

24 August 2005

**SR 520 Bridge Replacement  
and HOV Project Draft EIS**

**Appendix V**

**6-Lane Alternative  
Options Report**





# SR 520 Bridge Replacement and HOV Project Draft EIS

## 6-Lane Alternative Options Report



Prepared for  
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## Acronyms and Abbreviations

APE	area of potential effect
BMP	best management practice
EIS	Environmental Impact Statement
ft <sup>2</sup>	square foot
HOV	high-occupancy vehicle
LOS	level of service
LWD	large woody debris
MOHAI	Museum of History and Industry
NAC	noise abatement criteria
NOAA	National Oceanic and Atmospheric Administration
NRHP	National Register of Historic Places
WDFW	Washington Department of Fish and Wildlife
WSDOT	Washington State Department of Transportation
WSHR	Washington State Heritage Register



# Introduction

The draft environmental impact statement (EIS) for the SR 520 Bridge Replacement and HOV Project evaluates two build alternatives (4-Lane Alternative and 6-Lane Alternative) and a No Build Alternative. In winter 2005, through continuing involvement with the surrounding communities, the Washington State Department of Transportation (WSDOT) received feedback from the surrounding communities that the proposed 6-Lane Alternative was too wide through the corridor. WSDOT also received a request from the Montlake community to study SR 520 through Montlake on an elevated signature-style bridge with an interchange east of Montlake terminating at Pacific Street at the University of Washington. In addition, WSDOT held workshops with representatives from Sound Transit, King County Metro, Kirkland, and Bellevue to develop options for the 6-Lane Alternative that would improve access to the South Kirkland Park-and-Ride. In an effort to respond to the communities' and agencies' concerns and interests, WSDOT convened two workshops to brainstorm possible options that could reduce the footprint of the 6-Lane Alternative in both Seattle and the Eastside and address Montlake's interest in an elevated SR 520 bridge through their neighborhood. Options identified in these workshops were evaluated through two screening processes: one for options in Seattle and another for options on the Eastside. Through the two screening processes, eight potential options to the 6-Lane Alternative, four in Seattle and four on the Eastside, were selected to carry forward and evaluate in this technical appendix.

The options included in this technical appendix are options that could be added to the 6-Lane Alternative (referred to in this appendix as the original 6-Lane Alternative), either singularly or in a variety of combinations. This technical appendix qualitatively evaluates how each option would result in different environmental effects when compared to the effects of the original 6-Lane Alternative without the option. This appendix also identifies how proposed mitigation measures identified for the original 6-Lane Alternative would differ with each option. The effects and proposed mitigation measures of the original 6-Lane Alternative are thoroughly documented in the previously prepared discipline reports (Appendices C through T) and are incorporated by reference throughout this technical appendix. These appendices are:

- Appendix C – Air Quality Discipline Report
- Appendix D – Cultural Resources Discipline Report
- Appendix E – Ecosystems Report
- Appendix F – Energy Discipline Report
- Appendix G – Environmental Justice Analysis
- Appendix H – Geology and Soils Discipline Report
- Appendix I – Hazardous Materials Discipline Report
- Appendix J – Indirect and Cumulative Effects Discipline Report
- Appendix K – Land Use, Economics, and Relocations Discipline Report
- Appendix L – Navigable Waterways Discipline Report
- Appendix M – Noise Discipline Report
- Appendix N – Public Services and Utilities Discipline Report
- Appendix O – Recreation Discipline Report
- Appendix P – Section 4(f) Resources Evaluation
- Appendix Q – Social Discipline Report
- Appendix R – Transportation Discipline Report
- Appendix S – Visual Quality and Aesthetics Discipline Report
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All 8 options were evaluated for the same 18 environmental disciplines previously used to evaluate the original 6-Lane Alternative. However, for many of the environmental disciplines, several of the options would not differ in effects and/or proposed mitigation measures when compared to the original 6-Lane Alternative. Text describing these disciplines where no change would occur has not been included in this appendix, and these disciplines are identified in a text box at the beginning of each option discussion.

The analysis included in this technical appendix is qualitative in detail, as opposed to the quantitative level of analysis included in the discipline reports. If any of the options are selected to move forward with the original 6-Lane Alternative as a preferred alternative, then a quantitative level of analysis would need to be conducted to complete environmental review of the alternative. In addition, some of the options extend into new areas of affected environment that were not previously discussed in the discipline reports. Existing conditions data, in terms of field survey, modeling, or database searches, would need to be conducted, as well.

Exhibit 1 summarizes how each option's effects would differ and if these effects would be more or less than the original 6-Lane Alternative.

Descriptions of the options, along with exhibits showing the proposed footprints of the options, are included in the main text of the document after the summary table.

EXHIBIT 1  
Summary of Effects of Options to the 6-Lane Alternative

Seattle	6 Lanes with Pacific Street Interchange Option	High 6 Lanes with Pacific Street Interchange Option	No Montlake Freeway Transit Stop Option	Second Montlake Bridge Option
Air Quality	  Air emissions slightly increase at Pacific Street interchange; slight decrease at Montlake interchange	  Same as 6 Lanes with Pacific Street Interchange option	 Slightly reduced effects from air emissions by eliminating transit stop	  Same as No Montlake Freeway Transit Stop option, plus improvements to air quality at Pacific Street intersection; slight degradation of air quality near SR 520
Cultural Resources	  Fewer direct effects overall on Montlake historic district; historic residences along Lake Washington Boulevard East affected visually by new interchange. Residences in the Shelby-Hamlin part of the district would experience increased visual and noise effects from the new Union Bay bridge	  Same as 6 Lanes with Pacific Street Interchange option; plus increase in APE and effects on Montlake historic district due to height of SR 520	 Fewer direct effects on Montlake historic district	  Same as No Montlake Freeway Transit Stop option, plus removal of two historic homes in Montlake historic district and indirect effect on setting of historic Montlake Bridge
Ecosystems	  Double amount of wetland fill; 1/3 more wetland shading; 15% less wetland buffer effects; less vegetation effects, but more vegetation shading; fewer columns in Portage Bay, new columns in Union Bay in juvenile anadromous fish migration route; possible shading effects on fish from bridge	  Same as 6 Lanes with Pacific Street Interchange option; however, height of SR 520 mainline could reduce the intensity of the shading effects on wetlands and vegetation; fewer columns but greater bottom area occupied by columns in Portage Bay	No change from original 6-Lane Alternative	 Same as No Montlake Freeway Transit Stop option, plus minimal effect on flying birds from loss of trees and vegetation; a second shadow from bridge may or may not affect juvenile salmonid migration through Montlake Cut
Energy	 Energy consumption during construction would be higher	 Energy consumption during construction would be higher	 Energy consumption during construction would be lower	 Energy consumption during construction would be higher
Environmental Justice	 Could affect tribal fishing, which could be disproportionate effect on minority population	 Same as 6 Lanes with Pacific Street Interchange option	No change from original 6-Lane Alternative	No change from original 6-Lane Alternative
Geology and Soils	Groundwater collection system and sump pump needed to avoid effects on groundwater table at the Pacific Street intersection	Same as 6 Lanes with Pacific Street Interchange option	No change from original 6-Lane Alternative	Containment system required to prevent excavated material from falling down steep slope into Montlake Cut

EXHIBIT 1  
Summary of Effects of Options to the 6-Lane Alternative

Seattle	6 Lanes with Pacific Street Interchange Option	High 6 Lanes with Pacific Street Interchange Option	No Montlake Freeway Transit Stop Option	Second Montlake Bridge Option
Hazardous Materials	  Less effect on two hazardous sites; potential new effect on new hazardous site	  Same as 6 Lanes with Pacific Street Interchange Option	No change from original 6-Lane Alternative	Not known
Indirect and Cumulative Effects	No change from original 6-Lane Alternative	No change from original 6-Lane Alternative	No change from original 6-Lane Alternative	No change from original 6-Lane Alternative
Land Use, Economics, and Relocations	  Less displacement of NOAA; MOHAI and service station not displaced; less effect on property tax collections; could affect University of Washington WAC docks	  Same as 6 Lanes with Pacific Street Interchange option	 Less construction-related spending effects; possibly less displacement of NOAA facility	 Two additional single-family residences would be displaced east of Montlake Bridge
Navigable Waterways	 If a 70-foot vertical clearance is used for Union Bay bridge, two boats would be limited by clearance. No effect if a 110-foot vertical clearance is used.	 Same as 6 Lanes with Pacific Street Interchange option	No change from original 6-Lane Alternative	 Possible closures to boating traffic through Montlake Cut during construction
Noise	  Noise level increases of 1 to 5 dBA in some areas; decreases of up to 3 dBA in other areas	 Noise levels could increase 0 to 7 dBA, as well as farther away from structure. Vibrations from elevated structure itself would produce noise at receivers under or near bottom of structure.	No change from original 6-Lane Alternative	 Noise level increases east of Montlake Boulevard of up to 3 dBA
Public Services and Utilities	 Potential increase in response times for emergency access vehicles for areas south of Montlake Bridge due to removal of the ramps	 Same as 6 Lanes with Pacific Street Interchange option	 Removal of transit stop could be more difficult for NOAA facility users who need to access transit	 Same as No Montlake Freeway Transit Stop option, plus reduced response times for emergency service providers along Montlake Boulevard
Recreation	  Less effect on Submerged Lands, McCurdy Park, East Montlake Park; increased effect on Washington Park Arboretum, University of Washington recreational facilities	  Same as 6 Lanes with Pacific Street Interchange option, plus even less effect on East Montlake Park; however, greater visual effect on park users due to height	No change from original 6-Lane Alternative	 Effects on Montlake Boulevard (part of Olmstead Plan), Montlake Bike Path, Ship Canal Waterside Trail, and bike trail along north side of Montlake Cut

EXHIBIT 1  
Summary of Effects of Options to the 6-Lane Alternative

Seattle	6 Lanes with Pacific Street Interchange Option	High 6 Lanes with Pacific Street Interchange Option	No Montlake Freeway Transit Stop Option	Second Montlake Bridge Option
Social	  Removal of Montlake interchange would improve community cohesion; MOHAI would not be removed; however, additional recreation effects would occur; potential longer response times for emergency vehicles	  Same as 6 Lanes with Pacific Street Interchange option	  Minimal effect on Montlake neighborhood – slightly less footprint in neighborhood, removal of transit stop less accessible to neighborhood	  Same as No Montlake Freeway Transit Stop option, plus new disruptions to Montlake neighborhood
Transportation	 Forty-five percent of traffic moved from Montlake Bridge to new Union Bay bridge; widening of Montlake Boulevard north of Pacific Street would remove University of Washington parking; new Pacific Street intersection function at LOS D or better in peak period	 Same as 6 Lanes with Pacific Street Interchange option	 Eliminate two freeway conflict points in each direction, which improves traffic conditions, particularly for transit/HOV	 Improve traffic flow northbound along Montlake Boulevard, improved traffic flow southbound along Montlake Boulevard would increase queues at westbound and eastbound on-ramps to SR 520
Visual Quality and Aesthetics	 More visual change, except for NOAA and MOHAI properties; new interchange dramatically changes visual character of Union Bay/Ship Canal; views from Rainier Vista affected, mostly when trees are leafless	 Same as 6 Lanes with Pacific Street Interchange option, plus height of mainline would be more visible to surrounding neighborhoods, changing views from open views to bridge columns	 Slight reduction in visual effects by moving the SR 520 footprint farther away from NOAA and Shelby-Hamlin residences	  Same as No Montlake Freeway Transit Stop option, plus changed views of and from Montlake Bridge
Water Resources	 Increase in overall net impervious surface area; require relocation of stormwater treatment facilities	 Same as 6 Lanes with Pacific Street Interchange option	 Slight reduction in impervious surface and pollutant loading	  Increase in overall net impervious surface area and increased stormwater runoff rates to existing combined sewer system
 Fewer effects compared to 6-Lane Alternative  More effects compared to 6-Lane Alternative				

EXHIBIT 1  
Summary of Effects of Options to the 6-Lane Alternative

Eastside	Bicycle/Pedestrian Path to the North Option	No Evergreen Point Freeway Transit Stop Option	South Kirkland Park-and-Ride Transit Access – 108th Avenue Northeast Option	South Kirkland Park-and-Ride Transit Access – Bellevue Way Option
Air Quality	No change from original 6-Lane Alternative	 Slightly reduced air emissions at Medina due to removal of transit stop	  Increase in localized air quality effects at intersections of Lake Washington Boulevard and Northup Way, Northup Way and 108th Avenue Northeast, and the SR 520 on-/off-ramps at 108th Avenue Northeast during peak hours. Improved air quality near SR 520/ Bellevue Way interchange	 Slight reduction in air emissions at SR 520/Bellevue Way interchange
Cultural Resources	 Less effect on historic residence and historic school	 Similar to Bicycle/Pedestrian Path to the North option, except even less effect on historic residence	No change from original 6-Lane Alternative	No change from original 6-Lane Alternative
Ecosystems	  Less effect on wetlands and buffers; increased reduction in vegetation; slightly less effect on culverts	  Similar to Bicycle/Pedestrian path to the North option	 Increase in wetlands and buffer effects; loss of riparian wetlands along Yarrow Creek, possible Yarrow Creek channel modifications, and up to four necessary culvert extensions on Yarrow Creek would increase effects on stream and habitat functions	 Slight increase in effects on wetlands and buffers; increase in culvert extensions on Yarrow Creek (2 or 3 more)
Energy	 Energy consumption during construction would be higher	 Energy consumption during construction would be lower	 Energy consumption during construction would be lower	 Energy consumption during construction would be higher
Environmental Justice	No change from original 6-Lane Alternative	No change from original 6-Lane Alternative	No change from original 6-Lane Alternative	No change from original 6-Lane Alternative
Geology and Soils	 Fill section slightly shifted to potentially soft, compressible sediments	 Slightly less excavation of soils near Evergreen Point Road	 Construction of off-ramp would place slightly more fill on potentially soft or liquefiable soils	 Additional excavation and filling of soils at the SR 520/Bellevue Way loop ramp
Hazardous Materials	No change from original 6-Lane Alternative	No change from original 6-Lane Alternative	Not known	Not known
Indirect and Cumulative Effects	No change from original 6-Lane Alternative	No change from original 6-Lane Alternative	No change from original 6-Lane Alternative	No change from original 6-Lane Alternative

