Seattle Center Area 2030 Alternative 5 Case M2 Weekday PM Peak Hour Traffic Volumes

Seattle Arena

FIGURE
3-44

transpoGROUP

3.5.5.3 Transportation Concurrency

The City of Seattle has implemented a Transportation Concurrency system to comply with one of the requirements of the Washington State Growth Management Act (GMA). The system, described in the DPD Director's Rule5-2009 and the City's Land Use and Zoning Code, is designed to provide a mechanism that determines whether adequate transportation facilities would be available "concurrent" with proposed development projects.

The screenlines closest to the project site were chosen for review. The screenlines that were analyzed are shown in Table 2-13 and include:

- Magnolia (Screenline 2)
- Ship Canal (Freemont Bridge, Screenline 5.12),
- Ship Canal (Aurora Bridge, Screenline 5.13), and
- South of Lake Union (Screenline 8).

As a conservative estimate, it was assumed that all project-generated traffic traveling in the direction of the screenlines would extend across the screenlines included in this analysis.

Table 3-10
Alternative 5 Transportation Concurrency Analysis

SL#[1]	Location	Dir[2]	Capacity	2008 Volume	Alternative 5 Traffic[3]	V/C Ratio with Project	LOS Standard
2	Magnolia	EB	4,300	611	39	0.15	1.00
		WB	4,300	1,141	3	0.27	1.00
5.12	Ship Canal (Freemont Bridge)	NB	1,600	1,757	3	1.10	1.20
		SB	1,600	1,229	40	0.79	1.20
5.13	Ship Canal (Aurora Bridge	NB	5,100	4,472	3	0.88	1.20
		SB	5,100	3,756	40	0.74	1.20
8	South Lake Union	EB	6,000	4,509	55	0.76	1.20
		WB	3,600	3,020	195	0.89	1.20

1. SL# = Screenline Number
2. Direction: NB = Northbound, SB = Southbound, EB = Eastbound, WB = Westbound
3. 2018 trip generation and assignment

The transportation concurrency analysis indicates that with traffic generated by the project, the screenlines would have v/c ratios that are less than the City level of service threshold and thus, the conditions would meet concurrency requirements.

3.5.6 Mitigation Measures

A complete summary of potential mitigation measures to be considered across all the Transportation Elements evaluated in this report is included in Chapter 4.0 of Appendix E. This summary includes identification of both programmatic measures and physical improvements. For each of the potential mitigation measures a designation of high to low influence was noted. The following identifies those potential mitigation measures considered to have a high influence on this transportation element. These potential mitigation measures are appropriate for both Alternative 4 and Alternative 5.

- Event schedule protocol and management
- Public information coordinator
- Directional event signage
- Variable message and parking guidance signage
- Construction management plan

3.5.7 Secondary & Cumulative Impacts

The effective implementation of transportation demand reduction strategies through a Transportation Management Program would result in increases in demands on other transportation modes and systems, including pedestrians, transit, and bicycles.

3.5.8 Significant Unavoidable Adverse Impacts

Peak hour traffic volumes would increase substantially over current levels under No Action conditions and the order of magnitude of change in traffic volumes associated with an arena for any event case falls within the range of current event experience. There would be an increase in traffic volumes during peak conditions on event days, which would occur more frequently with an arena. A number of measures have been identified to reduce the level of increase in traffic volumes, including demand reduction, and management of vehicles to orient them to the most appropriate route.

3.6 Traffic Operations

This section evaluates the impacts of the project with respect to traffic operations within the defined Seattle Center study area. The traffic operations analysis included a review of three primary areas. This includes an analysis of the intersection levels of service, corridor performance measured through an assessment of travel times, and regional impacts as identified through a review of mainline I-5 and I-90 travel speeds and ramp terminal LOS. The following section provides further detail regarding the methodology applied to each of the three analyses.

3.6.1 Methodology

Intersection Level of Service: The operational performance of an intersection was determined by calculating the intersection LOS based on the procedures presented in HCM 2000 rather than the most recent HCM 2010. The use of HCM 2000 is due to limitations related to the HCM

2010 methodology for some conditions, analysis software coding bugs, a desire to apply a consistent methodology throughout the study area, and long-term acceptance of the previous HCM results. Specific limitations of the HCM 2010 methodology include the inability to model five-legged intersections as well as restrictions related to signal phasing that result in the inability to model some of the study area signalized locations. As a consistent approach to measuring intersection and corridor performance, the LOS analysis was completed using the HCM 2000 methodologies as implemented in the Synchro version 8 software program.

At signalized and all-way stop-controlled intersections, LOS is measured in average delay per vehicle for all vehicles at the intersection. At two-way stop-sign-controlled intersections, LOS is reported for the worst operating approach of the intersection. Traffic operations for an intersection can be described alphabetically with a range of LOS values (LOS A through F), with LOS A indicating free-flowing traffic and LOS F indicating extreme congestion and long vehicle delays. Intersection levels of service incorporate several intersection characteristics including signal timing, signal phasing, intersection channelization, traffic volumes, and pedestrian volumes. Table 3-11 summarizes the LOS criteria for signalized and unsignalized intersections.

The City of Seattle's Comprehensive Plan does not define a LOS standard for individual intersections; however, the City generally recognizes LOS E and F as poor operations for signalized locations and LOS F for unsignalized locations. As noted above, given the event-related nature of this analysis, and variant frequencies and intensities, traditional intersection LOS standards would not be appropriate as the sole measure of impacts on traffic operations.

Table 3-11
Level of Service Criteria

LOS[1]	Average Signalized Delay[2]	Average Unsignalized Delay[2]	General Description[2]
A	< 10 seconds	< 10 seconds	Free Flow
B	10 - 20 seconds	10 - 15 seconds	Stable Flow (slight delays)
C	20 - 35 seconds	15 - 25 seconds	Stable flow (acceptable delays)
D	35 - 55 seconds	25 - 35 seconds	Approaching unstable flow (tolerable delay, occasionally wait through more than one signal cycle before proceeding)
E	55 - 80 seconds	35 - 50 seconds	Unstable flow (intolerable delay)
F	> 80 seconds	> 50 seconds	Forced flow (jammed)

1. LOS = level of service
2. *Highway Capacity Manual*, Transportation Research Board, Special Report 209, 2000.

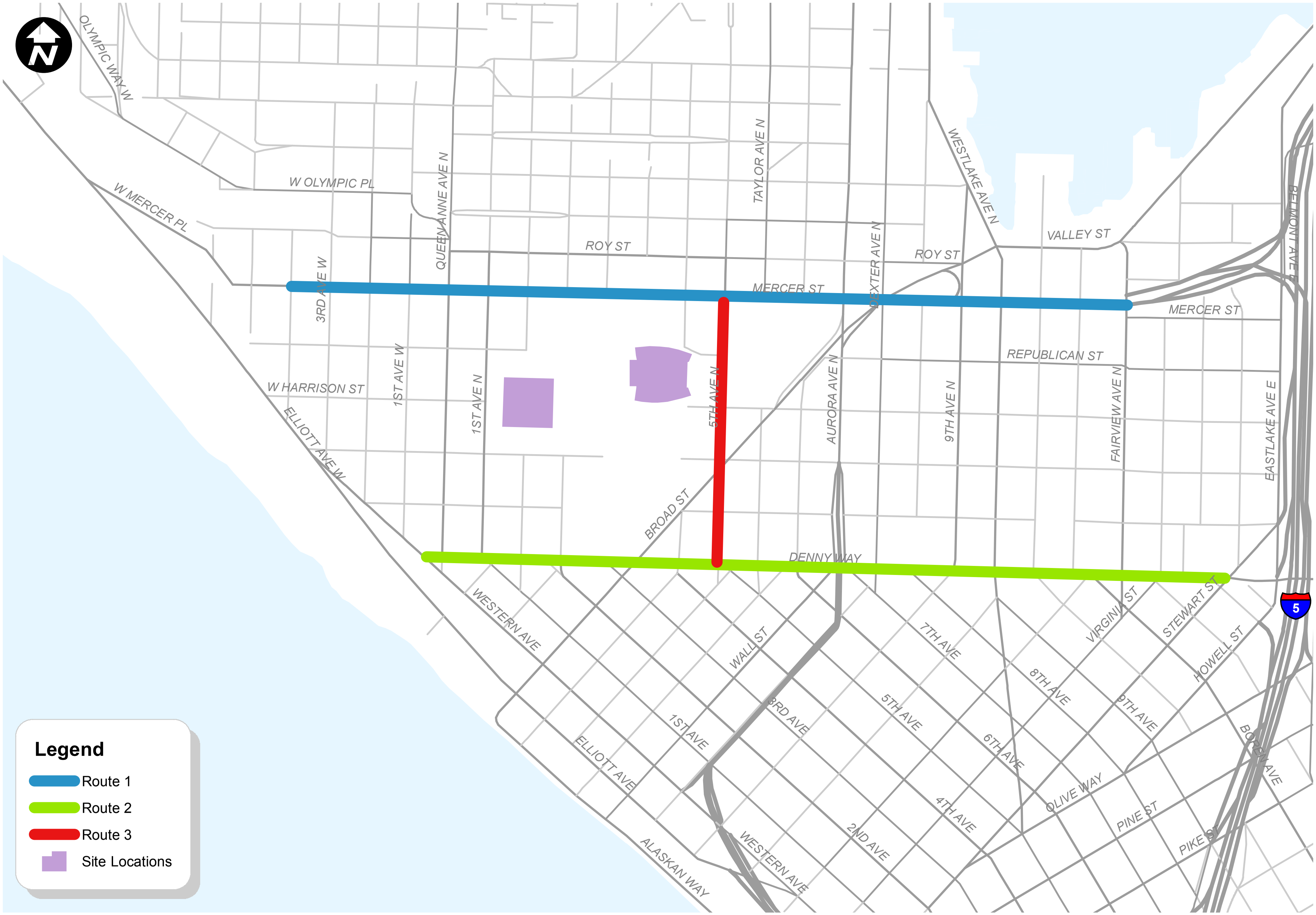
Corridor Performance: Route performance along key corridors was calculated within the study area to provide an additional level of analysis regarding the overall operations of the roadway system. This type of analysis adds context to the results of the intersection LOS described earlier, because it takes into account general travel times between intersections as well as additional delay anticipated at intersections for the specific movements relevant to the identified route.

Travel times were evaluated for three routes and were chosen based on a review of existing travel patterns in the area including key travel routes for commuters and the movement of freight and goods. These routes are generally representative of local circulation or regional travel. Figure 3–45 highlights the travel time routes identified for this analysis. The four routes are described as follows:

- **Route 1** focuses on east-west travel along W. Mercer Street between 3rd Avenue W. and Fairview Avenue.
- **Route 2** focuses on an east-west route along Denny Way between Queen Anne Avenue and Stewart Street.
- **Route 3** includes north-south travel along 5th Avenue N. between Denny Way and W. Mercer Street.

Travel times were calculated consistent with HCM methodologies defined for the analysis of arterial systems, consistent with the analysis of Stadium District travel routes associated with the evaluation of Alternatives 2 and 3.

Freeway / Regional Access Analysis: The analysis of regional access to the Seattle Center study area focused on both mainline performance considering corridor travel speeds as well as the LOS at the ramp intersections with the surface arterials. The analysis included a review of southbound I-5 between NE 145th and SR 520 and westbound I-90 between Rainier Avenue and I-5. Information prepared by the King County expert review panel in 2012 for the potential Arena was included in this analysis. This information highlights historical congestion patterns along the I-5 and I-90 corridors under event conditions. Ramp intersections also evaluated as part of the intersection LOS are highlighted in this section. The analysis of the ramp intersections is consistent with the LOS methodology previously described.



Seattle Center Area Corridor Travel Time Routes

Seattle Arena

FIGURE
3-45

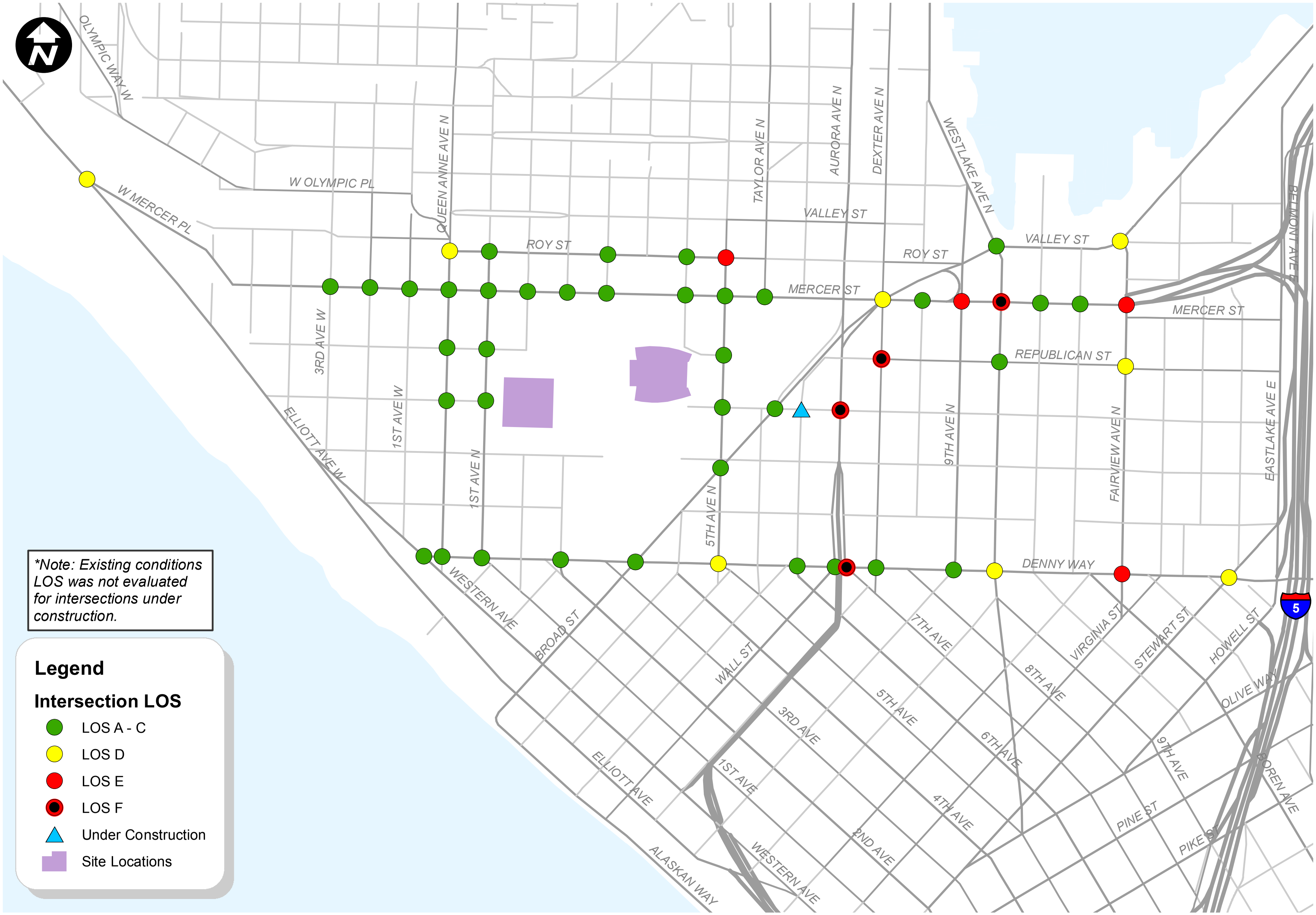
transpoGROUP

3.6.2 Affected Environment

The following sections summarize existing traffic operations within the Seattle Center study area.

3.6.2.1 Intersection Operations

As part of the intersection operations analysis, signal timing and phasing information was obtained from either the SDOT or collected in the field. Lane geometrics and traffic control was confirmed in the field and are summarized for each study area intersection in Attachment E-2, which is available from DPD upon request. LOS results for existing weekday PM peak hour conditions are summarized on Figure 3–46.



Seattle Center Area Existing Weekday PM Peak Hour Level of Service

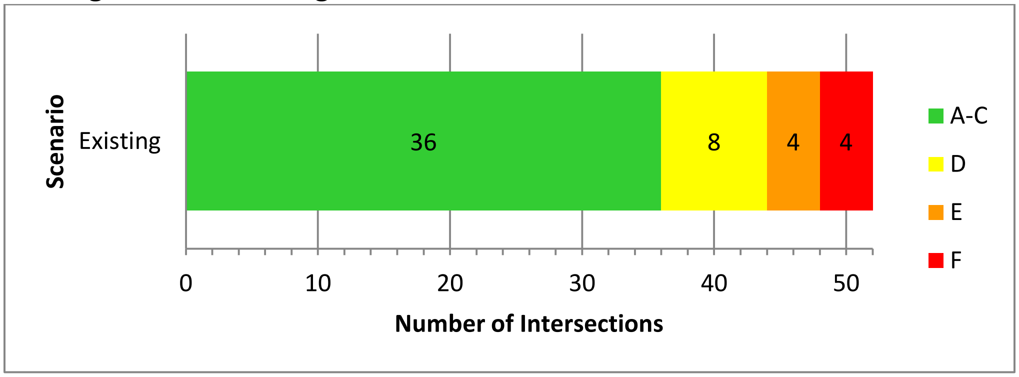
Seattle Arena

transpoGROUP

FIGURE **3-46**

The number of intersections operating at LOS C or better, LOS D, LOS E, and LOS F, are summarized on Figure 3–47. Detailed LOS summary tables and worksheets for each scenario are included in Attachment E-3, which is available from DPD upon request. As shown on Figure 3–46 and Figure 3–47, all study intersections operate at LOS D or better under existing conditions with the exception of the nine intersections that operate at LOS E or LOS F.

Figure 3–47 Existing Seattle Center Area Intersection LOS Overview



3.6.2.2 Corridor Travel Times

Table 3-12 summarizes the estimated existing travel times on the various routes for weekday PM peak hour conditions.

Table 3-12
Seattle Center Area Existing Weekday PM Peak Hour Corridor Travel Times

Route	Extents	Direction	Without Event (m:ss)[1]
1	W. Mercer Street from 3rd Avenue W. to Fairview Avenue N.	EB	8:59
	W. Mercer Street from Fairview Avenue N. to 3rd Avenue W.	WB	8:32
2	Denny Way from Queen Anne Avenue to Stewart Street	EB	6:18
	Denny Way from Stewart Street to Queen Anne Avenue	WB	6:54
3	5th Avenue N. from Denny Way to W. Mercer Street	NB	2:55
	5th Avenue N. from W. Mercer Street to Denny Way	SB	2:40

1. m:ss = minutes:seconds

As shown in Table 3-12, travel times in both travel directions on each route are similar in each direction. Several intersections along the travel time routes are shown to have left-turn queue lengths that exceed allowable storage, but occur along arterials that have multiple through lanes. As a result, vehicles potentially blocked by these queues are anticipated to utilize the other through lanes, minimizing the impact on the overall intersection capacity.

3.6.2.3 Regional Access Analysis

Primary freeway corridors that provide regional access to the Seattle Center area include I-5, I-90, SR 520, and SR 99. The PM peak commute period for these corridors occurs between 3:00 and 7:00 PM.

I-5 is a north-south corridor with 8 to 10 lanes of capacity through the downtown Seattle area. The corridor serves 7,000 to 7,500 vph in each direction through downtown during the evening commute. The I-5 corridor also includes a set of reversible lanes between Downtown Seattle and Northgate. This four-lane facility operates in the northbound direction during the PM peak period with a volume of 4,500 vph.

I-90 is an east-west corridor connecting cities east of the Lake Washington (such as Bellevue, Issaquah, Redmond, Mercer Island) and terminates in the SoDo area of Seattle. Approaching I-5 from the east, I-90 serves up to 9,300 vph during the PM peak period, with higher eastbound volumes leaving Seattle.

The I-5 and I-90 corridors experience congestion today during the PM peak commute (4:00 to 7:00 PM). I-5 southbound is congested with speeds less than 30 mph from 145th Street NE through downtown Seattle (north of I-90). I-90 westbound operates with speeds less than 30 mph from I-405 to the approach to I-5. Figure 3–48 depicts typical daily congestion that occurs today on I-5 southbound and I-90 westbound.

When events occur at existing downtown stadiums, peak travel times through the city increase (see Figure 3–49). PM peak travel times (on days with events in 2012) increased by up to eight minutes on southbound I-5 between NE 145th and I-90 and up to four minutes on westbound I-90 between I-405 and Rainer Avenue S.

Figure 3–48 I-5 and I-90 Existing Weekday Congestion

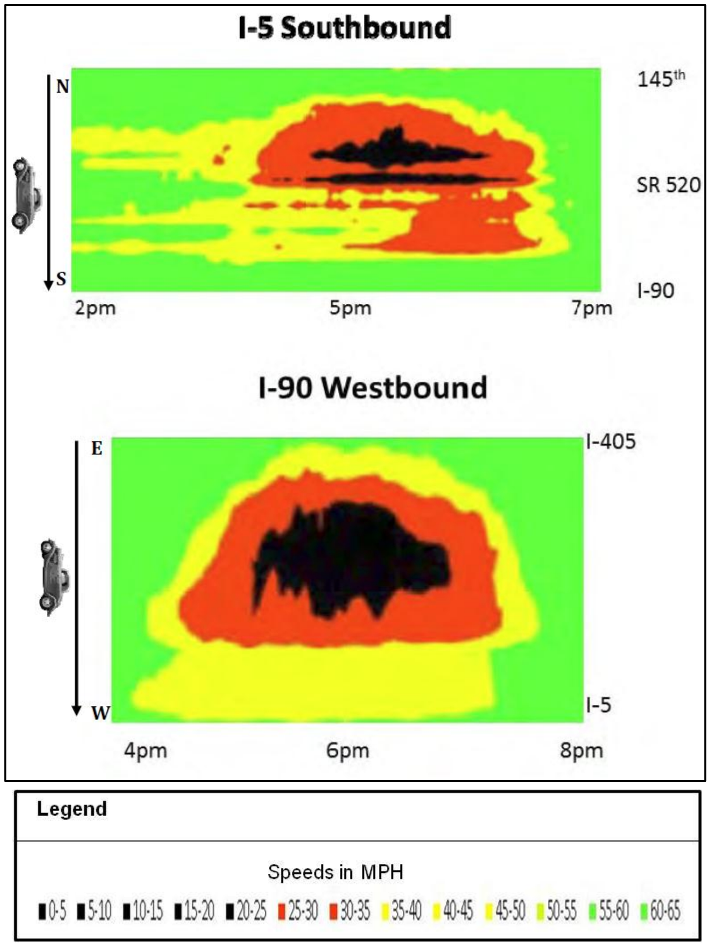
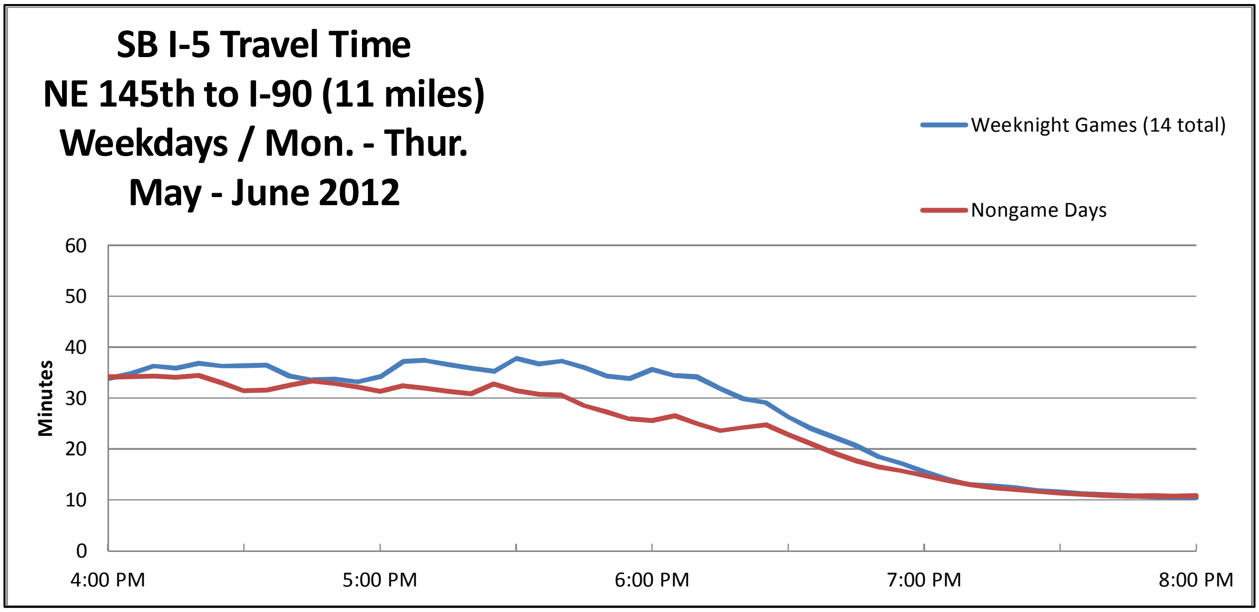
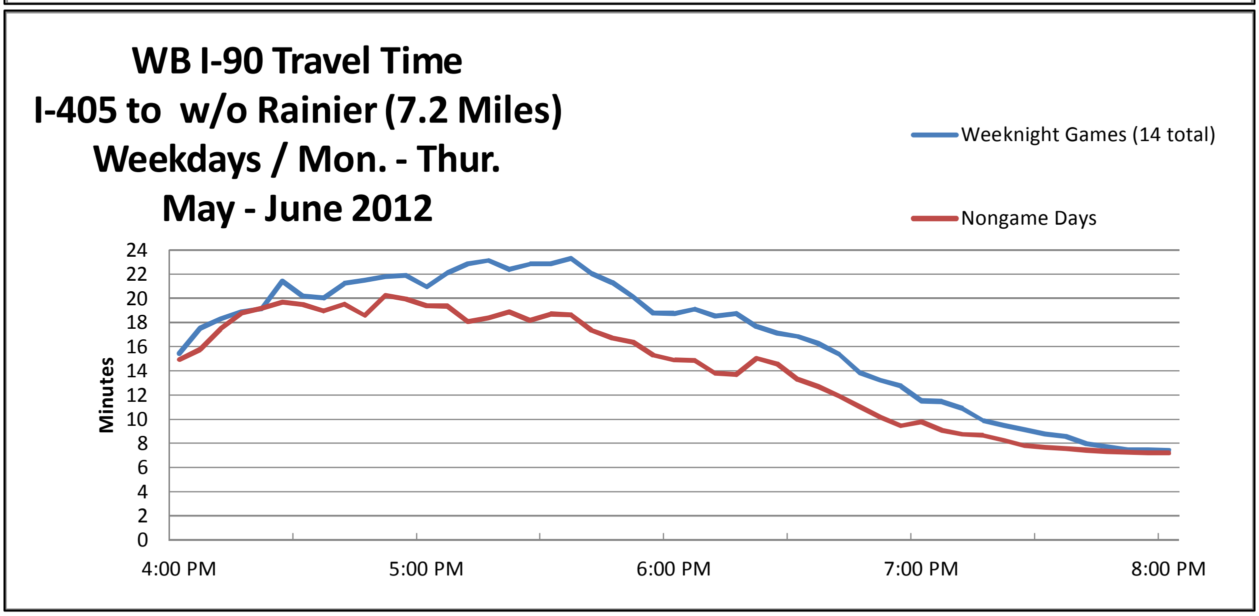


Figure 3–49 I-5 and I-90 Existing Weekday Travel Times with and without an Event





SR 520 is a second east-west cross-lake corridor operating between Redmond and Seattle. SR 520 is currently a four-lane tolled corridor and serves up to 4,800 vph during the PM peak period. Ultimately, the corridor will be six lanes (two general purpose lanes and an HOV lane in each direction). Portions of the project are funded and under construction.

SR 99 is a north-south corridor along the Seattle waterfront. SR 99 is also currently under construction. Today, the corridor provides six lanes through the downtown Seattle area and will be replaced by a four-lane tunnel and expanded Alaskan Way surface street when the project is complete. The tunnel is scheduled to open in 2015-2016, and the new surface street will follow in 2018.

The traffic signals or intersections at the ramp terminals operate as a constraint as traffic exits the freeway to access the Seattle Center area. The overall capacity of the intersection and off-ramp approach of two arterial intersections at the I-5 ramp terminals were reviewed to determine existing off-ramp constraints. This analysis focuses on the off-ramps only as it is most impacted by the inbound regional flows to the arena. On-ramp capacity is discussed in the intersection operations section. The analysis was completed for existing conditions. The study intersections include Mercer Street / Fairview Avenue and Denny Way / Stewart Street. Although Denny Way / Stewart Street does not operate as the actual southbound I-5 off-ramp at Eastlake Avenue / Stewart Street, southwest-bound traffic at Denny Way / Stewart Street has been observed to back up into the Eastlake Avenue / Stewart Street and is the source of off-ramp congestions.

Both intersections operate with a LOS E or better during normal peak operations and during an event. LOS and delay per vehicle is shown in Table 3-13.

Table 3-13
Seattle Center Area Existing Weekday PM Peak Hour Ramp Termini Intersection Operations

Ramp Terminal Intersection	Overall LOS / Delay	Off-Ramp LOS / Delay
Mercer Street / Fairview Avenue	E / 67	E / 61
Denny Way / Stewart Street	C / 28	D / 36

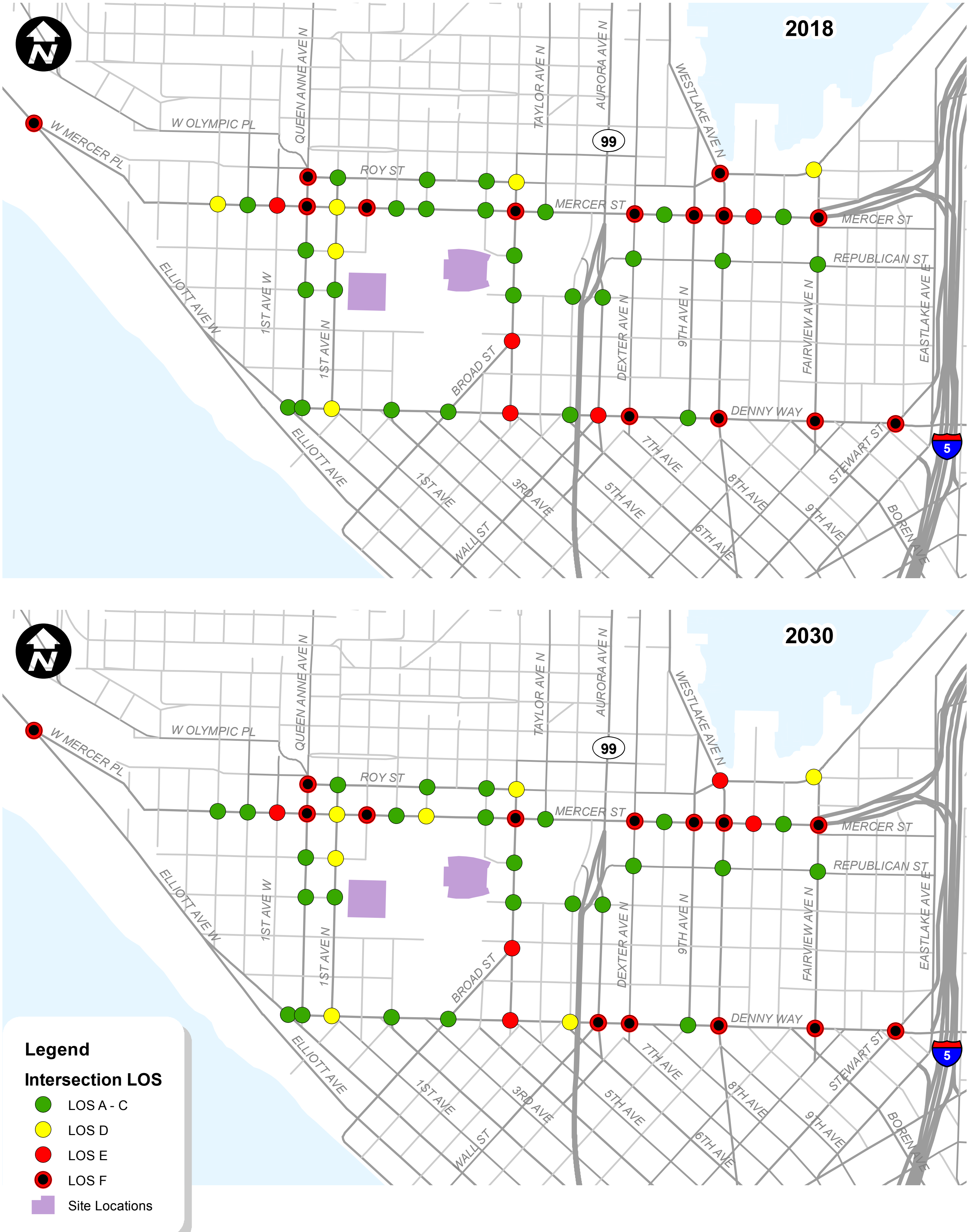
The peak flow of traffic occurs as event patrons arrive for (5:00 to 7:00 PM) and leave (9:00 to 11:00 PM) an event. The peak or worst operating time period occurs during the evening commute when trips not related to events are also operating at their peak. The weekday PM peak hour represents the combined peak activity associated with the arena and peak activity related to the PM peak commute. When traffic exits the Seattle Center in the later evening (9:00 to 11:00 PM), other traffic volumes on the system have decreased.

3.6.3 Impacts of No Action Alternative

The following sections summarize the results of the traffic operations analysis conducted for the No Action alternative for the Seattle Center study area. This analysis reflects the forecast traffic volumes and roadway improvements anticipated to be completed by the 2018 and 2030 horizon years. Consistent with the analysis of the Affected Environment, this section presents the results of the intersection LOS analysis, corridor performance, and an analysis of regional access to the Seattle Center area.

3.6.3.1 Intersection Operations

LOS results for 2018 and 2030 non-event peak hour conditions, with a 12,000 attendee event at KeyArena (Case K1), a 5,000 attendee event at Memorial Stadium (Case M1), and both events concurrently (Case K2/M2), are summarized on Figure 3–50 through Figure 3–52. Detailed LOS summary tables and worksheets for each of these scenarios are included in Attachment E-3, which is available from DPD upon request.

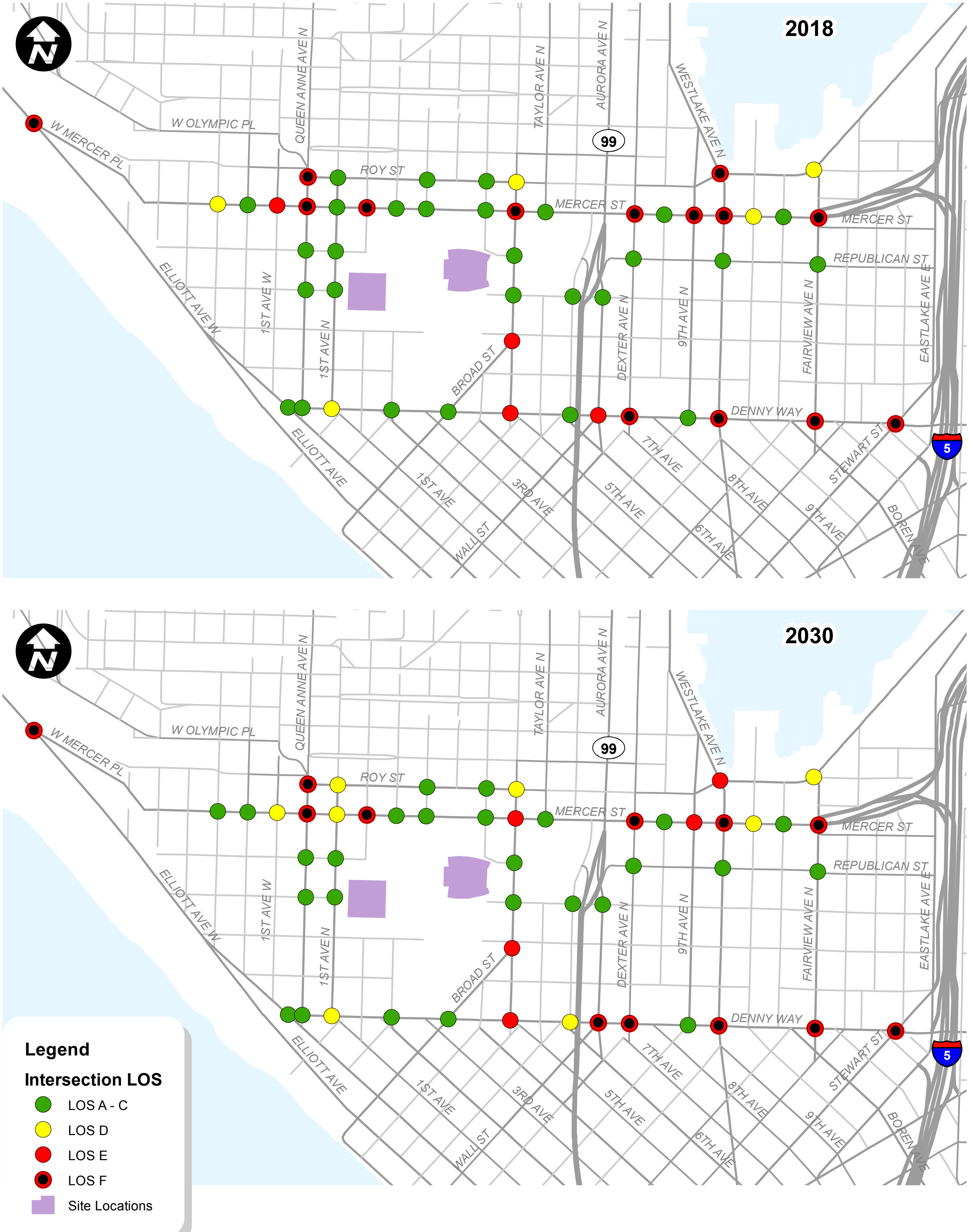


Seattle Center Area No Action Case K1
Weekday PM Peak Hour Level of Service

Seattle Arena

transpoGROUP

FIGURE
3-50

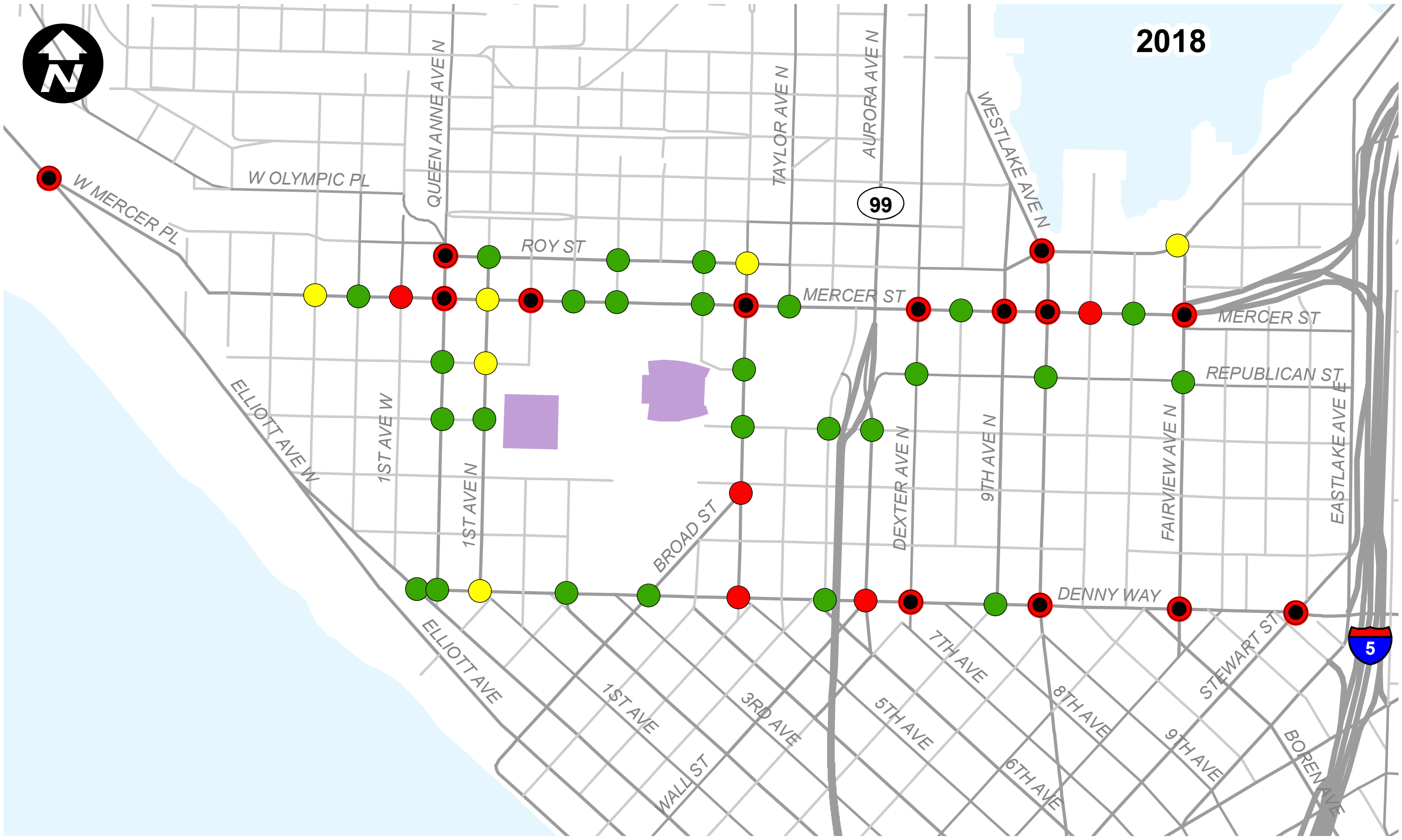


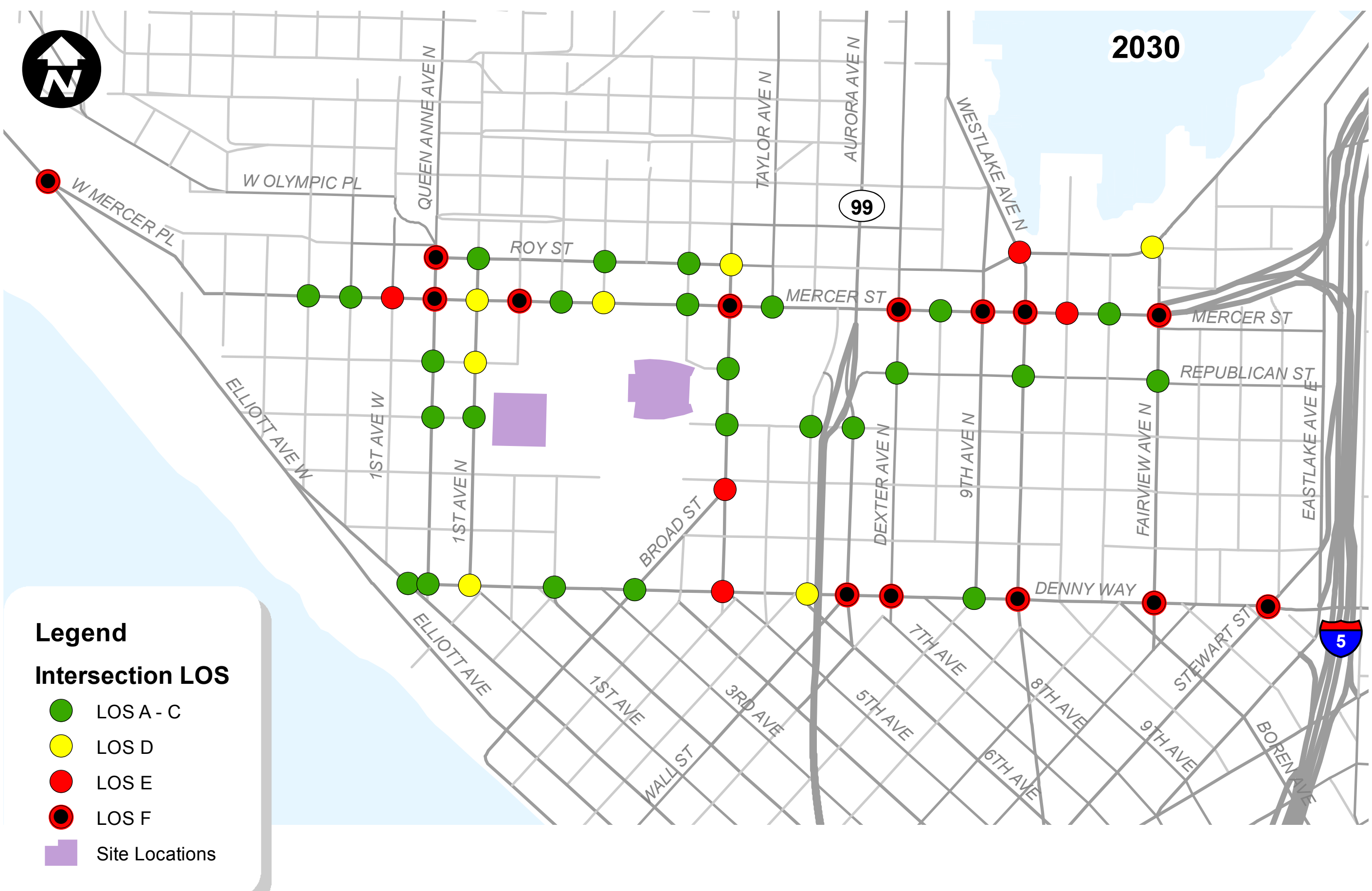
Seattle Center Area No Action Case M1
Weekday PM Peak Hour Level of Service

