

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

**Appendix X
Pacific Street Interchange
Option – Screening and
Location Analysis
Technical Memorandum**

Prepared by

Washington State Department of Transportation

July 24, 2006

Contents

List of Exhibits	iv
Acronyms and Abbreviations	v
What are the key points of this report?	1
Why did we consider Seattle options to the 6-Lane Alternative?	2
How did we identify the 6-Lane Alternative options?	3
What options to the 6-Lane Alternative in Seattle did WSDOT study?	4
What design variations did we consider for the Pacific Street interchange?.....	6
How were the options to the 6-Lane Alternative screened?	11
What were the results of the screening evaluation for the proposed Pacific Street Interchange?	13
What additional analysis of the Pacific Street Interchange did we perform?	16
How do the current Pacific Street Interchange designs and the Montlake shoreline alignment compare?	21
What was our conclusion about the proposed Pacific Street Interchange location?	28

List of Exhibits

- 1 Pacific Street Interchange–Proposed Location
- 2 Screening Evaluation, Full Diamond (Pacific Street Interchange Option)
- 3 Screening Evaluation, 3-Level Interchange
- 4 Screening Evaluation, Half-Diamond Interchange
- 5 Screening Evaluation, Pacific Street Interchange with Montlake Shoreline Alignment
- 6 Pacific Street Interchange–Montlake Shoreline Alignment
- 7 Direct "Use" Estimates of Section 4(f) Park and Recreational Resources, Proposed Pacific Street Interchange and Montlake Shoreline Alignments

Acronyms and Abbreviations

EB	eastbound
EIS	environmental impact statement
ESA	Endangered Species Act
FHWA	Federal Highway Administration
MOHAI	Museum of History and Industry
NOAA	National Oceanic and Atmospheric Administration
NRHP	National Register of Historic Places
WAC	Waterfront Activities Center
WB	westbound
WSDOT	Washington State Department of Transportation

The purpose of this document is to provide additional information on the analysis Washington State Department of Transportation (WSDOT) did to evaluate potential designs for the Pacific Street Interchange option. This option is one of the options for the 6-Lane Alternative analyzed in the SR 520 Bridge Replacement and HOV Project Draft Environmental Impact Statement (Draft EIS). This document explains the context in which options were developed for the 6-Lane Alternative, describes the locations and configurations WSDOT evaluated for the Pacific Street interchange, and explains the issues WSDOT considered in deciding which Pacific Street interchange design (or designs) to include in the Draft EIS.

What are the key points of this report?

In late 2004/early 2005, neighborhoods adjacent to SR 520 in Seattle expressed concern that that the 6-Lane Alternative was too wide through the corridor and that, also, the 6-Lane Alternative did not facilitate easy transfers between transit on SR 520 and the planned Sound Transit Link light rail station near Husky Stadium. In response to this feedback, WSDOT worked to develop options for the 6-Lane Alternative that met the goals of the community and were consistent with the purpose and need of the SR 520 Bridge Replacement and HOV Project. This process ultimately focused on different ways to achieve the transportation functions of the Montlake Boulevard and Lake Washington Boulevard interchanges. Among these was the possibility of a new interchange that connected SR 520 to Montlake Boulevard at Pacific Street. This design concept became known as the Pacific Street interchange.

WSDOT evaluated several locations and designs for the Pacific Street interchange. These locations and designs were evaluated using the same criteria used in the first-level screening of SR 520 project alternatives. Locations evaluated included east of Foster Island, Foster Island, south of Marsh Island, and the Montlake shoreline. The designs evaluated included a full diamond interchange, a three-level interchange, and a half-diamond interchange that was paired with another half diamond at the existing Montlake interchange location. Through the screening process, WSDOT concluded that the full diamond interchange south of Marsh Island was the only Pacific Street interchange option that should move forward into the Draft EIS.

After WSDOT completed the screening evaluation of potential Pacific Street Interchange options, several of the resource agencies that regulate aquatic resources requested that WSDOT further evaluate a Montlake shoreline alignment because of the agencies' concerns about potential negative effects on aquatic resources with the proposed Pacific Street interchange location, especially habitat to Endangered Species Act (ESA)-protected salmonids. WSDOT complied with this request and did a comparative analysis of the two alignments.

After the comparative analysis was completed, WSDOT concluded that the Montlake shoreline alignment would have greater effects on parks and historic resources protected by Section 4(f) the Department of Transportation Act of 1966 (49 USC Section 303). Given the stringent requirements of Section 4(f) and after considering effects to other social and environmental resources, WSDOT determined that the Montlake shoreline alignment for the Pacific Street interchange was not a viable option. This determination was based on the conclusion that locating the same interchange configuration in the proposed location south of Marsh Island was a feasible and prudent way to achieve better transportation benefits with less overall impact to Section 4(f) resources. In addition, the Montlake shoreline alignment would have greater neighborhood effects than the proposed location. These issues were found to outweigh the potential effects to ESA-listed salmonids raised as an issue by the resource agencies. As a result, WSDOT decided to move forward with the Pacific Street interchange south of Marsh Island and decided against continuing to evaluate the Montlake shoreline alignment in the Draft EIS.

If the Pacific Street interchange is chosen to be part of the Preferred Alternative, WSDOT would continue to evaluate the location and design of the interchange with the goal of further minimizing environmental effects.

Why did we consider Seattle options to the 6-Lane Alternative?

Within Seattle, the SR 520 corridor extends from the I-5 interchange to Lake Washington and encompasses two major interchanges at Montlake Boulevard and Lake Washington Boulevard, respectively. The Draft EIS evaluates two build alternatives for replacing SR 520 that would rebuild the highway completely: the 4-Lane Alternative and the 6-Lane Alternative. As mentioned above, in late 2004/early 2005,

neighborhoods adjacent to SR 520 in Seattle expressed concern that that the 6-Lane Alternative was too wide through the corridor and that, also, the 6-Lane Alternative did not facilitate easy transfers between transit on SR 520 and the planned Sound Transit Link light rail station near Husky Stadium. While working with community leaders, WSDOT identified the following community-based goals:

- Narrow the width of the 6-Lane Alternative
- Improve transit connections
- Improve HOV access
- Design the project to enhance local communities
- Design a facility that is structurally feasible and cost effective
- Preserve options for future high-capacity transit
- Provide a better connection to the proposed Sound Transit Link light rail station at Husky Stadium

How did we identify the 6-Lane Alternative options?