EXHIBIT 1  
Summary of Effects of Options to the 6-Lane Alternative

Eastside	Bicycle/Pedestrian Path to the North Option	No Evergreen Point Freeway Transit Stop Option	South Kirkland Park-and-Ride Transit Access – 108th Avenue Northeast Option	South Kirkland Park-and-Ride Transit Access – Bellevue Way Option
Land Use, Economics, and Relocations	 One additional residential displacement in Medina	  Access to transit more difficult for Medina residents; less effect on property tax collections	 More consistent with Kirkland's Comprehensive Plan of providing connections to regional transit	 Same as South Kirkland Park-and-Ride Transit Access – 108th Avenue Northeast option
Navigable Waterways	No change from original 6-Lane Alternative	No change from original 6-Lane Alternative	No change from original 6-Lane Alternative	No change from original 6-Lane Alternative
Noise	 Noise levels could change from 1 to 3 dBA	No change from original 6-Lane Alternative	No change from original 6-Lane Alternative	No change from original 6-Lane Alternative
Public Services and Utilities	No change from original 6-Lane Alternative	No change from original 6-Lane Alternative	 New ramp would provide for reduced response times for emergency vehicles	 Same as South Kirkland Park-and-Ride Transit Access – 108th Avenue Northeast option
Recreation	  New effect on Hunts Point Park; changed effects on Wetherill Park; less relocation of Points Loop Trail required; net acreage affected less than original 6-Lane Alternative	 Similar to Bicycle/Pedestrian path to the North option	No change from original 6-Lane Alternative	No change from original 6-Lane Alternative
Social	Minimal effects	  Minimal effects; reduction in transit access to Medina, decrease in transit travel times	 Minimal effects; reduced response times for emergency vehicles to surrounding areas	 Same as South Kirkland Park-and-Ride Transit Access – 108th Avenue Northeast option
Transportation	 Provides a more direct regional bicycle/pedestrian path connection and reduces grade from 11 to 6 percent on Points Drive	 Improved travel time for buses and remove two travel conflict points for buses from SR 520	 Improved transit travel time between SR 520 and South Kirkland Park-and-Ride lot	 Same as South Kirkland Park-and-Ride Transit Access – 108th Avenue Northeast option
Visual Quality and Aesthetics	 Tree buffer between Points Drive and SR 520 would be removed	  Same as Bicycle/Pedestrian path to the North option, plus less visual effect at Evergreen Point Road due to narrower footprint	 Removal of mature street trees along 108th Avenue Northeast and Northup Way would give intersection a more urban character	No change from original 6-Lane Alternative

EXHIBIT 1  
Summary of Effects of Options to the 6-Lane Alternative

Eastside	Bicycle/Pedestrian Path to the North Option	No Evergreen Point Freeway Transit Stop Option	South Kirkland Park-and-Ride Transit Access – 108th Avenue Northeast Option	South Kirkland Park-and-Ride Transit Access – Bellevue Way Option
Water Resources	 Slightly larger impervious surface area	 A slight reduction in impervious surface area	 Increase in impervious surface area, resulting in an increase of the amount of stormwater being directed to the existing outfall at Yarrow Creek; increase in pollutant loading and runoff volume	 Same effects as South Kirkland Park-and-Ride Transit Access – 108th Avenue Northeast option
 Fewer effects compared to 6-Lane Alternative  More effects compared to 6-Lane Alternative				

# Seattle Project Area

This chapter describes the four options to the original 6-Lane Alternative that could affect the Seattle project area. The four options currently under consideration are:

- 6 Lanes with Pacific Street Interchange option
- High 6 Lanes with Pacific Street Interchange option
- No Montlake Freeway Transit Stop option
- Second Montlake Bridge option

Each section below begins with a description of the option, followed by explanations, by discipline, of how that option would differ from the original 6-Lane Alternative.

Those disciplines that do not differ are listed in a text box next to the option description. Section 4(f) changes are discussed in a later chapter in this report.

## What is the 6 Lanes with Pacific Street Interchange option and how does it differ from the original 6-Lane Alternative?

The intent of the 6 Lanes with Pacific Street Interchange option is to reduce the traffic effects of the Montlake interchange on the surrounding neighborhood and to narrow the SR 520 footprint across Portage Bay. This option would remove the Montlake interchange along SR 520 and would include a new SR 520 interchange, called the Pacific Street interchange, just east of the Montlake interchange. The new interchange would be primarily located over the WSDOT-owned peninsula near the Washington Park Arboretum. A new on- and off-ramp to and from the north would extend to Pacific Street at the University of Washington. A column-supported ramp of four general purpose lanes (two lanes in each direction) would extend over Union Bay (referred to as the Union Bay bridge in this appendix) from the new interchange and would touch down at the University of Washington Husky Stadium parking lot before joining the intersection of Pacific Street and Montlake Boulevard. At that intersection, the roadway would be lowered 8 to 10

The 6 Lanes with Pacific Street Interchange Option would not differ from the 6-Lane Alternative in the following discipline areas:

Indirect and Cumulative Effects

These disciplines are not discussed in this section.

feet from the existing elevation to provide vehicle-only access. The intersection would be covered to allow pedestrian access above and away from vehicular traffic. The roadway on Montlake Boulevard north of Pacific Street would be widened to the east until just south of Northeast 45th Street. The Union Bay bridge would provide a 110-foot vertical clearance, possibly a 70-foot vertical clearance, across the Ship Canal portion of Union Bay. Columns would be placed just outside the width of the Ship Canal to not block boat traffic. Ramps to and from Lake Washington Boulevard would still be included in this option; however, their footprint would be slightly different from the original 6-Lane Alternative. The ramp connections to and from Lake Washington Boulevard and to and from the Union Bay bridge would construe a full diamond interchange, as opposed to a partial diamond interchange under the original 6-Lane Alternative. This full diamond interchange would provide more access to and from Lake Washington Boulevard. No access to or from SR 520 would be provided at Montlake. From Montlake to I-5, SR 520 would be six lanes wide (three in either direction). The profile of the Portage Bay Bridge would not differ under this option from the original 6-Lane Alternative. Buses would access SR 520 via the Union Bay bridge through the University area, providing for a more direct connection between buses and the proposed Sound Transit North Link Station at Husky Stadium. Instead of connecting to the Montlake interchange as in the original 6-Lane Alternative, the bicycle/pedestrian path would follow the Union Bay Bridge from SR 520 and would end at the Pacific Street interchange, close to the Burke-Gilman trail. See Exhibit 2 for the footprint of this option as it compares to the original 6-Lane Alternative footprint.

## **What are the potential effects and mitigation of the 6 Lanes with Pacific Street Interchange option?**

### **Air Quality**

This option would shift some traffic volume from Montlake Boulevard at the SR 520 on- and off-ramps to the Montlake Boulevard and Pacific Street intersection. Air emissions from vehicles would decrease slightly near the SR 520 on- and off-ramps, and would increase slightly in the vicinity of Montlake Boulevard and Pacific Street.

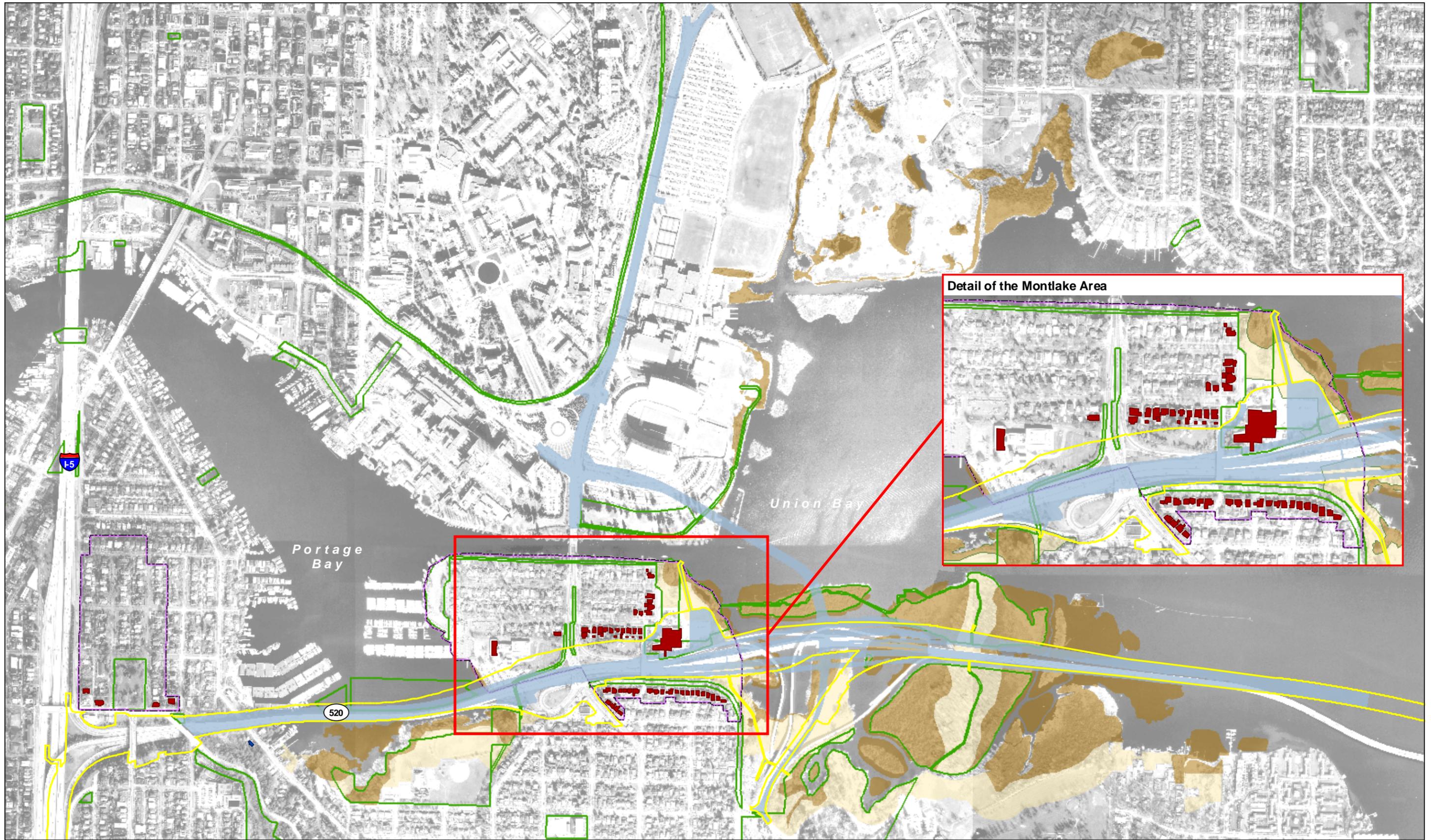
Effects on air quality would increase during the construction of the new interchange at the Washington Park Arboretum and the Ship Canal overpass. Air emissions would result from additional clearing, grading, and paving, as well as from use of diesel-fueled construction equipment.

## Cultural Resources

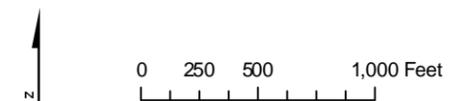
Various resources in the potential National Register of Historic Places (NRHP)-eligible Montlake historic district would experience direct effects from this option. Although some effects would be more severe than others, the district as a whole does not appear to be adversely affected by this option. The National Oceanic and Atmospheric Administration Northwest Fisheries Science Center (the NOAA facility) is located at 2725 Montlake Boulevard East in the Montlake historic district. This resource would be subject to fewer direct effects under this option. Only a small piece of property along the south boundary would be acquired, considerably less than under the original 6-Lane Alternative. The NOAA facility would also experience less visual intrusion from the new Portage Bay Bridge and the new traffic lanes, which would not be as close to the historic property under this option as they would under the original 6-Lane Alternative. In addition, removal of traffic lanes associated with the existing SR 520/Montlake Boulevard interchange would also have a beneficial visual effect on this resource.

The Museum of History and Industry (MOHAI), which is located at 2161 East Hamlin Street, would also experience fewer direct effects. Existing parking areas would still be acquired for this option, which could adversely affect the resource, depending on how much of the parking lot is taken. However, under this option, the building would likely not be demolished as it would under the original 6-Lane Alternative. The view of the new Evergreen Point Bridge west approach and the new bridge to Pacific Street would be more prominent from the MOHAI property, creating a greater visual intrusion. The new west approach to the Evergreen Point Bridge would be considerably higher than the original 6-Lane Alternative. The Pacific Street interchange structure, which would be 110 feet high (or possibly 70 feet high), would be located to the east and north of MOHAI; this structure would introduce a new, intrusive visual element in the surrounding landscape.

Under this option, the residences on East Hamlin Street and Montlake Boulevard East in the potential NRHP-eligible Montlake historic district



- |  |                |               |  |
|--|----------------|---------------|--|
| 6-Lanes with Pacific Street Interchange Option Footprint | Wetlands       | NRHP Eligible | Potentially Eligible Historic District |
| Original 6-Lane Alternative Footprint                    | Wetland Buffer | Contributing  | Parks                                  |



**Exhibit 2. 6 Lanes with Pacific Street Interchange Option**  
 SR 520 Bridge Replacement and HOV Project



would experience less visual intrusion on their historic setting from SR 520 because they would be located farther away. There would be no loss of landscaped buffer zone, and removal of roadway associated with the SR 520/Montlake Boulevard interchange would decrease the visual effects on the potential NRHP-eligible Montlake historic district compared to existing conditions. In addition, those residences along East Montlake Place East would not experience any visual intrusion. However, residences along East Hamlin and East Shelby Streets, east of Montlake Boulevard, and residences along East Park Street would be visually affected by and would experience increased noise from the Union Bay bridge.

The residence at 2209 Lake Washington Boulevard East may experience positive visual effects and a restoration of its setting when the Montlake Boulevard interchange is removed. However, this residence, along with all others along Lake Washington Boulevard East, would be visually affected by the new, taller west approach to the Evergreen Point Bridge and by the new Pacific Street interchange/bridge structure.

A complete cultural resource survey is necessary to assess the effects on historic resources along Pacific Street and Montlake Boulevard East north of the Montlake Cut. Additional research is also necessary to determine the specific history and context of that area. The purpose of this research is to assess whether any extant historic resources are eligible for the NRHP. If eligible resources are discovered, each resource would have to be examined for potential effects under this option.

Under this option, effects on archeological high-probability areas would be slightly reduced in the Montlake neighborhood, while effects would increase slightly on Lake Washington Boulevard East and Foster Island.

If MOHAI were not demolished, then all mitigation associated with that effect under the original 6-Lane Alternative for historic resources would be unnecessary.

Landscaping buffer would no longer be needed behind the residences along East Hamlin Street. Mitigation needed for the NOAA facility property loss would be considerably less under this option. While landscaping improvements may still be necessary, along with minor parking relocation, the replacement of all accessory buildings and large-scale parking would no longer be required, as the property acquisition under this option would involve only a small area along the south end

of the parking lot, and is not likely to demolish any accessory buildings. Additional mitigation may be necessary to address the increased visual effects of the higher Evergreen Point Bridge west approach and the new Pacific Street interchange/Union Bay bridge on the Montlake historic district. Mitigation would also be required for any adverse effects that may occur to potential cultural resources along Pacific Street and East Montlake Boulevard north of the Montlake Cut.