Seattle Arena

transpoGROUP

FIGURE
3-51





Seattle Center Area No Action Case K2/M2 Weekday PM Peak Hour Level of Service

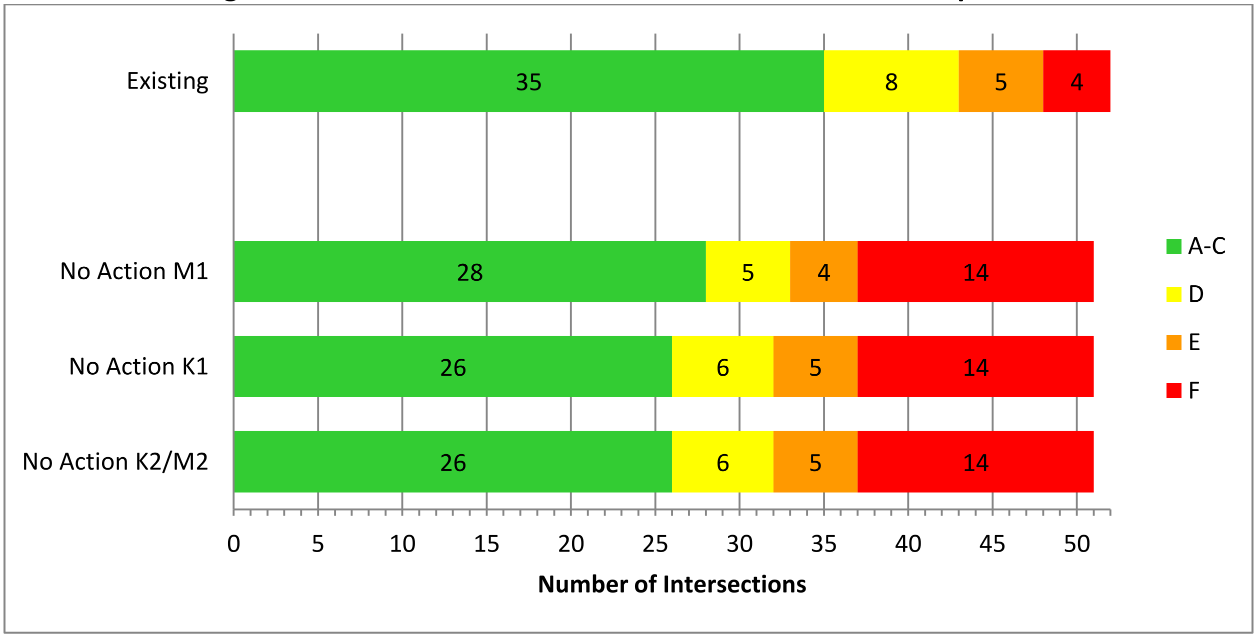
Seattle Arena

FIGURE
3-52

transpoGROUP

A summary of the No Action LOS for all study area intersections was prepared and compared to existing conditions as summarized on Figure 3–53 for 2018 conditions, and Figure 3–54 for 2030 conditions.

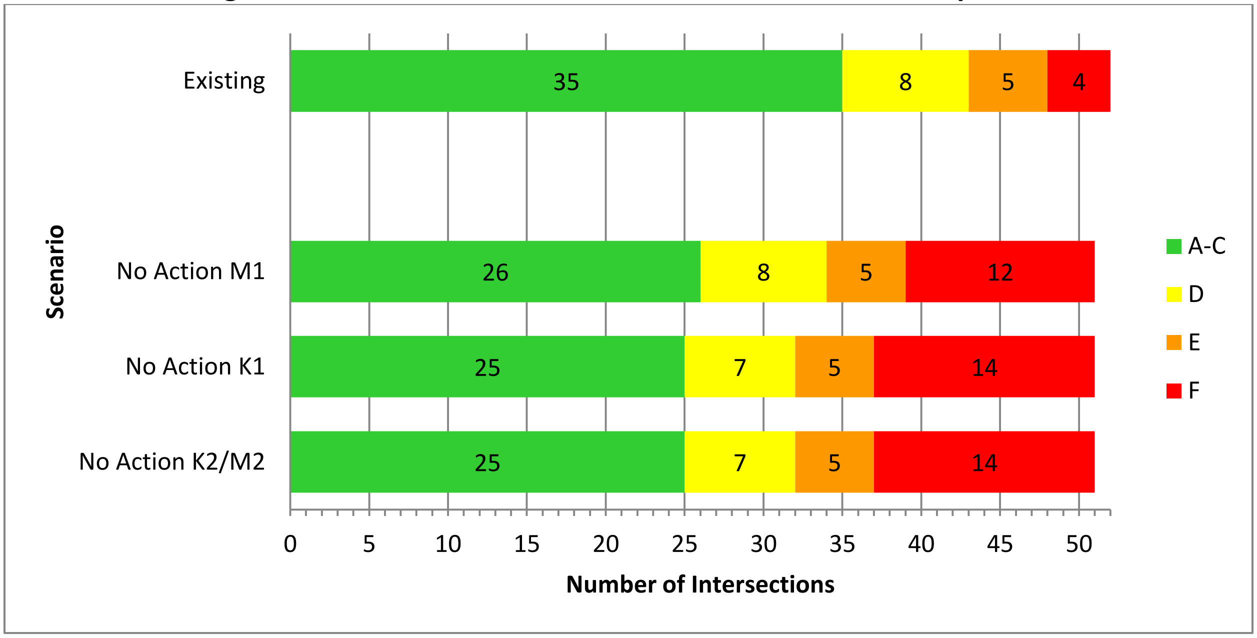
Figure 3–53 Seattle Center Area 2018 No Action LOS Comparison



As summarized in these figures:

- Increased traffic volumes and changes in travel patterns result in a greater number of intersections operating at LOS E/F under both 2018 and 2030 conditions.
- The greater attendance level of an event under Case K1 and K2/M2 results in one additional intersection operating at LOS E under 2018 conditions as compared to Case M1 and two additional operating at LOS F for 2030 conditions.

Figure 3–54 Seattle Center Area 2030 No Action LOS Comparison



Of the intersections shown to operate at LOS E or LOS F under 2018 No Action conditions (Cases K1, M1, and K2/M2), three are located within the vicinity of the Seattle Center area:

- Warren Avenue N. / Mercer Street
- 5th Avenue N. / Mercer Street
- 5th Avenue N. / Denny Way

All three of these intersections would operate at the same LOS regardless of event case.

Under 2030 No Action conditions (Cases K1, M1, and K2/M2), up to four intersections would operate at LOS E or LOS F within the vicinity of the Seattle Center area:

- Warren Avenue N. / Mercer Street
- 5th Avenue N. / Mercer Street
- 5th Avenue N. / Denny Way
- 1st Avenue N. / Denny Way

Four of these intersections would operate at the same LOS regardless of event case under 2030 conditions, with the 5th Avenue N. / Mercer Street intersection degrading from LOS E for Case K1and M1 to LOS F under Case K2/M2.

As discussed for the Stadium District alternatives, the methodology adds event traffic to non-event PM peak hour conditions with no regard for capacity constraints; congestion often results in modified travel behavior for non-event traffic. As a result, the cumulative conditions with an event in all cases likely overstate future congestion levels during the PM peak hour.

3.6.3.2 Corridor Travel Times

Table 3-14 summarizes the calculated travel times under 2018 conditions on the various routes for weekday PM peak hour under non-event and with event conditions. Table 3-15 summarizes the estimated travel times under 2030 conditions. Existing non-event conditions are also provided for comparison purposes.

Table 3-14
Seattle Center Area 2018 No Action Weekday PM Peak Hour Corridor Travel Times

Route	Extents	Direction	Case M1 (m:ss[1])	Case K1 (m:ss)	Case M2/K2 (m:ss)
1	W. Mercer Street from 3rd Avenue W. to Fairview Avenue N.	EB	17:40 (8:59)[2]	19:30	21:09
	W. Mercer Street from Fairview Avenue N. to 3rd Avenue W.	WB	10:01 (8:32)	12:37	14:47
2	Denny Way from Queen Anne Avenue to Stewart Street	EB	15:14 (6:18)	16:48	17:30
	Denny Way from Stewart Street to Queen Anne Avenue	WB	12:04 (6:54)	12:42	13:06
3	5th Avenue N. from Denny Way to W. Mercer Street	NB	5:04 (2:55)	5:16	5:25
	5th Avenue N. from W. Mercer Street to Denny Way	SB	3:00 (2:40)	3:02	3:04

1. m:ss = minutes:seconds
2. Existing non-event travel times provided for comparison.

As shown in Table 3-14:

- Calculated travel times under 2018 conditions increase from existing conditions and further increase with the addition of event traffic, under some cases approximately tripling.
- Travel times under 2018 conditions along routes #1 and #2 which are calculated to exceed 10 minutes with the addition of event traffic, with the addition of event traffic resulting in travel times of approximately 20 minutes or greater for eastbound route #1.
- Travel times along route #3 are calculated to increase to a lesser degree than the other routes. This route is along a north-south roadway that does not provide any direct connect to regional facilities under future conditions and as a result would serve less event traffic than route #1 and #2 corridors.

Table 3-15
Seattle Center Area 2030 No Action Weekday PM Peak Hour Corridor Travel Times

Route	Extents	Direction	Case M1 (m:ss[1])	Case K1 (m:ss)	Case M2/K2 (m:ss)
1	W. Mercer Street from 3rd Avenue W. to Fairview Avenue N.	EB	18:37 (8:59)[2]	21:04	22:38
	W. Mercer Street from Fairview Avenue N. to 3rd Avenue W.	WB	8:28 (8:32)	10:58	13:06
2	Denny Way from Queen Anne Avenue to Stewart Street	EB	19:46 (6:18)	21:37	22:24
	Denny Way from Stewart Street to Queen Anne Avenue	WB	13:00 (6:54)	13:58	14:36
3	5th Avenue N. from Denny Way to W. Mercer Street	NB	5:18 (2:55)	5:26	5:35
	5th Avenue N. from W. Mercer Street to Denny Way	SB	3:09 (2:40)	3:11	3:14

1. m:ss = minutes:seconds
2. Existing non-event travel times provided for comparison.

As shown in Table 3-15:

- Under 2030 conditions travel times are generally similar to 2018 conditions. Some travel time routes increase while others decrease under 2030 conditions.
- Travel time changes result from small differences in forecast volumes at some study intersections.
- Similar to 2018 conditions, travel times along route #3 are calculated to only slightly increase since this route does not provide any direct connect to regional facilities under future conditions and would serve less event traffic than route #1 and #2 corridors.

As previously discussed, the event case methodology likely overstates future travel times and congestion due to events.

3.6.3.3 Regional Access Analysis

The primary corridors serving the downtown area are I-5 and I-90. Today during the late afternoon commute, these freeways are congested for approximately two to three hours. As traffic demand increases by 2018 and 2030, the hours of congestion or "peak spreading" would lengthen or transit ridership may increase. However because the corridors are "at capacity" today, traffic volumes served would not increase during the peak period of 4:00 to 6:00 PM.

The analysis was conducted for the PM peak hour for the Year 2018 and the Year 2030, with and without an event at the existing stadiums. The expected operations of the study intersections are shown in Table 3-16.

Table 3-16
Seattle Center Area No Action Weekday PM Peak Hour Ramp Terminal Intersection Operations

Ramp Terminal Intersection	Scenario	2018		2030	
		Overall LOS / Delay	Off-Ramp LOS / Delay	Overall LOS / Delay	Off-Ramp LOS / Delay
Mercer Street / Fairview Avenue	Case K1	F / >180	E / >76	F / >180	F / 100
	Case M1	F / >180	F / >79	F / >180	F / 106
	Case M2/K2	F / >180	F / >75	F / >180	F / 97
Denny Way / Stewart Street	Case K1	F / 158	F / >180	F / 164	F / 167
	Case M1	F / 153	F / >180	F / 160	F / 167
	Case M2/K2	F / 162	F / >180	F / 168	F / 169

Under both 2018 and 2030 conditions during the PM peak hour off-ramp intersections are calculated to operate at LOS F at both Denny Way and Mercer Street. I-5 off-ramp approaches operate at LOS F for all cases and analysis years. Long overall intersection delays encountered by drivers are calculated for 2030 conditions at both intersections, and also would occur for the intersection approach from I-5.

3.6.4 Impacts of Alternative 4

As described for traffic volumes, construction impacts related to traffic operations would occur as a result of increased traffic levels. To minimize impacts to operations, a construction management plan would be developed and could include scheduling the most intensive construction activities such that they are spread out over time and prohibiting material deliveries from leaving or entering the area during AM and PM peak hours when feasible.

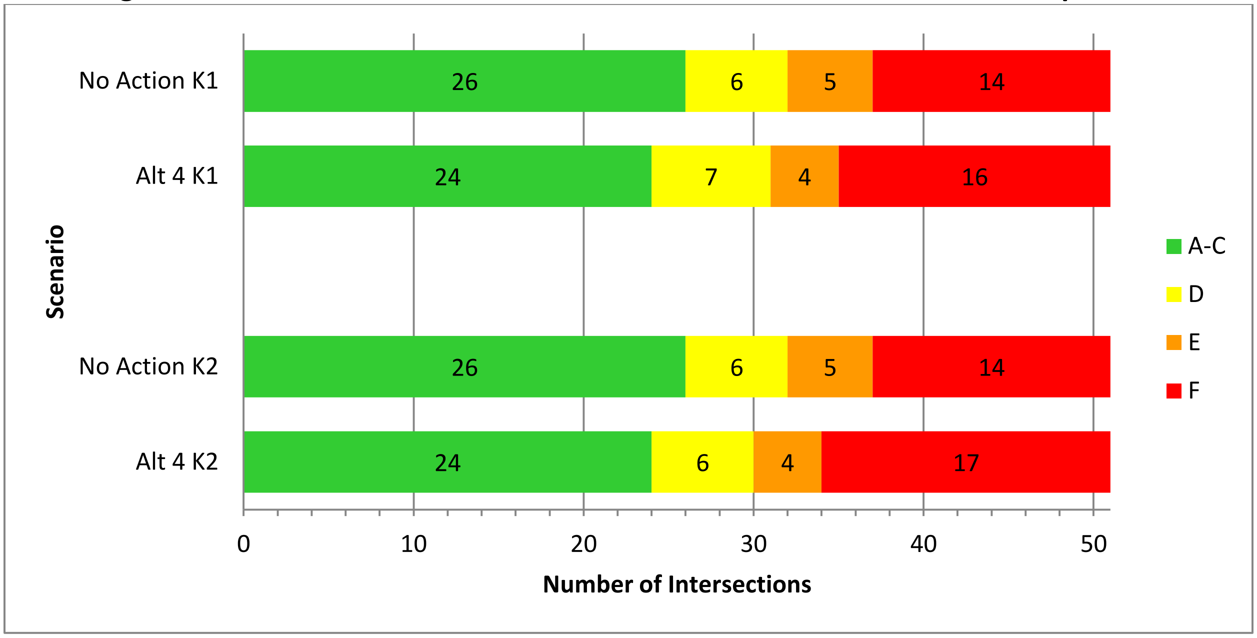
The following sections summarize the results of the traffic operation analysis conducted for Alternative 4. This analysis reflects the addition of traffic with a 20,000 attendee event at KeyArena (Case K1), and the further addition of a 5,000 attendee event at Memorial Stadium (Case K2). Consistent with the analysis of the Affected Environment, this section presents the results of the intersection LOS analysis, corridor performance, and an analysis of regional access to the Seattle Center area. Methodologies used in the evaluation of the Proposed Action conditions are consistent with those described previously in this chapter.

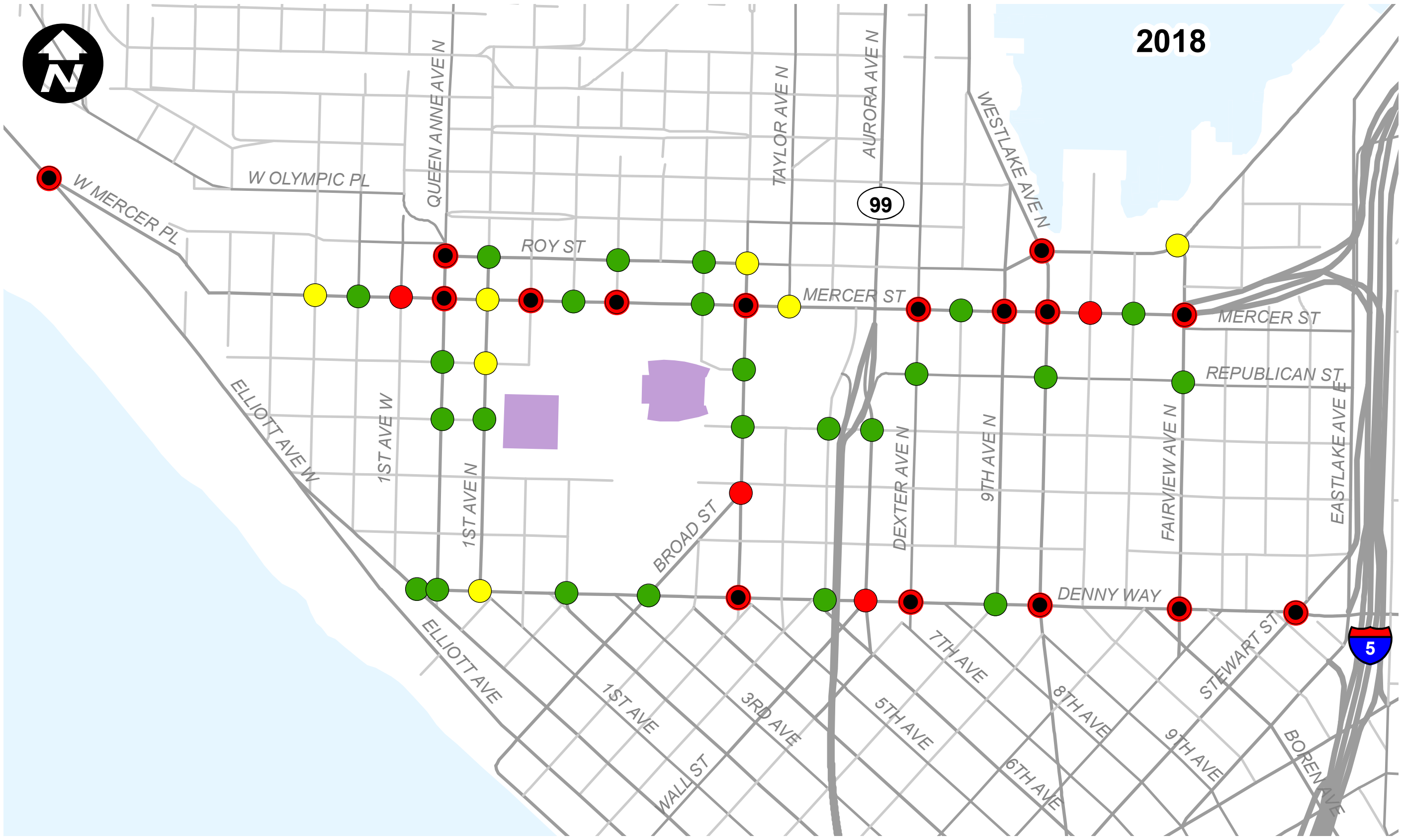
3.6.4.1 Intersection Operations

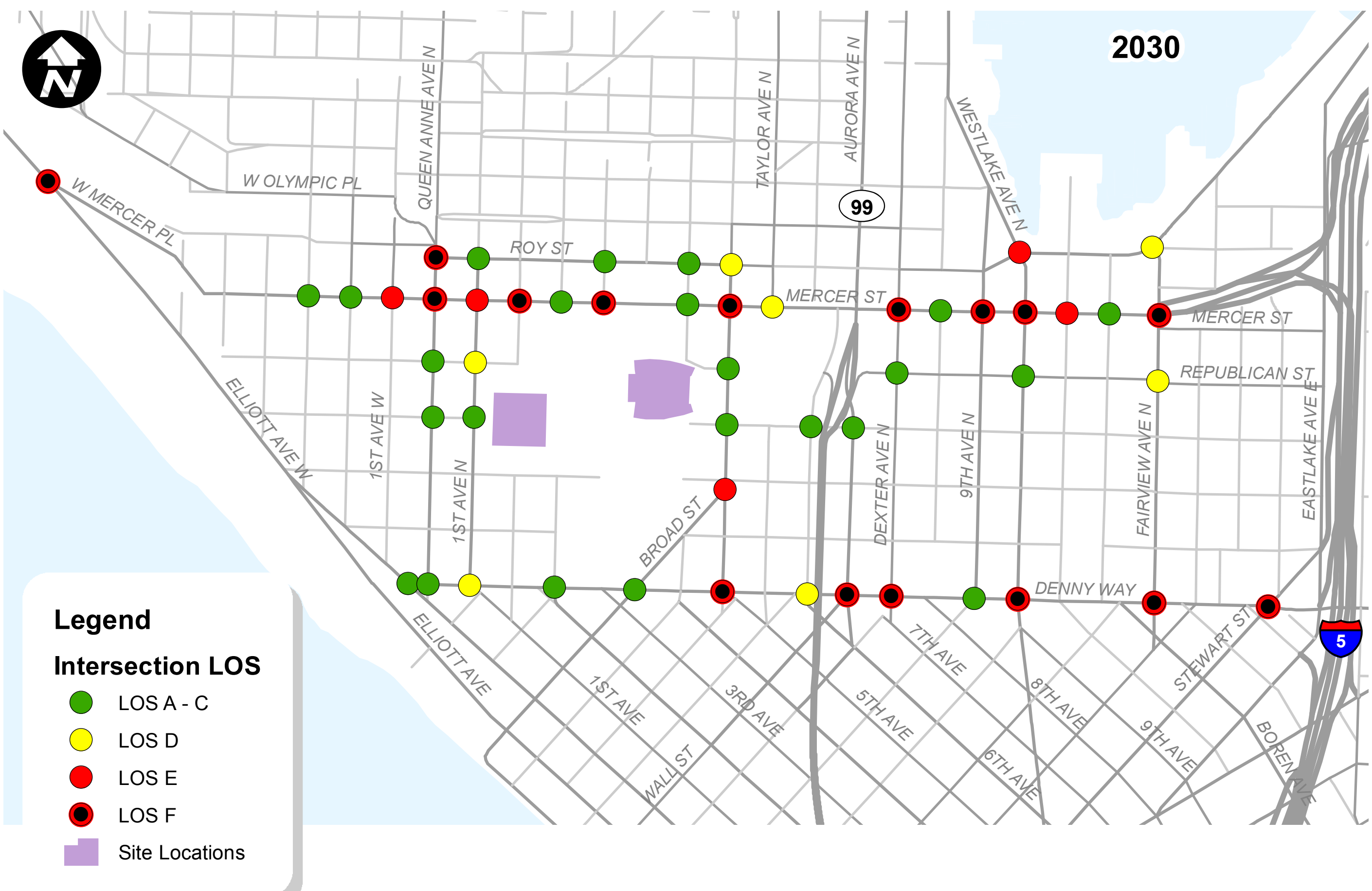
LOS results for 2018 and 2030 peak hour conditions with the arena event at KeyArena (Case K1) and with the addition of a 5,000-person event at Memorial Stadium (Case K2) are summarized on Figure 3–56 and Figure 3–57. Detailed LOS summary tables and worksheets for each of these scenarios are included in Attachment E-3, which is available from DPD upon request.

A summary of the Alternative 4 LOS for all study area intersections was prepared and compared No Action conditions as summarized on Figure 3–55 for 2018 conditions, and Figure 3–58 for 2030 conditions.

Figure 3–55 Seattle Center Area 2018 Alternative 4 Intersection LOS Comparison





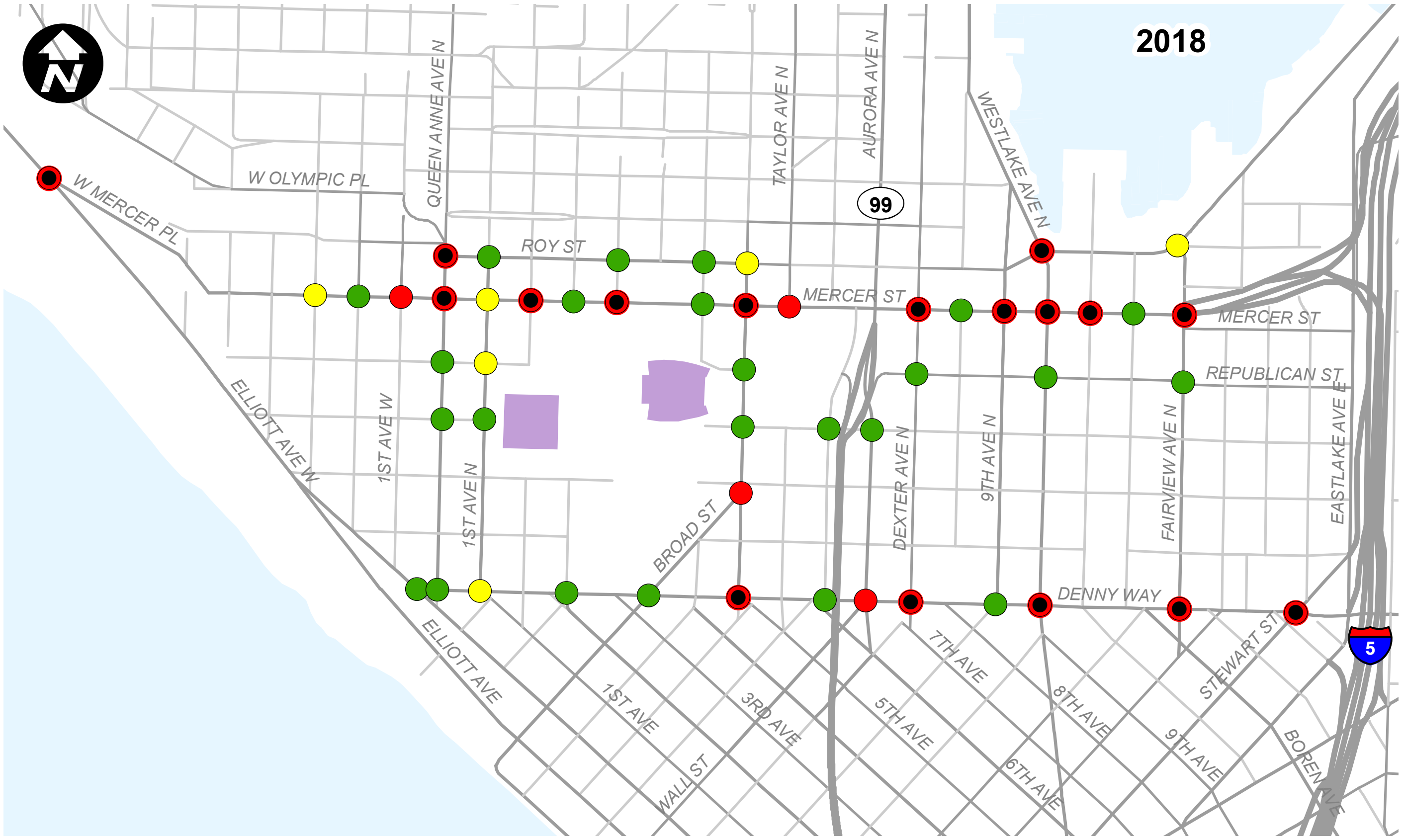


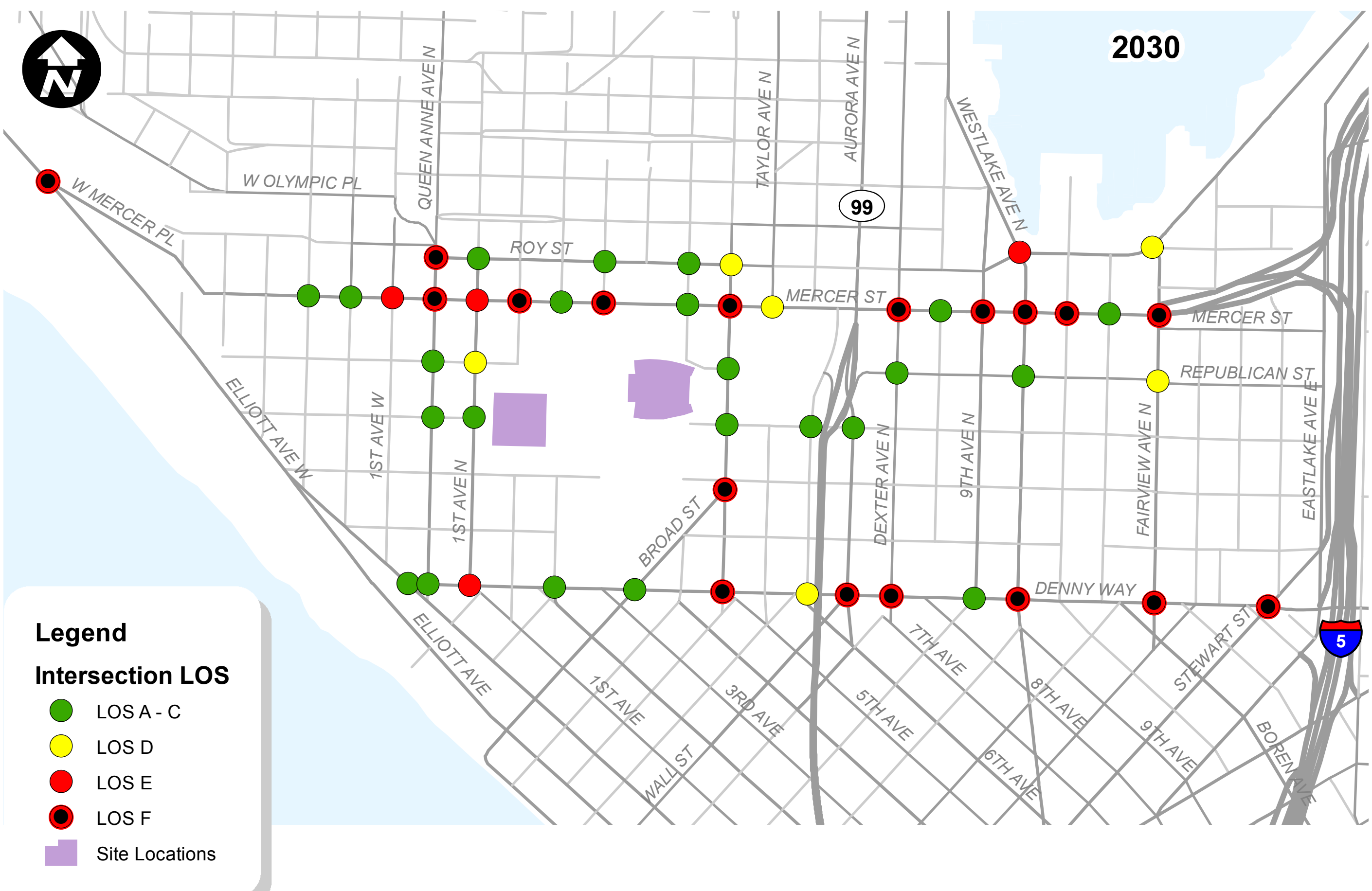
Seattle Center Area Alternative 4 Case K1
Weekday PM Peak Hour Level of Service

Seattle Arena

transpoGROUP

FIGURE
3-56



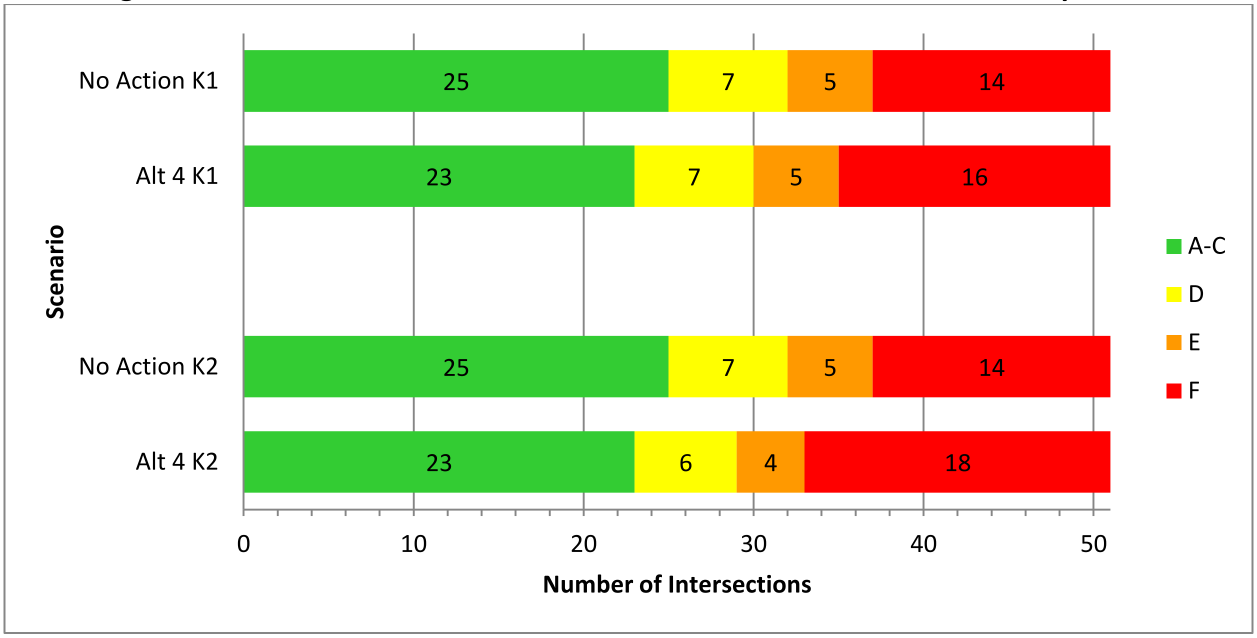


Seattle Center Area Alternative 4 Case K2 Weekday PM Peak Hour Level of Service

Seattle Arena

FIGURE
3-57

Figure 3–58 Seattle Center Area 2030 Alternative 4 Intersection LOS Comparison



As shown in Figure 3–55 and Figure 3–58:

- Throughout the wider study area, the addition of arena event trips would result in one additional intersection operating at a calculated LOS E/F under 2018 Case K1 and two additional intersections under Case K2.
- Under 2030 conditions two additional intersections would operate at LOS E/F under Alternative 4 Case K1 and three additional intersections would operate at LOS E/F under the multiple event case (Alternative 4 Case K2).

Table 3-17 summarizes the intersections that operate at LOS E or LOS F with the addition of arena event traffic under 2018 conditions and forecast results for 2030 conditions are summarized in Table 3-18. Note that some intersections would only operate at LOS E or LOS F under the multiple event scenario (Case K2).

