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SR 520 Bridge Replacement and HOV Project Draft EIS

6-Lane Alternative Options

Addendum to Transportation Discipline Report

Washington State Department of Transportation

SoundTransit

U.S. Department of Transportation Federal Highway Administration

SR 520 Bridge Replacement and HOV Project EIS
6-Lane Alternative Options

Addendum to Transportation Discipline Report

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Federal Highway Administration
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Acronyms and Abbreviations

AVO	average vehicle occupancy
EIS	Environmental Impact Statement
LOS	level of service
MOE	measures of effectiveness
SOV	single occupant vehicle
vph	vehicle per hour
WSDOT	Washington State Department of Transportation

Chapter 1: Introduction and Overview

This Addendum to the *Transportation Discipline Report* (Parametrix et al. 2005), Appendix R of the *Draft SR 520 Bridge Replacement and HOV Project Environmental Impact Statement* (Draft EIS), describes the effects of the three options to the original 6-Lane Alternative on the project area transportation system. These options are described below; two of these options are in Seattle and one is on the Eastside.

The following transportation analyses were performed to evaluate the three 6-Lane Alternative options:

- Freeway traffic forecasts
- Local traffic forecasts
- Freeway traffic operations
- Local traffic operations

This additional analysis was performed to ensure that the 6-Lane Alternative options were evaluated at the same level as those alternatives discussed in the *Transportation Discipline Report*.

What options are being evaluated?

The options evaluated in this memorandum are:

- The Second Montlake Bridge option
- The 6 Lanes with the Pacific Street Interchange (referred to as the Pacific Street Interchange option in this addendum)
- The South Kirkland Park-and-Ride Transit Access – 108th Avenue Northeast option (referred to as the South Kirkland P&R Transit Access option in this addendum)

Either the Second Montlake Bridge or the Pacific Street Interchange option could be added to the original 6-Lane Alternative. These two options would not be considered together. In other words, the original 6-Lane Alternative could include either the Second Montlake Bridge

option or the Pacific Street Interchange option but not both. The South Kirkland P&R Transit Access option could be included with any of the 6-Lane Alternative options or with the original 6-Lane Alternative.

Why are these options being evaluated?

The Second Montlake Bridge and Pacific Street Interchange options are being evaluated because of public input received by the Washington State Department of Transportation (WSDOT) during the winter of 2004/2005. The comments were primarily focused on considering possibilities to reduce the width of the original 6-Lane Alternative through the Montlake community. Additionally, the public also asked WSDOT to further explore ways to relieve the congestion across the Montlake Bridge.

The SR 520 Bridge Replacement and HOV Project team (SR 520 Project Team) is considering direct access ramps at the 108th Avenue Northeast interchange in Bellevue to provide travel time savings for buses serving the South Kirkland Park-and-Ride. The Modified Loop Ramp design option of the South Kirkland Park and Ride Transit Access option at the Bellevue Way/Lake Washington Boulevard Northeast interchange was developed to determine if the environmental effects associated with the direct access ramps at the 108th Avenue Northeast interchange could be reduced while still providing similar transit travel time benefits.

How were these options developed?

In addition to incorporating the feedback received from the Montlake community, WSDOT held two workshops with WSDOT design staff and other transportation professionals to refine some possible options that were still being developed. The SR 520 project team then refined the options through a screening process, and the Second Montlake Bridge and Pacific Street Interchange options were selected to be evaluated at the same level of analysis as the original 6-Lane Alternative. The South Kirkland P&R Transit Access option as developed through a series of meetings with the SR 520 project team, City of Kirkland staff, City of Bellevue staff, King County Metro staff, and Sound Transit staff.

What is the Second Montlake Bridge option?

Exhibit 1-1. Second Montlake Bridge Option *(draft conceptual plan as of October 2005)*

The intent of the Second Montlake Bridge option (Exhibit 1-1) is to narrow the SR 520 footprint through the Montlake neighborhood by removing the Montlake Freeway Transit Stop on SR 520. This option would include a second Montlake bridge across the Montlake Cut to provide additional capacity across the cut to help relieve congestion in this area. With less congestion, bus travel times and reliability would improve. This bridge would be a parallel, bascule (draw) bridge located just east of the existing Montlake Bridge. The two bridges would operate as one-way in opposite directions.

What is the Pacific Street Interchange option?

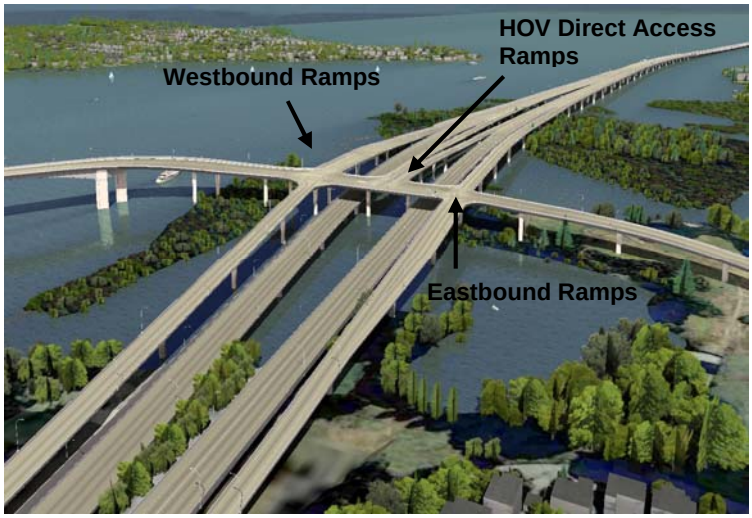


Exhibit 1-2. Pacific Street Interchange Option *(draft conceptual plan as of October 2005)*

The intent of the Pacific Street Interchange option is to reduce the traffic effects of the Montlake interchange on the surrounding neighborhood and to narrow the SR 520 footprint across Portage Bay. This option would remove the Montlake/SR 520 interchange and replace it with a new SR 520 interchange, called the Pacific Street interchange. The Pacific Street interchange would be approximately 1,300 feet to the east of the existing Montlake interchange (see Exhibit 1-2).

The new interchange would be primarily located over the WSDOT-owned peninsula near the Washington Park Arboretum. A new on- and off-ramp to and from the north would extend to the Northeast Pacific Street/Montlake Boulevard Northeast intersection. A column-supported ramp of four general purpose lanes (two lanes in each

direction) would extend over Union Bay (referred to as the Union Bay Bridge in this addendum) from the new interchange and would touch down at the University of Washington Husky Stadium parking lot before joining the Northeast Pacific Street/Montlake Boulevard Northeast intersection (see Exhibit 1-3).

Exhibit 1-3. Northeast Pacific Street/Montlake Boulevard Northeast with the Pacific Street Interchange Option *(draft conceptual plan as of October 2005)*

At this intersection, the roadway would be lowered 8 to 10 feet from the existing elevation to provide vehicle-only access. Grade-separated pedestrian access would be provided above and away from vehicular traffic. The roadway on Montlake Boulevard north of Pacific Street would be widened to the east until just south of Northeast 45th Street.

The Union Bay Bridge would provide a 110-foot vertical clearance (or alternately a 70-foot vertical clearance) across the ship canal portion of Union Bay. Columns would be placed just outside the width of the ship canal to accommodate boat traffic.

Ramps to and from Lake Washington Boulevard would still be included in this option; however, their footprint would be slightly different from the original 6-Lane Alternative. The ramp connections to and from Lake Washington Boulevard and to and from the Union Bay Bridge would create a full diamond interchange, as opposed to a partial diamond interchange proposed under the original 6-Lane Alternative. This full diamond interchange would provide more access to and from Lake Washington Boulevard. No access to or from SR 520 would be provided at Montlake Boulevard.

These new ramp connections would primarily affect traffic movements from the Lake Washington Boulevard area to SR 520 west of the interchange. For example, with the existing interchange configuration, traffic traveling from Lake Washington Boulevard to I-5 travels along Lake Washington Boulevard to Montlake Boulevard, makes a U-turn at Hamlin Street, and then accesses the westbound SR 520 on-ramp. With the new interchange, traffic would turn right from Lake Washington

Boulevard and then left onto the westbound on-ramp. This would eliminate the need for traffic to use Montlake Boulevard and the need for a U-turn on Montlake Boulevard. No access to or from SR 520 would be provided at Montlake Boulevard Northeast.

The interchange would also include HOV direct access ramps to and from the east (i.e., a westbound off-ramp and an eastbound on-ramp).

From Montlake to I-5, SR 520 would be six lanes wide (three in either direction). Buses would access SR 520 via the Union Bay Bridge through the University area, providing for a more direct connection between buses and the proposed Sound Transit North Link Station at Husky Stadium.

The bicycle/pedestrian path would follow the Union Bay Bridge from SR 520 and end at the Pacific Street interchange, close to the Burke-Gilman trail, instead of connecting to the Montlake interchange as in the original 6-Lane Alternative.

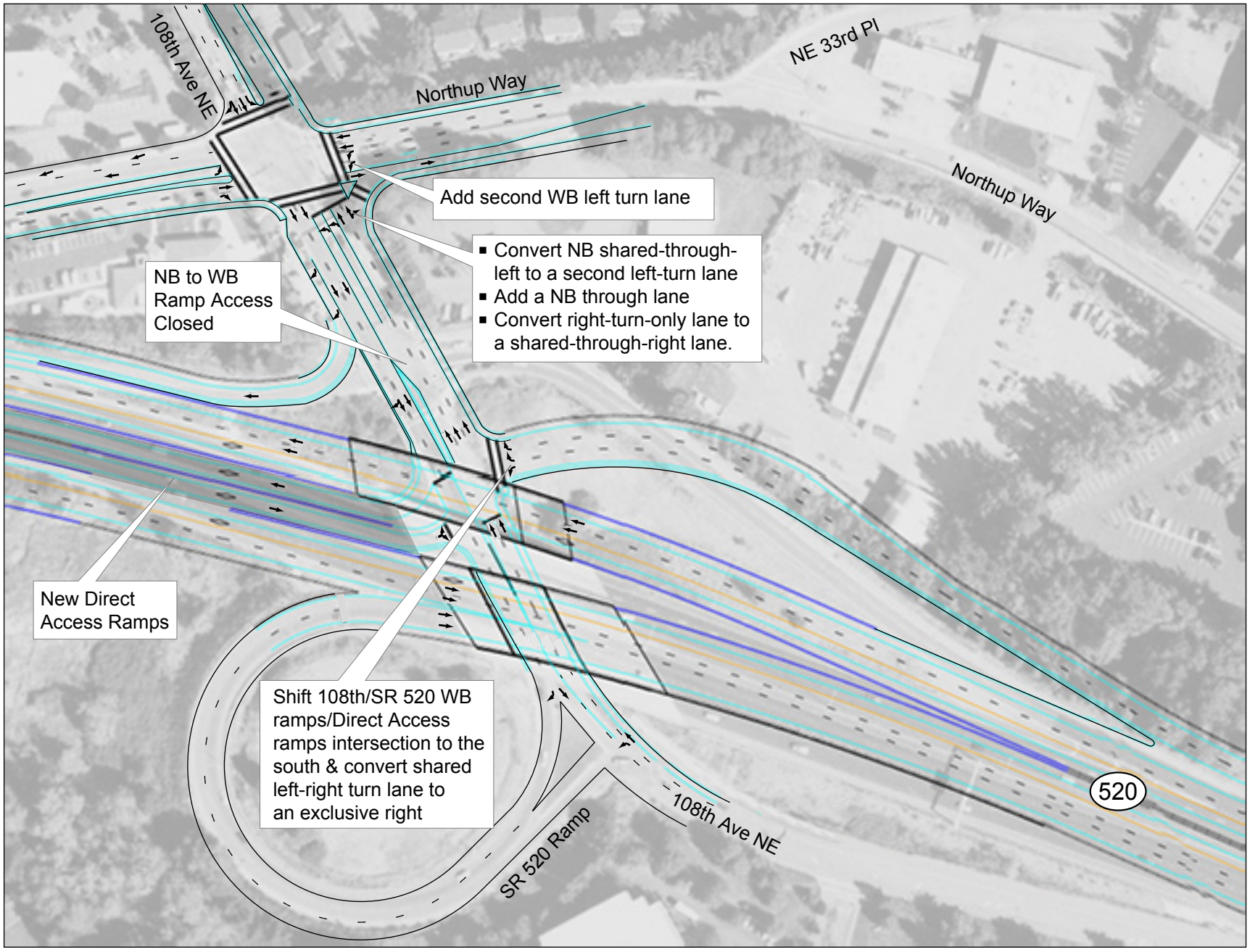
What is the South Kirkland Park-and-Ride Transit Access – 108th Avenue Northeast option?

The intent of the South Kirkland P&R Transit Access option is to provide improved access for buses to the South Kirkland Park-and-Ride from eastbound SR 520 and from the South Kirkland Park-and-Ride to westbound SR 520. This option includes two design options that would either add new transit/HOV-only direct access ramps to and from the west or add an HOV lane to the eastbound Bellevue Way Northeast off-ramp (see Exhibits 1-4 and 1-5).

With the original 6-Lane Alternative, the HOV lanes would be relocated from the outside lanes to the inside lanes and direct access ramps would provide buses and carpools with a direct loop connection to the HOV lane. HOV direct access ramps prevent buses and carpools from having to access SR 520 from a right-side ramp and cross over the two general purpose lanes to access the HOV lane, which reduces weaving activity. Reducing weaving activity would reduce congestion, improve safety, and improve bus travel times and reliability.

The following two design options were evaluated:

- Provide direct access ramps at new 108th Avenue Northeast/westbound SR 520 ramp intersection to the south (referred to as the Direct Access Ramps option from this point forward).



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Note: This alternative and its associated improvements were evaluated using Year 2030 traffic volumes from the original 6 Lane Alternative.

Exhibit 1-4. **South Kirkland P&R Transit Access Direct Access Ramp Option**

SR 520 Bridge Replacement and HOV Project

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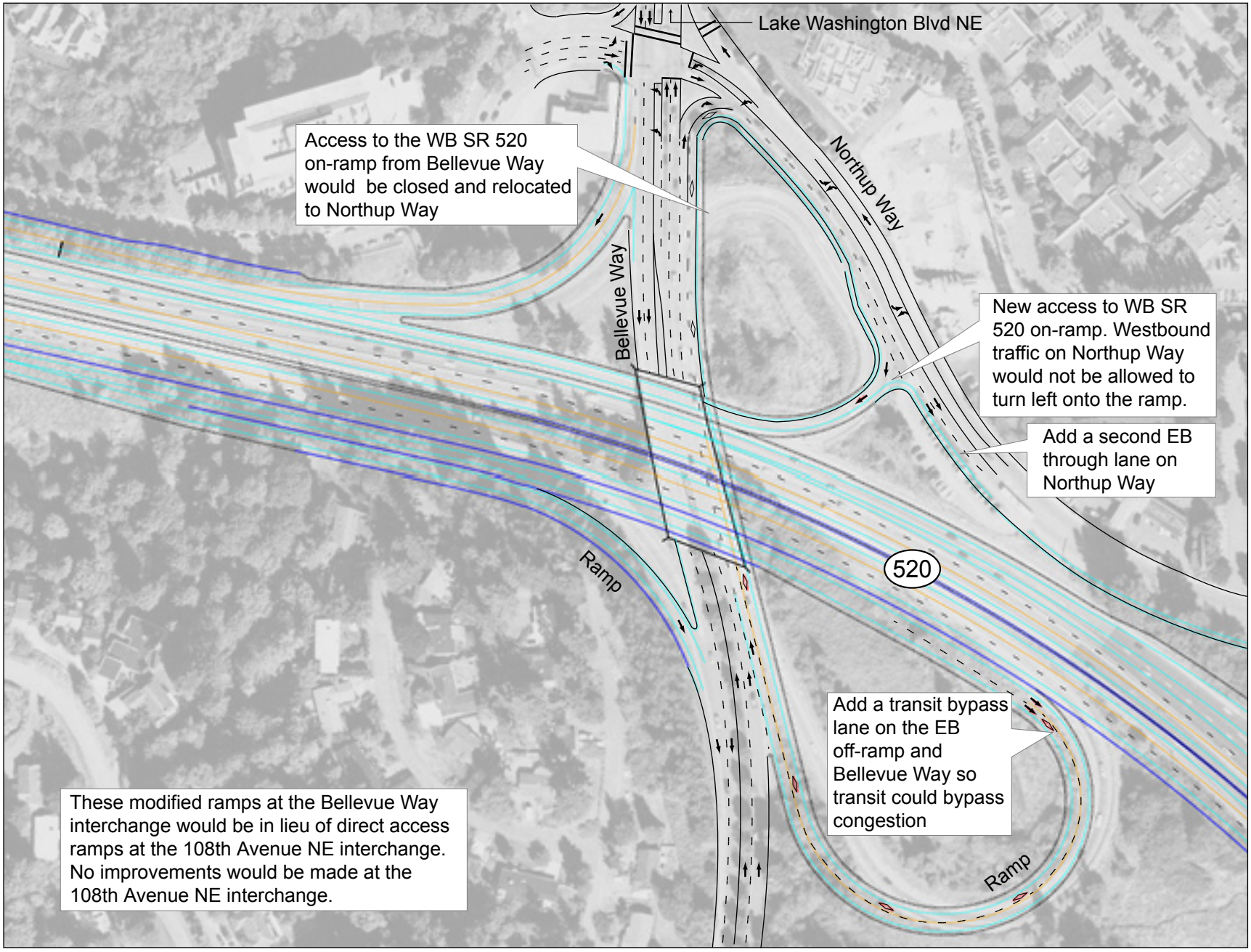

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Note: This alternative and its associated improvements were evaluated using Year 2030 traffic conditions with the original 6 Lane Alternative.

Exhibit 1-5. **South Kirkland P&R Transit Access Modified Loop Ramps Option**

SR 520 Bridge Replacement and HOV Project

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- Modified loop ramps with HOV lanes at the Lake Washington Boulevard/Bellevue Way interchange (referred to as the Modified Loop Ramp option from this point forward)

Direct Access Ramps Option

With this option, the 108th Avenue Northeast/westbound SR 520 off-ramp intersection would be relocated to the south (almost under SR 520) and the direct access ramps would connect at this signalized intersection.

Relocating the 108th Avenue Northeast/westbound SR 520 off-ramps intersection to the south was proposed because the congestion that occurs on 108th Avenue Northeast is complicated by the proximity of the Northup Way and westbound SR 520 ramp intersections. This option would increase the distance between the SR 520 ramp and the Northup Way intersection with 108th Avenue Northeast, which would allow more traffic to maneuver into the correct lane at the Northup Way intersection. The additional intersection capacity would improve traffic flow and reduce congestion.

With this configuration, the westbound SR 520 on-ramp and 108th Avenue Northeast would only be accessible to southbound traffic. Northbound vehicles that previously turned left from 108th Avenue Northeast onto the SR 520 westbound on-ramp would be required to access SR 520 at the on-ramp located on Bellevue Way.

This option evaluated a number of intersection improvements at the 108th Avenue Northeast/Northup Way intersection to determine if they would reduce congestion and delay between the SR 520 westbound ramps and the South Kirkland Park-and-Ride.

Along with direct access ramps, this location was examined as a location for a future freeway transit station. However, due to the proximity of the I-405/SR 520 Interchange, close structural column spacing in the interchange, and narrow shoulder width, the freeway transit station could not be constructed. If the I-405/SR 520 Interchange were reconstructed, then there could be a possibility for a freeway transit station.

Modified Loop Ramp Option

The Modified Loop Ramp option was developed in an effort to reduce the environmental effects that would occur under the Direct Access Ramps option, while still providing similar travel time savings.

With this option, HOV direct access ramps would not be built at the 108th Avenue Northeast interchange. Instead, an HOV lane would be added to the eastbound SR 520 off-ramp to Lake Washington Boulevard and continue on Bellevue Way to terminate as a right-turn only lane to Northup Way. Buses would then continue along Northup Way, which would be widened to two eastbound through lanes (between Bellevue Way Northeast and 108th Avenue Northeast). The westbound SR 520 on-ramp from Bellevue Way would be relocated to Northup Way. Under the Modified Loop Ramp option, there would be no changes to the existing 108th Avenue Northeast/Northup Way intersection.

Chapter 2: Key Findings

What are the key findings from freeway travel demand forecasts?

This section summarizes freeway travel demand forecasts in the SR 520 project area for the two Seattle project area 6-Lane Alternative options: the Second Montlake Bridge option and the Pacific Street Interchange option. No Build and 6-Lane Alternative information is provided to allow comparisons among the alternatives. The key findings are shown in terms of "peak-period bidirectional average values." SR 520 traffic engineers determined that the South Kirkland P&R Transit Access option would not substantially affect freeway travel demand forecasts over the original 6-Lane Alternative.

The **peak-period bidirectional average value** is the sum of the average a.m. and p.m. peak-period person or vehicle trips across the Evergreen Point Bridge—both eastbound and westbound. This value provides a consistent way of measuring total traffic across the bridge during the peak travel periods.

Exhibit 2-1 shows the average person-trip demand, vehicle-trip demand, and average vehicle occupancy (AVO) on SR 520. This exhibit reports freeway traffic forecasts only for the Montlake interchange area between I-5 and Montlake Boulevard Northeast (on the Portage Bay Bridge) because this is the only area of SR 520 where there would be differences in traffic demand with the options. For the Second Montlake Bridge and Pacific Street Interchange options, vehicle- and person-trip traffic demand across the Evergreen Point Bridge and areas to the east would be similar to the original 6-Lane Alternative. Chapter 3 of the *Transportation Discipline Report* presents traffic forecasts for these areas with the original 6-Lane Alternative.

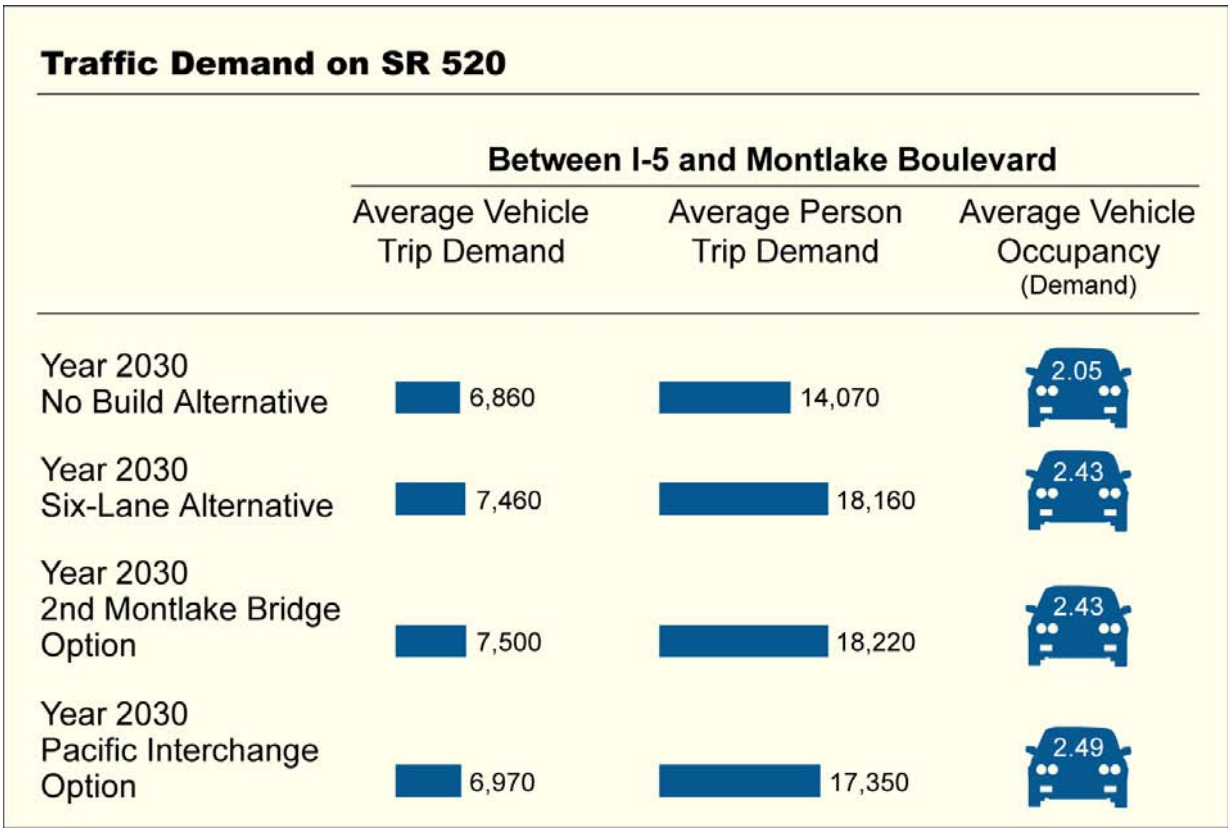


Exhibit 2-1. Traffic Demand on SR 520 for the No Build Alternative, Original 6-Lane Alternative, Second Montlake Bridge Option, and Pacific Street Interchange Option

Based on Exhibit 2-1, the freeway travel demand forecasts key findings are:

- Compared to the No Build Alternative, the original 6-Lane Alternative, Second Montlake Bridge option, and the Pacific Street Interchange option would increase vehicle- and person-trip demand between I-5 and Montlake Boulevard.
- The original 6-Lane Alternative and Second Montlake Bridge option would have similar vehicle-trip and person-trip demand.
- The vehicle-trip and person-trip demand with the Pacific Street Interchange option would be slightly less than the original 6-Lane Alternative but still more than the No Build Alternative. With the Pacific Street Interchange option, vehicle- and person-trip demand

would decrease between I-5 and Montlake Boulevard Northeast because traffic would use local streets rather than I-5 and SR 520.

- The Pacific Street Interchange option would provide a bypass to I-5 congestion for local traffic destined to areas north of the University District. Because traffic would exit at the new Pacific Street interchange, there would be a reduction in traffic volume on the Portage Bay Bridge compared to the original 6-Lane Alternative. Person trips would be higher than the No Build Alternative because of the HOV lane system completion.
- With the original 6-Lane Alternative and the Second Montlake Bridge option, traffic would access the University District and areas northeast of the I-5/SR 520 interchange via 45th and 65th Streets Northeast.
- As seen in Exhibit 2-1, there would be a decrease in general purpose and HOV traffic between I-5 and Montlake with the Pacific Street Interchange option; however, buses would not shift off SR 520 onto the local arterials with this option. The result would be a higher percentage of buses on SR 520 between I-5 and Montlake than with the original 6-Lane Alternative, which would result in a higher AVO for the Pacific Street Interchange option (2.49 versus 2.43).

What are the key findings for local traffic demand forecasts?

The Second Montlake Bridge and Pacific Street Interchange options would shift traffic patterns on local streets because roadway capacity on Montlake Boulevard Northeast would be increased. A new road would also be built between the new Pacific Street Interchange at SR 520 and the Northeast Pacific Street/Montlake Boulevard Northeast intersection. This increase in roadway capacity would lead to an increase in traffic traveling through the area, especially on Northeast Pacific Street and 15th Avenue Northeast. SR 520 traffic engineers determined that the South Kirkland P&R Transit Access option would not substantially affect freeway travel demand forecasts over the original 6-Lane Alternative; therefore, local traffic demand forecasts would not change.

Relative to the original 6-Lane Alternative, the Second Montlake Bridge and Pacific Street Interchange options would increase traffic demand on

Northeast Pacific Street between Montlake Boulevard Northeast and west of 15th Avenue Northeast, on Montlake Boulevard Northeast north of the Montlake Cut, and on 15th Avenue Northeast during both the a.m. and p.m. peak hours.

The increase in traffic demand would be associated with the following factors:

- Drivers taking advantage of increased capacity on Montlake Boulevard Northeast to access SR 520, rather than using I-5
- Improved access to and from the University District attracting some traffic that would have previously accessed the University District via I-5 and Northeast 45th Street.

