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SR 520 Bridge Replacement and HOV Project Draft EIS

Appendix R
Transportation
Discipline Report

Washington State Department of Transportation

Sound Transit

U.S. Department of Transportation
Federal Highway Administration

SR 520 Bridge Replacement and HOV Project Draft EIS

Transportation Discipline Report

Prepared for

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Federal Highway Administration
Sound Transit

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Acronyms and Abbreviations

AVO	average vehicle occupancy
BRT	bus rapid transit
CBD	central business district
CTR	Commute Trip Reduction
EBR	eastbound right
EBT	eastbound through
EIS	environmental impact statement
FTP	Flexible Transportation Plan
GP	general purpose
HAC	High Accident Corridor
HAL	High Accident Location
HCM	*Highway Capacity Manual*
HOV	high-occupancy vehicle
HSS	Non-Highway of Statewide Significance
ITS	Intelligent Transportation System
LOS	level of service
MOE	Measure of Effectiveness
MOHAI	Museum of History and Industry
MP	milepost
mph	miles per hour
NBR	northbound right
NBT	northbound through
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
PAL	Pedestrian Accident Location

PRSC	Puget Sound Regional Council
RSSH	Regionally Significant State Highway
SBR	southbound right
SBT	southbound through
SEPA	State Environmental Policy Act
SOV	single-occupancy vehicle
TDM	Transportation Demand Management
TMA	Transportation Management Associations
TSM	Transportation System Management
TSMC	Transportation System Management Center
UW	University of Washington
V/C	volume-to-capacity
VMS	variable message sign
vph	vehicles per hour
WBR	westbound right
WBT	westbound through
WSDOT	Washington State Department of Transportation

Chapter 1: Introduction and Overview

Why is transportation considered in an EIS?

Transportation affects everyone. Whether we are working, delivering products, driving children to school, or taking a vacation, all of us depend on a safe, efficient, reliable transportation system. Many people depend on multiple modes of travel, such as driving alone; carpooling; taking a bus, train, or plane; walking; or biking. Good connections between these various travel modes are critical to the efficient movement of people, goods, and services throughout an area.

Understanding the effects of a proposed public project and its alternatives on the transportation system is an important part of any environmental impact statement (EIS) and is required by law. The National Environmental Policy Act (NEPA) requires federal agencies to integrate environmental values into their decision-making processes and transportation is considered part of the "built environment." Federal, state, and local agencies must consider the environmental impacts of their proposed actions and reasonable alternatives to those actions. For example, how would each alternative affect traffic operations on the freeways and local streets? Would congestion improve or get worse? How would each alternative affect traffic volumes? How would moving a freeway ramp from the left side to the right side of a freeway affect traffic operations? How would moving high-occupancy vehicle (HOV) lanes from the outside lane to the inside lane affect traffic operations? Would the project change traffic patterns, causing people to take a different route to work and increasing traffic at one intersection while decreasing traffic at another? Does having a toll on the Evergreen Point Bridge shift traffic patterns? If so, how? It is because of these questions that transportation is included in our EIS.

What is the project history?

The current project expands on the work of previous studies that examined mobility and environmental issues in the corridors crossing Lake Washington. The Washington State Department of

Transportation's (WSDOT) Urban Corridors Office conducted the Trans-Lake Washington Study from June 1998 to August 1999 and the Trans-Lake Washington Project from March 2000 to December 2002. The Trans-Lake Washington Study focused on travel across and around Lake Washington in a study area bounded by the Snohomish-King County line on the north and the confluence of I-5 and I-405 to the south. The study developed and evaluated a variety of options to determine their overall effectiveness in improving cross-lake mobility.

Over a 14-month period, the Trans-Lake Washington Study Committee developed a Problem Statement and created and evaluated alternative mobility concepts across a full range of transportation solutions. The most attractive options were combined into "solution sets," which were designed to show the relative effectiveness, effects, and costs of different approaches to mobility and to illustrate how different transportation methods and modes interact with one another. Evaluation of the solution sets identified those elements that seemed to work well and that found widespread support. The Trans-Lake Washington Project made recommendations that led to this NEPA/State Environmental Policy Act (SEPA) EIS.

What are the project alternatives?

The SR 520 Bridge Replacement and HOV Project area comprises neighborhoods in Seattle from I-5 to the Lake Washington shore, Lake Washington, and Eastside communities and neighborhoods from the Lake Washington shore to 124th Avenue Northeast just east of I-405. Exhibit 1-1 shows the general location of the project. Neighborhoods and communities in the project area are:

- Seattle neighborhoods—Portage Bay/Roanoke, North Capitol Hill, Montlake, University District, Laurelhurst, and Madison Park

- Eastside communities and neighborhoods—Medina, Hunts Point, Clyde Hill, Yarrow Point, Kirkland (the Lakeview neighborhood), and Bellevue (the North Bellevue, Bridle Trails, and Bel-Red/Northup neighborhoods)

The SR 520 Bridge Replacement and HOV Project Draft EIS evaluates the following three alternatives and one option:

- No Build Alternative
- 4-Lane Alternative

- – Option with pontoons without capacity to carry future high capacity transit
- 6-Lane Alternative

Each of these alternatives is described below. For more information, see the *Description of Alternatives and Construction Techniques Report* contained in Appendix A of this EIS.

Exhibit 1-1. Project Vicinity Map

What is the No Build Alternative?

All EISs provide an alternative to assess what would happen to the environment in the future if nothing were done to solve the project's identified problem. This alternative, called the No Build Alternative, means that the existing highway would remain the same as it is today (Exhibit 1-2). The No Build Alternative provides the basis for measuring and comparing the effects of all of the project's build alternatives.

This project is unique because the existing SR 520 bridges may not remain intact through 2030, the project's design year. The fixed spans of the Portage Bay and Evergreen Point bridges are aging and are vulnerable to earthquakes; the floating portion of the Evergreen Point Bridge is vulnerable to wind and waves.

In 1999, WSDOT estimated the remaining service life of the Evergreen Point Bridge to be 20 to 25 years based on the existing structural integrity and the likelihood of severe windstorms. The floating portion of the Evergreen Point Bridge was originally designed for a sustained wind speed of 57.5 miles per hour (mph), and was rehabilitated in 1999 to withstand sustained winds of up to 77 mph. The current WSDOT design standard for bridges is to withstand a sustained wind speed of 92 mph. In order to bring the Evergreen Point Bridge up to current design standards to withstand at least 92 mph winds, the floating portion must be completely replaced.

The fixed structures of the Portage Bay and Evergreen Point bridges do not meet current seismic design standards because the bridge is supported on hollow-core piles. These hollow-core piles were not designed to withstand a large earthquake. They are difficult and cost prohibitive to retrofit to current seismic standards.

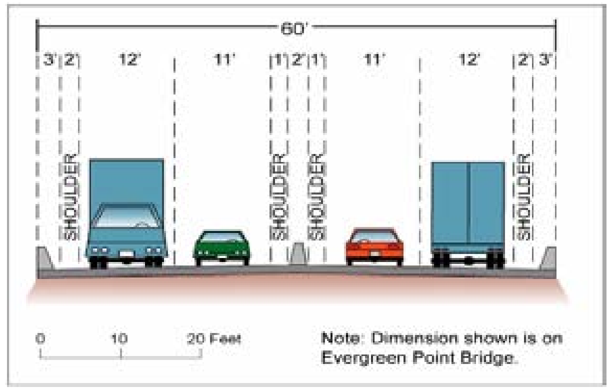


Exhibit 1-2. No Build Alternative

If nothing is done to replace the Portage Bay and Evergreen Point bridges, there is a high probability that both structures could fail and become unusable to the public before 2030. WSDOT cannot predict when or how these structures would fail, so it is difficult to determine the actual consequences of doing nothing. To illustrate what could happen, two scenarios representing the extremes of what is possible are evaluated as part of the No Build Alternative. These are the Continued Operation and Catastrophic Failure scenarios.

Under the Continued Operation Scenario, SR 520 would continue to operate as it does today as a 4-lane highway with nonstandard shoulders and without a bicycle/pedestrian path. No new facilities would be added and no existing facilities (including the unused R.H. Thompson Expressway Ramps near the Arboretum) would be removed. WSDOT would continue to maintain SR 520 as it does today. This scenario assumes the Portage Bay and Evergreen Point bridges would remain standing and functional through 2030. No catastrophic events (such as earthquakes or high winds) would be severe enough to cause major damage to the SR 520 bridges. This scenario is the baseline the EIS team used to compare the other alternatives.

In the Catastrophic Failure Scenario, both the Portage Bay and Evergreen Point bridges would be lost due to some type of catastrophic event. Although in a catastrophic event, one bridge might fail while the other stands, this Draft EIS assumes the worst-case scenario—that both bridges would fail. This scenario assumes that both bridges would be seriously damaged and would be unavailable for use by the public for an unspecified length of time.

What is the 4-Lane Alternative?

The 4-Lane Alternative would have four lanes (two general purpose lanes in each direction), the same number of lanes as today (Exhibit 1-3). SR 520 would be rebuilt from I-5 to Bellevue Way. Both the Portage Bay and Evergreen Point bridges would be replaced. The bridges over SR 520 would also be rebuilt. Roadway shoulders would meet current standards (4-foot inside shoulder and 10-foot outside shoulder). A 14-foot-wide bicycle/pedestrian path would be built along the north side of SR 520 through Montlake, across the Evergreen Point

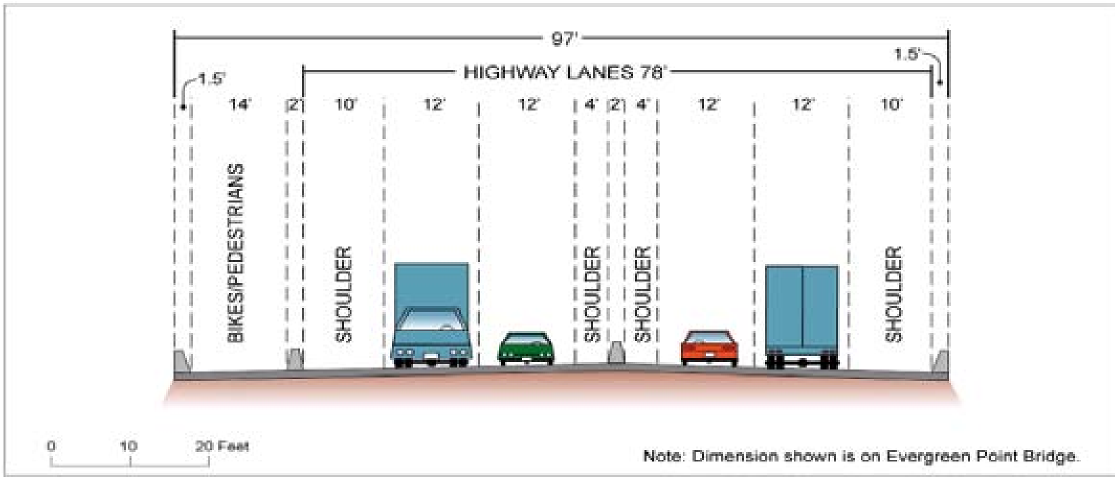


Exhibit 1-3. 4-Lane Alternative

Bridge, and along the south side of SR 520 through Medina, Hunts Point, Clyde Hill, and Yarrow Point to 96th Avenue Northeast, connecting to Northeast Points Drive. Sound walls would be built along much of SR 520 in Seattle and the Eastside. This alternative also includes stormwater treatment and electronic toll collection.

The floating bridge pontoons of the Evergreen Point Bridge would be sized to carry future high-capacity transit. An option with smaller pontoons that could not carry future high-capacity transit is also analyzed. The alternative does not include high-capacity transit.

A bridge operations facility would be built underground beneath the east roadway approach to the bridge as part of the new bridge abutment. A dock to moor two boats for maintenance of the Evergreen Point Bridge would be located under the bridge on the east shore of Lake Washington.

A flexible transportation plan would promote alternative modes of travel and increase the efficiency of the system. Programs include intelligent transportation and technology, traffic systems management, vanpools and transit, education and promotion, and land use as demand management.

What is the 6-Lane Alternative?