The same mitigation measures for the archeological high-probability areas proposed for the original 6-Lane Alternative would be applied under this option. The only difference would be that proportionally more of the mitigation work would occur at the high-probability areas located on Lake Washington Boulevard East and Foster Island.

## Ecosystems

### Wetlands

Additional wetlands may be affected by this option. Exhibit 2 shows the general location of these wetlands, which are discussed below. An in-depth analysis will be conducted if this option is chosen for further consideration.

Detained and treated stormwater from the proposed Pacific Street interchange and the Union Bay bridge would likely be discharged to Union Bay via the University Slough on the east campus of the University of Washington (University of Washington 2001). The University Slough intersects wetland areas along the Lake Washington shoreline in the east campus (east of Montlake Boulevard). See the *Water Resources* section below for a description of the stormwater system.

The flats of the east campus of the University of Washington were created when the Hiram M. Chittenden Locks were built in 1916. An original delta area became a cattail marsh; the marsh is underlain by peat deposits. Now known as the Union Bay Natural Area, this land is bounded on the southeast and south by Lake Washington, on the west by parking lots and athletic fields, on the north by the university's ceramic and metal arts facility, and on the east by the university's Center for Urban Horticulture. The marsh was used as a landfill until the mid-1960s, when the city of Seattle began closure. A minimum 2-foot cap of clean soil was spread over the area, graded, and seeded; closure was completed in 1971. Since then, subsidence of the deep, spongy peat substrate underlying the landfill has led to the

development and expansion of wetlands (University of Washington 2001).

The 55-acre Union Bay Natural Area encompasses landward and shoreline wetlands. This report describes the shoreline wetlands because they may be affected by the project. Additional information is available in the University of Washington Master Plan Seattle Campus Final EIS (University of Washington 2001).

The shoreline wetlands system runs from the east end of the Montlake Cut to Laurelhurst. This system comprises emergent, scrub-shrub, forested, and aquatic-bed wetlands. Emergent and some scrub-shrub wetlands dominate the western portion of this shoreline area. The eastern shoreline area, from the Center of Urban Horticulture to Laurelhurst, consists of scrub-shrub and forested wetlands.

Dominant vegetation in the emergent wetland area includes common cattail (*Typha latifolia*), yellow iris (*Iris pseudacorus*), purple loosestrife (*Lythrum salicaria*), soft rush (*Juncus effusus*), field horsetail (*Equisetum arvense*), water plantain (*Alisma plantago-aquatica*), and reed canarygrass (*Phalaris arundinacea*). The scrub-shrub wetlands are dominated by Himalayan blackberry (*Rubus discolor*), Pacific willow (*Salix lucida* var. *lasiandra*), Sitka willow (*Salix sitchensis*), red-osier dogwood (*Cornus sericea* ssp. *sericea*), red alder (*Alnus rubra*), and black cottonwood (*Populus balsamifera* ssp. *trichocarpa*).

Forested wetlands in the shoreline area are dominated by black cottonwood, red alder, Pacific willow, Sitka willow, and giant horsetail (*E. telmateia*). The aquatic bed wetland areas are dominated primarily by white water lily (*Nymphaea odorata* var. *odorata*), yellow pond lily (*Nuphar luteum* ssp. *polysepalum*), and Eurasian water-milfoil (*Miriophyllum spicatum*).

Noxious weeds in the shoreline wetland area include yellow iris, purple loosestrife, Himalayan blackberry, white water lily, and Eurasian water-milfoil. During the winter, these wetlands are affected when the water level in the lake is lowered by up to 2 feet to facilitate repair and cleanup along the Ship Canal and the shoreline (University of Washington 2001).

The University Slough extends from Wahkiakum Lane north to 45th Avenue Northeast. The banks of the slough are dominated by native and non-native invasive species, including Himalayan blackberry, willows, reed canarygrass, black cottonwood, Scots broom (*Cytisus*

*scoparius*), red alder, and horsetail. The water and saturated areas are composed of common cattail, yellow iris, lesser duckweed, (*Lemna minor*), purple loosestrife, hardstem bulrush (*Scirpus acutus*), and pond lily (University of Washington 2001).

This option would have more effects on wetlands than the original 6-Lane Alternative, primarily because of bridge column foundations on or near the shoreline of Marsh Island, wetland LWN-4. These structures would require almost double the amount of fill in wetlands, and an additional one-third of the wetlands in the Seattle project area would be shaded if this option were built. Most of the shading effects would occur over Marsh Island, wetlands LWS-2 and LWS-4. The degree of the shading intensity would be the same as the original 6-Lane Alternative because the height of the bridge would not change. Effects on wetland buffers would decrease by about 15 percent, primarily because of less shading from ramps in the Arboretum. For more information on wetlands, see Appendix E, *Ecosystems Discipline Report, Wetlands*.

This option would not directly affect the University Slough or the wetlands in the Union Bay Natural Area. Indirect effects would also not occur because stormwater would be treated prior to release to Ravenna Creek and the University Slough. These effects are similar to the original 6-Lane Alternative.

This option would require 0.9 to 1.3 acres more compensatory mitigation for effects on wetlands, including shoreline wetlands.

## Wildlife

The new affected environment area for this option consists mostly of Urban Matrix with roads and buildings. There is also some open water habitat in Union Bay and the Ship Canal, which provides wildlife habitat for waterfowl and other water birds, beaver, and foraging bald eagles. In addition, the new affected area includes some land categorized as Park and Other Protected Areas cover type (for more information, see Appendix E, *Ecosystems Discipline Report, Wildlife and Habitat*).

This option would remove less vegetation (about .75 acre less of trees and about 2 acres less of shrubs/grasses) than the original 6-Lane Alternative. However, this option would cause more shading effects on vegetation (about 2.4 acres more of wetland vegetation, about 1.25 acre more of shrubs/grasses, and about .75 acre more of trees would be

shaded by the elevated roadway). Actual shading effects on individual areas would depend on roadway height and existing vegetation cover.

The presence of the Union Bay bridge and associated traffic could affect bird use and behavior in the vicinity due to noise, visual disturbance, and the physical obstruction to flight that the bridge may cause. Marsh Island is one of the last contiguous undeveloped shorelines in the Seattle project area. Where the bridge crosses over Marsh Island, wildlife would be affected by loss and shading of habitat, as well as by noise and visual disturbance. Apart from the Union Bay bridge vicinity, disturbance to wildlife because of noise from highway operations would be similar to the original 6-Lane Alternative.

Compared to the original 6-Lane Alternative, this option would change the widths of several bridges (the Portage Bay Bridge would be narrower and the Montlake to Foster Island bridge would be wider). This could result in different effects on flying birds in the area. The actual effect on individual bird species would depend on hunting style, flying style (lower flying birds versus higher flying birds), and other factors.

## Fish Resources

This option would add a connecting bridge over the east end of Union Bay and would change the size, number, and locations of bridge support columns compared to the original 6-Lane Alternative. Exhibits 3, 4, and 5 list the physical characteristics of the existing bridges, the original 6-Lane Alternative, and the new option that would potentially affect the aquatic habitat.

Exhibit 3. Comparison of Number of Columns for the 6 Lanes with Pacific Street Interchange Option

Location	Existing (No Build)	Original 6-Lane Alternative	6 Lanes with Pacific Street Interchange Option
Portage Bay	76 (4-foot diameter) 958 ft <sup>2</sup>	54 (10-foot diameter) 4,240 ft <sup>2</sup>	36 (10-foot diameter) 2,826 ft <sup>2</sup>
Montlake – Foster Island	454 (4-foot diameter) 5,702 ft <sup>2</sup>	54 (10-foot diameter) 4,240 ft <sup>2</sup>	54 (10-foot diameter) 4,240 ft <sup>2</sup>
Foster Island – Lake Washington	(included above)	108 (10-foot diameter) 8,400 ft <sup>2</sup>	69 (10-foot diameter) 5,417 ft <sup>2</sup>
Ship Canal	NA	NA	8 (10-foot diameter) 628 ft <sup>2</sup>
Total Surface Area	6,660 ft <sup>2</sup>	16,880 ft <sup>2</sup>	13,111 ft <sup>2</sup>

NA = not applicable

Exhibit 4. Comparison of Bridge Widths at Shoreline Crossings for the 6 Lanes with Pacific Street Interchange Option

Location	Existing (No Build)	Original 6-Lane Alternative	6 Lanes with Pacific Street Interchange Option
<b>Portage Bay</b>			
West shoreline	62	148	137
East shoreline	78	198	123
<b>Montlake to Foster Island</b>			
West shoreline	96	224	352
East shoreline	60	147	392
<b>Union Bay</b>			
East side of Foster Island	65	180	222
<b>Union Bay Bridge</b>	NA	NA	82

Note that units are in feet.  
NA = not applicable

Exhibit 5. Comparison of Distance from Bottom of Bridges to Water Surface for the 6 Lanes with Pacific Street Interchange Option

Location	Existing (No Build)	Original 6-Lane Alternative	6 Lanes with Pacific Street Interchange Option
<b>Portage Bay</b>			
West end	60	66	66
Mid-span	11	27	27
East end	9	12	12
<b>Montlake to Foster Island</b>			
West end	4	14	14
East end	7	48	48
<b>Union Bay Bridge</b>	NA	NA	110 (or 70)

Note that units are in feet.  
NA = not applicable

The new Union Bay bridge would be supported by rows of two 10-foot-diameter columns. Spans between centerline rows of support columns would be 200 feet, except at the diagonal central span, where column spacing would be 500 feet, with one row of two columns on each side of

the navigation channel. A row of two columns would be placed in shallow water near the shoreline of Marsh Island on the south side of the Ship Canal.

This option would generally affect aquatic habitat in the same areas of Portage Bay, Union Bay, and Lake Washington as the original 6-Lane Alternative, with new affected environment areas occurring at the bridge crossing along the west end of Union Bay. Effects on aquatic habitat would increase substantially in the Union Bay area, but would decrease in the Portage Bay area.

Compared to the original 6-Lane Alternative, the Portage Bay Bridge would have 36 support columns, rather than 54, and would occupy 2,826 square feet of bottom area, rather than 4,240 square feet. Overall shading effects would decrease in Portage Bay because the Portage Bay Bridge would be narrower than the original 6-Lane Alternative.

Construction of the new Union Bay bridge to connect Pacific Street to SR 520 could affect water habitat within the Union Bay area. The new bridge would place support columns in shallow water at the edge of Marsh Island and on both sides of the navigation channel. These columns, which would occupy 628 square feet of bottom area, could provide refuge for fish species that prey on migrating juvenile salmon. The bridge would also cast an 82-foot-wide shadow across the east end of the bay, at a location where all juvenile salmon migrate into the Ship Canal. The bridge, which would be 110 feet above the water surface (or possibly 70 feet above the water surface), would likely produce a diffuse shadow that might influence the migration of some juvenile salmon. This effect would not occur with the original 6-Lane Alternative.

The overall amount of shading produced by the wider bridge and ramps proposed under this option would increase in the Arboretum area. This option would separate the westbound and eastbound roadway and ramps in the Arboretum area, which would produce bands of shadow rather than a continuous one. The ramps and interchange would be elevated over SR 520, slightly decreasing the effect of their shadows on the aquatic habitat.

Compared to the original 6-Lane Alternative, this option would have a total of 49 fewer columns. The net result would be a total decrease of 3,789 square feet of affected lake bottom in the Seattle project area compared to the original 6-Lane Alternative.

Additional support columns across Union Bay within the entrance to the Ship Canal and a bridge casting a shadow over the migratory route of juvenile salmon (at either 110-foot or 70-foot clearance) would likely be perceived as additional effects requiring additional mitigation.

## Energy

This option would move congestion from the existing Montlake interchange to a new interchange on Pacific Street near the southwest corner of Husky Stadium, which would increase mobility through the Montlake area and alleviate congestion over the Montlake Cut. It is unclear what effect the improvements along Montlake Boulevard would have on traffic in the area after the improvements are complete. A detailed traffic analysis is necessary to evaluate the effects on fuel consumption.

Energy effects associated with construction of the project are directly related to the cost of the project (see Appendix F, *Energy Discipline Report, How would project construction temporarily affect energy use?*). Because this option would likely have a higher construction cost than the original 6-Lane Alternative, it can be expected that energy consumption during construction would also be higher.

## Environmental Justice

This option could affect fish resources by adding new support columns to Union Bay and by creating a shadow across the juvenile salmon migratory route in Union Bay; therefore, this option could affect tribal fishing, since the project area is within “usual and accustomed” fishing areas of several federally recognized Indian Tribes. If so, this would require further environmental justice analysis and discussion. Tribes are a minority population; therefore, any potential effect on fish resources could disproportionately affect them compared to the general population.

## Geology and Soils

The new affected environment area for geology and soils includes:

- The Union Bay bridge, which would pass over younger alluvial and peaty soils that are highly compressible
- The Pacific Street interchange, which is located over an area mapped as glacial till. Groundwater is believed to be within a few feet of the existing ground surface in this area

Bridge foundations to support the increased width of the new bridge at the Montlake Cut would probably be placed in glacial till.

Construction of the proposed pedestrian lid at the Pacific Street intersection would require approximately 12 to 15 feet of fill above existing grade. The cut for this intersection would be about 8 feet below existing grade, which could be below the existing groundwater table. If the roadway finish grade is below the groundwater table, a groundwater collection system and sump pump would be needed during construction to keep the intersection from flooding.

This option would add columns to support the new Union Bay bridge at Marsh Island, across the Montlake Cut, and in the parking lot of Husky Stadium. Construction methods to build these columns would be similar to those described for the original 6-Lane Alternative. More information about construction times, temporary work bridges, vibrations, and water quality effects will be provided once the actual construction methods for this option are known.

The elimination of additional lanes and ramps at the existing Montlake interchange would eliminate construction effects from excavating the new wall that would have occurred with the original 6-Lane Alternative.

Ramps and walls close to MOHAI could require additional support of the building foundations prior to wall construction to limit potentially damaging settlement. This support, or underpinning, could involve the use of low overhead micropiles, reinforcement of grade beams and foundations, or soil grouting. Vibrations would be contractually limited and carefully monitored to minimize the potential for damage to the existing building.