Table 3-17
2018 Alternative 4 Weekday PM Peak Hour Intersections at LOS E or LOS F

	Case K1		Case K2	
Roadway	**No Action**	**Alternative 4**	**No Action**	**Alternative 4**
Elliott Avenue W. / W. Mercer Pl	F	F	F	F
Queen Anne Avenue N. / Roy Street	F	F	F	F
Broad Street / Valley Street	F	F	F	F
1st Avenue W. / W. Mercer Street	E	E	E	E
Mercer Street / Queen Anne Avenue N.	F	F	F	F
Mercer Street / Warren Avenue N.	F	F	F	F
3rd Avenue N. / Mercer Street	C	F	C	F
5th Avenue N. / Mercer Street	F	F	F	F
Mercer Street / Taylor Avenue N.	C	D	C	E
Dexter Avenue N. / Mercer Street	F	F	F	F
9th Avenue N. / Mercer Street	F	F	F	F
Mercer Street / Westlake Avenue N.	F	F	F	F
Mercer Street / Terry Avenue N.	E	E	E	F
Fairview Avenue N. / Mercer Street	F	F	F	F
5th Avenue N. / Broad Street	E	E	E	E
5th Avenue / Denny Way	E	F	E	F
Aurora Avenue N. / Denny Way	E	E	E	E
Denny Way / Dexter Avenue	F	F	F	F
Denny Way / Westlake Avenue	F	F	F	F
Denny Way / Fairview Avenue	F	F	F	F
Denny Way / Stewart Street	F	F	F	F

Table 3-18
2030 Alternative 4 Weekday PM Peak Hour Intersections at LOS E or LOS F

	Case K1		Case K2	
Roadway	**No Action**	**Alternative 4**	**No Action**	**Alternative 4**
Elliott Avenue W. / W. Mercer Pl	F	F	F	F
Queen Anne Avenue N. / Roy Street	F	F	F	F
Broad Street / Valley Street	E	E	E	E
1st Avenue W. / W. Mercer Street	E	E	E	E
Mercer Street / Queen Anne Avenue N.	F	F	F	F
1st Avenue N. / Mercer Street	D	E	D	E
Mercer Street / Warren Avenue N.	F	F	F	F
3rd Avenue N. / Mercer Street	D	F	D	F
5th Avenue N. / Mercer Street	F	F	F	F
Dexter Avenue N. / Mercer Street	F	F	F	F
9th Avenue N. / Mercer Street	F	F	F	F
Mercer Street / Westlake Avenue N.	F	F	F	F
Mercer Street / Terry Avenue N.	E	E	E	F
Fairview Avenue N. / Mercer Street	F	F	F	F
5th Avenue N. / Broad Street	E	E	E	F
1st Avenue S. / Denny Way	D	D	D	E
5th Avenue / Denny Way	E	F	E	F
Aurora Avenue N. / Denny Way	F	F	F	F
Denny Way / Dexter Avenue	F	F	F	F
Denny Way / Westlake Avenue	F	F	F	F
Denny Way / Fairview Avenue	F	F	F	F
Denny Way / Stewart Street	F	F	F	F

3.6.4.2 Corridor Travel Times

Table 3-19 summarizes the calculated weekday PM peak hour travel times under 2018 conditions on the defined routes. Table 3-20 summarizes the calculated travel times under 2030 conditions. No Action results conditions are shown in parentheses and provided for comparison purposes.

Table 3-19
2018 Alternative 4 Weekday PM Peak Hour Corridor Travel Times

Route	Extents	Direction	Case K1 (m:ss)[1]	Case K2 (m:ss)
1	W. Mercer Street from 3rd Avenue W. to Fairview Avenue N.	EB	23:14 (19:30)[2]	24:31 (21:09)
	W. Mercer Street from Fairview Avenue N. to 3rd Avenue W.	WB	27:02 (12:37)	31:05 (14:47)
2	Denny Way from Queen Anne Avenue to Stewart Street	EB	17:23 (16:48)	17:44 (17:30)
	Denny Way from Stewart Street to Queen Anne Avenue	WB	15:24 (12:42)	16:00 (13:06)
3	5th Avenue N. from Denny Way to W. Mercer Street	NB	6:13 (5:16)	6:24 (5:25)
	5th Avenue N. from W. Mercer Street to Denny Way	SB	3:40 (3:02)	4:02 (3:04)

1. m:ss = minutes:seconds
2. No Action travel times provided for comparison.

As shown in Table 3-19 and Table 3-20:

- Travel times under both 2018 and 2030 conditions are calculated to increase with the addition of arena event traffic. In particular, westbound Mercer Street increases substantially to over 30 minutes with the addition of arena traffic due to the majority of traffic (approximately 70 percent) travelling to the Seattle Center area utilizing the Mercer Street corridor.

- It is noted that No Action and all future estimates of event traffic volumes are simply additive to No Action conditions. This additive approach likely overestimates future traffic and congestion related to events. However, it does provide a consistent basis for comparing alternatives. There is no reliable way to assess the amount of diverted non-event traffic likely to occur for any given event.

Table 3-20
2030 Alternative 4 Weekday PM Peak Hour Corridor Travel Times

Route	Extents	Direction	Case K1 (m:ss[1])	Case K2 (m:ss)
1	W. Mercer Street from 3rd Avenue W. to Fairview Avenue N.	EB	24:11 (21:04)[2]	25:29 (22:38)
	W. Mercer Street from Fairview Avenue N. to 3rd Avenue W.	WB	25:20 (10:58)	29:09 (13:06)
2	Denny Way from Queen Anne Avenue to Stewart Street	EB	22:24 (21:37)	23:10 (22:24)
	Denny Way from Stewart Street to Queen Anne Avenue	WB	17:55 (13:58)	18:48 (14:36)
3	5th Avenue N. from Denny Way to W. Mercer Street	NB	6:19 (5:26)	6:27 (5:35)
	5th Avenue N. from W. Mercer Street to Denny Way	SB	3:46 (3:11)	4:07 (3:14)

1. m:ss = minutes:seconds
2. No Action travel times provided for comparison.

3.6.4.3 Regional Access Analysis

Traffic would access the new arena in the Seattle Center area via I-5, SR 99, and local arterials. It is estimated up to 20 percent of the trips that would access the arena would come from the north via I-5 and 55 percent via I-5 from the south. The other 25 percent of the trips would access the area via local arterials and SR 99.

For an event only at the new arena, up to an additional 1,500 vph would enter the city via I-5 to reach the arena. This is a 6-16 percent increase in trips compared to a typical evening commute on any one of those corridors. Table 3-21 shows the typical traffic volumes for a weekday and the anticipated increase in traffic, with the arena, for each of the event cases.

The typical weekday traffic flow values shown in Table 3-21 are existing volumes but represent anticipated traffic volumes in year 2018. Traffic demand (or volume of vehicles that want to use these corridors) typically increase as redevelopment occurs over time. However because the corridors are at or near capacity, additional traffic is not served during the peak hour of congestion. Therefore today's traffic volume served through these areas during the peak of congestion would be similar in future years unless capacity was increased for I-5.

Table 3-21 also focuses on the directions and locations of I-5 that would experience the greatest increase in trips from an arena event. During the PM peak hour, the majority of the trips (about 94 percent) associated with the arena are inbound trips (or trips heading to the arena).

Table 3-21
2018 Alternative 4 Increase in Weekday PM Peak Hour Traffic on Freeway Corridors

Location	Typical Weekday PM Peak Hour Traffic (vph)	Increase in traffic with Arena (vph / % compared to typical weekday traffic)	
		Case K1	Case K2
I-5 Southbound (north of Mercer)	6,700 vph	400 vph / 6%	450 vph / 7%
I-5 Northbound (south of Olive)	6,800 vph	1,100 vph / 16%	1,250 vph / 18%

The I-5 and I-90 corridors experience congestion today during the PM peak commute. Today, events at the downtown arenas results in an increase in travel time approaching the city center. The PM peak travel times (on days with events in 2012) increased by up to eight minutes on southbound I-5 between NE 145th and I-90 and up to four minutes on I-90 between I-405 and Rainer Avenue S. It is anticipated with the arena with capacity for 20,000 spectators, PM peak travel times would be similarly affected for a typical event day.

For an event only at the new arena, up to an additional 1,400 vph would enter the city via I-5 to reach the new arena in the year 2030. This is slightly less than the year 2018 condition as it's assumed more people would use transit to access this area. This is a result of Link light rail extensions and other transit improvements that will provide event attendees more options. Increases in traffic and effect to regional travel times on the I-5 and I-90 freeways would be similar in the year 2030 as experienced in the year 2018.

Regional or freeway access to the Seattle Center area is constrained by signals at the terminal of the off-ramps. Overall intersection and off-ramp approach operations of two arterial intersections at the I-5 ramp termini were reviewed. The analysis was conducted for the weekday PM peak hour for 2018 and 2030 horizon years, under Case K1 and K2 and summarized in Table 3-22 and Table 3-23, respectively.

Table 3-22
2018 Alternative 4 Weekday PM Peak Hour Ramp Terminal Intersection Operations

Intersection	Scenario	2018 No Action		2018 Alternative 4	
		Overall LOS / Delay	Off-Ramp LOS / Delay	Overall LOS / Delay	Off-Ramp LOS / Delay
Mercer Street / Fairview Avenue	Case K1	F / >180	E / >76	F / >180	F / 103
	Case K2	F / >180	F / >75	F / >180	F / 122
Denny Way / Stewart Street	Case K1	F / 158	F / >180	F / 160	F / >180
	Case K2	F / 162	F / >180	F / 163	F / >180

Table 3-23
2030 Alternative 4 Weekday PM Peak Hour Ramp Terminal Intersection Operations

Intersection	Scenario	2030 No Action		2030 Alternative 4	
		Overall LOS / Delay	Off-Ramp LOS / Delay	Overall LOS / Delay	Off-Ramp LOS / Delay
Mercer Street / Fairview Avenue	Case K1	F / >180	F / 100	F / >180	F / 102
	Case K2	F / >180	F / 97	F / >180	F / 113
Denny Way / Stewart Street	Case K1	F / 164	F / 167	F / 166	F / 169
	Case K2	F / 168	F / 169	F / 169	F / 169

Under both 2018 and 2030 conditions during the PM peak hour off-ramp conditions operate at LOS E/F at both Denny Way and Mercer Street and are similar to No Action conditions. The further addition of event traffic would add to the already poor off-ramp terminal operations that are forecast to occur under No Action conditions.

In addition to the traffic operations impacts outlined above, the increases in event traffic volumes related to an arena would have an impact on emergency vehicle access and circulation to the KeyArena site as well as through the area. This may require emergency response vehicles to use on-board flashing lights and sirens to navigate through the congestion and reduce delays. In addition, during periods of heavy congestion, manual traffic control may be necessary to facilitate the passage of emergency vehicles.

3.6.4.4 Post-Event Traffic Operations

At the end of a sporting event at the Seattle Center attendees typically depart the venue in a highly concentrated flow that can affect traffic operations within the vicinity of the venue. Post-event traffic counts for sporting event in the SoDo area[28] indicate that the peak 15 minutes near the end of an event can range between 30 to 40 percent of the total hourly flow that includes this peak with traffic volumes greatest travelling away from the venue.

[28] Seattle Mariners, April 11, 2013

As a result of this surge, professional sporting events in Seattle typically implement a Traffic Control Plan (TCP) to aid in the dispersion of event attendees to the transportation network. A TCP helps to alleviate this outbound surge in event attendees. However, post-event surge traffic volumes are usually less than the peak 15-minute period during a non-event peak evening commute period. As a result, the analysis of the peak evening commute period represents a worst-case condition.

3.6.5 Impacts of Alternative 5

As described for traffic volumes, construction impacts related to traffic operations would occur as a result of increased traffic levels. To minimize impacts to operations, a construction management plan would be developed and could include scheduling the most intensive construction activities such that they are spread out over time and prohibiting material deliveries from leaving or entering the area during AM and PM peak hours when feasible.

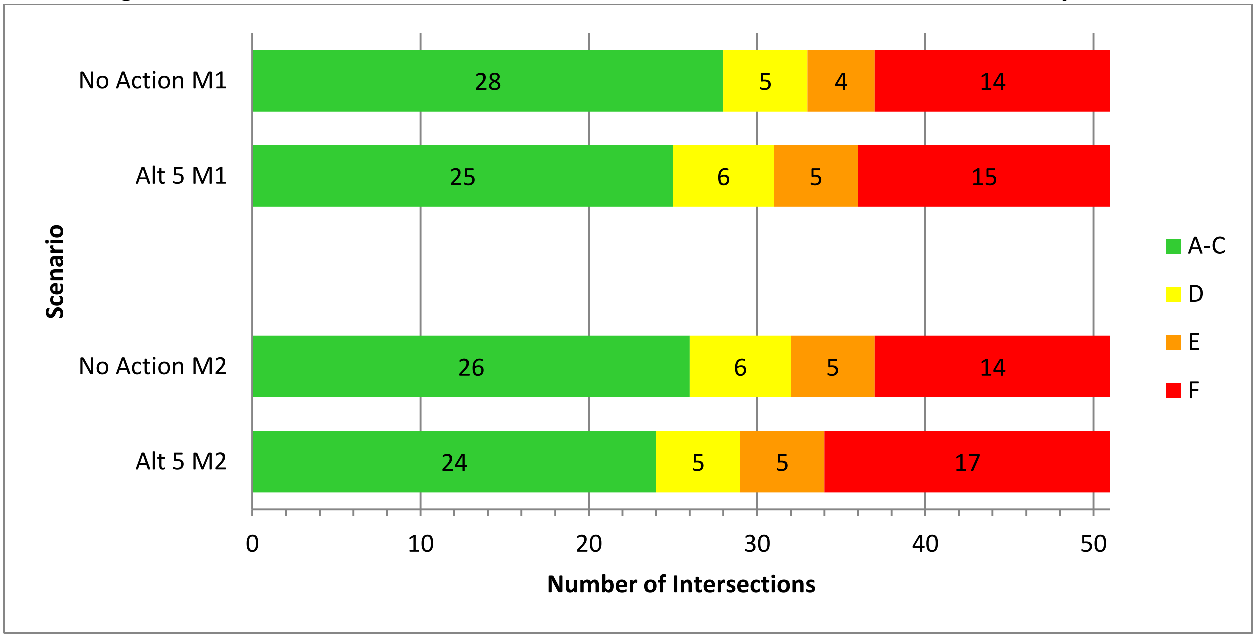
The following sections summarize the results of the traffic operation analysis conducted for Alternative 5. This analysis reflects the addition of traffic with a 20,000 attendee event at Memorial Stadium (Case M1), and the addition of a 12,000 attendee event at KeyArena (Case M2).

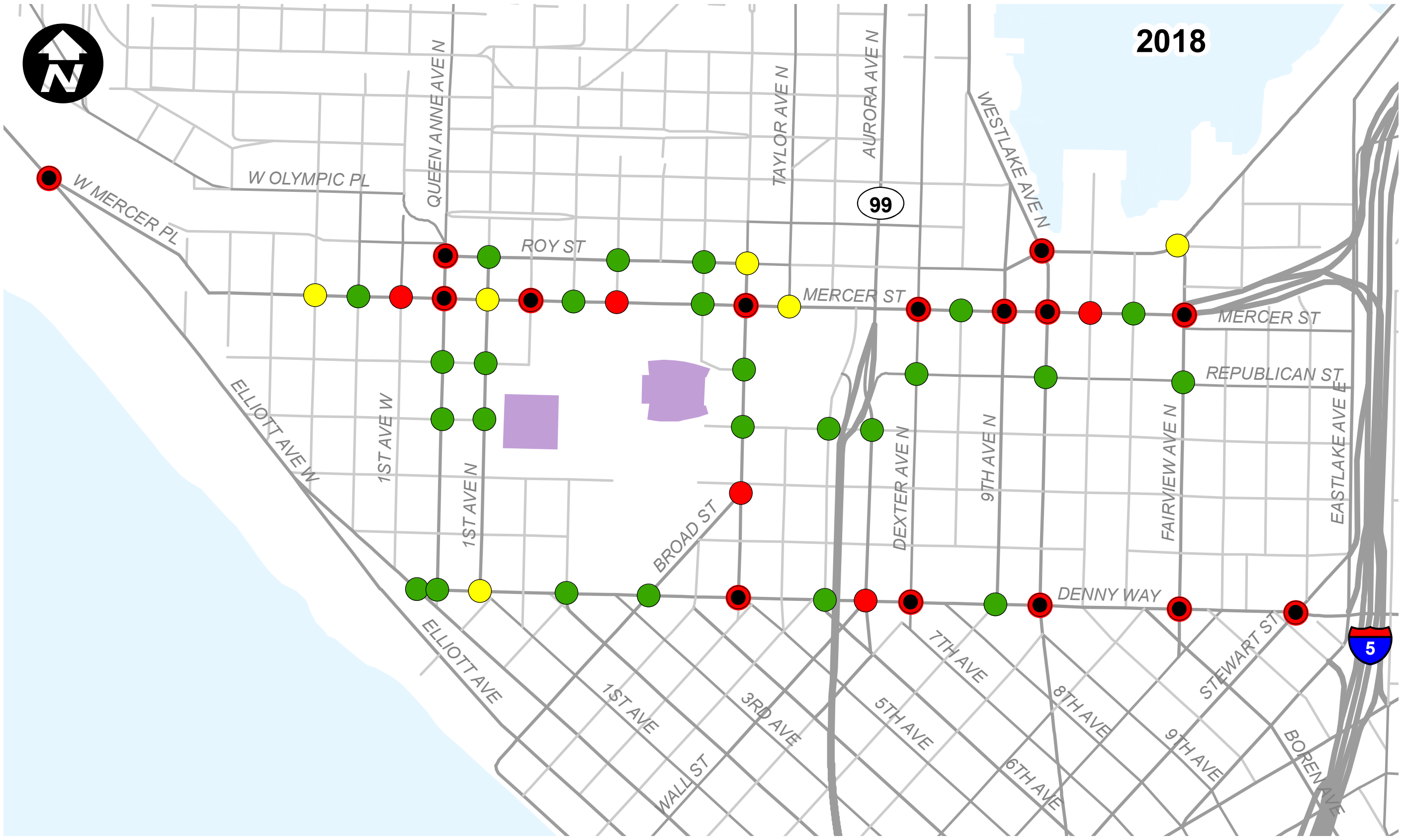
3.6.5.1 Intersection Operations

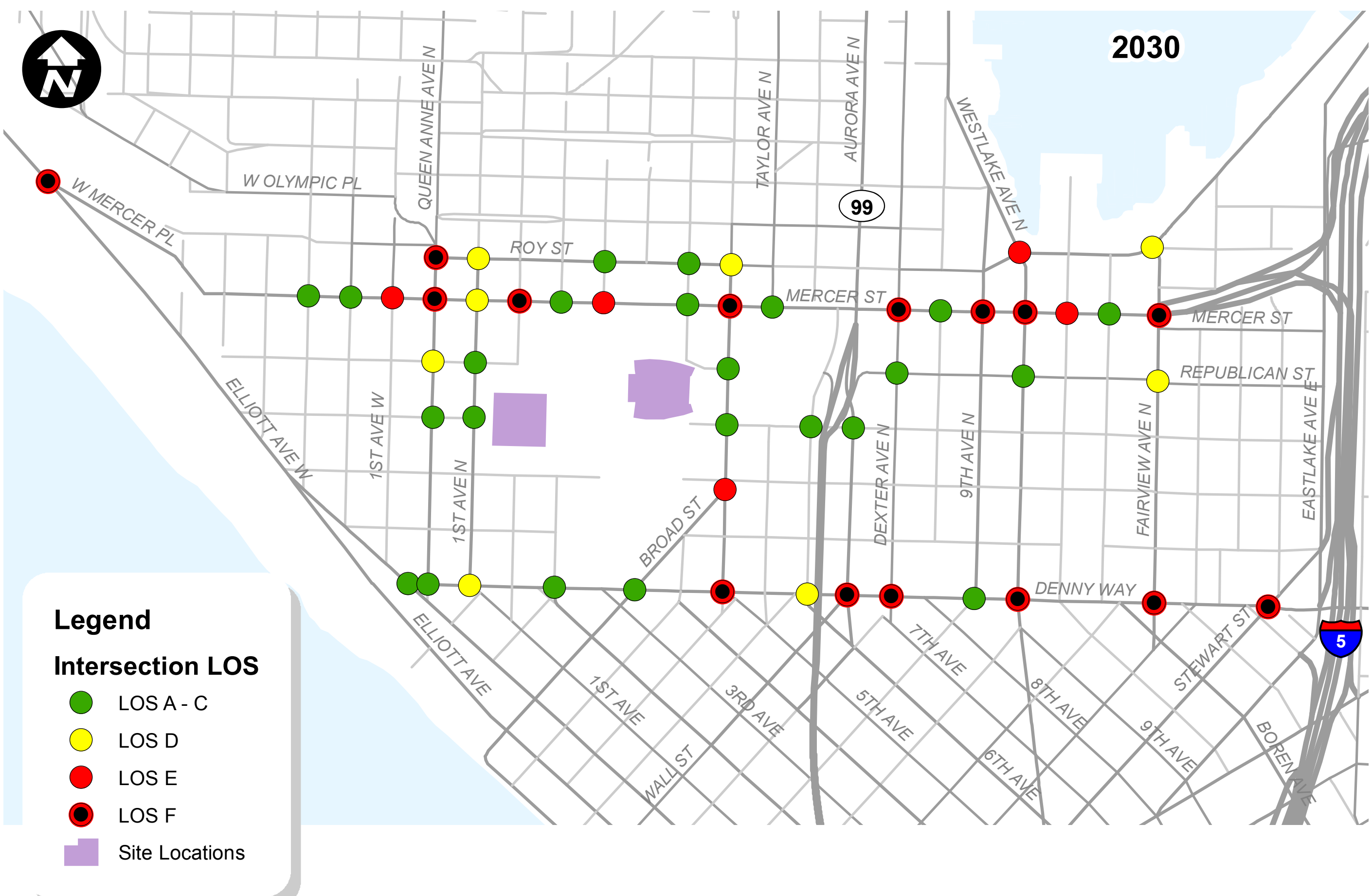
LOS results for 2018 and 2030 peak hour conditions for Alternative 5 Cases M1 and M2 are presented on Figure 3–60 and Figure 3–61. Detailed LOS summary tables and worksheets for each of these scenarios are included in Attachment E-3, which is available from DPD upon request.

A summary of the Alternative 5 LOS for all study area intersections was prepared and compared No Action conditions as summarized on Figure 3–59 for 2018 conditions, and Figure 3–62 for 2030 conditions.

Figure 3–59 Seattle Center Area 2018 Alternative 5 Intersection LOS Comparison





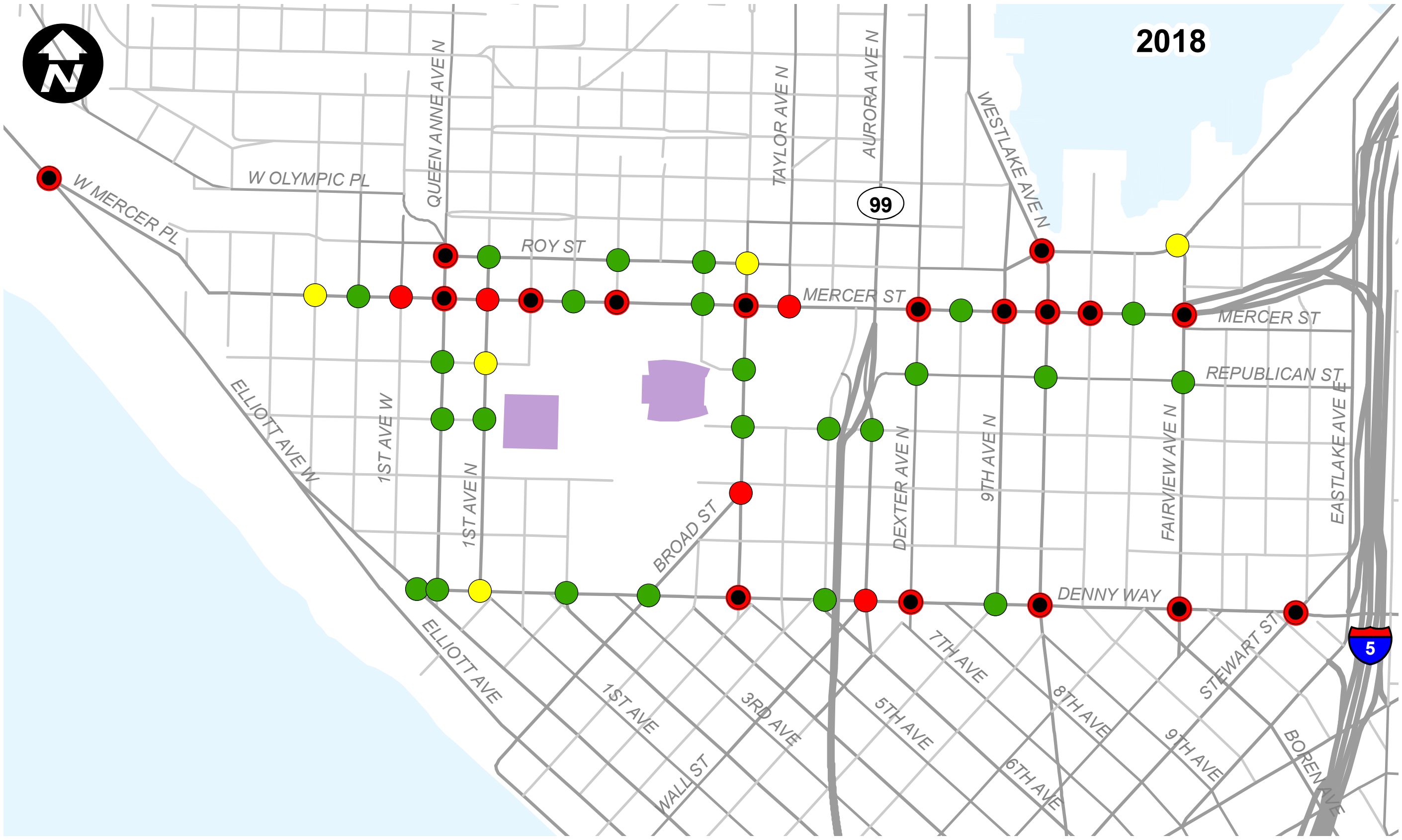


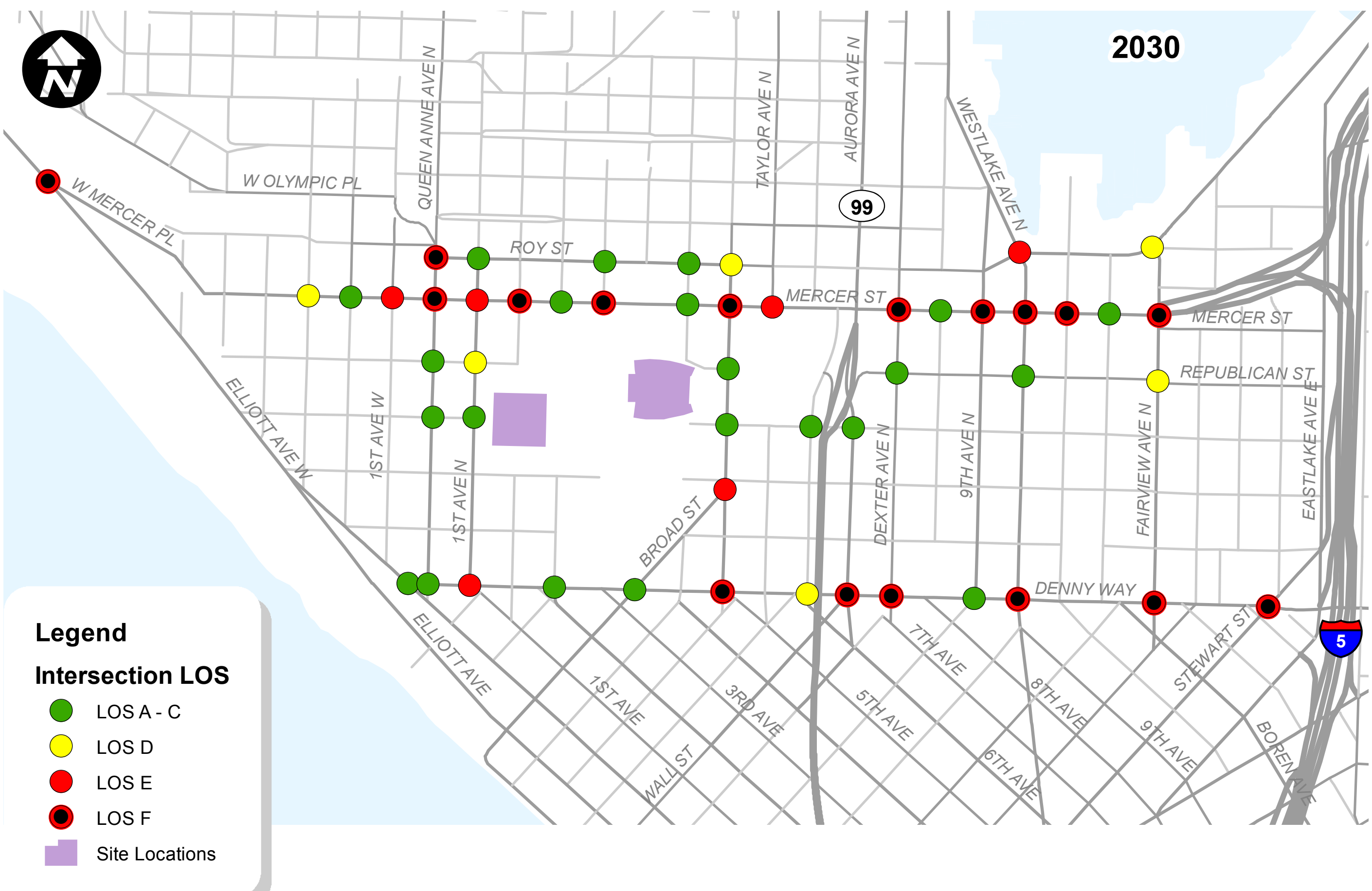
Seattle Center Area Alternative 5 Case M1 Weekday PM Peak Hour Level of Service

Seattle Arena

transpoGROUP

FIGURE
3-60





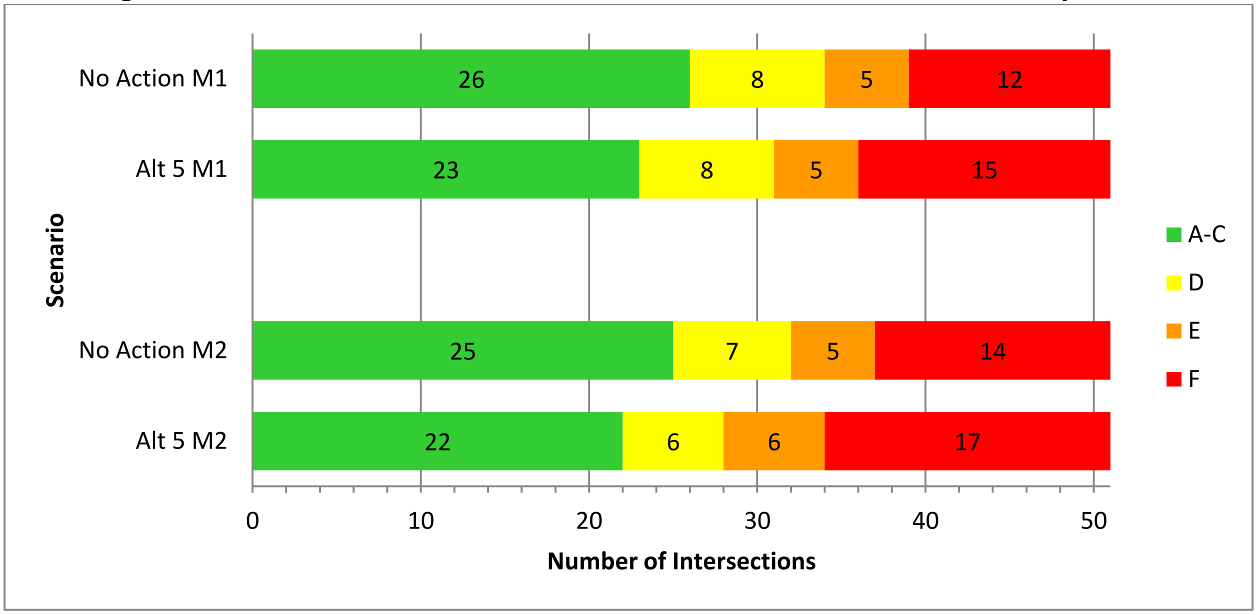
Seattle Center Area Alternative 5 Case M2 Weekday PM Peak Hour Level of Service

Seattle Arena

transpoGROUP

FIGURE
3-61

Figure 3–62 Seattle Center Area 2030 Alternative 5 Intersection LOS Comparison



As shown:

- Throughout the wider study area, the addition of arena event trips would result in two additional intersections operating at a calculated LOS E/F under 2018 Case M1 and three additional intersections under Case M2.
- Under 2030 conditions, three additional intersections would operate at LOS F for Alternative 5 Case M1 and four additional intersections would operate at LOS E/F for Alternative 5 Case M2.

Table 3-24 summarizes the intersections that operate at LOS E or LOS F with the addition of arena event traffic under 2018 conditions and forecast results for 2030 conditions are summarized in Table 3-25. Note that some intersections would only operate at LOS E or LOS F under the multiple event scenario (Case M2).

Table 3-24
2018 Alternative 5 Weekday PM Peak Hour Intersections at LOS E or LOS F

	Case M1		Case M2	
Roadway	**No Action**	**Alternative 5**	**No Action**	**Alternative 5**
Elliott Avenue W. / W. Mercer Pl	F	F	F	F
Queen Anne Avenue N. / Roy Street	F	F	F	F
Broad Street / Valley Street	F	F	F	F
1st Avenue W. / W. Mercer Street	E	E	E	E
Mercer Street / Queen Anne Avenue N.	F	F	F	F
1st Avenue N. / Mercer Street	C	D	D	E
Mercer Street / Warren Avenue N.	F	F	F	F
3rd Avenue N. / Mercer Street	B	E	C	F
5th Avenue N. / Mercer Street	F	F	F	F
Mercer Street / Taylor Avenue N.	C	D	C	E
Dexter Avenue N. / Mercer Street	F	F	F	F
9th Avenue N. / Mercer Street	F	F	F	F
Mercer Street / Westlake Avenue N.	F	F	F	F
Mercer Street / Terry Avenue N.	D	E	E	F
Fairview Avenue N. / Mercer Street	F	F	F	F
5th Avenue N. / Broad Street	E	E	E	E
5th Avenue / Denny Way	E	F	E	F
Aurora Avenue N. / Denny Way	E	E	E	E
Denny Way / Dexter Avenue	F	F	F	F
Denny Way / Westlake Avenue	F	F	F	F
Denny Way / Fairview Avenue	F	F	F	F
Denny Way / Stewart Street	F	F	F	F

Table 3-25
2030 Alternative 5 Weekday PM Peak Hour Intersections at LOS E or LOS F

	Case M1		Case M2	
Roadway	**No Action**	**Alternative 5**	**No Action**	**Alternative 5**
Elliott Avenue W. / W. Mercer Pl	F	F	F	F
Queen Anne Avenue N. / Roy Street	F	F	F	F
Broad Street / Valley Street	E	E	E	E
1st Avenue W. / W. Mercer Street	D	E	E	E
Mercer Street / Queen Anne Avenue N.	F	F	F	F
1st Avenue N. / Mercer Street	D	D	D	E
Mercer Street / Warren Avenue N.	F	F	F	F
3rd Avenue N. / Mercer Street	C	E	D	F
5th Avenue N. / Mercer Street	E	F	F	F
Mercer Street / Taylor Avenue N.	C	C	C	E
Dexter Avenue N. / Mercer Street	F	F	F	F
9th Avenue N. / Mercer Street	E	F	F	F
Mercer Street / Westlake Avenue N.	F	F	F	F
Mercer Street / Terry Avenue N.	D	E	E	F
Fairview Avenue N. / Mercer Street	F	F	F	F
5th Avenue N. / Broad Street	E	E	E	E
1st Avenue S. / Denny Way	D	D	D	E
5th Avenue / Denny Way	E	F	E	F
Aurora Avenue N. / Denny Way	F	F	F	F
Denny Way / Dexter Avenue	F	F	F	F
Denny Way / Westlake Avenue	F	F	F	F
Denny Way / Fairview Avenue	F	F	F	F
Denny Way / Stewart Street	F	F	F	F

3.6.5.2 Corridor Travel Times

Table 3-26 summarizes the calculated weekday PM peak hour travel times under 2018 conditions on the defined routes. Table 3-27 summarizes the calculated travel times under 2030 conditions. No Action results conditions are shown in parentheses and provided for comparison purposes.

Table 3-26
2018 Alternative 5 Weekday PM Peak Hour Corridor Travel Times

Route	Extents	Direction	Case M1 (m:ss)[1]	Case M2 (m:ss)
1	W. Mercer Street from 3rd Avenue W. to Fairview Avenue N.	EB	22:47 (17:40)[2]	26:37 (21:09)
	W. Mercer Street from Fairview Avenue N. to 3rd Avenue W.	WB	25:40 (10:01)	37:33 (14:47)
2	Denny Way from Queen Anne Avenue to Stewart Street	EB	16:57 (15:14)	19:17 (17:30)
	Denny Way from Stewart Street to Queen Anne Avenue	WB	15:21 (12:04)	17:00 (13:06)
3	5th Avenue N. from Denny Way to W. Mercer Street	NB	6:20 (5:04)	6:44 (5:25)
	5th Avenue N. from W. Mercer Street to Denny Way	SB	3:22 (3:00)	3:51 (3:04)

1. m:ss = minutes:seconds
2. No Action travel times provided for comparison.

As shown in Table 3-26 and Table 3-27:

- Travel times under both 2018 and 2030 conditions are calculated to increase with the addition of arena event traffic. In particular, westbound Mercer Street increases substantially to over 30 minutes with the addition of arena traffic due to the majority of traffic (approximately 70 percent) travelling to the Seattle Center area utilizing the Mercer Street corridor.

- It is noted that No Action and all future estimates of event traffic volumes are simply additive to No Action conditions. While existing counts and analysis show modest impacts to traffic volumes and operations on event days, this additive approach likely overestimates future traffic and congestion related to events. However, it does provide a consistent basis for comparing alternatives. There is no reliable way to assess the amount of diverted non-event traffic likely to occur for any given event.

Table 3-27
2030 Alternative 5 Weekday PM Peak Hour Corridor Travel Times

Route	Extents	Direction	Case M1 (m:ss[1])	Case M2 (m:ss)
1	W. Mercer Street from 3rd Avenue W. to Fairview Avenue N.	EB	23:21 (18:37)[2]	27:11 (22:38)
	W. Mercer Street from Fairview Avenue N. to 3rd Avenue W.	WB	22:26 (8:28)	33:18 (13:06)
2	Denny Way from Queen Anne Avenue to Stewart Street	EB	21:55 (19:46)	24:26 (22:24)
	Denny Way from Stewart Street to Queen Anne Avenue	WB	17:29 (13:00)	19:40 (14:36)
3	5th Avenue N. from Denny Way to W. Mercer Street	NB	6:19 (5:18)	6:38 (5:35)
	5th Avenue N. from W. Mercer Street to Denny Way	SB	3:28 (3:09)	3:52 (3:14)

1. m:ss = minutes:seconds
2. No Action travel times provided for comparison.

3.6.5.3 Regional Access Analysis

Traffic would access the new arena in the Seattle Center area via I-5, SR 99, and local arterials. It is estimated up to 20 percent of the trips that would access the arena would come from the north via I-5 and 55 percent via I-5 from the south. The other 25 percent of the trips would access the area via local arterials and SR 99.

For an event only at the new arena, up to an additional 1,500 vph would enter the city via I-5 to reach the Seattle Center area. This is a 6-15 percent increase in trips compared to a typical evening commute on any one of those corridors. Table 3-28 shows the typical traffic volumes for a weekday and the anticipated increase in traffic with the arena, and also with the combined with other events.

The typical weekday traffic flow values shown in Table 3-28 are existing volumes but represent anticipated traffic volumes in year 2018. Traffic demand (or volume of vehicles that want to use these corridors) increase as land use changes. However because the corridors are at or near capacity, additional traffic is not served during the peak hour of congestion. Therefore today's traffic volume served through these areas during the peak of congestion would be similar in future years unless capacity was increased for I-5.

Table 3-28 also focuses on the directions and locations of I-5 that would experience the greatest increase in trips from an arena event. During the PM peak hour, the majority of the trips (about 94 percent) associated with the arena are inbound trips (or trips heading to the arena).

Table 3-28
2018 Alternative 5 Weekday PM Peak Hour Increase in Traffic on Freeway Corridors

Location	Typical Weekday PM Peak Hour Traffic (vph)	Increase in traffic with Arena (vph / % compared to typical weekday traffic)	
		Case M1	Case M2
I-5 Southbound (north of Mercer)	6,700 vph	400 vph / 6%	550 vph / 8%
I-5 Northbound (south of Olive)	6,800 vph	1,100 vph / 15%	1,450 vph / 21%

The I-5 and I-90 corridors experience congestion today during the PM peak commute. Today, events at the downtown arenas results in an increase in travel time approaching the city center. The PM peak travel times (on days with events in 2012) increased by up to eight minutes on southbound I-5 between NE 145th and I-90 and up to four minutes on I-90 between I-405 and Rainer Avenue S. It is anticipated with the arena with capacity for 20,000 spectators, PM peak travel times would be similarly affected for a typical event day with an event only at the new arena (Case M1).

For an event only at the new arena, up to an additional 1,400 vph would enter the city via I-5 to reach the new arena in the year 2030. This is slightly less than the year 2018 condition as it's assumed more people would use transit to access this area. This is a result of Link light rail extensions and other transit improvements that will provide event attendees more options. Increases in traffic and effect to regional travel times on the I-5 and I-90 freeways would be similar in the year 2030 as experienced in the year 2018.