Exhibit 2-2 shows the changes in local and freeway traffic volumes associated with the No Build Alternative, original 6-Lane Alternative, Second Montlake Bridge option, and Pacific Street Interchange option on the following streets in the Montlake interchange area during the a.m. peak hour:

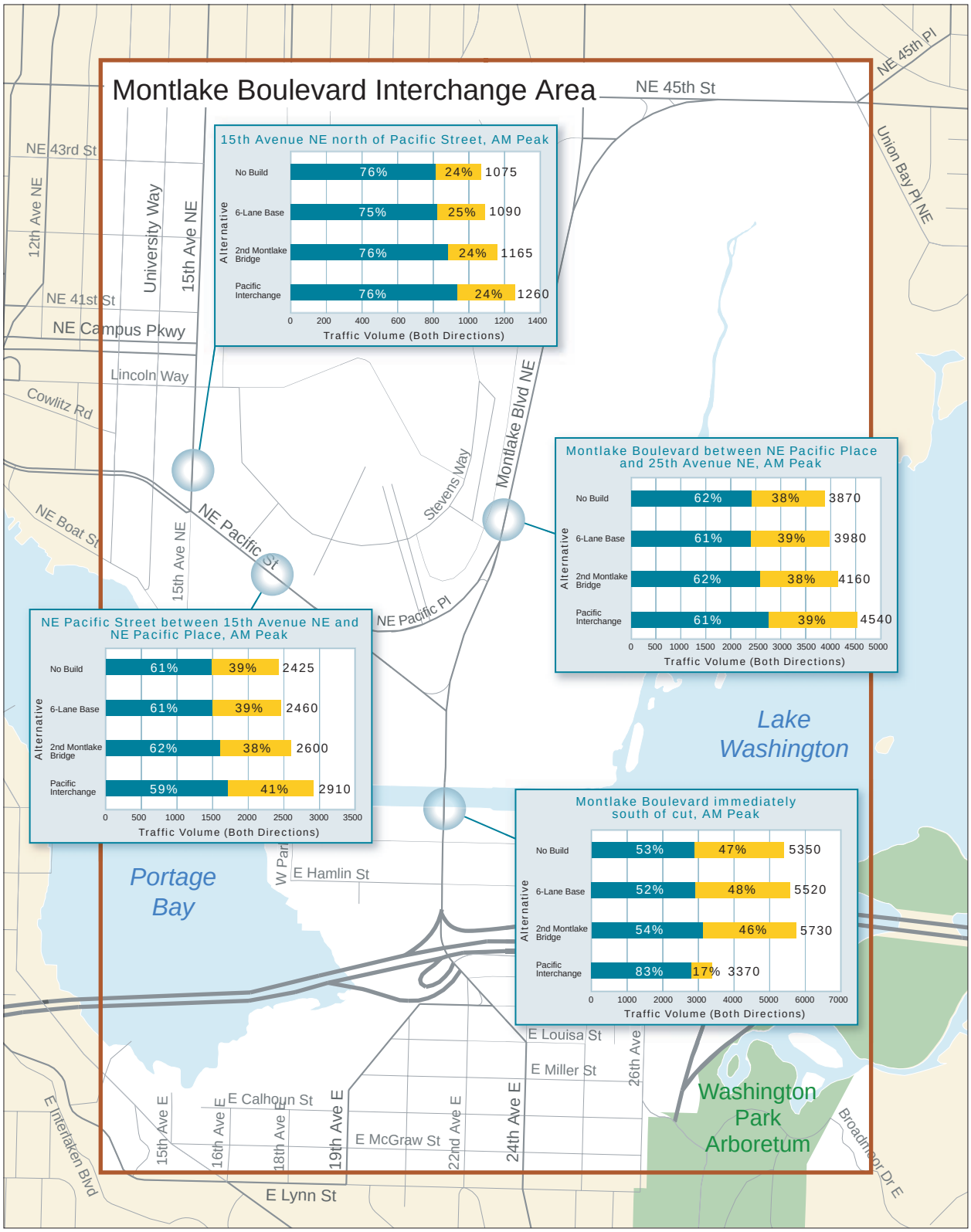
- Northeast Pacific Street between 15th Avenue Northeast and Northeast Pacific Place
- 15th Avenue Northeast just north of Northeast Pacific Street
- Montlake Boulevard Northeast just north of Northeast Pacific Place
- Montlake Boulevard Northeast just south of the Montlake Cut

With the Pacific Street Interchange option only, traffic demand would decrease on Montlake Boulevard Northeast between the Montlake Cut and SR 520 because access to the SR 520 ramps would be relocated. Relocating SR 520 access would increase traffic on Lake Washington Boulevard Northeast because traffic from north Capitol Hill would use this route. Some drivers would also travel through the Pacific Street interchange to access areas to the north and south.

In Exhibit 2-2, each bar of the graph represents the total amount of traffic on the street at the selected location (both directions) during the a.m. peak hour. The bar is then split to show how much of the total traffic is local traffic and how much is SR 520 traffic. Showing traffic this way illustrates how changes to SR 520 affect traffic in the Montlake interchange area.

Local traffic refers to those vehicle trips that are traveling to and from destinations around the Montlake interchange area, such as from a residence in the University District to a job at the University of Washington Hospital.

SR 520 traffic refers to those vehicle trips that are traveling through the Montlake interchange area to access SR 520.



LEGEND

Local Traffic

SR 520 Traffic

N

0 500 1,000 Feet

Exhibit 2-2. **Year 2030 Local vs Freeway Volumes – During the AM Peak Hour**

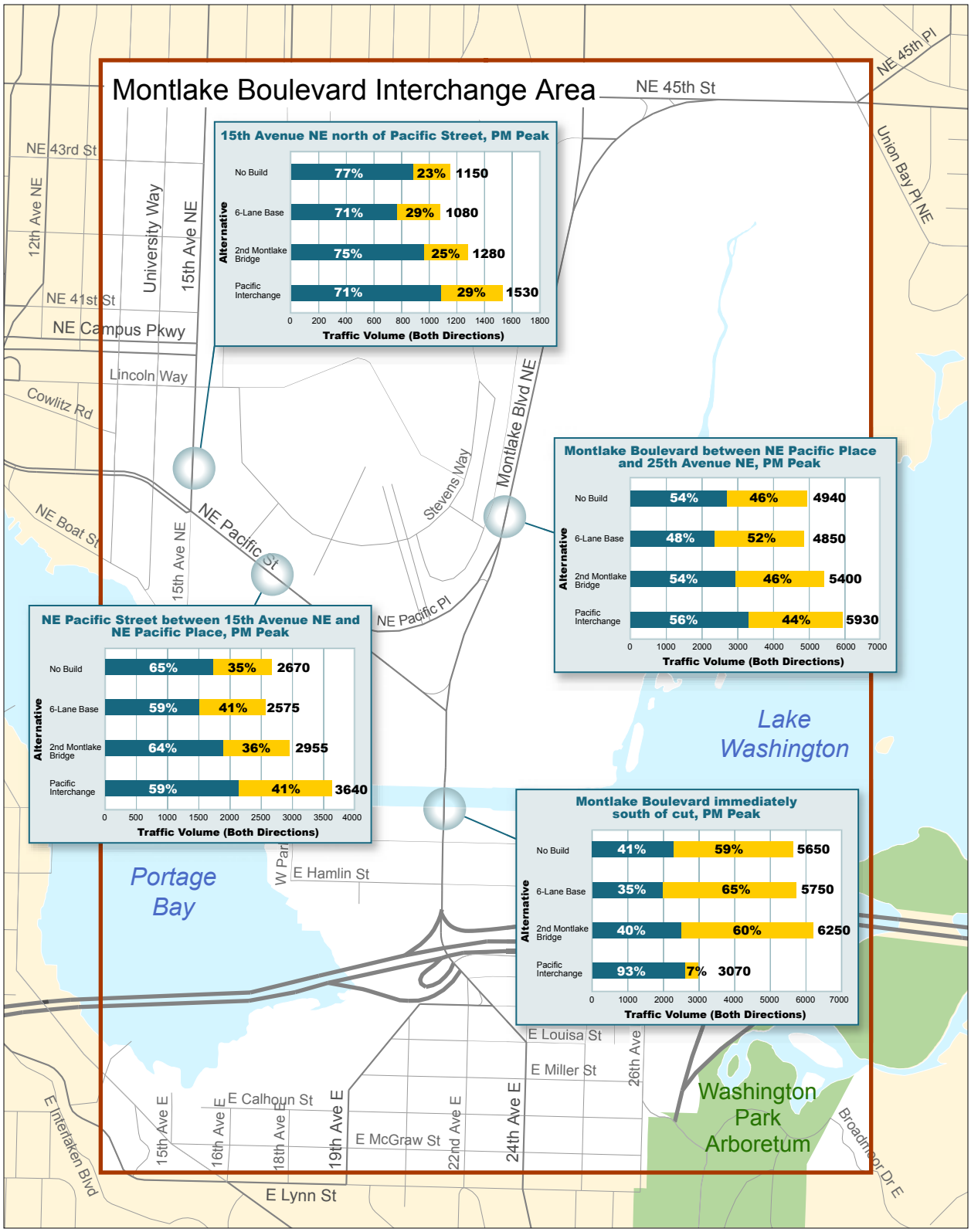
SR 520 Bridge Replacement and HOV Project

The key points in Exhibit 2-2 are:

- With the original 6-Lane Alternative, traffic volumes on the local streets would increase slightly compared with the No Build Alternative. For example, total traffic volumes on Northeast Pacific Street would increase from 2,425 with the No Build Alternative to the 2,460 with the original 6-Lane Alternative. Of these total volumes, approximately 1,490 vehicle trips would be associated with local trips and approximately 935 trips would be associated with freeway trips. This ratio of local trips to freeway trips would stay the same with the original 6-Lane Alternative (approximately 1,500 local trips and 960 freeway trips).
- The changes in total traffic volumes and local versus freeway trip ratios would be similar for the No Build Alternative, original 6-Lane Alternative, and Second Montlake Bridge Alternative.
- Total traffic volumes would increase slightly with the Second Montlake Bridge option because of the increased capacity across the Montlake Cut.
- Total traffic volumes on Northeast Pacific Street and Montlake Boulevard Northeast would increase more substantially with the Pacific Street Interchange option because of the increased capacity on Montlake Boulevard Northeast and the new roadway connecting the new interchange and the Northeast Pacific Street/Montlake Boulevard Northeast intersection.
- South of the Montlake Cut, there would be a substantial change in total traffic volumes and the local versus freeway trip ratio with the Pacific Street Interchange option. Traffic traveling to and from SR 520 would shift from Montlake Boulevard Northeast to the new Union Bay Bridge.

Exhibit 2-3 is the same as Exhibit 2-2 except that it shows p.m. peak hour traffic volumes. The key points in Exhibit 2-3 are:

- Generally, total traffic volumes would be higher in the p.m. peak hour than in the a.m. peak hour.
- The p.m. peak hour changes in traffic volumes and local versus freeway ratios would not be substantially different from those described for the a.m. peak hour.



LEGEND

Local Traffic

SR 520 Traffic

N

0 500 1,000 Feet

Exhibit 2-3. **Year 2030 Local vs Freeway Volumes – During the PM Peak Hour**

SR 520 Bridge Replacement and HOV Project

The changes in traffic volumes associated with the original 6-Lane Alternative and the Second Montlake Bridge and Pacific Street Interchange options are discussed in more detail in *Chapter 3: Freeway and Local Traffic Forecasts* of this addendum. Additional forecasted traffic volumes for the original 6-Lane Alternative and the Second Montlake Bridge and Pacific Street Interchange options are also shown in exhibits in the *Local Travel Demand Forecasts Results* section of this report.

What are the key findings for the freeway operations analysis?

The key findings from the freeway operations analysis are shown in Exhibit 2-4 in terms of average vehicles served, average persons served, and average vehicle occupancy (AVO). The traffic volumes and AVO represent how many vehicles and people would travel between I-5 and Montlake Boulevard Northeast (on the Portage Bay Bridge) with the No Build Alternative, original 6-Lane Alternative, Second Montlake Bridge option and Pacific Street Interchange option. The average travel times to travel between I-5 and Northeast 124th Street during the peak periods are shown in Exhibit 2-5.

The **peak-period bidirectional average value** is the sum of the average a.m. and p.m. peak-period vehicle or person trips across the Evergreen Point Bridge—both eastbound and westbound. This value provides a consistent way of measuring total traffic across the bridge during the peak travel periods.

As previously mentioned, results from the traffic operations analysis are reported only for the Montlake interchange area between I-5 and Montlake Boulevard Northeast because this was the only section of SR 520 where there were differences among the alternative and options in traffic volume distribution and freeway operations. However, the average travel times were provided for the entire project area (between I-5 and Northeast 124th Street) to show how the volume differences across the Portage Bay Bridge affects the entire project corridor.

Based on Exhibit 2-4, key findings from the freeway traffic operations analysis are:

- The original 6-Lane Alternative, Second Montlake Bridge option, and the Pacific Street Interchange option would serve more vehicle and person trips between I-5 and Montlake Boulevard than the No Build Alternative.
- The original 6-Lane Alternative and Second Montlake Bridge option would serve similar vehicle and person trips.

- The Pacific Street Interchange option would serve slightly less vehicle and person trips between I-5 and Montlake Boulevard Northeast than original 6-Lane Alternative and the Second Montlake Bridge option, but would serve more than the No Build Alternative. Fewer vehicle and person trips would occur at this location because local traffic would use local streets rather than I-5 for north-south trips.

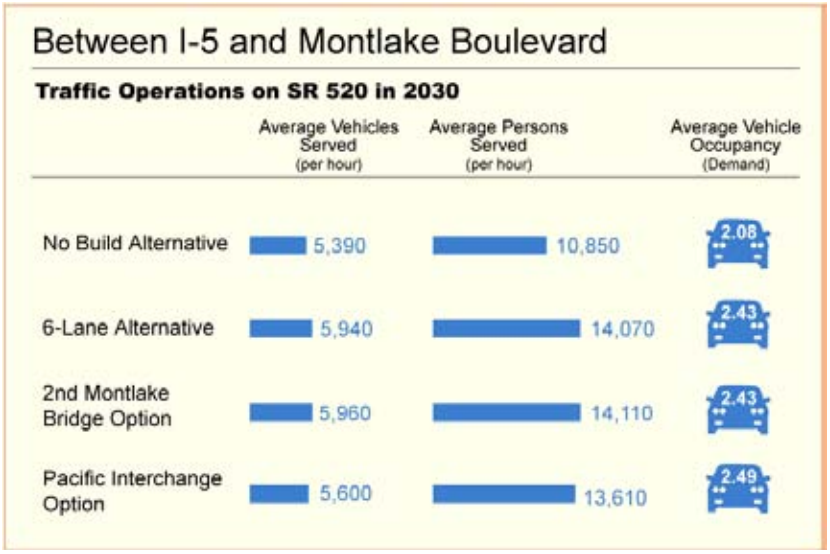


Exhibit 2-4. Traffic Throughput on SR 520 for the No Build, Original 6-Lane Alternative, Second Montlake Bridge Option, and Pacific Street Interchange Option

- As seen in Exhibit 2-4, the AVO would increase from 2.43 to 2.49 persons per vehicles between I-5 and Montlake Boulevard Northeast with the Pacific Street Interchange option. The AVO would increase because there would be a decrease in general purpose and carpool volumes but bus volumes would remain the same. The result would be a higher percentage of buses on SR 520 between I-5 and Montlake than with the original 6-Lane Alternative. Because buses carry more persons than other vehicles, this would result in a higher AVO for the Pacific Street Interchange option (2.49 versus 2.43).

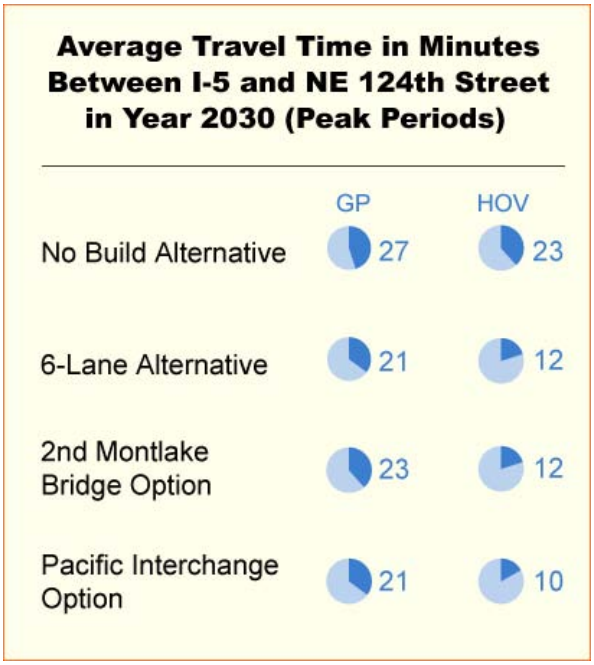


Exhibit 2-5. Average Travel Time in Minutes Between I-5 and Northeast 124th Street in Year 2030 (Peak Periods).

- Travel times would be similar for the original 6-Lane Alternative and the options (Exhibit 2-5). With the Second Montlake Bridge option, GP travel times would increase by 2 minutes because of an increase in traffic on the Portage Bay Bridge during the p.m. peak period (also see Exhibit 3-25). The two minute savings for the HOV

traffic in the Pacific Street Interchange option would be the result of fewer trips across Portage Bay Bridge that would be affected by I-5 congestion.

What are the key findings for the local traffic operations analysis?

The Second Montlake Bridge and Pacific Street Interchange options would shift traffic patterns on the local streets because roadway capacity crossing the Montlake cut would be increased. With the Pacific Street Interchange option, a new road would also be built between the new Pacific Street Interchange at SR 520 and the Northeast Pacific Street/Montlake Boulevard Northeast intersection. This increase in roadway capacity would lead to an increase in traffic traveling through the area.

Relative to the original 6-Lane Alternative, the Second Montlake Bridge and Pacific Street Interchange options would increase year 2030 traffic volumes on the following streets during both the a.m. and p.m. peak hours:

- Northeast Pacific Street between Montlake Boulevard Northeast and west of 15th Avenue Northeast
- Montlake Boulevard Northeast north of Northeast Pacific Street
- 15th Avenue Northeast
- 24th Avenue Northeast
- Lake Washington Boulevard (Pacific Street Interchange only)

With the changes in traffic patterns and traffic volumes, year 2030 intersection operations would also change. Level of service (LOS) would improve at the following four intersections:

- *Northeast Pacific Place/Montlake Boulevard Northeast* operations would improve from LOS E with the original 6-Lane Alternative to LOS D with the Pacific Street Interchange option during the p.m. peak hour because of the additional lanes on Montlake Boulevard Northeast.
- *Northeast 45th Street/Montlake Boulevard Northeast* operations would improve from LOS E with the original 6-Lane Alternative to LOS D with the Pacific Street Interchange option during the p.m. peak

hour because of the additional lanes on Montlake Boulevard Northeast.

- *Northeast Pacific Street/Montlake Boulevard Northeast* operations would improve from LOS D with the original 6-Lane Alternative to LOS C with the Second Montlake Bridge option during the a.m. peak period because of the additional lanes across the Montlake Cut.
- *Lake Washington Boulevard Northeast/Montlake Boulevard Northeast* operations would improve from LOS F with the original 6-Lane Alternative to LOS C with the Pacific Street Interchange option during the a.m. peak hour because traffic volumes would decrease with the relocation of the SR 520 ramps to the new interchange. During the p.m. peak hour, LOS would improve from LOS E to C.

LOS would degrade at the following intersection:

- *Northeast Pacific Street/15th Street Northeast* operations would degrade from LOS D with the original 6-Lane Alternative to LOS E with the Pacific Street Interchange option during the p.m. peak hour because traffic volumes would increase through this intersection.

The new intersections associated with the Pacific Street Interchange would operate as shown in Exhibit 2-6 below.

Exhibit 2-6. Year 2030 LOS with the Pacific Street Interchange Option

	A.M. Peak Hour LOS	P.M. Peak Hour LOS
SR 520 Westbound Ramps	B	D
SR 520 Eastbound Ramps	D	C
Direct Access Ramp	B	A

As shown in Exhibit 2-6, all of the new intersections associated with the Pacific Street Interchange option would operate acceptably at LOS D or better in the year 2030. With the new Pacific Street Interchange option, HOV direct access ramps to and from the east would be provided. These ramps would be located in the middle of the freeway and therefore connect in the center of the interchange, which would result in the westbound, eastbound, and HOV direct access ramps being very closely spaced. At times then, northbound and southbound traffic

would queue back through the adjacent intersection(s). However, these queues would not affect traffic operations on either local street or the SR 520 mainline.

The complete evaluation of the South Kirkland Park-and-Ride Transit Access –108th Avenue Northeast option can be found in the *Final 108th Direct Access Study* released in October 2005.

What are the key findings for the South Kirkland Park-and-Ride Transit Access – 108th Avenue Northeast option?

The South Kirkland P&R Transit Access option evaluation found that eastbound buses traveling to and from the South Kirkland Park-and-Ride during the p.m. peak hour would receive the greatest benefit, receiving a 15- to 16-minute reduction in transit travel time in the year 2030. None of the local intersections would be adversely affected with this option.

Chapter 3: Freeway and Local Traffic Forecasts

Freeway Traffic Forecasts

How were the freeway forecasts prepared?

The freeway forecasts for the Second Montlake Bridge and Pacific Street Interchange options were developed using the results from the SR 520 Project's EMME/2 travel demand computer model presented in Appendix R of the Draft EIS. Except for geometric changes to the roadway network, both options used identical modeling procedures and databases (including land use forecasts, trip generation, trip distribution, origin-destination trip tables, transit routes, ridership and service assumptions, and mode choice) to those used for the original 6-Lane Alternative.

Geometric changes to a roadway are physical changes that alter the way a roadway or an intersection is laid out. Geometric changes can range from constructing a new roadway to reconstructing an existing roadway to closing a street to re-striping lanes at an intersection (i.e., changing a right-turn only lane to a shared through-right lane).

For the South Kirkland P&R Transit Access–108th Avenue Northeast option, the addition of direct access ramps would not change either the freeway or local traffic forecasts over the original 6-Lane Alternative. Therefore, this option is not discussed in this chapter.

The geometric changes to the transportation network for the Second Montlake Bridge and Pacific Street Interchange options include:

Second Montlake Bridge Option

- One additional general purpose lane in each direction would be added across the Montlake Cut (increasing the total capacity across the Montlake Cut from 4 lanes to 6 lanes, or 4,000 vehicles per hour [vph] to 6,000 vph). This would relieve the existing bottleneck that is caused by the three lanes in each direction approaching the bridge narrowing to two lanes across the bridge.
- No additional capacity would be added to Montlake Boulevard Northeast north or south of the second bridge.

Pacific Street Interchange Option

- The existing ramp connections at the SR 520/Montlake Boulevard Northeast Interchange would be removed.

- The new interchange would be located 1,300 feet east of Montlake Boulevard Northeast.
- A new elevated roadway would be added between the Montlake Boulevard Northeast/Northeast Pacific Street intersection and the SR 520 ramps. This new roadway would be two lanes in each direction, for a total capacity of 4,000 vph (for both directions).
- HOV direct access to and from the east would be provided.
- The westbound off-ramp would be widened from two exit lanes from SR 520 to four lanes at the ramp terminus intersection.
- The westbound on-ramp would be widened to accommodate a metered general purpose lane and an HOV lane.
- The single eastbound off-ramp would be widened to three lanes at the ramp terminus intersection.
- The eastbound on-ramp would be widened to accommodate two metered general purpose lanes.

A detailed list of the Pacific Street Interchange option local arterial street improvements is provided in Chapter 5, *Local Traffic Operations*. Regarding local street improvements in relation to freeway traffic demand, it is important to understand that the additional capacity on local streets can cause drivers to change their travel routes.

More detailed information on the travel forecasting analysis methodology and results produced for the alternatives studied in the Draft EIS and its Appendix R, *Transportation Discipline Report*, are included in the Travel Forecasting Analysis Results Technical Memorandum dated May 17, 2004 (SR 520 Project Team 2004). Similarly, more detailed information on the travel forecasting analysis results for the Second Montlake Bridge and Pacific Street Interchange options are included in the *Year 2030 Travel Demand Forecasting Results for the Montlake Area Option* (SR 520 Project Team 2005a).

Freeway Travel Demand Forecast Results

This section discusses the results of the year 2030 travel forecasts for the a.m. and p.m. peak periods for the Second Montlake Bridge and Pacific Street Interchange options. Forecast results for the No Build and

original 6-Lane Alternatives are also presented to allow for meaningful comparisons of the effects of the improvements associated with each option.

Person- and vehicle-trip demand for the Second Montlake Bridge and Pacific Street Interchange options would be similar to the 6-Lane Alternative east of Lake Washington and on I-5 south of the I-5/SR 520 Interchange. The following discussions for the two options focus on areas where traffic volumes differ between the two options. A discussion of the original 6-Lane Alternative freeway travel demand forecasts for areas where traffic does not change between the options can be found in Appendix R of the Draft EIS.

Exhibit 3-1 summarizes the a.m. peak period vehicle-trip and person-trip demand volumes between I-5 and Montlake Boulevard (on the Portage Bay Bridge) by direction. The percent change in these volumes compared to the No Build Alternative is also shown. For the Second Montlake Bridge and Pacific Street Interchange options, vehicle- and person-trip demand forecasts for the floating portion of the Evergreen Point Bridge mid-span and areas to the east would be the same as for the original 6-Lane Alternative.

Exhibit 3-1. Year 2030 A.M. Peak Period Vehicle- and Person-Trip Average[a] Demand Between I-5 and Montlake Boulevard Northeast

	Westbound		Eastbound	
Alternative/Option	**Vehicle Trips**	**Person Trips**	**Vehicle Trips**	**Person Trips**
No Build Alternative	3,600	8,530	3,130	5,450
Original 6-Lane Alternative	4,510	11,900	2,930	6,500
Percent increase over No Build	*25%*	*40%*	*-6%*	*19%*
Second Montlake Bridge Option	4,410	11,740	3,070	6,730
Percent increase over No Build	*23%*	*38%*	*-2%*	*23%*
Pacific Street Interchange Option	4,060	11,130	2,930	6,500
Percent increase over No Build	*13%*	*30%*	*-6%*	*19%*

[a]The average represents the average hourly volume that occurs throughout the peak period.

The key points in Exhibit 3-1 are:

- Generally, when comparing the No Build and original 6-Lane Alternatives, both vehicle- and person-trip demand would increase. Vehicle-trip demand would increase because of the operational

improvements associated with adding shoulders and completing the HOV system eastbound and westbound on SR 520 between I-5 and I-405. Person-trip demand would increase substantially because of a mode shift from single occupancy vehicles (SOVs) to carpools and buses. Also, the increase in person-trip demand would be greater than the increase in vehicle-trip demand. This means that more people would be able to cross the Evergreen Point Bridge in fewer vehicles than today. These patterns are similar for the Second Montlake Bridge and Pacific Street Interchange options. Generally, there would also be a decrease in eastbound vehicle-trip demand compared to the No Build Alternative because the toll associated with the original 6-Lane Alternative would provide incentive for people to shift both modes of travel and travel routes (to non-tolled routes). The increase in eastbound person-trip demand is an example that shows how people shift modes from SOVs to carpools and buses. These patterns are similar for the Second Montlake Bridge and Pacific Street Interchange options.

- Westbound vehicle- and person-trip demand would be similar for the original 6-Lane and the Second Montlake Bridge option. Eastbound vehicle-trip demand would not decrease as much as with the original 6-Lane Alternative because, with capacity increases across the Montlake Cut, some drivers may choose to use SR 520 to access Montlake Boulevard Northeast. Person-trip demand would increase because of the shift in mode from SOVs to carpools and buses. Compared to the No Build Alternative, westbound vehicle- and person-trip demand would increase with the Pacific Street Interchange option. However, this demand would increase less than the original 6-Lane Alternative because westbound trips would use the new interchange and travel on local streets to their destinations. In the No Build and original 6-Lane Alternatives, these trips would have continued west on SR 520 to northbound I-5 to access the local streets.

Exhibit 3-2 summarizes the p.m. peak period vehicle-trip and person-trip demand volumes by direction on the Portage Bay Bridge between I-5 and Montlake Boulevard. The percent change in these volumes compared to the No Build Alternative is also shown.

Exhibit 3-2. Year 2030 P.M. Peak Period Vehicle- and Person-Trip Average[a] Demand Between I-5 and Montlake Boulevard Northeast

	Westbound		Eastbound	
	Vehicle Trips	**Person Trips**	**Vehicle Trips**	**Person Trips**
No Build	3,780	5,450	3,220	7,550
Original 6-Lane	4,200	8,360	3,280	9,550
Percent increase over No Build	*11%*	*53%*	*2%*	*26%*
Second Montlake Bridge	4,270	8,470	3,240	9,490
Percent increase over No Build	*13%*	*55%*	*1%*	*26%*
Pacific Street Interchange	3,900	7,870	3,060	9,190
Percent increase over No Build	*3%*	*44%*	*-5%*	*22%*

[a]The average represents the average hourly volume that occurs throughout the peak period.