To address community and agency concerns and interests, WSDOT convened two workshops in the spring of 2005 to brainstorm a list of possible design options for the 6-Lane Alternative that could (1) reduce the width of the 6-Lane Alternative; (2) improve transit operations in the corridor; and (3) enhance local communities.

Workshop participants included experts in the fields of transportation, construction, and context sensitive design who met over 3 days. There were four focus groups at the workshop:

- The **transit service group** explored possible transit service changes and the effects along the corridor. These changes included evaluating the removal of transit stops and direct access opportunities.
- The highway operations group looked at opportunities to reduce the width of the 6-Lane Alternative throughout the corridor.
- The bridge design and construction group focused on the feasibility of design, construction, and scheduling techniques, primarily

centering on the rehabilitation, retrofit, and reuse of existing structures as compared to complete replacement.

- The context sensitivity and community issues group considered and made recommendations for design options and design opportunities that would help the facility better fit into adjacent neighborhoods.

Key findings from these focus groups were used to formulate various design options that would reduce the overall footprint while maintaining safety, mobility, and operational efficiency along the corridor. Design options were developed for the corridor by exploring different lane configurations, interchange designs, transit applications, and context sensitivity.

The list of options identified to be carried forward for analysis was then evaluated through a screening process. The screening process for the various design options to the 6-Lane Alternative was modeled on the first-level screening analysis performed by the Trans-Lake Washington Study Committee in order to ensure consistency with the alternatives selection for the Draft EIS.

What options to the 6-Lane Alternative in Seattle did WSDOT study?

As described above, WSDOT formulated various design options for the 6-Lane Alternative that would reduce the overall footprint while maintaining safety, mobility, and operational efficiency along the corridor. Most of these involved either modifying the existing Montlake interchange or creating a new interchange to either completely or partially replacing it.

Montlake Interchange

WSDOT initially focused on modifications that could be made to the design of the existing Montlake interchange. The interchange is one of the widest points on SR 520 in Seattle and also affects the width of the Portage Bay Bridge. One of the reasons the 6-Lane Alternative is so wide at this location is to accommodate the large volume of traffic that uses the interchange. Over 60,000 vehicles a day use the Montlake and Lake Washington Boulevard ramp systems, which is 55 percent as many vehicles as use the SR 520/I-5 interchange.

The interchange design also affects the width of the Portage Bay Bridge. The 6-Lane Alternative includes a transit stop at the center of the highway, under the Montlake lid, that requires an acceleration lane on the Portage Bay Bridge to provide sufficient room for buses re-entering the highway to reach a safe merging speed. In addition, the short distance between the Montlake interchange and the I-5 interchange requires the addition of auxiliary lanes between the interchanges. Under existing conditions, the limited distance between the Montlake interchange and the I-5 ramps creates dangerous traffic weaving movements as westbound drivers try to change lanes within a short distance on an uphill grade.

The workshops WSDOT convened in 2005 built upon earlier efforts to redesign the Montlake interchange. As part of the initial design process for the 6-Lane Alternative, WSDOT looked at 10 different interchange configurations with the goal of minimizing the size of the interchange while providing acceptable transportation performance. Ideas for design options that would modify the Montlake interchange design were evaluated by comparing them to the 6-Lane Alternative and also by comparing them to each other.

The workshop process yielded two design options for the Montlake interchange – the “No Montlake Freeway Transit Stop” option and the “Second Montlake Bridge” option. The “No Montlake Freeway Transit Stop” option removes the Montlake transit stop on SR 520, narrowing the footprint of SR 520 through the Montlake neighborhood by as much as 40 feet, and eliminating the need for a transit acceleration lane on the Portage Bay Bridge. The “Second Montlake Bridge” option eliminates the freeway transit stop and adds a second parallel bridge across the Montlake Cut to help facilitate transit movement and access to the University of Washington and northeast Seattle. These two options represent the two most feasible options for modifying the existing interchange at Montlake, and were carried forward for further evaluation in the Draft EIS.

Pacific Street Interchange

While in the process of looking at different designs for the Montlake interchange, the Montlake community suggested a completely different proposal: to build a signature bridge through Portage Bay, high above the neighborhood, and relocate the existing Montlake interchange farther east near the Arboretum. Under this “high-level” bridge proposal, the new interchange would directly connect SR 520 to

Montlake Boulevard on the north side of the Montlake Cut at Pacific Street. This interchange would serve the large percentage of the people currently exiting at the Montlake Boulevard that are going to and from points north of the Montlake Cut. In addition, the Montlake Boulevard and Pacific Street intersection is the location of the planned Sound Transit Link light rail station. The community's proposal also included the Lake Washington Boulevard interchange in a configuration similar to what is proposed in the 6-Lane Alternative.

WSDOT worked with the Montlake community to develop their ideas related to this proposal and determined, through a series of meetings, that community support for the new bridge focused mainly on replacing the Montlake interchange with a new interchange connecting to Pacific Street. After additional design analysis, WSDOT determined that a new interchange, achieving this goal, could be added east of Montlake Boulevard without having to construct a high level bridge. With this new interchange design concept, it was also possible to combine the existing Lake Washington Boulevard interchange with the new interchange, thereby improving traffic operations. WSDOT continued to evaluate the interchange, known as the Pacific Street interchange, as part of the process for developing design options for the 6-Lane Alternative.

What design variations did we consider for the Pacific Street interchange?