The 6-Lane Alternative would include six lanes (two outer general purpose lanes and one inside HOV lane in each direction; Exhibit 1-4). SR 520 would be rebuilt from I-5 to 108th Avenue Northeast in Bellevue, with an auxiliary lane added on SR 520 eastbound east of I-405 to 124th Avenue Northeast. Both the Portage Bay and Evergreen Point bridges would be replaced. Bridges over SR 520 would also be rebuilt. Roadway shoulders would meet current standards (10-foot-

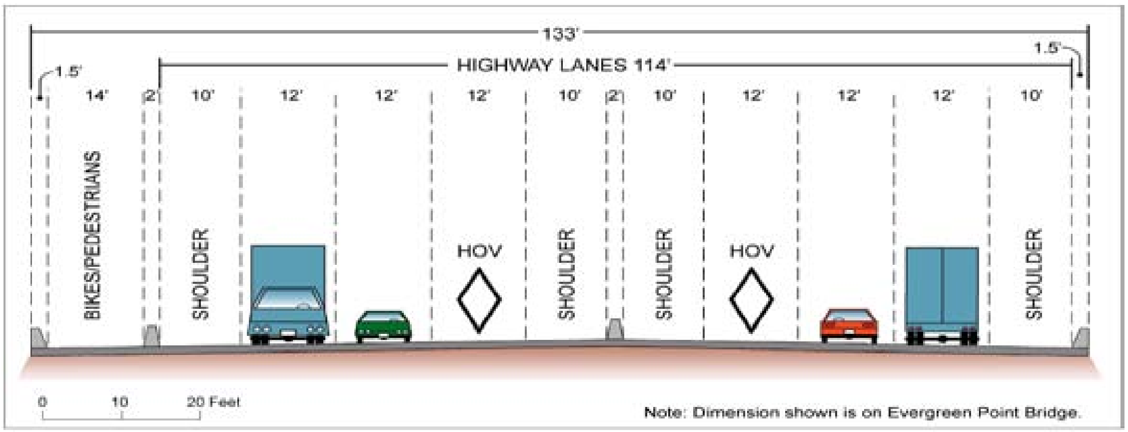


Exhibit 1-4. 6-Lane Alternative

wide inside shoulder and 10-foot-wide outside shoulder). A 14-foot-wide bicycle/pedestrian path would be built along the north side of SR 520 through Montlake, across the Evergreen Point Bridge, and along the south side of SR 520 through the Eastside to 96th Avenue Northeast, connecting to Northeast Points Drive. Sound walls would be built along much of SR 520 in Seattle and the Eastside. This alternative would also include stormwater treatment and electronic toll collection.

This alternative would also add five 500-foot-long landscaped lids to be built across SR 520 to help reconnect communities. These communities are Roanoke, North Capitol Hill, Portage Bay, Montlake, Medina, Hunts Point, Clyde Hill, and Yarrow Point. The lids are located at 10th Avenue East and Delmar Drive East, Montlake Boulevard, Evergreen Point Road, 84th Avenue Northeast, and 92nd Avenue Northeast.

The floating bridge pontoons of the Evergreen Point Bridge would be sized to carry future high-capacity transit. The alternative does not include high-capacity transit.

A bridge operations facility would be built underground beneath the east roadway approach to the bridge as part of the new bridge abutment. A dock to moor two boats and maintain the Evergreen Point Bridge would be located under the bridge on the east shore of Lake Washington.

A flexible transportation plan would promote alternative modes of travel and increase the efficiency of the system. Programs would include intelligent transportation and technology, traffic systems management, vanpools and transit, education and promotion, and land use as demand management.

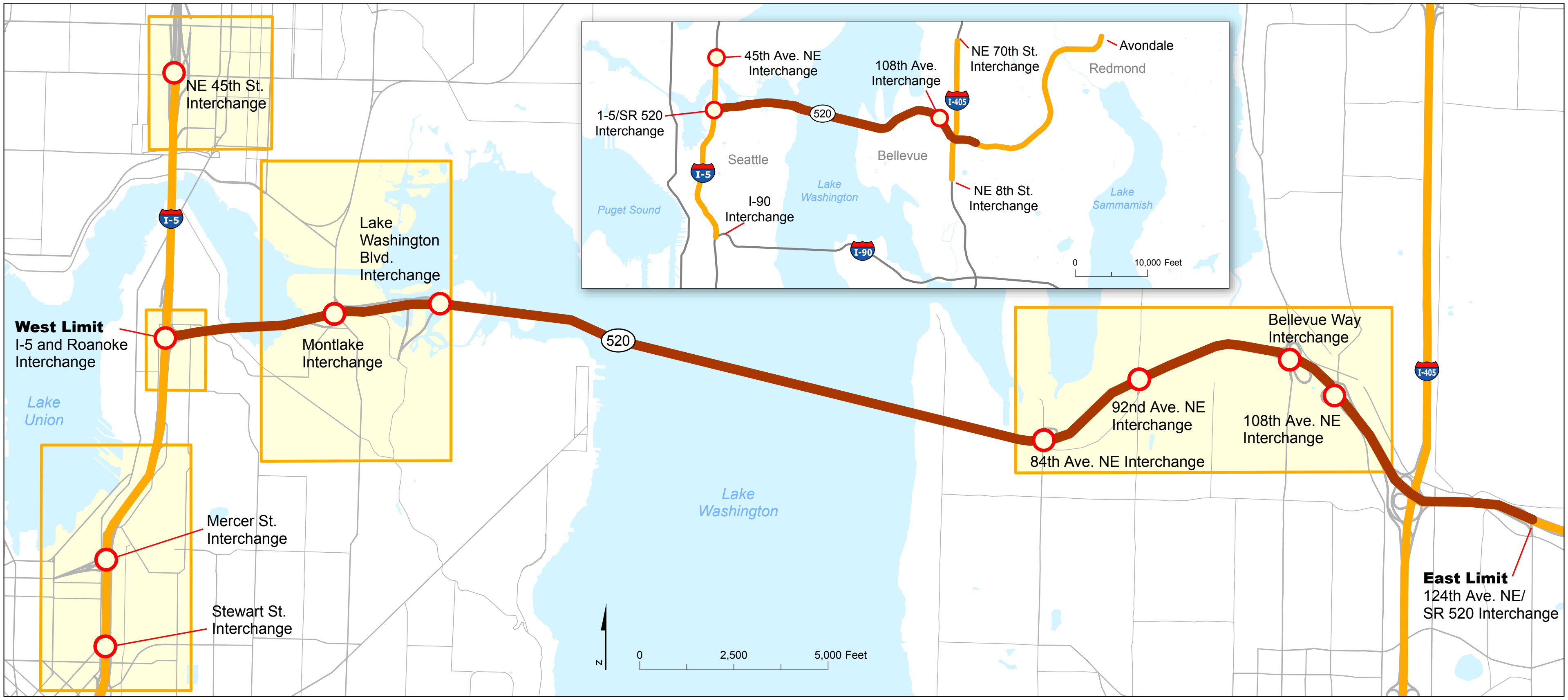
What is the transportation study area?

As shown in Exhibit 1-1, the SR 520 Bridge Replacement and HOV Project is located within the greater Seattle area. WSDOT considers SR 520 a highway of statewide significance (HSS) because it connects Seattle on the west side of Lake Washington with Medina, Hunts Point, Yarrow Point, Clyde Hill, Kirkland, Bellevue, and Redmond on the east side of the lake. SR 520 is a critical corridor for commuters traveling in both directions across Lake Washington.

Because the transportation system in the project vicinity is so complex and interconnected, changes in one location can have effects at relatively distant locations. As a result, some of the freeway and local traffic analyses extended beyond the project limits, requiring a larger study area for the transportation analysis. Exhibit 1-5 shows the extent of the transportation study area and the interchange influence areas, which formed the basis for some analysis work and also were used to organize the discussions of results for the freeway forecasting and freeway operations chapters.

Note to Reader:

In this Transportation Discipline Report, all references to No Build Alternative assume the existing facility would continue to function as it is today unless specifically stated otherwise. All No Build Alternative references are references to the Continued Operation Scenario, unless specifically stated otherwise. No Build's Continued Operation Scenario is the baseline for comparison with the 4-Lane and 6-Lane Alternatives. No Build's Continued Operation Scenario has been modeled for the year 2030. On the other hand, the discussion about the effects of Catastrophic Failure is qualitative only.



Interchange Influence Areas
Project Limits
Transportation Study Area
Analyzed Interchange Area

Note: The project limits provide the boundaries for areas where the project has identified geometric modifications. The transportation study area identifies the limits of the freeway analysis that was used to determine the effect of changing the HOV lane from the inside to the outside as part of the 6-Lane Alternative. No geometric modifications are proposed outside of the project limits.

Exhibit 1-5. **Study Area**

SR520 Bridge Replacement and HOV Project

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What is this report about?

This Transportation Discipline Report, Appendix R to the SR 520 Bridge Replacement and HOV Project Draft EIS, describes transportation conditions on the SR 520 corridor between I-5 to the west and Bellevue Way to the east. The report presents transportation information for SR 520 as it exists today and estimates transportation performance for the three future project alternatives (described above) under evaluation in the Draft EIS for this project.

Subsequent to this chapter, the Transportation Discipline Report consists of the following chapters:

- *Chapter 2: Key Findings.* Summarizes the most important information and findings of the transportation analysis.
- *Chapter 3: Freeway and Local Traffic Forecasts.* Provides the methodology and results of the detailed project-level forecasts developed for conducting detailed traffic operational analysis.
- *Chapter 4: Freeway Traffic Operations.* Describes the existing freeway operating conditions for the project corridor. Compares the future No Build Alternative with the 4-Lane and 6-Lane Alternatives.
- *Chapter 5: Local Traffic Operations.* Describes the existing operating conditions at local intersections. Compares the future No Build Alternative with the 4-Lane and 6-Lane Alternatives.
- *Chapter 6: Nonmotorized Facilities.* Describes existing bicycle, pedestrian and other nonmotorized transportation facilities as well as improvements proposed as part of the SR 520 Bridge Replacement and HOV Project.
- *Chapter 7: Transit Operations.* Describes and quantifies how the project alternatives affect SR 520 corridor bus service and person-moving capacity.
- *Chapter 8: Parking Supply.* Evaluates the existing parking supply, estimated demand, and estimated use and determines the effects of each alternative's proposed design on parking supply.
- *Chapter 9: Construction Traffic.* Describes the effect of construction on traffic and parking for each of the project alternatives and identifies temporary measures to mitigate the effect of construction on traffic.

- *Chapter 10: Cumulative Transportation Effects.* Identifies the cumulative effects of the project alternatives in combination with a regional package of additional transportation facility improvements (such as the Mercer Corridor Improvements, I-405 Nickel Projects, LINK Light Rail, Alaskan Way Viaduct and Seawall Replacement Project, Seattle Monorail, and improvements to the east end of SR 520).
- *Chapter 11: Traffic and Parking Mitigation.* Presents the approach and guidelines for determining the extent and timing of mitigation for freeway and local street operations and parking supply.
- *Chapter 12: References.* Lists all of the documentation cited in this report.
- *Attachment 1: Travel Forecasting Analysis Result.* Discusses the corridor-level travel demand forecasts developed for the SR 520 Bridge Replacement and HOV Project alternatives.

Chapter 2: Key Findings

Key Findings by Alternative

No Build Alternative

Under the No Build Alternative, more vehicles are forecast to be on SR 520, I-5, and I-405 in the year 2030 than today. The increase in vehicles would increase congestion on northbound and southbound I-5. Congestion on I-5 in 2030 would affect operations on SR 520 and result in nearly double the average travel time between I-5 and 124th Avenue Northeast compared to today. Congestion on I-5 would affect SR 520 in two ways: (1) I-5 traffic destined to eastbound SR 520 would not be served (during both the a.m. and p.m. peak periods) because of I-5 congestion, and (2) congestion from southbound I-5 would extend onto SR 520 as far back as I-405 during the a.m. peak period.

Because the SR 520 corridor will have an increase in congestion and more vehicular demand, more people in 2030 will likely prefer to commute using bus service. However, without a complete HOV lane, people using bus service would experience a trip time nearly double that of today.

4-Lane Alternative

The 4-Lane Alternative is forecast to have fewer vehicles on SR 520 in 2030 than the No Build Alternative. There would be a higher person demand for the SR 520 corridor; however, they would primarily travel in buses and carpools.

Even with the reduction in traffic volume crossing SR 520, I-5 is still forecast to operate over capacity and cause severe congestion on SR 520 in the westbound direction during the a.m. peak period. This severe congestion would affect travel time for all traffic. Carpools and buses would have a slightly shorter travel time than vehicles in the general purpose (GP) lanes due to the existing HOV lane between 124th Avenue Northeast and 76th Avenue Northeast.

One of the highly congested arterials in the project area is Montlake Boulevard, where congestion is caused by the Montlake Bridge drawbridge and the eastbound on-ramp. The proposed eastbound on-ramp design would add one lane at the ramp meter, providing additional storage and serving more trips. This design would eliminate the ramp meter backup onto the arterial.

The primary issue with the 4-Lane Alternative is that even if more buses were provided to serve the high transit demand, buses would not be served any faster than today because there would be no HOV lane in most of the corridor.

6-Lane Alternative

The 6-Lane Alternative would have the capacity to move more people in less time than both the No Build and 4-Lane Alternatives. With the completed HOV lanes across SR 520, more people would be served per hour. The average vehicle occupancy (AVO) for vehicles served across Lake Washington is 2.26, which is an increase compared to both the No Build Alternative AVO of 1.90 and the 4-Lane Alternative AVO of 2.18. Compared with the No Build Alternative, GP travel times would decrease from 27 to 21 minutes between I-5 and 124th Avenue Northeast and HOV lane travel times would decrease from 23 to 10 minutes. This travel time is the bi-directional average of the peak 10 hours of the day (average of a.m. and p.m. peak periods). Carpools and bus traffic would benefit greatly from this alternative with this substantially faster travel time.

This alternative would also eliminate backups from the eastbound on-ramp that extend back onto the arterial in the No-Build Alternative. This would be accomplished by providing two lanes for storage at the ramp meter and a higher service rate at the ramp meter.

This alternative would also remove the conflict points between the HOV lane and the on-ramps by moving the HOV lane to the inside lane. GP vehicles entering and exiting the freeway would no longer have to cross through the HOV lane in order to get to the GP lanes. With the 6-Lane Alternative, transit agencies could provide more frequent and more reliable bus service because buses would be able to bypass the congestion in the GP lanes.

What are the key findings from freeway travel demand forecasts?