The key points in Exhibit 3-2 are similar to those for Exhibit 3-1, with the following additions:

- Vehicle- and person-trip demand would be similar for the 6-Lane Alternative and the Second Montlake Bridge option in *both* directions.
- With the Pacific Street Interchange option, eastbound vehicle-trip demand would decrease relative to both the No Build and original 6-Lane Alternatives; however, the person-trip demand would still increase by 22 percent (compared to the No Build Alternative). Vehicle trip demand would decrease because some drivers would shift to the local street network to access SR 520. Vehicle trip demand can decrease while person trip demand increases because the number of people using buses and carpools could increase.

How would travel patterns change on westbound SR 520 during the a.m. peak period?

Exhibits 3-3 through 3-5 show the changes in year 2030 vehicle demand with the original 6-Lane Alternative, Second Montlake Bride option, and Pacific Street Interchange option, respectively, compared to the No Build Alternative.

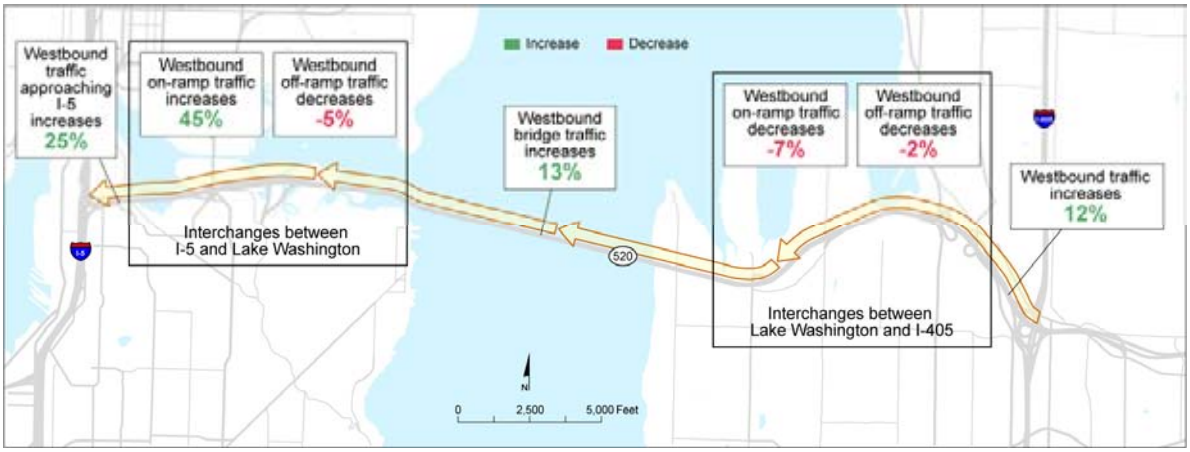


Exhibit 3-3. Original 6-Lane Alternative, A.M. Peak Period Westbound Vehicle Demand Compared to No Build Alternative

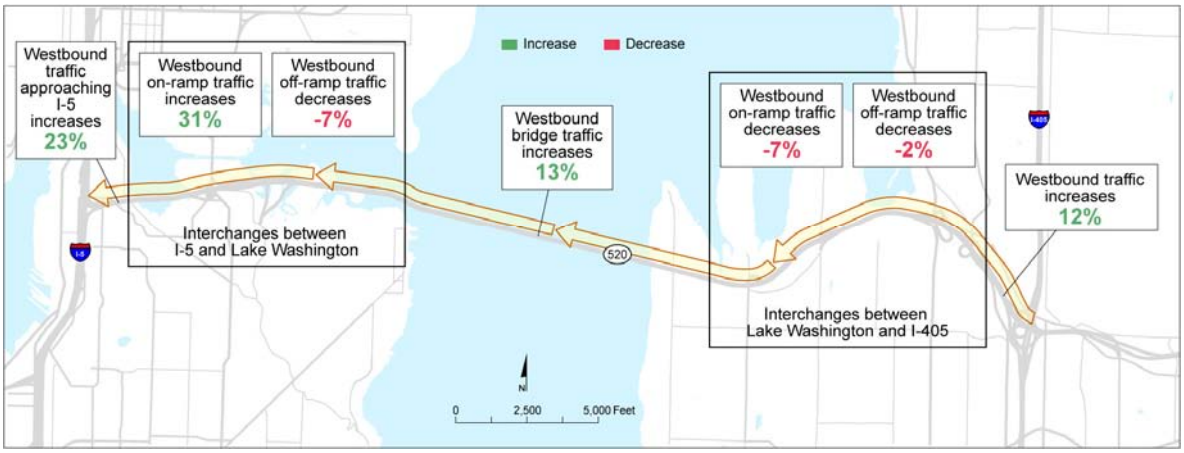


Exhibit 3-4. Second Montlake Bridge Option, A.M. Peak Period Westbound Vehicle Demand Compared to No Build Alternative

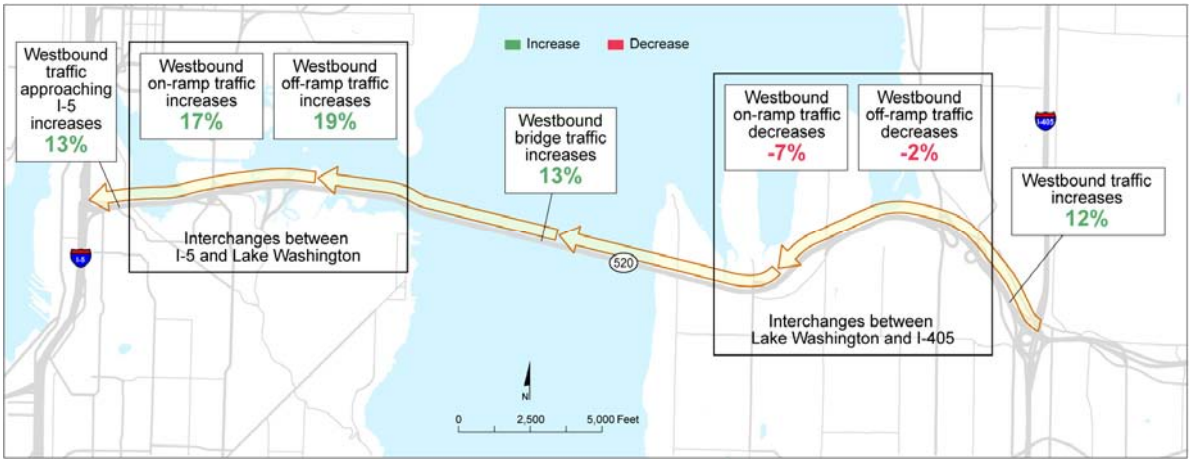


Exhibit 3-5. Pacific Street Interchange Option, A.M. Peak Period Westbound Vehicle Demand Compared to No Build Alternative

The key points in the comparisons of Exhibits 3-3 through 3-5 are:

- Vehicle-trip demand across the Evergreen Point Bridge and on the east side of the corridor would experience the same shifts with either the original 6-Lane Alternative, the Second Montlake Bridge option, or the Pacific Street Interchange option when compared to the No Build Alternative.
- Compared to the No Build Alternative, traffic demand at the SR 520 westbound on-ramp would not increase as much with the Second Montlake Bridge option as with the original 6-Lane Alternative (31 percent versus 45 percent). With the addition of the second Montlake Bridge, local vehicle trips would stay on the local streets, which would result in less of an increase in the traffic demand approaching I-5 (23 percent versus 25 percent).
- With the Pacific Street Interchange option, traffic demand at the SR 520 westbound off-ramp would increase substantially (to 19 percent) over the No Build Alternative. Traffic destined to the University District and areas to the northeast of I-5 would use the additional capacity crossing the Montlake Cut rather than use I-5.

With the Pacific Street Interchange option, traffic demand at the SR 520 westbound on-ramp would also increase compared to the No Build Alternative. However, this increase would be less than with either the original 6-Lane Alternative or the Second Montlake Bridge option. There would not be as much of an increase in traffic demand because this option would provide a better thoroughfare for local traffic on Montlake Boulevard Northeast to complete local trips.

How would travel patterns change on westbound SR 520 during the p.m. peak period?

Exhibits 3-6 through 3-8 show the changes in year 2030 vehicle demand with the original 6-Lane Alternative, Second Montlake Bride option, and Pacific Street Interchange option, respectively, compared to the No Build Alternative.

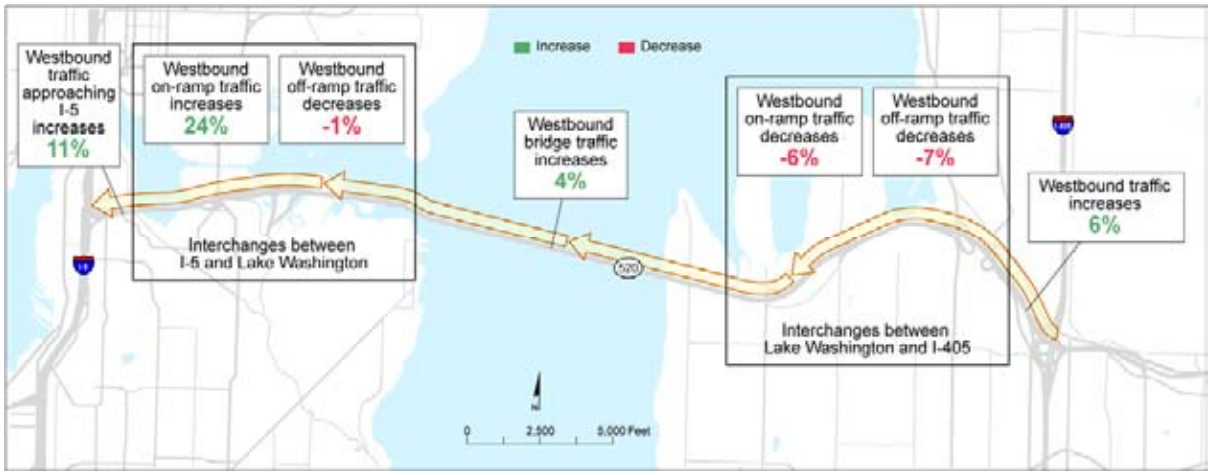


Exhibit 3-6. Original 6-Lane Alternative, P.M. Peak Period Westbound Vehicle Demand Compared to No Build Alternative

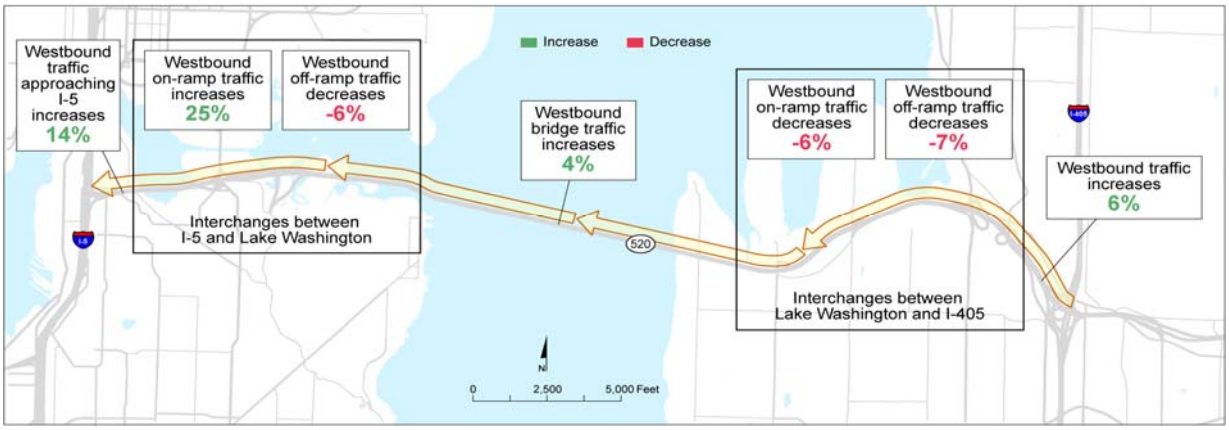


Exhibit 3-7. Second Montlake Bridge Option, P.M. Peak Period Westbound Vehicle Demand Compared to No Build Alternative

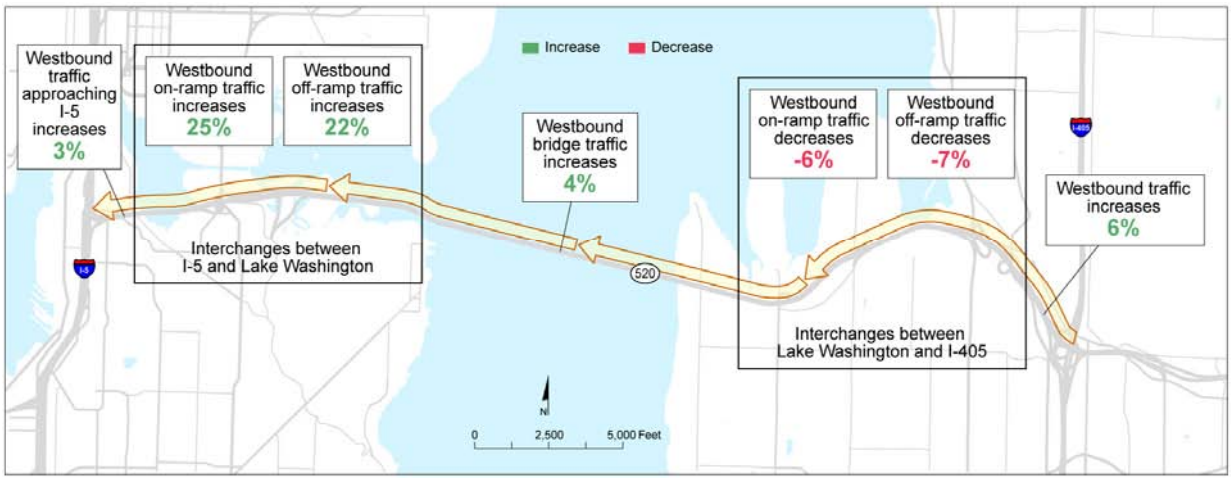


Exhibit 3-8. Pacific Street Interchange Option, P.M. Peak Period Westbound Vehicle Demand Compared to No Build Alternative

The key points in the comparisons of Exhibits 3-6 through 3-8 are:

- Vehicle-trip demand across the Evergreen Point Bridge and on the Eastside would experience the same shifts with either the original 6-Lane Alternative, the Second Montlake Bridge option, or the Pacific Street Interchange option when compared to the No Build Alternative.
- With the Second Montlake Bridge option, traffic demand at the SR 520 westbound off-ramp would decrease (6 percent) compared to the No Build Alternative. This is more of a decrease than under the original 6-Lane Alternative because there would be a shift in traffic patterns, with local traffic using the additional capacity on Montlake Boulevard Northeast. With less traffic exiting SR 520 at Montlake Boulevard Northeast, westbound traffic demand approaching I-5 would increase slightly (to 14 percent).
- Compared with the No Build Alternative, the original 6-Lane Alternative and the Second Montlake Bridge and Pacific Street Interchange options would have about the same increase in traffic demand at the SR 520 westbound on-ramp.
- With the Pacific Street Interchange option, traffic demand at the SR 520 westbound off-ramp would increase by 22 percent compared with the No Build Alternative. This increase is greater than with either the original 6-Lane Alternative or the Second Montlake Bridge option because of the additional traffic capacity provided with the new interchange.
- Because more traffic would exit SR 520 at the Pacific Street Interchange, there would only be a slight increase in traffic demand approaching I-5 compared with the No Build Alternative. This increase in traffic demand would be less than either the original 6-Lane Alternative or Second Montlake Bridge option.

How would travel patterns change on eastbound SR 520 during the a.m. peak hour?

Exhibits 3-9 through 3-11 show the changes in year 2030 vehicle demand with the original 6-Lane Alternative, Second Montlake Bride option, and Pacific Street Interchange option, respectively, compared to the No Build Alternative.

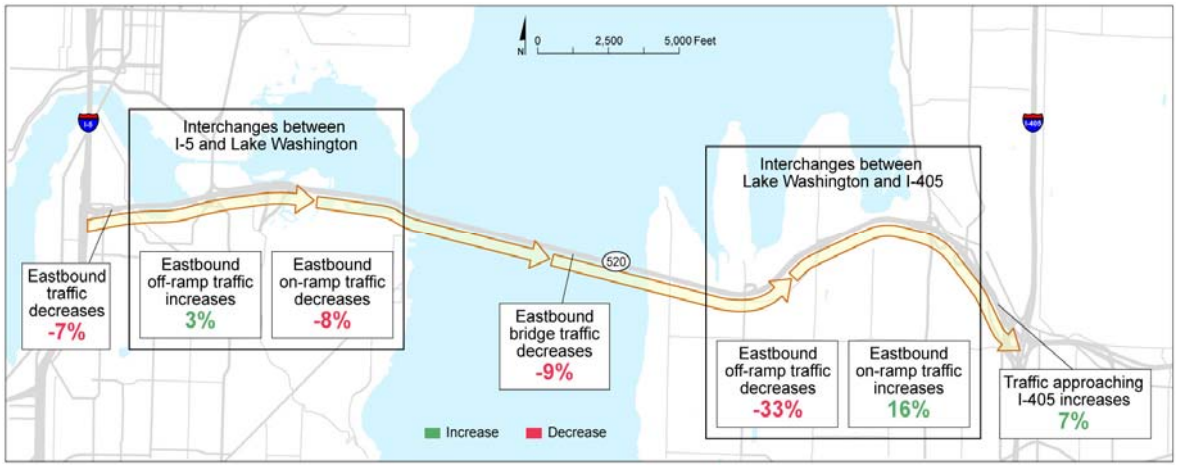


Exhibit 3-9. Original 6-Lane Alternative, A.M. Peak Period Eastbound Vehicle Demand Compared to the No Build Alternative

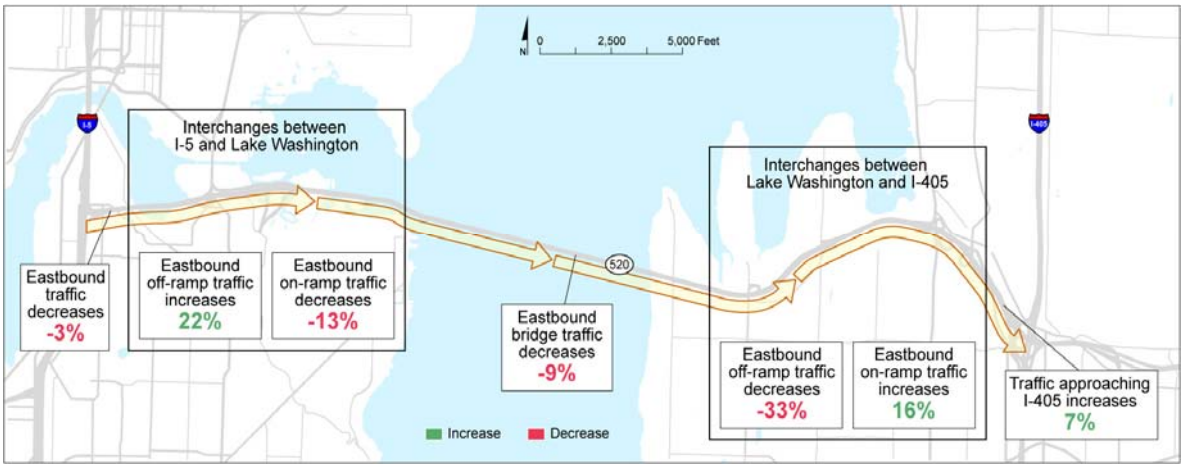


Exhibit 3-10. Second Montlake Bridge Option, A.M. Peak Period Eastbound Vehicle Demand Compared to the No Build Alternative

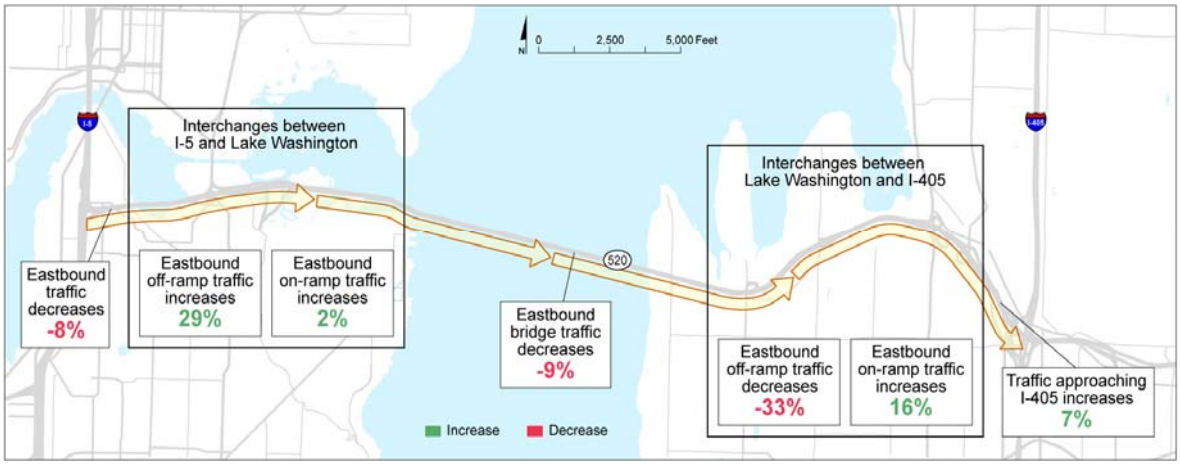


Exhibit 3-11. Pacific Street Interchange Option, A.M. Peak Period Eastbound Vehicle Demand Compared to the No Build Alternative

The key points in the comparisons of Exhibits 3-9 through 3-11 are:

- When comparing traffic patterns in the vicinity of the SR 520 eastbound ramps, the effect of tolling on SR 520 eastbound trip demand needs to be considered. With the tolls associated with original 6-Lane Alternative, there would generally be an increase at the SR 520 eastbound off-ramps and a decrease at the on-ramps as people shift from SOV to bus or carpool and to non-tolled routes. Because the 6-Lane Alternative options would be tolled the same as with the original 6-Lane Alternative, the differences in demand at the ramps between the original 6-Lane Alternative and the options can be attributed to features related to the options themselves (see next bullet).
- Compared with the Original 6-Lane Alternative, there would be a smaller decrease (31 versus 71) in traffic demand on SR 520 east of I-5 because with the additional capacity on the second Montlake Bridge, more traffic would access the Montlake Boulevard Interchange area using SR 520 eastbound. This would also result in a 22 percent increase in traffic demand at the SR 520 eastbound off-ramp (19 percent of which is likely attributable to the additional capacity across the Montlake Cut, while 3 percent is likely attributable to the toll associated with any of the 6-Lane Alternative options).
- With the Second Montlake Bridge option, traffic demand on the Montlake and Lake Washington Boulevard on-ramps would decrease by 13 percent compared with the No Build Alternative. The additional 5 percent decrease over the original 6-Lane Alternative would be due to a shift in traffic patterns. Drivers that previously used either the eastbound on-ramp at Montlake Boulevard Northeast or at Lake Washington Boulevard would use other routes.
- With the Pacific Street Interchange option, traffic volumes on SR 520 immediately east of I-5 would decrease by 8 percent compared to the No Build Alternative. This is similar to the 7 percent decrease experienced with the original 6-Lane Alternative, which would be due to the toll.
- Compared with the No Build Alternative, traffic volumes on the Pacific Street Interchange off-ramp (which would replace the

Montlake Boulevard off-ramp) would increase by 29 percent because of the improved access in this area.

- Traffic volumes on the Pacific Street Interchange on-ramp would increase by 2 percent compared to the No Build Alternative. The Pacific Street Interchange on-ramp would consolidate traffic that today uses the Montlake Boulevard and Lake Washington Boulevard on-ramps.
- With both the Second Montlake Bridge and Pacific Street Interchange options, vehicle trip growth and traffic patterns across the Evergreen Point Bridge and to the east would not change compared to the No Build Alternative.

How would travel patterns change on eastbound SR 520 during the p.m. peak hour?

Exhibits 3-12 through 3-14 show the changes in year 2030 vehicle demand with the original 6-Lane Alternative, Second Montlake Bride option, and Pacific Street Interchange option, respectively, compared to the No Build Alternative.

The key points in the comparisons of Exhibits 3-12 through 3-14 are:

- Compared with the No Build Alternative, traffic demand on SR 520 east of I-5 and on the eastbound SR 520 off-ramp would be similar with either the original 6-Lane Alternative or the Second Montlake Bridge option. For both these alternatives, the increase in traffic at the eastbound SR 520 off-ramp would be a result of the shift traffic patterns due to tolling. The slight increase in demand seen with the Second Montlake Bridge option would likely be due to the additional capacity across the Montlake cut.
- With the Pacific Street Interchange option, traffic demand on SR 520 east of I-5 would decrease compared to the No Build Alternative and the original 6-Lane Alternative. Traffic demand would decrease because some trips would shift from SR 520 to local streets for north-south travel to or through the Montlake interchange area.

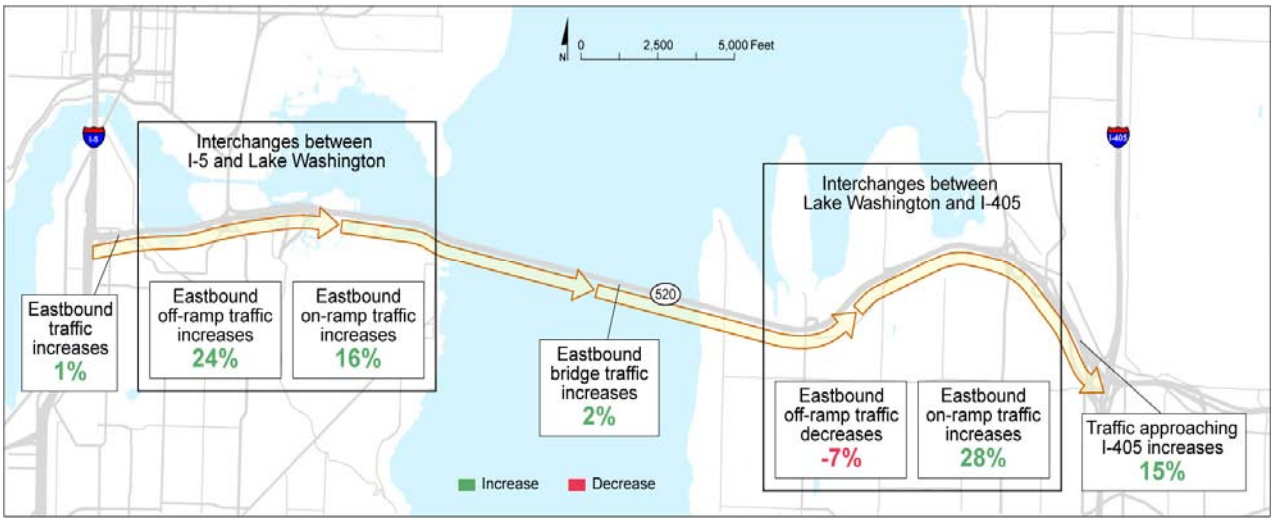


Exhibit 3-12. Original 6-Lane Alternative, P.M. Peak Period Eastbound Vehicle Demand Compared to the No Build Alternative

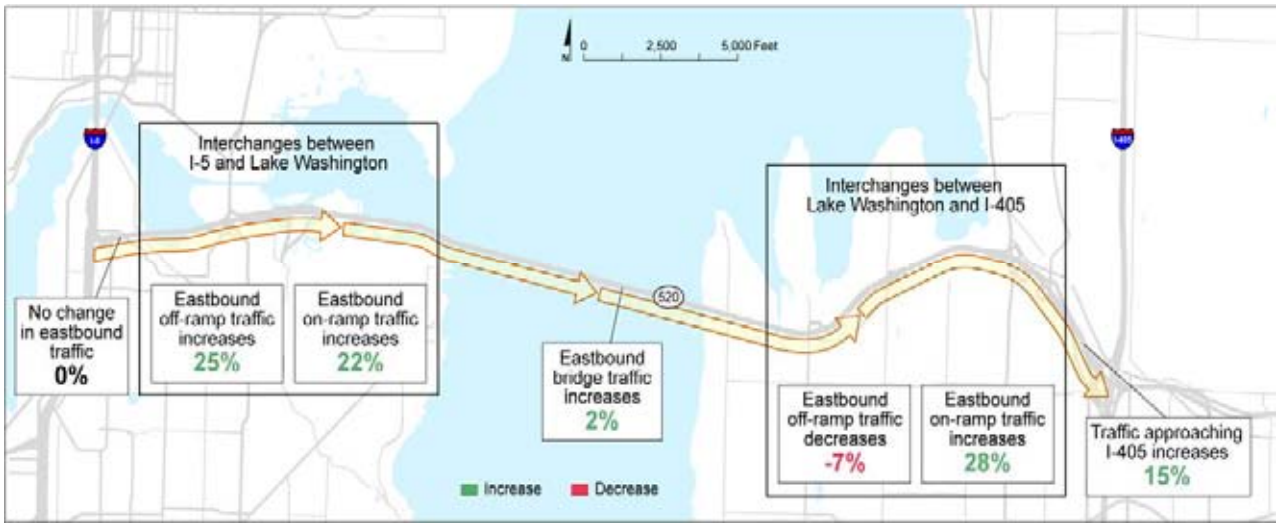


Exhibit 3-13. Second Montlake Bridge Option, P.M. Peak Period Eastbound Vehicle Demand Compared to the No Build Alternative

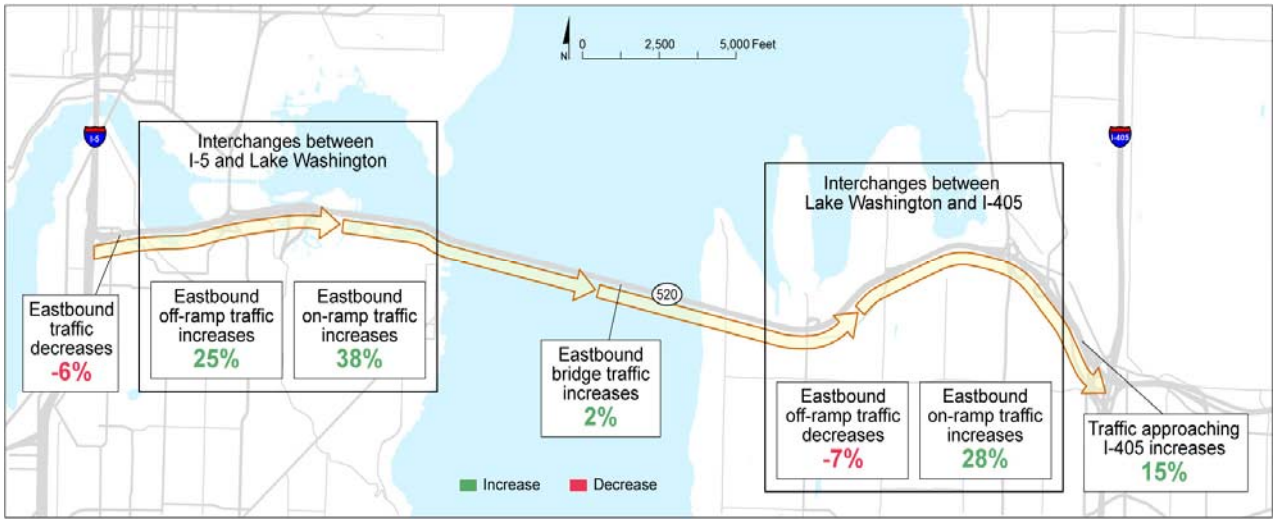


Exhibit 3-14. Pacific Street Interchange Option, P.M. Peak Period Eastbound Vehicle Demand Compared to the No Build Alternative

- Compared to the No Build Alternative, traffic demand at the SR 520 eastbound on-ramps would increase with all of the 6-Lane Alternative scenarios.
- Vehicle trip growth and traffic patterns across the Evergreen Point Bridge and to the east would be the same for the original 6-Lane Alternative and the Second Montlake Bridge and Pacific Street Interchange options compared to the No Build Alternative.