Regional or freeway access to the Seattle Center area is constrained by signals at the terminal of the off-ramps. Overall intersection and off-ramp approach operations of two arterial intersections at the I-5 ramp termini were reviewed. The analysis was conducted for the weekday PM peak hour for 2018 and 2030 horizon years, under Case M1 and M2 and summarized in Table 3-29 and Table 3-30, respectively.

Table 3-29
2018 Alternative 5 Weekday PM Peak Hour Ramp Terminal Intersection Operations

Intersection	Scenario	No Action		Alternative 5	
		Overall LOS / Delay	Off-Ramp LOS / Delay	Overall LOS / Delay	Off-Ramp LOS / Delay
Mercer Street / Fairview Avenue	Case M1	F / >180	E / >79	F / >180	F / 97
	Case M2	F / >180	E / 75	F / >180	F / 148
Denny Way / Stewart Street	Case M1	F / 153	F / >180	F / 160	F / >180
	Case M2	F / 162	F / >180	F / 168	F / >180

Table 3-30
2030 Alternative 5 Weekday PM Peak Hour Ramp Terminal Intersection Operations

Intersection	Scenario	No Action		Alternative 5	
		Overall LOS / Delay	Off-Ramp LOS / Delay	Overall LOS / Delay	Off-Ramp LOS / Delay
Mercer Street / Fairview Avenue	Case M1	F / >180	F / 106	F / >180	F / 96
	Case M2	F / >180	F / 97	F / >180	F / 126
Denny Way / Stewart Street	Case M1	F / 159	F / 167	F / 166	F / 169
	Case M2	F / 168	F / 169	F / 174	F / 170

Under both 2018 and 2030 conditions during the PM peak hour off-ramp conditions operate at LOS E/F at both Denny Way and Mercer Street and are similar to No Action conditions. The further addition of event traffic would add to the already poor off-ramp terminal operations that are forecast to occur under No Action conditions.

In addition to the traffic operations impacts outlined above, the increases in event traffic volumes related to an arena would have an impact on emergency vehicle access and circulation to the Memorial Stadium site as well as through the area. This may require emergency response vehicles to use on-board flashing lights and sirens to navigate through the congestion and reduce delays. In addition, during periods of heavy congestion, manual traffic control may be necessary to facilitate the passage of emergency vehicles.

3.6.5.4 Post-Event Traffic Operations

At the end of a sporting event at the Seattle Center attendees typically depart the venue in a highly concentrated flow that can affect traffic operations within the vicinity of the venue. Post-event traffic counts for sporting event in the SoDo area[29] indicate that the peak 15 minutes near the end of an event can range between 30 to 40 percent of the total hourly flow that includes this peak with traffic volumes greatest travelling away from the venue.

[29] Seattle Mariners, April 11, 2013

As a result of this surge, professional sporting events in Seattle typically implement a Traffic Control Plan (TCP) to aid in the dispersion of event attendees to the transportation network. A TCP helps to alleviate this outbound surge in event attendees. However, post-event surge traffic volumes are usually less than the peak 15-minute period during a non-event peak evening commute period. As a result, the analysis of the peak evening commute period represents a worst-case condition.

3.6.6 Mitigation Measures

A complete summary of potential mitigation measures to be considered across all the Transportation Elements evaluated in this report is included in Chapter 4.0 of Appendix E. This summary includes identification of both programmatic measures and physical improvements. For each of the potential mitigation measures a designation of high to low influence was noted. The following identifies those potential mitigation measures considered to have a high influence on this transportation element. These potential mitigation measures are appropriate for both Alternative 4 and Alternative 5.

- Event schedule protocol and management
- Public information coordinator
- Directional event signage
- Variable message and parking guidance signage
- SDOT traffic control center improvements
- Traffic signal control / improvements
- Event ingress / egress plan
- Construction management plan

3.6.7 Secondary and Cumulative Impacts

Within the Seattle Center area, several elements should be considered in light of these analysis results. Seattle Center historically accommodates up to 17,500 attendees at KeyArena with pre-event congestion and post-event egress involving a traffic management plan. With this attendance and TMP, congestion occurs throughout the Seattle Center study area. Since the relocation of the last NBA franchise significant growth has occurred in the South Lake Union area, the Gates Foundation was constructed, and the pending Alaskan Way Viaduct Replacement Project North Portal improvements will result in changes in local traffic patterns with increased congestion.

Major freeways are at or near capacity for much of the peak morning and evening commuter periods in the Puget Sound region. Future growth in the number of vehicles is anticipated to occur mostly outside of the peak commuter periods. Much of the growth in passenger trips in our region is estimated to occur on transit. Regional tolling strategies, such as those considered in PSRC Transportation 2040, would have a regional impact on vehicle travel. One of the tolling policy objectives is to achieve some performance objective, such as LOS. This change to the regional freeway system would likely result in some event attendees choosing another mode, such as public transit.

3.6.8 Significant Unavoidable Adverse Impacts

Several intersections are forecast to operate at LOS E or LOS F, in No Action, as well as in the case of additional traffic due to events at an arena at the site of KeyArena or Memorial Stadium. On event days, delays would be expected to increase as a result of arena event traffic. Some of these increases may be significant.

3.7 Freight and Goods Movement

This section describes the existing, No Action, and magnitude of future impacts associated with Alternatives 4 and 5 on the movement of freight and goods within the Seattle Center area.

3.7.1 Methodology

The impacts of the alternatives on freight and goods movements are evaluated based on the effect of the added magnitude and frequency of additional event traffic on freight activity. Thus, changes in specific intersection and arterial performance at locations along identified truck routes are evaluated. Technical data presented in this section is consistent with data presented in the traffic operations section of this report.

3.7.2 Affected Environment

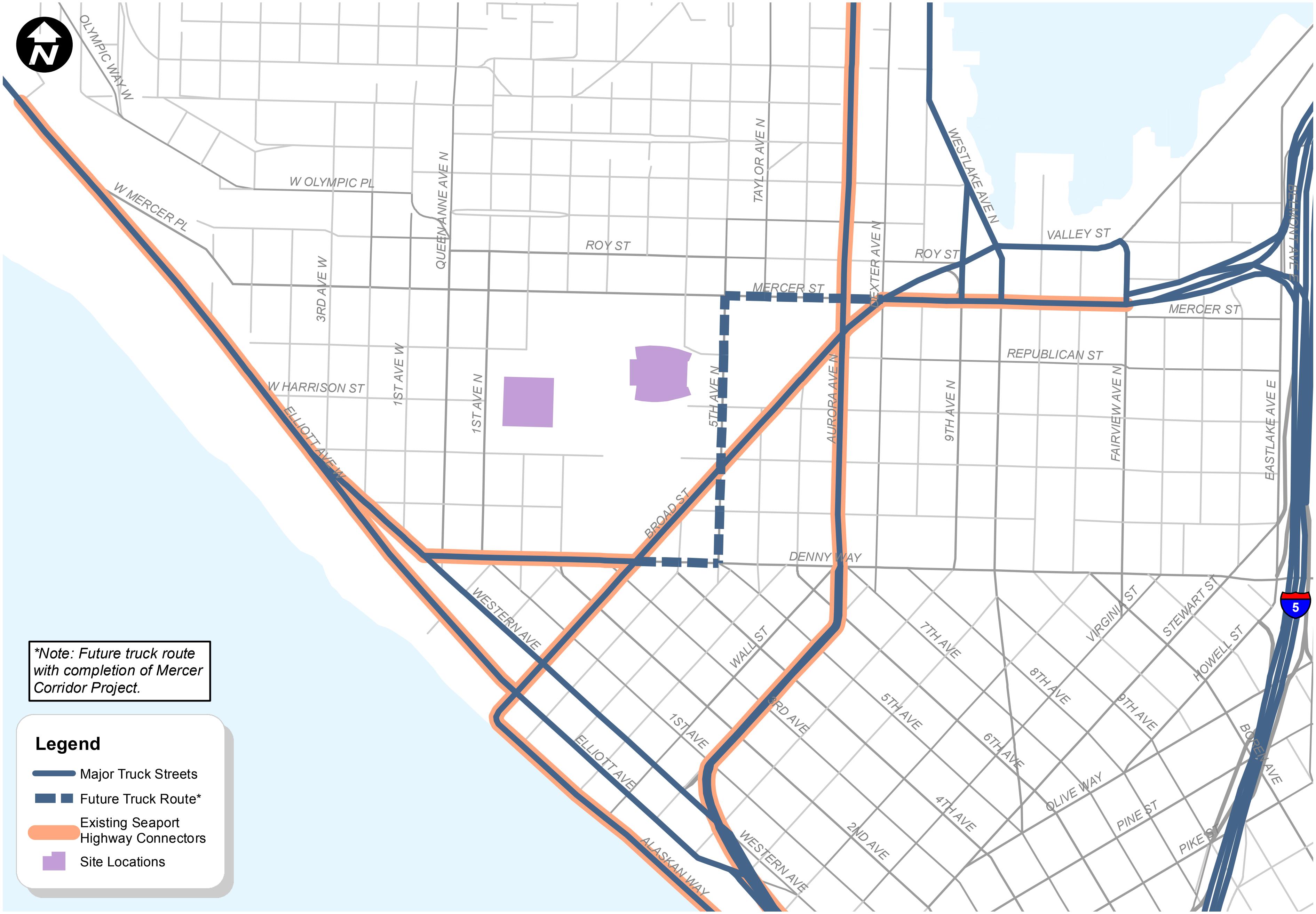
3.7.2.1 Transportation Network

Within the Seattle Center area, local and federal agencies have designated several roadways in the study area as Major Truck Routes and Seaport Highway Connectors. Figure 3–63 identifies these truck facilities within the study area. Two classes of truck facility are identified:

- Major Truck Routes and Seaport Highway Connector
    - Elliott Avenue W., north of Broad Street
    - Broad Street south of Mercer Street
    - Aurora Avenue N.
    - Western Avenue from Elliott Avenue W. to Denny Way
    - Denny Way from Western Avenue to Broad Street
    - Mercer Street from Dexter Avenue N. and Broad Street to Fairview Avenue N.
- Major Truck Routes only
    - Western Avenue south of Denny Way

- Broad Street north of Mercer Street
- 9th Avenue N., north of Mercer Street
- Westlake Avenue N., north of Mercer Street
- Fairview Avenue N., north of Mercer Street
- Valley Street between Westlake Avenue N. and Fairview Avenue N
- Elliott Avenue south of Broad Street

Trucks with over-legal loads utilize Mercer Street and Broad Street to access the waterfront and the CBD. These routes maintain a 20’ by 20’ design envelope.



Seattle Center Area Freight Facilities

Seattle Arena

FIGURE
3-63

transpoGROUP

3.7.2.2 Traffic Volumes

Due to ongoing construction along the Mercer Street corridor, current traffic counts were not conducted, as the data would not be indicative of stable conditions. Historical traffic counts[30] along the corridor showed that truck volumes over a 16-hour period totaled 450 semi-trucks utilized the I-5 ramps, 100 semi-trucks along Broad Street and 50 trucks were noted to use Westlake Avenue. The Synchro traffic models obtained from the City included heavy vehicles percentages of two percent. Future analyses conducted for this evaluation utilized the same assumptions.

3.7.2.3 Traffic Operations

Individual intersection and corridor operations have a significant impact on the efficiency and cost associated with the movement of freight and goods. This section highlights the traffic operations along the key corridors utilized by freight, as designated by the City of Seattle. This analysis focuses mainly on the Mercer Street corridor as that is the primary connection to the area from the regional system.

The analysis of existing conditions reflects the completion of the east section of the Mercer Street corridor. The results of the intersection analysis identified three of the seven intersections east of and including the Dexter Avenue N. intersection that are "currently"[31] operating at LOS E/F during the weekday PM peak hour. Truck traffic utilizing Mercer Street to access Elliot Avenue or Western will incur delay at these intersections commensurate with the delay experienced by all traffic. Likewise, corridor level impacts would experience similar delay and travel time impacts. It is noted that large trucks may experience additional delays during periods of extreme congestion as trucks require more clear space to enter and clear an intersection.

The travel time corridors identified for this review included Mercer Street from 3rd Avenue W. to Fairview Avenue N. This corridor was identified based on its designation as a Major Truck Street as well as its functionality with respect to access to the Seattle Center Area alternative sites. Existing travel times for this section of Mercer Street were calculated at approximately 9 minutes in the eastbound direction and 8.5 minutes in the westbound direction.

3.7.3 Impacts of No Action Alternative

Forecast conditions under the No Action alternative for freight and goods movement within the Seattle Center area are described in the following sections. With the changes in roadway infrastructure future discussions focus primarily on the Mercer Street corridor, due to its regional access and future east-west linkages and future impacts of the development alternatives.

[30] Mercer Corridor Improvements Project Transportation Discipline Report, November 2006.

[31] Assumes completion of the east portion of the West Mercer Improvement Project

3.7.3.1 Transportation Network

Several planned projects were identified that will affect truck travel within the study area. These include:

- **Alaskan Way Viaduct Replacement – North Portal**: This portion of the project provides connections to the transportation system in the Seattle Center area. This includes the following connections:
  - **Tunnel Access at Republican Street and 6th Avenue N.:** Access to SR 99 will be provided via new ramps at Republican Street. The northbound off-ramp traffic will exit to the east toward Dexter Avenue N. and the southbound traffic will merge onto SR 99 via a reconfigured 6th Avenue N. between Harrison Street and Mercer Street west of SR 99. The new 6th Avenue N. roadway will have one to two lanes in each direction and a traffic signal at the SR 99 ramp intersection.
  - **New Street Connections to Aurora Avenue N. (SR 99):** John Street, Thomas Street, and Harrison Street will connect to Aurora Avenue N. Thomas Street will have bike lanes between Dexter Avenue N. and 5th Avenue N. Aurora Avenue N. will have two travel lanes in each direction, an additional transit-only lane, and turn pockets between Denny Way and Harrison Street. The Denny Way intersections with John Street, Thomas Street, and Harrison Street will be signalized.
- **Mercer Corridor:** This project includes the conversion of two-way traffic flows along Mercer Street between I-5 and Elliott Avenue W. The main purpose is to improve the east-west connection in the area by turning Mercer Street into a two-way corridor and improving access for pedestrians and bicyclists. The project is separated into two phases: Mercer East and Mercer West. The impact to the study area of each phase is:
  - **Mercer East:** This portion of the project is located between Fairview Avenue N. and Dexter Avenue N. It provides two-way operations along both Mercer Street and Valley Street. The portion along Mercer Street is complete and has three travel lanes in each direction and sidewalks on both sides. Two new traffic signals are provided along Mercer Street at the Terry Avenue NE and Boren Avenue N. intersections. Valley Street is currently under construction and will have one lane in each direction with bicycle and pedestrian improvements. The project is scheduled to be completed by summer of 2013.
  - **Mercer West:** The portion stretches from Dexter Avenue N. to 5th Avenue W. Mercer Street will have three travel lanes in each direction between Dexter Avenue N. and Aurora Avenue N., two lanes in each direction between 5th Avenue N. and 2nd Avenue N., and one lane in each direction between 2nd Avenue N. and 5th Avenue W. Roy Street will also be converted to have two-way operations with one lane of travel lane in each direction. Pedestrian and bicycle improvements will be provided along both Mercer Street and Roy Street,

including bike lanes in both directions along Roy Street between 5th Avenue N. and Queen Anne Avenue N., a bike path on the north side of Mercer Street near the Aurora Avenue underpass, and new and / or improved sidewalks along the project corridor. In addition, with completion of the project Broad Street will be removed and the major truck street / seaport highway connector will shift to 5th Avenue N. between Denny Way and Mercer Street and Mercer Street from 5th Avenue N. to I-5. This project is scheduled to be complete by mid-2015 and will connect to improvements made in the area related to the Alaskan Way Viaduct Replacement Project.

3.7.3.2 Traffic Volumes

2018 traffic volumes along the Mercer Street corridor are forecast to nominally increase over the existing estimates by less than one percent during the weekday PM peak hour conditions. Traffic forecasts for the year 2030 are approximately two percent greater than the 2018 forecasts. Truck percentages assumed in the future No Action analyses were two percent for all approaches to each intersection. Based on the application of a 2 percent truck factor, traffic volumes along Mercer Street would total 100 trucks per weekday PM peak hour. Given the estimates of 450 trucks counted at the I-5 off-ramp in a 16-hour period, the assumption of 2 percent should be considered conservative as it totals approximately 25 percent of the total truck volume. It is unlikely that 25 percent of the observed truck volumes would occur during the 1-hour PM peak hour time period. In fact, many truck drivers specifically avoid travel during these periods given the difficulty of travel.

Along Broad Street the 2018 and 2030 forecasts reflect negligible growth over the existing traffic volumes. This is due primarily due to the reconfiguration of Broad Street and the elimination of the direct connection to W. Mercer Street. Trucks exiting I-5 at W. Mercer Street will still be able to access Broad Street, but utilize the 5th Avenue N. connection to do so.

3.7.3.3 Traffic Operations

Since the 2030 analysis presented in the Traffic Operations section represents the worst operating condition, this analysis reports operations for 2030 conditions only. The analysis indicates that in the future (2030) five of the seven intersections are forecast to operate at LOS E/F along W. Mercer Street from Dexter Avenue N. to I-5. Truck traffic utilizing Mercer Street to access Elliot Avenue or Western Avenue will incur delay at key intersections increasing travel times through the corridor overall.

The travel time analysis conducted for the W. Mercer Street corridor showed 2030 travel times of 18.5 minutes in the westbound direction and 8.5 in the eastbound direction. This represents no noticeable change in the eastbound direction and increase of approximately 9.5 minutes in the westbound direction as compared to the “existing” conditions. This change is likely due to several factors including development within the SLU neighborhood, planned changes to the roadway including the two-way Mercer Street improvement projects and Alaskan Way North Portal improvements, changes in travel patterns, and varying growth in traffic volumes along the length of the corridor.

3.7.4 Impacts of Alternative 4

Major truck routes surrounding the site could be intermittently impacted by construction. A construction management plan would be developed to minimize any street closures or other impacts as a result of the arena construction. This management plan would use of manual flaggers and signs to provide vehicle circulation. In addition, key stakeholders would be notified of any major roadway closures.

Forecast conditions in the Seattle Center area were evaluated for Alternative 4.

3.7.4.1 Transportation Network

No modifications to the transportation system that would impact freight and goods movements are identified as part of this Alternative.

3.7.4.2 Traffic Volumes

Traffic volume forecasts were developed for Alternative 4 for both K1 and K2. A comparison of the future volumes for the No Action Alternative and Alternative 4 are summarized in Table 3-31. As shown in this table, along W. Mercer Street, east of Terry Avenue, weekday PM peak hour traffic volumes are anticipated to increase by approximately 14 to 15 percent under either event case. This increase in traffic is representative of the incremental impact assuming an existing (12,000 attendance) event at the KeyArena. The No Action Case K1 includes the 12,000 attendance event and No Action Case K2 includes 12,000 attendance at the KeyArena and 5,000 at Memorial Stadium.

Table 3-31
2030 Alternative 4 Weekday PM Peak Hour Traffic Volumes Comparison

	Case K1		Case K2	
Location	**No Action**	**Alternative 4**	**No Action**	**Alternative 4**
Mercer Street east of Terry Avenue N.	5,785	6,645 (+15%)[1]	5,990	6,835 (+14%)

3.7.4.3 Traffic Operations

Intersections along the W. Mercer Street corridor as well as the performance of the corridor itself were reviewed to determine the potential impact on the movement of freight and goods through the corridor. As previously summarized and discussed in the traffic operations section, by 2030 five of the seven intersections along Mercer Street are projected to operate at LOS E/F under Alternative 4. This is compared to five intersections forecasted to operate at LOS E/F in either of the No Action event cases.

2030 PM peak hour travel times for the W. Mercer Street corridor were reviewed for the Alternative 4 event cases. The results of the analyses are summarized in Table 3-32.

Table 3-32
2030 Alternative 4 Weekday PM Peak Hour Corridor Travel Times

Route	Extents	Direction	Case K1 (m:ss[1])	Case K2 (m:ss)
1	W. Mercer Street from 3rd Avenue W. to Fairview Avenue N.	EB	24:11 (21:04)[2]	25:29 (22:38)
	W. Mercer Street from Fairview Avenue N. to 3rd Avenue W.	WB	25:20 (10:58)	29:09 (13:06)

3. m:ss = minutes:seconds
4. No Action travel times provided for comparison.

It is noted that No Action and all future estimates of event traffic volumes are simply additive to No Action conditions. While existing counts and analyses show modest impacts to traffic volumes and operations on event days, this additive approach likely overestimates future traffic and congestion related to events. However, it does provide a consistent basis for comparing alternatives.

3.7.5 Impacts of Alternative 5

Major truck routes surrounding the site could be intermittently impacted by construction. A construction management plan would be developed to minimize any street closures or other impacts as a result of the arena construction. This management plan would use of manual flaggers and signs to provide vehicle circulation. In addition, key stakeholders would be notified of any major roadway closures.

Forecast conditions in the Seattle Center area were evaluated for Alternative 5.

3.7.5.1 Transportation Network

No modifications to the transportation system that would impact freight and goods movements are identified as part of this Alternative.

3.7.5.2 Traffic Volumes

Traffic volume forecasts were developed for Alternative 5 for both M1 and M2. A comparison of the future volumes for the No Action and Alternative 5 are summarized in Table 3-33. As shown in this table, along Mercer Street, east of Terry Avenue, weekday PM peak hour traffic volumes are anticipated to increase by approximately 17 to 19 percent during under either event case. This increase in traffic is representative of the incremental impact assuming an existing (5,000 attendance) event at Memorial Stadium. The No Action Case M1 includes the 5,000 attendance event and No Action Case M2 includes 5,000 attendance at the Memorial Stadium and 12,000 at KeyArena.

Table 3-33
2030 Alternative 5 Weekday PM Peak Hour Traffic Volumes Comparison

	Case M1		Case M2	
Location	**No Action**	**Alternative 5**	**No Action**	**Alternative 5**
Mercer Street east of Terry Avenue N.	5,460	6,495 (+19%)[1]	5,990	7,025 (+17%)

3.7.5.3 Traffic Operations

Intersections along the Mercer Street corridor as well as the performance of the corridor itself were reviewed to determine the potential impact on the movement of freight and goods through the corridor. As previously summarized and discussed in the traffic operations section, by 2030 five of the seven intersections along Mercer Street are projected to operate at LOS E/F under Alternative 5. This is compared to five intersections forecasted to operate at LOS E/F in either of the No Action event cases.

2030 PM peak hour travel times for the Mercer Street corridor were reviewed for the Alternative 5 event cases. The results of the analyses are summarized in Table 3-34.

Table 3-34
2030 Alternative 5 Weekday PM Peak Hour Corridor Travel Times

Route	Extents	Direction	Case M1 (m:ss[1])	Case M2 (m:ss)
1	W. Mercer Street from 3rd Avenue W. to Fairview Avenue N.	EB	24:11 (21:04)[2]	25:29 (22:38)
	W. Mercer Street from Fairview Avenue N. to 3rd Avenue W.	WB	25:20 (10:58)	29:09 (13:06)

1. m:ss = minutes:seconds
2. No Action travel times provided for comparison.

3.7.6 Mitigation Measures

A complete summary of potential mitigation measures to be considered across all the Transportation Elements evaluated in this report is included in Chapter 4.0 of Appendix E. This summary includes identification of both programmatic measures and physical improvements. For each of the potential mitigation measures a designation of high to low influence was noted. The following identifies those potential mitigation measures considered to have a high influence on this transportation element. These potential mitigation measures are appropriate for both Alternative 4 and Alternative 5.

- Public information coordinator
- Construction management plan

3.7.7 Secondary and Cumulative Impacts

As described previously, there would be direct impacts to the movement of freight and goods caused by an increase in traffic volumes and congestion for the No Action Alternative by 2018 and 2030. These impacts would be increased on game days. Secondary and cumulative impacts to other motorists could occur by truckers choosing to reroute to avoid congestion at specific intersections.

3.7.8 Significant Unavoidable Adverse Impacts

Several intersections are forecast to operate at LOS E or LOS F, in No Action, as well as in the case of additional traffic due to events at the Arena. On event days, delays would be expected to increase as a result of Arena event traffic. These conditions would impact freight activity to the extent identified in the impact analysis.

3.8 Parking

As described for the Stadium District, a minimum parking supply of 2,500 spaces would be required for an arena with 20,000 seats. For spectator sports facilities, parking does not have to be dedicated, but must be available when the facility is in use (i.e., three hours before event start and one hour after the event expected end time). This analysis assumes that no new parking would be built as part of Alternatives 4 and 5. The remainder of this discussion focusses on the impact of arena parking demand on the existing and future parking supply in the study area.

3.8.1 Methodology

The following describes the general approach to the parking analysis:

- Establish the study area and appropriate time period for the evaluation
- Document existing parking conditions to provide an understanding of the underlying parking demands
- Examine effect of future “pipeline” development on parking supply and demand under the No Action Alternative
- Evaluate No Action conditions associated with the existing large event venues (KeyArena and Memorial Stadium) to provide a basis for understanding the impact of the arena on multiple large event conditions
- Add parking demand for the arena to each of the defined No Action baseline event cases and compare arena parking demand to the No Action condition to identify impacts of Alternatives 4 and 5
- Identify mitigation strategies, where appropriate, to reduce the effect of the identified Alternative 4 and 5 impacts

The balance of this methodology section describes the study area for the parking analysis, how the Seattle Center area parking patterns were used to determine the analysis time periods, and parking supply assumptions. Parking demand assumptions specific to existing and future conditions are described in the individual Affected Environment, No Action, and Alternatives 4 and 5 sections.

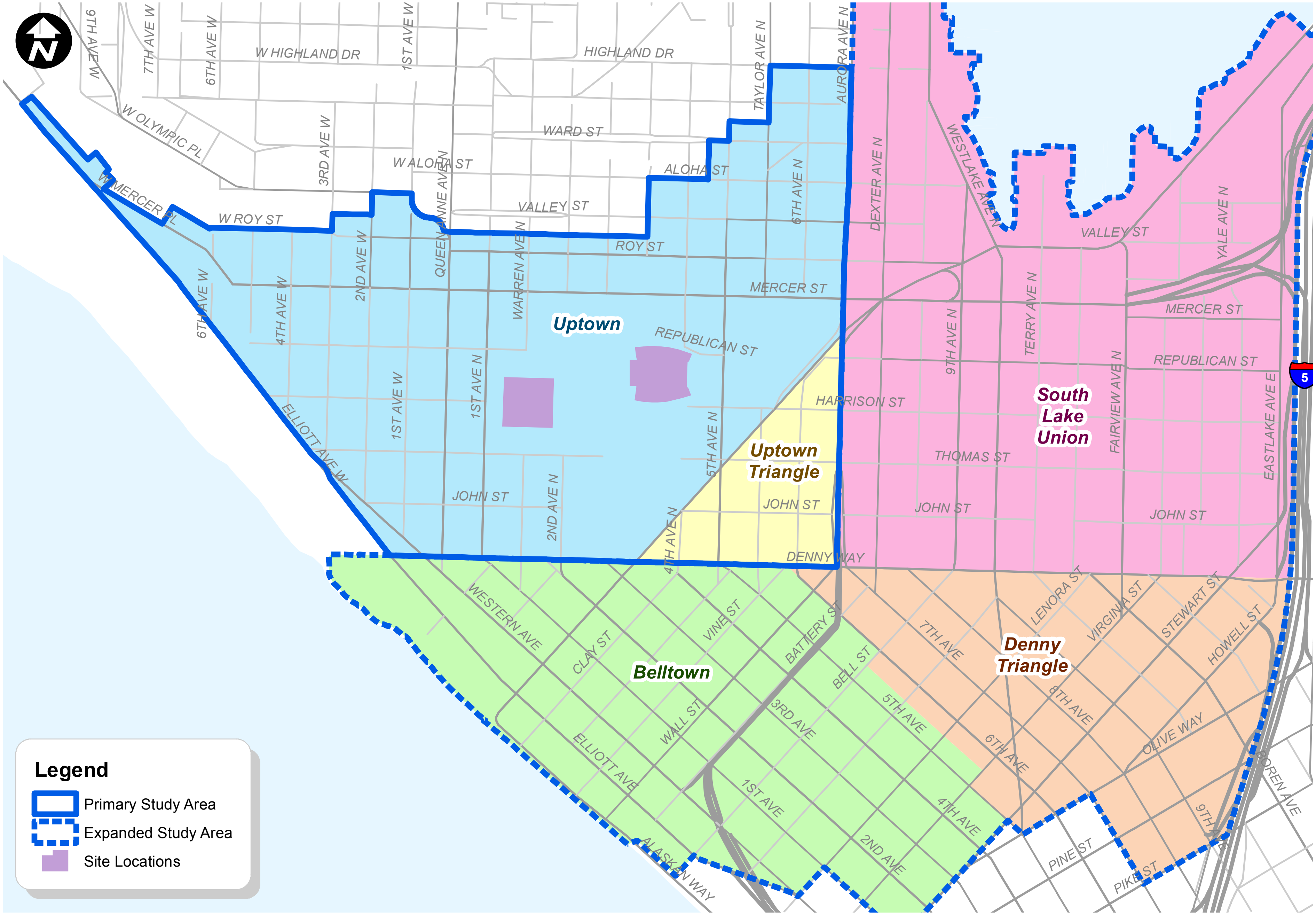
3.8.1.1 Study Area

The study area evaluated for parking is shown on Figure 3–64. Similar to the Stadium District sites, a primary and expanded study area were evaluated, with the expanded study area reflecting potential parking supply opportunities in the case of larger attendance events.

SR 99 currently creates a barrier in the study area, effectively separating SLU from the Seattle Center area for pedestrians. Future improvements in the study area will provide connections across SR 99 allowing for better access between the Seattle Center area and SLU, which will increase the available parking supply. North of the Seattle Center, steep uphill grades north of Roy Street make parking and accessing the Seattle Center area more difficult; the area is generally restricted to those with residential permits. Parking in the Denny Regrade requires crossing Denny Way to access it. High traffic volumes on Denny Way reduce the desirability of parking compared to locations immediately east or west of the Seattle Center area.

The primary study area considers parking between SR 99, Elliott Avenue W., Roy Street, and Denny Way. It includes the neighborhoods of Uptown and Uptown Triangle.

An expanded study area was also evaluated considering the Belltown, SLU, and Denny Triangle neighborhoods. The evaluation of the expanded study area provides a basis for understanding how parking for larger events may be accommodated by parking available at greater distances from the venues.



Seattle Center Area Parking Study Area

Seattle Arena

transpoGROUP

FIGURE
3-64

3.8.1.2 Analysis Time Periods

The parking analysis period was determined in the same manner as the Stadium District evaluation. Existing non-event and arena hourly parking demands for weekday and weekend conditions between 4:00 and 8:00 PM were examined assuming a 7:00 PM game start.

Weekday

The following figures illustrate the hourly parking demand for the existing weekday non-event, arena-only, and combined non-event and arena conditions. Figure 3–65 illustrates the weekday hourly demand in the study area and shows that parking demand decreases sharply until about 6:00 PM. Between 6:00 and 7:00 PM a slight increase in parking was observed, coinciding with arrivals for evening activities in some neighborhoods. Figure 3–66 shows arena-only hourly parking demand for a 7:00 PM start time. A majority of vehicles associated with the arena would be parked by 7:00 PM with approximately five percent of the vehicles arriving after the game start. Figure 3–67 illustrates the total (non-event plus arena) hourly parking demand and shows that on weekdays the peak occurs at 7:00 PM (start time).

Figure 3–65 Seattle Center Area Hourly Parking Demand – Weekday: Non-Event

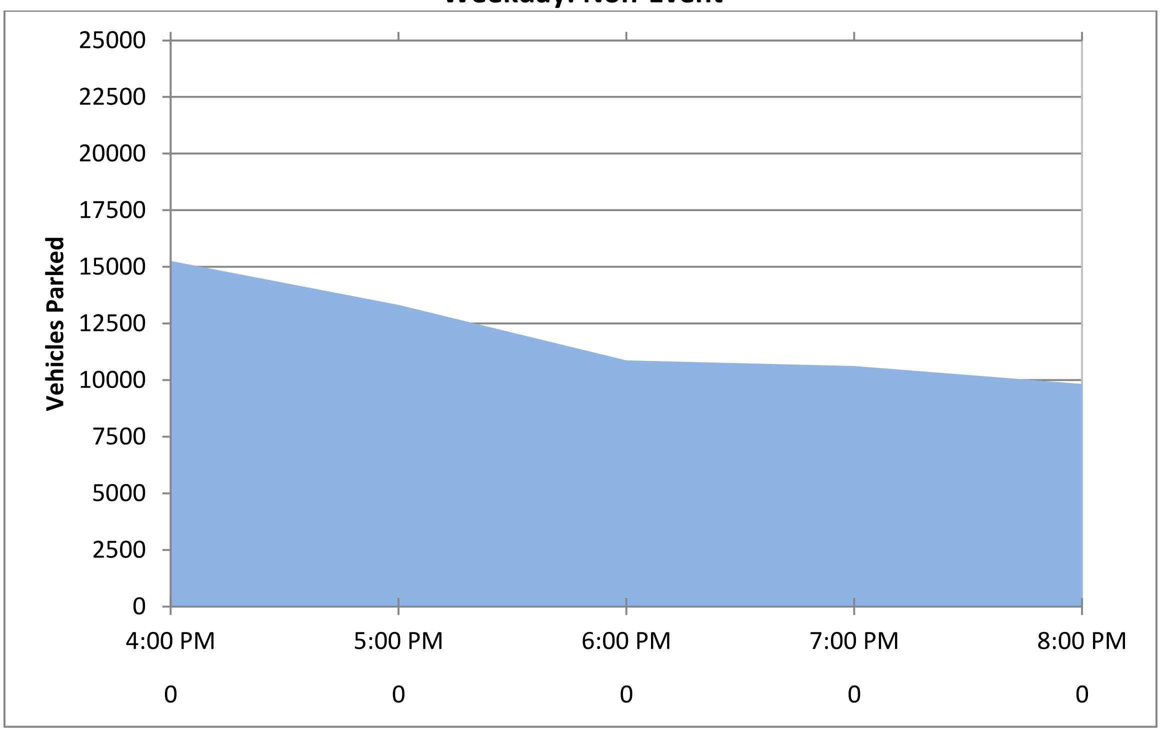


Figure 3–66 Seattle Center Area Hourly Parking Demand – Weekday: Arena Only

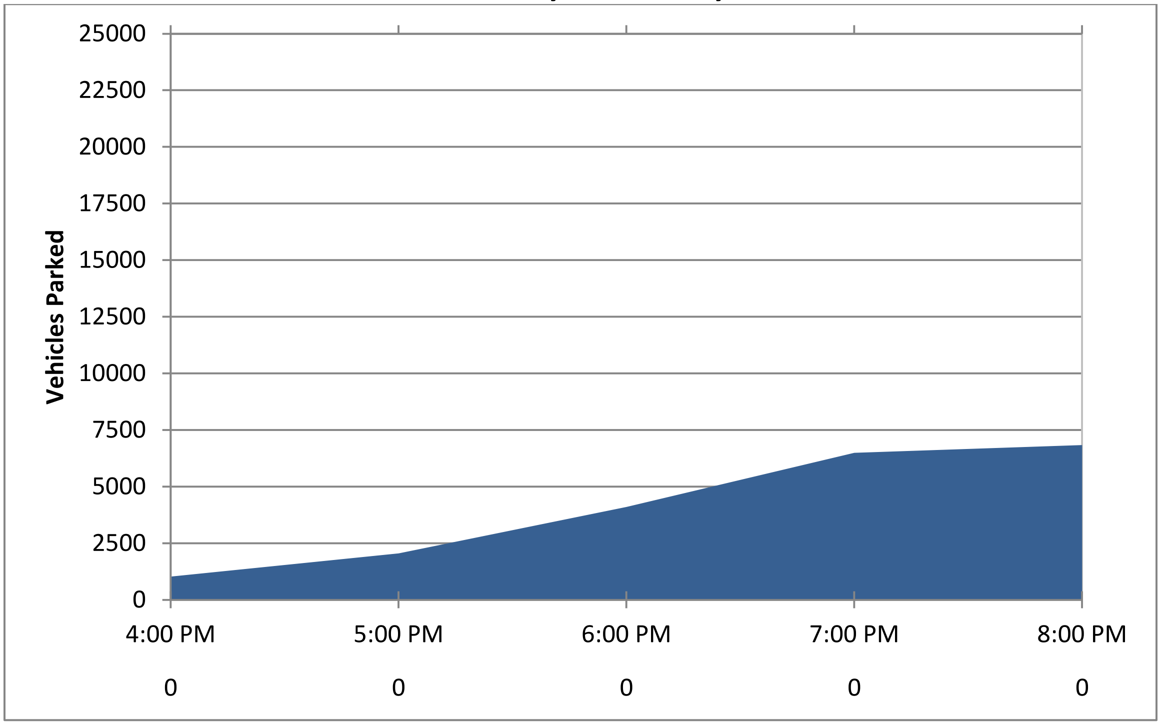
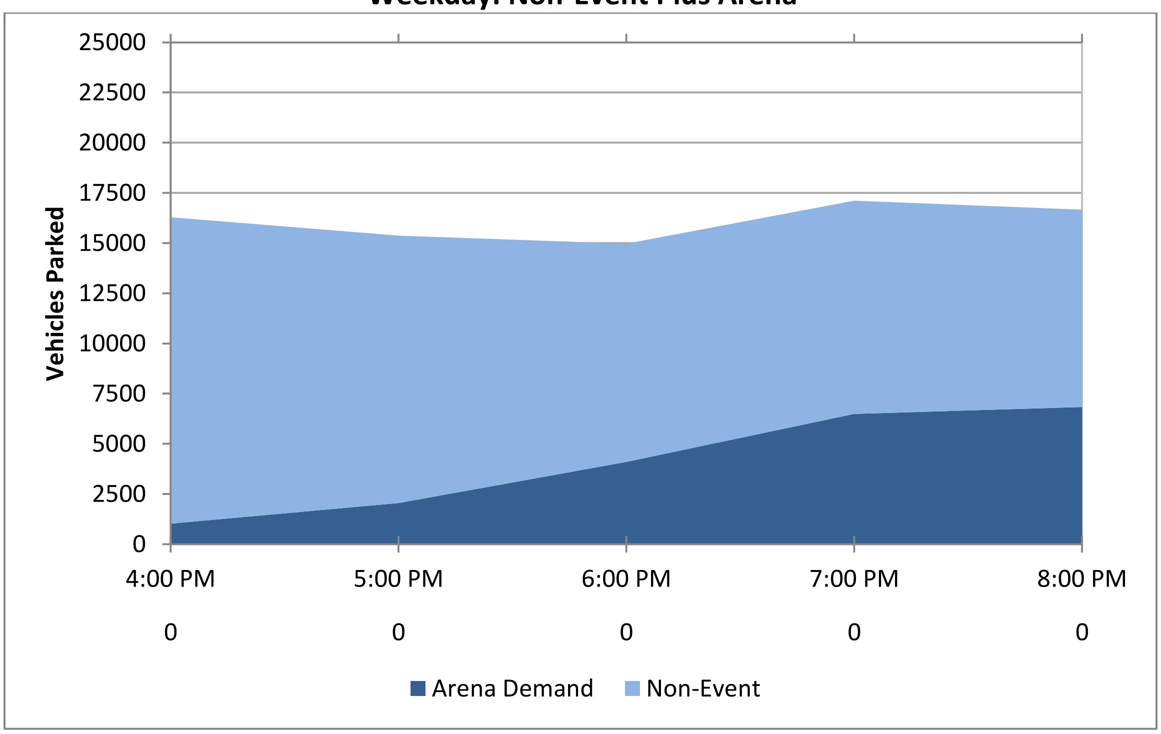


Figure 3–67 Seattle Center Area Hourly Parking Demand – Weekday: Non-Event Plus Arena



Weekend

This same approach was taken for the weekend conditions. Conditions are documented for a Saturday evening, which typically has higher non-event parking demand than occurs on a Sunday. In addition, Saturday evening parking demand is higher than weekday evening conditions. Figure 3–68 illustrates the existing non-event Saturday hourly demand in the study area and shows that parking demand steadily increases between 4:00 and 6:00 PM with arrivals related to evening activities in the study area. Figure 3–69 shows the arena hourly parking demand for a 7:00 PM event start time. As discussed for the weekday, a majority of vehicles associated with the arena would be parked by 7:00 PM (start time) with approximately five percent of the vehicles arriving after the game start. Figure 3–70 illustrates the total (non-event plus arena) hourly parking demand and shows that on weekends the peak occurs at 8:00 PM for a 7:00 PM game.