Because the Pacific Street interchange is a completely new facility in a new location, WSDOT explored a number of different possibilities for it. Multiple interchange locations and configurations for this concept were evaluated; ultimately, three different design configurations of the Pacific Street interchange were developed and screened. These design variations are described below.

In general, all of the variations WSDOT considered have some common elements. All include a new interchange east of the existing Montlake interchange, and all include a roadway that extends from the new interchange to the intersection of Montlake Boulevard and Pacific Street near Husky Stadium. A new bridge over the Lake Washington Ship Canal navigation channel is also a part of each Pacific Street interchange configuration.

The clearance required over the navigation channel is determined by two research vessels that pass through the Montlake Cut. One is owned by the National Oceanic and Atmospheric Administration (NOAA) and the other is owned by the University of Washington. Both vessels require a vertical clearance of 110 feet. Preliminary discussions with the U.S. Coast Guard indicate that they will consider whether these ships have an “essential use” in north Lake Washington before establishing a new governing clearance. The governing clearance would be evaluated by the U.S. Coast Guard as part of the bridge construction permit and would include public input, consistent with Title 33 of the Code of Federal Regulations, Navigation and Navigable Waters (33 CFR Chapter 1, Part 115). WSDOT considered the vertical clearance of 110 feet as a design criterion for all the Pacific Street interchange design variations. However, designs that cannot maintain that clearance were not dismissed solely because of this issue, as a lower clearance may be possible in the future.

Interchange Locations

South of Marsh Island

An area south of Marsh Island is the location currently proposed for the Pacific Street interchange. In general, the Pacific Street Interchange option would remove the existing Montlake transit stop and consolidate the Montlake and Lake Washington Boulevard interchanges into a single interchange. The new interchange would be located approximately 2,100 feet to the east of the existing Montlake interchange, primarily over the WSDOT-owned peninsula. A new street would extend from Lake Washington Boulevard (south of SR 520), over Union Bay, to Pacific Street (near the Husky stadium).

East of Foster Island

WSDOT also considered placing the Pacific Street interchange east of Foster Island. However, this location was eliminated and not advanced through the screening process based on several factors: the inability to build ramps to and from Lake Washington Boulevard; the extended length of the bridge required over Union Bay (4,000 feet versus 1,100 feet for the location south of Marsh Island); and, greater effects to aquatic habitat that would occur with a longer bridge.

Foster Island

WSDOT avoided placing the Pacific Street interchange directly over Foster Island because of the high probability of cultural resources. An alignment was not developed for this location.

Montlake Shoreline

WSDOT also avoided the Montlake shoreline as a location for the Pacific Street interchange. Putting the interchange in the East Montlake neighborhood was not consistent with several of the goals used to develop the 6-Lane Alternative options, including “reducing the width of the corridor” and “enhancing local communities.” As such, an alignment was not developed during the initial screening process.

Interchange Configurations

The three interchange configurations described below were considered for the location south of Marsh Island. All three were carried through the screening process.

Full Diamond Interchange

This design option would consolidate the Montlake and Lake Washington Boulevard interchanges into a single, full diamond interchange. This interchange would provide full access to and from SR 520 and would also include HOV-lane direct access to and from the east. The Montlake transit stop would not be replaced. A new street would extend through the interchange from Lake Washington Boulevard (south of SR 520), over Union Bay, to Pacific Street (near the Husky stadium). To ensure adequate clearance for large ships, the bridge would provide a minimum of 110 feet of vertical clearance above the navigation channel just east of the Montlake Cut. Exhibit 1 shows the location and configuration for the full diamond Pacific Street interchange.

3-Level Interchange

This design option is similar to the full diamond interchange in that it would close the existing Montlake interchange and relocate it to the east. The interchange would be in the same location and require the same vertical clearance above the navigation channel. However, instead of the on- and off-ramps meeting in a diamond formation, the ramps would be multi-level to allow free flow of traffic. These ramps would extend further over Foster Island as compared to the full diamond interchange. Another difference from the full diamond interchange is

that access to Lake Washington Boulevard would only be to and from the east on SR 520.

Half-Diamond Interchange

This design option would rebuild the existing Montlake interchange into a half-diamond interchange and would add a new half-diamond Pacific Street interchange. The half-diamond at Montlake Boulevard would serve SR 520 traffic to and from the west, while the half-diamond at Pacific Street would serve SR 520 traffic to and from the east. Drivers would also access Lake Washington Boulevard through the Pacific Street interchange.

How were the options to the 6-Lane Alternative screened?

WSDOT evaluated the range of potential design options identified for the 6-Lane Alternative in a screening process using the criteria first developed in October 2000 for first-level screening in the Trans-Lake Washington Project. The screening criteria for alternatives selection were approved by both the project's Executive Committee and the resource agencies that are part of the Signatory Agency Committee Agreement. The first-level screening process was used to (1) eliminate options that did not meet the project's purpose and need, and (2) to qualitatively and comparatively evaluate whether an option would generate environmental effects that could not be reasonably avoided, minimized, or mitigated. The criteria reflected three main categories:

- Transportation effectiveness
- Environmental effects
- Cost

The transportation effectiveness and environmental effects of the design options were compared to those of the 6-Lane Alternative to ensure that the options carried forward would improve the 6-Lane Alternative in one or both of these categories. The interchange-specific configurations for each design option were also compared to each other, with the goal that the final design options carried forward for further environmental review in the Draft EIS were viable options that provided the greatest possible transportation benefit while minimizing effects to the environment to the greatest extent possible.

Transportation Effectiveness Criteria

The transportation effectiveness criteria asked the question: “Will the option be effective for improving mobility for people and goods?” To answer this question, three criteria were evaluated, consistent with the purpose and need for the SR 520 project:

- Improves mobility
- Operates reliably and safely
- Compatible with existing regional transportation system plans

Environmental Effects Criteria

The environmental effects criteria asked the question: “Can we reasonably avoid, minimize, or mitigate environmental effects?” To answer this question, six key environmental criteria were evaluated:

- Wetland effects
- Effects to habitat for ESA species
- Park effects
- Historic resource effects
- Residential and commercial displacements
- Neighborhood disruption/proximity effects/community cohesion

Cost Criteria

Costs of the options were estimated generally. Cost was used to evaluate relative differences between options and was not used to eliminate an option from further consideration.