## Hazardous Materials

This option would be narrower through the Montlake area. Because of this, the Montlake gasoline service station (Map ID 69 from Appendix I, *Hazardous Materials Discipline Report*) would not be affected, as identified under the original 6-Lane Alternative. If a release of petroleum hydrocarbons has occurred at the station, however, contaminated soil or groundwater could be encountered during construction. The NOAA facility (Map ID 62 from Appendix I, *Hazardous Materials Discipline Report*) would be less affected by this option, which would lower the potential to encounter residual contaminated media below structures that were left in place following

removal and cleanup of three leaking underground storage tanks (LUST). This option could affect other sites identified and discussed for the original 6-Lane Alternative (Map IDs 69, 73, and 76 from Appendix I, *Hazardous Materials Discipline Report*).

The Pacific Street interchange area, which extends north and northwest beyond the original 6-Lane Alternative footprint, was not included in the original Ecology record review, visual reconnaissance, or historical record review discussed in Appendix I, *Hazardous Materials Discipline Report*. Additional study would be necessary to identify any possible effects in the new affected environment area.

## Land Use, Economics, and Relocations

### Land Use

This option would move the function of the Montlake interchange to the Pacific Street interchange, which would reduce the footprint through Montlake and require less land acquisition for right-of-way than the original 6-Lane Alternative. However, new land uses (namely, the University of Washington) not previously identified in the original 6-Lane Alternative would be acquired for the Pacific Street interchange.

### Economics

Compared to the original 6-Lane Alternative, this option would have higher construction costs, which could result in greater construction-related spending effects. Other construction-related effects (such as noise, dust, delays, access modifications) would be greater than the original 6-Lane Alternative because construction would affect a larger geographic area.

This option would affect fewer parcels and less taxable property than the original 6-Lane Alternative, resulting in less effect on property tax collections. There would be fewer effects on the south campus buildings of the NOAA facility, while effects on the service station and MOHAI would be avoided entirely.

The elimination of the SR 520/Montlake Boulevard interchange would help alleviate mobility issues that currently affect the area. It is unclear whether the new interchange would move the conflict area farther north and if the improvements along Montlake Boulevard would induce more trips to the area. Detailed traffic analysis would be needed to assess these potential effects more thoroughly.

The new interchange and the accompanying improvements to the north along Montlake Boulevard would result in a loss of parking on the University of Washington campus. A detailed parking analysis should be conducted to determine the level of effect on the university's overall parking inventory.

## Relocations

This option would reduce the effects on the south campus buildings of the NOAA facility, and would entirely avoid effects on the service station and MOHAI.

Several docks belonging to the University of Washington Waterfront Activities Center are located on the shore of Union Bay, where the Pacific Street interchange ramp would connect with the mainland just south of Husky Stadium. Because the height of this ramp is not known at this time, it is unclear whether the existing docks could continue at this location. WSDOT currently allows moorage under a bridge; however, Homeland Security may prohibit any uses under bridges and associated ramps in the future. It should be noted that while this option's footprint does not directly affect the University of Washington Waterfront Activities Center, design modifications that move the ramp to the north would require the relocation of the center.

If MOHAI were not demolished, then all mitigation associated with that effect under the original 6-Lane Alternative for and would be unnecessary. Mitigation for the Waterfront Activities Center's docks located along the shoreline near Husky Stadium would be determined based on the ability to continue to moor boats under the ramp. If the docks had to be moved from their present location, a new location along Union Bay would need to be identified.

## Navigable Waterways

The *Navigable Waterways Discipline Report* (Appendix L to this EIS) used the current I-5 bridge governing clearance of 127 feet. Since publication of that report, however, the Ship Canal has a new governing clearance of 120 feet, based on the height of the future Seattle Monorail bridge (termed the Ballard Crossing) (Pratt 2005).

Construction of the new Union Bay bridge could pose additional navigational restrictions to vessels traveling on Lake Washington north of the Evergreen Point Bridge, especially those requiring a high clearance. Two government research vessels, the University of

Washington's *R/V Thomas G. "Tommy" Thompson* and NOAA's *Ronald H. Brown*, regularly pass through the Ship Canal into north Lake Washington; these vessels could be affected by changes in vertical clearance. The *R/V Tommy Thompson*, which has an "air draft" (height from waterline to masthead) of 105 feet, does sea trials in Lake Washington (Pratt 2005, Schwartz 2005). The *Ronald H. Brown* has a maximum height of 102 feet above waterline. This vessel passes through the Ship Canal and north Lake Washington to its berth at the NOAA Sand Point Facility several times a year (Albondi 2005).

The navigational channel for the Union Bay bridge would be the same width as the existing Union Bay reach (175 feet); vertical clearance would be 110 feet (or possibly 70 feet). The establishment of a new governing clearance of 70 or 110 feet for vessels traveling east from the Montlake Cut to Lake Washington would prevent any vessel with a higher clearance requirement from traveling into the lake, particularly the *R/V Tommy Thompson* and the *Ronald H. Brown* under the 70-foot clearance scenario.

If the 70-foot vertical clearance were used for the Union Bay bridge, unavoidable negative effects would occur on vessels with higher clearance requirements. The *R/V Tommy Thompson* would no longer be able to use north Lake Washington for sea trials and the *Ronald H. Brown* would no longer be able to dock at the NOAA Sand Point facility. If the 110-foot vertical clearance were used for the Union Bay bridge, neither the *R/V Tommy Thompson* nor the *Ronald H. Brown* would be affected (regardless of the different lake levels maintained by the Army Corps of Engineers).

## Noise

New affected environment areas not previously identified in Appendix M, *Noise Discipline Report*, include the University of Washington Hospital and institutional land uses along Montlake Boulevard.

Noise would need to be modeled in order to determine future noise levels for this option. The noise levels discussed in this section are based on best professional judgment. Under this option, ramps would transition from the mainline of SR 520 to a high aerial structure (Union Bay bridge) east of the existing Montlake interchange. This elevated bridge structure is expected to increase noise levels by 3 to 5 decibels or more (on an A-weight scale [dBA] with no mitigation applied)

compared to the 6-Lane Alternative. In general, traffic noise on elevated structures can be 3 dBA or more than an equivalent at-grade alignment. These increased noise levels would affect residences located east of 25th Avenue East south of SR 520 and at locations near MOHAI and McCurdy Park north of SR 520.

Noise level increases would also be expected for residential receivers located along East Shelby Street near McCurdy Park. The change in noise levels for this area would vary depending on the speed and volume of traffic using the Pacific Street interchange, and could range from 1 to 5 dBA or more. In contrast, some residences along Montlake Boulevard south of the Montlake Bridge could experience a reduction in overall noise levels because traffic would be rerouted to the new interchange north of the Montlake Bridge. Finally, noise level increases of 1 to 3 dBA due to road widening are expected near Pacific Street, including the University of Washington Hospital, Husky Stadium, and other institutional land uses along Montlake Boulevard north of the new intersection.

In addition to the mitigation measures identified for the original 6-lane Alternative, additional noise mitigation may be required for the elevated section of SR 520 and the proposed Pacific Street interchange. Mitigation would likely consist of sound walls along the sides of the structures beginning at Montlake Boulevard, extending onto the interchange, and continuing east, as described under the original 6-Lane Alternative. Additional noise walls would also be likely along the ramps to the Pacific Street intersection. Noise levels at almost all residences exceeding the noise abatement criteria (NAC) could be reduced to below the criteria with mitigation. However, it is possible that residents located east of 25th Avenue East south of SR 520 and at locations near MOHAI and McCurdy Park north of SR 520 could experience future noise levels that are higher than today's noise levels with mitigation, even though they are below the criteria. The increase in noise levels would be due to the added noise from the aerial structures.

## Public Services and Utilities

Additional affected environment areas not previously identified in Appendix N, *Public Services and Utilities Discipline Report*, are Montlake Boulevard to 25th Avenue Northeast, a section of Pacific Street, and the area south of Husky Stadium.

The Seattle Fire Department has two stations located near the new affected area. Station #17, located at 1050 Northeast 50th Street, and station #38, located at 5503 33rd Avenue Northeast, may respond to calls in the area. The Seattle Police Department North Precinct, 10049 College Way North in Seattle, may respond to calls in the area. In addition to the Seattle Police Department, the University of Washington has its own police department that would respond to calls in the area. The effects on fire and police department response and travel times will be evaluated if this option is selected for further consideration.

The University of Washington operates a utility system that serves the campus facilities. Many of these utilities are in tunnels approximately 6 to 7 feet wide by 8.5 to 10 feet high that lie beneath Pacific Place and Rainier Vista. These tunnels continue underneath many of the University of Washington facilities located west of Montlake Boulevard. These utility tunnels cross under Montlake Boulevard, Pacific Street, and Campus Parkway many times. The effects on utilities will be evaluated if this option is selected for further consideration.

This option could require public service vehicles that use the Montlake on- and off-ramps to take a longer route to access the neighborhood south of the existing Montlake Bridge, which might increase response and travel times. However, public service vehicles that must either respond to or travel to the area north of the Montlake Bridge would no longer be delayed by the intermittent closures associated with the bridge.

The original 6-Lane Alternative included an enforcement area, where police vehicles could be stationed. It is not known if this option's design will include an enforcement area. If it does not, the benefit from having an enforcement area would be removed.

This option would reduce the project footprint south of the NOAA facility, which may reduce the effect on the facility.

If this option were selected, additional utilities lying outside of the original 6-Lane Alternative footprint would need to be located to determine the need for relocation and protection of utilities.

## Recreation

This option would acquire approximately 300 fewer square feet of land from Bagley Viewpoint compared to the original 6-Lane Alternative; the percentage of land acquired would drop from 60 percent to

55 percent. The remainder of land in Bagley Viewpoint could remain unusable.

This option would not shift the mainline of the roadway as far north as the original 6-Lane Alternative. As a result, the submerged lands in Portage Bay, which are part of Montlake Playfield, would not be affected to the extent predicted for the original 6-Lane Alternative.

The area of effect in McCurdy Park would only be 0.7 acre, compared to 1.5 acres under the original 6-Lane Alternative. This may allow MOHAI to be preserved. It should be noted, however, that the existing parking lot for MOHAI users would be removed to accommodate the proposed stormwater treatment wetland.

The portion of East Montlake Park to be acquired as part of the original 6-Lane Alternative (west of the proposed stormwater treatment wetland) would be spared, thus reducing the area of effect by 1.4 acres, or 20 percent of the total park area. Eastward views across Union Bay would change as a result of the proposed bridge above the Montlake Cut.

The effect on the Washington Park Arboretum at Foster Island would be similar to the original 6-Lane Alternative, although the proposed highway footprint would shift slightly beyond the footprint of the original alternative to the north and south of the mainline.

The Washington Park Arboretum would also be affected by the proposed Union Bay bridge, which would cross over previously unaffected Marsh Island. The bridge would be 65 to 70 feet above the island and the Arboretum Waterfront Trail (measured from the bottom of the structure); columns to support the bridge would lie along the north and south sides of the island. This crossing of Marsh Island would require acquisition of an additional 0.5 acre of parkland. The bridge and its support columns would be dominant and noticeable features (the *Visual Quality* analysis below indicates that the bridge would encroach upon the island's broad views, openness, and unobstructed sky overhead). This would affect the visual environment for park and trail users. Noise levels would also likely increase on Marsh Island, compared to the original 6-Lane Alternative.

Unlike the original 6-Lane Alternative, this option would affect the University of Washington's recreational facilities. The Union Bay bridge structure would cross over the University of Washington boat center (50 to 55 feet above measured from the bottom of the structure) and a

shoreline trail (approximately 40 feet above measured from the bottom of the structure) before touching down at the Pacific Street/Montlake Boulevard intersection, thus creating possible visual and noise effects for users of those recreational facilities. Farther north, widening Montlake Boulevard to the east of its existing alignment would not affect the Burke-Gilman Trail. Possible widening to the west, however, could affect the buffer of trees between the roadway and the trail, or the trail itself. Placing the roadway closer to the trail would certainly create more proximity effects (noise, air pollution, visual encroachment) for trail users.

Additional mitigation would be required due to the visual effects at East Montlake Park from the new Union Bay bridge. Additional mitigation would also be required for the recreation effects on Marsh Island and the University of Washington open spaces. Specific mitigation required would be defined after a more detailed environmental review is completed.

By removing the Montlake interchange, additional opportunities would be available to further improve the Montlake lid by possibly connecting the Montlake Playfield and/or the Arboretum to the lid.

## Social

The removal of the Montlake ramps and reduced traffic may have a positive effect on neighborhood cohesion. The continuous bicycle/pedestrian path would not connect directly with the existing Bill Dawson Trail; however, the link between Seattle and Eastside project area neighborhoods would still be possible.

The effects on recreational facilities would be reduced overall, and the effect on MOHAI would be avoided when compared to the original 6-Lane Alternative; however, this option would require acquisition of new parkland on Marsh Island in the Washington Park Arboretum. The Pacific Street interchange would dominate views from MOHAI, the trail on Marsh Island, and the University of Washington boat center.

Widening Montlake Boulevard north of Pacific Street may reduce the screening between the Burke Gilman Trail and the roadway. Noise levels in the area around MOHAI and McCurdy Park may increase due to the aerial structures, and noise levels along the section of the Burke Gilman Trail adjacent to Montlake Boulevard are expected to increase due to the additional traffic.

Public service vehicles that may have previously used the Montlake on- and off-ramps to access the neighborhood south of the existing Montlake Bridge may have to take a longer route, which could increase response and travel times. However, under this option, public service vehicles and transit that respond to calls or travel in the area north of the Montlake Bridge would no longer be delayed by the intermittent closures associated with the bridge.

Lowering the Pacific Street interchange would allow bicycle and pedestrian access to all quadrants of the intersection and would remove crossing time delays. The bicycle/pedestrian path across Lake Washington would end at the Pacific Street interchange, close to the Burke-Gilman trail. The new interchange could improve transit travel times to the University of Washington area because of the more direct connection.

## Transportation

This option assumes that the Montlake Boulevard interchange would be closed and the functionality would be relocated to a new interchange that would serve traffic to Montlake Boulevard/Pacific Street and Lake Washington Boulevard. Approximately 45 percent of the traffic on the Montlake Bridge under the original 6-Lane Alternative would be relocated to the new Union Bay bridge. Relocating the interchange to the east would increase the distance between the Montlake Boulevard interchange and I-5, allowing drivers more time to decide which lane they want. This longer distance would improve traffic operations and safety.

Traffic exiting SR 520 enroute to Montlake Boulevard or Lake Washington Boulevard would use the same interchange, rather than two separate interchanges. Because traffic volumes on the two interchanges would be combined, more lanes would be required to service that traffic than the original 6-Lane Alternative. The Pacific Street interchange, which would be as wide as 8 lanes, would operate at level of service (LOS) D or better through the p.m. peak period. This would be an improvement over the LOS E/F operations at the Montlake Boulevard interchange projected for the original 6-Lane Alternative.