How would the Second Montlake Bridge and Pacific Street Interchange options affect adjacent freeways?

The Second Montlake Bridge and Pacific Street Interchange options would only affect traffic volumes on I-5 to the north of the I-5/SR 520 Interchange. The transportation network changes associated with each of the options would cause vehicle trips to shift to the local arterial network in order to access the Montlake interchange area, which affects traffic demand on I-5 to the north of the I-5/SR 520 Interchange.

A.M. Peak Period

How would vehicle demand change on I-5?

Exhibit 3-15 summarizes the changes in vehicle demand on I-5 at the Ship Canal Bridge.

Exhibit 3-15. A.M. Peak Period Vehicle Demand Forecasts on I-5 on the Ship Canal Bridge

	Year 2030			
	No Build Alternative	Original 6-Lane Alternative[a]	Second Montlake Bridge Option	Pacific Street Interchange Option
Southbound I-5	7,220 vph	7,060 vph ↓ 2%	7,220 vph No change	7,095 vph ↓2%
Northbound I-5	**7,140 vph**	7,370 vph ↑ 3%	7,280 vph ↑ 2%	6,930 vph ↓ 3%

vph = vehicles per hour

[a]Original 6-Lane Alternative, Second Montlake Bridge option, and Pacific Street Interchange option changes in vehicle demand are compared with No Build Alternative.

The key point from Exhibit 3-15 is:

I-5 traffic volumes on the Ship Canal Bridge would be virtually the same for the original 6-Lane Alternative, the Second Montlake Bridge option, and the Pacific Street Interchange option. Traffic volumes would change between 0 and 230 vehicles per hour (increase or decrease), which is insubstantial relative to the total volume on the freeway. These changes in traffic volumes could be due to the toll and/or increases in roadway capacity.

P.M. Peak Period

How does vehicle demand change on I-5?

Exhibit 3-16 summarizes the changes in vehicle demand on I-5 at the Ship Canal Bridge between the No Build Alternative and the original 6-Lane Alternative and options.

Exhibit 3-16. P.M. Peak Period Vehicle Demand Forecasts on I-5 on the Ship Canal Bridge

	Year 2030			
	No Build Alternative	**Original 6-Lane Alternative[a]**	**Second Montlake Bridge Alternative**	**Pacific Street Interchange Alternative**
Southbound I-5	8,550 vph	8,780 vph ↑3%	8,730 vph ↑2%	8,550 vph No change
Northbound I-5	**8,190 vph**	8,640 vph ↑ 5%	8,710 vph ↑6%	8,325 vph ↑ 2%

vph = vehicles per hour

[a] Original 6-Lane Alternative, Second Montlake Bridge option, and Pacific Street Interchange option changes in vehicle demand are compared with No Build Alternative.

The key points from Exhibit 3-16 are:

- On southbound I-5, traffic volumes on the Ship Canal Bridge would be virtually the same with the original 6-Lane Alternative, the Second Montlake Bridge option and the Pacific Street Interchange option. Traffic volumes would increase between 0 and 230 vehicles per hour, which is insubstantial relative to the total volume on the freeway.
- On northbound I-5, traffic volumes would increase slightly with the original 6-Lane Alternative and the Second Montlake Bridge option. Traffic volumes would not increase as much with the Pacific Street

Interchange option because some drivers would use local streets instead of I-5.

Local Travel Forecasts

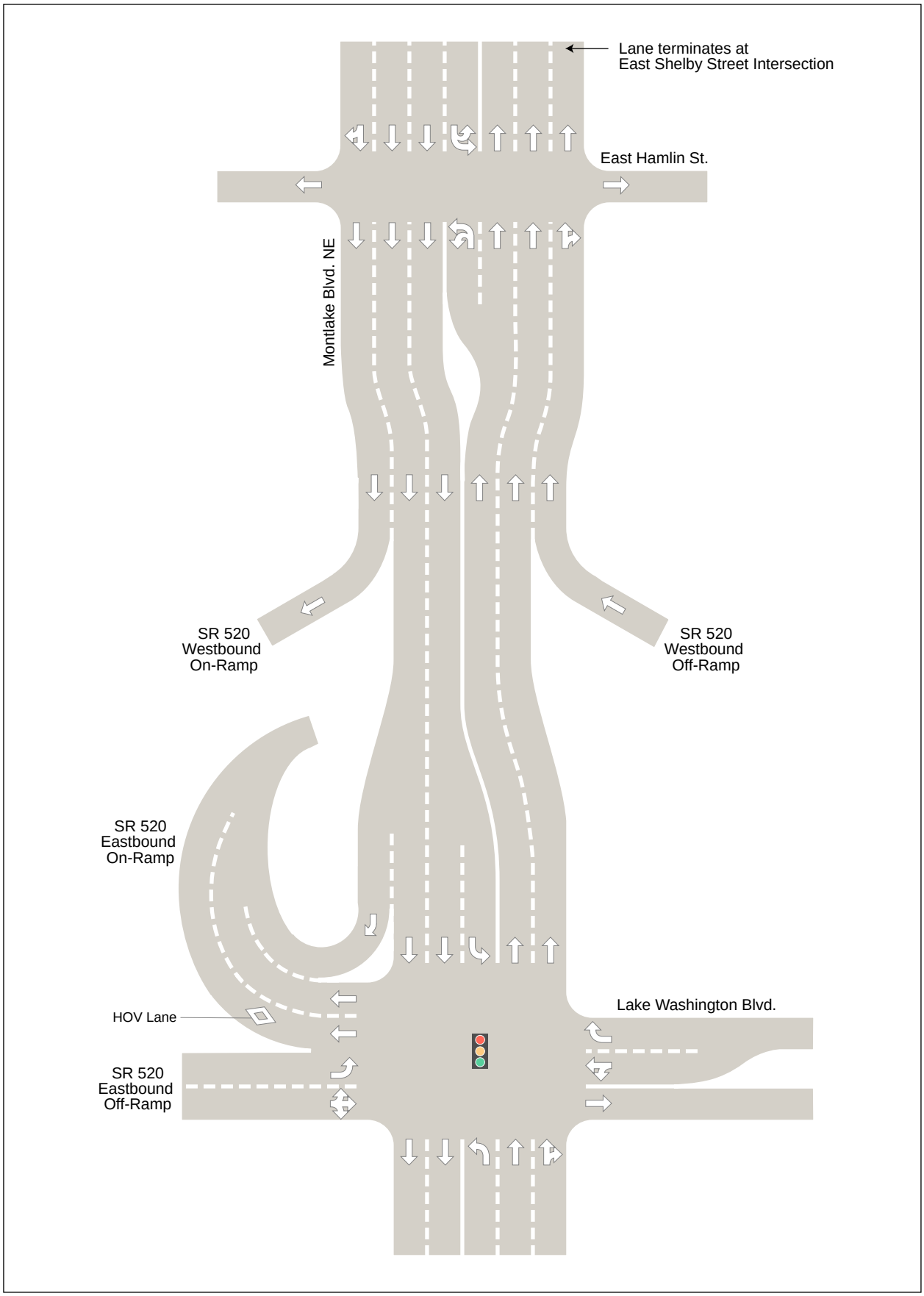
Year 2030 vehicle-trip forecasts were completed for the Second Montlake Bridge and Pacific Street Interchange options for the a.m. and p.m. peak hours. These forecasts compare the two options to the No Build Alternative. Local traffic forecasts for the original 6-Lane Alternative are also included in this report to understand the differences between all of the 6-Lane Alternative options.

What local street improvements are included in the alternatives?

Original 6-Lane Alternative

With the original 6-Lane Alternative, the Montlake Boulevard Northeast/Lake Washington Boulevard Northeast/SR 520 eastbound ramps intersection would be reconstructed. Exhibits 3-17 and 3-18 show existing/No Build Alternative conditions and proposed conditions with the original 6-Lane Alternative (and Second Montlake Bridge option). The design includes an additional lane for eastbound left-turning traffic, and the third lane would be converted to a shared through/right-turn lane. The additional lanes would allow more sharing of the signal green time with other traffic movements.

The Montlake Boulevard/SR 520 westbound ramps intersection would also be reconstructed and signalized. A westbound left-turn lane would be added at the end of the off-ramp to improve access to Montlake Boulevard south of the SR 520 interchange. Two northbound left-turn lanes would be added on the Montlake Boulevard bridge over SR 520 for improved access to the SR 520 westbound on-ramp for northbound traffic on Montlake. These left-turn lanes would replace the existing U-turn configuration at the Montlake Boulevard Northeast/East Hamlin Street intersection. In addition, the outside (westernmost) southbound lane at the Montlake Boulevard/SR 520 westbound ramps intersection would be converted from the existing right-turn-only lane to a shared through/right-turn-only lane. This would allow southbound through vehicles needing to get to the SR 520 eastbound on-ramp to use this outermost lane to bypass queues in the inside through lanes.



N Not To Scale

Exhibit 3-17. **SR 520 Eastbound and Westbound Ramps at Montlake—Existing Lane Geometry**

SR 520 Bridge Replacement and HOV Project

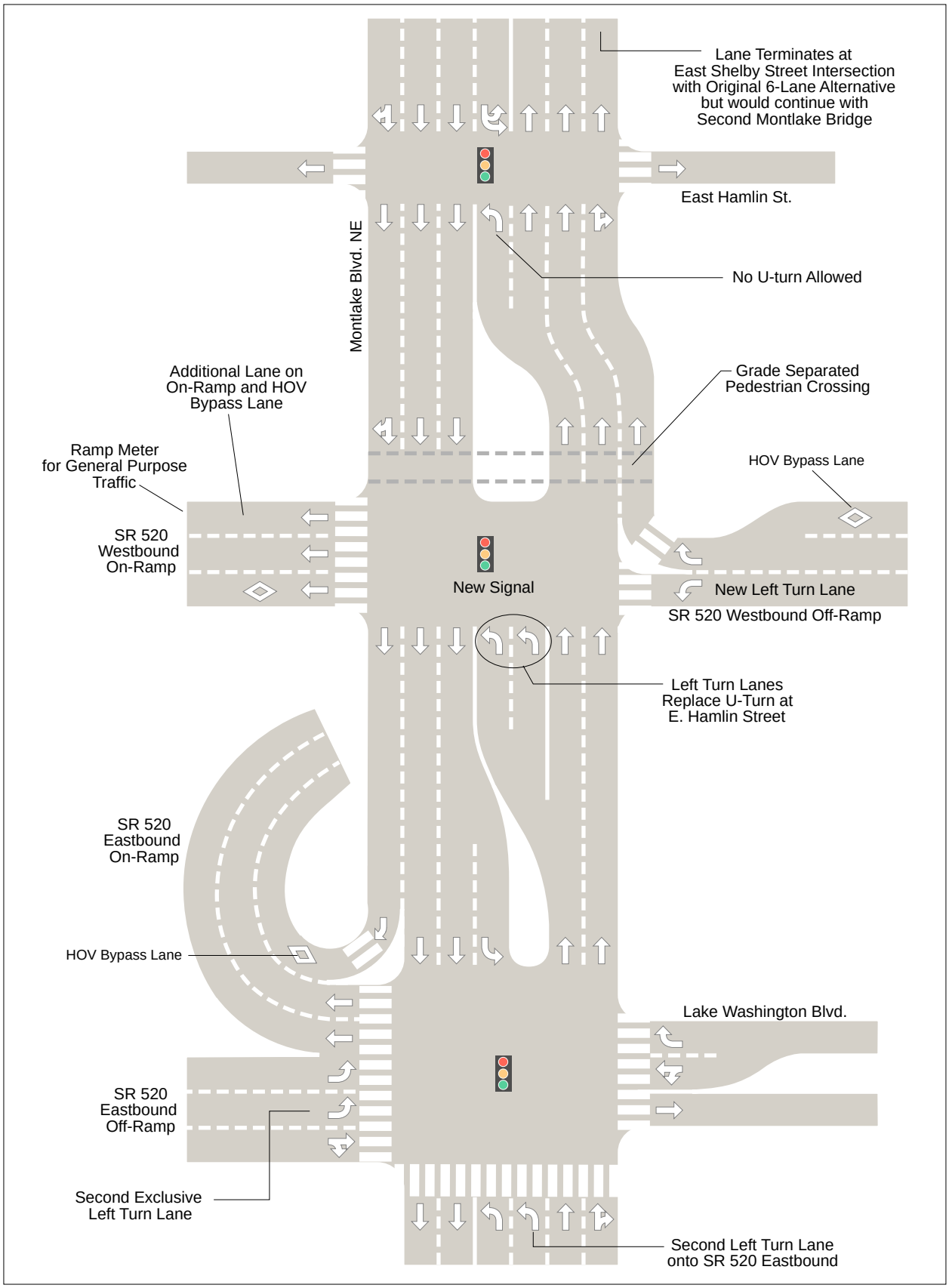


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Exhibit 3-18. **SR 520 Eastbound and Westbound Ramps at Montlake—Future Lane Geometry with the 6-Lane Alternative and Second Montlake Bridge Option**

SR 520 Bridge Replacement and HOV Project

Second Montlake Bridge Option

The Second Montlake Bridge option would include all the improvements constructed under the original 6-Lane Alternative as well as construction of a second bridge over the Montlake Cut. This new bridge would operate in conjunction with the existing bridge and would add two new lanes of capacity to provide a total of six lanes across the cut (three lanes in each direction).

Pacific Street Interchange Option

In terms of changes to the local roadway network, the Pacific Street Interchange option would:

- Reconfigure the Montlake Boulevard Northeast/Northeast Pacific Street intersection to include:
  - A fourth east leg
  - Two southbound left-turn lanes from Montlake Boulevard Northeast onto the new Union Bay Bridge
  - Two eastbound through lanes from Northeast Pacific Street onto the new Union Bay Bridge
- Change access along Montlake Boulevard Northeast between Lake Washington Boulevard and East Shelby Street because the existing SR 520 ramps would be removed.
- Provide full access between Lake Washington Boulevard Northeast and both eastbound and westbound SR 520.
- Widen Montlake Boulevard to from two to three lanes between Northeast Pacific Street and 25th Avenue Northeast.
- Widen Northeast Pacific Place to include a second eastbound through lane.
- Add a second eastbound left turn pocket from Northeast Pacific Street onto Northeast Pacific Place.
- Provide HOV direct access ramps to and from the east (i.e., a westbound off-ramp and an eastbound on-ramp) at the new interchange.

Intersection turning movements show the number of vehicles turning left, going through, or turning right at an intersection.

Using the turning movement volumes, traffic engineers can determine the ratios for each turning movement. For example, on Main Street, 910 vehicles, or 83 percent, go through the intersection. If traffic volumes were to increase on Main Street, this ratio could be used to determine how many more vehicles would go through the intersection in the future.

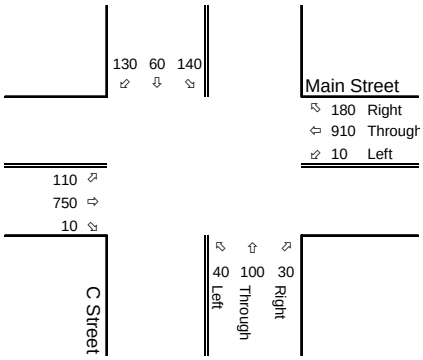


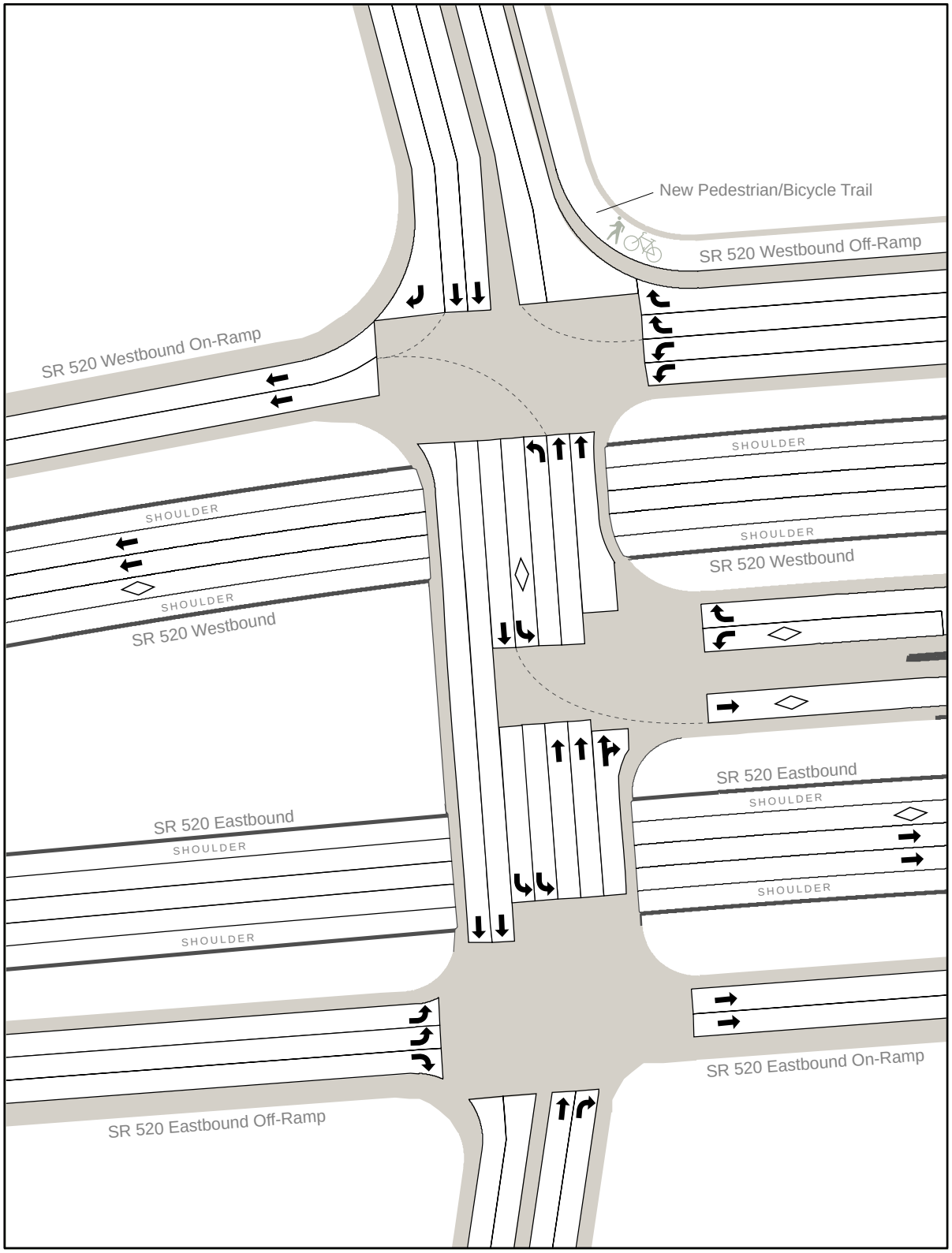
Exhibit 3-19 shows the Pacific Street Interchange option lane configuration, and Exhibit 3-20 shows the proposed lane configuration at the new Montlake Boulevard Northeast/Northeast Pacific Street intersection under this option. Exhibit 3-21 shows the proposed lane geometry for the adjacent intersections at Northeast Pacific Street/ Northeast Pacific Place and Northeast Pacific Place/Montlake Boulevard Northeast.

How was travel demand forecast for local streets?

As outlined in *Chapter 3: Freeway and Local Traffic Forecasts* of the *Transportation Discipline Report* (Appendix R of the Draft EIS), project traffic engineers distributed freeway on- and off-ramp traffic through the local roadway system by applying existing intersection turning movement ratios. Based on the EMME/2 travel demand model results for the Pacific Street Interchange option, project traffic engineers determined that the road network changes associated with this option would change how local traffic would distribute on the local street network. This would change the intersection turning movement ratios compared to those used for the original 6-Lane Alternative and Second Montlake Bridge option. The changes in trip distribution occurred primarily along 15th Avenue Northeast and Pacific Street and Montlake Blvd Northeast.

The updated local traffic volume forecasts also account for the changes in trip distribution that would occur with the Pacific Street Interchange option because of the new roadway connection between Montlake Boulevard Northeast/Pacific Street Northeast and Lake Washington Boulevard Northeast through the Arboretum. Again, this change in how local traffic would distribute on the local street network would change the intersection turning movement ratios over what was used for the original 6-Lane Alternative.

How were transit and pedestrian volumes on local streets estimated? The transportation discipline team analyzed the Second Montlake Bridge and Pacific Street Interchange options using the same transit and pedestrian assumptions as the original 6-Lane Alternative, with the exception of pedestrian crossings at the Montlake Boulevard Northeast/Northeast Pacific Street intersection in the Pacific Street Interchange option. Pedestrian crossings and associated signal timings were removed at the Montlake Boulevard Northeast/Northeast Pacific

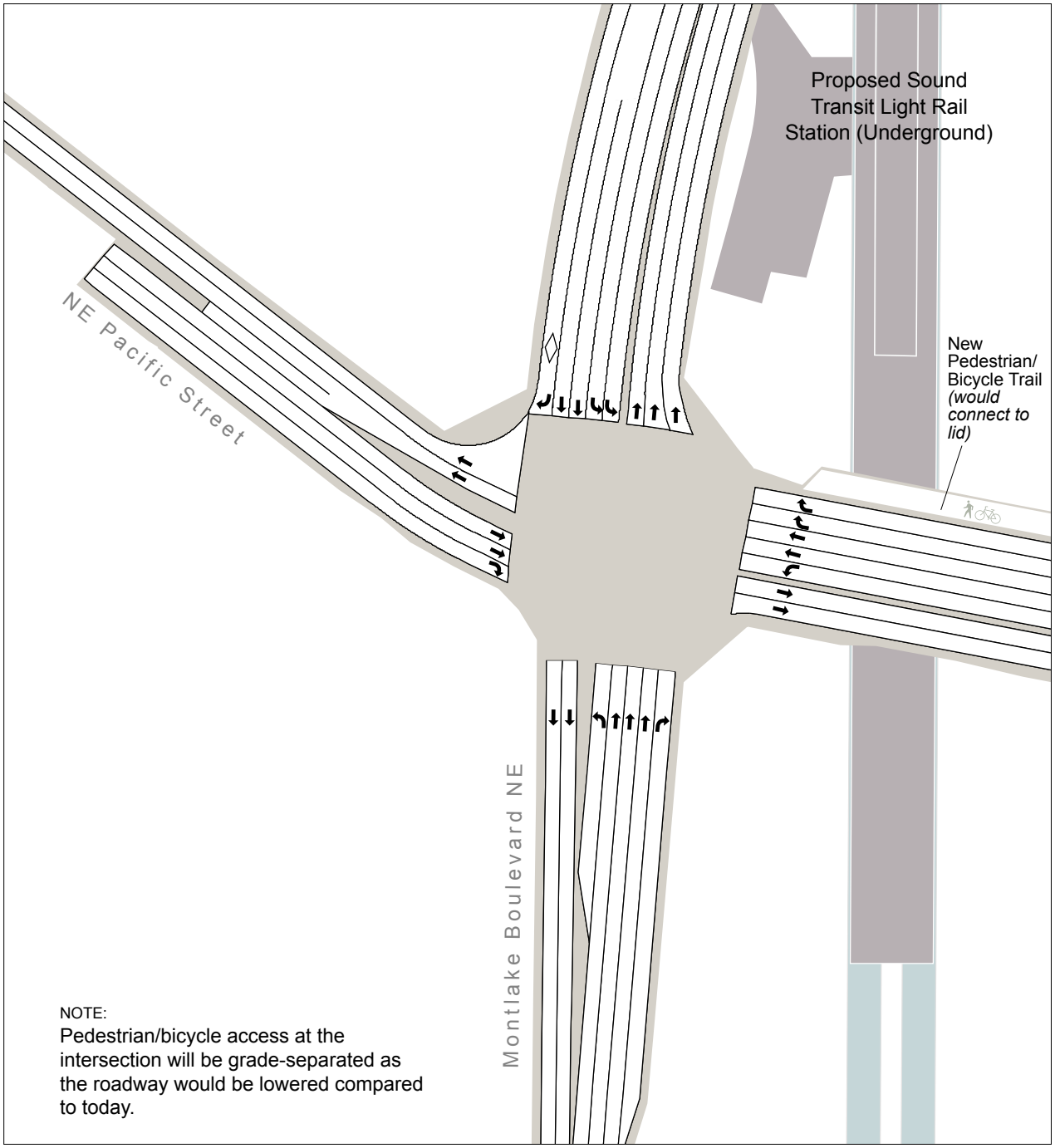


N

0 50 100 150 Feet

Exhibit 3-19. **Pacific Street Interchange Option Lane Geometry — SR 520 Interchange**

SR 520 Bridge Replacement and HOV Project



N

0 50 100 150 Feet

Exhibit 3-20. **Pacific Street Interchange Option Lane Geometry — Montlake Boulevard NE and NE Pacific Street**

SR 520 Bridge Replacement and HOV Project

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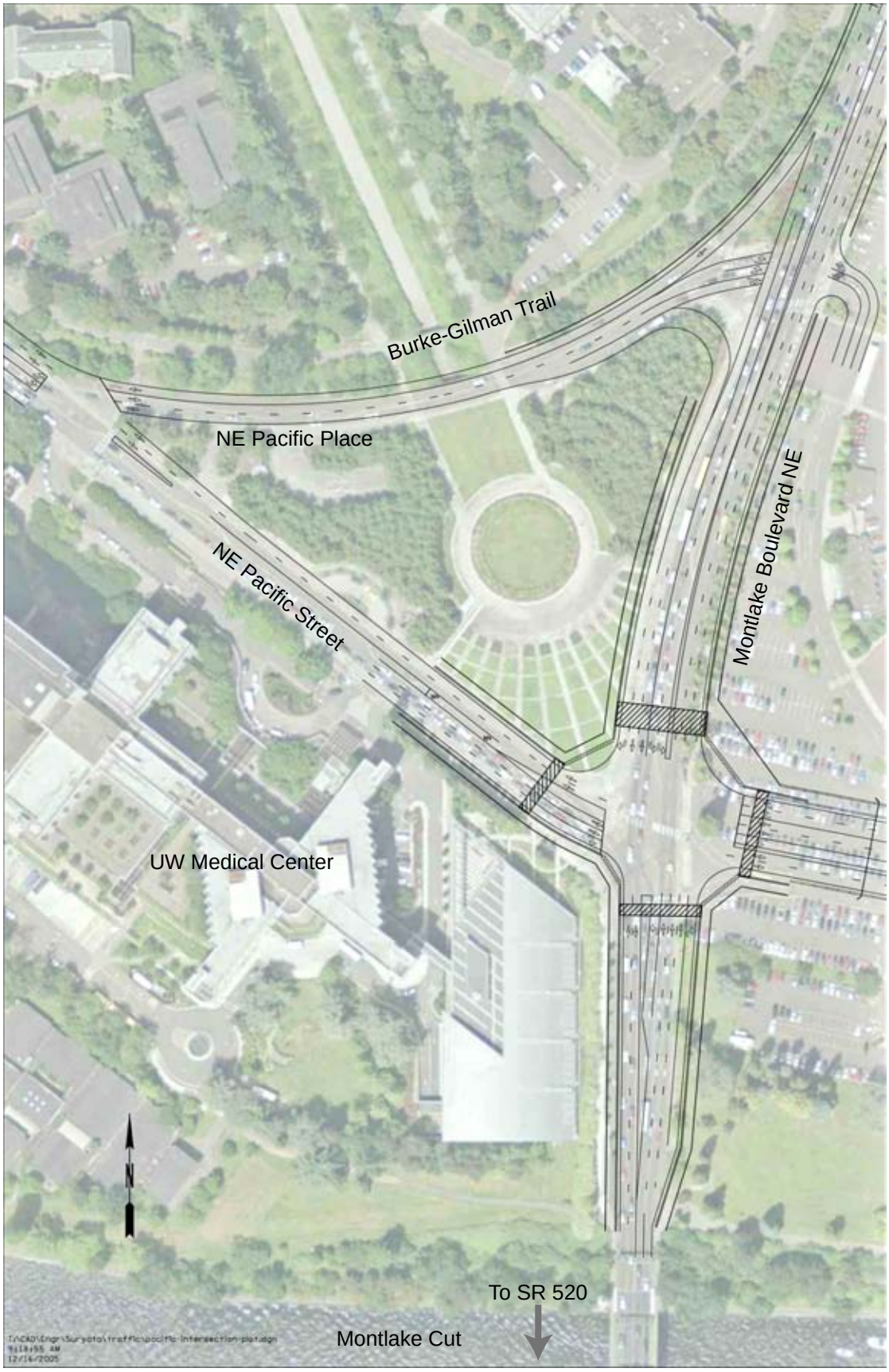


Exhibit 3-21. **Pacific Street Interchange Option – Lane Geometry UW Area**

SR 520 Bridge Replacement and HOV Project

Street intersection because pedestrian facilities would be grade-separated as part of the Pacific Street Interchange option.