Rating Scale

The rating scale used to screen the options was based on the rating system used for the first-level screening approach, and was used to indicate the potential performance of an option in terms of transportation effectiveness and environmental effects, as compared to the 6-Lane Alternative without the option.

Worst					Best
1	2	3	4	5	
Least effective when compared to base 6-Lane, or more effects	Less effective than the base 6-Lane, or moderately more effects	Effectiveness is similar to the base 6-Lane, or effects are also similar	Moderately more effective than the base 6-Lane, effects are decreased	More effective than the base 6-Lane, or environment is improved	

What were the results of the screening evaluation for the proposed Pacific Street Interchange?

The results of the screening evaluation are shown in Exhibits 2, 3, and 4.

For the screening evaluation presented in Exhibit 2, the design configuration carried forward is the one now known as the Pacific Street Interchange option.

Exhibit 2. Screening Evaluation, Full Diamond (Pacific Street Interchange Option)

Screening Evaluation		
Transportation Effectiveness: Will the option be effective in improving mobility for people and goods?		
Criteria	Summary	Rating
Improves mobility	<ul style="list-style-type: none"> Montlake Blvd traffic would be reduced by 45 percent. Intersection connection directly to Pacific Street would improve travel times to and from SR 520. Provides access to and from Lake Washington Blvd. for both eastbound and westbound SR 520. Existing congested arterial intersections along Montlake Blvd would be avoided. 	5
Operates reliably and safely	<ul style="list-style-type: none"> Urban freeway interchange spacing guidelines between I-5 and new interchange would be achieved. Eastbound/westbound (EB/WB) auxiliary lanes would no longer be required. Freeway operations would be improved over 6-Lane Alternative by removing auxiliary lanes and eliminating complex weaving movements. 	4
Compatible w/ regional transportation system	<ul style="list-style-type: none"> No change from base 6-Lane Alternative. 	3
Environmental Effects: Can we reasonably avoid, minimize, or mitigate environmental effects?		
Criteria	Summary	Rating
Wetlands	<ul style="list-style-type: none"> Increases wetland effects at Marsh Island, Foster Island, and WSDOT-owned peninsula. 	2
ESA Habitat	<ul style="list-style-type: none"> Bridge over Union Bay would increase shading and add new columns in anadromous fish migratory route in Lake Washington, potentially increasing predator habitat. 	1

Exhibit 2. Screening Evaluation, Full Diamond (Pacific Street Interchange Option)

Screening Evaluation		
Section 4(f) Resources		1
(Parks)	<ul style="list-style-type: none"> Reduces some park effects at East Montlake and McCurdy Parks. More acquisition of park land in Marsh Island and Foster Island. 	
(Historic)	<ul style="list-style-type: none"> Less acquisition of land within National Register of Historic Places (NRHP)-eligible Montlake Historic District, new proximity effect (views) to district. Less acquisition of land within NRHP-eligible Montlake Historic District, new proximity effect (views) to district. 	2
Displacements	<ul style="list-style-type: none"> Assumes demolition of Museum of History and Industry (MOHAI) building; opportunity exists to avoid or minimize this effect. Avoids 76 service station. 	4
Neighborhood Effects	<ul style="list-style-type: none"> Removing Montlake interchange would improve neighborhood cohesion. Montlake Blvd south of the University of Washington campus becomes a local street with reduced traffic. Surrounding neighborhoods would experience changes in existing views. 	4

The 3-Level Interchange option presented in Exhibit 3 was eliminated based primarily on the greater visual effects (e.g., blocked views) associated with the increased structural bulk of multi-level ramps as well as on increases in effects to the Arboretum in the Foster and Marsh Island areas, as compared to the full diamond interchange.

Exhibit 3. Screening Evaluation, 3-Level Interchange

Screening Evaluation		
Transportation Effectiveness: Will the option be effective in improving mobility for people and goods?		
Criteria	Summary	Rating
Improves mobility	<ul style="list-style-type: none"> Montlake Blvd traffic would be reduced by 45 percent. Intersection connection directly to Pacific Street would improve travel times to and from SR 520. Existing congested arterial intersections along Montlake Blvd would be avoided. 	4
Operates reliably and safely	<ul style="list-style-type: none"> Urban freeway interchange spacing between I-5 and new interchange would be improved. 	4
Compatible w/ regional transportation system	<ul style="list-style-type: none"> No change from base 6-Lane Alternative. 	3
Environmental Effects: Can we reasonably avoid, minimize, or mitigate environmental effects?		
Criteria	Summary	Rating
Wetlands	<ul style="list-style-type: none"> Increases wetland effects at Marsh 	2-

Exhibit 3. Screening Evaluation, 3-Level Interchange

Screening Evaluation		
	<ul style="list-style-type: none"> Island, Foster Island, and WSDOT-owned peninsula. Wetland effects are slightly more on Foster Island than under the full diamond interchange. 	
ESA Habitat	<ul style="list-style-type: none"> Bridge over Union Bay would increase shading and add new columns in anadromous fish migratory route in Lake Washington, potentially increasing predator habitat. 	1
Section 4(f) Resources (Parks)	<ul style="list-style-type: none"> Reduces some park effects at East Montlake and McCurdy Parks. More acquisition of park land in Marsh Island and Foster Island; Arboretum effects are slightly greater than under full diamond interchange. 	1-
(Historic)	<ul style="list-style-type: none"> Increases disturbance along Foster Island (potential tribal burial ground). Less acquisition of land within NRHP-eligible Montlake Historic District, new proximity effect (views) to district. 	2
Displacements	<ul style="list-style-type: none"> Assumes demolition of MOHAI building; opportunity exists to avoid or minimize this effect. Avoids 76 service station. 	4
Neighborhood effects	<ul style="list-style-type: none"> Removing Montlake interchange would improve neighborhood cohesion. Montlake Blvd south of the University of Washington campus becomes a local street with reduced traffic. Surrounding neighborhoods would experience changes in existing views and noise levels. 	4

For the Half-Diamond Interchange screening evaluation presented in Exhibit 4, the design option was eliminated primarily because the two half-diamond interchanges would provide less mobility benefits than the full diamond interchange, and the environmental effects would be greater. This option would have most of the environmental effects of the 6-Lane Alternative interchange at Montlake plus most of the environmental effects of the full diamond Pacific Street interchange.