This section summarizes freeway travel demand forecasts in the transportation study area for existing conditions and the No Build, 4-Lane, and 6-Lane Alternatives for the year 2030. The key findings are shown in terms of "peak-period bidirectional average values."

When comparing and presenting analysis results, existing conditions are compared only with the No Build Alternative to provide a point of reference for current conditions compared to the future. Both the 4-Lane and 6-Lane Alternatives are compared with the No Build Alternative to show improvements associated with each of the build alternatives.

The **peak-period bidirectional average value** is the sum of the average a.m. and p.m. peak-period 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) for existing conditions and the 2030 alternatives.

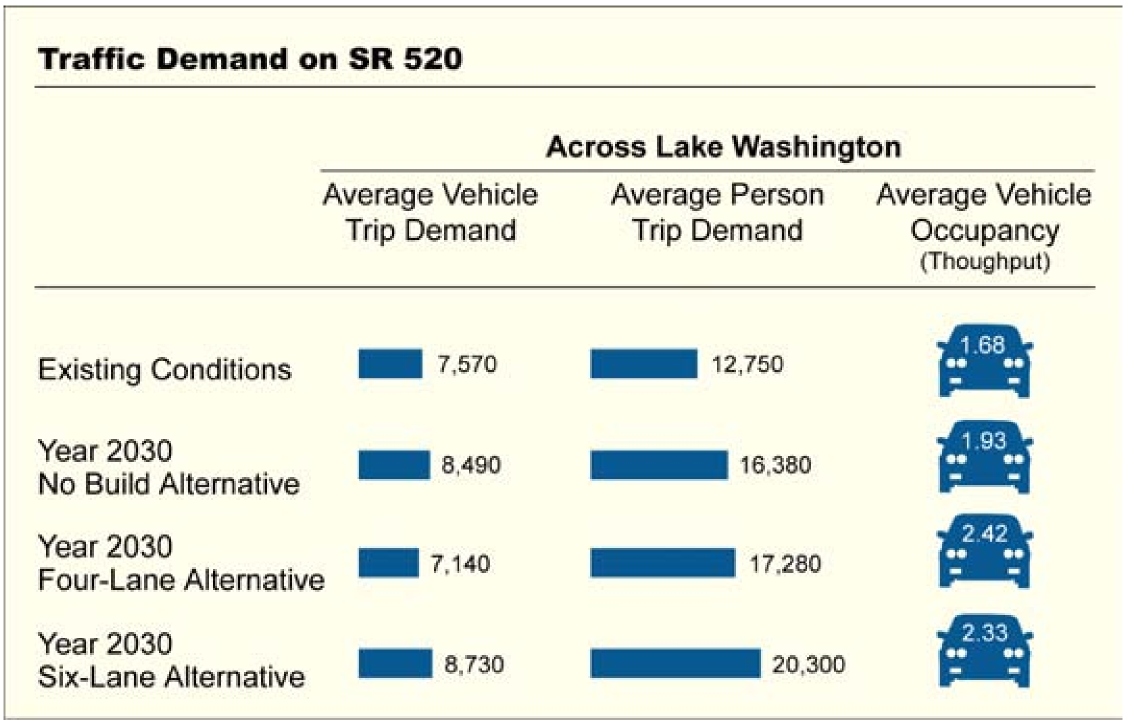


Exhibit 2-1. **Traffic Demand on SR 520 for Existing Conditions and all Project Alternatives**

Listed below are key findings of the freeway travel demand forecasts.

- SR 520 person-trip demand would grow at a faster rate than vehicle-trips. This is indicative of an increase in mode shift from the GP to bus/HOV.
- Completion of the HOV lane system on SR 520 under the 6-Lane Alternative would result in the highest person-trip demand with a small increase in vehicle-trip demand.

- Person-trip demand for the No Build Alternative would increase by 28 percent, and vehicle-trip demand by 12 percent, as compared to existing conditions.
- Vehicle-trip demand for the 4-Lane Alternative would decrease 16 percent, but the person-trip demand would increase 5 percent as compared to the No Build Alternative. Vehicle-trip demand would decrease because people would shift to buses and carpools on SR 520, travel during off-peak periods (such as mid-day or late evening), or divert to alternate routes because of congestion and tolling on SR 520. Person-trip demand would increase as a result of the design improvements, which would improve travel reliability.
- Vehicle-trip demand for the 6-Lane Alternative would increase by 3 percent, while person-trip demand would increase by 24 percent as compared to the No Build Alternative. Completion of the HOV lanes would encourage a shift from GP to buses and carpools, and the toll would further encourage the mode shift.
- For all year 2030 alternatives, bus use would increase compared to existing conditions. Today, approximately 11 percent of people crossing the Evergreen Point Bridge ride buses. By 2030, this number is predicted to rise to 25 percent. Current forecasts suggest that the number of buses available in 2030 would not be able to support this demand. Assuming 65 passengers per bus, almost twice the number of buses currently forecast would be required to serve the predicted demand across Lake Washington on the SR 520 corridor.
- The shift to buses and carpools for the 2030 alternatives would result in more persons per vehicle. Exhibit 2-2 shows the mode split for the alternatives across Lake Washington, and Exhibit 2-1 shows the resulting AVO. The AVO would increase to 2.42 for the 4-Lane Alternative and to 2.33 for the 6-Lane Alternative compared to the No Build Alternative (with an AVO of 1.93). While the 4-Lane Alternative AVO would be slightly higher than the 6-Lane Alternative AVO, fewer people would be served on the corridor. See the operations summary later in this chapter for additional information about how the AVO is affected by the corridor operations.
- Corridor traffic includes 3 percent heavy vehicles under existing conditions (a.m. and p.m. peak periods, both eastbound and

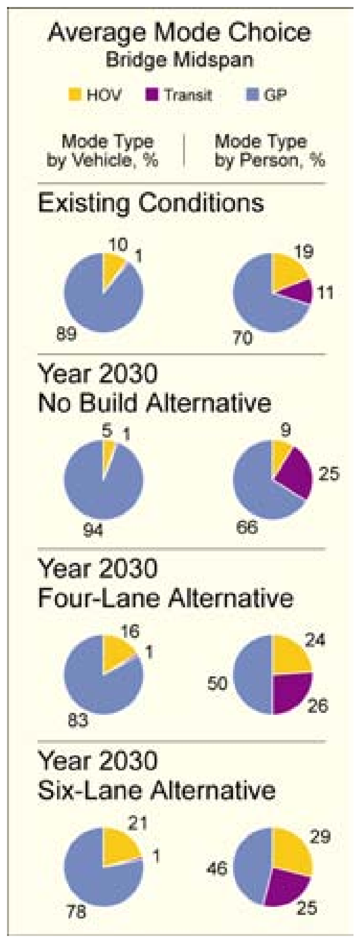


Exhibit 2-2. **Demand Mode Choice across Lake Washington**

westbound); 75 to 80 percent of the trucks are single-unit vehicles. The number of heavy vehicles is assumed to grow in the same proportion as other vehicle types, resulting in the same percentage of heavy vehicles under future scenarios (including the No Build Alternative). This methodology provides a conservatively high estimate for heavy vehicle volumes because as congestion increases, heavy vehicle operators tend to avoid hauling during peak periods.

What are the key findings for local traffic demand forecasts?

The following bullets summarize local travel demand forecasts for 2030 for the No Build Alternative and for the 4-Lane and 6-Lane Alternatives (compared to the No Build Alternative) for the a.m. and p.m. peak periods. Local traffic demand near the I-405 interchanges would not be substantially affected by the project alternatives because traffic volumes on the I-405 mainline would remain essentially the same as under the No Build Alternative.

A.M. Peak Hour

Exhibit 2-3 summarizes the growth forecasts for 2030 during the a.m. peak hour.

No Build Alternative

- Changes in traffic volumes for the I-5 interchange area would vary from a 4 percent decrease to an 11 percent increase over existing traffic volumes. The reduction in traffic volume would be the result of traffic patterns shifting and people choosing buses and carpools over single occupant travel. The traffic pattern shift shows more vehicle trips traveling through the Seattle central business district (CBD) area on I-5 rather than to the Seattle CBD.

- Arterials adjacent to the Montlake Boulevard and Lake Washington Boulevard interchanges would experience a 3 percent increase in traffic volume over existing conditions.

Exhibit 2-3. **A.M. Peak Hour Local Traffic Volume Growth**

Interchange	Compared to Today	Compared to the No Build Alternative	
	Year 2030 No Build Alternative	Year 2030 4-Lane Alternative	Year 2030 6-Lane Alternative
I-5 Interchange Areas			
Stewart Street	-4%	0%	3%
Mercer Street	-4%	0%	3%
Roanoke Street	11%	1%	1%
Northeast 45th Street	1%	-1%	1%
SR 520 Interchange Areas			
Montlake Boulevard and Lake Washington Boulevard	3%	-4%	2%
84th and 92nd Avenues Northeast	16%	-4%	-2%
104th and 108th Avenues Northeast	16%	-4%	-2%

- The arterials on the Eastside (84th Avenue Northeast through 108th Avenue Northeast interchanges would experience a 16 percent increase over existing traffic volumes.

4-Lane Alternative

- Traffic demand changes for I-5 interchanges would be 1 percent or less compared to the No Build Alternative. Little to no growth is anticipated because no new capacity is provided on SR 520.
- The traffic demand through the Montlake and Lake Washington Boulevard interchanges would generally decrease 4 percent compared to the No Build Alternative. The traffic volume reduction is due to the mode shift from SOV to bus/carpool. More people would be traveling in fewer cars.
- The arterial traffic demand through the Eastside interchange areas between Lake Washington and I-405 (including 84th Avenue Northeast, 92nd Avenue Northeast, 104th Avenue Northeast, and 108th Avenue Northeast) would increase 4 percent compared to the No Build Alternative.

6-Lane Alternative

- Traffic demand would increase by between 1 and 3 percent (compared to the No Build Alternative) for interchanges on I-5 because of the increased vehicular demand on SR 520 under the 6-Lane Alternative. This slight increase in traffic volume is associated with the construction of an HOV lane that would allow more vehicles, with more people, to bypass congestion.
- Traffic on the Seattle arterials (at the Montlake Boulevard and Lake Washington Boulevard interchanges) would increase by 2 percent compared to the No Build Alternative.
- Because traffic volumes at the Eastside interchanges would decrease, traffic on SR 520 between Lake Washington and I-405 would decrease by 2 percent.

P.M. Peak Hour

Exhibit 2-4 summarizes the growth forecasts for 2030 during the p.m. peak hour.

Exhibit 2-4. **P.M. Peak Hour Local Traffic Volume Growth**

	Compared to Today	Compared to the No Build Alternative	
Interchange	**No Build Alternative**	**4-Lane Alternative**	**6-Lane Alternative**
I-5 Interchange Areas			
Stewart Street	6%	0%	3%
Mercer Street	6%	0%	3%
Roanoke Street	7%	1%	5%
Northeast 45th Street	8%	-1%	2%
SR 520 Interchange Areas			
Montlake Boulevard and Lake Washington Boulevard	6%	-3%	0%
84th and 92nd Avenues Northeast	26%	-3%	1%
104th and 108th Avenues Northeast	26%	-3%	1%

No Build Alternative

- In 2030, traffic volumes would increase by between 6 and 8 percent compared to today for interchanges on I-5 and for the East Roanoke Street interchange on SR 520 in Seattle.
- Arterial traffic volumes would generally increase by 6 percent compared to today at the Montlake and Lake Washington Boulevard interchanges.
- Traffic volumes on the arterials at interchanges on the Eastside (between Lake Washington and I-405) would increase by 26 percent, which is consistent with the traffic growth pattern forecast for SR 520.

4-Lane Alternative

- In 2030, traffic demand would change by less than 1 percent compared to the No Build Alternative for interchanges on I-5.
- Arterial traffic volumes would generally decrease by 3 percent compared to the No Build Alternative at the interchange areas between I-5 and I-405. The decrease in arterial traffic would be similar to the traffic pattern forecast for SR 520, which would remain the same or decrease in volume compared to the No Build Alternative.

6-Lane Alternative

- In 2030, traffic demand would increase by between 2 and 5 percent for interchanges on I-5 (compared to the No Build Alternative).
- Traffic growth on the local arterials would not be substantially affected because the traffic increase on SR 520 comes from the regional freeways and not from the local arterials.

What are the key findings about freeway traffic operations?

Exhibit 2-5 compares the person-trip throughput and vehicle-trip throughput for existing conditions and the year 2030 alternatives and shows the average travel time for SR 520 between I-5 and 124th Avenue Northeast. Key findings about freeway traffic operations are listed below.

The key findings about freeway operations are presented in terms of **peak-period bidirectional average values**. The peak-period bidirectional average is the average of all travel times in the a.m. and p.m. peak periods for both the eastbound and westbound directions. This average was calculated to provide for a single point of comparison across the alternatives.

- Today and for all year 2030 alternatives, the congestion on I-5 and I-405 limits how much traffic can ultimately reach SR 520. The congestion on I-5 and I-405 queues into the study area and ultimately limits the traffic served.

- Eastbound SR 520 congestion from SR 202/Avondale Way would extend back to I-405 for all alternatives.

- Today, an average of 12,470 people in 7,390 vehicles cross Lake Washington on SR 520 each hour. The average travel time between I-5 and 124th Avenue Northeast is 13 minutes in the GP lanes and 11 minutes in the HOV lane.