Local Travel Demand Forecast Results

This section discusses the a.m. and p.m. peak period travel demand forecast results for the original 6-Lane Alternative and the Second Montlake Bridge and Pacific Street Interchange options.

As with the freeway forecasts, the original 6-Lane Alternative and the Second Montlake Bridge and Pacific Street Interchange options are compared to the No Build Alternative to answer the question: "How would travel demand change if we improve the corridor by the year 2030?"

How would travel change on the local streets during the a.m. peak hour?

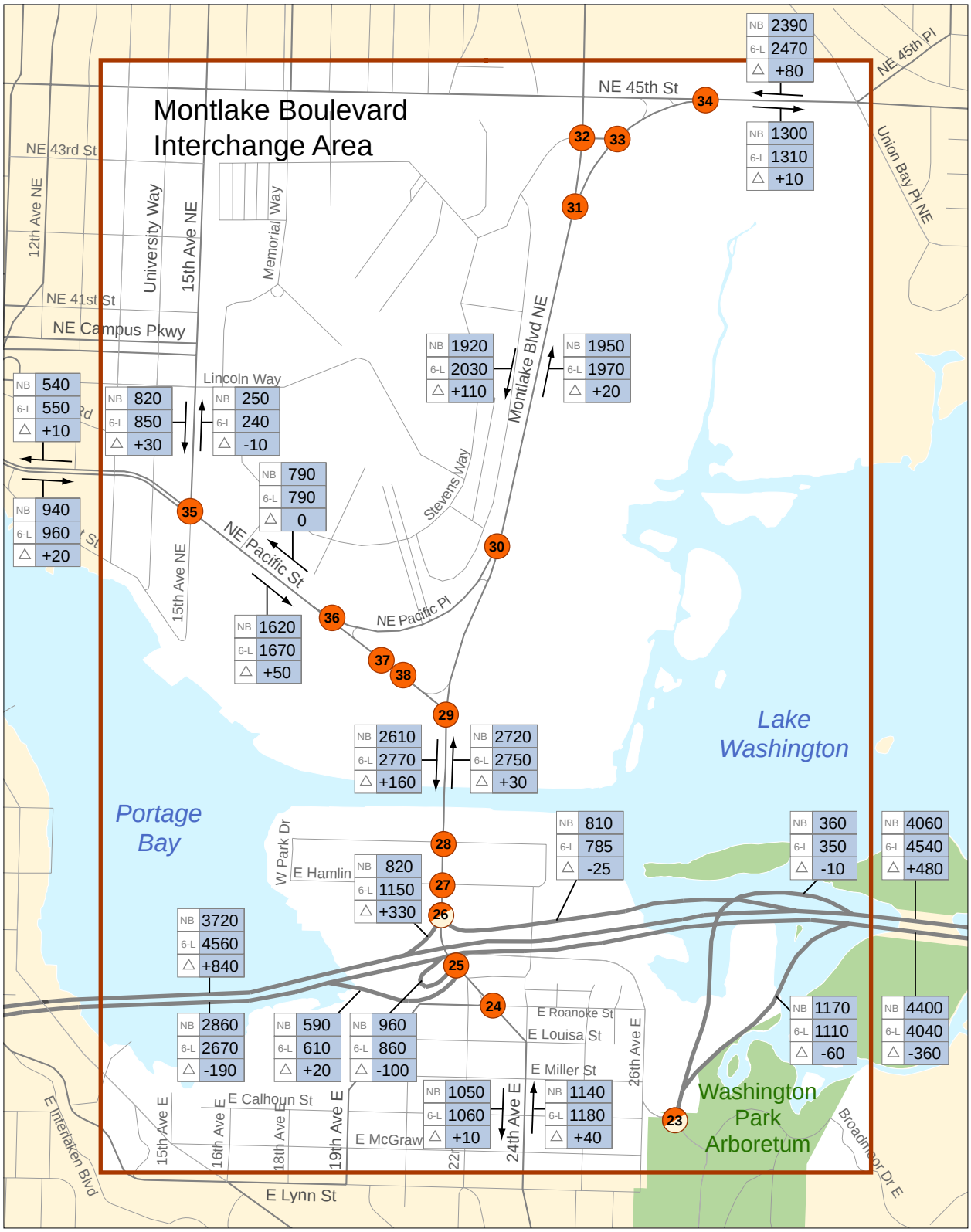
Original 6-Lane Alternative

A comparison of traffic volumes between the No Build and original 6-Lane Alternatives is shown in Exhibit 3-22. With the original 6-Lane Alternative, southbound traffic demand on Montlake Boulevard Northeast (between Northeast 45th Street and SR 520) would increase by approximately 6 percent (160 vph). This traffic would be destined for the SR 520 westbound on-ramp. Northbound traffic demand on Montlake Boulevard/24th Avenue East (approaching SR 520) would increase by approximately 4 percent (40 vph). Southbound traffic demand on Northeast Pacific Street would increase by approximately 3 percent (50 vph). There would be no change in northbound traffic demand.

Because traffic demand on the Lake Washington Boulevard Northeast ramps to and from SR 520 would decrease, traffic demand on Lake Washington Boulevard Northeast would also decrease. Traffic demand at the Lake Washington Boulevard Northeast westbound off-ramp would decrease by 3 percent (10 vph), and traffic demand at the Lake Washington Boulevard Northeast eastbound on-ramp would decrease by 5 percent (60 vph).

Second Montlake Bridge Option

A comparison of traffic volumes between the No Build and the Second Montlake Bridge option is shown in Exhibit 3-23. With the added capacity on the Montlake Bridge, southbound traffic demand on



LEGEND

1 Study signalized intersection

5 Study unsignalized intersection

26 These intersections would be signalized under the 4-Lane and 6-Lane Alternatives

A.M. Peak Hour

No Build — NB 1140

6-Lane — 6-L 1180

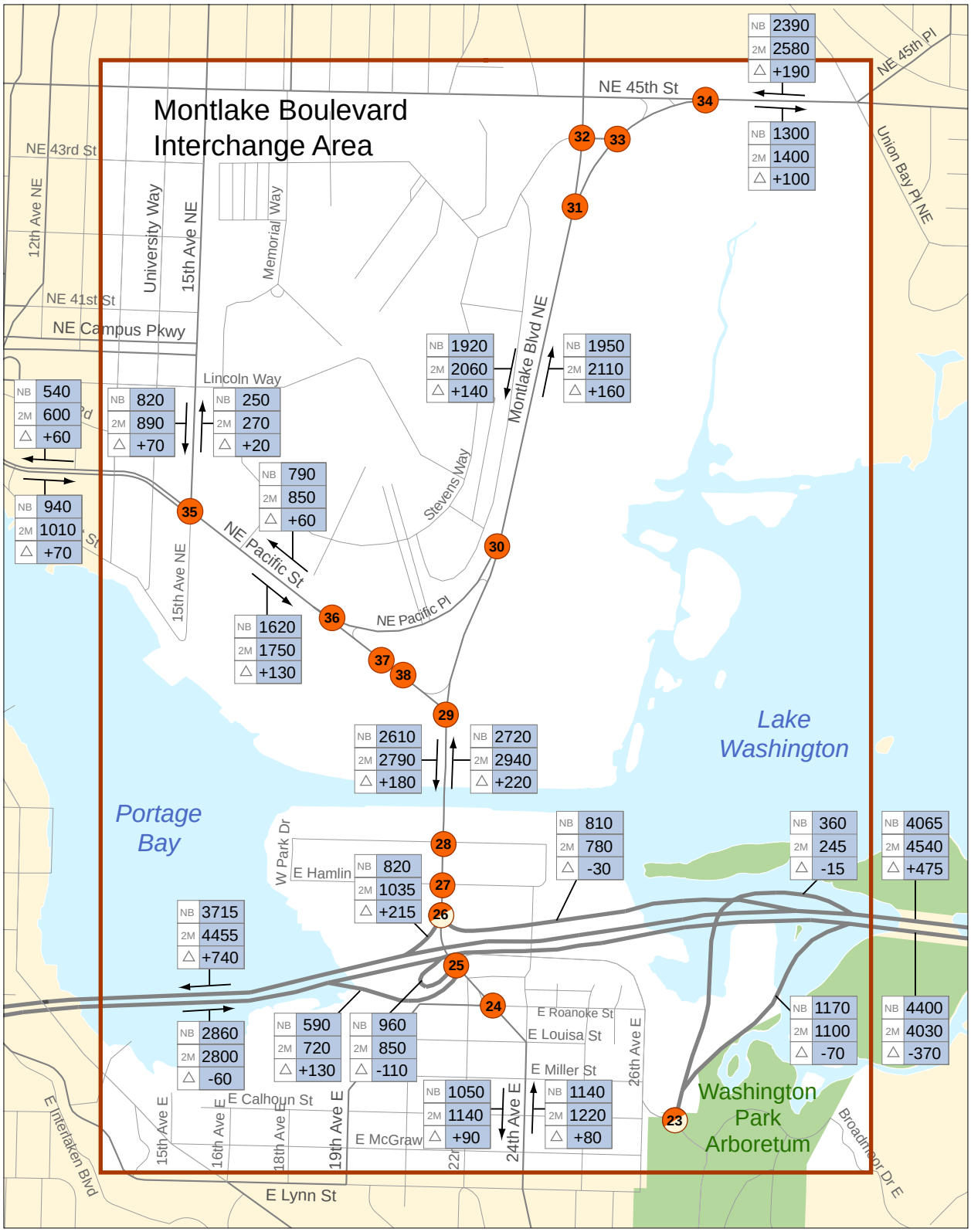
Difference — △ +40

N

0 500 1,000 Feet

Exhibit 3-22. **Year 2030 No Build and Original 6-Lane Alternative Approach Volumes – AM Peak Hour**

SR 520 Bridge Replacement and HOV Project



LEGEND

1 Study signalized intersection

5 Study unsignalized intersection

26 These intersections would be signalized under the 4-Lane and 6-Lane Alternatives

A.M. Peak Hour

No Build	NB	1140
2nd Montlake Bridge	2M	1180
Difference	△	+40

N

0 500 1,000 Feet

Exhibit 3-23. **Year 2030 No Build Alternative and Second Montlake Bridge Option Approach Volumes – AM Peak Hour**

SR 520 Bridge Replacement and HOV Project

Montlake Boulevard Northeast (just north of Northeast Pacific Place) would increase by approximately 7 percent (180 vph).

Northbound traffic demand on Montlake Boulevard/24th Avenue East (approaching SR 520) would increase by approximately 7 percent (80 vph). Southbound traffic demand at this same location would increase by approximately 9 percent (90 vph). As shown previously in Exhibit 2-2 in Chapter 2, these increases in traffic demand would be due to increases in both local and freeway-related traffic.

Southbound traffic demand on Northeast Pacific Street would increase by approximately 8 percent (130 vph). Northbound traffic demand would also increase by approximately 8 percent (60 vph). As shown previously in Exhibit 2-2, the increase in traffic demand in this area would be caused more by an increase in local trips rather than freeway-related trips.

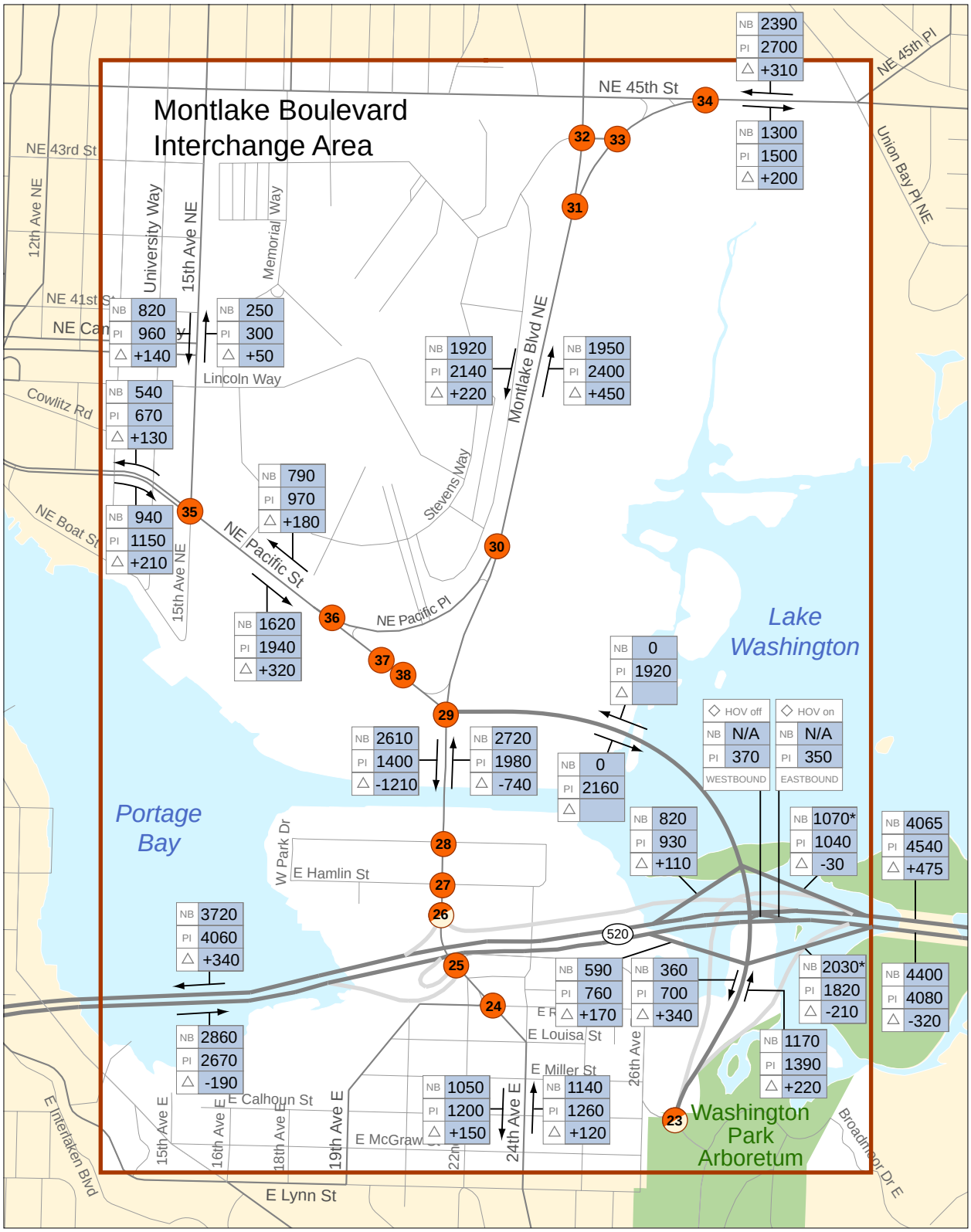
Similarly, traffic demand on 15th Avenue Northeast would increase more because of an increase in local trips rather than SR 520-related trips. In fact, the number of SR 520-related trips would decrease compared to the original 6-Lane Alternative. As shown previously in Exhibit 2-2, the added capacity across the Montlake Cut would shift trips onto the local street network.

Similar to the original 6-Lane Alternative, traffic demand on the Lake Washington Boulevard Northeast ramps to and from SR 520 would decrease. Therefore, traffic demand on Lake Washington Boulevard Northeast would also decrease. Traffic demand at the Lake Washington Boulevard Northeast westbound off-ramp would decrease by 4 percent (15 vph), and traffic demand at the Lake Washington Boulevard Northeast eastbound on-ramp would decrease by 6 percent (70 vph).

Pacific Street Interchange Option

A comparison of traffic volumes between the No Build Alternative and the Pacific Street Interchange option is shown in Exhibit 3-24. With the added capacity provided by the new Pacific Street interchange, southbound traffic demand on Montlake Boulevard Northeast (just north of Northeast Pacific Place) would increase by approximately 11 percent (220 vph). As shown previously in Exhibit 2-2 in Chapter 2, the increase in vehicle demand at this location would be caused more by an increase in local trips rather than SR 520 -related trips.

Southbound traffic demand across the Montlake Bridge would decrease by approximately 46 percent (1,210 vph). Traffic demand primarily



LEGEND

- 1 Study signalized intersection
- 5 Study unsignalized intersection
- 26 These intersections would be signalized under the 4-Lane and 6-Lane Alternatives

A.M. Peak Hour

No Build	NB	960
6-Lane with Pacific Interchange	PI	860
Difference	△	-100

* HOV volumes have been subtracted out.

N 0 500 1,000 Feet

Exhibit 3-24. **Year 2030 No Build Alternative and Pacific Street Interchange Option Approach Volumes – AM Peak Hour**

SR 520 Bridge Replacement and HOV Project

associated with SR 520 would shift to the new connector roadway between the Montlake Boulevard Northeast/Northeast Pacific Street intersection and the new interchange. With this decrease in demand for freeway-related trips, local trips could shift to using Montlake Boulevard Northeast for north-south trips.

Northbound traffic demand across the Montlake Bridge would decrease by approximately 27 percent (740 vph), primarily because the off-ramps to Montlake Boulevard Northeast would be relocated to the Pacific Street Interchange at SR 520. Northbound traffic demand would not decrease as much as southbound traffic demand because vehicles coming from the south would still cross the Montlake Bridge to access the new interchange via the Northeast Pacific Street/Montlake Boulevard Northeast intersection.

Southbound traffic demand on Northeast Pacific Street would increase by approximately 20 percent (320 vph). Northbound traffic demand would also increase by approximately 23 percent (180 vph). These increases in traffic demand would be associated both with additional local and freeway-related trips.

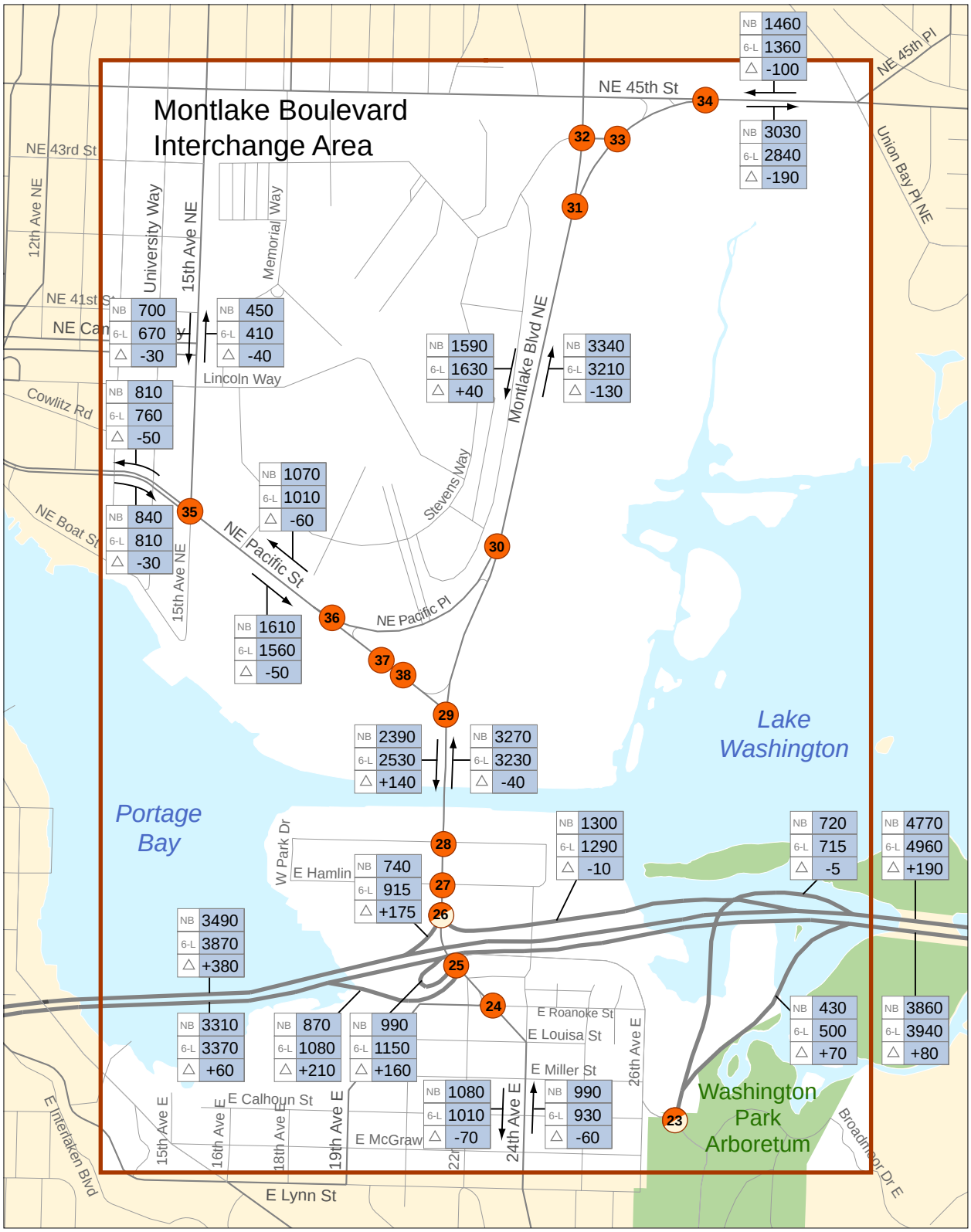
How would travel change on the local streets during the p.m. peak hour?

Original 6-Lane Alternative

A comparison of traffic volumes between the No Build and original 6-Lane Alternatives is shown in Exhibit 3-25. With the original 6-Lane Alternative, southbound traffic demand on Montlake Boulevard Northeast (between Northeast 45th Street and SR 520) would increase by approximately 3 percent (40 vph). This traffic would be destined for the SR 520 on-ramps. Northbound traffic demand at this location would decrease by approximately 4 percent (130 vph) because traffic demand also increases for trips onto the freeway and some background traffic becomes on-ramp traffic.

Northbound traffic demand on Montlake Boulevard/24th Avenue East (approaching SR 520) would decrease by approximately 6 percent (60 vph). Southbound traffic demand at this location would also decrease by 6 percent (70 vph). These traffic decreases would occur because SR 520 would be used more by traffic north of the interchange than south of the interchange.

Southbound traffic demand on Northeast Pacific Street would decrease by approximately 3 percent (50 vph), and northbound traffic demand



LEGEND

1 Study signalized intersection

5 Study unsignalized intersection

26 These intersections would be signalized under the 4-Lane and 6-Lane Alternatives

P.M. Peak Hour

No Build	NB	1140
6-Lane	6-L	1180
Difference	△	+40

N 0 500 1,000 Feet

Exhibit 3-25. **Year 2030 No Build and Original 6-Lane Alternatives Approach Volumes – PM Peak Hour**

SR 520 Bridge Replacement and HOV Project

would decrease by approximately 6 percent (60 vph) because Montlake Boulevard is more heavily used than Pacific Street by traffic associated with SR 520.

Traffic demand on the Lake Washington Boulevard Northeast eastbound on-ramp would increase by 16 percent (70 vph), which would result in an increase in traffic demand along Lake Washington Boulevard Northeast and other local arterials to the south of on-ramp.

Second Montlake Bridge Option

A comparison of traffic volumes between the No Build Alternative and the Second Montlake Bridge option is shown in Exhibit 3-26. With the additional capacity on the Montlake Bridge, southbound traffic demand on Montlake Boulevard Northeast (just north of Northeast Pacific Place) would increase by approximately 15 percent (240 vph). Northbound traffic demand at this location would increase by approximately 7 percent (230 vph). As shown previously in Exhibit 2-3 in Chapter 2, the increase in traffic demand in this area would be caused more by an increase in local trips than freeway-related trips. In fact, there would be a decrease in freeway-related trips.