Exhibit 4. Screening Evaluation, Half-Diamond Interchange

Screening Evaluation		
Transportation Effectiveness: Will the option be effective in improving mobility for people and goods?		
Criteria	Summary	Rating
Improves mobility	<ul style="list-style-type: none"> Montlake Blvd traffic would be reduced, but not as much as the full diamond interchange. Intersection connection directly to Pacific Street would improve travel times to and from SR 520. 	4
Operates reliably and safely	<ul style="list-style-type: none"> There would be some reliability and safety improvements, but less than the full diamond interchange. 	4
Compatible w/ regional transportation system	<ul style="list-style-type: none"> No change from base 6-Lane Alternative. 	3
Environmental Effects: Can we reasonably avoid, minimize, or mitigate environmental effects?		
Criteria	Summary	Rating
Wetlands	<ul style="list-style-type: none"> Increases wetland effects at Marsh Island, Foster Island and WSDOT-owned peninsula. 	2
ESA Habitat	<ul style="list-style-type: none"> Ramp across Ship Canal would add new columns in anadromous fish migratory route in Lake Washington, potentially increasing predator habitat. 	1
Section 4(f) Resources (Parks)	<ul style="list-style-type: none"> Reduces some park effects at East Montlake and McCurdy Parks. More acquisition of park land in Marsh Island and Foster Island. 	1
(Historic)	<ul style="list-style-type: none"> Increases disturbance along Foster Island (potential tribal burial ground). Less acquisition of land within NRHP-eligible Montlake Historic District, new proximity effect (views) to district. 	2
Displacements	<ul style="list-style-type: none"> Avoids demolition of MOHAI building, 76 service station, and part of NOAA building. 	4
Neighborhood effects	<ul style="list-style-type: none"> Some improvement in Montlake neighborhood cohesion. Surrounding neighborhoods would experience changes in existing views and noise levels. 	3+

What additional analysis of the Pacific Street Interchange did we perform?

After WSDOT completed the screening evaluation described above, several of the resource agencies that regulate aquatic resources, concerned about the potential negative effect on aquatic resources of the proposed Pacific Street interchange, requested that WSDOT evaluate a Montlake shoreline alignment further. This alignment was originally termed the “western shift” because it would locate the Pacific Street interchange west of the proposed location, along the shoreline. In

response to their request, WSDOT developed the Montlake shoreline alignment to a preliminary level of detail in order to advance it through the screening process and determine whether this alignment could be developed more fully as a 6-Lane Alternative option. The design and the results of our screening evaluation for the Montlake shoreline alignment are described below and shown in Exhibit 5.

Exhibit 5. Screening Evaluation, Pacific Street Interchange with Montlake Shoreline Alignment

Screening Evaluation		
Transportation Effectiveness: Will the option be effective in improving mobility for people and goods?		
Criteria	Summary	Rating
Improves mobility	<ul style="list-style-type: none"> Montlake Blvd traffic would be reduced by 45 percent. Intersection connection directly to Pacific Street would improve travel times to and from SR 520. Provides access to and from Lake Washington Blvd. for both eastbound and westbound SR 520. Existing congested arterial intersections along Montlake Blvd would be avoided. 	5
Operates reliably and safely	<ul style="list-style-type: none"> Urban freeway interchange spacing between I-5 and new interchange would be similar to the base 6-Lane Alternative; EB and WB auxiliary lanes would be required. Interchange must be designed with a skew to align off-ramps with bridge. 	3
Compatible with regional transportation system	<ul style="list-style-type: none"> No change from base 6-Lane Alternative. 	3
Environmental Effects: Can we reasonably avoid, minimize, or mitigate environmental effects?		
Criteria	Summary	Rating
Wetlands	<ul style="list-style-type: none"> Increases wetland effects at Marsh Island, Foster Island, East Montlake Park, and WSDOT-owned peninsula. 	2
ESA habitat	<ul style="list-style-type: none"> New bridge across Montlake Cut would shade anadromous fish migratory route. 	2
Section 4(f) Resources (Parks)	<ul style="list-style-type: none"> More total acquisition of park land (more in East Montlake Park, only partially offset by less land used in Arboretum). 	1-
(Historic)	<ul style="list-style-type: none"> Acquisition of part of the NRHP-eligible Montlake Historic District. Much greater proximity impacts to existing historic Montlake Bridge, NRHP-eligible Montlake Historic District and remaining park land in East Montlake Park. 	3+
Displacements	<ul style="list-style-type: none"> Demolishes MOHA; avoids 76 service station. 	3+
Neighborhood effects	<ul style="list-style-type: none"> Removing Montlake interchange would improve neighborhood cohesion in that part of Montlake neighborhood. Montlake Blvd south of the University of 	2

Exhibit 5. Screening Evaluation, Pacific Street Interchange with Montlake Shoreline Alignment

Screening Evaluation

Washington campus becomes a local street with reduced traffic.

- Interchange would be in different part of neighborhood, visual effects would be much greater because bridge structures would be out of scale with surroundings.
- Bridge over Montlake Cut would partially obstruct protected Rainier Vista view corridor.