By providing a new connection for traffic to reach the Pacific Street/Montlake Boulevard intersection and changing the directionality of traffic at the intersection, substantial widening would be necessary

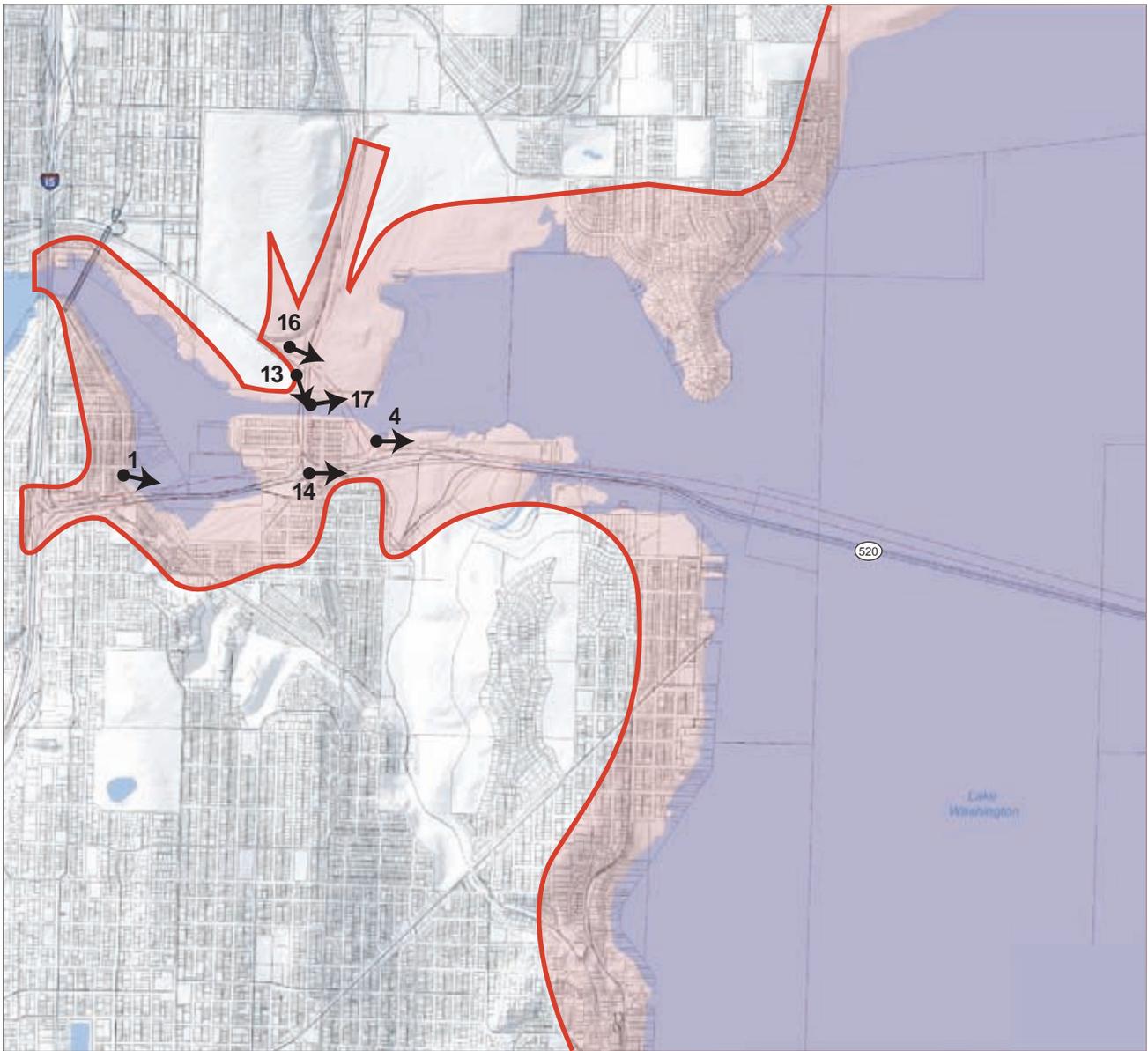
on roadways east and north of the intersection. Upon initial evaluation, at least one additional lane would be needed on Montlake Boulevard in the northbound direction on Montlake Boulevard between Pacific Street and 25th Avenue Northeast. Further study is currently under way to determine whether an additional southbound lane would also be needed.

The proposed intersection design would lower Montlake Boulevard and Pacific Street by 8 to 10 feet to accommodate a pedestrian overcrossing that would minimize the elevation change for people using the overcrossing. The overcrossing would allow pedestrian access to all quadrants of the intersection, thus eliminating pedestrian crossing times from the intersection operational parameters. Operations at the Pacific Street/Montlake Boulevard intersection would be similar to operations under the No Build Alternative intersection configuration. See Appendix R, *Transportation Discipline Report*, for information about the existing and projected levels of service in this area.

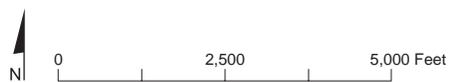
## Visual Quality and Aesthetics

Additional affected environment areas would include Montlake Boulevard through the University of Washington campus, the Montlake Cut/Ship Canal, the Pacific Street intersection, and Rainier Vista. These new areas would become part of the project viewshed (Exhibit 6). The Pacific Street/Montlake Boulevard intersection handles high traffic volumes (vehicular and pedestrian). The traffic volume, combined with the large parking areas south of Husky Stadium, overhead cables for buses, and traffic signals establish a distinctly urban transportation node character. There are no sensitive or important views from the Pacific Street/Montlake Boulevard intersection.

Montlake Boulevard north of Pacific Street is lined with mature trees and has a tree-lined median. These trees now act as a visual screen between the road, sidewalks, and parking lots, and create a spacious pedestrian space. Several driveways connect to the east side of Montlake Boulevard for access to parking areas and the sports facilities, including Husky Stadium. This is a pedestrian-friendly corridor that includes three pedestrian bridges connecting the east campus to the central campus. The Burke-Gilman Trail just west of and above Montlake Boulevard is a heavily used bicycle/pedestrian route for commuters and recreation.



-  Viewshed Boundary
-  Viewpoint Location and Direction



**Exhibit 6. Seattle and West Lake Washington Viewshed and Viewpoint Locations**

SR 520 Bridge Replacement and HOV Project

The University of Washington's Rainier Vista is a tree-lined view corridor. The Final EIS for the Seattle Campus Master Plan noted that Rainier Vista is the most precious view corridor of the University of Washington's Seattle campus, and is vital to the character and form of the campus's overall open space system. Rainier Vista dates to the 1909 Olmsted plan for the Alaska-Yukon Exposition, and is considered to be part of the historic structure of the campus.

Compared to the original 6-Lane Alternative, this option would cause much more visual change overall, with the exception of the MOHAI and NOAA facility properties. It would result in highly visible changes to the character of the SR 520/Montlake Boulevard interchange, Montlake Boulevard north of the Montlake Bridge, and the Pacific Street/Montlake Boulevard intersection. The Pacific Street interchange option would dramatically change the visual character of the Union Bay/Ship Canal area. As with the original 6-Lane Alternative, if sound walls were used on the roadways, the structure would appear more massive (Exhibit 7). The permanent removal of the on- and off-ramps at the SR 520/Montlake Boulevard interchange would result in highly noticeable visual changes there compared to the original 6-Lane Alternative. Less landscaping would be removed at the NOAA and MOHAI properties, allowing most or all of the NOAA facility structures, the MOHAI building, and the gas station to be retained. The retention of structures and landscaping, together with the removal of the Montlake Boulevard ramps, could be positive changes.

The Union Bay bridge, which would be 110 feet above the water near the Ship Canal (or possibly 70 feet above the water), would dominate views from MOHAI, East Montlake Park, and Marsh Island, and would be highly visible from all points around Union Bay having views toward Husky Stadium. Two sets of columns at Marsh Island and the bridge overhead would encroach upon the island's broad views, openness, and unobstructed sky overhead. The Union Bay bridge would be visible from the stands in the north half of Husky Stadium, but would not obstruct the iconic views of Lake Washington or Mount Rainier.

The Pacific Street/Montlake Boulevard intersection would be noticeably larger due to the Pacific Street interchange ramp terminus in the south Husky Stadium parking lot. Additionally, the recessed roadway at Montlake Boulevard would create a markedly different visual environment, but could provide a safer pedestrian environment.

Existing View



6 Lanes with Pacific Street Interchange Option



Looking east from midspan of the Montlake Bridge toward the Pacific Street interchange ramp.



**Exhibit 7. View of Union Bay — Viewpoint 17**

SR 520 Bridge Replacement and HOV Project

The view up Rainier Vista could be improved for pedestrians, but would be eliminated for people in vehicles.

The removal of the sidewalk and all or most of the street trees of various ages along the east side of the Montlake Boulevard would result in an additional visual effect that would not occur with the original 6-Lane Alternative. The wider roadway would also put vehicles closer to buildings and would reduce or require the relocation of the pedestrian zone. The three pedestrian bridges spanning Montlake Boulevard would be replaced with new bridges.

Views from Rainier Vista would be affected according to the distance from the Pacific Street/Montlake Boulevard intersection. The intersection and views beyond are not clearly visible from Central Plaza or Drumheller Fountain, the most sensitive portions of the vista, due to trees and variations in terrain. However, the Union Bay bridge would likely be visible from much of Rainier Vista when trees are leafless. The effect on views near the intersection would be moderate because the area already has a strongly transportation-oriented character to it.

Light, glare, and shadow effects due to this option would be similar to the original 6-Lane Alternative, except along Montlake Boulevard north of the Pacific Street intersection. Removal of trees there would change the light/shade conditions on the sidewalks and plazas of the University of Washington sports complex.

The widened Montlake Boulevard north of Pacific Street would need to be designed to recreate a pedestrian-friendly boulevard character by keeping sidewalks wide, replanting street trees and shrubs, and considering safety when designing drive entrances and parking.

Pedestrian bridges on Montlake Boulevard north of Husky Stadium that are removed for widening the street would need to be replaced because these are essential connections between parking and the east and central campuses of the University of Washington. Pedestrian bridge design should be consistent with the University of Washington Master Plan for the Seattle campus. The open spaces left behind after the removal of the SR 520 roadway and the Montlake Boulevard interchange ramps could be designed as enhanced public spaces that reference or incorporate the Olmstead style of the Arboretum and the University of Washington campus.

## Water Resources

In addition to the affected environment area described in Appendix T, *Water Resources Discipline Report*, this option would affect part of Pacific Street and Montlake Boulevard to its intersection with 25th Avenue Northeast, which would extend the surface water affected environment area to include the University Slough. Currently, stormwater runoff from pavement on Montlake Boulevard north of Pacific Street is conveyed to two sections of a combined sewer system. The section south of the University of Washington sports complex, which includes Husky Stadium and the Waterfront Activities Center, flows south toward Portage Bay; the section north flows along Montlake Boulevard, where it is conveyed in a stormwater pipe to Union Bay via the University Slough (University of Washington 2001). The Pacific Street interchange is located over glacial till, which means that groundwater is likely to occur within a few feet of land surface.

Elimination of the SR 520/Montlake Boulevard interchange and construction and operation of the new Union Bay bridge, which would reach from Marsh Island to the Pacific Street interchange and span the Union Bay reach navigational channel, would:

- Increase the overall net impervious surface in the project area
- Relocate the facilities where stormwater would be treated and discharged

Elimination of the SR 520/Montlake Boulevard on- and off-ramps would reduce the amount of stormwater discharged to the eastern part of the Portage Bay Basin (see Treatment Facility PB-2 in Exhibit 22 of Appendix T, *Water Resources Discipline Report*). In contrast, pollutant loading and flow rates would increase to the stormwater treatment wetland near MOHAI (Treatment Facility UB-1). This increase would be from runoff draining from the southeastern part of the Union Bay bridge. As noted above, improvements to the Pacific Street interchange and the addition of a lane on Montlake Boulevard to 25th Avenue Northeast would increase impervious surface in the area, which would lead to greater runoff volumes and pollutant loading to the existing combined sewer system and to Lake Washington via the University Slough. Increased stormwater discharges will be treated and detained as appropriate for those receiving environments.

As described in the *Geology and Soils* section above, the intersection at Pacific Street and Montlake Boulevard would likely be below the

existing groundwater table, requiring that a groundwater collection/dewatering system be designed and installed for construction and long-term operation to keep the intersection from flooding. Because of the relatively low hydraulic conductivity of glacial till, the radius of influence of the groundwater collection/dewatering system would be limited and likely be negligible beyond the right-of-way; therefore, the flow direction of regional groundwater would not be affected. The reduction of recharge to the regional groundwater flow system would be negligible relative to the total recharge and thus would have no effect on the quantity of regional groundwater flow.

The changes in where stormwater is generated, transported, and discharged would be accounted for by changes in the size, location, and number of treatment facilities identified for the original 6-Lane Alternative. For example, stormwater facility UB-1 would require enlargement to accommodate flows from the Union Bay bridge over Union Bay. Stormwater facility UB-2 would be relocated on the WSDOT-owned peninsula to accommodate a revised ramp profile. Also, a new stormwater facility and upgraded outfall would be needed near the new Union Bay structure on the north side of Union Bay. Stormwater generated by the Montlake Boulevard lane additions would require compliance with Seattle Drainage Code to avoid or minimize negative effects associated with this option. Along Montlake Boulevard north of Pacific Street, detention of stormwater flows would be necessary for discharges to the combined sewer system(s). In addition, potential opportunities for partial separation of stormwater may exist in this area, but would require treatment prior to discharge to the receiving waters.

## What is the High 6 Lanes with Pacific Street Interchange option and how does it differ from the original 6-Lane Alternative?

The intent of the High 6 Lanes with Pacific Street Interchange option is to reduce the traffic effects of the Montlake interchange on the surrounding neighborhood, narrow the SR 520 footprint across Portage Bay, and provide a signature-style high bridge through Portage Bay and Montlake. This option would be the same as the 6 Lanes with Pacific Street Interchange option, with the following exceptions. The Portage Bay Bridge would be elevated 80 to 90 feet above water level to the bottom of the bridge across Portage Bay through to Montlake (as opposed to approximately 15 to 70 feet above water level to the bottom of the bridge in the original 6-Lane Alternative). This bridge would be supported on columns spaced 500 feet apart through Portage Bay. Because SR 520 would be elevated through Montlake (approximately 50 feet above Montlake Boulevard to the bottom of the bridge structure), stormwater treatment proposed for the original 6-Lane Alternative at East Montlake Park could be located under the new elevated SR 520, reducing SR 520's footprint in that area. In addition, the Montlake lid would not be included with this option. See Exhibit 8 for the footprint of this option as it compares to the original 6-Lane Alternative footprint.