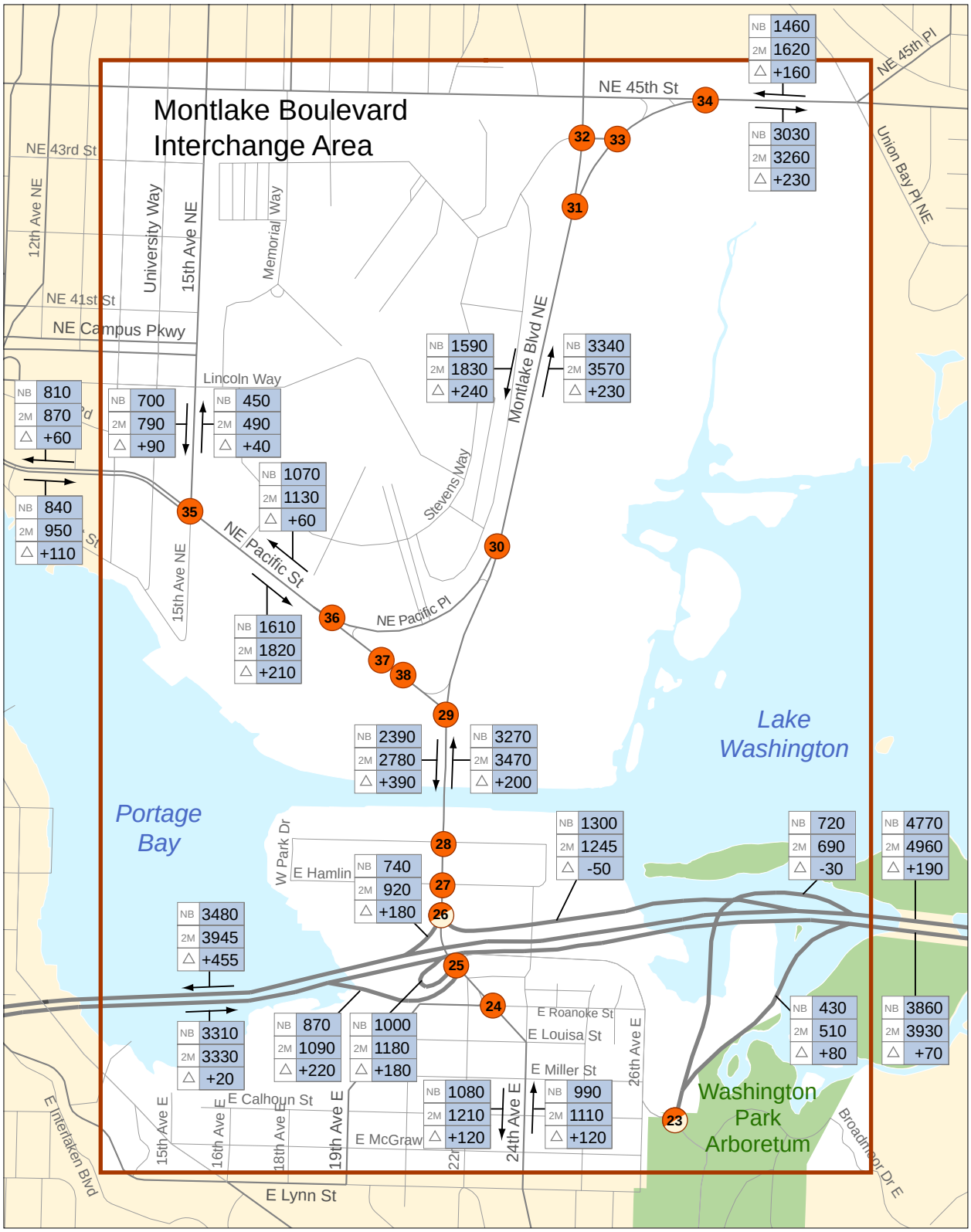
Northbound traffic demand on Montlake Boulevard/24th Avenue East (approaching SR 520) would increase by approximately 12 percent (120 vph). Southbound traffic demand at this location would also increase by 11 percent (120 vph). With the increase in capacity across the Montlake Cut, local trips could shift to Montlake Boulevard for north-south trips.

Southbound traffic demand on Northeast Pacific Street would increase by approximately 13 percent (210 vph), and northbound traffic demand would increase by approximately 6 percent (60 vph) because of an increase in local traffic demand. Again, because of the additional roadway capacity provided by the second Montlake Bridge, local traffic would shift to Montlake Boulevard Northeast for north-south trips.

Traffic demand on Lake Washington Boulevard Northeast would increase slightly because of an increase in demand at the Lake Washington Boulevard Northeast SR 520 on-ramp.

Pacific Street Interchange Option

A comparison of traffic volumes between the No Build Alternative and the Pacific Street Interchange option is shown in Exhibit 3-27. With the additional capacity provided by the new Pacific Street Interchange, southbound traffic demand on Montlake Boulevard Northeast (between



LEGEND

1 Study signalized intersection

5 Study unsignalized intersection

26 These intersections would be signalized under the 4-Lane and 6-Lane Alternatives

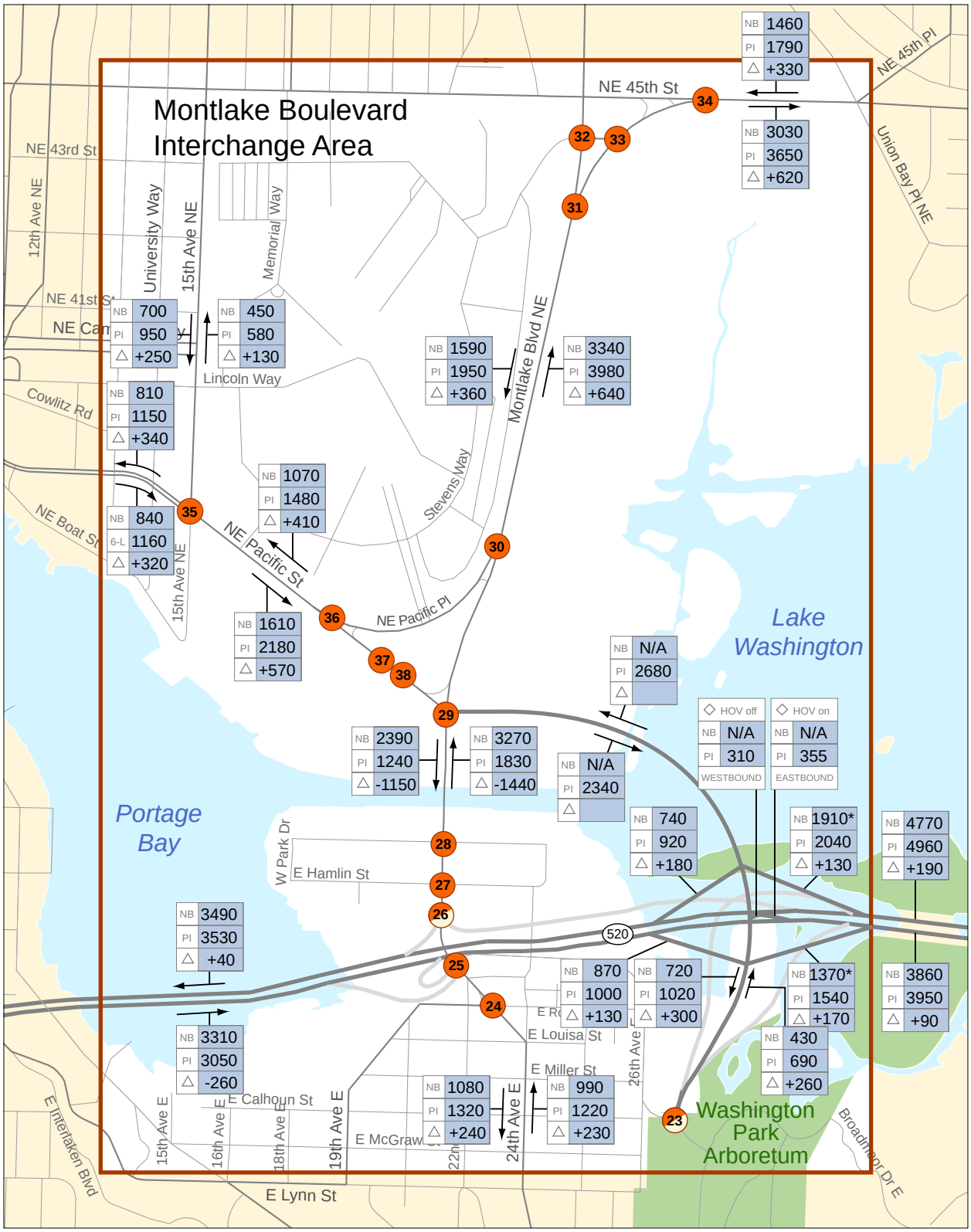
P.M. Peak Hour

No Build	NB	1140
2nd Montlake Bridge	2M	1180
Difference	△	+40

N 0 500 1,000 Feet

Exhibit 3-26. **Year 2030 No Build Alternative and Second Montlake Bridge Option Approach Volumes – PM Peak Hour**

SR 520 Bridge Replacement and HOV Project



LEGEND

1 Study signalized intersection

5 Study unsignalized intersection

26 These intersections would be signalized under the 4-Lane and 6-Lane Alternatives

P.M. Peak Hour

No Build	NB	960
6-Lane with Pacific Interchange	PI	860
Difference	△	-100

*HOV volumes have been subtracted out.

N 0 500 1,000 Feet

Exhibit 3-27. **Year 2030 No Build Alternative and Pacific Street Interchange Option Approach Volumes – PM Peak Hour**

SR 520 Bridge Replacement and HOV Project

Northeast 45th Street and SR 520) would increase by approximately 23 percent (360 vph). Northbound traffic demand at this location would increase by approximately 19 percent (640 vph). As shown previously in Exhibit 2-2 in Chapter 2, these increases in traffic demand would be primarily due to increases in local (93 percent) instead of freeway-related traffic (7 percent).

Traffic demand on Montlake Boulevard south of the Montlake Bridge would decrease substantially with the Pacific Street Interchange option. Southbound traffic demand would decrease by approximately 48 percent (1,150 vph), and northbound traffic demand would decrease similarly by approximately 44 percent (1,440 vph). Freeway vehicle demand would be re-routed to the new roadway connecting the Northeast Pacific Street/Montlake Boulevard Northeast intersection and the new interchange at SR 520.

Northbound traffic demand on Montlake Boulevard/24th Avenue East (approaching SR 520) would increase by approximately 23 percent (230 vph). Southbound traffic demand at this location would also increase similarly by 22 percent (240 vph). This increase in traffic would be associated with an increase in local traffic demand for north/south trips.

Southbound traffic demand on Northeast Pacific Street would increase by approximately 35 percent (570 vph), and northbound traffic demand would increase by approximately 38 percent (410 vph). These increases would be due to increases in both local and freeway-related traffic.

Traffic demand on Lake Washington Boulevard Northeast would increase because of an increase in both local and freeway-related trips.

- Total traffic volumes would increase more substantially with the Pacific Street Interchange option because of the increased capacity on Montlake Boulevard Northeast and the new roadway connecting the new interchange and the Northeast Pacific Street/Montlake Boulevard Northeast intersection.
- South of the Montlake Cut, there would be a substantial decrease in total traffic volumes and the local versus freeway trip ratio shifts with the Pacific Street Interchange option. Local traffic volumes would increase on Montlake Boulevard because the existing SR 520 ramps at Montlake Boulevard would be removed and relocated at the new interchange.

Chapter 4: Freeway Traffic Operations

How were the alternatives analyzed?

Freeway traffic operations for the Second Montlake Bridge and Pacific Street Interchange options were analyzed as described in the *Transportation Discipline Report* (Appendix R of the Draft EIS) using the FHWA CORSIM micro-simulation program. For the Pacific Street Interchange option, the transportation discipline team updated the CORSIM program inputs to reflect the geometric changes associated with the new interchange. Because the freeway traffic forecasts with South Kirkland P&R Transit Access option would be the same as with the original 6-Lane Alternative, freeway traffic operations would also be the same. Therefore, no further traffic analysis was needed for the South Kirkland P&R Transit Access option with ramps.

Geometric changes to a roadway are physical changes that alter the way a roadway or an intersection is laid out. Geometric changes can range from constructing a new highway or interchange, to reconstructing an existing highway, or interchange to re-striping lanes at an intersection (i.e., changing a right-turn only lane to a shared through-right lane).

How would the Second Montlake Bridge and Pacific Street Interchange options affect congestion on SR 520?

SR 520 traffic congestion and its causes are discussed in detail in the *Transportation Discipline Report*. In summary, most of the congestion on SR 520 between I-5 and Montlake Boulevard Northeast is associated with congestion on I-5. The relationship between I-5 and SR 520 congestion for the year 2030 No Build Alternative, original 6-Lane Alternative, Second Montlake Bridge option, and Pacific Street Interchange option is discussed below by direction and peak period.

Westbound SR 520, A.M. Peak Period

No Build Alternative

During the a.m. peak period, congestion on I-5 southbound in downtown Seattle would limit the amount of SR 520 traffic that can exit to I-5. Because some traffic could not exit, SR 520 westbound would become congested, with queues extending as far east as I-405. Because of this congestion, general purpose vehicle speeds on SR 520 would be 20 mph or less between I-5 and Montlake Boulevard Northeast.

Original 6-Lane Alternative

Congestion on westbound SR 520 would continue with the original 6-Lane Alternative because the congestion would not be related to conditions on SR 520. General purpose vehicle speeds would continue to be less than 20 mph.

Second Montlake Bridge Option

Congestion on westbound SR 520 would remain similar to the level of congestion expected with the original 6-Lane Alternative because the Second Montlake Bridge option would serve a similar number of vehicle trips. General purpose vehicle speeds would continue to be less than 20 mph.

Pacific Street Interchange Option

With the Pacific Street Interchange option, westbound SR 520 congestion would improve slightly because of the increased distance between the SR 520 westbound on-ramp and the I-5/SR 520 Interchange. With this increased distance, drivers would be able to maintain slightly higher speeds as they change lanes. However, because of the congestion on I-5, general purpose vehicle speeds would continue to be less than 20 mph.

Westbound SR 520, P.M. Peak Period

No Build Alternative

As during the a.m. peak period, congestion on I-5 southbound would limit the amount of SR 520 traffic that can exit to I-5. However, there would be slightly less congestion on westbound SR 520 because traffic congestion on SR 520 east of Lake Washington would limit the amount of traffic that reaches the west side of the lake. Between I-5 and Montlake Boulevard Northeast, general purpose vehicle speeds would be between 40 and 50 mph.

Original 6-Lane Alternative

Congestion on westbound SR 520 would worsen between I-5 and Montlake Boulevard Northeast because the original 6-Lane Alternative's improvements (wider shoulders and completed HOV lane system) would improve traffic flow and more traffic would reach Seattle. This increase in vehicle throughput would compound the congestion on SR 520 caused by I-5. As a result, general purpose vehicle speeds would decrease from between 40 and 50 mph to between 20 and 40 mph.

Second Montlake Bridge Option

Congestion on westbound SR 520 would remain similar to the level of congestion expected with the original 6-Lane Alternative because the Second Montlake Bridge option would serve a similar number of vehicle trips. While the total number of vehicle trips served would be similar, there would be a slight increase in the number of vehicles exiting SR 520 at Montlake Boulevard Northeast. As a result, congestion on this off-ramp would begin earlier and the average speed would decrease from 40 to 30 mph. Overall, between the Lake Washington Boulevard ramp and I-5, the average vehicle speeds would be the same as with the original 6-Lane Alternative.

Pacific Street Interchange Option

With the Pacific Street Interchange option, congestion on westbound SR 520 would improve slightly because of the increased distance between the Montlake Boulevard Northeast westbound on-ramp and the I-5/SR 520 Interchange. With this increased distance, drivers would be able to maintain slightly higher speeds as they change lanes and the average speed on the Portage Bay Bridge would improve from an average of 20 mph with the original 6-Lane Alternative to an average of 30 mph. Traffic speeds on the Portage Bay Bridge would continue to be affected by I-5 congestion. Because the SR 520 westbound on-ramp acceleration lane length would be longer, congestion would not occur until an hour later and it would dissipate a half hour earlier than with the original 6-Lane Alternative. In other words, the Pacific Street Interchange option would reduce the duration of congestion on the Portage Bay Bridge.

Eastbound SR 520, A.M. Peak Period

No Build Alternative

Year 2030 traffic volume forecasts indicate that southbound I-5 would be congested from north of the Northeast 45th Street interchange to downtown Seattle. I-5 northbound would also be congested approaching the Spokane Street/Columbia Way interchange and the express lanes off-ramp. This congestion would limit the amount of traffic that can access eastbound SR 520; therefore, eastbound SR 520 would operate under free-flow, uncongested conditions during the a.m. peak period.

Original 6-Lane Alternative

Traffic congestion on eastbound SR 520 with the original 6-Lane Alternative would be similar to the traffic congestion expected with the No Build Alternative because the causes of congestion on SR 520 are not

related to conditions on SR 520. Congestion on I-5 would continue to limit the amount of traffic that could access eastbound SR 520, thereby allowing traffic to operate under free-flow, uncongested conditions.

Second Montlake Bridge and Pacific Street Interchange Options

Traffic volumes on eastbound SR 520 between I-5 and Montlake Boulevard Northeast with either the Second Montlake Bridge or Pacific Street Interchange options would be similar to the original 6-Lane Alternative. I-5 congestion would also continue to affect traffic on SR 520. Therefore, freeway traffic operations and congestion would not be noticeably different with either option.

Eastbound SR 520, P.M. Peak Period

No Build Alternative

With the No Build Alternative, traffic congestion on northbound I-5 and its effect on eastbound SR 520 would be similar to that described for the a.m. peak period.

Year 2030 traffic forecasts indicate an increase in demand between the Lake Washington Boulevard Northeast on-ramp and the west end of the Evergreen Point Bridge. However, congestion on northbound I-5 would limit the amount of traffic could enter SR 520. Therefore, traffic actually arriving at this location would decrease for the No Build Alternative (compared to today), thereby decreasing congestion and allowing eastbound SR 520 to operate under free-flow, uncongested conditions.

Original 6-Lane Alternative

With the original 6-Lane Alternative, congestion between the Lake Washington Boulevard Northeast on-ramp and the west end of the Evergreen Point Bridge would be relieved because of the widened lanes and shoulders associated with the new facility. Traffic trying to access eastbound SR 520 would still be limited by I-5 congestion; therefore, eastbound SR 520 would operate under free-flow, uncongested conditions.

Second Montlake Bridge and Pacific Street Interchange Options

With both the Second Montlake Bridge or the Pacific Street Interchange options, traffic congestion on I-5 northbound and its effect on eastbound SR 520 would be similar to that described above for the original 6-Lane Alternative.

What effect would the Second Montlake Bridge and Pacific Street Interchange options have on travel time?

Travel time on the SR 520 corridor between Northeast 124th Street and I-5 would be similar to the original 6-Lane Alternative with either the Second Montlake Bridge or the Pacific Street Interchange option. While there would be some minor variations in traffic volumes and speeds with these two options, on average they would not result in noticeably different travel times.

How would the Second Montlake Bridge and Pacific Street Interchange options affect the number of vehicle and person trips served on SR 520?

The following discussions for the Second Montlake Bridge and Pacific Street Interchange options focus on SR 520 between I-5 and Montlake Boulevard, where traffic demand and throughput volumes differed for the two options compared with the original 6-Lane Alternative. Person- and vehicle-trip throughput volumes for the Second Montlake Bridge and Pacific Street Interchange options would be similar to the original 6-Lane Alternative east of Lake Washington and on I-5 south of the I-5/SR 520 Interchange. A discussion of the freeway traffic operations results for the No Build and original 6-Lane Alternatives for the areas not discussed here can be found in the *Transportation Discipline Report* (Appendix R of the Draft EIS).

Exhibit 4-1 summarizes the a.m. peak period vehicle-trip and person-trip throughput volumes on SR 520 between I-5 and Montlake Boulevard (on the Portage Bay Bridge) by direction. The percent change in these volumes compared to the No Build Alternative is also shown. Throughput volumes for the No Build and original 6-Lane Alternatives are also presented to allow for meaningful comparisons of the effects of the improvements associated with each option.

Exhibit 4-1. Year 2030 A.M. Peak Period Vehicle- and Person-Trip Average[a] Throughput Between I-5 and Montlake Boulevard Northeast

Alternative/Option	Westbound		Eastbound	
	Vehicle Trips	Person Trips	Vehicle Trips	Person Trips
No Build Alternative	2,630	5,900	2,340	4,270
Original 6-Lane Alternative	3,140	8,470	2,180	4,930
Percent increase over No Build	*19%*	*44%*	*-7%*	*15%*
Second Montlake Bridge Option	2,960	8,160	2,260	5,050
Percent increase over No Build	*13%*	*38%*	*-3%*	*18%*
Pacific Street Interchange Option	2,680	7,830	2,170	4,930
Percent increase over No Build	*2%*	*33%*	*-7%*	*15%*

[a]The average represents the average hourly volume that occurs throughout the peak period.

The key points in Exhibit 4-1 are:

- Compared to the No Build Alternative, the original 6-Lane Alternative and the Second Montlake Bridge option would serve more vehicles and people on westbound SR 520. The Pacific Street Interchange option would serve about the same number of vehicles as the No Build Alternative but would serve a higher number of person trips. The Pacific Street Interchange option would serve 33 percent more people (1,930 people) in 50 additional vehicles compared to the No Build Alternative.
- The Second Montlake Bridge and Pacific Street Interchange options would have fewer vehicle and person trips on westbound SR 520 between I-5 and Montlake Boulevard Northeast than the original 6-Lane Alternative because of the additional capacity on Montlake Boulevard Northeast. With this additional capacity, people would use alternate routes and modes.
- Compared to the No Build Alternative, all of the alternatives would serve slightly less vehicles eastbound between I-5 and Montlake Boulevard Northeast because more traffic would exit at the Montlake Boulevard Northeast/Pacific Street interchange. More traffic would exit because of tolls (with all alternatives) and the increase in roadway capacity in the Montlake area (Second Montlake Bridge and Pacific Street Interchange options).
- Similar to the original 6-Lane Alternative, both of the options would serve more people than the No Build Alternative because of a shift

in mode from SOVs to carpools and buses (due to tolling and congestion).

Exhibit 4-2 summarizes the p.m. peak period vehicle-trip and person-trip throughput volumes by direction on the Portage Bay Bridge between I-5 and Montlake Boulevard. The percent change in these volumes compared to the No Build Alternative is also shown.

Exhibit 4-2. Year 2030 P.M. Peak Period Vehicle- and Person-Trip Average[a] Throughput Between I-5 and Montlake Boulevard Northeast

	Westbound		Eastbound	
	Vehicle Trips	**Person Trips**	**Vehicle Trips**	**Person Trips**
No Build	3,250	5,740	2,560	5,780
6-Lane	3,950	7,490	2,600	7,250
Percent increase over No Build	*22%*	*30%*	*2%*	*25%*
Second Montlake Bridge	3,990	7,550	2,720	7,450
Percent increase over No Build	*23%*	*32%*	*6%*	*29%*
Pacific Street Interchange	3,760	7,190	2,580	7,260
Percent increase over No Build	*16%*	*25%*	*1%*	*26%*

[a]The average represents the average hourly volume that occurs throughout the peak period.

The key points in Exhibit 4-2 are:

- The original 6-Lane Alternative and the Second Montlake Bridge option would serve a similar volume of vehicle and person trips in both directions. The Second Montlake Bridge option would serve slightly more vehicle and person trips because of the additional capacity across the Montlake Cut.
- The Pacific Street Interchange option would serve more vehicle and person trips westbound on the Portage Bay Bridge than the No Build Alternative but slightly less than the original 6-Lane Alternative because more traffic would exit at the new interchange.

The results shown in Exhibits 4-1 and 4-2 are discussed by direction and by peak period in the following sections.

Westbound SR 520, A.M. Peak Period

Exhibit 4-3 depicts the vehicle- and person-trip demand and throughput for westbound SR 520 during the a.m. peak period between I-5 and Montlake Boulevard. For all of the alternatives, vehicle- and person-trip throughput is always less than demand because I-5 congestion affects SR 520.

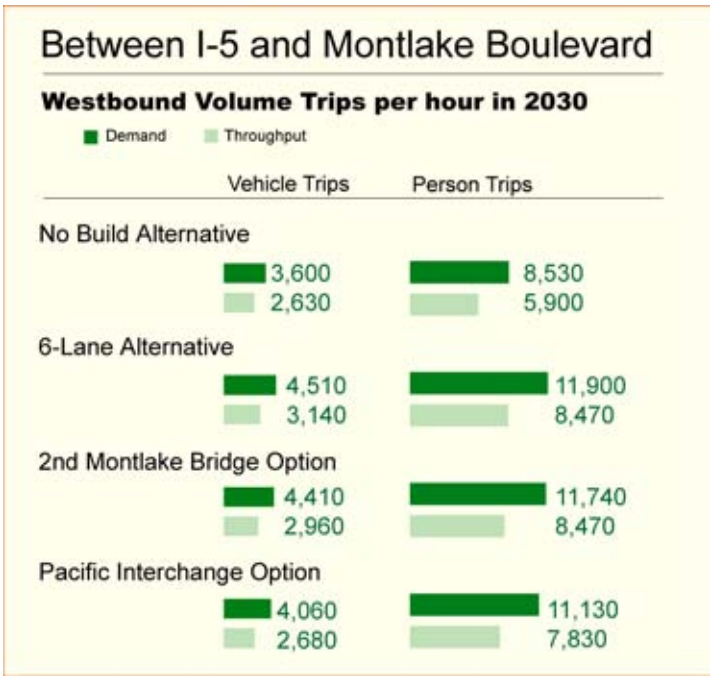


Exhibit 4-3. Westbound A.M. Peak Period Person- and Vehicle-Trip Demand and Throughput per Hour

Original 6-Lane Alternative

In 2030, the average vehicle throughput would increase 20 percent from 2,630 to 3,140 vehicles per hour (vph) with the original 6-Lane Alternative, and person trips would increase 44 percent from 5,900 to 8,470 persons per hour (pph) compared to the No Build Alternative. Vehicle trips would increase because of the new facility and its associated improvements (shoulders, completed HOV lanes, two-lane ramps at the Montlake interchange). The increase in person trips relative to the increase in vehicle trips indicates a shift to carpools and buses compared to the No Build Alternative. This shift to HOV modes would be primarily due to tolls and congestion.

Second Montlake Bridge Option

In 2030, the average vehicle throughput would increase 13 percent from 2,630 to 2,960 vph with the Second Montlake Bridge option, and person trips would increase 44 percent from 5,900 to 8,470 pph compared to the No Build Alternative. Compared to the original 6-Lane Alternative, vehicle trips would decrease on the Portage Bay Bridge because more vehicles would use the local streets. The increase in person trips relative to the increase in vehicle trips indicates a shift to carpools and buses compared to the No Build Alternative (due to tolls and congestion).

Pacific Street Interchange Option

In 2030, the average vehicle throughput with the Pacific Street Interchange option would be similar to the No Build Alternative (only a 2 percent increase from 2,630 to 2,680 vph). As mentioned previously, vehicle throughput between I-5 and Montlake Boulevard would be less

than the original 6-Lane Alternative because more traffic would use local streets.

Person trips would still increase 33 percent from 5,900 to 7,830 pph compared to the No Build Alternative and is attributable to a shift in mode due to tolls and congestion. Person trips would be less than the original 6-Lane Alternative because of the shift from freeway trips to local trips.

Westbound SR 520, P.M. Peak Period

Exhibit 4-4 shows the vehicle- and person-trip demand and throughput for westbound SR 520 during the p.m. peak period between I-5 and Montlake Boulevard. For all of the alternatives, vehicle- and person-trip throughput is always less than demand because I-5 congestion affects SR 520.

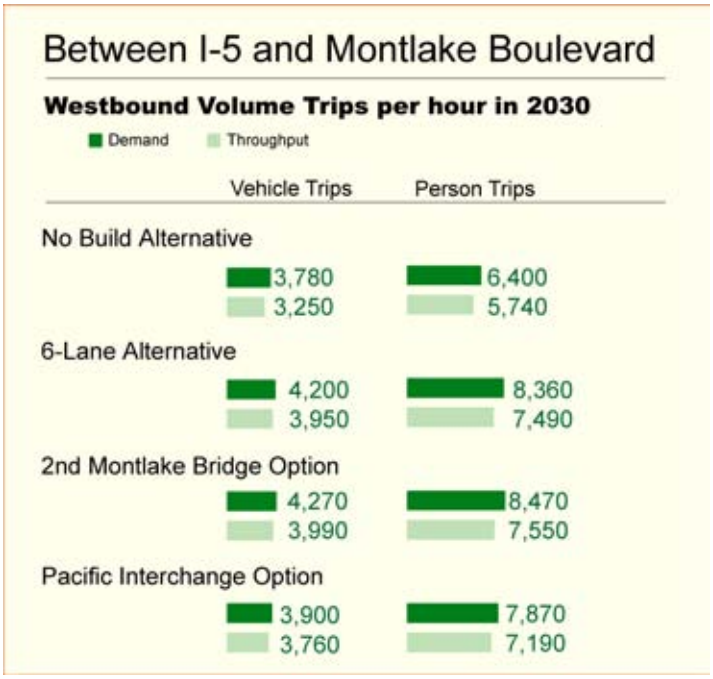


Exhibit 4-4. Westbound P.M. Peak Period Person-Trip and Vehicle-Trip Demand per Hour

Original 6-Lane Alternative

In 2030, the average vehicle throughput would increase 22 percent from 3,250 to 3,950 vph with the original 6-Lane Alternative, and person trips would increase 30 percent from 5,740 to 7,490 pph compared to the No Build Alternative. Vehicle trips would increase because of the new facility and its associated improvements. The increase in person trips relative to the increase in vehicle trips indicates a shift to carpools and buses compared to the No Build Alternative (due to tolls and congestion).