Montlake Shoreline Alignment Design

The Montlake shoreline alignment would locate the diamond interchange approximately 1,300 feet to the east of the existing Montlake Boulevard interchange and eliminate the need for in-water columns in Union Bay. Exhibit 6 shows the preliminary location and configuration of the shoreline alignment interchange. This alignment also assumes removal of the existing Montlake transit stop and Montlake interchange. A new street between Lake Washington Boulevard and Pacific Street would extend along the shoreline of East Montlake Park in the proposed Montlake Historic District and span the Montlake Cut.

Unlike the other designs considered for the Pacific Interchange, the Montlake shoreline alignment does not accommodate a 110-foot vertical clearance for vessels traveling through the Montlake Cut to Lake Washington. For the Montlake shoreline alignment, a maximum vertical clearance of 70 feet over the Montlake Cut is required to achieve the 7 percent roadway grade recommended under WSDOT design standards. Designing the roadway with a higher clearance would result in a roadway grade steeper than the design standard (e.g., up to 16 percent for a 110 foot clearance), which would pose safety risks for drivers, pedestrians, and bicyclists.

Shifting the Pacific Street interchange west along the East Montlake shoreline would not substantially increase the merging distance between I-5 and the existing Montlake interchange. As such, the existing safety issues for merging traffic would need to be addressed by adding an auxiliary lane in each direction over Portage Bay, increasing the roadway width by 24 feet.

How do the current Pacific Street Interchange designs and the Montlake shoreline alignment compare?

WSDOT developed the Montlake shoreline alignment to a preliminary level of detail in order to facilitate a qualitative and comparative screening analysis of the key transportation and environmental criteria for comparison with the proposed Pacific Street interchange location south of Marsh Island.

Transportation Effectiveness

Compared to the 6-Lane Alternative, both location options for the Pacific Street interchange would improve mobility on Montlake Boulevard and allow direct access to SR 520 from Pacific Street. Both location options could also provide acceptable grades for driver safety (if a 70-foot governing clearance were approved for the shoreline alignment).

The currently proposed Pacific Street interchange would be located far enough from I-5 that drivers would have ample room to merge and an auxiliary lane would not be required; this would allow the Portage Bay Bridge to be narrower by two lane widths (24 feet). With the Montlake shoreline alignment, the location would be close enough to the existing Montlake interchange that, as for the 6-Lane Alternative, auxiliary lanes would be required to provide adequate distance to accelerate and find a gap in traffic in order to allow safe merging.

Also, in order to meet intersection design standards and achieve acceptable traffic operations, the shoreline alignment interchange would need to be designed so that the westbound and eastbound off-ramps curve out to the north and south respectively. This would result in a retaining wall adjacent to Lake Washington Boulevard, which is designated a scenic route by the City of Seattle.

Because the Montlake shoreline alignment would require auxiliary lanes similar to the 6-Lane Alternative, it was rated as providing the same operation and safety benefit as the 6-Lane Alternative. The proposed Pacific Street interchange design does not require the auxiliary lanes, so it was rated as being slightly better than the 6-Lane Alternative. Both design concepts were equal in the other two transportation screening criteria.

Ecosystem Effects – Wetlands and Endangered Species Habitat

Both interchange locations would result in larger areas of wetlands being affected than under the 6-Lane Alternative. The majority of additional wetland and wetland buffer area affected under the currently proposed Pacific Street interchange would be within the Arboretum (Marsh and Foster Islands) and the WSDOT-owned peninsula. Under the Montlake shoreline alignment, the majority of additional wetland and wetland buffer area that would be affected is in East Montlake Park and along the park shoreline. Specific wetland effects were not quantified for the Montlake shoreline alignment, but the total area of wetland and wetland buffer was estimated to be similar to the proposed Pacific Street interchange alignment. Therefore, both configurations were given similar ratings for wetland effects.

The proposed Pacific Street interchange alignment would affect more aquatic habitat than the 6-Lane Alternative or the Montlake shoreline alignment due to the four 25-foot-wide by 25-foot-wide support columns that would be placed in Union Bay. The Montlake shoreline alignment would not require these large columns in Union Bay. Both interchange locations would increase over-water coverage (i.e., shading). The amount of shaded area would be greater under the proposed interchange alignment due to the longer bridge span; the intensity of contrast could be lower than the Montlake shoreline alignment, depending on the height of the bridge span. The addition of in-water columns and shaded (or partially shaded) areas could increase the risk of predation on salmon from predator species. These potential effects are of particular concern because of the location of the bridge near the Montlake Cut, where all the ESA-listed salmonid species migrating in and out of the Lake Washington system must pass.

After considering the potential effects described above, WSDOT determined that the proposed Pacific Street interchange alignment would have more negative effects on ESA habitat than the 6-Lane Alternative. The Montlake shoreline alignment would have fewer effects on ESA habitat than the proposed alignment, but moderately more ESA habitat effects than the 6-Lane Alternative.

Neighborhood Effects

To evaluate neighborhood effects during our screening process, we considered noise, visual effects, and community cohesion.

Noise

The magnitude of noise effects would likely be similar with both the Pacific Street interchange and the Montlake shoreline alignment. However, the affected locations would be different. The Pacific Street interchange would slightly increase noise in the Arboretum near Marsh Island. With the Montlake shoreline alignment, the roadway would extend through McCurdy and East Montlake parks, about 200 feet from the nearest residences. Because of the proximity of the roadway to the neighborhood homes, it is likely that noise levels within these parks and at adjacent residences would increase slightly, even with implementation of noise mitigation measures. Other areas would have noise levels similar to the 6-Lane Alternative.

Visual

The primary visual difference between the proposed Pacific Street interchange alignment and the Montlake shoreline alignment would be the location of the roadway that passes through the interchange connecting Lake Washington Boulevard and Pacific Street. With the Pacific Street interchange, the roadway would be on a bridge that extends the length of the WSDOT-owned peninsula, across Marsh Island and Union Bay, and into the Husky Stadium parking lot on the University of Washington campus. With the Montlake shoreline alignment, the bridge for the roadway would parallel Lake Washington Boulevard, extend along the shoreline of East Montlake Park, across the Montlake Cut, and into the Husky Stadium parking lot.