The High 6 Lanes with Pacific Street Interchange Option would not differ from the 6-Lane Alternative in the following discipline areas:

Indirect and Cumulative Effects

These disciplines are not discussed in this section.

## What are the potential effects and mitigation of the High 6 Lanes with Pacific Street Interchange option

### Air Quality

Effects on air quality would be the same as those discussed above for the 6 Lanes with Pacific Street Interchange option.

### Cultural Resources

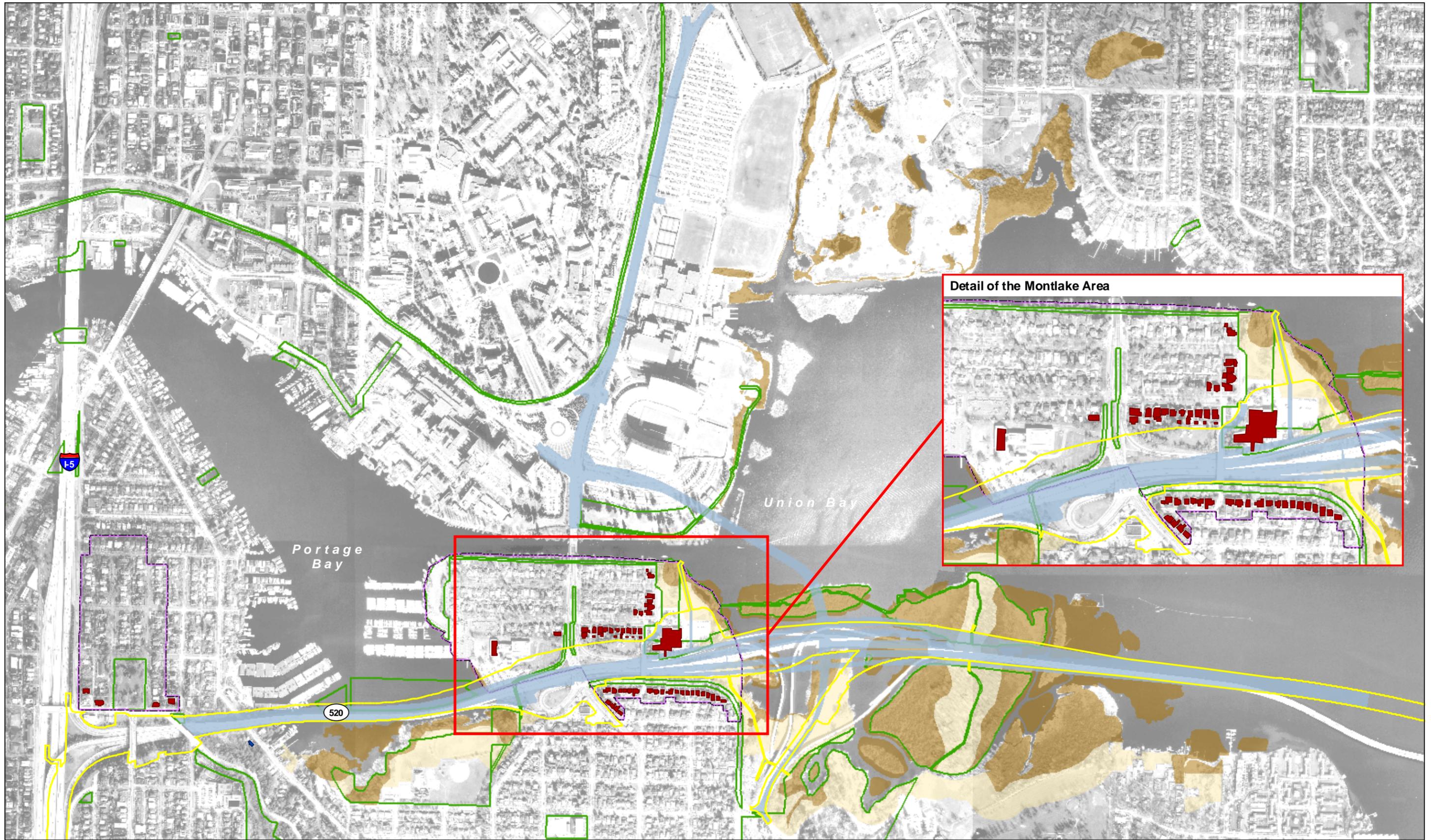
This option shares the differences in effects discussed above for the 6 Lanes with Pacific Street Interchange option. In addition, however, the height of SR 520 under this option (typically 80 feet to 90 feet above

water level and 70 to 90 feet over Montlake and the Arboretum measured from the bottom of the structure) would have an adverse visual effect on the Mason House at 2545 Boyer Avenue East, as well as all properties in the potential NRHP-eligible Montlake and Roanoke Park historic districts that are included in the area of potential effect (APE). Because of the anticipated height of the new SR 520 structure, which would be about 65 feet higher than the Montlake Bridge and about 90 feet above ground level in the Shelby-Hamlin area, the APE for visual effect would have to be expanded to include the Seattle Yacht Club and additional properties along Montlake Boulevard East and East Hamlin Street, all of which are in the potential NRHP-eligible Montlake historic district. The APE may also need to include other properties along the shores of Portage Bay that could be affected by the introduction of a higher bridge across the bay. This expanded APE could include more historic resources, and thus more potential effects. For more information about the original 6-Lane Alternative's APE, see Appendix D, *Cultural Resources Discipline Report*.

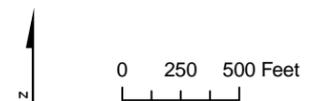
Installation of the high SR 520 structure would remove the existing road structure through Montlake, so the land could be restored as a green space, although it would be under the high roadway and punctuated by multiple piers. The visual effect on residences along SR 520 in Montlake would have one positive aspect – residents would probably view a swath of vegetation where the existing SR 520 roadway used to be. However, the same views would include rows of 6 columns at 250-foot intervals rising out of the new valley and green space under the elevated bridge. The high roadway itself would also be visible from these houses. This would be in strong contrast to the fairly open views over the recessed SR 520 roadway that now exist.

Under this option, effects on archeological high-probability areas would be considerably reduced in the Montlake neighborhood, while effects would slightly increase on Lake Washington Boulevard East and Foster Island.

If MOHAI were not demolished, then all mitigation associated with that effect under the original 6-Lane Alternative for historic resources would be unnecessary. Landscaping buffer would no longer be needed behind the residences along East Hamlin Street. Mitigation needed for the NOAA facility property loss would be considerably less under this option. Landscaping improvements and minor parking relocation would still be necessary, but the replacement of all accessory buildings and large-scale parking would no longer be required. Property



- |   |  |  |  |
|---|--|--|--|
|  High 6 Lanes with Pacific Street Interchange Option Footprint |  Wetlands       |  NRHP Eligible |  Potentially Eligible Historic District |
|  Original 6-Lane Alternative Footprint                         |  Wetland Buffer |  Contributing  |  Parks                                  |



**Exhibit 8. High 6 Lanes with Pacific Street Interchange Option**  
SR 520 Bridge Replacement and HOV Project



acquisition for this option would involve only a small area along the south end of the parking lot, so it would not be necessary to demolish any accessory buildings at the NOAA facility. Additional mitigation may be necessary to address the increased visual effects of the higher Evergreen Point Bridge west approach and the new Pacific Street interchange/Union Bay bridge on the Montlake historic district. Mitigation would also be required for any adverse effects on potential historic resources that may occur along Pacific Street and East Montlake Boulevard north of the Montlake Cut. This option would require additional mitigation measures to address the visual effects of the high SR 520 structure on the surrounding neighborhoods, including the Montlake and Roanoke Park historic districts.

The same mitigation measures for the archeological high-probability areas proposed for the original 6-Lane Alternative would apply under this option. The only difference would be that proportionally more of the mitigation work would occur at the high-probability areas located on Lake Washington Boulevard East and Foster Island.

## **Ecosystems**

### **Wetlands**

This option would have similar effects on wetlands as the 6 Lanes with Pacific Street Interchange option. The area of fill in wetlands and shading of wetlands would be the same for both options; however, the greater height of the bridge for this option would decrease the intensity of shading on wetland vegetation. This option would have about the same effects on wetland buffers as the 6 Lanes with Pacific Street Interchange option.

Direct and indirect effects of this option on the University Slough and the wetlands in the Union Bay Natural Area would be similar to those listed for the 6 Lanes with Pacific Street Interchange option.

This option would require 0.9 to 1.3 acres more compensatory mitigation for wetlands; however, a detailed analysis of light intensities may show effects on wetland vegetation from shading are less, thereby reducing the required mitigation for wetlands.

### **Wildlife**

Within Parks and Other Protected Areas, this option would remove less vegetation (about .75 acre less of trees and about 2.5 less of shrubs/grasses) than the original 6-Lane Alternative. However, this

option would cause more shading effects on vegetation (about 2.5 acres more of wetland vegetation, about 1 acre more of shrubs/grasses, and about 1 acre more of trees would be affected by shading from the elevated roadway).

Effects of the Union Bay bridge on wildlife would be similar to those listed for the 6 Lane with Pacific Street Interchange option.

Higher bridges at Portage Bay and Montlake to Foster Island could have a different type of effect on birds flying in the vicinity. Actual effects on individual bird species would depend on hunting style, flying style (lower flying birds versus higher flying birds), and other factors. Compared to the original 6-Lane Alternative, this option's different bridge widths (the Portage Bay bridge would be narrower and the Montlake to Foster Island and Union Bay bridges would be wider) could result in different effects on flying birds in the area.

Apart from the Union Bay bridge vicinity, noise levels and consequent disturbance to wildlife from highway operations under this option would be similar to the original 6-Lane Alternative.

## Fish Resources

This option would add a connecting bridge over the east end of Union Bay and would change the size, number, and locations of the bridge support columns, as well as the size of the footings, compared to the original 6-Lane Alternative. Exhibits 9, 10, and 11 list the physical characteristics of the existing bridges, the original 6-Lane Alternative, and the new option that would potentially affect the aquatic habitat.

Exhibit 9. Comparison of Number of Columns for the High 6 Lanes with Pacific Street Interchange Option

Location	Existing (No Build)	Original 6-Lane Alternative	High 6 Lanes with Pacific Street Interchange Option
Portage Bay	76 (4-foot diameter) 958 ft <sup>2</sup>	54 (10-foot diameter) 4,240 ft <sup>2</sup>	24 (24' x 24') 3,750 ft <sup>2</sup>
Montlake – Foster Island	454 (4-foot diameter) 5,702 ft <sup>2</sup>	54 (10-foot diameter) 4,240 ft <sup>2</sup>	59 (10-foot diameter) 4,632 ft <sup>2</sup>
Foster Island – Lake Washington	(included above)	108 (10-foot diameter) 8,400 ft <sup>2</sup>	78 (10-foot diameter) 6,123 ft <sup>2</sup>
Ship Canal	NA	NA	8 (10-foot diameter) 628 ft <sup>2</sup>
Total Surface Area	6,660 ft <sup>2</sup>	16,880 ft <sup>2</sup>	14,662 ft <sup>2</sup>

NA = not applicable

Exhibit 10. Comparison of Bridge Widths at Shoreline Crossings for the High 6 Lanes with Pacific Street Interchange Option

Location	Existing (No Build)	Original 6-Lane Alternative	High 6 Lanes with Pacific Street Interchange Option
<b>Portage Bay</b>			
West shoreline	62	148	123
East shoreline	78	198	125
<b>Montlake to Foster Island</b>			
West shoreline	96	224	345
East shoreline	60	147	412
<b>Union Bay</b>			
East shoreline	65	180	214
<b>Union Bay Bridge</b>	NA	NA	82

Note that units are in feet.  
NA = not applicable

Exhibit 11. Comparison of Distance from Bottom of Bridges to Water Surface for the High 6 Lanes with Pacific Street Interchange Option

Location	Existing (No Build)	Original 6-Lane Alternative	High 6 Lanes with Pacific Street Interchange Option
<b>Portage Bay</b>			
West end	60	66	100
Mid-span	11	27	105
East end	9	12	110
<b>Montlake to Foster Island</b>			
West end	4	14	125
East end	7	48	140
<b>Union Bay</b>			
<b>Union Bay Bridge</b>	NA	NA	110 (or 70)

Note that units are in feet  
NA = not applicable

This option would generally affect the same aquatic habitat areas as those described above for the 6 Lanes with Pacific Street Interchange option. The bridge crossing at the east end of Union Bay would require new rows of bridge support columns on the north and south sides of the navigation channel and a row adjacent to the Marsh Island

shoreline. In addition, the Union Bay bridge would cast a shadow across the Ship Canal.

The support columns in Portage Bay would be substantially different, with fewer, larger columns. This option would have 25-foot by 25-foot bridge support columns, which would be much larger than the 10-foot-diameter columns proposed for the original 6-Lane Alternative bridge. There would be fewer columns, 24 for this option compared to 54 for the original 6-Lane Alternative, and the bottom area occupied by the larger columns would be 3,750 ft<sup>2</sup> rather than 4,240 ft<sup>2</sup>.

Placing the Pacific Street interchange connection to the new Union Bay bridge over water in the Arboretum area (Montlake to Foster Island) would increase the number and locations of support columns placed in aquatic habitat. In the Arboretum area south of Marsh Island, the number of columns would increase from 54 to 59, increasing the amount of covered lake bottom area from 4,240 ft<sup>2</sup> to 4,632 ft<sup>2</sup>. In the Union Bay area east of Foster Island, the number of columns would decrease from 108 to 78, decreasing the covered lake bottom area occupied from 8,400 ft<sup>2</sup> to 6,123 ft<sup>2</sup>.

Similar to the 6 Lanes with Pacific Street Interchange option, the overall amount of shading produced by the wider bridge and ramps proposed under this option would increase slightly in the Arboretum area. The westbound and eastbound roadway and ramps would also be separated, producing bands of shadow rather than a continuous one. The ramps and interchange would be elevated, further decreasing the effect of their shadow on the aquatic habitat.

This option would place support columns in shallow water near the shoreline of Marsh Island and on both sides of the navigation channel. The additional support columns in this area would occupy 628 ft<sup>2</sup> of bottom area. The new Union Bay bridge would produce an 85-foot-wide shadow across the width of the Ship Canal at a location where juvenile salmon migrate into the canal. The bridge, at approximately 110 feet above the water surface (or possibly 70 feet above the water surface), would likely produce a diffuse shadow that could influence the migration of some juvenile salmon.

Changes in mitigation for aquatic habitat alteration would likely be requested by the resource agencies for this option. Additional support columns across Union Bay within the entrance to the Ship Canal and a bridge casting a shadow over the migratory route of juvenile salmon (at

either 110-foot or 70-foot clearance) would likely to be perceived as additional effects requiring additional mitigation.