Second Montlake Bridge Option

In 2030, the average vehicle throughput would increase 23 percent from 3,250 to 3,990 vph with the Second Montlake Bridge option, and person trips would increase 32 percent from 5,740 to 7,550 pph compared to the No Build Alternative. Person trips would increase over the original 6-Lane Alternative because more vehicles would be served due to the increase in capacity across the Montlake Cut.

Pacific Street Interchange Option

In 2030, the average vehicle throughput would increase 16 percent from 3,250 to 3,760 vph, and person-trips would increase 25 percent from

5,740 to 7,190 pph compared to the No Build Alternative. Compared to the original 6-Lane Alternative, vehicle trips would decrease on the Portage Bay Bridge because more vehicles would exit at the new Pacific Street interchange. This would also cause a decrease in person trips.

Eastbound SR 520, A.M. Peak Period

Exhibit 4-5 depicts the vehicle- and person-trip demand and throughput for eastbound SR 520 during the a.m. peak period between I-5 and Montlake Boulevard. For all of the alternatives, vehicle- and person-trip throughput is always less than demand because I-5 congestion affects SR 520.

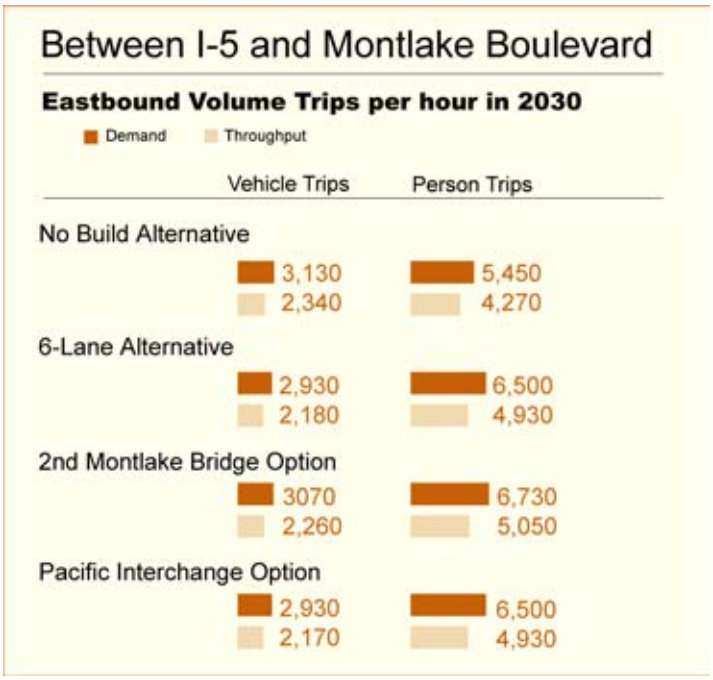


Exhibit 4-5. Eastbound A.M. Peak Period Person- and Vehicle-Trip Demand per Hour

Original 6-Lane Alternative

In 2030, the average vehicle throughput would decrease 7 percent from 2,340 to 2,180 vph, and person trips would increase 15 percent from 4,270 to 4,930 pph compared to the No Build Alternative. Vehicle trips would increase because of the new facility and its associated improvements. The increase in person trips relative to the increase in vehicle trips indicates a shift to carpools and buses compared to the No Build Alternative (due to tolls).

Second Montlake Bridge Option

In 2030, the average vehicle throughput across the Portage Bay Bridge would decrease 3 percent from 2,340 to 2,260 vph, and person trips would increase 18 percent from 4,270 to 5,050 pph compared to the No Build Alternative (due to tolls). Vehicle trips would increase over the original 6-Lane Alternative because of the increase in capacity across the Montlake Cut.

Pacific Street Interchange Option

In 2030, the average vehicle throughput across the Portage Bay Bridge would decrease 7 percent from 2,340 to 2,170 vph, and person trips would increase 15 percent from 4,270 to 4,930 pph compared to the No Build Alternative (due to tolls). Vehicle and person trips would be similar to the original 6-Lane Alternative.

Eastbound SR 520, P.M. Peak Period

Exhibit 4-6 shows the vehicle- and person-trip demand and throughput for eastbound SR 520 during the p.m. peak period between I-5 and Montlake Boulevard. For all of the alternatives, vehicle- and person-trip throughput is always less than demand because I-5 congestion affects SR 520.

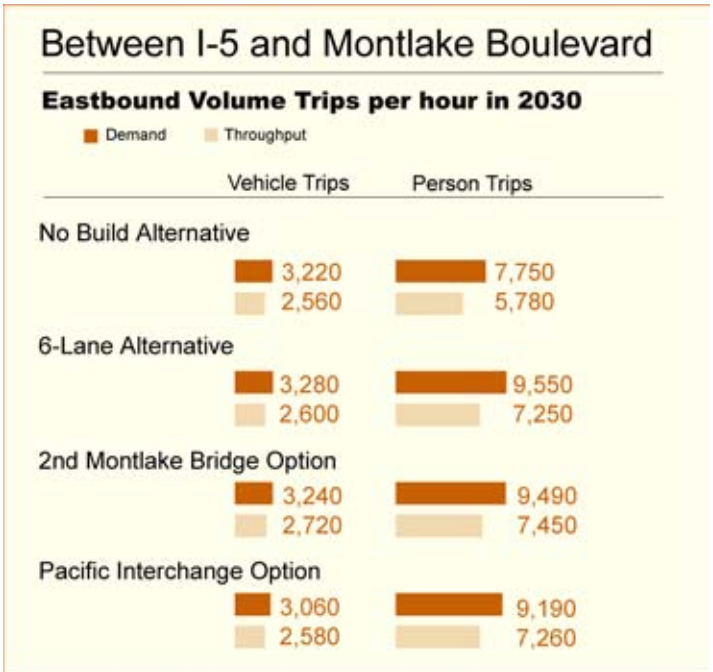


Exhibit 4-6. Eastbound P.M. Peak Period Person- and Vehicle-Trip Demand per Hour

Original 6-Lane Alternative

In 2030, the average vehicle throughput would be essentially the same as with the No Build Alternative (only a 2 percent increase from 2,560 to 2,600 vph). However, person- rips would increase 25 percent from 5,780 to 7,250 pph compared to the No Build Alternative. The increase in person trips relative to vehicle trips staying the same indicates a mode shift from SOVs to carpools and buses (due to tolls and congestion).

Second Montlake Bridge Option

In 2030, the average vehicle throughput would increase 6 percent from 2,560 to 2,720 vph, and the average person throughput would increase 29 percent from 5, 780 to 7,450 pph. As with the original 6-Lane Alternative, the increase in person trips relative to the small increase in vehicle trips indicates a mode shift from SOVs to carpools and buses (due to tolls and congestion). Vehicle and person trips would increase because of the increased capacity across the Montlake Cut.

Pacific Street Interchange Option

The Pacific Street Interchange option would serve essentially the same vehicle and person trips between I-5 and Montlake Boulevard Northeast as the original 6-Lane Alternative.

Would the 6-Lane Alternative options improve safety on SR 520?

Second Montlake Bridge and Pacific Street Interchange Options

The Second Montlake Bridge and Pacific Street Interchange options would improve safety in the SR 520 corridor in the following ways:

- Both options would include 10-foot-wide shoulders on both sides of the new freeway. This is similar to the original 6-Lane Alternative.
- The Second Montlake Bridge option would include a third general purpose lane in both directions between I-5 and Montlake Boulevard Northeast (add lane from the westbound on-ramp and a drop lane to the eastbound off-ramp). These lanes would provide additional space for lane changes and acceleration on the Portage Bay Bridge.
- The Pacific Street Interchange option would be further away from the I-5/SR 520 Interchange than the Montlake interchange would be, which would increase the distance for merging activity.
- The Pacific Street Interchange option would combine the eastbound Montlake Boulevard and Lake Washington Boulevard on-ramps, which would reduce the number of conflict points on the freeway.

The affect of these improvements on safety is discussed in more detail below.

During 2000, 2001, and 2002, an average of 360 accidents occurred per year on SR 520 between I-5 and 108th Avenue Northeast. This accident rate equates to nearly one accident per day on SR 520. Accidents are typically related to high weaving activity (frequent lane changes) and heavy congestion.

Accident rates westbound between 92nd Avenue Northeast and 84th Avenue Northeast and between I-5 and Montlake Boulevard were the highest on the SR 520 corridor. Accident rates were also relatively high in the Montlake Boulevard interchange area in both the eastbound and westbound directions, where there is also a lot of weaving activity and heavy congestion.

When accidents occur on SR 520 today, there is little to no shoulder for vehicles to seek refuge in, forcing them to block a travel lane. In addition to being unsafe for all involved, including passing traffic and

emergency response vehicles, vehicles stopped in the travel lanes reduce the capacity of SR 520 by more than half. Not only is traffic in the lane with the incident stopped, but traffic flow in the adjacent lane is also affected as vehicles from the stopped lane change lanes to get around the incident and drivers slow down to look at the incident. Response time for emergency vehicles is also affected because they must maneuver through the congestion to reach the vehicles involved in the incident.

With the original 6-Lane Alternative, 10-foot-wide shoulders would be provided on both sides of the new freeway. During an incident, the shoulder would provide an area for vehicles to await assistance. After an accident, vehicles would be able to pull onto the shoulder and traffic flow could resume. As described before, the lane nearest to the incident would operate at reduced speeds; however, the second lane from the shoulder would be less affected and operate at higher speeds. With these improvements, emergency vehicles would be able to respond more quickly by using the shoulder lanes to more effectively reach people in need of assistance. These safety and travel time benefits would also be realized with either the Second Montlake Bridge option or the Pacific Street Interchange option.

The original 6-Lane Alternative would also reconstruct the SR 520 westbound and eastbound on-ramps to meet current design guidelines. The eastbound on-ramp would gain approximately 300 feet and the westbound on-ramp would gain approximately 650 feet, which would make it safer for entering vehicles to merge with mainline traffic.

The Pacific Street Interchange option would have the additional benefit of shifting the interchange further east of (and therefore further away from) the I-5/SR 520 Interchange. The distance between the I-5 on-ramps and the SR 520 eastbound off-ramp would increase from approximately 1,900 feet to 3,100 feet. With this increased distance between I-5 and the new interchange, drivers would have more time to find bigger spaces in traffic in which to change lanes. With greater distances between merging vehicles, vehicles could maintain steadier and higher speeds, which would reduce congestion, improve traffic operations, and increase safety.

With the Pacific Street Interchange option, the distance between the SR 520 westbound on-ramp and I-5 would be similar to today but the on-ramp would increase in length from approximately 825 feet (today) to 2,450 feet. This additional distance would give vehicles enough space

to accelerate up to freeway speeds, which would make it easier and safer to merge with mainline traffic.

The Pacific Street Interchange option would also have only one eastbound on-ramp, which would reduce the number of conflict points and improve traffic flow. The eastbound on-ramp would not be a loop ramp and would be approximately 2,500 feet long (versus the 1,900-foot-long existing loop ramp). This on-ramp would also be ramp-metered and serve only general purpose traffic. The ramp would provide acceleration lengths that meet current design guidelines, thus allowing vehicles additional distance to accelerate up to freeway speeds. The longer ramp length would also provide more time for people to find a safe space to merge into freeway traffic, thereby improving freeway safety.

South Kirkland Park-and-Ride Direct Access Ramps Option

Direct access ramps would improve safety because buses would no longer have to merge across the general purpose lanes to access the inside HOV lanes. Also with the Direct Access Ramps option, the increased spacing between the SR 520 westbound ramps/108th Avenue Northeast and Northup Way/108th Avenue Northeast intersection would improve safety because drivers would have more time and space to change lanes. The Modified Loop Ramp option would not substantially change the safety of the interchange area over the original 6-Lane Alternative.

Chapter 5: Local Traffic Operations

How do traffic operations compare across the 6-Lane Alternative options?

The Montlake Boulevard interchange area is the only interchange area along the SR 520 corridor where the Second Montlake Bridge and Pacific Street Interchange options would affect local traffic volumes. Therefore, it is the only interchange area where an analysis of local traffic operations was needed.

How would the project affect traffic circulation in the Montlake Boulevard interchange area?

With the original 6-Lane Alternative and Second Montlake Bridge option, some local traffic patterns would change because of the new traffic signal at the Montlake Boulevard/SR 520 westbound ramps intersection and the additional capacity provided by second Montlake Bridge. With these improvements, Montlake Boulevard Northeast would become a more attractive travel route.

The Pacific Street Interchange option would also affect traffic patterns in the Montlake Boulevard interchange area by relocating the SR 520 ramps and constructing a new roadway. SR 520 traffic would use the new interchange, which would reduce traffic volumes and merging and weaving activity and eliminate the U-turns on Montlake Boulevard Northeast. This option would improve overall traffic flow and safety on Montlake Boulevard and intersections south of the Montlake Cut. Therefore, Montlake Boulevard Northeast would be an attractive route for drivers making local trips. Any increase in local trips would be more than offset by the reduction in traffic volumes caused by relocating SR 520 access to the new Pacific Street Interchange option. This is shown in Exhibit 2-2, where the proportion of local traffic increases from 53 percent in the No Build Alternative to 83 percent with the Pacific Street Interchange option. However, the total traffic volume through this area would decrease from 5,350 vehicles to 3,370 vehicles

during the p.m. peak hour. Exhibit 2-3 shows the same pattern. In other words, with the relocation of the SR 520 ramps to the new interchange, more drivers would use Montlake Boulevard for local trips than they do today because there would be no freeway-related congestion.

How do traffic volumes change across the alternatives and options during the a.m. peak hour?

Exhibit 5-1 shows year 2030 traffic volumes at key locations within the Montlake interchange area during the a.m. peak hour. These locations were selected because they best show the changes in traffic patterns and traffic volumes among the alternatives. The traffic volumes represent total two-way traffic. For example, traffic volumes listed for a location north of an intersection are the sum of the northbound traffic leaving the intersection and southbound traffic approaching the intersection. The changes in traffic volumes are briefly described below. For more information regarding changes in traffic volumes on the local street network, see the Final Submittal of the *Final Traffic Forecasts Report for the 6-Lane Alternative Options* (SR 520 Project Team 2005d).

Exhibit 5-1. A.M. Peak Hour Traffic Volumes for Local Streets at the Montlake Boulevard Interchange Area

	Total 2-Way Peak Hour Volume				Change Between					
					6-Lane and No Build		2nd Montlake Bridge and No Build		Pacific Street Interchange and No Build	
Location	No Build	6-Lane	2nd Montlake Bridge	Pacific I/C	(vph)	(%)	(vph)	(%)	(vph)	(%)
Montlake Blvd NE north of NE Pacific St	3,540	3,660	3,810	4,270	120	3%	270	8%	730	21%
NE Pacific Street west of Montlake Boulevard	1,850	1,910	1,990	2,270	60	3%	140	8%	420	23%
Montlake Boulevard north of SR 520 westbound ramps	5,380	5,550	5,750	3,350	170	3%	370	7%	-2,030	-38%
Montlake Blvd south of SR 520 eastbound ramps	2,600	2,670	2,800	2,920	70	3%	200	8%	320	12%
Lake Washington Blvd east of SR 520 ramps	2,520	2,480	2,550	2,620	-40	-2%	30	1%	100	4%

The key points from Exhibit 5-1 are:

- Compared to the No Build Alternative, traffic volumes would increase on Montlake Boulevard Northeast with both the original 6-Lane Alternative and the Second Montlake Bridge option. Traffic volumes would increase more with the Second Montlake Bridge option than with the original 6-Lane Alternative because of the additional capacity across the Montlake Cut.
- With the Pacific Street Interchange option, traffic volumes would decrease 38 percent on Montlake Boulevard Northeast north of the SR 520 on-ramps because the existing SR 520 ramps would be closed and relocated.
- Traffic on Montlake Boulevard Northeast north of Northeast Pacific Street would increase 21 percent because of the relocated access to SR 520. Traffic volumes on the new roadway between the Northeast Pacific Street/Montlake Boulevard Northeast intersection and the SR 520 interchange would be 2,160 vph during the a.m. peak period (total for both directions).

How do traffic volumes change across the alternatives and options during the p.m. peak hour?

Exhibit 5-2 shows year 2030 traffic volumes at key locations within the Montlake interchange area during the p.m. peak hour. The changes in traffic volumes are briefly described below. For more information regarding the traffic volume forecasts for the local street network, see the *Final Traffic Forecasts Report for the 6-Lane Alternative Options* (SR 520 Project Team 2005d).

A comparison of Exhibits 5-1 and 5-2 shows that the p.m. peak hour changes in traffic patterns and traffic volumes throughout the Montlake interchange area would be similar to those in the a.m. peak hour for the Second Montlake Bridge and Pacific Street Interchange options. Traffic volumes on the new roadway between the Northeast Pacific Street/ Montlake Boulevard Northeast intersection and the SR 520 interchange would be 2,340 vph during the p.m. peak period (total for both directions).

Exhibit 5-2. P.M. Peak Hour Traffic Volumes for Local Streets at the Montlake Boulevard Interchange Area

	Total 2-Way Peak Hour Volume				Change Between					
					6-Lane and No Build		2nd Montlake Bridge and No Build		Pacific Interchange and No Build	
Location	No Build	6-Lane	2nd Montlake Bridge	Pacific Street I/C	(vph)	(%)	(vph)	(%)	(vph)	(%)
Montlake Boulevard north of NE Pacific St	4,250	4,280	4,670	5,040	30	<1%	420	10%	790	19%
NE Pacific Street west of Montlake Boulevard	1,730	1,760	1,940	2,510	30	2%	210	12%	780	45%
Montlake Boulevard north of SR 520 westbound ramps	5,660	5,760	6,260	3,000	100	2%	600	11%	-2,660	-47%
Montlake Blvd south of SR 520 eastbound ramps	2,360	2,230	2,650	2,880	-130	-4%	290	12%	520	22%
Lake Washington Blvd east of SR 520 ramps	1,770	1,780	1,920	2,010	10	1%	150	8%	240	14%

For the original 6-Lane Alternative, traffic volumes would be similar to the No Build Alternative because there would no capacity improvements.

How were traffic operations at the study area intersections measured?

The transportation discipline team, together with WSDOT, developed the following three measures of effectiveness (MOEs):

- Level of service (LOS)
- Maximum volume-to-capacity ratio
- Vehicular queuing

The MOEs were used to evaluate and compare traffic operations among the alternatives.

What is level of service and how is it applied?

Level of service (LOS) rates the quality of traffic operations on a given transportation facility. The rating scale uses the letters A through F, similar to grading scales used in the education system, where A is the best grade and F the worst. The letter grades are based on the amount

of delay that drivers experience at an intersection. The letter A represents the least-delayed conditions, while the letter F represents the most-delayed conditions (see Exhibit 5-3). For intersections controlled by signals and all-way stops, LOS represents an average delay per vehicle for the entire intersection. For two-way stop-controlled intersections, LOS represents the most-delayed leg of the intersection. Delays are calculated using various factors, including V/C ratios (see *What is a maximum volume-to-capacity (V/C) ratio and what does it mean?*). It is standard traffic planning practice to consider LOS D as the threshold for acceptable intersection operations and levels of delay.

Exhibit 5-3. Delay Ranges Associated With LOS Ratings

LOS	Conditions	Signalized Intersection Delay (sec/vehicle)
A	Best (Very Short Delay)	≤ 10
B	↓	> 10 and ≤ 20
C		> 20 and ≤ 35
D		> 35 and ≤ 55
E		> 55 and ≤ 80
F	Worst (Very Long Delay)	> 80

Source: Highway Capacity Manual 2000 (Transportation Research Board, 2000).

What is a maximum volume-to-capacity ratio, and what does it mean?

Volume-to-capacity (V/C) ratios help traffic engineers highlight operational constraints at intersections and identify the most effective improvements. The V/C ratio compares the amount of traffic on a roadway (the traffic volume) to the roadway's available capacity (how many lanes). If the V/C ratio is greater than 1.0, it means that the traffic volumes exceed the roadway capacity. Conversely, if the V/C ratio is less than 1.0, it means the roadway is carrying less than its capacity. For example, a V/C ratio of 1.15 means that traffic volumes exceed the roadway capacity by 15 percent.

At intersections, the capacity of a lane depends on its physical layout (lane width, uphill/downhill grade, etc.), as well as the type and duration of traffic control (stop sign, signal, cycle length, etc.). For instance, given the same lane layout, the longer the signal is green, the more vehicles that can move through the intersection in that lane. At an intersection, V/C ratios are calculated for the groups of lanes

approaching the intersection. The maximum V/C ratio for the intersection as a whole represents the most constrained group of lanes at that intersection. When traffic volumes exceed the roadway capacity, congestion forms.

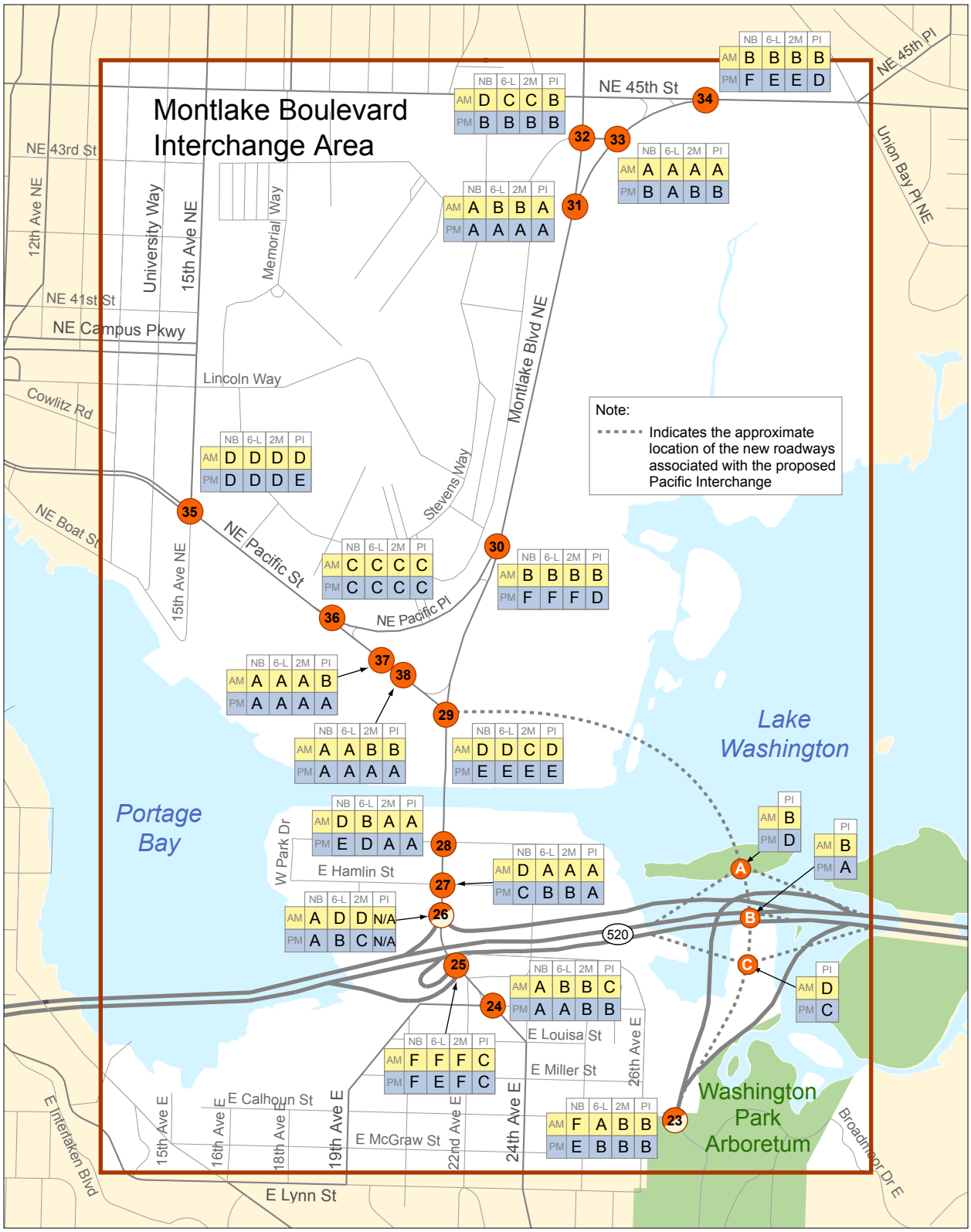
Which intersections are affected in the Montlake interchange area?

This section describes how the changes in traffic volumes associated with the Second Montlake Bridge and Pacific Street Interchange options would affect intersection operations in the Montlake interchange area. Exhibit 5-4 shows the LOS results from the Synchro traffic analysis that was performed with the updated Second Montlake Bridge and Pacific Street Interchange options traffic volume forecasts.

The LOS results shown in Exhibit 5-4 include the LOS results for the No Build and original 6-Lane Alternatives to provide a point of comparison. The effects of Second Montlake Bridge and Pacific Street Interchange options on traffic operations are discussed in detail for those intersections where (1) the LOS would either improve from LOS E or F to LOS D or better or (2) the LOS would worsen from either better than LOS D to LOS D or worse. The results are presented by intersection in the following section. Mini-graphics (excerpts from Exhibit 5-4) are also provided for easy comparison of the alternatives and options.

As shown in Exhibit 5-4, the following intersections would operate acceptably for all project alternatives during the a.m. and p.m. peak hours without any capacity and queuing issues:

- Lake Washington Boulevard/SR 520 Arboretum ramps (Location 23)
- Montlake Boulevard/East Roanoke Street (Location 24)
- Montlake Boulevard/East Hamlin Street (Location 27)
- Montlake Boulevard Northeast/25th Avenue Northeast (Location 31)
- 25th Avenue Northeast/Pend Orielle Street (Location 32)
- Montlake Boulevard/Northeast 44th Avenue (Location 33)
- Northeast Pacific Street/Northeast Pacific Place (Location 36)



LEGEND

- 1 Study signalized intersection
- 5 Study unsignalized intersection
- 26 These intersections would be signalized under the 6-Lane, 2nd Montlake Bridge, and Pacific Interchange Alternatives

6-Lane Alternative — No Build — 2nd Montlake Bridge — Pacific Interchange

	NB	6-L	2M	PI
A.M. Peak Hour	D	C	C	C
P.M. Peak Hour	B	B	B	B

Year 2030 Options

LEVEL OF SERVICE

- A-C No/Little Congestion
- D Moderate Congestion
- E Heavy Congestion
- F Severe Congestion/Over Capacity

N 0 500 1,000 Feet

Exhibit 5-4. **Montlake Boulevard Interchange Area Level of Service**

SR 520 Bridge Replacement and HOV Project

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- Northeast Pacific Street/UW Medical Center exit (Location 37)
- Northeast Pacific Street/UW Medical Center Emergency Entrance (Location 38)

Intersection operations for these intersections are not discussed further.

Traffic operations at the remaining intersections are explained in detail below because, as explained above, the LOS would either improve from LOS E or F to LOS D or better or the LOS would worsen from better than LOS D to LOS D or worse.

Montlake Boulevard/Lake Washington Boulevard/SR 520 Eastbound Ramps (Exhibits 5-4 and 5-5, Location 25)

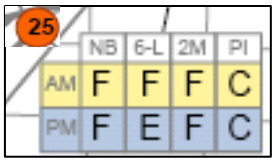

Exhibit 5-5. LOS at the Montlake Boulevard/Lake Washington Blvd/SR 520 Eastbound Ramps Intersection

Second Montlake Bridge Option

Under the Second Montlake Bridge option, this intersection would be reconstructed to provide the same approach lanes and signal phasing addition as discussed in the original 6-Lane Alternative. Under the original 6-Lane Alternative, this intersection would be reconstructed and signal phasing and timing would be optimized. The design includes an additional lane for eastbound left-turning traffic, and the third lane would be converted from a shared left/through/right lane to a shared through/right-turn lane. The additional lanes would allow more sharing of the signal green time with other movements (see Exhibits 3-17 and 3-18 in Chapter 3 for existing and proposed lane geometry for this and adjacent intersections). Also, a signal phase would be added for the westbound right turn during the southbound left-turn phase.

During the a.m. peak hour, the intersection would operate at LOS F, as under the No Build and 6-Lane Alternatives. During the p.m. peak hour, this intersection would operate at LOS F, which is the same as under the No Build Alternative but worse than under the original 6-Lane Alternative. Operations would be worse because of increased traffic volumes on Montlake Boulevard associated with the additional capacity provided by the second Montlake Bridge.