Figure 3–68 Seattle Center Area Hourly Parking Demand – Weekend: Non-Event

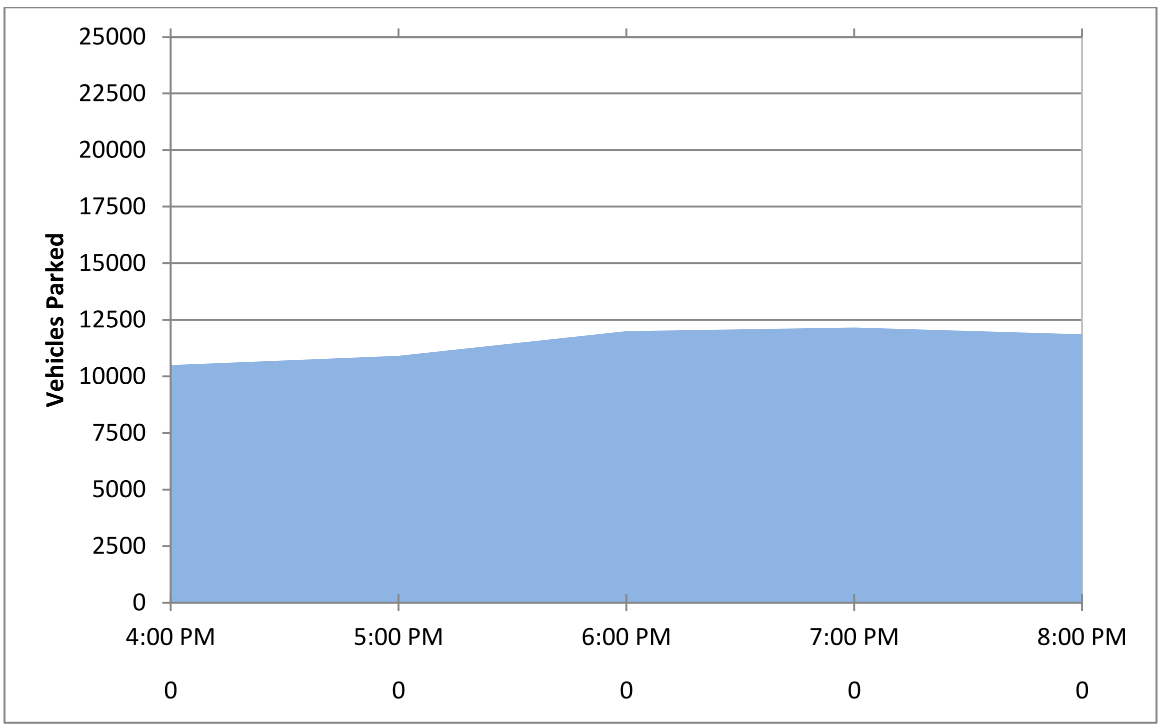


Figure 3–69 Seattle Center Area Hourly Parking Demand – Weekend: Arena Only

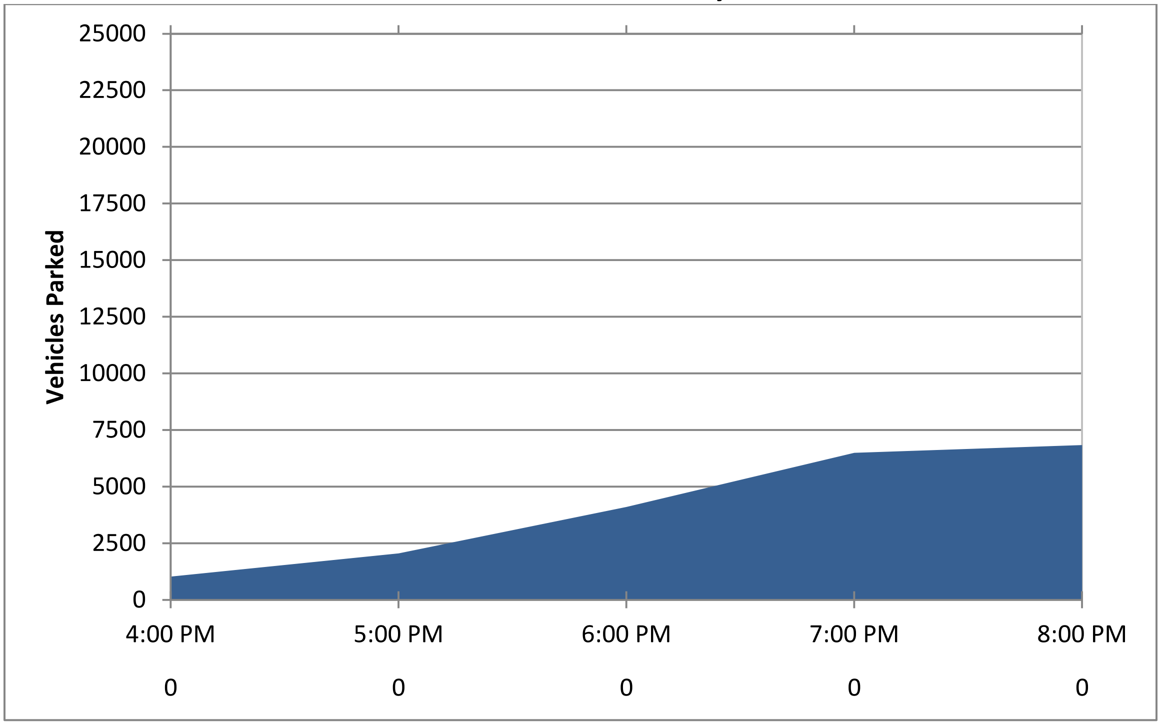
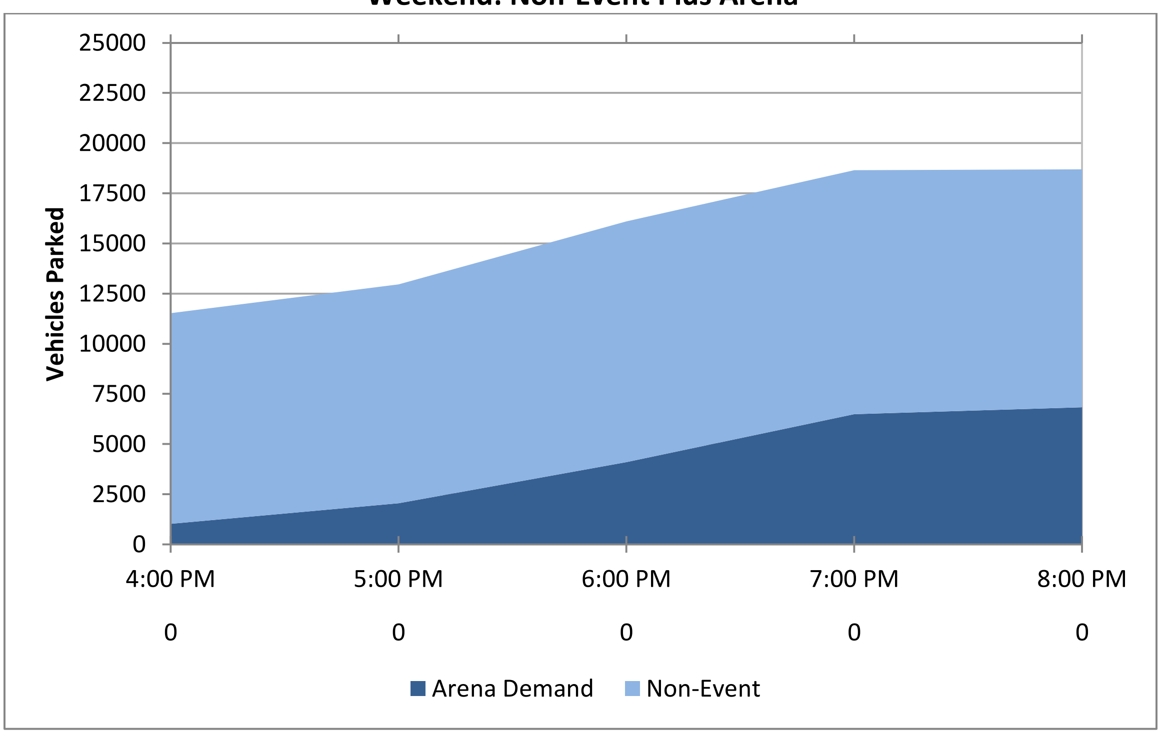


Figure 3–70 Seattle Center Area Hourly Parking Demand – Weekend: Non-Event Plus Arena



Based on the information presented above, the quantified parking impact illustrations focus on:

- Weekday: 7:00 PM (Game Start) conditions
- Weekend: 8:00 PM (One-Hour After Game Start) conditions

3.8.1.3 Parking Supply Assumptions

For the purposes of this analysis, a single parking supply for both weekday and weekend conditions is used to represent physical availability of parking that is generally open to or that could be made available to the public. These include on-street and off-street parking spaces that are available to the general public and would be available for arena event parking. Different from the Stadium District, the Seattle Center study areas generally do not have private customer, employee, or residential parking that would be available for arena events so there appears to be little practical potential that additional private parking spaces would become available.

Like the Stadium District, parking supply varies by time of day and day of the week. On-street parking supply is impacted by time and loading zone restrictions. There are wide variety of time restrictions that apply Monday through Saturday and a mix of both paid and unpaid on-street parking spaces within the study area. For example, Uptown and Belltown have on-street paid parking until 8:00 PM with a four-hour time limit. Uptown Triangle has a 10-hour time limit until 6:00 PM for paid parking areas and a two-hour time limit until 6:00 PM outside the paid areas.

Existing Supply: Parking supply is based on data collected by Transpo Group supplemented by data from the SDOT, and PSRC. Figure 3–71 illustrates the on-and off-street parking within the primary study area.

As describe for the Stadium District study area, drivers utilize on- and off-street parking supply differently and these supplies are managed in different ways. On-street parking supply is often more desirable than off-street parking because there is an opportunity to be in close proximity or even adjacent to a driver’s destination. In addition, on-street hourly parking rates are often less expensive than off-street parking and within the study area on-street parking is free after 6:00 or 8:00 PM (as well as all day Sunday). From 8:00 AM to 6:00 / 8:00 PM when on-street parking has time restrictions (e.g., one- to two-hour time limits), it is used for short-term parking; however, lifting time limits at event start times causes long-term use by event attendees. Given the convenient location and limited cost, on-street parking typically fills first during Seattle Center events, which results in limited short-term parking for adjacent businesses.

Off-street parking is generally provided for long-term use. Off-street parking in the Seattle Center area is typically easier to locate during an event given that there is more than double the supply.

There are approximately 9,200 parking spaces located within the primary study area and an additional 23,600 spaces within the expanded study area for a total of 32,800 spaces. The primary study area has approximately 2,400 on-street and 6,800 off-street spaces while the expanded study area has approximately 5,500 on-street and 18,100 off-street spaces.

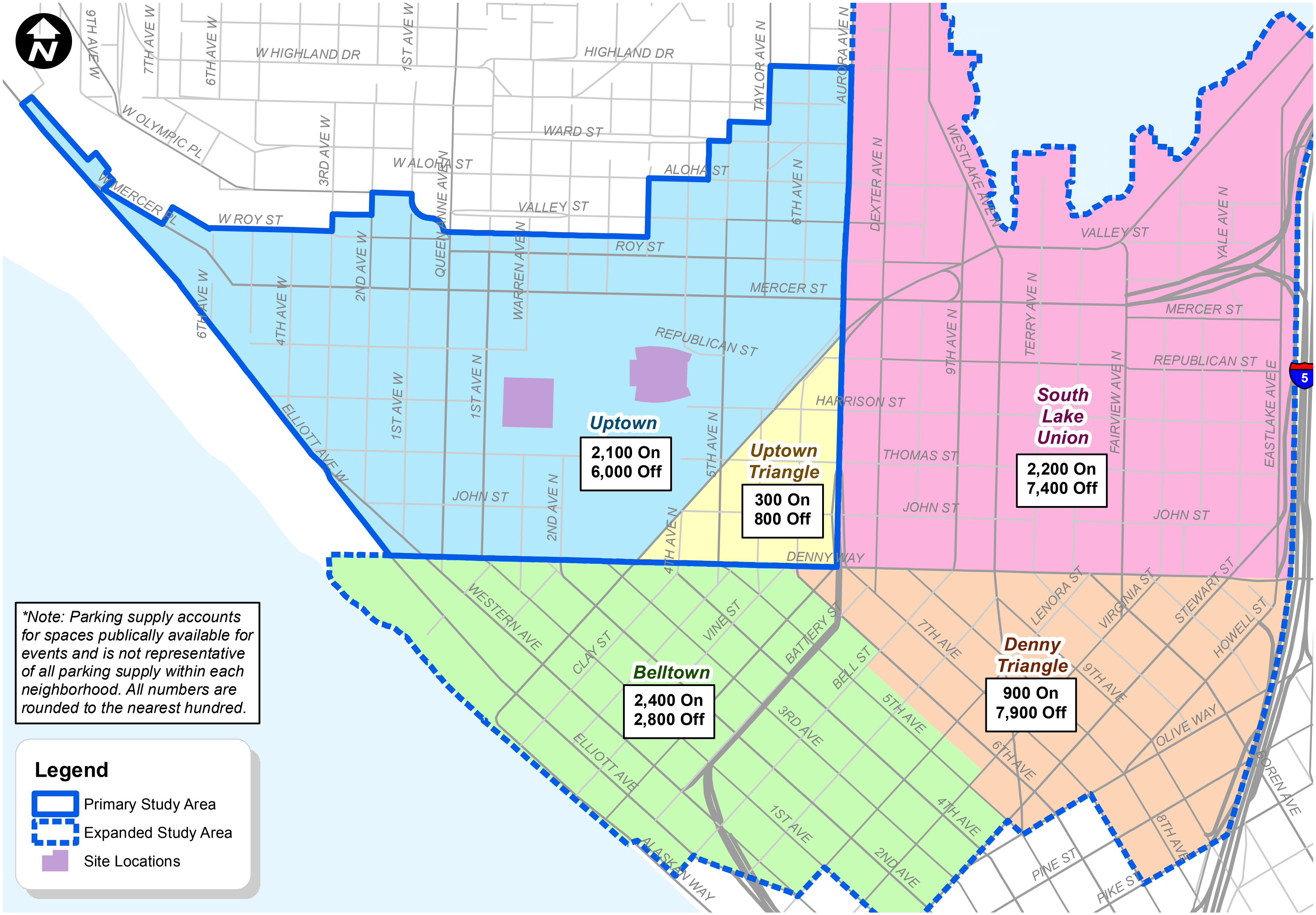
No Action Supply: The City provided information on future pipeline development that would likely be constructed and occupied by 2018. There are over seven million square-feet (7,000,000 square-feet) of redevelopment planned in association with nearly 20 development projects within the study area. The majority are located within the SLU and Denny Triangle neighborhoods. A substantial proportion of the planned development is office use.

Developments most proximate to the Seattle Center would be a hotel / residential development along John Street near 5th Avenue N. and the Experience Music Project warehouse / metal shop; none of which would likely provide event parking. Based on a review of pipeline projects, over 8,000 additional parking spaces will be developed with over 65 percent of these spaces located in the SLU neighborhood. Even if all residential and retail parking were reserved, a substantial portion of the office parking would likely be available. However, to be conservative, no additional parking supply was assumed under the No Action Alternative.

Action Alternative Supply: Development of Alternatives 4 and 5 would not result in loss of parking within the Seattle Center study area. Parking supply was assumed to be consistent with existing conditions with a total of 32,800 parking spaces within the study area.

The following sections (Affected Environment, Impacts of No Action Alternative, and Impacts of Alternatives 4 and 5) describe the existing and 2018 parking demand for the primary and expanded study areas. No additional analysis is provided for the 2030 parking conditions as overall analysis and conclusions regarding parking would be consistent with 2018. Accurately forecasting long-term parking demand is difficult given the uncertainty of area wide development and economic drivers. In addition, changes to parking policies relate to TDM may continue to evolve.

With the continued investments in transit (i.e., light rail, streetcar, etc.) by 2030, it is anticipated that there would be continued mode shift from auto to transit. This would result in lower overall parking demand rates associated with existing and future development. Given this, overall parking impacts for Cases K1, K2, M1, and M2 may be less than described herein for 2018 depending on the amount and type of redevelopment that occurs.



Seattle Center Area Existing On- and Off-Street Event Parking Supply

FIGURE 3-71

Seattle Arena

transpoGROUP

3.8.2 Affected Environment

Parking demand is based on data collected by Transpo Group supplemented by data from the SDOT and PSRC. Different from the Stadium District, no specific event-day parking demand was collected since events (i.e., performance, recreational sports, etc.) occur at the Seattle Center area on a daily basis. The following describes the existing weekday and weekend parking demand within the primary and expanded study areas.

3.8.2.1 Weekday Occupancy

Figure 3–72 and Figure 3–73 illustrate weekday parking occupancy within the primary and expanded study areas.

Figure 3–72 Seattle Center Area Parking Occupancy – Weekday: Existing Non-Event (Primary Study Area)

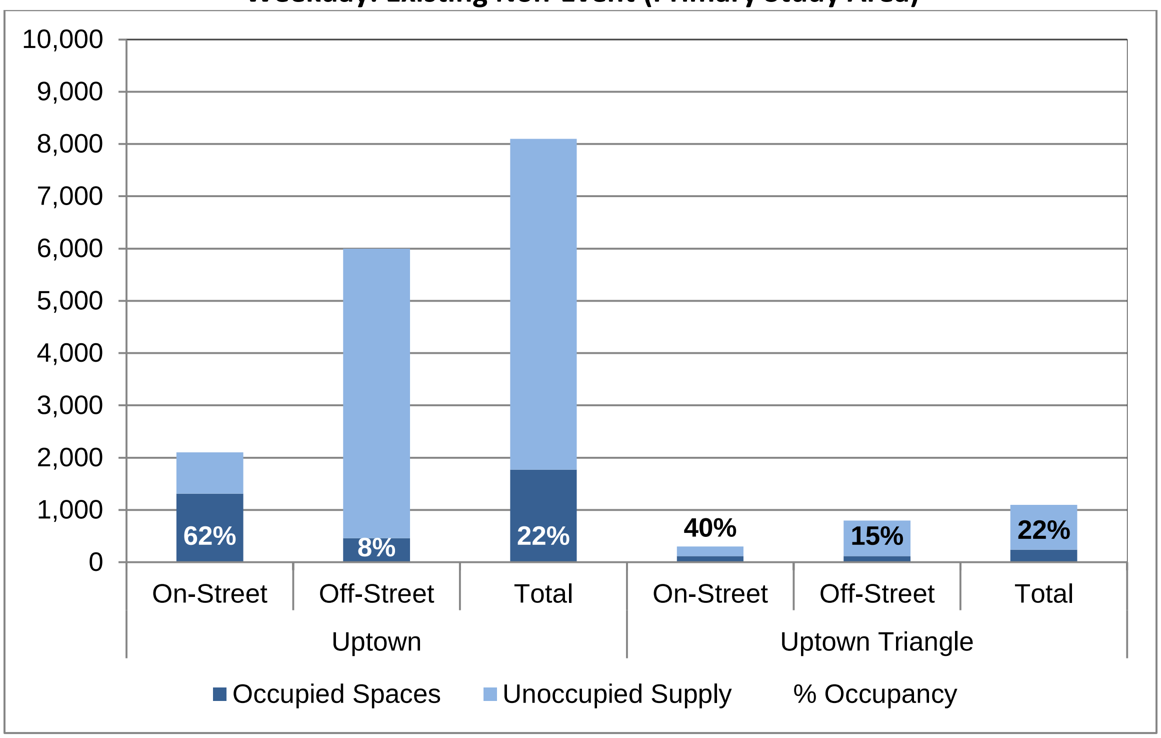
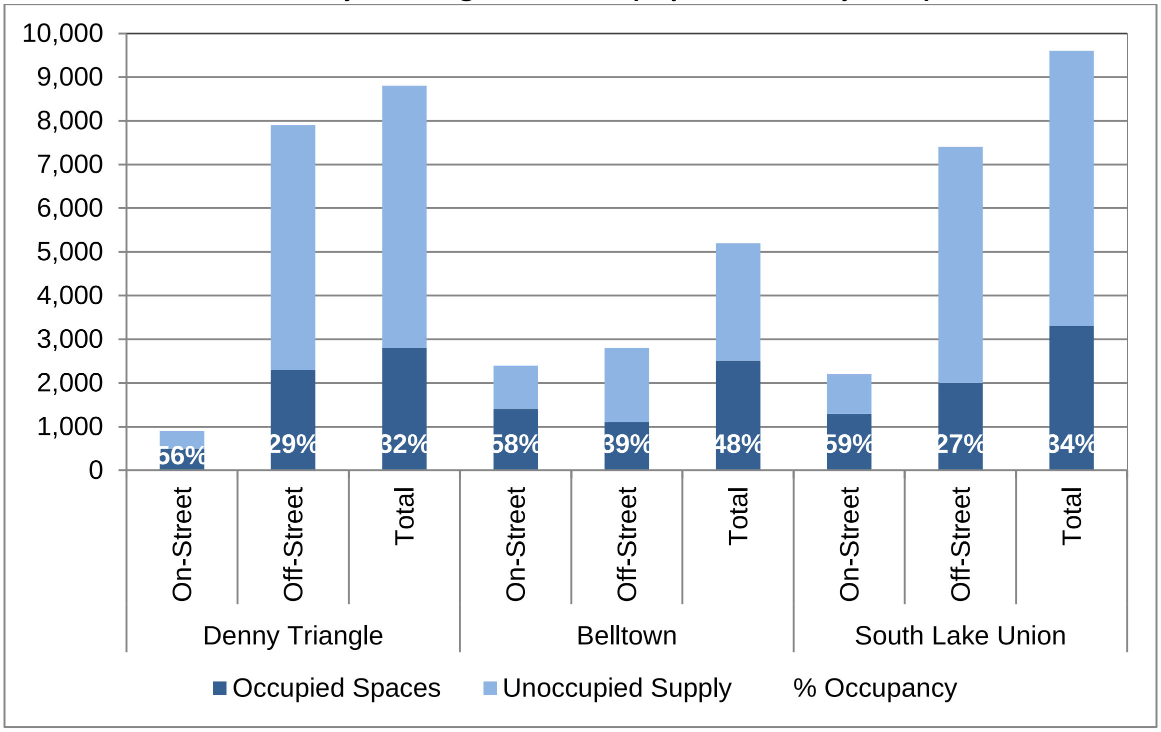


Figure 3–73 Seattle Center Area Parking Occupancy – Weekday: Existing Non-Event (Expanded Study Area)



It becomes difficult to locate parking spaces within an area when occupancies are 85 to 90 percent and generally areas with occupancies at that level are considered "full." As shown in the figures above:

- Within the primary study area, on-street parking is more utilized than off-street parking; however, at these occupancy levels, parking utilization would not be considered full for either location.
- The expanded study area parking utilization is similar to the primary study area with on-street parking more utilization than off-street, but with availability both on-and off-street.
- Field observations showed that immediately proximate to restaurant and retail uses within both the primary and expanded study area on-street parking is difficult to locate.

3.8.2.2 Weekend Occupancy

Figure 3–74 and Figure 3–75 illustrate weekend (Saturday) parking occupancy within the primary and expanded study areas.

Figure 3–74 Seattle Center Area Parking Occupancy – Weekend: Existing Non-Event (Primary Study Area)

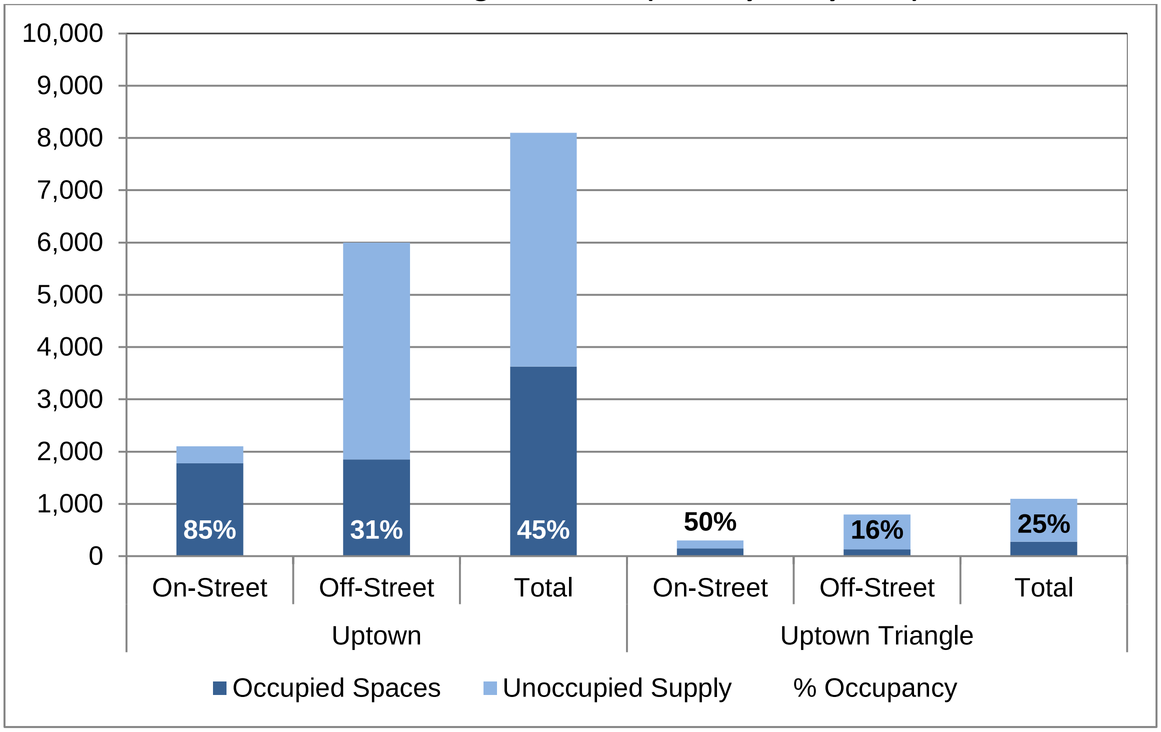
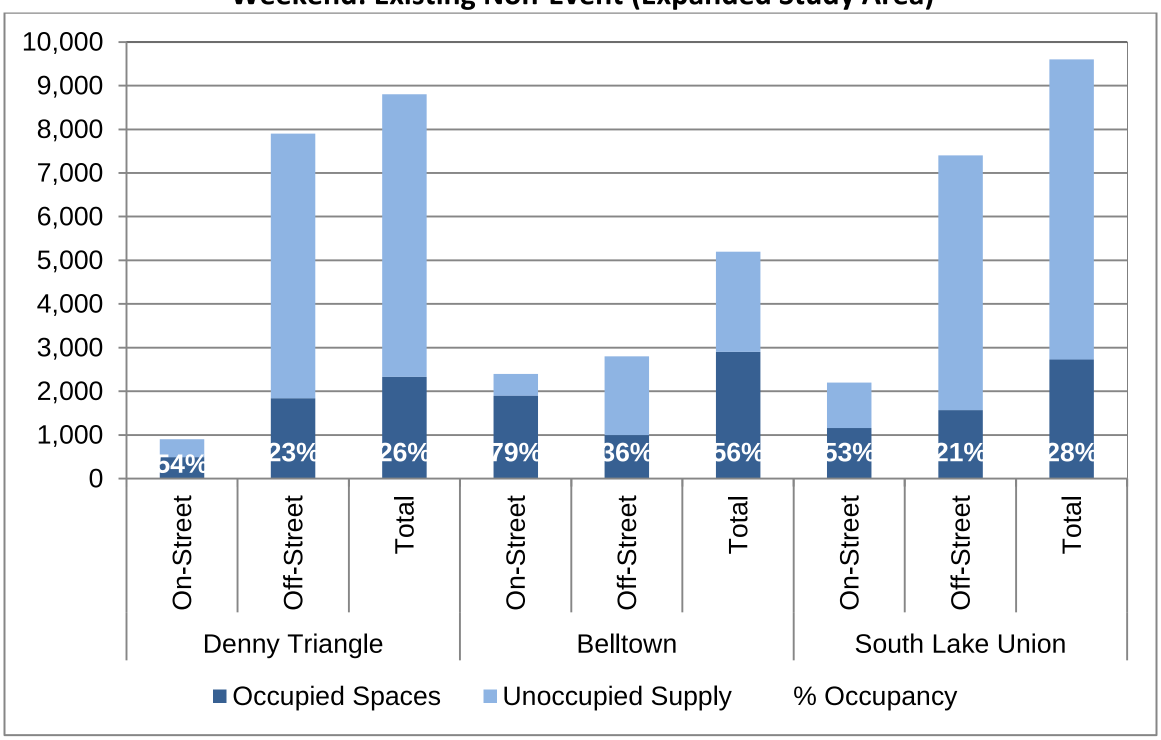


Figure 3–75 Seattle Center Area Parking Occupancy – Weekend: Existing Non-Event (Expanded Study Area)



As shown in the figures above:

- Weekend evening activity within the primary study area is considerably higher than weekday evenings especially in the Uptown neighborhood, which is most proximate to restaurants and the Mercer Street arts corridor.
- On-street parking utilization within Uptown is 85 percent, which is an indicator that drivers have difficulty locating this type of parking without excess circulation.
- Within the expanded study area, weekend characteristics are similar to the weekday conditions except in Belltown where on-street parking utilization increases by approximately 20 percent, which is attributable to the restaurant and bars located within the neighborhood.
- Consistent with weekday conditions, field observations showed that immediately proximate to restaurant and retail uses within both the primary and expanded study area on-street parking is more difficult to locate.

3.8.3 Impacts of No Action Alternative

The No Action conditions provides for a basis for comparing impacts of the proposal related to on- and off-street parking supply. However, projecting specifically where someone would park is difficult because the location depends on a variety of factors such as duration of stay, proximity to use, cost of parking, etc. Given this, the review of future conditions considers the parking supply as a whole rather than separate consideration of on- and off-street parking.

3.8.3.1 Demand Forecasts

As described in the methodology portion of this section, the City provided information on future pipeline development that would likely be constructed and occupied by 2018. Based on the pipeline developments identified in the study area, evening parking demand increases are anticipated to be small compared to the added supply. As a conservative estimate of background parking and consistent with the Stadium District evaluation, the existing parking demand was increased by 10 percent on the weekday and 5 percent on the weekend for the overall study area. Parking demand in specific neighborhoods within the primary and expanded study areas reflect higher increases for Denny Triangle and SLU where most of the pipeline development would occur.

For the No Action Case K1, K2, M1, and M2, parking demand for the KeyArena and Memorial Stadium was added to the background conditions. It was assumed that there was a 7:00 PM start time for events at these venues and that the arrival curve would be consistent with that described on Figure 1–5, Event Traffic Arrival Patterns (see Introduction), with 95 percent arrival by 7:00 PM and 100 percent by 8:00 PM. The distribution of parking among neighborhoods assumed 80 percent within the primary study area, which is closest to the venues and the remaining 20 percent within the expanded study area. The No Action event case parking demand was determined by adding the KeyArena and Memorial Stadium parking demand to the background parking demand with no adjustments or reductions in non-event demand. As described in relation to traffic operations this likely results in an overestimate of actual future demands, but reflects a conservative approach.

Weekday Occupancy

Figure 3–76through Figure 3–81 illustrate weekday No Action Cases K1, M1, and K2/M2 parking occupancy within the primary and expanded study areas. Case K2 and M2 are the same relative to the No Action; therefore, these are presented together using the same bar charts.

Figure 3–76 Seattle Center Area Parking Occupancy – Weekday: No Action Case K1 (Primary Study Area)

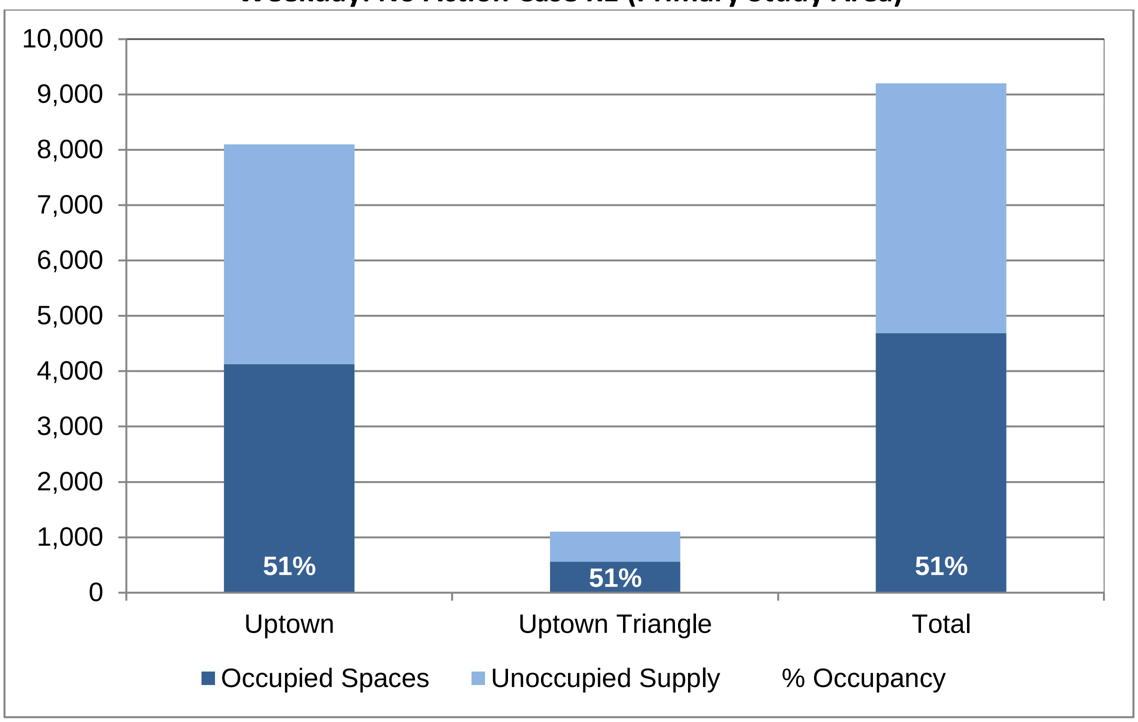


Figure 3–77 Seattle Center Area Parking Occupancy – Weekday: No Action Case K1 (Expanded Study Area)

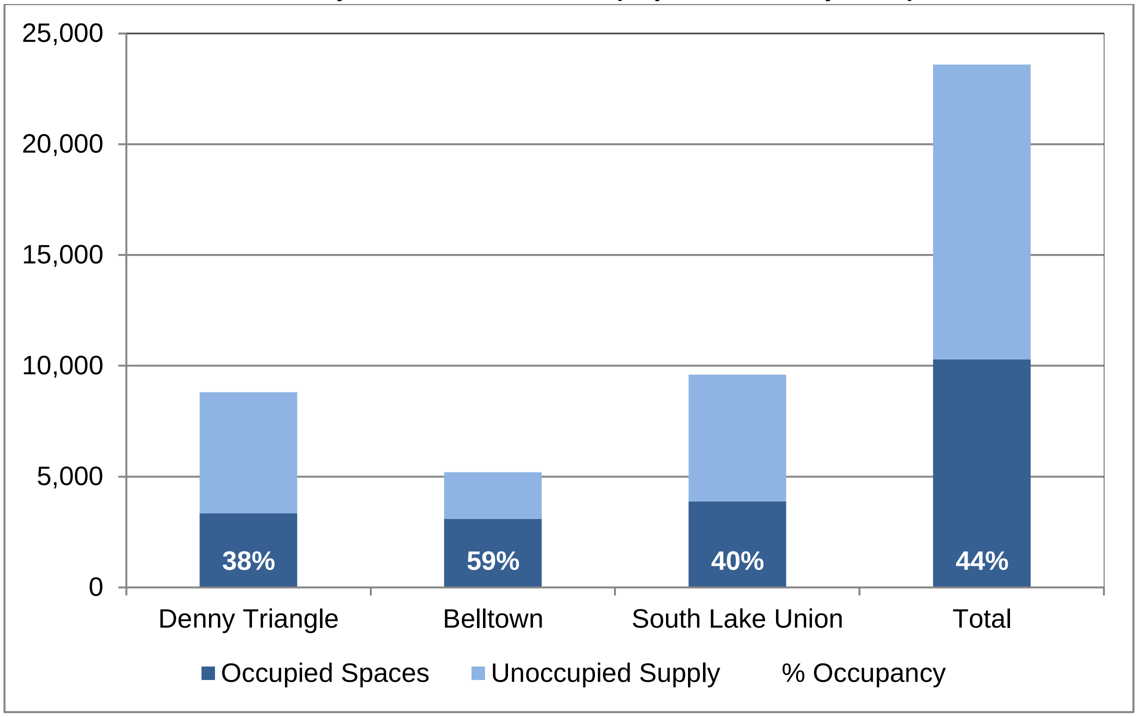


Figure 3–78 Seattle Center Area Parking Occupancy – Weekday: No Action Case M1 (Primary Study Area)

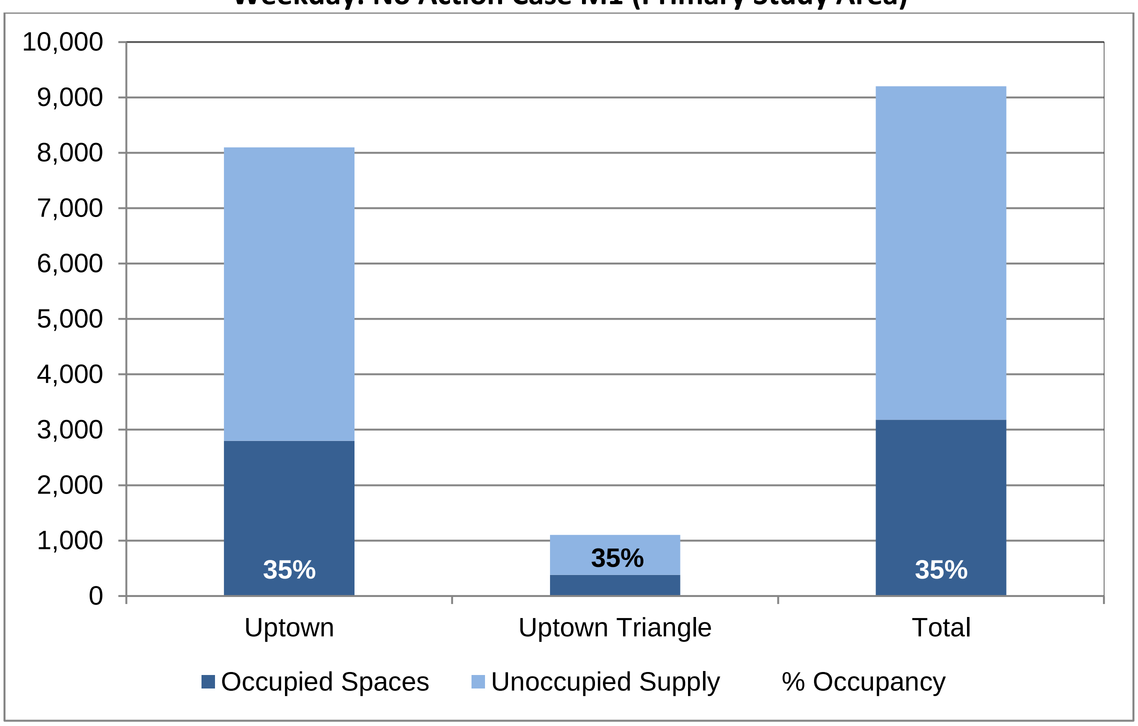


Figure 3–79 Seattle Center Area Parking Occupancy – Weekday: No Action Case M1 (Expanded Study Area)