## Energy

This option would have effects similar to the 6 Lanes with Pacific Street Interchange option.

## Environmental Justice

This option could affect fish resources by adding new support columns to Union Bay and by creating a shadow across the juvenile salmon migratory route in Union Bay; therefore, this option could affect tribal fishing. If so, this would require further environmental justice analysis and discussion because tribes are a minority population and this potential effect on fish resources could disproportionately affect tribes compared to the general population.

## Geology and Soils

This option's effects are similar to those described for the Pacific Street Interchange option above, with the following additional effects:

- The drilled shafts supporting the higher bridge would have to be larger than for the lower 6 Lanes with Pacific Street Interchange option bridge. Construction of these larger shafts would require larger equipment and larger temporary work bridges, would produce slightly more drilling spoils, and would take longer to construct.
- The loads on the Portage Bay Bridge would increase, which would change the structure type and involve longer spans between columns. The loads on the columns are so large that they cannot be supported by a single drilled shaft. Therefore, the bridge columns would have to transfer load to several piles or smaller-diameter drilled shafts by means of a cast-in-place concrete pile cap. The conceptual design at the Portage Bay Bridge calls for a 40-foot by 40-foot pile cap. The top of the pile cap would be below the top of the sediments. A sheet pile cofferdam would be constructed around the perimeter of the pile cap to create a watertight enclosure. The sediments would be excavated through the water within the sheet piles; no excavation or sediment would be exposed outside the sheet piles. Depending on the depth, either an unreinforced base slab or a reinforced concrete pile cap would be constructed by

pumping concrete via a tremie pipe through the water to the bottom of the excavation. Using the tremie pipe to pump concrete through the water would eliminate the need to dewater the soil around the cofferdam. After the concrete cap or slab has cured, the water would be pumped out of the sheet pile enclosure to allow the bridge column to form in a dry environment. The cofferdam would be watertight, so very little water would need to be pumped. The small volume of water could be collected and treated prior to disposal offsite. Water would be pumped to a treatment facility prior to discharge.

- There is a remote possibility that the shaft size for the other bridges would increase enough to make single drilled shaft support of each column uneconomical or impractical to construct using locally available equipment. If this were the case, the abovegrade bridge columns would have to be connected to several belowgrade piles or smaller-diameter drilled shafts by a pile cap, similar to that described for the Portage Bay Bridge, though smaller in size.

Effects at the Pacific Street interchange and Montlake crossing would be similar to those listed for the 6 Lanes with Pacific Street Interchange option listed above.

## **Hazardous Materials**

The footprint and the effects are similar to those identified above for the 6 Lanes with Pacific Street Interchange option.

## **Land Use, Economics, and Relocations**

### **Land Use**

The effects of this option would be the same as those described above for the 6 Lanes with Pacific Street Interchange option.

### **Economics**

This option would have similar operational and construction effects as the 6 Lanes with Pacific Street Interchange option relative to the original 6-Lane Alternative.

### **Relocations**

The effects of this option and mitigation would be the same as those described for the 6 Lanes with Pacific Street Interchange option.

## Navigable Waterways

The effects of this option and mitigation would be the same as those described for the 6 Lanes with Pacific Street Interchange option.

## Noise

Noise would need to be modeled in order to determine future noise levels for this option. The noise levels discussed in this section are based on best professional judgment. Under this option, future noise levels could be 0 to 7 dBA higher than predicted for the original 6-Lane Alternative. Noise levels would increase along the entire highway from Delmar Drive to the Pacific Street interchange because of the higher noise levels generally associated with this type of elevated highway structure. In addition, noise levels could increase farther away from the elevated structure than would be experienced under the original 6-Lane Alternative. These higher noise levels would also be the result of the elevated structure, which would not benefit from the noise-reducing shielding of front-line structures and the retained cut at the SR 520/Montlake Boulevard interchange.

Finally, aerial structures are known to vibrate as traffic uses them. In the process, the structure itself produces noise. This structure-borne noise radiates from the bottom and sides of the structure downward to noise-sensitive land uses, which could result in additional noise level increases for receivers located under or near the new structure.

Mitigation would be similar to the original 6-Lane Alternative and would include noise walls along the sides of the elevated structures, including the Pacific Street interchange. As with other alternatives and options, noise levels at almost all residences exceeding the NAC could be reduced to below the criteria with noise abatement measures. It is more likely under this option than the original 6-Lane Alternative and the 6 Lanes with Pacific Street Interchange option that some locations would experience higher future noise levels than today's noise levels. Also, there is no method of mitigation for structure-borne noise and some locations under or near the new SR 520 bridge are expected to have noise levels that are higher than would be experienced under the original 6-Lane Alternative.

## Public Services and Utilities

The effects of this option would be the same as those described for the 6 Lanes with Pacific Street Interchange option.

## Recreation

The effects of this option on Bagley Viewpoint and the Montlake Playfield (submerged lands) would be similar to those described for the 6 Lanes with Pacific Street Interchange option.

The affected areas in McCurdy Park would be further reduced (from both the original 6-Lane Alternative and from the 6 Lanes with Pacific Street Interchange option) to 0.5 acre. This would likely allow for the preservation of MOHAI.

East Montlake Park would be a major beneficiary of this option. The proposed stormwater treatment wetland would be located under the highway structure and the MOHAI structure would probably be spared. As a result, only 0.6 acre would need to be acquired (approximately 8.5 percent of the total park area), compared to 3.25 acres under the original 6-Lane Alternative and 1.84 acres under the 6 Lanes with Pacific Street Interchange option. Eastward views across Union Bay would be affected in a fashion similar to the 6 Lanes with Pacific Street Interchange option.

The effects on Foster Island and Marsh Island in the Washington Park Arboretum would be similar to the 6 Lanes with Pacific Street Interchange option, except that the bridge over the Montlake Cut would be at least 90 feet above Marsh Island and the Arboretum Waterfront Trail. The height of the structure would likely make it an even more dominant and noticeable feature, which would affect the visual environment for some park and trail users.

The effects on the University of Washington recreational facilities would be similar to those described for the 6 Lanes with Pacific Street Interchange option.

Additional mitigation would be required due to the visual effects at East Montlake Park. Additional mitigation would also be required for the recreation effects on Marsh Island and the University of Washington open spaces.

## Social

Effects of this option would be essentially the same as those described for the 6 Lanes with Pacific Street Interchange option. Effects on recreational facilities would be further minimized because of the design of the facility. However, the structure would be more visible from the

surrounding recreational facilities and noise levels could be louder due to vibrations caused by traffic on the elevated structure.

## Transportation

Traffic operations would be the same as those defined for the 6 Lanes with Pacific Street Interchange option.

## Visual Quality and Aesthetics

This option would be dramatically different from the original 6-Lane Alternative because of its height (typically 80 feet to 90 feet above water level and 70 to 90 feet over Montlake and the Arboretum measured from the bottom of the structure). This option would cause much less visual change to the NOAA and MOHAI properties than the original 6-Lane Alternative, and could result in substantial, potentially positive, changes to the visual character of Montlake Boulevard and the SR 520/Montlake Boulevard interchange area (Exhibit 12). The Pacific Street interchange ramp would dramatically change the visual character of the Union Bay/Ship Canal area near Husky Stadium and the Pacific Street/Montlake Boulevard intersection. As with the original 6-Lane Alternative, the structure would be more noticeable if sound walls were used on the roadways (Exhibit 13).

This option would make the height of the mainline highly visible from all points around Portage Bay; Union Bay; and much of Laurelhurst, Montlake, the Arboretum, and North Madison Park. Compared to the original 6-Lane Alternative, the increased column spacing over Portage Bay, from 250 feet apart to 650 feet apart, would substantially open up views at water level around the bay. By the same token, the increased height would make the SR 520 roadway visible from places where the original 6-Lane Alternative was not, such as Montlake, where this option would be about 55 feet above the Montlake Bridge and about 90 feet higher than ground level in the Shelby-Hamlin area (measured from the bottom of the structure) (Exhibit 14). This option would change the view from homes along SR 520 from roadway to a swath of vegetation. These homes would also have a view of the bridge support columns, which would rise out of the new valley where SR 520 used to be, aligned in rows of 6 columns at 250-foot intervals (Exhibit 15). This is in strong contrast to the fairly open views over the recessed SR 520 roadway that now exist, or to the sound walls that would result from the original 6-Lane Alternative.

Existing View



High 6 Lanes  
with Pacific  
Street  
Interchange  
Option



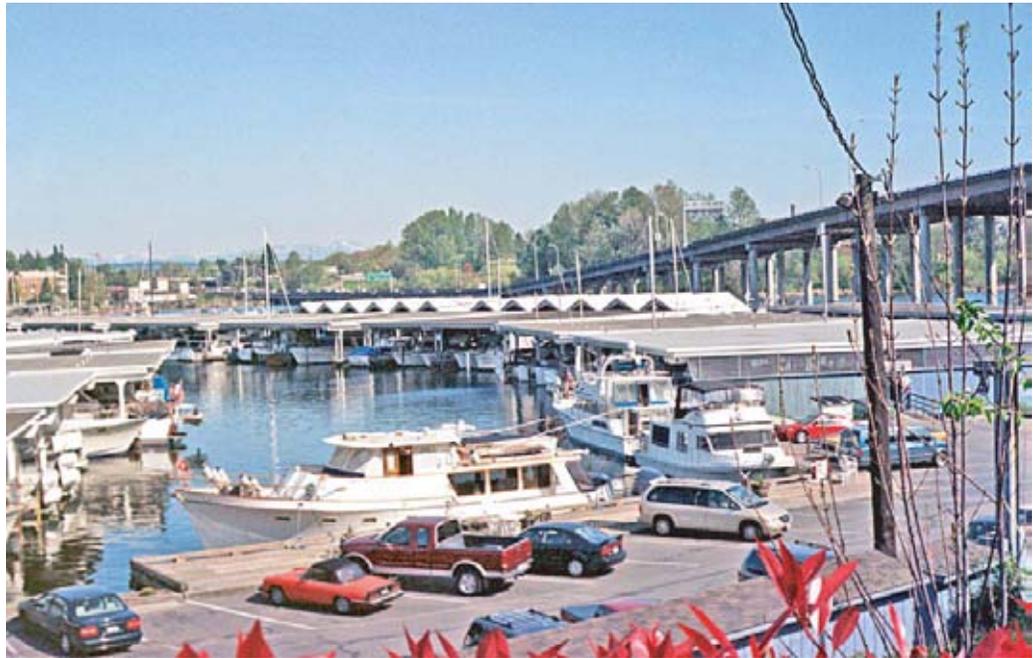
Looking southeast from the Triangle  
Underground Parking garage toward the  
redesigned Pacific Street interchange.



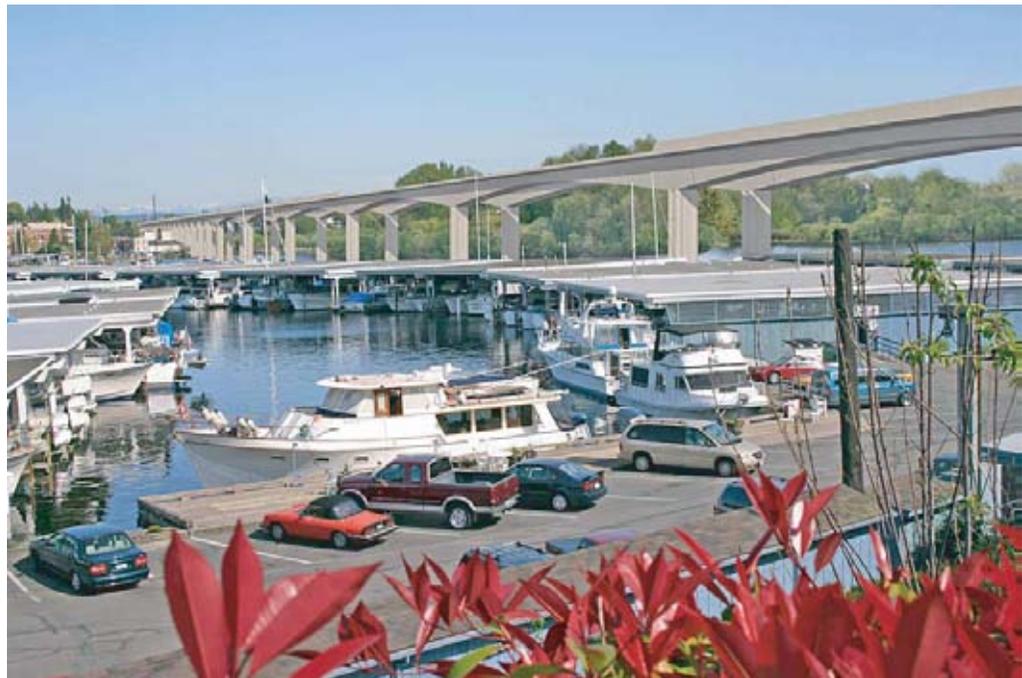
**Exhibit 12. View of Pacific Street  
Interchange — Viewpoint 16**

SR 520 Bridge Replacement and HOV Project

Existing View



High 6 Lanes  
with Pacific  
Street  
Interchange  
Option



Looking east-southeast from the sidewalk on Boyer Avenue just south of Edgar Street, across the Queen City Yacht Club toward Portage Bay



**Exhibit 13. View of Portage Bay — Viewpoint 1**

SR 520 Bridge Replacement and HOV Project

Existing View



High 6 Lanes with Pacific Street Interchange Option



Looking east from the shoreline near the Museum of History and Industry parking lot across waterway in the Arboretum.



**Exhibit 14. View of Evergreen Point Bridge near Arboretum — Viewpoint 14**

SR 520 Bridge Replacement and HOV Project

Existing View



High 6 Lanes with Pacific Street Interchange Option



Looking east toward Lake Washington along the route of the old SR 520 roadway.



**Exhibit 15. View of Bridge Support Columns — Viewpoint 14**

SR 520 Bridge Replacement and HOV Project

This option would also be highly visible from the Arboretum, where the road deck at Foster Island would be as much as 90 feet higher than the original 6-Lane Alternative. Views from ground level at the Arboretum would be much more open as a result, but the rows of 6- or 7-columns spaced at 250-foot intervals could dominate views. Two sets of columns on Marsh Island and the ramp overhead would encroach upon the island's broad views, openness, and unobstructed sky overhead. The Union Bay bridge ramp would be visible from stands in the north half of Husky Stadium, but would not obstruct the iconic views of Lake Washington or Mount Rainier.

Compared to the original 6-Lane Alternative, no landscape or buildings would be removed from the NOAA facility or MOHAI, and the service station would also be left in place. A highly noticeable visual change would result from the permanent removal of the on- and off-ramps at the SR 520/Montlake Boulevard interchange.