The average intersection delay would increase from 79 seconds under the original 6-Lane Alternative to 110 seconds under the Second Montlake Bridge option. Traffic volumes would be 10 percent over capacity with the original 6-Lane Alternative and 20 percent over capacity with the Second Montlake Bridge option. Queues would

increase the most noticeably for the westbound right turn from Lake Washington Boulevard onto Montlake Boulevard.

Pacific Street Interchange Option

Under the Pacific Street Interchange option, this intersection would be reconstructed (see Exhibit 3-19 in Chapter 3). The reconstruction would eliminate the eastbound SR 520 ramps (the ramps would be relocated to the new Pacific Street Interchange), resulting in a T-intersection between Lake Washington Boulevard and Montlake Boulevard Northeast. Also, as previously summarized, traffic volumes on Montlake Boulevard Northeast south of the Montlake Cut would decrease substantially. Therefore, intersection operations would improve from LOS F to LOS C with the Pacific Street Interchange option. Queue lengths would also be substantially shortened, reducing queue spillback south of Lake Washington Boulevard and East Roanoke Street.

Montlake Boulevard/SR 520 Westbound Ramps (Exhibits 5-4 and 5-6, Location 26)

Second Montlake Bridge Option

Intersection operations under the Second Montlake Bridge option would be similar to those under the original 6-Lane Alternative.

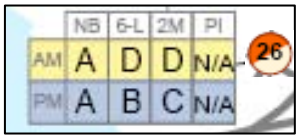

Exhibit 5-6. LOS at the Montlake Boulevard/SR 520 Westbound Ramps Intersection

As under the original 6-Lane Alternative, the Montlake Boulevard/SR 520 westbound ramps intersection would be reconstructed and signalized with the Second Montlake Bridge option. Exhibit 3-18 in Chapter 3 shows the proposed layout and highlights the changes between the existing and future configuration. This configuration was developed to eliminate the northbound u-turn at East Hamlin Street (and its associated congestion). It would provide direct access to the SR 520 westbound ramps for traffic traveling to and from the south on Montlake Boulevard Northeast. The LOS for the No Build Alternative is better because it reflects operations only for the SR 520 westbound off-ramp, which operates under yield conditions with little delay. With the original 6-Lane Alternative and the Second Montlake Bridge option, the LOS reflects the overall operation for the new signalized intersection, which would include all movements and their associated delays (northbound and southbound throughs, northbound left turns, and westbound left turns). The operational improvements associated with the reconstruction of this intersection are discussed in greater detail in the *Transportation Discipline Report*.

Pacific Street Interchange Option

This intersection would not exist with the Pacific Street Interchange option. Relocating the SR 520 ramps would improve traffic operations in the vicinity of this intersection because in addition to the substantial reduction in traffic volumes, merging, weaving, and U-turn disruptions would be eliminated. Removing the free right turn associated with the westbound off-ramp would improve pedestrian and bicyclist safety.

Montlake Boulevard Northeast/East Shelby Street (Exhibits 5-4 and 5-7, Location 28)

Second Montlake Bridge Option

Under the Second Montlake Bridge option, Montlake Boulevard would be increased from four travel lanes (two lanes in each direction) to six travel lanes (three lanes in each direction) across the Montlake Cut. This improvement would provide additional capacity and eliminate the merge previously required between the westbound SR 520 ramps and the bridge, thus improving operations. The LOS would improve from LOS D to LOS A in the a.m. peak period and LOS E to LOS A in the p.m. peak period. Vehicle queues would no longer back up through East Hamlin Street in the a.m. peak period.

Exhibit 5-7. LOS at the Montlake Boulevard NE/E Shelby Street Intersection

Pacific Street Interchange Option

Under the Pacific Street Interchange option, this intersection would operate at LOS A in both peak periods because of the substantial decrease in traffic volumes on Montlake Boulevard Northeast. All approaches would operate under capacity, and queues would be reduced compared with the No Build Alternative.

Montlake Boulevard/Northeast Pacific Street (Exhibits 5-4 and 5-8, Location 29)

Second Montlake Bridge Option

Under the Second Montlake Bridge option, the intersection would operate at LOS C during the a.m. peak hour in 2030, compared with LOS D operations under the No Build Alternative. Operations would improve because of the additional capacity on Montlake Boulevard Northeast. This added capacity would reduce the delay for most of the movements, especially the southbound through lanes.

During the p.m. peak hour, intersection LOS would be the same as under No Build Alternative conditions (LOS E).

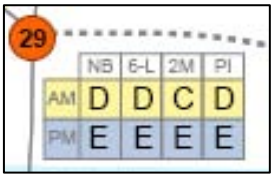

Exhibit 5-8. LOS at the Montlake Boulevard NE/NE Pacific Street Intersection

Pacific Street Interchange Option

Under the Pacific Street Interchange option, this intersection would operate at the same LOS as the No Build Alternative (LOS D in the a.m. peak hour and LOS E in the p.m. peak hour). While LOS would remain the same, overall intersection delay would increase because of the increase in traffic volumes and the high number of turning movements competing for green time.

New turning movements and higher traffic volumes associated with this option would require reconstructing the intersection and adding a new east leg that would connect to the new interchange. See Exhibit 3-20 in Chapter 3 for the proposed intersection design.

Overall, the new intersection design and associated improvements would provide enough capacity for all lane groups except for southbound left, which would be at capacity (v/c = 1.00). Most approaches would be close to capacity, such as the westbound right lanes (V/C = 0.99) and the northbound through lanes (V/C = 0.98).

Montlake Boulevard/Northeast Pacific Place (Exhibits 5-4 and 5-9, Location 30)

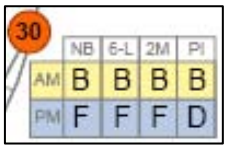

Exhibit 5-9. LOS at the Montlake Boulevard NE/NE Pacific Place Intersection

Second Montlake Bridge Option

Under the Second Montlake Bridge option, this intersection would operate at the same LOS (LOS B) in the a.m. peak period as under the No Build Alternative. All approaches would be under capacity.

In the p.m. peak period, this intersection would continue to operate at LOS F; however, compared to the No Build alternative, delay would decrease from 131 seconds per vehicle to 94 seconds per vehicle. Intersection delay would decrease because the westbound approach would be re-striped to one right turn only lane and one left turn only lane, which would better serve westbound traffic and allow more green time to be distributed to the high volume north-south through movements.

Pacific Street Interchange Option

This intersection would operate at the same LOS (LOS B) in the a.m. peak period as under the No Build Alternative. All approaches would be under capacity.

In the p.m. peak period, intersection operations would improve to LOS D (compared with LOS F under the No Build Alternative) because of added capacity on Montlake Boulevard.

Montlake Boulevard Northeast/Northeast 45th Avenue (Exhibits 5-4 and 5-10, Location 34)

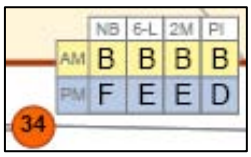

Exhibit 5-10. LOS at the Montlake Boulevard NE/45th Avenue NE Intersection

Second Montlake Bridge Option

Intersection operations under the Second Montlake Bridge option would be similar to the original 6-Lane Alternative during both peak hours.

Pacific Street Interchange Option

During the a.m. peak hour, this intersection would operate acceptably at LOS B. During the p.m. peak hour, intersection operations would improve to LOS D (over LOS F and E of the other alternatives and option) because of the additional lanes on Montlake Boulevard Northeast.

Northeast Pacific Street/15th Avenue Northeast (Exhibits 5-4 and 5-11, Location 35)

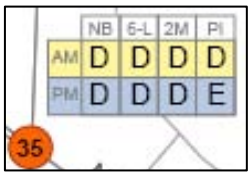

Exhibit 5-11. LOS at the NE Pacific Street/15th Avenue NE Intersection

Second Montlake Bridge Option

During the a.m. peak hour, this intersection would operate at LOS D in 2030, as under the No Build Alternative. The Second Montlake Bridge option would include small changes in traffic volumes entering the intersection and network signal optimization, but the effects of these changes would not be sufficient to improve the LOS. Capacity would be available for all movements, and queues would not back up into any adjacent study intersections.

During the p.m. peak hour, this intersection would operate at LOS D, as under the No Build Alternative. Many of the lanes would operate at or over capacity, but traffic would not queue into adjacent study intersections. In order to maintain this LOS, the northbound approach on Boat Street would need to be modified from its existing left turn pocket and shared right/through lane configuration to a shared left/through pocket and an exclusive right turn lane.

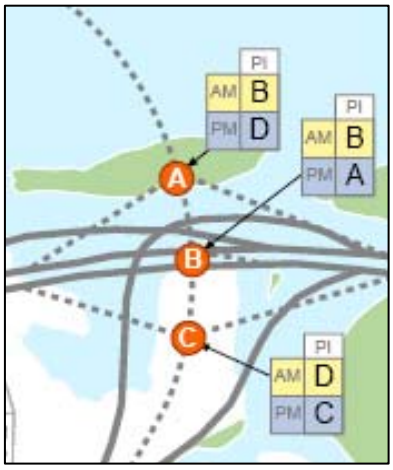

Exhibit 5-12. LOS at the Proposed Pacific Street Interchange Intersections

Pacific Street Interchange Option

During the a.m. peak hour, this intersection would operate at LOS D in 2030, as under the No Build Alternative. The Pacific Street Interchange option would include small changes in traffic volumes entering the intersection and network signal optimization, but the effects of these changes would not affect the LOS. Capacity would be available for all movements, but the southbound left and southbound through lanes would be

close to capacity (V/C = 0.94 and V/C = 0.95, respectively). Queues would not back up into any adjacent study intersections.

During the p.m. peak hour, this intersection would operate at LOS E. Many of the lanes would operate over capacity, but traffic would not queue into adjacent study area intersections. To maintain this LOS, the northbound approach on Boat Street would need to be modified from its existing left turn pocket and shared right/through lane configuration to a shared left/through pocket and an exclusive right turn lane.

Pacific Street Interchange (Exhibits 5-4 and 5-12, Locations A, B, and C)

Westbound Ramps (Location A)

The westbound ramps would operate at LOS B in the a.m. peak hour, and all approaches would have available capacity. The proposed ramp and storage lengths would accommodate the traffic exiting westbound SR 520 so that queues would not back up onto the freeway, but northbound traffic would queue through the adjacent HOV direct access ramp intersection.

In the p.m. peak hour, the intersection would operate at LOS D, primarily because of the high number of vehicles exiting SR 520 and turning right. These right-turning vehicles would compete for green time with the north and southbound movements. The westbound right turn lanes and northbound through would operate near capacity, with V/C ratios of 0.98 and 0.99, respectively. Because the interchange intersections are so closely spaced, northbound traffic would queue back through the HOV direct access ramp intersection.

HOV Direct Access Ramps (Location B)

The intersection at the HOV direct access ramps would operate at LOS B in the a.m. peak hour and LOS A in the p.m. peak hour. All approaches would have available capacity, and traffic would not queue onto the mainline.

Eastbound Ramps (Location C)

In the a.m. peak period, this intersection would operate at LOS D. All approaches would have additional capacity in 2030, but the northbound approach would operate near capacity (V/C = 0.98). Traffic queuing on the eastbound off-ramp would not spill back to the freeway, but southbound traffic would queue through the adjacent HOV direct access ramp intersection.

In the p.m. peak period, this intersection would operate at LOS C, and all approaches would have available capacity. Because the interchange intersections are so closely spaced, southbound traffic would queue back through the HOV direct access ramp intersection.

How would the South Kirkland Park-and-Ride Transit Access – 108th Avenue Northeast option affect local traffic operations?

Traffic operations under the South Kirkland P&R Transit Access option were evaluated at the following intersections:

- Bellevue Way/Northup Way
- 108th Avenue Northeast/Northup Way
- 108th Avenue Northeast/Westbound SR 520 ramp

These three study intersections are frequently congested during the a.m. and p.m. peak hours and buses are regularly delayed. HOV direct access ramps at 108th Avenue Northeast would allow buses to bypass congestion at the Bellevue Way/Northup Way intersection as well as along Northup Way, resulting in travel time savings.

Intersection improvements with the Direction Access Ramps design option to the South Kirkland P&R Transit Access option are listed below:

- On 108th Avenue Northeast:
    - Converting the shared northbound through-left-turn to an exclusive left-turn lane
    - Adding a through lane on 108th Avenue Northeast between the eastbound on-ramp and just north of the park and ride
    - Converting the exclusive northbound right turn lane to a shared through-right-turn lane
- On Northup Way:
    - Adding a second westbound left-turn lane (Northup Way onto 108th Avenue Northeast)

This option also evaluated converting the shared left-right turn lane from the westbound SR 520 off-ramp to 108th Avenue Northeast to an exclusive right-turn lane.

How would the South Kirkland Park-and-Ride Direct Access Ramps Option affect intersection operations?

Exhibits 5-13 and 5-14 show the a.m. and p.m. peak hour LOS results for the two design options evaluated for the South Kirkland P&R Transit Access option.

Exhibit 5-13. Year 2030 Intersection Level of Service Summary for the A.M. Peak Hour

Intersection	A.M. Peak Hour LOS Results by Alternative/Option			
	No Build Alternative	Original 6-Lane Alternative	Direct Access Ramps Option	Modified Loop Ramps Option
108th Ave NE/SR 520 Westbound Ramps	B	B	C	C
108th Avenue NE/Northup Way	D	D	D	D
Bellevue Way NE/Northup Way	C	C	C	D

Note: Average intersection delay based on first approach link delay output from CORSIM. Average intersection delay values were then used to determine LOS as defined by the Highway Capacity Manual (2000).

As shown in Exhibit 5-13, traffic operations would not be adversely affected by either of the South Kirkland P&R Transit Access design options. All of the intersections would continue to operate at LOS D or above.

Exhibit 5-14. Year 2030 Intersection Level of Service Summary for the P.M. Peak Hour

Intersection	P.M. Peak Hour LOS Results by Alternative/Option			
	No Build Alternative	Original 6-Lane Alternative	Direct Access Ramps Option	Modified Loop Ramps Option
108th Ave NE/SR 520 Westbound Ramps	E	E	D	E
108th Avenue NE/Northup Way	F	F	F	F
Bellevue Way NE/Northup Way	F	E	E	D

Note: Average intersection delay based on first approach link delay output from CORSIM. Average intersection delay values were then used to determine LOS as defined by the Highway Capacity Manual (2000).

As shown in Exhibit 5-14, the Direct Access Ramps option would improve traffic operations from LOS E to D at the 108th Avenue Northeast/SR 520 westbound ramps intersection. Traffic operations

would improve because the increased distance between the westbound SR 520 ramps and Northup Way and the improvements at the 108th Avenue Northeast/Northup Way intersection.

The Modified Loop Ramps option would improve traffic operations from LOS E to D at the Bellevue Way Northeast/Northup Way intersection because of the increases in capacity on Bellevue Way northbound and Northup Way eastbound.

Chapter 6: Nonmotorized Facilities

How would the 6-Lane Alternative options affect nonmotorized facilities?

Second Montlake Bridge Option

The Second Montlake Bridge option would not affect nonmotorized facilities. The new bridge would include sidewalks similar to what is provided on the existing Montlake Bridge.

Pacific Street Interchange Option

The Pacific Street Interchange option nonmotorized facility would follow the same alignment across the Evergreen Point Bridge as proposed with the original 6-Lane Alternative. The nonmotorized facility would parallel the westbound off-ramp at the new Pacific Street Interchange, then continue northwest along the new Union Bay Bridge to connect with the Burke Gilman Trail.

As previously described, the pedestrian/bicycle facilities at the Northeast Pacific Street/Montlake Boulevard Northeast intersection would be grade-separated above Montlake Boulevard Northeast and Northeast Pacific Street. This design improves safety and connectivity for pedestrians and bicyclists.

South Kirkland Park-and-Ride Transit Access–108th Avenue Northeast Option

Nonmotorized facilities would not be affected with this option.

Chapter 7: Transit Services

How would the 6-Lane Alternative options affect transit services?

Second Montlake Bridge Option

The Second Montlake Bridge option would likely improve bus travel time and reliability between SR 520 and Northeast Pacific Street. The additional capacity across the Montlake Cut would help reduce congestion because the roadway would no longer narrow to four lanes.

With the Second Montlake Bridge option, the transportation discipline team assumed that the existing Montlake Freeway Station would be closed. This would improve travel times for buses traveling to and from downtown Seattle and the Eastside because they would no longer have to stop. Bus patrons that currently use this stop to travel between the University District and the Eastside would have fewer bus routes to choose from because they could no longer use the downtown Seattle-Eastside routes to cross the bridge. Planning level analysis indicates that approximately six additional buses would be needed in each direction between the University District and the Eastside to accommodate the closure of the Montlake Station. The SR 520 project team will continue to coordinate with local and regional transit agencies regarding future transit service needs.

Pacific Street Interchange Option

With the Pacific Street Interchange option, existing bus services would be affected in the following ways:

- Bus routes that serve the University of Washington/Montlake area via SR 520 would use the new Pacific Street interchange. As previously mentioned, the new interchange would have HOV direct access ramps to and from the east (a westbound off-ramp and an eastbound on-ramp). Bus travel times would likely be better than under the No Build Alternative because of the HOV direct access ramps and buses would not be delayed by draw bridge openings. This would improve the reliability between bus and light rail connections at the University of Washington Station at Husky

Stadium that is planned as a part of the North Link light rail system.

- Improvements associated with the Pacific Street Interchange option would increase capacity at many locations in the University of Washington/Montlake vicinity. These capacity improvements would improve bus travel times and reliability in this area. As a result of these improvements, some of the bus layover spaces proposed by King County Metro could be relocated. The SR 520 project team will continue to coordinate with King County Metro regarding their needs for maintaining transit service in this area.
- The Montlake Freeway Station would also be closed with the Pacific Street Interchange option, which would require the same measures described for the Second Montlake Bridge option .

South Kirkland Park-and-Ride Transit Access–108th Avenue Northeast Option

As described in Chapter 5 in the *How would the South Kirkland Park-and-Ride Transit Access – 108th Avenue Northeast option affect local traffic operations?* section, this option has two design options: the Direct Access Ramps option and the Modified Loop Ramps option. In the analysis performed for the Final *108th Direct Access Study* (SR 520 Project Team 2005c), bus travel times were estimated for each option for buses that serve the South Kirkland Park-and-Ride. The transit travel times represent the amount of time it takes a bus to travel between I-405 and 92nd Avenue Northeast and serve the Park-and-Ride. The travel time includes both the amount of time spent on SR 520 and the amount of time spent on local arterial streets.

Under the Direct Access Ramps option, travel time for eastbound buses would improve by 28 minutes over the No Build Alternative and by 16 minutes over the original 6-Lane Alternative. Bus travel times would improve because they could exit directly to 108th Avenue Northeast and bypass congestion on Bellevue and Northup Ways.

Under the Modified Loop Ramps option, eastbound buses would receive almost the same travel time benefits as they would with the Direct Access Ramps option (27 minutes over the No Build Alternative and 15 minutes over the original 6-Lane Alternative). The addition of a second eastbound lane on Northup Way, an HOV lane on the Bellevue Way eastbound off-ramp, and on Bellevue Way northbound would also allow buses to bypass congestion.

Chapter 8: Parking

How would the 6-Lane Alternative options affect parking?

Second Montlake Bridge Option

The Second Montlake Bridge option would not affect parking outside of those parking losses identified under the original 6-Lane option (approximately 210 spaces in the Montlake Boulevard area).

Construction staging areas would not affect parking.

Pacific Street Interchange Option

In addition to the parking losses identified under the original 6-Lane Alternative, the Pacific Street Interchange option would displace up to approximately 180 parking spaces in the University of Washington's E-12 parking lot as result of the new Northeast Pacific Street/Montlake Boulevard Northeast intersection. Because Montlake Boulevard would be widened, an additional 70 parking spaces would also be displaced along the east side of Montlake Boulevard between the Hec Edmonson Pavilion and Northeast 45th Street.

Approximately 400 parking spaces would be temporarily displaced in University of Washington's E-11/E-12 parking lot for 6 to 12 months during construction of the new Union Bay Bridge and Northeast Pacific Street/Montlake Boulevard Northeast intersection.

While mitigation strategies have not yet been fully developed, it is possible that a new parking structure could be built in the University of Washington's E-11/E-12 parking lot because the E-12 parking lot is typically at capacity. During construction, parking could be relocated to the E-1 lot with a shuttle service provided to transport users back to the UW Medical Center area. It may also be possible to stage the bridge construction to reduce the temporary parking space losses or to shorten the duration of the parking losses.

South Kirkland Park-and-Ride Transit Access Option –108th Avenue Northeast Option

In addition to the parking losses identified under the original 6-Lane Alternative, the South Kirkland P&R Transit Access option would displace a parking lot located just east of the SR 520 loop ramp from northbound Bellevue Way Northeast to westbound SR 520. This lot has approximately 50 parking spaces and is primarily intended for patrons using the adjacent bus stop.

Chapter 9: Construction

How would construction of the 6-Lane Alternative options affect traffic operations?

Second Montlake Bridge Option

The second Montlake Bridge would be constructed alongside the existing Montlake Bridge and would generally not affect traffic operations because traffic would continue to use the existing bridge. There would be some increase in a.m. and p.m. peak hour traffic due to construction-related trips (such as trucks and employee vehicles) traveling to and from the site. The quantity of trucks and employee-related traffic has yet to be determined for this option.

During the new bridge construction, each half of the navigational channel would be blocked for approximately 2 weeks, for a total of 4 weeks of half-channel closures. Intermittent complete blockages would be required to erect girders. When necessary, the crane barge could be moved to clear the navigation channel (with a couple of hours advance notice). The specific requirements to maintain channel navigation would be obtained during the Coast Guard permitting process. Please see the Final Construction Staging and Techniques Memorandum for the 6-Lane Options (SR 520 Project Team, 2005c) for more information regarding construction.

The ship canal restrictions and closures would be publicized in the Local Notice to Mariners distributed electronically by the Coast Guard to alert local commercial and recreational boating communities. Please see the *Addendum to Navigable Waterways Discipline Report* (Parametrix 2006) for more information regarding the effects of the 6-Lane Alternative options on boat traffic.

'The Second Montlake Bridge could be constructed independently from SR 520 construction.

Pacific Street Interchange Option

As discussed in the Draft Construction Staging and Techniques Technical Memorandum for the 6-Lane Options (SR 520 Project Team

2005c) the Pacific Street Interchange option would be constructed in three stages, and traffic operations would only be affected during the last two stages. The overall construction period is estimated to be up to two years, with the second phase taking the longest to construct. There would be some increase in a.m. and p.m. peak hour traffic due to construction-related trips (such as trucks and employee vehicles) traveling to and from the site.

Prior to and throughout the entire construction period, the SR 520 project team would coordinate with the University of Washington, King County Metro, and Sound Transit to maximize the effectiveness of construction traffic management and minimize the effects on weekly traffic, University of Washington event traffic, the UW Medical Center, and local and regional bus service. Sound Transit plans to have an underground station for its North Link line in the vicinity. The construction staging scenario being explored by the SR 520 project team would work whether the station in constructed before, after, or in conjunction with the intersection work. Coordination with Sound Transit is currently underway and continued coordination will be necessary to minimize project conflicts and unnecessary affects due to construction.

The second stage of construction would affect Montlake Boulevard Northeast between the Montlake Cut and Northeast Pacific Place. During this stage, the existing travel lanes would be closed and traffic would be shifted to the west. The number of lanes and the channelization of the travel lanes would remain the same as they are today. The southbound transit-only right-turn lane would be removed during construction.

A planning level analysis indicates that the Montlake Boulevard Northeast/Northeast Pacific Street intersection would operate at LOS D during peak hours. Traffic could be disrupted during off-peak times to allow construction vehicles and access to the site.

The third stage of construction would close Northeast Pacific Street between the UW Medical Center Emergency Entrance and Montlake Boulevard Northeast and detour traffic north to turn left onto Northeast Pacific Place. Assuming that typical traffic volumes would continue to use the Montlake Boulevard and Pacific Street corridors, the intersections near the Husky Stadium would operate at LOS F and people would experience long delays.

During construction, various traffic management strategies could be applied to minimize adverse affects to traffic. Some of those traffic management strategies include providing incentives for the contractor to accelerate construction, scheduling construction during lowest traffic season, restricting construction activities to allow major University of Washington events, providing alternate routes, increasing bus service, and providing incentives to increase bus usage. These strategies would be explored in more detail for this option as part of the final EIS if it is selected as a preferred alternative.

To accommodate stage three construction, the following three intersections would need to be temporarily reconfigured:

- Montlake Boulevard Northeast/Northeast Pacific Street
- Montlake Boulevard Northeast/Northeast Pacific Place
- NE Pacific Street/NE Pacific Place

The temporary lane configurations for each intersection are described in detail below.

Montlake Boulevard Northeast/Northeast Pacific Street Intersection

With the partial closure of Northeast Pacific Street, traffic that previously turned right from Northeast Pacific Street onto Montlake Boulevard Northeast would be re-routed onto Northeast Pacific Place to turn right at the Montlake Boulevard Northeast/Northeast Pacific Place intersection. Traffic that previously turned left from Montlake Boulevard Northeast onto Northeast Pacific Street would be re-routed to the Montlake Boulevard Northeast/Northeast Pacific Place intersection. Traffic destined for the University of Washington E-12 parking lot would also be re-routed through the Montlake Boulevard Northeast/Northeast Pacific Place intersection. The Montlake Boulevard Northeast/Northeast Pacific Street intersection would only accommodate northbound and southbound through movements. It is likely that a temporary pedestrian overpass would be constructed over the south leg of the Montlake Boulevard Northeast/Northeast Pacific Street intersection. With these modifications, traffic would operate at LOS A during construction because there would be no conflicting movements.

Montlake Boulevard Northeast/Northeast Pacific Place

As mentioned above, northbound traffic that previously turned left from Montlake Boulevard Northeast onto Northeast Pacific Street would be temporarily re-routed to Northeast Pacific Place. A southbound left from Montlake Boulevard Northeast into the UW E-12 parking lot might also be needed temporarily. The Northeast Pacific Place leg would be reconfigured to provide two right-turn lanes onto Montlake Boulevard Northeast to accommodate the traffic re-routed from Northeast Pacific Street. With these modifications, this intersection would temporarily operate at LOS F, with over 3 minutes of delay and long queues on all approaches that would interfere with adjacent intersection operations. However, this stage of construction is expected to require three to four months and would likely be completed during the summer, which would reduce the effect on traffic.

When the Montlake Boulevard/Northeast Pacific Street intersection is constructed, the Montlake Boulevard Northeast/Northeast Pacific Place intersection would no longer include the northbound left-turn pockets but the southbound left turn pocket may be retained. The transit only right turn lane would be restored from Northeast Pacific Place onto Montlake Boulevard Northeast. The second eastbound through lane on Northeast Pacific Place would be retained, while the second westbound through lane may be converted to another use (possibilities could include bus layover spaces or a median).

Northeast Pacific Street/Northeast Pacific Place

To accommodate stage two construction, Northeast Pacific Place would be widened to four lanes (two lanes in each direction) during stage one. This widening would be necessary to accommodate the two northbound left-turn lanes from Montlake Boulevard Northeast and the two right turn lanes to Montlake Boulevard. With the widening of Northeast Pacific Place, a second eastbound left-turn pocket would be added on Northeast Pacific Street. A westbound left-turn pocket from Northeast Pacific Place to the UW Medical Center/Northeast Pacific Street would also be added to accommodate emergency vehicles and other hospital visitors. With these modifications, this intersection would operate at LOS B. During peak times, queues from the Montlake Boulevard Northeast/Northeast Pacific Place intersection could affect traffic turning left from Northeast Pacific Street onto Northeast Pacific Place.

With the increase in lanes and traffic volumes on Northeast Pacific Place, a mid-block pedestrian signal could be needed on Northeast Pacific Place. Planning level analysis results indicate that adding this signal would not adversely affect traffic operations at the adjacent intersections.

When the Montlake Boulevard/Northeast Pacific Street intersection is constructed, the Northeast Pacific Street/Northeast Pacific Place intersection would be returned to its previous configuration, except that the second eastbound left-turn pocket would be retained. The westbound left-turn pocket from Northeast Pacific Place to the UW Medical Center/Northeast Pacific Street would be removed.

South Kirkland Park-and-Ride Transit Access – 108th Avenue Northeast Option

Overall, construction of the South Kirkland P&R Transit Access option would not affect freeway traffic operations because no access changes or lane reductions would be required. At times, traffic would be shifted onto temporary structures while existing structures are widened, but these shifts would occur during non-peak times. There would be some increase in a.m. and p.m. peak hour traffic due to construction-related trips (such as trucks and employee vehicles) traveling to and from the site.

Chapter 10: References

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