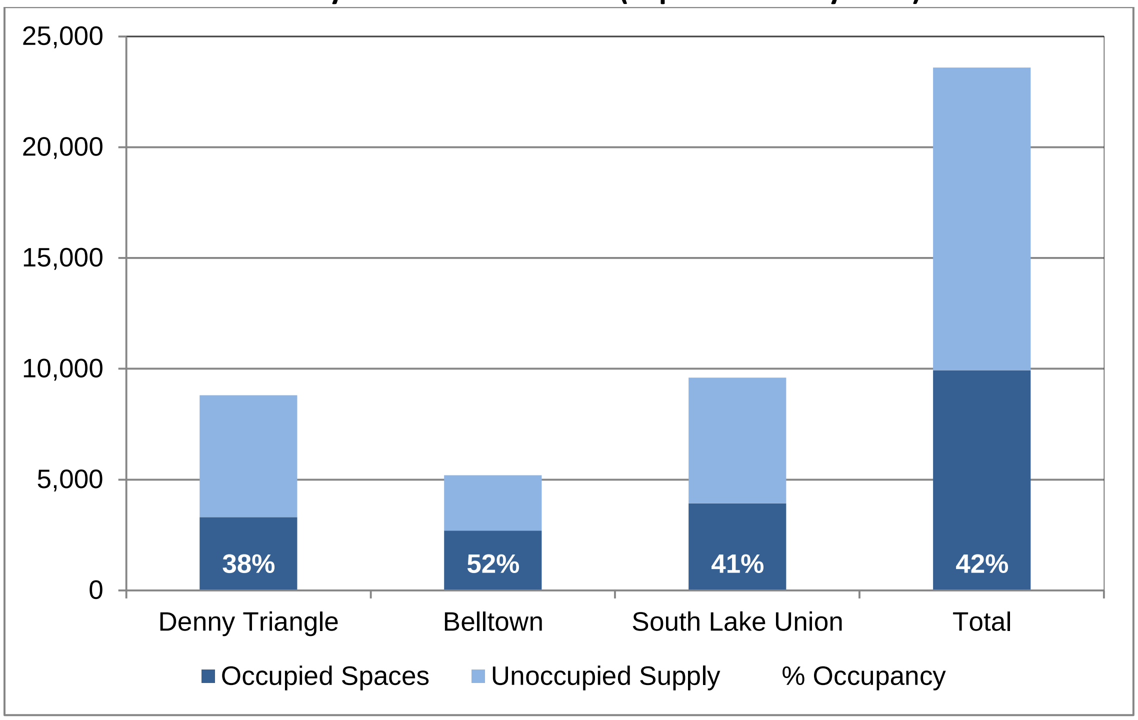


Figure 3–80 Seattle Center Area Parking Occupancy – Weekday: No Action Case M2/K2 (Primary Study Area)

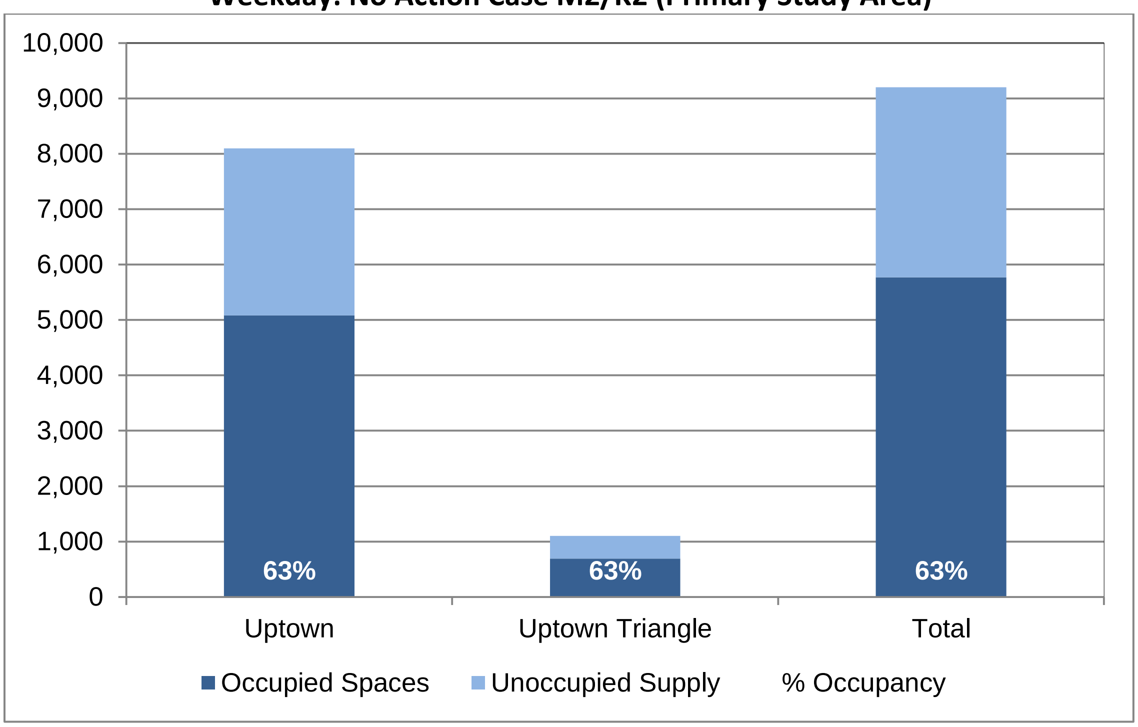
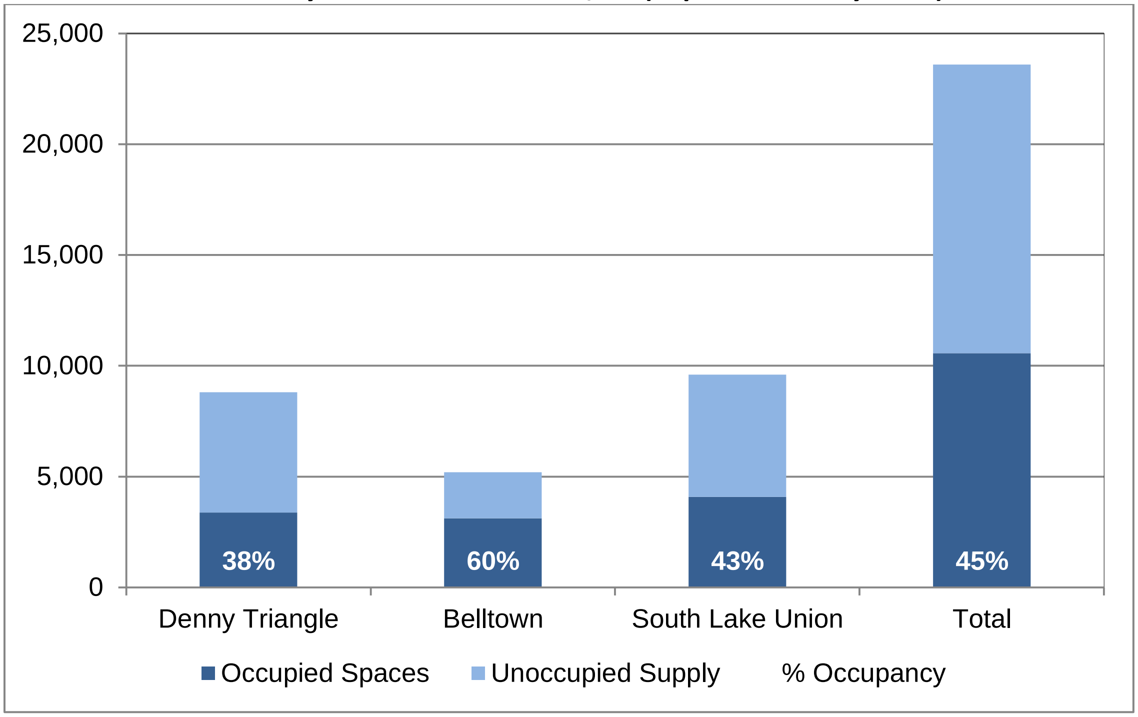


Figure 3–81 Seattle Center Area Parking Occupancy – Weekday: No Action Case M2/K2 (Expanded Study Area)



As shown in the figures above:

- The No Action occupancy for each of the cases are higher than existing conditions both in the primary and expanded studies areas due to the assumed increases in parking demand caused by anticipated development as well as demand associated with events at KeyArena and Memorial Stadium.
- A comparison of case K1 and M1 shows that utilization is about 15 percent less in the study area with No Action Case M1 given the smaller event (i.e., 5,000 attendees) at Memorial Stadium as compared to KeyArena (i.e., 12,000 attendees).
- For a single event, Case K1 or M1 (i.e., an event at KeyArena or Memorial Stadium), all of the anticipated parking demand could be fully accommodated within the primary study area.
- With No Action Case K2/M2, representing a dual event, parking occupancy increases; however, there would still be availability within both the primary and expanded study areas. In addition, all of the parking demand could be fully accommodated within the primary study area.
- Overall primary study area occupancies are calculated to be approximately 35 to 60 percent for the No Action event cases, which would allow for some additional parking.

It is likely that attendees of events at KeyArena or Memorial Stadium would desire to park close to the venues. Based on the review of existing conditions, on-street parking would likely be difficult to find close to the venues; however, off-street parking is more readily accessible and the Seattle Center area has several large garages in close proximity of both venues.

3.8.3.2 Weekend Occupancy

Figure 3–82 through Figure 3–87 illustrate weekend No Action Cases K1, M1, and K2/M2 parking occupancy within the primary and expanded study areas.

Figure 3–82 Seattle Center Area Parking Occupancy – Weekend: No Action Case K1 (Primary Study Area)

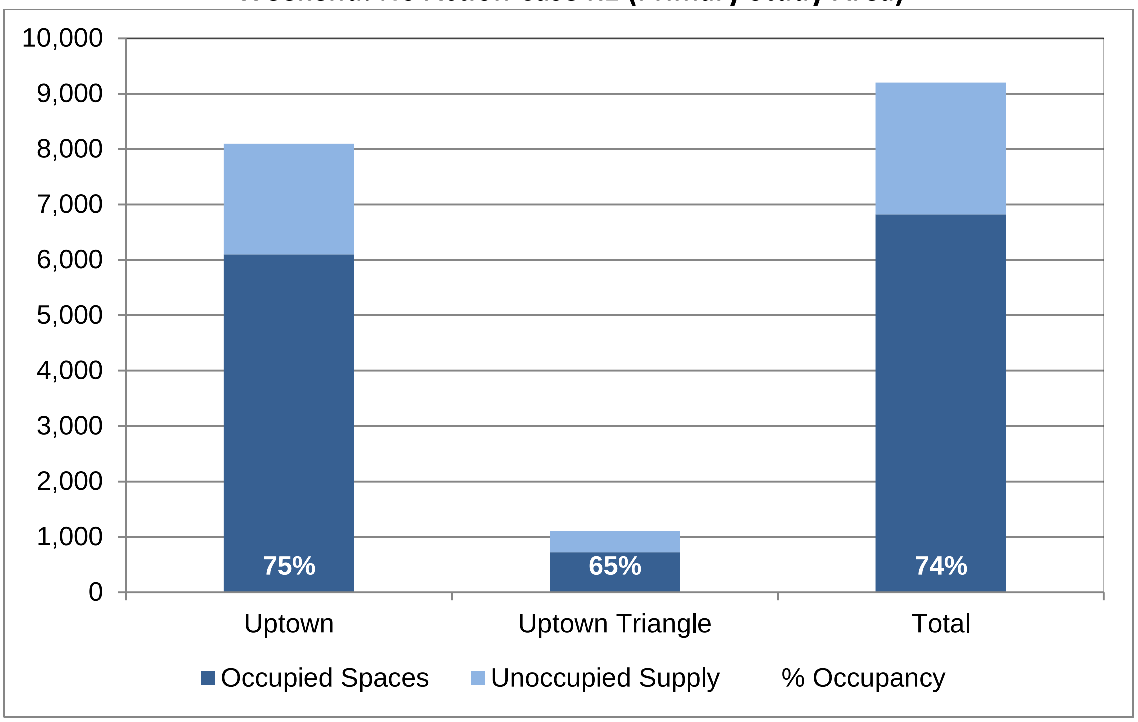


Figure 3–83 Seattle Center Area Parking Occupancy – Weekend: No Action Case K1 (Expanded Study Area)

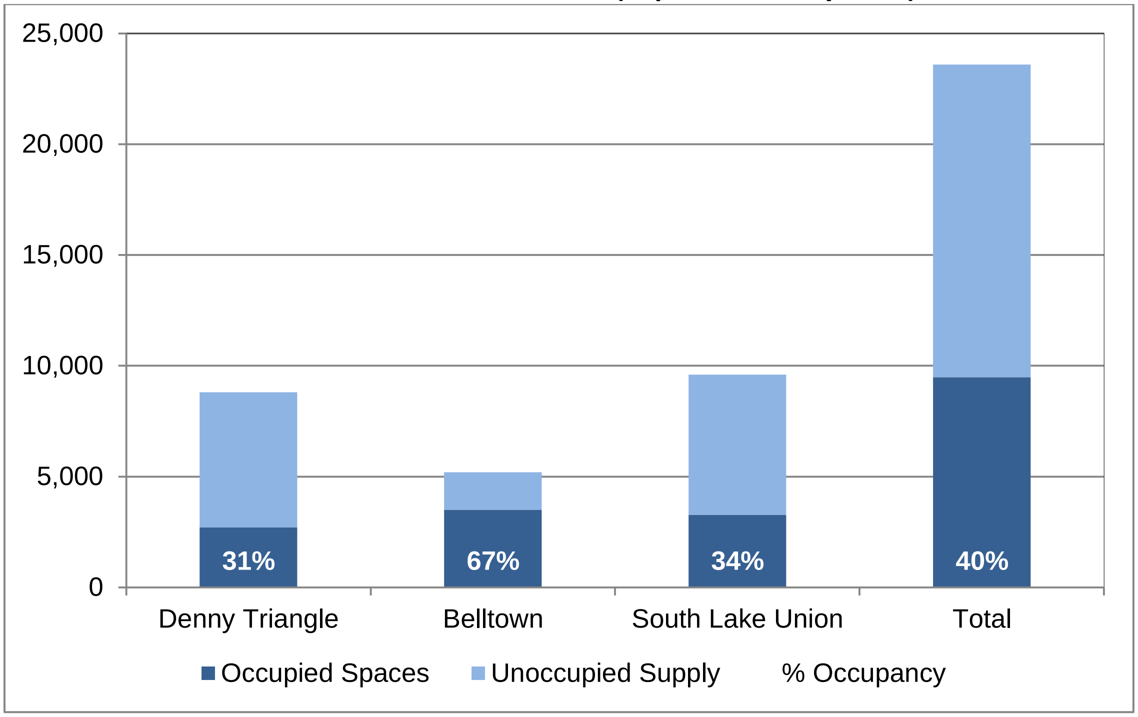


Figure 3–84 Seattle Center Area Parking Occupancy – Weekend: No Action Case M1 (Primary Study Area)

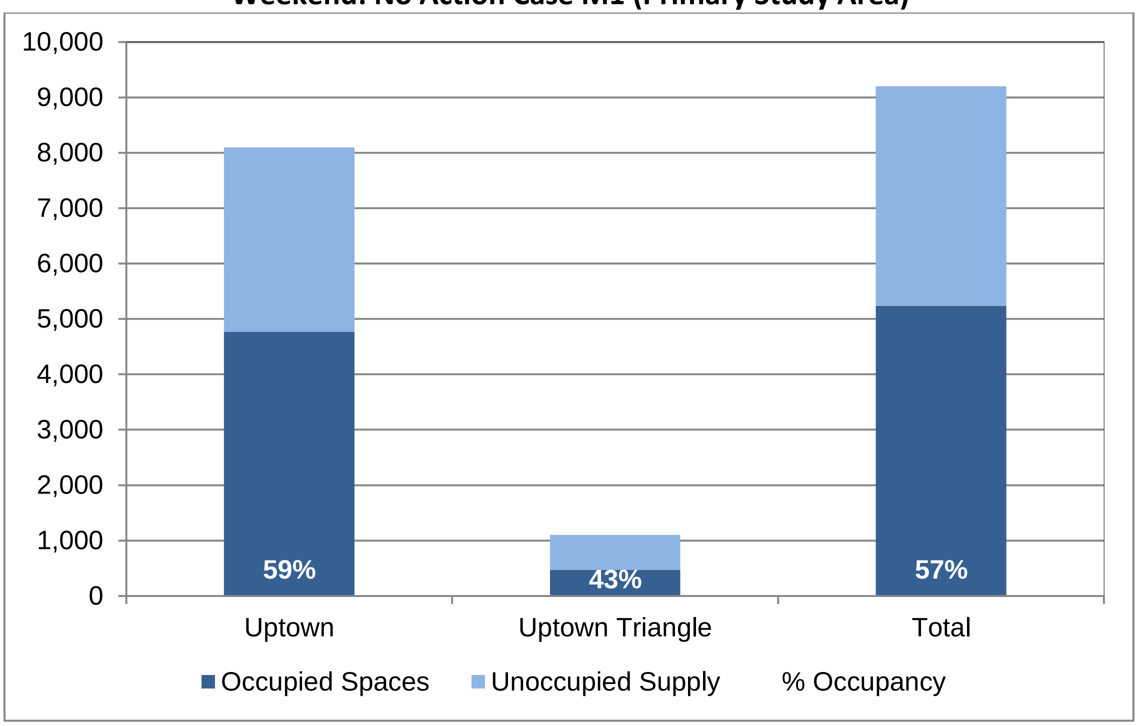


Figure 3–85 Seattle Center Area Parking Occupancy – Weekend: No Action Case M1 (Expanded Study Area)

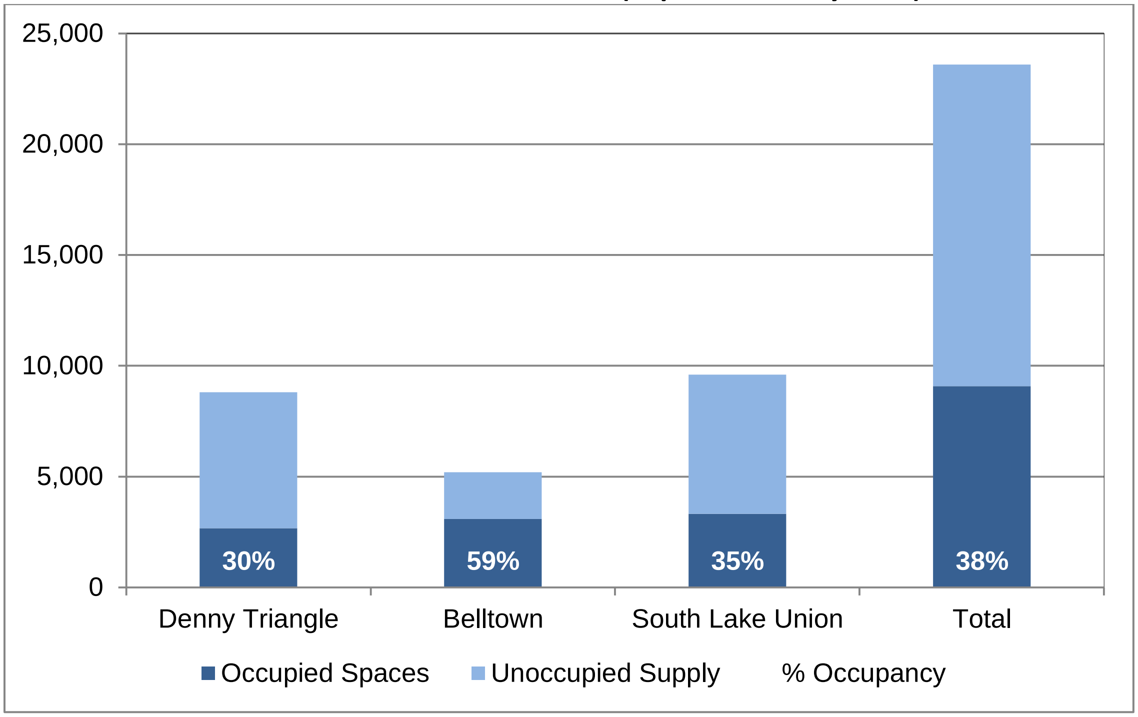


Figure 3–86 Seattle Center Area Parking Occupancy – Weekend: No Action Case M2/K2 (Primary Study Area)

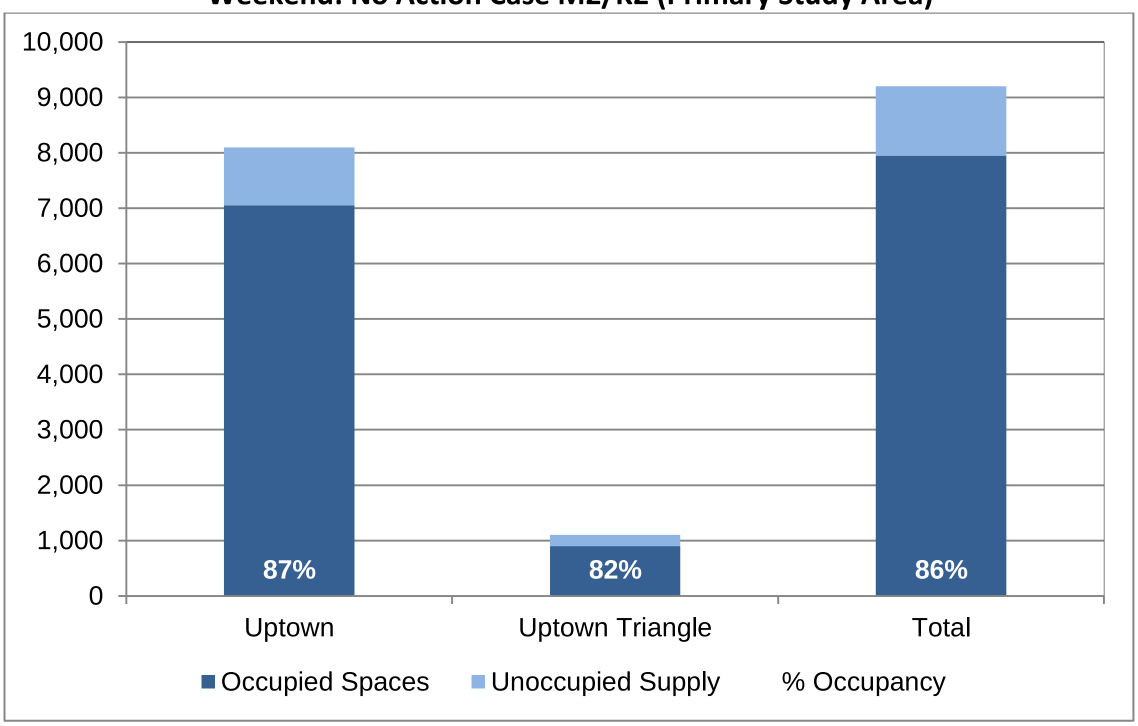
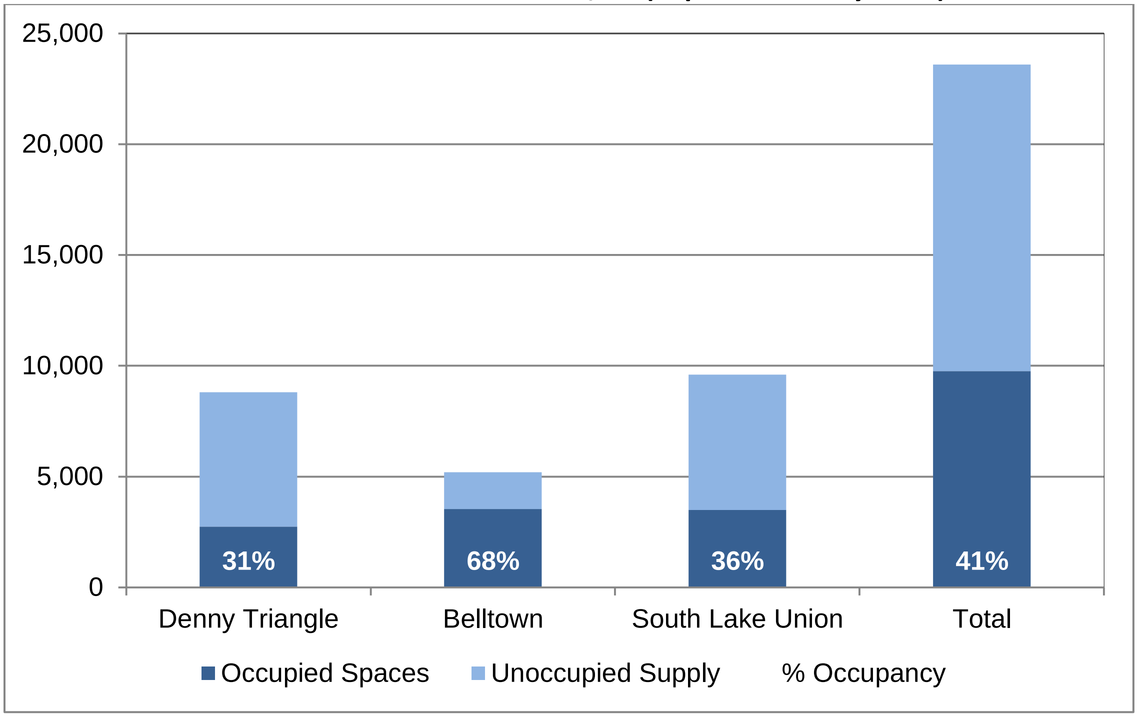


Figure 3–87 Seattle Center Area Parking Occupancy – Weekend: No Action Case M2/K2 (Expanded Study Area)



As shown in the figures above:

- As described in existing conditions, weekend utilization is higher in the primary study area as compared to weekday. Given the higher baseline, the No Action event cases have occupancies ranging between 60 and 85 percent.
- For a single event, Case K1 or M1 (i.e., an event at KeyArena or Memorial Stadium), all of the anticipated parking demand could be fully accommodated within the primary study area.
- With No Action Case K2/M2, representing a dual event, parking occupancy increases and the primary study area is essentially full. Although the dual event could be fully accommodated in the study area, this would result in occupancy of over 95 percent and finding parking would be increasingly difficult for all users.
- The expanded study area occupancy would be approximately 40 percent for No Action event cases indicating approximately 60 percent of the spaces would be available for arena use provided there are pedestrian connections and attendees are willing to walk a longer distance.

As discussed previously, attendees of events at KeyArena or Memorial Stadium would likely desire to parking close to the venues. Based on the review of existing conditions, on-street parking would likely be difficult to find close to the venues; however, off-street parking is more readily accessible and the Seattle Center area has several large garages in close proximity of both venues.

3.8.4 Impacts of Alternative 4

Parking impacts related to construction would be minimized by providing off-street parking, securing parking in near-by garages, as well as encouraging use of alternative modes. It is anticipated that parking impacts related to construction would be less than the 20,000-seat arena. In addition, construction activities could result in the need to close on-street parking adjacent to the site. These closures would be coordinated with SDOT and appropriate notice and signs would be provided.

Alternative 4 is compared to the No Action Alternative to identify parking impacts of an arena development on the KeyArena site. No additional parking supply is proposed as part of the development of an arena at this location. Should an arena go forward at this location, code-required parking would have to be satisfied either through added supply or parking agreements.

3.8.4.1 Arena Demand Forecasts

Alternative 4 parking demand represents an arena event with an attendance of 20,000 people, which represents a net increase of 8,000 attendees as it relates to the KeyArena site (see Table 1-12 in the event transportation demands section of this report). The arrivals patterns are consistent with the Stadium District site and the event arrival curve presented earlier. With a 7:00 PM game start, 95 percent of the attendee arrivals occur by 7:00 PM and 100 percent by 8:00 PM. Similar to the No Action, 80 percent of the parking was assumed within the primary study area, which is closest to the venues and the remaining 20 percent within the expanded study area or CBD. For the multi-event scenario (Cases K2), the parking demand of the combined events exceeds the parking supply within the primary study area; therefore, for this case, it is assumed parking would occur within the closer neighborhoods until an approximately 90 percent utilization is reached and the remaining parking would occur within the expanded study area. The total Alternative 4 parking demand for each event case is determine by adding the arena parking demand to the No Action Case K1 and K2. A simple layering process was used with no adjustments or reductions in non-event demand, as described earlier.

3.8.4.2 Weekday Occupancy

Figure 3–88 through Figure 3–91 provide a comparison between the No Action and Alternative 4 event cases within the primary and expanded study areas.

Figure 3–88 Seattle Center Area Parking Occupancy – Weekday: No Action and Alternative 4 Case K1 (Primary Study Area)

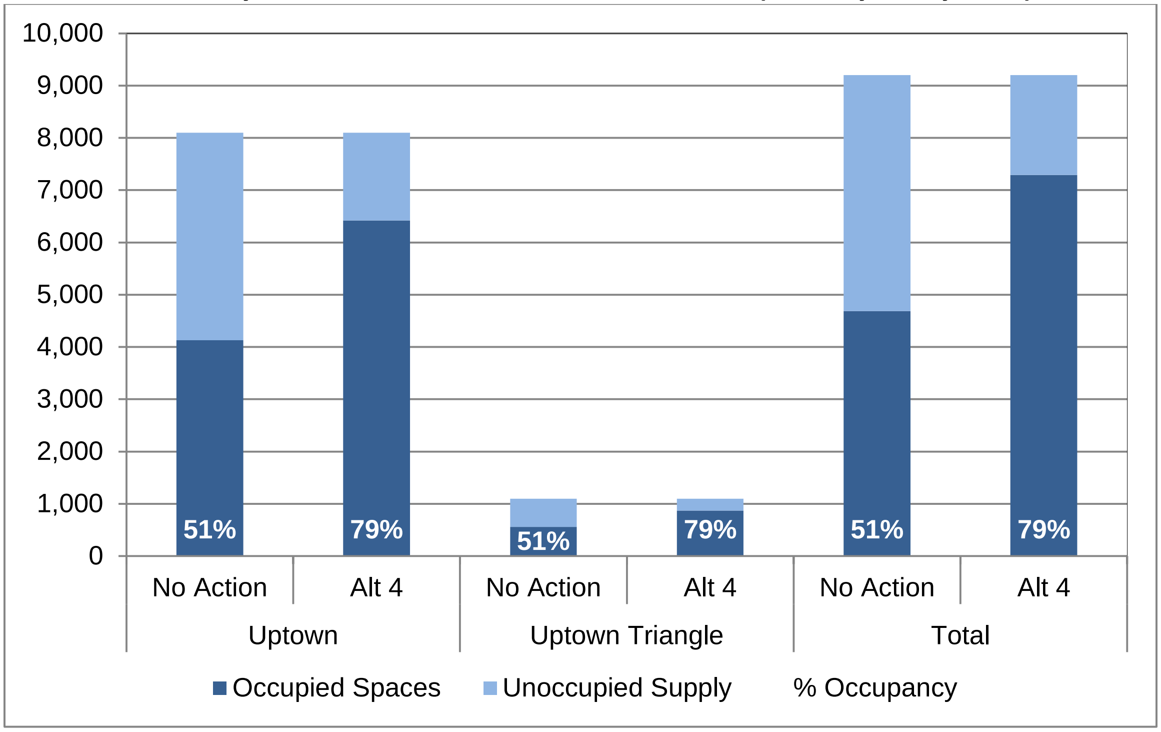


Figure 3–89 Seattle Center Area Parking Occupancy – Weekday: No Action and Alternative 4 Case K1 (Expanded Study Area)

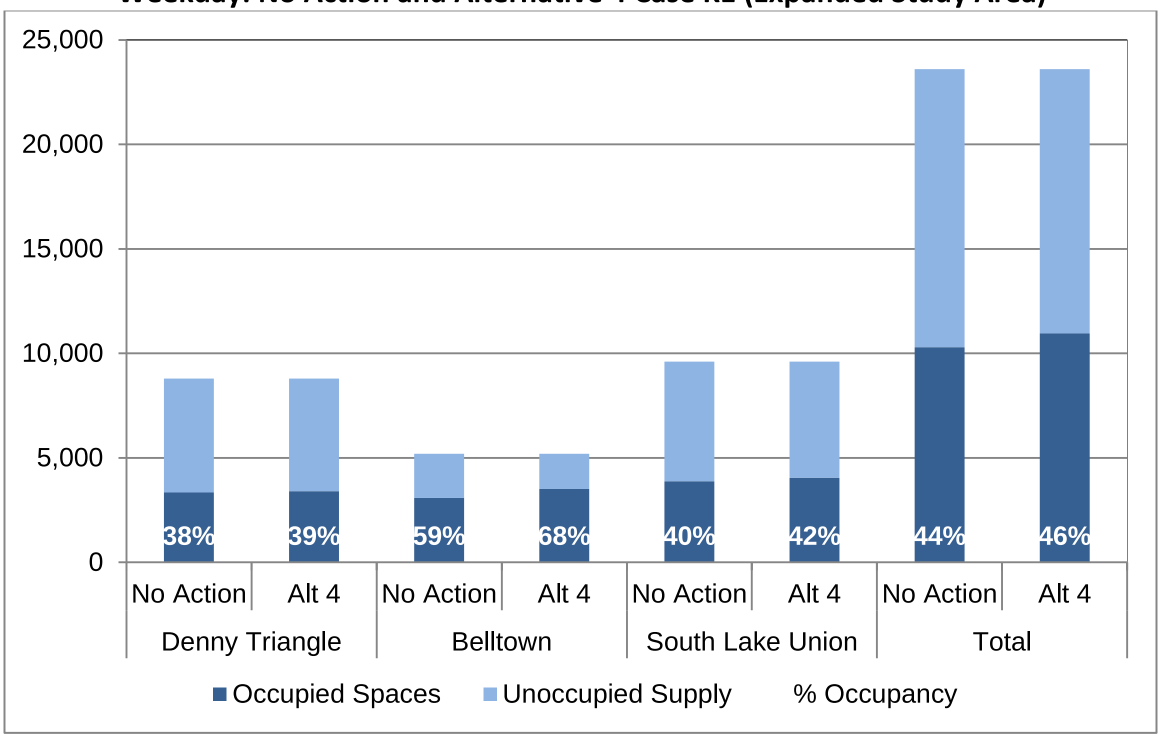


Figure 3–90 Seattle Center Area Parking Occupancy – Weekday: No Action and Alternative 4 Case K2 (Primary Study Area)

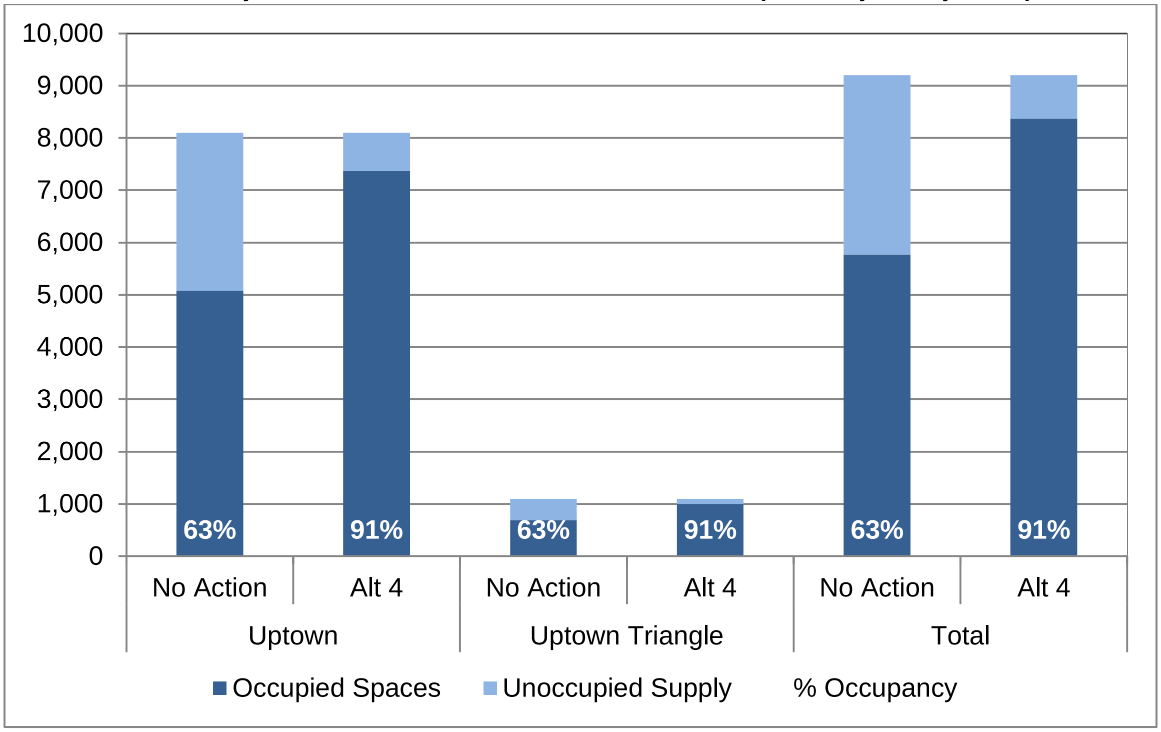
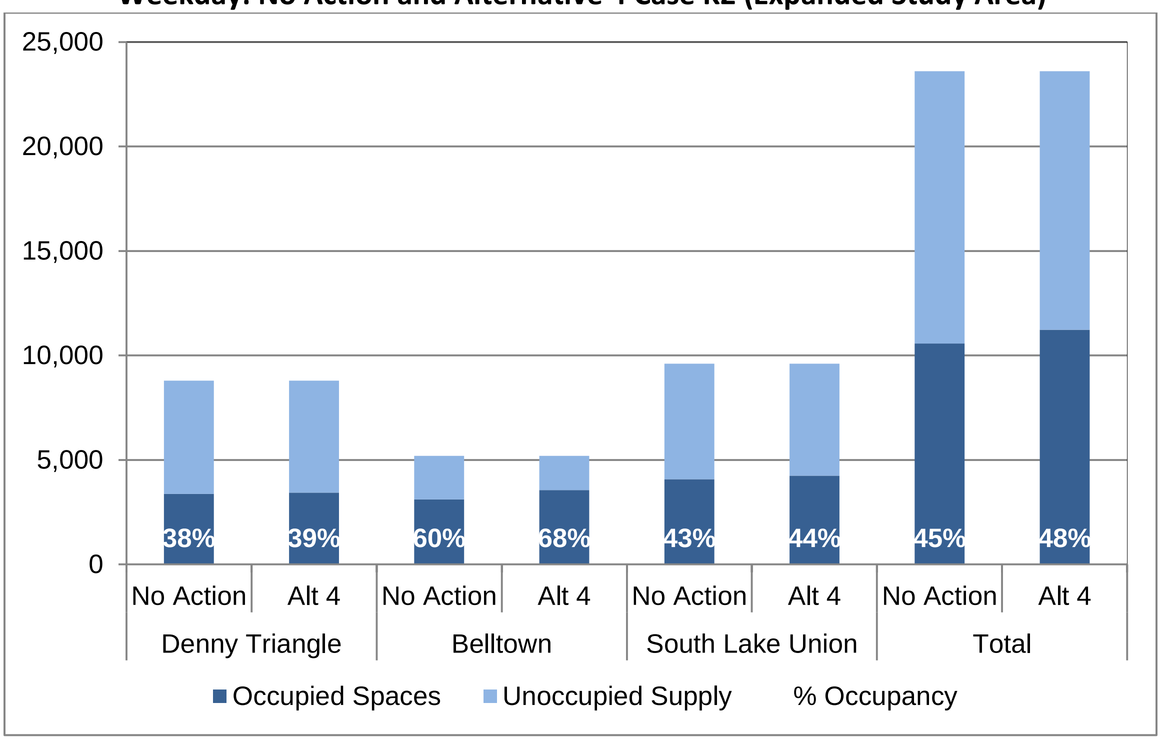


Figure 3–91 Seattle Center Area Parking Occupancy – Weekday: No Action and Alternative 4 Case K2 (Expanded Study Area)



As shown on the figures above:

- Alternative 4 Case K1, with the arena only, would result in an almost 30 percent increase in parking occupancy within the primary study area.
- For a multi-event scenario, Alternative 4 Case K2, the primary study area would become full and additional demand would spill into the expanded study area. The results show that the expanded study area could accommodate additional parking.

Given the proximity to the KeyArena site, the portion of the expanded study area in Belltown may be more desirable than the SLU and Denny Triangle neighborhoods for accommodating parking. As discussed in the methodology section, the parking supply in SLU is anticipated to increase by over 5,000 spaces. Therefore, parking in SLU could become more desirable as pedestrian connections to this neighborhood are constructed.

3.8.4.3 Weekend Occupancy

Figure 3–92 through Figure 3–95 illustrate weekend Case K1 and K2 parking occupancy within the primary and expanded study areas.