The visual changes to Montlake Boulevard and to views from Rainier Vista would be similar to those described for 6 Lanes with Pacific Street Interchange option. Views of the Union Bay bridge would be similar to the 6 Lanes with Pacific Street Interchange option.

This option would have light and glare effects similar to the original 6-Lane Alternative. The elevated roadway would cast shadows on the NOAA site, houses north of the structure, and Marsh Island. The Pacific Street interchange ramp over Union Bay would also cast shadows on the bay.

The widened Montlake Boulevard north of Pacific Street would need to be designed to recreate a pedestrian-friendly boulevard character by keeping sidewalks wide, replanting street trees and shrubs, and considering safety when designing drive entrances and parking. Pedestrian bridges on Montlake Boulevard north of Husky Stadium that are removed to widen the street would need to be replaced because these are essential connections between parking and the east and central campuses of the University of Washington. Pedestrian bridge design should be consistent with the University of Washington Master Plan for the Seattle campus. The open spaces left behind after the removal of the SR 520 roadway and the Montlake Boulevard interchange ramps could be designed as enhanced public spaces that reference or incorporate the Olmstead style of the Arboretum and the University of Washington campus.

## Water Resources

Elimination of the SR 520/Montlake Boulevard interchange and construction and operation of the new Union Bay bridge, which would reach from Marsh Island to the Pacific Street interchange and span the Union Bay reach navigational channel, would:

- Increase the overall net impervious surface in the project area
- Relocate the facilities where stormwater would be treated and discharged

Elimination of the SR 520/Montlake Boulevard on- and off-ramps, coupled with the height of the new bridge, would reduce discharge of SR 520 stormwater to the eastern part of the Portage Bay Basin. Stormwater generated by the high bridge west of Montlake Boulevard would flow towards the Boyer Street outfall (PB-1). Stormwater generated between the Montlake Boulevard and Foster Island high point would flow to the peninsula. Stormwater east of here would be discharged through the bridge column wetlands under the west approach highrise (see Exhibit 22 in Appendix T, *Water Resources Discipline Report*).

As described for the 6 Lanes with Pacific Street Interchange option, impervious surface would increase at the Pacific Street interchange and along Montlake Boulevard north of Pacific Street. This increase would lead to greater runoff volumes and pollutant loading to the combined sewer system and to Lake Washington via the University Slough. All changes in flow will be addressed following the guidelines in WSDOT's 2004 Highway Runoff Manual and the Seattle Drainage Code.

As described in the *Geology and Soils* section above, the drilled shafts supporting the higher bridges would have to be larger and deeper, with much larger pile caps (up to 40 feet by 40 feet). The larger shafts and pile caps would not affect the flow direction of regional groundwater. The reduction of recharge to the regional groundwater flow system would be negligible relative to the total recharge and thus would have no effect on the quantity of regional groundwater flow.

The changes in where stormwater is generated, conveyed, and discharged would be accounted for with changes in the size, number, and location of treatment facilities identified for the original 6-Lane Alternative. The Boyer Street wet vault (PB-1) would be enlarged to handle the higher volumes generated at that facility, and the existing outfall would need to be evaluated as to whether it must be enlarged to

handle the higher flows. Mitigation for this option differs from the original 6-Lane Alternative with a size adjustment of the PB-1 and UB-2 treatment facilities. Facility UB-2 located on the peninsula would be substantially larger due to the SR 520 mainline and ramp profile revisions in this area.

Depending on the additional volume generated, the number of bridge column wetlands would either remain the same or would be added to the additional columns required to support this section of the bridge. An additional difference from the original 6-Lane Alternative would be the treatment and discharge of stormwater from the Union Bay structure over Union Bay, from the Pacific Street interchange, and from the Montlake Boulevard lane addition. These stormwater flows would be controlled and treated prior to discharge to receiving waters. Compliance with the conditions and requirements of the WSDOT's 2004 Highway Runoff Manual and Seattle Drainage Code would avoid or minimize negative effects associated with this option.

## What is the No Montlake Freeway Transit Stop option and how does it differ from the original 6-Lane Alternative?

The intent of the No Montlake Freeway Transit Stop option is to narrow the SR 520 footprint through the Montlake neighborhood. This option would not provide any Montlake freeway transit stops on SR 520, however the same Eastside transit stops as in the original 6-Lane Alternative would still be included. The SR 520 footprint would be slightly reduced from the north through the Montlake neighborhood compared to the original 6-Lane Alternative. The function of the Montlake freeway transit stop would be assumed to occur at the University of Washington and would be closer to the proposed Sound Transit North Link Station. See Exhibit 16 for the footprint of this option as it compares to the original 6-Lane Alternative footprint.

The No Montlake Freeway Transit Stop Option would not differ from the 6-Lane Alternative in the following discipline areas:

- Ecosystems –
- Wetlands
- Wildlife
- Fish Resources
- Environmental Justice
- Geology and Soils
- Hazardous Materials
- Indirect and Cumulative Effects
- Land Use
- Noise
- Recreation
- Relocations

These disciplines are not discussed in this section.

## What are the potential effects and mitigation of the No Montlake Freeway Transit Stop option?

### Air Quality

The effect on air quality would be slightly reduced under this option because air emissions from a diesel-fueled bus are lower when it is traveling at a steady speed, versus during stopping, idling, and starting at the transit stop.

There would also be a slight reduction in effects during the construction phase because of the smaller highway footprint.

### Cultural Resources

This option would have few differences in its effect on cultural resources from the original 6-Lane Alternative. It would have a slightly less intense effect on the NOAA facility property by taking a smaller amount of land, but most accessory buildings would still be demolished and the parking lot would still be removed. The houses along East

Hamlin Street on the east side of Montlake Boulevard would be less affected because SR 520 and the bicycle/pedestrian path would be located farther away from the rear of these properties, removing less of the green space that serves as a landscape buffer.

Under this option, effects on archeological high-probability areas would be considerably reduced in the Montlake neighborhood, while effects would increase slightly on Lake Washington Boulevard East and Foster Island.

## **Energy**

This option is estimated to have a lower construction cost than the original 6-Lane Alternative; therefore, it can be expected that energy consumption during construction would also be lower.

## **Land Use, Economics, and Relocations**

### **Economics**

The effects of this option on property tax collections would be approximately the same as those described for the original 6-Lane Alternative.

Compared to the original 6-Lane Alternative, construction costs for this option are anticipated to be lower, which would result in lower construction-related spending effects. Other construction-related effects (i.e., noise, dust, travel delays) are expected to be similar to the original 6-Lane Alternative.

### **Navigable Waterways**

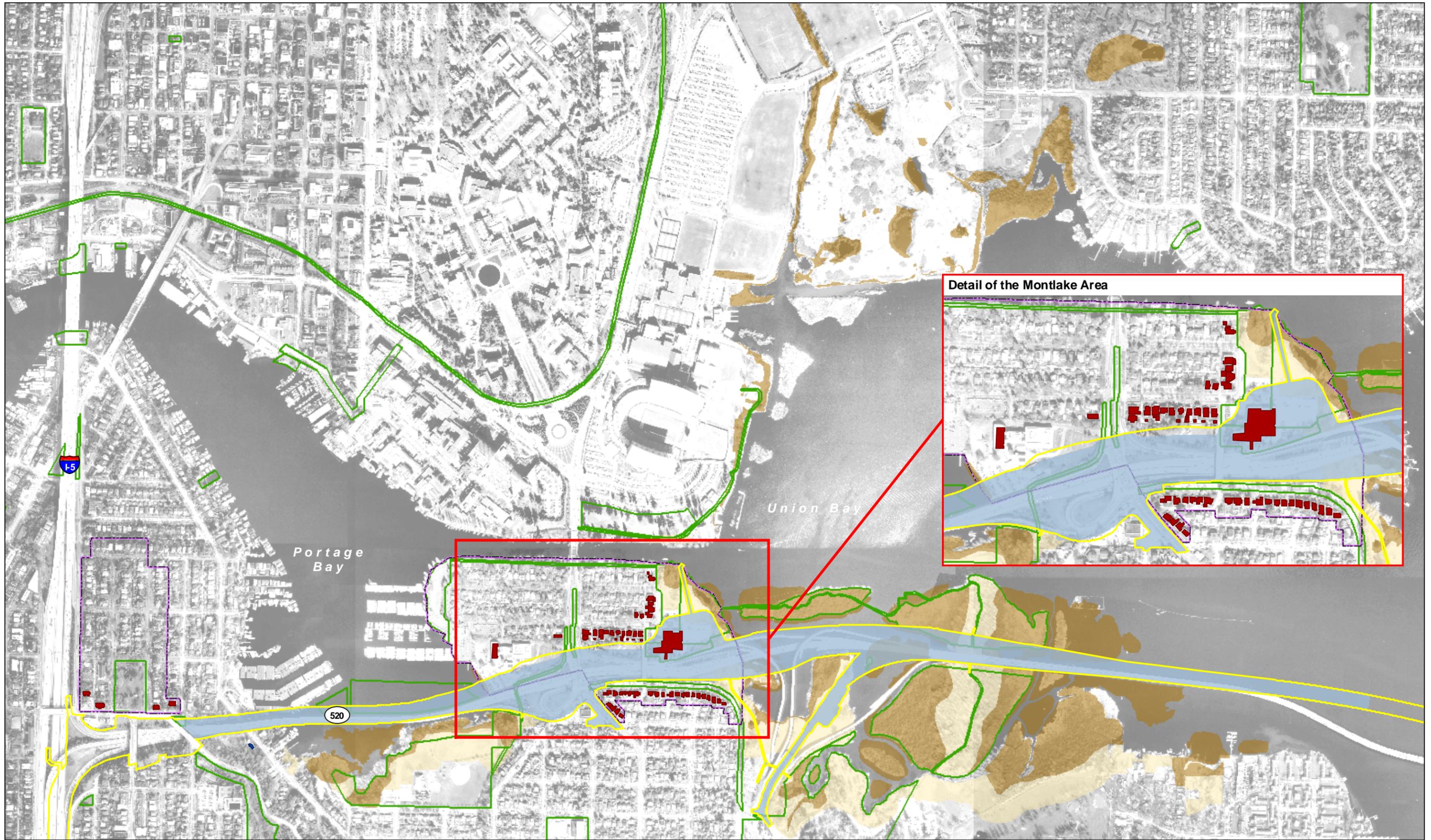
The effects of this option would be the same as those described for the original 6-Lane Alternative.

### **Public Services and Utilities**

This option may have a reduced effect on the NOAA facility because of the smaller footprint. In addition, removing this transit stop could make it more difficult for those who used it to access the NOAA facility, depending on where the transit stop is ultimately relocated.

### **Social**

This option would have minimal effects on the Montlake community. The smaller footprint associated with this option could slightly reduce



- |   |                |               |  |
|---|----------------|---------------|--|
| No Montlake Freeway Transit Stop Option Footprint | Wetlands       | NRHP Eligible | Potentially Eligible Historic District |
| Original 6-Lane Alternative Footprint             | Wetland Buffer | Contributing  | Parks                                  |



0 250 500 1,000 Feet



**Exhibit 16. No Montlake Freeway  
Transit Stop Option**  
SR 520 Bridge Replacement and HOV Project



the effect on the NOAA facility. The removal of the freeway transit stop may increase travel times for those who used this transit stop to access the NOAA facility and the surrounding neighborhood.

## Transportation

Removing the Montlake Boulevard freeway transit stop would eliminate two freeway conflict points in each direction, which would improve traffic operations, particularly for the HOV lane, where merge and diverge activity occurs.

This option would reduce access to high-frequency transit service across Lake Washington. To maintain high-frequency bus service to the University of Washington area, some additional service hours would have to be added. Initial estimates are that two additional buses would be needed during the peak hour to serve bus patrons. The project team is currently working with King County Metro and Sound Transit to evaluate updated origin/destination data to determine what level of additional service would be needed.

## Visual Quality and Aesthetics

This option would result in less visual change than the original 6-Lane Alternative because the footprint of the SR 520/Montlake Boulevard interchange would be narrower than the original 6-Lane Alternative footprint. This would be noticeable at the NOAA facility property and along the Shelby-Hamlin green space that parallels the westbound off-ramp. In addition, sound walls and the bicycle-pedestrian path would be farther from the Shelby houses and the NOAA facility.

This option's light, glare, and shadow effects would be similar to the original 6-Lane Alternative.

Less of a new landscape buffer would be needed if less of the existing green space behind the East Hamlin Street houses were removed. This would also provide more opportunity to visually screen the Shelby-Hamlin sound walls with trees and shrubs under this option.

## Water Resources

There would be a small difference in effects between this option and the original 6-Lane Alternative. A visual comparison of aerial photographs with the option footprint indicates that there would be some reduction in the amount of impervious surface area. Pollutant loading and

generated stormwater volumes would be also slightly reduced compared to the original 6-Lane Alternative.

Stormwater mitigation for the effects of this option would differ from the original 6-Lane Alternative only in the reduced size of the facilities required for water quality treatment.

## What is the Second Montlake Bridge option and how does it differ from the original 6-Lane Alternative?

The intent of the Second Montlake Bridge option is to narrow the SR 520 footprint through the Montlake neighborhood, while providing for transit (bus) access from SR 520 to the University of Washington. This option would be the same as the No Montlake Freeway Transit Stop option, except that it would also include a second Montlake bridge across the Montlake Cut. This bridge would be a parallel, bascule (draw) bridge located just east of the existing Montlake Bridge. The two bridges would operate as one-way in opposite directions. See Exhibit 17 for the footprint of this option as it compares to the original 6-Lane Alternative footprint.

The Second Montlake Bridge Option would not differ from the 6-Lane Alternative in the following discipline areas:

Ecosystems – Wetlands  
Environmental Justice  
Indirect and Cumulative Effects

These disciplines are not discussed in this section.

## What are the potential effects and mitigation of the Second Montlake Bridge option?

### Air Quality

This option would likely ease traffic congestion by adding an additional lane in each direction. The added capacity would improve traffic flow near the Pacific Street/Montlake Boulevard intersection. However, more traffic would reach the SR 520 interchange in a shorter period of time, which would extend the queues on both the westbound and eastbound on-ramps. This shift in traffic pattern would likely result in improvements to air quality near Pacific Street and Montlake Boulevard, with a slight degradation near the SR 520 interchange. Also, a slight reduction in effects on air quality would result from eliminating the Montlake freeway transit stops, as described above.

During the construction phase, effects on air quality would increase because of construction activities associated with the new Montlake bridge. Air emissions would result from additional clearing, grading, and paving, as well as from the use of additional diesel-fueled construction equipment.