- In 2030, the No Build Alternative would serve 5 percent more people than today, in 7 percent fewer vehicles. The decrease in vehicles served would be due to increased congestion on SR 520, I-5, and I-405. The average travel time for the corridor would be 27 minutes in the GP lanes and 23 minutes in the HOV lane. This is an increase of 13 minutes in the GP lanes and 12 minutes in the HOV lane compared to today. The HOV lanes (from the east to 76th Avenue Northeast in the westbound direction and from I-405 to the east in the eastbound direction) provide a bypass to the GP lane congestion, which results in a reduced travel time for buses and carpools.

Traffic Operations on SR 520

	Across Lake Washington			Between I-5 and 124th Avenue NE	
	Average Vehicles Served (Per Hour)	Average Persons Served (Per Hour)	Average Vehicle Occupancy (Thoughput)	Average Travel Time (Minutes) GP	Average Travel Time (Minutes) HOV
Existing Conditions	7,390	12,470	1.68	13	11
Year 2030 No Build Alternative	6,890	13,130	1.90	27	23
Year 2030 Four-Lane Alternative	6,220	13,590	2.18	21	18
Year 2030 Six-Lane Alternative	7,280	16,490	2.26	21	10

Exhibit 2-5. **Traffic Operations on SR 520 for Existing Conditions and all Project Alternatives**

- In 2030, the 4-Lane Alternative would serve 3 percent more people than the No Build Alternative in 10 percent fewer vehicles. The reduction in vehicles would result from tolling, rather than from increased congestion as under the No Build Alternative. Under the 4-Lane Alternative, the average travel time for the corridor would be 21 minutes in the GP lanes and 18 minutes in the HOV lane—a travel time reduction of 6 minutes in the GP lanes and 5 minutes in the HOV lane as compared to the No Build Alternative. The HOV lane (from the east to 76th Avenue Northeast in the westbound direction and from I-405 to the east in the eastbound direction) would provide a bypass to the GP lane congestion, resulting in a reduced travel time for buses and carpools.

- The 6-Lane Alternative would serve 26 percent more people than the No Build Alternative in 6 percent more vehicles. The average travel time for the corridor would be 21 minutes in the GP lanes and 10 minutes in the HOV lane. This represents a 6-minute reduction in travel time in the GP lanes and a 13-minute reduction in the HOV lane as compared to the No Build Alternative. This is a substantial travel time savings because 25 percent of the people on SR 520 would save 13 minutes of travel time.

- The shift to buses and carpools for the year 2030 alternatives would result in more people per vehicle. Based on traffic served across the Evergreen Point Bridge, the AVO would increase to 2.18 for the 4-Lane Alternative and to 2.26 for the 6-Lane Alternative compared to the No Build Alternative (with an AVO of 1.90). The 6-Lane Alternative AVO would be greater than the No Build and 4-Lane Alternative AVO because the 6-Lane Alternative would serve more carpool and bus vehicles with the HOV lane.

- Completion of the HOV lane would provide the system reliability and travel time benefits necessary to serve the increase in regional person trips.

What are the key findings about local traffic operations?

Listed below are key findings about local traffic operations.

- Only 4 of the 47 study area intersections would be negatively affected by changes under either the 4-Lane or 6-Lane Alternative. "Negatively affected" is defined as a drop in Level of Service (LOS) from D or E under No Build Alternative to E or F under one of the build alternatives. The intersections that would be negatively affected by changes under either the 4-Lane or 6-Lane Alternative are:

- *Fairview Avenue/Valley Street* operations would drop from LOS E to LOS F under the 6-Lane Alternative in the p.m. peak hour.
- *East Roanoke Street/Harvard Avenue East/SR 520 Westbound Off-ramp* operations would drop from LOS D to LOS E under the 6-Lane Alternative in the p.m. peak hour.
- *92nd Avenue Northeast/SR 520 Westbound Off-Ramp* operations would drop from LOS D to LOS F under the 4-Lane Alternative and to LOS E under the 6-Lane Alternative in the a.m. peak hour.
- *108th Avenue Northeast/SR 520 Eastbound On-Ramp* operations would decline on the northbound leg due to the left-turn volume. That movement would operate at LOS F under the 4-Lane Alternative and LOS E under the 6-Lane Alternative without some mitigation.

- Traffic operations would improve from LOS E or F to LOS D or better for eight intersections under one or both of the alternatives. These intersections are:
  - *Howell Street/Yale Avenue/I-5 Southbound On-ramp* operations would improve from LOS D to LOS C under both the 4-Lane and 6-Lane Alternatives during the p.m. peak hour.
  - *Lake Washington Boulevard/SR 520 Arboretum Ramps* operations would improve from LOS F to LOS A under both the 4-Lane and 6-Lane Alternatives during the a.m. peak hour. During the p.m. peak hour, operations would improve from LOS E to B under both build alternatives. These improvements assume signalization at this currently stop-controlled intersection.
  - *Montlake Boulevard/Lake Washington Boulevard/SR 520 Eastbound Ramp* operations would improve from LOS F to LOS E under the 6-Lane Alternative during the p.m. peak hour.
  - *Montlake Boulevard/East Shelby Street* operations would improve from LOS D to LOS B under both the 4-Lane and 6-Lane Alternatives during the a.m. peak hour. During the p.m. peak hour, operations would improve from LOS E to LOS D under both alternatives.

- *Montlake Boulevard/Northeast Pacific Street* operations would improve from LOS E to D under the 4-Lane Alternative during the p.m. peak hour.
- *Montlake Boulevard/Northeast 45th Street* operations would improve from LOS F to E under the 6-Lane Alternative during the p.m. peak hour.
- *Northeast Pacific Street/15th Avenue Northeast* operations would improve from LOS D to C under the 4-Lane Alternative during the a.m. peak hour.
- *Bellevue Way/Northup Way* operations would improve from LOS F to E during the p.m. peak hour under both the 4-Lane and 6-Lane Alternatives.

Exhibit 2-6 summarizes the results of the intersection operations analyses for all existing conditions and all future alternatives.

What are the key findings for each of the interchange areas?

Stewart Street Interchange Area

- The build alternatives would not have much effect on traffic operations at the Stewart Street interchange area. Generally, traffic would operate well at the Stewart Street interchange area under both of the build alternatives, with an LOS of D or better.

Mercer Street Interchange Area

- The build alternatives would not negatively affect traffic operations at the Mercer Street interchange area intersections, except for the Valley Street/Fairview Avenue North intersection under the 6-Lane Alternative, where LOS would drop from E to F.

Exhibit 2-6. **Intersection Operations Summary**

Locations	AM Peak Hour				PM Peak Hour			
		Year 2030				Year 2030		
	Existing	No Build	Four Lane	Six Lane	Existing	No Build	Four Lane	Six Lane
Stewart Street Interchange Area								
1 Yale Avenue/Howell Street/I-5 Southbound On-ramp	◆	◆	◆	◆	◆	◆	◆	◆
2 Yale Avenue/Stewart Street	◆	◆	◆	◆	◆	◆	◆	◆
3 Denny Way/Stewart Street	▽	◆	◆	◆	◆	◆	◆	◆
4 Stewart St./Eastlake Avenue	◆	◆	◆	◆	◆	◆	◆	◆
I-5/Mercer Street Interchange Area								
5 Mercer St./Fairview Ave./I-5 Ramps	●	●	●	●	●	●	●	●
6 Fairview Avenue/Valley Street	◆	◆	◆	◆	◆	▽	▽	●
7 Fairview Avenue/Eastlake Avenue	◆	◆	◆	◆	◆	◆	◆	◆
E. Roanoke Street Interchange Area								
8 Lakeview Boulevard/I-5 NB Off-ramp	◆	◆	◆	◆	◆	◆	◆	◆
9 Lakeview Boulevard/Harvard Avenue	◆	◆	◆	◆	◆	◆	◆	◆
10 Boylston Avenue/E Boston Street	◆	◆	◆	◆	◆	◆	◆	◆
11 Boylston Avenue/E Lynn Street	◆	◆	◆	◆	◆	◆	◆	◆
12 Boylston Avenue/E Louisa Street	◆	◆	◆	◆	◆	◆	◆	◆
13 Boylston Avenue/E Roanoke Street	◆	◆	◆	◆	◆	◆	◆	◆
14 E Roanoke Street/Harvard Avenue/SR 520 WB Off	▽	◆	◆	◆	●	◆	◆	▽
15 E Roanoke Street/Broadway Avenue	◆	◆	◆	◆	◆	◆	◆	◆
16 E Roanoke Street/10th Avenue	◆	◆	◆	◆	◆	◆	◆	◆
17 Boylston Avenue/E Edgar Street	◆	◆	◆	◆	◆	◆	◆	◆
18 E Edgar Street/Harvard Avenue	◆	◆	◆	◆	◆	◆	◆	◆
19 Harvard Ave/I-5 NB On-ramp	◆	◆	◆	◆	◆	◆	◆	◆

◆ = LOS A thru D
▽ = LOS E
● = LOS F

= Signalized Intersection (1, 2, 3, 4, 5, 6, 7, 11, 13, 14, 16)
= Unsignalized Intersection (8, 9, 10, 12, 15, 17, 18, 19)

Exhibit 2-6. **Intersection Operations Summary (continued)**

Locations	AM Peak Hour				PM Peak Hour			
		Year 2030				Year 2030		
	Existing	No Build	Four Lane	Six Lane	Existing	No Build	Four Lane	Six Lane
NE 45th Street Interchange Area	◆	◆	◆	◆	◆	◆	◆	◆
20 NE 42nd Street/7th Avenue NE	◆	◆	◆	◆	◆	◆	◆	◆
21 NE 45th Street/7th Avenue NE	◆	◆	◆	◆	●	▽	◆	▽
22 NE 45th Street/5th Avenue NE	▽	◆	◆	◆	◆	◆	◆	◆
Montlake Boulevard Interchange Area								
23 SR 520 Arboretum Ramps	●	●	◆	◆	◆	▽	◆	◆
24 Montlake Boulevard/E Roanoke Street	◆	◆	◆	◆	◆	◆	◆	◆
25 Montlake Boulevard. NE/SR 520 EB Ramp	●	●	●	●	●	●	●	▽
26 Montlake Boulevard NE/SR 520 WB Ramps*	◆	◆	◆	◆	◆	◆	◆	◆
27 Montlake Boulevard NE/E Hamlin Street	◆	◆	◆	◆	◆	◆	◆	◆
28 Montlake Boulevard NE/E Shelby St.	◆	◆	◆	◆	◆	▽	◆	◆
29 Montlake Blvd. NE/NE Pacific St.	◆	◆	◆	◆	◆	▽	◆	▽
30 Montlake Blvd. NE/NE Pacific Pl.	◆	◆	◆	◆	●	●	●	●
31 Montlake Blvd. NE/25th Ave. NE	◆	◆	◆	◆	◆	◆	◆	◆
32 25th Ave. NE/Pend Oreille Rd./NE 44th St.	◆	◆	◆	◆	◆	◆	◆	◆
33 Montlake Blvd./Walla Walla Rd./NE 44th St.	◆	◆	◆	◆	◆	◆	◆	◆
34 Montlake Blvd./NE 45th St.	◆	◆	◆	◆	▽	●	●	▽
35 NE Pacific St./15th Ave. NE	◆	◆	◆	◆	◆	◆	◆	◆
36 NE Pacific St./NE Pacific Pl.	◆	◆	◆	◆	◆	◆	◆	◆
37 Pacific Street/Hospital Exit	◆	◆	◆	◆	◆	◆	◆	◆
38 Pacific Street/Hospital Emergency Entrance	◆	◆	◆	◆	◆	◆	◆	◆

◆ = LOS A thru D
▽ = LOS E
● = LOS F

= Signalized Intersection
= Unsignalized Intersection

*This intersection is unsignalized under existing and no build alternative conditions and signalized under 4-lane and 6-lane alternative conditions.

Exhibit 2-6. **Intersection Operations Summary (continued)**

Locations	AM Peak Hour				PM Peak Hour			
		Year 2030				Year 2030		
	Existing	No Build	Four Lane	Six Lane	Existing	No Build	Four Lane	Six Lane
84th Avenue Interchange Area								
39 84th Avenue NE/SR 520 EB Off-ramp	◆	◆	◆	◆	◆	◆	◆	◆
40 84th Avenue NE/SR 520 WB On-ramp	◆	◆	◆	◆	◆	◆	◆	◆
92nd Avenue NE Interchange Area								
41 92nd Avenue NE/SR 520 EB On-ramp	◆	◆	◆	◆	◆	◆	◆	◆
42 92nd Avenue NE/SR 520 WB Off-ramp	◆	◆	●	▽	◆	◆	◆	◆
Bellevue Way Interchange Area								
43 Bellevue Way/Northup Way NE	◆	◆	◆	◆	▽	●	▽	▽
44 Lake Washington Boulevard NE/NE 38th Place	◆	◆	◆	◆	▽	●	●	●
108th Ave NE Interchange Area								
45 108th Avenue NE/SR 520 EB On-ramp	◆	◆	◆	◆	◆	◆	◆	◆
46 108th Avenue NE/SR 520 WB Ramps	◆	◆	◆	◆	◆	◆	◆	◆
47 108th Avenue NE/Northup Way NE	▽	▽	▽	▽	▽	●	●	●

◆ = LOS A thru D
▽ = LOS E
● = LOS F

\# = Signalized Intersection
\# = Unsignalized Intersection

- The 4-Lane and 6-Lane Alternatives would have similar effects on traffic operations within the Mercer Street interchange area.
- The Mercer Street/Fairview Avenue North intersection is over capacity now and would continue to be under all future alternatives.
- Queues at the Mercer Street/Fairview Avenue North intersection would not affect operations on I-5.
- The 6-Lane Alternative could result in an increase in traffic through this area, particularly the Eastlake Avenue East/Fairview Avenue East intersection. This is because drivers could choose to use the local street system, rather than I-5, to access downtown Seattle to avoid increased congestion at the SR 520/I-5 interchange.