Figure 3–92 Seattle Center Area Parking Occupancy – Weekend: No Action and Alternative 4 Case K1 (Primary Study Area)

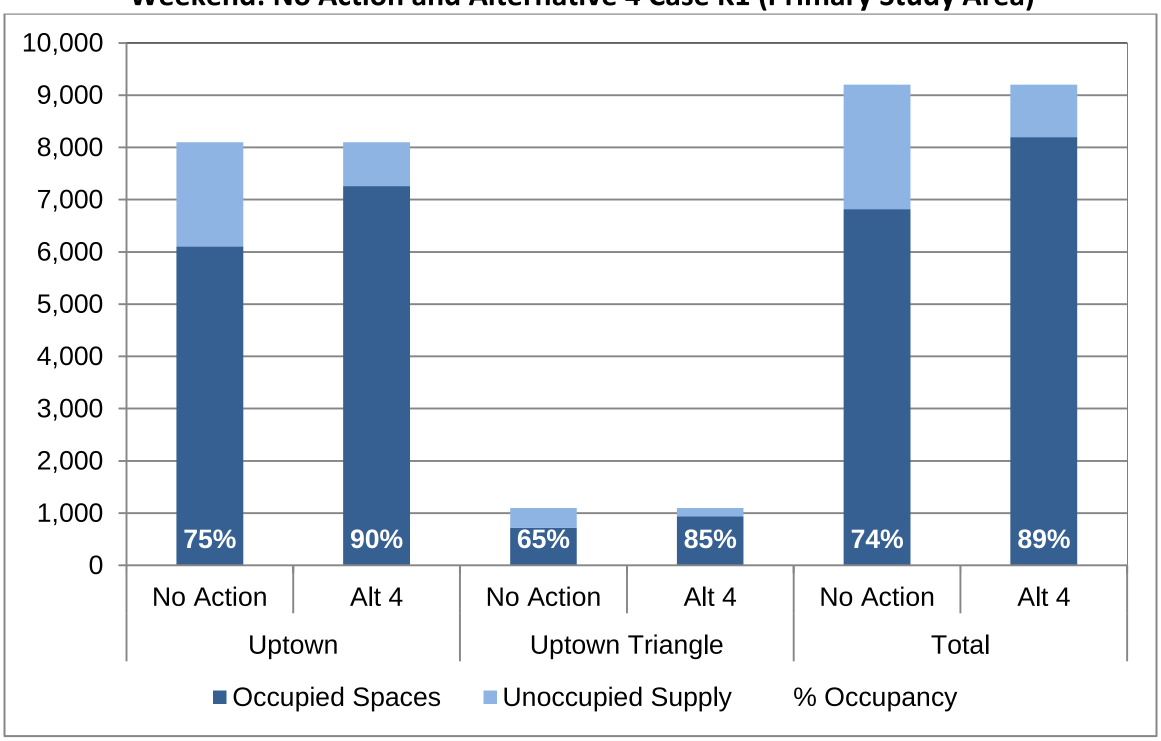


Figure 3–93 Seattle Center Area Parking Occupancy – Weekend: No Action and Alternative 4 Case K1 (Expanded Study Area)

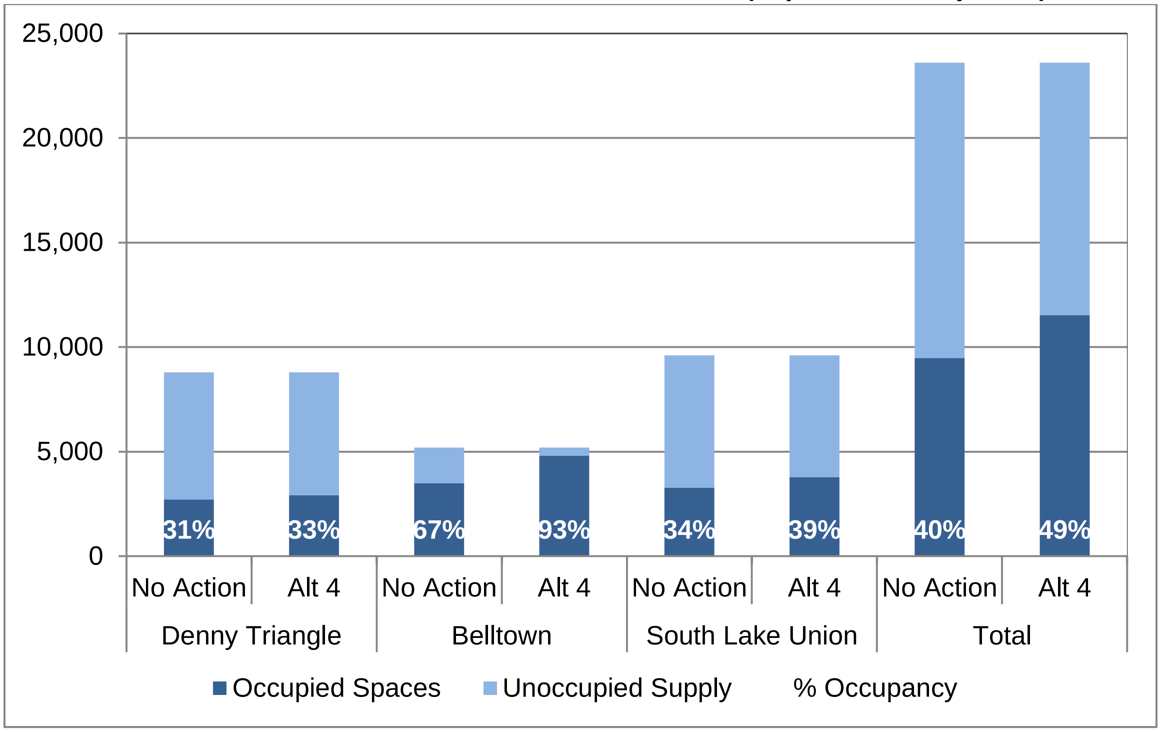


Figure 3–94 Seattle Center Area Parking Occupancy – Weekend: No Action and Alternative 4 Case K2 (Primary Study Area)

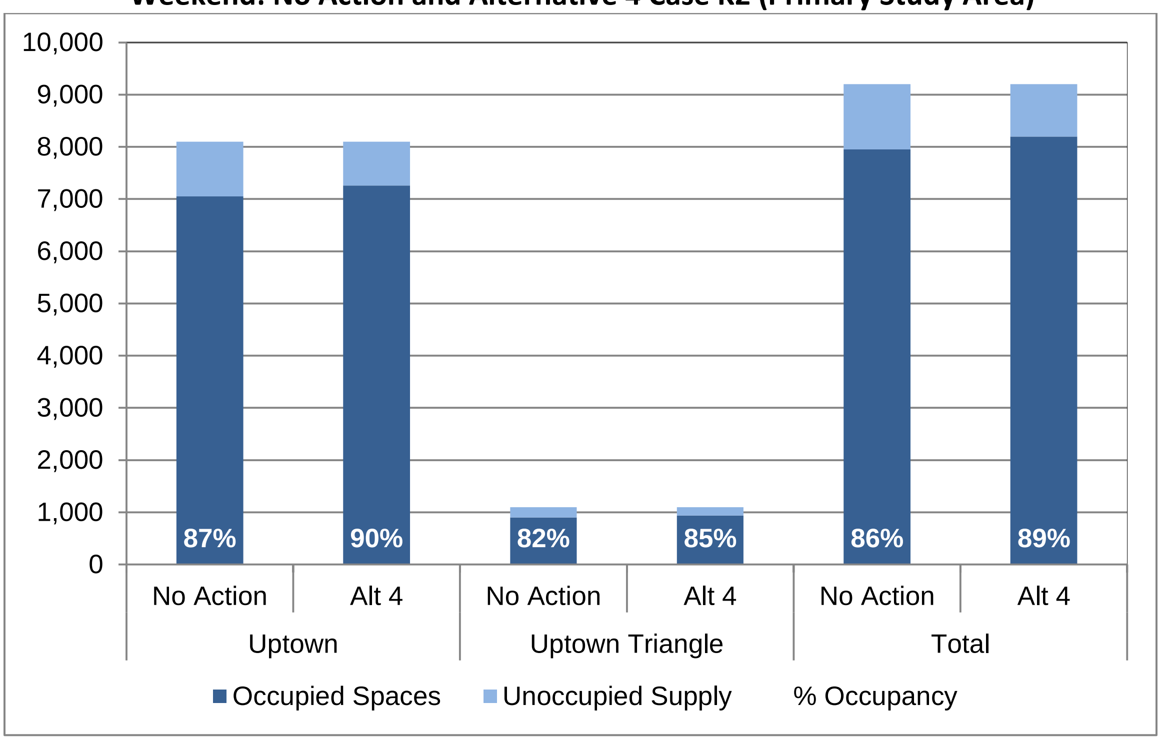
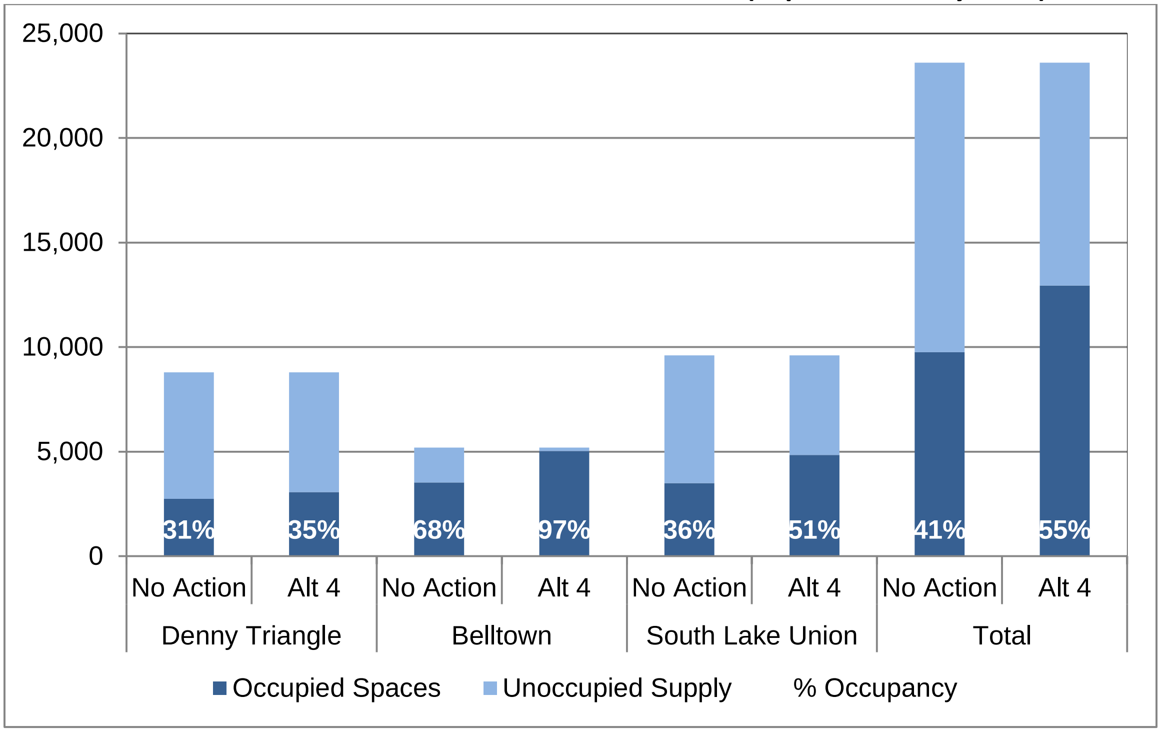


Figure 3–95 Seattle Center Area Parking Occupancy – Weekend: No Action and Alternative 4 Case K2 (Expanded Study Area)



As shown on the figures above:

- Given the higher non-event occupancies on weekends, only 60 percent of the arena parking demand could be accommodated within the primary study area on weekends and Alternative 4 Case K1, arena only, would fill the primary study area.
- With greater reliance on the expanded study area on weekends, Alternative 4 Case K1, would result in the Belltown neighborhood becoming full. This means on weekends parking within the Denny Triangle and SLU neighborhoods would be needed to support arena parking demands.
- The multi-event scenario, Alternative 4 Case K2, would also not be accommodated fully in the primary study area and the expanded study area would be needed to support multiple events.

Given the high non-event parking demand in the study area on weekends, limiting the frequency of multiple large events would assist in accommodating parking demand. In addition, ensuring adequate connections to and from the SLU and Denny Triangle neighborhoods would provide viable options for parking.

3.8.5 Impacts of Alternative 5

Parking impacts related to construction would be minimized by providing off-street parking, securing parking in near-by garages, as well as encouraging use of alternative modes. It is anticipated that parking impacts related to construction would be less than the 20,000-seat arena. In addition, construction activities could result in the need to close on-street parking adjacent to the site. These closures would be coordinated with SDOT and appropriate notice and signs would be provided.

Alternative 5 is compared to the No Action Alternative to identify parking impacts of an arena development on the Memorial Stadium site. Similar to Alternative 4, no additional parking supply is proposed as part of the defined alternative. It is noted that the adopted Seattle Center Master Plan calls for 1,300 spaces to be developed under a new transportation center at the Memorial Stadium site. The compatibility of a new arena with underground parking and transportation would require further analysis. For purposes of this review, no new parking is assumed.

3.8.5.1 Arena Demand Forecasts

Parking demand forecasts for the arena are consistent with Alternative 4. Alternative 5 parking demand represents a net increase of 15,000 attendees as it relates to the Memorial Stadium site (see Table 1-14 in the event transportation demands section of this report).

3.8.5.2 Weekday Occupancy

Figure 3–96 through Figure 3–99 provide a comparison between the No Action and Alternative 5 event cases within the primary and expanded study areas.

**Figure 3–96 Seattle Center Area Parking Occupancy –
Weekday: No Action and Alternative 5 Case M1 (Primary Study Area)**

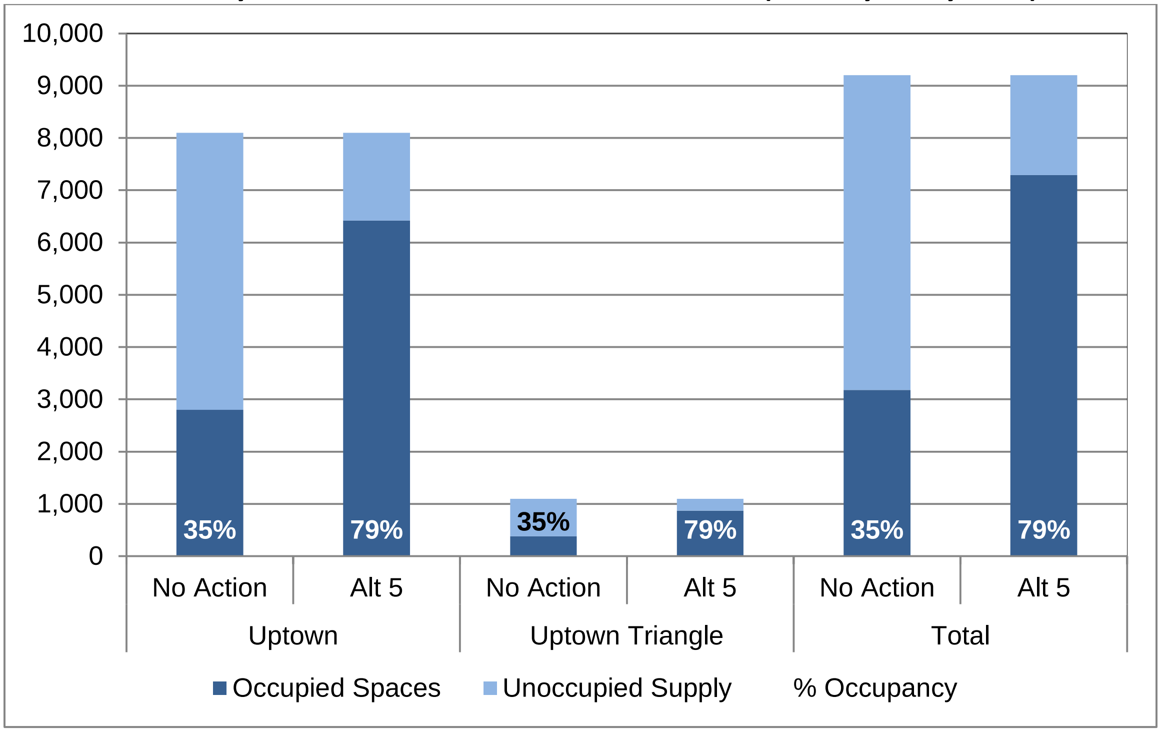


**Figure 3–97 Seattle Center Area Parking Occupancy –
Weekday: No Action and Alternative 5 Case M1 (Expanded Study Area)**

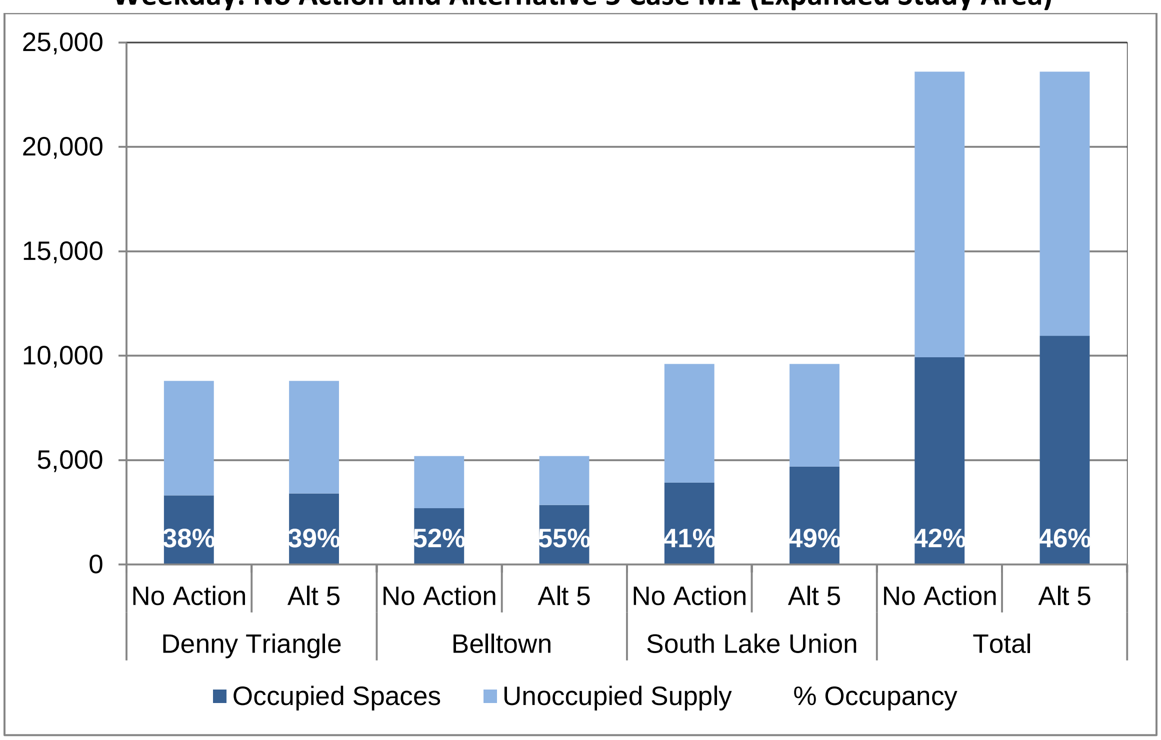


Figure 3–98 Seattle Center Area Parking Occupancy – Weekday: No Action and Alternative 5 Case M2 (Primary Study Area)

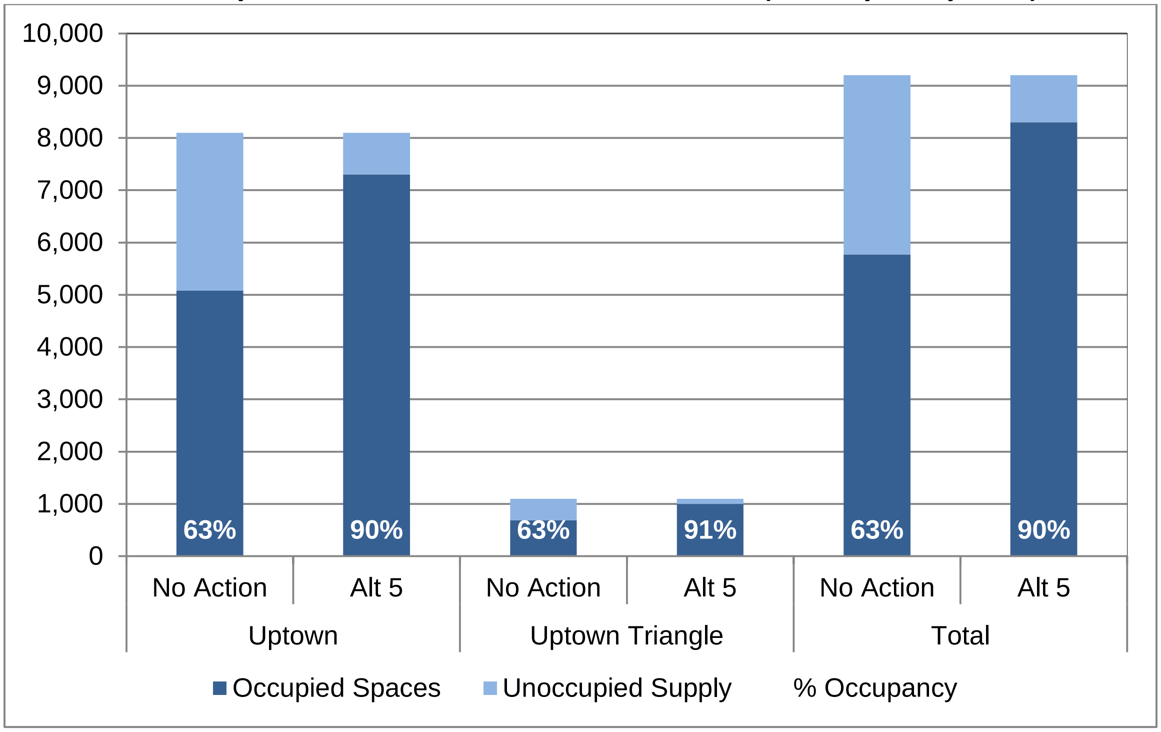
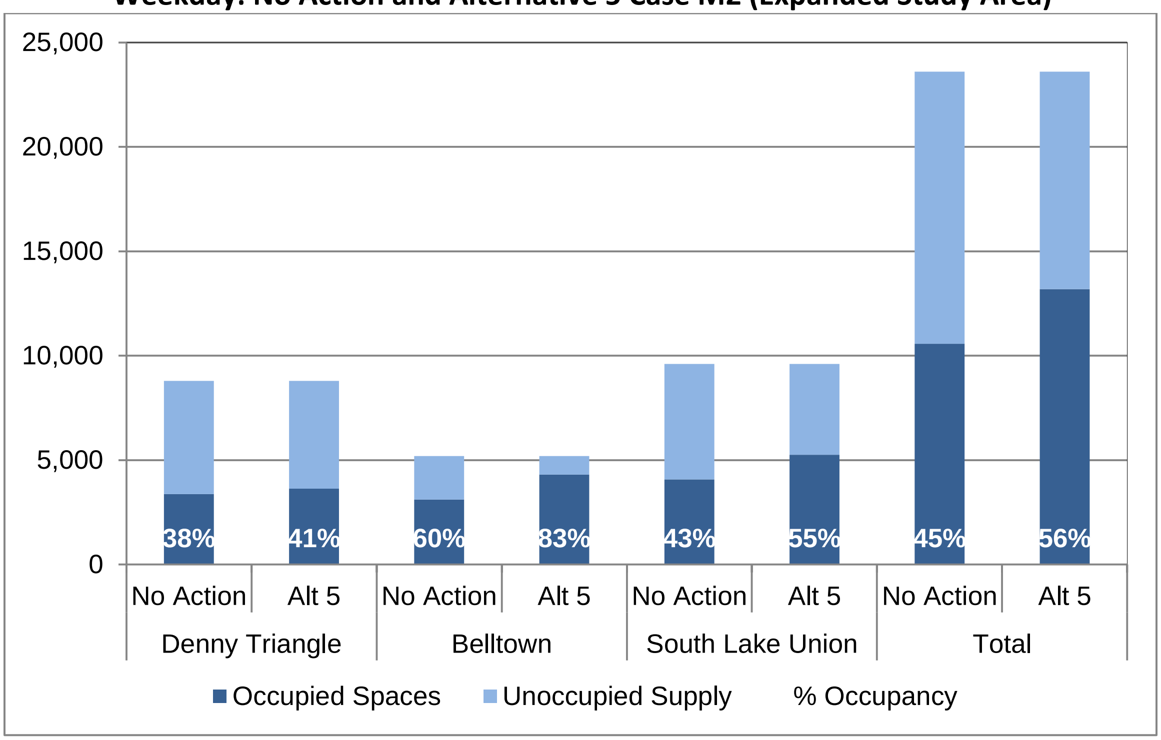


Figure 3–99 Seattle Center Area Parking Occupancy – Weekday: No Action and Alternative 5 Case M2 (Expanded Study Area)



As shown in the figures above:

- Alternative 5 Case M1 has slightly greater parking impacts within the primary study area than Alternative 4 Case K1 given the lower No Action Case M1 parking utilization. Alternative 5 Case M1 increases parking utilization by approximately 45 percent.
- For a multi-event scenario, Alternative 5 Case M2, the primary study area would become full and additional demand would spill into the expanded study area. The results show that the expanded study area could accommodate additional parking.

Given the location of Memorial Stadium, it was assumed that SLU would be most desirable for parking within the expanded study area. As discussed in the methodology section, the parking supply in SLU is anticipated to increase by over 5,000 spaces. Therefore, parking in SLU could become more desirable as pedestrian connections to this neighborhood are constructed.

3.8.5.3 Weekend Occupancy

Figure 3–100 through Figure 3–103 illustrate weekend Case M1 and M2 parking occupancy within the primary and expanded study areas.

Figure 3–100 Seattle Center Area Parking Occupancy – Weekend: No Action and Alternative 5 Case M1 (Primary Study Area)

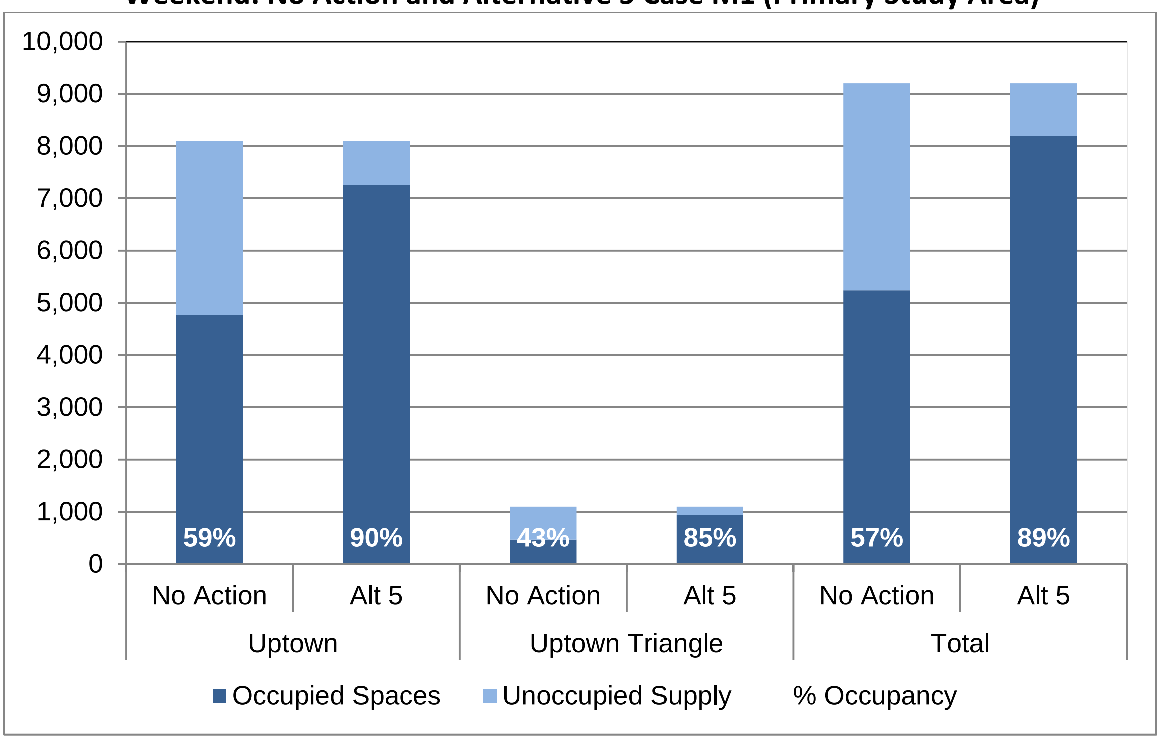


Figure 3–101 Seattle Center Area Parking Occupancy – Weekend: No Action and Alternative 5 Case M1 (Expanded Study Area)

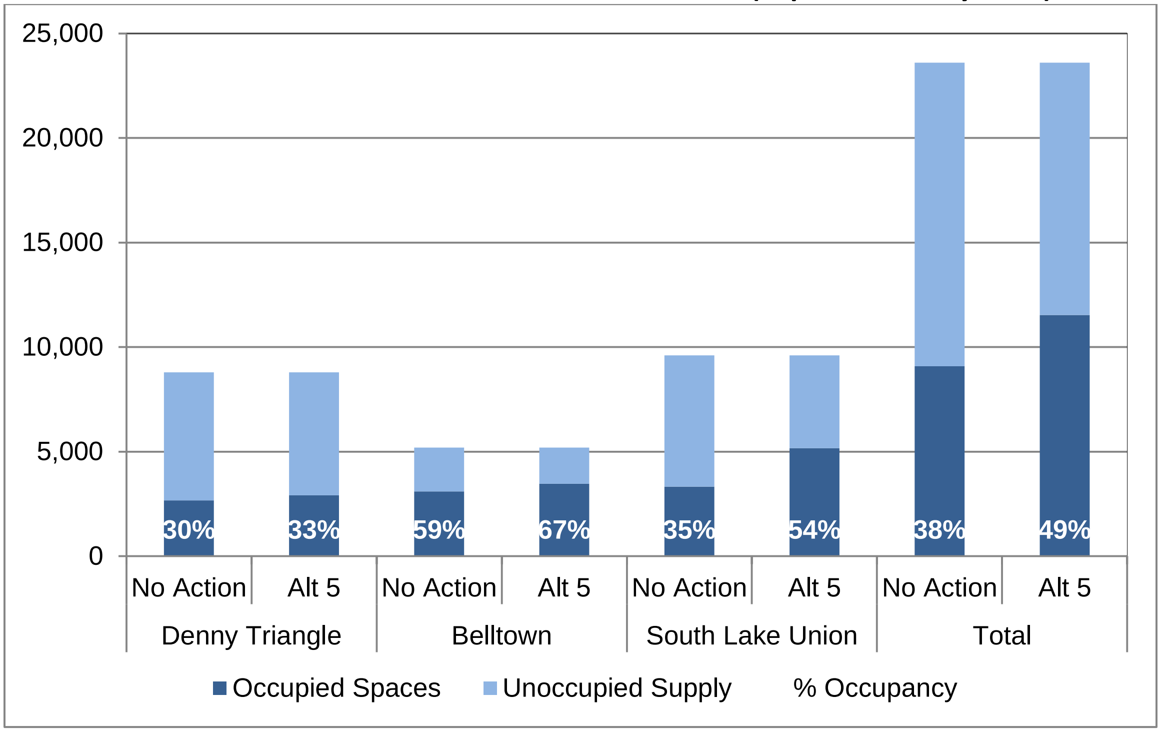


Figure 3–102 Seattle Center Area Parking Occupancy – Weekend: No Action and Alternative 5 Case M2 (Primary Study Area)

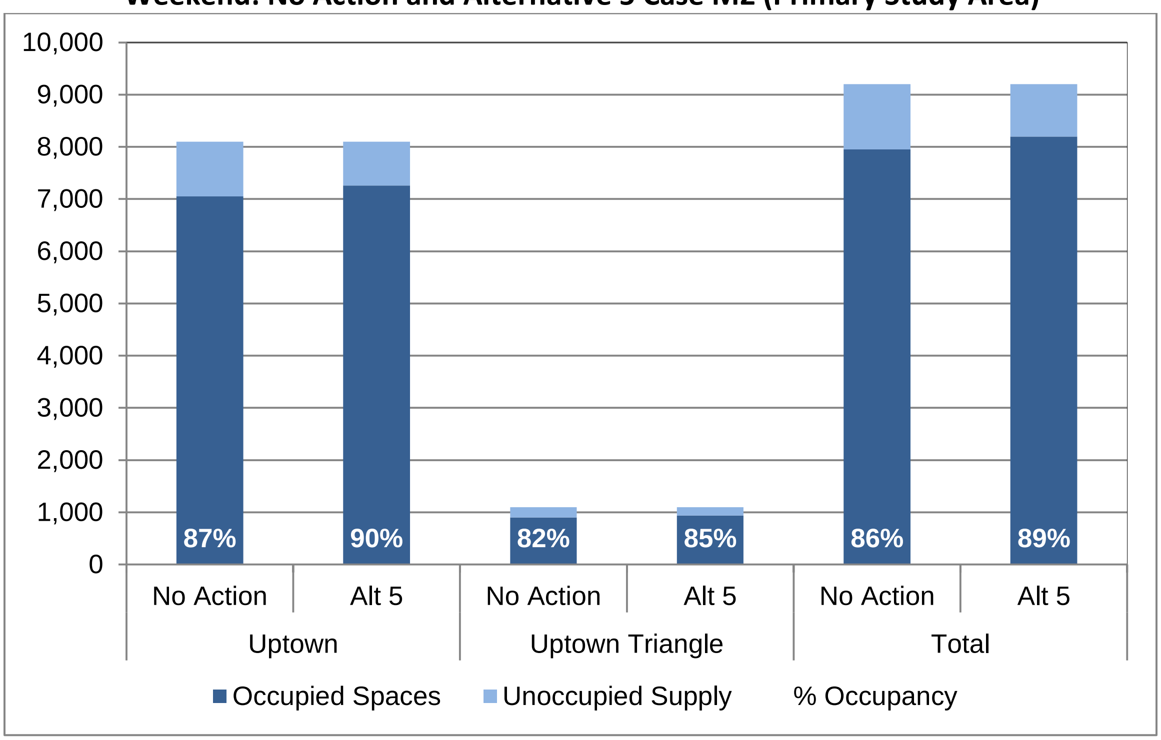
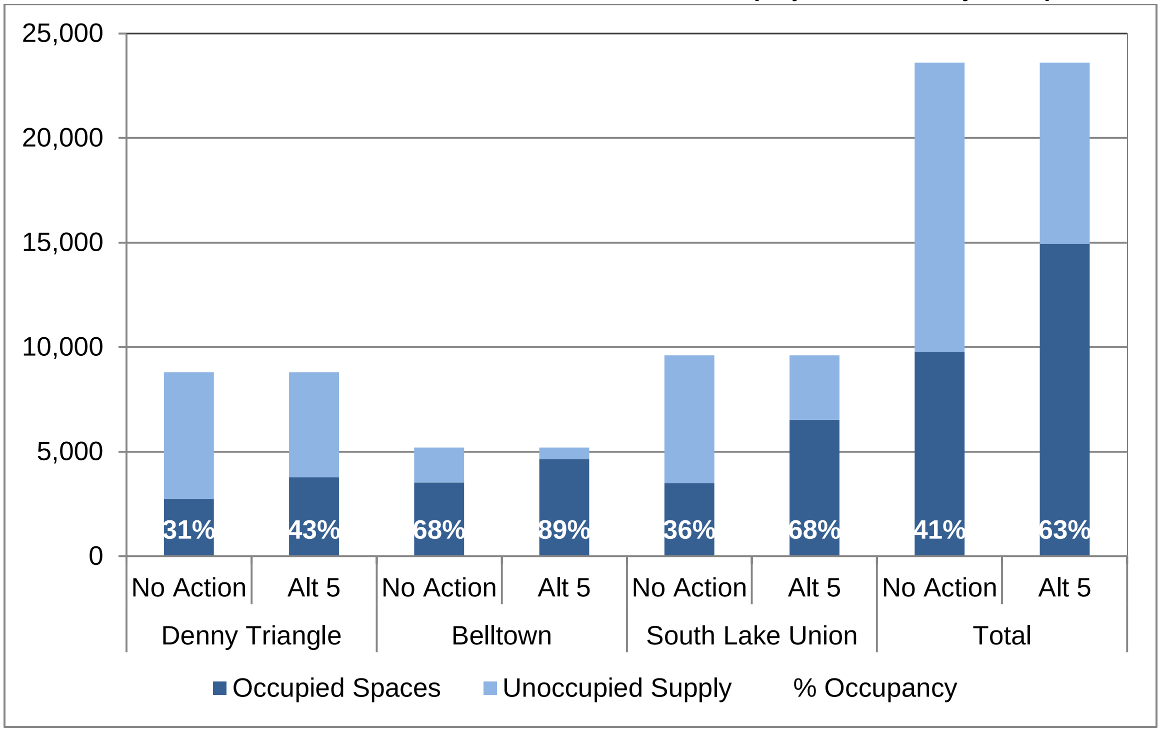


Figure 3–103 Seattle Center Area Parking Occupancy – Weekend: No Action and Alternative 5 Case M2 (Expanded Study Area)



As shown on the figures above:

- Consistent with Alternative 4, given the higher non-event occupancies on weekends, only 60 percent of the arena parking demand could be accommodated within the primary study area on weekends and Alternative 5 Case M1, Arena only, would fill the primary study area.
- With the greater reliance on the expanded study area on weekends, there would be a greater increase in parking occupancy as a result of Alternative 5 Case M1 as compared to the weekday.
- SLU has ample parking to accommodate arena parking demand and it is anticipated parking supply would increase in the future with development.
- The multi-event scenario, Alternative 5 Case M2, would also not be accommodated fully in the primary study area and the expanded study area would be needed to support multiple events.

Given the high non-event parking demand in the study area on weekends, limiting the frequency of multiple large events would assist in accommodating parking demand. In addition, ensuring adequate connections to and from the SLU and Denny Triangle neighborhoods would provide viable options for parking.

3.8.6 Mitigation Measures

A complete summary of potential mitigation measures to be considered across all the Transportation Elements evaluated in this report is included in Chapter 4.0 of Appendix E. This summary includes identification of both programmatic measures and physical improvements. For each of the potential mitigation measures a designation of high to low influence was noted. The following identifies those potential mitigation measures considered to have a high influence on this transportation element. These potential mitigation measures are appropriate for both Alternative 4 and Alternative 5.

- Event schedule protocol and management
- Expand on-street parking controls
- Establish covenant parking agreements
- Parking for event staff
- Pre-sell reserved arena covenant parking

3.8.7 Secondary and Cumulative Impacts

Short term parking restrictions may be implemented to support event related activities as a result of traffic control plans, or other efforts to balance traffic, transit, freight and goods movement, and parking demands.

3.8.8 Significant Unavoidable Adverse Impacts

As described in the impact analysis, the increase in event days anticipated with an arena would result in increased frequency of parking impacts resulting in competition for parking throughout the primary, and, on occasion, the extended study area.

3.9 Safety

3.9.1 Methodology

Collisions were reviewed at the study area intersections. Records of reported collisions were obtained from SDOT for the five-year period between January 1, 2007, and December 31, 2011. A summary of the total and average annual reported accidents at each study intersection is provided in Attachment E-4, which is available from DPD upon request. The City of Seattle has adopted criteria for assigning high accident location status to signalized intersections with 10 or more reported collisions per year and unsignalized intersections with five or more reported collisions per year. Intersections designated as high accident locations are targeted for future safety improvements in an effort to reduce the occurrence of accidents.

3.9.2 Affected Environment

Fewer than 10 collisions per year were reported at each signalized study intersections and for the unsignalized locations only the Mercer Street / Taylor Avenue intersection had an average of more than five collisions per year. No fatalities were identified in the study area for the five-year period.

A review of the collisions at the Mercer Street / Taylor Avenue intersection shows that roughly one-third of the collisions involved left-turning vehicles and in most of those cases, vehicles were improperly turning. There were four collisions with pedestrians, all of which involved the vehicle not granting right-of-way to the pedestrian. The Mercer West project would signalize this location in the future, which would likely minimize left-turning collisions and improve the overall safety for pedestrian and vehicular traffic at the intersection.

The data was reviewed for locations with collisions involving pedestrians or bicyclists. Of the 52 study intersections reviewed, 35 locations had collisions involving pedestrians and bicyclists over the 5-year study period. All locations with pedestrian or bicycle accidents experience less than two accidents per year. The corridors within the study area are undergoing significant pedestrian and bicycle safety improvements as part of the major transportation infrastructure projects. Elements related to pedestrian and bicyclists include signalized crossings, wider path / sidewalk, new bicycle facilities, etc. along Mercer Street and other nearby corridors. It is anticipated with these improvements conflicts between vehicular and pedestrian / bicycle traffic would be reduced and overall non-motorized safety could improve.

3.9.3 Impacts of No Action Alternative

As traffic volumes increase, the potential for traffic safety issues increases proportionately. The overall vehicular and non-motorized traffic in the area under 2018 and 2030 conditions are anticipated to be higher than occur under existing conditions; however, there are changes in transportation infrastructure underway and the impact of these changes on transportation safety is unknown. The projects are all designed to current standards of practice.

3.9.4 Impacts of Alternative 4

Alternative 4 construction would increase vehicular traffic within the study area, which could result in increased conflicts between vehicular, pedestrian, and bicycle traffic. It is anticipated that safety impacts related to construction would be less than the 20,000-seat arena.