With the Pacific Street interchange, Marsh Island in the Arboretum would have a bridge crossing it where there is not one today. The new bridge would intersect the island perpendicularly, so only a small portion of the island would have a bridge overhead. Other areas, such as the Montlake neighborhood and East Montlake Park, would have the new bridge as a mid-ground or distant view. The University of Washington's Rainier Vista, which encompasses a protected view of Mount Rainier important to context and setting of the University of Washington, would not be affected by the proposed Pacific Street Interchange option. Views from the Waterfront Activities Center (WAC) and Canoe House on the University of Washington campus would be affected by the proposed bridge over Union Bay.

The Montlake shoreline alignment would place the new bridge directly in East Montlake Park along the Union Bay shoreline (McCurdy Park would be eliminated). Because of this, the visual character of the park

would be completely altered. The bridge would be out of scale with the surroundings and would loom over park visitors for the whole length of the shoreline in the park. In the Arboretum, the bridge on the shoreline alignment would be less visible from most areas than with the Pacific Street interchange. Similarly, the interchange and bridge would be extremely prominent from both the adjacent residences. The highway would also loom above these residences and dominate their foreground views.

The University of Washington's Rainier Vista would also be affected by the Montlake shoreline alignment because the bridge along the shoreline would intrude into views of the mountain from the campus. Views from the Canoe House on the University of Washington campus would be affected by a new bridge over the Montlake Cut similarly to the Pacific Street interchange. Views from the WAC would be affected less than the Pacific Street interchange because the Montlake shoreline alignment would be less prominent from this location.

Community Cohesion

Both the proposed Pacific Street Interchange option and the Montlake shoreline alignment would improve community cohesion in the vicinity of the existing Montlake interchange by removing the interchange and a substantial amount of the traffic accessing SR 520 from the neighborhood. However, the shoreline alignment would be very disruptive to the eastern part of the neighborhood by creating a new interchange and elevated roadway on that side of the neighborhood, approximately 200 feet from the nearest residences.

After considering the potential effects of both alignments on noise, the visual environment, and community cohesion, we determined that the Pacific Street interchange would have substantially less effect on neighborhoods than the Montlake shoreline alignment.

Displacements

Both the proposed Pacific Street interchange and the Montlake shoreline alignment would improve upon the 6-Lane Alternative by not removing the 76 service station near the existing Montlake interchange. The Montlake shoreline alignment would likely require more land from the NOAA Northwest Fisheries Science Center than the Pacific Street interchange due to the proximity of the new interchange and the auxiliary lanes that would be required between the new interchange and the I-5 interchange. Both of the designs currently require the

acquisition of the Museum of History and Industry (MOHAI); however, the Pacific Street interchange requires only a very small part of the building and it may be possible to avoid it through additional design. After considering these findings, WSDOT determined that the Montlake shoreline alignment would have slightly greater displacement effects than the Pacific Street interchange.

Section 4(f) Effects – Parks and Historic Resources

Section 4(f) of the Department of Transportation Act of 1966 (49 USC Section 303) prohibits the Federal Highway Administration (FHWA) from approving a project or program that uses land from a significant public park, recreation area, wildlife or waterfowl refuge, or historic site unless:

1. There is no feasible and prudent alternative to the use of the land.
2. The project includes all possible planning to minimize harm to the property.

Public parks and recreation areas are considered Section 4(f) resources if they:

- Are considered to be significant by the federal, state, or local official having jurisdiction over the facility;
- Are intended for public recreational purposes and function as such; and
- Are open and available for use by all members of the public (23 CFR 771.135).

A “use” of Section 4(f) resources occurs when:

- Land is permanently incorporated into a transportation facility (in other words, the land is acquired to accommodate proposed improvements);
- There is a temporary occupancy of land that is adverse in terms of the statute's preservationist purposes; or
- Proximity effects are so severe that the protected activities, features, or attributes that qualify a resource for protection under Section 4(f) are substantially impaired and/or diminished (commonly referred to as a "constructive use" 23 CFR 771.135).

A constructive use occurs when:

- The proximity of the proposed project substantially impairs aesthetic features or attributes of a resource protected by Section 4(f), where such features are considered important contributing elements to the value of the resource. Examples of substantial impairment to visual or aesthetic qualities would be the location of a proposed transportation facility in such proximity that it substantially detracts from the setting of a park or historic site which derives its value in substantial part due to its setting.
- The projected noise level increase attributable to the project substantially interferes with the use and enjoyment of a noise-sensitive facility of a resource protected by Section 4(f), such as enjoyment of a historic site where a quiet setting is a generally recognized feature or attribute of the site's significance, or enjoyment of an urban park where serenity and quiet are significant attributes (23 CFR 771.135).

If a feasible and prudent alternative that avoids such use is identified, it must be selected. If such use is unavoidable, then possible measures that minimize harm to the property must be identified and incorporated into the proposed project.

Construction of the Pacific Street interchange would affect Section 4(f) parks, recreational facilities, and historic resources in the vicinity of the interchange. Effects to Section 4(f) resources from the proposed Pacific Street interchange alignment and the Montlake shoreline alignment are discussed comparatively below. With the exception of several distinct park areas, effects are discussed qualitatively.

Park and Recreational Facilities

Section 4(f) park lands affected by the Pacific Street interchange would include East Montlake and McCurdy parks, and Marsh and Foster islands within the Arboretum.

Exhibit 7 provides estimates of acres of park lands that would be affected under the proposed Pacific Street interchange and Montlake shoreline alignment interchange locations.