Roanoke Street Interchange Area

- Generally, the build alternatives would not have much effect on traffic operations at the Roanoke Street interchange area.
- Only two of the 12 analyzed intersections would experience any kind of degradation in LOS under the build alternatives; even with this degradation in LOS, traffic would operate at LOS E or above.
- Traffic would continue to exceed capacity and queuing would occur around the Harvard Avenue East/East Roanoke Street/SR 520 westbound off-ramp and the Boylston Avenue East/East Roanoke Street intersection because of traffic coming to and from SR 520.
- Queues at the Harvard Avenue East/East Roanoke Street/SR 520 westbound off-ramp would not affect operations on SR 520.

Northeast 45th Street Interchange Area

- The build alternatives would not negatively affect traffic operations in the Northeast 45th Street interchange area.
- The Northeast 45th Street/7th Avenue Northeast intersection operates above capacity under Existing Conditions and would continue to do so under all future alternatives.

Montlake Boulevard Interchange Area

- The build alternatives would not negatively affect traffic operations at the intersections within the Montlake Boulevard interchange area. In fact, LOS would improve to D or better at 5 intersections under both the 4-Lane and 6-Lane Alternatives. Additionally, LOS would not fall to D or worse at any of the study area intersections, except at the Montlake Boulevard/SR 520 westbound ramp intersection. This degradation would be due to a change in intersection control from a yield for the exiting SR 520 westbound traffic to a signal. With a signal, vehicles would experience more delay, but traffic operations and flow would improve.

- Traffic operations in the Montlake Boulevard interchange area are constrained by the number of vehicles traveling through the area, with traffic volumes exceeding capacity at most intersections. Traffic operations are also constrained by the Montlake Bridge and Lake Washington Boulevard, whose geometrics cannot accommodate existing traffic volumes. Given these constraints, traffic queues form and spill back to adjacent intersections, creating system-wide congestion through the interchange area.

- At the SR 520 Lake Washington Boulevard ramps intersection, traffic operations would benefit greatly from a change in traffic control from all-way stop control to signalization.

- The Montlake Boulevard/SR 520 eastbound ramp intersection operates at LOS F today and would continue to do so under all future alternatives. Traffic volumes would exceed capacity on all approaches and queue into adjacent intersections (except on Lake Washington Boulevard, where there is no adjacent intersection).

- The SR 520 eastbound on-ramp traffic would back up onto Montlake Boulevard under the No Build Alternative. Design modifications in the 4-Lane and 6-Lane Alternatives would reduce the backup such that it would not reach Montlake Boulevard.

- Traffic operations at the Montlake Boulevard/East Hamlin Street intersection would improve with signalization of the downstream intersection at the Montlake Boulevard/SR 520 westbound ramps.

- Northbound traffic operations at the Montlake Boulevard/East Shelby Street intersection are affected by queues from the Montlake Boulevard/Northeast Pacific Street intersection.

- During the p.m. peak hour, traffic operations at the Montlake Boulevard/Northeast Pacific Place intersection are affected by congestion. This intersection operates at LOS F today and would do so under all project alternatives.

- During the p.m. peak hour, the Montlake Boulevard Northeast/Northeast 45th Street intersection would operate at LOS F under both the No Build and 4-Lane Alternatives and at LOS E under the 6-Lane Alternative. Traffic operations would be constrained, as they are today, by geometrics on the Northeast 45th Street viaduct, causing traffic volumes to exceed capacity.

84th Avenue Northeast Interchange Area

- The build alternatives would not adversely affect traffic operations at the two ramp terminus intersections in this area.

92nd Avenue Northeast Interchange Area

- The 4-Lane Alternative would affect a.m. peak hour traffic volumes at the SR 520 westbound off-ramp at 92nd Avenue Northeast. Exiting traffic volumes would increase by 50 vehicles per hour (vph), and LOS would drop from D to F.

- The 6-Lane Alternative would affect traffic volumes on 92nd Avenue Northeast (rather than the SR 520 westbound off-ramp). Traffic volumes would increase by 20 vph.

Bellevue Way Interchange Area

- Generally, the build alternatives would not negatively affect traffic operations at the intersections within the Bellevue Way Interchange Area.

- At the Bellevue Way/Northup Way Northeast intersection, LOS would improve from C to B under the 4-Lane Alternative and would remain the same for the No Build and 6-Lane Alternatives during the a.m. peak hour. During the p.m. peak hour, LOS would improve from F to E under both the 4-Lane and 6-Lane Alternatives.

- At the Lake Washington Boulevard Northeast/Northeast 38th Place intersection, LOS would remain the same for all future alternatives during both the a.m. and p.m. peak hours.

- Traffic volumes would exceed capacity at both intersections during the p.m. peak hour as vehicles access westbound SR 520.

108th Avenue Northeast Interchange Area

- The 108th Avenue Northeast/SR 520 eastbound on-ramp intersection would operate at LOS B or above under all future alternatives. Northbound vehicles on 108th Avenue Northeast would experience LOS E and F under the 4-Lane and 6-Lane Alternatives.

- The 108th Avenue Northeast/SR 520 westbound ramps intersection would operate at LOS C or above for all future alternatives. Traffic volumes would exceed capacity for the westbound off-ramp during both the a.m. and p.m. peak hours under all future alternatives. Traffic would queue on the exit ramp but would not affect operations on SR 520.

- The 108th Avenue Northeast/Northup Way Northeast intersection would operate at LOS E during the a.m. peak hour and LOS F during the p.m. peak hour under all future alternatives. Traffic volumes would exceed capacity on the eastbound, southbound and northbound approaches during both peak hours, and queues would affect operations at the 108th Avenue Northeast/SR 520 ramps intersection.

What are the key findings about nonmotorized facilities?

The proposed improvements to nonmotorized facilities along the SR 520 corridor would improve connections between Seattle and the Eastside. These improvements include:

- A pedestrian/bicycle path on the Evergreen Point Bridge across Lake Washington.

- A pedestrian/bicycle path on the Eastside between Lake Washington and 92nd Avenue Northeast.

- More north-south connections across SR 520.

The nonmotorized improvements would provide better access to and from transit facilities, and in turn, the improved access would increase the viability of the combination nonmotorized/bus trip.

An improved nonmotorized transportation system would increase regional mobility and enhance the livability of the communities adjacent to the SR 520 corridor. The transportation and livability benefits of providing such facilities would likely add value to the Seattle neighborhoods, the Eastside communities, and the region as a whole.

What are the key findings about transit operations?

Key findings of the analysis about transit operations are listed below.

- The No Build and 4-Lane Alternatives include a partial HOV lane that would allow transit trips to bypass short sections of SR 520 congestion. The average transit travel time (the average time it takes to travel between I-5 and 124th Avenue Northeast during the a.m. and p.m. peak hours in the eastbound and westbound directions) is 23 minutes under the No Build Alternative and 18 minutes under the 4-Lane Alternative. The travel time would be 8 minutes if the corridor operated under free flow; therefore, transit for both the No Build and 4-Lane Alternatives would experience congestion.

- The 6-Lane Alternative includes the completion of the HOV lane to I-5. This would allow transit to bypass the congestion through much of the SR 520 corridor, resulting in an average travel time of 10 minutes.

- Congestion on the corridor under the No Build and 4-Lane Alternatives (shown in the travel time) would also reduce transit's ability to serve the person demand.

- Under the 6-Lane Alternative, the SR 520 corridor would be more reliable because transit would have access to an HOV lane. In addition, the HOV lane would be moved to the inside, which would reduce conflict points with the on- and off-ramps to SR 520.

- Under the No Build and build alternatives, average peak hour passenger busloads would generally be much higher than the current bus operating plans provide. This would be the case for both build alternatives, and to a lesser extent, for the No Build Alternative. Sound Transit service using SR 520 would continue to meet future demand; however, demand on Metro and Community Transit buses would likely increase beyond projected service levels.

- Carpool and bus ridership would increase substantially as the result of dedicated HOV facilities, as shown in Exhibit 2-7.

The transportation discipline team assumed that **bus service on the Eastside and across Lake Washington** would have the same general pattern of service as today, but with improved service frequencies during peak and off-peak periods and with selected additional bus routes. Future bus service was estimated by assuming a 2 percent per year growth in regional bus service hours.

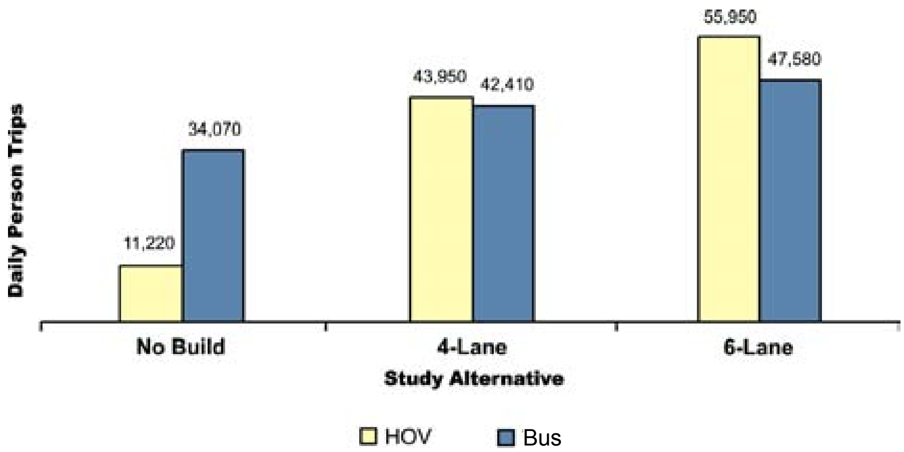


Exhibit 2-7. **SR 520 Carpool and Bus Ridership**

What are the key findings about parking supply?

The No Build Alternative would not affect parking supply because the highway would not be expanded. However, it is anticipated that the 4-Lane Alternative would result in an overall loss of 240 parking spaces, and the 6-Lane Alternative in an overall loss of 270 parking spaces. The 6-Lane Alternative is estimated to have the greatest effect on parking of all of the alternatives because it would have the widest cross-section. Exhibit 2-8 presents the total loss of parking spaces for each alternative by area.

Exhibit 2-8. **Summary of Estimated Parking Spaces Affected by Alternative and Area**

Year 2030 Alternative	I-5	Montlake	Eastside	Total
No-Build	0	0	0	0
4-Lane	10	190	40	240
6-Lane	10	210	50	270

What are the key findings about construction traffic ?

The design team prepared an estimate of potential construction-related truck traffic and haul routes. Note that the number of trucks expected is based on preliminary construction quantities, and the construction schedule and duration are also in preliminary stages of development.

Key findings are listed below. Exhibit 2-9 provides a summary of the estimated amount of truck traffic and a qualitative assessment of how truck haul trips would affect traffic.

Exhibit 2-9. **Summary of Haul Route Trips on Regional Highways**

	Estimated Number of Haul Route Trips				
	Per day		Per hour		
Facility	4-Lane	6-Lane	4-Lane	6-Lane	Traffic Effect
SR 520	289	309	36	39	Moderate-Substantial
I-5	179	187	23	24	Moderate
I-405	105	115	13	15	Small-Moderate

- The most substantial effect on overall weekday peak-period traffic operations due to construction would be the proposed closure of the SR 520 westbound HOV lane on the Eastside and Lake Washington Boulevard ramps in Seattle for the majority of the construction duration.
- The effect on traffic may be slightly greater under the 6-Lane Alternative than under the 4-Lane Alternative because of the higher number of trucks associated with the larger footprint and the construction of five lids. (Lids are not included in the 4-Lane Alternative.) The construction period for the 6-Lane Alternative would also be longer than for the 4-Lane Alternative.
- The westbound SR 520 HOV lane would be closed for approximately 24 months for either the 4-Lane or 6-Lane Alternative. Potential mitigation strategies to address the effects on SR 520 include providing incentives for the contractor to re-open the westbound SR 520 HOV lane as quickly as possible, thereby requiring the contractor to minimize and/or prohibit construction haul route trips during the peak periods, and strategies aimed at reducing overall peak period traffic levels on SR 520. Additionally, WSDOT would work with the transit agencies to increase rideshare and transit service.
- Virtually all adjacent local arterials would remain open during construction except for the Delmar Drive bridge, which would be closed for the majority of the construction period. The Delmar Drive bridge may be closed for 9 to 12 months for both the 4-Lane and

6-Lane Alternatives. The Lake Washington Boulevard ramps closure would be 37 months for the 4-Lane Alternative and 52 months for the 6-Lane Alternative (SR 520 Project Team 2004f). Detour routes have been developed for these areas. The estimated total construction period is 7 to 8 years under the 4-Lane Alternative and 9 to 10 years under the 6-Lane Alternative.