As noted above, as traffic volumes increase, the potential for traffic safety issues increases proportionately. Alternative 4 would increase both vehicular and non-motorized traffic within the study area, which could potentially increase conflicts between vehicular and non-motorized traffic resulting in the potential for increase safety issues.

3.9.5 Impacts of Alternative 5

Alternative 5 construction would increase vehicular traffic within the study area, which could result in increased conflicts between vehicular, pedestrian, and bicycle traffic. It is anticipated that safety impacts related to construction would be less than the 20,000-seat arena.

Safety impacts associated with Alternative 5 would be similar to those described for Alternative 4.

3.9.6 Mitigation Measures

A complete summary of potential mitigation measures to be considered across all the Transportation Elements evaluated in this report is included in Chapter 4.0 of Appendix E. This summary includes identification of both programmatic measures and physical improvements. For each of the potential mitigation measures a designation of high to low influence was noted. A series of mitigation measures have been developed, but none have been identified as having a high influence on this transportation element and the remaining measures are included in Chapter 4.0 of Appendix E.

3.9.7 Secondary and Cumulative Impacts

No secondary or cumulative impacts have been identified.

3.9.8 Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts are expected.

3.10 Interim 2016 Conditions Applicable to Alternatives 4 and 5

If an arena were to be constructed at either of the sites of Alternative 4 or 5, the arena would be anticipated to be completed by 2016 prior to completion of the Waterfront Seattle project and Link Light Rail (Northgate, East, and Lynnwood). The study provided a review of potential transportation impacts for 2018 when all of the major infrastructure improvements (Alaskan Way Viaduct, Waterfront Seattle, SR 520 Bridge Replacement, Mercer Corridor, and University Link Light Rail) would be substantially complete.

All of the major transportation infrastructure impacting the Seattle Center study area would be completed by 2016. Transportation impacts of both Alternatives 4 and 5 in 2016 would be consistent with these identified for the 2018 conditions. No additional impacts or mitigation measures beyond those recommended for 2018 are anticipated.

4.0 SUMMARY OF MITIGATION MEASURES

The analysis preceding this section identified transportation impacts associated with the development of an 18,000 to 20,000 multi-purpose Arena in the Stadium District of SoDo and in the Seattle Center area at the location of the existing KeyArena and Memorial Stadium sites. The types of potential mitigation measures that would address the specific impacts identified are discussed briefly in association with each element of the transportation environment (traffic volumes, traffic operations, parking, pedestrians, etc.) described previously. This section consolidates those mitigation measures and strategically groups them by type of mitigation. A number of the mitigation measures respond to multiple elements of the transportation environment.

There are two primary types of transportation mitigation measures that would address impacts:

- **Programmatic Measures** – The Arena, like any special event facility and different from most traditional developments, hosts a variety of events with varying attendance levels, times of the day, days of the week and audiences as well as alone and in the context of other events and activities in surrounding venues. The transportation mitigation must have the flexibility to respond to this wide variety of conditions. Programs to address these varying conditions would minimize conflicts with other venues and between travel modes (e.g. pedestrian conflicts with vehicles); manage expectations and increase certainty for spectators, neighbors and others who pass through the area; and reduce the size or intensity of the activity surges.

  Programmatic measures are typically delivered in the forma of a comprehensive plan, referred to as a Transportation Management Plan (TMP). A TMP would be required as a condition of approval of a new arena at any location. The TMP could cinclude a range of the programmatic strategies and actions, summarized within this section. The TMP would also contain a statement of goal to be achieved though the combination of these measures. The foal accoaciated with sports venues in the Stadium Distroct is expressed in terms of vehicles per 1,000 attendees.

- **Physical Improvements -** Physical improvements are specific elements that have been identified to enhance the transportation infrastructure in a manner that directly or indirectly reduces the impact of the Arena, or reduces the negative consequences of existing, project, or cumulative conditions associated with the Arena.

This combination of physical improvements and programs provides both the certainty and flexibility necessary to mitigate event generated transportation impacts. For the purposes of this analysis, both programmatic and physical mitigation measures have been organized into five-strategic groups. These groupings of measures have been successful in communicating and implementing event-related mitigation for special event facilities. This basic structure is summarized below:

- **Event Management and Public Education.** This program group concentrates on event and facility management measures to 1) eliminate and / or reduce event conflicts by ensuring coordination with other event facilities and neighbors, 2) ensure consistent and responsive implementation of the Transportation Program, and 3) provide the public and attendees with information on choices to avoid conflicts, take advantage of transportation and parking opportunities to reduce delay and frustration, and take advantage of opportunities that complement the event experience and minimize impact on the surrounding neighborhoods and business operations.

- **Traffic and Parking Demand Reduction.** The programs in this group encourage non-automobile modes of travel including Sound Transit and King County Metro Transit, charter bus, rail (Sounder Commuter Rail, Link Light Rail and Amtrak), waterborne, and non-motorized modes or where possible increase average vehicle occupancy. These programs are intended to reduce the size and intensity of the arrival and departure experience.
- **Capacity and Safety Improvements.** These measures are intended to provide physical improvements where existing systems need upgrading to serve surges in Arena ingress and egress pedestrian and vehicle traffic or to provide system continuity. Other improvements focus on increasing efficiency and predictability of traffic and parking control systems so attendees of the Arena, other event facilities and general purpose traffic can access desired destinations with greater efficiency by avoiding excess circulation patterns that create unnecessary congestion and safety conflicts.
- **Management of Vehicle and Pedestrian Demand.** Programs included in this group focus on parking, traffic and pedestrian management options to direct and control the traffic flows for those who drive to the Arena. These measures are intended to manage local vehicle and non-motorized traffic congestion to enhance safety and minimize delay on event days by efficiently directing drivers to available transportation and parking facilities.
- **Implementation and Monitoring.** These programs are targeted to achieve 1) continuous improvement of the operational management of the Transportation Management Program (TMP), 2) development of metrics to measure and report the effectiveness of TMP implementation, and 3) exchange of information with neighboring event centers and business operations to avoid conflicts.

This approach to mitigation is proposed to mitigate Arena transportation impacts for several reasons:

- **Effective.** TMPs are effective in mitigating transportation and parking impacts for special events and special event facilities. Major special event facilities in the region, including Safeco Field, CenturyLink Field and the University of Washington Husky Stadium have consistently demonstrated that impacts can be effectively managed at or below the levels forecast prior to their operation.
- **Compatible.** This structure and elements of this TMP are compatible with the TMPs used by other major special event facilities, particularly those in the Stadium District. The programs in this structure reinforce attendee expectation and when more than one

event occurs in the same general time period the plans and programs will be tailored to the requirements of the multiple event condition.

- **Mutually Supportive.** The mitigation strategies during multiple event conditions will be mutually supportive. The communications outreach and operational plan implementation for each facility will therefore compliment and build on one another rather than create conflicts that add to congestion and safety.
- **Flexible.** The program will be flexible to address attendance for a single event and / or multiple event conditions; this approach will address single, dual or triple event conditions by simply modifying the elements of a basic strategy (e.g. add more police control, refine and modify the temporary signing plan, supplement complimentary transit services, implement more extensive attendee and public information programs to increase awareness of unique conditions, and / or adjust event scheduling to minimize conflicts.

A summary listing of potential mitigation measures is presented in Table 4-1. This table briefly describes the benefits and estimated effectiveness of each measure and identifies the extent to which each measure relates Alternatives 1 through 5. The table includes a sixth group of measures related to additional temporary mitigation associated with impacts when the Arena is being constructed.

Each Alternative examined has some distinguishing feature like location, contextual setting or size; therefore, each mitigation measure will have a different level of applicability. To characterize the level of applicability associated with each measure the following descriptions have been developed and are reflected in summary in Table 4-1:

- **C – Complete** or direct applicability, indicating that the specific program could be considered as a part of the mitigation for this Alternative.
- **L – Limited** or partial applicability, indicating that some variation / reduced level of implementation is appropriate because the ability to implement this measure with the Alternative may be limited.
- **N/A – Not applicable** indicating the measure is not appropriate because the impact or conflict would not exist or the contextual setting of the Alternative precludes implementation of the specific measure.
- **E – Existing** deficiency indicating that the measure may be appropriate but that the deficiency currently exists and the mitigation could likely be part of a more comprehensive improvement program by others.

Table 4-1
Suggested Implementation Phasing and Effectiveness

Strategy / Element	Benefits / Estimated Effectiveness	Alternative 1	2	3	4	5
C = Complete; L = Limited; N/A = Not Applicable; E = Existing						
Event Management and Public Information						
Event Management						
Event Transportation Coordinator	Facilitates and coordinates programs to ensure consistency.	N/A	C	C	C	C
Event Access Guide	Informs guests about access options, parking opportunities and other transportation resources to reduce vehicle volume.	N/A	C	C	C	C
Off-Site Construction Coordination	Facilitates exchange of road / utility construction to minimize impact on access routes to and from the Arena.	N/A	C	C	C	C
Event Scheduling Protocol & Management	Implement a Multiple Events Scheduling Agreement with other event venues.	N/A	C	C	L	C
Port of Seattle Protocols	Provides priority routes and time windows for Port access during event ingress / egress periods.	N/A	C	C	N/A	N/A
Public Information						
Public Information Coordinator	Integrates and disseminates transportation / parking information applicable to each type of event.	N/A	C	C	C	C
Static Electronic Media	Provides a single source of consistent and updated transportation information for Arena attendees.	N/A	C	C	C	C
Dynamic Electronic Media	Provides real-time pre- and post- game information to avoid conflicts and parking opportunities to minimize erroneous vehicle circulation.	N/A	C	C	C	C
Arena Call Center	Provides a source of Arena specific access information in advance of an event.	N/A	C	C	C	C
Broadcast Advisory	Provides promotion of alternate modes of travel and traffic advisories to help guests minimize access delay.	N/A	C	C	C	C
Traffic and Parking Demand Reduction						
Transit						
Premium Transit Service	Provides predictable capacity on existing routes to encourage mode shift. Potential parking demand and traffic volume reductions of 85-170 autos.	N/A	C	C	C	C

Table 4-1 (Continued)
Suggested Implementation Phasing and Effectiveness

Shuttles	Reduces automobile traffic and parking by making remote parking and ferry access for walk-on passengers more convenient.	N/A	C	C	C	C
Subsidize Transit Fares	Provides a financial incentive to use alternate travel modes.	N/A	C	C	C	C
Charter Bus/Meal/Ticket Packages	Potential to reduce parking demand and traffic volume 20-60 cars. Reduce pedestrian volumes that conflict with entering vehicles.	N/A	C	C	C	C
Add Cars to Link Light Rail Trains	Gives Link Light Rail additional capacity.	N/A	C	C	N/A	N/A
Additional Trains on Link Light Rail Pocket Track	Provides extra service to serve surges associated with time specific events.	N/A	C	C	N/A	N/A
Rail and Waterborne						
Rail/Lodging/Ticket Packages	Reduces long distance driving and circulation near the Arena by drivers unfamiliar with the area. Potential to reduce parking demand and traffic volume 20-80 cars.	N/A	C	C	L	L
Facilitate Washington State Ferry Use	Reduce auto travel by encouraging walk on ferry patrons. Potential to reduce parking demand and traffic volume 40-80 cars.	N/A	C	C	N/A	N/A
Facilitate King County Passenger Ferry Service	Provides for walk-on passenger service from / to West Seattle.	N/A	C	C	N/A	N/A
Bicycle						
Bicycle Racks	Provides a secure place for attendees to leave their bikes when attending an event. Potential to reduce parking demand and traffic volume 20-40 cars.	N/A	C	C	C	C
Bicycle Route Improvements	Provides clearer / safer routes which facilitate bicycle use.	N/A	C	C	C	C
Average Vehicle Occupancy						
Priority Disabled/Taxi/Limousine Loading	Makes access for disabled person(s) more seamless and convenient. Potential to reduce parking demand and traffic volume 170-260 cars.	N/A	C	C	C	C
Higher Vehicle Occupancy Incentives	Reduces parking demand and automobile congestion.	N/A	C	C	C	C
Capacity and Safety Improvements						
Event Access App (Application)	Provides real-time pre- and post- game information to avoid conflicts and parking opportunities to minimize erroneous vehicle circulation.	N/A	C	C	C	C
Directional Event Signage	Provides clear direction from limited access highways to the Arena to avoid excess circulation.	N/A	C	C	L	L
Parking Guidance Signage	Provides the location of event congestion and / or alternate routes and availability of parking spaces in real-time to minimize circulation.	N/A	C	C	C	C

Table 4-1 (Continued)
Suggested Implementation Phasing and Effectiveness

SDOT Traffic Control Center Improvements	Provides event day traffic control and advisory hub to coordinate observed conditions and suggested direction for traffic flow.	E	C	C	L	L
Traffic Signal Control / Improvements	Provide upgraded traffic control equipment to be more responsive to traffic flow dynamics and reduce locations that typically require manual traffic control.	E	C	C	L	L
Pedestrian Improvements	Increases safety by establishing designated walkways in the immediate vicinity of the Arena. Reduces rail / pedestrian conflicts.	E	C	C	N/A	N/A
At Grade Way-Finding System	Provides preferred directions for pedestrians along routes that minimize conflicts with automobiles and rail traffic.	E	C	C	L	L
Pedestrian Scale Street Lighting	Provides missing or under-performing lighting segments to improve pedestrian safety.	E	C	C	N/A	N/A
Manage Resultant Vehicle and Pedestrian Demand						
On-Street Parking						
Expand On-Street Parking Controls/Time Limits	Preserves short-term on-street parking for adjacent businesses.	N/A	C	C	C	C
Change Parking Rates	Preserves short-term on-street parking for adjacent businesses.	E	L	L	L	L
Shared Use Parking Protocol	Reduces impact associated with concurrent or closely spaced major time-specific events.	N/A	C	C	N/A	N/A
Off-Street Parking						
Establish Covenant Parking Agreements	Provides for reasonable levels of event parking to reduce neighborhood business and resident parking impacts.	N/A	C	C	C	C
Parking for Event Staff	Identifies staff parking that does not compete with event attendee and neighborhood parking needs.	N/A	C	C	C	C
Pre-Sell Reserved Arena Covenant Parking	Reduces confusion on availability of parking and minimizes excess vehicle circulation and associated congestion.	N/A	C	C	L	L
Promote and Pre-Sell Off-Site Private Parking	Reduces confusion on availability of parking and minimizes excess vehicle circulation and associated congestion.	N/A	C	C	L	L
Vehicle Traffic						
Event Ingress and Egress Plan	Provide an organized ingress and egress plan that corresponds with designated preferred parking areas.	N/A	C	C	L	L
Implementation and Monitoring						
Parking and Access Review Committee (PARC)	Facilitates communication among key stakeholders relative to special event facility activity.	N/A	C	C	N/A	N/A
Traffic Operations Group	Helps to ensure continuous improvement of parking and traffic operations.	N/A	C	C	N/A	N/A

Table 4-1 (Continued)
Suggested Implementation Phasing and Effectiveness

Periodic Program Review and Survey	Provides regular periodic discrete measure of performance to evaluate transportation management program effectiveness.	N/A	C	C	C	C
Construction						
Central Construction Coordination Office	Reduces potential for conflicts between construction and event venue activity	N/A	C	C	C	C
Off-Site Construction Worker Parking	Reduces parking impact on businesses and residents during construction	N/A	C	C	C	C
Priority Truck Routing and Loading	Reduces impact on congestion and adjacent street loading / unloading.	N/A	C	C	C	C
Street and Sidewalk Closures	Reduces the effect of street closure on adjacent businesses, events, and residents.	N/A	C	C	C	C
Other						
S. Massachusetts St. Realignment	Enhance accessibility to the Safeco Field garage and service road	N/A	C	C	N/A	N/A
North-South On-site Connection	Provide direct ingress and egress to the Safeco Field parking garage and surface parking lot and replace the service road connection.	N/A	C	C	N/A	N/A

Each of these mitigation measures has the potential to address the various elements of the transportation environment differently. This is summarized in Table 4-2. While some measures are targeted to address a single element, other measures cross over to address several transportation elements. For example, an event scheduling protocol has the potential to significantly benefit traffic operations by reducing peak surges in traffic volumes, but could also have the benefit of reducing overcrowding on park-and-ride transit service during weeknight events. Each potential mitigation measure has been related to each element of the transportation environment according to the following ranking:

- H – Indicating the measure has the potential to have a significant relationship or level of influence on a given element of the transportation environment
- M – Indicating the transportation element is moderately affected by an individual mitigation measure
- L – Indicating the relationship between the mitigation measure and the transportation element is minimal or insignificant

Table 4-2
Relationship of Possible Mitigation Measures Transportation Element

Strategy	Transportation Element								
	Street System	Public Transportation	Pedestrian	Bicycle	Traffic Volumes	Traffic Operations	Freight & Goods Mobility	Parking	Safety
H - Significant Relationship / Influence; M - Moderate Relationship / Influence; L – Minimal / Insignificant Relationship / Influence									
Event Management and Public Information									
Event Management									
Event Transportation Coordinator	L	M	L	L	M	M	L	M	L
Event Access Guide	L	M	M	M	M	M	L	M	L
Off-Site Construction Coordination	M	L	L	L	M	M	M	L	L
Event Scheduling Protocol & Management	L	M	L	L	H	H	M	H	M
Port of Seattle Protocols	L	L	L	L	H	H	H	L	L
Public Information									
Public Information Coordinator	L	M	M	M	H	H	H	M	L
Static Electronic Media	L	M	M	M	M	M	L	M	L
Dynamic Electronic Media	L	M	M	M	M	M	L	M	L
Arena Call Center	L	M	M	M	M	M	L	M	L
Broadcast Advisory	L	L	L	L	M	M	L	L	L

Table 4-2 (Continued)
Relationship of Possible Mitigation Measures Transportation Element

Traffic and Parking Demand Reduction									
Transit									
Premium Transit Service	L	H	L	L	L	L	L	L	L
Shuttles	L	H	L	L	L	L	L	L	L
Subsidize Transit Fares	L	H	L	L	L	L	L	L	L
Charter Bus/Meal/Ticket Packages	L	L	L	L	M	M	L	M	L
Add Cars to Link Light Rail Trains	L	H	L	L	M	M	L	M	L
Additional Trains on Pocket Track	L	H	L	L	M	M	L	M	L
Rail and Waterborne									
Rail/Lodging/Ticket Packages	L	H	L	L	M	M	L	M	L
Facilitate Washington State Ferry Use	L	H	L	L	M	M	L	M	L
Facilitate King County Passenger Ferry Service	L	H	L	L	M	M	L	M	L
Bicycle									
Bicycle Racks	L	L	L	H	L	L	L	L	L
Bicycle Route Improvements	L	L	L	H	L	L	L	L	L
Average Vehicle Occupancy									
Priority Disabled/Taxi/Limousine Loading	L	L	L	L	M	M	L	M	L
Higher Vehicle Occupancy Incentives	L	L	L	L	M	M	L	M	L
Capacity and Safety Improvements									
Event Access App (Application)	L	M	L	L	L	M	L	M	L
Directional Event Signage	M	L	L	L	H	H	L	L	L
Parking Guidance Signage	M	L	L	L	H	H	M	L	L
SDOT Traffic Control Center Improvements	L	L	L	L	L	H	M	L	L
Traffic Signal Control / Improvements	M	L	L	L	L	H	M	L	L
Pedestrian Improvements	L	L	H	L	L	L	L	L	H
At Grade Way-Finding System	L	L	H	L	L	L	L	L	L
Pedestrian Scale Street Lighting	L	L	H	L	L	L	L	L	H
S. Massachusetts St. Realignment	H	L	H	L	M	M	L	M	M
North-South On-site connection	H	L	M	L	H	H	L	M	H
Manage Resultant Vehicle and Pedestrian Demand									
On-Street Parking									
Expand On-Street Parking Controls	M	L	L	L	L	L	L	H	L
Change Parking Rates and Time Limits	M	L	L	L	L	L	L	H	L
Shared Use Parking Protocol	L	L	L	L	L	L	L	H	L
Off-Street Parking									
Establish Covenant Parking Agreements	L	L	L	L	L	L	L	H	L
Parking for Event Staff	L	L	L	L	L	L	L	H	L
Pre-Sell Reserved Arena Covenant Parking	L	L	L	L	L	M	L	H	M
Promote and Pre-Sell Off-Site Private Parking	L	L	L	L	L	M	L	H	M

Table 4-2 (Continued)
Relationship of Possible Mitigation Measures Transportation Element

Vehicle Traffic									
Event Ingress and Egress Plan	L	M	M	L	L	H	L	L	L
Implementation and Monitoring									
Parking and Access Review Committee (PARC)	L	M	L	L	L	M	M	L	M
Traffic Operations Group	L	M	L	L	L	H	M	L	M
Periodic Program Review and Survey	L	M	L	L	M	M	L	M	L
Construction									
Construction Management Plan	H	M	M	M	H	H	H	M	M
Central Construction Coordination Office	H	L	L	L	L	M	M	L	L
Off-Site Construction Worker Parking	L	L	L	L	L	L	L	H	L
Priority Truck Routing and Loading	L	L	L	L	M	M	M	L	L
Street and Sidewalk Closures / Detour Plans	H	L	L	L	L	L	L	L	M

The following provides additional detail on the intent of the mitigation measures shown in the tables above within each of the five-strategic groups.

4.1 Event Management and Public Information

4.1.1 Event Management

Event Transportation Coordinator. The Arena Manager could identify a staff person to coordinate and manage the Transportation Management Program (TMP) and Arena scheduling such that multiple event days with attendance in excess of an identified thresholds are minimized or eliminated. This could be done in the context of an updated Event Scheduling Agreement with the Arena as an added party to the existing group (see Event Scheduling Protocol and Management described below). This person would represent the Arena on the Parking and Access Review Committee (PARC) and would coordinate with the City of Seattle, Port of Seattle, King County Metro Transit and other affected public and private transportation operators in the area on event schedules and implementation of the TMP. On an event day implementation and monitoring of the TMP could be their primary function prior to and following the event.

Event Access Guide. An event access guide could be developed to list alternatives to driving, preferred parking areas and other designated Arena parking areas that offer carpool incentives, neighborhood dinner / parking promotions, and other programs and resources to assist ticket purchasers with options for traveling to and from the area.

Off-site Construction Coordination. The Transportation Coordinator could regularly attend and / or be informed by the Maintenance of Traffic Task Force (MOTTF) relating to utility and road projects that would potentially impact Arena and other event access in the immediate area as well as more regional transportation projects like the SR 520 and Mercer Corridor projects that shift traffic patterns and may impact access to the Arena.

Event Scheduling Protocol and Management. Considering the existing and proposed event venues, their potential effect on each other and cumulative traffic, and the effect of event traffic on localized freight movements, it may be desirable to establish a protocol for scheduling to minimize the conflict with special events among the three major Stadium District venues. This protocol would strive to work with major tenants and franchises to minimize the occurrence of simultaneous and closely scheduled major events. When two or more time specific events with the combined forecasted attendance, (not ticket sales), of over 58,000 persons appears to be scheduled the protocol would identify a basic approach for resolving apparent conflicts. The separation of event start and end times could vary dependent on projected attendance levels, time of day, and the host facilities.

As a part of this process it would be desirable for the Port of Seattle to be a part of this protocol or a parallel process to work with Stadium District event facilities to advise them when container ship loading / unloading requires double shifting so events and TMP activities can be adjusted to accommodate priority truck routes and / or time windows.

Port of Seattle Protocols. The Port of Seattle has expressed concern around increased levels of interference with freight access to and from the Port on days with events, especially when event days coincide with extended gate operations. Consistent with the event scheduling agreement, it would be desirable to work with the Port and other event stakeholders to identify protocols that could be put in place when notice of extended gate operations is provided. Such protocols could involve schedule adjustments, freight routing designations, event traffic routing, or other measures specifically tailored to support minimizing event traffic impacts on Port operations. Effective implementation of such a measure would require consistent engagement by all parties, including the Port of Seattle, in the event scheduling / management discussions.

4.1.2 Public Information

Public Information Coordinator. The Public Relations coordinator for the Arena or their representative could include in their job responsibilities development, coordination and distribution of transportation and parking information and advisory services. Information regarding events and community activities could be exchanged and incorporated in these media notices. The webpage may be an effective medium for ensuring timely and accurate updates.

A major role of this position is to ensure that non-event attendees are aware of an upcoming event. While not reflected in the traffic forecast (to ensure a worst case analysis condition for disclosure of potential impacts), experience at other event venues have found that background volumes decline when there is a major weekday evening event. The background traffic volume decline reflects drivers who make a slight shift in their work or daily commute pattern or schedule, use another mode of travel, telecommute for all or a portion of the day. These shifts can reduce the background traffic volume by 15 to 20 percent, which results in smaller delays and / or reduced duration of congesting at forced flow intersections.

Static Electronic Media. The Arena could develop a webpage incorporating the transportation access guide as well as significant partnerships with community businesses and associations so the surrounding neighbors gain, to the degree desired, some of the benefits of additional Arena attendee activity. This transportation guide could be coordinated with the primary franchises and tenants. The webpage could include information, advertisements or promotional meal / parking packages particularly encouraging the use of community services and businesses.

Dynamic Electronic Media. The Arena could utilize Twitter, Facebook and mass email broadcasts to alert guests of travel options and more particularly of incidents and real-time congestion and / or safety issues. This could include information about event day traffic conditions and regional traffic constraints (e.g. SR 520 and Mercer Street construction closures and significant incidents like car fire, overturned truck, etc.) as well as resources and links to alternative modes so they can plan their trip to the Arena.

Arena Call Center. A call center could be established with a central phone number specifically for transportation and parking information and referral. During non-event periods the main reception desk could field calls. After business hours, but outside of event periods, a pre-recorded referral to the website and other transportation providers could be provided. During events, this could be field by the event receptionist on duty and / or the traffic control center.

Broadcast Advisory. The Arena could coordinate with the broadcast team for each major franchise to actively promote alternative modes of travel in advance of games and major events and to provide real-time information within four-hours prior to an event. Real-time information could be coordinated with feeds through the Arena traffic control center, WSDOT and SDOT traffic control centers. The service could be coupled with other advertising and promotion through broadcasting contracts.

4.2 Traffic and Parking Demand Reduction

4.2.1 Transit

Premium Transit Service. The Arena could coordinate with King County Metro Transit and Sound Transit (ST) to identify express bus service that connects Park-and-Ride lots in Northgate, South Kirkland, Eastgate and Federal Way with destinations in the vicinity of the Arena. The intent would be to use under-capacity return routes at the end of the commuter peak. Work with King County Metro Transit on staging return coaches after events similar to the operation that currently exists after Sounders FC matches.

Shuttles. The Arena could consider operating shuttles or jitneys that follow a fixed route on a fixed headway that link major offsite parking reservoirs, the Washington State Ferry terminal, Link Light Rail and Transit Stations to / from the Arena. The intent of these jitneys and / or shuttles would be to provide an incentive for walk-on ferry passengers, transit users and persons parking in more remote offsite parking spaces.

Subsidize Transit Fares. The Arena could work with King County Metro Transit, ST, and Washington State Ferries, to provide attendees with a discount to regular fares to encourage use of these travel modes.

Charter Bus/Meal/Ticket Packages. Work with preformed groups and restaurants to develop packages that involve meals, event admission, and bus transportation for events at the Arena. Provide preferential charter bus parking and preferred exit routes following events.

Add Cars to Link Light Rail Trains. To increase the capacity of regularly scheduled Link Light Rail prior to and following Arena events, the trains could be expanded from two to four cars. This would reduce crowding and make the light rail a more attractive option for event attendees.

Additional Link Light Rail Trains on Pocket Track. For larger events, to the extent that multiple events cannot be avoided, or if the demand for Link Light Rail appears to exceed current forecasts, additional capacity could be provided by staging an additional train on a pocket track to provide the extra capacity. This would be particularly effective after events in serving the surges following time specific events.

4.2.2 Rail and Waterborne

Rail/Lodging/Ticket Packages. Similar to the charter bus packages, the Arena could work with out-of-town travel companies and businesses to develop rail/lodging/meal packages with tickets to events. These would rely on regularly scheduled Amtrak trains and partnerships with local and downtown hotels and restaurants.

Facilitate Washington State Ferry Use. The Arena could work with Washington State Ferries to promote use of ferries from Bremerton and Bainbridge. Consider operating a shuttle between the ferry terminal and the Arena during winter months.

Facilitate Passenger Ferry Service. The Arena could work with King County to extend passenger service to and from West Seattle on major event days to provide return service after events.

4.2.3 Bicycle

Bicycle Racks. The Arena could incorporate bicycle racks as part of the site design. Locate racks near major entrances in well-lit areas that are proximate to designated bike routes. If possible, these should be located in a covered area.

Bicycle Route Improvements. The Arena could participate in marketing and upgrading the bike route system and prioritize bike lanes in the immediate vicinity of the site.

4.2.4 Average Vehicle Occupancy

Priority Disabled/Taxi/Limousine Loading. The Arena could identify two locations for limousine/taxi/passenger drop-off and pick-up. One location could be reserved for disabled attendees and located adjacent to the building with barrier free access. A second location could be located one to two blocks from the building, on a route that provides minimal delay to and from destinations and the Arena. The location of these areas should be coordinated with taxi and limousine operators to ensure adequate loading and queuing space. The price of nearby parking should be high enough to motivate attendees to carpool.

Higher Vehicle Occupancy Incentives. The Arena could coordinate with private and public parking operators to develop rates, which discourage single occupancy vehicles. Stepped or phased parking rates have not been found to be practical nor effective in encouraging high vehicle occupancy. The most significant factor appears to be charging more for parking closest to the site. Thus, as much as practical, reserved parking associated with the covenant and Arena exclusive parking could be priced as high as practical.

4.2.5 Capacity and Safety Improvements

Event Access App (Application). The Arena could develop a cellular phone application that provides event goers with a menu of features ranging from information and links to alternate transportation modes to real-time information regarding congested routes and alternative access. In addition, it would be desirable to link this application with a parking guidance system so those who drive can make more strategic decisions about the route they take before arriving in the immediate vicinity of the Arena. Information regarding parking pricing, comparisons against alternate modes, notification of street closures or restrictions, and other traffic related real-time features could be incorporated in this application.

Directional (Dynamic / Static) Event Signage. Directional signage between the freeway and other limited access facilities could be revised to incorporate the Arena. For Alternatives 2 and 3, this would complement the existing signage that currently exists for CenturyLink Field and Safeco Field and for Alternatives 4 and 5, it would further integrate with the Seattle Center signing.

Parking Guidance Signage. The Arena could participate with the City of Seattle in implementing a parking guidance system that provides direction and information regarding parking availability to those drivers who do not pre-purchase parking. This system could notify drivers as to the location and number of spaces available in public and event garages in the Stadium District or Seattle Center area, reducing excess and erroneous circulation.

SDOT Traffic Control Center Improvements. The Arena could consider contributing to improvements to the SDOT Traffic Control Center. The improved Center would serve not only the Arena, but the other event venues and the surrounding neighborhood. It would distribute information from WSDOT and SDOT traffic cameras and allow for posting of current conditions relating to congestion, parking, and traffic incidents that could help driver's decision-making as they travel to an event at the Arena, Safeco Field, and / or CenturyLink Field, for Alternatives 2 and 3, and the Seattle Center area attractions for Alternatives 4 and 5. For maximum effectiveness, this Center should be staffed during major events and the staff should be involved in coordinating the on-ground activities of event traffic control personnel. Additional intelligent transportation system (ITS) equipment such as CCTV cameras could be installed at key locations in the Stadium District or Seattle Center area to better inform traffic management center (TMC) staff on current conditions to effectively manage traffic flows.

Traffic Signal Control / Improvements. For Alternatives 2 and 3, consider working with SDOT to upgrade the traffic control equipment at signalized intersections in the Stadium District to increase its reliability through improving communications with the SDOT traffic control center and by utilizing current Adaptive Traffic Control technology. Similar signal optimization enhancement would be desirable in the Seattle Center area in the event Alternative 4 or 5 are constructed. This would also require close coordination with SDOT.

Pedestrian Improvements. Implementation of the following pedestrian improvements would contribute to increased safety and / or improved connectivity between the Arena and pedestrian connections to transit and / or offsite parking areas.

- Improve the north-south crossing of S. Atlantic Street at Occidental Avenue S. during Arena events by:
    - Providing manual traffic control at the north-south crossing, and / or, developing a more-permanent improvement such as adding a staircase to the south side of S. Atlantic Street connecting to 3rd Avenue S.
- Improve the connectivity and safety of the east-west pedestrian connection between the Arena site and 4th Avenue S. by developing one or more of the following:
    - Increased active traffic and pedestrian management during pre- and post-event conditions to assist in helping pedestrians navigate the many railroad crossing points along with enhance surface management of railroad crossings through the implementation of additional crossing gates for pedestrians together with the development of wider sidewalks to accommodate surges in pedestrian demands before and after events and the associated pedestrian queuing.
    - Consider the construction of a pedestrian bridge from the Arena along S. Holgate Street to the east spanning such that it clears the easternmost railroad tracks. This would reduce the need for surface management pedestrian traffic control measures before or after events. If possible, the pedestrian bridge should directly connect to the Arena with a pathway wide enough to assure free flow of pedestrians during ingress and egress conditions.

At Grade Way-Finding System. In coordination with other Stadium District stakeholders, consider developing a way-finding system to guide pedestrians and cyclists to the various venues in the Stadium District. To the extent possible consider linking this system with and through the Pioneer Square, International District, and SoDo.

Pedestrian Scale Street Lighting. Consider upgrading street lighting to enhance safety for pedestrians in several areas where there are preexisting low light levels. The following locations have been identified as needing improvement or upgrades:

- 1st Avenue S. from S. Royal Brougham Way to S. Massachusetts (west side)
- 1st Avenue S. from S. Holgate Street to S. Walker Street (west side)
- 1st Avenue S. from S. Holgate Street to S. Stacy Street (east side)
- 1st Avenue S. from S. Holgate Street to S. Lander Street (both sides)
- S. Lander Street from 4th Avenue S. to the SoDo Busway (both sides)
- S. Edgar Martinez Drive S. from S. Occidental Street to 3rd Avenue S. (south side)
- 3rd Avenue S. from S. Edgar Martinez Drive S. to S. Royal Brougham Way (east side)

- 3rd Avenue S. from S. Atlantic Street to S. Holgate Street (both sides)
- 4th Avenue S. from S. Royal Brougham Way to S. Holgate Street (both sides)
- S. Royal Brougham Way from 3rd Avenue S. to the SoDo Busway (both sides)

S Massachusetts Street Realignment. As part of the Proposed Action, S. Massachusetts Street between Occidental and 1st Avenues S. would be realigned to the north to improve the direct alignment of the street with the section immediately east of Occidental Avenue S. This would enhance accessibility to the Safeco Field garage and service road. In addition, it would allow the pedestrian plaza at the north side of the Arena to be generous in size and limit the potential for pedestrian spillover onto S. Massachusetts Street, avoiding the potential for conflict with S. Massachusetts Street traffic.

North-South On-Site Connection. As part of the Proposed Action, a north-south connection parallel to the proposed vacated Occidental Avenue S. would link S. Holgate Street with the extension of S. Massachusetts Street, along the east side of the property. This link would serve as direct ingress and egress to the Safeco Field garage, as well as replace the connection to the south for emergency and service vehicles to the Safeco Field garage, surface parking, and service and emergency road.

4.3 Manage Resultant Vehicle and Pedestrian Demand

4.3.1 On-Street Parking

Expand On-Street Parking Controls. Expansion of signed and metered parking could be considered in selected commercial areas where businesses desire moderate turnover of customer on-street parking and want on-street parking protected when event ingress or egress conflict with business hours. Likewise, there may be locations where residences need passenger loading and unloading zones established to facilitate access when events are scheduled.

Change Parking Rates and Time Limits. The use of on-street parking for long-term events parking limits the short-term parking supply for adjacent businesses. Parking rates and time limits could be adjusted on event days to minimize use of on-street parking for short-term use. Adjustments could include extending study area time limits from 6:00 PM or 8:00 PM to 10:00 PM, increasing paid parking rates such that prices are greater than or comparable to off-street parking, and implementing Sunday paid parking and / or time limits.

Shared Use Parking Protocol. For Alternatives 2 and 3, consider working with other Stadium District venue owners / managers to develop a predefined protocol for sharing parking to minimize the amount of single use parking that is needed to serve the Arena.

4.3.2 Off-Street Parking

Establish Covenant Parking Agreements. Shared use agreements for available parking could be established. As much as practical, the shared use agreements would account for required covenant parking. In addition, the reservoirs of covenant parking could be distributed around the Arena as widely as possible in order to dilute traffic flows and minimize the concentration of traffic volume entering and leaving before and after events. While it is necessary to provide adequate parking, a more distributed parking program including shared parking between other venues and parking in private developments could be actively encouraged. Where parking is shared between venues, there could be a protocol similar to the multiple events' agreement that identifies when parking is available to each of the parties in the agreement.

Parking for Event Staff. Parking opportunities for event staff could be identified in areas that do not compete with event attendee parking. These are often located in parking structures that do not have attendants on duty during the evenings and weekends when most Arena events are scheduled. While the Arena could negotiate special rates for its employees, it is recommended that such rates be typical of non-event evening parking rates and that staff be required to pay for parking to encourage alternative, lower cost non-automobile transportation opportunities from a cost perspective.

Pre-Sell Reserved Arena Covenant Parking. As much as practical, covenant parking could be presold and incorporated as part of ticket packages. The purpose in pre-selling parking is to be clear to attendees that Arena covenant parking, particularly parking that is directly adjacent to the Arena is essentially sold out so non-season ticket holders do not attempt to drive in the immediate vicinity of the Arena to find parking. This coupled with assigned offsite parking, a parking guidance system, and other dynamic electronic media tools could guide attendees away from streets directly adjacent to the Arena and thus contribute to a net reduction in congestion.

Promote and Pre-Sell Off-Site Private Parking. For those people who do drive and who are not eligible for onsite / adjacent site parking, consider promoting parking that is two or more blocks away from the Arena. By designating satellite parking areas as preferred Arena parking, traffic will be dispersed and deluded and egress times will be moderated. To the extent that there is demand for reserved parking beyond that purchased by season ticket holders, parking tickets for offsite parking could be considered. Such a program can be managed by a private parking manager in coordination with on-site parking programs.

4.3.3 Vehicle Traffic

Event Ingress and Egress Plan. Consider developing preferred ingress and egress plans as a basis for guiding drivers to specific parking destinations and diverging extraneous traffic to or around areas. These plans would be the basis for developing a manual traffic control plan, preferred bus staging and routing, taxi and passenger drop-off, and preferred pedestrian routes.

4.3.4 Implementation and Monitoring

Parking and Access Review Committee (PARC). The Arena Transportation Manager could become actively engaged as a member of PARC to help integrate the Arena as part of existing Stadium District activity and event management.

Traffic Operations Group. During the initial years of operation and as major tenants / franchises become tenants in the Arena, the Transportation Manager could periodically assemble Seattle Police Department (SPD), SDOT, parking managers, King County Metro Transit, and any others involved in event day traffic control and parking to debrief on the effectiveness and problems associated with event related traffic management. This group would then make adjustments in a coordinated fashion to ensure that signing, signalization and timing, electronic media, and manual traffic control were all coordinated.

Periodic Program Review and Survey. To evaluate the performance of the Arena Traffic Management Program, a set of metrics could be established to evaluate the performance of major single and multiple event traffic conditions. Surveys during these periods measuring the effectiveness of the traffic control plans could be recorded and reported to PARC annually.

4.4 Construction

Central Construction Coordination Office. During construction, the construction manager could maintain coordination with the existing venues and the Port of Seattle to advise them of major phases of construction that may create constraints or disruption along roads and sidewalks in the immediate vicinity of the Arena.

Off-Site Construction Worker Parking. As part of the agreement with the Arena general contractor could be a requirement to develop a construction worker parking program, so available public off-street and on-street parking is not adversely impacted by the influx of this large temporary population of workers. This could involve remote parking with a shuttle service, use of parking and loading areas in vacant buildings, or other means of providing construction worker parking without impacting existing on- and off-street public parking.

Priority Truck Routing and Loading. The Arena general contractor could specify priority truck routes and loading areas as part of a coordinated Construction Traffic Control Plan. This plan could not only be reviewed by SDOT but also could be coordinated with other venue transportation managers and the Port of Seattle to ensure that there are minimal conflicts with existing and scheduled operations.

Street and Sidewalk Closures. As part of the Arena construction, identify anticipated street closures, the timing for street closures, and the detour routes and signing plan to guide drivers and pedestrians around these restrictions. This proposal could be reviewed and coordinated with SDOT, the Port of Seattle, and others nearby venues.

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