Exhibit 7. Direct “Use” Estimates of Section 4(f) Park and Recreational Resources, Proposed Pacific Street Interchange and Montlake Shoreline Alignments¹

Affected Section 4(f) Park Resources	Pacific Street Interchange Proposed Alignment (acres)	Pacific Street Interchange with a Montlake Shoreline Alignment (acres)
East Montlake Park (7.1 acres)	0.4	2.9
McCurdy Park (1.5 acres)	0.6	1.5
Foster Island (31.5 acres)	1.8	0.9
Marsh Island (4.15 acres)	0.5	>0.1
Burke-Gilman Trail	>0.1	>0.1
University of Washington Waterfront Activities Center	0.2	No acquisition
Total	3.6	5.5

Source: WSDOT, 2006

¹ Acreages are estimated based on preliminary design information.

In general, shifting the interchange to the west along the Montlake shoreline would reduce “direct use” effects to the Arboretum and increase direct use effects to East Montlake and McCurdy parks. The Montlake shoreline alignment would permanently occupy about 2.9 acres of East Montlake Park, including virtually the entire shoreline, and eliminate McCurdy Park completely. Also, the visual effects from the location of the new bridge on the shoreline of East Montlake Park would greatly detract from the setting of the park. FHWA would evaluate whether these visual effects would be considered a “constructive use” impact under Section 4(f) regulations.

The proposed Pacific Street interchange would occupy about 2.5 acres less of East Montlake Park than the Montlake shoreline alignment and slightly less than half of McCurdy Park. About 0.9 more acre of Foster Island and 0.5 more acre of Marsh Island would be affected under the proposed Pacific Street interchange than under the Montlake shoreline alignment. Overall, the shoreline alignment would require about 1.9 total acres more of Section 4(f) park and recreation resources than the proposed Pacific Street interchange alignment.

Other recreational facilities affected by a new interchange would include several waterfront trails, a small section of the Burke-Gilman Trail, and the University of Washington’s WAC. An estimated 0.18 acre area in the vicinity of the WAC could be occupied by the Pacific Street interchange; total direct effects on the WAC would depend on the final alignment of the new roadway. These effects would be similar for both the proposed alignment and the Montlake shoreline alignment.

Historic Resources

Section 4(f) historic resources affected by the Pacific Street interchange would include the National Register of Historic Places (NRHP)-eligible Montlake Historic District; the existing Montlake Bridge; the Montlake Cut; and several historic structures, including the MOHAI building, a building at the NOAA Northwest Fisheries Science Center (both within the historic district), and the University of Washington Canoe House (located on the north shore of the Montlake Cut).

MOHAI, the NOAA Northwest Fisheries Science Center, and the Canoe House would be affected under both the proposed Pacific Street interchange and the Montlake shoreline alignments. However, because of the auxiliary lanes that would be needed under the Montlake shoreline alignment, WSDOT would have to acquire more property at the NOAA facility. As described above, the Montlake shoreline alignment would require acquisition of park property within the historic district, which would constitute a direct use of both the district and the parks under Section 4(f). While it is possible to mitigate the acquisition of parks by creating new park land, it is not possible to create more historic district.

In addition, the shoreline alignment would result in comparatively greater visual intrusion on both the Montlake Bridge and the Montlake Cut. The addition of a new interchange and bridge would negatively alter the setting of the Montlake Historic District as described earlier. FHWA would evaluate whether these effects would be considered constructive use impacts under Section 4(f) regulations.

What was our conclusion about the proposed Pacific Street Interchange location?

WSDOT weighed the advantages and disadvantages of the Pacific Street interchange locations and configurations and determined that the proposed design located south of Marsh Island met the most number of community goals identified during the screening process for the 6-Lane Alternative options, generated the greatest transportation benefits to the SR 520 corridor, and offered the best mitigation opportunities for environmental effects that cannot be reasonably avoided. As such, the Pacific Street interchange location south of Marsh Island was carried forward as a 6-Lane Alternative option in the Draft EIS.

Both the Pacific Street interchange and Montlake shoreline alignment would achieve the overall purpose and need for the project; however, the proposed Pacific Street interchange would improve freeway ramp spacing over both the 6-Lane Alternative and Montlake shoreline alignment, thereby providing a greater assurance of safety to drivers and increased operational reliability.

Effects to habitat for ESA-listed species would be greater with the proposed Pacific Street interchange than they would with the Montlake shoreline alignment location. The Pacific Street interchange would have more over-water coverage than the Montlake shoreline alignment and the columns adjacent to the navigation channel in Union Bay may have the potential to become habitat for predators of juvenile salmonids.

The proposed Pacific Street interchange would have fewer negative effects on neighborhoods as compared to the Montlake shoreline alignment by minimizing the width of SR 520 through Seattle neighborhoods and avoiding the visual and noise effects related to placing tall bridge structures in the East Montlake neighborhood.

The proposed Pacific Street interchange location would also minimize effects on parks and historic resources as compared to the Montlake shoreline alignment. Given the stringent mandate to preserve public park and recreation lands under Section 4(f), FHWA, as lead federal agency, will be required to select a “feasible and prudent alternative” that results in the fewest impacts to Section 4(f) resources. Overall, the proposed Pacific Street interchange would result in less harm to Section 4(f) resources than the Montlake shoreline alignment.

Given the stringent requirements of Section 4(f) and after considering effects to other social and environmental resources, WSDOT determined that the Montlake shoreline alignment for the Pacific Street interchange was not a viable option. This determination was based on the conclusion that locating the same interchange configuration south of Marsh Island was a feasible and prudent way to achieve better transportation benefits with less overall impact to Section 4(f) resources. In addition, the Montlake shoreline alignment would have greater neighborhood effects. These issues were found to outweigh the potential effects to ESA-listed salmonids raised as an issue by the resource agencies. As a result, WSDOT decided to move forward with the Pacific Street interchange south of Marsh Island and decided against continuing to evaluate the Montlake shoreline alignment in the Draft EIS.

If the Pacific Street Interchange option is chosen to be part of the Preferred Alternative, WSDOT would continue to evaluate the location and design of the interchange with the goal of further minimizing environmental effects.