- Closure of the Lake Washington Boulevard ramps is likely to cause an increase in congestion at the Montlake Boulevard interchange. Some traffic might also choose to use the I-90 corridor, thus increasing local traffic. Potential mitigation could be in the form of detour signing, as well as improvements to intersection channelization and/or signal operations along the detour routes. Overall, outside of the closures noted above, local arterials would not be substantially affected by project construction.

What are the key findings about cumulative transportation effects?

The objective of the cumulative effects analysis is to identify the cumulative effects of the project alternatives in combination with a regional package of transportation facilities improvements that are considered reasonably forseeable for future implementation but are not currently funded. The cumulative effects scenarios provide a conservative estimate of anticipated travel demand throughout the region, taking into account the variety of projects that may be constructed during the same time frame as the SR 520 Bridge Replacement and HOV Project.

Capacity improvements included in the cumulative effects scenarios are in addition to those assumed in the modeling for the direct effects of the alternatives being considered in the SR 520 Bridge Replacement and HOV Project EIS. Several conclusions can be drawn by comparing projected travel demand and travel patterns for the project alternatives with those from the cumulative effects scenarios.

- The cumulative effects scenarios are expected to result in slightly fewer trips across SR 520 in comparison to the direct effects analysis. This means that the analysis conducted for this EIS represents a conservatively high estimate of traffic and associated traffic effects. In other words, if the regional projects assumed in the cumulative effects scenarios are implemented in conjunction with the SR 520 Bridge Replacement and HOV Project, traffic conditions within the project corridor would be similar to or better than those estimated and documented in the EIS.

- In general, screenline volumes in the cumulative effects scenario would be relatively consistent across all alternatives. The additional transportation capacity improvements in the cumulative effects scenarios would have little effect on relative results between the project alternatives.
- A considerable increase in carpool/bus demand would occur with the 4-Lane and 6-Lane Alternatives as compared to the No Build Alternative along SR 520. A sizeable increase is also projected in the cumulative effects scenarios for the 4-Lane and 6-Lane Alternative scenarios as compared to the No Build Alternative. However, the increase would not be as large as that seen in the project's direct effects.
- Internal traffic circulation on the Eastside would improve and more trips would likely remain on the Eastside due to capacity improvements along regional corridors such as I-405, SR 167, and SR 522. Hence, the volume across the cross-lake screenline would decrease, while volumes across screenlines on the Eastside would increase.
- Total cross-lake travel on SR 520 and I-90 in the cumulative effects scenario would be slightly lower for both the 4-Lane and 6-Lane Alternatives as compared to the direct effects. The reduction in HOV trips is projected to be higher than the reduction in GP trips.
- An increase in longer-distance, north-south through trips is expected to occur in the I-405 corridor under the cumulative effects scenarios because of the additional capacity along I-405 and SR 167. This increase corresponds to a decrease in longer-distance, north-south through trips on the west side of the lake.
- On SR 520, total trips would decrease slightly for the 4-Lane Alternative in the cumulative effects scenario as compared to the direct effects; HOV trips would decrease at a higher rate than GP trips.
- On SR 520, the 6-Lane Alternative in the cumulative effects scenario would result in a relatively large reduction in total trips as

compared to the direct effects, with a considerably greater reduction (proportionately) in HOV trips than in GP trips.

What are the key findings about traffic and parking mitigation?

This section presents possible mitigation for traffic that exceeds design thresholds on SR 520 (mainline and ramp termini) and local intersections, as well as mitigation for the loss of parking spaces.

Four intersections would experience a reduction in level of service, as identified in the *What are the key findings about local traffic operations?* section.

- Fairview Avenue/Valley Street operations would drop from LOS E to LOS F under the 6-Lane Alternative during the p.m. peak hour.
- The Harvard Avenue East/East Roanoke Street/SR 520 Westbound off-ramp would operate at LOS E in the year 2030 under the 6-Lane Alternative. Operations would shift from a poor LOS D to a good LOS E because an additional 140 vehicle trips would occur at the intersection. This level of change in traffic volume is considered minor, and congestion resulting from the additional traffic would not be severe. No mitigation is proposed.
- The 92nd Avenue Northeast/SR 520 Westbound off-ramp would operate at LOS F under the 4-Lane Alternative and LOS E under the 6-Lane Alternative. Control of traffic from the off-ramp is governed by a stop sign. The LOS level at this intersection would be reduced because local through-traffic is uncontrolled. No mitigation is proposed because congestion on the off-ramp would not affect freeway operations and implementation of additional intersection control would add delay to the local traffic.
- The 108th Avenue Northeast/SR 520 Eastbound on-ramp was identified because it would benefit from mitigation, even though the volume-to-capacity ratio did not indicate a need. Mitigation at this intersection would include installation of a traffic control signal to allow northbound left-turn traffic to safely access the eastbound on-ramp to SR 520. This traffic signal would also limit the length of backup in the left lane, such that it would not block local access onto 112th Avenue Northeast.

Exhibit 2-10 lists the affected local intersections and presents a potential mitigation strategy for each.

Exhibit 2-10. **Affected Intersections and Potential Mitigation**

Intersection	Reason for Mitigation	Alternative	Potential Mitigation
Fairview Avenue/Valley Street	LOS E to LOS F Close proximity to I-5	6-Lane	Coordination with the City of Seattle to develop a mitigation plan
108th Avenue Northeast/SR 520 Eastbound On-ramp	Northbound left turn fails	4-Lane	Signalize intersection

Mitigation listed below is proposed for lost parking in three locations.

- **National Oceanographic and Atmospheric Administration (NOAA) Northwest Fisheries Science Center, Seattle.** The 4-Lane Alternative would affect 8 to 16 parking spaces and the 6-Lane Alternative would affect 20 to 40 parking spaces. One potential mitigation strategy would be to construct an onsite parking structure.
- **The Hop-In Market, Seattle.** Approximately 19 out of 27 parking spaces (east and west sides) at the Hop-In Market would be affected. The excess space on the 76 station lot to be acquired for the project (directly adjacent to Hop-In) could be used to replace enough of the displaced parking spaces to meet demand.
- **The Evergreen Point Park-and-Ride, Medina.** Approximately 5 to 7 parking spaces would be displaced. On average, the park-and-ride has an 88 percent use rate. The proposed bicycle/pedestrian path design in that location could be shifted within the current right-of-way to reduce the effect on parking spaces.

Chapter 3: Freeway and Local Traffic Forecasts

What is in this chapter?

This chapter describes and presents the results of freeway travel demand forecasts and local travel forecasts.

Freeway Travel Demand Forecasts

This section presents the results of the year 2030 forecast analyses. It focuses on the SR 520 freeway mainline and ramps; it also summarizes the results of the I-5 and I-405 freeway mainline and ramp analyses. The limits of the study were shown in *Chapter 1: Introduction* in Exhibit 1-5.

The study area encompasses three freeways and many arterials in an effort to address the functionality and interrelationships of the various roadway networks.

How were travel forecasts and patterns determined?

Existing and forecast traffic volumes were developed to help assess potential project effects on existing and/or proposed roadway operations throughout the study area. The travel forecasts were based on data extracted from the Puget Sound Regional Council (PSRC) Transportation Planning Model. The details of the transportation planning model process are outlined in the attached Travel Demand Forecasting Analysis Results Technical Memorandum.

The following discussion and Exhibit 3-1 summarize the method used to determine existing and forecast future travel demand and travel patterns.

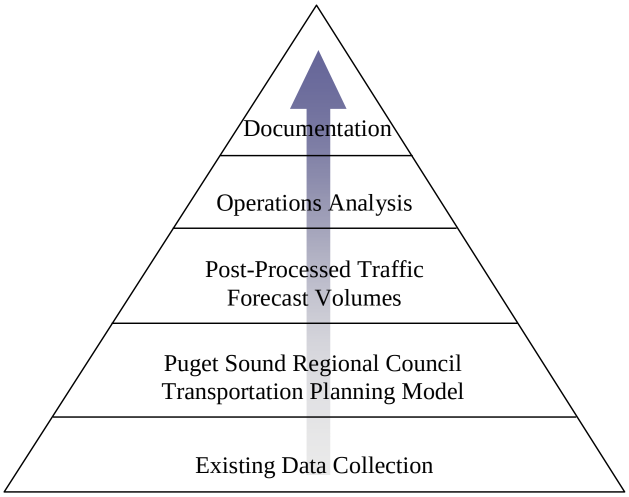


Exhibit 3-1. Travel Forecasts Process

In what terms do we discuss demand and travel patterns?

Demand can be measured in terms of both “person-trips” and “vehicle-trips.” These two measures of demand are associated through the way people choose to travel (for example, single-occupant vehicle, carpool, or bus). When people choose one method of travel over another, they have made a “mode choice.” Transportation forecasting takes this type of decision into account when forecasting the person and vehicle-trips within the project area. The mode choices used in the traffic forecasts include general-purpose (GP), carpool, or bus. Carpools are defined as vehicles carrying three or more people.

Demand

When we discuss freeway and local traffic forecasts, the term “demand” refers to the estimated traffic growth that is forecast based on the travel demand model. The term demand reflects the fact that there are locations in the transportation network where the forecast traffic volumes might not be accommodated in a 1-hour period or a 5-hour period—in other words, demand may exceed the capacity of the roadway. Potential changes in traffic volume forecasts resulting from changes in land use are discussed in Chapter 10, *Cumulative Transportation Effects*.

Person-Trips

As noted above, demand can be measured in terms of person-trips, which simply identifies how many people are moving along a roadway corridor by any mode during a given period of time. Measuring demand this way is consistent with the priorities WSDOT has set for this project; the Purpose and Need statement for the SR 520 Bridge Replacement and HOV Project states that the purpose of this project is to improve the mobility of people. The best way to measure the improvement of mobility is first to assess the person-trip demand associated with any change to the corridor.

Vehicle-Trips

Demand can also be measured in terms of vehicle-trips. Vehicle demand correlates directly with roadway operations, which will be discussed in *Chapter 4: Freeway Traffic Operations.*

Mode Choice

The relationship between person-trip demand and vehicle-trip demand can be described as mode choice. As described above, the mode choices used in the traffic forecasts include GP, carpool (3+), and bus.

What time periods were evaluated and why?

Exhibit 3-2. SR 520 Congestion Today

Today, congestion occurs along SR 520 for more than 2 continuous hours in both the morning and in the evening (Exhibit 3-2 shows congestion at Bellevue Way). Over the next 30 years with the No Build Alternative, traffic volumes would be expected to increase by up to 14 percent across Lake Washington during the p.m. peak period. Since the corridor is congested today for more than 2 hours and because there will be traffic growth, WSDOT decided to simulate SR 520 corridor operations for two 5-hour peak periods: 5:00 a.m. to 10:00 a.m. and 2:30 p.m. to 7:30 p.m. The reason for analyzing 5-hour periods encompassing the actual peak hour was to capture the queuing effects that occur when sections of the freeway operate over capacity during multiple time periods. To facilitate analysis, the project team divided the peak-period travel demand into 15-minute blocks spread over the two 5-hour periods.

Most of the local arterials peak for a single hour in the morning and in the evening.

Exhibit 3-3 depicts the relationship between peak period (as used in the freeway operations analyses) and peak hour (as used in the local operations analyses).

How were existing data compiled?

Information on existing traffic volumes, patterns, and mode choice was needed to determine existing conditions as well as to estimate travel demand forecasts. This information was collected for SR 520, I-5, and I-405.

Freeway mainline and ramp count data were compiled from data banks compiled by the Northwest Region of the WSDOT Traffic Systems Management Center. Data included daily traffic volumes for each ramp

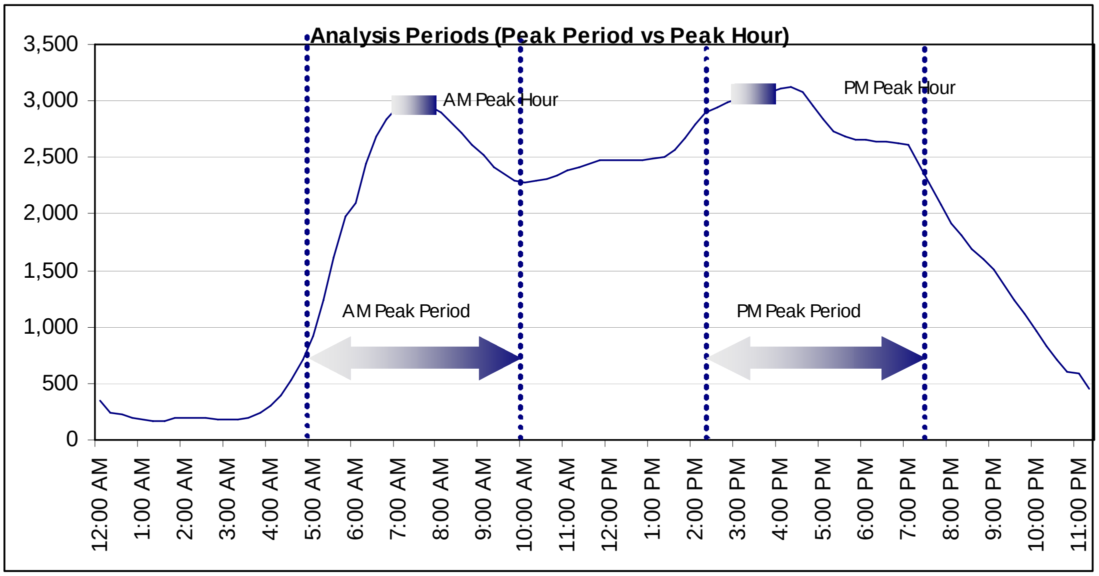


Exhibit 3-3. Peak Hour Versus Peak Period

within the study area. Traffic volumes for the freeway mainlines were also compiled to serve as checkpoints along the corridors. Data on existing traffic counts can be found in the Data Collection Summary Technical Memorandum (SR 520 Project Team 2004d) and in the Final Submittal of Freeway and Local Traffic Forecasts and Operations Technical Memorandum (SR 520 Project Team 2004c). These technical memoranda are available through the WSDOT Urban Corridors Office.

Vehicle volumes were forecast through the local arterial networks and freeway corridors. Traffic patterns were identified on the local network and at critical locations for the freeway. These critical locations typically include weave sections (i.e., places in which traffic is entering and exiting the freeway from a single lane), where conflict points exist and often are a source of congestion. For the local arterial networks, traffic patterns were identified for freeway and nonfreeway traffic.

Carpool traffic was estimated at freeway screenline locations based on Transportation Systems Management Center (TSMC) count data and balanced through the corridor.

How was the PSRC travel demand model used to predict traffic growth?

Forecasting traffic growth within the project area required use of the PSRC travel demand model. PSRC's latest calibrated model was used, as described in the *Trans-Lake Washington Project Travel Forecasting*

Model Validation Report for Base Year 1998 (SR 520 Project Team 2002). This model was updated for the SR 520 Bridge Replacement and HOV Project to include roadway network refinements, a new volume delay function, and updated 2003 land use information. Attachment 1, *Travel Forecasting Analysis Results Technical Memorandum*, further discusses the attributes of this model.

Once the model was calibrated, planned, and programmed, future roadway network improvements in the area were incorporated into the model for the No Build Alternative. This list of network improvements is summarized in Attachment 1. Roadway network modifications for each of the project alternatives were also coded into the travel demand model. The model was used to develop growth rates, which were applied to existing ground count data as a post-processing effort. Post processing is described further in the following sections.

From the planning-level volumes, the project team determined forecast volumes at "checkpoints," or several screenline locations along the freeway, and for interchange influence areas. Exhibit 3-4 explains and illustrates screenlines. Exhibit 3-5 depicts the screenline locations used in the travel forecasts.

Did you know?

A **screenline** as used here is an imaginary line across a section of freeway or arterials. Screenlines are often used in traffic analyses to determine how much volume is entering or exiting a particular area.

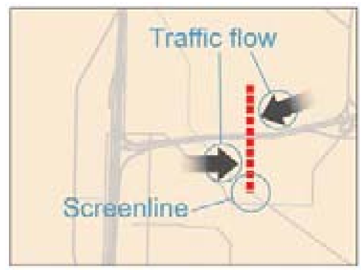
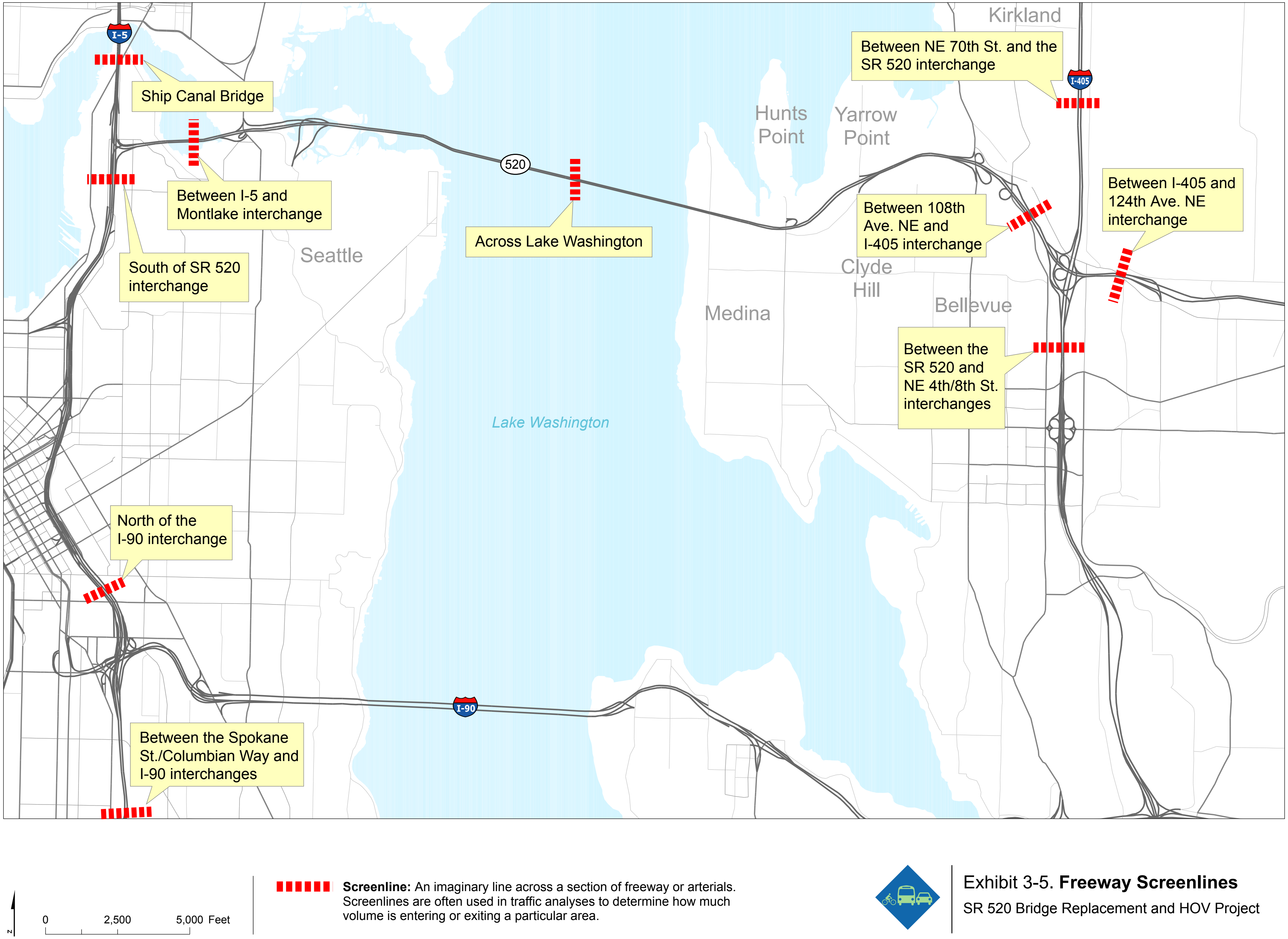


Exhibit 3-4. Screenline Definition

How was the toll rate selected for the SR 520 Bridge Replacement and HOV Project?

The SR 520 Toll Feasibility Study was done to evaluate potential ranges of revenue generation resulting from the tolling within the corridor. Two scenarios were defined: Traffic Management and Maximum Funding. The Traffic Management strategy examined economically attractive toll ranges, which minimized the volume of trips diverted from the SR 520 corridor to other corridors. The Maximum Funding strategy examined toll ranges expected to generate the most revenue while limiting the volume of diverted trips to ensure acceptable operations within other corridors. These two strategies provided an



Screenline: An imaginary line across a section of freeway or arterials. Screenlines are often used in traffic analyses to determine how much volume is entering or exiting a particular area.

Exhibit 3-5. **Freeway Screenlines**

SR 520 Bridge Replacement and HOV Project

180171.AF.14 TDR_03-05_FreewayScreenlines_15jun04 indication of the low and high ranges of revenue that could be generated by implementing a toll within the SR 520 corridor. While the Traffic Management strategy resulted in the least trip diversion, it also resulted in the lowest generation of toll revenues. Conversely, the Maximum Funding strategy produced the maximum revenue from tolling and resulted in nearly twice the number of vehicle-trip diversions as the Traffic Management strategy. Neither strategy was deemed appropriate for modeling transportation operations and performance with the Draft EIS.

For this Draft EIS, the transportation discipline team used data from the SR 520 Toll Feasibility Study to determine what level of toll pricing would reasonably represent future SR 520 conditions. A pricing strategy that generates 80 percent of the Maximum Funding strategy revenue was selected. The peak and off-peak period toll ranges used for the project are presented in Exhibit 3-6. The value of time was determined using a stated preference survey as described in the SR 520 Toll Feasibility Study and was used to compare travel times for tolled trips versus nontolled trips.

Exhibit 3-6. Proposed Toll Rate and Value of Time Modeling Assumptions for 2030

	Values Expressed in Dollars of Year			
Model Input	**1990**	**1998**	**Today[a]**	**2030**
2030 p.m. peak-period toll rate[b]	$2.50	$3.05	$3.35	$6.50
2030 off-peak toll rate[b]	$1.35	$1.65	$1.80	$3.50
2030 peak-period value of time[c]	$10.80/hr	$13.20/hr	$14.43/hr	$28.17/hr
2030 off-peak value of time[c]	$9.10/hr	$11.20/hr	$12.21/hr	$23.85/hr

Note: Historical inflation based on the average of the Bureau of Economic Analysis Consumer Price Index for All Urban Consumers and the Implicit Price Deflator. Projected inflation based on Global Insight's March 2003 forecast for the Implicit Price Deflator.

[a]Based on year-end 2002 dollars; 2003 price levels not yet determined.

[b]Toll rates that yield 80% of maximum revenue, based on analysis performed with the Regional Transportation Investment District projects background network.

[c]Based on a 2003 stated preference survey of SR 520 users; assumes no real growth in the value of time.

Source: (Parsons Brinckerhoff 2003).

We have assumed that all alternatives would have the same tolling structure. We also assumed that transit service, registered vanpools, and carpools with three or more people would not be required to pay the toll. Toll collection would be done using an electronic toll collection

(ETC) system. An ETC system would allow traffic to operate at free-flow conditions, as opposed to manual toll collection that would require drivers to reduce speeds to pass through a toll collection plaza to pay.

How was traffic forecast for the screenline and influence areas?

The travel demand model estimated existing and future traffic volumes, which were compared to one another to develop year 2030 traffic volumes for the project alternatives.

The freeway traffic volume forecasts used the screenline level data from the travel demand model to provide control points for the remainder of the forecasts. On- and off-ramp traffic volumes provide the connectivity between the freeway and local traffic volume forecasts. Because of the interconnectivity between the on- and off-ramps and the local traffic volumes, they both use the interchange influence area growth rates as a target value.

The following sections describe how we identified freeway screenlines, how we determined interchange influence areas, and how we developed vehicle forecasts for both the freeway screenlines and interchange influence areas.

Identifying Freeway Screenline Locations

Screenlines were selected to determine key travel patterns adjacent to and within the project limits. The screenlines on SR 520 between I-5 and Montlake and between I-405 and 124th Avenue Northeast represent the locations where traffic enters and exits the project area. Screenlines adjacent to the I-405 and I-5 interchanges with SR 520 were necessary to determine travel patterns to and from the adjacent freeways; therefore, a screenline between 108th Avenue Northeast and I-405 was also valuable. A screenline at the middle of Lake Washington on SR 520 was chosen to determine vehicle demand crossing the lake.

Screenlines on I-405 and I-5 provide information about the effects that changes on SR 520 might have on alternate and adjacent travel routes. The two southern I-5 screenlines were used to understand how traffic would shift between SR 520 and I-90 through the Seattle area under different alternatives.

Identifying Interchange Influence Areas

Growth in local traffic volumes was calculated using an areawide growth rate that encompassed many local roads within an interchange influence area. Interchange influence areas were identified as areas where similar growth in traffic was expected. Each influence area includes one or more interchanges. The five influence areas (shown in Exhibit 1-5 in Chapter 1) are:

- **Montlake Boulevard and Lake Washington Boulevard**. Traffic on SR 520 destined to the University District, Madison Park, Capitol Hill, and Madrona Park may take either Lake Washington Boulevard or Montlake Boulevard; therefore, these interchanges were grouped.
- **Northeast 45th Street**. This is a single interchange area, and the growth patterns were assigned based solely on information from this location.
- **84th Avenue Northeast, 92nd Avenue Northeast, Bellevue Way Northeast, 108th Avenue Northeast**. These interchanges were grouped because of their similarities in serving traffic to and from Bellevue and the adjacent neighborhoods. Bellevue Way and 108th Avenue Northeast are also similar in their service of traffic to the north.
- **Mercer Street and Stewart Street**. Both interchanges serve traffic to downtown Seattle and have connections to I-5 mainline and express lanes.
- **Boylston and Roanoke**. This interchange area serves the neighborhoods adjacent to I-5, north Capitol Hill, and Eastlake. Traffic growth in these areas is similar, and they were combined to assess an overall local growth rate.

Developing Vehicle Forecasts

The a.m. and p.m. peak period forecasts were developed using slightly different forecasting techniques, as described below.

P.M. Peak Forecast

The forecasting methodology begins with planning-level forecasts from the travel demand model. The model’s existing year volumes are calibrated to within ±10 percent of actual data, which is valid for a planning-level forecast. However, these data are refined for the traffic analyses by applying planning-level forecast growth to actual count data.

$$\text{Direct Model Vehicular Growth} = \text{2030 Model Vehicular Volume} - \text{Existing Model Vehicular Volume}$$

$$\text{Vehicular Forecast} = \text{Direct Model Vehicular Growth} + \text{Existing Vehicular Volume (Survey Data)}$$

A.M. Peak Forecast

Results from the travel demand model indicated that during the a.m. peak period, the build alternatives would operate with an average of 71 percent of the existing SR 520 traffic volume on the Evergreen Point Bridge. Results from the travel demand model also illustrated that traffic south of SR 520 would be similar to or less than the No Build Alternative, indicating that the reduction in trips from SR 520 would be offset by new trips originating from north of the Ship Canal Bridge on I-5. Growth patterns on southbound I-405 between SR 520 and I-90 showed a 5 percent reduction in traffic volume. These combined findings led the project team traffic engineers to believe that a modified forecasting method would provide a more conservative and reasonable estimate for the a.m. peak-period traffic volumes.

To provide a more conservative estimate of a.m. peak-period growth, the team developed an alternate method of forecasting. The diversion of traffic from SR 520 was only apparent in the a.m. tolled scenario, while the untolled scenario was similar to the p.m. peak and existing conditions trips distributions. Because the a.m. untolled model results were reasonable, they were used to develop a.m. tolled forecasts. The traffic engineers assumed that the correlation between a.m. and p.m. peak-period, untolled traffic distributions would be similar to a.m. and p.m. peak-period, tolled traffic distributions. Thus, a.m. tolled vehicular volume forecasts were based on output from the a.m. and p.m. peak period of untolled and the p.m. peak-period tolled models by applying the ratio shown below.

$$\text{AM Tolled Future Forecast} \div \text{AM Untolled Future Forecast} = \text{PM Tolled Future Forecast} \div \text{PM Untolled Future Forecast}$$

How was the GP and Carpool mode split determined?

P.M. Peak Carpool Forecasts

To develop carpool forecasts for the p.m. peak period, several calculations were completed at the screenlines previously listed. First, the travel demand model was used to determine the mode split:

Direct Model Percent HOV	=	Direct Model HOV Volume	÷	Direct Model Total Volume

Then, to estimate the carpool forecast volume, the percentage of carpools derived from the travel demand model was applied to the vehicular forecast:

HOV Forecast Volume	=	Direct Model Percent HOV	x	Vehicular Forecast Volume

Carpool volumes were forecast throughout the corridor using a method similar to that described for the total volume.

A.M. Peak Carpool Forecasts

Tolled carpool forecasts for the a.m. peak period were based on a.m. and p.m. peak-period untolled models and the p.m.-tolled model, assuming the following ratio:

AM Tolled HOV Future Forecast	÷	AM Untolled HOV Future	=	PM Tolled HOV Future Forecast	÷	PM Untolled HOV Future Forecast

How were transit volumes determined?

Vehicle- and person-trip forecasts for buses were based on the PSRC model planning-level forecasts. The demand for person-trips was not based on an average bus loading, but on the actual demand for people desiring to use the bus.

How were freeway and local forecasts refined?

The planning-level forecasts were expanded to include freeway sections, on- and off-ramps, and arterial turn movements between the freeway screenline checkpoints identified in the previous section.

Growth factors were applied to freeway ramps and freeway screenlines, which then were adjusted until the final growth (for the screenlines and interchange influence areas) converged on the targeted forecast volumes from the travel demand model.

To ensure a conservative approach, ramps were not allowed a negative growth (i.e., a reduction in volumes) relative to existing conditions if the adjacent freeway screenlines and local arterials both showed positive growth. This approach occasionally produces a local forecast growth that is larger than the growth originally calculated from the direct travel demand model data output.

At the SR 520/I-5 and SR 520/I-405 interchanges, forecast volumes on the interchange ramps were estimated using techniques described in Chapter 8 of *NCHRP 255, Highway Traffic Data for Urbanized Area Project Planning and Design*. This technique balances future interchange volumes by applying future mainline volumes to existing ramp split proportions. The ramp splits are incrementally adjusted until the interchange turn movements are in equilibrium with the forecast approach and departure volumes.

What improvements are included in the travel demand model?

No Build Alternative

The No Build Alternative includes development of the Nickel Projects (Exhibit 3-7) on freeways adjacent to SR 520 and an eastbound auxiliary lane between the Northeast 51st Street on-ramp and the West Lake Sammamish Parkway off-ramp. The No Build Alternative evaluates the growth in travel demand expected for the year 2030 with no additional improvements to SR 520.

4-Lane and 6-Lane Alternatives

The 4-Lane and 6-Lane Alternatives include all of the improvements assumed for the No Build Alternative network, as well as the improvements proposed for each of the alternatives. See *What are the project alternatives?* in Chapter 1.

Did you know?

The **Nickel Projects** are WSDOT projects adopted in 2003. The name Nickel Projects comes from the funding source, which is the five-cent gas tax increase.

The projects on adjacent freeways include:

- *I-405 - Congestion Relief & Bus Rapid Transit (BRT) Projects.* The Bellevue project constructs one lane in each direction between Southeast 8th and I-90 and replaces the Wilburton Tunnel. The Kirkland project constructs one lane northbound from Northeast 70th to Northeast 124th and southbound from SR 522 to SR 520.
- *SR 520 - W Lake Sammamish Parkway to SR 202 - Add Lanes.* Constructs one HOV lane and one auxiliary lane in each direction between West Lake Sammamish Parkway and SR 202, and completes the interchanges at SR 202 and West Lake Sammamish Parkway. Improves safety and relieves congestion on SR 520, SR 202, and Avondale Road. There are currently four lanes. There will be eight lanes (including an HOV lane in each direction) when this project is completed.

Exhibit 3-7. Nickel Projects

Freeway Travel Demand Forecast Results

This section discusses the results of travel forecasts for the a.m. and p.m. peak periods for existing conditions and the No Build, 4-Lane, and 6-Lane Alternatives in 2030. The following sections discuss travel forecasts in detail for each direction because traffic growth issues vary between westbound and eastbound SR 520 during the a.m. and p.m. peak periods.

Exhibit 3-8 summarizes the a.m. and p.m. peak periods at the midspan of the Evergreen Point Bridge. This information is also shown graphically, along with mode choice information, for each peak period in Exhibits 3-9 and 3-10.

Exhibit 3-8. Average Hourly Summary of Peak-Period Traffic Demand Forecasts for SR 520

			Year 2030					
	Existing Conditions		No Build Alternative		4-Lane Alternative		6-Lane Alternative	
Measure of Effectiveness	**WB**	**EB**	**WB**	**EB**	**WB**	**EB**	**WB**	**EB**
A.M. Peak Period								
Vehicle Demand (per hour) (across Lake Washington)	3,710	3,830	3,900	4,360	3,540	3,330	4,420	4,010
Person Demand (per hour) (across Lake Washington)	6,810	5,850	8,980	7,210	10,390	7,140	11,960	8,250
P.M. Peak Period								
Vehicle Demand (per hour) (across Lake Washington)	4,020	3,580	4,830	3,890	4,320	3,090	5,050	3,980
Person Demand (per hour) (across Lake Washington)	6,390	6,440	7,900	8,670	8,300	8,740	9,680	10,710

EB = eastbound
WB = westbound

Existing conditions are described first to provide a basis for understanding the future forecasts. The No Build Alternative is the baseline 2030 scenario and describes the growth that is expected between now and the year 2030. The 4-Lane and 6-Lane Alternatives are the 2030 build scenarios, which are compared to the No Build Alternative to answer the question: "How does travel demand change if we improve the corridor by the year 2030?"

Westbound SR 520, A.M. Peak Period

This section summarizes travel forecasts for westbound SR 520 during the a.m. peak period. The average represents the average hourly volume that occurs throughout the peak period.

What is the person and vehicle-trip demand?

Exhibit 3-11 depicts the vehicle- and person-trip demand for westbound SR 520 during the a.m. peak period across Lake Washington.

Existing Conditions

Today, the average person-trip demand on westbound SR 520 across Lake Washington is 6,810 persons per hour. The vehicle-trip demand is 3,710 vehicles per hour (vph).

No Build Alternative

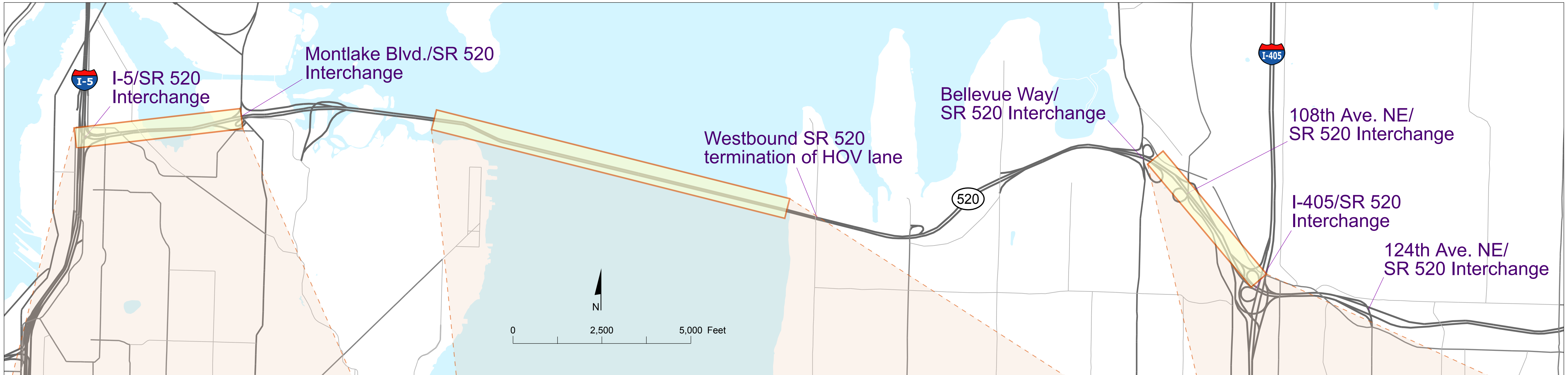
By 2030, person-trip demand would increase to 8,980 persons per hour (an increase of over 32 percent compared to today). Vehicle demand would increase 5 percent compared to today, resulting in 3,900 vph across Lake Washington. Person-trip demand increases at a greater rate than vehicle demand due to a shift to buses.

4-Lane Alternative

In 2030 with the 4-Lane Alternative, the average person-trip demand would be 10,390 persons per hour (a 16 percent increase compared to the No Build Alternative) in 10 percent fewer vehicles. This indicates a substantial shift to carpools and buses and a decrease in GP demand compared to the No Build Alternative. The vehicle demand across Lake Washington would be 3,540 vph with the 4-Lane Alternative.

6-Lane Alternative

In 2030, the average person-trip demand would be 11,960 persons per hour (over a 33 percent increase compared to the No Build Alternative) in 13 percent more vehicles. Similar to the 4-Lane Alternative, this indicates a shift to carpools and buses compared to the No Build Alternative. With the 6-Lane Alternative, the vehicle demand across Lake Washington would be 4,420 vph.



I-5 and Montlake Blvd.

Volume Trips per hour (Westbound Demand / Eastbound Demand)

		Vehicle Trips	Person Trips
Existing Conditions	Westbound	3520	6500
	Eastbound	2840	4480
Year 2030 No Build Alternative	Westbound	3600	8530
	Eastbound	3130	5450
Year 2030 4-Lane Alternative	Westbound	3700	10460
	Eastbound	2640	5830
Year 2030 6-Lane Alternative	Westbound	4510	11900
	Eastbound	2930	6500

Bridge Midspan

Volume Trips per hour (Westbound Demand / Eastbound Demand)

		Vehicle Trips	Person Trips
Existing Conditions	Westbound	3710	6810
	Eastbound	3830	5850
Year 2030 No Build Alternative	Westbound	3900	8980
	Eastbound	4360	7210
Year 2030 4-Lane Alternative	Westbound	3540	10390
	Eastbound	3330	7140
Year 2030 6-Lane Alternative	Westbound	4420	11960
	Eastbound	4010	8250

Mode Choice (HOV / Transit / GP)

	Westbound Mode Type by Vehicle, % (HOV / Transit / GP)	Westbound Mode Type by Person, % (HOV / Transit / GP)	Eastbound Mode Type by Vehicle, % (HOV / Transit / GP)	Eastbound Mode Type by Person, % (HOV / Transit / GP)
Existing Conditions	11 / 1 / 88	19 / 18 / 63	9 / <1 / 91	18 / 3 / 79
Year 2030 No Build Alternative	8 / 2 / 90	11 / 37 / 52	5 / 1 / 94	9 / 15 / 76
Year 2030 4-Lane Alternative	26 / 3 / 71	28 / 40 / 32	18 / 1 / 81	26 / 24 / 50
Year 2030 6-Lane Alternative	25 / 2 / 73	29 / 35 / 36	16 / 1 / 83	24 / 22 / 54

West of I-405

Volume Trips per hour (Westbound Demand / Eastbound Demand)

		Vehicle Trips	Person Trips
Existing Conditions	Westbound	3830	7030
	Eastbound	3620	5490
Year 2030 No Build Alternative	Westbound	4780	10210
	Eastbound	3730	6260
Year 2030 4-Lane Alternative	Westbound	4820	12180
	Eastbound	3740	7450
Year 2030 6-Lane Alternative	Westbound	5340	13140
	Eastbound	4000	7880

Exhibit 3-9. **A.M. Peak Volume and Mode Choice**

SR 520 Bridge Replacement and HOV Project